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STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FINAL REPORT

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SECTION 1.0

INTRODUCTION

1.1 WHAT IS A WATERSHED MANAGEMENT PLAN?

Significant improvements in the protection and restoration of the physical, chemical, and biological integrity of the nation's waters have been made in the last 25 years. The passage of the Clean Water Act and Safe Drinking Water Act has resulted in the control of pollution from "point sources" such as industrial waste and sewage treatment plants. However, until recently the federal laws have tended to focus on particular sources, pollutants, or water uses, and have not resulted in an integrated environmental management approach. Problems resulting from nonpoint pollution sources, habitat degradation, flooding, and wastewater overflows have not been resolved. These problems necessitate a comprehensive understanding of a complex system, and solutions that integrate disciplines and overlap political boundaries. This holistic, comprehensive approach is called a watershed management plan. The watershed management plan approach to improving the physical, chemical, and biological integrity of surface water is a three-part process. These three components include identifying the watershed's natural boundaries, applying the latest scientific methods to identify problems, and coordinating the improvements within social, political, and economic constraints.

- A watershed boundary incorporates all the land area that contributes stormwater runoff to a particular surface water body.
- In order to identify, characterize, and evaluate the problems within a watershed, the latest scientific tools, techniques, and theory must be utilized. The proposed solutions must include the latest and most cost-effective methods of watershed rehabilitation, integrating various scientific disciplines and expertise.
- Watersheds are seldom contained within a single political boundary. This necessitates a team approach, incorporating local, state, and federal agencies, as

well as the concerned public. Team members form a partnership and work together toward a common goal based on shared information, and an understanding of the priorities and responsibilities of all parties.

1.2 THE BENEFITS OF A WATERSHED MANAGEMENT APPROACH

Coordination of a watershed management plan is beneficial for environmental, financial, social, and administrative reasons. Managers from all levels of government will be better able to understand and reduce the cumulative effects of human activities in a watershed on pollution control, increased surface water runoff, fish and wildlife protection, drinking water protection, and other water resource programs when allowed to view the "big picture," rather than just their portion of the watershed. The most critical problems are identified, and priorities can then be set to allocate the available financial and human resources.

The watershed management approach also can result in significant savings by improving communication and coordination, which will in turn reduce costly duplication of efforts and conflicting actions. This cooperation gives an active voice in resource management to the people who depend on the area resources for their recreation, health, and overall quality of life.

1.3 THE STEVENSON CREEK WATERSHED

1.3.1 Watershed Location And Description

The Stevenson Creek Watershed, the largest and most urbanized watershed within the City of Clearwater, drains 6,286 acres in west central Pinellas County (refer to Figure 1.3-1). Of this area, 4,057 acres (65 percent) are within the Clearwater city limits. The remaining 35 percent of the basin is within the City of Dunedin (1,287 acres or 20%), unincorporated Pinellas County (859 acres or 14%) and the City of Largo (83 acres or about 1%).

(FIGURE 1.3-1)

Stevenson Creek discharges to Clearwater Harbor. The majority of the creek has been channelized or otherwise altered, and little of the historic floodplain remains intact. Land uses within the basin are predominantly medium- and high-density residential, commercial, and open space. Approximately 90 percent of the watershed has been developed, and the vast majority of the development occurred prior to the implementation of regulatory requirements for floodplain preservation, environmental protection, stormwater treatment and attenuation. Several developments have been constructed within the creek's floodplain and have experienced severe flooding. In addition, the creek and its tributaries experience moderate to severe erosion problems due to steep embankments, improper maintenance, highly erodable soils, and inadequate right-of-way.

1.3.2 Basin History

Land use changes within the Stevenson Creek Watershed over the last 100 years have been significant. A cursory history of the changes within the basin can be determined from a review of historic archives and aerial photography. Aerial photography dated

Figure 1.3-2 Stevenson Creek Bridge, near Clearwater, Fla., 1890.
(Photo courtesy of City of Clearwater Public Library)

1926 shows the Stevenson Creek Estuary to be much wider than it is now, approximately 1,000’ wide at the mouth, compared to only 700’ today. Prior to 1926, the original 19th Century wooden bridge connecting Clearwater to Dunedin, which spanned the entire estuary (Figure 1.3.2), was replaced with an earthen causway with a much narrower open span for Edgewater drive. The 1926 photography depicts a relatively intact floodplain and associated wetlands, with adjacent land uses predominantly agricultural, under development, or undeveloped. Some channelization had occurred within Spring Branch, and within Stevenson Creek between Drew Street and Druid Road. The east-west railroad that bisects the basin as well as the coastal railroad that borders the basin to the east had already been constructed. Most of the population at the time was concentrated within a ½-mile strip of land bordering Clearwater Harbor. Effects of the 1920’s land boom are evidenced by the numerous subdivision streets with sidewalks constructed throughout the interior portions of the watershed. However, by 1942, only a few homes had been built within these interior subdivisions. During the post-war boom of the 1950’s and 1960’s, the majority of the watershed was built out within these medium density residential subdivisions and commercial developments. Also during this period, portions of the Stevenson Creek estuary were filled in along its southern banks.

By 1974, over 95% of the developable area in the watershed had been developed or set aside as parks and golf courses, and the full length of Stevenson Creek and its tributaries had been channelized. Very little of the creek’s floodplain and associated wetlands remained intact. With the exception of the two golf courses bordering the creek, almost the entire floodplain of Stevenson Creek had been developed.

The majority of the land use changes within the watershed have been detrimental to water quality, flood protection, and wildlife habitat. Urban development has resulted in greater stormwater runoff volumes and peak flow rates, as well as the transport of sediments and pollutants into the creek. The effects of land use changes within the watershed on wildlife habitat are described in Section 2.2.

In response to severe flooding experienced within the watershed as a result of a storm event in July of 1987, a flood control study was commissioned by the City of Clearwater in April of 1988. In the study, a three-phase flood control project was developed for the main channel of Stevenson Creek. To date, two of the three phases of the project have been constructed, consisting of the main channel segments between Betty Lane and Jeffords Streets. The third phase, which included segments upstream of Jeffords Street, has not been constructed, primarily because of environmental concerns. Because the objective of the original study was focused on flood control on the main stem of Stevenson Creek, water quality and environmental enhancement/ protection needs and problems were not addressed. The tributaries and secondary drainage systems were not analyzed in detail, and the Spring Branch portion of the watershed was excluded from the original study.

1.4 PROJECT OBJECTIVES

The Stevenson Creek Watershed Management Plan has been initiated as the result of a cooperative agreement between the City of Clearwater and the Southwest Florida Water Management District (SWFWMD). Drainage improvements for enhanced stormwater quality and quantity are identified within the City of Clearwater Comprehensive Plan as areas of service deficiencies which must be addressed. Section 16.2 of the Plan states:

> *Objective – The City of Clearwater shall continue to develop watershed management plans which should seek to identify, evaluate, and implement the most cost effective and cost efficient programs for stormwater management, including stormwater quantity and quality…*

In addition to the municipal and regulatory involvement, the residents within the watershed have had an active role in the shaping of the watershed plan. Numerous suggestions and comments concerning management actions have been received from residents and other property owners in the area through documented reports and through the public meeting process. Public involvement is a very important component of this plan; watershed improvements cannot be realized without the willingness and cooperation of residents within the watershed boundaries.

The basic purpose of the management plan is to identify the causes and sources of problems such as flooding, water quality degradation, excessive channel erosion, and loss of riparian habitat. Once these problems were identified, recommendations were made to solve or alleviate the problems. Recommendations include capital improvement projects (i.e. stormwater infrastructure improvements), creation and restoration of habitat, maintenance strategies, pollution reduction programs, and public involvement and awareness. This management plan will be used as a tool in the planning, regulation, and management of natural resources and future development, and as a basis for determining and prioritizing capital improvements by the City of Clearwater and SWFWMD. The initial phase to meet this objective included a comprehensive analysis of the watershed in order to identify the problems to be addressed.

The first task in the analysis process was to collect, record, and organize all potentially useful existing information relevant to the watershed. Once the data were collected and analyzed, any data deficiencies were noted and the missing data were gathered. The information-gathering process included such activities as a literature search and review of existing data, field reconaissance and ground-truthing of aerial photography, ground surveying, streamflow monitoring, surface water sampling and testing, habitat assessment, interviews with City operations personnel, and input from residents of the watershed.

The second task included a comprehensive stormwater quantity and quality modeling analysis of the watershed. The model was used to develop a comprehensive watershed management plan with recommendations for site-specific physical improvements for flood protection, habitat improvement, and water quality improvement. This planning phase included a conceptual design sufficient to determine permit and construction feasibility, cost effectiveness, and property acquisition requirements. At the end of the planning phase, meetings of the Management Plan participants will be held to discuss a course of action for proceeding to the implementation phase.

The following sections describe the methods used to gather the necessary data, how the data were applied in the development of the watershed plan, and the recommended improvements produced through the cooperative efforts of the project team.

SECTION 2.0

WATERSHED ASSESSMENT AND PROBLEM IDENTIFICATION

This section of the Watershed Management Plan describes the existing flooding, natural resources, and water quality conditions within the Stevenson Creek Watershed, and the watershed assessment methods used. The first portion of the section addresses the primary concern of those living within the watershed; the periodic flooding of roads and buildings. The second portion describes the natural resources available within the watershed, such as the location and quality of wildlife habitat. The third portion details the water quality assessment, including the results of the water quality sampling program and pollutant loading modeling.

2.1 FLOODING CONDITIONS ASSESSMENT

2.1.1 Watershed Model Selection

This section details the methods and procedures used to perform the assessments of watershed hydrologic and hydraulic conditions. An important component of this Watershed Management Plan for Stevenson Creek is an assessment of the current flood protection level of service provided throughout the watershed. A thorough understanding of basinwide hydrologic and hydraulic processes is necessary to determine the most effective means of alleviating the identified flooding problems. The watershed model prepared for this Management Plan was used as a planning tool to assess the existing flooding problems and susequently, to optimize the flood protection benefits of the proposed improvements.

The Advanced Interconnected Channel and Pond Routing Model, Version 2.2 (AdICPR) was chosen for the hydrologic and hydraulic modeling analysis, in part because of its ability to mathematically represent the time-dependent processes that govern flow and stage in low-relief coastal watersheds such as Stevenson Creek. Furthermore, it was necessary to select a model which has been accepted by the Federal Emergency Management Agency (FEMA) for flood insurance studies, since the results of the analysis will be used to support a request for revision of the applicable FEMA flood insurance rate maps.

2.1.2 Hydrologic Model Development

The hydrologic model used for this study is the SCS Runoff Curve Number (CN) and Unit Hydrograph Method contained within AdICPR. This method computes a runoff (flow) versus time relationship (hydrograph) for each subbasin, given a set of hydrologic input parameters.

Hydrologic parameters required for the SCS Runoff CN and Unit Hydrograph Method include the following:

- Subbasin drainage area
- Subbasin time of concentration (TC)
- Subbasin percent directly connected impervious area (DCIA)
- Subbasin weighted runoff curve number (CN) for areas outside of DCIA
- Unit hydrograph shape factor
- Rainfall data

A description of the methodologies used to derive each of these hydrologic parameters follows in the remainder of this section.

2.1.2.1 Subbasin Delineations

The Stevenson Creek watershed drainage area consists of approximately 9.82 square miles (6,286 acres) of moderately sloping terrain in west central Pinellas County that discharges to Clearwater Harbor. To provide the level of detail that was deemed necessary to analyze the primary drainage facilities within the heavily urbanized Stevenson Creek watershed, the basin was divided into a total of 307 discrete subbasins that range in size from 1 to 197 acres. The average subbasin size is 20.5 acres. The delineation of individual subbasins was dictated to a large extent by the complexity of the drainage network itself and the need to define the contributing drainage area to modeled elements of the conveyance system.

Approximately 20% and 14% of the watershed area lies within the City of Dunedin and unincorporated Pinellas County, respectively. Although these governmental bodies are not official participants in the Management Plan, approximately the same level of hydrologic and hydraulic model detail was applied in these areas. This was deemed necessary in order to accurately quantify the volumes and peak rates of runoff contributed to Stevenson Creek and its tributaries by these areas.

Figure 2.1-1 in the attached map pocket shows the delineation of the Stevenson Creek watershed into its 307 individual subbasins. Subbasin ID numbers consist of the letter "B" followed by a four-digit number. The four-digit number generally coincides with the ID number of the node at the outlet of the subbasin. In cases where two subbasins drain to the same node, the second subbasin has an ID number equal to the node number plus one. Nodes and subbasins were generally numbered in order increasing in the upstream direction. For convenience, the 307 individual subbasins were aggregated into eight major subbasins, or "subwatersheds". Subbasin and node numbers are grouped according to the subwatershed in which they lie, as follows:

Table 2.1-1 Node / Subbasin Numbering Scheme

Subwatershed	Node / Subbasin ID Range
Lower Stevenson Creek	0000 – 0499
Lower Spring Branch	0500 – 0999
Upper Spring Branch	1000 – 1999
Hammond Branch	2000 – 2999
Middle Stevenson Creek	3000 – 3499
Lake Belleview Branch	3500 – 3999
Upper Stevenson Creek	4000 – 4139
Jeffords Street Branch	4140 – 4999

The means of defining subbasin boundaries employed a number of sources of information and methods. The principle source was 1”=200’ topographic aerial photographic mapping of the watershed provided by SWFWMD. This mapping shows overland topography, thus indicating direction of overland flow. However, because much of the watershed is developed, with a variety of residential, commercial, industrial, and institutional developments, man-made secondary drainage systems comprising swales, gutters, storm sewer systems, ditches, and detention ponds have interrupted the natural overland flow patterns within the basin and, in many cases, diverted storm runoff in directions that are not readily apparent from inspection of the topographic mapping. It is also important to note that the SWFWMD mapping within the basin is, for the most part, over 20 years old. Therefore, new development that has occurred within the watershed since that time does not appear on these maps, and drainage patterns and grades in certain areas have been altered since that time due to this new development.

The City of Clearwater drainage atlas maps provided detailed layouts of the secondary drainage systems within the incorporated city portions of the watershed and proved to be of immense value for assisting in the delineation of the subbasins. In addition, record drawings of permitted stormwater management facilities within the basin on file with the SWFWMD were reviewed and referenced in the subbasin delineation process as a means of defining the drainage systems and drainage areas for newer developments that did not show up on any of the previously listed information sources.

The final check of subbasin delineations was field reconnaissance of the watershed to confirm the initial boundaries and to inspect the drainage facilities and conditions in the basin firsthand, to investigate areas where there was no information available from the previously listed sources, and to resolve discrepancies where there was a conflict between different sources of information regarding drainage facilities.

2.1.2.2 Land Use

Existing land use conditions within the Stevenson Creek watershed were defined with the aid of a Geographic Information System (GIS) land use coverage data file provided by SWFWMD. For convenience, the 26 different land use classifications that were defined in the SWFWMD land use coverage of the basin were consolidated into the following 13 categories:

- Commercial
- Cropland and Pastureland
- Forest
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Industrial
- Institutional
- Open Land and Range Land
- Specialty Farms
- Transportation, Communications and Utilities
- Water
- Wetlands

For the purposes of this study, the medium density residential classification was redefined to include residential areas containing between 2 and 5 dwelling units per acre. In the SWFWMD classification system, this was considered to be high density. It was deemed necessary to reclassify these areas, because the actual (measured) impervious area percentages in these areas are more consistent with literature values cited for medium density residential. The significance and determination of impervious area is described in the next section. This change increased the percentage of the basin classified as medium density residential from none to the majority of the basin. Areas of multi-family developments (i.e., apartment and condominium complexes) remained classified as high density residential.

These land use coverages were then field-truthed by examination of recent aerial photography of the basin and comparing to the map to confirm that both the classifications and the areal extent are properly represented. Many adjustments were required. The majority involved the delineation of the developed portions of areas that were designated as institutional or transportation/utilities in the SWFWMD land use coverage to separate them from open land areas that occurred within these parcels to various degrees. The institutional land use classification includes parcels such as nursing homes, schools, churches, hospitals, auditoriums, and cemeteries, which can vary over a wide range in their degree of imperviousness. For the same reasons, significant open land areas within industrial and commercial tracts were delineated to segregate them from the actual developed portions of the parcels. Other changes were required in order to update the mapping to account for recent development. The resultant hydrologic land use classification map of the Stevenson Creek watershed that was used for model development purposes is shown in Figure 2.1-2. Table 2.1-2 presents a composite breakdown of land use acreages and percentages in the Stevenson Creek Watershed.

Table 2.1-2 Basin Land Use Percentages

Land Use Classification	**Total Area (acres)**	**Percentage of Basin (%)**
Commercial	610	9.7
Cropland and Pastureland	5	0.1
Forest	50	0.8
Low Density Residential	56	0.9
Medium Density Residential	3861	61.4
High Density Residential	459	7.3
Industrial	42	0.7
Institutional	182	2.9
Open Land and Range Land	573	9.1
Specialty Farms	10	0.2
Transportation, Communications, and Utilities	170	2.7
Water	205	3.3
Wetlands	63	1.0
Total	**6286**	**100.0**

(Figure 2.1-2)

2.1.2.3 Impervious Areas

Impervious areas are those surfaces such as rooftops and pavement, which impede the infiltration of runoff into the soil. Directly connected impervious area (DCIA) is defined as those impervious areas that are connected directly to the subbasin outfall (i.e., node) without flow occurring over a pervious surface. In the AdICPR model, DCIA is an optional parameter which, if used, is treated as a separate subarea within each subbasin. A separate hydrograph is computed for the DCIA, which is not subject to any initial abstraction (i.e., infiltration). Any impervious area which is not directly connected to the subbasin outfall is then used in computing a weighted curve number (CN) as described in the next section.

For the Stevenson Creek watershed model, literature values of total percent imperviousness for the different land use classifications were utilized. Measurements of impervious coverage within representative samples of each land use classification were conducted using aerial photography, in order to confirm the literature values. The split between DCIA and non-directly connected impervious areas was determined through the model calibration process, as discussed in subsequent sections.

2.1.2.4 Runoff Curve Number

By superposition, the hydrograph computed using the DCIA is added by AdICPR to the hydrograph computed using a weighted runoff curve number (CN). This results in a single composite hydrograph, which is then input into the corresponding node of the hydraulic model.

In the SCS method, the CN is a function of S, the potential maximum infiltration after runoff begins (in inches):

$$CN = \frac{1000}{S+10}$$

The standard SCS method uses the following empirical relationship:

$$I_a = 0.2S$$

Where I_a is the initial abstraction, which includes all losses before runoff begins. It includes water intercepted by vegetation, shallow depression storage, evaporation, and infiltration. For design storm conditions in watersheds containing sandy soils, experience and literature on the subject indicate that infiltration losses comprise the majority of the initial abstraction.

The weighted CN is therefore primarily a function of the non-directly connected impervious coverages (based on land use), and the infiltration capacity of the soils. For this study, a land use/ hydrologic soils group intersection analysis was performed using the ArcView/ArcInfo Geographic Information Systems (GIS) software.

The Soil Conservation Service (SCS) (now the Natural Resources Conservation Service) of the U.S. Department of Agriculture has mapped soils in Pinellas County in its publication “Soil Survey of Pinellas County, Florida” (1972). This soil survey also provides generalized information on the hydrologic properties of the soil classifications.

A standard method of soils classification is the hydrologic soils group. Soils are grouped into four hydrologic soil groups A through D. These groups are commonly used in hydrologic analyses to estimate infiltration rates and soil moisture capacities. Descriptions of these soil groups are:

Hydrologic Soil Group A (low runoff potential): Soils that have high infiltration rates even when thoroughly wetted and a high rate of water transmission. Typical maximum infiltration rate of 10 inches per hour when dry and 0.5 in/hr when saturated.

Hydrologic Soil Group B (moderately low runoff potential): Soils that have moderate infiltration rates when thoroughly wetted and a moderate rate of water transmission. Typical maximum infiltration rate of 8 in/hr when dry and 0.4 in/hr when saturated.

Hydrologic Soil Group C (moderately high runoff potential): Soils that have a slow infiltration rate when thoroughly wetted and a slow rate of water transmission. Typical maximum infiltration rate of 5 in/hr when dry and 0.25 in/hr when saturated.

Hydrologic Soil Group D (high runoff potential): Soils having very slow infiltration rates when thoroughly wetted and a very slow rate of water transmission. Typical infiltration rate of 3 in/hr when dry and 0.10 in/hr when saturated.

In many cases in Florida, dual hydrologic soil group classifications (A/D or B/D) are assigned to soils that, during the wet season, are saturated throughout much of the soil column due to a high surficial water table. Thus, during this time of year, infiltration is impeded and the soil acts as a D soil. However, during the rest of the year, when the water table is lower, the soil acts as an A or B soil.

Figure 2.1-3 presents a composite hydrologic soil group classification map of the Stevenson Creek watershed. It can be seen from the map that soils within the basin are predominantly classified as A and B/D. Group A soils occur on upland sand ridges and group B/D soils occur on low lying areas and flat areas with poor natural drainage around natural waterbodies and wetlands. A composite breakdown of the hydrologic soil group acreage and percentages for the basin is as follows:

Table 2.1-3 Hydrologic Soil Group Acreages and Percentages

Hydrologic Soil Group	Total Area (acres)	Percentage of Basin (%)
A	2424	38.6
B	21	0.3
B/D	2158	34.3
C	1114	17.7
D	370	5.9
Water	199	3.2
Total	**6286**	**100.0**

(Figure 2.1-3)

The following table presents the Runoff Curve Number Computation Matrix used by the ArcView/ArcInfo Geographic Information Systems (GIS) software to compute the overall area-weighted curve number for each subbasin. In this method, a unique curve number is assigned to each possible combination of hydrologic soil group and land use category. The computer program then computes an area-weighted value based on the percentages of these soil/land use combinations found within the particular subbasin.

Table 2.1-4 Runoff Curve Number Computation Matrix

Land Use Classification	Hydrologic Soil Group	Runoff Curve Number
Commercial	A	89
Commercial	B	92
Commercial	C	94
Commercial	D	95
Commercial	B/D	94
Cropland and Pastureland	A	49
Cropland and Pastureland	B	69
Cropland and Pastureland	C	79
Cropland and Pastureland	D	84
Cropland and Pastureland	B/D	79
Forest	A	36
Forest	B	60
Forest	C	73
Forest	D	79
Forest	B/D	73
High Density Residential	A	77
High Density Residential	B	85
High Density Residential	C	90
High Density Residential	D	92
High Density Residential	B/D	90
Industrial	A	81
Industrial	B	88
Industrial	C	91
Industrial	D	93
Industrial	B/D	91
Institutional	A	81
Institutional	B	87
Institutional	C	91

Table 2.1-4 (Continued) Runoff Curve Number Computation Matrix

Land Use Classification	Hydrologic Soil Group	Runoff Curve Number
Institutional	D	93
Institutional	B/D	91
Low Density Residential	A	50
Low Density Residential	B	65
Low Density Residential	C	76
Low Density Residential	D	87
Low Density Residential	B/D	76
Medium Density Residential	A	61
Medium Density Residential	B	75
Medium Density Residential	C	83
Medium Density Residential	D	86
Medium Density Residential	B/D	83
Open Land and Rangeland	A	39
Open Land and Rangeland	B	61
Open Land and Rangeland	C	74
Open Land and Rangeland	D	80
Open Land and Rangeland	B/D	74
Specialty Farms	A	59
Specialty Farms	B	74
Specialty Farms	C	82
Specialty Farms	D	86
Specialty Farms	B/D	82
Transportation, Communications, and Utilities	A	78
Transportation, Communications, and Utilities	B	83
Transportation, Communications, and Utilities	C	88
Transportation, Communications, and Utilities	D	90
Transportation, Communications, and Utilities	B/D	88
Water	W	100
Wetland	A-D	98
Wetland	W	100

Overall CN values were calculated for each subbasin using the above matrix and GIS intersection analysis. In order to derive the percent impervious area for each subbasin, a “pervious area” CN was created for each subbasin based only on its soil type and its pervious area land use. For example, medium density residential was shown as open land and range land to represent the lawns and open space. By comparing the overall CN to the pervious area CN, a total percent impervious area for each subbasin was back-calculated using using an excel spreadsheet. Then, based on the percent of total impervious as DCIA (derived through the calibration process), the curve numbers were recomputed using only the unconnected impervious area. The excel spreadsheet used for this analysis is included in Appendix A.

2.1.2.5 Time of Concentration

The time of concentration (TC) is a measure of the time scale of the runoff hydrograph and is a function of subbasin slope and surface roughness. Conceptually, it is the time required for the hydrologically most distant point in the subbasin to begin contributing flow to the subbasin outlet, following the commencement of rainfall. The time of concentration for each subbasin within the Stevenson Creek watershed was computed using the Kinematic Wave approach as outlined in SCS Technical Release 55. In this method, the TC is computed as the sum of travel times for sheet flow, shallow concentrated flow, and open channel flow. The reader is referred to chapter 3 of SCS Technical Release 55 in Appendix E for further details on this method.

2.1.3 Hydraulic Model Development

The hydraulic model used for this study was AdICPR, which contains a one-dimensional unsteady flow hydraulic routing model. This model uses a node-reach representation of the drainage system. AdICPR receives hydrograph input at specific nodes by file transfer from the hydrologic model. The model performs dynamic routing of stormwater flows through the defined storm drainage system to the points of outfall in the receiving waterbody. The program will simulate branched or looped networks; backwater due to tidal or non-tidal conditions; free-surface flow; pressure flow or surcharge; flow reversals; flow transfer by weirs, orifices, and pumping facilities; and storage. Types of reaches that can be simulated include pipes, weirs, open channels of regular or irregular cross section, bridges, and drop structures (weir and pipe in series).

Simulation output takes the form of water surface elevations and discharges at each node and reach within the model network, reported at user-specified time intervals.

2.1.3.1 Drainage Facility Inventory

The initial and most important step in the development of the hydraulic model of the Stevenson Creek watershed was the inventory of the drainage structures along the primary drainage system. This information provides the foundation for the model representation of the hydraulic system. The drainage facility inventory of the study area was compiled from an array of sources and methods. Hydraulic data for culverts, storm sewers, bridges, control structures, and watercourse cross sections were obtained from city drainage atlas mapping, development plans, roadway plans, previous studies, and field surveys. Data collected included elevations, lengths, dimensions, construction materials, channel vegetation, structure entrance and exit conditions, and other pertinent features. The following is a discussion of the sources and methods used to collect this information:

Existing Maps, Plans and As-Builts

The City of Clearwater maintains 1”=100’ scale drainage atlas maps that include considerable detail of locations, dimensions, and invert elevations of drainage facilities located within the incorporated city limits. These maps are periodically updated as new development occurs or new information is obtained, and provide a great deal of detail within the areas they cover, including secondary storm sewer systems. Invert elevations are not always indicated, however, and there is no information shown for the unincorporated areas within the basin. The City of Dunedin storm atlas provides a similar degree of mapping of drainage facilities.

It was previously noted that the SWFWMD stormwater management facility permit files were researched to collect information on facilities constructed within the Stevenson Creek watershed since the inception of the permit regulations in 1984. The City of Clearwater, Pinellas County, and the City of Dunedin also provided record drawings of drainage and flood control works that have been constructed within the basin. In addition, the Stevenson Creek Sediment Evaluation with Cross Sections completed by the City of Clearwater in August 1999 provided many of the irregular cross sections used in the model. The following list contains the most noteworthy plans, maps and as-builts used as sources of existing hydraulic model input data used in the development of the Stevenson Creek hydraulic model:

- Pinellas-Anclote Basin Aerial Photography with Contours. March 1977, May 1979, and December 1985, Southwest Florida Water Management District.
- City of Clearwater Stormwater Atlas. 1996-1999, City of Clearwater Public Works Administration, Engineering.
- City of Dunedin Stormwater Atlas. 1999, City of Dunedin Engineering Section
- Stevenson Creek Sediment Evaluation with Cross Sections. August 1999, City of Clearwater Public Works Administration, Engineering.
- Spring Branch of Stevenson's Creek Drainage Basin Field Survey Notes. March 1979, Pinellas County Engineering Department.
- Stevenson's Creek Watershed Channel Improvements, Phase 1 As-Built Plans. February 1993, W.K. Daughtery Consulting Engineers, Inc.
- Stevenson Creek – Channel Improvements – Phase II Plans. March 1995, Camp, Dresser and McKee.
- Highland Avenue Stormwater Improvements As-Built Plans. November 1998, HDR Engineering, Inc.
- The Mall From Union Street to the South Terminus Record Drawings. July 1994, Seminole Engineering.
- 3rd Avenue Drainage Improvements Record Drawings. March 2000, City of Dunedin Department of Public Works and Utilities.
- Villas at Renaissance Square (Old Sunshine Mall) Construction Plans. January 1999. Florida Design Consultants, Inc.
- Various MSSW and ERP permit information on file with the Southwest Florida Water Management District.

Previous Studies

The Stevenson Creek watershed has been the subject of several stormwater management studies in the last 20 years that served as valuable sources of information on the existing structures and channels along the primary drainage system of the basin. These sources were used to varying degrees to supplement and/or confirm other sources to provide the required AdICPR model input data to describe the primary drainage system and facilities in the watershed.

The first of these studies was a storm drainage basin study conducted in 1981 by Henningson, Durham, and Richardson, Inc. (HDR) for Pinellas County. This study was a part of the countywide comprehensive stormwater drainage master plan, which has since been adopted within the Pinellas County Comprehensive Plan in its Drainage Element (1989). To conduct its study of the Stevenson Creek basin, HDR used the SCS TR-20 computer model for hydrologic analysis. Runoff hydrographs were developed for each subbasin in the watershed, using existing and comprehensive future land use, with the 25-year, 6-hour duration storm event of 5.5 inches total precipitation used as the basis for design. The U.S. Army Corps of Engineers HEC-2 model was used to perform backwater analyses to determine flood profiles for each of the design storm events. The Pinellas County Study also served as the basis for a Master Drainage Plan for the Spring Branch Watershed, prepared in 1983 by the City of Dunedin Public Works Department. For this study, Parsons ES used selected information from the original Pinellas County field survey notes as needed to augment the structure and cross section information within the City of Dunedin portion of Spring Branch.

In 1988, a Preliminary Master Plan for Stevenson Creek was prepared by W.K. Daughtery, Inc. for the City of Clearwater. In the 1988 study, a three-phase channel improvement project was recommended for the main channel of Stevenson Creek. The modeling methodology employed TR-20 to generate runoff hydrographs for the 5-, 10-, 25-, 50-, and 100-year, 24 hour duration storm events. The hydrographs were then input to a one-dimensional, steady-flow water surface profile model (WSP-2) to calculate the flood elevations. In 1990-1991, Camp, Dresser, and McKee, Inc. (CDM) prepared a limited re-study of Stevenson Creek under which the TR-20/WSP-2 model was converted to AdICPR, Version 1.4. The AdICPR model was then used to support the detailed design of portions of the preliminary master plan project, as well as a FEMA Letter of Map Revision (LOMR). This re-study by CDM also included analysis of alternatives for floodplain enhancements within the Glen Oaks Golf Course. To date, two of the three phases of the original project have been constructed, consisting of the channel segments between Betty Lane and Jeffords Streets. The previously referenced as-built plans for these channel improvements were relied upon extensively in the development of the model.

The following list summarizes the previous and on-going studies of the Stevenson Creek Watershed which were consulted in the development of this watershed management plan:

- Summary Report for Stevenson's Creek Preliminary Master Plan. August, 1988, W.K. Daughtery Consulting Engineers, Inc.
- City of Clearwater 1997 Watershed Management Plan, Volume II. Post, Buckley, Schuh & Jernigan
- Stevenson Creek Channel Improvements, Phase 2 – Joint Dredge and Fill Permit Application. April 1992, Camp, Dresser, and McKee
- Technical information submitted to FEMA in support of request for Stevenson Creek Letter of Map Revision. May 1998, Camp, Dresser and McKee.
- Pinellas County Storm Drainage Basin Study Technical Appendix – Spring Branch of Stevenson Creek Basin and Coastal Zone 4 Basin. October 1981, Henningson, Durham & Richardson, Inc.
- Repetitive Loss Report – City of Clearwater, FL. October 1998, FEMA
- Master Drainage Plan: Spring Branch Watershed. September, 1983, City of Dunedin Public Works Department, Water Resources.
- Stevenson Creek Sediment Characterization and Removal Feasibility Study - Final Report. August 1998, BCI, Inc.

- Stevenson Creek Estuary – Preliminary Restoration Plan. October 2000, U.S. Army Corps of Engineers, Jacksonville District

Field Reconnaissance and Field Survey

Field reconnaissance of the Stevenson Creek watershed was conducted by driving and walking the basin to determine drainage patterns, map drainage facilities, measure facility dimensions inspect the condition of the drainage facilities in the field, assemble a photographic log of drainage facilities, and to confirm information collected from the previously discussed sources and/or resolve differences between different sources.

Following completion of the field reconnaissance, Parsons ES developed a field survey plan to establish the size, location, dimensions and inverts of drainage structures, and to define current stream channel and floodplain cross sections within the Stevenson Creek watershed based on the specific needs of the hydraulic model. The emphasis of this survey was placed on areas within the basin where there were no available sources of as-built record drawings and surveys. The survey program was conducted by Harry Marlow, Inc., under the direction of Parsons ES. In addition, the City of Dunedin conducted limited surveys of selected structures and cross sections for use in the portion of the model that lies within the limits of the City of Dunedin.

2.1.3.2 Channel Cross Section and Floodplain Definition

A variety of sources of channel cross section and drainage structure data were utilized in the formulation of the AdICPR model. Parsons ES used what was judged to be the most current, detailed, and representative source of information available for any particular reach of the open channel system. In addition, the extension of channel cross-sections into the floodplain regions of the Stevenson Creek floodway was necessary for many of the surveyed cross-sections obtained from the various sources. In these instances, the SWFWMD one-foot contour topographic maps were used to scale off the floodplain extensions.

One of the most important requirements of the hydraulic model representation of open channel reaches is the selection of an appropriate channel roughness coefficient, or Manning's n, value. This is an index of the resistance to flow, primarily due to friction, that is dependent upon factors such as the extent and type of channel vegetation, channel bottom material, channel irregularity, channel alignment, obstructions, and depth of flow. Selection of an appropriate Manning's n value for a particular channel reach is a subjective procedure that is facilitated by past experience. As a first step in this procedure, Parsons ES personnel took color photographs of all open channel reaches within the model. Published guides and past modeling experience were then applied in the selection of channel and floodplain Manning's n values. These values were either confirmed or adjusted during the model calibration process using the rating curves of the streamflow gaging stations and the measured high water elevations.

2.1.3.3 Storage Node Stage-Area Relationships

In order to represent the attenuating effects of storage on the hydrographs computed by the hydrologic model, it is important that all significant stormwater storage areas and their hydraulic controls features be well defined within the model. This is especially important in the Stevenson Creek watershed where much of the drainage throughout the basin is controlled by lakes (man-made and natural) and natural depression areas. The AdICPR model allows the user to specify a variable stage-area relationship at any model node that defines the storage properties at that point, be it a pond, lake, wetland, or other water body.

In the development of the Stevenson Creek watershed hydraulic model, Parsons ES used, where available, record drawings and permits as a means of establishing stage-area relationships of constructed stormwater management facilities. For all others, including the natural lakes, ponds, and wetlands within the watershed, the stage-area relationships were determined by direct measurement of SWFWMD one-foot topographic maps with a planimeter.

2.1.3.4 Model Schematic

The hydraulic model (AdICPR) of the Stevenson Creek watershed consists of a network of open channel segments, culverts, bridges, storm sewers, weirs, lakes, ponds, and wetlands that compose the primary drainage system within the basin. AdICPR uses a link-node concept to idealize the "real world" drainage system. A node is a discrete location in the drainage system where conservation of mass (continuity) is maintained. Links, or "reaches" are the connections between nodes and are used to convey water through the system. The entire network of nodes and reaches forms the hydraulic model network and serves as the computational framework for AdICPR.

The first step in development of a model schematic was to identify the primary drainage system and all drainage facilities within it. This task was accomplished through the research and review of all available sources of information that have been previously described, and through field reconnaissance of the entire watershed. All such information was compiled and a watershed drainage map developed which depicts the primary drainage system. Figure 2.1-1, included in the attached map pocket, presents the drainage map of the Stevenson Creek watershed and the model node locations which were used to define the primary conveyance network of the basin. General guidelines which were followed in development of the model schematic are:

- Nodes are required at the upstream and downstream ends of any structure (e.g. culvert, bridge, weir, etc.).
- Storage elements (ponds, lakes, wetlands, etc.) are specified as nodes.
- Nodes are located at tributary confluence locations.
- Nodes are placed at locations where there is a major surface water inflow to the conveyance system.
- Points of change in channel geometry and/or slope are specified as node locations.

- Nodes are added at locations within the network to define the hydraulic gradeline in greater detail.

When constructing a model network, unique identifiers must be assigned to all nodes and reaches. The node-numbering scheme is the same as the subbasin numbering scheme previously described, except that node identifiers begin with the letter “N”. By convention, the identification of a reach between two nodes is the same as the name of the upstream node. Reach identifiers begin with a letter prefix pertaining to the type of reach as follows:

Reach Type	Prefix
Channel	C
Pipe	P
Weir	W
Drop Structure	DS
Bridge	BR
Overland Flow Channel	COF
Overland Flow Weir	WOF

A node-reach schematic of the AdICPR model of the Stevenson Creek watershed is provided in Figure 2.1-4, contained within the attached map pocket. This schematic represents the hydraulic network as it is modeled. Storage nodes and type of reaches are indicated as they are represented within the AdICPR model. The schematic includes “overflow” reaches which model the overland flow paths that floodwaters can follow when flow rates exceed the capacities of the primary drainage system. In all, the model includes 383 nodes, 252 pipe reaches, 176 open channel reaches, 171 irregular cross sections, 98 weir reaches, 39 drop structure reaches, and 6 bridge reaches.

2.1.3.5 Boundary Conditions

The AdICPR model requires specification of hydraulic boundary conditions at all outfall points of the model schematic. In the Stevenson Creek watershed application, the primary basin outlet is located at the downstream face of the most downstream bridge at Edgewater Drive (Alt. US 19). A constant tailwater boundary condition representing the water elevation of Clearwater Harbor, a tidal waterbody, was specified at elevation 2.5 feet above mean sea level, 1929 National Geodetic Vertical Datum (NGVD) for all model simulations. This elevation was intended to approximate a “spring tide” condition within the harbor. It should be noted that for flow rates above approximately 3,000 cfs (which applies to the peak rates of flow for all design storms), the existing conditions stages within the Stevenson Creek estuary were not found to be sensitive to changes in the tidal boundary condition over a range of 0 to 3 feet NGVD.

An “overflow” boundary node exists at the northern end of the Jeffords Street Branch where floodwaters can “pop off” to the Allens Creek Basin when the flows exceed the capacity of the storm sewers. A third boundary node exists at the Clearwater Executive Airport, where a 36” diameter CMP culvert under the runways diverts a portion of the flow from the headwaters of Hammond Branch east into the Alligator Creek Basin. The tailwater elevations at these overflow boundary nodes are allowed to fluctuate with normal depth in the boundary link. Modeling results from the completed Allens Creek and Alligator Creek Watershed Plans were consulted to determine whether flooding was predicted in those watersheds which would influence stages in the corresponding Stevenson Creek boundary nodes. These model results indicated that the design flood elevations are well below the Stevenson Creek “pop-off” elevations, therefore it was not necessary to code in the time/stage boundary conditions based on these other models.

2.1.4 Model Calibration and Verification

2.1.4.1 Introduction

Model calibration refers to the adjustment of model parameters within reasonable limitations so that the model results (i.e., streamflows and water elevations) are in reasonable agreement with a set of measured data. A reasonable range of values for the adjustment of model parameters is established through the review of literature references, and adjustments outside of those ranges are made only if some unusual hydrologic or hydraulic condition exists. Ideally, the model is calibrated to more than one different storm event in order to represent a variety of volumes, intensities, and distributions. It is also desirable to calibrate to recorded flow and stage information at different locations within the watershed.

The two primary data requirements for model calibration and verification are gaged rainfall and streamflow for the study area. When selecting a calibration storm event, the rainfall and streamflow data must be sufficiently documented in appropriate time intervals so that variations in rainfall intensity and the associated runoff can be accurately simulated. Data should be recently acquired so that the current land use and hydraulic conditions existing in the study area are accurately represented. Additionally, because of the non-uniform spatial distribution inherent in Florida rainfall patterns, it is desirable that precipitation data be collected at more than one location within a large study area.

2.1.4.2 Streamflow and Precipitation Gaging Data

Prior to the initiation of this watershed management plan, no known measured streamflow data existed for Stevenson Creek. Therefore, it was necessary to collect streamflow data for calibration of the hydrologic/hydraulic computer model. This was accomplished by establishing two streamflow gaging stations within the Watershed. Continuous rainfall, stage, and streamflow data were collected under the direction of Parsons ES by Hydrogage, Inc. at Stevenson Creek near Drew Street and at Spring Branch near King’s Highway. The locations of the stations are shown on Figure 2.1.5.

(Figure 2.1-5)

The streamflow data was collected in digital format from May 12, 2000 to October 12, 2000. Stream stage (water level) was recorded at 15-minute intervals using a calibrated pressure transducer. Rainfall amounts were recorded at 15-minute intervals using a standard tipping-bucket rain gage. The rainfall data recorder utilized a telemetry system to alert Hydrogage of storm events in progress. Streamflow measurements were made over a wide range of flow conditions using standard USGS stream gaging procedures. These measurements were then correlated to recorded stage elevations to establish a flow versus stage rating curve at each location.

In addition to the precipitation and streamflow data, storm event flow-weighted composite water samples were collected with the aid of automatic samplers at each station. The water quality monitoring program is described in detail in Section 2.3.2.

2.1.4.3 Selection of Calibration/Verification Storm Events

July 15, 2000

Due to the relatively short period of record, only a handful of storm events was available for calibration of the model. Fortunately for this analysis, the period of record captured a large storm that occurred on July 15, 2000. This storm produced 7.60” and 5.21” of total rainfall within a ten-hour period at the Drew Street and King’s Highway sites, respectively. As evident from Figure 2.1-6, this storm consisted of two separate rainfall events occurring approximately 6 to 7 hours apart. The first event occurred from about 7:00 AM to 10:00 AM and produced 3.23” at the Drew Street site and 1.69” at the King’s Highway site. At 2:00 PM, the second event occurred, producing 4.37” at the Drew Street site and 3.52” at the King’s Highway site. All of the rainfall in the afternoon event fell within a 2-hour period from 2:00 PM to 4:00 PM. The peak 15-minute intensity occurred at about 2:30, averaging 7.44 and 4.04 inches per hour at the Drew Street and King’s Highway sites, respectively. This storm produced widespread flooding throughout Stevenson Creek and the City of Clearwater. Following this event, staff from

(Figure 2.1-6)

Parsons ES and the City marked visible high water elevations at 21 locations throughout the basin, which City survey personnel later surveyed (three of the elevations marked in the field as "questionable" were later discarded).

Because the hydrologic model chosen for the analysis is intended to be used strictly as a single-event model, the larger, afternoon rainfall event was chosen as a calibration event. By inspection of Figure 2.1-6, it is evident that both Stevenson Creek and Spring Branch responded to the two storms as separate and distinct events. It should be noted, however, that the first event served to substantially increase the soil moisture leading into the second event. Prior to the morning of July 15, hydrologic conditions within the watershed were still extremely dry due to the several months of drought during the spring of 2000.

June 12, 2000

In order to compliment and verify the large storm event of July 15, a smaller storm was chosen in order to verify the calibration parameters, and to "fine-tune" the DCIA percentages. For these purposes, the storm of June 12, 2000 was chosen, which produced 0.85 and 0.54 inches of rainfall at the Drew Street and King's Highway stations, respectively. The antecedent moisture conditions preceding this event were extremely dry. The total rainfall amounts were therefore small enough to make the assumption that all runoff due to this storm was contributed by the DCIA, and thus all rainfall in areas outside the DCIA was lost to infiltration.

2.1.4.4 Calibration Parameters and Results

When calibrating a computer model, certain model input parameters are held constant while others are adjusted in attempt to produce reasonable agreement with measured data. Those parameters that are adjusted are referred to as calibration parameters. Since it is desirable to limit the number of calibration parameters to the fewest possible, those parameters that can be easily measured or calculated normally are not adjusted. Calibration parameters are typically those coefficients and or indexes that are not easily determined from known quantities and/or established procedures. The two primary calibration parameters chosen for the Stevenson Creek model are runoff peak rate factor for the hydrologic component, and channel Manning's roughness for the hydraulic component of the model.

When calibrating a model which uses the SCS unit hydrograph and runoff curve number method, it is often necessary to adjust the runoff curve number (CN) in order for the model to match the measured runoff volume. This is primarily due to the fact that the selected calibration storm events may have antecedent moisture conditions which differ significantly from typical design values found in the literature, which are conventionally based on either average, or average wet season, conditions. Runoff volumes can be very sensitive to CN, especially in southwest Florida where the sandy soils and seasonally high water table can result in a wide range of CN values depending on the time of year (i.e, wet season versus dry season). However, no CN adjustment was necessary for the Stevenson Creek calibration since the runoff volumes predicted for the July 15th storm using CN's corresponding to average antecedent moisture conditions matched the observed volumes fairly well. This is due to the likelihood that the first of the two rainfall events on July 15th served to increase the soil moisture conditions from dry conditions to something closer to typical design conditions.

<u>*Channel Mannings Roughness*</u>

The primary means of calibrating the AdICPR hydraulic model was through adjustment of the Mannings Roughness Coefficient, or Mannings "n". This is an index of the resistance to flow through a channel, primarily due to friction, that is dependent upon factors such as the extent and type of channel vegetation, channel bottom material, channel irregularity, channel alignment, obstructions, and depth of flow. Adjustments to the channel Mannings "n" were made to the cross sections in the vicinity of the streamflow gages until the simulated flow versus stage rating curve provided a reasonable match with streamflow measurements made during a number of different storm events and flow conditions. No adjustments were made to the Manning's roughness in the vicinity of the Spring Branch at King's Highway station however, since within the range of the measurements, the flow appears to be controlled by the box culverts under King's Highway (refer to Figure 2.1-7). The simulated rating curve at this location provided a reasonable fit to the measured data without any adjustment to the Mannings "n" values.

Figure 2.1-7 Box Culverts Downstream of King's Highway Monitoring Station

At the Drew Street gage in Stevenson Creek, it was necessary to increase the in-bank Mannings "n" from the initial estimate of 0.07, to 0.09 for the cross section immediately downstream of the gage in order to match the measured data. In a field visit in March of 2000, this section was observed to be heavily vegetated (refer to Figure 2.1-8), although the degree of vegetation in the channel generally decreased in the sections further downstream through the golf course. Of course, the degree of vegetation varies not only with location, but also with time of year and point in the maintenance cycle.

Figure 2.1-8 Vegetation in Channel Downstream of Drew Street Monitoring Station

Figures 2.1-9 and 2.1-10 illustrate the simulated flow versus stage rating curves at Drew Street and King's Highway, respectively. Note that the dependant variable (flow) is plotted on the X-axis. The measured values are plotted for comparison.

Following calibration of the Peak Rate Factor (described below), the channel Mannings "n" values were adjusted at several other locations in the watershed in order to match the surveyed high water elevations of the July 15th flood event.

Peak Rate Factor

In the SCS Unit Hydrograph Method, a composite unit hydrograph is constructed of several incremental triangular unit hydrographs that adhere to the basic SCS triangular unit hydrograph equation:

$$q_p = \frac{K'AQ}{T_p}$$

(Figure 2.1-9 and 2.1-10)

Where q_p = peak runoff rate in cfs,
A = area in square miles,
Q = rainfall excess depth in inches,
K’ = runoff peak rate factor

The runoff peak rate factor, K’, includes a unit conversion and a hydrograph shape factor which determines the respective fractions of the runoff volume occurring under the rising and falling limbs of the hydrograph. The value of K’ has been shown to vary widely, from 100 in extremely flat basins in South Florida, up to 600 in steep, mountainous terrain. It has been suggested that K’ varies with watershed surface storage and/or average watershed slope. However, since no definitive relationship between subbasin slope and K’ has been proposed, it is often used as a calibration parameter. In the absence of gage data, the SCS recommends using a value of 256 for Florida, and 484 for most of the rest of the country. It can be shown that a K’ of 484 corresponds to 3/8 and 5/8 of the runoff volume occurring on the rising and falling limbs of the hydrograph, respectively. A K’ of 256 corresponds to 1/5 and 4/5 of the runoff volume occurring on the rising and falling limbs, respectively. The lower peak rate factors produce longer recession limbs with a smaller peak discharge rate for the same unit volume of runoff. It should be noted that these empirical values were derived from regional studies of small groups of similar watersheds, and are not necessarily applicable when applied outside their experimental ranges.

For the Stevenson Creek watershed, a value of 256 was used as the initial estimate of K’ for all subbasins, in accordance with the SCS recommendation for Florida. However, this value tended to produce simulated hydrograph shapes that suggested that the K’ value was too low. The K’ was increased to 484 for several of the steeper subbasins throughout the watershed, including several along the main channel of Stevenson creek which had average slopes exceeding 3%. Those subbasins with average slopes of less than about 1% were left with their original K’ of 256. This adjustment produced better agreement with the observed hydrograph shapes. Figures 2.1-11 and 2.1-12 provide a comparison between the simulated and measured hydrographs for the storm of July 15, 2000.

(Figure 2.1-11 and 2.1-12)

Once the model was calibrated to match the observed hydrograph shape, the Mannings "n" was adjusted for the remaining cross sections throughout the watershed, in order to provide a closer match to the surveyed high water elevations. The following table compares the simulated and the measured high water elevations of the flood of July 15, 2000:

Table 2.1-5 Comparison of Measured and Simulated High Water Elevations Storm of July 15, 2000

Node ID	Node Location	Peak Stage (ft NGVD '29)		Difference (ft)
		Measured	Simulated	
1000	Spring Branch at King's Highway gage	12.51	12.48	-0.03
1040	Spring Branch at Union Street (u/s)	16.45	16.36	-0.09
2030	Hammond Branch Pond at King's Highway	13.16	13.47	0.31
2130	Flagler Ditch at Saturn Avenue	61.10	61.11	0.01
2300	Smallwood Circle and Rosewood Road	45.98	46.08	0.10
3000	Stevenson Creek at Drew Street gage	14.12	14.14	0.02
3040	Stevenson Creek at Cleveland Street (u/s)	18.04	17.81	-0.23
3090	Stevenson Creek at Court Street (d/s)	18.61	18.83	0.22
3100	Stevenson Creek at Court Street (u/s)	18.97	18.88	-0.09
3120	Stevenson Creek at Druid Road (d/s)	20.76	20.60	-0.16
3125	Stevenson Creek at Druid Road (u/s)	20.67	20.82	0.15
3700	Lake Belleview outfall structure at Lakeview	40.22	40.13	-0.09
4020	Stevenson Creek at Browning Street (u/s)	30.05	30.21	0.16
4040	Stevenson Creek at Lakeview Road (u/s)	31.16	31.14	-0.02
4080	Stevenson Creek at St. Thomas Drive (u/s)	39.53	39.52	-0.01
4090	Stevenson Creek at Belleair Road (d/s)	39.80	39.58	-0.22
4100	Stevenson Creek at Belleair Road (u/s)	40.08	40.12	0.04
4140	Jeffords Street Branch at Highland Avenue	28.73	28.73	0.00
4160	Jeffords St Branch at Skyview and Jeffords	31.14	30.70	-0.44
4190	Jeffords Street Branch at Barry and Tuscola	30.80	30.67	-0.13

All of the simulated high water elevations were within 0.50 feet of the measured values, which is within the accuracy of computation for this type of analysis, and exceeds FEMA's minimum requirements for flood insurance studies. All except two of the values were with 0.25 feet of the measurements.

Model Verification and DCIA

The storm of June 12, 2000 was simulated in order to verify the calibration parameters and to fine-tune estimates of DCIA as a percentage of total impervious area. As mentioned in previous sections, total impervious area within each subbasin was estimated based on land use and aerial photography. A 50/50 split between directly and non-directly connected impervious areas was initially assumed. Since runoff volumes resulting from high intensity, large volume storm events normally are not sensitive to the percentage of total impervious as DCIA, a small, less intense storm event was chosen for DCIA determination. Since the storm of June 12 was a low volume, low intensity storm that had extremely dry antecedent moisture conditions, all runoff from this storm can reasonably be attributed to DCIA. The initial model simulation slightly under predicted the volume from this storm. The percentage of total impervious as DCIA was then raised from 50% to 65%, which resulted in a better fit with the measured hydrographs (refer to Figures 2.1-13 and 2.1-14). The 15% impervious area that was transferred into DCIA was subtracted from the calculations of weighted CN, resulting in slightly lower CN values. Then, the calibration storm of July 15 was simulated with the new CN and DCIA values. As expected, the results from the larger storm event did not change significantly.

2.1.5 Flooding Conditions Assessment

Upon the successful completion of the development and calibration of the detailed hydrologic and hydraulic model, the next step of the watershed management planning process was to apply the model to assess the performance of the basin drainage network for a given set of design storm events. Results of these simulations were then analyzed with respect to the flooding level of service criteria, in order to identify the locations and the severity of potential flooding problems.

(Figure 2.1-13 and 2.1-14)

2.1.5.1 Design Storm Events

The basis for the evaluation of flooding conditions in the watershed were the 10, 25, 50, and 100-year return period, 24-hour duration design storm events. The total rainfall for these events are 7.5, 9.0, 10.5, and 12.0 inches, respectively, as determined from the SWFWMD Environmental Resource Permitting (ERP) Information Manual (February 1996). The 500-year, 24-hour storm was also simulated in order to be consistent with FEMA mapping guidelines. The rainfall of 14.8 inches for the 500-year storm was determined through a probability analysis of the more frequent design storm events. The SCS Type II Florida-Modified rainfall distribution was used to develop the design storm hyetographs for the all return periods.

2.1.5.2 Existing Flooding Conditions

Using the described design storm events as the basis for simulations, the AdICPR model was run to generate predictions of basinwide flooding conditions for the existing conditions throughout the Stevenson Creek watershed. The results of these model simulations are summarized in Appendix D, Table D.1. This table lists the model nodes in sequence starting from the downstream end and the corresponding model predictions of 10-, 25-, and 100-year flood elevation at those locations. Also listed are the locations and descriptions of the adjacent roadways and the low road elevation at each structure. Note that the low road elevation does not necessarily occur at the exact location of the structure itself, since sags along the road profile, as determined from SWFWMD topographic mapping and/or roadway construction drawings, may occur several hundred feet away in certain instances. When a peak flood elevation exceeds the low road elevation, it indicates that the roadway will be inundated at that location by a depth corresponding to the difference in elevations.

<u>*Comparison with Previous Studies*</u>

The following table compares the simulated 100-year flood elevations and peak discharge rates at five key locations within Stevenson Creek to the previous analyses of the watershed:

Table 2.1-6 Comparison of 100-year Peak Discharge Rates and Flood Stages

Location	W.K. Daugherty 1988 Preliminary Master Plan, Future Conditions		CDM 1997 FEMA Submittal		Parsons ES Existing Conditions	
	100-yr Flow (cfs)	100-yr Stage (ft, NGVD)	100-yr Flow (cfs)	100-yr Stage (ft, NGVD)	100-yr Flow (cfs)	100-yr Stage (ft, NGVD)
Douglass Avenue	5,859	4.6	n/a	n/a	4,697	7.73
Palmetto Street	4,603	11.0	2,190	8.67	3,300	10.14
Drew Street Gage	3,718	15.5	2,030	12.75	2,848	15.70
S. of Court Street	3,075	22.8	1,280	19.58	2,588	22.89
Jeffords Street	2,574	28.0	1,724	25.00	1,998	28.24

Because the modeling completed for this study was calibrated to measured stage and flow data, and the level of detail in the model network is an order of magnitude higher than the modeling completed for the previous studies, differences in the results are to be expected. Comparison of the peak discharge rates shows that those predicted by the Watershed Management Plan model consistently fall between those predicted by the other two studies. Upstream of Palmetto Street, the flood elevations predicted by the Parsons ES model generally compare closely with the W.K. Daugherty future conditions model, which includes the phase 1, 2, and 3 improvements (of which only phases 1 and 2 were constructed). In these same locations, the flood elevations predicted both in this study and in the W. K. Daugherty study are approximately three feet higher than those reported in the 1997 CDM study. While the reason for this large difference was not readily discernable, it should be mentioned that the 100-year project conditions flood levels reported in the 1997 CDM FEMA submittal are 0.5’ to 2.5’ lower than the 25-year project conditions flood levels reported in the 1992 CDM dredge and fill permit application (not shown). In addition, when comparing flood elevations at Douglass Avenue and Palmetto Street, it should be noted that neither of the two previous studies included the modeling of bridges at Edgewater Drive and the Pinellas Trail. In addition, the CDM study did not include the bridge at Douglass Avenue.

2.1.5.3 Flooding Level of Service Criteria

For the development of the comprehensive watershed management plan for the Stevenson Creek watershed, it was necessary to establish flood protection level of service (FPLOS) criteria by which flooding problems can be identified and alternatives for flood control can be evaluated. Determination of appropriate FPLOS criteria is therefore a very important part of the watershed planning process. Once the design storm flood elevations have been determined through the comprehensive modeling procedures, the FPLOS criteria then become the primary factor in determining the cost taxpayers must bear in order to remedy the existing flooding problems. Thus, the FPLOS criteria become the point at which the cost of infrastructure improvements is balanced against the public’s desire to further reduce the flooding in the watershed.

The primary FPLOS criterion is that there is to be no structural flooding (i.e., homes and businesses) for events up to and including the 100-year flood. This criterion refers to the low floor slab elevation (lowest inhabited floor) as the point of structural flooding. This is consistent with FEMA guidelines, and has been widely adopted by counties and municipalities across the state and the country.

The secondary set of FPLOS criteria specifies allowable thresholds for street flooding. The criteria is based upon residential, collector, and arterial roadways being passable for the 10, 25, and 100-year flood events, respectively. For the purposes of this study, “passable” is defined as 6” of flooding or less at the lowest edge of pavement in a travel lane. No flooding is allowable on hurricane evacuation routes for events up to and including the 100-year flood. The following table summarizes the proposed FPLOS criteria for Stevenson Creek:

Table 2.1-7 -- Proposed Flood Protection Level of Service (FPLOS) Criteria for the Stevenson Creek Basin

FPLOS Category	Allowable Flooding Depths
1. Residential Streets, 2 lanes	Up to 6” Allowed for 10-year flood
2. Collector Roads, 2-4 lanes	Up to 6” Allowed for 25-year flood
3. Arterial Roads, 4 or more lanes	Up to 6” Allowed for 100-year flood
4. Hurricane Evacuation Routes	No flooding up to 100-year flood
5. Habitable Structures	No flooding up to 100-year flood

In the next section, the above FPLOS criteria is used to identify and develop potential projects to reduce the design flood elevations to within the allowable flooding depths. However, experience shows that improving infrastructrue to reduce flood depths to meet a desired level of service is not always cost effective. For this reason, project costs must be weighed against the relative benefits. Of course, multiple-use facilities provide benefits in addition to flood control which must also be considered, as will be discussed in subsequent sections. Projects which do not provide benefits commensurate with the costs will not be recommended for funding.

Furthermore, it is not always technically feasable to reduce flood depths to meet a desired level of service. For example, many structures in low-lying areas near the coast in Clearwater were erected prior to the community’s participation in the National Flood Insurance Program, which first began in 1968. Many of these structures are subject to saltwater inundation from the 100-year storm (hurricane) surge from the Gulf of Mexico. Although beyond the scope of this Watershed Management Plan, it is highly unlikely that an infrastructure project designed to protect against the 100-year storm surge in this area would be technically feasable.

In instances such as these where it is not cost effective or technically feasable to lower the floodplain, alternatives to flood level reduction should be considered. One such alternative would be a program which allows the city, in cooperation with FEMA, to assist willing property owners in the floodproofing, elevating, or purchase of flood prone structures.

2.1.5.4 Flooding Problem Identification

The limits of the 100-year floodplain were generated by delineating the predicted flood elevations on SWFWMD 1”=200’ one foot contour aerial maps. Within the lower tidal portions of Stevenson Creek, the mapped floodplain limits are governed by FEMA’s computed storm surge elevations, as they are higher than those predicted to occur from riverine (freshwater) flooding due to rainfall and runoff. The storm surge floodplain intersects with the riverine floodplain near the Palmetto Street crossing of Stevenson Creek.

The floodplain limits were digitized for incorporation into the GIS, as illustrated in Figure 2.1-15 in the rear map pocket. The 500-year floodplain was mapped per FEMA requirements and is shown for informational purposes only. Although the hydrologic and hydraulic modeling necessarily included the entire watershed, including areas outside the corporate limits of the City of Clearwater, floodplain limits within the City of Dunedin were not mapped. Riverine flood profiles were plotted for the 10, 25, 50, 100, and 500-year design storm events for Stevenson Creek and Spring Branch, as shown on Figures 2.1-16 through 2.1-24 at the end of this section.

Flood protection level of service deficiencies were identified in the watershed area within the corporate limits of the City of Clearwater. The street flooding level of service deficiencies for the basin are tabulated in Appendix D, Table D.1. Shaded cells indicate locations that currently do not meet the proposed FPLOS criteria. The locations of the street FPLOS deficiencies are shown graphically on Figure 2.1-15.

In order to determine the number and location of structure FPLOS deficiencies, habitable structures within the limits of the 100-year floodplain were identified. A determination was then made as to which homes and businesses were likely to be susceptible to flooding for the 100-year event. This determination was based on the assumption that the floor elevations for slab-on-grade type structures are at least 6 inches above adjacent ground as shown on the SWFWMD aerials. Using this proceedure, 470 structures were identified as potentially flood susceptible. In order to more accurately approximate the actual number of structure FPLOS deficiencies, surveyed finished floor information was compiled for the majority of these structures. Surveyed elevations for approximately 75 of the structures were obtained as part of the 1988 W.K. Daugherty study. An additional 272 structures were surveyed by Harry Marlow, Inc., as part of this study. The remaining 123 structure elevations were estimated from the SWFWMD topography and the surveyed elevations of nearby structures.

Of the 470 structures entered into the database, 263 structures were found to have finished floor elevations below the 100-year flood level. This is, by definition, a structure flooding level of service deficiency. As indicated on Figure 2.1-15, the majority of these structures are located within the primary floodplains of the Stevenson Creek and Spring Branch main channels. However, many of the identified FPLOS deficiencies result from inadequate secondary drainage systems that feed into the main channels.

Table D.2 in Appendix D provides a complete listing of the structure flooding level of service evaluation for the Stevenson Creek Watershed. A summary of the identified structure FPLOS deficiencies in terms of both structures and total dwelling units is provided below as Table 2.1-8. Because many of the structures are multi-family buildings (duplexes, apartment buildings, etc), the number of flood-susceptible dwelling units is larger than the number of flood susceptible structures.

Table 2.1-8 Summary of Structure Flooding Level of Service Deficiencies

Subwatershed	Identified 100-year Flood-Susceptible Structures	Identified 100-year Flood-Susceptible Dwelling Units
Spring Branch	32	32
Lower Stevenson Creek	32	32
Middle Stevenson Creek	49	105
Upper Stevenson Creek	85	85
Hammond Branch	6	6
Lake Bellevue Branch	14	23
Jeffords Street Branch	45	51
Total	**263**	**334**

Subwatershed 1: Spring Branch

The Spring Branch Subwatershed was found to contain 32 structure FPLOS deficiencies. The majority of these (27) are in the area of Byram Drive and Flora Drive between King's Highway and Highland Avenue, and along Huntington Lane, east of King's Highway. These FPLOS deficiencies are located in a depressional area bordering the historical Spring Branch channel. At Woodlawn Terrace, east of Douglass Avenue, an additional four structure FPLOS deficiencies were identified in an isolated depressional area drained by an inadequate secondary storm sewer system. These two areas were identified in the 1997 City of Clearwater Watershed Management Plan, through interviews with City staff in the Engineering Department, as "areas of concern for flooding". Sunset Point Baptist Church was also identified as a level of service deficiency. Four residential street FPLOS deficiencies and eight collector road FPLOS deficiencies were identified, including Douglass Avenue, King's Highway, Sunset Point Road (two locations) and Highland Avenue. Although not FPLOS deficiencies of the City of Clearwater, there are estimated to be 10-15 flood-susceptible homes along Betty Lane and Macomber Avenue, north of Sunset Point Road within unincorporated Pinellas County. The locations of the City of Clearwater FPLOS deficiencies are shown on Figure 2.1-15.

Subwatershed 2: Lower Stevenson Creek

In the Lower Stevenson Creek Subwatershed, 32 structure FPLOS deficiencies were identified. The majority of these (27) are located along the main channel of Stevenson Creek between Douglass Avenue and Palmetto Street. These homes and businesses all have floor elevations below 9.5 feet NGVD, and are susceptible to flooding from both riverine flooding (rainfall and runoff) and storm (hurricane) surge. The 100-year storm surge elevation, as determined from the FEMA Flood Insurance Rate Maps, is elevation 11.0, NGVD. In addition to the structures susceptible to both flooding sources, there are several additional structures between Edgewater Drive and Palmetto Street which are susceptible to storm surge flooding only, which were not included. Other structure FPLOS deficiencies in Lower Stevenson Creek include two utility buildings adjacent to the Creek in the Clearwater Country Club. Also identified were two relatively isolated structure FPLOS deficiencies in the North Greenwood area and one near the intersection of Palmetto Street and King's Highway. The latter three FPLOS deficiencies are far removed from the creek, and are the result of inadequate secondary drainage systems. Residential street FPLOS deficiencies were identified at seven locations, and collector road FPLOS deficiencies were identified at six locations, including Douglass Avenue, Fairmont Avenue (two locations), Palmetto Street (two locations), and North Greenwood Avenue (refer to Figure 2.1-15).

Subwatershed 3: Middle Stevenson Creek

In terms of the concentration of flood-susceptible dwelling units, the most severe flooding problems in the watershed occur within the Middle Stevenson Creek subwatershed. Approximately 49 structures consisting of 105 ground-floor dwelling units along the banks of Middle Stevenson Creek were identified that are subject to inundation from the 100-year design flood. Many of the structures are multi-family buildings. All of the FPLOS deficiencies identified in this subwatershed are adjacent to the main channel of the Creek between Drew Street and Jeffords Street. The majority (60) of these structure FPLOS deficiencies occur in the area immediately to the west of Glen Oaks Golf Course. To provide an idea of the magnitude of the flood problem in this area, 24 dwelling units were also found to be vulnerable to the 25-year flood. In addition, three homes were found susceptible to the 10-year flood, including two homes in the 600 block of Betty Lane, which have been the subject of documented structure flooding. The most notable street FPLOS deficiency occurs at Cleveland Street, a hurricane evacuation route, at its crossing of Stevenson Creek. The predicted flood depths are more than two feet above the roadway for the 100-year flood. The roadway would also be impassable for a 25-year flood, and minor flooding is predicted for a 10-year flood. Residential street FPLOS deficiencies were identified at five locations, including Pierce Street, Franklin Street, Betty Lane (2 locations), and Mark Drive.

Although the construction of the Phase 1 and Phase 2 improvements in the 1990's significantly improved the conveyance capacity of Stevenson Creek from Drew Street to Court Street, floodplain enhancements within the Glen Oaks Golf Course were never constructed to the level originally envisioned in the 1990-1991 re-study of Stevenson Creek by CDM. In addition, the effectiveness of the constructed conveyance improvements has been greatly diminished due to a lack of adequate maintenance. Layers of sediment, and at times dense vegetation, have occupied portions of the improved channel. This problem was observed to be most severe between Drew Street and Cleveland Street.

Subwatershed 4: Upper Stevenson Creek

Upper Stevenson Creek encompasses the portion of the Creek targeted for conveyance improvements in Phase 3 of the 1988 W.K. Daugherty study. This phase was never constructed, primarily due to environmental concerns over the proposed improvement method of hardlining (paving) the channel with concrete. In the current analysis, the Upper Stevenson Creek subwatershed was found to contain 85 structure FPLOS deficiencies. All of these lie within the floodplain of the main channel of Stevenson Creek, with the largest concentration of them occuring on both sides of the Creek between Jeffords Street and Lakeview Avenue, and along Hillcrest Avenue south of Lakeview Road (see Figure 2.1-25).

Figure 2.1-25 Flooding on Hillcrest Avenue, South of Lakeview Road Storm of July 15 , 2000

However, the most severe and frequent flooding in the subwatershed occurs along Evergreen Avenue between Bellevue Boulevard and St. Thomas Drive, where seven homes were found susceptible to the 10-year flood. According to the City's complaint logs, at least two of these structures flooded during the recent storm of July 15, 2000. The flooding problem at this location is due to a 54" CMP culvert placed within the Stevenson Creek Channel that lacks the capacity to convey even the mean annual storm event. Residential street FPLOS deficiencies were identified at seven locations, and collector road FPLOS deficiencies were identified on Belleair Rd and Highlands Avenue.

Subwatershed 5: Hammond Branch

Hammond Branch was found to contain six structure FPLOS deficiencies, the fewest of all the subwatersheds. All of the FPLOS deficiencies are a result of inadequate secondary drainage systems. A single structure FPLOS deficiency on Hibiscus Street near King's Highway occurs when the storage capacity of the Hibiscus Pond is exceeded due to inflows from a 54" RCP culvert from the Highland Avenue drainage system. The existing outfall of Hibiscus Pond, consisting of a gunited 30" CMP, is not adequate to handle the inflows from the Highland's Avenue culvert. An unrelated problem occurs on Smallwood Circle (southeast of Highland and Palmetto), where two structure FPLOS deficiencies were identified. These homes were built in a depressional area surrounding a small city park, which floods frequently during moderate to heavy rains. The depression is drained by an undersized, failing 24" CMP culvert which runs under existing homes on Elmwood Street and Smallwood Circle. In addition, three FPLOS deficiencies were identified on Linwood Drive near Sharondale Drive, on the north side of the CSX railroad that runs parallel to Flagler Drive. This problem area is the result of floodwaters from the Flagler Drive ditch backing up through twin 48" RCP culverts under the CSX railroad. The 48" culverts were intended to convey runoff from the subbasin to the north into the Flagler ditch. During flood events, however, the culverts flow in the opposite direction, directing floodwaters from the south side of the railroad, across the flood susceptible properties bordering Linwood Drive. The problem is exacerbated by the fact that the floor elevations of the homes are only two to three feet above the invert of the Flagler Drive Ditch.

Residential street FPLOS deficiencies were identified at twelve locations in the Hammond Branch Subwatershed. Collector road FPLOS deficiencies were identified at nine locations, including three locations on King's Highway, four locations on Highland Avenue, and two locations on Palmetto Street.

Subwatershed 6: Lake Bellevue Branch

Incrementally over past several decades, the Lake Bellevue Branch has been almost completely enclosed in storm sewer. Unfortunately, little of the storm piping was designed to adequately handle major a storm event. In the Lake Bellevue Branch Subwatershed, 14 structures consisting of 23 ground-floor dwelling units were found susceptible to inundation from the 100-year design flood. Of this total, five are businesses located on Missouri Avenue immediately south of Turner Street. Missouri Avenue itself constitutes an arterial road FPLOS deficiency at this location. This flooding problem is due to the fact that upstream of Missouri Avenue, the Lake Bellevue Branch flows into a 54" diameter culvert which lacks the capacity to convey the flow resulting from even a mean-annual storm event. Further upstream in the subwatershed, four structure FPLOS deficiencies occur at Pinellas Street, east of Greenwood Avenue, and one on Tuskawilla Street, west of Greenwood Avenue. These FPLOS deficiencies are also the result of undersized culverts placed within the historic channel of the Lake Bellevue Branch. Upstream of Lake Bellevue, four flood-susceptible structures containing a total of 13 dwelling units were identified on Wildwood Way, west of the CSX railroad. These structures were built in a low area southwest of the Lake. The drainage for this area is towards Lake Bellevue, but flows are restricted by undersized culverts beneath the CSX railroad tracks. In addition to the single arterial road FPLOS deficiency on Missouri Avenue, the Lake Bellevue Branch contains five collector road FPLOS deficiencies on Druid Road, South Greenwood Avenue (two locations), Lakeview Road, and Belleair Road, and six residential street FPLOS deficiencies.

Subwatershed 7: Jeffords Street Branch

Within the Jeffords Street Branch Subwatershed, 45 structures containing 51 dwelling units were found susceptible to the 100-year flood. The majority of these structures (35 of 45) are located within a contiguous floodplain area that encompasses the Jeffords Street ditch and the three interconnected lakes in the vicinity of Duncan Avenue and Jeffords Street. Historical 1926 aerial photography shows a wetland existed where these structures and lakes are today. It is likely that material dredged to form the three lakes was used as fill to form the building lots and roadways in the former wetland. However, the area is still extremely floodprone, as evidenced by the numerous documented complaints of flooding, and the mapped extent of the 100-year floodplain. The remaining structure FPLOS deficiencies (10 structures/16 dwelling units) were also constructed in a former wetland, in the area now bounded by Spencer Avenue, Turner Street, Duncan Avenue, and Druid Road. These structures flood on a very frequent basis, as seven are below the 10-year flood level and nine of the ten are below the 25-year flood level. According to the City's complaint logs, at least two of these structures flooded during the recent storm of July 15, 2000. Collector road FPLOS deficiencies were identified on Highland Avenue, Lake Avenue (two locations), and Cleveland Street at Duncan Avenue. In addition, seven residential street FPLOS deficiencies were identified, most of which lie within the large contiguous floodplain area that encompasses the Jeffords Street Ditch.

- Figure 2.1-17 Stevenson Creek Flood Profile, Existing Conditions
- Figure 2.1-18 Stevenson Creek Flood Profile, Existing Conditions
- Figure 2.1-19 Stevenson Creek Flood Profile, Existing Conditions
- Figure 2.1-20 Stevenson Creek Flood Profile, Existing Conditions
- Figure 2.1-21 Stevenson Creek Flood Profile, Existing Conditions
- Figure 2.1-22 Stevenson Creek Flood Profile, Existing Conditions
- Figure 2.1-23 Spring Branch Flood Profile, Existing Conditions

2.2 NATURAL RESOURCES ASSESSMENT AND PROBLEM IDENTIFICATION

2.2.1 Introduction

In order to prepare the Watershed Management Plan for the Stevenson Creek Watershed, the entire watershed was investigated for undeveloped land, wetlands, natural areas, and potential restoration or preservation areas. The boundaries of the natural areas were identified and mapped on aerial photography (scale: 1" = 200'). These areas were characterized using the Florida Land Use Cover and Forms Classification System (FLUCCS) (FDOT, 1985).

The Stevenson Creek Watershed is a highly urbanized, densely populated area with little to offer in the way of natural systems. With one exception, the only undeveloped areas are golf courses and city parks. Wetlands are predominantly small isolated stormwater retention ponds or natural lakes that have been altered to such a degree that their origin can only be determined from historic aerial photography. The waterways are predominantly channelized with little riparian habitat. The intense development has also altered the estuarine system so that little habitat is provided at the mouth of Stevenson Creek.

Despite the intense urbanization of the watershed, improvements that do not require large expanses of open land and large expenditures of public funds can be made to increase the wildlife habitat and improve water quality. Studies have shown that golf courses can be managed to improve the water quality and wildlife habitat provided by the expanses of open space without negatively impacting the recreational function. For the purposes of this watershed management plan, a discussion of the existing natural conditions is provided in this section, while improvements that can be accomplished by public entities, private non-profit organizations, and by concerned private citizens are discussed in Section 3.

2.2.2 Existing Conditions

As can be seen in the land use map (Figure 2.1-2) and Table 2.2-1, the predominant land use within the watershed is residential, comprising approximately 70% of the total land area. Other developed areas such as commercial, industrial, institutional, open land, and transportation/utility land uses combined make up another 19% of the watershed. This leaves only 11% of the watershed in potential natural resource land uses, which includes undeveloped upland areas, recreational areas, open water bodies, or wetlands.

Most of the individual subwatersheds are similar in distribution of land uses. The Upper Spring Subwatershed has more wetlands than any other subwatershed, with 40 acres compared to less than 7 acres for each of the other subwatersheds. This is due to two large forested wetland areas near the intersection of Keene Road and Virginia Street. A 36-acre upland forested area in the Lower Spring Branch Subwatershed is by far the largest available habitat area in the watershed. The other subwatersheds have 0 to 7 acres of undeveloped uplands that may provide habitat. The open water bodies land use, which includes ponds, lakes, and other open water areas, is divided among three subwatersheds that have only 7 acres and four subwatersheds that have between 22 and 56 acres. The following paragraphs provide a subwatershed-by-subwatershed description of the land uses and available habitat.

Upper Spring Branch Subwatershed

The Upper Spring Subwatershed is located in the northernmost portion of the watershed and is the largest in total land area. There are several forested wetland areas within the watershed, as well as a freshwater marsh.

The freshwater marsh (approximately 4 acres) is located west of the forested wetland areas near the intersection of Virginia and Keene. The marsh is highly disturbed and dominated by nuisance vegetation such as primrose willow, cattail, and others. Some open water is present in the center of the marsh, indicating a depth that may be associated

Table 2.2-1

LAND USE TYPES PER BASIN IN THE STEVENSON CREEK WATERSHED (Approximate acreages)									
Land Use	**Hammond Branch**	**Jeffords Street**	**Lake Belleview**	**Lower Spring**	**Lower Stevenson**	**Middle Stevenson**	**Upper Spring**	**Upper Stevenson**	**TOTAL**
Residential (1000-1300)	649	529	340	338	516	287	1226	491	4376
Commercial (1400)	34	31	178	11	56	145	115	41	610
Industrial (1500)	5	4	13	0	20	00	0	0	42
Institutional (1700)	21	14	16	23	31	11	53	15	182
Recreational (1800)	96	40	24	0	116	45	18	0	339
Open Land (1900)	41	2	13	37	11	11	105	14	234
Agriculture (2000)	10	0	0	0	0	0	5.	0	15
Upland Forests (4000)	2	0	5	36	0	0	7	0	50
Water Bodies (5000)	27	22	37	8	40	7	56	7	205
Wetlands (6000)	1	1	7	7	5	2	40	0	63
Trans./Utilities Communication (8000)	27	8	22	5	27	27	47	7	170
Total per Basin	**914**	**651**	**655**	**465**	**821**	**535**	**1673**	**575**	**6286**

with historic activities such as peat mining or excavation to increase retention and/or to reduce the ground water levels in adjacent properties. Development is encroaching upon the marsh, with new housing constructed on the east side. In its current state, this marsh still can provide wildlife habitat, although the isolated, fragmented condition of the marsh has greatly reduced the potential.

The 30 acres of forested wetlands appear to be the former headwaters of Spring Branch, which flows from this area south and west to the confluence with Stevenson Creek. These forested wetlands have been substantially altered with dredging, draining, filling, and channelizing. The canopy consists of a mixture of hardwoods and cypress, with slash pine in the drier transitional areas. The vegetation in these wetlands has been impacted by the hydrologic alterations, and nuisance species are now dominant in some areas.

Lower Spring Branch Subwatershed

The Lower Spring Branch Subwatershed is located north and east of the confluence of Stevenson Creek and Clearwater Harbor. This is the smallest of the subwatersheds, at only 465 acres. Although this subwatershed is 80% developed, there are two areas within this subwatershed that offer habitat to wildlife. In addition, portions of the Spring Branch channel still maintain a remnant of riparian habitat in the form of trees and a somewhat natural streambed.

The forested upland area within this watershed is located near the intersection of Sunset Point Road and Betty Lane. This approximately 25-acre parcel has been impacted in the past with clear-cutting and grading. Historic aerial photography (1926) shows that this parcel was cleared and a pond was excavated on the west side, potentially in preparation for development. The southern portion of the parcel supports a stand of second-growth oak and pine with an open understory. Spring Branch borders the east side of this portion of the parcel. The northern, more mesic portion of the parcel supports more nuisance vegetation, especially around the pond and the outer edges of the site. However, there are mature trees in the canopy and native species in the understory and shrub layer. The vegetation in the pond is dominated by Carolina willow, and appears to be intermittently inundated.

This photo was taken facing north from the ditch that drains the small excavated pond within the forested area at Betty Lane and Sunset Point Drive.

This photo was taken in the mesic forested area, in the southern part near State Street. The vegetation in this area includes slash pine, laurel oak, saw palmetto, and cabbage palm.

Despite the impacted condition of the parcel, it currently provides the only wildlife habitat of any substantial size within the watershed. Recent survey lines cut through the parcel indicate that it may be too late to preserve it, but it has the potential to become locally significant wildlife habitat, as well as a neighborhood recreational area.

Lower Stevenson Creek Subwatershed

This subwatershed is 80% developed in residential, industrial, commercial, and utility/transportation land uses. Fourteen percent of the watershed is identified as recreational, but this includes a ballpark and the Clearwater Country Club. There are no large tracts of undeveloped upland areas that may provide habitat for wildlife, and few areas that would provide wetland habitat. There is a small (approximately 9-acre) parcel of land east of the Douglas Avenue Bridge on the north side of Stevenson Creek that provides the best potential habitat in the subwatershed. The parcel appears to have been a dumping ground for construction material, fill, household waste, and landscape trimmings. The majority of the site is vegetated with nuisance exotic species such as ear tree (*Enterolobium contortisiliquum*), lead tree (*Leucaena leucocephala*), Caesar weed (*Urena lobata*), castor bean (*Ricinus communis*), beggar's tick (*Bidens pilosa*), Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*), and other noxious weeds. Some remnants of native upland vegetation are present on the eastern boundary, adjacent to the auto-salvage yard along the eastern boundary of the undeveloped parcel. Species present in this area include laurel oak (*Quercus laurifolia*), saw palmetto (*Serenoa repens*), cat briar (*Smilax bona-nox*), and wild grape (*Vitis* sp.).

The shoreline of the parcel along Stevenson Creek is vegetated in mangroves, including black (*Avicennia germinans*) and red (*Laguncularia racemosa*). A small mangrove swamp is located on the western side of the property. This swamp is predominantly black mangrove with an open water area in the center. The City is currently in negotiations with the owner to purchase the property containing this parcel.

The photo to the left was taken on the north bank of Stevenson Creek west of the Douglas Avenue Bridge. The view is to the southeast

Stevenson Creek meanders through the Clearwater Country Club golf course on a semi–natural streambed. There have been previous attempts to create marsh habitat on-line with the creek that have been somewhat successful. On-line wetlands are always difficult to create because of the need to accommodate the occasional heavy volumes of water flowing through the stream and the potential for erosion. In addition, maintenance is difficult due to the nuisance exotic vegetation that can be washed in from problem areas upstream. In spite of the drawbacks, the golf course provides one of the best potential areas for habitat improvement, depending upon the available area.

This photo shows the mitigation area within the golf course. The low gabion wall was installed to protect the mitigation area from erosion and the influx of exotic vegetation.

Middle Stevenson Creek Subwatershed

The Middle Stevenson Creek Subwatershed is 90% developed, with golf courses and a few stormwater ponds comprising the remaining ten percent. This subwatershed has the second highest area devoted to commercial enterprises, but no industrial land uses. There are no potential habitat areas with the exception of the golf courses, which provide marginal habitat at best. The creek is armored and channelized through this portion of the watershed, and although these types of improvements may be essential for flood abatement, they do little to enhance water quality and wildlife habitat.

The photo to the left shows a typical section of the creek (Lynn Lake) through the Middle Stevenson Creek Subwatershed. The algal mats on the water surface usually indicate poor water quality.

Hammond Branch Subwatershed

This second largest subwatershed is located on the east side of the watershed, with the majority of the subwatershed lying north of Drew Street. This subwatershed is 87% developed, with a golf course and ball fields again comprising the majority of the undeveloped land. There are three fairly large water bodies in the subwatershed totaling 27 acres. These managed water bodies and two very small freshwater marshes provide the best habitat options in the subwatershed.

The photo to the left shows a view of Lake Hobart facing south. This lake is one of the larger water bodies.

Jeffords Street Subwatershed

The Jeffords Street Subwatershed is located in the eastern portion of the watershed, south of the Hammond Branch Subwatershed. This watershed is 91% developed with several water bodies and a golf course making up the remaining land uses. Crest Lake, the 20+-acre lake in the northern portion of the subwatershed, is located within a city park. This lake and the surrounding shoreline could potentially be enhanced to increase the habitat potential without impacting the park significantly. A discussion of these improvements and Best Management Practices for golf courses is provided in Section 3.

There are several small water bodies in the subwatershed ranging in size from 0.5 to 4.0 acres. These ponds are located within dense residential neighborhoods and likely do not provide more than the most minimal habitat for wildlife. Even small ponds can be improved to enhance the wildlife habitat availability by planting the shoreline with native species and improving water quality by reducing the pollutants in stormwater runoff.

This photograph is a view of Crest Lake from the northeastern corner. The sparseness of the understory vegetation can contribute to erosion and sedimentation in the lake due to stormwater runoff.

Lake Bellevue Branch Subwatershed

The Lake Belleview Subwatershed is located in the southwestern portion of the Stevenson Creek Watershed, with Missouri Road roughly forming the eastern boundary. The subwatershed is 89% developed, with the 33-acre Lake Bellevue comprising another 5% and the adjacent park and playgrounds adding another 5%.

This recreational area (Ed Wright Park) is the only potential wildlife habitat in the Subwatershed, but the habitat is marginal at best. The lake is maintained to keep aquatic weeds from overtaking, however on the west side of the lake, the banks are covered with Brazilian pepper and other noxious invasive plants. These weeds do provide some function acting as a buffer from the heavy traffic on Myrtle Avenue. The northeast corner of the park supports a heavy canopy of mature oaks, but the understory is predominantly a parking area.

There are six small water bodies in the subwatershed, excluding Lake Bellevue. As with the majority of the other small water bodies in the watershed, these are highly maintained, isolated, and located within dense residential neighborhoods. These areas provide marginal habitat at best.

This photograph of Lake Bellview shows the bare shorelines and lack of significant littoral vegetation. The littoral vegetation would provide habitat and water quality benefits.

This photograph was taken on the southwestern corner of the lake and shows the nuisance vegetation infestation. Cleaning up this area would enhance the wildlife habitat provided by this area.

Upper Stevenson Creek Subwatershed

The Upper Stevenson Creek Subwatershed is located in the southeastern portion of the watershed with Missouri Avenue forming the western boundary. This subwatershed is completely built out, with the exception of four small water bodies totaling 7 acres. The creek is completely lined with houses, leaving no options for habitat improvements without purchasing expensive residential property.

This is an example of one the culverts within the Upper Stevenson Creek Subwatershed. This culvert is near the intersection of Hillcrest and Browning.

2.2.3 Wildlife

This highly urbanized area does not provide much habitat for wildlife, other than for generalist species that have adapted to urban environments. Table 2.2-2 provides a list of common faunal species that were observed or are expected to occur in the watershed.

The Backyard Habitat program promoted by the National Wildlife Federation educates citizens on building habitat within their own backyards, which increases the available habitat in urban environments. Details on this program are available on the National Wildlife Federation website.

2.2.4 Endangered and Threatened Species

Endangered and threatened species are those that have been categorized in some way by the respective jurisdictional agencies as meriting special protection or consideration. The state lists of animals are maintained by the Florida Fish and Wildlife Conservation Commission and categorized as endangered, threatened or of special concern. The lists constitute Rules 39-27.003, 39-27.004, and 39-27.005, respectively, Florida Administrative Code.

Table 2.2-2

Wildlife Observed (*) or Expected Within the Stevenson Creek Watershed	
Scientific Name	**Common Name**
Birds	
Accipiter cooperii	Cooper's hawk
*Agelaius phoeniceus**	Red-winged blackbird
*Ajaia ajaja**	Roseate spoonbill.
*Anas fulvigula**	Mottled duck
*Anhinga anhinga**	Anhinga
*Ardea herodias**	Great blue heron
Aramus guarauna	Limpkin
*Bombycilla cedrorum**	Cedar waxwing
Botaurus lentiginosus	American bittern
*Bubulcus ibis**	Cattle egret
*Buteo lineatus**	Red-shouldered hawk
*Butorides virescens**	Green heron
*Cardinalis cardinalis**	Cardinal
*Casmerodius albus**	Great egret
*Cathartes aura**	Turkey vulture
*Ceryle alcyon**	Belted kingfisher
*Chadradrius vociferous**	Killdeer
*Colaptes auratus**	Northern flicker
*Columba livia**	Rock dove
*Coragyps atratus**	Black vulture
*Corvus brachyrhynchos**	American crow
*Corvus ossifragus**	Fish crow
*Cyanocitta cristata**	Blue jay
*Dendroica coronata**	Yellow-rumped warbler
Dendroica palmarum	Palm warbler
*Dryocopus pileatus**	Pileated woodpecker
*Dumetella carolinensis**	Catbird
*Egretta caerula**	Little blue heron
*Egretta thula**	Snowy egret
*Egretta tri-color**	Tricolor heron
*Elanoides forficatus**	Swallow-tailed kite
*Eudocimus albus**	White ibis
*Falco sparverius**	American kestral
Falco peregrinus	Peregrine falcon

*Fulica americana**	American coot

Table 2.2-2 (cont.)

Wildlife Observed (*) or Expected Within the Stevenson Creek Watershed	
Scientific Name	**Common Name**
Birds (cont.)	
*Gallinula chloropus**	Common moorhen
*Geothlypis trichas**	Common yellowthroat
*Ixobrychus exilis**	Least bittern
*Lanius ludovicianus**	Loggerhead shrike
*Larus argentatus**	Herring gull
*Larus atricilla**	Laughing gull
*Larus delawarensis**	Ring-billed gull
Larus philadelphi	Bonapart’s gull
*Melanerpes carolinus**	Red-bellied woodpecker
*Mimus polyglottus**	Mocking bird
*Mycteria Americana**	Wood stork
*Nycticorax nycticorax**	Black-crowned night heron
*Nyctanassa violacea**	Yellow-crowned night heron
*Otus asio**	Belted kingfisher
*Pandion haliaetus**	Osprey
*Passer domesticus**	House sparrow
*Parus bicolor**	Tufted titmouse
*Pelecanus occidentalis**	Brown pelican
Phalacrocorax auritus*	Double-crested cormorant
Picoides pubescens*	Downy woodpecker
Plegadis falcinellus	Glossy ibis
*Podilmbus podiceps**	Pied-billed grebe
*Quiscalus major**	Boat-tailed grackle
*Quiscalus quiscula**	Common grackle
Rallus elegans	King rail
Rallus limicola	Virginia rail
*Sterna forsteri**	Forster’s tern
*Streptopelia decaocto**	Eastern screech owl
Strix varia	Barred owl
*Sturnus vulgarus**	European starling
*Tachycineta bicolor**	Tree swallow
*Toxostoma rufum**	Brown thrasher
*Turdus migratorius**	American robin
Thryothorus ludovicianus	Carolina wren

*Zenaida macroura**	Mourning dove

Table 2.2-2 (cont.)

Wildlife Observed (*) or Expected Within the Stevenson Creek Watershed	
Scientific Name	**Common Name**
Mammals	
*Dasypus novemcinctus**	Armadillo
*Didelphis virginiana**	Opossum
Lasiurus intermedius	Northern yellow bat
Lontra canadensis	River otter
Peromyscus gossypinus	Cotton mouse
Peromyscus polionotus	Oldfield mouse
*Procyon lotor**	Raccoon
Nycticeius humeralis	Evening bat
*Sciurus carolinensis**	Eastern gray squirrel
Sciurus niger shermanii	Sherman's fox squirrel
Sigmodon hispidus	Hispid cotton rat
Sylvilagus floridanus	Eastern cottontail
Sylvilagus palustris	Marsh rabbit
Tadarida brasiliensis	Brazilian free-tail bat
Reptiles And Amphibians	
Anolis carolinensis	Green anole
Anolis sagrei sagrei	Brown anole
Acris gryllus	Southern cricket frog
Rana sphenocephala	Southern leopard frog
Bufo terrestris	Southern toad
Coluber constrictor	Black racer
Diadophis punctatus	Ring necked snake
Hyla cinerea	Green tree frog
Hyla gratiosa	Barking tree frog
Hyla squirella	Squirrel tree frog
Osteopilus septentrionalis	Cuban tree frog
Pseudemys floridana floridana	Florida cooter
Rana sphenocephala	Southern leopard frog
Sternotherus sp.	Common musk turtle
Thamnophis sirtalis	Common garter snake
Trachemys scripta elegans	Red-eared turtle
Trachemys scripta scripta	Yellow bellied turtle

Table 2.2-2 (cont.)

Wildlife Observed (*) or Expected Within the Stevenson Creek Watershed	
Common Name	**Common Name**
Fish and Shellfish	
Lane Snapper	Spotted Sea trout
Mojarra	Silver Sea trout
Grunt	Red Snapper
Weakfish	Yellowtail Snapper
Gray Snapper	Scad
Atlantic Bumper	Silver Perch
Mutton Snapper	Spot
Lookdown	Atlantic Croaker
Leatherjack	Silver Porgy
Mahogany Snapper	Sand Perch
Permit	Gag Grouper
Black Drum	Stone Crab
Red Drum	Tunicate
Sheepshead	Burrfish
Pinfish	Puffer
Blue Crab	Flounder
Toadfish	Hogfish
Cowfish	Wrasse
Filefish	Spadefish
Sole	Black Seabass
Mullet	Glass Slipper
Parrotfish	Squid Egg Mass
Sergeant Major	Comb Jelly
Snook	Sea Urchin
Gulf Shrimp	Bivalve (U.N.I.D)
Grass Shrimp	Sea Snail (Banded Tulip)
Ghost Shrimp	Sea Hare
Mud Crab	Sea Pork
Hermit Crab	Trunkfish
Arrow Crab	Sea Horse
Pipefish	Spade Crab
Sand Dollar	Feather Bleeny
Lizardfish	Scallop
Spider Crab	Sponge

Table 2.2-2 (cont.)

Wildlife Observed (*) or Expected Within the Stevenson Creek Watershed	
Common Name	**Common Name**
Seabream	Octopus
Shade Crab	Polychete Worms
Scaled Sardine	Sea Snail (Moon Snail)
Wort Jelly	Juv. Flying Gunnard
Horshoe Crab	Squid
Lentil Spider	Calico Crab
Sea Cucumber	Mangrove Snapper
Silverside	Whelk Egg
Brittle Star	Sea Snail (Banded Tulip)

Source: Clearwater Audubon Society (Ms. Jane Williams), and Clearwater Marine Aquarium (Mr. Geoff Lane), field observations (Parsons ES, May 2000), and Florida Natural Areas Inventory, 1996

The state lists of plants are categorized into endangered and threatened and commercially exploited and are administered and maintained by the Florida Department of Agriculture and Consumer Services via Chapter 5B-40, F.A.C. The federal list of animals and plants is administered by the U.S. Fish and Wildlife Service and are published in 50 CFR 17 (animals) and 50 CFR 23 (plants).

Even the most urban environments can support some endangered species. For instance, during the field reviews for this project, white ibis and little blue heron were observed on one of the golf courses within the watershed. Bald eagles have nested in other watersheds within the City of Clearwater, and could nest in the Stevenson Creek watershed if the appropriate habitat were available. Table 2.2-3 lists the endangered, threatened, or species of special concern that occur or potentially occur in the watershed.

Table 2.2-3
Endangered, Threatened, or Special Concern Species Observed (*)
or Potentially Present in the
Stevenson Creek Watershed

Gopher Tortoise	Sherman's fox squirrel*	Florida sandhill crane
Gopher frog	Little blue heron*	Peregrine falcon*
American alligator*	Wood stork*	SE American kestrel
Florida mouse	Tri-colored heron*	Bald eagle*
Eastern indigo snake	Snowy egret*	Burrowing owl
Limpkin*	Roseate spoonbill*	White ibis*

The species identified with an asterisk (*) in the table above have been observed in the watershed by members of the Clearwater Audubon Society. It is highly unlikely that any of these species are successfully breeding in or if viable populations of these species exist within the Stevenson Creek Watershed due to the lack of suitable habitat.

2.3 WATER QUALITY ASSESSMENT

The Stevenson Creek Watershed is the largest watershed in the City of Clearwater. Residential land uses are dominant in this urban watershed, which provides drainage for the western portion of Clearwater as well as portions of Dunedin and unincorporated Pinellas County. The main stem of the creek originates near Belleair Road and flows northward to Clearwater Harbor.

The largest tributary is Spring Branch which flows from Dunedin and southward entering Stevenson Creek just upstream of Clearwater Harbor. Other major tributaries include two highly altered streams draining the eastern portion of the watershed. One of these streams drains into Stevenson Creek near Palmetto Street and the other empties into the creek near Jeffords Street. Another major tributary is a remnant stream that drains Lake Belleview and enters the main channel near Glenn Oaks Golf Course.

Numerous small, natural water storage areas are located throughout the basin as well as several lakes. Most notable in size is Lake Bellevue which is around 25 acres. The two other largest lakes in the basin are Crest Lake and Lake Hobart which are about half the size of Lake Bellevue.

These storage areas and lakes provide stormwater runoff treatment. Best management practices (BMPs) for new (post-1982) development are also present; however, stormwater runoff treatment is lacking in many areas. New BMPs can help to improve water quality in the watershed; however, anthropogenic sources other than stormwater runoff appear to influence water quality in the Stevenson Creek Watershed to a significant degree.

Low dissolved oxygen levels, fecal contamination, and excessive nutrient concentrations are the primary water quality issues that have been identified in the watershed, and as such, water quality in Stevenson Creek is rated as “poor” by the state. The state’s rating is based on sampling conducted by the Pinellas County Department of

Environmental Management (PDEM). The city's ambient monitoring program as well as monitoring conducted for this study affirms these water quality issues.

Stevenson Creek is included on Florida's impaired waters list {303(d) List} due to concerns over dissolved oxygen, coliforms, and nutrients. The FDEP has given Stevenson Creek a priority rating of "High". Stevenson Creek is located in the "Crystal River to St. Petersburg Beach Basin" which is in Group 5 of the basin rotation cycle. TMDL development activity is expected to begin in 2004.

Water quality assessments conducted for this study included a

- Review of Existing Data (Section 2.3.1, *Existing Data*),
- Base flow and storm event monitoring program (Section 2.3.2, *Monitoring Program*),
- Water quality data interpretation (Section 2.3.3, *Water Quality Characteristics*), and
- Nonpoint source loading assessment (Section 2.3.4, *Nonpoint Source Loads*).

Each of these four elements is described separately in the following subsections.

2.3.1 Existing Data

During the last decade, Pinellas County and the city have conducted and documented water quality monitoring programs within the Stevenson Creek Watershed (Figure 2.3-1); likewise, the Marshall Street Wastewater Treatment plant (MWWTP) maintains operating records, and the Pinellas County Health Department maintains records concerning individual septic tanks. These monitoring programs and records were reviewed and are more specifically described as follows:

- **Pinellas County ambient surface water monitoring program**-- active Pinellas County monitoring program containing two stations within the Stevenson Creek Watershed (Refer to *Existing Water Quality Monitoring Programs*, Section 2.3.1.1)

Figure 2.3-1
Water Quality Monitoring Stations

- **City of Clearwater ambient surface water monitoring** program -- ambient surface water quality monitoring program from 1992 through 1995 containing ten stations within the Stevenson Creek Watershed (Refer to *Existing Water Quality Monitoring Programs*, Section 2.3.1.1)

- **Southwest Florida Water Management District, Lake Bellevue monitoring program--** short-term program from 1996-1997 (Refer to *Existing Water Quality Monitoring Programs*, Section 2.3.1.1)

- **Marshall Street Wastewater Treatment Plant operating reports --** ten-year record (Refer to *Other Existing Data*, Section 2.3.1.2)

- **Pinellas County Health Department septic tank records--** Recent septic tank construction and repair applications (Refer to *Other Existing Data*, Section 2.3.1.2)

2.3.1.1 Existing Monitoring Programs

Pinellas County, the Southwest Florida Water Management District (SWFWMD), and the City of Clearwater have conducted monitoring programs within the Stevenson Creek Watershed. Summary results from each of these monitoring programs are provided in Appendix I.

Pinellas County Department of Environmental Management (PDEM) maintains two stations in Stevenson Creek as part of its countywide ambient water quality monitoring program. The data from these two stations is the basis for the state’s inclusion of Stevenson Creek on the impaired waters list, and the county has used these data to implicate Stevenson Creek as having some of the poorest water quality in the county (Myers et al. 2000).

PDEM provided the following description of these two stations to EPA’s STORET database:

- “Stevenson's Creek off the southeast side of the Douglass Ave bridge just north of the Clearwater WWTP from mid span sampled monthly”

- "collected from Spring Branch of Stevenson's Creek off the west side of the Overbrook bridge just west of Douglass Ave at mid span sampled monthly"

Most prominent in each of these data sets are average fecal coliforms counts and ammonia nitrogen levels, which often exceed state standards. Phosphorous is high at the Spring Branch station, and nitrate + nitrite is high at both stations, particularly at the Stevenson Creek Station. The state reports a trophic state index of 65 for the Stevenson Creek estuary indicating that water quality is poor. A review of the nitrogen/phosphorus ratios shows that the estuary is nitrogen-limited.

A short-term monitoring program was conducted by SWFWMD on Lake Belleview (1996-1997). This program consisted of two sampling events- one in each year. The results showed low phosphorous levels for both measurements and high nitrogen levels for the 1996-measurement followed by low nitrogen levels during the 1997-measurement. Accordingly, a sharp drop in lake productivity was observed during the second year. Nitrogen forms were almost entirely organic.

The city conducted an ambient surface water quality monitoring program from years 1992 through 1995. The program included 10 stations in the Stevenson Creek Watershed. The monitoring program included grab samples analyzed for nutrients, oil and grease, suspended solids, coliforms and fecal streptococcus, biochemical oxygen demand (BOD_5), chlorides, and field parameters (dissolved oxygen, pH, etc.). Dissolved oxygen and fecal contamination were the most significant concerns identified for the Stevenson Creek Watershed during the city's monitoring program. Nutrient levels were also often elevated during the monitoring period.

2.3.1.2 Other Existing Data

Operating reports for Marshall Street Wastewater Treatment plant (MWWTP) were reviewed along with limited septic tank information made available by the Pinellas County Health Department. These records show that MWWTP (Figure 2.3-2) contributes significant quantities of nutrients, solids, and oxygen-demanding substances to the Stevenson Creek estuary, and, the septic tank information, considered in

Figure 2.3-2

Marshall Street Wastewater Treatment Plant

conjunction with coliforms sampling results, provides information concerning potential sources of fecal contamination in the basin.

The MWWTP discharges nutrients, solids, and oxygen-demanding substances to Stevenson Creek. While concentrations for these constituents in the plant effluents are within appropriate standards, the average 5.55 MGD-flow (6.8 MGD average daily flow minus 1.25 MGD flow to the reclaimed water system) results in masses that make up a significant percentage of total loads to the estuary originating from the Stevenson Creek Watershed. Information from the monthly operating reports for the year 1999 were averaged to produce the table below which compares loads from the treatment plant with loads measured during the 186-day monitoring period, of this study, at the two monitoring stations (Drew Street and Kings Highway). Stevenson Creek at the location of the MWWTP discharge has a much higher

Table 2.3-1
Loads During Monitoring Period

Input Source	Volume Discharged (ac-ft)	BOD_5 (Pounds)	TSS (Pounds)	TN (Pounds)	TP (Pounds)
Base and Storm Flow (1)	3,170	101,199	157,406	11,542	3,084
MWWTP	2,587	82,596	128,471	9,420	2,517

Note: Loads measured (based on mean concentration of all samples, this study, and the overall flow) at the Spring Branch (King's Highway) and Stevenson Creek (Drew Street) Station, May 2000 – November 2000

capacity to assimilate pollution than do the upper, freshwater reaches of the creek, and these mass loading calculations are provided only to add perspective to overall watershed load estimates presented elsewhere in this report.

Indirect evidence suggests that both the sanitary sewer system (i.e., cross-connections or inflow) and septic tanks may contribute to bacteria and nutrient levels in the Stevenson Creek Watershed. The MWWTP appears to receive a moderate increase in flow during the wet season. In addition, the locations and density of septic tank repair permits seem to coincide with the highest percent of human isolates found in the results of the fecal coliform sampling.

A fourteen-year flow record (January 1985- January 2000) was reviewed for the MWWTP. During this time period the average daily flow during the wet season (June-September) was 7.06 MGD as compared to 6.65 MGD during the remaining eight months of the year. If this variation is due to increased rainfall during the wet season, then possible explanations for the increase are infiltration, inflow, or cross connections between the sanitary and storm systems. Anecdotal evidence of one possible infiltration or cross connection problem is provided by a resident who reported that a lift station on Sunset Point Road (just west of Stevenson Avenue) overflows during heavy rains “causing the creek to stink like sewage”.

Pinellas County recently began keeping records of applications for septic tanks repairs. The locations of the septic tanks contained in this database were plotted (Figure 2.3-3), and seem to suggest that septic tanks within the city are concentrated between Union Street and Palmetto Street. These locations are near City of Clearwater monitoring Station STC1 and STC2, which happen to be the two stations with the highest percent of human isolates in fecal coliform samples (refer to Appendix J and Figure 2.3-1). While this seems to implicate septic tanks as a source of fecal contamination, a direct “cause and effect” statement concerning the use of septic tanks in the Stevenson Creek Watershed cannot be made. Other factors, such as the downstream position of STC1 and STC2, may be the cause of the higher human-source fecal contamination that was observed - in other words, the origin of the human-sourced fecal contamination measured at STC1 and STC2 could potentially be located upstream of the septic tanks.

Figure 2.3-3

Septic Tank Densities

2.3.2 Monitoring Program

A hydrologic and water quality monitoring program was implemented for the Stevenson Creek Watershed project. Two monitoring stations were installed – one station in Stevenson Creek (*Stevenson Creek Station*) just downstream of Drew Street and one station in Spring Branch (*Spring Branch Station*) just downstream of Kings Highway (Figure 2.3-4).

Each station logged rainfall depth and channel stage at 15-minute intervals from May 21,2001 through November 23, 2000. Flow-weighted composite samples were collected for seven (7) separate storm events and grab samples were taken for six (6) base flow events at each station. Savannah Laboratories in Tampa analyzed the samples in accordance with their FDEP-approved quality assurance plan. One equipment blank for each station was collected and analyzed prior to the first storm-sampling event.

Laboratory parameter included solids, oxygen demand, nutrients, metals and petroleum hydrocarbons. These parameters are more specifically described in Table 2.3-2 along with their corresponding minimum detection limits.

2.3.2.1 Monitored Basins

The majority (65%) of the watershed was monitored. Figure 2.3-4 shows the areas that drain to each of the monitoring stations. These areas include a 2400-acre area draining to the Stevenson Creek Station and a 1700-acre area draining to the Spring Branch Station. The unmonitored portion of the basin is approximately 2200 acres.

Both the Stevenson Creek and Spring Branch Stations are similar with respect to land use. The dominant land use is residential. The primary distinguishing factor is the presence of a larger amount of commercial land use in the Stevenson Creek Basin and a larger amount of high-density residential land use in the Spring Branch Basin. The Land uses in the unmonitored portion of the basin are similar to the monitored basins as shown in Figure 2.3-5 – shown as a doughnut graph to emphasize similarity.

Table 2.3-2

Water Quality Sampling Parameters

Parameter	MDL[1] (mg/l)
Hardness as $CaC0_3$	3.3
Petroleum Hydrocarbons	
Oil and Grease	5.0
Total Recoverable Petroleum Hydrocarbons, TRPH	0.30
Oxygen Demand	
Biochemical Oxygen Demand (5 Day), BOD_5	2.0
Chemical Oxygen Demand, COD	20
Total Organic Carbon, TOC	1.0
Solids	
Total Suspended Solids, TSS	5.0
Total Dissolved Solids, TDS	5.0
Metals	
Aluminum, Al	0.20
Arsenic, As	0.010
Cadmium, Cd	0.0050
Chromium, Cr	0.010
Copper, Cu	0.020
Lead, Pb	0.0050
Nickel, Ni	0.040
Zinc, Zn	0.020
Nutrients	
Ortho Phosphate, P	0.050
Total Phosphorus, TP	0.10
Ammonia, NH_3	0.03
Total Kjeldahl Nitrogen, TKN	0.20
Nitrate + Nitrite, NO_3, NO_2	0.05

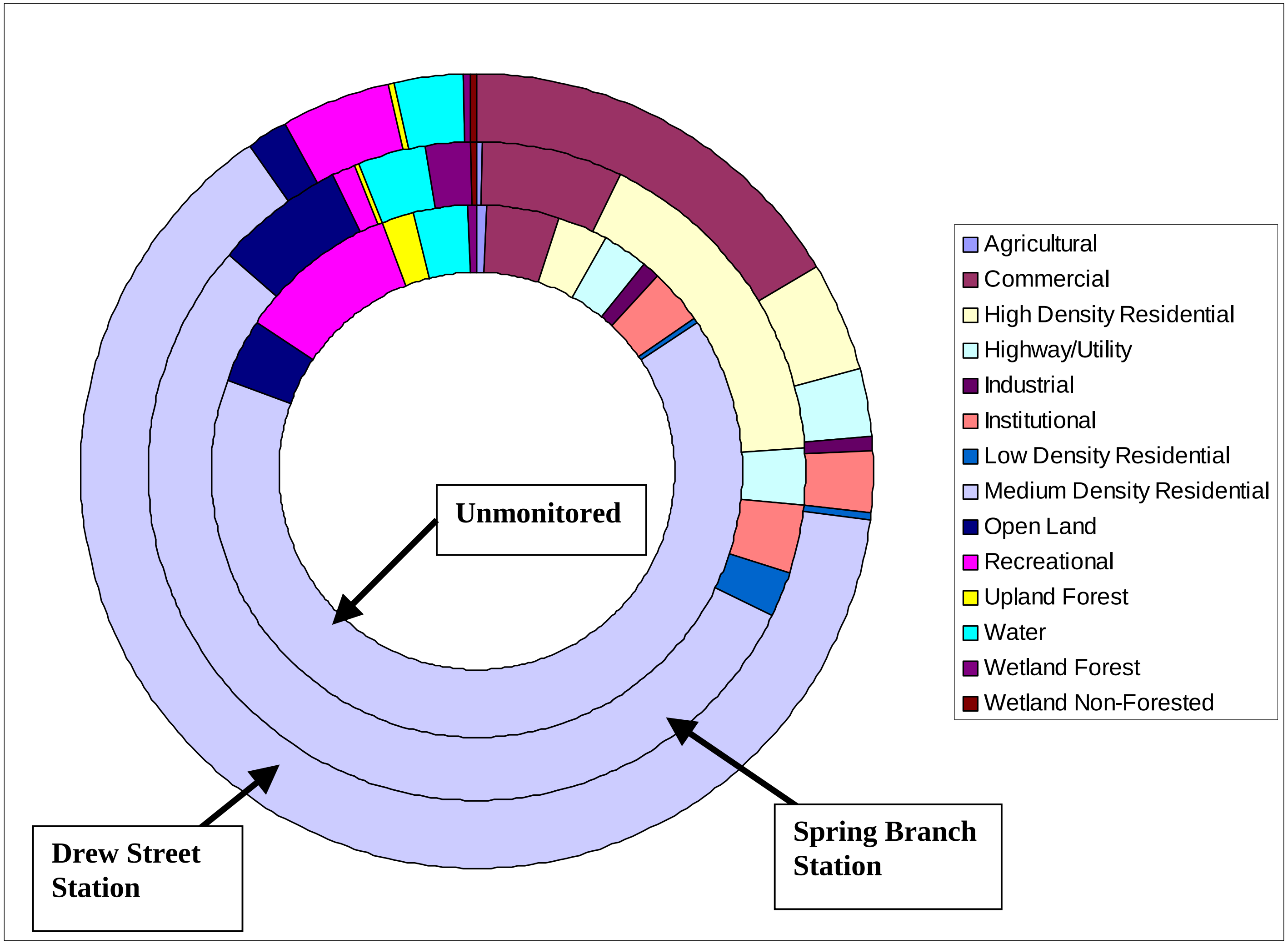
[1] Minimum Detection Limit

Figure 2.3-4

Monitoring Stations Location and Coverage

Figure 2.3-5

Land Use by Monitoring Station



2.3.2.2 Hydrologic Monitoring

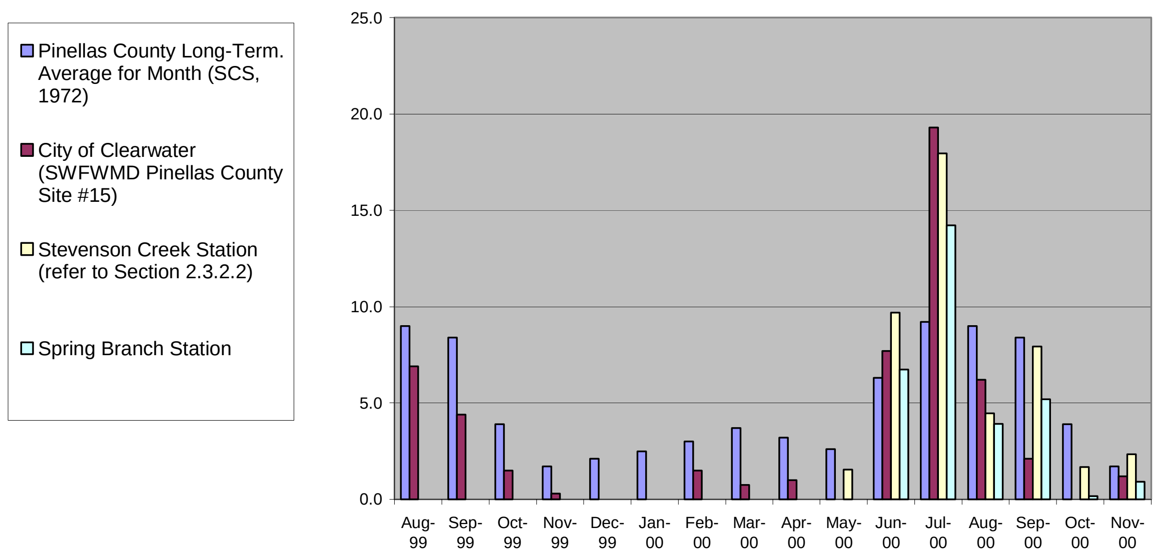
Hydrologic monitoring was conducted from May 21, 2000 through November 23, 2000. Rainfall conditions preceding and during the monitoring period were, in general, drier than normal. Rainfall conditions leading up to and including the monitoring period as compared to normal conditions are shown on Figure 2.3-6. The monitoring period followed an extremely dry “dry season” (5.1 inches of rainfall were received October 1999 to May 2000 at SWFWMD’s Site #15 rain gauge) with monthly rainfall conditions recovering to normal during the second month (June 2000) of monitoring. July 2000 was wetter than normal due chiefly to a large storm event that occurred on July 15 dropping 7.7 inches at the Stevenson Creek Station and 5.7 inches at the Spring Branch Station. Drier-than-normal conditions returned after July.

Towards the end of May 1999 it was discovered that the Stevenson Creek rain gage was receiving inputs from the Clearwater Country Club’s sprinkler system. The rain gauge was moved away from the influence of the sprinklers as far as possible; however, minor inputs were still received from the sprinklers.

Translating the total measured flow during the monitoring period to a depth (flow volume divided by basin area), at the Stevenson Creek station 11.0 inches of rainfall appeared as flow the creek; likewise, 31.16 inches of rainfall at the Spring Branch Station resulted in 6.9 inches of flow. The remaining rainfall was lost to initial abstraction and evapotranspiration or became groundwater - later to appear as base flow of aquifer recharge. A simplified technique of base flow separation was applied to determine the relative magnitude of base flow. This technique uses the minimum daily flow during dry periods together with professional judgment to separate the flow into two components-base flow and storm event runoff. Overall hydrologic conditions for the monitoring period are listed in Table 2.3-3. Daily flow along with rainfall for the two monitoring stations is shown on Figures 2.3-7 and 2.3-9. Figures 2.3-8 and 2.3-10 provide a more detailed view for low flow conditions.

Figure 2.3-6

Rainfall Conditions



	Aug-99	Sep-99	Oct-99	Nov-99	Dec-99	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00
Pinellas County Long-Term. Average for Month (SCS, 1972)	9.0	8.4	3.9	1.7	2.1	2.5	3.0	3.7	3.2	2.6	6.3	9.2	9.0	8.4	3.9	1.7
City of Clearwater (SWFWMD Pinellas County Site #15)	6.9	4.4	1.5	0.3	0.0	0.0	1.5	0.8	1.0	0.0	7.7	19.3	6.2	2.1	0.0	1.2
Stevenson Creek Station (refer to Section 2.3.2.2)										1.54	9.70	17.95	4.46	7.93	1.68	2.34
Spring Branch Station										0.00	6.74	14.22	3.92	5.20	0.17	0.91

Table 2.3-3
Overall Hydrologic Conditions at Monitoring Stations

Watershed	Item	Quantity	Percent of Rainfall
Spring Branch	Area (AC)	1,673.50	--
	Rainfall Depth (in.)	31.16	100%
	Volume of Rain (AC-Ft.)	4,345.52	100%
	Total Flow (AC-Ft.)	960	22%
	Base Flow (AC-Ft.)	184	4%
	Storm Flow (AC-Ft.)	776	18%
Stevenson Creek	Area (AC)	2,415.50	
	Rainfall Depth (in.) (1)	45.61	100%
	Volume of Rain (AC-Ft.)	9,181.91	100%
	Total Flow (AC-Ft.)	2210	24%
	Base Flow (AC-Ft.)	376	4%
	Storm Flow (AC-Ft.)	1834	20%

Note 1 : Rainfall depth reflects inputs from Clearwater Country Club sprinkler system- refer to Section 2.3.2.2.

Figure 2.3-7

Stevenson Creek Hydrologic Record

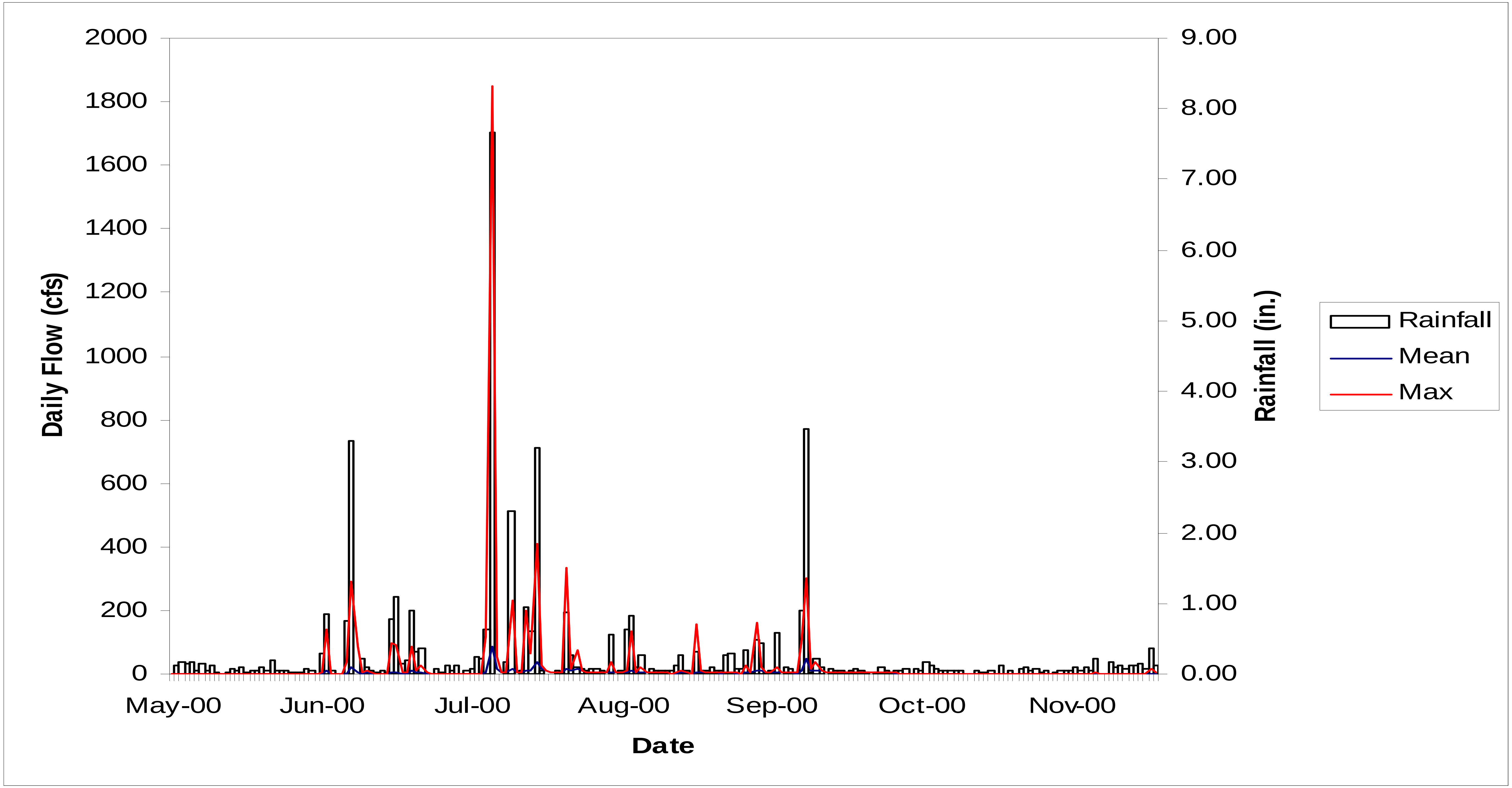


Figure 2.3-8
Stevenson Creek Hydrologic Record
Low Flow Detail

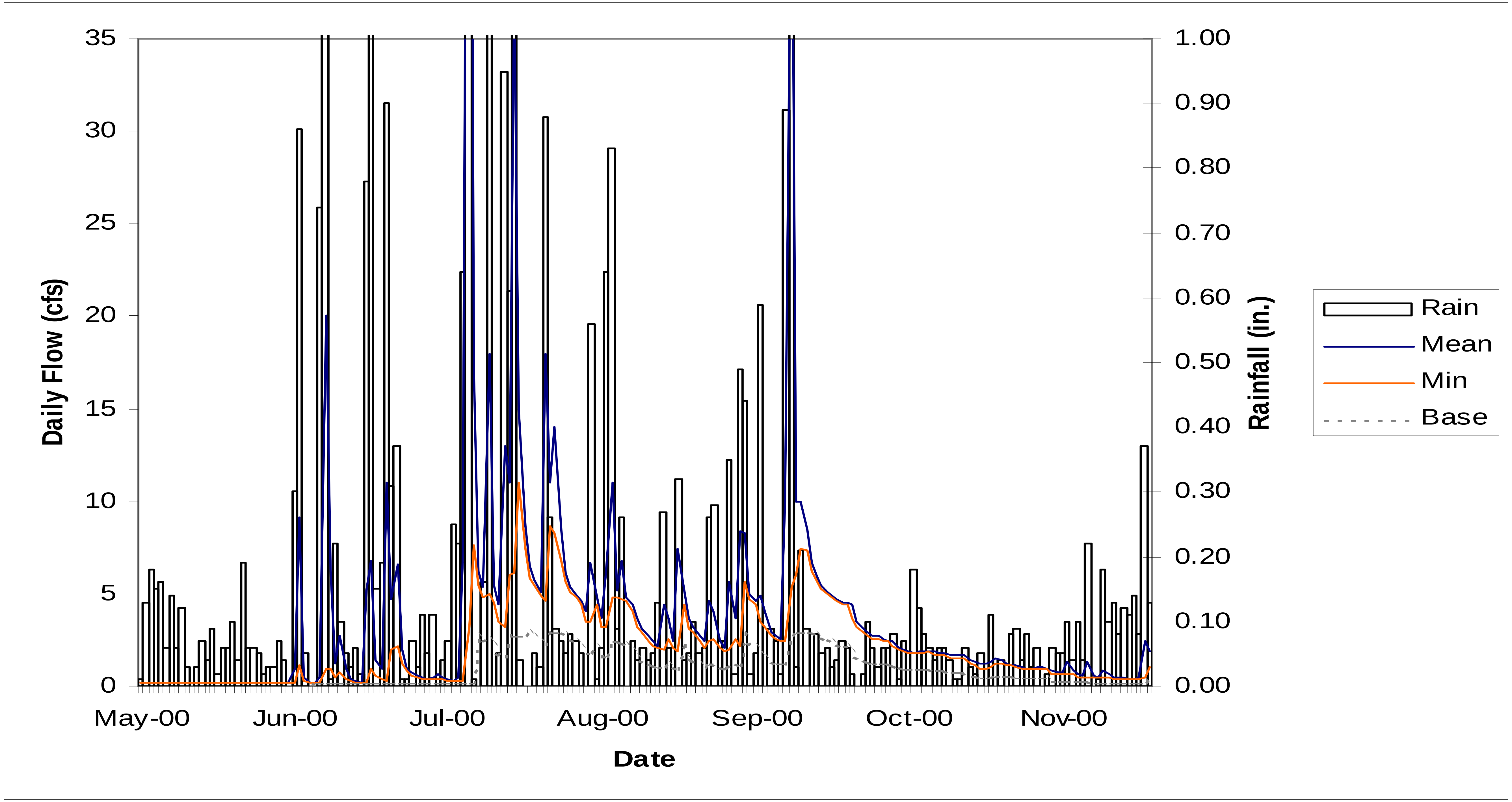


Figure 2.3-9
Spring Branch Hydrologic Record

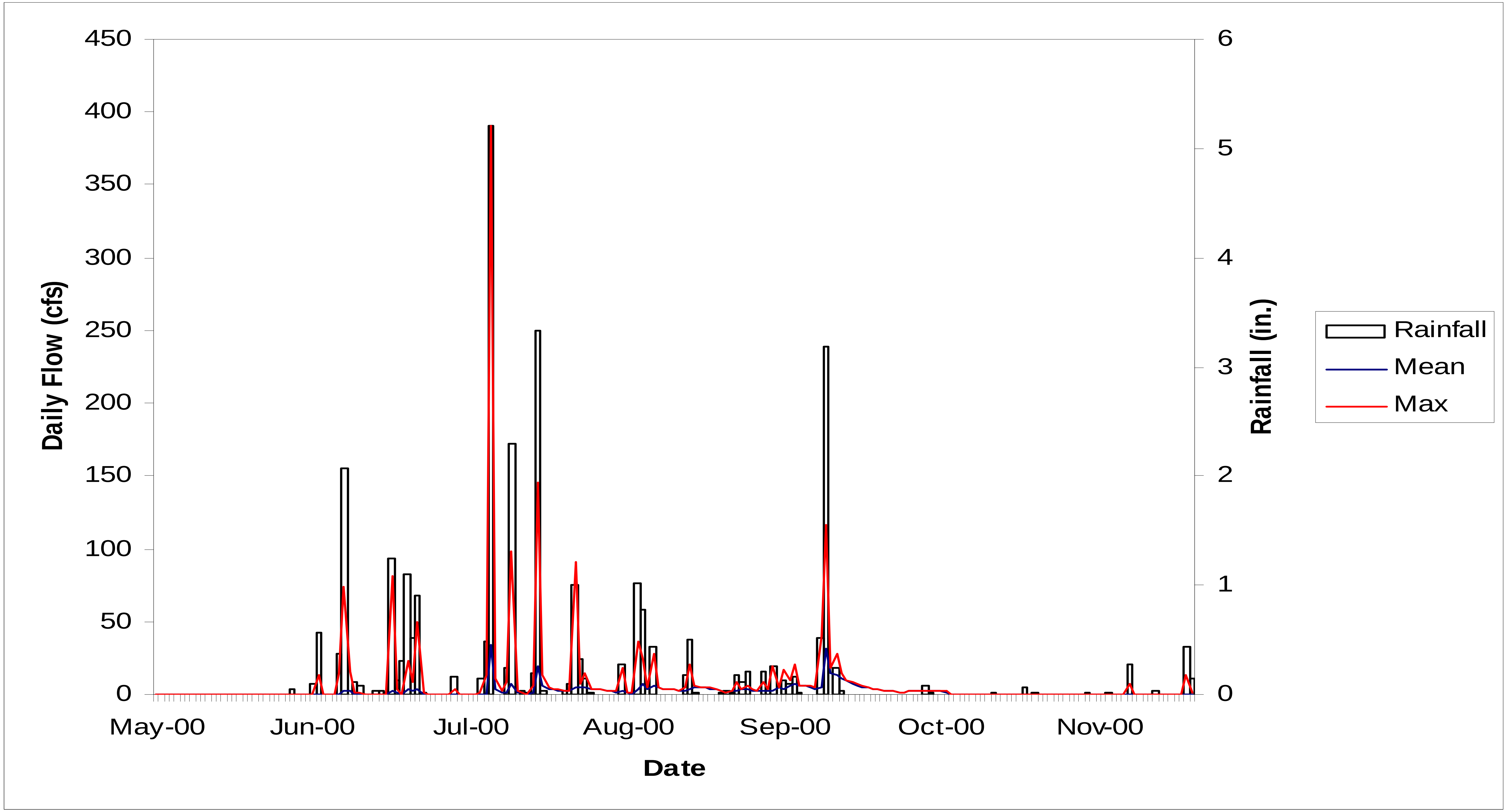
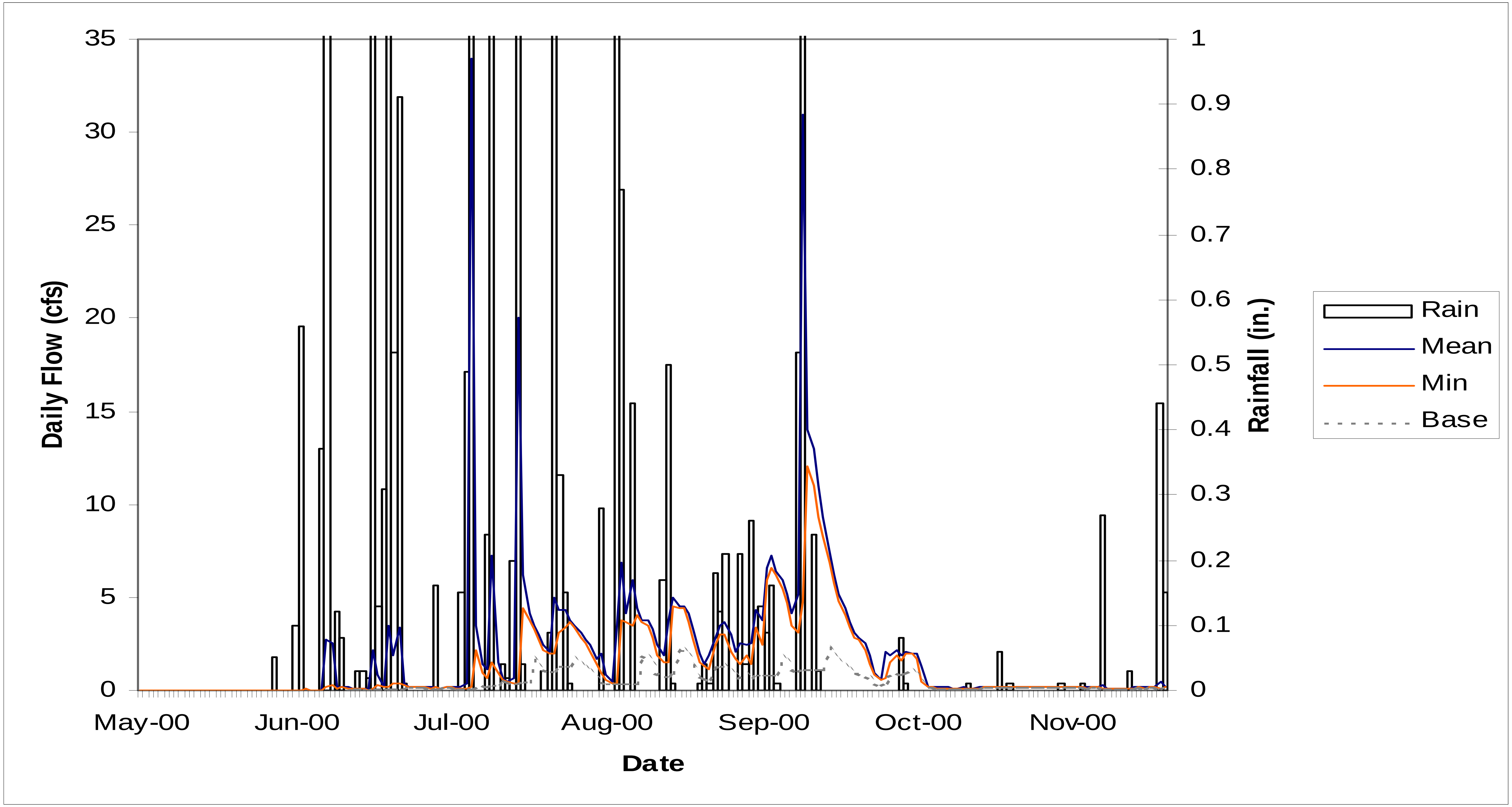


Figure 2.3-10
Spring Branch Hydrologic Record
Low Flow Detail



2.3.2.3 Water Quality

Seven (7) storm event samples and six (6) base flow samples were collected at each monitoring station. The laboratory results are provided in Table 2.3-4. Violations of Class III water quality criteria occurred in a number of instances. Details concerning these exceedences as well as other information concerning the findings of the sampling program are described in the following section.

2.3.3 Water Quality Characteristics

Water quality in the Stevenson Creek Watershed is described in the following subsections. These descriptions include assessments of base flow and storm flow and identify probable sources of pollution. Water quality parameters measured during this project are compared to Florida water quality criteria (*Chapter 62-302, Florida Administrative Code*- referred to as water quality standards in this report*)*, STORET database values (as published in the 2000 state Section 305(b) report), and comparable literature values, as appropriate. More specifically, comparisons are made with state water quality standard where numeric standards exists; otherwise, comparison is made with Florida averages as published in the 305(b) report (for base flow samples) or literature values (for stormwater runoff samples). Water quality indices are calculated for the base flow samples.

The Florida Department of Environmental Protection (FDEP) recommends the use of a Water Quality Index (WQI) to summarize water quality conditions in rivers and streams (Hand et al. 1996). The WQI is based on six categories of water quality indicators (water clarity, dissolved oxygen, oxygen-demanding substances, bacteria, nutrients, and biological diversity). Several categories contain multiple constituents (e.g., total organic carbon and BOD_5, within the category of oxygen-demanding substances). In such cases, data availability determines constituent(s) used in calculating the WQI. For each measured constituent, the raw data (e.g., monthly or quarterly observations) are converted to annual averages. The annual averages are then converted to percentiles,

Table 2.3-4 – Laboratory Results

						Metals								Oxygen Demand			Solids		Nutrients						
Date	Log #	Time	Type	Oil and Grease	Hardness as CaCO3	Al	As	Cd	Cr	Cu	Pb	Ni	Zn	BOD5	COD	Total Organic	Total Suspended	Total Dissolved	Ortho Phosphate	Total Phosphoru	Ammonia	Total Kjeldahl	Nitrate + Nitrite	Organic-N	Total Nitrogen
Stevenson Creek (Drew Street)																									
"June 20, 2000"	61864-2	10:19	Base Flow #1	<5.0	140	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	5.9	30	15.0	6.8	200	0.450	0.56	0.088	1.10	<0.050	1.01	1.10
"June 30, 2000"	61983-1	14:15	Storm Event #1	<5.0	76	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	2.1	30	9.3	<5.0	130	0.170	0.22	0.059	0.66	<0.050	0.60	0.66
"July 12, 2000"	62071-2	12:08	Base Flow #2	<5.0	210	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	<2.0	37	12.0	<5.0	350	0.370	0.36	0.140	1.80	<0.050	1.66	1.80
"July 20, 2000"	62194-1	12:30	Storm Event #2	<5.0	68	<.20	<0.01	<0.005	<0.01	<0.02	<0.005	<0.04	0.029	24	54	15	15.0	110	0.10	0.17	0.12	0.78	<0.050	0.66	0.78
"July 24, 2000"	62218-1	11:35	Storm Event #3	<5.0	71	<0.20	<0.010	<0.0050	<0.010	0.02	<0.0050	<0.040	<0.020	7.2	26	8.2	6.0	94	0.110	0.16	0.290	0.88	<0.050	0.59	0.88
"July 31, 2000"	62290-1	17:30	Storm Event #4	<5.0	59	0.69	<0.010	<0.0050	<0.010	<0.020	0.0071	<0.040	0.038	8.9	29	7.4	30.0	86	0.140	0.30	0.058	0.65	0.51	0.59	1.16
"August 3, 2000"	62336-2	14:34	Base Flow #3	<5.0	140	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	2.0	45	11.0	8.4	210	0.200	0.27	0.091	0.81	0.18	0.72	0.99
"August 23, 2000"	62526-1	10:27	Base Flow #4	<5.0	210	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.0040	0.200	<2.0	<20	11.0	<5.0	300	0.17	0.21	0.088	0.82	0.27	0.73	1.09
"September 13, 2000"	62731-1	13:45	Base Flow #5	<5.0	180	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	19.0	58	24.0	<5.0	240	0.12	0.21	0.150	0.89	0.44	0.74	1.33
"September 13, 2000"	62737-3	13:30	Storm Event #5	<5.0	140	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	<2.0	58	11.0	6.0	220	0.20	0.26	0.037	0.87	0.55	0.83	1.42
"September 17, 2000"	62758-2	12:45	Storm Event #6	<5.0	89	0.62	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	0.036	60	38	30.0	26	140	0.24	0.49	0.054	1.20	0.23	1.15	1.43
"October 12, 2000"	62999-2	14:50	Base Flow #6	<5.0	190	0.33	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	0.022	<2.0	22	10.0	18	300	0.18	0.38	0.038	1.10	0.27	1.06	1.37
"November 15, 2000"	63376-2	13:30	Storm Event #7	<5.0	140	0.27	<0.010	<0.0050	<0.010	<0.020	0.0054	<0.040	0.066	14	93	27.0	26	240	0.34	0.57	0.031	1.60	0.34	1.57	1.94
Spring Branch (Kings Highway)																									
"June 20, 2000"	61864-1	9:10	Base Flow #1	<5.0	150	0.25	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	7.8	43	19.0	16.0	270	0.560	0.76	0.110	1.90	<0.050	1.79	1.90
"June 30, 2000"	61983-2	15:00	Storm Event #1	<5.0	64	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	3.3	<20	10.0	8.8	100	0.290	0.33	0.079	0.80	0.06	0.72	0.86
"July 12, 2000"	62071-1	11:17	Base Flow #2	<5.0	130	<0.20	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	6.1	62	20.0	15.0	240	0.640	0.73	<0.030	2.10	<0.050	2.10	2.10
"July 17, 2000"	62131-1	15:30	Storm Event #2	<5.0	34	0.44	<0.010	<0.0050	<0.010	<0.020	0.0130	<0.040	0.049	2.2	<20	4.6	39.0	41	0.210	0.45	0.150	1.40	<0.050	1.25	1.40
"July 20, 2000"	62194-2	13:25	Storm Event #3	<5.0	58	0.32	<0.01	<0.005	<0.01	<0.02	<0.005	<0.04	<0.020	14	43	12	14.0	120	0.20	0.27	0.110	0.93	<0.050	0.82	0.93
"July 31, 2000"	62290-2	18:45	Storm Event #4	<5.0	56	0.70	<0.010	<0.0050	<0.010	<0.020	0.0078	<0.040	0.037	25.0	58	23.0	23.0	200	0.220	0.35	0.160	0.95	0.18	0.79	1.13
"August 3, 2000"	62336-1	13:45	Base Flow #3	<5.0	130	0.65	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	0.024	<2.0	26	13.0	19.0	240	0.260	0.46	0.067	0.94	0.36	0.87	1.30
"August 23, 2000"	62526-2	12:05	Base Flow #4	<5.0	160	0.21	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.0040	0.200	98.0	38	21.0	7.2	220	0.230	0.30	0.097	1.10	0.068	1.00	1.17
"August 23, 2000"	62526-3	11:45	Storm Event #5	<5.0	120	0.28	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.0040	0.250	52.0	<20	15.0	21.0	170	0.190	0.36	0.084	1.40	0.32	1.32	1.72
"September 13, 2000"	62731-2	15:00	Base Flow #5	<5.0	120	0.22	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	12.0	54	18.0	9.2	220	0.17	0.27	0.046	1.20	<0.050	1.15	1.20
"September 17, 2000"	62758-1	11:00	Storm Event #6	<5.0	92	0.41	<0.10	<0.0050	<0.010	<0.020	0.0063	<0.040	0.037	12	36	10.0	21	120	0.14	0.41	0.110	0.81	0.25	0.70	1.06
"October 12, 2000"	62999-1	13:30	Base Flow #6	<5.0	220	0.39	<0.010	<0.0050	<0.010	<0.020	<0.0050	<0.040	<0.020	2.1	35	11.0	10	330	0.067	0.15	0.120	0.89	0.05	0.77	0.94
"November 15, 2000"	63376-1	12:00	Storm Event #7	<5.0	140	0.52	<0.010	<0.0050	<0.010	<0.020	0.0087	<0.040	0.100	21	110	37.0	44	370	0.60	1.00	0.078	2.80	<0.050	2.72	2.80

using a database constructed by FDEP staff (Hand et al. 1990, 1996) using data from 2,000 Florida stream monitoring locations. These percentile values, which range from 0 (best quality) to 100 (poorest quality), are then averaged to generate the WQI. The final averaging process ignores water quality categories for which no data are available. The WQI calculated for a given stream-monitoring site can therefore represent the average of from 1 to 6 categories. Although the index can be calculated based on a single category, the use of additional categories provides greater reliability (Hand et al. 1990, 1996).

FDEP recommends the following interpretation of WQI values, based on an analysis of Florida stream data and the US EPA National Profiles Water-Quality Index (Hand et al. 1996):

0 < WQI < 45	=	"good" water quality
45 < WQI < 60	=	"fair" water quality
WQI > 60	=	"poor" water quality.

Data for four of the six possible water quality index categories was collected at the two sampling stations. Overall water quality at both stations is rated "poor" based on

Table 2.3-5
Water Quality Indices

Category	Subcategory	Drew Street	Spring Branch
Water Clarity	TSS	50.9	70.9
Oxygen Demand	Overall	57.1	64.9
	BOD	89.3	90
	COD	32.8	46.2
	TOC	49.2	58.6
Nutrients	Overall	66.1	62.9
	Total Nitrogen	54	61.8
	Nitrate + Nitrite	70.2	47.7
	Total Phosphorous	74.2	79.3
Bacteria	Fecal Coliform	90	90
Overall		**66.0**	**72.2**

the average of base flow samples taken during this monitoring program with quality at the Spring Branch station rated moderately poorer than at the Drew Street station Table (2.3-5).

2.3.3.1 Petroleum Hydrocarbons

Petroleum hydrocarbons include oil and grease; the "BTEX" compounds: benzene, toluene, ethyl benzene, and xylene; as well as other polynuclear aromatic hydrocarbons (PAHs). The most common sources of petroleum hydrocarbons are associated with vehicle usage. These sources include parking lots and roads, leaking storage tanks, automobile emissions, and improper or careless handling or disposal of oil; therefore, petroleum hydrocarbons are typically concentrated along transportation routes. Petroleum hydrocarbons are acutely toxic at relatively low concentrations.

For this study, oil and grease was used as an "indicator" pollutant for petroleum hydrocarbons. The sampling plan specified that if oil and grease concentrations above 5.0 mg/l were detected, then tests would also be conducted for petroleum hydrocarbons. Oil and grease was not detected; therefore, tests for petroleum hydrocarbons were not conducted. While petroleum hydrocarbons are certainly present in any urban area, they do not appear to be a significant concern in the portion of the Stevenson Creek Watershed that was monitored.

2.3.3.2 Oxygen Demand

Oxygen-demanding substances were measured by testing for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Total Organic Carbon (TOC). Maintaining appropriate levels of dissolved oxygen is one of the most important considerations for the protection of fish and aquatic life. The state standard for dissolved oxygen in Class III waters is 5.0 mg/l or greater.

The direct impact of storm water runoff on dissolved oxygen conditions in receiving waters is normally not as important as the secondary impacts. Secondary impacts of low dissolved oxygen conditions include nutrient enrichment, eutrophication, and increased sediment oxygen demand.

Base flow sampling results values (Table 2.3-6) in comparison to Florida averages), and storm event sampling results (Table 2.3-7) in comparison with Nationwide Urban Runoff Program (NURP) data from the Tampa Bay Sampling sites are provided. Three laboratory measurements appear to be in error and, therefore, were not used. The laboratory is unable to specifically identify the source of the error; however, the error may have been caused by a standard solution that was more concentrated than specified by the test. These erroneous measurements include the base flow sample taken on August 23, 2000 at the Kings Highway Station, the storm event sample that was composited on the same day and location, and the September 17, 2000 storm event sample taken at Drew Street. These readings are suspect due to the much lower COD measurements taken on the same sample. COD should normally be higher than BOD_5, and no case should BOD_5 be significantly greater than COD. This is because BOD measures the actual oxygen consumption of microorganisms, and COD measures the amount of oxidant required to oxidize the available organic matter; therefore, a BOD that is higher than a COD implies that more organic material was consumed than was available for consumption.

Table 2.3-6, Base Flow Oxygen Demand

Date	BOD_5 (mg/l)	COD (mg/l)	TOC (mg/l)
Stevenson Creek - Drew Street			
June 20, 2000	5.9	30	15
July 12, 2000	<2.0	37	12
August 3, 2000	2	45	11
August 23, 2000	<2.0	<20	11
September 13, 2000	19	58	24
October 12, 2000	<2.0	22	10
Mean	5.0	34	14
WQI	89.3	32.8	49.2
Spring Branch - Kings Highway			
June 20, 2000	7.8	43	19
July 12, 2000	6.1	62	20
August 3, 2000	<2.0	26	13
August 23, 2000	98	38	21
September 13, 2000	12	54	18
October 12, 2000	2.1	35	11
Mean	5.8	43	17
WQI	90	46.2	58.6
Frequency of Exceedance in Florida Streams			
STORET-10%	0.8	16	5
Median	1.5	46	14
STORET-90%	5.1	146	37

BOD was still high relative to typical Florida streams even without considering the erroneous measurements. Moderately higher BOD concentrations were present at the

Table 2.3-7

Storm Event Oxygen Demand

Date	BOD_5 (mg/l)	COD (mg/l)	TOC (mg/l)
Drew Street			
June 30, 2000	2.1	30	9.3
July 20, 2000	24	54	15
July 24, 2000	7.2	26	8.2
July 31, 2000	8.9	29	7.4
September 13, 2000	<2.0	58	11
September 17, 2000	60[i]	38	30
November 15, 2000	14	93	27
EMC	12.19	47.3	15.7
Kings Highway			
June 30, 2000	3.3	<20	10
July 17, 2000	2.2	<20	4.6
July 20, 2000	14	43	12
July 31, 2000	25	58	23
August 23, 2000	52[1]	<20	15
September 17, 2000	12	36	10
November 15, 2000	21	110	37
EMC	15.35	43.5	16.5
Tampa Bay NURP			
Minimum	0.7	5	0
Mean	5.4	58	14
maximum	28	210	88

[i] Erroneous measurement – not used

Spring Branch station than were observed at the Stevenson Creek station. COD and BOD were near the state average.

2.3.2.3 Solids

Solids are one of the most common contaminants found in urban storm water. Solids originate from many sources including the erosion of pervious surfaces and dust, litter and other particles deposited on land surfaces from human activities and the atmosphere. Stream bank and streambed erosion also appears to be a major source of solids in the Stevenson Creek Watershed.

Solids contribute to water quality, habitat and maintenance problems in Stevenson Creek Watershed. Elevated levels of solids increase turbidity, reduce the depth of light penetration within the water column, and limit the growth of desirable aquatic plants. Solids that settle out as bottom deposits and can alter habitat for fish and bottom-dwelling organisms. Solids also provide a medium for the accumulation, transport and storage of other pollutants including nutrients and metals. Sediment- bound pollutants interact with the water column through cycles of deposition, re-suspension, and re-deposition.

Suspended solids (TSS) concentrations in base flow were high at the Spring Branch station and near the Florida average at the Drew Street station. As expected, suspended solids concentrations increased substantially during storm events with the Spring Branch station experiencing higher concentrations than the Drew Street station. Results are provided on Tables 2.3-8 and 2.3-9.

2.3.2.4 Metals

Metals detected in the Stevenson Creek Watershed include aluminum, lead, and zinc. This finding is typical. Aluminum is the second most abundant naturally occurring metal and lead and zinc are the most commonly detected metals in stormwater runoff[1]. Likely sources of the lead and zinc present in the Stevenson Creek Watershed include vehicle usage, atmospheric deposition, and erosion. A major finding of the NURP study is as follows:

1 Lead and zinc were detected in 94% of NURP samples.

Table 2.3-8
Base Flow Solids

Date	Total Suspended Solids (TSS, mg/l)	Total Dissolved Solids (TDS, mg/l)
Stevenson Creek		
June 20, 2000	6.8	200
July 12, 2000	<5.0	350
August 3, 2000	8.4	210
August 23, 2000	<5.0	300
September 13, 2000	<5.0	240
October 12, 2000	18	300
Mean	6.78	267
WQI	50.9	-
Spring Branch		
June 20, 2000	16	270
July 12, 2000	15	240
August 3, 2000	19	240
August 23, 2000	7.2	220
September 13, 2000	9.2	220
October 12, 2000	10	330
Mean	12.73	253
WQI	70.9	-
Frequency of Exceedance in Florida Streams		
STORET-10%	2	-
Median	6.5	-
STORET-90%	26.5	-

Table 2.3-9
Storm Event Solids

Date	Total Suspended Solids (TSS, mg/l)	Total Dissolved Solids (TDS, mg/l)
Stevenson Creek		
June 30, 2000	<5.0	130
July 20, 2000	15	110
July 24, 2000	6	94
July 31, 2000	30	86
September 13, 2000	6	220
September 17, 2000	26	140
November 15, 2000	26	240
EMC	18.3	147
Spring Branch		
June 30, 2000	8.8	100
July 17, 2000	39	41
July 20, 2000	14	120
July 31, 2000	23	200
August 23, 2000	21	170
September 17, 2000	21	120
November 15, 2000	44	370
EMC	25.13	168
NURP Mixed Urban - Mean	67	-

> *Heavy metals (especially copper, lead and zinc) are by far the most prevalent priority pollutant constituents found in urban runoff. End-of-pipe concentrations exceed EPA ambient water quality criteria and drinking water standards in many instances. Some of the metals are present often enough and in high enough concentrations to be potential threats to beneficial uses.*

Metals can be toxic to aquatic life, and lead and zinc concentrations exceeding state standards were often measured during the monitoring program- more often in storm flow and more often at Spring Branch. Metals concentration for both of the monitoring stations are shown on Table 2.3-10 along with comparison to state water quality criteria and NURP data. The standards for lead and zinc are hardness-dependant, and the standard for lead was often less than the detection limit.

2.3.3.5 Nutrients

Nitrogen and phosphorus are the principal nutrients of concern in urban storm water. The major sources of nitrogen and phosphorus in the Stevenson Creek Watershed are likely associated with landscape runoff (fertilizers and organic debris) and atmospheric deposition. Improperly functioning septic tank systems and animal waste may also be an important source.

There are a number of parameters used to measure the various forms of nitrogen. Ammonia (NH_3) nitrogen is the nitrogen form that is usually the most readily toxic to aquatic life. Nitrate (NO_3) and nitrite (NO_2) are the inorganic fractions of nitrogen. Very little nitrite is usually found in storm water. Total Kjeldahl nitrogen (TKN) measures the organic and ammonia nitrogen forms. The organic fraction is determined by subtracting the NH_3 from the TKN.

Total phosphorus measures the total amount of phosphorus in both the organic and inorganic forms. Ortho-phosphate measures phosphorus that is most immediately biologically available. Most of the soluble phosphorus in storm water is usually present in the ortho-phosphate form.

Table 2.3-10
Metals

Date	Type of Flow	Aluminum[1] Measurement (1)	Lead Measurement	Lead Class III-Fresh Standard	Zinc Measurement	Zinc Class III-Fresh Standard
Stevenson Creek						
June 20, 2000	Base Flow #1	<0.20	<0.0050	0.00488	<0.020	0.14096
July 12, 2000	Base Flow #2	<0.20	<0.0050	0.00818	<0.020	0.19874
August 3, 2000	Base Flow #3	<0.20	<0.0050	0.00488	<0.020	0.14096
August 23, 2000	Base Flow #4	<0.20	<0.0050	0.00818	0.200	0.19874
September 13, 2000	Base Flow #5	<0.20	<0.0050	0.00672	<0.020	0.17441
October 12, 2000	Base Flow #6	0.33	<0.0050	0.00720	0.022	0.18258
June 30, 2000	Storm Event #1	<0.20	<0.0050	0.00224	<0.020	0.08400
July 20, 2000	Storm Event #2	<.20	<0.0050	0.00195	0.029	0.07645
July 24, 2000	Storm Event #3	<0.20	<0.0050	0.00206	<0.020	0.07929
July 31, 2000	Storm Event #4	0.69	0.0071	0.00163	0.038	0.06778
September 13, 2000	Storm Event #5	<0.20	<0.0050	0.00488	<0.020	0.14096
September 17, 2000	Storm Event #6	0.62	<0.0050	0.00274	0.036	0.09603
November 15, 2000	Storm Event #7	0.27	0.0054	0.00488	0.066	0.14096
Spring Branch						
June 20, 2000	Base Flow #1	0.25	<0.0050	0.00533	<0.020	0.14944
July 12, 2000	Base Flow #2	<0.20	<0.0050	0.00444	<0.020	0.13238
August 3, 2000	Base Flow #3	0.65	<0.0050	0.00444	0.024	0.13238
August 23, 2000	Base Flow #4	0.21	<0.0050	0.00579	0.200	0.15784
September 13, 2000	Base Flow #5	0.22	<0.0050	0.00401	<0.020	0.12370
October 12, 2000	Base Flow #6	0.39	<0.0050	0.00868	<0.020	0.20673
June 30, 2000	Storm Event #1	<0.20	<0.0050	0.00180	<0.020	0.07262
July 17, 2000	Storm Event #2	0.44	0.0130	0.00081	0.049	0.04249
July 20, 2000	Storm Event #3	0.32	<0.005	0.00159	<0.020	0.06681
July 31, 2000	Storm Event #4	0.70	0.0078	0.00152	0.037	0.06485
August 23, 2000	Storm Event #5	0.28	<0.0050	0.00401	0.250	0.12370
September 17, 2000	Storm Event #6	0.41	0.0063	0.00286	0.037	0.09876
November 15, 2000	Storm Event #7	0.52	0.0087	0.00488	0.100	0.14096

	Lead	Zinc
NURP -Nationwide Mean		
Residential	0.144	0.135
Mixed Urban	0.114	0.154
Commercial	0.104	0.226
Tampa Bay NURP		
Minimum	0.012	0.020
Mean	0.058	0.097
Maximum	0.320	0.300

[1] There is no aluminum standard for freshwater. The aluminum standard for Class III marine waters is 1.5 mg/l.

The degree to which nitrogen and phosphorus are present can determine the trophic status and amount of algal biomass produced. Excess nutrients increase biological productivity. The major impact associated with nutrient over-enrichment is excessive growth of algae that leads to nuisance algal blooms and eutrophic conditions. A secondary impact is the residual negative effect of decomposing algae in the form of sediment oxygen demand that depletes dissolved oxygen concentrations, particularly in bottom waters.

Nutrient concentrations measured during the monitoring period are presented on Tables 2.3-11 and 2.3-12 in comparison with STORET and NURP data. Nutrient concentrations do not appear to increase with storm event flow; however, since storms produce high flows the resulting increases in masses are significant.

With respect to nutrients, the Spring Branch station had slightly worse water quality than did the Drew Street station with the primary difference being nitrogen forms at each of the station. Higher-than-average levels of inorganic nitrogen levels were recorded at the Drew Street station and higher-than-average organic nitrogen levels were recorded at the Spring Branch station. Ammonia nitrogen often exceeded the state standard during the monitoring period at both stations.

2.3.3.6 Bacteria

Fecal contamination is one of the most severe water quality issues in Stevenson Creek. The magnitude and frequency of fecal counts reported in past monitoring (City of Clearwater 1992-1995)) as well as this current program are very high. The state threshold for ranking a stream in the top ten percent of Florida's worst water quality with respect to fecal coliforms is 960 colony-forming units (CFU) per 100ml. The highest count during this study was 20,000 and previous studies have recorded similarly high counts. The state standard for fecal coliforms in Class III waters is 800 counts per 100 ml.

The University of South Florida Department of Biology accomplished sampling for fecal contamination under a separate monitoring program. A bacterial source tracking

Table 2.3-11

Base Flow Nutrients

Date	Ortho Phosphate (mg/l)	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Nitrate + Nitrite (mg/l)	Organic-N (mg/l)	Ammonia (mg/l)	Total Nitrogen (mg/l)
Stevenson Creek - Drew Street Station							
June 20, 2000	0.45	0.56	1.1	<0.050	1.012	0.088	1.1
July 12, 2000	0.37	0.36	1.8	<0.050	1.66	0.14	1.8
August 3, 2000	0.2	0.27	0.81	0.18	0.719	0.091	0.99
August 23, 2000	0.17	0.21	0.82	0.27	0.732	0.088	1.09
September 13, 2000	0.12	0.21	0.89	0.44	0.74	0.15	1.33
October 12, 2000	0.18	0.38	1.1	0.27	1.062	0.038	1.37
Mean	0.25	0.33	1.09	0.20	0.988	0.10	1.28
WQI	-	74.2	-	70.2	-	-	54.0
Spring Branch - Kings Highway Station							
June 20, 2000	0.56	0.76	1.9	<0.050	1.79	0.11	1.9
July 12, 2000	0.64	0.73	2.1	<0.050	2.1	<0.030	2.1
August 3, 2000	0.26	0.46	0.94	0.36	0.873	0.067	1.3
August 23, 2000	0.23	0.3	1.1	0.068	1.003	0.097	1.168
September 13, 2000	0.17	0.27	1.2	<0.050	1.154	0.046	1.2
October 12, 2000	0.067	0.15	0.89	0.052	0.77	0.12	0.942
Mean	0.32	0.45	1.36	0.093	1.28	0.088	1.44
WQI	-	79.3	-	47.7	-	-	61.8
Frequency of Exceedence in Florida Streams							
STORET-10%	0.02	-	-	0.01	-	-	0.5
Median	0.09	--	-	0.1	-	-	1.2
STORET-90%	0.89	-	-	0.64	-	-	2.7
State Class III Standard		-	-	-	-	<0.02	

Table 2.3-12

Storm Event Nutrients

Date	Ortho Phosphate (mg/l)	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Nitrate + Nitrite (mg/l)	Organic-N (mg/l)	Ammonia (mg/l)	Total Nitrogen (mg/l)
Stevenson Creek - Drew Street Station							
June 30, 2000	0.17	0.22	0.66	<0.050	0.601	0.059	0.66
July 20, 2000	0.1	0.17	0.78	<0.050	0.66	0.12	0.78
July 24, 2000	0.11	0.16	0.88	<0.050	0.59	0.29	0.88
July 31, 2000	0.14	0.3	0.65	0.51	0.592	0.058	1.16
September 13, 2000	0.2	0.26	0.87	0.55	0.833	0.037	1.42
September 17, 2000	0.24	0.49	1.2	0.23	1.146	0.054	1.43
November 15, 2000	0.34	0.57	1.6	0.34	1.569	0.031	1.94
EMC	0.19	0.31	0.95	0.36	0.86	0.09	1.31
Spring Branch - Kings Highway Station							
June 30, 2000	0.29	0.33	0.8	0.055	0.721	0.079	0.855
July 17, 2000	0.21	0.45	1.4	<0.050	1.25	0.15	1.4
July 20, 2000	0.2	0.27	0.93	<0.050	0.82	0.11	0.93
July 31, 2000	0.22	0.35	0.95	0.18	0.79	0.16	1.13
August 23, 2000	0.19	0.36	1.4	0.32	1.316	0.084	1.72
September 17, 2000	0.14	0.41	0.81	0.25	0.7	0.11	1.06
November 15, 2000	0.6	1	2.8	<0.050	2.722	0.078	2.8
EMC	0.26	0.45	1.30	0.14	1.19	0.11	1.41
State Class III Standard		-	-	-	-	<0.02	-
NURP -Nationwide Mean							
Residential	0.143	0.383	1.9	0.736			2.636
Mixed Urban	0.056	0.263	1.288	0.558			1.846
Commercial	0.08	0.201	1.179	0.572			1.751
Tampa Bay NURP							
Minimum	0.02	0.02		0.01	0.18	0.04	0.52
Mean	0.09	0.23		0.34	1.1	0.4	2.0
Maximum	0.22	1.1		0.81	2.7	1.5	3.2

(BST) method was applied to classify the source of fecal matter into three categories – human, dog, and wild animal. The report, which documents the results and findings, is provided in Appendix J.

The source of most of the fecal contamination was identified as wild animal; however, significant human-sourced contamination was also discovered. The presence of fecal coliform bacteria from human sources was particularly evident at sample site STC1 (near the confluence of Spring Branch with the main branch), a site that is surrounded by onsite wastewater treatment and disposal systems (OSTDS). STC2, on Hammond Branch, was also impacted frequently by indicator bacteria from human sources, and is downstream from another cluster of residences serviced by OSTDS.

Some percent of isolates from other sources will misclassify as human isolates-this is true of all BST methodologies. The rate of misclassification of isolates into the human category can be used to develop a cut-off point for significant levels of human isolates. In this database, about 20% of wild animal isolates are misclassified as human, and wild animal isolates have the highest rate of misclassification as human of all sources. The conservative rate of 25% is used as the cut-off point for identification of a significant percentage of isolates from human sources in any sample.

Valerie J. Harwood, a professor at the University of South Florida who conducted the BST study for this project, provided the following description of the significance of fecal coliform in surface waters.

> *The goal of bacteriological water quality testing is, in large part, to identify water that contains human pathogens in order to protect public health. Ideally, water quality testing would reliably identify public health threats, while allowing full use of waters that do not constitute a health threat. This goal has been elusive, in part because of the limitations of the methods we use. It is difficult, time-consuming and expensive to directly quantify disease-causing bacteria and viruses, and virtually impossible to test for all possible pathogens in a water sample. Thus, we quantify indicator bacteria, whose presence more-or-less reflects the probability that there are pathogens in the water. A major problem with the fecal coliform indicator is that it is a poor predictor of some human pathogens, particularly enteric viruses, but can also be present in waters where there are few or no viral, bacterial or protozoan pathogens. The same problem exists when* E. coli*, a member of the fecal coliform group, or* Enterococcus*, a different bacterial group, are used as indicator organisms for water quality.*

> *One of the major reasons that fecal coliforms are inadequate indicators is that they are present in the gastrointestinal tract of all warm-blooded animals and some cold-blooded animals. Some animal feces, i.e. those of humans, cattle, and swine, have a higher probability of containing human pathogens than the feces of most other species, therefore many water quality experts would place contamination from these animals in a "high risk" group. Human feces are considered particularly dangerous because of the human-specific viruses transmitted exclusively by human sources. Very low levels of fecal indicator bacteria from a high-risk animal group indicate a greater potential health hazard than higher levels of indicator bacteria from a low risk animal group. There is, however, no testing method approved by regulatory agencies such as the EPA that can be used to determine the source (i.e. cow, human, dog) of fecal indicator bacteria. Such a method would allow much more accurate risk assessment than we can achieve with standard testing methods. It would also allow regulatory agencies to more effectively identify and eliminate the source of bacterial contamination to natural waters, and would contribute greatly to the accuracy of total maximum daily load (TMDL) models.*
>
> *Due to the history of high fecal coliform numbers in the urban Stevenson Creek watershed in Clearwater, Florida, the City of Clearwater funded a cutting-edge study of the sources of bacteria in this area. Based on land use patterns in the waters studied, one could predict significant fecal inputs from wild animals, particularly birds and raccoons, and from dogs. Other major candidates for fecal coliform contamination in this watershed include onsite wastewater treatment and disposal systems (OSTDS) whose drainfields are not functioning properly, or which have been bypassed. While limited steps can be taken to reduce the amount of dog wastes that enter surface waters, runoff from yards and other surfaces inevitably transports such waste to waters. Contributions from wild animal feces to the watershed are, if anything, more difficult to control than contributions from dogs. It is, however, possible to control the impact of human waste on water quality. Improvements in central sewer systems and OSTDS installations have greatly improved water quality overall in the U.S. since the implementation of the Clean Water Act in 1970. However, continued degradation of water quality in many surface waters, combined with heightened awareness of the dangers of waterborne pathogens, has led to renewed efforts to understand and mitigate the sources of microbial pollution in natural waters.*

2.3.4 Nonpoint Source Loading Model

A nonpoint source loading model was prepared to estimate pollutant loads from Stevenson Creek Watershed. This model uses the EPA Simple Method, which is an event mean concentration (EMC) approach. In this approach, mass loads are calculated as the product of the EMC and the stormwater runoff volume. The stormwater runoff volume is estimated as the fraction of rainfall appearing as runoff multiplied by the basin area. The EMC is constant; thus, this method is also refereed to as the "constant concentration" method.

This loading model is intended to serve as an estimate. The water quality estimating procedures used for this project are very simple, yet water quality estimations by any means are not precise. Dr. Wayne Huber in the EPA SWMM User's Manual expressed this fact very well.

> *Simulation of urban runoff quality is a very inexact science if it can even be called such. Very large uncertainties arise both in the representation of the physical, chemical and biological processes and in the acquisition of data and parameters for model algorithms*

Nevertheless, the loading estimates for the Stevenson Creek Watershed presented herein represent a reasonable estimate that can be used to guide management actions.

The flow and water quality data collected for this project (Section 2.3.2) were used along with soils and land use coverage information to develop the runoff coefficients (Section 2.3.4.1) and EMCs (2.3.4.2); subsequently, this information was used in combination with an existing stormwater treatment evaluation to determine mass loads and loading rates. Additional details concerning the individual elements of the analysis are contained in the following subsections.

2.3.4.1 Runoff Coefficients

Runoff coefficients are based on soils and landuse and represent the fraction of rainfall appearing as runoff. The relationship between rainfall and runoff is, however, not truly linear; thus, each unique rainfall event will have a different runoff coefficient for a given basin. During the dry season less runoff occurs because more water is required to wet the ground surface, and infiltration occurs at a faster rate. This is because there is less soil moisture. Runoff will occur on a pervious surface only if the rainfall rate exceeds the soil infiltration rate. Infiltration rates are lower when the ground is wet and become equal to zero when the ground is saturated.

The runoff coefficients developed for the Stevenson Creek Watershed are intended to represent the fraction of rainfall appearing as runoff for an average year. The vast majority of published runoff coefficients are intended for use in the Rational Formula for peak discharge rate estimation as opposed to runoff volume estimation.

While, by definition, there is no difference between these two types of runoff coefficients (peak rate or flow volume), runoff coefficients used in the Rational formula generally have factors of safety built in. For this reason the runoff coefficients developed for the Stevenson Creek Watershed are generally lower than published runoff coefficients.

The overall runoff coefficients for the monitored basin are 0.29 for the Stevenson Creek Station and 0.27 for the Spring Branch Station. These overall coefficients were calculated using the overall storm event runoff coefficients (Table 2.3-3) for the monitoring period and the overall runoff coefficient for a September 17, 2000 event. Assuming that, in an average year, 60% of the total rainfall depth occurs during the four wet months (June, July, August, and September), the overall coefficients were weighted 60-40 between the "typical wet season event" (September 17, 2000) and the overall monitoring period coefficients. Runoff coefficients developed for this project are shown in Table 2.3-13.

Runoff coefficients for each unique soil-landuse combination were then developed. The weighted average of these coefficients match the calculated overall runoff coefficients which, in turn, are based on the monitoring data; thus, the runoff coefficients are, in a sense, calibrated. Obviously, runoff coefficients for soils/landuse combinations that are well represented in the monitored basins will be more accurate than combinations that are not well represented.

2.3.4.2 Event Mean Concentrations

An EMC is the concentration that has a 50% probability of being exceeded during a storm event; thus, over the course of time, half of the storms will produce concentrations higher than the EMC and half of the storms will produce concentrations lower than the EMC.

Landuse-based EMCs were developed based on a two-step process. In the first step, in-stream EMCs and runoff coefficients were developed using the monitoring data;

Table 2.3-13

Stevenson Creek Watershed Runoff Coefficients

Landuse	Soil	RC
Agricultural	A	0.075
	B/D	0.104
	C	0.133
	D	0.154
	UND	0.098
Commercial	A	0.421
	B/D	0.439
	C	0.457
	D	0.469
	W	1.000
High Density Residential	A	0.421
	B	0.439
	B/D	0.448
	C	0.457
	D	0.469
	W	1.000
Highway/Utility	A	0.347
	B/D	0.367
	C	0.387
	D	0.402
	UND	0.363
	W	1.000
Industrial	A	0.347
	B/D	0.367
	C	0.387
	D	0.402
Institutional	A	0.298
	B/D	0.319
	C	0.341
	D	0.357
	W	1.000
Low Density Residential	A	0.100
	B/D	0.128
	C	0.156
	D	0.177
	W	1.000
Medium Density Residential	A	0.149
	B	0.176
	B/D	0.189
	C	0.202
	D	0.222
	UND	0.170
	W	1.000

Landuse	Soil	RC
Open Land	A	0.075
	B	0.104
	B/D	0.119
	C	0.133
	D	0.154
	W	1.000
Recreational	A	0.124
	B/D	0.152
	C	0.179
	D	0.199
	UND	0.146
	W	1.000
Upland Forest	A	0.050
	B/D	0.080
	C	0.110
	D	0.132
	W	1.000
Water	A	1.000
	B	1.000
	B/D	1.000
	C	1.000
	D	1.000
	W	1.000
Wetland Forest	B/D	0.046
	C	0.110
	D	0.132
	W	1.000
Wetland Non-Forested	B/D	0.046
	C	0.110
	D	0.132
	W	1.000

subsequently, the in-stream EMCs were used to develop landuse-based EMCs. The process used to develop EMCs for this project is described in the following three subsections.

2.3.4.2.1 In-stream EMCs

Statistical analyses were conducted using the storm event monitoring data to develop the in-stream EMCs. EMCs are commonly assumed to follow a lognormal distribution. A normal distribution is the familiar bell-shaped curve. The lognormal distribution is similarly shaped; however, it is the natural log of the data that is distributed symmetrically about the mean rather than the data itself. Studies[1] have shown that a lognormal distribution best represents EMCs. Lognormal distributions are used for many applications when the sample size is relatively small and variations between individual measurements are extreme. As the sample size increases the mean calculated using a lognormal distribution will approach the arithmetic mean.

Table 2.3-14
In-Stream EMCs

Paramete	Spring Branch EMC (mg/l)	Stevenson Creek EMC (mg/l)
Pb	0.006	0.004
Zn	0.079	0.030
BOD5	15.350	12.190
TSS	25.129	18.260
TP	0.452	0.310
TN	1.412	1.310

In-stream EMCs for the Stevenson Creek and Spring Branch Stations are shown in Table 2.3-14.

2.3.4.2.2 Existing Stormwater Runoff Treatment

Exiting stormwater treatment areas are present in the Stevenson Creek Watershed. These treatment areas consist of permitted dry retention and wet detention pond as well as natural lakes and man-made depressional storage areas. The general locations of these treatment areas are shown on Figure 2.3-11 inside the subbasin in which they are contained. Assumptions used in this evaluation of existing treatment are as follows:

Figure 2.3-11

Existing Stormwater Treatment Areas

- ***Treatment depth***. Permitted stormwater treatment areas are assumed to provide one inch of treatment for wet detention areas and one-half inch of treatment for dry retention areas. This is consistent with SWFWMD and City of Clearwater design criteria for stormwater treatment areas. Lakes and other "natural" BMPs are assumed to provide a maximum treatment depth of one inch adjusted downward based on the ratio of the BMP area to the tributary basin. This results in a treatment depth range of 0.01 to 1 inch. BMP efficiencies equal to one-half those for wet detention were applied and adjusted by the estimated treatment depth.

- ***Treatment Coverage***. Water is treated only once. In other words water from a BMP (BMP A) which drains to a downstream basin that also contains a BMP (BMP B) is not treated again in BMP B. This assumption simplified the analysis and is rational for a number of reasons. First, most permitted BMPs do not receive runoff from offsite basins and, instead, drain directly to the primary storm sewer system. Second, BMPs in-line to the main storm sewer system will fill with water from the nearest areas first. Subsequent flows will either bypass treatment or reduce the treatment efficiency; therefore, it is reasonable to assume that these flows will not be treated. Treatment coverage is illustrated on Figure 2.3-12.

BMP efficiencies (Table 2.3-15) are based on literature values and adjusted for agreement with measurements taken during the monitoring program.

Table 2.3-15

BMP Maximum Efficiencies

Parameter	Wet Detention	Dry Retention	Natural Treatment
Pb	**75%**	80%	0.38
Zn	**60%**	80%	0.3
BOD5	**50%**	80%	0.25
TSS	**75%**	80%	0.38
TP	**60%**	80%	0.3
TN	**30%**	80%	0.15

Figure 2.3-12
Treatment Coverage

2.3.4.2.3 Landuse-Based EMCs

Landuse-based EMCs were developed based on the measured in-stream EMCs. The process used to develop EMCs was to vary estimates of landuse-based EMCs until agreement with recorded data as well as agreement between the two monitoring stations was achieved. This process was performed mindful of literature values of EMCs so that individual EMC values were not assigned outside of a reasonable range.

The results agree well with the recorded data at the Stevenson Creek Station; however, lead, zinc, BOD and TSS estimates agree less well with measured values at the Spring Branch Station. Obviously, land use variation alone cannot precisely account for variations in water quality from one location to the next; nevertheless, landuse-based EMCs can provide good wash-off quality estimates- both the strengths and the shortcomings of landuse-based EMCs are apparent in the Stevenson Creek Watershed water quality monitoring data.

EMC combinations that "made the numbers work" were found for lead, zinc, BOD, and TSS; however, these EMC combinations produced EMC values that were not reasonable for the land uses. The "true EMC" may not have been measured because of the limited number of samples that were collected. Another possible explanation for the difference is sediment re-suspension in Byrum Sump. The Spring Branch Station is located just downstream of Byrum Sump and it is likely that re-suspended sediments made up significant portions of the samples at this location. This would explain the elevated TSS levels as well as lead and zinc levels. There is normally a correlation between TSS and metals concentrations in stormwater runoff; furthermore, since lead and zinc tend to accumulate in sediments, higher levels could be expected in storm flow as well as base flow.

The landuse-based EMCs are presented in Table 2.3-16 along with the percent variation from measured values at each station. Table 2.3-17 provides a listing of some of the literature values used for reference in this study.

Table 2.3-16

Landuse-Based EMCs for Stevenson Creek Watershed[1]

LAND USE	Pb	Zn	BOD_5	TSS	TP	TN
Agricultural	0.004	0.029	15.36	27.64	0.96	1.27
Commercial	0.006	0.044	14.68	38.36	0.40	1.37
High Density Residential	0.013	0.147	20.49	51.41	1.14	2.35
Highway/Utility	0.029	0.138	20.49	40.80	0.32	1.35
Institutional	0.006	0.044	6.83	35.91	0.43	0.97
Industrial	0.004	0.081	12.29	51.14	0.43	1.16
Low Density Residential	0.001	0.009	11.52	7.75	0.25	1.14
Medium Density Residential	0.001	0.011	14.72	11.02	0.28	1.48
Open Land	0.001	0.010	10.67	5.98	0.10	0.81
Recreational	0.001	0.007	1.71	5.98	0.10	0.81
Natural Areas	0.001	0.002	7.68	2.72	0.18	1.03
Water	0.001	0.002	2.73	0.82	0.10	0.81

Agreement with Monitoring Data[2]						
Monitoring Station	**Pb**	**Zn**	**BOD_5**	**TSS**	**TP**	**TN**
Stevenson Creek	0%	0%	0%	0%	0%	0%
Spring Branch	32%	43%	21%	24%	11%	1%

[1] All concentrations in mg/l
[2] Percent difference between measured loads and calculated loads using landuse-based EMCs.

Table 2.3-17
Landuse-Based EMCs – Selected Literature Values[1]

NURP Median						
LAND USE	Pb	Zn	BOD_5	TSS	TP	TN
Residential	0.1440	0.1350	10	101	0.383	2.636
Mixed Urban	0.1140	0.1540	7.8	67	0.263	1.846
Commercial	0.1040	0.2260	9.3	70	0.201	1.751

Stormwater Loading Rate Parameters for Central and South Florida						
LAND-USE	Pb	Zn	BOD5	TSS	TP	TN
General Agricultural	-	-	3.80	55.30	0.344	2.32
Commercial-High Intensity	0.2140	0.1700	17.20	94.00	0.430	2.83
Multi-Family	0.0870	0.0550	11.00	71.70	0.490	2.42
Highway	0.1890	0.1340	5.60	50.30	0.340	2.08
Industrial	0.2020	0.1220	9.60	93.90	0.310	1.79
Low Density Residential	0.0370	0.0320	4.40	19.10	0.177	1.77
Single Family	0.0480	0.0570	7.40	27.00	0.300	2.29
Open Land/Recreational	0.0250	0.0060	1.45	11.10	0.053	1.25
Water	0.0250	0.0280	1.60	3.10	0.110	1.25
Wetland	0.0250	0.0060	4.63	10.20	0.190	1.6

Hillsborough County						
LAND-USE	PB	ZN	BOD5	TSS	TP	TN
Agricultural	0.003	0.017	18.30	12.70	2.349	2.97
Commercial	0.004	0.026	2.67	22.92	0.279	2.032
High Density Residential	0.006	0.058	2.60	29.00	1.337	2.047
Highway/Utility	0.960	0.410	24.00	261.00	0.120	4.13
Institutional	0.004	0.026	2.67	22.92	0.279	2.032
Light Industrial	0.006	0.096	2.87	18.20	0.332	2.275
Low/Medium Density Residential	0.008	0.022	1.00	19.00	0.401	1.363
Open Land	0.001	0.006	3.80	11.10	0.050	2.598
Recreational	0.006	0.004	3.80	11.10	0.050	2.598
Upland Forest	0.000	0.000	0.00	0.00	0.000	0
Water	0.000	0.000	0.00	0.00	0.000	0
Wetland Forest	0.000	0.000	0.00	0.00	0.000	0
Wetland Non-Forested	0.000	0.000	0.00	0.00	0.000	0

[1] All concentrations in mg/l

2.3.4.3 Results

Mass loads are divided into three parts: Gross load, removed load, and net load. These three types of loads are described as follows:

- Gross Load - The mass washed off, or mass generated.
- Removed Load - The mass removed by BMPS.
- Net Load - Gross load minus removed load.

Load totals are provided on Table 2.3-18 and presented visually in terms of loading rate (lb./ac) on Figures 2.3-13 through 2.3-16. Additional details concerning the results of the nonpoint source loading analysis are provided in Appendix K.

These loading estimates are intended to represent an average year. The annual rainfall used for these calculations was 55.6 inches – this is based on the average annual rainfall depth reported by the SCS in the Pinellas County Soil Survey. According to the "constant concentration" method which was used (refer to Table 2.3.4.2), load estimates for other years (or time periods) could be made by multiplying the loads presented here by the ratio of rainfall, for the period of interest, to 55.6.

The highest load totals were calculated for the Upper Spring basin. Upper Spring basin is also the largest in terms of area; therefore, this result can be misleading. A better indicator of "hot spots" is loading rate, or pound per acre (refer to Figures 2.3-13 to 2.3-16). Reviewing the results from a loading rate perspective shows the Middle Stevenson basin to have the worst stormwater runoff quality. For example, the net load of TSS originating from Upper Spring Branch is 108,743 pounds per year, and the net TSS loading rate is 65 pounds per acre per year. For Middle Stevenson Creek the net annual load of TSS is estimated at 59,604 pounds and the net TSS loading rate is 111 pounds per acre per year – a smaller load than Upper Spring Branch but a higher loading rate. The Middle Stevenson basin has an abundance of the three factors that cause high loads – soils with low infiltration rates, intense developed land use, and lack of treatment.

Table 2.3-18

Major Basin Loads

Watershed	Pb	Zn	BOD_5	COD	TSS	TP	TN
Gross Load (pounds per year)							
Hammond Branch	10	80	36,441	46,777	903	3,861	10
Jeffords Street	5	38	26,273	29,436	574	2,790	5
Lake Belleview	15	118	37,515	73,482	1,080	3,903	15
Lower Spring	4	36	17,527	22,031	451	1,831	4
Lower Stevenson	11	75	33,941	49,546	817	3,715	11
Middle Stevenson	13	104	31,534	61,338	903	3,172	13
Upper Spring	36	325	84,074	147,929	2,907	9,021	36
Upper Stevenson	6	49	26,642	33,141	633	2,704	6
Total	100	826	293,948	463,680	8,269	30,997	100
Load Removed (pounds per year)							
Hammond Branch	1	9	3,049	6,362	104	236	1
Jeffords Street	1	5	2,889	4,090	74	208	1
Lake Belleview	5	27	8,861	24,454	274	554	5
Lower Spring	1	8	2,250	4,379	78	188	1
Lower Stevenson	-	-	-	-	-	-	-
Middle Stevenson	0	2	678	1,734	19	68	0
Upper Spring	10	71	15,068	39,186	607	1,048	10
Upper Stevenson	1	6	1,781	4,936	48	101	1
Total	20	128	34,576	85,142	1,205	2,403	20
Net Load (pounds per year)							
Hammond Branch	9	71	33,393	40,415	799	3,625	9
Jeffords Street	4	34	23,384	25,345	500	2,582	4
Lake Belleview	10	90	28,654	49,028	807	3,349	10
Lower Spring	3	29	15,277	17,651	373	1,644	3
Lower Stevenson	11	75	33,941	49,546	817	3,715	11
Middle Stevenson	13	102	30,856	59,604	884	3,104	13
Upper Spring	25	254	69,006	108,743	2,300	7,974	25
Upper Stevenson	4	43	24,861	28,205	585	2,603	4
Total	80	697	259,372	378,538	7,064	28,594	80

SECTION 3.0

RECOMMENDED MASTER PLAN IMPROVEMENTS

This section of the watershed management plan describes the improvements that are recommended to address the problems identified in the previous section. The first portion of this section describes the projects recommended to address the flood protection, water quality, and erosion/sedimentation problems. Several of these projects also incorporate features to enhance the quality of wildlife habitat, and to provide the potential for recreational and educational facilities. The second portion of this section provides recommendations for maintenance of the existing and proposed stormwater infrastructure throughout the watershed. The third and fourth subsections present recommendations for public awareness/involvement and exotic plant eradication programs; and the fifth section outlines the regulatory framework governing actions related to stormwater management within City of Clearwater. The sixth and final section summarizes the capital improvement cost estimates for the recommended projects.

3.1 FLOOD PROTECTION, WATER QUALITY, NATIVE HABITAT, EROSION AND SEDIMENTATION IMPROVEMENTS

In accordance with Sections 16.3.2, 17.1.2, and 23.1.2 of the City of Clearwater Comprehensive Plan, conservation of natural drainage systems, use of natural alternatives such as natural and man-made wetlands, and the protection and improvement of the quality of receiving waters are goals of the Stevenson Creek Watershed Management Plan. These goals, together with the flood protection level of service goals identified in Section 2.1.5.3, are reflected in the recommended improvement projects as illustrated on Figure 3.1-1 (located in the rear map pockets) and described in the following subsections.

Computer modeling of each project was conducted using the AdICPR model and the pollutant loading spreadsheet model developed for the existing conditions, as described in Sections 2.1 and 2.3. Various alternatives were analyzed by modifying the models to reflect an array of infrastructure improvement scenarios. In this manner, the modeling was used as a planning tool to optimize the flood protection and water quality benefits of the projects, while working within the constraints of cost, available right-of-way, and existing facilities and infrastructure. The relative scarcity of publicly-owned and vacant land within the watershed limited the range of available alternatives and posed a unique challenge in meeting all the goals of the Watershed Management Plan in a cost effective manner. For this reason, acquisition of private property, including 33 flood-prone or flood-susceptible single-family residential homes, is recommended in order to provide the necessary land for various infrastructure improvement projects that will benefit the watershed as a whole.

In most, but not all cases, it was considered feasible and cost-effective to achieve the adopted flood protection level of service goals. If all recommended projects are implemented, 243 of the identified 334 structure FPLOS deficiencies (73%) will be remedied. Many (28) of the remaining FPLOS deficiencies are located within the coastal high hazard area of Lower Stevenson Creek and are susceptible to flooding from storm surge. Reductions in the riverine floodplain (flooding due to rainfall and runoff) will therefore not remedy these FPLOS deficiencies. The combined projects would remove FPLOS deficiencies at 33 locations on residential streets, 16 locations on collector roads, and on one arterial road. Proposed conditions AdICPR model input and output are provided in Appendix E. Proposed conditions flood elevations and levels of service for the 10-, 25-, and 100-year design storm events are provided in Appendix F, along with a node-by-node comparison of existing and proposed 100-year flood elevations. AdICPR results are provided for Spring Branch Alternative 1 (Project 1B); results are similar for Alternative 2 (Project 1C) with identical level of service for proposed conditions. Proposed conditions flood profiles are included as Figures 3.1-36 through 3.1-44 at the end of this section. A comparison of the existing and project conditions 100-year floodplain limits is provided as Figure 3.1-45 in the rear map pockets.

Water quality, habitat, erosion and sedimentation projects were developed individually and in conjunction with the recommended flood protection projects wherever feasible. Alternative projects were evaluated with respect to water quality improvement benefits. The net loads (refer to Section 2.3.4) present at each project location were calculated and BMP removal efficiencies were applied to calculate the load removed by each project.

Wet detention, percolation, and sedimentation were considered for stormwater treatment methods. These treatment methods, or BMP's, are described more specifically in Table 3.1-1, along with the maximum removal efficiencies. These efficiencies were adjusted downward based on the percentage to which the project achieved ideal conditions. For example, if a wet detention pond providing 1-inch of treatment is assumed to remove 60% of phosphorus, then a wet detention pond providing one-half-inch of treatment is assumed to remove 30% of phosphorus.

Table 3.1-1
Maximum BMP Removal Efficiencies

BMP Type	Pb	Zn	BOD_5	TSS	TP	TN
CDS Unit	0.5	0.35	0.3	0.5	0.25	0
Channel Improvements	0.2	0.15	0.1	0.2	0.15	0.1
Percolation	0.8	0.8	0.8	0.8	0.8	0.8
Sediment Sump	0.7	0.55	0.1	0.7	0.25	0
Water Quality Inlet	0.15	0.05	0.05	0.35	0.1	0
Wet Detention (1-inch)	0.75	0.6	0.5	0.75	0.6	0.3
Wet Detention (2-inches)	0.24	0.8	0.6	0.9	0.75	0.45

The alternative projects are listed along with the type of BMP proposed, loads present at BMP site, and the estimated load removed, in Table 3.1-2.

Descriptions and conceptual schematic plans of these improvements are provided in the following subsections.

(TABLE 3.1-2)

3.1.1 Subwatershed 1: Spring Branch

Project 1A. Spring Branch Conveyance Enhancements. In order to address the 27 structure FPLOS deficiencies in the area of Byram Drive and Flora Drive between King's Highway and Highland Avenue, and along Huntington Lane, east of King's Highway, various enhancements to the conveyance capacity of the existing Spring Branch system are proposed. These enhancements include widening approximately 700 linear feet of the Spring Branch Channel downstream of King's Highway. This section of channel was constructed with high, steep, and unstable banks that are now nearly vertical in places due to soil erosion. The recommended project is to reshape the banks to a 4:1 (horizontal to vertical) side slope, providing additional cross sectional area for conveyance of flood flows, and providing a more stable bank configuration that would support vegetation. The bottom width and bottom elevations of the channel would remain essentially unchanged, with the exception that low, sloping walls (2.5'-3' high) constructed of gabion baskets or a cellular confinement system such as Geoweb (or equivalent) would be constructed to reduce bank erosion. The project would also include a maintenance travelway that would normally be dry but would be submerged for brief periods during major flood events. To accommodate the widened cross section, approximately 50' of additional easement width would be required adjacent to the existing 50' easement for Spring Branch extending from King's Highway downstream to the City Limits (refer to Figure 3.1-3).

Some planting of native vegetation will be undertaken for this project. Where possible, trees will be planted along the banks of the channel to eventually provide shade and reduce erosion. The shade will reduce maintenance requirements significantly because most nuisance exotic species require full sun for exponential growth. Trees recommended for the upper banks in this area are dahoon holly, southern magnolia, and eastern red cedar. These evergreen trees will not contribute as much litter to the channel as deciduous trees.

The understory on the banks and on the slopes above the normal water elevation may be planted with Florida coontie and Virginia chain fern. Both species will tolerate full sun but can adapt to full shade as the trees mature. Another species recommended for the upper banks is cord grass. This grass forms dense clumps that will prevent bank erosion and filter runoff from the adjacent residential areas. The area around the planted vegetation may be sodded with bahia grass for temporary stabilization.

Planting in the channel at and below the normal water elevation may occur in areas where lining the channel with gabions or other bank armaments is not required. For these areas sturdy species that will withstand occasional floodwaters are recommended. Such species include bulrush, pickerelweed, and soft rush. These plants will not only provide erosion protection, they will also improve water quality during periods of low flow. The scientific names and planting depths of the recommended plants are provided in Table 3.1-3.

In addition to the channel improvements, the project includes removal of a private driveway crossing of Spring Branch between Sunset Point Road and Betty Lane, within unincorporated Pinellas County (See Figure 3.1-2). This crossing consists of a 92" x 152" CMP arch culvert, which severely restricts the flow for major storm events. As evidenced in the Spring Branch flood profile (Figure 2.1-22), this structure causes 3.4 feet of head loss for the 100-year storm. Although the culvert under Betty Lane is the same size, Betty Lane itself is much lower than the private crossing, so floodwaters are allowed to overtop the road during major events. The purpose of this private driveway is unclear, as the property served by it has access from Macomber Avenue. This culvert would have to be removed prior to implementing the channel improvements described above. Removal of this culvert would also reduce flooding for the estimated 10-15 flood-susceptible homes along Betty Lane and Macomber Avenue within unincorporated Pinellas County.

(TABLE 3.1-3)

Figure 3.1-2. Private Crossing of Spring Branch Near Betty Lane (to be Removed)

In order to provide flood relief for the areas east of Highland Avenue, Project 1A also includes the upsizing of approximately 3,300 feet of storm sewer near Highland Avenue and Byram Drive. The Project 1A.1 and 1A.2 conveyance improvements would work together to remove the 100-year flood risk from 21 homes east of King's Highway. This total does not include the estimated 10-15 homes in unincorporated Pinellas County. Because Project 1A would increase the discharge rates to downstream areas, this project will require construction of either Project 1B (alternative 1) or Project 1C (alternative 2) in order to offset potential downstream flooding impacts. Projects 1A.1 and 1A.2 are illustrated on Figures 3.1-3 and 3.1-4, respectively.

Project 1B. Springtime Avenue and Douglas Avenue Bridges. In order to offset the potential downstream flooding impacts of Project 1A, the bridges at Springtime Avenue and Douglas Avenue over Spring Branch could be enlarged (refer to Figure 3.1-5). This alternative would allow the excess food flows to be safely conveyed to the Stevenson Creek estuary. The existing crossings consist of a 6' x 15' concrete arch at Springtime

Avenue, and twin 7' x 8' box culverts at Douglas Avenue. The recommended pipe sizes are twin 9' x 12' box culverts (or equivalent) at both locations. This alternative would rely on the planned dredging of sediment from Edgewater Drive Bridge, as part of the Stevenson Creek Estuary Restoration Project, in order to avoid increases in flood elevations within the estuary.

Project 1C. Spring Branch Flood Detention Basin. As an alternative to Project 1B, a stormwater detention basin could be constructed downstream of the proposed channel improvements. This detention basin would provide storage and attenuation of the excess floodwaters, which could then be safely conveyed by the existing downstream system. This new facility would provide over 0.1-inches of treatment for the Spring Branch subwatershed removing an estimated 9,950 pounds of suspended solids and 290 pounds of nitrogen on an annual average basis. As illustrated on Figure 3.1-6, the recommended improvements consist of a three-acre expansion of the existing Pinellas County mitigation area and construction of an eight-acre flood detention facility on vacant property owned by the Pinellas County School Board.

A discharge control weir would be constructed upstream of Betty Lane at elevation 5.5' NGVD, and a diversion weir would be constructed near the downstream end of Project 1A, at elevation 6.5', to divert a portion of the flow from Spring Branch into the facility where it would be treated and attenuated. The total area of the facility would be approximately 11 acres, and would require acquisition of a 4-acre parcel from Sunset Point Baptist Church, and acquisition of approximately 8-10 acres of property from the School Board. The project provides a significant opportunity for wetland habitat creation and water quality improvements.

The existing mitigation area on the north side of Sunset Point Road could be graded on the east side to extend the wetland into the existing church recreation area. This wetland would be connected via a culvert to another created wetland on the School Board property on the southern side of Sunset Point Road.

(FIGURE 3.1-3)

(FIGURE 3.1-4)

(FIGURE 3.1-5)

(FIGURE 3.1-6)

Figure 3.1-7. This photograph shows the area on the south side of Sunset Point Road that could be excavated to create the stormwater detention facility.

The majority of the created wetland will consist of a shallow littoral shelf that would be planted with pickerelweed, soft rush, arrowhead, water lily, and other wetland species. Table 3.1-3 provides a list of suitable wetland species and their planting depths. A shallow channel would meander through the center of the wetland, as shown in Figure 3.1-6. It is recommended that trees be planted around the perimeter of the wetlands to screen the area from adjacent land uses. Recommended trees are pond cypress, red maple, and pop ash in the wetland and laurel and live oak at the top of bank. The wetland vegetation would provide water quality treatment and wildlife habitat in a very depauperate area.

Project 1D. Woodland Terrace Storm Sewer Replacement. As illustrated on Figure 3.1-8, this project involves upsizing approximately 1,300' of 24" diameter storm sewer along Woodland Terrace, from Oakdale Way to Shore Drive, with 42" RCP storm sewer.

The project will eliminate the four structure FPLOS deficiencies near Woodlawn Terrace and Oakdale Way, and may incorporate water quality inlets and / or CDS units for stormwater treatment.

Project 1E. Byram Pond Dredging and Expansion. Byram Pond is located in-line with Spring Branch immediately east of King's Highway. Since the small pond is in-line with the channel, it is a natural place for sediments to settle out of the water column and accumulate. The City desires to have the ability to regularly dredge the accumulated sediments from the pond. However, concerns over access and possible impacts to surface water quality have prevented the dredging from taking place. In order to provide an equipment access and staging area, removal of three (3) flood-susceptible homes adjacent to Byram Pond is proposed. The location of the proposed expansion and/or staging and de-watering area is illustrated on Figure 3.1-9.

Project 1F. Spring Branch Stabilization, Union Street to Byram Pond. Extremely steep banks and lack of access for equipment create difficulties in maintaining the portion of the main Spring Branch channel that extends from Union Street, south to the Byram Pond. As illustrated on Figure 3.1-10, the proposed improvements consist of reshaping the banks to a stable configuration and constructing a maintenance travelway within the existing 65' drainage easement. The improvements would require the construction of 4' high retaining walls on either side of a 10' wide earth-bottom channel which would convey the majority of storm events. Flood events would be allowed to occupy the upper portions of the cross section including the maintenance travelway. As an alternative, an 11' x 7' box culvert could be constructed within the existing ditch at approximately the same cost and hydraulic efficiency. However, the box culvert alternative could be expected to result in much lower long-term maintenance costs. Although this would require wetland mitigation, Project 1C could potentially be used for that purpose.

Project 1G. Clearview Lake. As illustrated on Figure 3.1-11, this project includes construction of approximately 3,000' of 18" to 66" storm sewer with inlets in order to provide drainage for, and divert runoff from, approximately 20 acres into Clearview Lake. In addition to providing stormwater treatment for the currently untreated runoff from the 20 acres, this diversion will decrease the load on the downstream storm sewer system by utilizing excess storage capacity within Clearview Lake. In addition, an outfall control structure would be constructed on the lake in order to increase residence time for small storm events, providing additional water quality benefits for the runoff that currently enters the lake. This project will remedy a collector road flooding level of service deficiency at Highland Avenue and Sunset Point, while providing wet detention stormwater treatment for a total of 52 acres.

Project 1H. Betty Lane Forested Habitat Preservation Site. Approximately 1200 feet of Spring Branch maintains a remnant of riparian habitat and a somewhat natural profile. Adjacent to the north side of the stream is a forested area that although disturbed by draining and some clearing, has not yet been developed. This forested upland area is approximately 25 acres and is located in the northeast quadrant of the intersection of Sunset Point Road and Betty Lane (refer to Figure 3.1-12).

Despite the impacted condition of the parcel, it currently provides the only existing wildlife habitat of any substantial size within the watershed. Discussions with City staff indicate that residential development may be pending on portions of the site, despite the fact that the majority of the property lies within the 100-year floodplain of Spring Branch (refer to Figure 2.1-15). Approximately six acres of this property is under City ownership and will be used as a park site. If, however, more of the site could be preserved in a natural state through purchase of additional privately owned property, it would have the potential to become locally significant wildlife habitat, floodplain preservation, and neighborhood recreational area. The site would need to be cleaned up, and all nuisance vegetation and trash removed. If the site were to become a passive park, fencing the site would be essential.

(FIGURE 3.1-8)

(FIGURE 3.1-9)

(FIGURE 3.1-10)

(FIGURE 3.1-11)

(FIGURE 3.1-12)

3.1.2 Subwatershed 2: Lower Stevenson Creek

Project 2A. Palmetto Street Sediment Sump. As part of the Stevenson Creek Phase 1 improvements, a small sediment sump was created south of Palmetto Street, within the Clearwater Country Club Golf Course. Since its completion, the sump has rapidly filled with sediment resulting in, on at least one occasion, the migration of sediment downstream of the low control weir. Although the City routinely removes sediment from the sump, this operation requires closing of a portion of the golf course.

Creation of an expanded sedimentation basin north of Palmetto Street on Stevenson Creek would provide improved equipment access and staging areas, and a less frequent maintenance interval than the existing sump. The proposed 60' x 350' sump, as illustrated on Figure 3.1-13, is designed to have an average maintained bottom elevation of –4.5' NGVD. A low weir would be constructed at elevation 1.5' NGVD at the downstream end of the project in order to trap the sediment. Dredging would be required when the average bottom elevation reaches –3.5' NGVD, at which point an average of 2' of sediment over the bottom would be removed (allowing one foot of overdredging). The capacity of the sump with two feet of sedimentation between elevations –5.5 and –3.5 is approximately 1,550 cubic yards (bank measure). Maintenance dredging of the sump would be recommended annually, or as needed based on actual rates of accumulation. Construction of the sump would require the acquisition of an existing residential property on Palmetto Street to create an access drive from the Street. The property to be acquired is currently a structure FPLOS deficiency. Acquisition of additional drainage/access easements would be required from three properties on Betty Lane that front the Creek.

As the City of Clearwater continues to search for ways to improve water quality, wildlife habitat, and aesthetics in the community, they have been receptive to comments and suggestions from the experts at state and local environmental agencies, as well as from the Pinellas County Department of Environmental Management. It has been suggested by some of these experts that this proposed sump be planted with wetland species to the greatest extent possible. This will be a challenge due to the spatial requirements needed for the maintenance equipment, but the proposed conceptual design would allow some plantings of wetland species in the area near the outfall. Plants proposed for this area will include species tolerant of a wide range in salinity, such as bulrush, black rush, red and black mangrove, and leather fern. Also proposed are trees such as cypress and red maple at the toe of slope in areas that will not interfere with the maintenance equipment. Table 3.1-3 lists the scientific names of the recommended plants and planting depths.

Project 2B. North Missouri Avenue and Palmetto Street Drainage Improvements. In order to remedy street FPLOS deficiencies at North Missouri Avenue and Seminole Street, upsizing of approximately 1,450 feet of existing 42” and 54” storm drain to 60” RCP is proposed (refer to Figure 3.1-14). As an alternative to constructing a portion of the 60” culvert, approximately 860 feet of 36” RCP culvert could be installed parallel to the existing 54” pipe on the opposite side of Palmetto Street.

This project will incorporate water quality improvements as part of the City’s North Greenwood Demonstration Project, in which CDS units will be installed within the storm piping systems near North Missouri Avenue and Palmetto Street, and near Pennsylvania Avenue and Grant Street. CDS units are devices that can be installed underground within new or existing storm sewer systems to remove sediment and floatable debris from the stormwater runoff stream. Together, these two units are expected to remove an estimated 2,320 pounds of suspended solids on an annual average basis. As part of the North Greenwood Demonstration Project currently underway, the stormwater quality of the inflow and outflow streams will be monitored and evaluated to assess the efficiency of the CDS units. In addition, 192 feet of the proposed 60” RCP will be installed as part of the North Greenwood Project.

Project 2C. Installation of Additional CDS Units. In addition to the CDS units installed as part of the North Greenwood Demonstration Project, other CDS units could be installed at strategic outfall locations within the Lower Stevenson Creek

Subwatershed. This project would reduce the loading of sediments, floatable debris, and other pollutants from stormwater runoff prior to entering the Stevenson Creek Estuary. Potential locations for these additional units are located on Figure 3.1-1.

Project 2D. Overbrook Avenue Detention Pond. In order to remedy street FPLOS deficiencies on Rollen Road at Parkwood Street and Terrace Road, and to provide stormwater treatment and attenuation for currently untreated runoff from 78 acres, creation of a four-acre stormwater detention pond is proposed. This new facility would provide over 0.8-inches of treatment removing an estimated 3,320 pounds of suspended solids on an annual average basis. As illustrated on Figure 3.1-15, the pond would be constructed at the site of an existing auto-salvage facility southwest of Betty Lane and Overbrook Road, which has also been identified as a possible dredge material de-watering area for the Stevenson Creek Estuary Restoration Project. The detention pond would be constructed following completion of the dredging, spoil de-watering, and spoil material final disposal. In addition to the flood protection and water quality benefits, this project will remove a potential source of pollution and incompatible riparian land use adjacent to Stevenson Creek. However, prior to final determination of the feasibility of this project, testing and evaluation of the soil underneath the existing auto salvage facility is recommended.

The vacant site adjacent to the west side of the salvage yard could be incorporated into the stormwater facility created on the salvage yard, or could be converted into riparian habitat. The mangrove areas along the shoreline and in the western portion of the site should be cleaned up by removing trash and Brazilian pepper. The upland areas could be dredged and turned into additional mangrove and salt marsh habitat. This area could be developed into a passive use park with a canoe launch area and a boardwalk through the mangroves with an observation deck overlooking the creek.

Figure 3.1-16. This photograph shows the nuisance vegetation and trash on the 9-acre vacant land parcel adjacent to the west side of the auto salvage.

Plantings in the proposed stormwater treatment facility may include pickerelweed, bulrush, soft rush, arrowhead, alligator flag, cord grass, saw grass, and other freshwater species listed in Table 3.1-3. If the vacant land is developed into a salt marsh/mangrove combination habitat area, species planted should include black mangrove, red mangrove, buttonwood, black rush, and other species tolerant of brackish water. Figure 3.1-15 depicts the conceptual design for the proposed stormwater facility and estuarine habitat.

Stevenson Creek Estuary Restoration Plan**.** The sedimentation of the Stevenson Creek Estuary has been identified as a primary concern for the City of Clearwater. The deposition of sediments over the years has reduced flow, impacted water quality, and degraded wildlife habitat. In addition, the residents in the area have reported foul odors when the sediments are exposed to the air.

The Stevenson Creek Estuary is located within an area of the City that has been designated as a “Brownfield”. Brownfield areas, as defined by the Environmental

Protection Agency (EPA), are abandoned, idled, or underused industrial and commercial areas where expansion or redevelopment is complicated by real or perceived environmental contamination. The EPA's Brownfield Initiative is intended to empower states, municipalities, and other stakeholders to work together to determine the optimal way to assess, safely cleanup, and develop brownfields for sustainable uses that would improve the community. The Stevenson Creek Estuary area was chosen as a pilot project for the Brownfields Assessment Program, and the City of Clearwater is working with the U.S. Army Corps of Engineers (USACE) to develop a preliminary plan and feasibility study for the restoration project. If the project is deemed feasible by the USACE, the project could qualify for federal funding of up to 65% of the total cost of project implementation. The City is also working with the FDEP, the SWFWMD, Pinellas County, and local residents to promote awareness and solicit input regarding the project.

The proposed project includes a plan to dredge the estuary between the Douglas Avenue Bridge and the North Fort Harrison Bridge. As previously stated, dredging under the North Fort Harrison Bridge is a necessary precursor to Project 1B, and will improve both tidal circulation and flood flows in the estuary. The dredging will remove approximately 80,000 cubic yards of sediment and deposit it on an undeveloped parcel adjacent to the auto salvage yard, and potentially on the salvage yard site as well. The spoil will be allowed to de-water in this location and then will either be used as cover at a local landfill, or deposited on a nearby vacant parcel. The City intends to use the dredge material disposal site as a public park eventually, with a canoe launch, boardwalk, and other amenities. During the dredging, nuisance vegetation such as Brazilian pepper and cattail will be removed. Upon completion of the dredging, the banks of the creek will be planted with native vegetation such as mangroves, black rush, giant leather leaf ferns, and other species tolerant of salt or brackish water.

Although analysis of the Estuary Restoration Plan is the beyond the scope of this report, it is being developed in conjunction with this Watershed Management Plan and is considered to be a key component of the Plan. Many of the projects recommended herein would reduce sediment and pollutant loading to the estuary, with the intent of ensuring the future environmental and physical integrity of the estuary once it has been restored.

(FIGURE 3.1-13)

(FIGURE 3.1-14)

(FIGURE 3.1-15)

3.1.3 Subwatershed 3: Middle Stevenson Creek

Project 3A. Glen Oaks Stormwater Detention Facility. A major stormwater infrastructure project is needed in the Middle Stevenson Creek Subwatershed in order to address the severe flooding and water quality level of service deficiencies documented within the Lower and Middle Stevenson Creek Subwatersheds. As discussed in Section 2.1.5.4, a total of 49 structures consisting of 105 ground-floor dwelling units along the banks of Middle Stevenson Creek are identified to be subject to inundation from the 100-year design flood. In addition, there have been numerous documented water quality and sedimentation problems in the downstream creek and estuary, due in large part to the contribution of untreated runoff from areas upstream of Glen Oaks. The parcel of land containing Glen Oaks Golf Club was chosen as a potential capital improvement project site due to the following factors:

- The parcel is strategically located on Stevenson Creek immediately adjacent to the most severe flooding problem area in the subwatershed,
- There are no vacant properties in the area that are large enough to provide benefits on a scale commensurate with the scale of the problems, and
- The parcel is currently under City ownership.

The recommended project would entail conversion of almost the entire parcel into a multi-purpose flood detention, stormwater treatment, wildlife habitat and recreational facility. Alternatives to this plan were considered that would provide some flood protection and water quality benefits, while allowing the existing golf course to remain in service. However, these alternatives would provide only a fraction of the benefits needed to alleviate the majority of the level of service deficiencies in the area, and would likely have a negative impact the functioning of the golf course due to poor drainage and increased frequency of flooding.

As shown conceptually in Figures 3.1-17 and 3.1-18, the facility would consist of two separate ponds. The western portion of the site would be converted into a 13-acre wet pond on-line with Stevenson Creek. A weir structure with a bleed-down orifice located just south of the Court Street box culverts would control the normal water level at elevation 14.0 ft NGVD, or four feet above the existing channel bottom. A wide concrete overflow weir would be constructed at the same location at elevation 15.25, allowing the water level to fluctuate between elevations 14.0 and 15.25 during the wet season. This pond would provide improved conveyance of flood flows through the area, while at the same time attenuating peak discharge rates in the Creek. A net increase of 78 acre-feet of available floodplain storage would be created at the proposed 100-year flood elevation. The pond could be designed with both shallow and deep zones for maximum water quality benefits. Wetland plantings would be introduced into the shallow zones, with the deep zones acting as sediment sumps.

In the northeast portion of the property, a 4-acre pond would be constructed which would capture, treat, and attenuate the currently untreated runoff from approximately 50 acres of residential and commercial land uses. The 100-year peak discharge rate from the contributing area would be reduced from over 300 cfs to approximately 20 cfs. The pond could be a designed as a dry pond with a bottom elevation of 25.0 ft NGVD, although additional investigation is needed in order to determine whether this site would support a dry pond. The alternative would be a wet pond with a control orifice at elevation 25.0.

The flood protection benefits of this project would be to remove the risk of flooding from 33 out of the 49 identified flood-susceptible structures (78 out of 104 dwelling units) from floods up to and including the 100-year design event. For 14 of the remaining flood susceptible structures in the Middle Stevenson Subwatershed, the frequency of flooding would be reduced from every 5 to 25 years to every 50 to 100 years. In addition, four out of the five residential street FPLOS deficiencies in the subwatershed would be eliminated. These streets are Pierce Street, Franklin Street, Betty Lane, and Mark Drive. Also, 100-year flood depths would be reduced by more than 1.7' on Cleveland Street (S.R. 60), currently a hurricane evacuation route.

The water quality benefits of this plan would include 100% treatment (retention) of runoff from the 50 acres draining to the northeastern pond, and partial, yet substantial treatment of runoff from the remaining 1,193 acres which drain directly to Stevenson

Creek at the Glen Oaks parcel. Based on the pond surface area available, and assuming a maximum fluctuation depth of 15 inches, the on-line pond could provide wet detention for ½" of runoff from the directly connected impervious surfaces contained within the 1,193 acres. This is approximately equivalent to the runoff generated from a 0.6" rainfall over the entire contributing area. The project is expected to remove an estimated 16,500 pounds of suspended solids and 560 pounds of nitrogen on an annual average basis. The Glen Oaks treatment pond would be designed to function, in conjunction with the modified Lake Belleview system and the modified lakes upstream of Jeffords street ditch, as a "cascading pond" treatment system (refer to Sections 3.1.6 and 3.1.7). The upstream lake outfall structures would be designed to create substantially longer residence times than would exist in the Glen Oaks pond, to ensure that the residence time in the downstream pond would not be compromised by the contribution of treated discharge from the upstream ponds.

In addition to the flood protection and water quality benefits, the Glen Oaks facility would provide up to seven acres of new wetland habitat. The wetland would be planted with species such as pickerelweed, arrowhead, alligator flag, soft rush, cord grass, yellow canna, saw grass, string lily, prairie iris, water lily, spatterdock, cypress, red maple, dahoon holly, water hickory, buttonbush, and Virginia willow (refer to Table 3.1-3). This site could therefore serve as a mitigation bank to provide compensation for wetland impacts for this and other City of Clearwater capital improvement projects.

Due to variations in topography, approximately six acres of upland area is unusable as part of the stormwater facility. This remaining property would be suitable for use as either a passive or an active recreational facility. Active recreational facilities could include soccer fields, which are currently in short supply throughout the City. Alternatively, creation of upland habitat in this area would enhance the value of the wetland habitat and provide a buffer against the adjacent residential areas. If this area is converted to passive recreation and wildlife habitat, some landscaping will be required. Trees planted should include holly, southern magnolia, live oak, laurel oak, and cabbage palm. Understory plantings may include saw palmetto, wax myrtle, and gallberry.

(FIGURE 3.1-17)

(FIGURE 3.1-18)

3.1.4 Subwatershed 4: Upper Stevenson Creek

Upper Stevenson Creek encompasses the portion of the Creek targeted for conveyance improvements in Phase 3 of the 1988 W.K. Daugherty study. This phase was never constructed, primarily due to environmental concerns raised over the proposed improvement method of hardlining (paving) the channel with concrete. Because of this project history, hardlining this section of the creek was eliminated as an alternative without further study in the Stevenson Creek Watershed Management Plan. Instead, various alternatives are proposed to solve the flood control and erosion problems within Upper Stevenson Creek.

<u>Project 4A. Hillcrest Avenue Overflow Bypass Culvert.</u> In order to remove the 100-year flood risk from 47 homes adjacent to the Creek between Jeffords Street and Bellevue Boulevard, installation of 1,900’ of 7’ x 11’ box culvert from Browning Street to the upstream end of Linn Lake at the Evergreen Avenue footbridge is recommended. The culvert would be constructed primarily under the southbound lane of Hillcrest Avenue, and within the Jeffords Street right-of-way. Initially, alternatives were considered that would have involved channel widening or installing a box culvert in the existing channel with a swale over the top of the culvert. Both of these alternatives would have required the removal of the existing Sweetgum trees on the banks of the Creek, shown on Figure 3.1-19. Several residents spoke out at the public meetings opposing any plan that would require removal of the trees or otherwise permanently impact the nature of the existing Creek. In the recommended plan, however, the box culvert would be installed under the street, allowing the existing channel and sweetgum trees along Hillcrest Avenue to remain mostly undisturbed. This alternative received favorable comments at the second public meeting. Construction of high-flow diversion weir will allow low flows to remain within the existing channel. In addition to the bypass, the crossing of Stevenson Creek at Browning Street is proposed to be replaced with a 5’ x 12’ concrete box culvert.

Figure 3.1-19. Stevenson Creek Channel and Trees Along Hillcrest Avenue, Between Jeffords Street and Browning Street (to remain)

This project also includes replacement of a failing retaining wall upstream of Browning Street, and removal of excess vegetation from the Creek downstream of the Lakeview Road Bridge. As can be seen in Figure 3.1-20, the majority of the vegetation to be removed is nuisance vegetation such as primrose willow (*Ludwigia peruviana*), melaleuca (*Melaleuca quinquenervia*), and Brazilian pepper (*Schinus terebinthifolius*). The City of Clearwater spends many precious man-hours and a significant part of the annual budget removing these noxious species from their waterways. The conceptual layout of Project 4A is depicted in Figure 3.1-21.

Figure 3.1-20. Failing Retaining Wall Upstream of Browning Street, to be Replaced and Exotic Vegetation to be Removed

Project 4B. Upper Stevenson Creek Stabilization. Channel bank erosion is a major problem within Upper Stevenson Creek, in particular the section between Lakeview Road and Bellevue Boulevard, and to a lesser extent between Jeffords Street and Lakeview Road. As a partial remedy, various site-specific erosion repair measures could be implemented. These would consist of "spot" repairs of severely eroded areas using various methods such as gabion walls and geotextiles. These minor projects would target only those repairs necessary to protect public safety and private property from stream bank failures. However, this alternative would not stop the erosion from occurring, it would only repair the existing eroded areas. Additional repairs would have to be made periodically as problems occur. Another, more permanent alternative would be to re-shape the channel cross section and install erosion control measures along entire lengths of channel, in particular between Lakeview Road and Bellevue Boulevard. Examples of erosion control measures would be low retaining walls along the toe of the channel banks, constructed of gabion baskets or "geoweb"-type retaining walls. These walls would support a gradually sloping backfill that could support vegetation, as illustrated on Figure 3.1-22. The recommended cross section would also include a maintenance travelway to facilitate access to the creek by City maintenance crews. This alternative would create a temporary impact to the creek that would require removal of some of the existing trees and other vegetation. Many of the trees within the easement could be preserved, however, and those that are removed would be replanted with 12'-15' shade trees such as Live Oak.

The project could also incorporate low rock weirs that create shallow pools, providing habitat for small fish, turtles, and beneficial invertebrates. The weirs would have the additional benefit of slowing bed erosion and oxygenating the water as it riffles over the rocks. The weirs would be low enough as to not cause a restriction to flood flows.

Project 4C. St Thomas Drive / Bellevue Boulevard Creek Restoration. The most severe and frequent flooding in the subwatershed occurs along Evergreen Avenue between Bellevue Boulevard and St. Thomas Drive, where seven homes were found susceptible to the 10-year flood. The flooding problem at this location is due to a 54" CMP culvert placed within the Stevenson Creek Channel that lacks the capacity to convey even the mean annual storm event. As illustrated on Figure 3.1-23, the recommended alternative project for Stevenson Creek between St. Thomas Drive and Belleview Boulevard includes removal of 950 feet of 54" CMP, restoration of the historical, meandering stream channel, and replacement of the Rice Lake control structure.

The Rice Lake control structure is designed as a 20-foot wide fixed concrete weir crest at elevation 36.0' NGVD, with a 24" wide low-flow notch at elevation 35.0', attached to a proposed 58" x 91" elliptical RCP culvert under St. Thomas Drive. It is recommended that the proposed Rice Lake control structure include an operable sluice gate at elevation 30.0' NGVD that would allow the lake to be temporarily drained for periodic maintenance dredging with the City's Menzi-Muck excavator. The recommended maintained bottom elevation of Rice Lake is 30.0’ NGVD. The culvert under Bellevue Boulevard is proposed to be replaced with a 58” x 91” elliptical RCP as well.

The project will require purchase of ten (10) flood prone homes on Evergreen Avenue between Belleview Boulevard and St. Thomas Drive. Including the ten homes to be removed, the project will remove 19 structure FPLOS deficiencies adjacent to the Creek between Bellevue Boulevard and Belleair Road.

The creation of a meandering stream in this area will greatly enhance the aesthetics of the neighborhood and provide significant water quality benefits. The meanders will include natural rock riffles at intervals in the stream. The riffles will provide protection against erosion in strategic areas but will also perform water quality functions. These riffles will oxygenate the water and provide habitat for beneficial invertebrates on the rock surfaces and in the interstitial spaces. The stream will be planted with trees and understory species that will mimic a natural hardwood hammock. Tree species proposed include laurel oak, Virginia live oak, red maple, cabbage palm, and American elm. Understory species may include such native shrub species Virginia willow, saw palmetto, and fetterbush, while the ground cover will likely be ferns such as royal fern, cinnamon fern, and Virginia chain fern. The master list of plants and the recommended planting depths are provided in Table 3.1-3.

As an alternative to this project, the 54” CMP could be replaced with 950’ of double 8’ x 14’ box culvert within the existing easement. The culvert would safely convey and contain the 100-year discharge, alleviating the flooding and allowing all of the existing homes to remain for approximately the same capital cost, and substantially lower maintenance costs. However, this alternative would not create the secondary benefits associated with water quality, habitat, and aesthetics provided by the recommended alternative.

(FIGURE 3.1-21)

(FIGURE 3.1-22)

(FIGURE 3.1-23)

3.1.5 Subwatershed 5: Hammond Branch

Project 5A. Flagler Drive / CSX Railroad North Swale Improvements. As illustrated on Figure 3.1-24, this project includes construction of approximately 2,120 linear feet of minor ditch improvements along north side of the CSX Railroad from Linwood Drive and Sharondale Drive, west and southwest along the railroad, to Highland Avenue. The project will remedy the three FPLOS deficiencies identified on Linwood Drive near Sharondale Drive, on the north side of the CSX railroad that runs parallel to Flagler Drive. This problem area is the result of floodwaters from the Flagler Drive ditch backing up through twin 48" RCP culverts under the CSX railroad. The 48" culverts were intended to convey runoff from the subbasin to the north into the Flagler ditch. During flood events, however, the culverts flow in the opposite direction, directing floodwaters from the south side of the railroad, across the flood susceptible properties bordering Linwood Drive. The problem is exacerbated by the fact that the floor elevations of the homes are only 2-3 feet above the invert of the Flagler Drive Ditch.

The project alignment currently contains a poorly defined drainage swale. The proposed typical cross section has a 5-foot bottom width, and 3:1 (horizontal to vertical) side slopes on the side adjacent to the residential properties and 1:1 side slopes on the railroad side. The railroad side will need to be armored with riprap, and the project will require permission to perform work in railroad-owned Right-of-Way.

Downstream of the swale improvements, several upgrades to the Hammond Branch conveyance system will be required in order to remedy existing FPLOS deficiencies on Highland Avenue and Overlea Street, to replace a failed control structure between the two ponds between King's Highway and Highland Avenue, and to safely convey the additional discharge due to the swale improvements. The improvements include replacing the twin 48" culverts under King's Highway with a double 7' x 5' box culvert, replacement of both control structures on the two ponds between King's Highway and Highland Avenue, and replacement of the 38" x 60" ERCP culvert from the CSX railroad to the Highland Avenue pond with a combination of 10' x 6' box culvert and twin 60"

RCP's. In addition, construction of a 350'-long berm adjacent to the proposed swale would be required in order to divert drainage from a partially blocked ditch to Highland Avenue and into the proposed twin 60" RCP's (refer to Figure 3.1-24).

Project 5B. Palmetto Street Drainage Improvements. As illustrated on Figure 3.1-25, construction of approximately 1,900' of 54" RCP along Palmetto Street is recommended to divert treated stormwater from the Highland Avenue drainage system directly into Stevenson Creek. This project will provide flood relief for streets and homes in the area of the Hibiscus Street Pond, where a single structure FPLOS deficiency occurs on Hibiscus Street near King's Highway, when the storage capacity of the Hibiscus Pond is exceeded due to inflows from a 54" RCP culvert from the Highland Avenue drainage system. The existing outfall of Hibiscus Pond, consisting of a gunited 30" CMP, is not adequate to handle the inflows from the Highland Avenue culvert. A diversion weir near the outfall of the Highland Avenue detention pond will divert flood flows into the proposed 54" culvert. By installation of a small orifice, low flows could be allowed to continue to flow into the Hibiscus pond in order to promote flushing. The project will remedy a second structure FPLOS deficiency at the corner of Palmetto Street and King's Highway, and a collector road FPLOS deficiency at the same location. These FPLOS deficiencies technically lie within the Lower Stevenson Creek Subwatershed.

In order to provide additional water quality benefits, two existing small ponds on the Clearwater Country Club Golf Course near King's Highway and Palmetto Street could potentially be converted into an offline treatment system.

Project 5C. Saturn Avenue Drainage Improvements. This project includes the upsizing of 1,200' of existing 24" CMP and 14" x 23 arch CMP storm sewer along Saturn Avenue from Sherwood Street to Flagler Drive, in order to remedy street FPLOS deficiencies on Saturn Avenue at Sherwood Street and Leo Lane. The proposed pipe sizes are 36" RCP and 38" x 60" ERCP, as illustrated on Figure 3.1-26. The project could incorporate water quality features such as water quality inlets and/or CDS units.

Project 5D. Smallwood Circle Drainage Improvements. In the area of Smallwood Circle and Rosemere Road (southeast of Highland and Palmetto), homes were built in a depressional area surrounding a small city park, which floods frequently during moderate to heavy rains. As illustrated on Figure 3.1-27, the depression is drained by an undersized, failing 24" CMP culvert that runs under existing homes on Elmwood Street and Smallwood Circle. The recommended project is to abandon and fill the existing 24" CMP storm drain and construct approximately 1,000 feet of 24" x 38" and 36" storm sewer in a new alignment. The new alignment will tie into the Highland Avenue drainage system at Elmwood Street. Although the majority of the pipe will be constructed in public property or right-of-way, acquisition of drainage easements will be necessary along the rear lot lines of four properties on Smallwood Circle. The project will remove 100-year flood risk from two homes, and it will reduce the risk of house foundation failures due to the failing metal pipes. In addition, the project could incorporate water quality features such as water quality inlets and/or CDS units.

Project 5E. Lake Hobart Outfall Control Structure. The decrepit metal and wood outfall structure on this lake is proposed to be replaced with a new concrete structure, located on Figure 3.1-28. The new structure will be designed to increase hydraulic residence time of runoff from small storm events, which will increase the level of stormwater treatment this lake provides. This will be accomplished by incorporating a bleed-down notch at the existing control water elevation of approximately 63.7 feet, NGVD. In order to avoid increasing the flood elevations in the lake, a 6'-wide overflow weir will be constructed at elevation 64.5, allowing unrestricted discharge of flood flows. An oil and grease skimmers will be included to prevent discharge of these contaminants to the downstream system. In addition, homeowners around the lake could be encouraged to plant the shoreline with native aquatic species that will provide biological treatment and wildlife habitat. Figure 3.1-29 provides an example of the plants that can be used and the depths at which they should be planted.

(FIGURE 3.1-24)

(FIGURE 3.1-25)

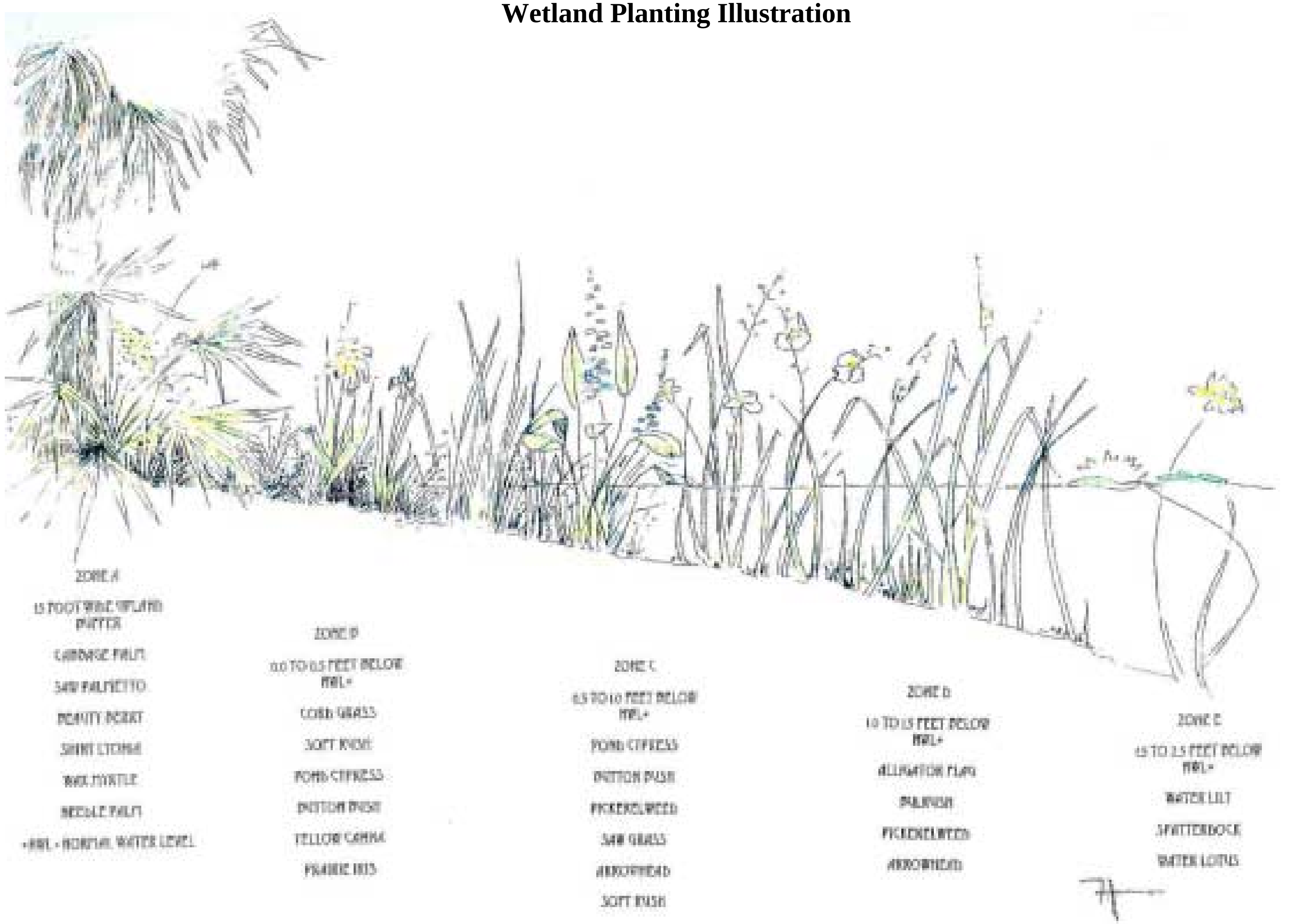
(FIGURE 3.1-26)

(FIGURE 3.1-27)

(FIGURE 3.1-28)

Figure 3.1-29

Wetland Planting Illustration



3.1.6 Subwatershed 6: Lake Bellevue Branch

Project 6A. Expansion of Lake Bellevue. In order to provide additional flood storage and littoral/wetland vegetation for water quality improvements, up to an eight-acre expansion of Lake Bellevue is proposed. The expansion would be accomplished by excavating the unutilized areas of Ed Wright Park and Ross Norton Park to provide additional lake area. The expansion is shown conceptually on Figure 3.1-30, however the actual limits of excavation must be coordinated with the City of Clearwater Parks and Recreation Department due to the plans for construction of a new recreation center in Ross Norton Park. A location for the recreation center has not been determined at the time of this writing.

This expansion would further increase the level of treatment provided by the lake and should improve overall lake water quality. Additional mass reductions of approximately 13,300 pounds of suspended solids and 550 pounds of nitrogen are expected on an annual average basis. These improvements will also enhance the ability of this lake to cope with current loadings and may reduce the frequency and severity of seasonal algal blooms that have been observed.

The project includes reconfiguration of Lake Bellevue outfall structure with addition of a bleed down notch and 30’ wide overflow weir to control the 100-year flood discharge. Control of the 100-year flood discharge would also require elevating the eastern 400’ of Dempsey Street approximately 12”, and construction of a low berm (1’-2’ high) through a portion of the park

The proposed expansion would remove an area of overgrown vegetation on the west side of the lake, as well as some areas on the east side. The vegetation on the west side of the lake includes some native trees such as laurel oak and live oak, as well as a number of exotic tree species such as ear tree (*Enterolobium contortisiliquum*) and Brazilian pepper. Several dead pine trees are also present on the site and the entire area is overgrown with wild grape. Native trees in good health could be preserved by creative grading, and some of the dense vegetation adjacent to the railroad tracks could be preserved as a buffer. The inflow could be redirected to meander through this area for treatment prior to discharging into the lake. The excavated areas will be planted with pickerelweed, soft rush, arrowhead, yellow canna, cordgrass, and other herbaceous plant species suitable for this shallow littoral habitat. Trees will be planted to replace those removed, and the species planted will include cypress, red maple, and pop ash at the lake shoreline, and laurel oak, live oak, and dahoon holly in the upland portions of the site.

On Wildwood Way, west of the CSX railroad, several structures were built in a low area southwest of the Lake. The drainage for this area is towards Lake Bellevue, but flows are restricted by undersized culverts beneath the CSX railroad tracks. As illustrated on Figure 3.1-31, addition of three (3) 36" culverts by jack-and-bore under the railroad tracks is proposed at this location. Replacement of the culverts within the CSX railroad ditch at Woodlawn Ave. and Howard Street are proposed in order to remedy street FPLOS deficiencies at those locations. Projects 6A.1 and 6A.2 combined will remove the 100-year flood risk from eight structures corresponding to a total of 17 dwelling units, and will remedy street FPLOS deficiencies on one collector road and three residential streets.

<u>Project 6B. Turner Street Box Culvert</u> This project is to alleviate structure FPLOS deficiencies in five businesses on Missouri Avenue immediately south of Turner Street, and on Missouri Avenue itself, which constitutes an arterial road FPLOS deficiency at this location. This flooding problem is due to the fact that upstream of Missouri Avenue, the Lake Bellevue Branch flows into a 54" diameter culvert which lacks the capacity to convey the discharge resulting from even a mean-annual storm event. As illustrated on Figure 3.1-32, the recommended project includes construction of a 25-foot wide concrete control weir on the existing pond west of Missouri Avenue and north of Druid. The weir would have a lower notch at elevation 17.5 and an overflow weir at elevation 18.5. A portion of the 54" culvert would be replaced by approximately 180 feet of 5' x 9' concrete box culvert from the weir to Missouri Avenue, and construction of 1,530' of 6' x 11' concrete box culvert along Turner Street from Missouri Avenue to Glen Oaks

stormwater detention facility. A portion of the existing 60" and 66" culvert that runs along the south lot lines of properties on the south side of Turner Street could remain in service, running parallel to the proposed box culvert. In addition to the structure FPLOS deficiencies, the project will remedy street FPLOS deficiencies on one arterial road, one collector road, and two residential streets.

(FIGURE 3.1-30)

(FIGURE 3.1-31)

(FIGURE 3.1-32)

3.1.7 Subwatershed 7: Jeffords Street Branch

Due to the severe flooding problems identified at the confluence of the Jeffords Street Branch and Stevenson Creek, improvements to the conveyance system of the Jeffords Street Branch that would increase flood elevations downstream were not considered. The projects in this subwatershed consist primarily of creation or expansion of lakes, ponds, and wetlands in order to temporarily detain the floodwaters and control their discharge at a rate more effectively conveyed by the existing downstream system. These projects will also reduce pollutant loadings to Stevenson Creek. Collectively these three projects are estimated to remove approximately 6,960 pounds of suspended solids and 390 pounds of nitrogen on an annual average basis.

Project 7A. Crest Lake Expansion. The primary objective of this project is to reduce 100-year flood elevations in downstream areas of Jeffords Street Branch, and to provide water quality treatment of currently untreated runoff from 43 acres of residential land use. This would be accomplished by diverting runoff from subbasins 4424 and 4426 (refer to Figures 2.1-1 and 3.1-33) into Crest Lake via a proposed 1,370' long 36" RCP culvert from the intersection of Duncan Avenue and Rainbow Drive, along Rainbow Drive to Crest Lake. The existing 24" storm sewer along Duncan Avenue between Rainbow Drive and Marion Street would be abandoned. In order to provide an acceptable design tailwater elevation for the proposed diversion pipe, an expansion of Crest Lake of approximately six acres will be required. The expansion is shown conceptually on Figure 3.1-33, however the exact limits of excavation will need to be coordinated with the City Parks Department. In order to preserve the relatively good water quality in Crest Lake, the lake expansion could be designed as a shallow littoral shelf that will enhance the assimilative capacity of the lake.

Creating the 6-acre littoral shelf will require creative grading and sensitive design to preserve as many of the trees as possible. Several upland tree islands may be preserved in the created wetland for wildlife habitat. However, the expansion of the lake will require the removal of numerous oaks, pines, and cabbage palms. These trees and other valuable plants will be replaced by installing new trees in all available upland areas. The littoral area will be planted with pickerelweed, arrowhead, soft rush, cord grass, alligator flag, bulrush, yellow canna, spatterdock, saw grass, and other beneficial aquatic species. Trees planted will include cypress, red maple, and pop ash at the lake shoreline, and laurel oak, live oak, and dahoon holly in the upland portions of the site.

The water quality improvements that will be realized by the creation of this wetland will be significant, and the wetland will be of sufficient size and quality to become breeding habitat for some wading birds, small mammals, and reptiles and amphibians.

The project is designed to work in tandem with Projects 7B and 7C to reduce FPLOS deficiencies within the Jeffords Street Branch Subwatershed.

Project 7B. Duncan Avenue/Turner Street Detention Pond. In the area bounded by Spencer Avenue, Turner Street, Duncan Avenue, and Druid Road, ten structure FPLOS deficiencies were identified, as described in Section 2.1.5.4. These structures were built in what was once a wetland, and they now flood on a very frequent basis, as seven are below the 10-year flood level and nine of the ten are below the 25-year flood level. The recommended solution to this problem is acquisition and removal of the ten flood-prone structures at this location and construction of a 2.5-acre wet pond, as shown on Figure 3.1-34. Since two of the structures have recently been purchased by the City, the project will require purchase of the remaining eight structures, two of which are on the same building lot and would likely be sold as a single property. The project includes construction of a control structure for the proposed pond that will control the normal water level at elevation 56.0 NGVD, and will tie into the existing 30” storm sewer along Duncan Avenue, south of Marion Street. The project will work in tandem with Projects 7A and 7C to reduce 100-year flood elevations in downstream areas of Jeffords Street Branch. In addition, the project will provide water quality treatment of currently untreated runoff from 27 acres of residential land use.

Project 7C. Jeffords Street/Barry Road Detention Pond. The primary component of this project is the construction of a 2.5-acre pond with wetland plantings east of Lake Avenue, incorporating 500 linear feet of the existing Jeffords/Barry ditch and requiring the purchase of nine (9) flood prone residential structures on south side of the existing ditch (refer to Figure 3.1-35). The pond will include construction of control structure with bleed down orifice near Lake Avenue, and new storm sewers to equalize the proposed pond with three existing lakes at the headwaters of the Jeffords Street Branch. The orifice at Lake Avenue will control the normal water level of the four equalized lakes at elevation 25.0 NGVD. A 30-foot wide overflow weir would be constructed at elevation 26.0 for flood control. The four lakes will be equalized by three segments of new storm sewer constructed below the proposed control water elevation, totaling approximately 930 feet in length, and ranging in size from 30” to 66”. These culverts will allow the elevations within the four lakes to fluctuate together, thus behaving as a single lake for flood control and stormwater treatment purposes.

If constructed as part of projects 7A and 7B, the project will remove 100-year flood risk from 28 out of 45 structures (34 of 51 dwelling units). In addition, the four equalized lakes will provide wet detention stormwater treatment for runoff from 362 acres. The bleed down orifices will create a longer residence time in the lake system compared to the downstream Glen Oaks pond (Project 3A), so that the two projects would work together as a cascading wet detention system. The proposed 2.5-acre pond will serve as the littoral zone for the interconnected system of lakes. Plants recommended for this area include pickerelweed, arrowhead, soft rush, cord grass, alligator flag, bulrush, yellow canna, spatterdock, saw grass, and other beneficial aquatic species. Trees may be planted on the perimeter of the pond to act as a buffer from the residential areas. Trees recommended for planting in this vicinity are laurel oak, live oak, and dahoon holly. The planting depth zones for these species are found in Table 3.1-3.

In order to resolve problems of bank erosion and nuisance vegetation, and to reduce annual maintenance costs, the remaining 600 feet of the Jeffords/Barry Street ditch west of Lake Avenue is proposed to be piped in with twin 60" HDPE storm sewer. This portion of the project will nearly eliminate the $45,000 per year in maintenance costs to maintain existing ditch, based on man-hour and equipment cost estimates provided by the City's Road and Drainage Division to periodically remove the nuisance vegetation. If a project life span of 50 years is assumed with an annual interest rate of 7.0%, the present value of the savings in maintenance costs would be over $620,000 per year. Mitigation for this project would be provided in the proposed 2.5-acre pond on the east side of Lake Avenue.

(FIGURE 3.1-33)

(FIGURE 3.1-34)

(FIGURE 3.1-35)

- Figure 3.1-37 Stevenson Creek Flood Profile, Project Conditions
- Figure 3.1-38 Stevenson Creek Flood Profile, Project Conditions
- Figure 3.1-39 Stevenson Creek Flood Profile, Project Conditions
- Figure 3.1-40 Stevenson Creek Flood Profile, Project Conditions
- Figure 3.1-41 Stevenson Creek Flood Profile, Project Conditions
- Figure 3.1-42 Stevenson Creek Flood Profile, Project Conditions
- Figure 3.1-43 Spring Branch Flood Profile, Project Conditions
- Figure 3.1-44 Spring Branch Flood Profile, Project Conditions

Table 3.1-2 Alternative Projects-Water Quality Improvement Benefits

Project Name	BMP Type	Percent of Ideal Coverage	Tributary Area (ac)	Pollutant Loading Present (lb/year)						Pollutant Loading Removed (lb/year)					
				Pb	Zn	BOD5	TSS	TP	TN	Pb	Zn	BOD5	TSS	TP	TN
Project 1A.1 Spring Branch Conveyance Enhancements Lower Portion	Channel Improvements	10.7%	1,687	25.4	257	69,500	109,798	2,327	8,033	0.54	4.1	742	2,343	37.2	85.7
Project 1A.2 Spring Branch Conveyance Enhancements Upper Portion	Water Quality Inlets	100.0%	28.6	0.66	7.3	2,684	3,448	81	284	0.10	0.37	134	1,207	8.1	-
Project 1C. Spring Branch Flood Detention Basin	Wet Detention (1-inch)	11.7%	1,772	26.3	263	71,652	113,598	2,380	8,248	2.3	18.4	4,184	9,951	167	289
Project 1D. Woodland Terrace Storm Sewer Replacement.															
Water Quality Improvement Option 1	Water Quality Inlets	100.0%	42.1	0.15	1.48	1,232	1,012	27	132	0.02	0.07	62	354	2.7	-
Water Quality Improvement Option 2	CDS Unit	100.0%	42.1	0.15	1.48	1,232	1,012	27	132	0.07	0.52	370	506	6.8	-
Project 1E. Byram Pond Dredging and Expansion	Sediment Sump	2.7%	1,668	25.0	253	68,740	107,940	2,292	7,947	0.47	3.8	185	2,038	15.4	-
Project 1G. Clearview Lake.	Wet Detention (1-inch)	100.0%	52.6	0.24	1.8	1,732	1,581	35.8	213	0.18	1.06	866	1,186	21.5	63.8
Project 2A. Palmetto Street Sediment Sump.	Sediment Sump	0.4%	2,630	33.5	280	114,310	169,790	2,915	12,400	0.10	0.68	50	523	3.2	-
Project 2B. North Missouri Ave and Palmetto St Drainage Improvements	CDS Unit	100.0%	44	0.86	8.2	1,903	4,631	49	189	0.43	2.9	571	2,316	12.2	-
Project 2C. Installation of Additional CDS Units															
Project 2C.1. Douglas Avenue BMP	CDS Unit	100.0%	86.5	0.60	4.0	3,653	3,317	77	411	0.30	1.39	1,096	1,659	19.3	-
Project 2C.2. Martin Luther King Avenue BMP	CDS Unit	100.0%	142	2.1	19.6	7,097	12,354	210	739	1.07	6.9	2,129	6,177	52.6	-
Project 2C.3. Holt Avenue BMP	CDS Unit	100.0%	39.8	0.56	4.8	1,398	3,389	43	161	0.28	1.70	419	1,695	10.8	-
Project 2C.4. Pennsylvania CDS Unit	CDS Unit	100.0%	10.1	0.06	0.55	429	511	9.6	44	0.03	0.19	129	256	2.4	-
Project 2D. Overbrook Avenue Detention Pond.	Wet Detention (1-inch)	82.2%	76.7	2.1	11.3	3,562	5,398	73	331	1.29	5.6	1,463	3,326	35.9	81.6
Project 3A. Glen Oaks Stormwater Detention Facility															
Project 3A.1 Wet Detention Facility	Wet Detention (1-inch)	11.0%	2,133	22.8	204	89,610	123,370	2,264	9,874	1.87	13.4	4,916	10,152	149	325
Project 3A.2 Percolation Pond	Percolation	100.0%	50.4	1.00	6.2	2,539	3,941	55	245	0.80	4.9	2,031	3,152	44	196
Project 3A.1 Wet Detention Facility with Group (2)	Wet Detention (1-inch)	19.4%	1,193	17.6	156	59,370	91,620	1,625	6,198	2.6	18.2	5,768	13,350	189	361
Project 4C. St Thomas Drive / Bellevue Boulevard Creek Restoration.	Channel Improvements	21.1%	297	1.63	14.5	12,094	13,014	253	1,253	0.07	0.46	255	549	8.0	26.5
Project 5C. Saturn Avenue Drainage Improvements.															
Water Quality Improvement Option 1	Water Quality Inlets	100.0%	18.3	0.16	1.3	843	1,153	18.1	82.6	0.02	0.06	42.2	404	1.8	-
Water Quality Improvement Option 2	CDS Unit	100.0%	18.3	0.16	1.3	843	1,153	18.1	82.6	0.08	0.45	253	576	4.5	-
Project 5D. Smallwood Circle Drainage Improvements.															
Water Quality Improvement Option 1	Water Quality Inlets	100.0%	25.4	0.07	0.70	937	683	17.2	94.2	0.01	0.04	46.9	239	1.7	-
Water Quality Improvement Option 2	CDS Unit	100.0%	25.4	0.07	0.70	937	683	17.2	94.2	0.04	0.25	281	341	4.3	-
Project 5E. Lake Hobart Outfall Control Structure.	Wet Detention (1-inch)	100.0%	63.8	0.25	1.5	1,763	1,108	35.4	256	0.19	0.90	882	831	21	77
Project 6A. Expansion of Lake Bellevue	Wet Detention (1-inch)	100.0%	439	3.1	30.0	14,167	17,740	324	1,845	2.3	18	7,084	13,300	195	553
Project 6B. Turner Street Box Culvert	Wet Detention (1-inch)	6.8%	605	7.3	71.3	24,478	39,580	690	2,974	0.37	2.9	837	2,030	28	61
Project 7A. Crest Lake Expansion.	Wet Detention (2-inch)	100.0%	102	0.28	2.3	2,412	1,969	48.4	339	0.25	1.86	1,447	1,772	36	153
Project 7B. Duncan Avenue/Turner Street Detention Pond.	Wet Detention (1-inch)	100.0%	26.6	0.25	2.1	1,216	1,843	27.1	122	0.19	1.24	608	1,382	16	36.5
Project 7C. Jeffords Street/Barry Road Detention Pond.	Wet Detention (1-inch)	49.8%	362	1.50	13.3	12,439	10,200	239	1,371	0.56	4.0	3,096	3,810	72	205

Table 3.1-3 Vegetation Recommended for Planting in Varying Water Depths

COMMON NAME	BOTANICAL NAME	PLANTING ELEVATION (IN FEET TO NWL)				
		<0.0	0.0 to -0.5	-0.5 to -1.0	-1.0 to -2.5	> -2.5
TREES						
Red maple	*Acer rubrum*	X	X			
Black mangrove**	*Avicennia germinans*			X		
Water hickory	*Carya aquatica*		X			
Pop ash	*Fraxinus caroliniana*			X		
Dahoon holly	*Ilex cassine*	X	X			
Eastern red cedar	*Juniperus silicicola*	X				
Sweet gum	*Liquidambar styraciflua*	X				
Southern magnolia	*Magnolia grandiflora*	X				
Laurel oak	*Quercus laurifolia*	X				
Live oak	*Quercus virginiana*	X				
Red mangrove**	*Rhizophora mangle*			X		
Cypress*	*Taxodium* spp.		X	X		
American elm	*Ulmus americana*	X	X			
SHRUBS						
Beauty berry	*Callicarpa americana*	X				
Button bush	*Cephalanthus occidentalis*		X	X		
Gallberry	*Ilex glabra*	X				
Virginia willow	*Itea virginica*		X	X		
Wax myrtle	*Myrica cerifera*	X				
Saw palmetto	*Serenoa repens*	X				
FORBS						
Leather fern*	*Acrostichum aureum*		X			
Swamp fern	*Blechnum serrulatum*		X			
Yellow canna	*Canna flaccida*		X	X		
Saw grass*	*Cladium jamaicense*		X	X		
String lily	*Crinum americanum*		X			
Prairie iris	*Iris hexagona*		X			
Soft rush	*Juncus effusus*		X	X		
Black rush*	*Juncus roemerianus*		X			
Spatterdock	*Nuphar lutea*				X	X
Water lily	*Nymphaea odorata*				X	X
Pickerelweed	*Pontederia cordata*		X	X	X	
Arrowhead	*Sagittaria lancifolia*			X	X	
Bulrush*	*Scirpus validus*			X	X	X
Alligator flag	*Thalia geniculata*			X	X	
Virginia chain fern	*Woodwardia virginica*		X			
Florida coontie	*Zamia pumila*	X				

*   Indicates tolerance of brackish water.
** Indicates tolerance of salt water.

3.2 HUMAN-SOURCED FECAL CONTAMINATION STUDY

The sampling and subsequent analysis of fecal coliforms (refer to Section 2.3.3.6) that was conducted last year (July 2000 – December 2000) confirmed that fecal coliforms from human sources are present in the watershed. While human input does not appear to be the dominant source of fecal coliform in the watershed, the levels of human-sourced fecal contamination measured during this study (refer to Appenxix J) are cause for concern. Human feces are considered particularly dangerous because of the human-specific viruses transmitted exclusively by human sources. This significant finding underscores the need for accurate information concerning the sources of fecal contamination within the watershed.

Further study is needed to better define the origins, magnitude, and spatial extent of fecal contamination from human sources in the Stevenson Creek Watershed. This study will provide information needed to plan and prioritize improvements directed at reducing fecal contamination within the watershed.

3.2.1 Purpose of Further Study

While circumstantial evidence implicates improperly functioning onsite wastewater treatment and disposal systems (OSTDS) in contamination of the Stevenson Creek Watershed, direct evidence is not available. The possible contribution of illicit sewage connections, sewage overflows, and the sub-drain system underlying the streets may also be contributing to the bacterial loading, and while there is a high likelihood that the source is OSTDS, information is not available concerning which OSTDS areas are contributing to the problem.

3.2.2 Plan of Study

Some of these issues can be addressed through further study, and a four-step approach is recommended. First, better information regarding the locations and other basic attributes of existing OSTDS and the sanitary sewer system is needed (Step 1). Secondly, additional sampling and field investigations are needed to direct attention to areas that are problematic with respect to fecal contamination (Step 2). Next, focused microbiological sampling can provide direct proof that OSTDS are contributing to water quality impairments (Step 3). Finally, the results of Steps 1 – 3 can be used to reach conclusions concerning the origins, magnitude, and extent of human-sourced fecal contamination within the Stevenson Creek Watershed as well as to provide information needed to plan improvements.

These four steps (Existing Data Compilation and Review, Data Collection and Conventional Sampling, Focused Microbiological Sampling, and Data Evaluation) are more specifically described below.

Existing Data Compilation and Review (Step 1)

Existing information concerning the OSTDS and sanitary sewer system should be compiled. In regards to OSTDS, this information should include locations, approximate age, general topography, soil type, and material type, as appropriate. In regards to the sanitary sewer system, this information should include interviews with city staff, results from smoke tests, video logs, rainfall, and flow monitoring as well as population and overall plant flow and capacity data. These sewer system data can be used to provide evaluations concerning the overall soundness of the sanitary sewer system as well as the feasibility of connecting OSTDS areas to the central sewer system.

One of the main purposes of the sanitary sewer evaluation is to assess the likelihood of sewage releases to the environment through overflows, cross-connections, or pipe structural problems. Loose pipe joints and cracks would not be expected to cause measurable exfiltration due to high groundwater; however, the possibility of capacity problems due to wet weather inflows should be investigated, as should the possibility of significant cracks or cross-connections with the storm sewer system.

The locations of septic tanks is generally not available (refer to Section 2.3.1.2) but can likely be inferred by cross-referencing sewer service bills and property tax data or other city and county databases. Approximate age can be estimated based on the age of the dwelling or structure, and recent repair permits. The septic tank points can be intersected with available soil data to assign soil type and seasonal high water elevation.

These OSTDS and sewer system characteristics will be used to plan the sampling program and to seek relationships between these characteristics and fecal contamination. The Healthy Beaches Tampa Bay study, an extensive, multi-agency study of Pinellas and Hillsborough County waters, can also be used to identify other areas of interest for the study if desired.

Data Collection and Conventional Sampling (Step 2).

The data from Step 1 can be used to develop a field investigation and sampling program designed to "zero-in" on problem areas. Field investigations can be used to collect evidence of illicit sewage connections to the storm sewer system and other problems (i.e. soggy drainfields, etc.). Water quality samples would be collected in channels and storm sewer pipes. The recommended sampling program would consist of a large number of samples from a minimum of two events. The large number of samples is for purposes of better and more refined delineation of problem areas. The sampling frequency will be selected based on costs with a minimum of one sample representative of dry conditions and one sample representative of wet conditions. Stormwater runoff samples are desirable, but introduce cost and logistic problems that should be carefully considered before they are included in this study. All samples will be analyzed for fecal coliforms; in addition, limited bacterial source tracking using antibiotic resistance analysis may be employed.

The sampling program will draw attention to problem areas, and together with the information collected in Step 1, will be used to design a microbiological sampling program that is focused on identifying areas where OSTDS usage is problematic.

Focused Microbiological Sampling (Step 3)

A detailed microbiological study should be undertaken that explores the prevalence of human pathogens (enteric viruses) and *E. coli* from human sources at various Stevenson Creek sites. Antibiotic resistance analysis for the source of fecal bacteria will indicate whether the contamination is dominated by human or animal sources. "Tracer" studies, in which a specific bacteriophage (bacterial virus) that cannot infect humans is flushed down the toilets of volunteer homes, can provide evidence of the rate of viral transport from OSTDS to surface water. Bacteriophage studies are superior to dye tracer studies because the bacteriophage particles are similar in size and soil adsorption properties to human viruses, therefore their transport rate is a better approximation for that of viral pathogens than dye particles, which often predict an overly rapid transport rate. Piezometer wells can be used to trace the direction and magnitude of a contamination plume.

If sufficient funds are available, a countywide study could be conducted in which the experiments mentioned above are conducted in OSTDS drainfields situated in various types of soil with different separation distances from the water table, and of various ages. Because they are time-consuming and require a great deal of expertise, such studies are rarely conducted and would contribute a great deal to our understanding of the processes governing transport of human pathogens from OSTDS drainfields.

Data Evaluation (Step 4)

The data collected in Steps 1 – 3 will be used to develop and prioritize improvement plans. In addition, correlations and other relationships will be sought so that the results of this study may provide useful information to other areas of Pinellas County that experience fecal contamination problems.

3.2.3 Dissemination of Results to End Users

A multi-county task force should be formed with representatives from entities such as city public works, the Pinellas County Department of Health, the University of South Florida, the Southwest Florida Water Management District, Tampa Bay Water, and the Florida Department of Environmental Protection. The purpose of the task force would be to foster communication and facilitate problem solving on water quality issues and studies. The synergistic potential of such a group could serve as a model for similar groups across the state and the nation.

3.3 RECOMMENDED WATERSHED MAINTENANCE PLAN

Comprehensive, regular maintenance of stormwater management systems is essential to ensure the systems, once constructed, continue to function within their original design parameters for many years. Maintenance is also often required for aesthetics and safety reasons. This section outlines recommended maintenance practices and schedules for the Stevenson Creek Watershed.

Open Channels. Excessive vegetation and sediment accumulation can create new flooding problems, and worsen those problems which already exist. In some instances, excessive exotic invasive vegetation and sedimentation can inhibit the growth of beneficial flora and fauna. Excessive vegetation in open channels, particularly exotic or invasive species and plants with stiff, woody stems, can greatly increase the resistance to flow, thereby reducing the capacity of the channel to convey floodwaters and ultimately resulting in higher flood levels. Excessive sediment accumulation reduces the cross sectional area and hydraulic radius of the channel, creating a similar effect. In addition, sedimentation within concrete-lined channels can allow the growth of nuisance vegetation where none was assumed to exist in the roughness coefficients used original design calculations; as has occurred within the channel segment between Court Street and Pierce Street.

Proposed Watershed Management Plan Projects 1A, 1E, 1F, 2A, 4B, and 4C are improvements to the main channels that incorporate features that will allow improved access for maintenance, including approximately 4,000 linear feet of new maintenance access roads adjacent to Stevenson Creek and Spring Branch. These maintenance access ways typically consist of earthen roads that will facilitate equipment access for slope mowers, small dump trucks, and excavators. The width of the proposed access ways varies from 12’ to 25’ depending on the nature of the anticipated maintenance activities, whether access will be from one side or both sides of the drainage course, and the availability of land.

The recommended maintenance practice for open channels is mowing, and if necessary, hand removal of invasive vegetation. Spraying of herbicide should be used only in rare cases where lack of access and/or manpower prohibits the alternative methods. Any herbicide spraying should be conducted in compliance with the City of Clearwater National Pollutant Discharge Elimination System (NPDES) permit, which requires the implementation of a spray reduction program. The recommended maintenance type and frequency for each major open channel segment within the Stevenson Creek Watershed is presented Table 3.3-1.

Table 3.3-1 Recommended Channel Maintenance Plan

Channel Segment	**Applicable Improvement Project**	**Recommended Maintenance Type(s)**	**Recommended Frequency**
Stevenson Creek			
Stevenson Creek - US Alt. 19 to Douglas Avenue	Stevenson Creek Estuary Restoration Plan (U.S.A.C.O.E.)	Periodic removal of exotic and invasive plant species	Once every 2-5 years, or as needed
Douglas Avenue to Betty Lane	N/A	Periodic removal of exotic and invasive plant species	Once every 2-5 years, or as needed
Betty Lane to Proposed Sediment Sump Control Weir	Stevenson Creek Phase 1 (W.K. Daugherty Plans)	Initial dredging of accumulated sediment, periodic removal of exotic and invasive plant species	Once every 2-5 years, or as needed
Palmetto Street Sediment Sump	WMP Project 2A	Dredging	Annually
Palmetto Street to Drew Street	N/A	Periodic removal of exotic and invasive plant species	Once Every 2 years, or as needed
Drew Street to Pierce Street	Stevenson Creek Phase 1 (W.K. Daugherty Plans)	Periodic removal of accumulated sediment	Once every 5 years, or as needed
Pierce Street to Court Street	Stevenson Creek Phase 2 (CDM Plans)	Mowing	Semi-annually

Table 3.3-1 (Continued) Recommended Channel Maintenance Plan

Channel Segment	Applicable Improvement Project	Recommended Maintenance Type(s)	Recommended Frequency
Court Street to Druid Road	WMP Project 3A (Glen Oaks)	Mowing of embankment slopes and grassed areas	Monthly during the growing season
		Initial monitoring and maintenance of created wetland areas	Quarterly for the first year, Semi-annually thereafter, until beneficial vegetation is well established
Druid Road to Jeffords Street	Stevenson Creek Phase 2 (CDM Plans)	Repair vandalism damage to gabion walls	As needed
		Dredge sediment from Jeffords Street sediment sump	Semi-annually, or as needed
Jeffords Street to Lakeview Road	WMP Project 4A	Mowing	Semi-annually
Lakeview Road to Bellevue Boulevard	WMP Project 4B	Mowing	Semi-annually
		Removal of sediment from behind rock weirs	Annually, or as needed
Bellevue Boulevard to St. Thomas Drive	WMP Project 4C	Mowing of embankment slopes and grassed areas	Monthly during the growing season until tree canopy is established, semi-annually thereafter
		Removal of sediment from upstream of proposed Bellevue Blvd control weir	Annually, or as needed
St. Thomas Drive to Belleair Boulevard	N/A	None	N/A
Belleair Boulevard to South Ridge	N/A	Mowing	Semi-annually

Table 3.3-1 (Continued) Recommended Channel Maintenance Plan

Channel Segment	Applicable Improvement Project	Recommended Maintenance Type(s)	Recommended Frequency
Spring Branch			
Stevenson Creek to Douglas Avenue	N/A	Periodic removal of exotic and invasive plant species	Once every 2-5 years, or as needed
Douglas Avenue to Sunset Point Church	N/A	Jurisdiction of Pinellas County	N/A
Sunset Point Church to King's Highway	WMP Project 1A.1	Mowing	Semi-annually
Byram Pond	WMP Project 1E	Dredging	Annually
Byram Pond to Union Street	WMP Project 1F	Mowing	Semi-annually
Hammond Branch			
Stevenson Creek to King's Highway	N/A	Periodic removal of exotic and invasive plant species	Once every 2-5 years, or as needed
Flagler Drive Ditch, Highland Avenue to Keene Road	N/A	Mowing	Semi-annually
CSX Railroad north swale, Highland Ave. to Sharondale Drive	WMP Project 5A	Mowing	Semi-annually
Jeffords Street Branch			
600' west of Lake Ave to Lake Avenue.	WMP Project 7C	Mowing	Semi-annually
Proposed Pond at Barry Road and Tuscola	WMP Project 7C	Mowing of embankment slopes and grassed areas	Semi-annually
		Initial monitoring and maintenance of created wetland areas	Quarterly for the first year, Semi-annually thereafter, until beneficial vegetation is well established

In addition to the main channel segments listed in the above table, maintenance of the CSX railroad ditch that runs parallel to Maple Street, from Betty Lane to North

Greenwood Avenue is recommended. The City currently owns a narrow tract of land adjacent to the south side of the ditch that could be used for maintenance access. Regular maintenance of this ditch would alleviate a structure FPLOS deficiency at 512 Washington Avenue.

Created Wetlands and Littoral Shelves. Proposed Projects 1C, 2D, 3A, 6A, 7A, 7B, and 7C are improvements that incorporate created wetland and/or littoral shelf areas. Monitoring and maintenance of created wetland areas is recommended to ensure the success of the wetland plantings. Maintenance should be conducted quarterly for the first year, and semi-annually thereafter, until beneficial vegetation is well established.

Inlets and Control Structures. Curb and ditch-bottom inlets should be inspected at least annually for blockages due to vegetation, sediment, trash, etc, and for structural integrity and safety. Cleaning of existing and proposed catch basins, or water quality inlets, and CDS units should be conducted based on an established schedule. The City of Clearwater currently has two (2) vacuum trucks for this purpose, and is in the process of purchasing a third one. Periodic inspection of all existing and new water level control structures for structural integrity, safety, accumulated sediment, vegetation, and blockages should be conducted by qualified engineering staff. Vegetation and accumulated sediment should be removed as needed from around water level control structures to ensure their proper functioning.

Culverts and Storm Sewers. The Stevenson Creek Watershed contains many existing culverts and storm sewers that are several decades old. Most of these culverts are still in serviceable condition and do not require regular maintenance. Those that were identified to be in an obvious state of deterioration are recommended for replacement in one of the 28 recommended projects described in Section 3.1. However, all infrastructure is continually deteriorating, and culverts, storm sewers, and inlets should be inspected periodically (approximately every 3 to 5 years) to identify those in need of replacement. When culverts and storm sewers are identified for replacement, the design should be evaluated to determine the appropriate size for the culvert to meet current design criteria for flood protection level of service.

Golf Course Best Management Practices. There are currently three golf courses within the Stevenson Creek Watershed. The two largest courses include the Clearwater Country Club Course and the Clearwater Executive Course. The third course is the Glen Oaks Golf Club, a small course that under this plan is proposed to be converted into a stormwater detention facility. Golf courses are some of the most highly maintained developed areas in the state. The expanses of turf grass, manicured landscaping, and sparkling blue water traps lead some people to think that because these areas are not paved, that they are beneficial to the environment. What most people don't realize is that a considerable amount of physical and chemical manipulation of the natural environment must be undertaken to create this illusion of perfection. The physical alterations include site grading and changing historic drainage patterns, removing native vegetation, and planting exotic, typically high-maintenance vegetation. The chemical manipulations include applications of:

- Fertilizers to help the exotic vegetation survive in the foreign environment,
- Insecticides to protect the exotic vegetation against predators for which they have no natural defense,
- Herbicides to reduce competition from other exotic species, and
- Fungicides to counteract the effects of the excessive amounts of water the exotic turf grasses require.

When these chemicals are used, the excess typically is found in surface and ground water, where they can be extremely detrimental to the environment. The effects of pesticides and fertilizers on surface and groundwater quality should motivate golf course operators to opt for application methodologies and the selection of substances with the least potential to cause water quality problems.

A comprehensive program of best management practices specifically for golf courses was developed by the University of Florida Institute of Food and Agriculture Sciences (IFAS). This program discusses ways to reduce or eliminate the need for fertilizers and pesticides, and recommends more environmentally friendly substances to use when needed. Some of the recommendations include:

- Use native plants in the landscape. Native plants have adapted to the environment and require less water to survive. They also have natural defenses against many predators, which will reduce the need for pesticides. Native plants will also provide habitat for wildlife.
- There are turf grasses that have been developed for use on golf courses that are hardier and require less water and fertilizer. The Pinellas County Agricultural Extension Office has information on these newly developed grasses.
- Before using a pesticide, identify the target pest. This is essential for the selection of the proper pesticide to be used. Once the pest is identified, check with the IFAS to determine the recommended pesticides for that species. These recommendations will consider soil properties such as runoff potential, leaching potential, and the relative toxicity of the pesticide.
- The application methodology is an important factor to consider when using pesticides and fertilizers. Applications directly on the soil or incorporated into the soil will likely make more product available for leaching or runoff loss. Applications to foliage may lose some product to evaporation, absorption into the foliage, or decomposition in sunlight and thereby would reduce the amount available for wash-off and transport to water bodies.
- Create littoral shelves within the water traps and plant them with emergent aquatic vegetation. The vegetation will improve water quality and reduce the occurrence of algal blooms. Fewer chemicals will be needed to keep the water features clear.
- Use organic pesticides and fertilizers when possible. Many products have been developed especially for use on golf courses and have been tested successfully by the IFAS. Information on these products is available from the county extension service.

3.4 PUBLIC AWARENESS AND INVOLVEMENT PROGRAMS

An essential component of any restoration plan is a focused and integrated public education and involvement program. Many agencies, both public and private, have information for the homeowner regarding practices that can be implemented at the individual home level for the benefit of the local environment. Most residents, when educated regarding their immediate environment and their potential impact upon it, become more interested in acting more responsibly.

3.4.1 Adopt-a-Creek Program for Stevenson Creek

One of the most successful methods of encouraging public involvement/awareness in the Tampa Bay area is to establish a citizen's group that "adopts" a piece of property or natural feature. Adopt-a-Pond, Adopt-a-Highway, and Adopt-a-Shoreline are examples of such programs in which a group of citizens accepts the responsibility of maintaining a section of the property on a regular basis. The Adopt-a-Pond program in Hillsborough County has been very successful in the past years, and a similar program for Stevenson Creek could be implemented. The program would encourage residents along the creek to take interest in keeping the creek clean and to help prevent water quality problems.

No regularly scheduled program of adoption and maintenance is currently offered for Stevenson Creek, despite the obvious interest and concern of the local residents. It is recommended that a program of this nature be implemented within the watershed, to accomplish the maintenance and enhancement as needed. The greatest benefit to the watershed would be the regular removal of trash and exotic vegetation within and adjacent to the creek. The creek can be segmented and the responsibilities distributed among the various civic groups and homeowner associations. A group leader will be trained in plant identification and the proper methods of eradication. Pam Leasure with the Pinellas County Department of Environmental Resources (telephone: 727-464-4793) can be contacted if there is an interest in implementing an Adopt-a-Creek program for the Stevenson Creek Watershed.

3.4.2 Proper Use of Pesticides and Fertilizers

3.4.2.1 Pesticide Use

Pesticides are applied to control a pest species, usually by reducing the population to an acceptable level. This objective can sometimes be achieved without damage to non-target species. However, when pesticides are broadcast sprayed over lawns and fields, a variety of onsite non-target organisms is impacted. In addition, much of the sprayed pesticide invariably drifts away from the intended site and deposits in non-target organisms and ecosystems. Many pesticides are not thoroughly tested prior to distribution and long term effects are not determined until too late. The pesticide DDT is a well-known example. Although the use of DDT was banned in the United States over twenty-five years ago, there are several sites within Tampa Bay where sediment concentrations exceed the No Observable Effects Level (NOEL) (TBNEP 1996).

A preferable alternative to pesticide use is integrated pest management (IPM). Within the context of IPM, acceptable pest control is achieved by employing an array of complementary approaches. The can include:

- use of natural predators, parasites, and other biological controls
- Use of pest resistant varieties of turf grass and landscape plants. Native plant species are frequently more resistant to pests and pathogens than non-native species.
- Modification of environmental conditions so as to reduce the optimality of the pest habitat. This would entail not planting monocultures of specific plants.
- Careful monitoring of pest abundance, and using pest-specific, less toxic pesticides such as *Bacillus thuringensis.*
- Use of pesticides only when they are required as a specific component of the IPM.

Information regarding insect pests, the proper use of pesticides and IPM is available at the Pinellas County Cooperative Extension Service or visit the web site at http://gnv.ifas.ufl.edu/~FAIRSWEB/IPM/IPMFL/IPMFL.HTM.

3.4.2.2 Fertilizers

Most homeowners use too much fertilizer in their landscapes. Over-fertilizing actually encourages the growth and proliferation of certain insects and diseases and increases maintenance needs. When choosing fertilizers, homeowners should request products that contain nutrients in water-insoluble or controlled-release form. These fertilizers dissolve slowly into the soil, reducing amount of nutrients lost in stormwater runoff. The PCCES has free information regarding the most environmentally friendly fertilizers to purchase, and how they should be applied. This information can be obtained at the extension office or at the web site listed above.

3.4.3 "Green" Thumb Landscaping Practices

The University of Florida Cooperative Extension Service, in partnership with the Tampa Bay National Estuary Program, the Florida Sea Grant College Program and numerous other environmental agencies, has prepared a Landscaping Guide for the Florida Yards and Neighborhoods Program. This informative guide describes the benefits of using native plants in the landscape and how to recreate the habitat that was lost when development occurred. The guide explains such practices as composting, mulching, fertilizing, and watering, and how these common practices can be undertaken without comprising the environment. The program also touches on such issues as maintaining waterfront property in a non-invasive manner, how to maintain a septic system, and how to attract wildlife to your backyard. This information is free from the PCCES or visit the web site at http://coop.co.pinellas.fl.us/.

A valuable source of information for creating an environmental landscape is the National Wildlife Federation (NWF). This organization has prepared a program that educates homeowners in the benefits of landscaping to attract wildlife and provides the basic information needed to develop wildlife habitat in a residential setting. This program is called the Backyard Habitat program, and participating residents can have their houses certified as habitat by the NWF. This and other useful topics are discussed on their web site at http://www.nwf.org/.

Another successful program is the *Naturescape* Urban Wildlife Enhancement Program, developed by the Pinellas County Department of Environmental Management (PCDEM). The booklet was produced for the residents within the Allen's Creek watershed, but the principles are applicable to all watersheds in central Florida. The booklet provides ideas on how to reduce water loss when irrigating the landscape, how to use less pesticides and fertilizers, how to create wildlife habitat, and what plants to put in the landscape, as well as what plants to avoid. This booklet is free and can be obtained from the PCDEM.

The Southwest Florida Water Management District has produced a significant amount of information on Xeriscaping. This method of landscaping reduces the amount of water that is needed by planting native and non-native plants that require little water, reducing the square-footage of water-dependent turf-grass, and by planting species that do require water in zones that can be irrigated more efficiently. Other aspects of Xeriscaping include the use of mulch to reduce moisture loss from the soil, and the use of mulch made from exotic species such as melaleuca and eucalyptus or from recycled wood products. Information can be obtained from SWFWMD free or for a nominal fee. The SWFWMD Tampa Field Office can be contacted at (813)-985-7481 or on the world wide web at http://www.swfwmd.state.fl.us/watercon/xeris/swfxeris.html. Information about native plants can be obtained at the Florida Native Plant Society web site at http://www.fnps.org/index.html. Additional information regarding xeriscaping can be obtained from the PCCES on their web site at http://coop.co.pinellas.fl.us/Toughcom.htm.

3.4.4 Florida Yards and Neighborhoods Program

The Pinellas County branch of the Florida Yards and Neighborhoods Program was developed by the National Estuary Program and is managed by the Pinellas County Cooperative Extension Service. This program utilizes the educational elements by helping neighborhoods work together to treat area-specific problems such as nutrient- and chemical-rich stormwater runoff, yard waste disposal, misuse of chemical biocides, and improper shoreline maintenance.

The first step in participation with this program is a preliminary meeting with FYNP staff and homeowners associations requesting participation in the program. Each of the homeowners is given a detailed questionnaire to determine their specific yard maintenance activities. If a neighborhood meets the requirements for investigation by the FYNP, a team of environmental specialists performs inspections, targeting problems associated with landscape practices and stormwater runoff. Results of these inspections are analyzed and presented to the homeowners association along with suggestions on ways to remedy current environmental problems through sustainable yard maintenance practices.

3.4.5 Storm Drain Marking Program

An important component of public education for watershed management is the storm drain-marking program. This program enlightens citizens about the potential adverse effects of stormwater runoff entering surface water bodies. Many people allow paint, petroleum products and yard wastes to wash into gutters and into storm drains without consideration of the potential effects on surface waters. The storm drain marking program involves simply painting legible messages on the drains to remind the public where the drains lead. Within the Stevenson Creek Watershed, the messages may read “NO DUMPING - DRAINS TO CLEARWATER HARBOR," or “DUMPING HERE POLLUTES STEVENSON CREEK AND CLEARWATER HARBOR”. Some of the messages may include illustrations of fish, manatees, wading birds, or dolphins.

The storm drain marking program has been successfully implemented within other areas of the City of Clearwater, and could be implemented within the Stevenson Creek Watershed without significant expense. Volunteers from local schools and civic groups could be organized to conduct the marking under the supervision of officials from various Tampa Bay agencies such as Tampa Baywatch, Tampa Bay National Estuarine Program, and city and county government. Items needed for the drain marking include traffic cones, a broom, paint, safety vests, instruction sheets, and stencils. These items can be purchased or fabricated from materials costing less than $220.00.

3.5 EXOTIC PLANT ERADICATION PROGRAM

Native plant communities evolve with a complex relationship of natural controls that keep them in balance. These natural controls may include environmental requirements, competing plant species, herbivores including insects, and pathogens. When exotic plants are introduced to areas, they often have a competitive advantage over native plants because natural controls of the exotic plants are not present. Removal of exotic plant species and restoration of native communities includes supplemental control methods to replace natural controls. These supplemental controls may include manual and/or mechanical removal, physical control such as fire or water level manipulation, chemical control including application of herbicides, and biological controls such as natural insect or pathogenic controls. The ultimate exotic plant control objective is to remove exotic species and re-establish natural conditions that will restore normal competitive processes, reducing the potential for re-invasion and the requirement for continual maintenance.

Exotic plant species commonly found in the Stevenson Creek Watershed are listed in Table 3.5-1:

Table 3.5-1 Exotic Plant Species Found in the Stevenson Creek Watershed

Scientific Name	Common Name	Scientific Name	Common Name
Casuarina equisetifolia	Australian pine	*Melaleuca quinquenervia*	Melaleuca
Colocasia esculenta	Wild taro	*Melia azedarach*	Chinaberry
Dioscorea bulbifera	Air-potato	*Panicum repens*	Torpedo grass
Eichhornia crassipes	Water-hyacinth	*Ricinus communis*	Castor bean
Enterolobium contortisiliquum	Ear-pod tree	*Sapium sebiferum*	Chinese tallow tree
Hibiscus tiliaceus	Mahoe	*Schinus terebinthifolius*	Brazilian pepper
Hydrilla verticillata	Hydrilla	*Typha sp.*	Cattail
Leucaena leucocephala	Lead tree	*Urena lobata*	Caesar's weed
Ludwigia peruviana	Primrose willow	*Wedelia trilobata*	Wedelia

Citation: Florida Exotic Pest Plant Council. FLEPPC 1999 List of Florida's Most Invasive Species. Internet: http://www.fleppc.org/99list.htm

Current exotic plant control techniques used by City of Clearwater employees for non-aquatic vegetation include manual removal, herbicide application, and burning. Mechanical removal is not effective for control of Australian pine, Brazilian pepper, or melaleuca when used alone because the disturbance of soil creates conditions for regrowth from seeds and root fragments, and allows further invasion by pioneering exotic plants. Intense follow up with other control methods, preferably herbicide, is also required. Burning and water level manipulation are not applicable within this watershed due to the high density of the residential and commercial areas.

Aquatic nuisance vegetation is removed from lakes and ponds via herbicide application, manual removal, and the installation of native species. Private contractors do the majority of the exotic plant maintenance. The maintenance activity in the watershed is concentrated on the removal and treatment of emergent nuisance species such as *Ludwigia peruviana*, *Typha* sp., and *Eichhornia crassipes.* These plants can choke waterways and cause flooding.

3.5.1 Brazilian Pepper

Brazilian pepper is the most aggressive exotic in the watershed, and has been found in every terrestrial plant community. This exotic forms dense monocultures in previously disturbed areas and along roadside ditches. Brazilian pepper seeds are commonly dispersed by birds and small mammals.

Removal techniques for Brazilian pepper currently used in the City of Clearwater include manual removal and herbicide application. Herbicide application involves basal bark application of a Garlon 4/diesel solution in a minimum 4-inch band approximately 6 to 12 inches above ground. The Garlon 4/diesel solution consists of two ounces of Garlon 4, Ortho X-77 spreader, and one quart diesel mixed into three quarts of water. Diesel is added to the herbicide to increase adherence to the stem, and decrease the potential for wash-off during rainfall. Retreatment may be required for larger stems. Dead stems are left standing to decay, or are removed to a landfill or mulch site. Mist application of a Garlon 4/diesel solution using one part Garlon 4 in 50 parts water is also required for treatment of seedlings under mature trees. Garlon 4 should also be applied to roots to eliminate regrowth. Safety equipment required during application includes a respirator, safety face shield, rubber gloves, and protective clothing. Eyewash should be carried to flush eyes in case of accidental splash or spray.

3.5.2 Australian pine

Australian pine also spreads through dispersion of seeds deposited along shorelines. Australian pine grows rapidly, forms dense monocultures, and tolerates saline conditions and a wide range of soil moisture. The dense shade and thick litter layer produced by stands of Australian pine prevent germination and growth of native species that provide food for birds and small mammals. Australian pine boles do not decay readily after being killed by girdling and tend to dry without decaying ("petrify").

Australian pine removal techniques currently used in the City of Clearwater include cutting of the stem with a chainsaw, and spraying the stump with the Garlon 4/diesel solution described for Brazilian pepper. The cut stem is left to dry ("petrify") for later disposal or use as fuel source. The effects of herbicide application will be noticeable within 3 to 7 days of application. Although trees can be treated throughout the year, herbicide application in April and May is most effective, followed by applications in June or July. Retreatment is performed after one month if required for larger trees. Small stems can be hand-pulled, bagged, and burned. The Garlon 4/diesel solution is also applied to roots to eliminate regrowth. Safety equipment required during application is the same as described for Brazilian pepper.

3.5.3 Melaleuca

Development activities, water level alterations, and climatic conditions make all areas in south and central Florida vulnerable to invasion by this exotic. Melaleuca grows very rapidly with trees as young as two years producing seeds. Melaleuca bark is thick and fire resistant; consequently, this exotic cannot be controlled by fire. Viable seeds formed on trees cannot be killed with herbicide or by cutting of the stem because any interference with water flow through the xylem to the seed capsules triggers immediate seed release.

Melaleuca removal techniques currently utilized in the City of Clearwater include removal as encountered including manual cutting of the trunk, followed by stump treatment with herbicide Garlon 4. Seed capsules are put in plastic garbage bags within 20 minutes of stem cutting for disposal at the Pinellas County landfill. Landfill disposal includes burial at a depth sufficient to allow decay of the seed capsules, eliminating the potential for future sprouting. Stems are cut up and left to decay. Small seedlings are hand pulled, bagged, and burned; saplings too large to be pulled are sprayed with Garlon 4. Garlon 4 is also applied to the ground within an approximately 10-foot radius of the trunk to prevent growth of seedlings. Retreatment is provided as necessary at approximately six-month intervals.

3.5.4 Other Exotics

Other exotics currently present in areas within the watershed include ear-tree, chinaberry, Caesar weed, and air potato. These exotics are more easily controlled than those listed above. Removal techniques currently used for ear-tree include girdle and application of the Garlon 4/diesel solution described for Brazilian pepper. Chinaberry and air potato are controlled through manual removal and application of Garlon 4. These exotics are removed as encountered.

3.5.5 Estuary Restoration Plan

The U.S. Army Corps of Engineers is currently reviewing an application from the City of Clearwater to participate in a Brownfields demonstration project using the Stevenson Creek Estuary. The proposed Section 206 project will involve the removal of approximately 80,000 cubic yards of muck sediments from the creek between the Douglas Avenue Bridge and the North Fort Harrison Bridge. In addition to the muck removal, the project will involve the removal of nuisance species that currently grow on some of the sediment deltas and on the shoreline of the creek. Species to be removed include cattail, torpedo grass, Brazilian pepper, melaleuca, and mahoe. Once the nuisance vegetation accumulated sediments are removed, the shorelines of the creek will be planted with native vegetation, such as mangroves, cord grass and giant leather leaf fern.

3.5.6 Summary and Recommendations

The proposed watershed improvements are expected to effect exotic control activities in areas currently being maintained, and to facilitate removal and maintenance activities in additional exotic species affected areas by increasing accessibility. Some exotic species removal may be proposed as mitigation for impacts to wetlands during watershed improvements.

Precautions must be taken during all grading and filling activities associated with the watershed improvements, as well as removal of large-stem exotics, to minimize the enhancement of seedbed conditions. Enhancement may arise from scraping of existing seedbeds or deposition of materials that provide a seed source for exotics.

Damage to non-target vegetation and potential water contamination are potential concerns for exotics control. Herbicides effective for Australian pine and Brazilian pepper control are not selective and many native species are highly sensitive to these herbicides. Over spray and heavy rainfall following application can wash the herbicide off the trunk and damage non-target vegetation and/or enter surface water. For these reasons, the use of injection techniques instead of basal bark or girdle applications is preferred for exotics control in wetlands. In addition, while the current practice of leaving stems to decay or "petrify" provides some habitat value as bird perches and small mammal cover, stems and debris generated from larger scale exotics removal activities must be removed from wetland areas.

Exotic plant species control methods and recommendations discussed above are primarily applicable to the undeveloped public lands within the watershed. Development of a detailed plan for exotics removal and maintenance is recommended.

3.6 LEGAL AND REGULATORY FRAMEWORK

This section summarizes the existing legal and regulatory framework governing stormwater and environmental management within the City of Clearwater and the Stevenson Creek Watershed. The first four subsections outline the regulatory authority of federal and state agencies over watershed management issues. Implementation of the Watershed Management Plan will require close coordination with these agencies. The fifth and final subsection concerns the City of Clearwater and its stormwater and environmental legal framework governing items such as funding of capital improvement projects, stormwater levels of service, and municipal codes and ordinances regulating stormwater discharges, erosion control, etc.

3.6.1 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) regulates dredge and fill activities within existing wetlands and other surface waters of the United States, including both natural and man-made lakes and ponds. Federal permitting of the recommended projects of the Stevenson Creek Watershed Management Plan will require close coordination with the USACE. The Environmental Resource Permit (ERP) program, implemented jointly in 1995 with the state water management districts, was designed to streamline the permitting process. Although the ERP application is described as a joint state and federal permit vehicle, the USACE application process can be lengthy and complicated even for relatively simple projects. The USACE issues four types of permits depending upon the type of activity proposed. The categories of permits include the 1) Letter of Permission, 2) Individual Permit, 3) Nationwide Permit, and 4) Regional or General Permit.

The permitting process for improvements proposed in this management plan will be a complex process. Because significant drainage improvements are proposed, a conceptual permit approach is recommended to facilitate the process. Once conceptual approval is achieved, the projects within the management plan can be permitted individually and expeditiously. More information regarding federal permitting can be obtained by calling Stuart Santos at (904)-232-2018 or by visiting the USACE web site at http://www.saj.usace.army.mil/permit/types_of_permits.htm.

3.6.2 U.S. Environmental Protection Agency

The National Pollution Discharge Elimination System (NPDES) is a federal program implemented as a result of the Clean Water Act. This program, in conjunction with the stormwater pollution prevention plan (U.S. EPA 833-R-92-001, October 1992) requires permit approval and compliance with water quality standards for stormwater discharges from municipal and industrial stormwater treatment facilities and construction sites. In 1998, the EPA issued the Municipal Separate Stormwater Sewer System Permit (MS4 Permit) for Region IV, that includes several municipalities including the City of Clearwater. The 1997 Stormwater Management Plan for the City of Clearwater addressed many of the requirements for compliance with the MS4 Permit, and made recommendations for current and future needs. The implementation of the capital improvements recommended in the Stevenson Creek Watershed management plan, along with the maintenance of standard best management practices during and after construction, will help ensure compliance with the MS4 Permit.

3.6.3 Federal Emergency Management Agency

In 1968, the Federal Emergency Management Agency (FEMA) began the national flood insurance program (NFIP), a cooperative program between FEMA and local governments, of which the City of Clearwater is a participant. The purpose of the NFIP is to identify and map areas of special flood hazards (SFHA), to regulate building construction and related activities within SFHA's, and to make affordable flood insurance available to owners of homes and businesses.

The maps of SFHA's are known as flood insurance rate (FIRM) maps. Once adopted, FIRM maps can be amended by the local community through a formal FEMA/NFIP application process known as a letter of map revision (LOMR). As part of this Watershed Management Plan, the FIRM maps for the City of Clearwater, last updated in 1983, will be amended based on the existing conditions hydrologic and hydraulic modeling of the Stevenson Creek Watershed, and the corresponding 100- and 500-year floodplain maps and flood profiles illustrated on Figures 2.1-15 through 2.1-23.

The basis for the revision will be better technical information, and a more detailed analysis than was conducted for the original flood insurance study.

Since 1990, the City of Clearwater has participated in the NFIP's community rating system, which gives flood insurance premium reductions to policyholders in communities that take additional measures to reduce flood damages, beyond the minimum standards necessary to participate in the NFIP. Under the system, communities earn "credit points" for floodplain management activities within the four categories of public information, mapping and regulation, flood damage reduction, and flood preparedness. Communities are assigned a rating between 1 and 10, with class 1 requiring the most credit points and giving the greatest premium reductions, and class 10 providing no reduction in premiums. Currently, the City of Clearwater enjoys a "class 7" status in the CRS, which puts Clearwater in the top 16% of participating communities, and translates directly into a 15% premium reduction for policyholders within an identified SFHA.

Implementation of the Stevenson Creek Watershed Management Plan will qualify the City for additional credit points in the CRS through flood damage reduction. As indicated in Section 3.1, implementation of the flood protection capital improvements of the Plan will eliminate 73% of the identified structure flood protection level of service (FPLOS) deficiencies within the watershed. Under the CRS, additional credit points are also provided to communities that institute programs to relocate or floodproof structures within the 100-year floodplain. It is recommended that concurrent to implementation of the flood protection capital improvement (CIP) projects, the City work with FEMA, the NFIP/CRS, and the owners of the remaining FPLOS deficiencies to relocate or floodproof those remaining FPLOS deficient structures that cannot be cost-effectively remedied by the recommended CIP projects. FEMA provides technical assistance and in many cases, grant money to help fund the flood proofing or relocation of flood-susceptible structures. Additional information regarding the National Flood Insurance Program is available at http://www.fema.gov/nfip.

3.6.4 Southwest Florida Water Management District / Florida Department of Environmental Protection

The Environmental Resource Permit (ERP) Program that became effective on October 3, 1995 governs watershed management activities in Florida including design of new development and stormwater management facilities with respect to allowable rates of runoff, stormwater treatment, and impacts to floodplains and wetlands. The program represents the merging of the former wetland resource permit program from Chapter 403, Florida Statutes (F.S.), with the management and storage of surface water (MSSW) permit program in Part IV of Chapter 373, F.S. The ERP Program applies statewide, except within the Northwest Florida Water Management District, where the former wetland resource permitting program remains in effect.

To allow an applicant to deal with only one agency when seeking an ERP, the review and approval or denial of the ERP permit application will be performed by either the Department of Environmental Protection (DEP), or the Southwest Florida Water Management District (SWFWMD), depending upon the type of activity involved. Operating agreements have been signed by the agencies to specify the responsibilities between them. Information regarding the type of activity that would require coordination with the DEP is available at their web site at http://www.dep.state.fl.us/.

Any projects within the watershed that are funded fully or partially by the SWIM program will also require permit review by the DEP, to avoid the potential for charges of a conflict of interest. The majority of the permit applications for capital improvements within the Stevenson Creek watershed will likely be made through SWFWMD. Additional information on State Environmental Resource Permitting is available at http://www.swfwmd.state.fl.us/osp/permits.htm.

3.6.5 City of Clearwater

Comprehensive Plan.

The City of Clearwater Comprehensive Plan, as adopted in May of 2000, includes nine major elements. Among the goals stated within these nine elements are the conservation, protection, and restoration of the quality of surface waters within the City, the conservation and protection of wildlife habitat, and the management of the quantity and quality of stormwater runoff. The comprehensive plan identifies the need to "continue to prepare stormwater management plans which will identify and prioritize the implementation of programs to improve and enhance stormwater quality and quantity." Other specific goals, needs, and policies related to watershed management stated within the comprehensive plan are highlighted below:

<u>Future Land Use Element</u>

- No new development or redevelopment will be permitted which causes the level of City services (traffic circulation, recreation and open space, water, sewage treatment, garbage collection, and drainage) to fall below minimum acceptable levels.

<u>Utilities Element – Sanitary Sewer</u>

- New septic tanks should not be permitted. Residents located in nearby unincorporated areas using septic tanks should connect to the City sewage system, as sewer lines become available.

<u>Utilities Element – Stormwater Management</u>

- The City of Clearwater needs to continue to monitor the stormwater management utility fee rate structure and amend it as required to remain competitive and maintain an adequate funding source to provide revenue for flood control, maintenance, retrofitting, and treatment of stormwater.
- The City of Clearwater needs to take advantage of any alternative funding opportunities that may become available from any State Agency with regard to watershed management and/or general stormwater improvements.
- The City of Clearwater needs to continue to reduce flooding problems and strive for abatement of flood damage to houses and streets.
- The City of Clearwater needs to continue to maintain, correct deficiencies and improve, where necessary, current levels of service. Maintenance and

improvement of the City Stormwater management system must be recognized as a service provided by the City on a regular and continuous basis.

- Natural and man-made wetlands need to be utilized for stormwater storage and protected as natural resources. Wetlands provide a natural wildlife habitat and groundwater recharge functions which are pivotal characteristics of the natural and urbanized environment.
- The City of Clearwater needs to research and develop new methods that are technically, environmentally, and economically viable of treating stormwater runoff before final discharge to improve and enhance local surface waters.

<u>Conservation Element</u>

- The City shall continue to protect floodplains, drainage ways, and all other natural areas having functional hydrological characteristics.

<u>Recommendations.</u>

With regards to level of service goals for drainage and flood protection, it is recommended that Policy 16.1.1 in the Comprehensive Plan be amended to coincide with the flood protection level of service (FPLOS) criteria adopted for the Stevenson Creek Watershed Management Plan. The primary FPLOS criterion is that there is to be no structural flooding (i.e., homes and businesses) for events up to and including the 100-year flood. This criterion refers to the low floor slab elevation (lowest inhabited floor) as the point of structural flooding. This is consistent with FEMA/NFIP guidelines, and has been widely adopted by counties and municipalities across the state and the country.

The secondary set of FPLOS criteria specifies allowable thresholds for street flooding. The criteria is based upon residential, collector, and arterial roadways being passable for the 10, 25, and 100-year flood events, respectively. “Passable” is defined herein as 6” of flooding or less at the lowest edge of pavement in a travel lane. No flooding is allowable on hurricane evacuation routes for events up to and including the 100-year flood. The following table summarizes the FPLOS criteria adopted for the Stevenson Creek Watershed Management Plan and the City of Clearwater:

Proposed Flood Protection Level of Service (FPLOS) Criteria

FPLOS Category	Allowable Flooding Depths
1. Residential Streets, 2 lanes	Up to 6” Allowed for 10-year flood
2. Collector Roads, 2-4 lanes	Up to 6” Allowed for 25-year flood
3. Arterial Roads, 4 or more lanes	Up to 6” Allowed for 100-year flood
4. Hurricane Evacuation Routes	No flooding up to 100-year flood
5. Habitable Structures	No flooding up to 100-year flood

The above criteria is recommended for retrofit of existing City facilities that currently fall below the minimum levels of service. Due to varying levels of maintenance and the inevitable deterioration of public infrastructure over time, it is recommended that a safety factor be applied to all new stormwater management facilities serving new development within the City. The “safety factor” would help ensure these systems continue to function in the future at the minimum level of service, and could take the form of an additional 6” to 12” of freeboard applied to the minimum criteria stated above.

With regards to reducing damages and losses due to flooding, it is recommended that Policy 16.3 be amended to include a provision that would allow the City, in cooperation with FEMA and/or SWFWMD, to consider the purchase, relocation, or floodproofing of flood-susceptible private properties in cases where it is not technically feasible or cost-effective to reduce flood levels through infrastructure improvements. The purchases, relocations, and/or floodproofing should be done in cooperation with willing owners of flood-susceptible homes and businesses, and only after infrastructure improvement alternatives have been explored within an adopted watershed management plan.

Community Development Code.

The community development code for the City of Clearwater governs the design and construction of new development and re-development. The applicable divisions of this code include Division 7 – Erosion and Siltation Control, and Division 9 – General Applicability Standards. Within Division 9, the City of Clearwater Subdivision Design

Standards and Stormwater Drainage Criteria Manual is incorporated by reference. The Stormwater Drainage Criteria Manual specifies the methods to be used for calculating peak rates of runoff. This document includes a requirement for redevelopment of land upon which no stormwater treatment or attenuation facilities exist, whereby the redeveloper is required to provide "treatment of ½" of rainfall as applied to the entire area of a development project, and ½ inch as applied over the portion of the site plan undergoing alteration in the case of redevelopment." The manual also specifies the use of a pre-redevelopment weighted runoff coefficient of 0.2 for a site that drains to an area of known flooding problems, and a coefficient of ½ of the actual calculated coefficient for a site that does not drain to an area of known flooding problems. This requirement results in a reduction in peak rates of runoff from sites undergoing redevelopment. These provisions exceed the requirements of the SWFWMD, which in many cases of redevelopment do not require any treatment or attenuation.

<u>Recommendations</u>

To ensure compliance with the recommended drainage and flood protection level of service goals stated at the beginning of this section, the City of Clearwater Subdivision Design Standards and Stormwater Drainage Criteria Manual should be amended to include the proposed FPLOS criteria, with an appropriate safety factor to be applied to new development. It is also recommended that possible changes to the Stormwater Drainage Criteria Manual be considered that would allow some flexibility in the methods used to calculate peak rates of runoff, such as allowing the SCS method in place of the rational method. This change would reduce any potential liability the City may be taking on be specifying the hydrologic methods to be used for private development, as these methods may not be the most applicable in all situations.

Municipal Code of Ordinances.

The applicable portions of the City's Code of Ordinances related to watershed management include the following chapters:

<u>Chapter 32. Utilities.</u> Article VI. of this chapter governs Stormwater Management. This article establishes the legal framework for the City's Stormwater Utility in

accordance with Florida Statute 403.0893, and establishes the stormwater utility fee structure. Additional articles in this chapter govern Sanitary Sewers, Water Supply, and Solid Waste.

Chapter 33. Waterways and Vessels. Section 33.003 of Article I prohibits the placing, discharging, or depositing of sewage, trash, garbage, etc., into navigable waters. This includes the banks and shores of any tributaries where this material "is reasonably likely to be washed into such navigable waters, either by ordinary tidal actions or by the action of rain, floods or otherwise."

Chapter 47. Buildings and Building Regulations. Article I of this chapter specifies the methods and sources used to set the minimum floor elevations for new buildings or additions to existing buildings.

Chapter 51. Flood Damage Prevention. This Chapter governs management of the floodplain within the City of Clearwater including adoption of floodplain mapping, and requirements for new development and building construction, including encroachments into designated floodplains and floodways. Adoption and enforcement of this ordinance is required for participation in FEMA's National Flood Insurance Program (refer to Section 3.5-3).

Recommendations

Dumping of yard waste into creeks, ditches, swales and even storm sewers is a fairly common practice throughout the Stevenson Creek Watershed (see Figure 3.5-1). This practice increases the workload of City maintenance crews, and degrades the quality of the stormwater by introducing nutrient-rich organic material to the system. When water levels and velocities rise due to heavy rainfalls, the material is washed into the Creek, and downstream where it ultimately deposits in the Stevenson Creek Estuary. The estuary has, in recent decades, become choked with highly organic sediments. Illegal dumping of yard waste has undoubtedly contributed to the accumulation of these sediments.

Section 32.274 of the Code of Ordinances prohibit the placement of solid waste into any creeks, watercourses, storm sewers, and ditches, within the City and prohibits the placement of "waste materials of any kind…which impairs the proper operation of the city's sewer or drainage system". Although these ordinances are interpreted to include lawn clippings, leaves, and fallen limbs, etc., such yard waste is not specifically mentioned in this portion of the Code. In order to facilitate the understanding and enforcement of this facet of the Code, it is recommended that "yard waste" be specifically included as a prohibited item.

Figure 3.6-1 Yard waste (Oak leaves) dumped by a resident on the banks of Upper Stevenson Creek.

The City Should actively seek to educate its residents on the negative effects of the dumping of yard waste into its creeks, ditches, and storm sewers. If necessary, these education efforts should be followed by active enforcement of the applicable ordinances.

3.7 CAPITAL IMPROVEMENT COST ESTIMATES

For purposes of budgetary planning, cost estimates were made, in 2001 dollars, of each recommended capital improvement project. The cost estimates are based on the conceptual design and are subject to change pending completion of a more detailed design process. Costs for most items were estimated based on past or current similar Parsons ES projects, and by consulting the FDOT 1- and 3-year cost history listings dated February 2001. Mobilization and demobilization costs were typically estimated to comprise approximately 9% of the total construction cost.

Table 3.7-1 summarizes the total cost estimates for the individual projects, detailed estimates of which are included as Appendix H. The estimates include land acquisition, engineering and related services (surveying, environmental permitting, etc.), construction, and contingency.

Cost estimates for acquisition of private property were based on the most recent assessed value as reported by the Pinellas County Property Appraiser's Office, multiplied by a factor of 1.5 to include fair market value of the property plus legal fees.

The magnitude and scope of the recommended improvements, coupled with budgetary constraints, will require phased implementation of the plan over a number of years. The capital costs listed in Table 3.7-1 will need to be adjusted annually for inflation, up to the year of actual construction, based on the construction price indices for the applicable year(s). In the next section, the recommended prioritization rankings are presented which will facilitate the development of an implementation schedule.

Table 3.7-1. Stevenson Creek Watershed Management Plan Capital Cost Estimates

Project No.	Project Description	Estimated Capital Cost (2001 dollars)
Spring Branch		
1A.1	Spring Branch Conveyance Enhancements (Lower Portion)	$526,115
1A.2	Spring Branch Conveyance Enhancements (Upper Portion)	$960,703
1B	Springtime Avenue and Douglas Avenue Bridges	$830,830
1C	Spring Branch Flood Detention Basin	$2,634,542
1D	Woodland Terrace Storm Sewer Replacement	$446,783
1E	Byram Pond Dredging and Expansion	$831,636
1F	Spring Branch Stabilization, Union Street to Byram Pond	$933,969
1G	Clearview Lake	$620,212
1H	Betty Lane Forested Habitat Preservation Site	$1,100,000
Subtotal (for alternative 2 - excluding project 1B)		**$8,053,960**
Lower Stevenson		
2A	Palmetto Street Sediment Sump	$544,546
2B	N. Missouri Ave. and Palmetto St. Drainage Improvements	$486,615
2C	Installation of Additional CDS Units	$526,500
2D	Overbrook Avenue Detention Pond	$1,755,860
Subtotal		**$3,313,520**
Middle Stevenson		
3A	Glen Oaks Stormwater Detention Facility	$2,203,240
Subtotal		**$2,203,240**
Upper Stevenson		
4A	Hillcrest Avenue Overflow Bypass Culvert	$2,299,109
4B	Upper Stevenson Creek Stabilization	$1,415,843
4C	St Thomas Drive / Bellevue Boulevard Creek Restoration	$1,801,913
Subtotal		**$5,516,865**
Hammond Branch		
5A	Flagler Drive / CSX Railroad North Swale Improvements	$737,241
5B	Palmetto Street Drainage Improvements	$735,643
5C	Saturn Avenue Drainage Improvements	$303,382
5D	Smallwood Circle Drainage Improvements	$161,283
5E	Lake Hobart Outfall Control Structure	$14,300
Subtotal		**$1,951,848**
Lk Bellevue Branch		
6A	Expansion of Lake Bellevue	$1,337,884
6B	Turner Street Box Culverts	$1,554,761
Subtotal		**$2,892,645**
Jeffords St Branch		
7A	Crest Lake Expansion	$881,466
7B	Duncan Avenue/Turner Street Detention Pond	$1,494,952
7C	Jeffords Street/Barry Road Detention Pond	$1,690,634
Subtotal		**$4,067,053**
Grand Total		**$27,999,132**

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Subtotal (for alternative 2 - excluding project 1B)		**$8,053,960**
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3A	Glen Oaks Stormwater Detention Facility	$2,203,240
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Subtotal		**$4,067,053**
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SECTION 4.0
WATERSHED MANAGEMENT PLAN
PROJECT PRIORITIZATION

As stated in the introduction, the objectives of this Watershed Management Plan are to identify the causes of the problems of flooding, surface water quality degradation, excessive channel erosion, and loss of riparian habitat; and to identify, evaluate and recommend solutions to these problems. The problems and the causes of these problems were identified in Section 2.0. Recommendations for solutions to the problems were made in Section 3.0. This section serves to prioritize the improvements on the basis of benefits provided, cost effectiveness, and logical precedence.

The projects recommended in this document, whether considered singly or as a whole, are economically justifiable, and clearly in the interest of public safety, health, and welfare. The management plan is consistent with the laws of the federal, state and local government, and follows the policies outlined in State, regional, and local comprehensive plans.

In this section, projects that can be expected to provide the greatest overall benefit in the most cost effective manner are identified using a project ranking procedure. This management tool is a convenient and effective method of recommending priorities for the allocation of available funding. To help identify the priority projects in the Stevenson Creek Watershed Management Plan, a set of comparative evaluation criteria were identified, and a project ranking matrix was developed. The evaluation criteria selected as a means of grading the relative merits of the recommended master plan projects are discussed below. Within each category, individual projects were graded on a scale from 0 to 10, with the lowest score indicating no real benefit and the highest indicating a high beneficial value.

Flood Control Benefits. The relative flood control benefit of an individual project is a function of the number and type of Flood Protection Level of Service (FPLOS) deficiencies remedied by that project. The projects that rank the highest in this category will either alleviate flooding over a large geographic area, or reduce flooding within a geographically concentrated large group of flood-susceptible homes and businesses. A score of one-half point was earned for each structure FPLOS deficiency and each residential street FPLOS deficiency remedied by the project. Remediation of each collector, arterial, and evacuation route FPLOS deficiencies earned scores of 1.0, 1.5, and 2.0 points, respectively. The scores were summed for each individual project. Two projects, (3A) Glen Oaks, and (4A) Hillcrest Avenue Bypass, initially exceeded the maximum score of 10, and thus were assigned a score of 10.

Water Quality Benefits. The relative water quality benefits of an individual project reflect the ability of the project to capture and remove pollutant loads from the stormwater runoff prior to discharge into downstream waterbodies. Those projects with little or no real water quality benefits receive a score of 0, while a project specifically designed to provide a high level of treatment of currently untreated stormwater runoff from a large drainage basin would receive a high score. In assigning scores in this category, the total suspended solids (TSS) and total nitrogen (TN) loads expected to be removed (lb./year) by each project were determined from the proposed conditions pollutant loading model. These removal rates were used as comparative indicators of relative water quality benefits. The project with the largest rate of pollutant removal (Glen Oaks), was assigned a score of 10, and the scores for the other projects are based on their individual pollutant removal rates, expressed as a fraction of the removal rates of the Glen Oaks Project.

Ecological Benefits. The potential ecological benefits of individual projects are ranked based on evaluations of the anticipated improvements to wildlife habitat that will be realized after project construction. Factors such as the size of the affected area, current quality and ecological conditions, and proximity to other habitat areas are considered in the evaluation of benefits and the relative ranking. Areas that currently provide no habitat, but will provide significant habitat upon project completion, will rank the highest in the matrix. Conversely, those projects which will have no habitat impacts, such as the replacement of culverts for flood control, will rank the lowest.

Channel Erosion and Sedimentation Control Benefits. Projects which will have little or no effect in the remediation of channel erosion problems and sedimentation in the watershed are assigned a score of 0. Secondary benefits of projects that attenuate downstream peak discharge rates tend to reduce the potential for channel erosion, and therefore would earn the project a score of up to 5, depending on the magnitude of the attenuation and the proximity and severity of downstream erosion problems. Projects designed to permanently remedy severe channel erosion problems along a substantial length of channel would receive the highest ranking of 10. Projects that involve creation or expansion of maintainable sediment sumps on Stevenson Creek and Spring Branch would also receive a high score.

Recreational and Educational Benefits. The recreational and educational benefits associated with a project are those that provide new opportunities for the general public by accommodating the placement of features such as picnic areas and shelters, trails and boardwalks, nature parks, fishing, boating, and/or interpretive exhibits. Projects that provide no new opportunities for recreational and educational benefits receive a score of 0, and those that can provide a high level of recreational and educational opportunity would be assigned a score of 10.

Implementability. Implementability as a ranking criterion is an assessment of the relative severity of obstacles that must be overcome in order to construct the project. It is a cumulative assessment of factors such as property and easement acquisition requirements, permitting requirements, temporary impacts to nearby residences and businesses during construction, long-term maintenance and operation requirements, and relative ease of construction. A low ranking would be assigned to projects which would have a high degree of difficulty related to any or all of these issues. A high ranking would be assigned to a project with no foreseeable implementation concerns.

Relative Benefits to Cost. As stated previously, all of the recommended projects of the Stevenson Creek Watershed Management Plan can be justified economically. However, because funding for public infrastructure improvements is not unlimited, it is useful to identify those projects that provide the most benefit for the least cost. In order to assign a score for this criterion, a total weighted benefits score was assigned to each project based on the sum of the weighted scores of the project in the five categories of flood control, water quality, ecological benefits, erosion control benefits, and recreational/educational benefits. The total benefit score was then divided by the preliminary cost estimate of the project in thousands of dollars. A multiplier was applied to the result to force an average score of 5.0, on a scale of 1 to 10, with 0 being the least cost effective and 10 being the most cost effective. A few projects earned scores greater than 10; these were subsequently reduced to 10. It should be noted that the result is not an actual benefit to cost ratio, but rather a relative measure of each project's cost effectiveness compared to the other projects the plan.

While each of the listed ranking criteria is an important factor when evaluating the individual watershed management projects, it is not essential that each should have an equal weighting in the evaluation matrix. For that reason, weighting factors were assigned to each, ranging from 1 to 5, to establish the relative importance of individual ranking criteria. The following is a list of the weighting factors used:

Ranking Criterion	**Weighting Factor**
Flood Control Benefits	5
Water Quality Benefits	4
Ecological Benefits	4
Channel Erosion and Sedimentation Control Benefits	3
Recreational and Educational Benefits	2
Implementability	2
Relative Benefits versus Cost	5

Table 4-1. Stevenson Creek Watershed Management Plan Project Ranking Matrix

Project No.	Project Description	Flood Control Benefits 5	Water Quality Benefits 4	Ecological Benefits 4	Erosion Control Benefits 3	Recreational/ Educational Benefits 2	Ability to Implement 2	Relative Benefits vs. Cost 5	Weighted Score	Rank
Spring Branch										
1A.1	Spring Branch Conveyance Enhancements (Lower Portion)	10	1.5	0	10	0	6	10.0	5.7	**3**
1A.2	Spring Branch Conveyance Enhancements (Upper Portion)	6.5	0.5	0	0	0	8	4.2	2.8	**14**
1B	Springtime Avenue and Douglas Avenue Bridges	1	0	0	0	0	7	0.7	0.9	**28**
1C	Spring Branch Flood Detention Basin	1	5.7	10	5	2	4	3.9	4.4	**6**
1D	Woodland Terrace Storm Sewer Replacement	2.5	0.1	0	0	0	9	3.4	1.8	**22**
1E	Byram Pond Dredging and Expansion	1.5	0.8	0	5	0	4	3.6	2.0	**21**
1F	Spring Branch Stabilization, Union Street to Byram Pond	0	0	0	10	0	10	3.8	2.6	**16**
1G	Clearview Lake	0.5	0.9	0	1	0	8	1.7	1.3	**27**
1H	Betty Lane Forested Habitat Preservation Site	0	0	10	0	6	3	5.5	3.3	**12**
Lower Stevenson										
2A	Palmetto Street Sediment Sump	0.5	0.2	2	9	0	4	10.0	3.7	**9**
2B	N. Missouri Ave. and Palmetto St. Drainage Improvements	1	0.9	0	0	0	9	2.1	1.4	**24**
2C	Installation of Additional CDS Units	0	4	1	0	0	10	4.4	2.4	**18**
2D	Overbrook Avenue Detention Pond	2	1.8	6	0	4	6	3.3	3.0	**13**
Middle Stevenson										
3A	Glen Oaks Stormwater Detention Facility	10	10	10	5	10	6	8.8	8.5	**1**
Upper Stevenson										
4A	Hillcrest Avenue Overflow Bypass Culvert	10	0	0	3	0	6	3.0	3.3	**10**
4B	Upper Stevenson Creek Stabilization	0	0	0	10	0	8	2.5	2.2	**19**
4C	St Thomas Drive / Bellevue Boulevard Creek Restoration	9.5	0.4	6	2	2	3	5.4	4.5	**5**
Hammond Branch										
5A	Flagler Drive / CSX Railroad North Swale Improvements	5.5	0	0	2	0	4	5.3	2.6	**17**
5B	Palmetto Street Drainage Improvements	2	0	0	2	0	8	2.5	1.7	**23**
5C	Saturn Avenue Drainage Improvements	1	0.2	0	0	0	9	2.2	1.3	**26**
5D	Smallwood Circle Drainage Improvements	1	0.1	0	0	0	6	3.9	1.4	**25**
5E	Lake Hobart Outfall Control Structure	0	0.8	0	0	0	10	10.0	2.8	**15**
Lk Bellevue Branch										
6A.1	Expansion of Lake Bellevue	4.5	8.7	7	1	3	8	9.7	6.1	**2**
6A.2	Upper Lake Bellevue Culverts	7.5	0	0	0	0	10	10.0	4.1	**8**
6B	Turner Street Box Culverts	4.5	1.2	0	0	0	7	2.1	2.0	**20**
Jeffords St Branch										
7A	Crest Lake Expansion	2	1.6	6	1	4	10	6.8	4.1	**7**
7B	Duncan Avenue/Turner Street Detention Pond	7	0.8	4	0	0	5	4.2	3.3	**11**
7C	Jeffords Street/Barry Road Detention Pond	8	2.8	5	10	0	3	7.0	5.5	**4**

The project prioritization ranking matrix for the Stevenson Creek Watershed Management Plan is presented in Table 4-1. It is noted that this ranking matrix evolved over time, with input from all the participating entities and the general public.

It should be stressed that the ranking process is, to a certain degree, a subjective process that is oriented towards personal values. It is, however, a valuable tool for screening projects and grouping them into relative priority classes. It is apparent through examination of Table 4-1 that those projects which serve multiple purposes rank the highest when compared to those with singular objectives. Also apparent is the observation that the projects that rank the highest generally have the highest scores in the relative benefits to cost category.

Logical Precedence. Although not included as a ranking criterion per se, the successful implementation of the Stevenson Creek Watershed Management Plan will require consideration of the logical precedence, or order of construction of the individual projects. Many of the projects will rely on the prior completion of downstream improvements, in order to avoid creating unintended flooding impacts. Or, a project might not function at its intended full capacity unless constructed in conjunction with another nearby project. Within the Stevenson Creek Watershed Management Plan, four groups of projects were identified that require ordering by logical precedence. The four groups could be constructed in any order, however the projects within each group must follow the specified sequences. For comparison, the project rank is provided for each project in the sequence, within Table 4-2 below:

Table 4-2. Project Precedence

Project Precedence Grouping	Required Sequence of Construction	Project Rank (Independent of Sequence)
Spring Branch Group	1. 1B or 1C	28 (1B), 6 (1C)
	2. 1A.1	3
	3. 1A.2	14
	4. 1G	27
Glen Oaks Group	1. 3A	1
	2. 4A, 6B	10 (4A), 20 (6B)
Hammond Branch Group	1. 5A	17
	2. 5C	26
Lake Bellevue Group	1. 6A.1	2
	2. 6A.2	8

By examination of the Spring Branch Group in Table 4-2, it is apparent that construction of third-ranked project (1A.1) Spring Branch Improvements, Lower Portion, will require the prior construction of a lower-ranked project, either (1B) or (1C), in order to avoid downstream flooding impacts associated with the channel improvements. The preferred alternative, Project (1C) Spring Branch Detention Basin, is close in rank to project (1A.1) at a rank of 6. However, if Project (1C) cannot be implemented, for any reason, 28^{th}-ranked Project (1B) Springtime Avenue and Douglas Avenue Bridges must be built instead. This raises the question of how to assign priorities to two projects with widely different ranks that must be built together. This could be resolved by re-assigning some of the flood control benefits from Project (1A.1) to (1B), until the scores of the two projects in Table 4-1 are equal. The resulting weighted score would be 3.8, which would result in an overall rank of 8 for the combined projects (1A.1 and 1B). The relative benefits to cost scores for projects (1A.1) and (1B) would change to 9.1 and 7.0, respectively.

In the remaining project precedence groups, the project precedence follows the order of the project rankings. Projects not specifically listed in the above table are considered "stand alone" projects that could logically be constructed at any point during plan implementation.

Public Acceptance. Public acceptance is a qualitative measure of the support for a particular project among the City's taxpaying residents. In the early planning stages of a future public works project, public acceptance of the project can be difficult, if not impossible to gauge with any certainty. For this reason, it was not included herein as a ranking criterion. However, public involvement is a very important component of this plan; watershed improvements cannot be realized without the willingness and cooperation of residents within the watershed boundaries. For this reason, three (3) public meetings, or workshops, are being held to provide information and to receive comments and suggestions from the public. These comments and suggestions have helped to determine improvement projects and priorities. The first meeting was held in November of 1999, prior to the commencement of the project, to receive input from the public on known problems. A total of 68 questionnaires were received, containing descriptions by the residents of problems of sedimentation/erosion, water quality, and flood control. These questionnaires, along with the City's complaint logs, were used to create a GIS map of the known problem areas, which was compared with the results of the computer modeling analyses by overlaying it on the 100-year floodplain map and the pollutant loading map. This information was then used in identifying areas to be targeted for watershed improvements.

The second meeting was held in January of 2001, where the results of the existing conditions analysis were presented along with the preliminary identified solutions for flood control, water quality, erosion and sedimentation. The residents were asked to comment in writing on the potential improvement projects. Approximately 70 residents attended, and 28 questionnaires were filled out. Most of the project-related comments received were positive, and many additional suggestions were made regarding specific components of the projects. These comments and suggestions were thoroughly reviewed and considered during the final completion of the Stevenson Creek Watershed Management Plan. Public meeting questionnaires from the first two public meetings are included as Appendix L of this report. A third public meeting is scheduled to be held later this year to present the completed Plan during a City Commission workshop, which will be televised city-wide.

Through the public meetings, workshops, and meetings among members of the project team, five projects were identified as potentially controversial projects. Project 3A (Glen Oaks), although on City-owned property, will eliminate the existing golf course at that location, currently operated through a lease agreement by the non-profit Chi-Chi Rodriguez Foundation. Projects 4C (St. Thomas Drive to Bellevue Boulevard), and 7C (Jeffords/Barry Road Pond) were identified as potentially controversial projects due to the proposed acquisition of several residential properties. Projects 6A (Expansion of Lake Bellevue) and 7A (Crest Lake Expansion) were identified by the City Parks and Recreation Department as potentially controversial due to the proposed conversion of existing upland park areas to wetland habitat.

Winning public support for these projects through the City's public information initiatives will be crucial to successful implementation of these projects. The final design and implementation of these projects must be sensitive to resident's potential concerns regarding alternative recreational opportunities, the environment, safety, aesthetics, and property values.

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Spring Branch										
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1A.2	Spring Branch Conveyance Enhancements (Upper Portion)	6.5	0.5	0	0	0	8	4.2	2.8	**14**
1B	Springtime Avenue and Douglas Avenue Bridges	1	0	0	0	0	7	0.7	0.9	**28**
1C	Spring Branch Flood Detention Basin	1	5.7	10	5	2	4	3.9	4.4	**6**
1D	Woodland Terrace Storm Sewer Replacement	2.5	0.1	0	0	0	9	3.4	1.8	**22**
1E	Byram Pond Dredging and Expansion	1.5	0.8	0	5	0	4	3.6	2.0	**21**
1F	Spring Branch Stabilization, Union Street to Byram Pond	0	0	0	10	0	10	3.8	2.6	**16**
1G	Clearview Lake	0.5	0.9	0	1	0	8	1.7	1.3	**27**
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2D	Overbrook Avenue Detention Pond	2	1.8	6	0	4	6	3.3	3.0	**13**
Middle Stevenson										
3A	Glen Oaks Stormwater Detention Facility	10	10	10	5	10	6	8.8	8.5	**1**
Upper Stevenson										
4A	Hillcrest Avenue Overflow Bypass Culvert	10	0	0	3	0	6	3.0	3.3	**10**
4B	Upper Stevenson Creek Stabilization	0	0	0	10	0	8	2.5	2.2	**19**
4C	St Thomas Drive / Bellevue Boulevard Creek Restoration	9.5	0.4	6	2	2	3	5.4	4.5	**5**
Hammond Branch										
5A	Flagler Drive / CSX Railroad North Swale Improvements	5.5	0	0	2	0	4	5.3	2.6	**17**
5B	Palmetto Street Drainage Improvements	2	0	0	2	0	8	2.5	1.7	**23**
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6B	Turner Street Box Culverts	4.5	1.2	0	0	0	7	2.1	2.0	**20**
Jeffords St Branch										
7A	Crest Lake Expansion	2	1.6	6	1	4	10	6.8	4.1	**7**
7B	Duncan Avenue/Turner Street Detention Pond	7	0.8	4	0	0	5	4.2	3.3	**11**
7C	Jeffords Street/Barry Road Detention Pond	8	2.8	5	10	0	3	7.0	5.5	**4**

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EXECUTIVE SUMMARY

Watershed Description

The Stevenson Creek Watershed, the largest and most urbanized watershed within the City of Clearwater, drains 6,286 acres in west central Pinellas County. Of this area, 4,057 acres (65 percent) are within the Clearwater city limits. The remaining 35 percent of the basin is within the City of Dunedin (1,287 acres or 20%), unincorporated Pinellas County (859 acres or 14%) and the City of Largo (83 acres or about 1%).

Stevenson Creek discharges to Clearwater Harbor. The majority of the creek has been channelized or otherwise altered, and little of the historic floodplain remains intact. Land uses within the basin are predominantly medium- and high-density residential, commercial, and open space. Approximately 90 percent of the watershed has been developed, and the vast majority of the development occurred prior to the implementation of regulatory requirements for floodplain preservation, environmental protection, stormwater treatment and attenuation. Several developments have been constructed within the creek's floodplain and have experienced severe flooding. In addition, the creek and its tributaries experience moderate to severe erosion problems due to steep embankments, improper maintenance, highly erodable soils, and inadequate right-of-way.

The majority of the land use changes within the watershed have been detrimental to water quality, flood protection, and wildlife habitat. Urban development has resulted in greater stormwater runoff volumes and peak flow rates, as well as the transport of sediments and pollutants into the creek.

Purpose and Objectives

The Stevenson Creek Watershed Management Plan has been initiated as the result of a cooperative agreement between the City of Clearwater and the Southwest Florida Water Management District (SWFWMD). Stormwater quality and quantity are identified within the City of Clearwater Comprehensive Plan as areas of service deficiencies which must be addressed.

The basic purpose of the management plan is to identify the causes and sources of problems such as flooding, water quality degradation, excessive channel erosion, and loss of riparian habitat. Once these problems were identified, recommendations were made to solve or alleviate the problems. Recommendations include capital improvement projects (i.e. stormwater infrastructure improvements), creation and restoration of habitat, maintenance strategies, pollution reduction programs, and public involvement and awareness. This management plan will be used as a tool in the planning, regulation, and management of natural resources and future development, and as a basis for determining and prioritizing capital improvements by the City of Clearwater and SWFWMD.

Data Collection

The information-gathering process included such activities as a literature search and review of existing data, field reconnaissance and ground-truthing of aerial photography, ground surveying, streamflow monitoring, surface water sampling and testing, habitat assessment, interviews with City operations personnel, and input from residents of the watershed.

Flood Protection Level of Service

In order to assess the current flood protection level of service and to determine the most effective means of alleviating the identified flooding problems, a hydrologic and hydraulic model of the watershed was prepared.

The Advanced Interconnected Channel and Pond Routing Model, Version 2.2 (AdICPR) was chosen for the hydrologic and hydraulic modeling analysis. To provide the necessary level of detail, the basin was divided into a total of 307 discrete subbasins averaging 20.5 acres in size. The delineation of subbasins was dictated to a large extent by the complexity of the drainage network itself and the need to define the contributing drainage area to modeled elements of the conveyance system.

The AdICPR model was calibrated to measured rainfall and streamflow data collected for this project. The large storm of July 15, 2000 was used as the calibration event. Once calibrated, the model was used to simulate the 5, 10, 25, 50, 100, and 500-year design flood events. Floodplain mapping and flood profiles were prepared in order to identify flooding problem areas. This information will be used to support a request for revision of the applicable FEMA flood insurance rate maps.

Design 100 year flood elevations were compared with surveyed finished floor elevations of homes and businesses within the 100-year floodplain. Of the 470 structures entered into the database, 263 structures were found to have finished floor elevations below the 100-year flood level. This is, by definition, a structure flooding level of service deficiency. The majority of these structures are located within the primary floodplains of the Stevenson Creek and Spring Branch main channels. However, many of the identified FPLOS deficiencies result from inadequate secondary drainage systems that feed into the main channels.

Natural Systems

The entire watershed was investigated for undeveloped land, wetlands, natural areas, and potential restoration or preservation areas. The boundaries of the natural areas were identified and mapped on aerial photography. These areas were characterized using the Florida Land Use Cover and Forms Classification System (FLUCCS) (FDOT, 1985).

The Stevenson Creek Watershed is a highly urbanized, densely populated area with little to offer in the way of natural systems. With one exception, the only undeveloped areas are golf courses and city parks. Wetlands are predominantly small isolated stormwater retention ponds or natural lakes that have been altered to such a degree that their origin can only be determined from historic aerial photography. The waterways are predominantly channelized with little riparian habitat. The intense development has also altered the estuarine system so that little habitat is provided at the mouth of Stevenson Creek.

Water Quality Assessment

Low dissolved oxygen levels, fecal contamination, and excessive nutrient concentrations are the primary water quality issues that have been identified in the watershed, and as such, water quality in Stevenson Creek is rated as “poor” by the state. The state’s rating is based on sampling conducted by the Pinellas County Department of

Environmental Management (PDEM). The city's ambient monitoring program as well as monitoring conducted for this study affirms these water quality issues.

Stevenson Creek is included on Florida's impaired waters list {303(d) List} due to concerns over dissolved oxygen, fecal coliform bacteria, and nutrients. The FDEP has given Stevenson Creek a priority rating of "High". Stevenson Creek is located in the "Crystal River to St. Petersburg Beach Basin" which is in Group 5 of the basin rotation cycle. TMDL development activity is expected to begin in 2004.

Water quality assessments conducted for this study included the following elements:

- Review of Existing Data,
- Base flow and storm event monitoring program,
- Water quality data interpretation,
- Nonpoint source loading assessment, and
- Fecal contamination source tracking study.

Capital Improvement Projects

The relative scarcity of publicly-owned and vacant land within the watershed limited the range of available alternatives and posed a unique challenge in meeting all the goals of the Watershed Management Plan in a cost effective manner. For this reason, acquisition of private property, including 33 flood-prone or flood-susceptible single-family residential homes, is recommended in order to provide the necessary land for various infrastructure improvement projects that will benefit the watershed as a whole.

In most, but not all cases, it was considered feasible and cost-effective to achieve the adopted flood protection level of service goals. A total of 26 individual capital projects are recommended, consisting of a combination new stormwater management facilities and retrofits to existing facilities and infrastructure. If all recommended projects are implemented, 243 of the identified 334 structure FPLOS deficiencies (73%) will be remedied. Many (28) of the remaining FPLOS deficiencies are located within the coastal high hazard area of Lower Stevenson Creek and are susceptible to flooding from storm surge. Reductions in the riverine floodplain (flooding due to rainfall and runoff) will therefore not remedy these FPLOS deficiencies. The combined projects would remove

FPLOS deficiencies at 33 locations on residential streets, 16 locations on collector roads, and on one arterial road.

Water quality, habitat, erosion and sedimentation projects were developed individually and in conjunction with the recommended flood protection projects wherever feasible. Alternative projects were evaluated with respect to water quality improvement benefits.

Other Improvements/Recommendations

In addition to the capital improvement projects, the WMP includes recommendations for watershed maintenance activities, exotic plant eradication, public education and involvement, and legal and regulatory framework. A more detailed and comprehensive study to pinpoint the source(s) of the fecal coliform bacteria is also recommended. The study would serve as the basis for developing an effective strategy to address the fecal contamination problem.

Capital Costs

For purposes of budgetary planning, cost estimates were made of each recommended capital improvement project. The cost estimates are based on the conceptual design and are subject to change pending completion of a more detailed design process. The total estimated cost of the recommended projects is approximately $27 million, in 2001 dollars, including property acquisition design, and permitting. The magnitude and scope of the recommended improvements, coupled with budgetary constraints, will require phased implementation of the plan over a number of years.

Project Prioritization

Capital projects that can be expected to provide the greatest overall benefit in the most cost effective manner were identified using a project ranking procedure. This management tool is a convenient and effective method of recommending priorities for the allocation of available funding. To help identify the priority projects in the Stevenson Creek Watershed Management Plan, a set of comparative evaluation criteria were identified, and a project ranking matrix was developed. Within each category, individual projects were graded on a scale from 0 to 10, with the lowest score indicating no real benefit and the highest indicating a high beneficial value. The categories considered in the ranking analysis included the following:

- flood control benefits,
- water quality benefits,
- ecological benefits,
- channel erosion and sedimentation control benefits,
- Recreational and Educational Benefits,
- Implementability, and
- Relative Benefits to Cost.

Those projects which serve multiple purposes rank the highest when compared to those with singular objectives. Also apparent is the observation that the projects that rank the highest generally have the highest scores in the relative benefits to cost category.

Through the public meetings, workshops, and meetings among members of the project team, five projects were identified as potentially controversial. These include the highest-ranked project, the Glen Oaks stormwater detention facility. Winning public support for these projects through the City's public information initiatives will be crucial to successful implementation of these projects. The final design and implementation of these projects must be sensitive to resident's potential concerns regarding alternative recreational opportunities, the environment, safety, aesthetics, and property values.

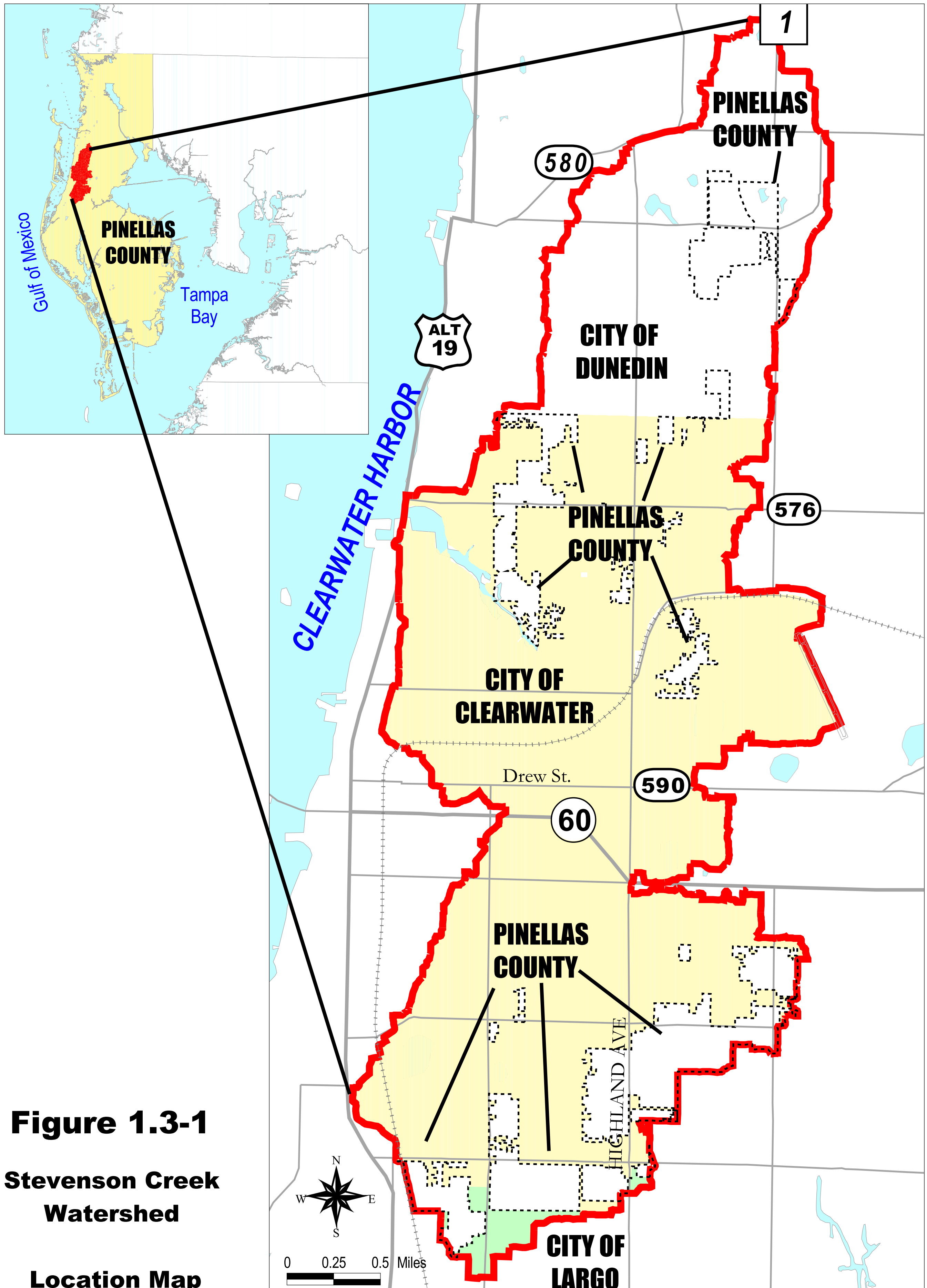


Figure 1.3-1

Stevenson Creek Watershed

Location Map

PARSONS ENGINEERING SCIENCE

PARSONS ENGINEERING SCIENCE, INC.

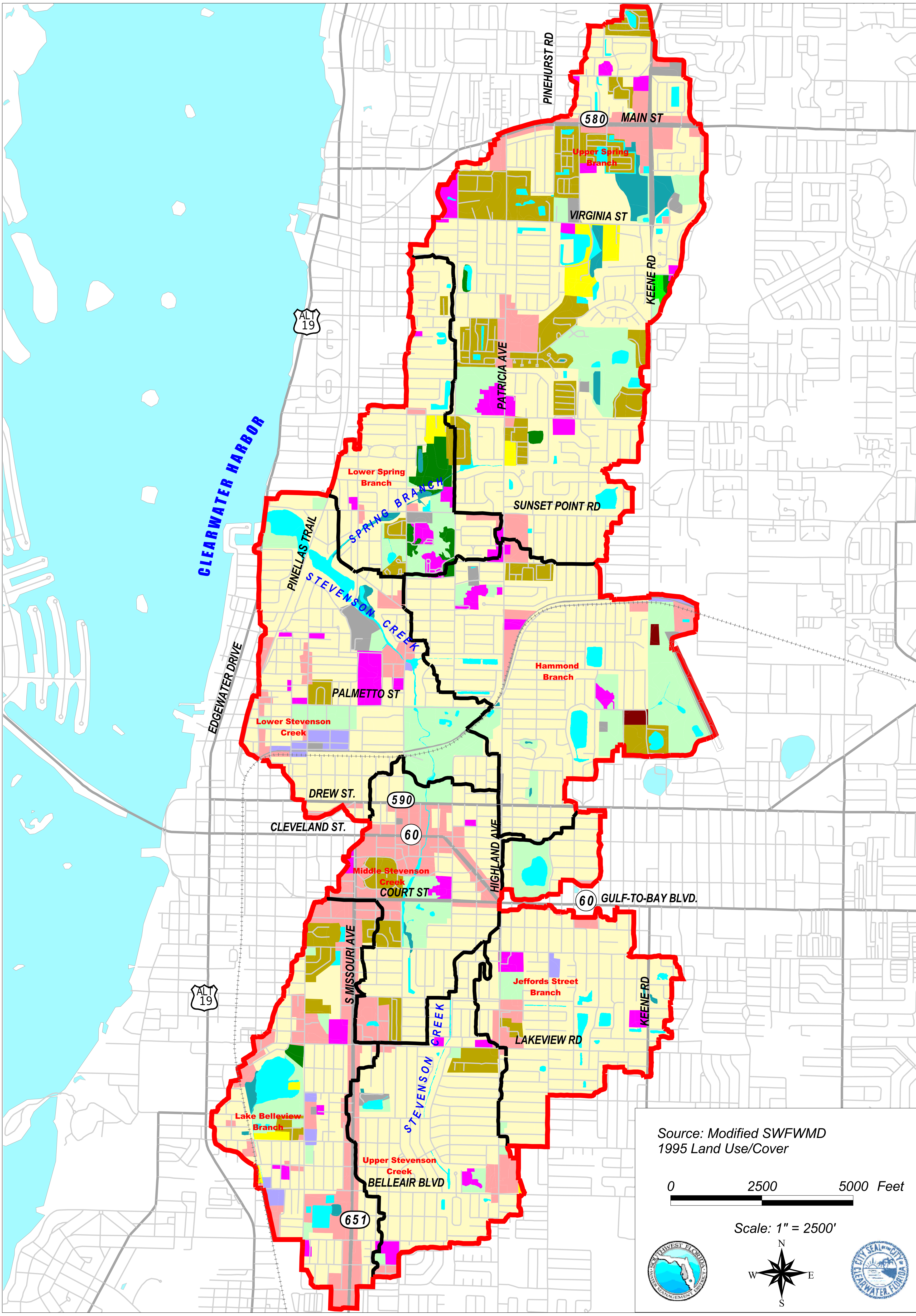


Figure 2.1-2

Stevenson Creek Watershed Land Use Classification Map

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Institutional
- Open Land/Recreation
- Cropland and Pastureland
- Specialty Farms
- Forest
- Wetland
- Transportation, Communications, and Utilities
- Water
- Major Subbasin Delineation
- Watershed Boundary

PARSONS ENGINEERING SCIENCE

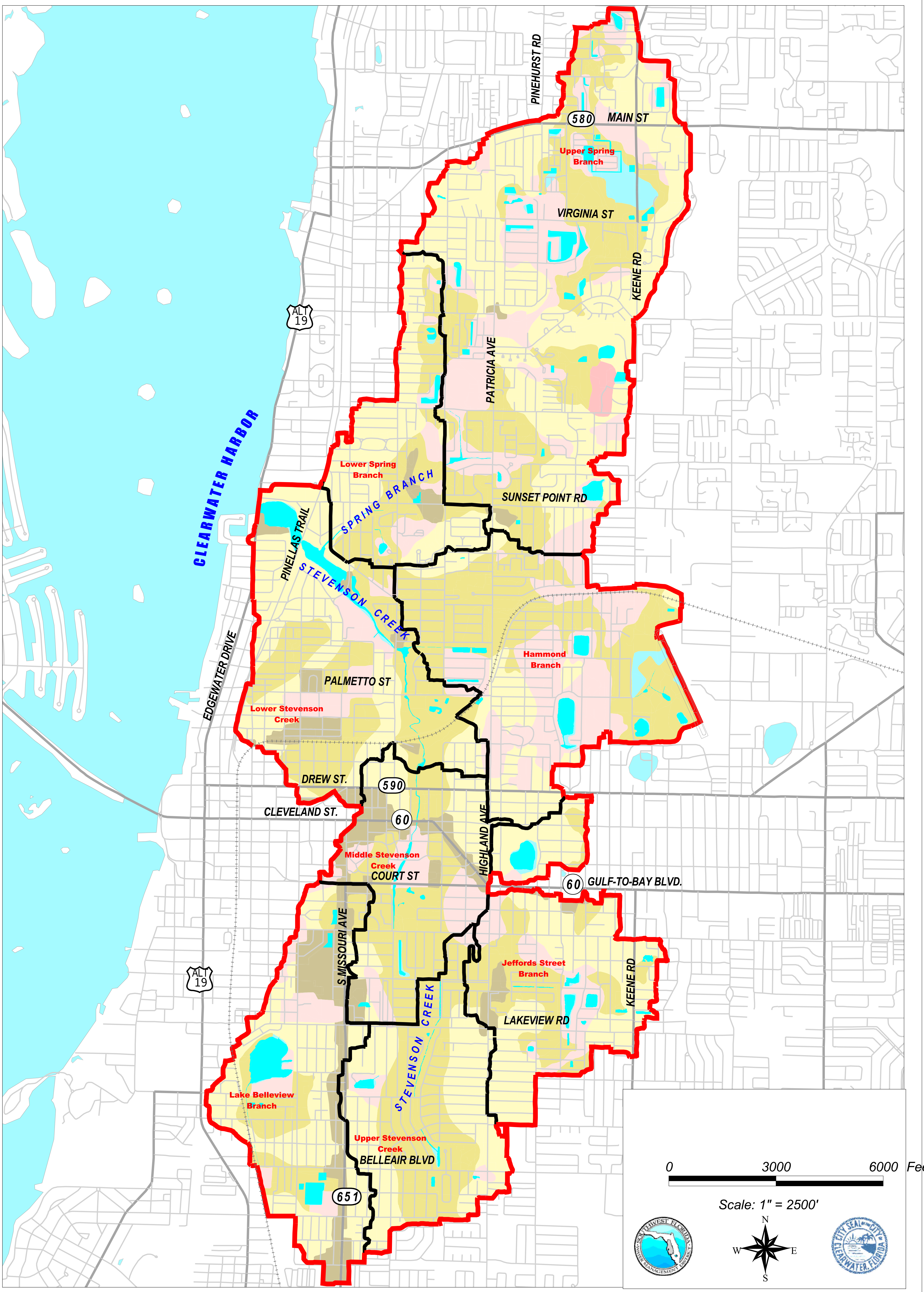


Figure 2.1-3

Stevenson Creek Watershed
Hydrologic Soils Classification

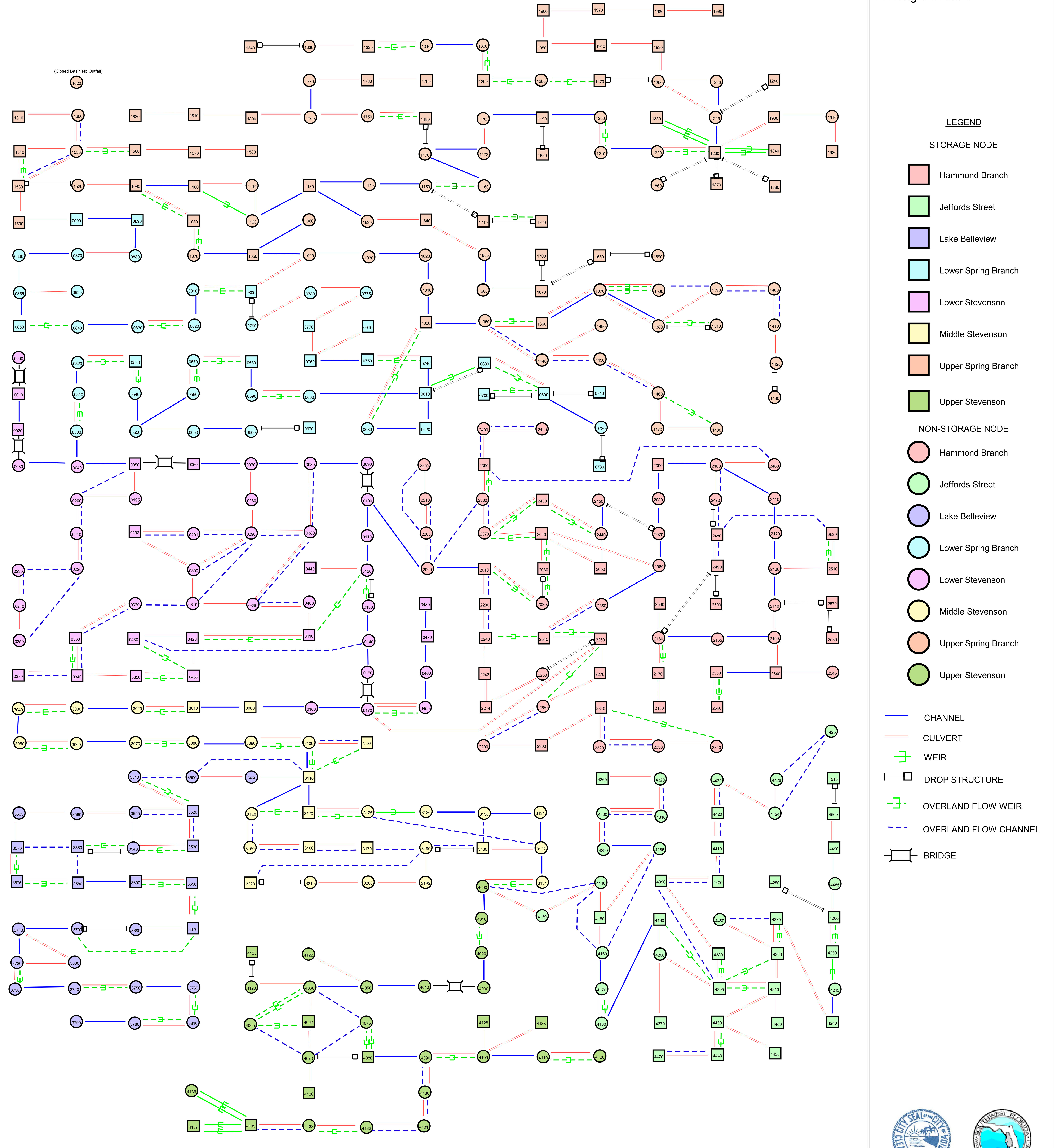
A
B
B/D
C
D
Water

Major Subbasin Delineation
Watershed Boundary

PARSONS ENGINEERING SCIENCE

Figure 2.1.-4

Stevenson Creek Watershed
AdICPR Node-Reach Schematic
Existing Conditions



PARSONS ENGINEERING SCIENCE

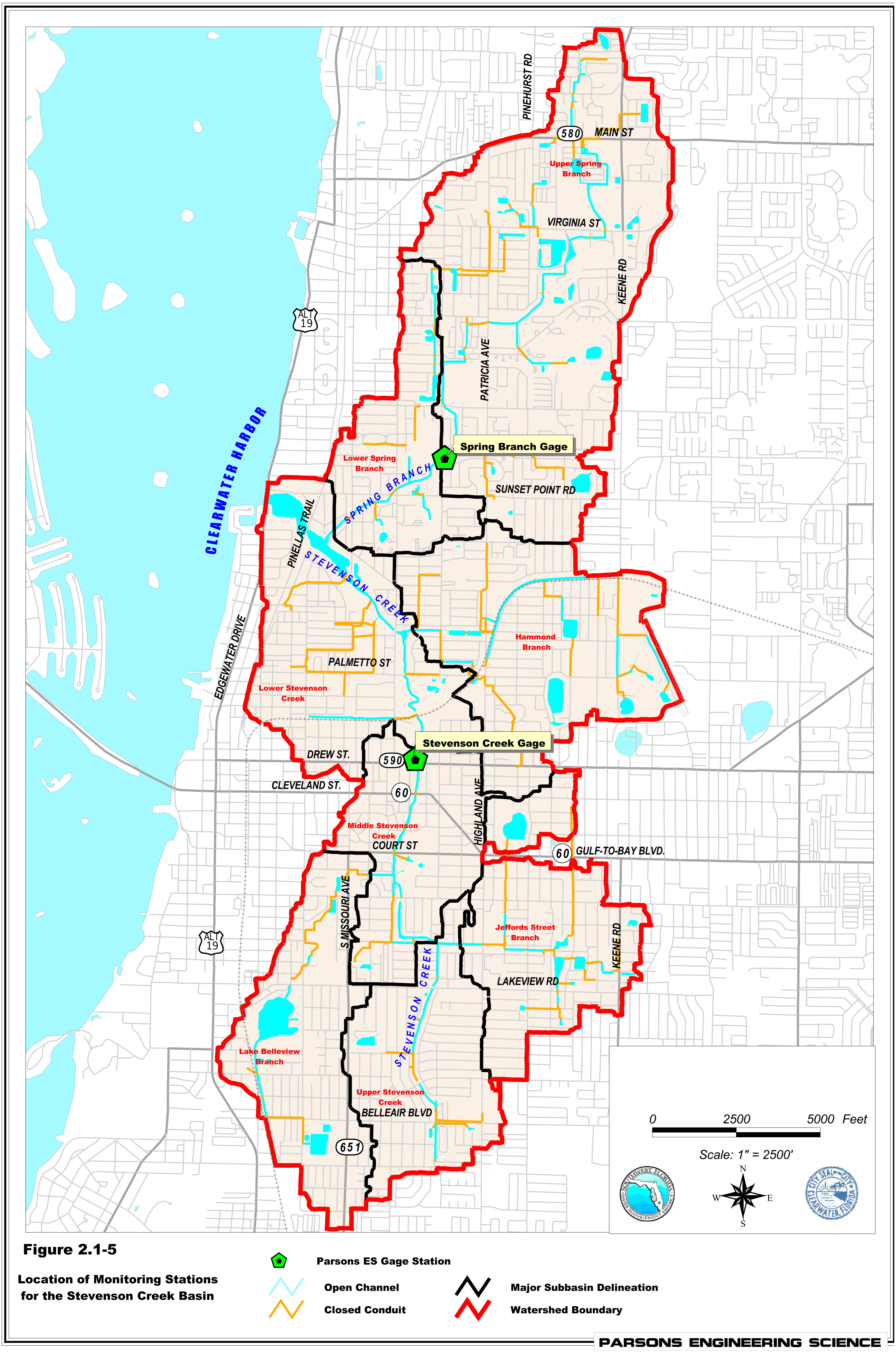


Figure 2.1-5

Location of Monitoring Stations for the Stevenson Creek Basin


CLEARWATER HARBOR
CITY OF DUNEDIN
1. Lower Spring Branch
SPRING BRANCH
STEVENSON CREEK
2. Lower Stevenson Creek
5. Hammond Branch
8. Upper Spring Branch
LAKE LUCILLE
LAKE HOBART
CLEARWATER COUNTRY CLUB
CREST LAKE
3. Middle Stevenson Creek
7. Jeffords Street Branch
LAKE BELLEVUE
6. Lake Bellevue Branch
4. Upper Stevenson
CITY OF LARGO
ALLENS CREEK BASIN
Figure 2.1-15
Stevenson Creek Watershed Existing Conditions 100-and 500-Year Floodplain Map
Existing Flood Plain
Limit of 100 -Year Floodplain
Limit of 500 -Year Floodplain
Lake/Pond
Property Parcel Limit
City of Clearwater Corporate Limits
Railroad
Watershed Boundary
Basin Boundary
Structure Level of Service Deficiency
Street Level of Service Deficiency
Evacuation
Arterial
Collector
Residential
0 600 1200 1800 Feet
SCALE: 1" = 600'
SOURCE:
Property Lines from Pinellas County Property Appraiser
PARSONS ENGINEERING SCIENCE

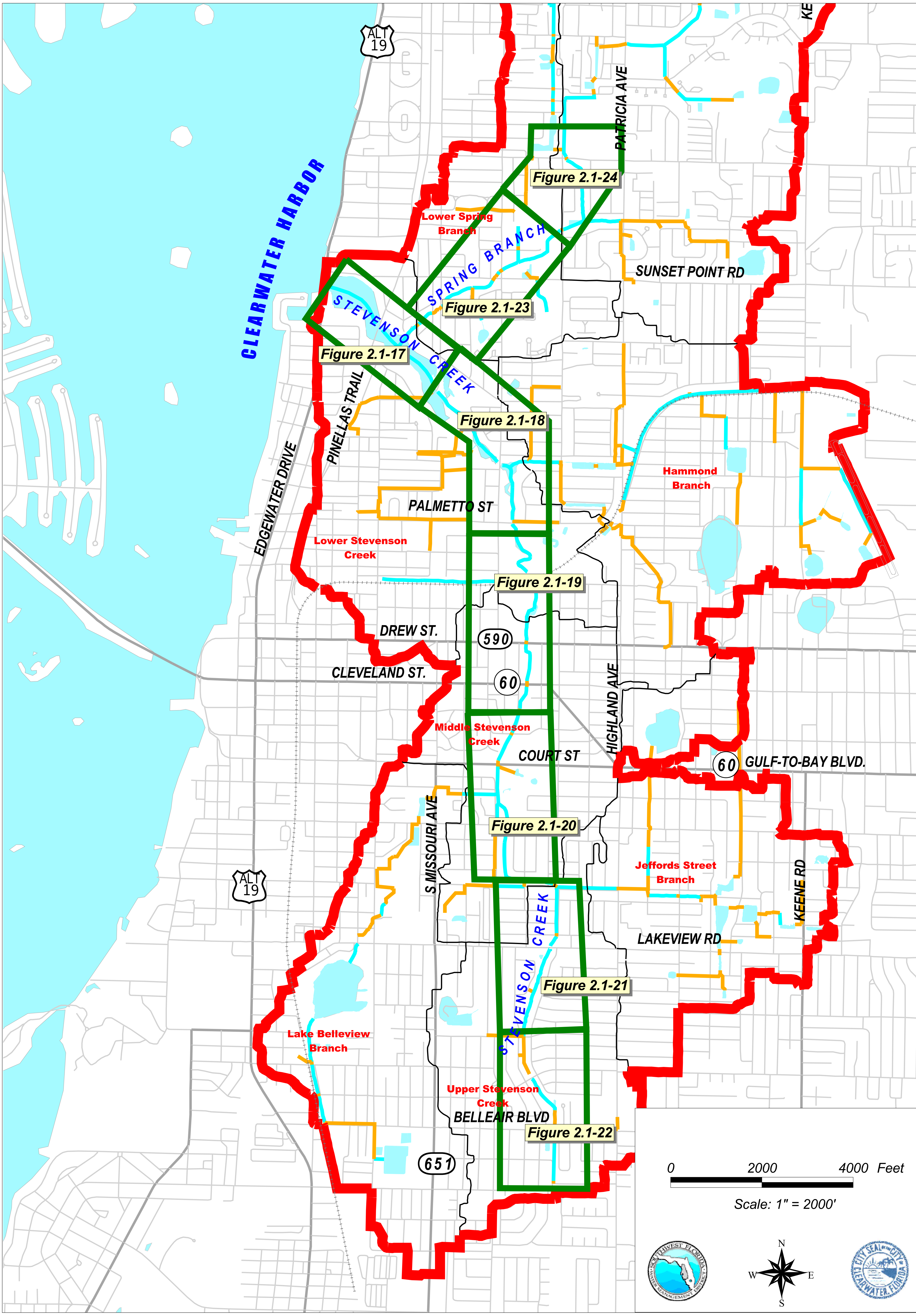


Figure 2.1-16

Stevenson Creek Watershed
Existing Conditions
Flood Profiles Key Map

Figure Extent
Water
Modeled Closed Conduit
Modeled Open Channel
Major Subbasin Delineation
Watershed Boundary

PARSONS ENGINEERING SCIENCE

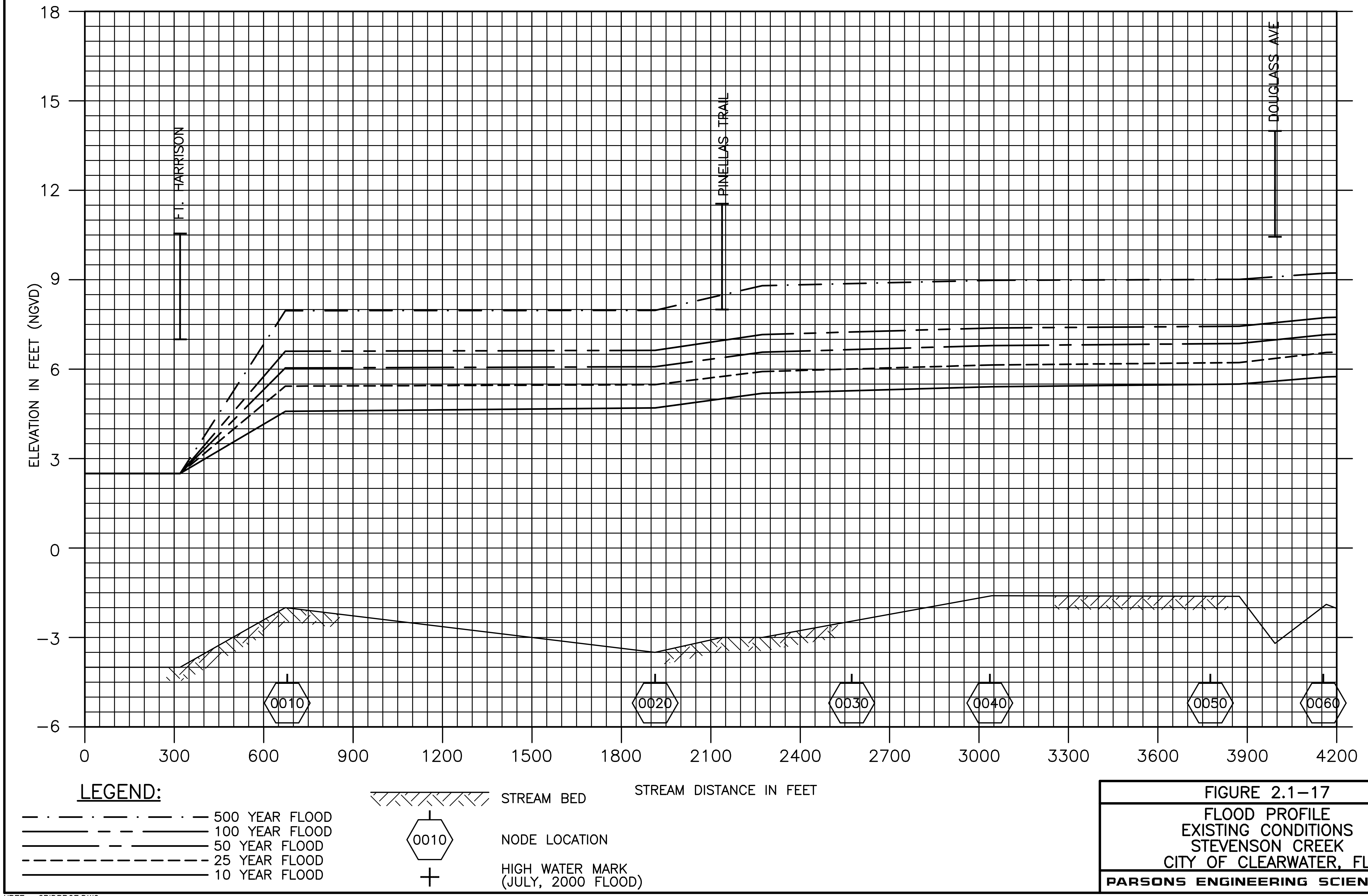


FIGURE 2.1–17

FLOOD PROFILE
EXISTING CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\7626FIG1.dwg, 08/29/2001 at 03:43, NJM, 1

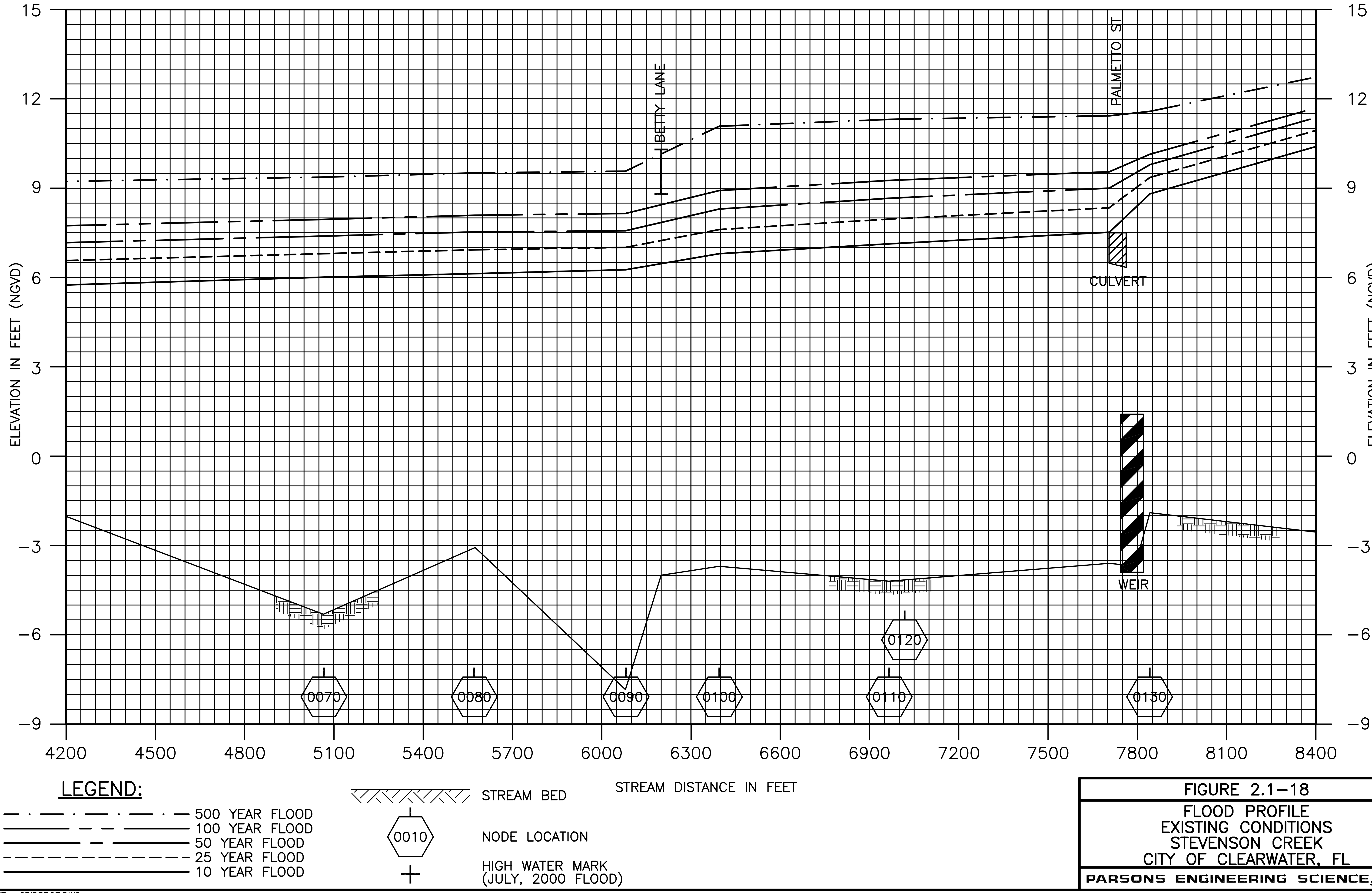


FIGURE 2.1−18

FLOOD PROFILE
EXISTING CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\7626FIG2.dwg, 08/29/2001 at 03:44, NJM, 1

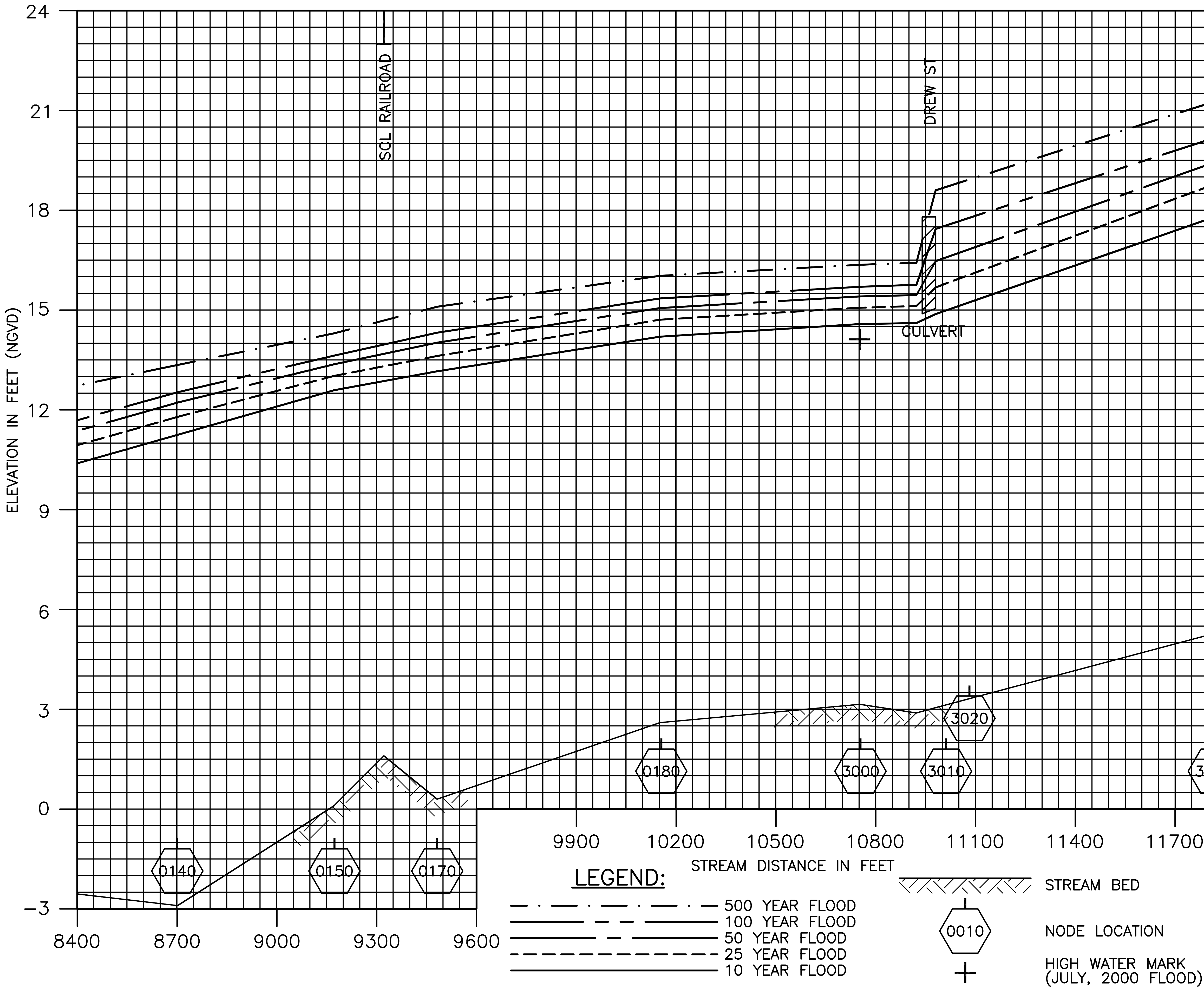
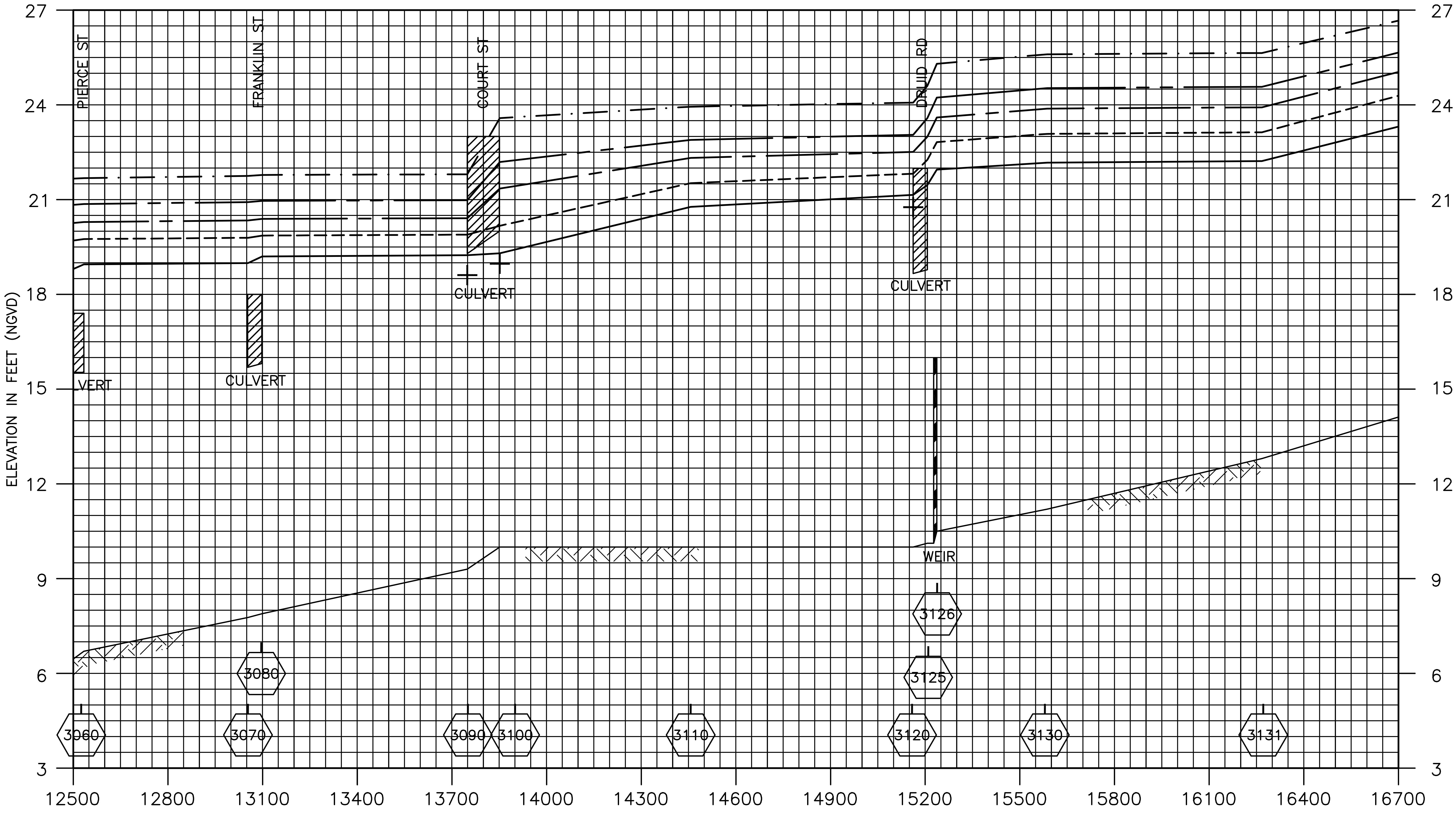


FIGURE 2.1–19

FLOOD PROFILE
EXISTING CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\7626FIG3.dwg, 08/15/2001 at 22:18, NJM, 1



LEGEND:

500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
25 YEAR FLOOD
10 YEAR FLOOD

STREAM BED

0010 NODE LOCATION

HIGH WATER MARK (JULY, 2000 FLOOD)

FIGURE 2.1–20

FLOOD PROFILE
EXISTING CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\7626FIG4.dwg, 08/29/2001 at 03:53, NJM, 1

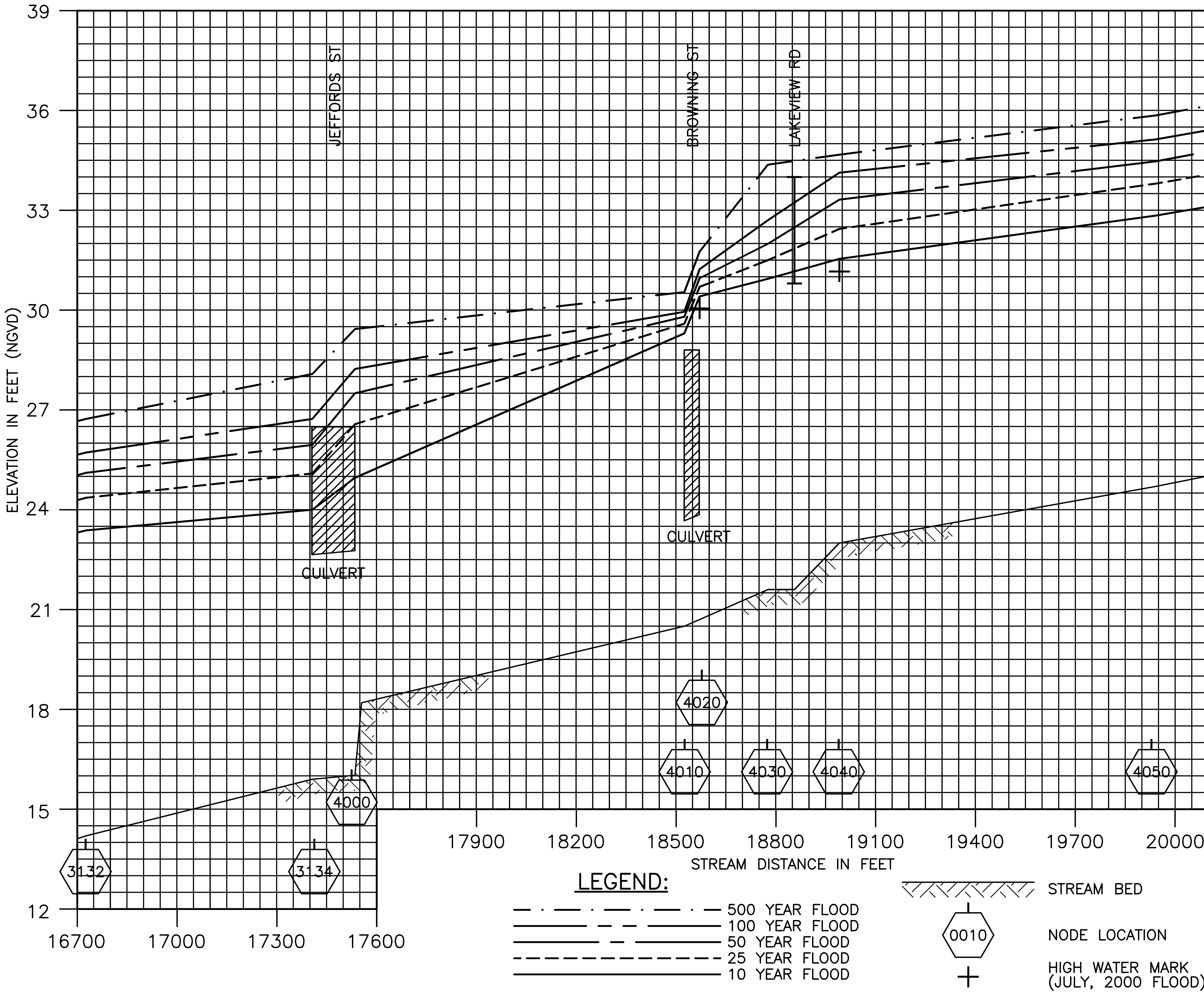
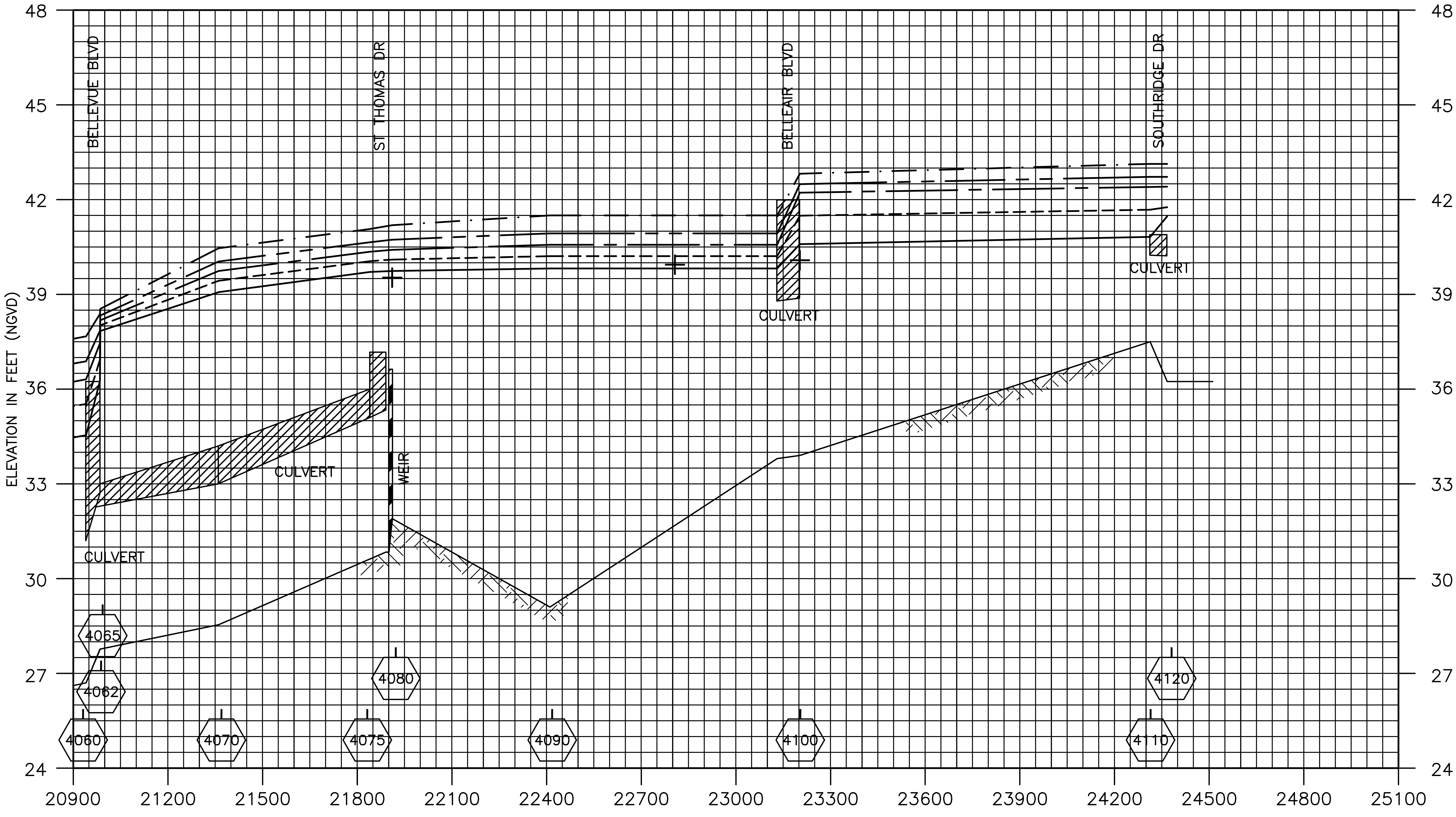


FIGURE 2.1–21

FLOOD PROFILE
EXISTING CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\7626FIG5.dwg, 08/29/2001 at 03:56, NJM, 1



LEGEND:

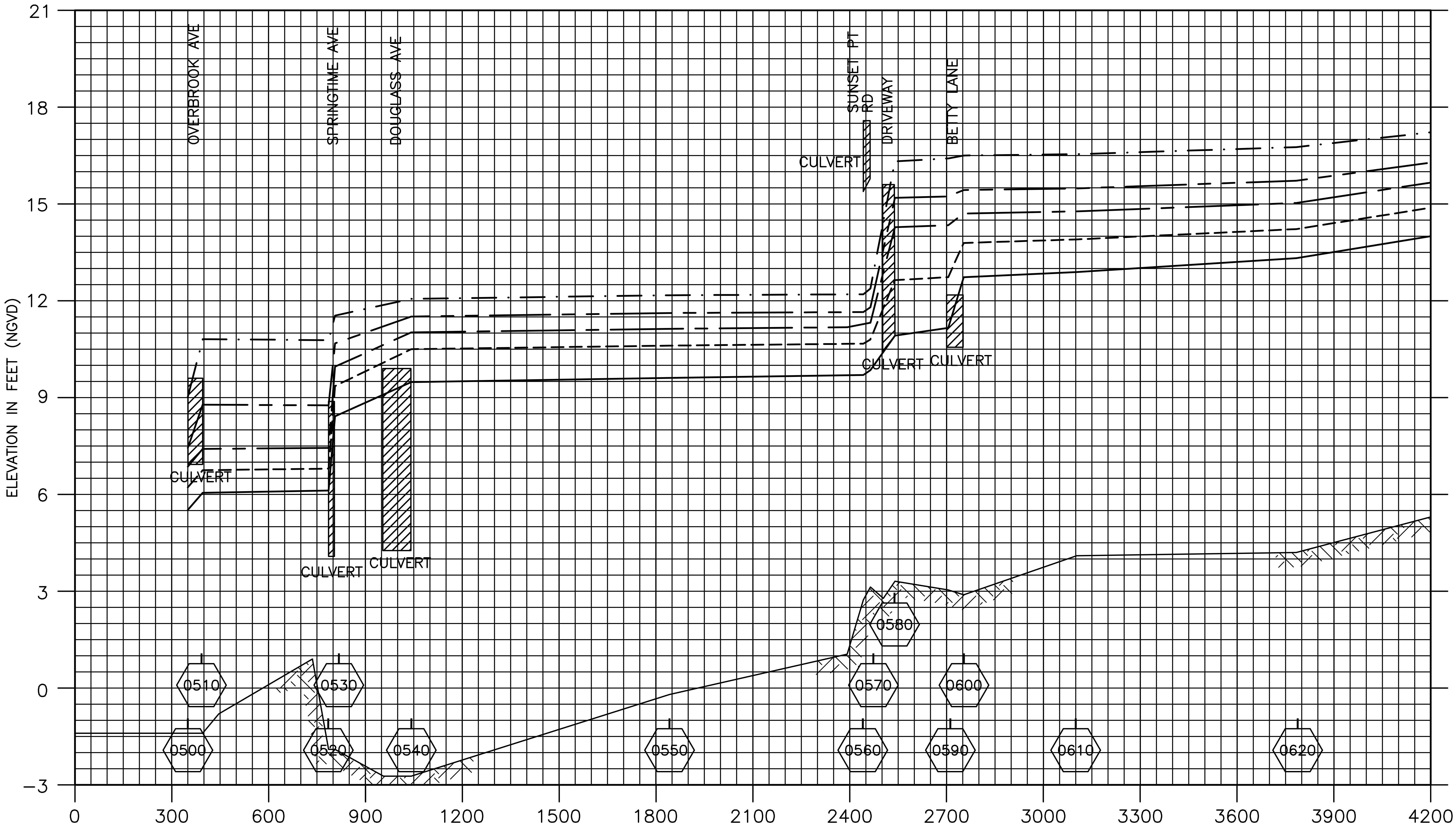
- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 25 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- 0010 NODE LOCATION
- HIGH WATER MARK (JULY, 2000 FLOOD)

FIGURE 2–1.22

FLOOD PROFILE
EXISTING CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\7626FIG6.dwg, 08/29/2001 at 03:57, NJM, 1



LEGEND:

500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
25 YEAR FLOOD
10 YEAR FLOOD

STREAM BED

0010 NODE LOCATION

HIGH WATER MARK (JULY, 2000 FLOOD)

FIGURE 2.1−23
FLOOD PROFILE
EXISTING CONDITIONS
SPRING BRANCH
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF(SPRINGBRANCH).DWG
J:\CADD\737626\STEVENSON\7626FIG7.dwg, 08/29/2001 at 04:03, NJM, 1

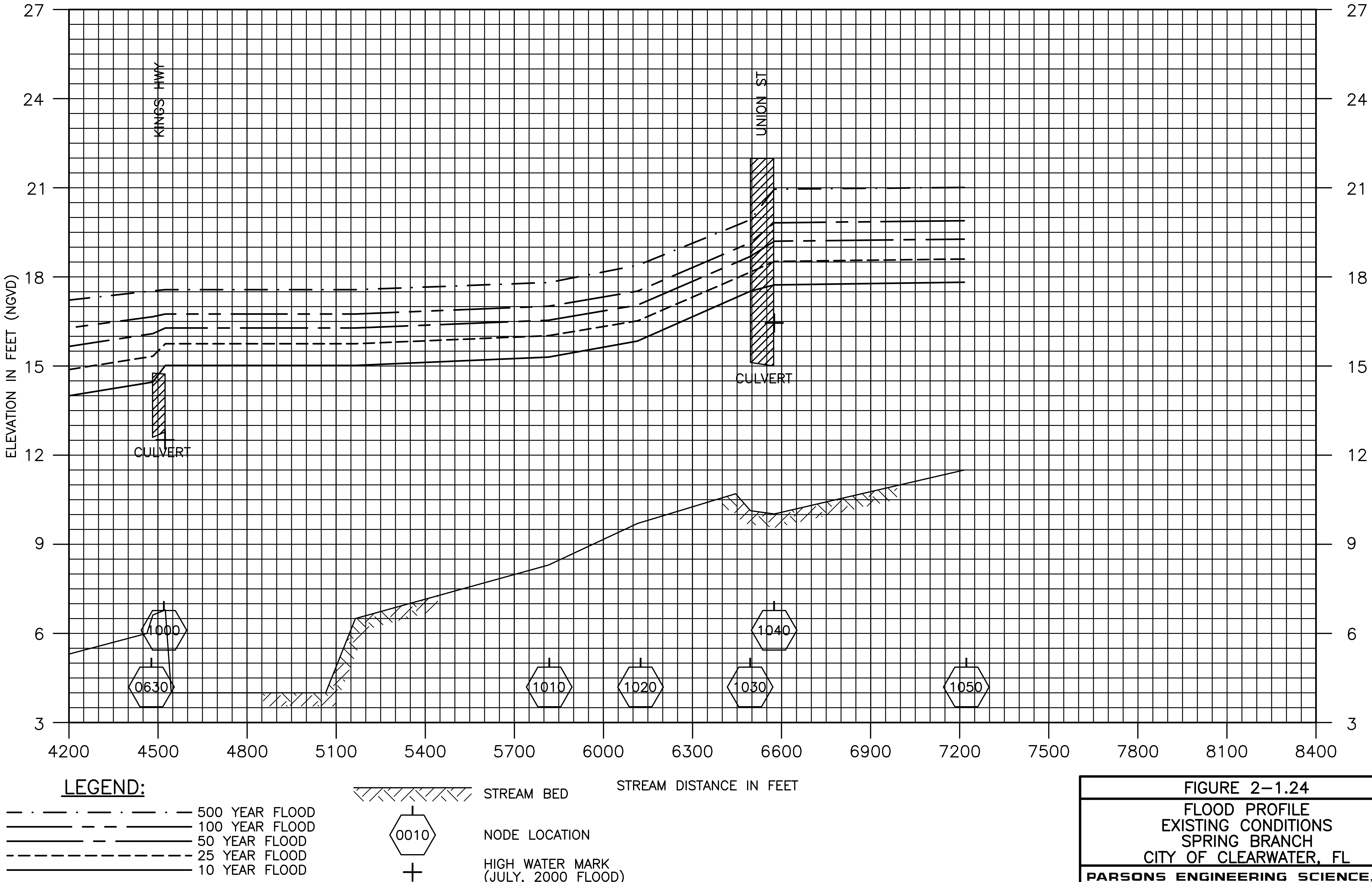


FIGURE 2–1.24

FLOOD PROFILE
EXISTING CONDITIONS
SPRING BRANCH
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF(SPRINGBRANCH).DWG
J:\CADD\737626\STEVENSON\7626FIG8.dwg, 08/29/2001 at 04:05, NJM, 1

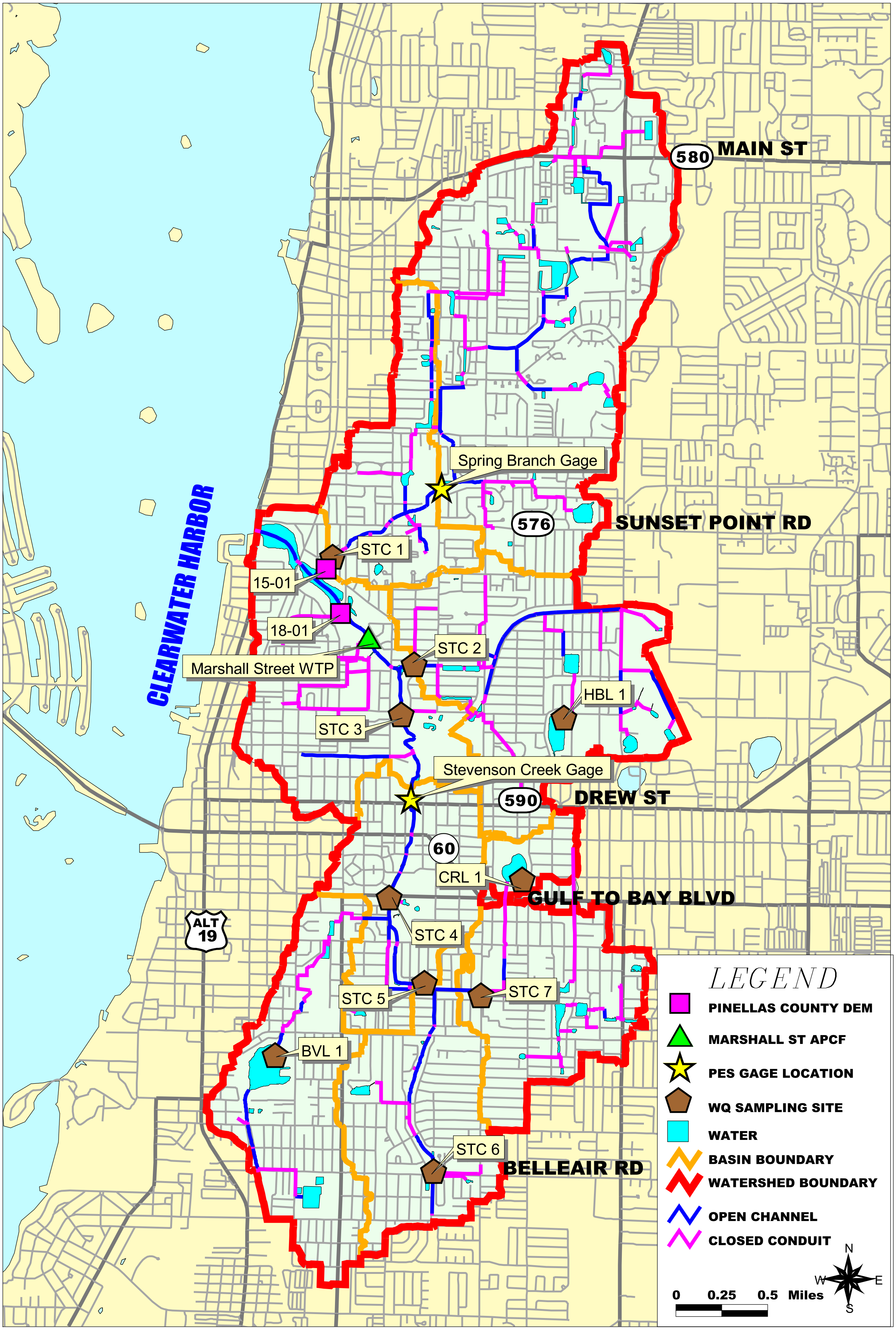


Figure 2.3-1 - Water Quality Monitoring Stations

PARSONS ENGINEERING SCIENCE

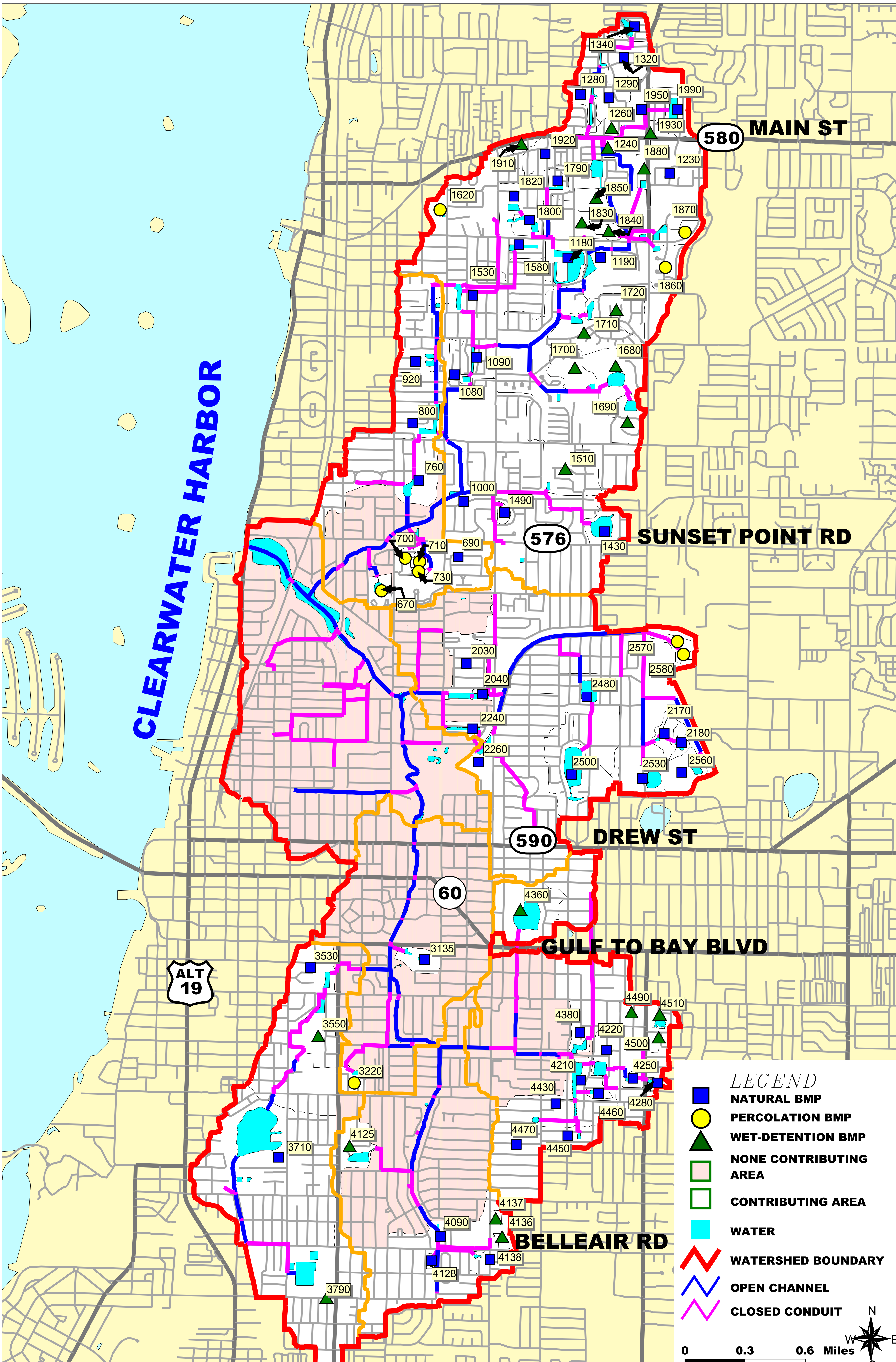


Figure 2.3-11 - Existing Treatment Locations

PARSONS ENGINEERING SCIENCE

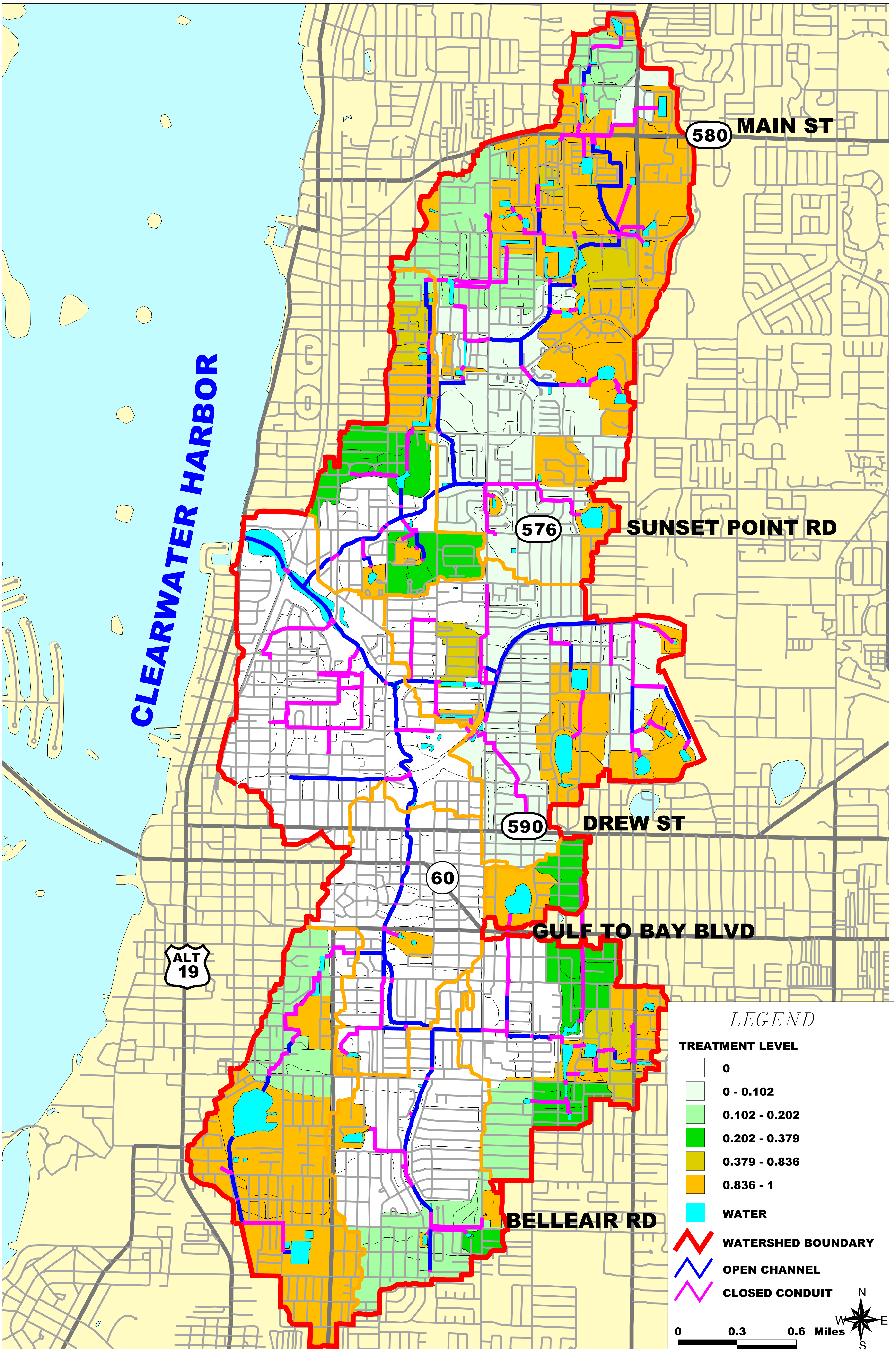


Figure 2.3-12 - Existing Treatment Coverage

PARSONS ENGINEERING SCIENCE

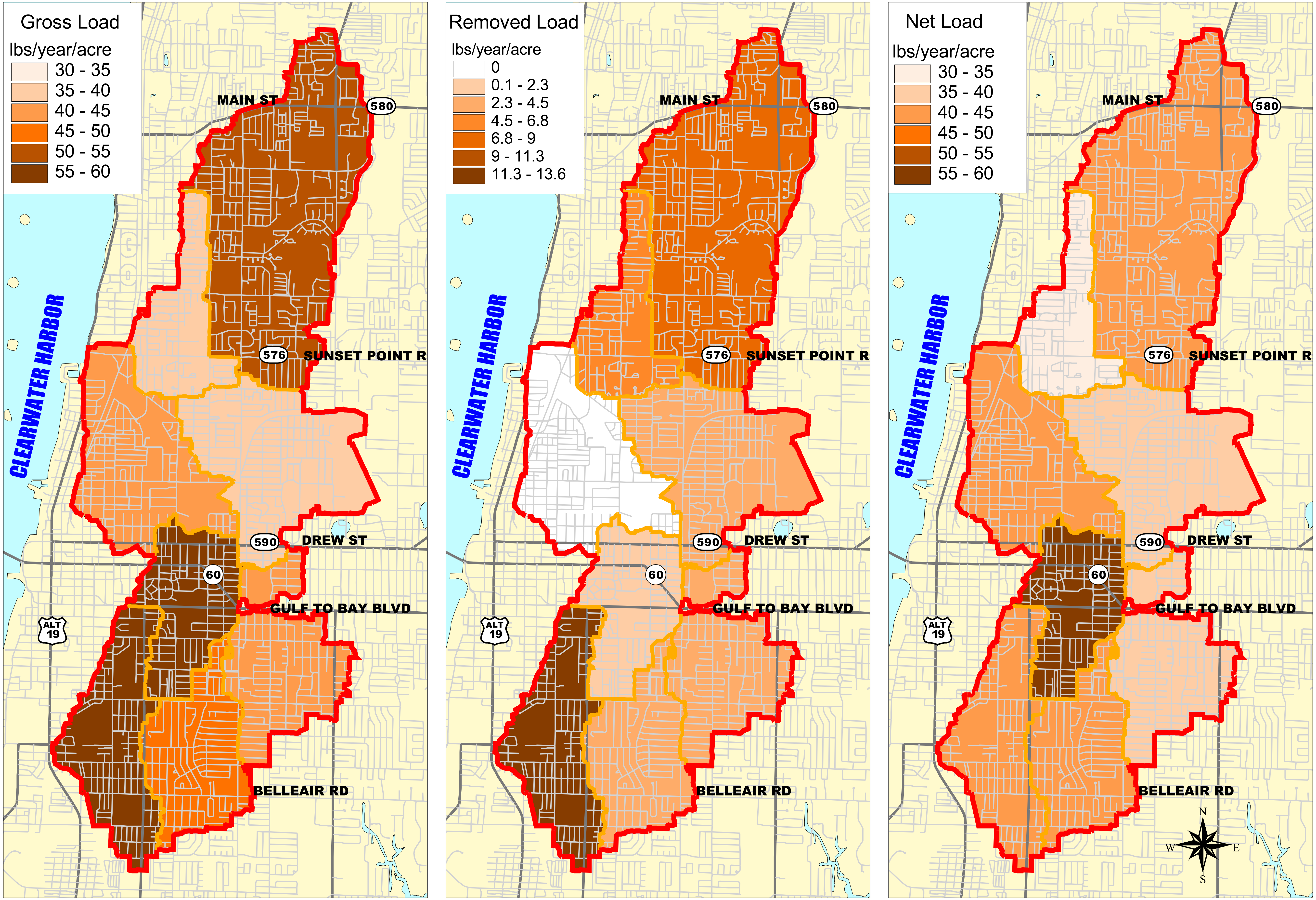


Figure 2.3-13 Major Basin Loading - BOD

PARSONS ENGINEERING SCIENCE

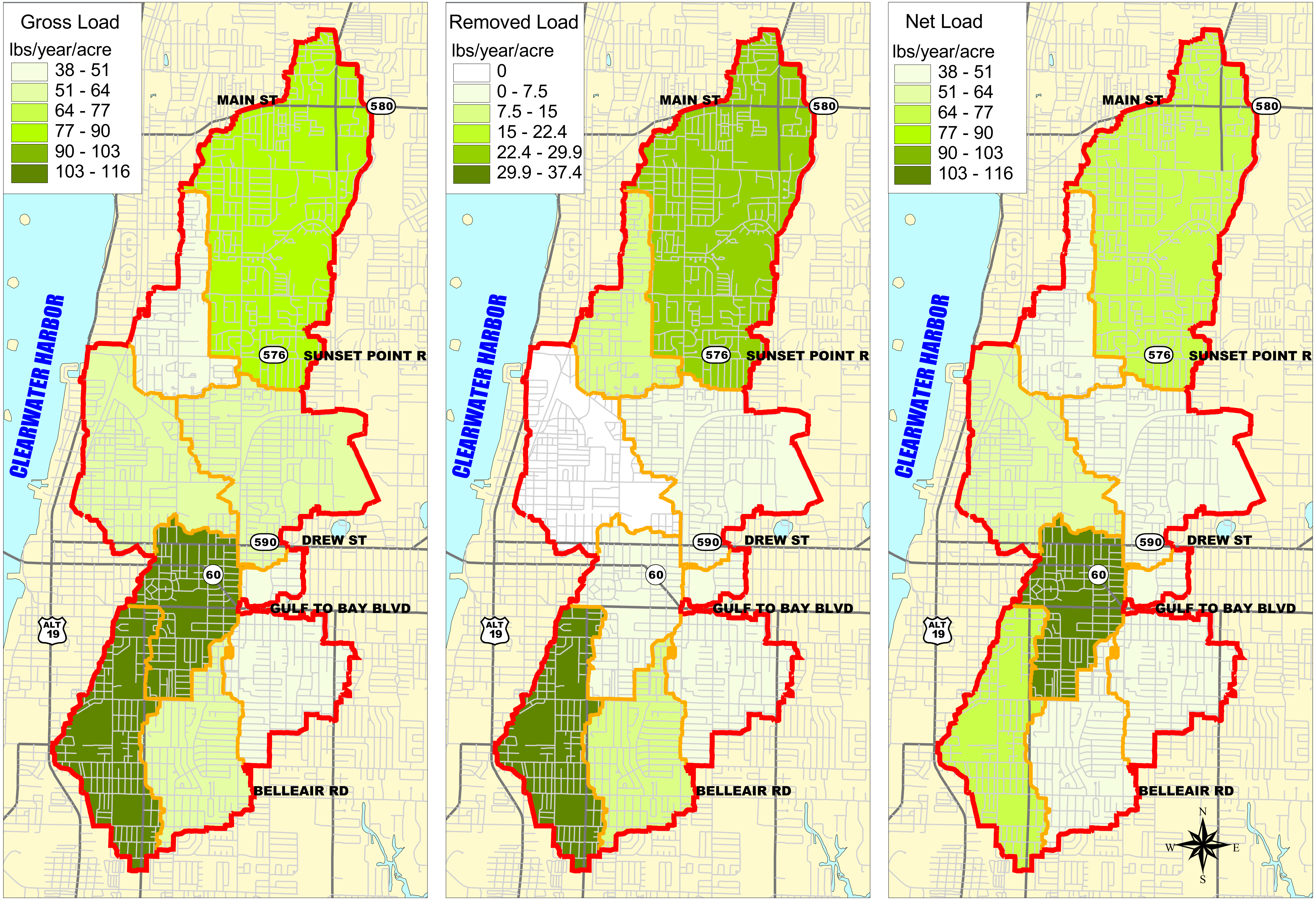


Figure 2.3-14 Major Basin Loading - TSS

PARSONS ENGINEERING SCIENCE

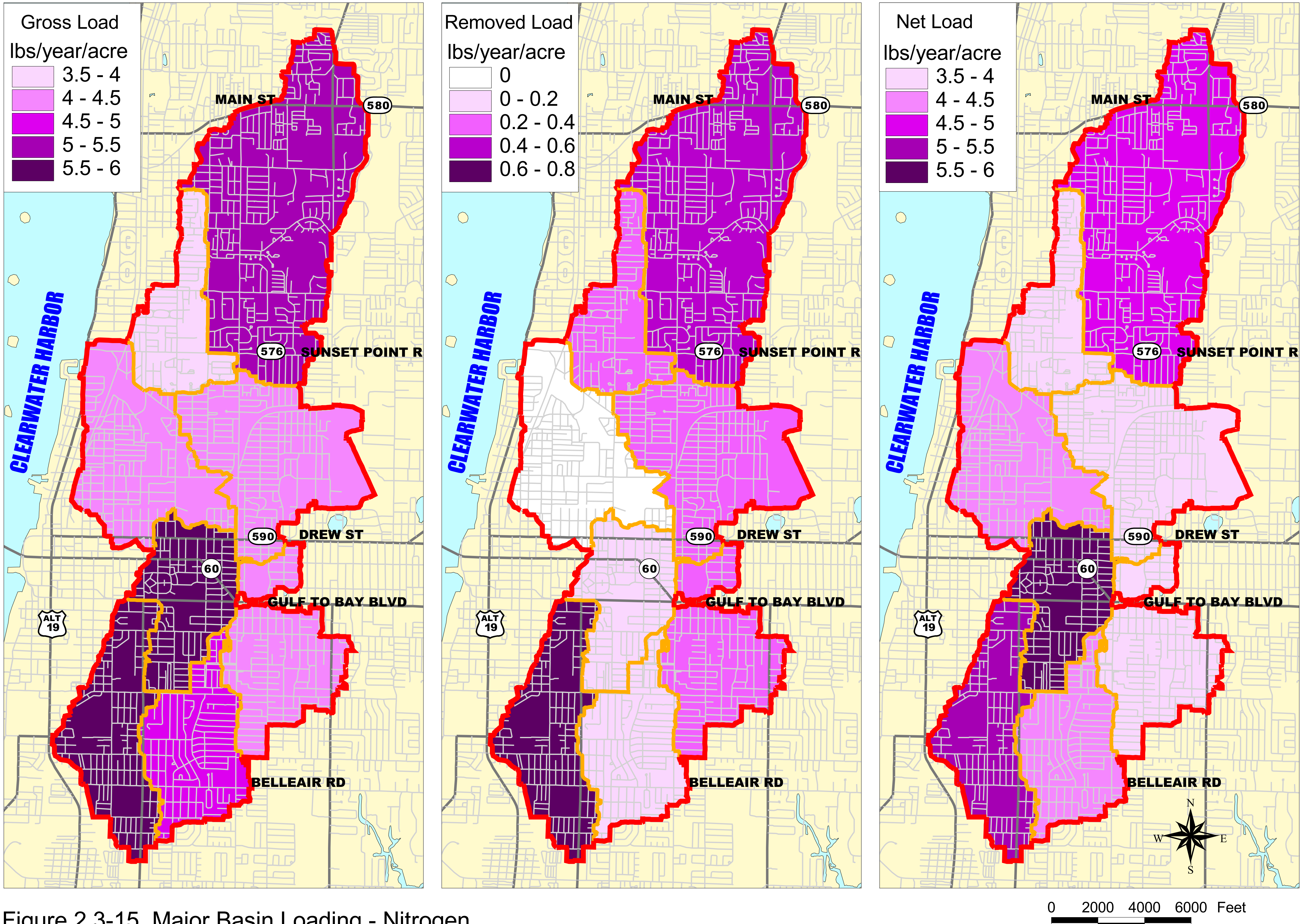


Figure 2.3-15 Major Basin Loading - Nitrogen

PARSONS ENGINEERING SCIENCE

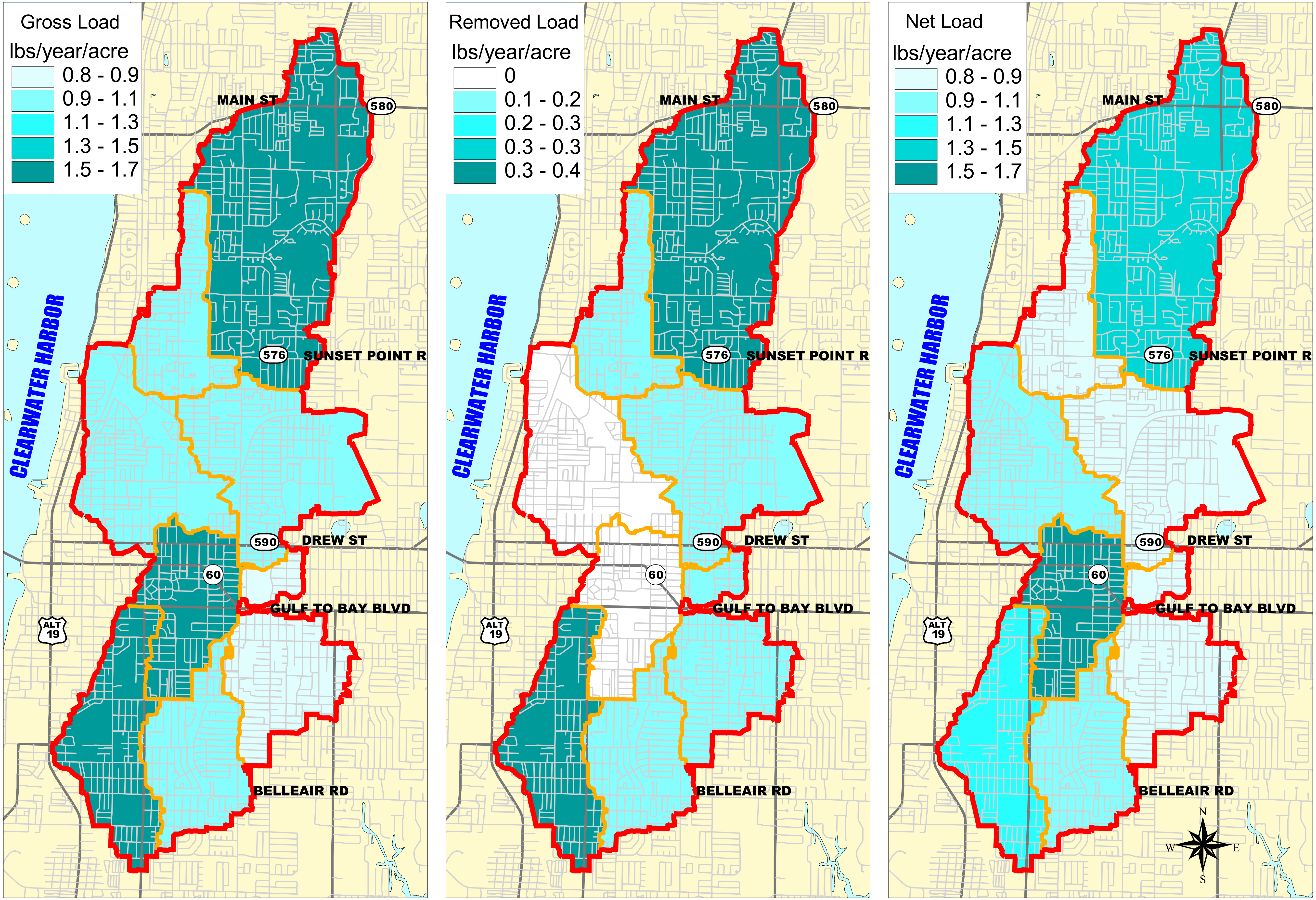


Figure 2.3-16 Major Basin Loading - Phosphorus

PARSONS ENGINEERING SCIENCE

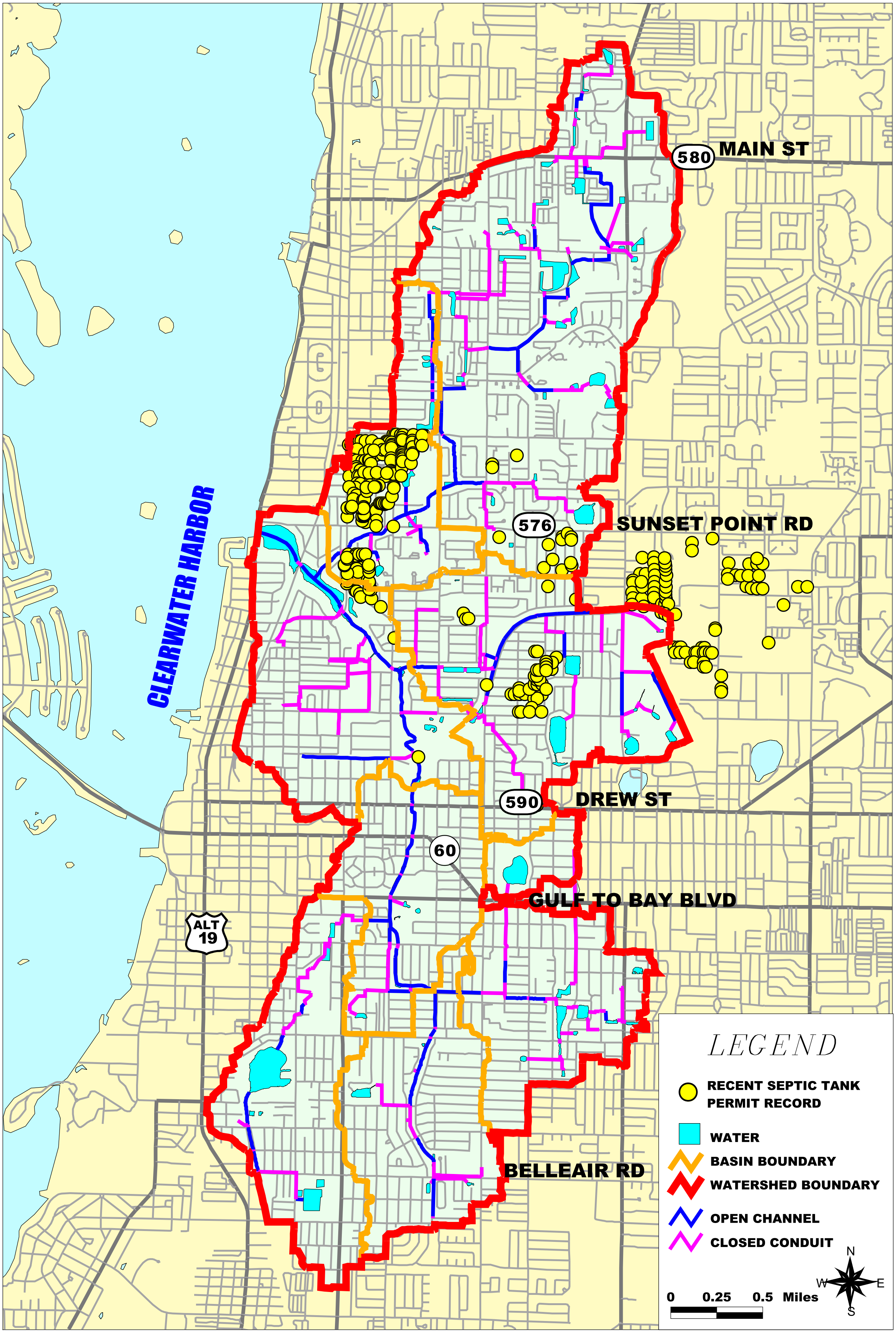


Figure 2.3-3 - Septic Tank Densities

PARSONS ENGINEERING SCIENCE

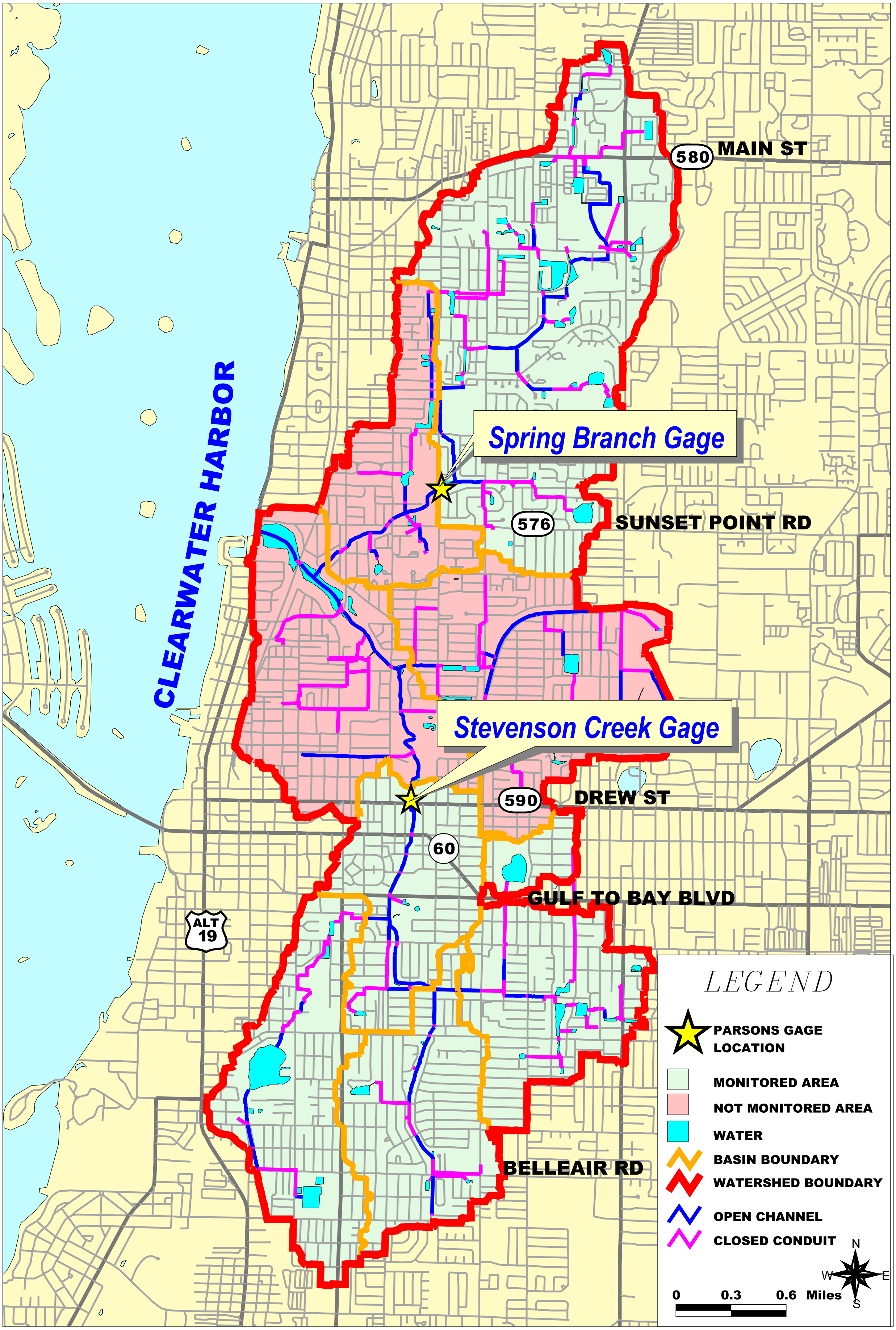
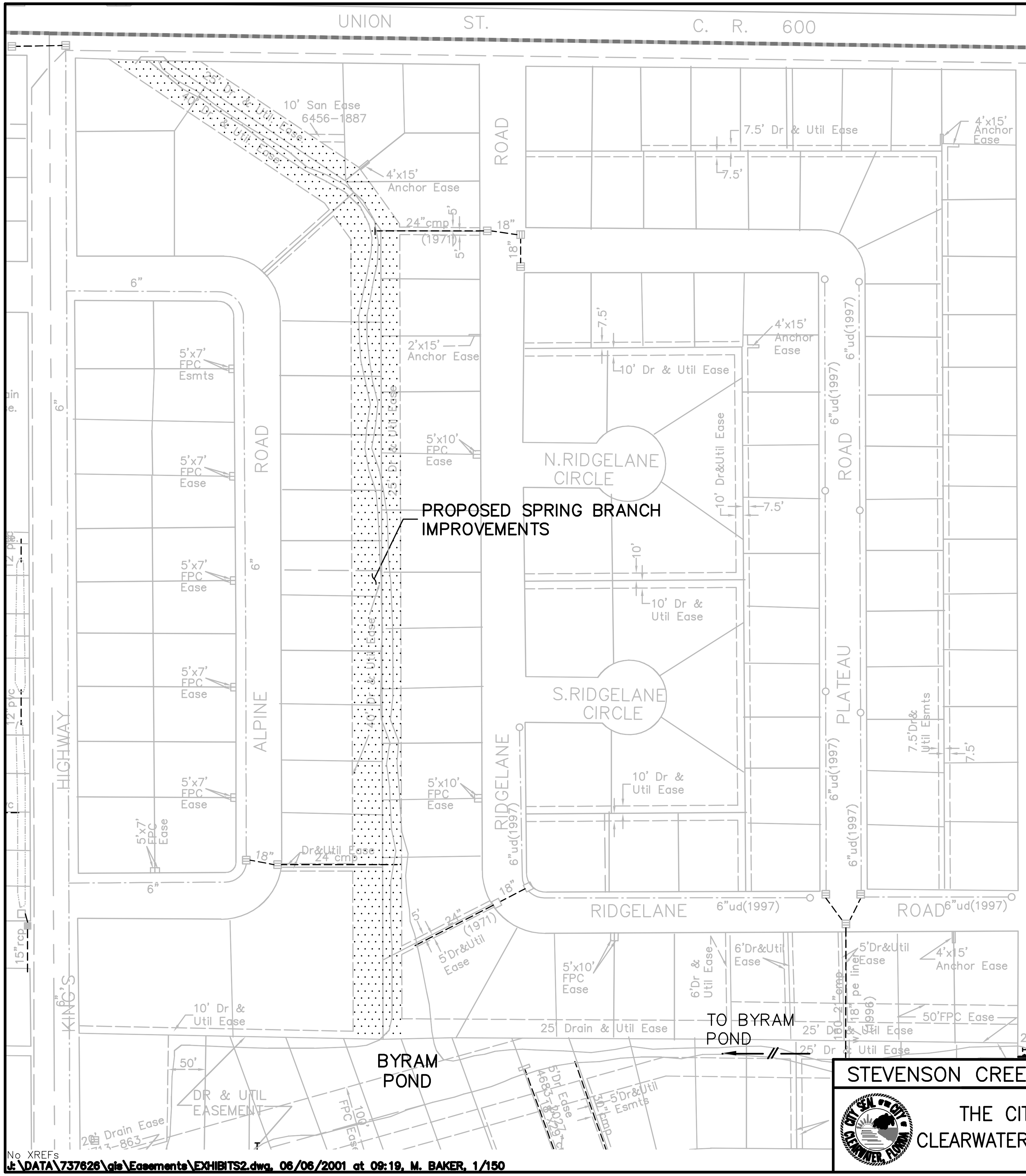
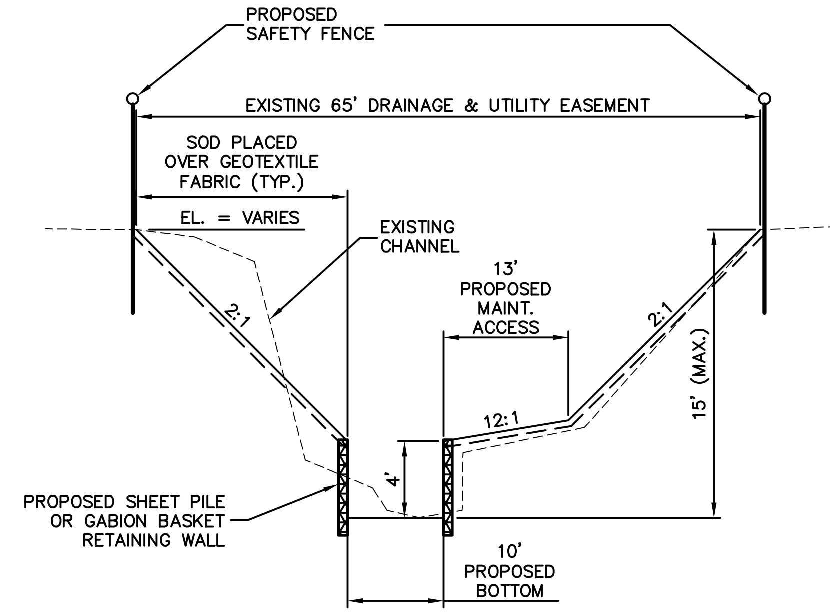


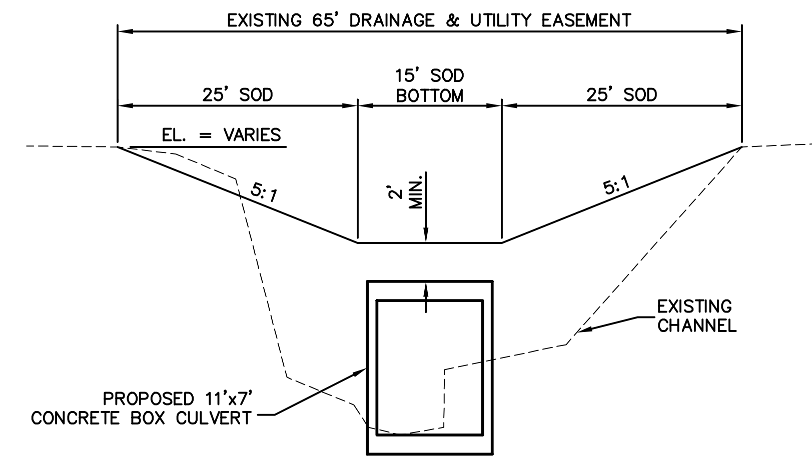
Figure 2.3-4 - Monitoring Station Coverage

CITY OF DUNEDIN
CLEARWATER HARBOR
1. Spring Branch
2. Lower Stevenson Creek
3. Middle Stevenson Creek
4. Upper Stevenson Creek
5. Hammond Branch
6. Lake Bellevue Branch
7. Jeffords Street Branch
SPRING BRANCH
STEVENSON CREEK
BYRAM SUMP
LAKE LUCILLE
LAKE HOBART
CREST LAKE
LAKE BELLEVUE
CLEARWATER COUNTRY CLUB
ALLENS CREEK BASIN
Location #1
Location #2
DREW ST.
CLEVELAND ST
GULF-TO-BAY BLVD.
1A
1B
1C
1D
1E
1F
1G
2A
2B
2C
2D
3A
4A
4B
4C
5A
5B
5C
5D
5E
6A
6B
7A
7B
7C
Figure 3.1-1
Potential Improvement
Projects Locations Map
Stevenson Creek
Watershed Management Plan
Project Number
Existing Lake \ Pond
Proposed Pond
Proposed Wetland / Littoral Zone
Proposed Dry Retention Pond
Existing Open Channel
Proposed Channel Improvements
Existing Pipe
Proposed Pipe
Existing Pipe To Be Abandoned
Proposed Control Structure
Proposed Weir
Watershed Boundary
Subwatershed Boundary
City Limits
0 600 1200 1800 Feet
SCALE: 1" = 600'
SOURCE:
Property Lines from Pinellas County
Propert Appraisal
PARSONS ENGINEERING SCIENCE, INC.

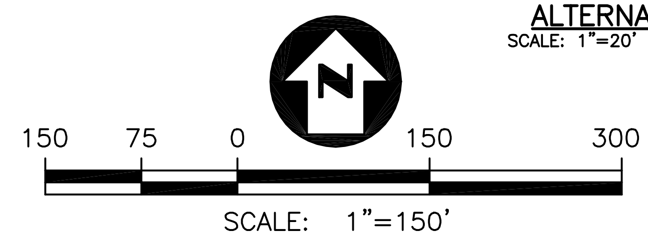




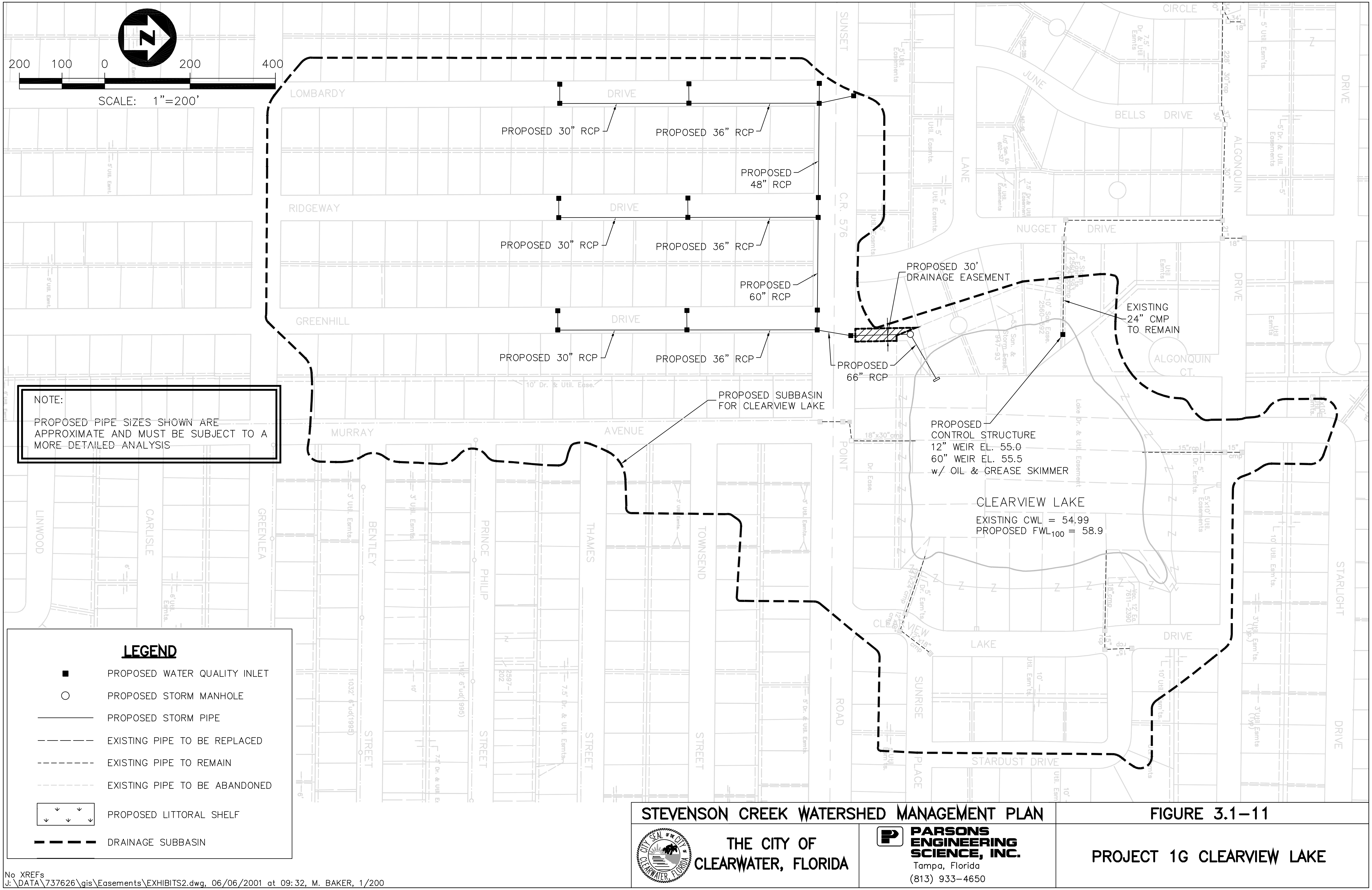
TYPICAL CROSS SECTION
ALTERNATE 'A'
SCALE: 1"=20' H, 1"=10' V



TYPICAL CROSS SECTION
ALTERNATE 'B'
SCALE: 1"=20' H, 1"=10' V



STEVENSON CREEK WATERSHED MANAGEMENT PLAN		FIGURE 3.1-10
THE CITY OF CLEARWATER, FLORIDA	PARSONS ENGINEERING SCIENCE, INC. Tampa, Florida (813) 933-4650	PROJECT 1F SPRING BRANCH STABILIZATION FROM UNION STREET TO BYRAM POND


200 100 0 200 400
SCALE: 1"=200'
LOMBARDY DRIVE
RIDGEWAY DRIVE
GREENHILL DRIVE
MURRAY AVENUE
PROPOSED 30" RCP
PROPOSED 36" RCP
PROPOSED 48" RCP
PROPOSED 60" RCP
PROPOSED 66" RCP
PROPOSED 30' DRAINAGE EASEMENT
EXISTING 24" CMP TO REMAIN
PROPOSED SUBBASIN FOR CLEARVIEW LAKE
PROPOSED CONTROL STRUCTURE
12" WEIR EL. 55.0
60" WEIR EL. 55.5
w/ OIL & GREASE SKIMMER
CLEARVIEW LAKE
EXISTING CWL = 54.99
PROPOSED FWL100 = 58.9
SUNSET POINT ROAD
C.R. 576
NUGGET DRIVE
BELLS DRIVE
JUNE LANE
ALGONQUIN DRIVE
ALGONQUIN CT.
CIRCLE
CLEARVIEW LAKE DRIVE
STARDUST DRIVE
SUNRISE PLACE
STARLIGHT DRIVE
LINWOOD
CARLISLE
GREENLEA
BENTLEY STREET
PRINCE PHILIP STREET
THAMES STREET
TOWNSEND STREET
NOTE:
PROPOSED PIPE SIZES SHOWN ARE APPROXIMATE AND MUST BE SUBJECT TO A MORE DETAILED ANALYSIS
LEGEND
PROPOSED WATER QUALITY INLET
PROPOSED STORM MANHOLE
PROPOSED STORM PIPE
EXISTING PIPE TO BE REPLACED
EXISTING PIPE TO REMAIN
EXISTING PIPE TO BE ABANDONED
PROPOSED LITTORAL SHELF
DRAINAGE SUBBASIN
No XREFs
J:\DATA\737626\gis\Easements\EXHIBITS2.dwg, 06/06/2001 at 09:32, M. BAKER, 1/200
STEVENSON CREEK WATERSHED MANAGEMENT PLAN
THE CITY OF CLEARWATER, FLORIDA
PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650
FIGURE 3.1-11
PROJECT 1G CLEARVIEW LAKE

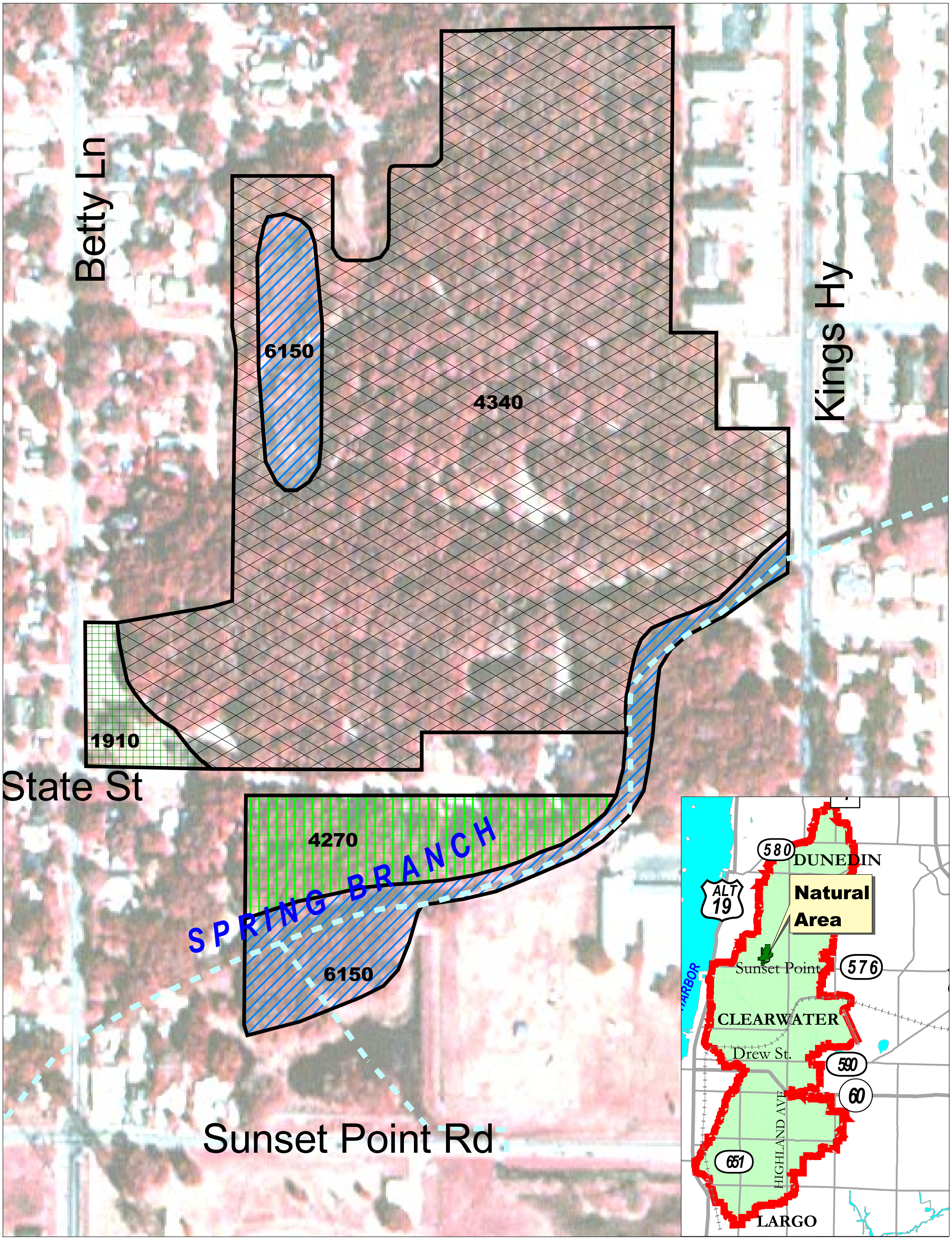


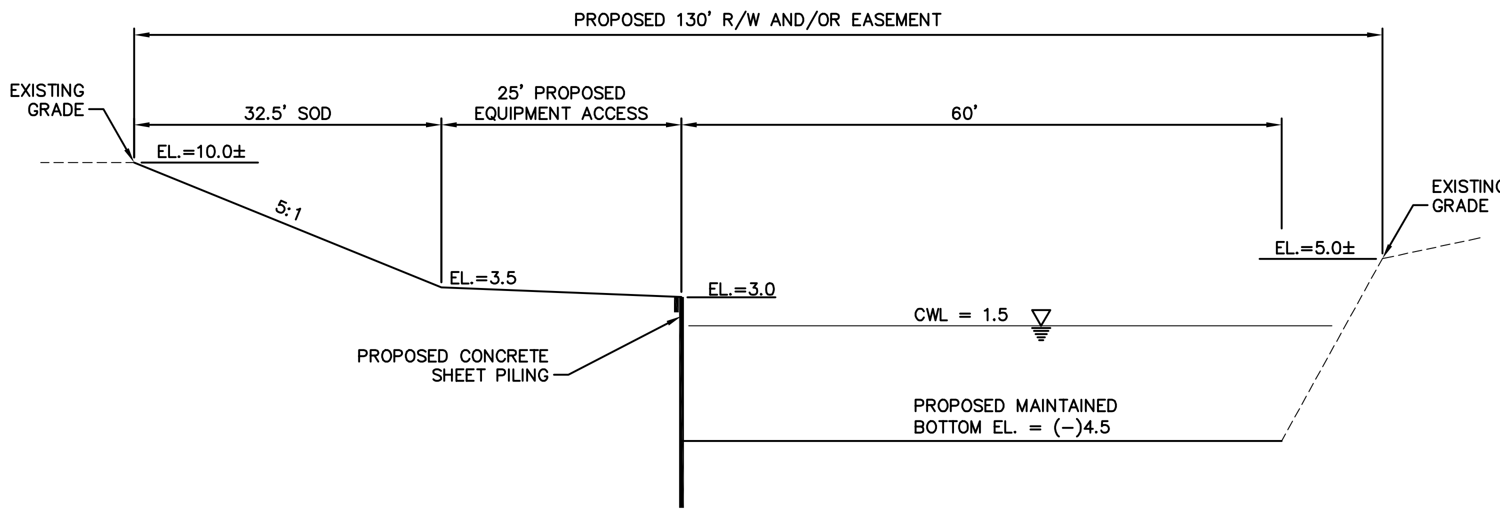
Figure 3.1-12
Stevenson Creek Watershed Potential Natural Resource Improvement Area

1910 - OPEN LAND (W/IN URBAN AREAS)
4270 - LIVE OAK
6150 - WETLANDS - BOTTOMLANDS
4340 - HARDWOOD - CONIFER MIXED

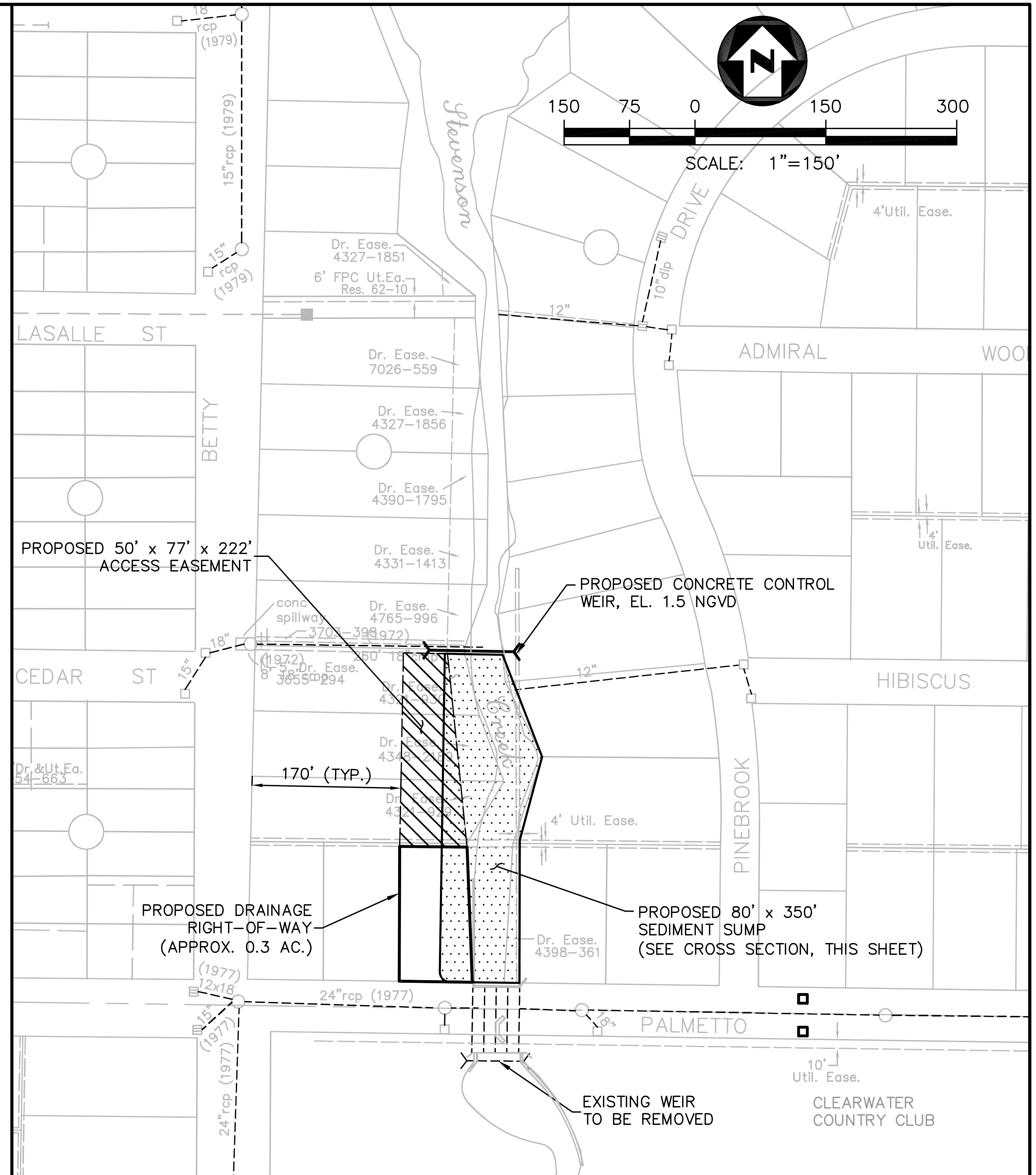
N S W E

0 125 250 Feet

PARSONS ENGINEERING SCIENCE



SEDIMENT SUMP
TYPICAL CROSS SECTION
PROJECT 2A
SCALE: 1"=20' H, 1"= 10' V



STEVENSON CREEK WATERSHED MANAGEMENT PLAN		FIGURE 3.1-13
THE CITY OF CLEARWATER, FLORIDA	PARSONS ENGINEERING SCIENCE, INC. Tampa, Florida (813) 933-4650	PROJECT 2A PALMETTO STREET SEDIMENT SUMP

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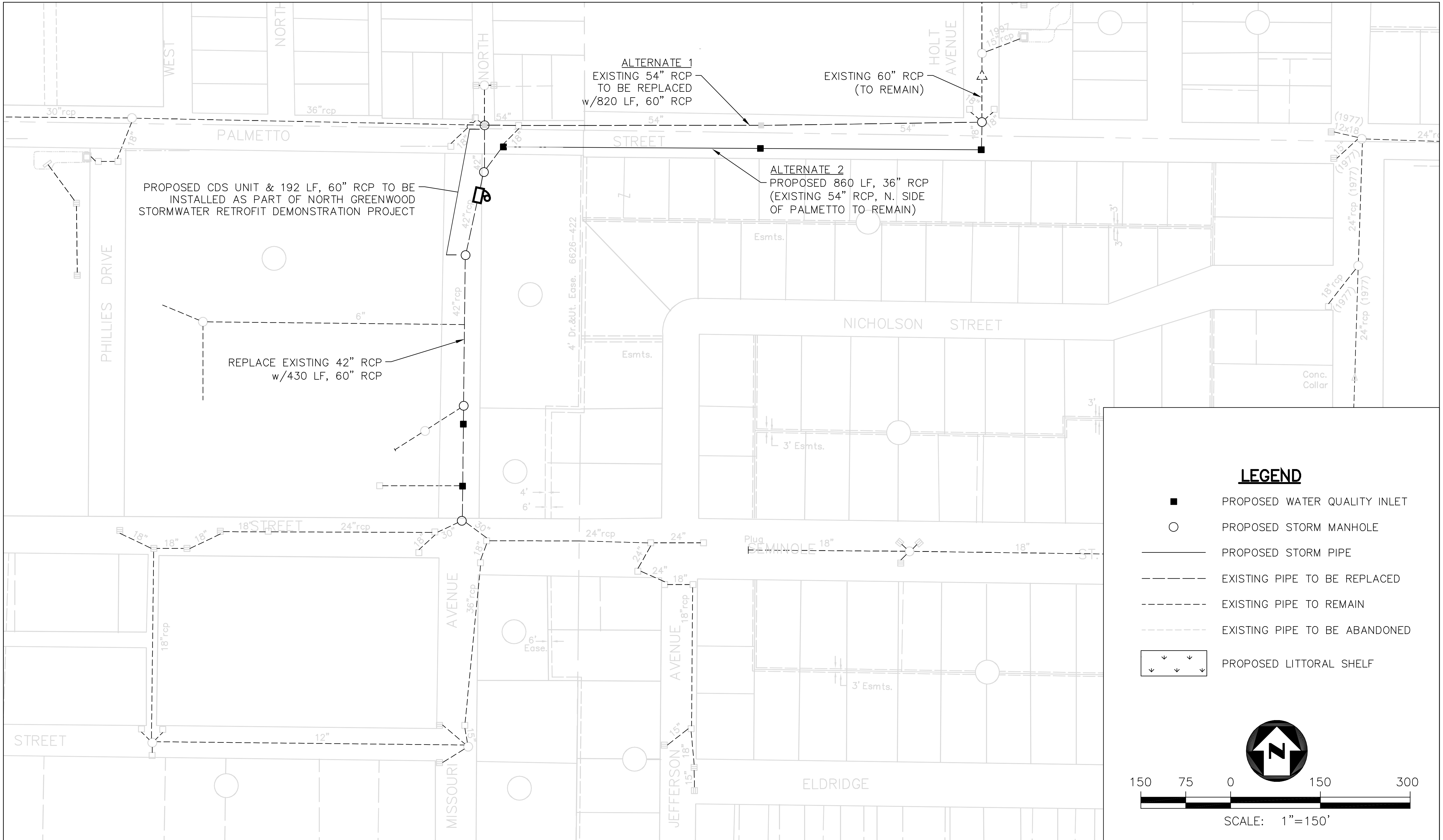

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1-14

PROJECT 2B NORTH MISSOURI AVENUE & PALMETTO STREET DRAINAGE IMPROVEMENTS

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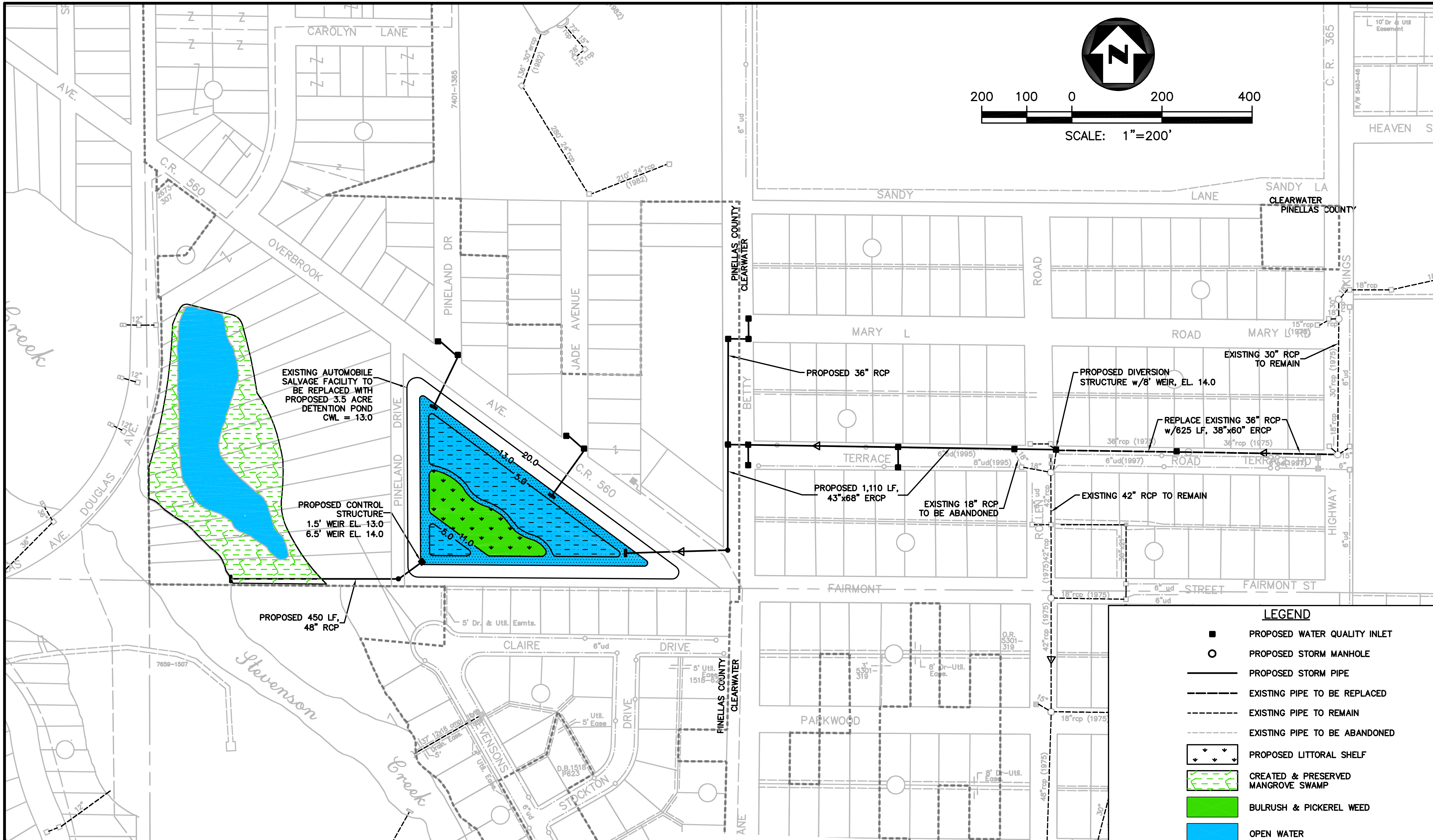

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1-15

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

PROJECT 2D OVERBROOK AVENUE DETENTION POND

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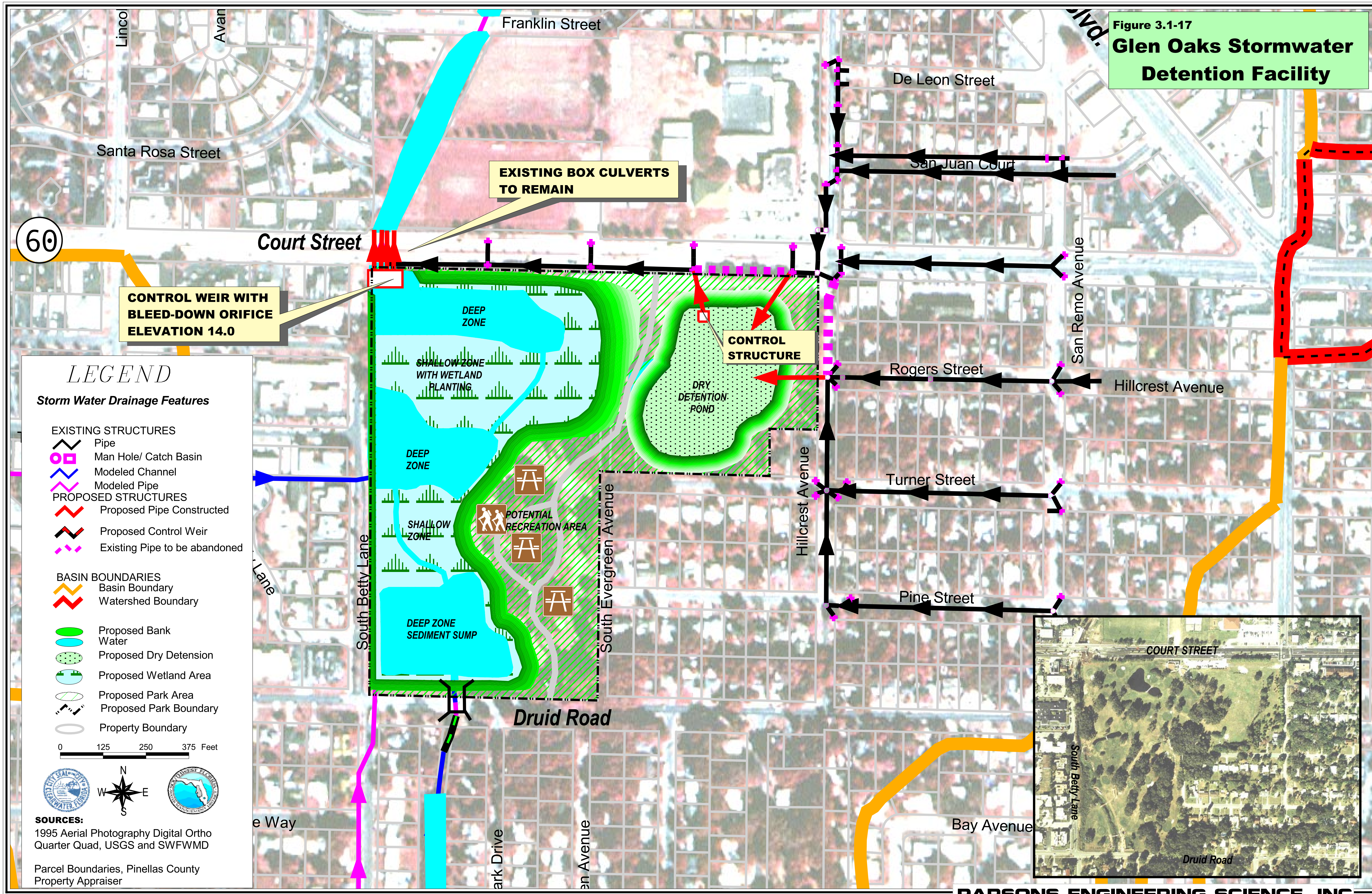
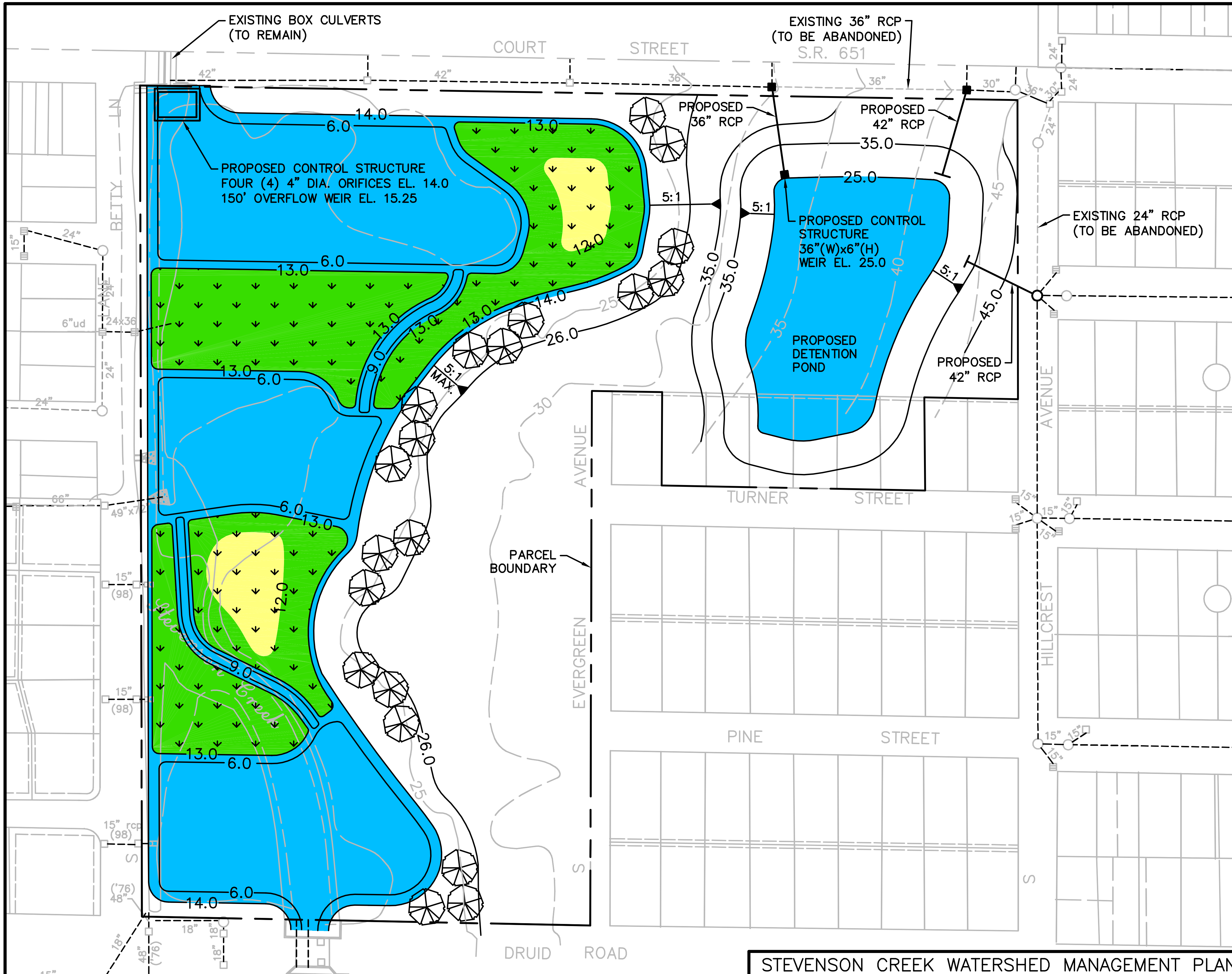


Figure 3.1-17
Glen Oaks Stormwater Detention Facility
Franklin Street
De Leon Street
Santa Rosa Street
San Juan Court
EXISTING BOX CULVERTS TO REMAIN
60
Court Street
San Remo Avenue
CONTROL WEIR WITH BLEED-DOWN ORIFICE ELEVATION 14.0
DEEP ZONE
CONTROL STRUCTURE
SHALLOW ZONE WITH WETLAND PLANTING
Rogers Street
Hillcrest Avenue
DRY DETENTION POND
DEEP ZONE
Turner Street
SHALLOW ZONE
POTENTIAL RECREATION AREA
Hillcrest Avenue
South Evergreen Avenue
South Betty Lane
Pine Street
DEEP ZONE SEDIMENT SUMP
Druid Road
Bay Avenue
COURT STREET
South Betty Lane
Druid Road
LEGEND
Storm Water Drainage Features
EXISTING STRUCTURES
Pipe
Man Hole/ Catch Basin
Modeled Channel
Modeled Pipe
PROPOSED STRUCTURES
Proposed Pipe Constructed
Proposed Control Weir
Existing Pipe to be abandoned
BASIN BOUNDARIES
Basin Boundary
Watershed Boundary
Proposed Bank
Water
Proposed Dry Detension
Proposed Wetland Area
Proposed Park Area
Proposed Park Boundary
Property Boundary
0 125 250 375 Feet
N W E S
SOURCES:
1995 Aerial Photography Digital Ortho Quarter Quad, USGS and SWFWMD
Parcel Boundaries, Pinellas County Property Appraiser
PARSONS ENGINEERING SCIENCE, INC.



N

150 75 0 150 300

SCALE: 1"=150'

LEGEND

- PROPOSED WATER QUALITY INLET
- PROPOSED STORM MANHOLE
- PROPOSED STORM PIPE
- EXISTING PIPE TO BE REPLACED
- EXISTING PIPE TO REMAIN
- EXISTING PIPE TO BE ABANDONED
- PROPOSED LITTORAL SHELF
- DRAINAGE SUBBASIN
- PICKEREL WEED, ARROWHEAD BULRUSH
- WATER LILIES SPATTER DOCK
- OPEN WATER
- PROPOSED TREE

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1–18

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933–4650

PROJECT 3A GLEN OAKS STORMWATER DETENTION FACILITY

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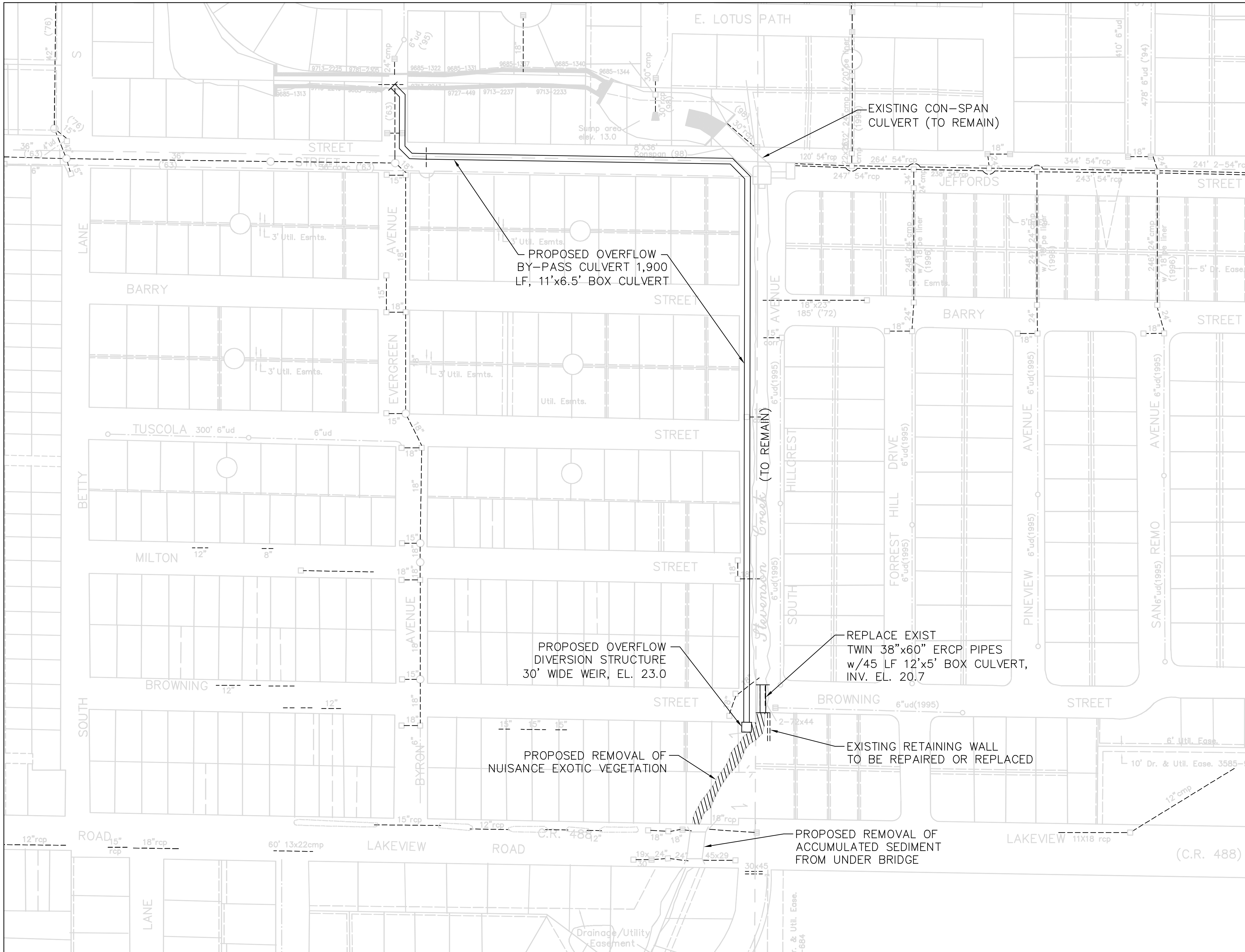

200 100 0 200 400

SCALE: 1"=200'

LEGEND

- ■ PROPOSED WATER QUALITY INLET
- ○ PROPOSED STORM MANHOLE
- PROPOSED STORM PIPE
- EXISTING PIPE TO BE REPLACED
- EXISTING PIPE TO REMAIN
- EXISTING PIPE TO BE ABANDONED
- PROPOSED LITTORAL SHELF
- DRAINAGE SUBBASIN

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1-21

PROJECT 4A HILLCREST AVENUE OVERFLOW BY-PASS CULVERT

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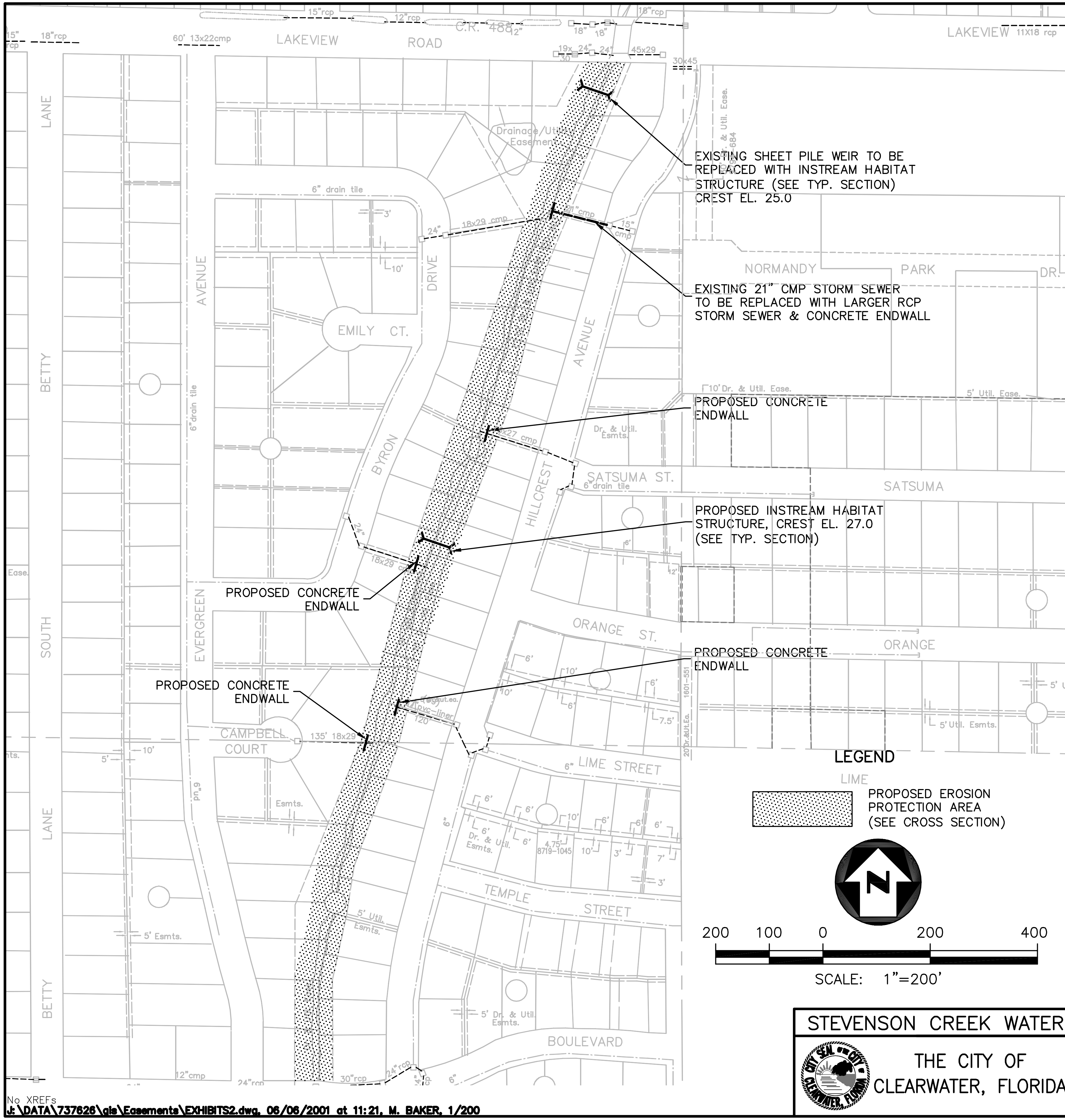
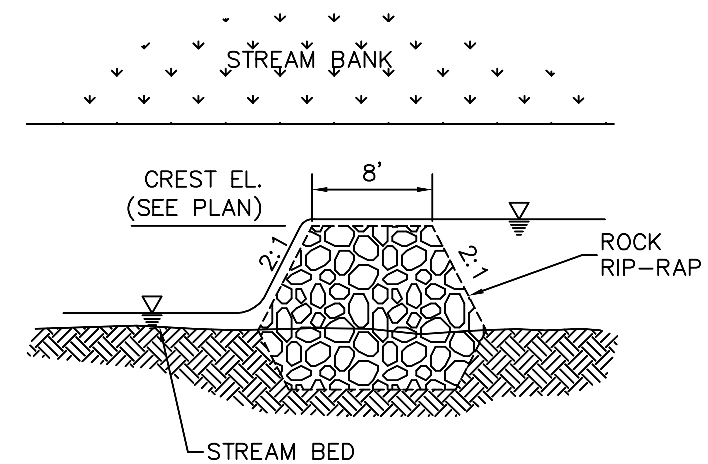
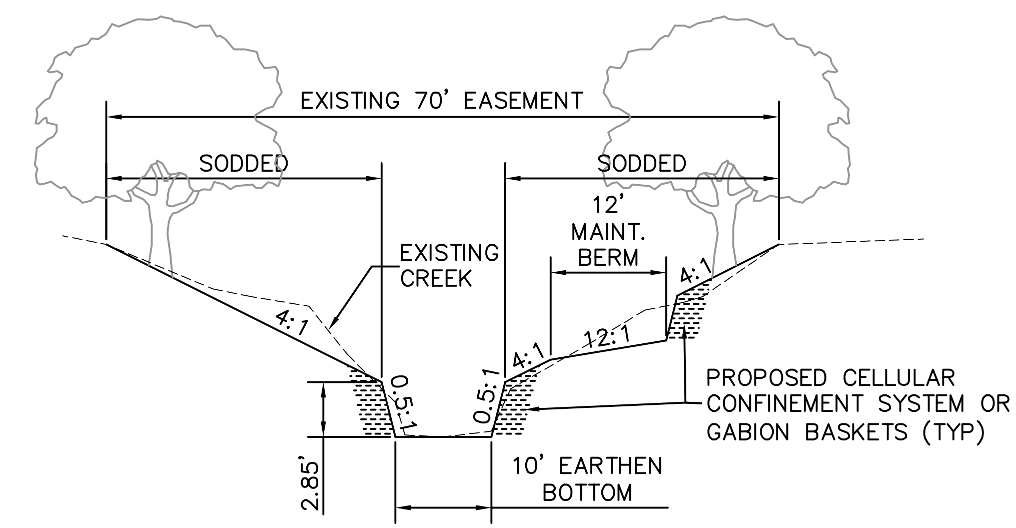




TYPICAL SECTION
INSTREAM HABITAT STRUCTURE
NOT TO SCALE



TYPICAL CROSS SECTION
UPPER STEVENSON CREEK
LAKEVIEW TO BELLEVUE BLVD. – PROJECT 4B
SCALE: 1"=20' H, 1"=10' V

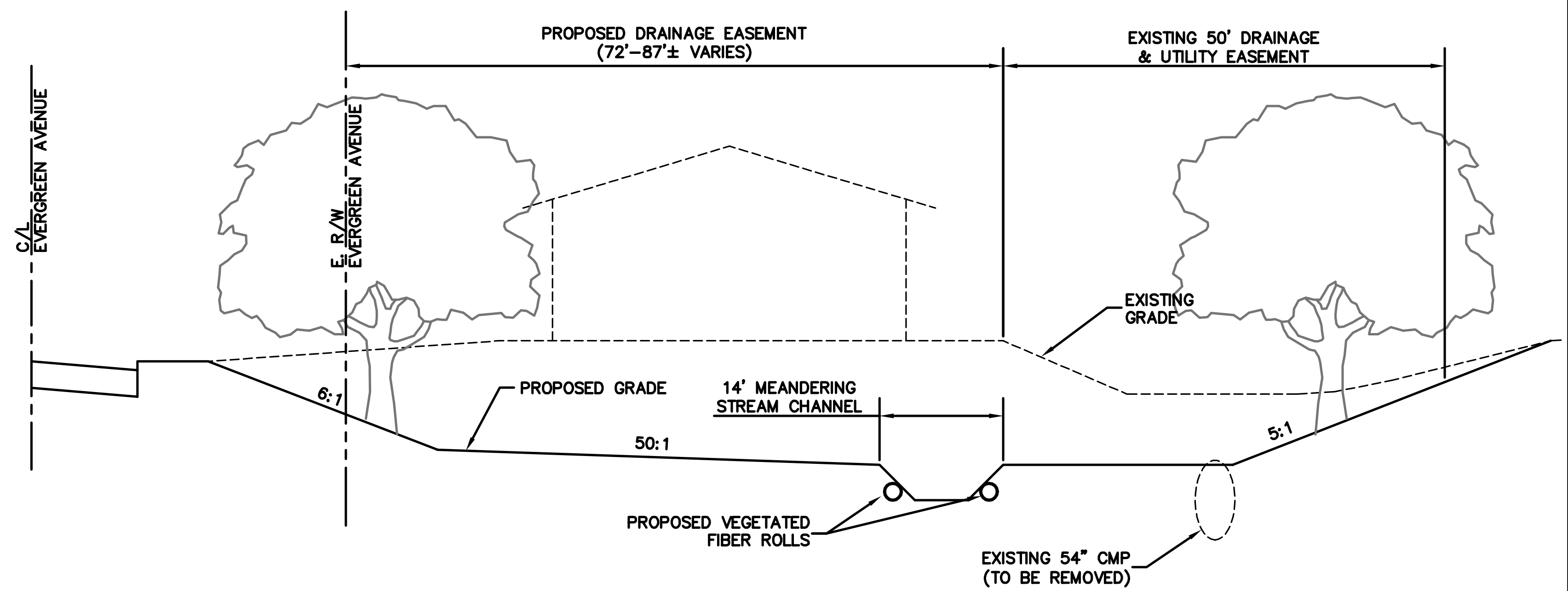
STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1–22

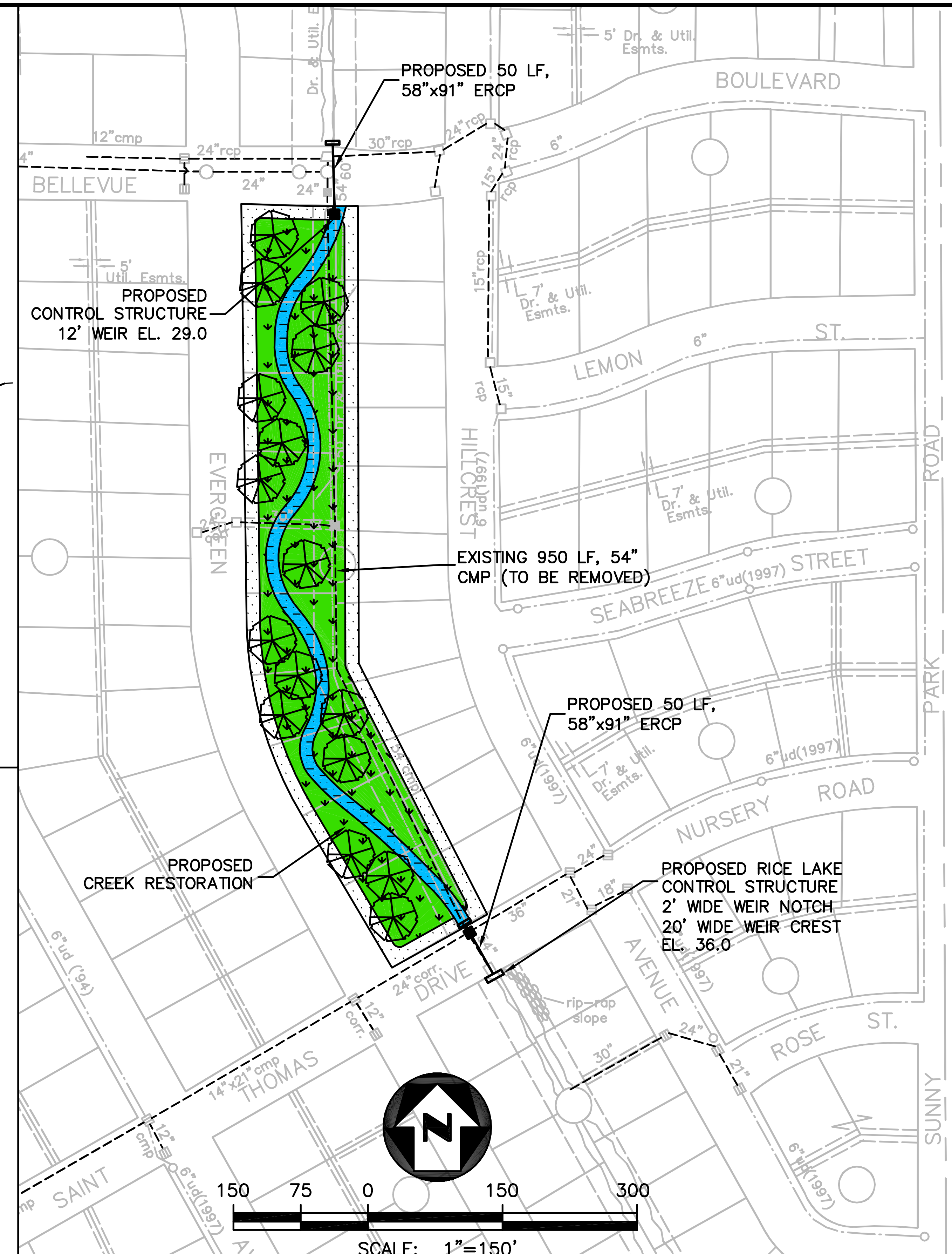
THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933–4650

PROJECT 4B UPPER STEVENSON CREEK EROSION PROTECTION MEASURES



TYPICAL CROSS SECTION
PROJECT 4C
SCALE: 1=20' H, 1'=10' V



LEGEND

- PROPOSED WATER QUALITY INLET
- PROPOSED STORM MANHOLE
- PROPOSED STORM PIPE
- EXISTING PIPE TO BE REPLACED
- EXISTING PIPE TO REMAIN
- EXISTING PIPE TO BE ABANDONED
- DRAINAGE SUBBASIN
- UNDERSTORY PLANTINGS
- OPEN WATER CHANNEL
- PROPOSED TREE

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1-23

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

PROJECT 4C ST. THOMAS DRIVE TO BELLEVUE BOULEVARD CREEK RESTORATION PROJECT

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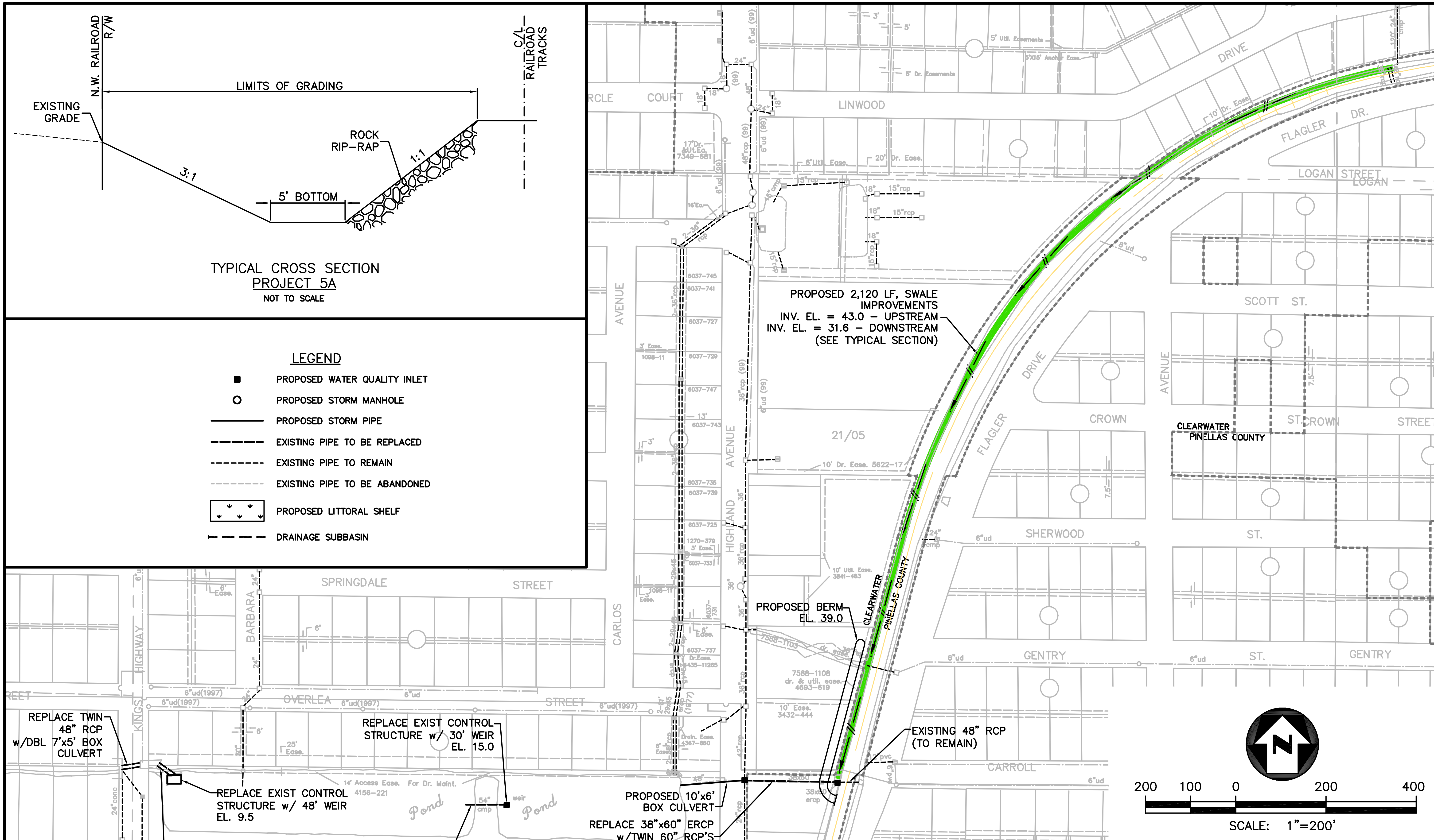

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1-24

PROJECT 5A FLAGLER DRIVE / CSX RAILROAD NORTH SWALE IMPROVEMENTS

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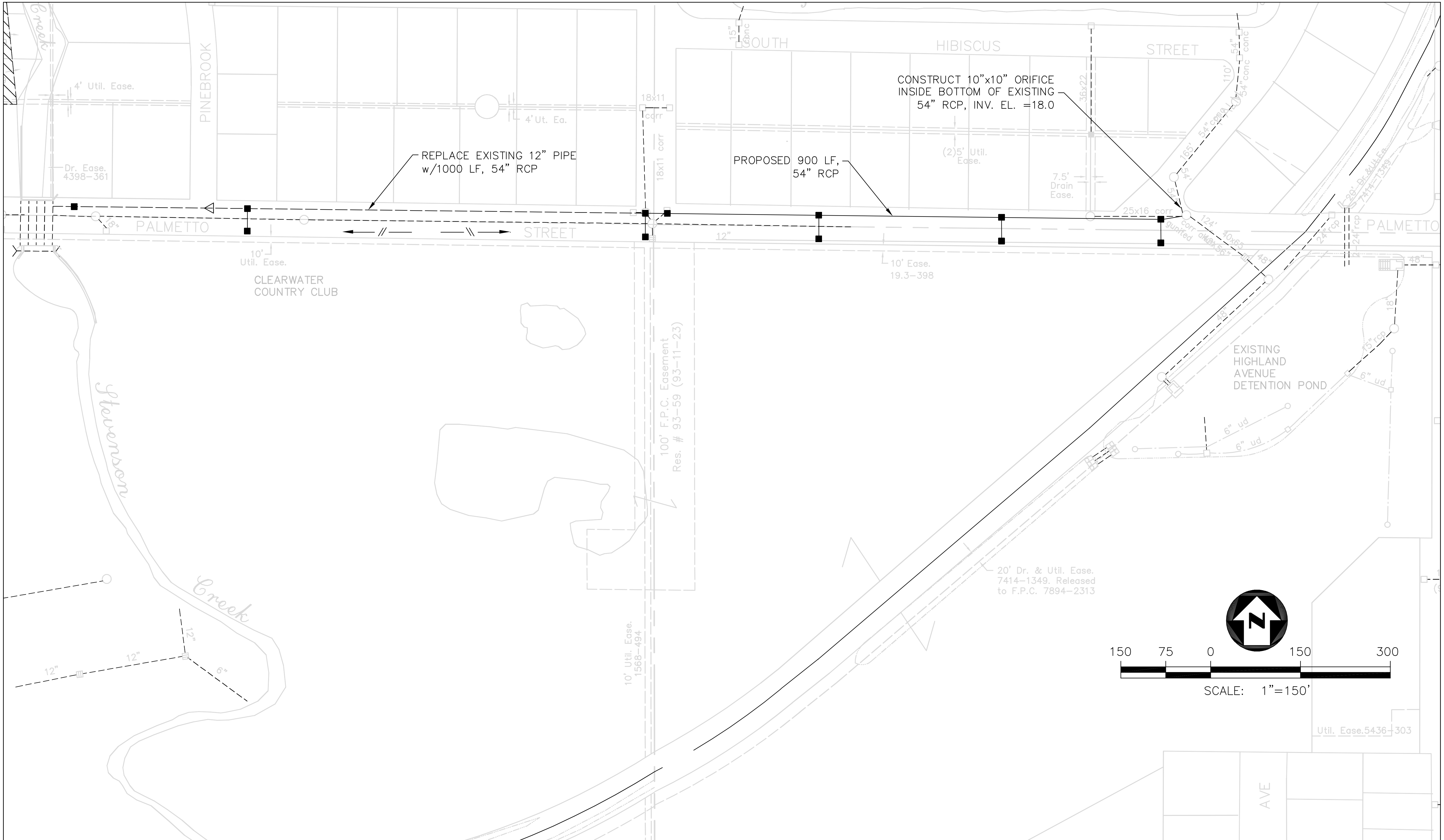

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1-25

THE CITY OF
CLEARWATER, FLORIDA

PARSONS
ENGINEERING
SCIENCE, INC.
Tampa, Florida
(813) 933-4650

PROJECT 5B PALMETTO STREET
DRAINAGE IMPROVEMENTS

No XREFs
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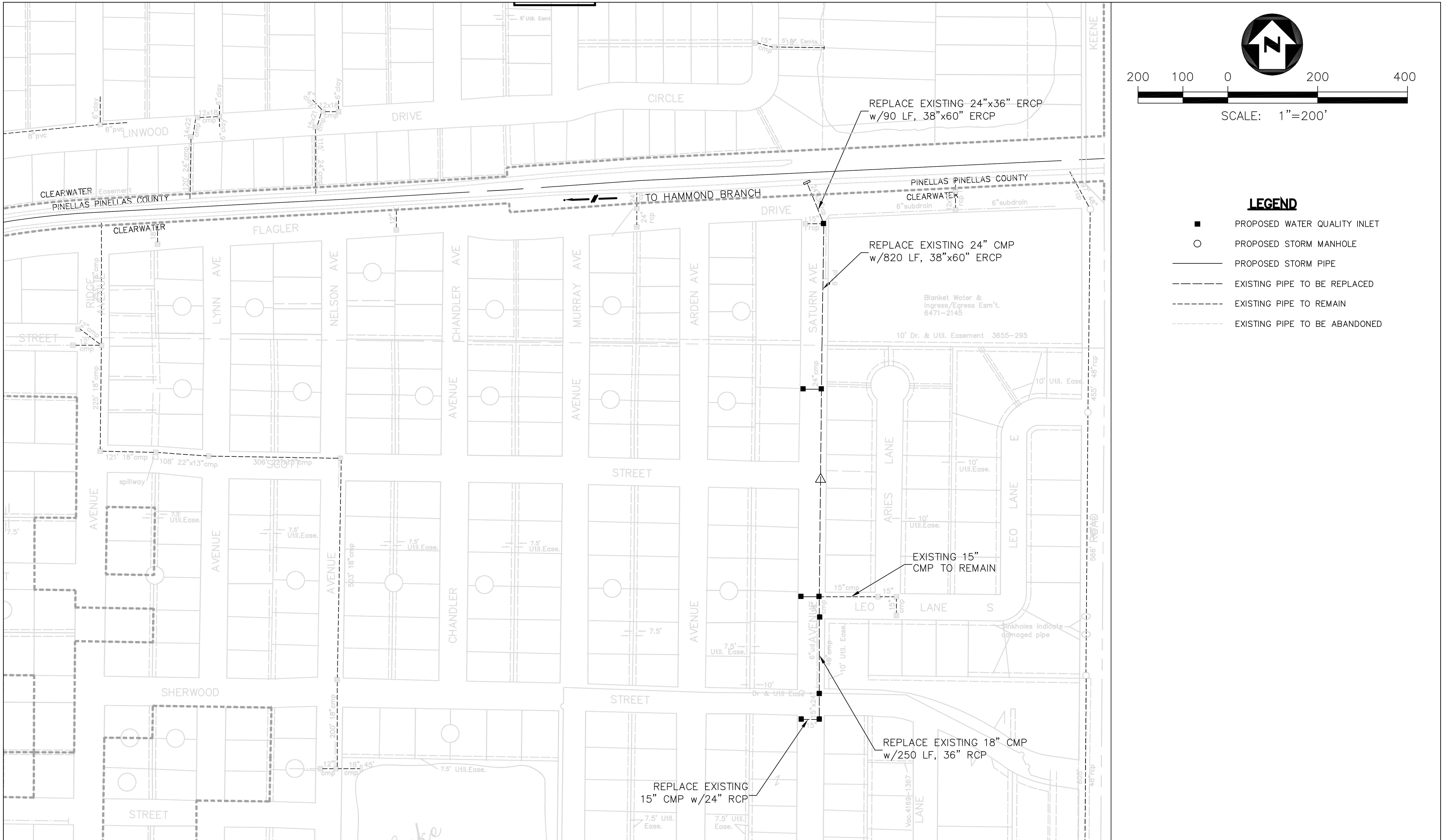

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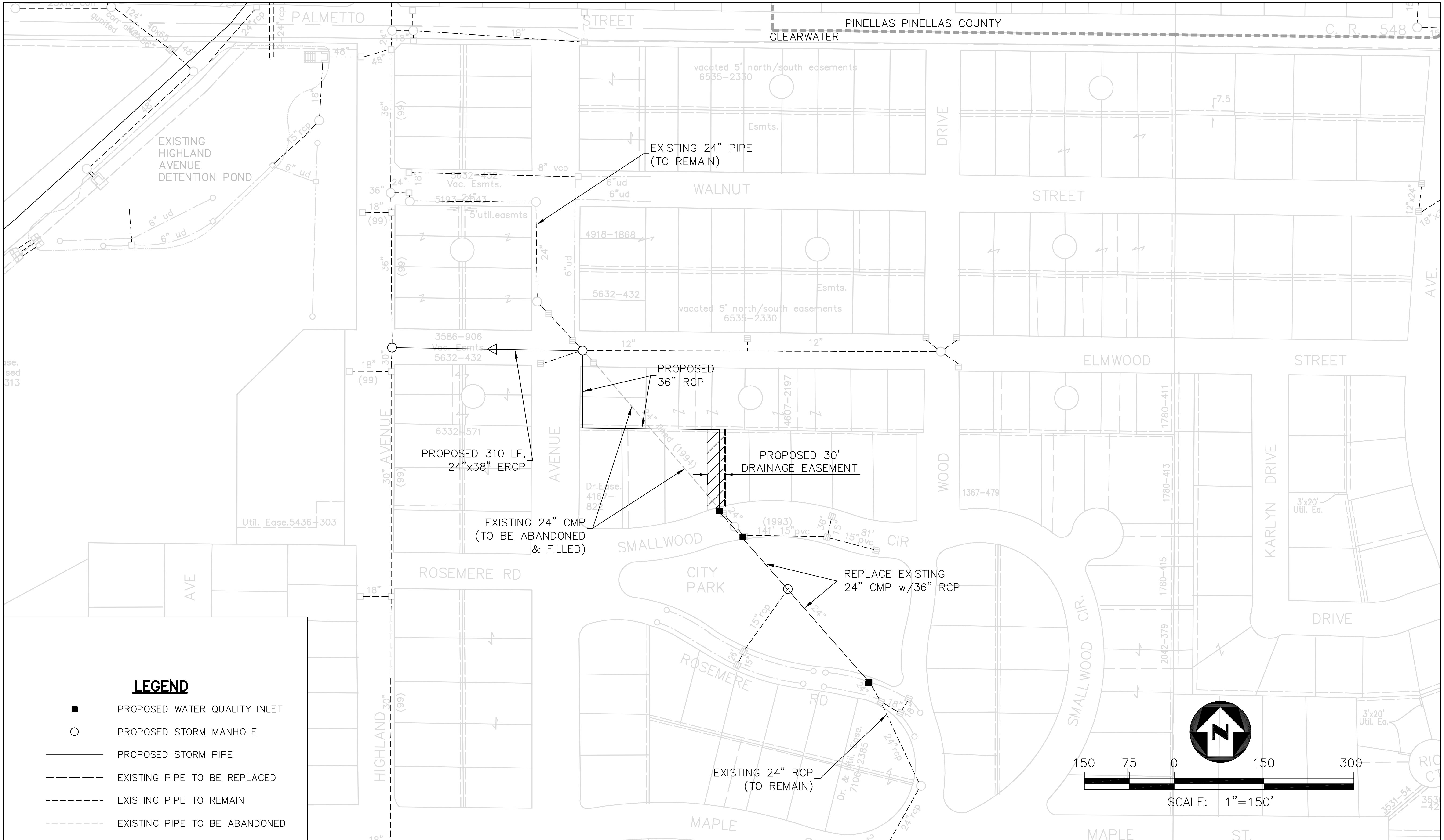
STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1-26

PROJECT 5C SATURN AVENUE DRAINAGE IMPROVEMENTS



LEGEND

■	PROPOSED WATER QUALITY INLET
○	PROPOSED STORM MANHOLE
———	PROPOSED STORM PIPE
— — —	EXISTING PIPE TO BE REPLACED
- - - -	EXISTING PIPE TO REMAIN
- - - -	EXISTING PIPE TO BE ABANDONED
	PROPOSED LITTORAL SHELF
▬ ▬ ▬	DRAINAGE SUBBASIN

No XREFs
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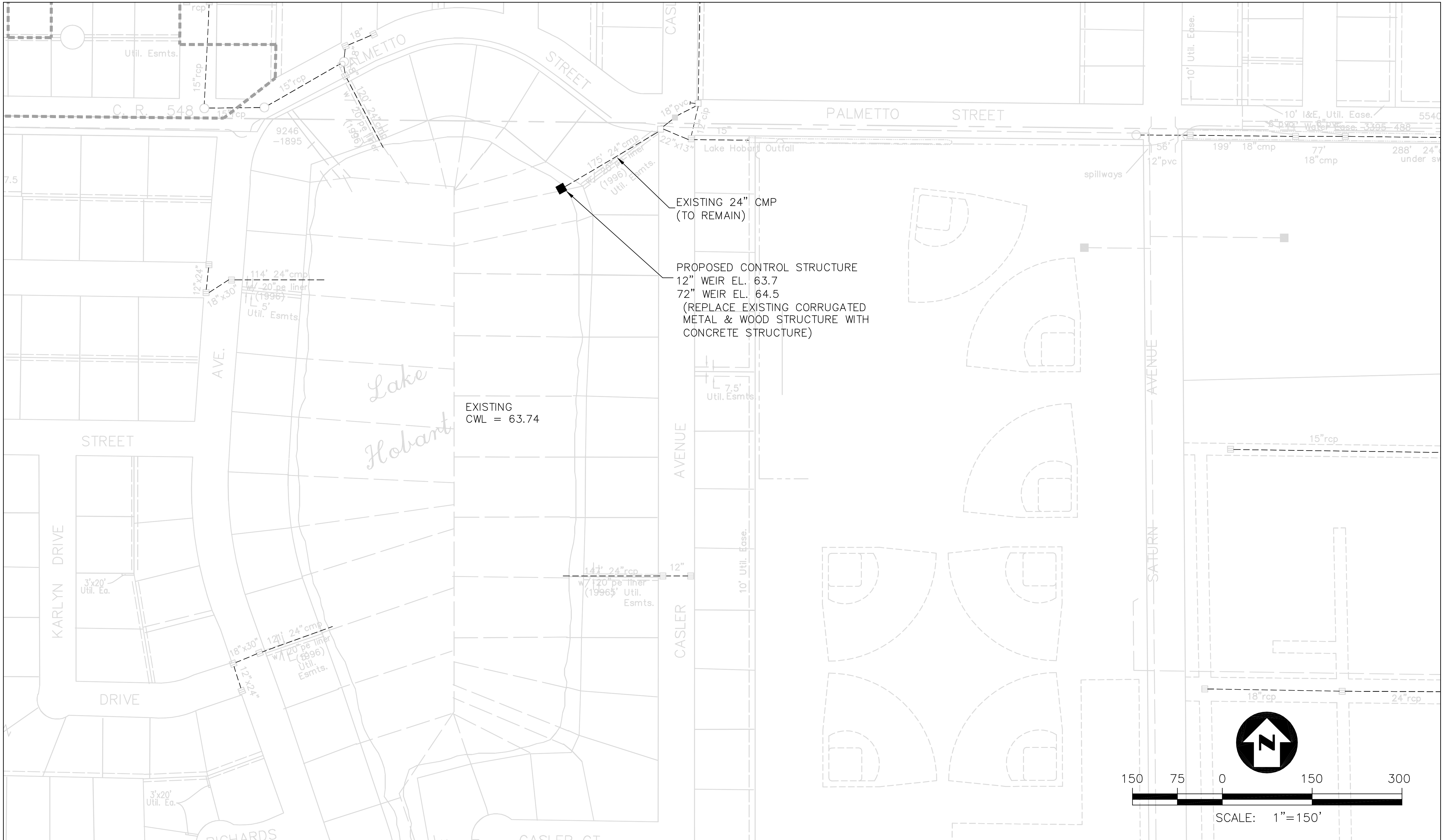
STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1-27

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

PROJECT 5D SMALLWOOD CIRCLE DRAINAGE IMPROVEMENTS



STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1-28

PROJECT 5E LAKE HOBART CONTROL STRUCTURE

No XREFs
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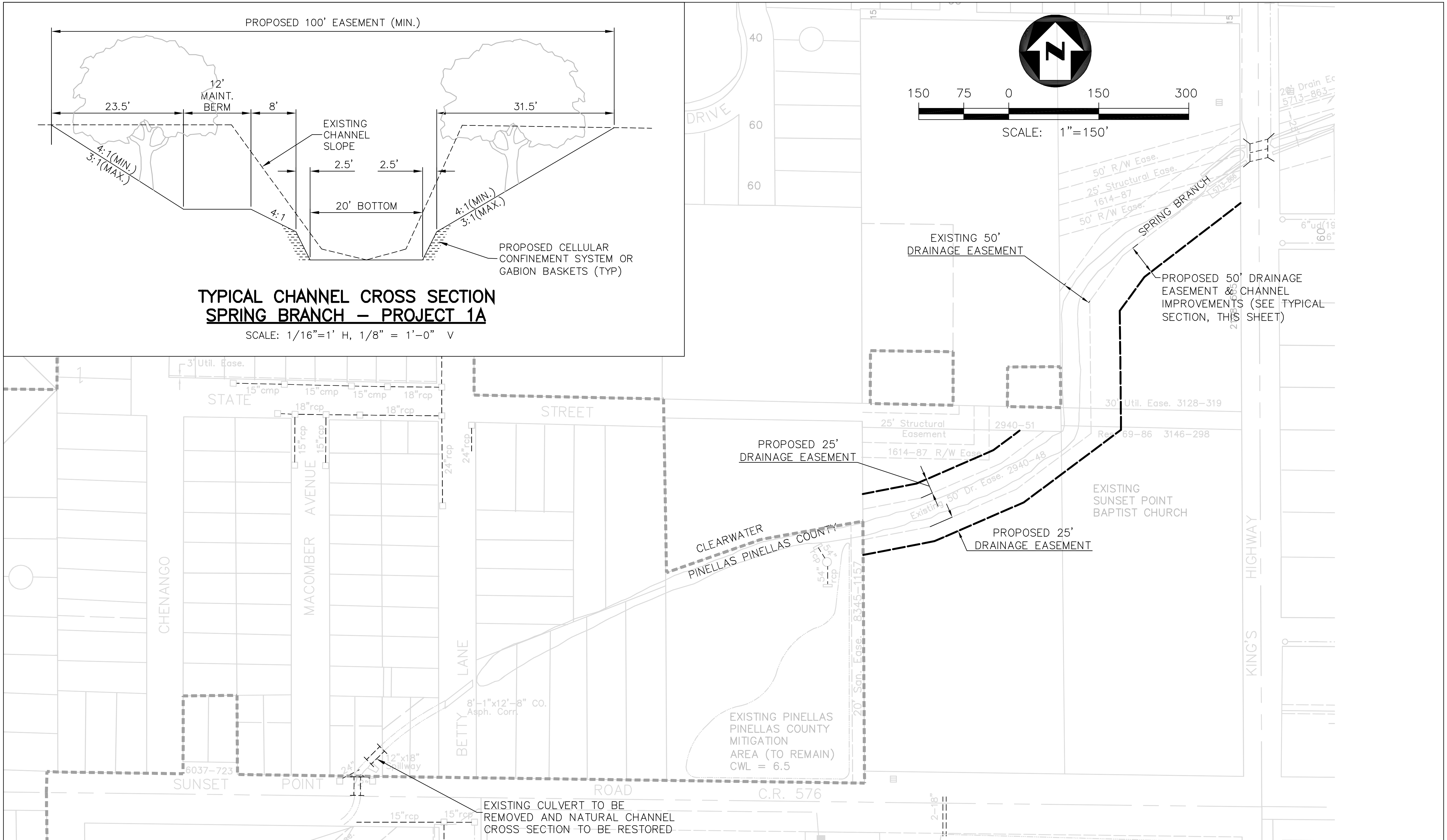

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1–3

PROJECT 1A.1 SPRING BRANCH CONVEYANCE ENHANCEMENTS (LOWER PORTION)

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
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FIGURE 3.1-30

PROJECT 6A.1 LAKE BELLEVUE EXPANSION

No XREFs
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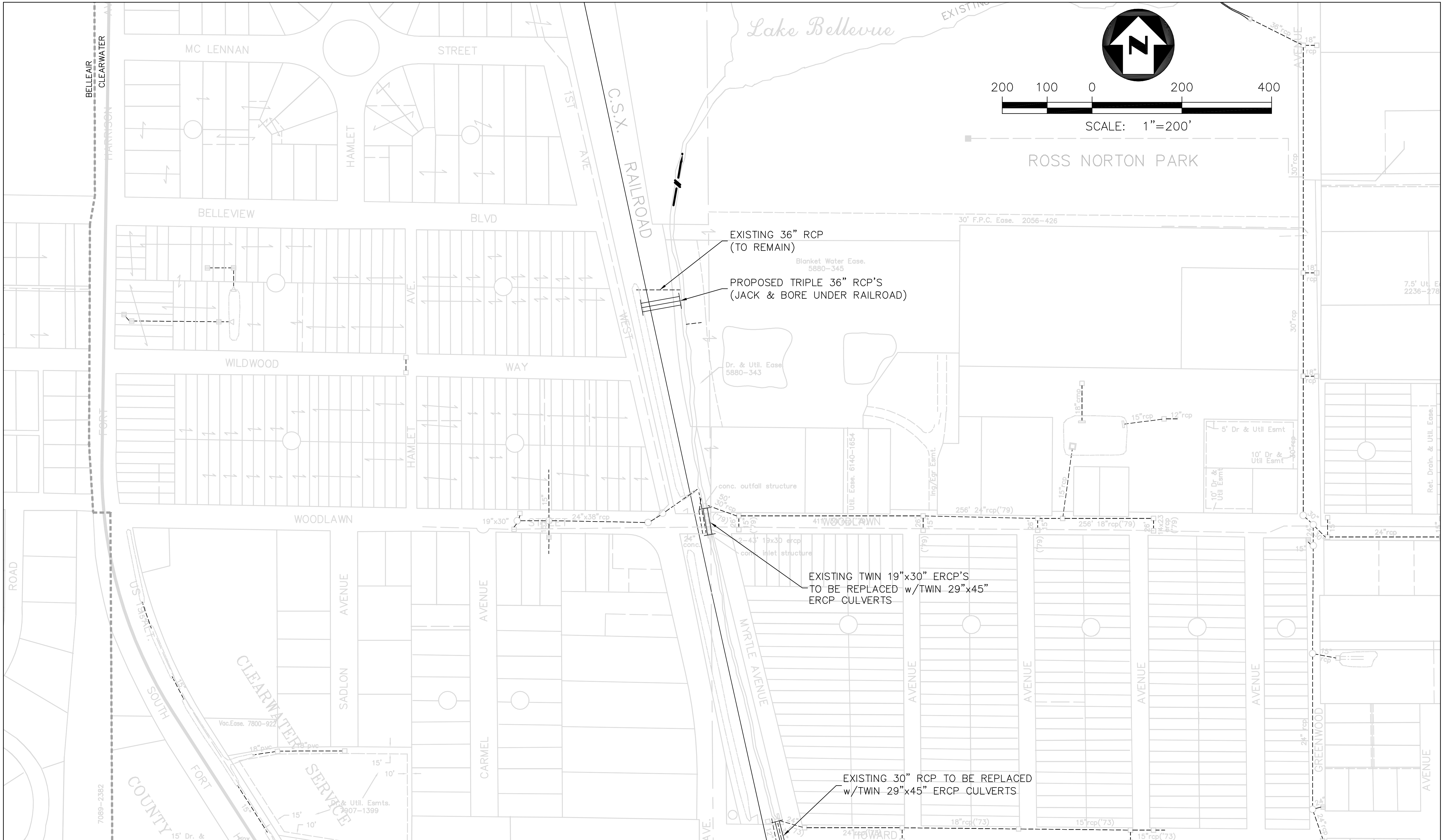

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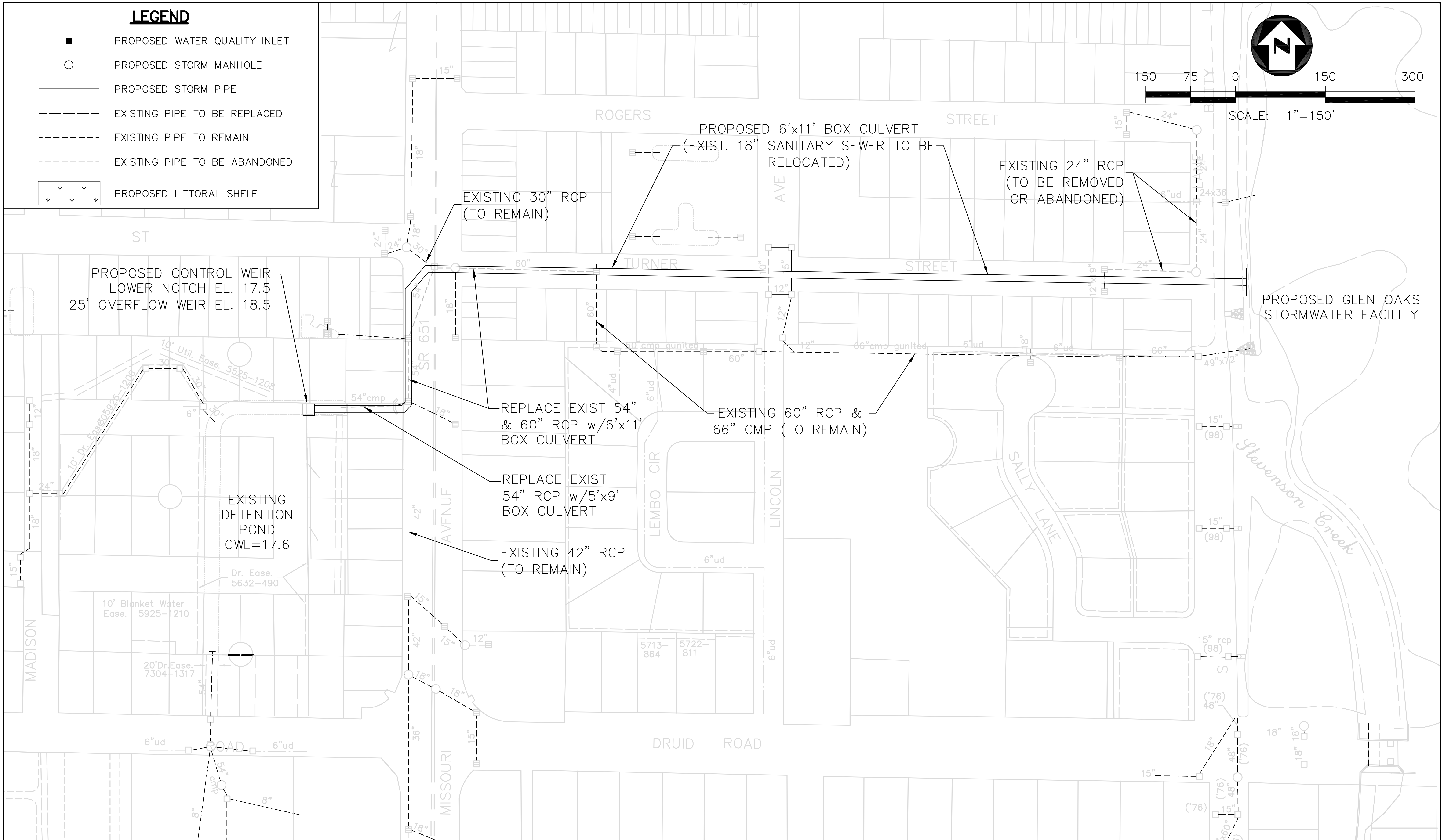
STEVENSON CREEK WATERSHED MANAGEMENT PLAN		FIGURE 3.1-31
THE CITY OF CLEARWATER, FLORIDA	PARSONS ENGINEERING SCIENCE, INC. Tampa, Florida (813) 933-4650	PROJECT 6A.2 UPPER LAKE BELLEVUE CULVERTS



STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1-32

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

PROJECT 6B TURNER STREET BOX CULVERT

No XREFs
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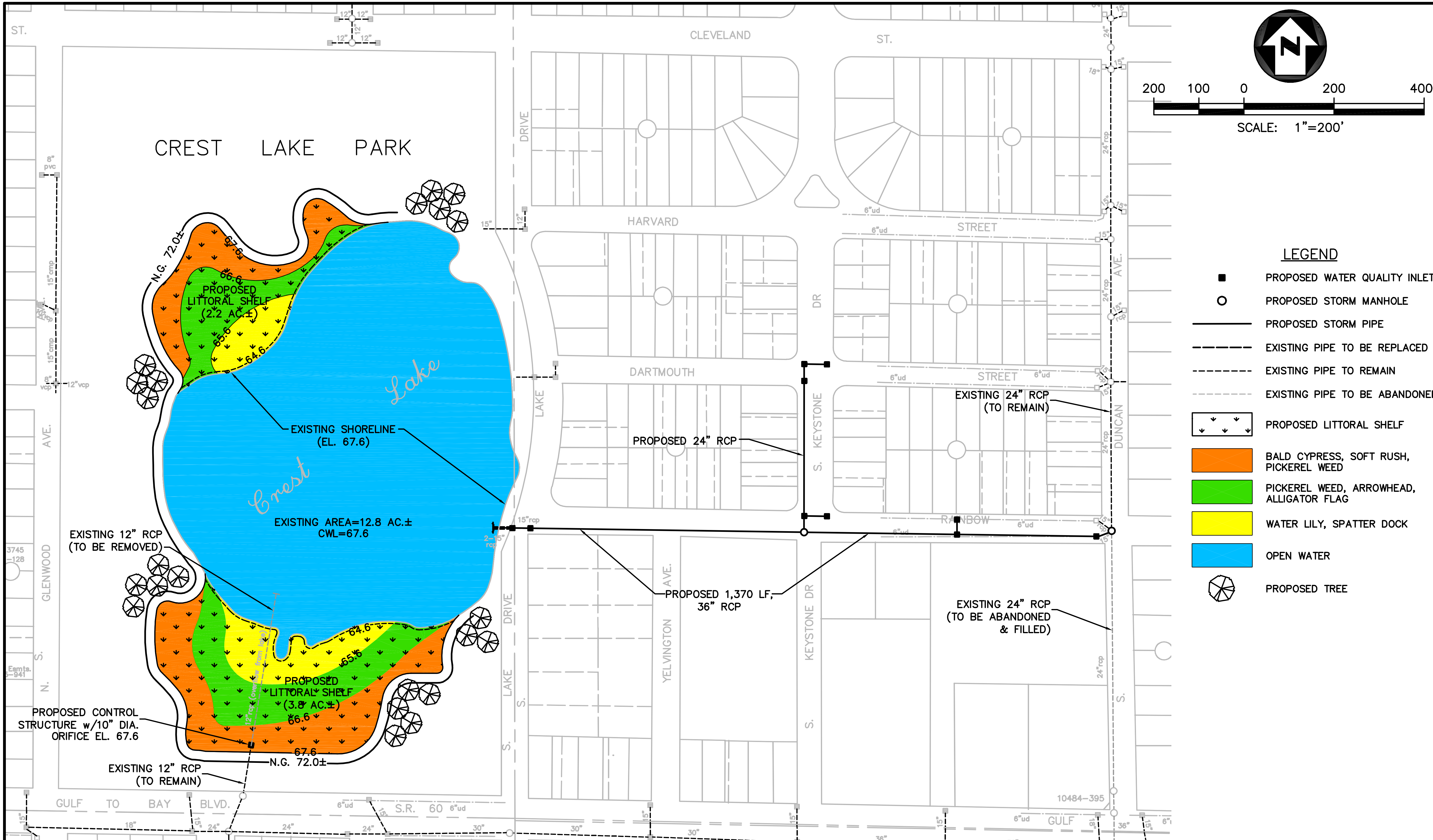

STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1–33

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933–4650

PROJECT 7A CREST LAKE EXPANSION

No XREFs
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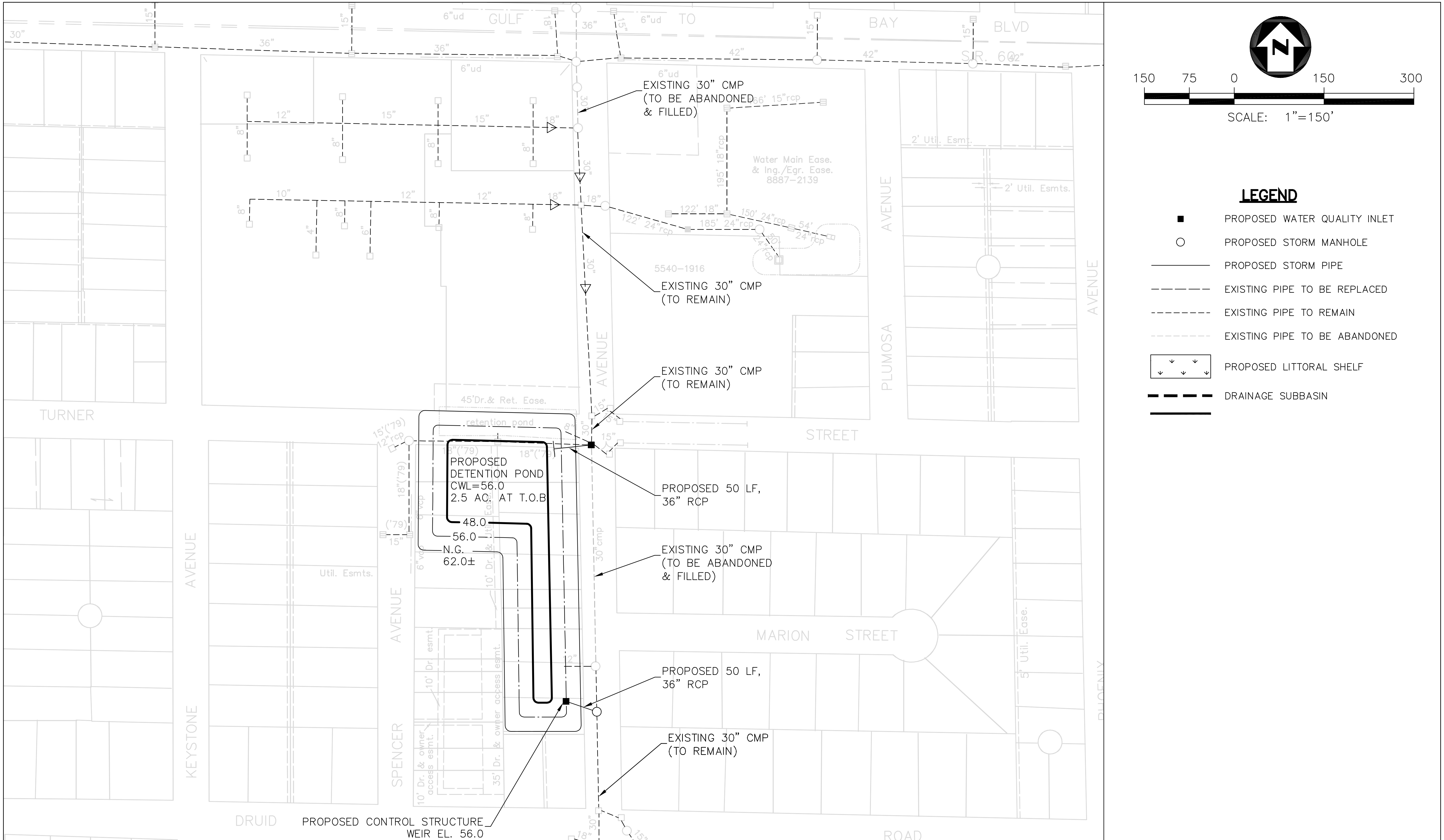

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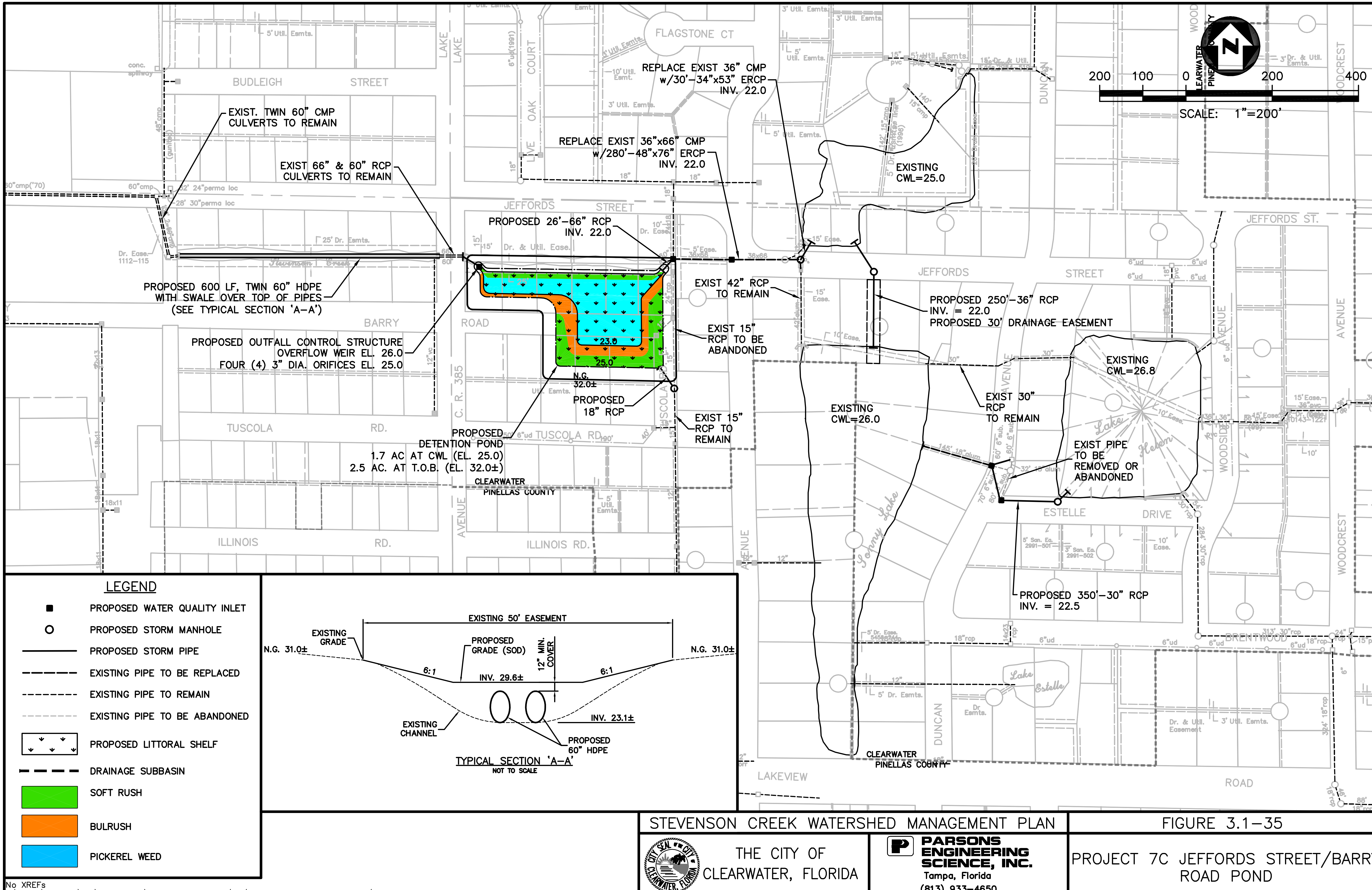
STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1-34

PROJECT 7B
DUNCAN AVENUE/TURNER STREET
DETENTION POND



STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1–35

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933–4650

PROJECT 7C JEFFORDS STREET/BARRY ROAD POND

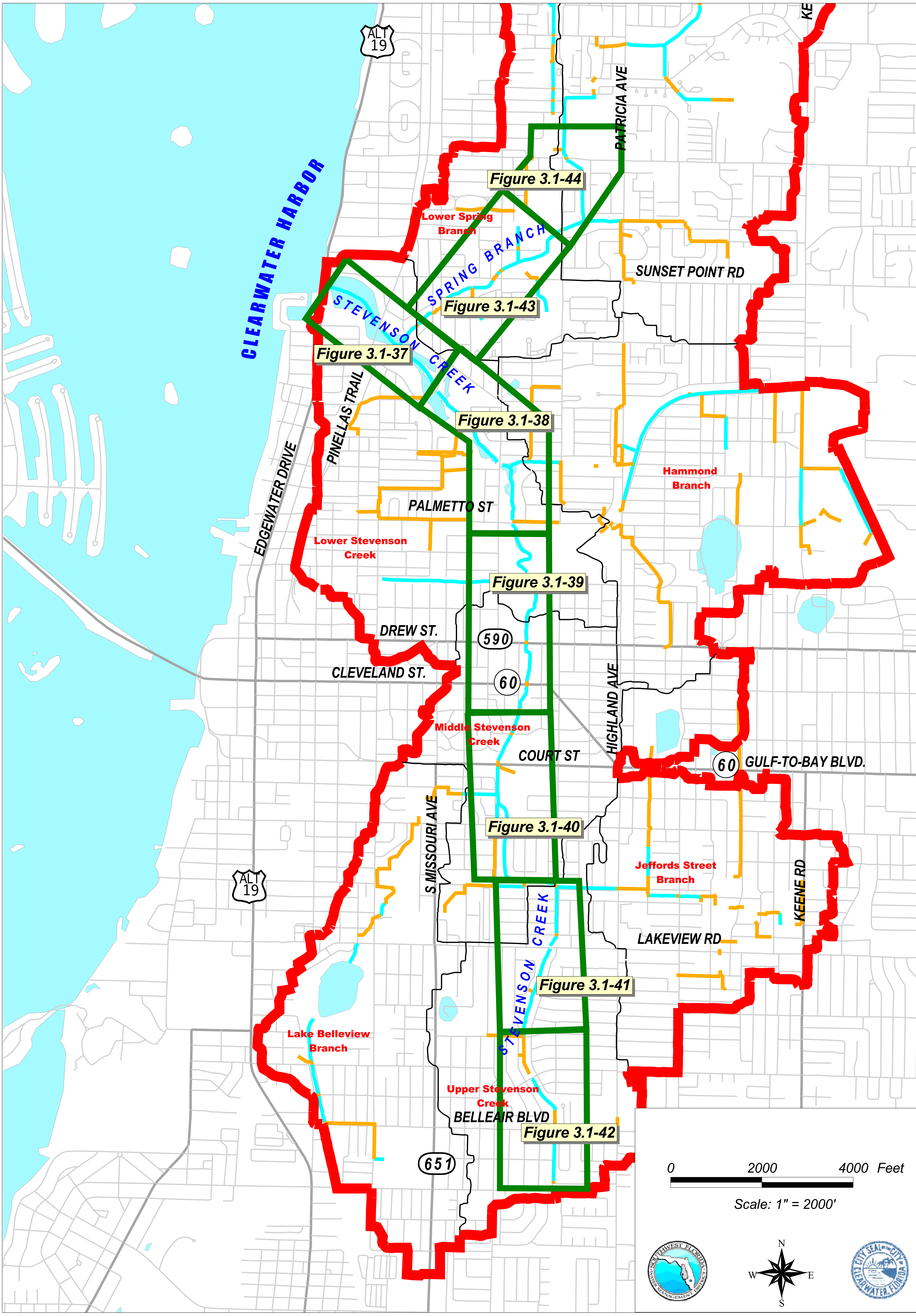


Figure 3.1-36

Stevenson Creek Watershed
Project Conditions
Flood Profiles Key Map

Figure Extent
Water
Modeled Closed Conduit
Modeled Open Channel
Major Subbasin Delineation
Watershed Boundary

PARSONS ENGINEERING SCIENCE

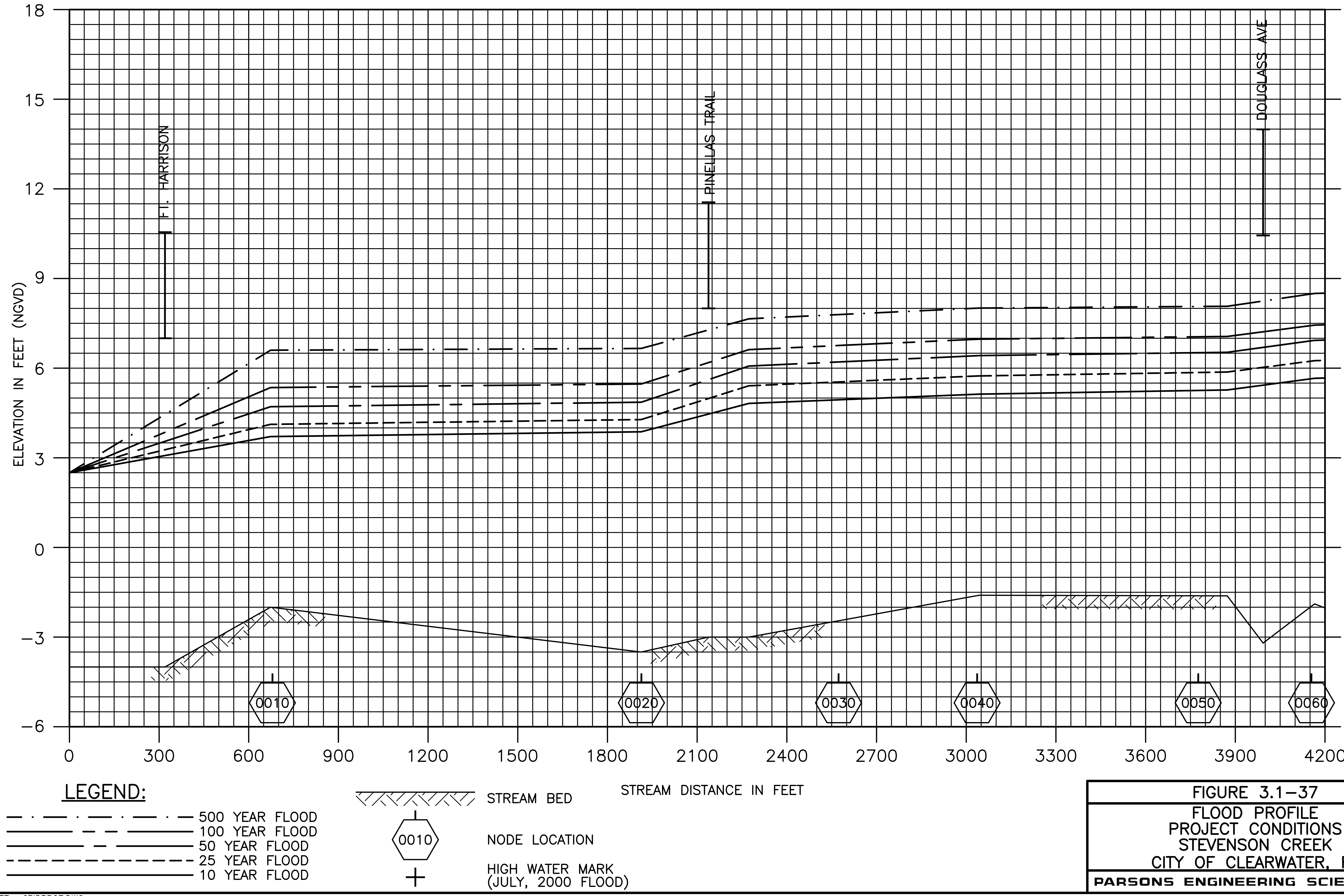
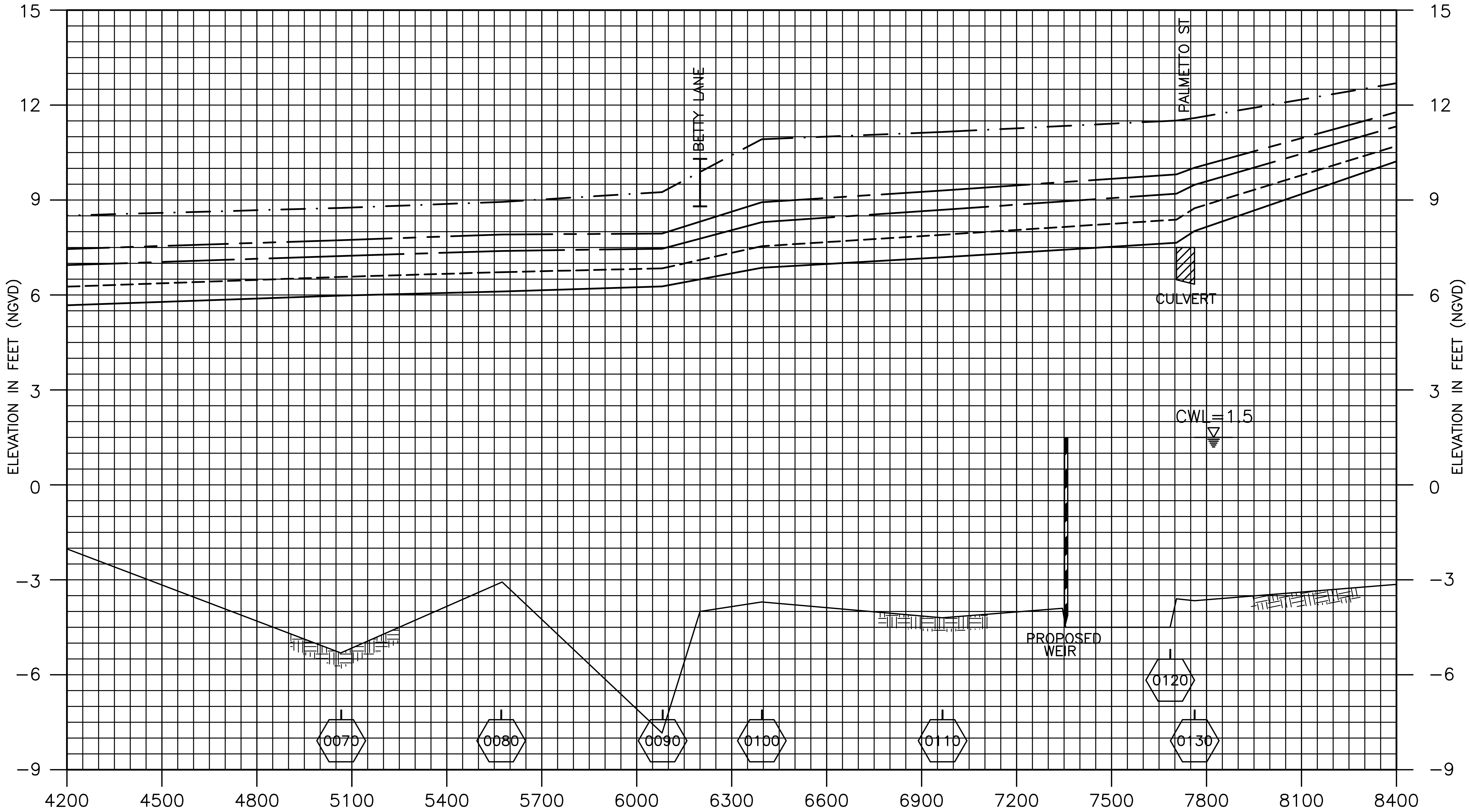


FIGURE 3.1−37
FLOOD PROFILE
PROJECT CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\flood\7626FIG1.dwg, 08/29/2001 at 04:30, NJM, 1



LEGEND:

500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
25 YEAR FLOOD
10 YEAR FLOOD

STREAM BED

0010 NODE LOCATION

HIGH WATER MARK (JULY, 2000 FLOOD)

FIGURE 3.1–38

FLOOD PROFILE
PROJECT CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\flood\7626FIG2.dwg, 08/29/2001 at 04:30, NJM, 1

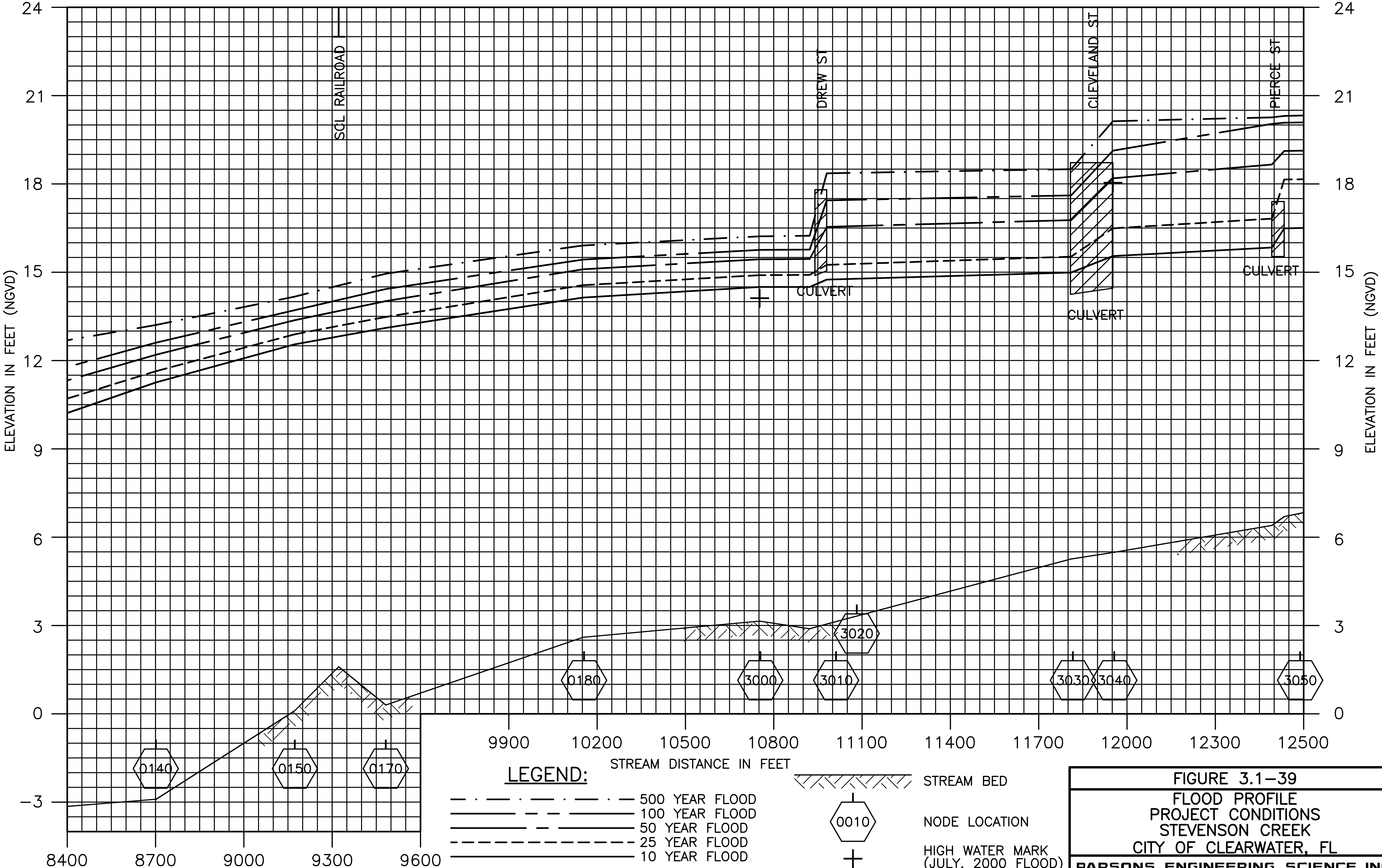
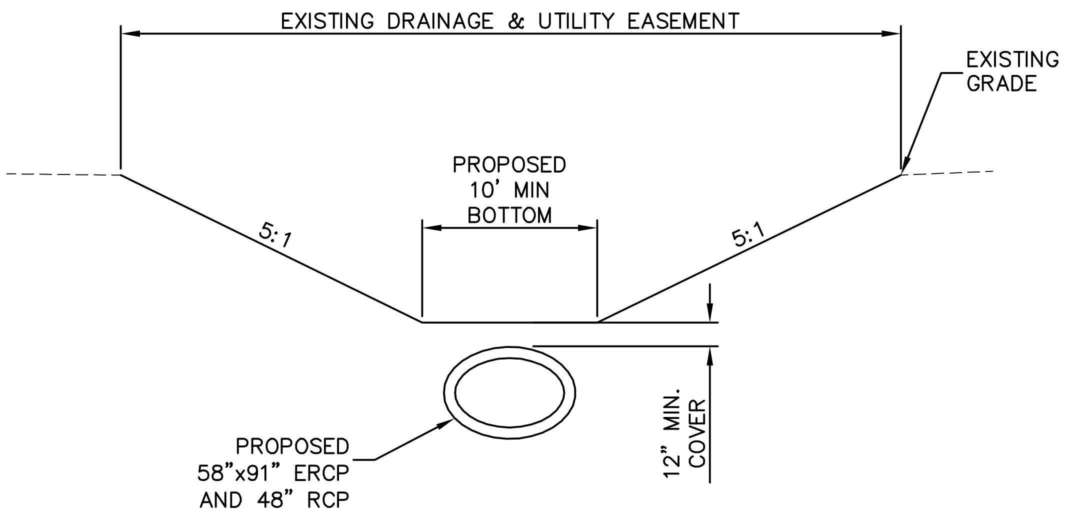


FIGURE 3.1−39
FLOOD PROFILE
PROJECT CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

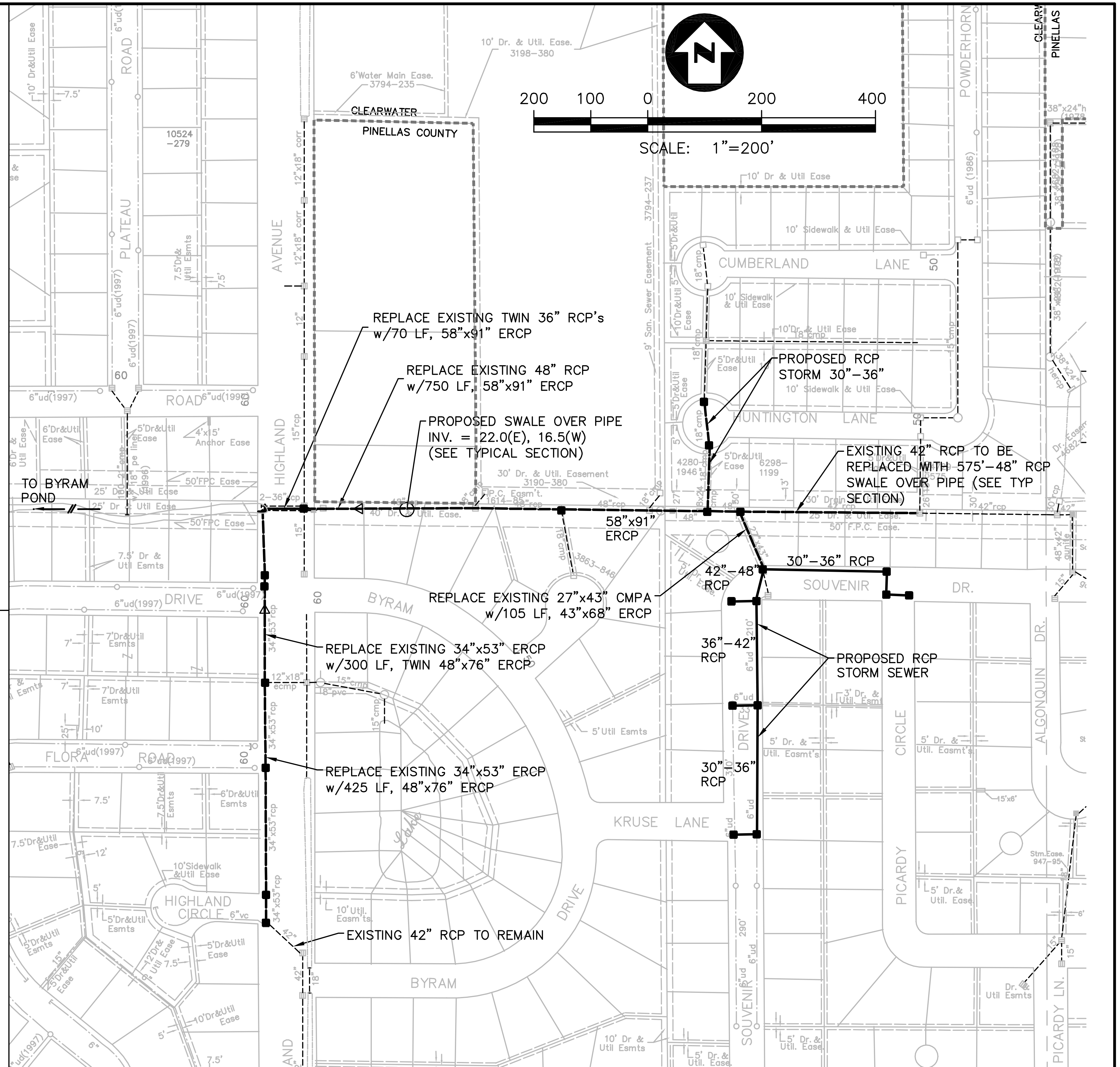
XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\flood\7626FIG3.dwg, 08/29/2001 at 04:31, NJM, 1



TYPICAL CROSS SECTION
PROJECT 1A.2
NOT TO SCALE

LEGEND

■	PROPOSED WATER QUALITY INLET
O	PROPOSED STORM MANHOLE
———	PROPOSED STORM PIPE
— — —	EXISTING PIPE TO BE REPLACED
- - - - -	EXISTING PIPE TO REMAIN
- - - - -	EXISTING PIPE TO BE ABANDONED
	PROPOSED LITTORAL SHELF



STEVENSON CREEK WATERSHED MANAGEMENT PLAN		FIGURE 3.1-4
THE CITY OF CLEARWATER, FLORIDA	PARSONS ENGINEERING SCIENCE, INC. Tampa, Florida (813) 933-4650	PROJECT 1A.2 SPRING BRANCH CONVEYANCE ENHANCEMENTS (UPPER PORTION)

No XREFs
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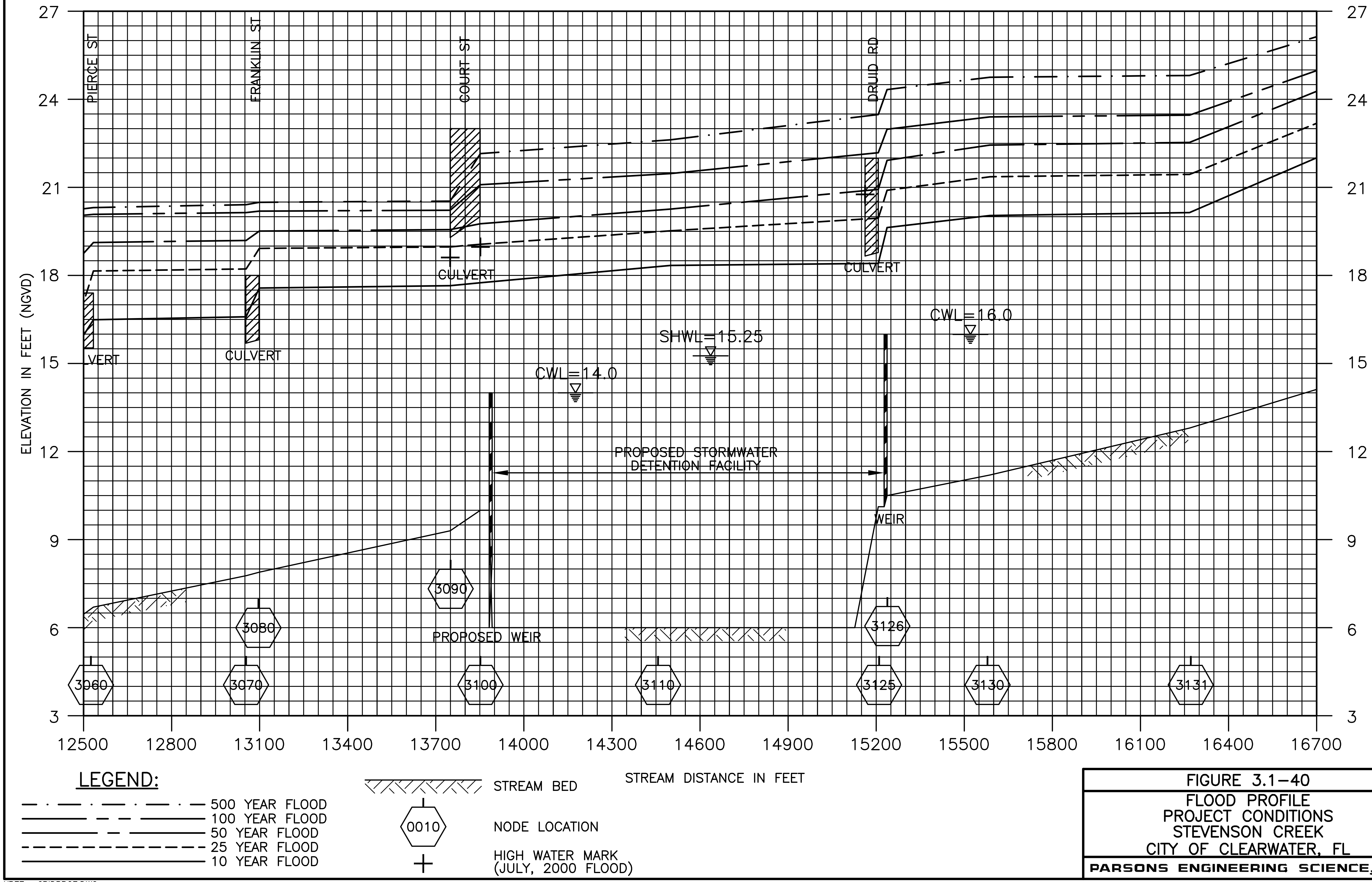
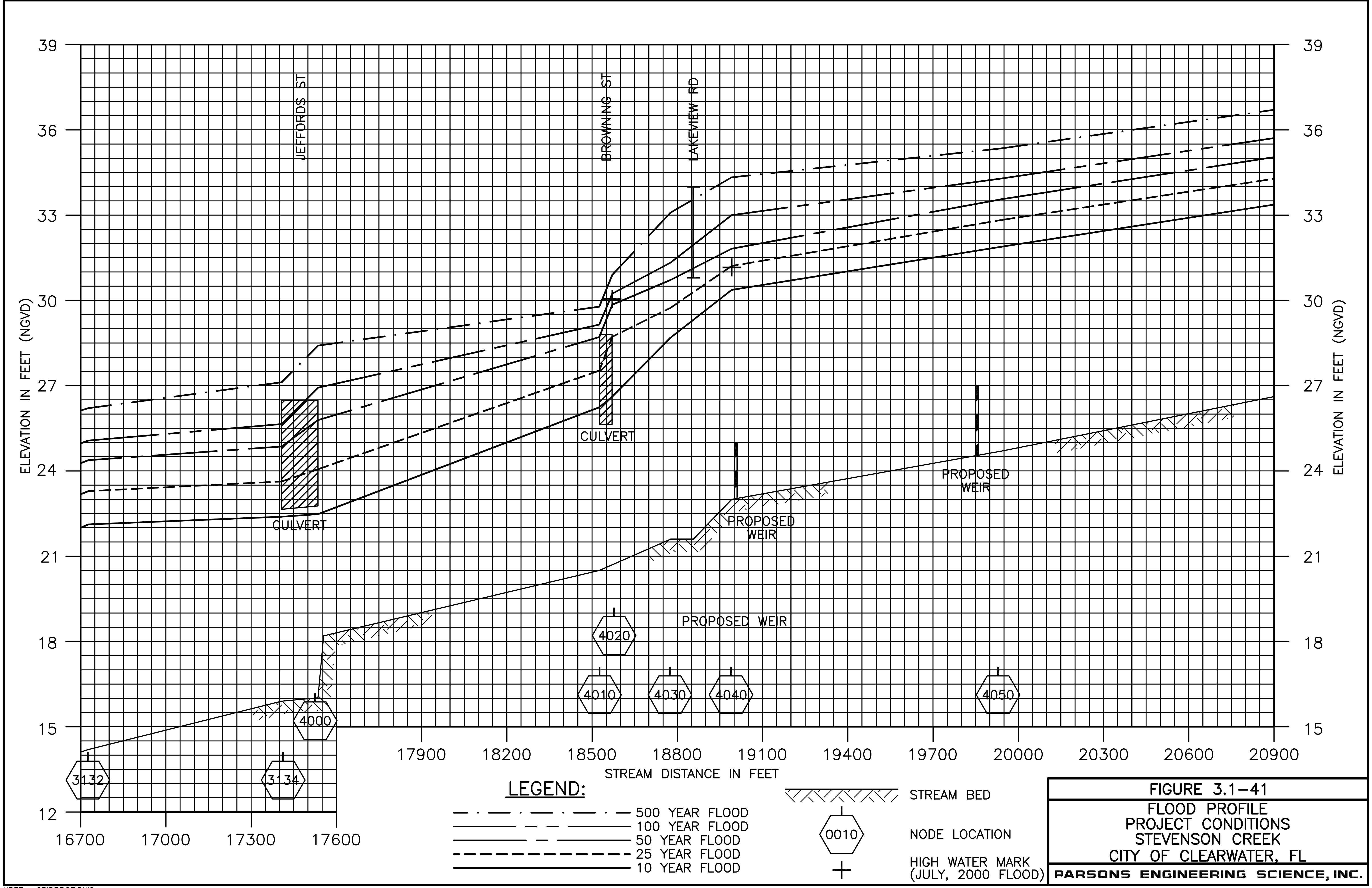


FIGURE 3.1-40

FLOOD PROFILE
PROJECT CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\flood\7626FIG4.dwg, 08/29/2001 at 04:32, NJM, 1



XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\flood\7626FIG5.dwg, 08/29/2001 at 04:38, NJM, 1

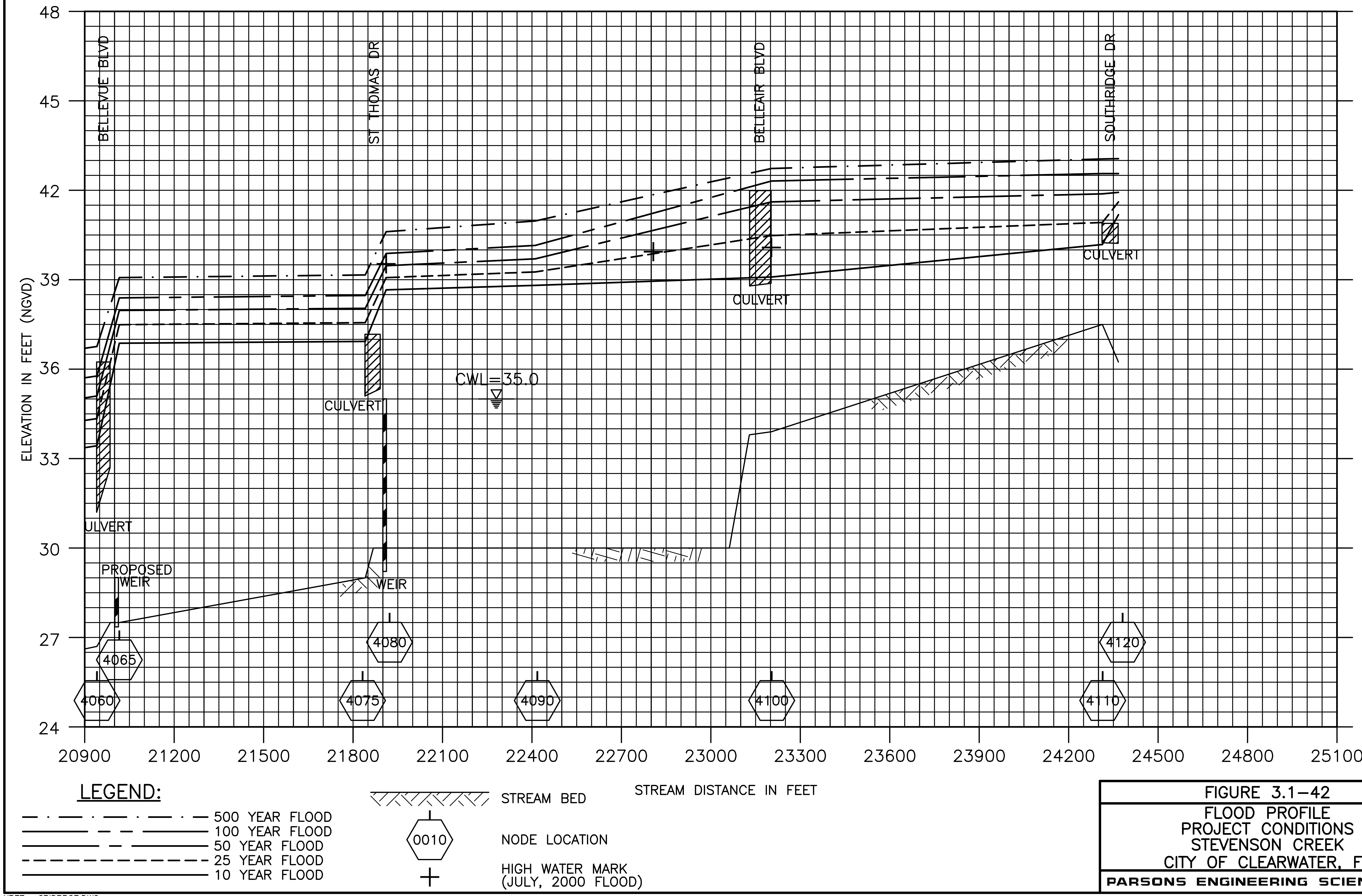


FIGURE 3.1–42

FLOOD PROFILE
PROJECT CONDITIONS
STEVENSON CREEK
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF.DWG
J:\CADD\737626\STEVENSON\flood\7626FIG6.dwg, 08/29/2001 at 04:56, NJM, 1

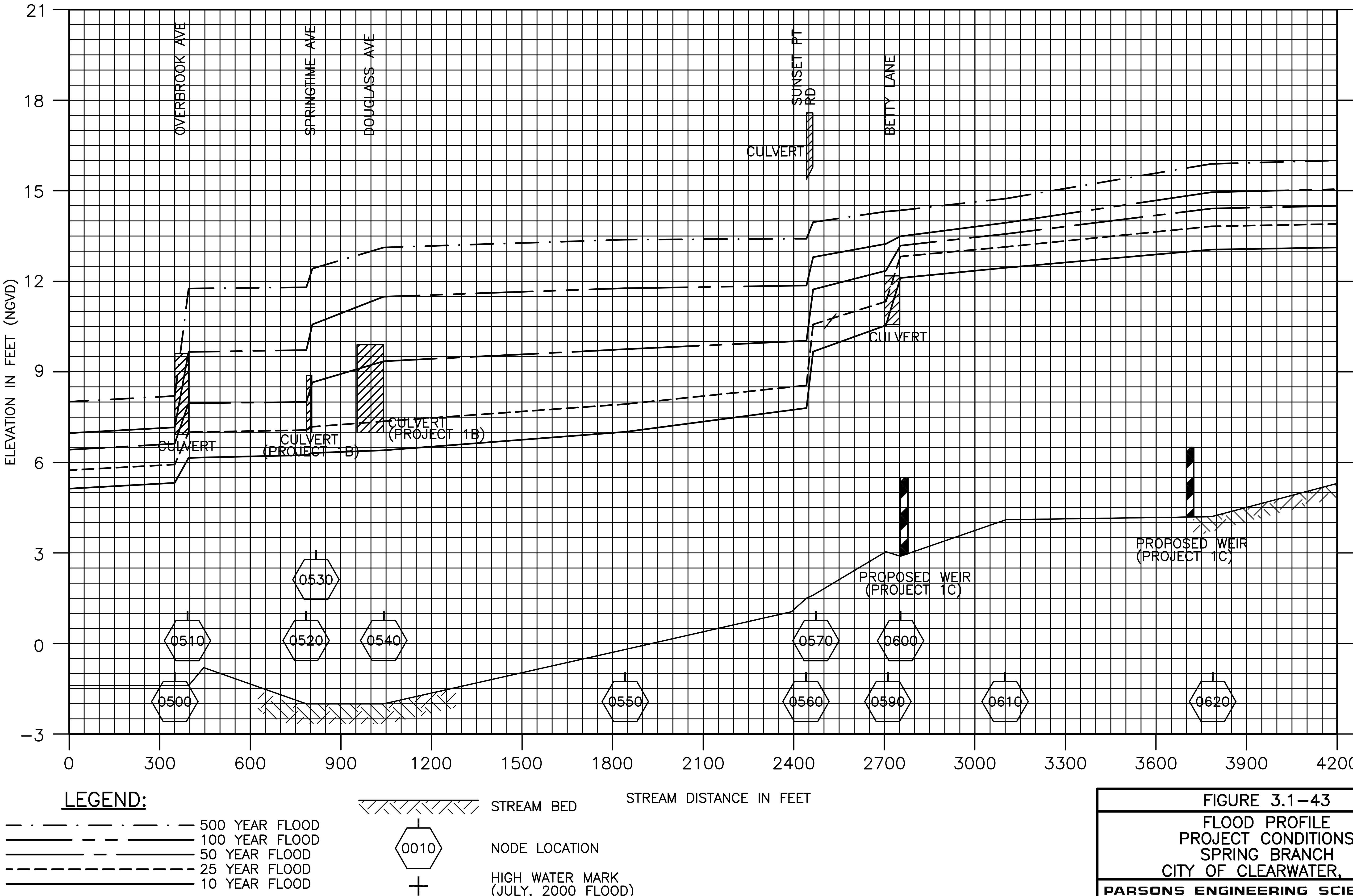


FIGURE 3.1-43
FLOOD PROFILE
PROJECT CONDITIONS
SPRING BRANCH
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF(SPRINGBRANCH).DWG
J:\CADD\737626\STEVENSON\flood\7626FIG7.dwg, 08/29/2001 at 04:39, NJM, 1

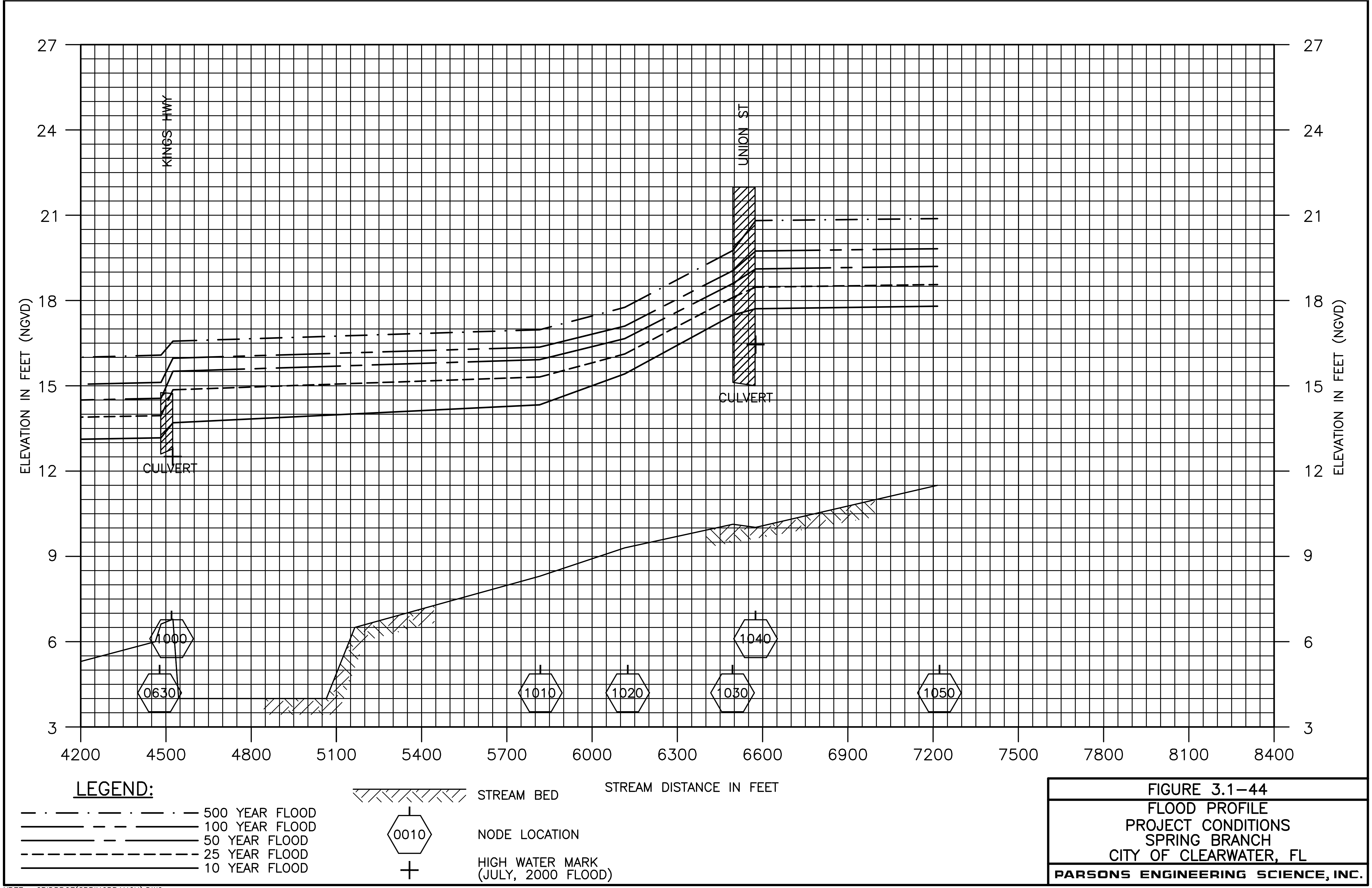
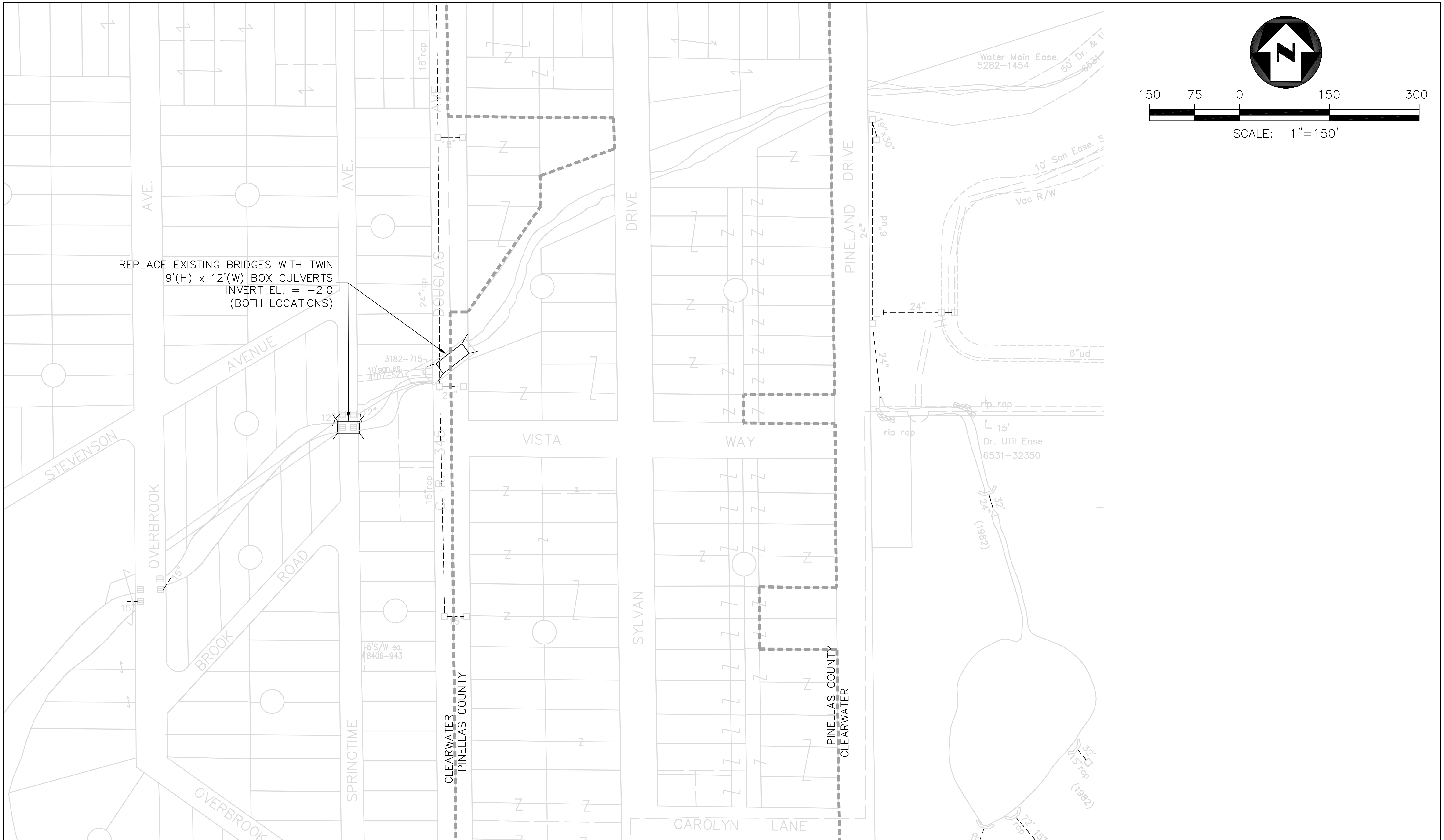


FIGURE 3.1-44
FLOOD PROFILE
PROJECT CONDITIONS
SPRING BRANCH
CITY OF CLEARWATER, FL

PARSONS ENGINEERING SCIENCE, INC.

XREFs: GRIDPROF(SPRINGBRANCH).DWG
J:\CADD\737626\STEVENSON\flood\7626FIG8.dwg, 08/29/2001 at 04:40, NJM, 1

Figure 3.1-45
Stevenson Creek Watershed Existing 100-Year Floodplain Map
Existing and Project Conditions
Limit of Existing Conditions 100 -Year Floodplain (riverine only)
Limit of Project Conditions 100 -Year Floodplain (riverine only)
Lake/Pond
Property Parcel Limit
City of Clearwater Corporate Limits
Railroad
Watershed Boundary
Basin Boundary
Structure Level of Service Deficiency (Project Conditions)
Street Level of Service Deficiency (Project Conditions)
Evacuation
Arterial
Collector
Residential
0 600 1200 1800 Feet
SCALE: 1" = 600'
SOURCE:
Property Lines from Pinellas County Property Appraiser
PARSONS ENGINEERING SCIENCE
CLEARWATER HARBOR
CITY OF DUNEDIN
CITY OF LARGO
ALLENS CREEK BASIN
1. Lower Spring Branch
2. Lower Stevenson Creek
3. Middle Stevenson Creek
4. Upper Stevenson
5. Hammond Branch
6. Lake Bellevue Branch
7. Jeffords Street Branch
8. Upper Spring Branch
SPRING BRANCH
STEVENSON CREEK
CLEARWATER COUNTRY CLUB
LAKE LUCILLE
LAKE HOBART
CREST LAKE
LAKE BELLEVUE
BYRAM SUMP



STEVENSON CREEK WATERSHED MANAGEMENT PLAN		FIGURE 3.1-5
THE CITY OF CLEARWATER, FLORIDA	PARSONS ENGINEERING SCIENCE, INC. Tampa, Florida (813) 933-4650	PROJECT 1B REPLACEMENT OF BRIDGES AT SPRINGTIME AVE & DOUGLAS AVE OVER SPRING BRANCH

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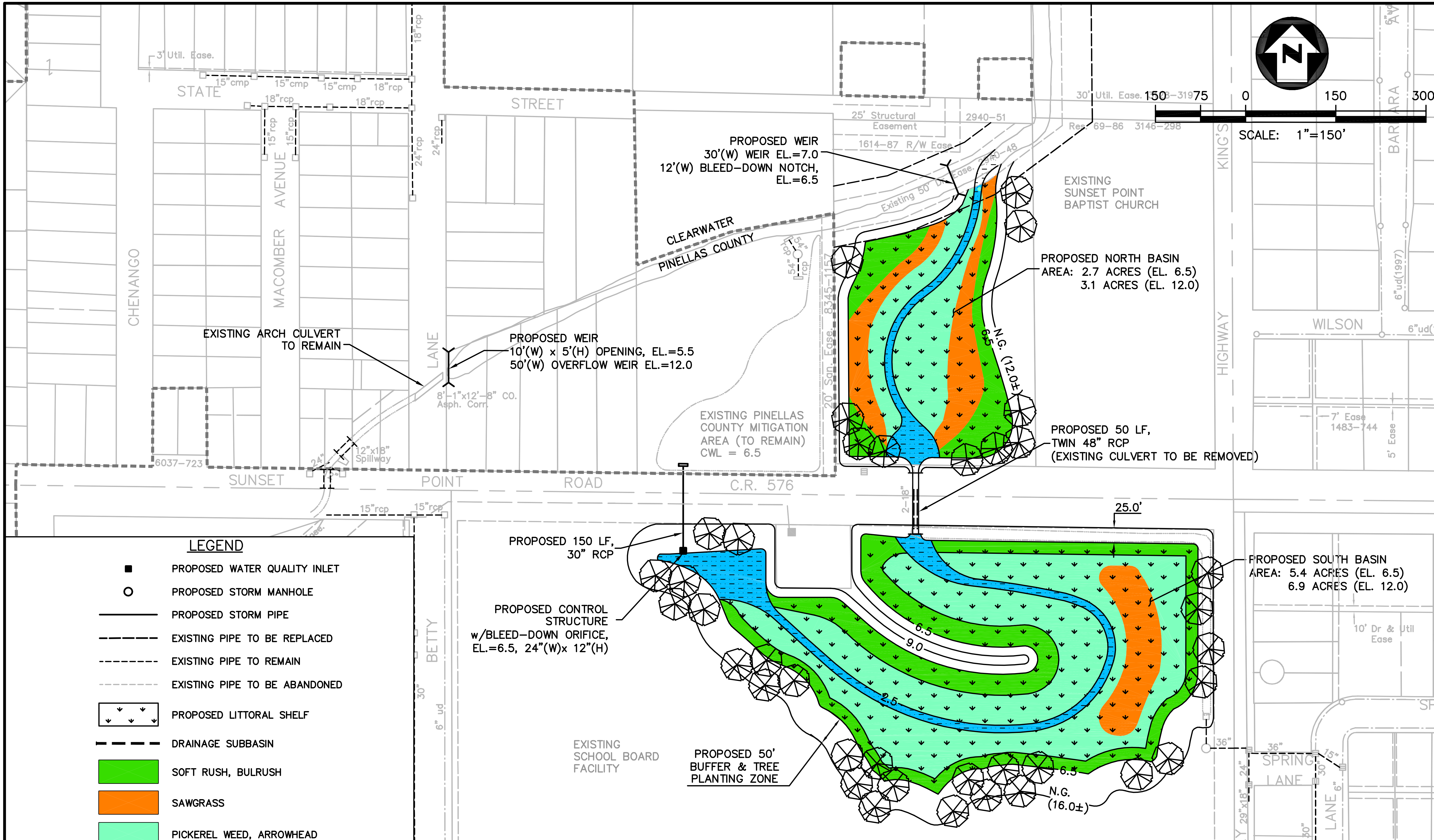

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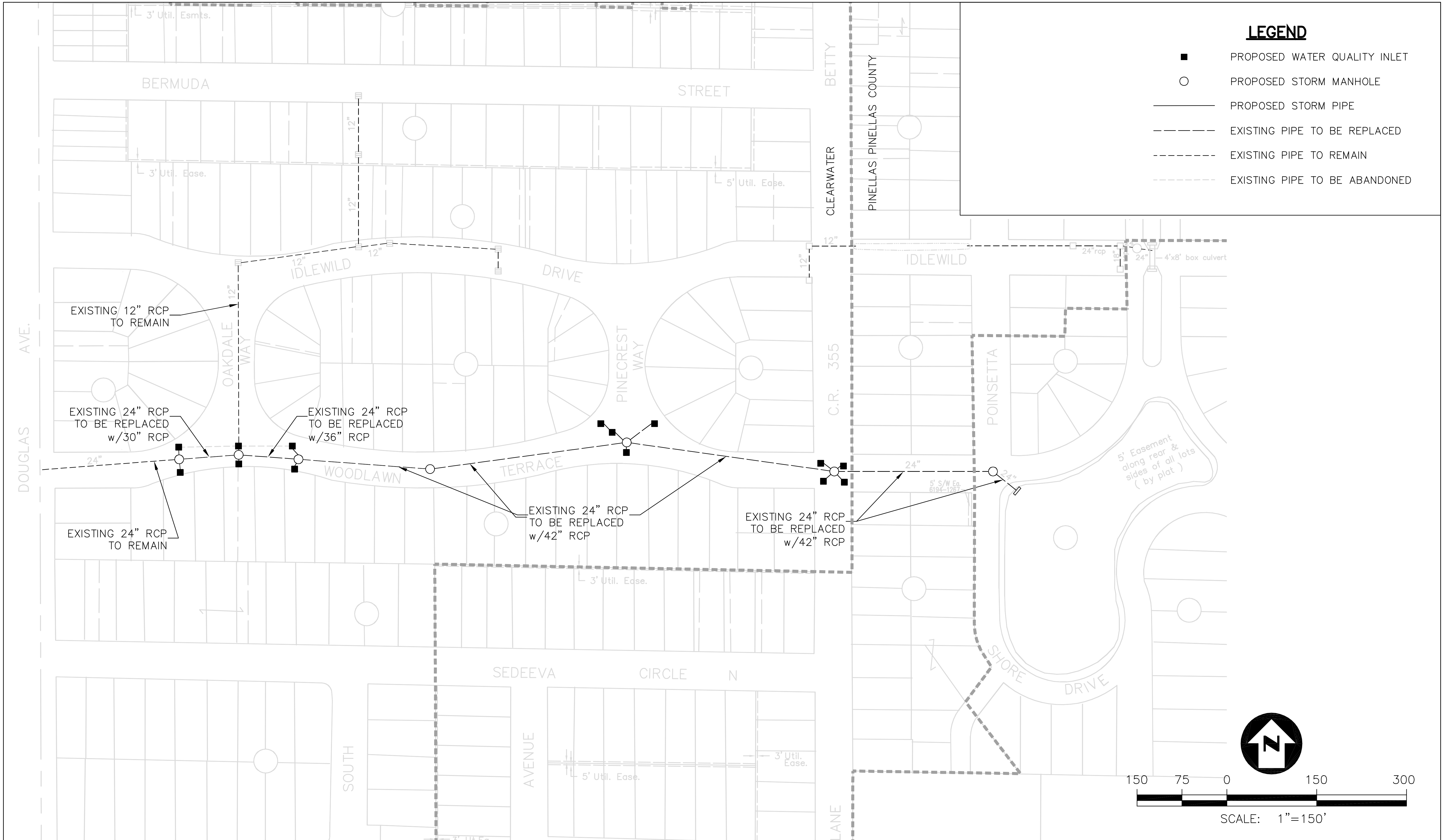
STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1-6

PROJECT 1C SPRING BRANCH STORMWATER DETENTION BASIN



STEVENSON CREEK WATERSHED MANAGEMENT PLAN

FIGURE 3.1-8

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

PROJECT 1D WOODLAND TERRACE STORM SEWER REPLACEMENT

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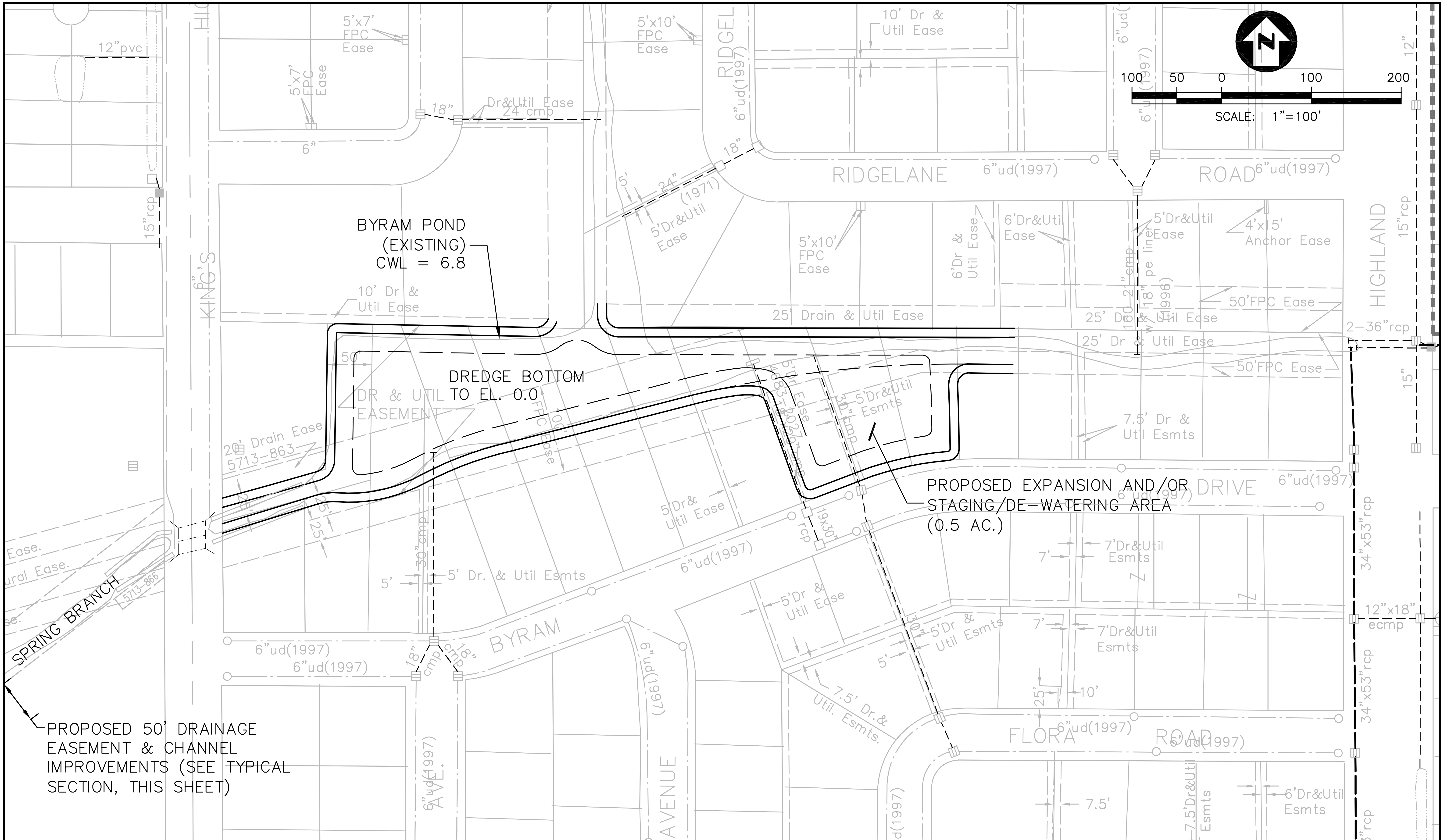

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STEVENSON CREEK WATERSHED MANAGEMENT PLAN

THE CITY OF CLEARWATER, FLORIDA

PARSONS ENGINEERING SCIENCE, INC.
Tampa, Florida
(813) 933-4650

FIGURE 3.1-9

PROJECT 1E BYRAM POND DREDGING & EXPANSION

Figure 2.1-11 Stevenson Creek near Drew Street
Measured and Simulated Hydrographs - Storm of 7/15/00

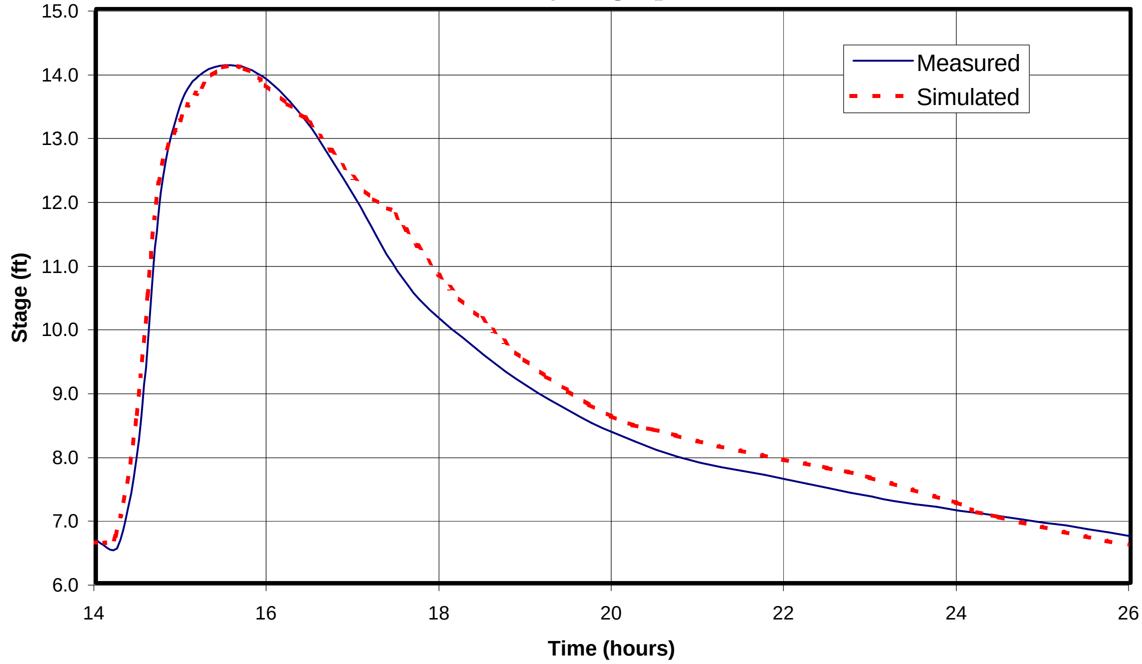


Figure 2.1-12 Spring Branch at Kings Highway
Measured and Simulated Hydrographs - Storm of 7/15/00

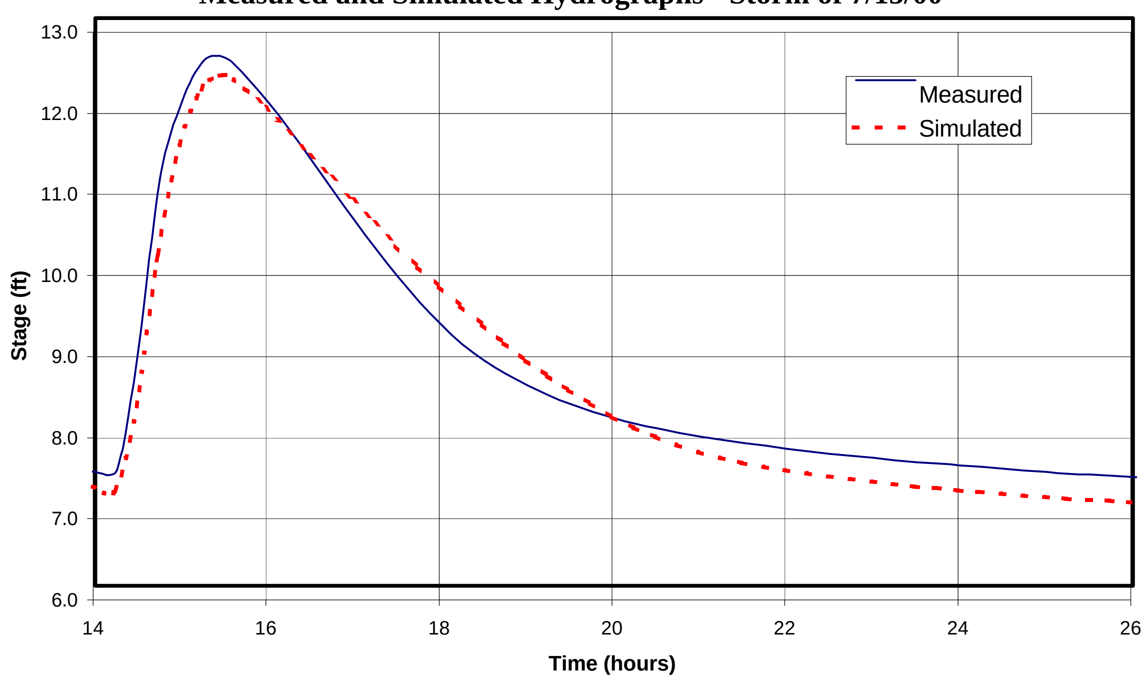


Figure 2.1.13 Stevenson Creek near Drew Street
Measured and Simulated Hydrographs - Storm of 6/12/00 (0.85" Rainfall)

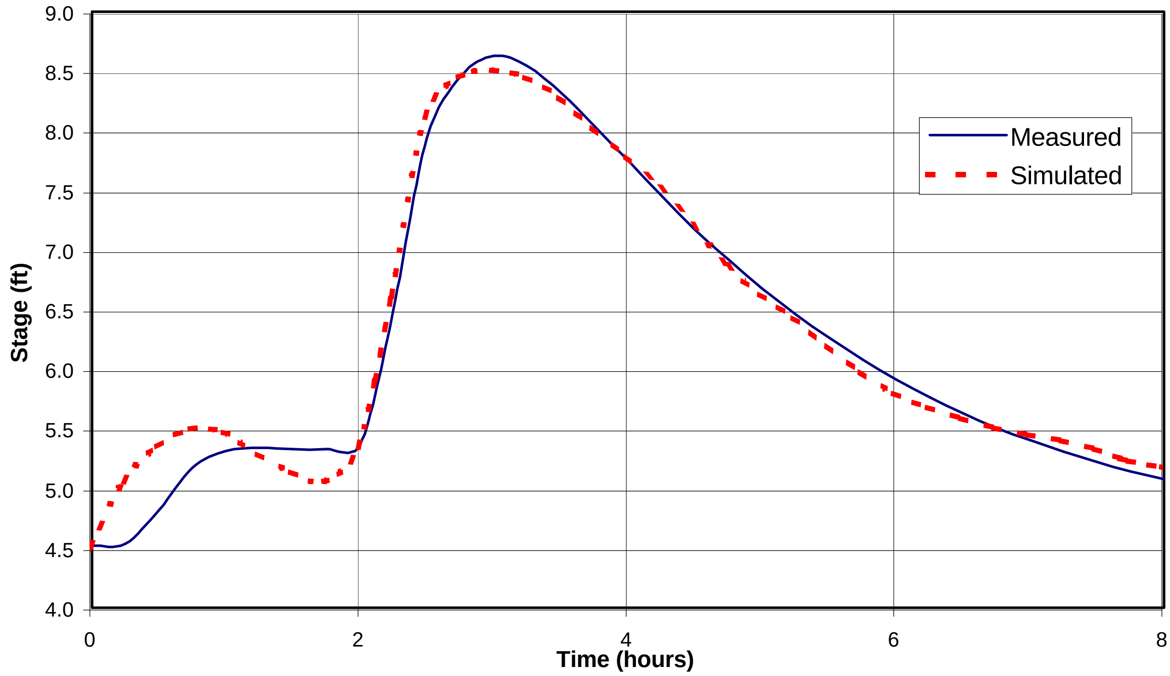
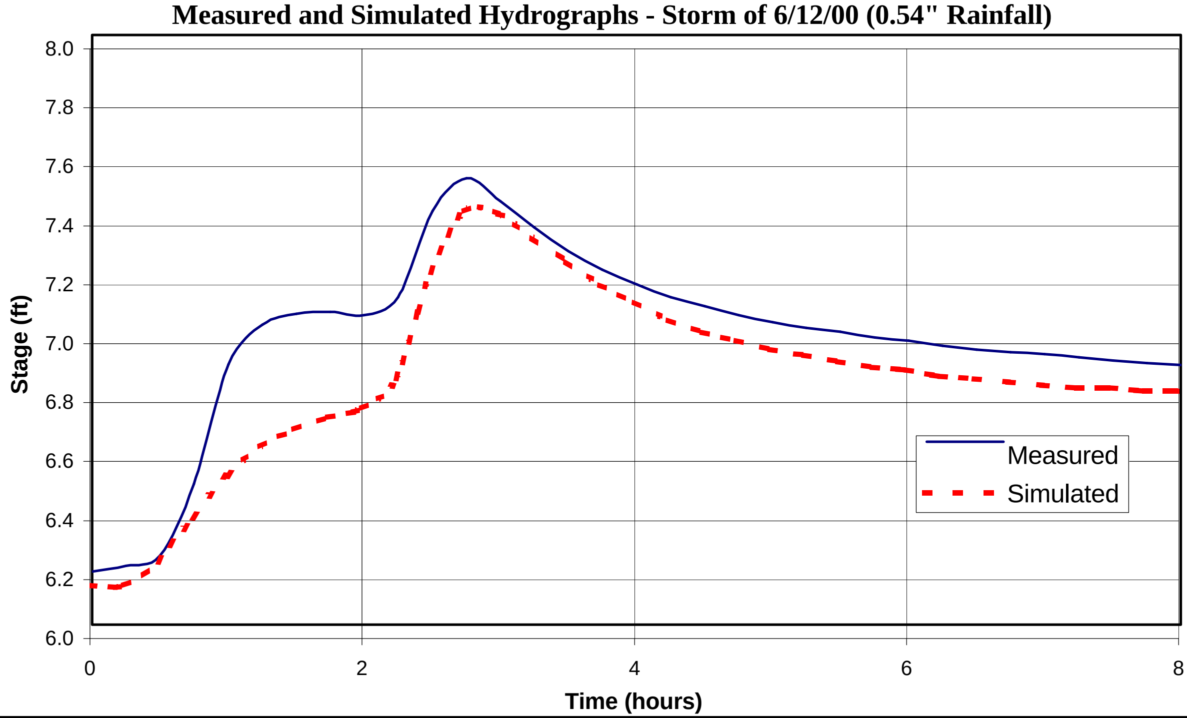
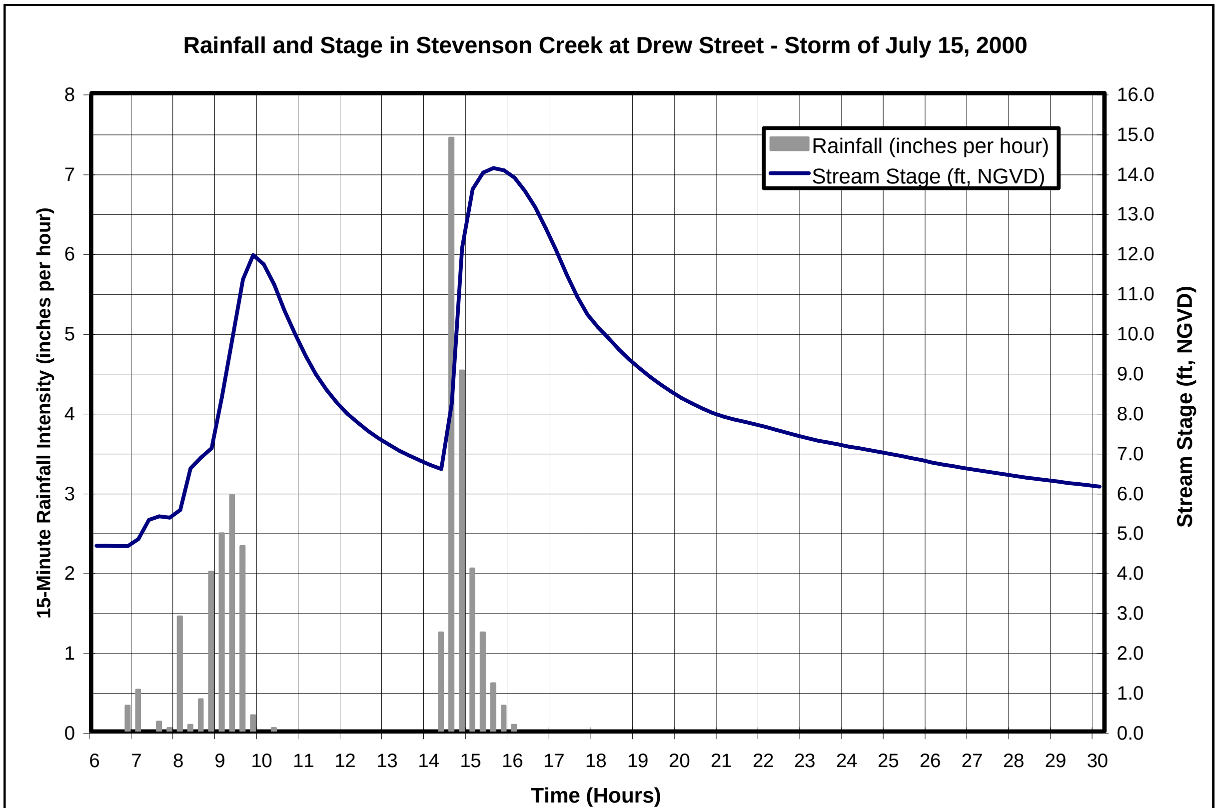


Figure 2.1-14 Spring Branch at Kings Highway
Measured and Simulated Hydrographs - Storm of 6/12/00 (0.54" Rainfall)





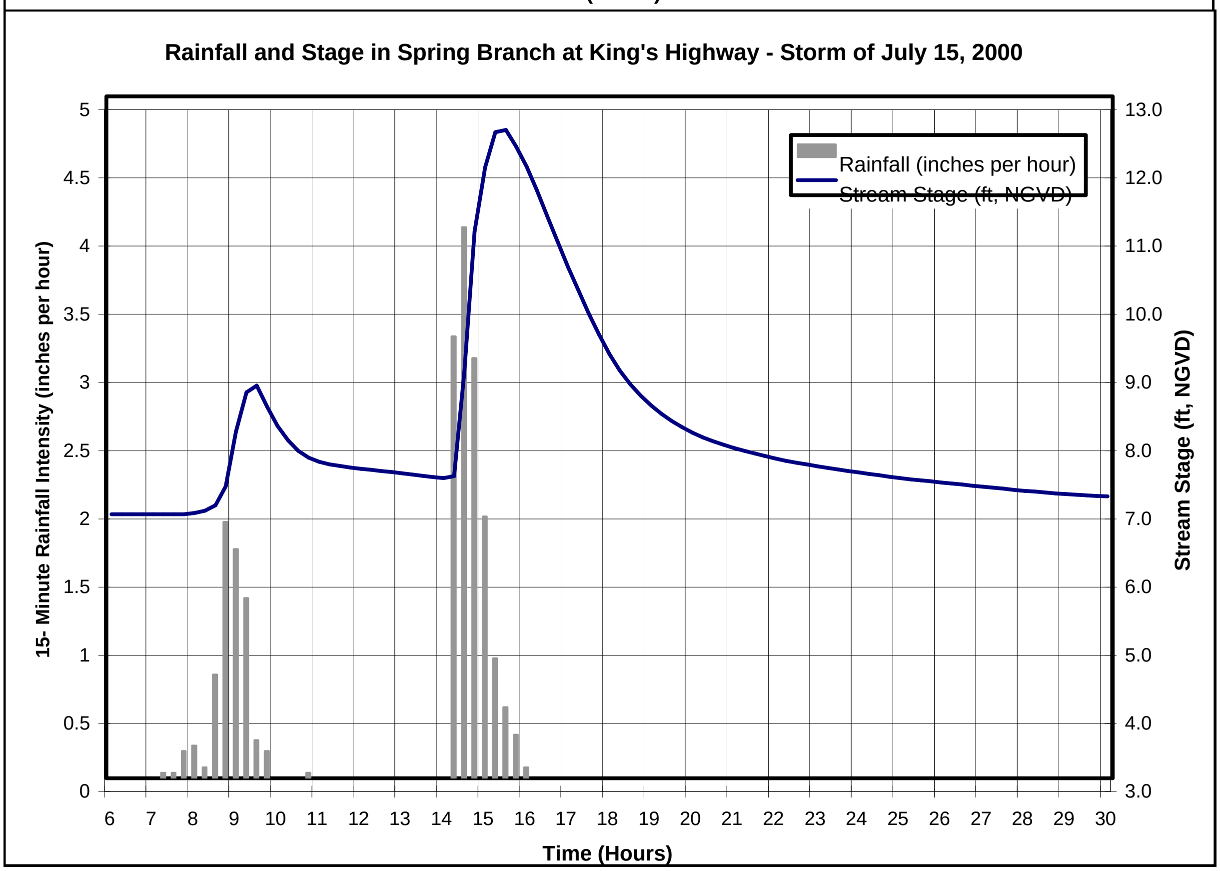


Figure 2.1-6 July 15, 2000 Storm Events

Figure 2.1.9 Simulated and Measured Stage vs Flow in Stevenson Creek

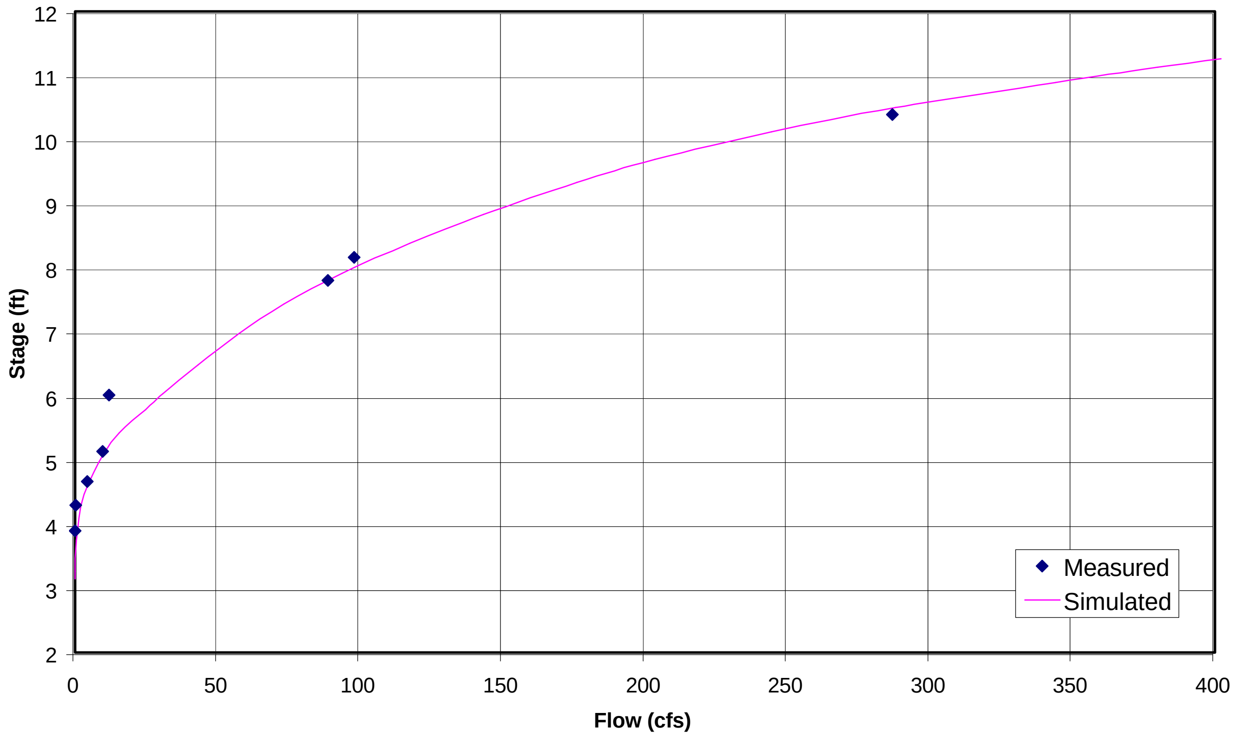


Figure 2.1.10 Simulated and Measured Stage vs Flow in Spring Branch

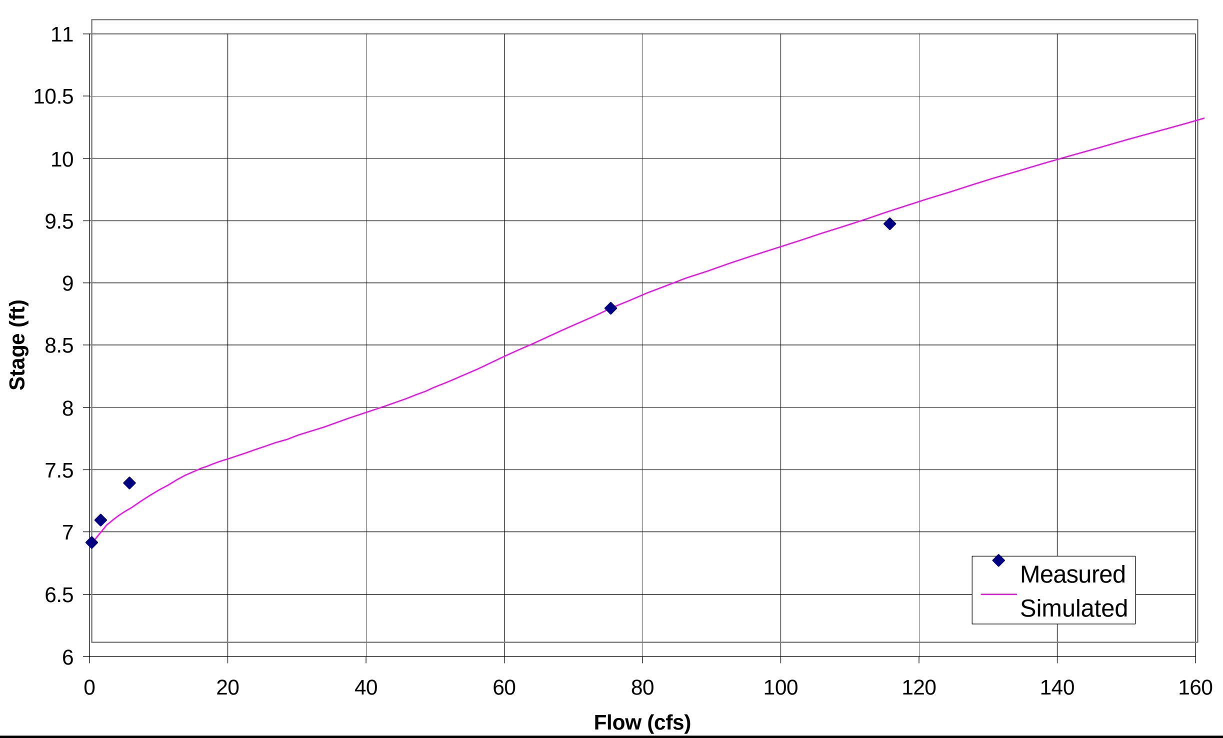


Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N0000	Clearwater Harbor	Collector	7.5	2.50	(0.00)	2.50	(0.00)	2.50	(0.00)
N0010	Stevenson Creek, 320' E. of Alt. 19	Collector	7.5	4.63	(0.00)	5.43	(0.00)	6.60	(0.00)
N0020	Stevenson Creek, 225' NW of Pinellas Trail	Residential	6.3	4.70	(0.00)	5.48	(0.00)	6.63	0.33
N0030	Stevenson Creek, 120' SE of Pinellas Trail	Residential	9.3	5.19	(0.00)	5.92	(0.00)	7.16	(0.00)
N0040	Stevenson Creek, 890' SE of Pinellas Trail	Residential	9.3	5.41	(0.00)	6.14	(0.00)	7.38	(0.00)
N0050	Stevenson Creek, 120' NW of Douglass Ave	Collector	9.0	5.50	(0.00)	6.22	(0.00)	7.44	(0.00)
N0060	Stevenson Creek, 120' SE of Douglass Ave	Residential	10.5	5.74	(0.00)	6.56	(0.00)	7.73	(0.00)
N0070	Stevenson Creek, 1,020 SE of Douglass Ave	Residential	10.5	6.01	(0.00)	6.80	(0.00)	7.95	(0.00)
N0080	Stevenson Creek, 1,530' SE of Douglass Ave	Residential	9.0	6.13	(0.00)	6.93	(0.00)	8.09	(0.00)
N0090	Stevenson Creek, 120' NW of Betty Lane	Collector	10.1	6.26	(0.00)	7.01	(0.00)	8.15	(0.00)
N0100	Stevenson Creek, 120' E of Betty Lane	Residential	6.1	6.80	0.70	7.61	1.51	8.92	2.82
N0110	Stevenson Creek, 690' SE of Betty Lane	Residential	10.0	7.13	(0.00)	7.96	(0.00)	9.26	(0.00)
N0120	Stevenson Creek at Palmetto Street	Collector	7.0	7.52	0.52	8.34	1.34	9.55	2.55
N0130	Stevenson Creek at Palmetto Street	Collector	7.0	8.81	1.81	9.36	2.36	10.14	3.14
N0140	Stevenson Creek, 860' S of Palmetto Street	Collector	16.5	11.25	(0.00)	11.79	(0.00)	12.53	(0.00)
N0150	Stevenson Creek, 150' NW of SCL Railroad	Collector	25.7	12.59	(0.00)	13.02	(0.00)	13.63	(0.00)
N0170	Stevenson Creek, 150' S of SCL Railroad	Collector	25.0	13.16	(0.00)	13.62	(0.00)	14.32	(0.00)
N0180	Stevenson Creek, 820' S of SCL Railroad	Residential	21.0	14.20	(0.00)	14.71	(0.00)	15.35	(0.00)
N0195	Douglass Avenue, 200' E of Harbor Drive	Collector	9.0	6.65	(0.00)	7.27	(0.00)	8.24	(0.00)
N0200	Douglass Avenue, 150' W of Harbor Drive	Collector	10.3	10.83	0.53	10.96	0.66	11.19	0.89
N0210	Fairmont Street and Washington Avenue	Collector	12.0	12.67	0.67	12.81	0.81	13.07	1.07
N0220	Fairmont Steet and N. Greenwood Avenue	Collector	14.0	14.65	0.65	14.79	0.79	15.04	1.04
N0230	Fairmont Street and Fulton Avenue	Collector	21.5	17.06	(0.00)	17.06	(0.00)	17.06	(0.00)
N0240	Marshall Street and Fulton Avenue	Residential	26.5	20.89	(0.00)	21.08	(0.00)	21.29	(0.00)
N0250	Pennsylvania Street and Grant Street	Residential	22.4	22.50	0.10	22.67	0.27	22.77	0.37
N0280	Marshall Street AWTP	Residential	7.5	7.40	(0.00)	7.95	0.45	8.74	1.24
N0290	Russel Street 350' W of Holt Avenue	Residential	9.0	9.32	0.32	9.62	0.62	9.92	0.92
N0291	Russel Street and Martin Luther King Ave	Residential	16.0	9.71	(0.00)	10.22	(0.00)	10.95	(0.00)
N0292	Russel Street and N Madison Ave	Residential	16.0	13.39	(0.00)	14.98	(0.00)	16.76	0.76
N0300	Martin Luther King Ave S of Russel Street	Residential	13.0	11.02	(0.00)	11.43	(0.00)	11.91	(0.00)
N0310	Martin Luther King Ave and Engman Street	Residential	12.0	12.76	0.76	12.97	0.97	13.28	1.28
N0320	Martin Luther King Ave and Palm Bluff St	Residential	15.0	15.67	0.67	15.75	0.75	15.88	0.88

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N0330	Palm Bluff Street and N Madison Avenue	Residential	14.8	16.21	1.41	16.32	1.52	16.50	1.70
N0340	N Greenwood Avenue and Metto Street	Collector	19.2	20.18	0.98	20.43	1.23	21.00	1.80
N0350	N Greenwood Avenue and Palmetteo Street	Collector	21.7	20.90	(0.00)	21.26	(0.00)	21.55	(0.00)
N0370	Pennsylvania Avenue and Metto Street	Residential	20.8	21.41	0.61	21.66	0.86	21.96	1.16
N0380	Holt Avenue and Russel Street	Residential	5.9	6.79	0.89	7.24	1.34	8.21	2.31
N0390	Holt Avenue and Engman Street	Residential	16.5	9.83	(0.00)	10.34	(0.00)	11.18	(0.00)
N0400	Holt Avenue 420' S of Engman Street	Residential	20.2	11.55	(0.00)	12.29	(0.00)	13.32	(0.00)
N0410	Palmetto Street and Holt Avenue	Collector	20.1	13.71	(0.00)	14.63	(0.00)	15.78	(0.00)
N0420	Palmetto Street and N Missouri Avenue	Collector	20.2	16.77	(0.00)	17.86	(0.00)	18.88	(0.00)
N0430	N Missouri Avenue and Seminole Street	Residential	19.2	20.30	1.10	20.73	1.53	21.33	2.13
N0435	Palmetto Street and Phillies Stadium Drive	Collector	20.2	18.67	(0.00)	20.63	0.43	21.33	1.13
N0440	Palmetto Street and Kings Highway	Collector	19.4	19.69	0.29	20.12	0.72	20.68	1.28
N0450	Betty Lane and SCL Railroad Ditch	Collector	23.8	21.26	(0.00)	22.77	(0.00)	24.11	0.31
N0460	N. Lincoln Avenue and SCL Railroad Ditch	Residential	26.0	22.16	(0.00)	23.14	(0.00)	24.30	(0.00)
N0470	N. Missouri Avenue and SCL Railroad Ditch	Residential	24.0	23.20	(0.00)	23.71	(0.00)	24.58	0.58
N0480	N. Greenwood Avenue and Maple Street	Collector	23.6	23.52	(0.00)	23.93	0.33	24.69	1.09
N0500	Spring Branch at Overbrook Avenue	Residential	9.4	5.52	(0.00)	6.22	(0.00)	7.44	(0.00)
N0510	Spring Branch at Overbrook Avenue	Residential	9.4	6.05	(0.00)	6.75	(0.00)	8.78	(0.00)
N0520	Spring Branch at Springtime Avenue	Residential	8.9	6.12	(0.00)	6.80	(0.00)	8.76	(0.00)
N0530	Spring Branch at Douglass Avenue	Collector	9.5	8.42	(0.00)	9.36	(0.00)	10.68	1.18
N0540	Spring Branch at Douglass Avenue	Collector	9.5	9.48	(0.00)	10.50	1.00	11.51	2.01
N0550	(Pinellas County - FPLOS not determined)			9.61		10.61		11.62	
N0560	Spring Branch at Sunset Point Drive	Collector	17.4	9.70	(0.00)	10.67	(0.00)	11.65	(0.00)
N0570	(Pinellas County - FPLOS not determined)			9.85		10.80		11.80	
N0580	(Pinellas County - FPLOS not determined)			10.92		12.64		15.19	
N0590	(Pinellas County - FPLOS not determined)			11.16		12.73		15.23	
N0600	(Pinellas County - FPLOS not determined)			12.73		13.79		15.43	
N0610	(Pinellas County - FPLOS not determined)			12.89		13.90		15.48	
N0620	Spring Branch, 700' SW of Kings Highway	Collector	16.0	13.32	(0.00)	14.22	(0.00)	15.72	(0.00)
N0630	Spring Branch at Kings Highway (west side)	Collector	14.5	14.46	(0.00)	15.33	0.83	16.66	2.16
N0650	Pineland Avenue and Vista Way	Residential	19.0	16.45	(0.00)	16.89	(0.00)	17.61	(0.00)
N0660	Retention pond outfall SE of Pineland, Vista	Residential	20.0	17.19	(0.00)	17.39	(0.00)	17.90	(0.00)

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N0670	Retention pond SE of Pineland and Vista	Residential	22.0	19.38	(0.00)	19.65	(0.00)	20.17	(0.00)
N0680	(Pinellas County - FPLOS not determined)			12.91		13.91		15.49	
N0690	Sunset Point Drive, 750' E of Betty Lane	Collector	11.9	12.91	1.01	13.91	2.01	15.49	3.59
N0700	School Board Retention Pond	Residential	17.0	16.68	(0.00)	16.71	(0.00)	16.77	(0.00)
N0710	School Board Retention Pond	Residential	17.0	16.21	(0.00)	16.39	(0.00)	16.78	(0.00)
N0720	School Board Ditch	Residential	19.0	18.64	(0.00)	18.82	(0.00)	19.05	0.05
N0730	School Board Retention Pond	Residential	20.0	19.39	(0.00)	19.61	(0.00)	20.05	0.05
N0740	State Street Ditch, 320' E of Betty Lane	Residential	12.3	12.97	0.67	13.92	1.62	15.53	3.23
N0750	State Street Ditch, 320' E of Betty Lane	Residential	12.3	13.02	0.72	13.92	1.62	15.50	3.20
N0760	Pond E of Betty Lane and Woodlawn Terr.	Residential	15.0	13.32	(0.00)	13.96	(0.00)	15.51	0.51
N0770	(Pinellas County - FPLOS not determined)			13.36		14.01		15.58	
N0775	(Pinellas County - FPLOS not determined)			13.82		15.08		17.08	
N0780	(Pinellas County - FPLOS not determined)			13.95		15.32		17.48	
N0790	(City of Dunedin - FPLOS not determined)			14.14		15.49		17.64	
N0800	(City of Dunedin - FPLOS not determined)			17.76		18.58		19.83	
N0810	(City of Dunedin - FPLOS not determined)			17.84		18.59		19.85	
N0820	(City of Dunedin - FPLOS not determined)			17.84		18.59		19.80	
N0830	(City of Dunedin - FPLOS not determined)			17.92		18.60		19.85	
N0840	(City of Dunedin - FPLOS not determined)			17.94		18.61		19.83	
N0850	(City of Dunedin - FPLOS not determined)			18.15		18.68		19.85	
N0855	(City of Dunedin - FPLOS not determined)			18.17		18.70		19.85	
N0860	(City of Dunedin - FPLOS not determined)			18.48		19.07		20.13	
N0870	(City of Dunedin - FPLOS not determined)			18.54		19.10		20.14	
N0880	(City of Dunedin - FPLOS not determined)			18.71		19.28		20.28	
N0890	(City of Dunedin - FPLOS not determined)			18.77		19.31		20.29	
N0900	(City of Dunedin - FPLOS not determined)			18.79		19.33		20.29	
N0910	Woodlawn Terrace and Oakdale Way	Residential	19.0	20.79	1.79	21.32	2.32	21.88	2.88
N0920	(City of Dunedin - FPLOS not determined)			18.18		18.70		19.82	
N1000	Spring Branch at Kings Highway (east side)	Collector	14.5	15.02	0.52	15.75	1.25	16.75	2.25
N1010	Spring Branch, 680' S of Union Street	Residential	21.0	15.30	(0.00)	16.02	(0.00)	17.01	(0.00)
N1020	Spring Branch, 380' S of Union Street	Residential	20.8	15.84	(0.00)	16.52	(0.00)	17.52	(0.00)
N1030	Spring Branch at Union Street	Collector	20.0	17.52	(0.00)	18.16	(0.00)	19.15	(0.00)

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N1040	(City of Dunedin - FPLOS not determined)			17.73		18.52		19.82	
N1050	(City of Dunedin - FPLOS not determined)			17.82		18.60		19.89	
N1060	(City of Dunedin - FPLOS not determined)			17.82		18.60		19.89	
N1070	(City of Dunedin - FPLOS not determined)			17.95		18.71		19.97	
N1080	(City of Dunedin - FPLOS not determined)			18.05		18.77		20.01	
N1090	(City of Dunedin - FPLOS not determined)			18.37		18.90		20.07	
N1100	(City of Dunedin - FPLOS not determined)			22.32		22.89		23.85	
N1110	(City of Dunedin - FPLOS not determined)			23.04		23.47		24.21	
N1120	(City of Dunedin - FPLOS not determined)			23.99		24.22		24.67	
N1130	(City of Dunedin - FPLOS not determined)			24.39		24.77		25.62	
N1140	(City of Dunedin - FPLOS not determined)			24.49		24.90		25.84	
N1150	(City of Dunedin - FPLOS not determined)			24.54		24.95		25.95	
N1160	(City of Dunedin - FPLOS not determined)			24.61		25.06		26.26	
N1170	(City of Dunedin - FPLOS not determined)			24.61		25.06		26.27	
N1172	(City of Dunedin - FPLOS not determined)			24.64		25.09		26.33	
N1174	(City of Dunedin - FPLOS not determined)			24.65		25.10		26.36	
N1180	(City of Dunedin - FPLOS not determined)			24.62		25.08		26.28	
N1190	(City of Dunedin - FPLOS not determined)			24.67		25.12		26.40	
N1200	(City of Dunedin - FPLOS not determined)			24.74		25.18		26.48	
N1210	(City of Dunedin - FPLOS not determined)			27.61		28.49		29.20	
N1220	(City of Dunedin - FPLOS not determined)			27.63		28.50		29.23	
N1230	(City of Dunedin - FPLOS not determined)			28.01		28.64		29.24	
N1240	(City of Dunedin - FPLOS not determined)			28.02		28.65		29.27	
N1245	(City of Dunedin - FPLOS not determined)			28.02		28.65		29.26	
N1250	(City of Dunedin - FPLOS not determined)			28.02		28.65		29.27	
N1260	(City of Dunedin - FPLOS not determined)			28.23		28.78		29.82	
N1270	(City of Dunedin - FPLOS not determined)			30.34		30.98		32.08	
N1280	(City of Dunedin - FPLOS not determined)			30.35		30.99		32.08	
N1290	(City of Dunedin - FPLOS not determined)			30.60		30.99		32.08	
N1300	(City of Dunedin - FPLOS not determined)			33.12		33.35		33.71	
N1310	(City of Dunedin - FPLOS not determined)			33.38		33.72		34.31	
N1320	(City of Dunedin - FPLOS not determined)			33.74		33.89		34.36	

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N1330	(City of Dunedin - FPLOS not determined)			42.18		42.56		43.19	
N1340	(City of Dunedin - FPLOS not determined)			42.36		42.75		43.40	
N1350	Byram East Ditch at Highland Avenue	Collector	17.2	15.37	(0.00)	16.16	(0.00)	17.27	0.07
N1360	Byram East Ditch at Highland Avenue	Collector	17.2	18.64	1.44	19.08	1.88	19.93	2.73
N1370	Byram East Ditch, 730' E of Highland Ave	Residential	23.7	25.27	1.57	25.68	1.98	26.52	2.82
N1380	Byram East Ditch, 1,350' E of Highland Ave	Residential	28.5	27.81	(0.00)	28.22	(0.00)	28.62	0.12
N1390	Souvenir Drive near Algonquin Drive	Residential	29.0	28.47	(0.00)	29.28	0.28	29.66	0.66
N1400	Algonquin Drive, 340' W of Picardy Circle	Residential	34.5	29.14	(0.00)	30.74	(0.00)	33.66	(0.00)
N1410	Algonquin Drive and Nugget Drive	Residential	56.5	50.48	(0.00)	50.77	(0.00)	50.88	(0.00)
N1420	Nugget Drive, 400' S of Algonquin Drive	Residential	58.5	53.89	(0.00)	53.90	(0.00)	54.73	(0.00)
N1430	Clearview Lake	Residential	59.0	56.19	(0.00)	56.54	(0.00)	57.36	(0.00)
N1440	Highland Avenue, 130' S of Byram Drive	Collector	16.0	17.57	1.57	17.94	1.94	18.43	2.43
N1450	Highland Avenue at Highland Circle	Collector	20.0	20.67	0.67	20.85	0.85	21.11	1.11
N1460	Highland Avenue at Sunset Point Road	Collector	32.5	32.72	0.22	32.91	0.41	33.14	0.64
N1470	Sunset Point Road, 250' E of Highland Ave	Collector	33.3	33.62	0.32	33.79	0.49	33.96	0.66
N1480	Sunset Point Road, 250' E of Highland Ave	Collector	33.3	33.81	0.51	33.86	0.56	33.96	0.66
N1490	Pond NE of Highland Avenue and Byram Dr	Residential	16.8	15.48	(0.00)	15.98	(0.00)	16.69	(0.00)
N1500	Souvenir Drive, 250' W of Picardy Circle	Residential	24.6	26.64	2.04	27.22	2.62	27.87	3.27
N1510	Retention Pond in Windsor Woods Sub.	Residential	28.0	28.08	0.08	28.28	0.28	28.68	0.68
N1520	(City of Dunedin - FPLOS not determined)			19.03		19.58		20.61	
N1530	(City of Dunedin - FPLOS not determined)			19.26		19.82		20.80	
N1540	(City of Dunedin - FPLOS not determined)			19.83		20.03		20.80	
N1550	(City of Dunedin - FPLOS not determined)			22.47		24.03		24.54	
N1560	(City of Dunedin - FPLOS not determined)			23.79		24.54		24.84	
N1570	(City of Dunedin - FPLOS not determined)			23.97		24.44		24.96	
N1580	(City of Dunedin - FPLOS not determined)			23.81		24.30		24.87	
N1590	(City of Dunedin - FPLOS not determined)			19.21		19.75		20.73	
N1600	(City of Dunedin - FPLOS not determined)			26.88		26.99		27.12	
N1610	(City of Dunedin - FPLOS not determined)			27.87		28.23		28.87	
N1620	(City of Dunedin - FPLOS not determined)			31.14		31.43		32.02	
N1630	(City of Dunedin - FPLOS not determined)			26.18		26.47		26.83	
N1640	(City of Dunedin - FPLOS not determined)			30.11		30.77		31.89	

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N1650	(City of Dunedin - FPLOS not determined)			30.96		31.53		32.80	
N1660	(City of Dunedin - FPLOS not determined)			31.34		31.81		32.91	
N1670	(City of Dunedin - FPLOS not determined)			32.22		32.58		33.29	
N1680	(City of Dunedin - FPLOS not determined)			35.81		36.67		38.54	
N1690	(City of Dunedin - FPLOS not determined)			39.53		39.80		40.59	
N1700	(City of Dunedin - FPLOS not determined)			36.31		36.69		37.49	
N1710	(City of Dunedin - FPLOS not determined)			27.35		28.17		30.34	
N1720	(City of Dunedin - FPLOS not determined)			44.60		44.74		44.88	
N1750	(City of Dunedin - FPLOS not determined)			24.62		25.08		26.28	
N1760	(City of Dunedin - FPLOS not determined)			24.63		25.10		26.29	
N1770	(City of Dunedin - FPLOS not determined)			25.19		25.31		26.30	
N1780	(City of Dunedin - FPLOS not determined)			27.09		27.39		27.95	
N1790	(City of Dunedin - FPLOS not determined)			28.64		29.01		29.52	
N1800	(City of Dunedin - FPLOS not determined)			24.64		25.06		26.09	
N1810	(City of Dunedin - FPLOS not determined)			24.64		25.06		26.10	
N1820	(City of Dunedin - FPLOS not determined)			24.87		25.41		26.30	
N1830	(City of Dunedin - FPLOS not determined)			26.96		27.24		27.97	
N1840	(City of Dunedin - FPLOS not determined)			28.02		28.64		29.24	
N1850	(City of Dunedin - FPLOS not determined)			28.02		28.64		29.25	
N1860	(City of Dunedin - FPLOS not determined)			30.84		31.60		33.17	
N1870	(City of Dunedin - FPLOS not determined)			31.62		32.40		34.09	
N1880	(City of Dunedin - FPLOS not determined)			29.71		30.14		30.93	
N1900	(City of Dunedin - FPLOS not determined)			28.03		28.65		29.33	
N1910	(City of Dunedin - FPLOS not determined)			28.10		28.73		29.91	
N1920	(City of Dunedin - FPLOS not determined)			30.71		31.09		31.72	
N1930	(City of Dunedin - FPLOS not determined)			31.34		32.81		35.58	
N1940	(City of Dunedin - FPLOS not determined)			33.14		35.17		38.45	
N1950	(City of Dunedin - FPLOS not determined)			37.03		39.57		43.93	
N1960	(City of Dunedin - FPLOS not determined)			50.58		50.77		50.77	
N1970	(City of Dunedin - FPLOS not determined)			52.94		53.52		54.89	
N1980	(City of Dunedin - FPLOS not determined)			52.81		53.12		54.16	
N1990	(City of Dunedin - FPLOS not determined)			51.70		52.20		53.42	

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N2000	Hammond Branch, 625' W of Kings Highway	Residential	6.5	6.83	0.33	7.64	1.14	8.95	2.45
N2010	Hammond Branch at Kings Highway	Collector	9.8	9.26	(0.00)	10.55	0.75	12.26	2.46
N2020	Hammond Branch at Kings Highway	Collector	9.8	10.58	0.78	10.94	1.14	12.27	2.47
N2030	Hammond Branch Pond E of Kings Highway	Residential	15.1	16.22	1.12	16.72	1.62	16.94	1.84
N2040	Hammond Branch Pond W of Highland Ave	Residential	19.0	18.92	(0.00)	19.18	0.18	19.66	0.66
N2050	Hammond Branch at Highland Avenue	Residential	27.5	22.39	(0.00)	22.49	(0.00)	24.19	(0.00)
N2060	RR ditch at Flagler Drive and Carroll Street	Residential	43.3	42.56	(0.00)	43.05	(0.00)	43.63	0.33
N2070	RR ditch at Flagler Drive and Gentry Street	Residential	44.2	43.97	(0.00)	44.46	0.26	44.98	0.78
N2080	RR ditch at Flagler Drive and Crown Street	Residential	46.7	46.78	0.08	47.11	0.41	47.42	0.72
N2090	RR ditch at Flagler Drive 200' N of Scott St	Residential	48.4	48.85	0.45	49.07	0.67	49.33	0.93
N2100	RR ditch at Flagler Dr 250' W of Ridge Ave	Residential	50.3	51.12	0.82	51.25	0.95	51.50	1.20
N2110	RR ditch at Flagler Dr 100' E of Lynn Ave	Residential	55.3	53.45	(0.00)	53.60	(0.00)	53.90	(0.00)
N2120	RR ditch at Flagler Dr 80' W of Murry Ave	Residential	60.1	58.04	(0.00)	58.27	(0.00)	58.72	(0.00)
N2130	RR ditch at Flagler Dr and Saturn Avenue	Residential	63.3	61.22	(0.00)	61.45	(0.00)	61.87	(0.00)
N2140	RR ditch at Flagler Drive and Keene Road	Collector	62.9	62.75	(0.00)	62.95	0.05	63.24	0.34
N2150	Keene Road ditch 200' N of Long Street	Residential	65.3	67.41	2.11	68.09	2.79	69.16	3.86
N2155	Keene Road ditch 440' S of Long Street	Residential	69.0	67.43	(0.00)	68.10	(0.00)	69.17	0.17
N2160	Keene Road ditch at Palmetto Street	Collector	67.0	67.47	0.47	68.10	1.10	69.18	2.18
N2170	West pond in Clearwater Golf Park	(no street)		68.45		68.62		69.18	
N2180	Center pond in Clearwater Golf Park	(no street)		68.87		69.18		69.63	
N2200	Rollen Road and Parkwood Street	Residential	13.8	14.71	0.91	15.61	1.81	16.00	2.20
N2210	Rollen Road and Terrrace Road	Residential	17.0	17.51	0.51	17.70	0.70	17.94	0.94
N2220	Kings Highway and Terrace Road	Collector	19.9	20.38	0.48	20.52	0.62	20.74	0.84
N2230	Kings Highway and Admiral Woodson Lane	Collector	15.5	16.23	0.73	16.48	0.98	16.88	1.38
N2240	Pond at Kings Highway and Hibiscus Street	Residential	23.0	19.86	(0.00)	20.07	(0.00)	20.42	(0.00)
N2242	Palmetto Street and Palm Terrace Drive	Collector	25.0	22.06	(0.00)	22.07	(0.00)	22.93	(0.00)
N2244	Palmetto Street and SCL Railroad	Collector	30.0	26.41	(0.00)	26.41	(0.00)	26.43	(0.00)
N2250	Palmetto Street and SCL Railroad	Collector	36.0	30.71	(0.00)	31.14	(0.00)	32.05	(0.00)
N2260	Detention Pond SW of Highland & Palmetto	Collector	37.0	33.31	(0.00)	34.38	(0.00)	36.85	(0.00)
N2270	Highland Avenue and Palmetto Street	Collector	37.5	33.73	(0.00)	34.92	(0.00)	37.25	(0.00)
N2280	Highland Avenue and Walnut Street	Collector	42.0	41.86	(0.00)	42.46	0.46	43.24	1.24
N2290	Glenwood Avenue and Elmwood Street	Residential	49.0	49.11	0.11	49.29	0.29	49.46	0.46

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N2300	Park at Smallwood Circle and Rosemere Rd	Residential	44.5	46.30	1.80	46.65	2.15	49.39	4.89
N2310	Park at Ridgewood Street and Wood Ave	Residential	53.0	53.06	0.06	53.77	0.77	55.12	2.12
N2320	Ridgewood Street and Edgewood Avenue	Residential	58.0	55.60	(0.00)	56.40	(0.00)	57.33	(0.00)
N2330	Drew Street at Edgewood Avenue	Collector	66.0	58.86	(0.00)	59.44	(0.00)	60.59	(0.00)
N2340	Drew Street at Crest Avenue	Collector	62.7	62.61	(0.00)	63.10	0.40	63.22	0.52
N2345	Highland Avenue and Palmetto Street	Collector	36.6	36.81	0.21	36.93	0.33	37.13	0.53
N2350	Flagler Drive and Levern Street	Residential	39.0	39.78	0.78	40.03	1.03	40.43	1.43
N2370	Overlea Street, E of Carlos Avenue	Residential	23.5	24.25	0.75	24.49	0.99	24.89	1.39
N2380	Highland Avenue and Fairmont Street	Collector	27.3	27.83	0.53	28.05	0.75	28.33	1.03
N2390	Highland Avenue and Fairmont Street	Collector	27.3	28.37	1.07	28.53	1.23	28.76	1.46
N2400	Highland Avenue and Sandy Lane	Collector	32.5	33.35	0.85	33.47	0.97	33.68	1.18
N2420	Highland Avenue and Greenlea Drive	Collector	34.9	35.36	0.46	35.44	0.54	35.55	0.65
N2430	Highland Avenue 200' N of Overlea Street	Collector	26.8	27.38	0.58	27.51	0.71	27.64	0.84
N2440	Highland Avenue 200' N of Overlea Street	Collector	26.8	27.40	0.60	27.53	0.73	27.66	0.86
N2450	SCL RR W of Gentry Street and Flagler Drive	Residential	44.2	36.49	(0.00)	36.54	(0.00)	36.60	(0.00)
N2460	Linwood Drive and Sharondale Drive	Residential	51.0	51.27	0.27	51.39	0.39	51.60	0.60
N2470	Nelson Avenue and Scott Street	Residential	58.4	58.79	0.39	58.86	0.46	59.33	0.93
N2480	Lake Lucille	Residential	59.0	60.37	1.37	60.55	1.55	61.09	2.09
N2490	Palmetto Street and Casloer Avenue	Collector	66.4	66.49	0.09	66.94	0.54	67.12	0.72
N2500	Lake Hobart	Collector	67.3	65.74	(0.00)	66.35	(0.00)	67.42	0.12
N2510	Saturn Avenue and Leo Lane	Residential	63.4	64.67	1.27	64.75	1.35	64.89	1.49
N2520	Saturn Avenue and Sherwood Street	Residential	63.2	64.67	1.47	64.75	1.55	64.88	1.68
N2530	Lake at St Andrews Cove Apartments	Residential	69.4	67.22	(0.00)	67.78	(0.00)	68.92	(0.00)
N2540	Clearwater Air Park	Evacuation	68.0	67.15	(0.00)	67.59	(0.00)	68.61	0.61
N2545	Clearwater Air Park	Evacuation	68.0	61.40	(0.00)	61.40	(0.00)	61.40	(0.00)
N2550	Clearwater Air Park	Evacuation	70.5	68.44	(0.00)	68.59	(0.00)	68.87	(0.00)
N2560	SE Pond in Clearwater Golf Park	(no street)		69.64		69.72		69.83	
N2570	City of Clearwater Public Service Complex	Residential	64.3	63.76	(0.00)	64.03	(0.00)	64.47	0.17
N2580	City of Clearwater Public Service Complex	Residential	66.0	66.07	(0.00)	66.24	(0.00)	66.71	(0.00)
N3000	Stevenson Creek gage, 170' N of Drew Street	Collector	21.0	14.58	(0.00)	15.07	(0.00)	15.70	(0.00)
N3010	Stevenson Creek at Drew Street	Collector	17.6	14.61	(0.00)	15.12	(0.00)	15.76	(0.00)
N3020	Stevenson Creek at Drew Street	Collector	17.6	14.88	(0.00)	15.68	(0.00)	17.44	(0.00)

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N3030	Stevenson Creek at Cleveland Street (SR 60)	Evacuation	18.0	17.77	(0.00)	18.75	0.74	20.15	2.14
N3040	Stevenson Creek at Cleveland Street (SR 60)	Evacuation	18.0	18.53	0.52	19.65	1.64	20.74	2.73
N3050	Stevenson Creek at Pierce Street	Residential	17.2	18.77	1.57	19.69	2.49	20.83	3.63
N3060	Stevenson Creek at Pierce Street	Residential	17.2	18.95	1.75	19.75	2.55	20.86	3.66
N3070	Stevenson Creek at Franklin Street	Residential	17.8	18.99	1.19	19.79	1.99	20.92	3.12
N3080	Stevenson Creek at Franklin Street	Residential	17.8	19.20	1.40	19.86	2.06	20.96	3.16
N3090	Stevenson Creek at Court Street (SR 595A)	Arterial	22.0	19.24	(0.00)	19.89	(0.00)	20.98	(0.00)
N3100	Stevenson Creek at Court Street (SR 595A)	Arterial	22.0	19.30	(0.00)	20.17	(0.00)	22.19	0.19
N3110	Stevenson Creek 605' S of Court Street	Residential	19.0	20.77	1.77	21.52	2.52	22.89	3.89
N3120	Stevenson Creek at Druid Road	Collector	21.8	21.15	(0.00)	21.82	0.02	23.05	1.25
N3125	Stevenson Creek at Druid Road	Collector	21.8	21.46	(0.00)	22.26	0.46	23.58	1.78
N3126	Stevenson Creek Weir S of Druid Road	Residential	21.5	21.95	0.45	22.82	1.32	24.23	2.73
N3130	Stevenson Creek 350' S of Druid (Linn Lake)	Residential	21.5	22.17	0.67	23.08	1.58	24.53	3.03
N3131	Stevenson Creek 1030' S of Druid(Linn Lake)	Residential	23.0	22.22	(0.00)	23.13	0.13	24.57	1.57
N3132	Stevenson Creek at Evergreen Avenue	Residential	24.0	23.38	(0.00)	24.36	0.36	25.72	1.72
N3134	Stevenson Creek at Hillcrest N of Jeffords	Residential	26.5	24.00	(0.00)	25.09	(0.00)	26.73	0.23
N3135	Pond in Golf Course S of Druid	Residential	33.0	20.70	(0.00)	20.89	(0.00)	22.77	(0.00)
N3140	Druid Road and S. Betty Lane	Collector	22.2	20.77	(0.00)	21.52	(0.00)	22.91	0.71
N3150	S. Betty Lane and Jasmine Way	Residential	24.0	24.42	0.42	24.72	0.72	25.06	1.06
N3160	S. Betty Lane and Magnolia Drive	Residential	26.0	26.55	0.55	26.74	0.74	26.99	0.99
N3170	S. Betty Lane and Lotus Path	Residential	28.5	28.94	0.44	29.11	0.61	29.30	0.80
N3180	Jeffords Street and Byron Avenue	Residential	25.5	25.61	0.11	25.88	0.38	26.10	0.60
N3190	Jeffords Street and S. Betty Lane	Residential	33.0	33.14	(0.00)	33.34	0.34	33.52	0.52
N3195	Jeffords Street and Lincoln Avenue	Residential	53.0	49.95	(0.00)	50.21	(0.00)	50.22	(0.00)
N3200	Plaza Pines Shopping Center	Residential	57.0	52.21	(0.00)	52.23	(0.00)	52.85	(0.00)
N3210	Plaza Pines Shopping Center	Residential	58.5	54.32	(0.00)	54.71	(0.00)	55.14	(0.00)
N3220	Plaza Pines Shopping Center Pond	Residential	60.8	61.22	0.42	61.27	0.47	61.34	0.54
N3450	Lake Bellevue Branch at S. Betty Lane	Residential	19.0	21.01	2.01	21.64	2.64	22.91	3.91
N3500	Lake Bellevue Branch at S. Lincoln Drive	Residential	20.3	22.23	1.93	22.62	2.32	23.27	2.97
N3510	Lake Bellevue Branch at Missouri Avenue	Arterial	23.0	24.36	1.36	24.64	1.64	25.68	2.68
N3520	Lake Bellevue Branch at Missouri Avenue	Arterial	23.0	24.37	1.37	24.65	1.65	25.67	2.67
N3530	Lake Bellevue Branch Pond W of Missouri	Residential	25.0	25.37	0.37	25.75	0.75	26.56	1.56

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N3540	Lake Bellevue Branch at Druid Road	Collector	27.8	28.15	0.35	28.35	0.55	29.04	1.24
N3550	Stormwater Pond at Renaissance Sq. Villas	Residential	31.0	30.09	(0.00)	31.21	0.21	32.02	1.02
N3555	Lake Bellevue Branch 400' S of Druid	Residential	32.5	28.82	(0.00)	29.56	(0.00)	30.51	(0.00)
N3560	Lake Bellevue Branch W of Renaissance Sq	Residential	36.0	30.23	(0.00)	32.93	(0.00)	34.03	(0.00)
N3565	Lk Bellevue Brnch at Lotus Path/ S Greenwd	Collector	45.6	32.10	(0.00)	36.27	(0.00)	37.45	(0.00)
N3570	Lake Bellevue Branch S of Renaissance Sq	Residential	37.5	33.90	(0.00)	38.77	1.27	39.81	2.31
N3575	Lk Bellevue Branch 150' S of Renaissance Sq	Residential	36.0	36.54	0.54	38.77	2.77	39.81	3.81
N3580	Lake Bellevue Branch 250' N of Pinellas St	Residential	38.0	38.44	0.44	39.01	1.01	39.88	1.88
N3600	Lake Bellevue Branch at Pinellas Street	Residential	38.5	38.57	0.07	39.42	0.92	40.74	2.24
N3650	Lk Bellevue Brnch at Tuskawilla/ S Greenwd	Collector	39.8	40.35	0.55	40.71	0.91	41.28	1.48
N3670	Lake Bellevue Branch at Tuskawilla Ave	Residential	39.8	40.43	0.63	40.79	0.99	41.39	1.59
N3680	Lake Bellevue Branch 160' N of Lakeview	Residential	42.5	41.85	(0.00)	42.11	(0.00)	42.57	0.07
N3700	Lake Bellevue Branch at Lakeview Road	Collector	41.8	42.34	0.54	42.69	0.89	43.24	1.44
N3710	Lake Bellevue	Collector	44.5	42.36	(0.00)	42.76	(0.00)	43.48	(0.00)
N3720	Lake Bellevue Branch at Woodlawn Ave	Residential	48.8	44.80	(0.00)	46.03	(0.00)	47.90	(0.00)
N3730	Lake Bellevue Branch at Woodlawn Ave	Residential	48.8	49.31	0.51	49.85	1.05	50.65	1.85
N3740	Lake Bellevue Branch at Howard Street	Residential	51.8	50.90	(0.00)	50.90	(0.00)	52.27	0.47
N3750	Lake Bellevue Branch at Howard Street	Residential	51.8	52.58	0.78	52.99	1.19	53.67	1.87
N3760	Lake Bellevue Branch at Belleair Road	Collector	56.3	55.12	(0.00)	55.80	(0.00)	56.82	0.52
N3780	S. Greenwood Avenue at Hawkins Street	Collector	61.5	61.95	0.45	62.19	0.69	62.55	1.05
N3790	Missouri Avenue FDOT Detention Pond	Arterial	64.5	61.98	(0.00)	62.28	(0.00)	62.78	(0.00)
N3800	Wildwood Way and SCL Railroad	Residential	44.0	44.35	0.35	44.96	0.96	45.74	1.74
N3810	Belleair Road and SCL Railroad	Collector	56.3	56.86	0.56	57.34	1.04	58.02	1.72
N4000	Stevenson Creek at Jeffords Street	Residential	24.5	24.96	0.46	26.57	2.07	28.24	3.74
N4010	Stevenson Creek at Browning Street	Residential	28.6	29.30	0.70	29.59	0.99	29.94	1.34
N4020	Stevenson Creek at Browning Street	Residential	28.6	30.41	1.81	30.70	2.10	31.24	2.64
N4030	Stevenson Creek at Lakeview Road	Collector	33.8	30.94	(0.00)	31.50	(0.00)	32.72	(0.00)
N4040	Hillcrest Avenue S. of Lakeview Road	Residential	31.0	31.54	0.54	32.44	(0.00)	34.13	3.13
N4050	Stevenson Creek 950' S of Lakeview Road	Residential	33.5	32.84	(0.00)	33.80	0.30	35.13	1.63
N4060	Stevenson Creek at Bellevue Boulevard	Residential	36.0	34.54	(0.00)	35.53	(0.00)	36.88	0.88
N4062	Stevenson Creek at Bellevue Boulevard	Residential	36.0	36.26	0.26	36.93	0.93	37.85	1.85
N4065	Stevenson Creek at Bellevue Boulevard	Residential	36.0	37.84	1.84	38.02	2.02	38.34	2.34

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N4070	Stevenson Creek 380' S of Bellevue Blvd.	(no street)		39.07		39.43		40.05	
N4075	Stevenson Creek at St Thomas Drive	Residential	36.8	39.71	2.91	40.05	3.25	40.65	3.85
N4080	Stevenson Creek at St Thomas Drive	Residential	36.8	39.74	2.94	40.10	3.30	40.73	3.93
N4090	Rice Lake	Collector	41.8	39.82	(0.00)	40.21	(0.00)	40.94	(0.00)
N4100	Stevenson Creek at Belleair Boulevard	Collector	41.8	40.59	(0.00)	41.49	(0.00)	42.49	0.69
N4110	Stevenson Creek at Southridge Drive	Residential	40.9	40.82	(0.00)	41.68	0.78	42.72	1.82
N4120	Stevenson Creek at Southridge Drive	Residential	40.9	41.47	0.57	41.76	0.86	42.72	1.82
N4122	Byron Drive 400' S of Emily Court	Residential	34.3	35.50	1.20	35.94	1.64	36.65	2.35
N4123	Bellevue Boulevard at Boylan Avenue	Residential	55.0	53.49	(0.00)	53.60	(0.00)	53.83	(0.00)
N4125	Missouri Avenue FDOT Detention Pond	Arterial	65.0	59.83	(0.00)	60.46	(0.00)	61.64	(0.00)
N4126	Evergreen Avenue 400' S of Bellevue Blvd	Residential	35.2	38.47	3.27	38.76	3.56	39.27	4.07
N4128	Pond adj. to Stevenson Creek S of Belleair	Residential	47.7	39.04	(0.00)	39.40	(0.00)	40.00	(0.00)
N4130	Belleair Road 700' W of Highland Avenue	Collector	44.5	44.88	0.38	45.01	0.51	45.17	0.67
N4131	Belleair Road 350' W of Highland Avenue	Collector	44.9	45.57	0.67	45.69	0.79	45.87	0.97
N4132	Belleair Road and Highland Avenue	Collector	46.6	46.83	0.23	46.90	0.30	47.03	0.43
N4133	Belleair Road and Highland Avenue	Collector	46.6	47.05	0.45	47.11	0.51	47.32	0.72
N4135	Highland Avenue 280' N of Belleair Road	Collector	53.3	47.65	(0.00)	48.24	(0.00)	53.43	0.13
N4136	Labelle Plaza South Detention Pond	Residential	56.0	52.63	(0.00)	53.72	(0.00)	54.69	(0.00)
N4137	Labelle Plaza North Detention Pond	Residential	60.0	54.62	(0.00)	55.20	(0.00)	56.45	(0.00)
N4138	Pond SE of Belleair Road and Clearview Ave	Residential	45.5	45.76	0.26	46.58	1.08	47.66	2.16
N4139	Jeffords Street Branch at Hillcrest Avenue	Residential	26.0	25.16	(0.00)	26.72	0.72	28.33	2.33
N4140	Jeffords Street Branch at Highland Avenue	Collector	28.5	29.15	0.65	29.64	1.14	30.28	1.78
N4150	Jeffords Street Branch 650' E of Highland	Residential	31.0	31.42	0.42	31.86	0.86	32.43	1.43
N4160	Jeffords Street Branch 600' W of Lake Ave	Residential	31.0	31.42	0.42	31.84	0.84	32.42	1.42
N4170	Jeffords Street Branch at Lake Avenue	Collector	31.3	31.41	0.11	31.82	0.52	32.52	1.22
N4180	Jeffords Street Branch at Lake Avenue	Collector	31.3	31.35	0.05	31.88	0.58	32.57	1.27
N4190	Jeffords Street Branch 460' E of Lake Ave	(no street)		31.34		31.89		32.59	
N4200	Jeffords Street Branch 486' E of Lake Ave	Residential	30.4	31.23	0.83	32.06	1.66	32.79	2.39
N4205	Jeffords Street 100' E of Tuscola Road	Residential	30.0	31.60	1.60	32.28	2.28	32.97	2.97
N4210	Sonny Lake	Residential	30.3	31.85	1.55	32.29	1.99	32.98	2.68
N4220	Lake Helen	Residential	30.2	31.60	1.40	32.29	2.09	32.97	2.77
N4230	Woodcrest Avenue 450' S of Jeffords Street	Residential	31.2	32.21	1.01	32.36	1.16	32.97	1.77

Table D.1 Existing Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N4240	Ditch Terminus 220' E of Woodcrest Avenue	Residential	44.0	33.68	(0.00)	34.04	(0.00)	34.74	(0.00)
N4245	Beginning of Lake Alpine Outfall Ditch	Residential	36.0	33.68	(0.00)	34.04	(0.00)	34.74	(0.00)
N4250	Lake Alpine	Residential	36.0	33.73	(0.00)	34.08	(0.00)	34.77	(0.00)
N4260	Keene Road and Beverly Circle	Arterial	36.6	34.93	(0.00)	36.13	(0.00)	37.12	0.52
N4280	Pond SE of Keene Road and Beverly Circle	Residential	36.7	34.66	(0.00)	35.08	(0.00)	35.80	(0.00)
N4285	West End of Budleigh Street at N-S Ditch	Residential	34.5	34.92	0.42	35.07	0.57	35.48	0.98
N4290	West End of Magnolia Drive at N-S Ditch	Residential	50.0	47.20	(0.00)	47.50	(0.00)	47.90	(0.00)
N4300	Druid Road and Skyview Avenue	Collector	56.0	56.31	0.31	56.31	0.31	56.52	0.52
N4310	Turner Street and Skyview Avenue	Residential	68.5	68.60	0.10	68.75	0.25	68.84	0.34
N4320	Gulf to Bay Boulevard and Skyview Avenue	Evacuation	72.2	68.58	(0.00)	68.73	(0.00)	68.83	(0.00)
N4360	Crest Lake	Collector	71.2	68.73	(0.00)	69.11	(0.00)	69.90	(0.00)
N4370	Tuscola Road and Barry Road	Residential	28.0	31.32	3.32	32.10	4.10	32.86	4.86
N4380	Lake NE of Jeffords St and Keystone Ave	Residential	31.3	31.60	0.30	32.29	0.99	32.97	1.67
N4390	Duncan Avenue 470' N of Jeffords Street	Residential	32.5	32.66	0.16	32.96	0.46	33.60	1.10
N4400	Duncan Avenue at Magnolia Drive	Residential	40.5	37.43	(0.00)	37.43	(0.00)	40.83	0.33
N4410	Duncan Avenue and Druid Road	Collector	59.9	56.13	(0.00)	57.11	(0.00)	56.65	(0.00)
N4420	Duncan Avenue and Turner Street	Residential	61.5	61.78	0.28	61.99	0.49	62.20	0.70
N4422	Duncan Avenue and Gulf-to-Bay Boulevard	Evacuation	67.5	65.04	(0.00)	65.53	(0.00)	65.90	(0.00)
N4424	Duncan Avenue and Rainbow Drive	Residential	70.0	70.19	0.19	70.31	0.31	70.47	0.47
N4425	Allens Creek Boundary Node	Residential	68.0	68.00	0.00	68.00	0.00	68.00	0.00
N4426	Duncan Avenue and Cleveland Street	Collector	69.0	69.61	0.61	69.69	0.69	69.83	0.83
N4430	Pond SW of Lakeview Rd and Duncan Ave	Collector	35.4	32.24	(0.00)	33.60	(0.00)	36.03	0.63
N4440	Balmora Drive near Norwood Avenue	Residential	34.0	34.87	0.87	35.55	1.55	36.09	2.09
N4450	Pond SE of Pinewood Dr and Norwood Ave	Residential	34.0	32.91	(0.00)	33.78	(0.00)	35.44	1.44
N4460	Pond SE of Duncan Ave and Brentwood Dr	Residential	33.0	31.85	(0.00)	32.30	(0.00)	32.98	(0.00)
N4470	Pond at Lake Avenue and Bamora Drive	Collector	46.5	47.10	0.60	47.25	0.75	47.49	0.99
N4480	Brentwood Drive and Woodcrest Avenue	Residential	36.0	34.30	(0.00)	36.31	0.31	36.54	0.54
N4485	Keene Road 540' N of Beverly Circle	Arterial	42.7	35.86	(0.00)	37.21	(0.00)	38.21	(0.00)
N4490	Pond SW of Keene Rd and Magnolia Drive	Arterial	42.7	40.95	(0.00)	41.57	(0.00)	42.66	(0.00)
N4500	Pond SE of Keene Road and Magnolia Drive	Arterial	42.7	41.38	(0.00)	42.09	(0.00)	43.17	0.47
N4510	Pond NE of Keene Road and Magnolia Drive	Residential	49.5	44.99	(0.00)	45.42	(0.00)	46.35	(0.00)

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
1	1508 Stevenson Dr.	1	N0080	9.75	6.13	-3.62	6.93	-2.82	8.09	-1.66	0 Structures
2	1300 Betty Lane (Business)	1	N0090	7.26	6.26	-1.00	7.01	-0.25	8.15	0.89	
2A	1300 Block Betty Ln (FF estimated)	1	N0090	7.5	6.26	-1.24	7.01	-0.49	8.15	0.65	
2B	1300 Block Betty Ln (FF estimated)	1	N0090	7.5	6.26	-1.24	7.01	-0.49	8.15	0.65	
2C	1300 Block Betty Ln (FF estimated)	1	N0090	7.5	6.26	-1.24	7.01	-0.49	8.15	0.65	5 Structures
2D	1200 Block Betty Ln (FF estimated)	1	N0090	7.5	6.26	-1.24	7.01	-0.49	8.15	0.65	5 Units
3	1211 Betty Lane	1	N0100	8.33	6.80	-1.53	7.61	-0.72	8.92	0.59	
3A	1200 Block Betty Ln (FF estimated)	1	N0100	8.0	6.80	-1.20	7.61	-0.39	8.92	0.92	
3B	1300 Block Betty Ln (FF estimated)	1	N0100	8.0	6.80	-1.20	7.61	-0.39	8.92	0.92	
3C	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.80	-1.00	7.61	-0.19	8.92	1.12	
3D	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.80	-1.00	7.61	-0.19	8.92	1.12	
3E	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.80	-1.00	7.61	-0.19	8.92	1.12	
3F	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.80	-1.00	7.61	-0.19	8.92	1.12	
3G	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.80	-1.00	7.61	-0.19	8.92	1.12	
3H	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.80	-1.00	7.61	-0.19	8.92	1.12	
3I	1300 Block Overlea (FF estimated)	1	N0100	8.0	6.80	-1.20	7.61	-0.39	8.92	0.92	
3J	1300 Block Overlea (FF estimated)	1	N0100	8.0	6.80	-1.20	7.61	-0.39	8.92	0.92	
3K	1300 Block Overlea (FF estimated)	1	N0100	8.0	6.80	-1.20	7.61	-0.39	8.92	0.92	
3L	1300 Block Springdale Str. (FF estimated)	1	N0100	8.7	6.80	-1.90	7.61	-1.09	8.92	0.22	
3M	Bethany C.M.E. Church on Sprindale (est.)	1	N0100	9.0	6.80	-2.20	7.61	-1.39	8.92	-0.08	
3N	1300 Block Overlea (FF estimated)	1	N0100	8.7	6.80	-1.90	7.61	-1.09	8.92	0.22	
3O	1300 Block Overlea (FF estimated)	1	N0100	9	6.80	-2.20	7.61	-1.39	8.92	-0.08	
3P	1300 Block Overlea (FF estimated)	1	N0100	9	6.80	-2.20	7.61	-1.39	8.92	-0.08	
3Q	1300 Block Overlea (FF estimated)	1	N0100	9	6.80	-2.20	7.61	-1.39	8.92	-0.08	
272	1321 Springdale St.	1	N0100	8.73	6.80	-1.93	7.61	-1.12	8.92	0.19	
273	1315 Betty Lane	1	N0100	7.12	6.80	-0.32	7.61	0.49	8.92	1.80	17 Structures
274	1317 Overea St.	1	N0100	7.80	6.80	-1.00	7.61	-0.19	8.92	1.12	17 Units
4	1020 Pine Brook Dr.	1	N0110	12.14	7.13	-5.01	7.96	-4.18	9.26	-2.88	

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5	1201 Betty Lane	1	N0110	12.14	7.13	-5.01	7.96	-4.18	9.26	-2.88	
4A	1000 Block Pinebrook Dr. (Estimated)	1	N0110	9.6	7.13	-2.47	7.96	-1.64	9.26	-0.34	
4B	1000 Block Pinebrook Dr. (Estimated)	1	N0110	9.1	7.13	-1.97	7.96	-1.14	9.26	0.16	
4C	1000 Block Pinebrook Dr. (Estimated)	1	N0110	9.1	7.13	-1.97	7.96	-1.14	9.26	0.16	
4D	1000 Block Pinebrook Dr. (Estimated)	1	N0110	9.1	7.13	-1.97	7.96	-1.14	9.26	0.16	3 Structures
275	1012 PineBrook Dr.	1	N0110	10.08	7.13	-2.95	7.96	-2.12	9.26	-0.82	3 Units
6	1324 Palmetto Street	1	N0120	9.41	7.52	-1.89	8.34	-1.07	9.55	0.14	2 Structures
7	1312 Palmetto Street	1	N0120	9.24	7.52	-1.72	8.34	-0.90	9.55	0.31	2 Units
8	Clearwater C.C. utility bldg -W. bank	1	N0170	12.60	13.16	0.56	13.62	1.02	14.32	1.72	2 Structures
9	Clearwater C.C. utility bldg -E. bank	1	N0170	12.34	13.16	0.82	13.62	1.28	14.32	1.98	2 Units
158	902 Palm Bluff St.	1	N0370	24.34	21.41	-2.93	21.66	-2.68	21.96	-2.38	
159	904 Palm Bluff St.	1	N0370	23.52	21.41	-2.11	21.66	-1.86	21.96	-1.56	
160	908 Palm Bluff St.	1	N0370	22.62	21.41	-1.21	21.66	-0.96	21.96	-0.66	
161	1012 Pennsylvania Ave.Church	1	N0370	22.19	21.41	-0.78	21.66	-0.53	21.96	-0.23	
162	910 Jurgens St.	1	N0370	24.30	21.41	-2.89	21.66	-2.64	21.96	-2.34	
163	912 Jurgens St.	1	N0370	22.98	21.41	-1.57	21.66	-1.32	21.96	-1.02	
164	913 Jurgens St.	1	N0370	23.47	21.41	-2.06	21.66	-1.81	21.96	-1.51	
165	1010 Pennsylvania Ave.	1	N0370	22.93	21.41	-1.52	21.66	-1.27	21.96	-0.97	
166	1008 Pennsylvania Ave.	1	N0370	21.85	21.41	-0.44	21.66	-0.19	21.96	0.11	
170	912 Palmetto St.	1	N0370	21.96	21.41	-0.55	21.66	-0.30	21.96	0.00	1 Structure
172	920 Pennsylvania Ave.	1	N0370	22.38	21.41	-0.97	21.66	-0.72	21.96	-0.42	1 Unit
175	1396 Palmetto St.	1	N0440	19.94	19.69	-0.25	20.12	0.18	20.68	0.74	1 Structure
187	511 Washington Ave.	1	N0470	25.47	23.20	-2.27	23.71	-1.76	24.58	-0.89	0 Structures
179	506 N. Greenwood Ave.	1	N0480	24.85	23.52	-1.33	23.93	-0.92	24.69	-0.16	
180	1003 Lee St.	1	N0480	25.55	23.52	-2.03	23.93	-1.62	24.69	-0.86	
181	1027 Lee St.	1	N0480	25.74	23.52	-2.22	23.93	-1.81	24.69	-1.05	
182	1004 Plaza St.	1	N0480	25.95	23.52	-2.43	23.93	-2.02	24.69	-1.26	
183	1008 Plaza St.	1	N0480	26.13	23.52	-2.61	23.93	-2.20	24.69	-1.44	

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184	1010 Plaza St.	1	N0480	26.22	23.52	-2.70	23.93	-2.29	24.69	-1.53	
185	500 N. Greenwood Ave.	1	N0480	25.96	23.52	-2.44	23.93	-2.03	24.69	-1.27	1 Structure
186	512 N. Washington Ave.	1	N0480	24.64	23.52	-1.12	23.93	-0.71	24.69	0.05	1 Unit
117	Sunset Pt. Baptist Church	1	N0620	14.40	13.32	-1.08	14.22	-0.18	15.72	1.32	1 Structure
101	1226 Idlewild Drive	1	N0910	23.10	20.79	-2.31	21.32	-1.78	21.88	-1.22	
102	1242 Idlewild Drive	1	N0910	22.38	20.79	-1.59	21.32	-1.06	21.88	-0.50	
103	1246 Idlewild Drive	1	N0910	21.92	20.79	-1.13	21.32	-0.60	21.88	-0.04	
104	1250 Idlewild Drive	1	N0910	21.54	20.79	-0.75	21.32	-0.22	21.88	0.34	
105	1254 Idlewild Drive	1	N0910	21.45	20.79	-0.66	21.32	-0.13	21.88	0.43	
106	1260 Idlewild Drive	1	N0910	22.63	20.79	-1.84	21.32	-1.31	21.88	-0.75	
107	1266 Idlewild Drive	1	N0910	22.88	20.79	-2.09	21.32	-1.56	21.88	-1.00	
108	1243 Idlewild Drive	1	N0910	22.94	20.79	-2.15	21.32	-1.62	21.88	-1.06	
109	1245 Idlewild Drive	1	N0910	22.17	20.79	-1.38	21.32	-0.85	21.88	-0.29	
110	1212 Woodlawn Terr.	1	N0910	20.23	20.79	0.56	21.32	1.09	21.88	1.65	
111	1232 Woodlawn Terr.	1	N0910	21.87	20.79	-1.08	21.32	-0.55	21.88	0.01	
112	1234 Woodlawn Terr.	1	N0910	22.58	20.79	-1.79	21.32	-1.26	21.88	-0.70	
113	2000 Douglas Ave.	1	N0910	22.48	20.79	-1.69	21.32	-1.16	21.88	-0.60	
114	1209 Woodlawn Terr.	1	N0910	22.26	20.79	-1.47	21.32	-0.94	21.88	-0.38	
115	1213 Woodlawn Terr.	1	N0910	22.43	20.79	-1.64	21.32	-1.11	21.88	-0.55	4 Structures
116	1225 Woodlawn Terr.	1	N0910	22.01	20.79	-1.22	21.32	-0.69	21.88	-0.13	4 Units
118	1400 Byram Drive	1	N1000	16.61	15.02	-1.59	15.75	-0.86	16.75	0.14	
119	1408 Byram Drive	1	N1000	16.72	15.02	-1.70	15.75	-0.97	16.75	0.03	
120	1422 Byram Drive	1	N1000	16.62	15.02	-1.60	15.75	-0.87	16.75	0.13	
121	1430 Byram Drive	1	N1000	16.66	15.02	-1.64	15.75	-0.91	16.75	0.09	
122	1436 Byram Drive	1	N1000	16.71	15.02	-1.69	15.75	-0.96	16.75	0.04	
123	1446 Byram Drive	1	N1000	16.82	15.02	-1.80	15.75	-1.07	16.75	-0.07	
124	1450 Byram Drive	1	N1000	16.47	15.02	-1.45	15.75	-0.72	16.75	0.28	
125	1456 Byram Drive	1	N1000	16.85	15.02	-1.83	15.75	-1.10	16.75	-0.10	

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

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126	1458 Byram Drive	1	N1000	14.91	15.02	0.11	15.75	0.84	16.75	1.84	
127	1460 Byram Drive	1	N1000	13.99	15.02	1.03	15.75	1.76	16.75	2.76	
128	1462 Byram Drive	1	N1000	15.73	15.02	-0.71	15.75	0.02	16.75	1.02	
129	1466 Byram Drive	1	N1000	16.10	15.02	-1.08	15.75	-0.35	16.75	0.65	
130	1468 Byram Drive	1	N1000	16.04	15.02	-1.02	15.75	-0.29	16.75	0.71	
131	1472 Byram Drive	1	N1000	16.30	15.02	-1.28	15.75	-0.55	16.75	0.45	
132	1476 Byram Drive	1	N1000	17.01	15.02	-1.99	15.75	-1.26	16.75	-0.26	
133	1482 Byram Drive	1	N1000	18.13	15.02	-3.11	15.75	-2.38	16.75	-1.38	
134	1492 Byram Drive	1	N1000	18.04	15.02	-3.02	15.75	-2.29	16.75	-1.29	
135	1447 Byram Drive	1	N1000	17.08	15.02	-2.06	15.75	-1.33	16.75	-0.33	
136	1457 Byram Drive	1	N1000	17.01	15.02	-1.99	15.75	-1.26	16.75	-0.26	
137	1461 Byram Drive	1	N1000	16.28	15.02	-1.26	15.75	-0.53	16.75	0.47	
138	1463 Byram Drive	1	N1000	15.91	15.02	-0.89	15.75	-0.16	16.75	0.84	
139	1465 Byram Drive	1	N1000	16.07	15.02	-1.05	15.75	-0.32	16.75	0.68	
140	1467 Byram Drive	1	N1000	17.06	15.02	-2.04	15.75	-1.31	16.75	-0.31	
141	1471 Byram Drive	1	N1000	17.43	15.02	-2.41	15.75	-1.68	16.75	-0.68	
142	1944 Flora Rd.	1	N1000	16.58	15.02	-1.56	15.75	-0.83	16.75	0.17	
143	1950 Flora Rd.	1	N1000	16.68	15.02	-1.66	15.75	-0.93	16.75	0.07	
144	1464 Flora Rd.	1	N1000	16.52	15.02	-1.50	15.75	-0.77	16.75	0.23	
145	1466 Flora Rd.	1	N1000	16.20	15.02	-1.18	15.75	-0.45	16.75	0.55	
146	1468 Flora Rd.	1	N1000	16.38	15.02	-1.36	15.75	-0.63	16.75	0.37	20 Structures
147	1467 Flora Rd.	1	N1000	16.91	15.02	-1.89	15.75	-1.16	16.75	-0.16	20 Units
151	1556 Huntington Lane	1	N1370	25.19	25.27	0.08	25.68	0.49	26.52	1.33	
152	1549 Huntington Lane	1	N1370	24.64	25.27	0.63	25.68	1.04	26.52	1.88	3 Structures
153	1555 Huntington Lane	1	N1370	25.08	25.27	0.19	25.68	0.60	26.52	1.44	3 Units
148	1949 Highland Ave.	1	N1440	17.60	17.57	-0.03	17.94	0.34	18.43	0.83	
149	1943 Highland Ave.	1	N1440	17.39	17.57	0.18	17.94	0.55	18.43	1.04	3 Structures
150	1937 Highland Ave.	1	N1440	16.39	17.57	1.18	17.94	1.55	18.43	2.04	3 Units

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

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154	1550 Souvenir Drive	1	N1500	26.59	26.64	0.05	27.22	0.63	27.87	1.28	1 Structure
173	1402 N. Hibiscus St.	1	N2240	19.95	19.86	-0.09	20.07	0.12	20.42	0.47	1 Structure
174	1410 N. Hibiscus St.	1	N2240	20.84	19.86	-0.98	20.07	-0.77	20.42	-0.42	1 Unit
176	1536 Smallwood Circle	1	N2300	48.43	46.30	-2.13	46.65	-1.78	49.39	0.96	2 Structures
177	1544 Smallwood Circle	1	N2300	48.99	46.30	-2.69	46.65	-2.34	49.39	0.40	2 Units
178	1550 Ridgewood St.	1	N2310	55.72	53.06	-2.66	53.77	-1.95	55.12	-0.60	0 Structures
155	1585 Linwood Drive	1	N2460	48.69	51.27	2.58	51.39	2.70	51.60	2.91	
156	1591 Linwood Drive	1	N2460	48.28	51.27	2.99	51.39	3.11	51.60	3.32	3 Structures
157	1593 Linwood Drive	1	N2460	49.02	51.27	2.25	51.39	2.37	51.60	2.58	3 Units
10	1329 Drew Street	1	N3020	19.59	14.88	-4.71	15.68	-3.91	17.44	-2.15	
11	1345 Drew Street	1	N3020	18.11	14.88	-3.23	15.68	-2.43	17.44	-0.67	
12	111 Lady Mary Drive	1	N3020	17.12	14.88	-2.24	15.68	-1.44	17.44	0.32	
13	106A Evergreen Avenue	1	N3020	18.08	14.88	-3.20	15.68	-2.40	17.44	-0.64	1 Structure
14	105&107 Lady Mary Drive	2	N3020	18.44	14.88	-3.56	15.68	-2.76	17.44	-1.00	1 Unit
15	1330 Cleveland St (Office Building)	2	N3030	19.72	17.77	-1.95	18.75	-0.97	20.15	0.43	
15A	11 Lady Mary Dr (Office Building)	2	N3030	19.72	17.77	-1.95	18.75	-0.97	20.15	0.43	
15B	1300 Blk Cleveland St (Map #19?)	1	N3030	18.31	17.77	-0.54	18.75	0.44	20.15	1.84	4 Structures
15C	1300 Blk Cleveland St (FF estimated)	1	N3030	19.5	17.77	-1.73	18.75	-0.75	20.15	0.65	6 Units
16	1343 Cleveland Street	1	N3040	20.04	18.53	-1.51	19.65	-0.39	20.74	0.70	2 Structures
17	1331 Cleveland Street	1	N3040	20.01	18.53	-1.48	19.65	-0.36	20.74	0.73	2 Units
18	1345 Park Street	1	N3050	21.93	18.77	-3.16	19.69	-2.24	20.83	-1.10	
20	1338 Pierce Street (Business)	3	N3050	19.16	18.77	-0.39	19.69	0.53	20.83	1.67	
188	1318 Pierce St.	1	N3050	20.00	18.77	-1.23	19.69	-0.31	20.83	0.83	
189	1320 Pierce St.	1	N3050	18.87	18.77	-0.10	19.69	0.82	20.83	1.96	4 Structures
190	1326 Pierce St.	1	N3050	18.57	18.77	0.20	19.69	1.12	20.83	2.26	6 Units
191	1313 Pierce St.	1	N3060	21.00	18.95	-2.05	19.75	-1.25	20.86	-0.14	0 Structures
21	215 Waverly Way	2	N3070	19.95	18.99	-0.96	19.79	-0.16	20.92	0.97	
22	221 Waverly Way	2	N3070	19.28	18.99	-0.29	19.79	0.51	20.92	1.64	

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation

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23	227 Waverly Way	1	N3070	19.5	18.99	-0.51	19.79	0.29	20.92	1.42	4 Structures
24	229 Waverly Way	1	N3070	19.5	18.99	-0.51	19.79	0.29	20.92	1.42	6 Units
276	1305 Franklin St. (Office Bldg.)	1	N3080	20.72	19.20	-1.52	19.86	-0.86	20.96	0.24	1 Unit
25	311 S. Betty Lane (Bldg. 1)	4	N3090	21.03	19.20	-1.83	19.86	-1.17	20.96	-0.07	
26	1290 Court Street (Business)	1	N3090	22.43	19.24	-3.19	19.89	-2.54	20.98	-1.45	
277	311 S. Betty Lane (Bldg. 2)	15	N3090	21.32	19.24	-2.08	19.89	-1.43	20.98	-0.34	
278	1295 Santa Rosa Dr. Apt.# 1-5	5	N3090	20.51	19.24	-1.27	19.89	-0.62	20.98	0.47	2 Structures
279	1295 Santa Rosa Dr. Apt.# 11-15	5	N3090	20.51	19.24	-1.27	19.89	-0.62	20.98	0.47	10 Units
27	514 Betty Lane	1	N3100	22.19	19.30	-2.89	20.17	-2.02	22.19	0.00	
30	600 Betty Lane	1	N3110	20.49	20.77	0.28	21.52	1.03	22.89	2.40	
31	606 Betty Lane	1	N3110	20.35	20.77	0.42	21.52	1.17	22.89	2.54	
32	610 Betty Lane	1	N3110	21.33	20.77	-0.56	21.52	0.19	22.89	1.56	
33	616 Betty Lane	1	N3110	21.25	20.77	-0.48	21.52	0.27	22.89	1.64	
34	620 Betty Lane	1	N3110	21.83	20.77	-1.06	21.52	-0.31	22.89	1.06	
35	622 Betty Lane	1	N3110	21.82	20.77	-1.05	21.52	-0.30	22.89	1.07	
192	1245 Rogers St. (Office Building)	2	N3110	23.44	20.77	-2.67	21.52	-1.92	22.89	-0.55	
193	1266 Turner St. (Office Building)	3	N3110	21.60	20.77	-0.83	21.52	-0.08	22.89	1.29	
194	1270 Turner St. (Nursing Home)	20	N3110	21.58	20.77	-0.81	21.52	-0.06	22.89	1.31	
201	601 S. Lincoln Ave. (Office Building)	1	N3110	21.87	20.77	-1.10	21.52	-0.35	22.89	1.02	
202	1241 Turner St.	1	N3110	21.61	20.77	-0.84	21.52	-0.09	22.89	1.28	
203	1253 Turner St.	5	N3110	21.17	20.77	-0.40	21.52	0.35	22.89	1.72	
204	1265 Turner St.	3	N3110	21.01	20.77	-0.24	21.52	0.51	22.89	1.88	
205	610 Sally Lane	6	N3110	22.60	20.77	-1.83	21.52	-1.08	22.89	0.29	
206	612 Sally Lane - Apt. Building	3	N3110	22.44	20.77	-1.67	21.52	-0.92	22.89	0.45	
207	same as above	3	N3110	22.44	20.77	-1.67	21.52	-0.92	22.89	0.45	
208	622 Sally Lane	2	N3110	23.04	20.77	-2.27	21.52	-1.52	22.89	-0.15	
209	605 Sally Lane	2	N3110	21.38	20.77	-0.61	21.52	0.14	22.89	1.51	
211	619 Sally Lane	3	N3110	21.73	20.77	-0.96	21.52	-0.21	22.89	1.16	18 Structures

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212	621 Sally Lane	4	N3110	22.17	20.77	-1.40	21.52	-0.65	22.89	0.72	60 Units
38A	1301 Druid Rd (FF estimated)	1	N3126	24.50	21.95	-2.55	22.82	-1.68	24.23	-0.27	
38B	1311 Druid Rd (FF estimated)	1	N3126	23.50	21.95	-1.55	22.82	-0.68	24.23	0.73	
38C	800 Blk S Betty Ln (FF estimated)	1	N3126	25.50	21.95	-3.55	22.82	-2.68	24.23	-1.27	2 Structures
38D	800 Blk Mark Drive (FF estimated)	1	N3126	23.80	21.95	-1.85	22.82	-0.98	24.23	0.43	2 Units
38	813 Betty Lane	1	N3130	26.42	22.17	-4.25	23.08	-3.34	24.53	-1.89	
39	910 Mark Drive	1	N3130	23.78	22.17	-1.61	23.08	-0.70	24.53	0.75	
40	913 S Betty Lane	1	N3130	27.34	22.17	-5.17	23.08	-4.26	24.53	-2.81	
38E	800 Blk S Betty Ln (FF estimated)	1	N3130	25.80	22.17	-3.63	23.08	-2.72	24.53	-1.27	
38F	800 Blk Mark Drive (FF estimated)	1	N3130	23.80	22.17	-1.63	23.08	-0.72	24.53	0.73	
38G	800 Blk S Betty Ln (FF estimated)	1	N3130	26.70	22.17	-4.53	23.08	-3.62	24.53	-2.17	
38H	800 Blk S Betty Ln (FF estimated)	1	N3130	26.90	22.17	-4.73	23.08	-3.82	24.53	-2.37	
38I	900 Blk S Betty Ln (FF estimated)	1	N3130	27.10	22.17	-4.93	23.08	-4.02	24.53	-2.57	
38J	900 Blk S Betty Ln (FF estimated)	1	N3130	27.25	22.17	-5.08	23.08	-4.17	24.53	-2.72	
39A	800 Blk Mark Drive (FF estimated)	1	N3130	23.80	22.17	-1.63	23.08	-0.72	24.53	0.73	
39B	800 Blk Mark Drive (FF estimated)	1	N3130	23.80	22.17	-1.63	23.08	-0.72	24.53	0.73	
39C	800 Blk Mark Drive (FF estimated)	1	N3130	23.80	22.17	-1.63	23.08	-0.72	24.53	0.73	
39D	900 Blk Mark Drive (FF estimated)	1	N3130	23.80	22.17	-1.63	23.08	-0.72	24.53	0.73	
39E	900 Blk Mark Drive (FF estimated)	1	N3130	23.90	22.17	-1.73	23.08	-0.82	24.53	0.63	
39F	900 Blk Mark Drive (FF estimated)	1	N3130	24.10	22.17	-1.93	23.08	-1.02	24.53	0.43	
39G	900 Blk Mark Drive (FF estimated)	1	N3130	24.60	22.17	-2.43	23.08	-1.52	24.53	-0.07	
39H	900 Blk Mark Drive (FF estimated)	1	N3130	24.60	22.17	-2.43	23.08	-1.52	24.53	-0.07	8 Structures
39I	900 Blk Mark Drive (FF estimated)	1	N3130	24.60	22.17	-2.43	23.08	-1.52	24.53	-0.07	8 Units
41	1101 S Betty Lane	1	N3131	30.91	22.22	-8.69	23.13	-7.78	24.57	-6.34	
42	1020 Mark Drive	1	N3131	25.54	22.22	-3.32	23.13	-2.41	24.57	-0.97	
42A	1000 Blk Mark Drive (FF estimated)	1	N3131	24.60	22.22	-2.38	23.13	-1.47	24.57	-0.03	
42B	1000 Blk Mark Drive (FF estimated)	1	N3131	25.00	22.22	-2.78	23.13	-1.87	24.57	-0.43	
42C	1000 Blk Mark Drive (FF estimated)	1	N3131	25.20	22.22	-2.98	23.13	-2.07	24.57	-0.63	

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42D	1000 Blk Mark Drive (FF estimated)	1	N3131	25.40	22.22	-3.18	23.13	-2.27	24.57	-0.83	
42E	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	22.22	-3.38	23.13	-2.47	24.57	-1.03	
42F	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	22.22	-3.38	23.13	-2.47	24.57	-1.03	
42G	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	22.22	-3.38	23.13	-2.47	24.57	-1.03	
42H	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	22.22	-3.38	23.13	-2.47	24.57	-1.03	0 Structures
42I	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	22.22	-3.38	23.13	-2.47	24.57	-1.03	0 Units
42J	1000 Blk Mark Drive (FF estimated)	1	N3132	25.60	23.38	-2.22	24.36	-1.24	25.72	0.12	
42K	1000 Blk Mark Drive (FF estimated)	1	N3132	25.60	23.38	-2.22	24.36	-1.24	25.72	0.12	3 Structures
42L	1000 Blk Mark Drive (FF estimated)	1	N3132	25.60	23.38	-2.22	24.36	-1.24	25.72	0.12	3 Units
198	603 S. Missouri Ave.	1	N3510	24.36	24.36	0.00	24.64	0.28	25.68	1.32	
199	613 S. Missouri Ave.	1	N3510	23.87	24.36	0.49	24.64	0.77	25.68	1.81	3 Structures
200	615 S. Missouri Ave.	1	N3510	25.21	24.36	-0.85	24.64	-0.57	25.68	0.47	3 Units
195	701 Madison Ave. S.	1	N3530	27.88	25.37	-2.51	25.75	-2.13	26.56	-1.32	
196	600 S. Missouri Ave.	1	N3530	26.16	25.37	-0.79	25.75	-0.41	26.56	0.40	2 Structures
197	614 S. Missouri Ave.	1	N3530	25.79	25.37	-0.42	25.75	-0.04	26.56	0.77	2 Units
229	1122 Pinellas St.	1	N3600	39.65	38.57	-1.08	39.42	-0.23	40.74	1.09	
230	1114 Pinellas St.	1	N3600	39.24	38.57	-0.67	39.42	0.18	40.74	1.50	
231	1120 Pinellas St.	1	N3600	40.34	38.57	-1.77	39.42	-0.92	40.74	0.40	
233	1111 Pinellas St.	1	N3600	40.97	38.57	-2.40	39.42	-1.55	40.74	-0.23	4 Structures
234	1115 Pinellas St.	1	N3600	40.45	38.57	-1.88	39.42	-1.03	40.74	0.29	4 Units
232	1260 S. Greenwood Ave.	1	N3650	42.94	40.35	-2.59	40.71	-2.23	41.28	-1.66	
235	1015 Tuskawilla St.	1	N3670	41.08	40.43	-0.65	40.79	-0.29	41.39	0.31	
236	1000 Lakeview Rd.	1	N3670	43.08	40.43	-2.65	40.79	-2.29	41.39	-1.69	
237	1012 Lakeview Rd.	1	N3670	42.46	40.43	-2.03	40.79	-1.67	41.39	-1.07	1 Structure
238	1020 Lakeview Rd.	1	N3670	43.31	40.43	-2.88	40.79	-2.52	41.39	-1.92	1 Unit
239	931 Dempsey St.	1	N3710	45.54	42.36	-3.18	42.76	-2.78	43.48	-2.06	
240	925 Dempsey St.	1	N3710	44.13	42.36	-1.77	42.76	-1.37	43.48	-0.65	
241	915 Dempsey St.	1	N3710	44.37	42.36	-2.01	42.76	-1.61	43.48	-0.89	

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
242	909 Dempsey St.	1	N3710	44.05	42.36	-1.69	42.76	-1.29	43.48	-0.57	0 Structures
243	901 Dempsey St.	1	N3710	44.83	42.36	-2.47	42.76	-2.07	43.48	-1.35	0 Units
244	629 Belleview Blvd.	1	N3800	45.99	44.35	-1.64	44.96	-1.03	45.74	-0.25	
245	630 A, B, C, D Wildwood Way	4	N3800	44.92	44.35	-0.57	44.96	0.04	45.74	0.82	
246	633-635 Wildwood Way	3	N3800	44.66	44.35	-0.31	44.96	0.30	45.74	1.08	
247	629/627/625 Wildwood Way	3	N3800	44.01	44.35	0.34	44.96	0.95	45.74	1.73	
248	619-621 Wildwood Way	3	N3800	45.13	44.35	-0.78	44.96	-0.17	45.74	0.61	
249	616 Woodlawn St.	1	N3800	46.89	44.35	-2.54	44.96	-1.93	45.74	-1.15	
250	618-620 Woodlawn St.	3	N3800	46.63	44.35	-2.28	44.96	-1.67	45.74	-0.89	
251	622-624 Woodlawn St.	3	N3800	46.90	44.35	-2.55	44.96	-1.94	45.74	-1.16	
252	626-628 Woodlawn St.	3	N3800	46.84	44.35	-2.49	44.96	-1.88	45.74	-1.10	4 Structures
253	638 Woodlawn St.	1	N3800	47.57	44.35	-3.22	44.96	-2.61	45.74	-1.83	13 Units
45	1400 Jeffords Street	1	N4000	28.52	24.96	-3.56	26.57	-1.95	28.24	-0.28	
46	1201 Hillcrest Avenue	1	N4000	27.12	24.96	-2.16	26.57	-0.55	28.24	1.12	
46A	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.17	24.96	-2.21	26.57	-0.60	28.24	1.07	
46B	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.22	24.96	-2.26	26.57	-0.65	28.24	1.02	
46C	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.27	24.96	-2.31	26.57	-0.70	28.24	0.97	
46D	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.32	24.96	-2.36	26.57	-0.75	28.24	0.92	
47A	1370 Barry Ave.	1	N4000	28.4	24.96	-3.44	26.57	-1.83	28.24	-0.16	
47B	1371 Barry Ave.	1	N4000	28.57	24.96	-3.61	26.57	-2.00	28.24	-0.33	
254	NE Cor. S. Evergreen & Jeffords St.	1	N4000	27.32	24.96	-2.36	26.57	-0.75	28.24	0.92	
255	1351 Jeffords St.	1	N4000	27.07	24.96	-2.11	26.57	-0.50	28.24	1.17	
256	1355 Jeffords St.	1	N4000	27.24	24.96	-2.28	26.57	-0.67	28.24	1.00	
257	1359 Jeffords St.	1	N4000	26.93	24.96	-1.97	26.57	-0.36	28.24	1.31	
258	1363 Jeffords St.	1	N4000	27.30	24.96	-2.34	26.57	-0.73	28.24	0.94	
259	1367 Jeffords St.	1	N4000	27.35	24.96	-2.39	26.57	-0.78	28.24	0.89	
260	1371 Jeffords St.	1	N4000	27.68	24.96	-2.72	26.57	-1.11	28.24	0.56	
261	1375 Jeffords St.	1	N4000	27.61	24.96	-2.65	26.57	-1.04	28.24	0.63	

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
262	1200 S. Hillcrest Ave.	1	N4000	27.86	24.96	-2.90	26.57	-1.29	28.24	0.38	
263	1374 Barry St.	1	N4000	28.60	24.96	-3.64	26.57	-2.03	28.24	-0.36	
264	1210 S. Hillcrest Ave.	1	N4000	28.27	24.96	-3.31	26.57	-1.70	28.24	-0.03	
265	1375 Barry St.	1	N4000	28.51	24.96	-3.55	26.57	-1.94	28.24	-0.27	
266	1220 S. Hillcrest Ave.	1	N4000	28.58	24.96	-3.62	26.57	-2.01	28.24	-0.34	
267	1374 Tuscola St.	1	N4000	28.59	24.96	-3.63	26.57	-2.02	28.24	-0.35	
268	1230 S. Hillcrest Ave.	1	N4000	28.22	24.96	-3.26	26.57	-1.65	28.24	0.02	
269	1375 Tuscola St.	1	N4000	28.79	24.96	-3.83	26.57	-2.22	28.24	-0.55	
270	1240 S. Hillcrest Ave.	1	N4000	28.55	24.96	-3.59	26.57	-1.98	28.24	-0.31	
271	1392 Milton St.	1	N4000	28.85	24.96	-3.89	26.57	-2.28	28.24	-0.61	
280	1246 S. Hillcrest Ave.	1	N4000	28.25	24.96	-3.29	26.57	-1.68	28.24	-0.01	
286	1227 S. Hillcrest Ave.	1	N4000	27.20	24.96	-2.24	26.57	-0.63	28.24	1.04	
286A	1200 Blk Hillcrest Ave (FF Estimated)	1	N4000	26.90	24.96	-1.94	26.57	-0.33	28.24	1.34	
286B	1200 Blk Barry Ave. (FF Estimated)	1	N4000	26.20	24.96	-1.24	26.57	0.37	28.24	2.04	
286C	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	26.50	24.96	-1.54	26.57	0.07	28.24	1.74	
286D	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	27.10	24.96	-2.14	26.57	-0.53	28.24	1.14	
286E	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	27.70	24.96	-2.74	26.57	-1.13	28.24	0.54	
286F	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	28.30	24.96	-3.34	26.57	-1.73	28.24	-0.06	
286G	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	28.50	24.96	-3.54	26.57	-1.93	28.24	-0.26	
286H	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	28.70	24.96	-3.74	26.57	-2.13	28.24	-0.46	
286I	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	28.90	24.96	-3.94	26.57	-2.33	28.24	-0.66	
286J	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	29.10	24.96	-4.14	26.57	-2.53	28.24	-0.86	
286K	1000 Blk Hillcrest Ave (FF Estimated)	1	N4000	27.60	24.96	-2.64	26.57	-1.03	28.24	0.64	
287	1239 S. Hillcrest Ave.	1	N4000	28.49	24.96	-3.53	26.57	-1.92	28.24	-0.25	
287A	1200 Blk Hillcrest Ave (FF Estimated)	1	N4000	28.21	24.96	-3.25	26.57	-1.64	28.24	0.03	
287B	1200 Blk Hillcrest Ave (FF Estimated)	1	N4000	28.60	24.96	-3.64	26.57	-2.03	28.24	-0.36	
287C	1200 Blk Hillcrest Ave (FF Estimated)	1	N4000	28.80	24.96	-3.84	26.57	-2.23	28.24	-0.56	
289	1425 Jeffords St.	1	N4000	27.38	24.96	-2.42	26.57	-0.81	28.24	0.86	

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
289A	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.58	24.96	-2.62	26.57	-1.01	28.24	0.66	
289B	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.78	24.96	-2.82	26.57	-1.21	28.24	0.46	
289C	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.98	24.96	-3.02	26.57	-1.41	28.24	0.26	
289D	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.18	24.96	-3.22	26.57	-1.61	28.24	0.06	
289E	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.38	24.96	-3.42	26.57	-1.81	28.24	-0.14	
290	1418 Barry St.	1	N4000	26.61	24.96	-1.65	26.57	-0.04	28.24	1.63	
290A	1400 Blk Barry St. (FF Estimated)	1	N4000	26.60	24.96	-1.64	26.57	-0.03	28.24	1.64	
290B	1400 Blk Barry St. (FF Estimated)	1	N4000	26.60	24.96	-1.64	26.57	-0.03	28.24	1.64	
290C	1400 Blk Barry St. (FF Estimated)	1	N4000	26.60	24.96	-1.64	26.57	-0.03	28.24	1.64	
290D	1400 Blk Barry St. (FF Estimated)	1	N4000	26.60	24.96	-1.64	26.57	-0.03	28.24	1.64	
291	1451 Jeffords St.	1	N4000	28.57	24.96	-3.61	26.57	-2.00	28.24	-0.33	
291A	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.53	24.96	-3.57	26.57	-1.96	28.24	-0.29	
291B	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.55	24.96	-3.59	26.57	-1.98	28.24	-0.31	
291C	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.57	24.96	-3.61	26.57	-2.00	28.24	-0.33	
291D	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.54	24.96	-3.58	26.57	-1.97	28.24	-0.30	
292	1442 Barry St.	1	N4000	27.59	24.96	-2.63	26.57	-1.02	28.24	0.65	
292A	1400 Blk Barry St. (FF Estimated)	1	N4000	27.90	24.96	-2.94	26.57	-1.33	28.24	0.34	
292B	1400 Blk Barry St. (FF Estimated)	1	N4000	27.80	24.96	-2.84	26.57	-1.23	28.24	0.44	
292C	1400 Blk Barry St. (FF Estimated)	1	N4000	27.39	24.96	-2.43	26.57	-0.82	28.24	0.85	
292D	1400 Blk Barry St. (FF Estimated)	1	N4000	27.19	24.96	-2.23	26.57	-0.62	28.24	1.05	
292E	1400 Blk Barry St. (FF Estimated)	1	N4000	27.01	24.96	-2.05	26.57	-0.44	28.24	1.23	
292F	1400 Blk Barry St. (FF Estimated)	1	N4000	26.81	24.96	-1.85	26.57	-0.24	28.24	1.43	
293	1481 Jeffords St.	1	N4000	28.50	24.96	-3.54	26.57	-1.93	28.24	-0.26	
293A	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.58	24.96	-3.62	26.57	-2.01	28.24	-0.34	
293B	1200 Blk S. Highland Ave (FF Estimated)	1	N4000	28.64	24.96	-3.68	26.57	-2.07	28.24	-0.40	
294	1468 Barry St.	1	N4000	28.64	24.96	-3.68	26.57	-2.07	28.24	-0.40	
294A	1400 Blk Barry St. (FF Estimated)	1	N4000	28.44	24.96	-3.48	26.57	-1.87	28.24	-0.20	
294B	1400 Blk Barry St. (FF Estimated)	1	N4000	28.24	24.96	-3.28	26.57	-1.67	28.24	0.00	

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294C	1400 Blk Barry St. (FF Estimated)	1	N4000	28.04	24.96	-3.08	26.57	-1.47	28.24	0.20	
295	1212 S. Highland Ave.	1	N4000	28.72	24.96	-3.76	26.57	-2.15	28.24	-0.48	
295A	1400 Blk Barry St. (FF Estimated)	1	N4000	28.70	24.96	-3.74	26.57	-2.13	28.24	-0.46	
295B	1400 Blk Barry St. (FF Estimated)	1	N4000	28.69	24.96	-3.73	26.57	-2.12	28.24	-0.45	41 Structures
295C	1400 Blk Barry St. (FF Estimated)	1	N4000	28.67	24.96	-3.71	26.57	-2.10	28.24	-0.43	41 Units
281	1393 Milton St.	1	N4010	28.86	29.30	0.44	29.59	0.73	29.94	1.08	
282	1250 Hillcrest Ave.	1	N4010	28.70	29.30	0.60	29.59	0.89	29.94	1.24	
283	1260 Hillcrest Ave.	1	N4010	29.85	29.30	-0.55	29.59	-0.26	29.94	0.09	
288	1251 S. Hillcrest Ave.	1	N4010	28.94	29.30	0.36	29.59	0.65	29.94	1.00	5 Structures
288A	1200 Blk Hillcrest Ave (FF Estimated)	1	N4010	28.94	29.30	0.36	29.59	0.65	29.94	1.00	5 Units
284	1395 Browning St.	1	N4020	30.48	30.41	-0.07	30.70	0.22	31.24	0.76	
285	1397 Browning St.	1	N4020	30.37	30.41	0.04	30.70	0.33	31.24	0.87	3 Structures
48	1397 Browning St.	1	N4020	30.51	30.41	-0.10	30.70	0.19	31.24	0.73	3 Units
49	1388 Lakeview Rd.	1	N4030	31.74	30.94	-0.8	31.50	-0.24	32.72	0.98	1 Structure
50	1322 Hillcrest Ave.	1	N4040	33.50	31.54	-1.96	32.44	-1.06	34.13	0.63	
50A	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.7	31.54	-2.16	32.44	-1.26	34.13	0.43	
50B	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.6	31.54	-2.06	32.44	-1.16	34.13	0.53	
50C	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.5	31.54	-1.96	32.44	-1.06	34.13	0.63	
50D	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.6	31.54	-2.06	32.44	-1.16	34.13	0.53	
50E	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.7	31.54	-2.16	32.44	-1.26	34.13	0.43	
373	1346 Hillcrest Ave. S.	1	N4040	34.11	31.54	-2.57	32.44	-1.67	34.13	0.02	
373A	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	34.0	31.54	-2.46	32.44	-1.56	34.13	0.13	9 Structures
373B	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.8	31.54	-2.26	32.44	-1.36	34.13	0.33	9 Units
51	1357 Byron Dr.	1	N4050	36.88	32.84	-4.04	33.80	-3.08	35.13	-1.75	
374	1380 Hillcrest Ave. S.	1	N4050	34.81	32.84	-1.97	33.80	-1.01	35.13	0.32	
374A	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.7	32.84	-1.86	33.80	-0.90	35.13	0.43	
374B	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.5	32.84	-1.66	33.80	-0.70	35.13	0.63	
374C	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.4	32.84	-1.56	33.80	-0.60	35.13	0.73	

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374D	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.3	32.84	-1.46	33.80	-0.50	35.13	0.83	
374E	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.2	32.84	-1.36	33.80	-0.40	35.13	0.93	
375	1400 Hillcrest Ave. S.	1	N4050	36.49	32.84	-3.65	33.80	-2.69	35.13	-1.36	
375A	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	36.2	32.84	-3.36	33.80	-2.40	35.13	-1.07	
375B	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	35.9	32.84	-3.06	33.80	-2.10	35.13	-0.77	
375C	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	35.6	32.84	-2.76	33.80	-1.80	35.13	-0.47	
375D	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	35.3	32.84	-2.46	33.80	-1.50	35.13	-0.17	7 Structures
375E	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	35.0	32.84	-2.16	33.80	-1.20	35.13	0.13	7 Units
52	1375 Campbell Ct.	1	N4060	38.82	34.54	-4.28	35.53	-3.29	36.88	-1.94	
376	1424 Hillcrest Ave. S.	1	N4060	37.75	34.54	-3.21	35.53	-2.22	36.88	-0.87	
376A	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	38.0	34.54	-3.46	35.53	-2.47	36.88	-1.12	
376B	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	37.6	34.54	-3.06	35.53	-2.07	36.88	-0.72	
376C	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	37.4	34.54	-2.86	35.53	-1.87	36.88	-0.52	
376D	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	37.2	34.54	-2.66	35.53	-1.67	36.88	-0.32	
376E	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	37.0	34.54	-2.46	35.53	-1.47	36.88	-0.12	0 Structures
376F	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	36.9	34.54	-2.36	35.53	-1.37	36.88	-0.02	0 Units
53	1453 Evergreen Ave.	1	N4070	40.04	39.07	-0.97	39.43	-0.61	40.05	0.01	
54	1430 Hillcrest Ave.	1	N4070	38.72	39.07	0.35	39.43	0.71	40.05	1.33	
55	1434 Hillcrest Ave.	1	N4070	39.12	39.07	-0.05	39.43	0.31	40.05	0.93	
56	1457 Evergreen Ave.	1	N4070	38.66	39.07	0.41	39.43	0.77	40.05	1.39	
57	1438 Hillcrest Ave.	1	N4070	39.58	39.07	-0.51	39.43	-0.15	40.05	0.47	
58	1461 Evergreen Ave.	1	N4070	37.97	39.07	1.10	39.43	1.46	40.05	2.08	
59	1465 Evergreen Ave.	1	N4070	37.69	39.07	1.38	39.43	1.74	40.05	2.36	
60	1442 Hillcrest Ave.	1	N4070	39.66	39.07	-0.59	39.43	-0.23	40.05	0.39	
61	1466 Hillcrest Ave.	1	N4070	39.76	39.07	-0.69	39.43	-0.33	40.05	0.29	
62	1469 Evergreen Ave.	1	N4070	38.65	39.07	0.42	39.43	0.78	40.05	1.40	
63	1450 Hillcrest Ave.	1	N4070	39.83	39.07	-0.76	39.43	-0.40	40.05	0.22	
64	1473 Evergreen Ave.	1	N4070	39.09	39.07	-0.02	39.43	0.34	40.05	0.96	

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
65	1454 Hillcrest Ave.	1	N4070	39.92	39.07	-0.85	39.43	-0.49	40.05	0.13	
66	1479 Evergreen Ave.	1	N4070	38.73	39.07	0.34	39.43	0.70	40.05	1.32	
67	1458 Hillcrest Ave.	1	N4070	40.46	39.07	-1.39	39.43	-1.03	40.05	-0.41	
68	1501 Evergreen Ave.	1	N4070	38.97	39.07	0.1	39.43	0.46	40.05	1.08	
69	1462 Hillcrest Ave.	1	N4070	40.48	39.07	-1.41	39.43	-1.05	40.05	-0.43	
70	1509 Evergreen Ave.	1	N4070	39.7	39.07	-0.63	39.43	-0.27	40.05	0.35	
71	1466 Hillcrest Ave.	1	N4070	40.35	39.07	-1.28	39.43	-0.92	40.05	-0.3	
72	1517 Evergreen Ave.	1	N4070	39.62	39.07	-0.55	39.43	-0.19	40.05	0.43	17 Structures
73	1470 Hillcrest Ave.	1	N4070	40.38	39.07	-1.31	39.43	-0.95	40.05	-0.33	17 Units
74	1506 Hillcrest Ave.	1	N4080	40.03	39.74	-0.29	40.10	0.07	40.73	0.7	2 Structures
75	1521 Evergreen Ave.	1	N4080	40.65	39.74	-0.91	40.10	-0.55	40.73	0.08	2 Units
296	1551 Jeffords St.	1	N4160	31.30	31.42	0.12	31.84	0.54	32.42	1.12	
297	1557 Jeffords St.	1	N4160	31.79	31.42	-0.37	31.84	0.05	32.42	0.63	
298	1563 Jeffords St.	1	N4160	33.11	31.42	-1.69	31.84	-1.27	32.42	-0.69	
299	1571 Jeffords St.	1	N4160	32.99	31.42	-1.57	31.84	-1.15	32.42	-0.57	
300	1579 Jeffords St.	1	N4160	31.97	31.42	-0.55	31.84	-0.13	32.42	0.45	3 Structures
301	1585 Jeffords St.	1	N4160	32.44	31.42	-1.02	31.84	-0.60	32.42	-0.02	3 Units
302	1601 Jeffords St.	1	N4180	32.83	31.35	-1.48	31.88	-0.95	32.57	-0.26	
303	1607 Jeffords St.	1	N4180	32.42	31.35	-1.07	31.88	-0.54	32.57	0.15	
304	1613 Jeffords St.	1	N4180	32.48	31.35	-1.13	31.88	-0.60	32.57	0.09	
305	1619 Jeffords St.	1	N4180	32.58	31.35	-1.23	31.88	-0.70	32.57	-0.01	
306	1625 Jeffords St.	1	N4180	32.53	31.35	-1.18	31.88	-0.65	32.57	0.04	
307	1631 Jeffords St.	1	N4180	32.33	31.35	-0.98	31.88	-0.45	32.57	0.24	
308	1211 Lake Dr.	1	N4180	32.12	31.35	-0.77	31.88	-0.24	32.57	0.45	
309	1606 Barry Rd.	1	N4180	31.26	31.35	0.09	31.88	0.62	32.57	1.31	
310	1612 Barry Rd.	1	N4180	31.37	31.35	-0.02	31.88	0.51	32.57	1.20	
311	1618 Barry Rd.	1	N4180	31.18	31.35	0.17	31.88	0.70	32.57	1.39	
312	1624 Barry Rd.	1	N4180	31.41	31.35	-0.06	31.88	0.47	32.57	1.16	10 Structures

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
313	1630 Barry Rd.	1	N4180	31.57	31.35	-0.22	31.88	0.31	32.57	1.00	10 Units
316	1172 S. Keystone Ave.	1	N4205	33.11	31.60	-1.51	32.28	-0.83	32.97	-0.14	
317	1176 S. Keystone Ave.	1	N4205	32.91	31.60	-1.31	32.28	-0.63	32.97	0.06	
318	1180 S. Keystone Ave.	1	N4205	32.59	31.60	-0.99	32.28	-0.31	32.97	0.38	
319	1182 S. Keystone Ave.	1	N4205	34.26	31.60	-2.66	32.28	-1.98	32.97	-1.29	
320	1184 S. Keystone Ave.	1	N4205	33.28	31.60	-1.68	32.28	-1.00	32.97	-0.31	
321	1188 S. Keystone Ave.	1	N4205	32.81	31.60	-1.21	32.28	-0.53	32.97	0.16	
324	1641 Jeffords St.	1	N4205	32.99	31.60	-1.39	32.28	-0.71	32.97	-0.02	
326	1658 Jeffords St.	1	N4205	32.79	31.60	-1.19	32.28	-0.51	32.97	0.18	
327	1664 Jeffords St.	1	N4205	33.05	31.60	-1.45	32.28	-0.77	32.97	-0.08	
328	1668 Jeffords St.	1	N4205	33.57	31.60	-1.97	32.28	-1.29	32.97	-0.60	
329	1670 Jeffords St.	1	N4205	33.45	31.60	-1.85	32.28	-1.17	32.97	-0.48	
330	1030 S. Duncan Ave.	1	N4205	33.28	31.60	-1.68	32.28	-1.00	32.97	-0.31	
331	1028 S. Duncan Ave.	1	N4205	33.57	31.60	-1.97	32.28	-1.29	32.97	-0.60	4 Structures
332	1024 S. Duncan Ave.	1	N4205	33.50	31.60	-1.90	32.28	-1.22	32.97	-0.53	4 Units
325	1183 S. Keystone Ave.	1	N4210	32.68	31.85	-0.83	32.29	-0.39	32.98	0.30	
333	1647 Jeffords St.	1	N4210	33.65	31.85	-1.80	32.29	-1.36	32.98	-0.67	
334	1659 Jeffords St.	1	N4210	32.32	31.85	-0.47	32.29	-0.03	32.98	0.66	
335	1665 Jeffords St.	1	N4210	32.15	31.85	-0.30	32.29	0.14	32.98	0.83	
336	1671 Jeffords St.	1	N4210	32.49	31.85	-0.64	32.29	-0.20	32.98	0.49	
337	1104 Duncan Ave.	1	N4210	32.81	31.85	-0.96	32.29	-0.52	32.98	0.17	
338	1184 Duncan Ave.	1	N4210	32.97	31.85	-1.12	32.29	-0.68	32.98	0.01	
339	1188 Duncan Ave.	1	N4210	33.87	31.85	-2.02	32.29	-1.58	32.98	-0.89	
340	1192 Duncan Ave.	1	N4210	34.53	31.85	-2.68	32.29	-2.24	32.98	-1.55	
341	1196 Duncan Ave.	1	N4210	34.34	31.85	-2.49	32.29	-2.05	32.98	-1.36	
342	1200 Duncan Ave.	1	N4210	34.07	31.85	-2.22	32.29	-1.78	32.98	-1.09	
356	1201 Duncan Ave.	1	N4210	32.41	31.85	-0.56	32.29	-0.12	32.98	0.57	7 Structures
357	1707 Estelle Dr.	1	N4210	33.00	31.85	-1.15	32.29	-0.71	32.98	-0.02	7 Units

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
343	1035 S. Duncan Ave.	1	N4220	33.03	31.60	-1.43	32.29	-0.74	32.97	-0.06	
344	1706 Jeffords St.	1	N4220	33.23	31.60	-1.63	32.29	-0.94	32.97	-0.26	
345	1714 Jeffords St.	1	N4220	33.01	31.60	-1.41	32.29	-0.72	32.97	-0.04	
346	1718 Jeffords St.	1	N4220	33.09	31.60	-1.49	32.29	-0.80	32.97	-0.12	
347	1701 Jeffords St.	1	N4220	32.76	31.60	-1.16	32.29	-0.47	32.97	0.21	
348	1707 Jeffords St.	1	N4220	32.89	31.60	-1.29	32.29	-0.60	32.97	0.08	
349	1717 Jeffords St.	1	N4220	32.30	31.60	-0.70	32.29	-0.01	32.97	0.67	
350	1733 Jeffords St.	1	N4220	32.40	31.60	-0.80	32.29	-0.11	32.97	0.57	
351	1105 Duncan Ave.	1	N4220	33.24	31.60	-1.64	32.29	-0.95	32.97	-0.27	
352	1109 Duncan Ave.	1	N4220	33.19	31.60	-1.59	32.29	-0.90	32.97	-0.22	
353	1113 Duncan Ave.	1	N4220	33.60	31.60	-2.00	32.29	-1.31	32.97	-0.63	
354	1117 Duncan Ave.	1	N4220	33.59	31.60	-1.99	32.29	-1.30	32.97	-0.62	
355	1121 Duncan Ave.	1	N4220	33.61	31.60	-2.01	31.60	-2.01	32.97	-0.64	
358	1101 Woodside Ave.	1	N4220	33.43	31.60	-1.83	31.60	-1.83	32.97	-0.46	
359	1105 Woodside Ave.	1	N4220	33.19	31.60	-1.59	31.60	-1.59	32.97	-0.22	
360	1109 Woodside Ave.	1	N4220	32.81	31.60	-1.21	31.60	-1.21	32.97	0.16	
361	1115 Woodside Ave.	1	N4220	33.12	31.60	-1.52	31.60	-1.52	32.97	-0.15	
362	1117 Woodside Ave.	1	N4220	33.28	31.60	-1.68	31.60	-1.68	32.97	-0.31	5 Structures
363	1121 Woodside Ave.	1	N4220	33.05	31.60	-1.45	31.60	-1.45	32.97	-0.08	5 Units
364	1135 Jeffords St.	1	N4230	33.77	32.21	-1.56	32.36	-1.41	32.97	-0.80	
365	1106 Woodcrest Ave.	1	N4230	33.66	32.21	-1.45	32.36	-1.30	32.97	-0.69	
366	1110 Woodcrest Ave.	1	N4230	33.49	32.21	-1.28	32.36	-1.13	32.97	-0.52	
367	1114 Woodcrest Ave.	1	N4230	33.23	32.21	-1.02	32.36	-0.87	32.97	-0.26	
368	1118 Woodcrest Ave.	1	N4230	33.12	32.21	-0.91	32.36	-0.76	32.97	-0.15	
369	1120 Woodcrest Ave.	1	N4230	34.24	32.21	-2.03	32.36	-1.88	32.97	-1.27	
370	1126 Woodcrest Ave.	1	N4230	33.12	32.21	-0.91	32.36	-0.76	32.97	-0.15	
371	1115 Woodcrest Ave.	1	N4240	33.93	33.68	-0.25	34.04	0.11	34.74	0.81	2 Structures
372	1121 Woodcrest Ave.	1	N4240	33.19	33.68	0.49	34.04	0.85	34.74	1.55	2 Units

Table D.2 Existing Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
314	1619 Barry Rd.	1	N4370	31.36	31.32	-0.04	32.10	0.74	32.86	1.50	
314A	1613 Barry Rd (FF estimated)	1	N4370	32.40	31.32	-1.08	32.10	-0.30	32.86	0.46	3 Structures
315	1625 Barry Rd.	1	N4370	32.37	31.32	-1.05	32.10	-0.27	32.86	0.49	3 Units
322	1131 S. Keystone Ave.	1	N4380	32.75	31.60	-1.15	32.29	-0.46	32.97	0.22	1 Structure
323	1640 Jeffords St.	1	N4380	33.00	31.60	-1.40	32.29	-0.71	32.97	-0.03	1 Unit
213	601,603 Spencer Ave.	2	N4420	61.62	61.78	0.16	61.99	0.37	62.20	0.58	
214	605,607 Spencer Ave.	2	N4420	61.14	61.78	0.64	61.99	0.85	62.20	1.06	
215	609,611 Spencer Ave.	2	N4420	61.81	61.78	-0.03	61.99	0.18	62.20	0.39	
216	613,615 Spencer Ave.	2	N4420	62.55	61.78	-0.77	61.99	-0.56	62.20	-0.35	
217	617,619 Spencer Ave.	2	N4420	62.81	61.78	-1.03	61.99	-0.82	62.20	-0.61	
218	701, 707, 713, 719 Spencer Ave.	2	N4420	63.05	61.78	-1.27	61.99	-1.06	62.20	-0.85	
219	same as # 118 above	2	N4420	63.05	61.78	-1.27	61.99	-1.06	62.20	-0.85	
220	725, 731, 737 Spencer Ave.	3	N4420	63.25	61.78	-1.47	61.99	-1.26	62.20	-1.05	
221	602, 600 S. Duncan Ave.	2	N4420	61.97	61.78	-0.19	61.99	0.02	62.20	0.23	
222	610, 608 S. Duncan Ave.	2	N4420	61.45	61.78	0.33	61.99	0.54	62.20	0.75	
223	612 S. Duncan Ave.	1	N4420	61.44	61.78	0.34	61.99	0.55	62.20	0.76	
224	618 S. Duncan Ave.	1	N4420	61.31	61.78	0.47	61.99	0.68	62.20	0.89	
225	704, 706 S. Duncan Ave.	2	N4420	61.13	61.78	0.65	61.99	0.86	62.20	1.07	
226	710 S. Duncan Ave.	1	N4420	61.33	61.78	0.45	61.99	0.66	62.20	0.87	
226A	708 S. Duncan Ave	1	N4420	62.07	61.78	-0.29	61.99	-0.08	62.20	0.13	
227	1672 Druid Rd.	1	N4420	63.79	61.78	-2.01	61.99	-1.80	62.20	-1.59	10 Structures
228	1676 Druid Rd.	1	N4420	63.23	61.78	-1.45	61.99	-1.24	62.20	-1.03	16 Units

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N0000	Clearwater Harbor	Collector	7.5	2.50	(0.00)	2.50	(0.00)	2.50	(0.00)
N0010	Stevenson Creek, 320' E. of Alt. 19	Collector	7.5	3.71	(0.00)	4.12	(0.00)	5.35	(0.00)
N0020	Stevenson Creek, 225' NW of Pinellas Trail	Residential	6.3	3.87	(0.00)	4.28	(0.00)	5.47	(0.00)
N0030	Stevenson Creek, 120' SE of Pinellas Trail	Residential	9.3	4.82	(0.00)	5.41	(0.00)	6.62	(0.00)
N0040	Stevenson Creek, 890' SE of Pinellas Trail	Residential	9.3	5.13	(0.00)	5.74	(0.00)	6.97	(0.00)
N0050	Stevenson Creek, 120' NW of Douglass Ave	Collector	9.0	5.27	(0.00)	5.87	(0.00)	7.06	(0.00)
N0060	Stevenson Creek, 120' SE of Douglass Ave	Residential	10.5	5.66	(0.00)	6.25	(0.00)	7.44	(0.00)
N0070	Stevenson Creek, 1,020 SE of Douglass Ave	Residential	10.5	5.98	(0.00)	6.57	(0.00)	7.73	(0.00)
N0080	Stevenson Creek, 1,530' SE of Douglass Ave	Residential	9.0	6.11	(0.00)	6.72	(0.00)	7.91	(0.00)
N0090	Stevenson Creek, 120' NW of Betty Lane	Collector	10.1	6.27	(0.00)	6.84	(0.00)	7.94	(0.00)
N0100	Stevenson Creek, 120' E of Betty Lane	Residential	6.1	6.86	0.76	7.54	1.44	8.93	2.83
N0110	Stevenson Creek, 690' SE of Betty Lane	Residential	10.0	7.19	(0.00)	7.90	(0.00)	9.30	(0.00)
N0120	Stevenson Creek at Palmetto Street	Collector	7.0	7.65	0.65	8.38	1.38	9.81	2.81
N0130	Stevenson Creek at Palmetto Street	Collector	7.0	8.02	1.02	8.74	1.74	10.02	3.02
N0140	Stevenson Creek, 860' S of Palmetto Street	Collector	16.5	11.26	(0.00)	11.64	(0.00)	12.61	(0.00)
N0150	Stevenson Creek, 150' NW of SCL Railroad	Collector	25.7	12.55	(0.00)	12.89	(0.00)	13.71	(0.00)
N0170	Stevenson Creek, 150' S of SCL Railroad	Collector	25.0	13.11	(0.00)	13.48	(0.00)	14.43	(0.00)
N0180	Stevenson Creek, 820' S of SCL Railroad	Residential	21.0	14.14	(0.00)	14.56	(0.00)	15.43	(0.00)
N0195	Douglass Avenue, 200' E of Harbor Drive	Collector	9.0	6.53	(0.00)	7.01	(0.00)	7.99	(0.00)
N0200	Douglass Avenue, 150' W of Harbor Drive	Collector	10.3	10.83	0.53	10.96	0.66	11.19	0.89
N0210	Fairmont Street and Washington Avenue	Collector	12.0	12.67	0.67	12.81	0.81	13.07	1.07
N0220	Fairmont Steet and N. Greenwood Avenue	Collector	14.0	14.65	0.65	14.79	0.79	15.04	1.04
N0230	Fairmont Street and Fulton Avenue	Collector	21.5	17.06	(0.00)	17.06	(0.00)	17.06	(0.00)
N0240	Marshall Street and Fulton Avenue	Residential	26.5	20.89	(0.00)	21.08	(0.00)	21.29	(0.00)
N0250	Pennsylvania Street and Grant Street	Residential	22.4	22.50	0.10	22.67	0.27	22.77	0.37
N0280	Marshall Street AWTP	Residential	7.5	7.44	(0.00)	7.87	0.37	8.65	1.15
N0290	Russel Street 350' W of Holt Avenue	Residential	9.0	9.38	0.38	9.65	0.65	9.93	0.93
N0291	Russel Street and Martin Luther King Ave	Residential	16.0	9.71	(0.00)	10.24	(0.00)	10.95	(0.00)
N0292	Russel Street and N Madison Ave	Residential	16.0	13.39	(0.00)	15.01	(0.00)	16.77	0.77
N0300	Martin Luther King Ave S of Russel Street	Residential	13.0	11.07	(0.00)	11.46	(0.00)	11.92	(0.00)
N0310	Martin Luther King Ave and Engman Street	Residential	12.0	12.77	0.77	12.99	0.99	13.29	1.29

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation

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N0320	Martin Luther King Ave and Palm Bluff St	Residential	15.0	15.67	0.67	15.75	0.75	15.88	0.88
N0330	Palm Bluff Street and N Madison Avenue	Residential	14.8	16.21	1.41	16.31	1.51	16.50	1.70
N0340	N Greenwood Avenue and Metto Street	Collector	19.2	20.18	0.98	20.43	1.23	21.00	1.80
N0350	N Greenwood Avenue and Palmetteo Street	Collector	21.7	20.97	(0.00)	21.27	(0.00)	21.55	(0.00)
N0370	Pennsylvania Avenue and Metto Street	Residential	20.8	21.41	0.61	21.66	0.86	21.96	1.16
N0380	Holt Avenue and Russel Street	Residential	5.9	6.88	0.98	7.22	1.32	8.11	2.21
N0390	Holt Avenue and Engman Street	Residential	16.5	10.29	(0.00)	10.80	(0.00)	11.55	(0.00)
N0400	Holt Avenue 420' S of Engman Street	Residential	20.2	12.58	(0.00)	13.34	(0.00)	14.27	(0.00)
N0410	Palmetto Street and Holt Avenue	Collector	20.1	15.32	(0.00)	16.23	(0.00)	17.26	(0.00)
N0420	Palmetto Street and N Missouri Avenue	Collector	20.2	17.63	(0.00)	18.61	(0.00)	19.51	(0.00)
N0425	Palmetto Street and N Missouri Avenue	Collector	20.2	18.73	(0.00)	19.65	(0.00)	20.45	0.25
N0430	N Missouri Avenue and Seminole Street	Residential	19.2	19.59	0.39	20.52	1.32	21.23	2.03
N0435	Palmetto Street and Phillies Stadium Drive	Collector	20.2	19.34	(0.00)	20.58	0.38	21.23	1.03
N0440	Palmetto Street and Kings Highway	Collector	19.4	15.66	(0.00)	15.60	(0.00)	19.59	0.19
N0450	Betty Lane and SCL Railroad Ditch	Collector	23.8	21.53	(0.00)	22.94	(0.00)	24.19	0.39
N0460	N. Lincoln Avenue and SCL Railroad Ditch	Residential	26.0	22.00	(0.00)	23.15	(0.00)	24.31	(0.00)
N0470	N. Missouri Avenue and SCL Railroad Ditch	Residential	24.0	22.98	(0.00)	23.59	(0.00)	24.52	0.52
N0480	N. Greenwood Avenue and Maple Street	Collector	23.6	23.39	(0.00)	23.82	0.22	24.64	1.04
N0490	Overbrook Avenue Detention Pond	Residential	20.0	15.91	(0.00)	16.28	(0.00)	16.76	(0.00)
N0500	Spring Branch at Overbrook Avenue	Residential	9.4	5.32	(0.00)	5.93	(0.00)	7.16	(0.00)
N0510	Spring Branch at Overbrook Avenue	Residential	9.4	6.15	(0.00)	7.00	(0.00)	9.66	0.26
N0520	Spring Branch at Springtime Avenue	Residential	8.9	6.24	(0.00)	7.07	(0.00)	9.72	0.82
N0530	Spring Branch at Douglass Avenue	Collector	9.5	6.31	(0.00)	7.18	(0.00)	10.57	1.07
N0540	Spring Branch at Douglass Avenue	Collector	9.5	6.40	(0.00)	7.36	(0.00)	11.49	1.99
N0550	(Pinellas County - FPLOS not determined)			7.01		7.93		11.77	
N0560	Spring Branch at Sunset Point Drive	Collector	17.4	7.80	(0.00)	8.55	(0.00)	11.86	(0.00)
N0570	(Pinellas County - FPLOS not determined)			9.67		10.57		12.80	
N0590	(Pinellas County - FPLOS not determined)			10.54		11.33		13.24	
N0600	(Pinellas County - FPLOS not determined)			12.11		12.82		13.49	
N0610	(Pinellas County - FPLOS not determined)			12.45		13.14		13.94	
N0620	Spring Branch, 700' SW of Kings Highway	Collector	16.0	13.05	(0.00)	13.82	(0.00)	14.95	(0.00)

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N0630	Spring Branch at Kings Highway (west side)	Collector	14.5	13.17	(0.00)	13.95	(0.00)	15.12	0.62
N0650	Pineland Avenue and Vista Way	Residential	19.0	16.45	(0.00)	16.61	(0.00)	17.65	(0.00)
N0660	Retention pond outfall SE of Pineland, Vista	Residential	20.0	17.19	(0.00)	17.38	(0.00)	17.90	(0.00)
N0670	Retention pond SE of Pineland and Vista	Residential	22.0	19.38	(0.00)	19.65	(0.00)	20.17	(0.00)
N0680	(Pinellas County - FPLOS not determined)			12.50		13.17		13.98	
N0690	Sunset Point Drive, 750' E of Betty Lane	Collector	11.9	12.75	0.85	13.17	1.27	13.98	2.08
N0700	School Board Retention Pond	Residential	17.0	16.68	(0.00)	16.71	(0.00)	16.77	(0.00)
N0710	School Board Retention Pond	Residential	17.0	16.21	(0.00)	16.39	(0.00)	16.78	(0.00)
N0720	School Board Ditch	Residential	19.0	18.64	(0.00)	18.82	(0.00)	19.05	0.05
N0730	School Board Retention Pond	Residential	20.0	19.39	(0.00)	19.61	(0.00)	20.05	0.05
N0740	State Street Ditch, 320' E of Betty Lane	Residential	12.3	12.64	0.34	13.28	0.98	14.06	1.76
N0750	State Street Ditch, 320' E of Betty Lane	Residential	12.3	13.03	0.73	13.29	0.99	14.06	1.76
N0760	Pond E of Betty Lane and Woodlawn Terr.	Residential	15.0	13.38	(0.00)	13.62	(0.00)	14.20	(0.00)
N0770	(Pinellas County - FPLOS not determined)			13.42		13.66		14.38	
N0775	(Pinellas County - FPLOS not determined)			14.09		15.16		16.91	
N0780	(Pinellas County - FPLOS not determined)			14.24		15.44		17.36	
N0790	(City of Dunedin - FPLOS not determined)			14.40		15.56		17.48	
N0800	(City of Dunedin - FPLOS not determined)			17.73		18.51		19.74	
N0810	(City of Dunedin - FPLOS not determined)			17.82		18.51		19.73	
N0820	(City of Dunedin - FPLOS not determined)			17.83		18.52		19.76	
N0830	(City of Dunedin - FPLOS not determined)			17.91		18.52		19.73	
N0840	(City of Dunedin - FPLOS not determined)			17.94		18.54		19.77	
N0850	(City of Dunedin - FPLOS not determined)			18.14		18.65		19.76	
N0855	(City of Dunedin - FPLOS not determined)			18.17		18.67		19.77	
N0860	(City of Dunedin - FPLOS not determined)			18.47		19.06		20.08	
N0870	(City of Dunedin - FPLOS not determined)			18.53		19.09		20.08	
N0880	(City of Dunedin - FPLOS not determined)			18.71		19.27		20.24	
N0890	(City of Dunedin - FPLOS not determined)			18.77		19.31		20.25	
N0900	(City of Dunedin - FPLOS not determined)			18.79		19.32		20.25	
N0910	Woodlawn Terrace and Oakdale Way	Residential	19.0	16.13	(0.00)	16.47	(0.00)	20.13	1.13
N0920	(City of Dunedin - FPLOS not determined)			18.17		18.68		19.72	

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N1000	Spring Branch at Kings Highway (east side)	Collector	14.5	13.70	(0.00)	14.86	0.36	15.97	1.47
N1010	Spring Branch, 680' S of Union Street	Residential	21.0	14.33	(0.00)	15.31	(0.00)	16.36	(0.00)
N1020	Spring Branch, 380' S of Union Street	Residential	20.8	15.42	(0.00)	16.12	(0.00)	17.10	(0.00)
N1030	Spring Branch at Union Street	Collector	20.0	17.49	(0.00)	18.11	(0.00)	19.05	(0.00)
N1040	(City of Dunedin - FPLOS not determined)			17.71		18.47		19.74	
N1050	(City of Dunedin - FPLOS not determined)			17.80		18.56		19.82	
N1060	(City of Dunedin - FPLOS not determined)			17.80		18.56		19.82	
N1070	(City of Dunedin - FPLOS not determined)			17.93		18.68		19.90	
N1080	(City of Dunedin - FPLOS not determined)			18.04		18.74		19.95	
N1090	(City of Dunedin - FPLOS not determined)			18.37		18.87		20.02	
N1100	(City of Dunedin - FPLOS not determined)			22.32		22.89		23.84	
N1110	(City of Dunedin - FPLOS not determined)			23.04		23.47		24.21	
N1120	(City of Dunedin - FPLOS not determined)			24.00		24.23		24.67	
N1130	(City of Dunedin - FPLOS not determined)			24.40		24.78		25.62	
N1140	(City of Dunedin - FPLOS not determined)			24.50		24.90		25.84	
N1150	(City of Dunedin - FPLOS not determined)			24.54		24.96		25.94	
N1160	(City of Dunedin - FPLOS not determined)			24.61		25.06		26.25	
N1170	(City of Dunedin - FPLOS not determined)			24.62		25.07		26.27	
N1172	(City of Dunedin - FPLOS not determined)			24.64		25.09		26.32	
N1174	(City of Dunedin - FPLOS not determined)			24.65		25.10		26.35	
N1180	(City of Dunedin - FPLOS not determined)			24.63		25.08		26.28	
N1190	(City of Dunedin - FPLOS not determined)			24.67		25.12		26.40	
N1200	(City of Dunedin - FPLOS not determined)			24.74		25.18		26.47	
N1210	(City of Dunedin - FPLOS not determined)			27.60		28.47		29.19	
N1220	(City of Dunedin - FPLOS not determined)			27.62		28.48		29.22	
N1230	(City of Dunedin - FPLOS not determined)			28.01		28.63		29.23	
N1240	(City of Dunedin - FPLOS not determined)			28.01		28.64		29.25	
N1245	(City of Dunedin - FPLOS not determined)			28.01		28.64		29.25	
N1250	(City of Dunedin - FPLOS not determined)			28.01		28.64		29.26	
N1260	(City of Dunedin - FPLOS not determined)			28.22		28.77		29.80	
N1270	(City of Dunedin - FPLOS not determined)			30.34		30.98		32.07	

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N1280	(City of Dunedin - FPLOS not determined)			30.35		30.99		32.08	
N1290	(City of Dunedin - FPLOS not determined)			30.60		30.99		32.08	
N1300	(City of Dunedin - FPLOS not determined)			33.12		33.35		33.71	
N1310	(City of Dunedin - FPLOS not determined)			33.38		33.72		34.31	
N1320	(City of Dunedin - FPLOS not determined)			33.74		33.89		34.36	
N1330	(City of Dunedin - FPLOS not determined)			42.18		42.56		43.19	
N1340	(City of Dunedin - FPLOS not determined)			42.36		42.75		43.40	
N1350	Byram East Ditch at Highland Avenue	Collector	17.2	14.74	(0.00)	15.40	(0.00)	16.71	(0.00)
N1360	Byram East Ditch at Highland Avenue	Collector	17.2	17.98	0.78	18.33	1.13	19.35	2.15
N1370	Byram East Ditch, 730' E of Highland Ave	Residential	23.7	22.53	(0.00)	23.50	(0.00)	24.60	0.90
N1380	Byram East Ditch, 1,350' E of Highland Ave	Residential	28.5	26.83	(0.00)	27.63	(0.00)	28.02	(0.00)
N1390	Souvenir Drive near Algonquin Drive	Residential	29.0	27.72	(0.00)	29.26	0.26	29.68	0.68
N1400	Algonquin Drive, 340' W of Picardy Circle	Residential	34.5	28.58	(0.00)	31.37	(0.00)	34.77	(0.00)
N1410	Algonquin Drive and Nugget Drive	Residential	56.5	50.86	(0.00)	50.98	(0.00)	51.20	(0.00)
N1420	Nugget Drive, 400' S of Algonquin Drive	Residential	58.5	54.31	(0.00)	54.79	(0.00)	55.76	(0.00)
N1430	Clearview Lake	Residential	59.0	56.97	(0.00)	57.60	(0.00)	58.90	(0.00)
N1440	Highland Avenue, 130' S of Byram Drive	Collector	16.0	15.19	(0.00)	16.07	0.07	17.41	1.41
N1450	Highland Avenue at Highland Circle	Collector	20.0	16.90	(0.00)	18.49	(0.00)	20.61	0.61
N1460	Highland Avenue at Sunset Point Road	Collector	32.5	32.66	0.16	32.83	0.33	32.98	0.48
N1470	Sunset Point Road, 250' E of Highland Ave	Collector	33.3	33.60	0.30	33.73	0.43	33.88	0.58
N1480	Sunset Point Road, 250' E of Highland Ave	Collector	33.3	33.75	0.45	33.80	0.50	33.88	0.58
N1490	Pond NE of Highland Avenue and Byram Dr	Residential	16.8	14.43	(0.00)	14.96	(0.00)	15.76	(0.00)
N1500	Souvenir Drive, 250' W of Picardy Circle	Residential	24.6	23.38	(0.00)	24.81	0.21	26.43	1.83
N1510	Retention Pond in Windsor Woods Sub.	Residential	28.0	28.06	0.06	28.20	0.20	28.43	0.43
N1520	(City of Dunedin - FPLOS not determined)			19.03		19.57		20.60	
N1530	(City of Dunedin - FPLOS not determined)			19.26		19.81		20.80	
N1540	(City of Dunedin - FPLOS not determined)			19.83		20.03		20.80	
N1550	(City of Dunedin - FPLOS not determined)			22.47		24.03		24.54	
N1560	(City of Dunedin - FPLOS not determined)			23.79		24.54		24.84	
N1570	(City of Dunedin - FPLOS not determined)			23.97		24.44		24.96	
N1580	(City of Dunedin - FPLOS not determined)			23.81		24.30		24.87	

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N1590	(City of Dunedin - FPLOS not determined)			19.21		19.75		20.72	
N1600	(City of Dunedin - FPLOS not determined)			26.88		26.99		27.12	
N1610	(City of Dunedin - FPLOS not determined)			27.87		28.23		28.87	
N1620	(City of Dunedin - FPLOS not determined)			31.14		31.43		32.02	
N1630	(City of Dunedin - FPLOS not determined)			26.18		26.47		26.84	
N1640	(City of Dunedin - FPLOS not determined)			30.11		30.77		31.89	
N1650	(City of Dunedin - FPLOS not determined)			30.96		31.53		32.80	
N1660	(City of Dunedin - FPLOS not determined)			31.34		31.81		32.91	
N1670	(City of Dunedin - FPLOS not determined)			32.22		32.58		33.29	
N1680	(City of Dunedin - FPLOS not determined)			35.82		36.68		38.55	
N1690	(City of Dunedin - FPLOS not determined)			39.53		39.80		40.59	
N1700	(City of Dunedin - FPLOS not determined)			36.31		36.69		37.49	
N1710	(City of Dunedin - FPLOS not determined)			27.35		28.18		30.35	
N1720	(City of Dunedin - FPLOS not determined)			44.60		44.74		44.88	
N1750	(City of Dunedin - FPLOS not determined)			24.63		25.09		26.28	
N1760	(City of Dunedin - FPLOS not determined)			24.63		25.11		26.28	
N1770	(City of Dunedin - FPLOS not determined)			25.19		25.30		26.30	
N1780	(City of Dunedin - FPLOS not determined)			27.09		27.39		27.95	
N1790	(City of Dunedin - FPLOS not determined)			28.64		29.01		29.52	
N1800	(City of Dunedin - FPLOS not determined)			24.64		25.06		26.09	
N1810	(City of Dunedin - FPLOS not determined)			24.64		25.06		26.09	
N1820	(City of Dunedin - FPLOS not determined)			24.87		25.41		26.30	
N1830	(City of Dunedin - FPLOS not determined)			26.96		27.24		27.98	
N1840	(City of Dunedin - FPLOS not determined)			28.01		28.63		29.23	
N1850	(City of Dunedin - FPLOS not determined)			28.01		28.64		29.23	
N1860	(City of Dunedin - FPLOS not determined)			30.84		31.60		33.16	
N1870	(City of Dunedin - FPLOS not determined)			31.62		32.40		34.09	
N1880	(City of Dunedin - FPLOS not determined)			29.71		30.14		30.93	
N1900	(City of Dunedin - FPLOS not determined)			28.02		28.64		29.30	
N1910	(City of Dunedin - FPLOS not determined)			28.09		28.73		29.88	
N1920	(City of Dunedin - FPLOS not determined)			30.71		31.10		31.72	

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N1930	(City of Dunedin - FPLOS not determined)			31.33		32.81		35.57	
N1940	(City of Dunedin - FPLOS not determined)			33.13		35.16		38.44	
N1950	(City of Dunedin - FPLOS not determined)			37.02		39.56		43.92	
N1960	(City of Dunedin - FPLOS not determined)			50.58		50.77		50.78	
N1970	(City of Dunedin - FPLOS not determined)			52.94		53.52		54.89	
N1980	(City of Dunedin - FPLOS not determined)			52.81		53.12		54.16	
N1990	(City of Dunedin - FPLOS not determined)			51.70		52.20		53.42	
N2000	Hammond Branch, 625' W of Kings Highway	Residential	6.5	6.90	0.40	7.59	1.09	8.98	2.48
N2010	Hammond Branch at Kings Highway	Collector	9.8	10.31	(0.00)	10.68	0.88	11.26	1.46
N2020	Hammond Branch at Kings Highway	Collector	9.8	10.75	0.95	10.94	1.14	11.36	1.56
N2030	Hammond Branch Pond E of Kings Highway	Residential	15.1	13.27	(0.00)	14.50	(0.00)	16.62	1.52
N2040	Hammond Branch Pond W of Highland Ave	Residential	19.0	19.28	(0.00)	19.58	0.58	20.34	1.34
N2050	Hammond Branch at Highland Avenue	Collector	26.8	26.60	(0.00)	26.12	(0.00)	26.79	(0.00)
N2055	Proposed Improved Railroad Ditch			38.10		37.93		38.03	
N2060	RR ditch at Flagler Drive and Carroll Street	Residential	43.3	41.39	(0.00)	42.04	(0.00)	42.91	(0.00)
N2070	RR ditch at Flagler Drive and Gentry Street	Residential	44.2	42.62	(0.00)	43.37	(0.00)	44.32	0.12
N2080	RR ditch at Flagler Drive and Crown Street	Residential	46.7	45.45	(0.00)	45.94	(0.00)	46.72	(0.00)
N2090	RR ditch at Flagler Drive 200' N of Scott St	Residential	48.4	47.66	(0.00)	48.01	(0.00)	48.66	0.26
N2100	RR ditch at Flagler Dr 250' W of Ridge Ave	Residential	50.3	50.17	(0.00)	50.51	0.21	50.99	0.69
N2110	RR ditch at Flagler Dr 100' E of Lynn Ave	Residential	55.3	54.71	(0.00)	55.11	(0.00)	55.49	(0.00)
N2120	RR ditch at Flagler Dr 80' W of Murry Ave	Residential	60.1	58.21	(0.00)	58.61	(0.00)	59.06	(0.00)
N2130	RR ditch at Flagler Dr and Saturn Avenue	Residential	63.3	61.90	(0.00)	62.22	(0.00)	62.54	(0.00)
N2140	RR ditch at Flagler Drive and Keene Road	Collector	62.9	62.87	(0.00)	63.09	0.19	63.40	0.50
N2150	Keene Road ditch 200' N of Long Street	Residential	65.3	67.47	2.17	68.14	2.84	69.18	3.88
N2155	Keene Road ditch 440' S of Long Street	Residential	69.0	67.49	(0.00)	68.14	(0.00)	69.19	0.19
N2160	Keene Road ditch at Palmetto Street	Collector	67.0	67.53	0.53	68.15	1.15	69.20	2.20
N2170	West pond in Clearwater Golf Park	(no street)		68.45		68.62		69.20	
N2180	Center pond in Clearwater Golf Park	(no street)		68.87		69.18		69.63	
N2200	Rollen Road and Parkwood Street	Residential	13.8	12.12	(0.00)	14.92	1.12	15.88	2.08
N2210	Rollen Road and Terrrace Road	Residential	17.0	17.25	0.25	17.64	0.64	17.95	0.95
N2220	Kings Highway and Terrace Road	Collector	19.9	19.26	(0.00)	20.20	0.30	20.54	0.64

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Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N2230	Kings Highway and Admiral Woodson Lane	Collector	15.5	15.75	0.25	15.87	0.37	16.18	0.68
N2240	Pond at Kings Highway and Hibiscus Street	Residential	23.0	17.44	(0.00)	18.37	(0.00)	19.75	(0.00)
N2242	Palmetto Street and Palm Terrace Drive	Collector	25.0	21.89	(0.00)	22.10	(0.00)	22.12	(0.00)
N2244	Palmetto Street and SCL Railroad	Collector	30.0	26.52	(0.00)	26.54	(0.00)	26.55	(0.00)
N2250	Palmetto Street and SCL Railroad	Collector	36.0	30.39	(0.00)	30.73	(0.00)	31.34	(0.00)
N2260	Detention Pond SW of Highland & Palmetto	Collector	37.0	32.54	(0.00)	33.33	(0.00)	34.86	(0.00)
N2270	Highland Avenue and Palmetto Street	Collector	37.5	33.66	(0.00)	34.31	(0.00)	35.72	(0.00)
N2280	Highland Avenue and Walnut Street	Collector	42.0	41.43	(0.00)	42.23	0.23	42.96	0.96
N2290	Glenwood Avenue and Elmwood Street	Residential	49.0	46.63	(0.00)	47.17	(0.00)	48.72	(0.00)
N2300	Park at Smallwood Circle and Rosemere Rd	Residential	44.5	46.90	2.40	47.38	2.88	48.27	3.77
N2310	Park at Ridgewood Street and Wood Ave	Residential	53.0	53.10	0.10	53.83	0.83	55.21	2.21
N2320	Ridgewood Street and Edgewood Avenue	Residential	58.0	55.61	(0.00)	56.41	(0.00)	57.34	(0.00)
N2330	Drew Street at Edgewood Avenue	Collector	66.0	58.86	(0.00)	59.44	(0.00)	60.60	(0.00)
N2340	Drew Street at Crest Avenue	Collector	62.7	62.61	(0.00)	63.10	0.40	63.22	0.52
N2345	Highland Avenue and Palmetto Street	Collector	36.6	36.57	(0.00)	36.75	0.15	36.95	0.35
N2350	Flagler Drive and Levern Street	Residential	39.0	38.89	(0.00)	39.60	0.60	40.04	1.04
N2370	Overlea Street, E of Carlos Avenue	Residential	23.5	23.77	0.27	24.07	0.57	24.53	1.03
N2380	Highland Avenue and Fairmont Street	Collector	27.3	27.77	0.47	27.97	0.67	28.17	0.87
N2390	Highland Avenue and Fairmont Street	Collector	27.3	28.36	1.06	28.50	1.20	28.69	1.39
N2400	Highland Avenue and Sandy Lane	Collector	32.5	33.35	0.85	33.47	0.97	33.68	1.18
N2420	Highland Avenue and Greenlea Drive	Collector	34.9	35.36	0.46	35.44	0.54	35.55	0.65
N2450	SCL RR W of Gentry Street and Flagler Drive	Residential	44.2	38.41	(0.00)	38.26	(0.00)	38.35	(0.00)
N2460	Linwood Drive and Sharondale Drive	Residential	51.0	46.27	(0.00)	46.77	(0.00)	47.44	(0.00)
N2470	Nelson Avenue and Scott Street	Residential	58.4	58.79	0.39	58.86	0.46	59.13	0.73
N2480	Lake Lucille	Residential	59.0	60.34	1.34	60.41	1.41	60.84	1.84
N2490	Palmetto Street and Casloer Avenue	Collector	66.4	66.49	0.09	66.94	0.54	67.12	0.72
N2500	Lake Hobart	Collector	67.3	65.74	(0.00)	66.34	(0.00)	67.42	0.12
N2510	Saturn Avenue and Leo Lane	Residential	63.4	63.23	(0.00)	64.10	0.70	64.54	1.14
N2520	Saturn Avenue and Sherwood Street	Residential	63.2	63.77	0.57	64.17	0.97	64.55	1.35
N2530	Lake at St Andrews Cove Apartments	Residential	69.4	67.23	(0.00)	67.79	(0.00)	68.93	(0.00)
N2540	Clearwater Air Park	Evacuation	68.0	67.17	(0.00)	67.59	(0.00)	68.62	0.62

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N2545	Clearwater Air Park	Evacuation	68.0	61.40	(0.00)	61.40	(0.00)	61.40	(0.00)
N2550	Clearwater Air Park	Evacuation	70.5	68.44	(0.00)	68.58	(0.00)	68.87	(0.00)
N2560	SE Pond in Clearwater Golf Park	(no street)		69.64		69.72		69.83	
N2570	City of Clearwater Public Service Complex	Residential	64.3	63.78	(0.00)	64.05	(0.00)	64.52	0.22
N2580	City of Clearwater Public Service Complex	Residential	66.0	66.07	(0.00)	66.24	(0.00)	66.71	0.71
N3000	Stevenson Creek gage, 170' N of Drew Street	Collector	21.0	14.50	(0.00)	14.90	(0.00)	15.76	(0.00)
N3010	Stevenson Creek at Drew Street	Collector	17.6	14.50	(0.00)	14.91	(0.00)	15.77	(0.00)
N3020	Stevenson Creek at Drew Street	Collector	17.6	14.75	(0.00)	15.25	(0.00)	17.44	(0.00)
N3030	Stevenson Creek at Cleveland Street (SR 60)	Evacuation	18.0	14.99	(0.00)	15.53	(0.00)	17.61	(0.00)
N3040	Stevenson Creek at Cleveland Street (SR 60)	Evacuation	18.0	15.55	(0.00)	16.49	(0.00)	19.13	1.12
N3050	Stevenson Creek at Pierce Street	Residential	17.2	15.84	(0.00)	16.82	(0.00)	20.04	2.84
N3060	Stevenson Creek at Pierce Street	Residential	17.2	16.49	(0.00)	18.15	0.95	20.08	2.88
N3070	Stevenson Creek at Franklin Street	Residential	17.8	16.59	(0.00)	18.22	0.42	20.14	2.34
N3080	Stevenson Creek at Franklin Street	Residential	17.8	17.57	(0.00)	18.92	1.12	20.19	2.39
N3090	Stevenson Creek at Court Street (SR 595A)	Arterial	22.0	17.65	(0.00)	18.97	(0.00)	20.22	(0.00)
N3100	Stevenson Creek at Court Street (SR 595A)	Arterial	22.0	17.75	(0.00)	19.06	(0.00)	21.09	(0.00)
N3110	Stevenson Creek 605' S of Court Street	Residential	19.0	18.34	(0.00)	19.52	0.52	21.47	2.47
N3125	Stevenson Creek at Druid Road	Collector	21.8	18.41	(0.00)	19.95	(0.00)	22.18	0.38
N3126	Stevenson Creek Weir S of Druid Road	Residential	21.5	19.63	(0.00)	20.90	(0.00)	22.98	1.48
N3130	Stevenson Creek 350' S of Druid (Linn Lake)	Residential	21.5	20.04	(0.00)	21.36	(0.00)	23.40	1.90
N3131	Stevenson Creek 1030' S of Druid(Linn Lake)	Residential	23.0	20.14	(0.00)	21.44	(0.00)	23.46	0.46
N3132	Stevenson Creek at Evergreen Avenue	Residential	24.0	22.12	(0.00)	23.29	(0.00)	25.07	1.07
N3134	Stevenson Creek at Hillcrest N of Jeffords	Residential	26.5	22.39	(0.00)	23.63	(0.00)	25.65	(0.00)
N3135	Pond in Golf Course S of Druid	Residential	33.0	29.91	(0.00)	31.06	(0.00)	33.30	0.30
N3150	S. Betty Lane and Jasmine Way	Residential	24.0	22.57	(0.00)	24.54	0.54	24.95	0.95
N3160	S. Betty Lane and Magnolia Drive	Residential	26.0	26.18	0.18	26.71	0.71	26.98	0.98
N3170	S. Betty Lane and Lotus Path	Residential	28.5	28.84	0.34	29.11	0.61	29.30	0.80
N3180	Jeffords Street and Byron Avenue	Residential	25.5	25.22	(0.00)	25.85	0.35	26.08	0.58
N3190	Jeffords Street and S. Betty Lane	Residential	33.0	33.02	(0.00)	33.34	0.34	33.52	0.52
N3195	Jeffords Street and Lincoln Avenue	Residential	53.0	49.95	(0.00)	50.21	(0.00)	50.22	(0.00)
N3200	Plaza Pines Shopping Center	Residential	57.0	52.21	(0.00)	52.23	(0.00)	52.85	(0.00)

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N3210	Plaza Pines Shopping Center	Residential	58.5	54.32	(0.00)	54.71	(0.00)	55.14	(0.00)
N3220	Plaza Pines Shopping Center Pond	Residential	60.8	61.22	0.42	61.27	0.47	61.34	0.54
N3450	Lake Bellevue Branch at S. Betty Lane	Residential	19.0	18.44	(0.00)	19.64	0.64	21.48	2.48
N3500	Lake Bellevue Branch at S. Lincoln Drive	Residential	20.3	19.05	(0.00)	20.15	(0.00)	21.50	1.20
N3510	Lake Bellevue Branch at Missouri Avenue	Arterial	23.0	19.21	(0.00)	20.43	(0.00)	22.49	(0.00)
N3520	Lake Bellevue Branch at Missouri Avenue	Arterial	23.0	19.37	(0.00)	21.05	(0.00)	23.50	0.50
N3530	Lake Bellevue Branch Pond W of Missouri	Residential	25.0	21.09	(0.00)	22.49	(0.00)	25.54	0.54
N3540	Lake Bellevue Branch at Druid Road	Collector	27.8	27.89	0.09	28.18	0.38	28.75	0.95
N3550	Stormwater Pond at Renaissance Sq. Villas	Residential	31.0	29.97	(0.00)	30.68	(0.00)	31.54	0.54
N3555	Lake Bellevue Branch 400' S of Druid	Residential	32.5	28.58	(0.00)	28.88	(0.00)	30.00	(0.00)
N3560	Lake Bellevue Branch W of Renaissance Sq	Residential	36.0	30.30	(0.00)	31.24	(0.00)	33.22	(0.00)
N3565	Lk Bellevue Brnch at Lotus Path/ S Greenwd	Collector	45.6	33.03	(0.00)	34.80	(0.00)	36.54	(0.00)
N3570	Lake Bellevue Branch S of Renaissance Sq	Residential	37.5	35.39	(0.00)	37.80	0.30	38.95	1.45
N3575	Lk Bellevue Branch 150' S of Renaissance Sq	Residential	36.0	36.70	0.70	37.80	1.80	38.95	2.95
N3580	Lake Bellevue Branch 250' N of Pinellas St	Residential	38.0	38.41	0.41	38.66	0.66	39.11	1.11
N3600	Lake Bellevue Branch at Pinellas Street	Residential	38.5	38.53	0.03	38.85	0.35	39.59	1.09
N3650	Lk Bellevue Brnch at Tuskawilla/ S Greenwd	Collector	39.8	40.18	0.38	40.31	0.51	40.78	0.98
N3670	Lake Bellevue Branch at Tuskawilla Ave	Residential	39.8	40.19	0.39	40.40	0.60	40.86	1.06
N3680	Lake Bellevue Branch 160' N of Lakeview	Residential	42.5	41.08	(0.00)	41.87	(0.00)	42.27	(0.00)
N3700	Lake Bellevue Branch at Lakeview Road	Collector	41.8	41.74	(0.00)	42.30	0.50	42.75	0.95
N3705	Proposed Lake Bellevue Outfall Weir			42.46		43.01		43.89	
N3710	Lake Bellevue	Collector	44.5	42.46	(0.00)	43.02	(0.00)	43.91	(0.00)
N3720	Lake Bellevue Branch at Woodlawn Ave	Residential	48.8	44.46	(0.00)	45.63	(0.00)	48.00	(0.00)
N3730	Lake Bellevue Branch at Woodlawn Ave	Residential	48.8	45.90	(0.00)	49.16	0.36	50.34	1.54
N3740	Lake Bellevue Branch at Howard Street	Residential	51.8	51.51	(0.00)	51.64	(0.00)	52.38	0.58
N3750	Lake Bellevue Branch at Howard Street	Residential	51.8	52.21	0.41	52.57	0.77	53.45	1.65
N3760	Lake Bellevue Branch at Belleair Road	Collector	56.3	55.14	(0.00)	55.86	(0.00)	56.92	0.62
N3780	S. Greenwood Avenue at Hawkins Street	Collector	61.5	61.95	0.45	62.19	0.69	62.55	1.05
N3790	Missouri Avenue FDOT Detention Pond	Arterial	64.5	61.98	(0.00)	62.28	(0.00)	62.78	(0.00)
N3800	Wildwood Way and SCL Railroad	Residential	44.0	42.89	(0.00)	43.20	(0.00)	43.94	(0.00)
N3810	Belleair Road and SCL Railroad	Collector	56.3	56.86	0.56	57.34	1.04	58.03	1.73

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N4000	Stevenson Creek at Jeffords Street	Residential	24.5	22.50	(0.00)	24.10	(0.00)	26.93	2.43
N4010	Stevenson Creek at Browning Street	Residential	28.6	26.24	(0.00)	27.53	(0.00)	29.15	0.55
N4020	Stevenson Creek at Browning Street	Residential	28.6	26.62	(0.00)	28.72	0.12	30.24	1.64
N4030	Stevenson Creek at Lakeview Road	Collector	33.8	28.69	(0.00)	29.74	(0.00)	31.33	(0.00)
N4040	Hillcrest Avenue S. of Lakeview Road	Residential	31.0	30.37	(0.00)	31.21	(0.00)	33.00	2.00
N4050	Stevenson Creek 950' S of Lakeview Road	Residential	33.5	31.89	(0.00)	32.83	(0.00)	34.29	0.79
N4060	Stevenson Creek at Bellevue Boulevard	Residential	36.0	33.43	(0.00)	34.34	(0.00)	35.77	(0.00)
N4065	Stevenson Creek at Bellevue Boulevard	Residential	36.0	36.87	0.87	37.49	1.49	38.39	2.39
N4075	Stevenson Creek at St Thomas Drive	Residential	36.8	36.93	0.13	37.56	0.76	38.47	1.67
N4080	Stevenson Creek at St Thomas Drive	Residential	36.8	38.66	1.86	39.07	2.27	39.88	3.08
N4090	Rice Lake	Collector	41.8	38.81	(0.00)	39.26	(0.00)	40.15	(0.00)
N4100	Stevenson Creek at Belleair Boulevard	Collector	41.8	39.09	(0.00)	40.48	(0.00)	42.31	0.51
N4110	Stevenson Creek at Southridge Drive	Residential	40.9	40.18	(0.00)	40.92	0.02	42.56	1.66
N4120	Stevenson Creek at Southridge Drive	Residential	40.9	41.18	0.28	41.61	0.71	42.56	1.66
N4122	Byron Drive 400' S of Emily Court	Residential	34.3	35.45	1.15	35.84	1.54	36.51	2.21
N4123	Bellevue Boulevard at Boylan Avenue	Residential	55.0	53.49	(0.00)	53.63	(0.00)	53.88	(0.00)
N4125	Missouri Avenue FDOT Detention Pond	Arterial	65.0	59.85	(0.00)	60.47	(0.00)	61.64	(0.00)
N4128	Pond adj. to Stevenson Creek S of Belleair	Residential	47.7	38.48	(0.00)	38.85	(0.00)	39.54	(0.00)
N4130	Belleair Road 700' W of Highland Avenue	Collector	44.5	44.85	0.35	45.00	0.50	45.16	0.66
N4131	Belleair Road 350' W of Highland Avenue	Collector	44.9	45.56	0.66	45.69	0.79	45.87	0.97
N4132	Belleair Road and Highland Avenue	Collector	46.6	46.83	0.23	46.90	0.30	47.03	0.43
N4133	Belleair Road and Highland Avenue	Collector	46.6	47.05	0.45	47.11	0.51	47.32	0.72
N4135	Highland Avenue 280' N of Belleair Road	Collector	53.3	47.66	(0.00)	48.24	(0.00)	53.43	0.13
N4136	Labelle Plaza South Detention Pond	Residential	56.0	52.63	(0.00)	53.72	(0.00)	54.69	(0.00)
N4137	Labelle Plaza North Detention Pond	Residential	60.0	54.62	(0.00)	55.20	(0.00)	56.45	(0.00)
N4138	Pond SE of Belleair Road and Clearview Ave	Residential	45.5	45.68	0.18	46.50	1.00	47.61	2.11
N4139	Jeffords Street Branch at Hillcrest Avenue	Residential	26.0	22.81	(0.00)	24.34	(0.00)	27.08	1.08
N4140	Jeffords Street Branch at Highland Avenue	Collector	28.5	28.84	0.34	29.34	0.84	30.10	1.60
N4150	Jeffords Street Branch 650' E of Highland	Residential	31.0	30.52	(0.00)	31.57	0.57	32.23	1.23
N4160	Jeffords Street Branch 600' W of Lake Ave	Residential	31.0	30.47	(0.00)	31.56	0.56	32.25	1.25
N4170	Jeffords Street Branch at Lake Avenue	Collector	31.3	30.46	(0.00)	31.51	0.21	32.43	1.13

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N4180	Jeffords Street Branch at Lake Avenue	Collector	31.3	30.46	(0.00)	31.54	0.24	32.49	1.19
N4200	Jeffords Street Branch 486' E of Lake Ave	Residential	30.4	30.51	0.11	31.72	1.32	32.61	2.21
N4205	Jeffords Street 100' E of Tuscola Road	Residential	30.0	31.11	1.11	32.18	2.18	32.74	2.74
N4210	Sonny Lake	Residential	30.3	31.33	1.03	32.19	1.89	32.75	2.45
N4220	Lake Helen	Residential	30.2	31.16	0.96	32.18	1.98	32.74	2.54
N4230	Woodcrest Avenue 450' S of Jeffords Street	Residential	31.2	32.18	0.98	32.31	1.11	32.75	1.55
N4240	Ditch Terminus 220' E of Woodcrest Avenue	Residential	44.0	33.68	(0.00)	34.03	(0.00)	34.70	(0.00)
N4245	Beginning of Lake Alpine Outfall Ditch	Residential	36.0	33.68	(0.00)	34.03	(0.00)	34.70	(0.00)
N4250	Lake Alpine	Residential	36.0	33.73	(0.00)	34.08	(0.00)	34.74	(0.00)
N4260	Keene Road and Beverly Circle	Arterial	36.6	34.94	(0.00)	36.13	(0.00)	37.12	0.52
N4280	Pond SE of Keene Road and Beverly Circle	Residential	36.7	34.66	(0.00)	35.08	(0.00)	35.80	(0.00)
N4285	West End of Budleigh Street at N-S Ditch	Residential	34.5	34.85	0.35	35.12	0.62	35.34	0.84
N4290	West End of Magnolia Drive at N-S Ditch	Residential	50.0	47.17	(0.00)	47.51	(0.00)	47.90	(0.00)
N4300	Druid Road and Skyview Avenue	Collector	56.0	56.33	0.33	56.32	0.32	56.52	0.52
N4310	Turner Street and Skyview Avenue	Residential	68.5	68.59	0.09	68.75	0.25	68.84	0.34
N4320	Gulf to Bay Boulevard and Skyview Avenue	Evacuation	72.2	68.58	(0.00)	68.74	(0.00)	68.83	(0.00)
N4360	Crest Lake	Collector	71.2	68.85	(0.00)	69.14	(0.00)	69.62	(0.00)
N4380	Lake NE of Jeffords St and Keystone Ave	Residential	31.3	31.18	(0.00)	32.18	0.88	32.74	1.44
N4390	Duncan Avenue 470' N of Jeffords Street	Residential	32.5	31.60	(0.00)	32.78	0.28	33.17	0.67
N4400	Duncan Avenue at Magnolia Drive	Residential	40.5	37.41	(0.00)	37.42	(0.00)	40.78	0.28
N4410	Duncan Avenue and Druid Road	Collector	59.9	55.51	(0.00)	56.08	(0.00)	56.70	(0.00)
N4420	Duncan Avenue and Turner Street	Residential	61.5	59.23	(0.00)	60.01	(0.00)	61.55	0.05
N4424	Duncan Avenue and Rainbow Drive	Residential	70.0	69.92	(0.00)	70.25	0.25	70.41	0.41
N4425	Allens Creek Boundary Node	Residential	68.0	68.00	0.00	68.00	0.00	68.00	0.00
N4426	Duncan Avenue and Cleveland Street	Collector	69.0	69.59	0.59	69.68	0.68	69.83	0.83
N4430	Pond SW of Lakeview Rd and Duncan Ave	Collector	35.4	31.81	(0.00)	33.32	(0.00)	35.92	0.52
N4440	Balmora Drive near Norwood Avenue	Residential	34.0	34.67	0.67	35.51	1.51	36.06	2.06
N4450	Pond SE of Pinewood Dr and Norwood Ave	Residential	34.0	32.85	(0.00)	33.67	(0.00)	35.35	1.35
N4460	Pond SE of Duncan Ave and Brentwood Dr	Residential	33.0	31.33	(0.00)	32.19	(0.00)	32.76	(0.00)
N4470	Pond at Lake Avenue and Bamora Drive	Collector	46.5	47.10	0.60	47.25	0.75	47.49	0.99
N4480	Brentwood Drive and Woodcrest Avenue	Residential	36.0	34.37	(0.00)	36.27	0.27	36.53	0.53

Table F.1 Proposed Conditions Street Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Node ID	Node Location	Roadway Classification	Lowest Road Elev.	Flood Elev. 10-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 25-yr, 24-hr	Depth of Flooding (ft)	Flood Elev. 100-yr,24-hr	Depth of Flooding (ft)
N4485	Keene Road 540' N of Beverly Circle	Arterial	42.7	35.86	(0.00)	37.21	(0.00)	38.21	(0.00)
N4490	Pond SW of Keene Rd and Magnolia Drive	Arterial	42.7	40.95	(0.00)	41.57	(0.00)	42.66	(0.00)
N4500	Pond SE of Keene Road and Magnolia Drive	Arterial	42.7	41.38	(0.00)	42.09	(0.00)	43.17	0.47
N4510	Pond NE of Keene Road and Magnolia Drive	Residential	49.5	44.99	(0.00)	45.42	(0.00)	46.35	(0.00)

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
1	1508 Stevenson Dr.	1	N0080	9.75	6.11	-3.64	6.72	-3.03	7.91	-1.84	0 Structures
2	1300 Betty Lane (Business)	1	N0090	7.26	6.27	-0.99	6.84	-0.42	7.94	0.68	
2A	1300 Block Betty Ln (FF estimated)	1	N0090	7.5	6.27	-1.23	6.84	-0.66	7.94	0.44	
2B	1300 Block Betty Ln (FF estimated)	1	N0090	7.5	6.27	-1.23	6.84	-0.66	7.94	0.44	
2C	1300 Block Betty Ln (FF estimated)	1	N0090	7.5	6.27	-1.23	6.84	-0.66	7.94	0.44	5 Structures
2D	1200 Block Betty Ln (FF estimated)	1	N0090	7.5	6.27	-1.23	6.84	-0.66	7.94	0.44	5 Units
3	1211 Betty Lane	1	N0100	8.33	6.86	-1.47	7.54	-0.79	8.93	0.60	
3A	1200 Block Betty Ln (FF estimated)	1	N0100	8.0	6.86	-1.14	7.54	-0.46	8.93	0.93	
3B	1300 Block Betty Ln (FF estimated)	1	N0100	8.0	6.86	-1.14	7.54	-0.46	8.93	0.93	
3C	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.86	-0.94	7.54	-0.26	8.93	1.13	
3D	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.86	-0.94	7.54	-0.26	8.93	1.13	
3E	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.86	-0.94	7.54	-0.26	8.93	1.13	
3F	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.86	-0.94	7.54	-0.26	8.93	1.13	
3G	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.86	-0.94	7.54	-0.26	8.93	1.13	
3H	1300 Block Overlea (FF estimated)	1	N0100	7.8	6.86	-0.94	7.54	-0.26	8.93	1.13	
3I	1300 Block Overlea (FF estimated)	1	N0100	8.0	6.86	-1.14	7.54	-0.46	8.93	0.93	
3J	1300 Block Overlea (FF estimated)	1	N0100	8.0	6.86	-1.14	7.54	-0.46	8.93	0.93	
3K	1300 Block Overlea (FF estimated)	1	N0100	8.0	6.86	-1.14	7.54	-0.46	8.93	0.93	
3L	1300 Block Springdale Str. (FF estimated)	1	N0100	8.7	6.86	-1.84	7.54	-1.16	8.93	0.23	
3M	Bethany C.M.E. Church on Sprindale (est.)	1	N0100	9.0	6.86	-2.14	7.54	-1.46	8.93	-0.07	
3N	1300 Block Overlea (FF estimated)	1	N0100	8.7	6.86	-1.84	7.54	-1.16	8.93	0.23	
3O	1300 Block Overlea (FF estimated)	1	N0100	9	6.86	-2.14	7.54	-1.46	8.93	-0.07	
3P	1300 Block Overlea (FF estimated)	1	N0100	9	6.86	-2.14	7.54	-1.46	8.93	-0.07	
3Q	1300 Block Overlea (FF estimated)	1	N0100	9	6.86	-2.14	7.54	-1.46	8.93	-0.07	
272	1321 Springdale St.	1	N0100	8.73	6.86	-1.87	7.54	-1.19	8.93	0.20	
273	1315 Betty Lane	1	N0100	7.12	6.86	-0.26	7.54	0.42	8.93	1.81	17 Structures
274	1317 Overea St.	1	N0100	7.80	6.86	-0.94	7.54	-0.26	8.93	1.13	17 Units
4	1020 Pine Brook Dr.	1	N0110	12.14	7.19	-4.95	7.90	-4.24	9.30	-2.84	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
5	1201 Betty Lane	1	N0110	12.14	7.19	-4.95	7.90	-4.24	9.30	-2.84	
4A	1000 Block Pinebrook Dr. (Estimated)	1	N0110	9.6	7.19	-2.41	7.90	-1.70	9.30	-0.30	
4B	1000 Block Pinebrook Dr. (Estimated)	1	N0110	9.1	7.19	-1.91	7.90	-1.20	9.30	0.20	
4C	1000 Block Pinebrook Dr. (Estimated)	1	N0110	9.1	7.19	-1.91	7.90	-1.20	9.30	0.20	
4D	1000 Block Pinebrook Dr. (Estimated)	1	N0110	9.1	7.19	-1.91	7.90	-1.20	9.30	0.20	3 Structures
275	1012 PineBrook Dr.	1	N0110	10.08	7.19	-2.89	7.90	-2.18	9.30	-0.78	3 Units
6	1324 Palmetto Street	1	N0120	9.41	7.65	-1.76	8.38	-1.03	9.81	0.40	1 Structures
7	1312 Palmetto Street	1	To be acquired as part of project 2A								1 Units
8	Clearwater C.C. utility bldg -W. bank	1	N0170	12.60	13.11	0.51	13.48	0.88	14.43	1.83	2 Structures
9	Clearwater C.C. utility bldg -E. bank	1	N0170	12.34	13.11	0.77	13.48	1.14	14.43	2.09	2 Units
158	902 Palm Bluff St.	1	N0370	24.34	21.41	-2.93	21.66	-2.68	21.96	-2.38	
159	904 Palm Bluff St.	1	N0370	23.52	21.41	-2.11	21.66	-1.86	21.96	-1.56	
160	908 Palm Bluff St.	1	N0370	22.62	21.41	-1.21	21.66	-0.96	21.96	-0.66	
161	1012 Pennsylvania Ave.Church	1	N0370	22.19	21.41	-0.78	21.66	-0.53	21.96	-0.23	
162	910 Jurgens St.	1	N0370	24.30	21.41	-2.89	21.66	-2.64	21.96	-2.34	
163	912 Jurgens St.	1	N0370	22.98	21.41	-1.57	21.66	-1.32	21.96	-1.02	
164	913 Jurgens St.	1	N0370	23.47	21.41	-2.06	21.66	-1.81	21.96	-1.51	
165	1010 Pennsylvania Ave.	1	N0370	22.93	21.41	-1.52	21.66	-1.27	21.96	-0.97	
166	1008 Pennsylvania Ave.	1	N0370	21.85	21.41	-0.44	21.66	-0.19	21.96	0.11	
170	912 Palmetto St.	1	N0370	21.96	21.41	-0.55	21.66	-0.30	21.96	0.00	1 Structure
172	920 Pennsylvania Ave.	1	N0370	22.38	21.41	-0.97	21.66	-0.72	21.96	-0.42	1 Unit
175	1396 Palmetto St.	1	N0440	19.94	15.66	-4.28	15.60	-4.34	19.59	-0.35	0 Structures
187	511 Washington Ave.	1	N0470	25.47	22.98	-2.49	23.59	-1.88	24.52	-0.95	0 Structures
179	506 N. Greenwood Ave.	1	N0480	24.85	23.39	-1.46	23.82	-1.03	24.64	-0.21	
180	1003 Lee St.	1	N0480	25.55	23.39	-2.16	23.82	-1.73	24.64	-0.91	
181	1027 Lee St.	1	N0480	25.74	23.39	-2.35	23.82	-1.92	24.64	-1.10	
182	1004 Plaza St.	1	N0480	25.95	23.39	-2.56	23.82	-2.13	24.64	-1.31	
183	1008 Plaza St.	1	N0480	26.13	23.39	-2.74	23.82	-2.31	24.64	-1.49	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
184	1010 Plaza St.	1	N0480	26.22	23.39	-2.83	23.82	-2.40	24.64	-1.58	
185	500 N. Greenwood Ave.	1	N0480	25.96	23.39	-2.57	23.82	-2.14	24.64	-1.32	0 Structures
186	512 N. Washington Ave.	1	N0480	24.64	23.39	-1.25	23.82	-0.82	24.64	0.00	0 Units
117	Sunset Pt. Baptist Church	1	N0620	14.40	13.05	-1.35	13.82	-0.58	14.95	0.55	1 Structure
101	1226 Idlewild Drive	1	N0910	23.10	16.13	-6.97	16.47	-6.63	20.13	-2.97	
102	1242 Idlewild Drive	1	N0910	22.38	16.13	-6.25	16.47	-5.91	20.13	-2.25	
103	1246 Idlewild Drive	1	N0910	21.92	16.13	-5.79	16.47	-5.45	20.13	-1.79	
104	1250 Idlewild Drive	1	N0910	21.54	16.13	-5.41	16.47	-5.07	20.13	-1.41	
105	1254 Idlewild Drive	1	N0910	21.45	16.13	-5.32	16.47	-4.98	20.13	-1.32	
106	1260 Idlewild Drive	1	N0910	22.63	16.13	-6.50	16.47	-6.16	20.13	-2.50	
107	1266 Idlewild Drive	1	N0910	22.88	16.13	-6.75	16.47	-6.41	20.13	-2.75	
108	1243 Idlewild Drive	1	N0910	22.94	16.13	-6.81	16.47	-6.47	20.13	-2.81	
109	1245 Idlewild Drive	1	N0910	22.17	16.13	-6.04	16.47	-5.70	20.13	-2.04	
110	1212 Woodlawn Terr.	1	N0910	20.23	16.13	-4.10	16.47	-3.76	20.13	-0.10	
111	1232 Woodlawn Terr.	1	N0910	21.87	16.13	-5.74	16.47	-5.40	20.13	-1.74	
112	1234 Woodlawn Terr.	1	N0910	22.58	16.13	-6.45	16.47	-6.11	20.13	-2.45	
113	2000 Douglas Ave.	1	N0910	22.48	16.13	-6.35	16.47	-6.01	20.13	-2.35	
114	1209 Woodlawn Terr.	1	N0910	22.26	16.13	-6.13	16.47	-5.79	20.13	-2.13	
115	1213 Woodlawn Terr.	1	N0910	22.43	16.13	-6.30	16.47	-5.96	20.13	-2.30	0 Structures
116	1225 Woodlawn Terr.	1	N0910	22.01	16.13	-5.88	16.47	-5.54	20.13	-1.88	0 Units
118	1400 Byram Drive	1	N1000	16.61	13.70	-2.91	14.86	-1.75	15.97	-0.64	
119	1408 Byram Drive	1	N1000	16.72	13.70	-3.02	14.86	-1.86	15.97	-0.75	
120	1422 Byram Drive	1	N1000	16.62	13.70	-2.92	14.86	-1.76	15.97	-0.65	
121	1430 Byram Drive	1	N1000	16.66	13.70	-2.96	14.86	-1.80	15.97	-0.69	
122	1436 Byram Drive	1	N1000	16.71	13.70	-3.01	14.86	-1.85	15.97	-0.74	
123	1446 Byram Drive	1	N1000	16.82	13.70	-3.12	14.86	-1.96	15.97	-0.85	
124	1450 Byram Drive	1	N1000	16.47	13.70	-2.77	14.86	-1.61	15.97	-0.50	
125	1456 Byram Drive	1	N1000	16.85	13.70	-3.15	14.86	-1.99	15.97	-0.88	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation

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126	1458 Byram Drive	1	To be acquired as part of project 1E								
127	1460 Byram Drive	1	To be acquired as part of project 1E								
128	1462 Byram Drive	1	To be acquired as part of project 1E								
129	1466 Byram Drive	1	N1000	16.10	13.70	-2.40	14.86	-1.24	15.97	-0.13	
130	1468 Byram Drive	1	N1000	16.04	13.70	-2.34	14.86	-1.18	15.97	-0.07	
131	1472 Byram Drive	1	N1000	16.30	13.70	-2.60	14.86	-1.44	15.97	-0.33	
132	1476 Byram Drive	1	N1000	17.01	13.70	-3.31	14.86	-2.15	15.97	-1.04	
133	1482 Byram Drive	1	N1000	18.13	13.70	-4.43	14.86	-3.27	15.97	-2.16	
134	1492 Byram Drive	1	N1000	18.04	13.70	-4.34	14.86	-3.18	15.97	-2.07	
135	1447 Byram Drive	1	N1000	17.08	13.70	-3.38	14.86	-2.22	15.97	-1.11	
136	1457 Byram Drive	1	N1000	17.01	13.70	-3.31	14.86	-2.15	15.97	-1.04	
137	1461 Byram Drive	1	N1000	16.28	13.70	-2.58	14.86	-1.42	15.97	-0.31	
138	1463 Byram Drive	1	N1000	15.91	13.70	-2.21	14.86	-1.05	15.97	0.06	
139	1465 Byram Drive	1	N1000	16.07	13.70	-2.37	14.86	-1.21	15.97	-0.10	
140	1467 Byram Drive	1	N1000	17.06	13.70	-3.36	14.86	-2.20	15.97	-1.09	
141	1471 Byram Drive	1	N1000	17.43	13.70	-3.73	14.86	-2.57	15.97	-1.46	
142	1944 Flora Rd.	1	N1000	16.58	13.70	-2.88	14.86	-1.72	15.97	-0.61	
143	1950 Flora Rd.	1	N1000	16.68	13.70	-2.98	14.86	-1.82	15.97	-0.71	
144	1464 Flora Rd.	1	N1000	16.52	13.70	-2.82	14.86	-1.66	15.97	-0.55	
145	1466 Flora Rd.	1	N1000	16.20	13.70	-2.50	14.86	-1.34	15.97	-0.23	
146	1468 Flora Rd.	1	N1000	16.38	13.70	-2.68	14.86	-1.52	15.97	-0.41	1 Structure
147	1467 Flora Rd.	1	N1000	16.91	13.70	-3.21	14.86	-2.05	15.97	-0.94	1 Unit
151	1556 Huntington Lane	1	N1370	25.19	22.53	-2.66	23.50	-1.69	24.60	-0.59	
152	1549 Huntington Lane	1	N1370	24.64	22.53	-2.11	23.50	-1.14	24.60	-0.04	0 Structures
153	1555 Huntington Lane	1	N1370	25.08	22.53	-2.55	23.50	-1.58	24.60	-0.48	0 Units
148	1949 Highland Ave.	1	N1440	17.60	15.19	-2.41	16.07	-1.53	17.41	-0.19	
149	1943 Highland Ave.	1	N1440	17.39	15.19	-2.20	16.07	-1.32	17.41	0.02	2 Structures
150	1937 Highland Ave.	1	N1440	16.39	15.19	-1.20	16.07	-0.32	17.41	1.02	2 Units

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154	1550 Souvenir Drive	1	N1500	26.59	23.38	-3.21	24.81	-1.78	26.43	-0.16	0 Structures
173	1402 N. Hibiscus St.	1	N2240	19.95	17.44	-2.51	18.37	-1.58	19.75	-0.20	0 Structures
174	1410 N. Hibiscus St.	1	N2240	20.84	17.44	-3.40	18.37	-2.47	19.75	-1.09	0 Units
176	1536 Smallwood Circle	1	N2300	48.43	46.90	-1.53	47.38	-1.05	48.27	-0.16	0 Structures
177	1544 Smallwood Circle	1	N2300	48.99	46.90	-2.09	47.38	-1.61	48.27	-0.72	0 Units
178	1550 Ridgewood St.	1	N2310	55.72	53.10	-2.62	53.83	-1.89	55.21	-0.51	0 Structures
155	1585 Linwood Drive	1	N2460	48.69	46.27	-2.42	46.77	-1.92	47.44	-1.25	
156	1591 Linwood Drive	1	N2460	48.28	46.27	-2.01	46.77	-1.51	47.44	-0.84	0 Structures
157	1593 Linwood Drive	1	N2460	49.02	46.27	-2.75	46.77	-2.25	47.44	-1.58	0 Units
10	1329 Drew Street	1	N3020	19.59	14.75	-4.84	15.25	-4.34	17.44	-2.15	
11	1345 Drew Street	1	N3020	18.11	14.75	-3.36	15.25	-2.86	17.44	-0.67	
12	111 Lady Mary Drive	1	N3020	17.12	14.75	-2.37	15.25	-1.87	17.44	0.32	
13	106A Evergreen Avenue	1	N3020	18.08	14.75	-3.33	15.25	-2.83	17.44	-0.64	1 Structure
14	105&107 Lady Mary Drive	2	N3020	18.44	14.75	-3.69	15.25	-3.19	17.44	-1.00	1 Unit
15	1330 Cleveland St (Office Building)	2	N3030	19.72	14.99	-4.73	15.53	-4.19	17.61	-2.11	
15A	11 Lady Mary Dr (Office Building)	2	N3030	19.72	14.99	-4.73	15.53	-4.19	17.61	-2.11	
15B	1300 Blk Cleveland St (Map #19?)	1	N3030	18.31	14.99	-3.32	15.53	-2.78	17.61	-0.70	0 Structures
15C	1300 Blk Cleveland St (FF estimated)	1	N3030	19.5	14.99	-4.51	15.53	-3.97	17.61	-1.89	0 Units
16	1343 Cleveland Street	1	N3040	20.04	15.55	-4.49	16.49	-3.55	19.13	-0.91	0 Structures
17	1331 Cleveland Street	1	N3040	20.01	15.55	-4.46	16.49	-3.52	19.13	-0.88	0 Units
18	1345 Park Street	1	N3050	21.93	15.84	-6.09	16.82	-5.11	20.04	-1.89	
20	1338 Pierce Street (Business)	3	N3050	19.16	15.84	-3.32	16.82	-2.34	20.04	0.88	
188	1318 Pierce St.	1	N3050	20.00	15.84	-4.16	16.82	-3.18	20.04	0.04	
189	1320 Pierce St.	1	N3050	18.87	15.84	-3.03	16.82	-2.05	20.04	1.17	4 Structures
190	1326 Pierce St.	1	N3050	18.57	15.84	-2.73	16.82	-1.75	20.04	1.47	6 Units
191	1313 Pierce St.	1	N3060	21.00	16.49	-4.51	18.15	-2.85	20.08	-0.92	0 Structures
21	215 Waverly Way	2	N3070	19.95	16.59	-3.36	18.22	-1.73	20.14	0.19	
22	221 Waverly Way	2	N3070	19.28	16.59	-2.69	18.22	-1.06	20.14	0.86	

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23	227 Waverly Way	1	N3070	19.5	16.59	-2.91	18.22	-1.28	20.14	0.64	4 Structures
24	229 Waverly Way	1	N3070	19.5	16.59	-2.91	18.22	-1.28	20.14	0.64	6 Units
276	1305 Franklin St. (Office Bldg.)	1	N3080	20.72	17.57	-3.15	18.92	-1.80	20.19	-0.53	0 Structures
25	311 S. Betty Lane (Bldg. 1)	4	N3090	21.03	17.57	-3.46	18.92	-2.11	20.19	-0.84	
26	1290 Court Street (Business)	1	N3090	22.43	17.65	-4.78	18.97	-3.46	20.22	-2.21	
277	311 S. Betty Lane (Bldg. 2)	15	N3090	21.32	17.65	-3.67	18.97	-2.35	20.22	-1.10	
278	1295 Santa Rosa Dr. Apt.# 1-5	5	N3090	20.51	17.65	-2.86	18.97	-1.54	20.22	-0.29	0 Structures
279	1295 Santa Rosa Dr. Apt.# 11-15	5	N3090	20.51	17.65	-2.86	18.97	-1.54	20.22	-0.29	0 Units
27	514 Betty Lane	1	N3100	22.19	17.75	-4.44	19.06	-3.13	21.09	-1.10	0 Structures
30	600 Betty Lane	1	N3110	20.49	18.34	-2.15	19.52	-0.97	21.47	0.98	
31	606 Betty Lane	1	N3110	20.35	18.34	-2.01	19.52	-0.83	21.47	1.12	
32	610 Betty Lane	1	N3110	21.33	18.34	-2.99	19.52	-1.81	21.47	0.14	
33	616 Betty Lane	1	N3110	21.25	18.34	-2.91	19.52	-1.73	21.47	0.22	
34	620 Betty Lane	1	N3110	21.83	18.34	-3.49	19.52	-2.31	21.47	-0.36	
35	622 Betty Lane	1	N3110	21.82	18.34	-3.48	19.52	-2.30	21.47	-0.35	
192	1245 Rogers St. (Office Building)	2	N3110	23.44	18.34	-5.10	19.52	-3.92	21.47	-1.97	
193	1266 Turner St. (Office Building)	3	N3110	21.60	18.34	-3.26	19.52	-2.08	21.47	-0.13	
194	1270 Turner St. (Nursing Home)	20	N3110	21.58	18.34	-3.24	19.52	-2.06	21.47	-0.11	
201	601 S. Lincoln Ave. (Office Building)	1	N3110	21.87	18.34	-3.53	19.52	-2.35	21.47	-0.40	
202	1241 Turner St.	1	N3110	21.61	18.34	-3.27	19.52	-2.09	21.47	-0.14	
203	1253 Turner St.	5	N3110	21.17	18.34	-2.83	19.52	-1.65	21.47	0.30	
204	1265 Turner St.	3	N3110	21.01	18.34	-2.67	19.52	-1.49	21.47	0.46	
205	610 Sally Lane	6	N3110	22.60	18.34	-4.26	19.52	-3.08	21.47	-1.13	
206	612 Sally Lane - Apt. Building	3	N3110	22.44	18.34	-4.10	19.52	-2.92	21.47	-0.97	
207	same as above	3	N3110	22.44	18.34	-4.10	19.52	-2.92	21.47	-0.97	
208	622 Sally Lane	2	N3110	23.04	18.34	-4.70	19.52	-3.52	21.47	-1.57	
209	605 Sally Lane	2	N3110	21.38	18.34	-3.04	19.52	-1.86	21.47	0.09	
211	619 Sally Lane	3	N3110	21.73	18.34	-3.39	19.52	-2.21	21.47	-0.26	7 Structures

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
212	621 Sally Lane	4	N3110	22.17	18.34	-3.83	19.52	-2.65	21.47	-0.70	14 Units
38A	1301 Druid Rd (FF estimated)	1	N3126	24.50	19.63	-4.87	20.90	-3.60	22.98	-1.52	
38B	1311 Druid Rd (FF estimated)	1	N3126	23.50	19.63	-3.87	20.90	-2.60	22.98	-0.52	
38C	800 Blk S Betty Ln (FF estimated)	1	N3126	25.50	19.63	-5.87	20.90	-4.60	22.98	-2.52	0 Structures
38D	800 Blk Mark Drive (FF estimated)	1	N3126	23.80	19.63	-4.17	20.90	-2.90	22.98	-0.82	0 Units
38	813 Betty Lane	1	N3130	26.42	20.04	-6.38	21.36	-5.06	23.40	-3.02	
39	910 Mark Drive	1	N3130	23.78	20.04	-3.74	21.36	-2.42	23.40	-0.38	
40	913 S Betty Lane	1	N3130	27.34	20.04	-7.30	21.36	-5.98	23.40	-3.94	
38E	800 Blk S Betty Ln (FF estimated)	1	N3130	25.80	20.04	-5.76	21.36	-4.44	23.40	-2.40	
38F	800 Blk Mark Drive (FF estimated)	1	N3130	23.80	20.04	-3.76	21.36	-2.44	23.40	-0.40	
38G	800 Blk S Betty Ln (FF estimated)	1	N3130	26.70	20.04	-6.66	21.36	-5.34	23.40	-3.30	
38H	800 Blk S Betty Ln (FF estimated)	1	N3130	26.90	20.04	-6.86	21.36	-5.54	23.40	-3.50	
38I	900 Blk S Betty Ln (FF estimated)	1	N3130	27.10	20.04	-7.06	21.36	-5.74	23.40	-3.70	
38J	900 Blk S Betty Ln (FF estimated)	1	N3130	27.25	20.04	-7.21	21.36	-5.89	23.40	-3.85	
39A	800 Blk Mark Drive (FF estimated)	1	N3130	23.80	20.04	-3.76	21.36	-2.44	23.40	-0.40	
39B	800 Blk Mark Drive (FF estimated)	1	N3130	23.80	20.04	-3.76	21.36	-2.44	23.40	-0.40	
39C	800 Blk Mark Drive (FF estimated)	1	N3130	23.80	20.04	-3.76	21.36	-2.44	23.40	-0.40	
39D	900 Blk Mark Drive (FF estimated)	1	N3130	23.80	20.04	-3.76	21.36	-2.44	23.40	-0.40	
39E	900 Blk Mark Drive (FF estimated)	1	N3130	23.90	20.04	-3.86	21.36	-2.54	23.40	-0.50	
39F	900 Blk Mark Drive (FF estimated)	1	N3130	24.10	20.04	-4.06	21.36	-2.74	23.40	-0.70	
39G	900 Blk Mark Drive (FF estimated)	1	N3130	24.60	20.04	-4.56	21.36	-3.24	23.40	-1.20	
39H	900 Blk Mark Drive (FF estimated)	1	N3130	24.60	20.04	-4.56	21.36	-3.24	23.40	-1.20	0 Structures
39I	900 Blk Mark Drive (FF estimated)	1	N3130	24.60	20.04	-4.56	21.36	-3.24	23.40	-1.20	0 Units
41	1101 S Betty Lane	1	N3131	30.91	20.14	-10.77	21.44	-9.47	23.46	-7.45	
42	1020 Mark Drive	1	N3131	25.54	20.14	-5.40	21.44	-4.10	23.46	-2.08	
42A	1000 Blk Mark Drive (FF estimated)	1	N3131	24.60	20.14	-4.46	21.44	-3.16	23.46	-1.14	
42B	1000 Blk Mark Drive (FF estimated)	1	N3131	25.00	20.14	-4.86	21.44	-3.56	23.46	-1.54	
42C	1000 Blk Mark Drive (FF estimated)	1	N3131	25.20	20.14	-5.06	21.44	-3.76	23.46	-1.74	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
42D	1000 Blk Mark Drive (FF estimated)	1	N3131	25.40	20.14	-5.26	21.44	-3.96	23.46	-1.94	
42E	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	20.14	-5.46	21.44	-4.16	23.46	-2.14	
42F	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	20.14	-5.46	21.44	-4.16	23.46	-2.14	
42G	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	20.14	-5.46	21.44	-4.16	23.46	-2.14	
42H	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	20.14	-5.46	21.44	-4.16	23.46	-2.14	0 Structures
42I	1000 Blk Mark Drive (FF estimated)	1	N3131	25.60	20.14	-5.46	21.44	-4.16	23.46	-2.14	0 Units
42J	1000 Blk Mark Drive (FF estimated)	1	N3132	25.60	22.12	-3.48	23.29	-2.31	25.07	-0.53	
42K	1000 Blk Mark Drive (FF estimated)	1	N3132	25.60	22.12	-3.48	23.29	-2.31	25.07	-0.53	0 Structures
42L	1000 Blk Mark Drive (FF estimated)	1	N3132	25.60	22.12	-3.48	23.29	-2.31	25.07	-0.53	0 Units
198	603 S. Missouri Ave.	1	N3510	24.36	19.21	-5.15	20.43	-3.93	22.49	-1.87	
199	613 S. Missouri Ave.	1	N3510	23.87	19.21	-4.66	20.43	-3.44	22.49	-1.38	0 Structures
200	615 S. Missouri Ave.	1	N3510	25.21	19.21	-6.00	20.43	-4.78	22.49	-2.72	0 Units
195	701 Madison Ave. S.	1	N3530	27.88	21.09	-6.79	22.49	-5.39	25.54	-2.34	
196	600 S. Missouri Ave.	1	N3530	26.16	21.09	-5.07	22.49	-3.67	25.54	-0.62	0 Structures
197	614 S. Missouri Ave.	1	N3530	25.79	21.09	-4.70	22.49	-3.30	25.54	-0.25	0 Units
229	1122 Pinellas St.	1	N3600	39.65	38.53	-1.12	38.85	-0.80	39.59	-0.06	
230	1114 Pinellas St.	1	N3600	39.24	38.53	-0.71	38.85	-0.39	39.59	0.35	
231	1120 Pinellas St.	1	N3600	40.34	38.53	-1.81	38.85	-1.49	39.59	-0.75	
233	1111 Pinellas St.	1	N3600	40.97	38.53	-2.44	38.85	-2.12	39.59	-1.38	1 Structure
234	1115 Pinellas St.	1	N3600	40.45	38.53	-1.92	38.85	-1.60	39.59	-0.86	1 Unit
232	1260 S. Greenwood Ave.	1	N3650	42.94	40.18	-2.76	40.31	-2.63	40.78	-2.16	
235	1015 Tuskawilla St.	1	N3670	41.08	40.19	-0.89	40.40	-0.68	40.86	-0.22	
236	1000 Lakeview Rd.	1	N3670	43.08	40.19	-2.89	40.40	-2.68	40.86	-2.22	
237	1012 Lakeview Rd.	1	N3670	42.46	40.19	-2.27	40.40	-2.06	40.86	-1.60	0 Structures
238	1020 Lakeview Rd.	1	N3670	43.31	40.19	-3.12	40.40	-2.91	40.86	-2.45	0 Units
239	931 Dempsey St.	1	N3710	45.54	42.46	-3.08	43.02	-2.52	43.91	-1.63	
240	925 Dempsey St.	1	N3710	44.13	42.46	-1.67	43.02	-1.11	43.91	-0.22	
241	915 Dempsey St.	1	N3710	44.37	42.46	-1.91	43.02	-1.35	43.91	-0.46	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
242	909 Dempsey St.	1	N3710	44.05	42.46	-1.59	43.02	-1.03	43.91	-0.14	0 Structures
243	901 Dempsey St.	1	N3710	44.83	42.46	-2.37	43.02	-1.81	43.91	-0.92	0 Units
244	629 Belleview Blvd.	1	N3800	45.99	42.89	-3.10	43.20	-2.79	43.94	-2.05	
245	630 A, B, C, D Wildwood Way	4	N3800	44.92	42.89	-2.03	43.20	-1.72	43.94	-0.98	
246	633-635 Wildwood Way	3	N3800	44.66	42.89	-1.77	43.20	-1.46	43.94	-0.72	
247	629/627/625 Wildwood Way	3	N3800	44.01	42.89	-1.12	43.20	-0.81	43.94	-0.07	
248	619-621 Wildwood Way	3	N3800	45.13	42.89	-2.24	43.20	-1.93	43.94	-1.19	
249	616 Woodlawn St.	1	N3800	46.89	42.89	-4.00	43.20	-3.69	43.94	-2.95	
250	618-620 Woodlawn St.	3	N3800	46.63	42.89	-3.74	43.20	-3.43	43.94	-2.69	
251	622-624 Woodlawn St.	3	N3800	46.90	42.89	-4.01	43.20	-3.70	43.94	-2.96	
252	626-628 Woodlawn St.	3	N3800	46.84	42.89	-3.95	43.20	-3.64	43.94	-2.90	0 Structures
253	638 Woodlawn St.	1	N3800	47.57	42.89	-4.68	43.20	-4.37	43.94	-3.63	0 Units
45	1400 Jeffords Street	1	N4000	28.52	22.50	-6.02	24.10	-4.42	26.93	-1.59	
46	1201 Hillcrest Avenue	1	N4000	27.12	22.50	-4.62	24.10	-3.02	26.93	-0.19	
46A	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.17	22.50	-4.67	24.10	-3.07	26.93	-0.24	
46B	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.22	22.50	-4.72	24.10	-3.12	26.93	-0.29	
46C	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.27	22.50	-4.77	24.10	-3.17	26.93	-0.34	
46D	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.32	22.50	-4.82	24.10	-3.22	26.93	-0.39	
47A	1370 Barry Ave.	1	N4000	28.4	22.50	-5.9	24.10	-4.3	26.93	-1.47	
47B	1371 Barry Ave.	1	N4000	28.57	22.50	-6.07	24.10	-4.47	26.93	-1.64	
254	NE Cor. S. Evergreen & Jeffords St.	1	N4000	27.32	22.50	-4.82	24.10	-3.22	26.93	-0.39	
255	1351 Jeffords St.	1	N4000	27.07	22.50	-4.57	24.10	-2.97	26.93	-0.14	
256	1355 Jeffords St.	1	N4000	27.24	22.50	-4.74	24.10	-3.14	26.93	-0.31	
257	1359 Jeffords St.	1	N4000	26.93	22.50	-4.43	24.10	-2.83	26.93	0.00	
258	1363 Jeffords St.	1	N4000	27.30	22.50	-4.80	24.10	-3.20	26.93	-0.37	
259	1367 Jeffords St.	1	N4000	27.35	22.50	-4.85	24.10	-3.25	26.93	-0.42	
260	1371 Jeffords St.	1	N4000	27.68	22.50	-5.18	24.10	-3.58	26.93	-0.75	
261	1375 Jeffords St.	1	N4000	27.61	22.50	-5.11	24.10	-3.51	26.93	-0.68	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation

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Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
262	1200 S. Hillcrest Ave.	1	N4000	27.86	22.50	-5.36	24.10	-3.76	26.93	-0.93	
263	1374 Barry St.	1	N4000	28.60	22.50	-6.10	24.10	-4.50	26.93	-1.67	
264	1210 S. Hillcrest Ave.	1	N4000	28.27	22.50	-5.77	24.10	-4.17	26.93	-1.34	
265	1375 Barry St.	1	N4000	28.51	22.50	-6.01	24.10	-4.41	26.93	-1.58	
266	1220 S. Hillcrest Ave.	1	N4000	28.58	22.50	-6.08	24.10	-4.48	26.93	-1.65	
267	1374 Tuscola St.	1	N4000	28.59	22.50	-6.09	24.10	-4.49	26.93	-1.66	
268	1230 S. Hillcrest Ave.	1	N4000	28.22	22.50	-5.72	24.10	-4.12	26.93	-1.29	
269	1375 Tuscola St.	1	N4000	28.79	22.50	-6.29	24.10	-4.69	26.93	-1.86	
270	1240 S. Hillcrest Ave.	1	N4000	28.55	22.50	-6.05	24.10	-4.45	26.93	-1.62	
271	1392 Milton St.	1	N4000	28.85	22.50	-6.35	24.10	-4.75	26.93	-1.92	
280	1246 S. Hillcrest Ave.	1	N4000	28.25	22.50	-5.75	24.10	-4.15	26.93	-1.32	
286	1227 S. Hillcrest Ave.	1	N4000	27.20	22.50	-4.70	24.10	-3.10	26.93	-0.27	
286A	1200 Blk Hillcrest Ave (FF Estimated)	1	N4000	26.90	22.50	-4.40	24.10	-2.80	26.93	0.03	
286B	1200 Blk Barry Ave. (FF Estimated)	1	N4000	26.20	22.50	-3.70	24.10	-2.10	26.93	0.73	
286C	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	26.50	22.50	-4.00	24.10	-2.40	26.93	0.43	
286D	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	27.10	22.50	-4.60	24.10	-3.00	26.93	-0.17	
286E	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	27.70	22.50	-5.20	24.10	-3.60	26.93	-0.77	
286F	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	28.30	22.50	-5.80	24.10	-4.20	26.93	-1.37	
286G	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	28.50	22.50	-6.00	24.10	-4.40	26.93	-1.57	
286H	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	28.70	22.50	-6.20	24.10	-4.60	26.93	-1.77	
286I	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	28.90	22.50	-6.40	24.10	-4.80	26.93	-1.97	
286J	1200 Blk Forrest Hill Dr. (FF Estimated)	1	N4000	29.10	22.50	-6.60	24.10	-5.00	26.93	-2.17	
286K	1000 Blk Hillcrest Ave (FF Estimated)	1	N4000	27.60	22.50	-5.10	24.10	-3.50	26.93	-0.67	
287	1239 S. Hillcrest Ave.	1	N4000	28.49	22.50	-5.99	24.10	-4.39	26.93	-1.56	
287A	1200 Blk Hillcrest Ave (FF Estimated)	1	N4000	28.21	22.50	-5.71	24.10	-4.11	26.93	-1.28	
287B	1200 Blk Hillcrest Ave (FF Estimated)	1	N4000	28.60	22.50	-6.10	24.10	-4.50	26.93	-1.67	
287C	1200 Blk Hillcrest Ave (FF Estimated)	1	N4000	28.80	22.50	-6.30	24.10	-4.70	26.93	-1.87	
289	1425 Jeffords St.	1	N4000	27.38	22.50	-4.88	24.10	-3.28	26.93	-0.45	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation

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Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
289A	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.58	22.50	-5.08	24.10	-3.48	26.93	-0.65	
289B	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.78	22.50	-5.28	24.10	-3.68	26.93	-0.85	
289C	1400 Blk Jeffords St. (FF Estimated)	1	N4000	27.98	22.50	-5.48	24.10	-3.88	26.93	-1.05	
289D	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.18	22.50	-5.68	24.10	-4.08	26.93	-1.25	
289E	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.38	22.50	-5.88	24.10	-4.28	26.93	-1.45	
290	1418 Barry St.	1	N4000	26.61	22.50	-4.11	24.10	-2.51	26.93	0.32	
290A	1400 Blk Barry St. (FF Estimated)	1	N4000	26.60	22.50	-4.10	24.10	-2.50	26.93	0.33	
290B	1400 Blk Barry St. (FF Estimated)	1	N4000	26.60	22.50	-4.10	24.10	-2.50	26.93	0.33	
290C	1400 Blk Barry St. (FF Estimated)	1	N4000	26.60	22.50	-4.10	24.10	-2.50	26.93	0.33	
290D	1400 Blk Barry St. (FF Estimated)	1	N4000	26.60	22.50	-4.10	24.10	-2.50	26.93	0.33	
291	1451 Jeffords St.	1	N4000	28.57	22.50	-6.07	24.10	-4.47	26.93	-1.64	
291A	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.53	22.50	-6.03	24.10	-4.43	26.93	-1.60	
291B	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.55	22.50	-6.05	24.10	-4.45	26.93	-1.62	
291C	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.57	22.50	-6.07	24.10	-4.47	26.93	-1.64	
291D	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.54	22.50	-6.04	24.10	-4.44	26.93	-1.61	
292	1442 Barry St.	1	N4000	27.59	22.50	-5.09	24.10	-3.49	26.93	-0.66	
292A	1400 Blk Barry St. (FF Estimated)	1	N4000	27.90	22.50	-5.40	24.10	-3.80	26.93	-0.97	
292B	1400 Blk Barry St. (FF Estimated)	1	N4000	27.80	22.50	-5.30	24.10	-3.70	26.93	-0.87	
292C	1400 Blk Barry St. (FF Estimated)	1	N4000	27.39	22.50	-4.89	24.10	-3.29	26.93	-0.46	
292D	1400 Blk Barry St. (FF Estimated)	1	N4000	27.19	22.50	-4.69	24.10	-3.09	26.93	-0.26	
292E	1400 Blk Barry St. (FF Estimated)	1	N4000	27.01	22.50	-4.51	24.10	-2.91	26.93	-0.08	
292F	1400 Blk Barry St. (FF Estimated)	1	N4000	26.81	22.50	-4.31	24.10	-2.71	26.93	0.12	
293	1481 Jeffords St.	1	N4000	28.50	22.50	-6.00	24.10	-4.40	26.93	-1.57	
293A	1400 Blk Jeffords St. (FF Estimated)	1	N4000	28.58	22.50	-6.08	24.10	-4.48	26.93	-1.65	
293B	1200 Blk S. Highland Ave (FF Estimated)	1	N4000	28.64	22.50	-6.14	24.10	-4.54	26.93	-1.71	
294	1468 Barry St.	1	N4000	28.64	22.50	-6.14	24.10	-4.54	26.93	-1.71	
294A	1400 Blk Barry St. (FF Estimated)	1	N4000	28.44	22.50	-5.94	24.10	-4.34	26.93	-1.51	
294B	1400 Blk Barry St. (FF Estimated)	1	N4000	28.24	22.50	-5.74	24.10	-4.14	26.93	-1.31	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
294C	1400 Blk Barry St. (FF Estimated)	1	N4000	28.04	22.50	-5.54	24.10	-3.94	26.93	-1.11	
295	1212 S. Highland Ave.	1	N4000	28.72	22.50	-6.22	24.10	-4.62	26.93	-1.79	
295A	1400 Blk Barry St. (FF Estimated)	1	N4000	28.70	22.50	-6.20	24.10	-4.60	26.93	-1.77	
295B	1400 Blk Barry St. (FF Estimated)	1	N4000	28.69	22.50	-6.19	24.10	-4.59	26.93	-1.76	9 Structures
295C	1400 Blk Barry St. (FF Estimated)	1	N4000	28.67	22.50	-6.17	24.10	-4.57	26.93	-1.74	9 Units
281	1393 Milton St.	1	N4010	28.86	26.24	-2.62	27.53	-1.33	29.15	0.29	
282	1250 Hillcrest Ave.	1	N4010	28.70	26.24	-2.46	27.53	-1.17	29.15	0.45	
283	1260 Hillcrest Ave.	1	N4010	29.85	26.24	-3.61	27.53	-2.32	29.15	-0.70	
288	1251 S. Hillcrest Ave.	1	N4010	28.94	26.24	-2.70	27.53	-1.41	29.15	0.21	4 Structures
288A	1200 Blk Hillcrest Ave (FF Estimated)	1	N4010	28.94	26.24	-2.70	27.53	-1.41	29.15	0.21	4 Units
284	1395 Browning St.	1	N4020	30.48	26.62	-3.86	28.72	-1.76	30.24	-0.24	
285	1397 Browning St.	1	N4020	30.37	26.62	-3.75	28.72	-1.65	30.24	-0.13	0 Structures
48	1397 Browning St.	1	N4020	30.51	26.62	-3.89	28.72	-1.79	30.24	-0.27	0 Units
49	1388 Lakeview Rd.	1	N4030	31.74	28.69	-3.05	29.74	-2	31.33	-0.41	0 Structures
50	1322 Hillcrest Ave.	1	N4040	33.50	30.37	-3.13	31.21	-2.29	33.00	-0.5	
50A	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.7	30.37	-3.33	31.21	-2.49	33.00	-0.7	
50B	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.6	30.37	-3.23	31.21	-2.39	33.00	-0.6	
50C	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.5	30.37	-3.13	31.21	-2.29	33.00	-0.5	
50D	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.6	30.37	-3.23	31.21	-2.39	33.00	-0.6	
50E	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.7	30.37	-3.33	31.21	-2.49	33.00	-0.7	
373	1346 Hillcrest Ave. S.	1	N4040	34.11	30.37	-3.74	31.21	-2.9	33.00	-1.11	
373A	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	34.0	30.37	-3.63	31.21	-2.79	33.00	-1	0 Structures
373B	1300 Blk Hillcrest Ave. (FF estimated)	1	N4040	33.8	30.37	-3.43	31.21	-2.59	33.00	-0.8	0 Units
51	1357 Byron Dr.	1	N4050	36.88	31.89	-4.99	32.83	-4.05	34.29	-2.59	
374	1380 Hillcrest Ave. S.	1	N4050	34.81	31.89	-2.92	32.83	-1.98	34.29	-0.52	
374A	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.7	31.89	-2.81	32.83	-1.87	34.29	-0.41	
374B	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.5	31.89	-2.61	32.83	-1.67	34.29	-0.21	
374C	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.4	31.89	-2.51	32.83	-1.57	34.29	-0.11	

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
374D	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.3	31.89	-2.41	32.83	-1.47	34.29	-0.01	
374E	1300 Blk Hillcrest Ave. (FF estimated)	1	N4050	34.2	31.89	-2.31	32.83	-1.37	34.29	0.09	
375	1400 Hillcrest Ave. S.	1	N4050	36.49	31.89	-4.60	32.83	-3.66	34.29	-2.20	
375A	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	36.2	31.89	-4.31	32.83	-3.37	34.29	-1.91	
375B	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	35.9	31.89	-4.01	32.83	-3.07	34.29	-1.61	
375C	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	35.6	31.89	-3.71	32.83	-2.77	34.29	-1.31	
375D	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	35.3	31.89	-3.41	32.83	-2.47	34.29	-1.01	1 Structures
375E	1400 Blk Hillcrest Ave. (FF estimated)	1	N4050	35.0	31.89	-3.11	32.83	-2.17	34.29	-0.71	1 Units
52	1375 Campbell Ct.	1	N4060	38.82	33.43	-5.39	34.34	-4.48	35.77	-3.05	
376	1424 Hillcrest Ave. S.	1	N4060	37.75	33.43	-4.32	34.34	-3.41	35.77	-1.98	
376A	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	38.0	33.43	-4.57	34.34	-3.66	35.77	-2.23	
376B	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	37.6	33.43	-4.17	34.34	-3.26	35.77	-1.83	
376C	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	37.4	33.43	-3.97	34.34	-3.06	35.77	-1.63	
376D	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	37.2	33.43	-3.77	34.34	-2.86	35.77	-1.43	
376E	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	37.0	33.43	-3.57	34.34	-2.66	35.77	-1.23	0 Structures
376F	1400 Blk Hillcrest Ave. (FF estimated)	1	N4060	36.9	33.43	-3.47	34.34	-2.56	35.77	-1.13	0 Units
53	1453 Evergreen Ave.	1	To be acquired as part of project 4C								
54	1430 Hillcrest Ave.	1	N4065	38.72	36.87	-1.85	37.49	-1.23	38.39	-0.33	
55	1434 Hillcrest Ave.	1	N4065	39.12	36.87	-2.25	37.49	-1.63	38.39	-0.73	
56	1457 Evergreen Ave.	1	To be acquired as part of project 4C								
57	1438 Hillcrest Ave.	1	N4065	39.58	36.87	-2.71	37.49	-2.09	38.39	-1.19	
58	1461 Evergreen Ave.	1	To be acquired as part of project 4C								
59	1465 Evergreen Ave.	1	To be acquired as part of project 4C								
60	1442 Hillcrest Ave.	1	N4065	39.66	36.87	-2.79	37.49	-2.17	38.39	-1.27	
61	1466 Hillcrest Ave.	1	N4065	39.76	36.87	-2.89	37.49	-2.27	38.39	-1.37	
62	1469 Evergreen Ave.	1	To be acquired as part of project 4C								
63	1450 Hillcrest Ave.	1	N4065	39.83	36.87	-2.96	37.49	-2.34	38.39	-1.44	
64	1473 Evergreen Ave.	1	To be acquired as part of project 4C								

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
65	1454 Hillcrest Ave.	1	N4065	39.92	36.87	-3.05	37.49	-2.43	38.39	-1.53	
66	1479 Evergreen Ave.	1	To be acquired as part of project 4C								
67	1458 Hillcrest Ave.	1	N4065	40.46	36.87	-3.59	37.49	-2.97	38.39	-2.07	
68	1501 Evergreen Ave.	1	To be acquired as part of project 4C								
69	1462 Hillcrest Ave.	1	N4065	40.48	36.87	-3.61	37.49	-2.99	38.39	-2.09	
70	1509 Evergreen Ave.	1	To be acquired as part of project 4C								
71	1466 Hillcrest Ave.	1	N4065	40.35	36.87	-3.48	37.49	-2.86	38.39	-1.96	
72	1517 Evergreen Ave.	1	To be acquired as part of project 4C								0 Structures
73	1470 Hillcrest Ave.	1	N4065	40.38	36.87	-3.51	37.49	-2.89	38.39	-1.99	0 Units
74	1506 Hillcrest Ave.	1	N4080	40.03	38.66	-1.37	39.07	-0.96	39.88	-0.15	0 Structures
75	1521 Evergreen Ave.	1	N4080	40.65	38.66	-1.99	39.07	-1.58	39.88	-0.77	0 Units
296	1551 Jeffords St.	1	N4160	31.30	30.47	-0.83	31.56	0.26	32.25	0.95	
297	1557 Jeffords St.	1	N4160	31.79	30.47	-1.32	31.56	-0.23	32.25	0.46	
298	1563 Jeffords St.	1	N4160	33.11	30.47	-2.64	31.56	-1.55	32.25	-0.86	
299	1571 Jeffords St.	1	N4160	32.99	30.47	-2.52	31.56	-1.43	32.25	-0.74	
300	1579 Jeffords St.	1	N4160	31.97	30.47	-1.50	31.56	-0.41	32.25	0.28	3 Structures
301	1585 Jeffords St.	1	N4160	32.44	30.47	-1.97	31.56	-0.88	32.25	-0.19	3 Units
302	1601 Jeffords St.	1	N4180	32.83	30.46	-2.37	31.54	-1.29	32.49	-0.34	
303	1607 Jeffords St.	1	N4180	32.42	30.46	-1.96	31.54	-0.88	32.49	0.07	
304	1613 Jeffords St.	1	N4180	32.48	30.46	-2.02	31.54	-0.94	32.49	0.01	
305	1619 Jeffords St.	1	N4180	32.58	30.46	-2.12	31.54	-1.04	32.49	-0.09	
306	1625 Jeffords St.	1	N4180	32.53	30.46	-2.07	31.54	-0.99	32.49	-0.04	
307	1631 Jeffords St.	1	N4180	32.33	30.46	-1.87	31.54	-0.79	32.49	0.16	
308	1211 Lake Dr.	1	To be acquired as part of project 7C								
309	1606 Barry Rd.	1	To be acquired as part of project 7C								
310	1612 Barry Rd.	1	To be acquired as part of project 7C								
311	1618 Barry Rd.	1	To be acquired as part of project 7C								
312	1624 Barry Rd.	1	To be acquired as part of project 7C								3 Structures

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
313	1630 Barry Rd.	1	To be acquired as part of project 7C								3 Units
316	1172 S. Keystone Ave.	1	N4205	33.11	31.11	-2.00	32.18	-0.93	32.74	-0.37	
317	1176 S. Keystone Ave.	1	N4205	32.91	31.11	-1.80	32.18	-0.73	32.74	-0.17	
318	1180 S. Keystone Ave.	1	N4205	32.59	31.11	-1.48	32.18	-0.41	32.74	0.15	
319	1182 S. Keystone Ave.	1	N4205	34.26	31.11	-3.15	32.18	-2.08	32.74	-1.52	
320	1184 S. Keystone Ave.	1	N4205	33.28	31.11	-2.17	32.18	-1.10	32.74	-0.54	
321	1188 S. Keystone Ave.	1	N4205	32.81	31.11	-1.70	32.18	-0.63	32.74	-0.07	
324	1641 Jeffords St.	1	N4205	32.99	31.11	-1.88	32.18	-0.81	32.74	-0.25	
326	1658 Jeffords St.	1	N4205	32.79	31.11	-1.68	32.18	-0.61	32.74	-0.05	
327	1664 Jeffords St.	1	N4205	33.05	31.11	-1.94	32.18	-0.87	32.74	-0.31	
328	1668 Jeffords St.	1	N4205	33.57	31.11	-2.46	32.18	-1.39	32.74	-0.83	
329	1670 Jeffords St.	1	N4205	33.45	31.11	-2.34	32.18	-1.27	32.74	-0.71	
330	1030 S. Duncan Ave.	1	N4205	33.28	31.11	-2.17	32.18	-1.10	32.74	-0.54	
331	1028 S. Duncan Ave.	1	N4205	33.57	31.11	-2.46	32.18	-1.39	32.74	-0.83	1 Structure
332	1024 S. Duncan Ave.	1	N4205	33.50	31.11	-2.39	32.18	-1.32	32.74	-0.76	1 Unit
325	1183 S. Keystone Ave.	1	N4210	32.68	31.33	-1.35	32.19	-0.49	32.75	0.07	
333	1647 Jeffords St.	1	N4210	33.65	31.33	-2.32	32.19	-1.46	32.75	-0.90	
334	1659 Jeffords St.	1	N4210	32.32	31.33	-0.99	32.19	-0.13	32.75	0.43	
335	1665 Jeffords St.	1	N4210	32.15	31.33	-0.82	32.19	0.04	32.75	0.60	
336	1671 Jeffords St.	1	N4210	32.49	31.33	-1.16	32.19	-0.30	32.75	0.26	
337	1104 Duncan Ave.	1	N4210	32.81	31.33	-1.48	32.19	-0.62	32.75	-0.06	
338	1184 Duncan Ave.	1	N4210	32.97	31.33	-1.64	32.19	-0.78	32.75	-0.22	
339	1188 Duncan Ave.	1	N4210	33.87	31.33	-2.54	32.19	-1.68	32.75	-1.12	
340	1192 Duncan Ave.	1	N4210	34.53	31.33	-3.20	32.19	-2.34	32.75	-1.78	
341	1196 Duncan Ave.	1	N4210	34.34	31.33	-3.01	32.19	-2.15	32.75	-1.59	
342	1200 Duncan Ave.	1	N4210	34.07	31.33	-2.74	32.19	-1.88	32.75	-1.32	
356	1201 Duncan Ave.	1	N4210	32.41	31.33	-1.08	32.19	-0.22	32.75	0.34	5 Structures
357	1707 Estelle Dr.	1	N4210	33.00	31.33	-1.67	32.19	-0.81	32.75	-0.25	5 Units

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation

0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
343	1035 S. Duncan Ave.	1	N4220	33.03	31.16	-1.87	32.18	-0.85	32.74	-0.29	
344	1706 Jeffords St.	1	N4220	33.23	31.16	-2.07	32.18	-1.05	32.74	-0.49	
345	1714 Jeffords St.	1	N4220	33.01	31.16	-1.85	32.18	-0.83	32.74	-0.27	
346	1718 Jeffords St.	1	N4220	33.09	31.16	-1.93	32.18	-0.91	32.74	-0.35	
347	1701 Jeffords St.	1	N4220	32.76	31.16	-1.60	32.18	-0.58	32.74	-0.02	
348	1707 Jeffords St.	1	N4220	32.89	31.16	-1.73	32.18	-0.71	32.74	-0.15	
349	1717 Jeffords St.	1	N4220	32.30	31.16	-1.14	32.18	-0.12	32.74	0.44	
350	1733 Jeffords St.	1	N4220	32.40	31.16	-1.24	32.18	-0.22	32.74	0.34	
351	1105 Duncan Ave.	1	N4220	33.24	31.16	-2.08	32.18	-1.06	32.74	-0.50	
352	1109 Duncan Ave.	1	N4220	33.19	31.16	-2.03	32.18	-1.01	32.74	-0.45	
353	1113 Duncan Ave.	1	N4220	33.60	31.16	-2.44	32.18	-1.42	32.74	-0.86	
354	1117 Duncan Ave.	1	N4220	33.59	31.16	-2.43	32.18	-1.41	32.74	-0.85	
355	1121 Duncan Ave.	1	N4220	33.61	31.16	-2.45	31.16	-2.45	32.74	-0.87	
358	1101 Woodside Ave.	1	N4220	33.43	31.16	-2.27	31.16	-2.27	32.74	-0.69	
359	1105 Woodside Ave.	1	N4220	33.19	31.16	-2.03	31.16	-2.03	32.74	-0.45	
360	1109 Woodside Ave.	1	N4220	32.81	31.16	-1.65	31.16	-1.65	32.74	-0.07	
361	1115 Woodside Ave.	1	N4220	33.12	31.16	-1.96	31.16	-1.96	32.74	-0.38	
362	1117 Woodside Ave.	1	N4220	33.28	31.16	-2.12	31.16	-2.12	32.74	-0.54	2 Structures
363	1121 Woodside Ave.	1	N4220	33.05	31.16	-1.89	31.16	-1.89	32.74	-0.31	2 Units
364	1135 Jeffords St.	1	N4230	33.77	32.18	-1.59	32.31	-1.46	32.75	-1.02	
365	1106 Woodcrest Ave.	1	N4230	33.66	32.18	-1.48	32.31	-1.35	32.75	-0.91	
366	1110 Woodcrest Ave.	1	N4230	33.49	32.18	-1.31	32.31	-1.18	32.75	-0.74	
367	1114 Woodcrest Ave.	1	N4230	33.23	32.18	-1.05	32.31	-0.92	32.75	-0.48	
368	1118 Woodcrest Ave.	1	N4230	33.12	32.18	-0.94	32.31	-0.81	32.75	-0.37	
369	1120 Woodcrest Ave.	1	N4230	34.24	32.18	-2.06	32.31	-1.93	32.75	-1.49	
370	1126 Woodcrest Ave.	1	N4230	33.12	32.18	-0.94	32.31	-0.81	32.75	-0.37	
371	1115 Woodcrest Ave.	1	N4240	33.93	33.68	-0.25	34.03	0.10	34.70	0.77	2 Structures
372	1121 Woodcrest Ave.	1	N4240	33.19	33.68	0.49	34.03	0.84	34.70	1.51	2 Units

Table F.2 Proposed Conditions Structure Flooding Level of Service Evaluation 0.51 = FPLOS Deficiency

Map #	Address	# Grnd Flr Dwelling Units	Node ID	Finished Floor Elev. (ft,NGVD)	Flood Elev.(ft) 10-year	Depth of Flooding (feet)	Flood Elev.(ft) 25-year	Depth of Flooding (feet)	Flood Elev.(ft) 100-year	Depth of Flooding (feet)	Node Total Flood-prone Structures
314	1619 Barry Rd.	1	To be acquired as part of project 7C								
314A	1613 Barry Rd (FF estimated)	1	To be acquired as part of project 7C								0 Structures
315	1625 Barry Rd.	1	To be acquired as part of project 7C								0 Units
322	1131 S. Keystone Ave.	1	N4380	32.75	31.18	-1.57	32.18	-0.57	32.74	-0.01	0 Structures
323	1640 Jeffords St.	1	N4380	33.00	31.18	-1.82	32.18	-0.82	32.74	-0.26	0 Units
213	601,603 Spencer Ave.	2	To be acquired as part of project 7B								
214	605,607 Spencer Ave.	2	To be acquired as part of project 7B								
215	609,611 Spencer Ave.	2	To be acquired as part of project 7B								
216	613,615 Spencer Ave.	2	N4420	62.55	59.23	-3.32	60.01	-2.54	61.55	-1.00	
217	617,619 Spencer Ave.	2	N4420	62.81	59.23	-3.58	60.01	-2.80	61.55	-1.26	
218	701, 707, 713, 719 Spencer Ave.	2	N4420	63.05	59.23	-3.82	60.01	-3.04	61.55	-1.50	
219	same as # 118 above	2	N4420	63.05	59.23	-3.82	60.01	-3.04	61.55	-1.50	
220	725, 731, 737 Spencer Ave.	3	N4420	63.25	59.23	-4.02	60.01	-3.24	61.55	-1.70	
221	602, 600 S. Duncan Ave.	2	To be acquired as part of project 7B								
222	610, 608 S. Duncan Ave.	2	To be acquired as part of project 7B								
223	612 S. Duncan Ave.	1	To be acquired as part of project 7B								
224	618 S. Duncan Ave.	1	To be acquired as part of project 7B								
225	704, 706 S. Duncan Ave.	2	To be acquired as part of project 7B								
226	710 S. Duncan Ave.	1	To be acquired as part of project 7B								
226A	708 S. Duncan Ave	1	To be acquired as part of project 7B								
227	1672 Druid Rd.	1	N4420	63.79	59.23	-4.56	60.01	-3.78	61.55	-2.24	0 Structures
228	1676 Druid Rd.	1	N4420	63.23	59.23	-4.00	60.01	-3.22	61.55	-1.68	0 Units

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929)			Notes
		Existing	Proposed	Difference	
N0000	Clearwater Harbor	2.50	2.50	0.00	
N0010	Stevenson Creek, 320' E. of Alt. 19	6.60	5.35	-1.25	
N0020	Stevenson Creek, 225' NW of Pinellas Trail	6.63	5.47	-1.16	
N0030	Stevenson Creek, 120' SE of Pinellas Trail	7.16	6.62	-0.54	
N0040	Stevenson Creek, 890' SE of Pinellas Trail	7.38	6.97	-0.41	
N0050	Stevenson Creek, 120' NW of Douglass Ave	7.44	7.06	-0.38	
N0060	Stevenson Creek, 120' SE of Douglass Ave	7.73	7.44	-0.29	
N0070	Stevenson Creek, 1,020 SE of Douglass Ave	7.95	7.73	-0.22	
N0080	Stevenson Creek, 1,530' SE of Douglass Ave	8.09	7.91	-0.18	
N0090	Stevenson Creek, 120' NW of Betty Lane	8.15	7.94	-0.21	
N0100	Stevenson Creek, 120' E of Betty Lane	8.92	8.93	0.01	
N0110	Stevenson Creek, 690' SE of Betty Lane	9.26	9.30	0.04	
N0120	Stevenson Creek at Palmetto Street	9.55	9.81	0.26	
N0130	Stevenson Creek at Palmetto Street	10.14	10.02	-0.12	
N0140	Stevenson Creek, 860' S of Palmetto Street	12.53	12.61	0.08	
N0150	Stevenson Creek, 150' NW of SCL Railroad	13.63	13.71	0.08	
N0170	Stevenson Creek, 150' S of SCL Railroad	14.32	14.43	0.11	
N0180	Stevenson Creek, 820' S of SCL Railroad	15.35	15.43	0.08	
N0195	Douglass Avenue, 200' E of Harbor Drive	8.24	7.99	-0.25	
N0200	Douglass Avenue, 150' W of Harbor Drive	11.19	11.19	0.00	
N0210	Fairmont Street and Washington Avenue	13.07	13.07	0.00	
N0220	Fairmont Steet and N. Greenwood Avenue	15.04	15.04	0.00	
N0230	Fairmont Street and Fulton Avenue	17.06	17.06	0.00	
N0240	Marshall Street and Fulton Avenue	21.29	21.29	0.00	
N0250	Pennsylvania Street and Grant Street	22.77	22.77	0.00	
N0280	Marshall Street AWTP	8.74	8.65	-0.09	
N0290	Russel Street 350' W of Holt Avenue	9.92	9.93	0.01	
N0291	Russel Street and Martin Luther King Ave	10.95	10.95	0.00	
N0292	Russel Street and N Madison Ave	16.76	16.77	0.01	
N0300	Martin Luther King Ave S of Russel Street	11.91	11.92	0.01	
N0310	Martin Luther King Ave and Engman Street	13.28	13.29	0.01	
N0320	Martin Luther King Ave and Palm Bluff St	15.88	15.88	0.00	
N0330	Palm Bluff Street and N Madison Avenue	16.50	16.50	0.00	
N0340	N Greenwood Avenue and Metto Street	21.00	21.00	0.00	
N0350	N Greenwood Avenue and Palmetteo Street	21.55	21.55	0.00	
N0370	Pennsylvania Avenue and Metto Street	21.96	21.96	0.00	
N0380	Holt Avenue and Russel Street	8.21	8.11	-0.10	
N0390	Holt Avenue and Engman Street	11.18	11.55	0.37	OK - Inside manhole
N0400	Holt Avenue 420' S of Engman Street	13.32	14.27	0.95	OK - Inside manhole
N0410	Palmetto Street and Holt Avenue	15.78	17.26	1.48	OK - Inside manhole
N0420	Palmetto Street and N Missouri Avenue	18.88	19.51	0.63	OK - Inside manhole
N0425	Palmetto Street and N Missouri Avenue		20.45		

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929)			Notes
		Existing	Proposed	Difference	
N0430	N Missouri Avenue and Seminole Street	21.33	21.23	-0.10	
N0435	Palmetto Street and Phillies Stadium Drive	21.33	21.23	-0.10	
N0440	Palmetto Street and Kings Highway	20.68	19.59	-1.09	
N0450	Betty Lane and SCL Railroad Ditch	24.11	24.19	0.08	
N0460	N. Lincoln Avenue and SCL Railroad Ditch	24.30	24.31	0.01	
N0470	N. Missouri Avenue and SCL Railroad Ditch	24.58	24.52	-0.06	
N0480	N. Greenwood Avenue and Maple Street	24.69	24.64	-0.05	
N0490	Overbrook Avenue Detention Pond		16.76		
N0500	Spring Branch at Overbrook Avenue	7.44	7.16	-0.28	
N0510	Spring Branch at Overbrook Avenue	8.78	9.66	0.88	OK - within banks
N0520	Spring Branch at Springtime Avenue	8.76	9.72	0.96	OK - within banks
N0530	Spring Branch at Douglass Avenue	10.68	10.57	-0.11	
N0540	Spring Branch at Douglass Avenue	11.51	11.49	-0.02	
N0550	(Pinellas County - FPLOS not determined)	11.62	11.77	0.15	OK - within banks
N0560	Spring Branch at Sunset Point Drive	11.65	11.86	0.21	OK - within banks
N0570	(Pinellas County - FPLOS not determined)	11.80	12.80	1.00	OK - within banks
N0590	(Pinellas County - FPLOS not determined)	15.23	13.24	-1.99	
N0600	(Pinellas County - FPLOS not determined)	15.43	13.49	-1.94	
N0610	(Pinellas County - FPLOS not determined)	15.48	13.94	-1.54	
N0620	Spring Branch, 700' SW of Kings Highway	15.72	14.95	-0.77	
N0630	Spring Branch at Kings Highway (west side)	16.66	15.12	-1.54	
N0650	Pineland Avenue and Vista Way	17.61	17.65	0.04	
N0660	Retention pond outfall SE of Pineland, Vista	17.90	17.90	0.00	
N0670	Retention pond SE of Pineland and Vista	20.17	20.17	0.00	
N0680	(Pinellas County - FPLOS not determined)	15.49	13.98	-1.51	
N0690	Sunset Point Drive, 750' E of Betty Lane	15.49	13.98	-1.51	
N0700	School Board Retention Pond	16.77	16.77	0.00	
N0710	School Board Retention Pond	16.78	16.78	0.00	
N0720	School Board Ditch	19.05	19.05	0.00	
N0730	School Board Retention Pond	20.05	20.05	0.00	
N0740	State Street Ditch, 320' E of Betty Lane	15.53	14.06	-1.47	
N0750	State Street Ditch, 320' E of Betty Lane	15.50	14.06	-1.44	
N0760	Pond E of Betty Lane and Woodlawn Terr.	15.51	14.20	-1.31	
N0770	(Pinellas County - FPLOS not determined)	15.58	14.38	-1.20	
N0775	(Pinellas County - FPLOS not determined)	17.08	16.91	-0.17	
N0780	(Pinellas County - FPLOS not determined)	17.48	17.36	-0.12	
N0790	(City of Dunedin - FPLOS not determined)	17.64	17.48	-0.16	
N0800	(City of Dunedin - FPLOS not determined)	19.83	19.74	-0.09	
N0810	(City of Dunedin - FPLOS not determined)	19.85	19.73	-0.12	
N0820	(City of Dunedin - FPLOS not determined)	19.80	19.76	-0.04	
N0830	(City of Dunedin - FPLOS not determined)	19.85	19.73	-0.12	
N0840	(City of Dunedin - FPLOS not determined)	19.83	19.77	-0.06	

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929)			Notes
		Existing	Proposed	Difference	
N0850	(City of Dunedin - FPLOS not determined)	19.85	19.76	-0.09	
N0855	(City of Dunedin - FPLOS not determined)	19.85	19.77	-0.08	
N0860	(City of Dunedin - FPLOS not determined)	20.13	20.08	-0.05	
N0870	(City of Dunedin - FPLOS not determined)	20.14	20.08	-0.06	
N0880	(City of Dunedin - FPLOS not determined)	20.28	20.24	-0.04	
N0890	(City of Dunedin - FPLOS not determined)	20.29	20.25	-0.04	
N0900	(City of Dunedin - FPLOS not determined)	20.29	20.25	-0.04	
N0910	Woodlawn Terrace and Oakdale Way	21.88	20.13	-1.75	
N0920	(City of Dunedin - FPLOS not determined)	19.82	19.72	-0.10	
N1000	Spring Branch at Kings Highway (east side)	16.75	15.97	-0.78	
N1010	Spring Branch, 680' S of Union Street	17.01	16.36	-0.65	
N1020	Spring Branch, 380' S of Union Street	17.52	17.10	-0.42	
N1030	Spring Branch at Union Street	19.15	19.05	-0.10	
N1040	(City of Dunedin - FPLOS not determined)	19.82	19.74	-0.08	
N1050	(City of Dunedin - FPLOS not determined)	19.89	19.82	-0.07	
N1060	(City of Dunedin - FPLOS not determined)	19.89	19.82	-0.07	
N1070	(City of Dunedin - FPLOS not determined)	19.97	19.90	-0.07	
N1080	(City of Dunedin - FPLOS not determined)	20.01	19.95	-0.06	
N1090	(City of Dunedin - FPLOS not determined)	20.07	20.02	-0.05	
N1100	(City of Dunedin - FPLOS not determined)	23.85	23.84	-0.01	
N1110	(City of Dunedin - FPLOS not determined)	24.21	24.21	0.00	
N1120	(City of Dunedin - FPLOS not determined)	24.67	24.67	0.00	
N1130	(City of Dunedin - FPLOS not determined)	25.62	25.62	0.00	
N1140	(City of Dunedin - FPLOS not determined)	25.84	25.84	0.00	
N1150	(City of Dunedin - FPLOS not determined)	25.95	25.94	-0.01	
N1160	(City of Dunedin - FPLOS not determined)	26.26	26.25	-0.01	
N1170	(City of Dunedin - FPLOS not determined)	26.27	26.27	0.00	
N1172	(City of Dunedin - FPLOS not determined)	26.33	26.32	-0.01	
N1174	(City of Dunedin - FPLOS not determined)	26.36	26.35	-0.01	
N1180	(City of Dunedin - FPLOS not determined)	26.28	26.28	0.00	
N1190	(City of Dunedin - FPLOS not determined)	26.40	26.40	0.00	
N1200	(City of Dunedin - FPLOS not determined)	26.48	26.47	-0.01	
N1210	(City of Dunedin - FPLOS not determined)	29.20	29.19	-0.01	
N1220	(City of Dunedin - FPLOS not determined)	29.23	29.22	-0.01	
N1230	(City of Dunedin - FPLOS not determined)	29.24	29.23	-0.01	
N1240	(City of Dunedin - FPLOS not determined)	29.27	29.25	-0.02	
N1245	(City of Dunedin - FPLOS not determined)	29.26	29.25	-0.01	
N1250	(City of Dunedin - FPLOS not determined)	29.27	29.26	-0.01	
N1260	(City of Dunedin - FPLOS not determined)	29.82	29.80	-0.02	
N1270	(City of Dunedin - FPLOS not determined)	32.08	32.07	-0.01	
N1280	(City of Dunedin - FPLOS not determined)	32.08	32.08	0.00	
N1290	(City of Dunedin - FPLOS not determined)	32.08	32.08	0.00	

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929)			Notes
		Existing	Proposed	Difference	
N1300	(City of Dunedin - FPLOS not determined)	33.71	33.71	0.00	
N1310	(City of Dunedin - FPLOS not determined)	34.31	34.31	0.00	
N1320	(City of Dunedin - FPLOS not determined)	34.36	34.36	0.00	
N1330	(City of Dunedin - FPLOS not determined)	43.19	43.19	0.00	
N1340	(City of Dunedin - FPLOS not determined)	43.40	43.40	0.00	
N1350	Byram East Ditch at Highland Avenue	17.27	16.71	-0.56	
N1360	Byram East Ditch at Highland Avenue	19.93	19.35	-0.58	
N1370	Byram East Ditch, 730' E of Highland Ave	26.52	24.60	-1.92	
N1380	Byram East Ditch, 1,350' E of Highland Ave	28.62	28.02	-0.60	
N1390	Souvenir Drive near Algonquin Drive	29.66	29.68	0.02	
N1400	Algonquin Drive, 340' W of Picardy Circle	33.66	34.77	1.11	OK - Inside manhole
N1410	Algonquin Drive and Nugget Drive	50.88	51.20	0.32	OK - Inside manhole
N1420	Nugget Drive, 400' S of Algonquin Drive	54.73	55.76	1.03	OK - Inside manhole
N1430	Clearview Lake	57.36	58.90	1.54	OK - Inside manhole
N1440	Highland Avenue, 130' S of Byram Drive	18.43	17.41	-1.02	
N1450	Highland Avenue at Highland Circle	21.11	20.61	-0.50	
N1460	Highland Avenue at Sunset Point Road	33.14	32.98	-0.16	
N1470	Sunset Point Road, 250' E of Highland Ave	33.96	33.88	-0.08	
N1480	Sunset Point Road, 250' E of Highland Ave	33.96	33.88	-0.08	
N1490	Pond NE of Highland Avenue and Byram Dr	16.69	15.76	-0.93	
N1500	Souvenir Drive, 250' W of Picardy Circle	27.87	26.43	-1.44	
N1510	Retention Pond in Windsor Woods Sub.	28.68	28.43	-0.25	
N1520	(City of Dunedin - FPLOS not determined)	20.61	20.60	-0.01	
N1530	(City of Dunedin - FPLOS not determined)	20.80	20.80	0.00	
N1540	(City of Dunedin - FPLOS not determined)	20.80	20.80	0.00	
N1550	(City of Dunedin - FPLOS not determined)	24.54	24.54	0.00	
N1560	(City of Dunedin - FPLOS not determined)	24.84	24.84	0.00	
N1570	(City of Dunedin - FPLOS not determined)	24.96	24.96	0.00	
N1580	(City of Dunedin - FPLOS not determined)	24.87	24.87	0.00	
N1590	(City of Dunedin - FPLOS not determined)	20.73	20.72	-0.01	
N1600	(City of Dunedin - FPLOS not determined)	27.12	27.12	0.00	
N1610	(City of Dunedin - FPLOS not determined)	28.87	28.87	0.00	
N1620	(City of Dunedin - FPLOS not determined)	32.02	32.02	0.00	
N1630	(City of Dunedin - FPLOS not determined)	26.83	26.84	0.01	
N1640	(City of Dunedin - FPLOS not determined)	31.89	31.89	0.00	
N1650	(City of Dunedin - FPLOS not determined)	32.80	32.80	0.00	
N1660	(City of Dunedin - FPLOS not determined)	32.91	32.91	0.00	
N1670	(City of Dunedin - FPLOS not determined)	33.29	33.29	0.00	
N1680	(City of Dunedin - FPLOS not determined)	38.54	38.55	0.01	
N1690	(City of Dunedin - FPLOS not determined)	40.59	40.59	0.00	
N1700	(City of Dunedin - FPLOS not determined)	37.49	37.49	0.00	
N1710	(City of Dunedin - FPLOS not determined)	30.34	30.35	0.01	

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929)			Notes
		Existing	Proposed	Difference	
N1720	(City of Dunedin - FPLOS not determined)	44.88	44.88	0.00	
N1750	(City of Dunedin - FPLOS not determined)	26.28	26.28	0.00	
N1760	(City of Dunedin - FPLOS not determined)	26.29	26.28	-0.01	
N1770	(City of Dunedin - FPLOS not determined)	26.30	26.30	0.00	
N1780	(City of Dunedin - FPLOS not determined)	27.95	27.95	0.00	
N1790	(City of Dunedin - FPLOS not determined)	29.52	29.52	0.00	
N1800	(City of Dunedin - FPLOS not determined)	26.09	26.09	0.00	
N1810	(City of Dunedin - FPLOS not determined)	26.10	26.09	-0.01	
N1820	(City of Dunedin - FPLOS not determined)	26.30	26.30	0.00	
N1830	(City of Dunedin - FPLOS not determined)	27.97	27.98	0.01	
N1840	(City of Dunedin - FPLOS not determined)	29.24	29.23	-0.01	
N1850	(City of Dunedin - FPLOS not determined)	29.25	29.23	-0.02	
N1860	(City of Dunedin - FPLOS not determined)	33.17	33.16	-0.01	
N1870	(City of Dunedin - FPLOS not determined)	34.09	34.09	0.00	
N1880	(City of Dunedin - FPLOS not determined)	30.93	30.93	0.00	
N1900	(City of Dunedin - FPLOS not determined)	29.33	29.30	-0.03	
N1910	(City of Dunedin - FPLOS not determined)	29.91	29.88	-0.03	
N1920	(City of Dunedin - FPLOS not determined)	31.72	31.72	0.00	
N1930	(City of Dunedin - FPLOS not determined)	35.58	35.57	-0.01	
N1940	(City of Dunedin - FPLOS not determined)	38.45	38.44	-0.01	
N1950	(City of Dunedin - FPLOS not determined)	43.93	43.92	-0.01	
N1960	(City of Dunedin - FPLOS not determined)	50.77	50.78	0.01	
N1970	(City of Dunedin - FPLOS not determined)	54.89	54.89	0.00	
N1980	(City of Dunedin - FPLOS not determined)	54.16	54.16	0.00	
N1990	(City of Dunedin - FPLOS not determined)	53.42	53.42	0.00	
N2000	Hammond Branch, 625' W of Kings Highway	8.95	8.98	0.03	
N2010	Hammond Branch at Kings Highway	12.26	11.26	-1.00	
N2020	Hammond Branch at Kings Highway	12.27	11.36	-0.91	
N2030	Hammond Branch Pond E of Kings Highway	16.94	16.62	-0.32	
N2040	Hammond Branch Pond W of Highland Ave	19.66	20.34	0.68	OK - Within bank
N2050	Hammond Branch at Highland Avenue	24.19	26.79	2.60	OK - Within manhole
N2055	Proposed Improved Railroad Ditch		38.03		
N2060	RR ditch at Flagler Drive and Carroll Street	43.63	42.91	-0.72	
N2070	RR ditch at Flagler Drive and Gentry Street	44.98	44.32	-0.66	
N2080	RR ditch at Flagler Drive and Crown Street	47.42	46.72	-0.70	
N2090	RR ditch at Flagler Drive 200' N of Scott St	49.33	48.66	-0.67	
N2100	RR ditch at Flagler Dr 250' W of Ridge Ave	51.50	50.99	-0.51	
N2110	RR ditch at Flagler Dr 100' E of Lynn Ave	53.90	55.49	1.59	OK - Within bank
N2120	RR ditch at Flagler Dr 80' W of Murry Ave	58.72	59.06	0.34	OK - Within bank
N2130	RR ditch at Flagler Dr and Saturn Avenue	61.87	62.54	0.67	OK - Within bank
N2140	RR ditch at Flagler Drive and Keene Road	63.24	63.40	0.16	
N2150	Keene Road ditch 200' N of Long Street	69.16	69.18	0.02	

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929)			Notes
		Existing	Proposed	Difference	
N2155	Keene Road ditch 440' S of Long Street	69.17	69.19	0.02	
N2160	Keene Road ditch at Palmetto Street	69.18	69.20	0.02	
N2170	West pond in Clearwater Golf Park	69.18	69.20	0.02	
N2180	Center pond in Clearwater Golf Park	69.63	69.63	0.00	
N2200	Rollen Road and Parkwood Street	16.00	15.88	-0.12	
N2210	Rollen Road and Terrrace Road	17.94	17.95	0.01	
N2220	Kings Highway and Terrace Road	20.74	20.54	-0.20	
N2230	Kings Highway and Admiral Woodson Lane	16.88	16.18	-0.70	
N2240	Pond at Kings Highway and Hibiscus Street	20.42	19.75	-0.67	
N2242	Palmetto Street and Palm Terrace Drive	22.93	22.12	-0.81	
N2244	Palmetto Street and SCL Railroad	26.43	26.55	0.12	Ok - Within manhole
N2250	Palmetto Street and SCL Railroad	32.05	31.34	-0.71	
N2260	Detention Pond SW of Highland & Palmetto	36.85	34.86	-1.99	
N2270	Highland Avenue and Palmetto Street	37.25	35.72	-1.53	
N2280	Highland Avenue and Walnut Street	43.24	42.96	-0.28	
N2290	Glenwood Avenue and Elmwood Street	49.46	48.72	-0.74	
N2300	Park at Smallwood Circle and Rosemere Rd	49.39	48.27	-1.12	
N2310	Park at Ridgewood Street and Wood Ave	55.12	55.21	0.09	
N2320	Ridgewood Street and Edgewood Avenue	57.33	57.34	0.01	
N2330	Drew Street at Edgewood Avenue	60.59	60.60	0.01	
N2340	Drew Street at Crest Avenue	63.22	63.22	0.00	
N2345	Highland Avenue and Palmetto Street	37.13	36.95	-0.18	
N2350	Flagler Drive and Levern Street	40.43	40.04	-0.39	
N2370	Overlea Street, E of Carlos Avenue	24.89	24.53	-0.36	
N2380	Highland Avenue and Fairmont Street	28.33	28.17	-0.16	
N2390	Highland Avenue and Fairmont Street	28.76	28.69	-0.07	
N2400	Highland Avenue and Sandy Lane	33.68	33.68	0.00	
N2420	Highland Avenue and Greenlea Drive	35.55	35.55	0.00	
N2450	SCL RR W of Gentry Street and Flagler Drive	36.60	38.35	1.75	OK - Within proposed berm (el. 39.0)
N2460	Linwood Drive and Sharondale Drive	51.60	47.44	-4.16	
N2470	Nelson Avenue and Scott Street	59.33	59.13	-0.20	
N2480	Lake Lucille	61.09	60.84	-0.25	
N2490	Palmetto Street and Casloer Avenue	67.12	67.12	0.00	
N2500	Lake Hobart	67.42	67.42	0.00	
N2510	Saturn Avenue and Leo Lane	64.89	64.54	-0.35	
N2520	Saturn Avenue and Sherwood Street	64.88	64.55	-0.33	
N2530	Lake at St Andrews Cove Apartments	68.92	68.93	0.01	
N2540	Clearwater Air Park	68.61	68.62	0.01	
N2545	Clearwater Air Park	61.40	61.40	0.00	
N2550	Clearwater Air Park	68.87	68.87	0.00	
N2560	SE Pond in Clearwater Golf Park	69.83	69.83	0.00	
N2570	City of Clearwater Public Service Complex	64.47	64.52	0.05	

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929)			Notes
		Existing	Proposed	Difference	
N2580	City of Clearwater Public Service Complex	66.71	66.71	0.00	
N3000	Stevenson Creek gage, 170' N of Drew Street	15.70	15.76	0.06	
N3010	Stevenson Creek at Drew Street	15.76	15.77	0.01	
N3020	Stevenson Creek at Drew Street	17.44	17.44	0.00	
N3030	Stevenson Creek at Cleveland Street (SR 60)	20.15	17.61	-2.54	
N3040	Stevenson Creek at Cleveland Street (SR 60)	20.74	19.13	-1.61	
N3050	Stevenson Creek at Pierce Street	20.83	20.04	-0.79	
N3060	Stevenson Creek at Pierce Street	20.86	20.08	-0.78	
N3070	Stevenson Creek at Franklin Street	20.92	20.14	-0.78	
N3080	Stevenson Creek at Franklin Street	20.96	20.19	-0.77	
N3090	Stevenson Creek at Court Street (SR 595A)	20.98	20.22	-0.76	
N3100	Stevenson Creek at Court Street (SR 595A)	22.19	21.09	-1.10	
N3110	Stevenson Creek 605' S of Court Street	22.89	21.47	-1.42	
N3125	Stevenson Creek at Druid Road	23.58	22.18	-1.40	
N3126	Stevenson Creek Weir S of Druid Road	24.23	22.98	-1.25	
N3130	Stevenson Creek 350' S of Druid (Linn Lake)	24.53	23.40	-1.13	
N3131	Stevenson Creek 1030' S of Druid(Linn Lake)	24.57	23.46	-1.11	
N3132	Stevenson Creek at Evergreen Avenue	25.72	25.07	-0.65	
N3134	Stevenson Creek at Hillcrest N of Jeffords	26.73	25.65	-1.08	
N3135	Pond in Golf Course S of Druid	22.77	33.30	10.53	OK new pond
N3150	S. Betty Lane and Jasmine Way	25.06	24.95	-0.11	
N3160	S. Betty Lane and Magnolia Drive	26.99	26.98	-0.01	
N3170	S. Betty Lane and Lotus Path	29.30	29.30	0.00	
N3180	Jeffords Street and Byron Avenue	26.10	26.08	-0.02	
N3190	Jeffords Street and S. Betty Lane	33.52	33.52	0.00	
N3195	Jeffords Street and Lincoln Avenue	50.22	50.22	0.00	
N3200	Plaza Pines Shopping Center	52.85	52.85	0.00	
N3210	Plaza Pines Shopping Center	55.14	55.14	0.00	
N3220	Plaza Pines Shopping Center Pond	61.34	61.34	0.00	
N3450	Lake Bellevue Branch at S. Betty Lane	22.91	21.48	-1.43	
N3500	Lake Bellevue Branch at S. Lincoln Drive	23.27	21.50	-1.77	
N3510	Lake Bellevue Branch at Missouri Avenue	25.68	22.49	-3.19	
N3520	Lake Bellevue Branch at Missouri Avenue	25.67	23.55	-2.12	
N3530	Lake Bellevue Branch Pond W of Missouri	26.56	25.54	-1.02	
N3540	Lake Bellevue Branch at Druid Road	29.04	28.75	-0.29	
N3550	Stormwater Pond at Renaissance Sq. Villas	32.02	31.54	-0.48	
N3555	Lake Bellevue Branch 400' S of Druid	30.51	30.00	-0.51	
N3560	Lake Bellevue Branch W of Renaissance Sq	34.03	33.22	-0.81	
N3565	Lk Bellevue Brnch at Lotus Path/ S Greenwd	37.45	36.54	-0.91	
N3570	Lake Bellevue Branch S of Renaissance Sq	39.81	38.95	-0.86	
N3575	Lk Bellevue Branch 150' S of Renaissance Sq	39.81	38.95	-0.86	
N3580	Lake Bellevue Branch 250' N of Pinellas St	39.88	39.11	-0.77	

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929) Existing	Proposed	Difference	Notes
N3600	Lake Bellevue Branch at Pinellas Street	40.74	39.59	-1.15	
N3650	Lk Bellevue Brnch at Tuskawilla/ S Greenwd	41.28	40.78	-0.50	
N3670	Lake Bellevue Branch at Tuskawilla Ave	41.39	40.86	-0.53	
N3680	Lake Bellevue Branch 160' N of Lakeview	42.57	42.27	-0.30	
N3700	Lake Bellevue Branch at Lakeview Road	43.24	42.75	-0.49	
N3705	Proposed Lake Bellevue Outfall Weir		43.89		
N3710	Lake Bellevue	43.48	43.91	0.43	OK - Lake Bellevue Low FF = 44.05
N3720	Lake Bellevue Branch at Woodlawn Ave	47.90	48.00	0.10	
N3730	Lake Bellevue Branch at Woodlawn Ave	50.65	50.34	-0.31	
N3740	Lake Bellevue Branch at Howard Street	52.27	52.38	0.11	
N3750	Lake Bellevue Branch at Howard Street	53.67	53.45	-0.22	
N3760	Lake Bellevue Branch at Belleair Road	56.82	56.92	0.10	
N3780	S. Greenwood Avenue at Hawkins Street	62.55	62.55	0.00	
N3790	Missouri Avenue FDOT Detention Pond	62.78	62.78	0.00	
N3800	Wildwood Way and SCL Railroad	45.74	43.94	-1.80	
N3810	Belleair Road and SCL Railroad	58.02	58.03	0.01	
N4000	Stevenson Creek at Jeffords Street	28.24	26.93	-1.31	
N4010	Stevenson Creek at Browning Street	29.94	29.15	-0.79	
N4020	Stevenson Creek at Browning Street	31.24	30.24	-1.00	
N4030	Stevenson Creek at Lakeview Road	32.72	31.33	-1.39	
N4040	Hillcrest Avenue S. of Lakeview Road	34.13	33.00	-1.13	
N4050	Stevenson Creek 950' S of Lakeview Road	35.13	34.29	-0.84	
N4060	Stevenson Creek at Bellevue Boulevard	36.88	35.77	-1.11	
N4065	Stevenson Creek at Bellevue Boulevard	38.34	38.39	0.05	
N4075	Stevenson Creek at St Thomas Drive	40.65	38.47	-2.18	
N4080	Stevenson Creek at St Thomas Drive	40.73	39.88	-0.85	
N4090	Rice Lake	40.94	40.15	-0.79	
N4100	Stevenson Creek at Belleair Boulevard	42.49	42.31	-0.18	
N4110	Stevenson Creek at Southridge Drive	42.72	42.56	-0.16	
N4120	Stevenson Creek at Southridge Drive	42.72	42.56	-0.16	
N4122	Byron Drive 400' S of Emily Court	36.65	36.51	-0.14	
N4123	Bellevue Boulevard at Boylan Avenue	53.83	53.88	0.05	
N4125	Missouri Avenue FDOT Detention Pond	61.64	61.64	0.00	
N4128	Pond adj. to Stevenson Creek S of Belleair	40.00	39.54	-0.46	
N4130	Belleair Road 700' W of Highland Avenue	45.17	45.16	-0.01	
N4131	Belleair Road 350' W of Highland Avenue	45.87	45.87	0.00	
N4132	Belleair Road and Highland Avenue	47.03	47.03	0.00	
N4133	Belleair Road and Highland Avenue	47.32	47.32	0.00	
N4135	Highland Avenue 280' N of Belleair Road	53.43	53.43	0.00	
N4136	Labelle Plaza South Detention Pond	54.69	54.69	0.00	
N4137	Labelle Plaza North Detention Pond	56.45	56.45	0.00	
N4138	Pond SE of Belleair Road and Clearview Ave	47.66	47.61	-0.05	

Table F.3 100-Year, 24-Hour Design Flood Elevation Comparison, Existing and Proposed Conditions

Node ID	Node Location	100-Year, 24-Hour Design Storm Flood Elevations in Feet (NGVD 1929)			Notes
		Existing	Proposed	Difference	
N4139	Jeffords Street Branch at Hillcrest Avenue	28.33	27.08	-1.25	
N4140	Jeffords Street Branch at Highland Avenue	30.28	30.10	-0.18	
N4150	Jeffords Street Branch 650' E of Highland	32.43	32.23	-0.20	
N4160	Jeffords Street Branch 600' W of Lake Ave	32.42	32.25	-0.17	
N4170	Jeffords Street Branch at Lake Avenue	32.52	32.43	-0.09	
N4180	Jeffords Street Branch at Lake Avenue	32.57	32.49	-0.08	
N4200	Jeffords Street Branch 486' E of Lake Ave	32.79	32.61	-0.18	
N4205	Jeffords Street 100' E of Tuscola Road	32.97	32.74	-0.23	
N4210	Sonny Lake	32.98	32.75	-0.23	
N4220	Lake Helen	32.97	32.74	-0.23	
N4230	Woodcrest Avenue 450' S of Jeffords Street	32.97	32.75	-0.22	
N4240	Ditch Terminus 220' E of Woodcrest Avenue	34.74	34.70	-0.04	
N4245	Beginning of Lake Alpine Outfall Ditch	34.74	34.70	-0.04	
N4250	Lake Alpine	34.77	34.74	-0.03	
N4260	Keene Road and Beverly Circle	37.12	37.12	0.00	
N4280	Pond SE of Keene Road and Beverly Circle	35.80	35.80	0.00	
N4285	West End of Budleigh Street at N-S Ditch	35.48	35.34	-0.14	
N4290	West End of Magnolia Drive at N-S Ditch	47.90	47.90	0.00	
N4300	Druid Road and Skyview Avenue	56.52	56.52	0.00	
N4310	Turner Street and Skyview Avenue	68.84	68.84	0.00	
N4320	Gulf to Bay Boulevard and Skyview Avenue	68.83	68.83	0.00	
N4360	Crest Lake	69.90	69.62	-0.28	
N4380	Lake NE of Jeffords St and Keystone Ave	32.97	32.74	-0.23	
N4390	Duncan Avenue 470' N of Jeffords Street	33.60	33.17	-0.43	
N4400	Duncan Avenue at Magnolia Drive	40.83	40.78	-0.05	
N4410	Duncan Avenue and Druid Road	56.65	56.70	0.05	
N4420	Duncan Avenue and Turner Street	62.20	61.55	-0.65	
N4424	Duncan Avenue and Rainbow Drive	70.47	70.41	-0.06	
N4425	Allens Creek Boundary Node	68.00	68.00	0.00	
N4426	Duncan Avenue and Cleveland Street	69.83	69.83	0.00	
N4430	Pond SW of Lakeview Rd and Duncan Ave	36.03	35.92	-0.11	
N4440	Balmora Drive near Norwood Avenue	36.09	36.06	-0.03	
N4450	Pond SE of Pinewood Dr and Norwood Ave	35.44	35.35	-0.09	
N4460	Pond SE of Duncan Ave and Brentwood Dr	32.98	32.76	-0.22	
N4470	Pond at Lake Avenue and Bamora Drive	47.49	47.49	0.00	
N4480	Brentwood Drive and Woodcrest Avenue	36.54	36.53	-0.01	
N4485	Keene Road 540' N of Beverly Circle	38.21	38.21	0.00	
N4490	Pond SW of Keene Rd and Magnolia Drive	42.66	42.66	0.00	
N4500	Pond SE of Keene Road and Magnolia Drive	43.17	43.17	0.00	
N4510	Pond NE of Keene Road and Magnolia Drive	46.35	46.35	0.00	

Stevenson Creek Watershed Management Plan
Preliminary Engineer's Opinions of
Probable Construction Cost

1. Spring Branch

Project	COST
1A.1	$526,115
1A.2	$960,703
1B	$830,830
1C	$2,634,542
1D	$446,783
1E	$831,636
1F	$933,969
1G	$620,212
TOTAL	
(Alt. 1)	**$5,150,248**
(Alt. 2)	**$6,953,960**

2. Lower Stevenson Creek

Project	COST
2A	$544,546
2B	$486,615
2C	$526,500
2D	$1,755,860
TOTAL	**$3,313,520**

3. Middle Stevenson Creek

Project	COST
3A	$2,203,240
TOTAL	**$2,203,240**

4. Upper Stevenson Creek

Project	COST
4A	$2,299,109
4B	$1,415,843
4C	$1,801,913
TOTAL	**$5,516,865**

5. Hammond Branch

Project	COST
5A	$737,241
5B	$735,643
5C	$303,382
5D	$161,283
5E	$14,300
TOTAL	**$1,951,848**

6. Lake Bellevue Branch

Project	COST
6A	$1,337,884
6B	$1,554,761
TOTAL	**$2,892,645**

7. Jeffords Street Branch

Project	COST
7A	$881,466
7B	$1,494,952
7C	$1,690,634
TOTAL	**$4,067,053**

Plan 1 Total Cost =	**$25,095,419**
Plan 2 Total Cost =	**$26,899,132**

Stevenson Creek Watershed Management Plan
Preliminary Engineer's Opinions of Cost

1. Spring Branch Improvements

Project 1A.1 Spring Branch Conveyance Enhancements (Lower Portion)

Item #	Description	Unit	Quantity	Unit Cost	Total Cost
110A	Channel Excavation	CY	12,200	$11.00	$134,200
	Low Retaining Wall (Gabions or Geoweb)	LF	1,400	$120.00	$168,000
120A	Sod (bahia)	SY	5,500	$1.50	$8,250
	Remove and Dispose of Existing Pipe and Headwall	LS	1	$1,500	$1,500
	12'-15' Trees, on 50' Centers	EA	30	$190.00	$5,700
	Mobilization				$31,765
	Total Estimated Construction Cost				$349,415
	Engineering and Contingency (30% of construction)				$104,825
	Acquisition of Drainage Easement	SF	62,500	$1.15	$71,875
	ESTIMATED TOTAL COST				**$526,115**

Project 1A.2 Spring Branch Conveyance Enhancements (Upper Portion)

Item #	Description	Unit	Quantity	Unit Cost	Total Cost
	58" x 91" ERCP	LF	820	$190	$155,800
	48" x 76" ERCP	LF	725	$175	$126,875
	43" x 68" ERCP	LF	105	$140	$14,700
	42" RCP	LF	815	$85	$69,275
	30"-36" RCP	LF	650	$65	$42,250
	18"-24" RCP	LF	150	$40	$6,000
	Remove and Dispose of Existing Pipe	LF	2,430	$12.50	$30,375
	Swale Replacement and Grading	LF	750	$5.00	$3,750
120A	Sod (bahia)	SY	3,000	$1.50	$4,500
	Inlets and Junction Boxes	LS	22	$3,500	$77,000
130A	Pavement Removal and Restoration	SY	2,000	$42.00	$84,000
	Misc Demolition and Restoration	LS	1	$15,000	$15,000
	Maintenance of Traffic	DY	120	$300	$36,000
	Utility Relocation				$6,295
	Mobilization				$67,182
	Total Estimated Construction Cost				$739,002
	Engineering and Contingency (30% of construction)				$221,701
	ESTIMATED TOTAL COST				**$960,703**

Project 1B. Replacement of bridges at Springtime Avenue and Douglass Avenue over Spring Branch. (Cost estimate does not include dredging of sediment from Edgewater Drive bridge over Stevenson Creek).

Item #	Description	Unit	Quantity	Unit Cost	Total Cost
	Springtime Ave. (Two 9' x 12' Box Culverts, L=30')	LS	1	$175,000.00	$175,000
	Douglass Ave. (Two 9' x 12' Box Culverts, L=86')	LS	1	$350,000.00	$350,000
120B	Sod (bahia)	SY	2,000	$1.50	$3,000
	Utility Relocation + Misc Demo and Restoration	LS	1	$50,000	$50,000
	BMP Measure	LS	1	$500	$500
	Maintenance of Traffic	LS	1	$2,500	$2,500
	Mobilization				$58,100
	Total Estimated Construction Cost				$639,100
	Engineering and Contingency (30% of construction)				$191,730
	ESTIMATED TOTAL COST				**$830,830**

Project 1C. Spring Branch Stormwater Detention Basin

Item #	Description	Unit	Quantity	Unit Cost	Total Cost
110C	Excavation	CY	167,000	$5.50	$918,500
120C	Sod (bahia)	SY	18,665	$1.50	$27,998
	Concrete Control Weirs	EA	2	$40,000	$80,000
	Outfall Control Structure	EA	1	$5,000	$5,000
	48" RCP	LF	195	$95	$18,525
	30" RCP	LF	150	$50	$7,500
	Pavement Removal and Restoration	SY	90	$42.00	$3,780
	Wetland Plantings	AC	8.0	$3,500	$28,000
	Organic Mulch	CY	6,500	$3.00	$19,500
	12'-15' Trees, on 50' Centers	EA	44	$190.00	$8,360
	Mobilization				$111,716
	Total Estimated Construction Cost				$1,228,879
	Engineering and Contingency (30% of construction)				$368,664
	Property Acquisition				$1,037,000
	ESTIMATED TOTAL COST				**$2,634,542**

Project 1D. Replacement of 1,300' of 24" storm sewer along Woodland Terrace

Item #	Description	Unit	Quantity	Unit Cost	Total Cost
	42" RCP	LF	1,300	$85.00	$110,500
130D	Pavement Removal and Restoration	SY	1,733	$42.00	$72,786
	Remove and dispose of Existing Pipe	LF	1,300	$12.50	$16,250
	Manholes and Inlets	LS	21	$4,000.00	$84,000
	Endwall	LS	1	$1,400.00	$1,400
	Erosion Control Measures	LS	1	$500.00	$500
	Maintenance of Traffic	LS	1	$2,000	$2,000
	Miscellaneous Demolition and Restoration	LS	1	$25,000	$25,000
	Mobilization				$31,244
	Total Estimated Construction Cost				$343,680
	Engineering and Contingency (30% of construction)				$103,104
	ESTIMATED TOTAL COST				**$446,783**

Project 1E. Byram Pond Dredging and Expansion

Item #	Description	Unit	Quantity	Unit Cost	Total Cost
	Dredging of Byram Sump	CY	9,000	$25.00	$225,000
	Demolition and Disposal of Existing Structures	LS	3	$5,000	$15,000
	Sod (bahia)	SY	3,933	$1.50	$5,900
	Mobilization				$24,590
	Total Estimated Construction Cost				$270,489
	Engineering and Contingency (30% of construction)				$81,147
	Total Property Acquisition				$480,000
	ESTIMATED TOTAL COST				**$831,636**

Project 1F. Spring Branch Stabilization, from Union Street to Byram Pond

Item #	Description	Unit	Quantity	Unit Cost	Total Cost
110F	Channel Excavation	CY	11,875	$15.00	$178,125
	Sheet Pile Retaining Wall	LF	2,000	$220.00	$440,000
	Sod (bahia)	SY	10,000	$1.50	$15,000
	Diversion of Flow / BMP Measure	LS	1	$20,000	$20,000
	Mobilization				$65,313
	Total Estimated Construction Cost				$718,438
	Engineering and Contingency (30% of construction)				$215,531
	ESTIMATED TOTAL COST				**$933,969**

Project 1G. Clearview Lake

Item #	Description	Unit	Quantity	Unit Cost	Total Cost
	Control Structure for Clearview Lake	LS	1	$5,000	$5,000
	66" RCP	LF	340	$180	$61,200
	60" RCP	LF	260	$170	$44,200
	48" RCP	LF	270	$95	$25,650
	36" RCP	LF	900	$65	$58,500
	30" RCP	LF	900	$52	$46,800
	18"-24" RCP	LF	240	$40	$9,600
130G	Pavement Removal and Restoration	SY	350	$42.00	$14,700
	Standard Inlet Structures	EA	20	$3,500	$70,000
	Endwall	LS	1	$1,400	$1,400
	Sawcut and Replace Existing Driveways	EA	24	$2,600	$62,400
	Sidewalk	SY	400	$15	$6,000
	Sod (St. Augustine)	SY	6,000	$3.50	$21,000
	Utility Relocation	LS	1	$4,265	$4,265
	Erosion Control Measures	LS	1	$500	$500
	Maintenance of Traffic				$2,500
	Mobilization				$43,371
	Total Estimated Construction Cost				$477,086
	Engineering and Contingency (30% of construction)				$143,126
	Acquisition of Drainage Easement	SF	3,300	$3.00	$9,900
	ESTIMATED TOTAL COST				**$620,212**

Total Cost for Spring Branch Projects, Alternative 1

Project	Cost
1A.1	526,115
1A.2	960,703
1B	830,830
1D	446,783
1E	831,636
1F	933,969
1G	620,212
Total	**5,150,248**

Total Cost for Spring Branch Projects, Alternative 2

Project	Cost
1A.1	526,115
1A.2	960,703
1C	2,634,542
1D	446,783
1E	831,636
1F	933,969
1G	620,212
Total	**6,953,960**

2. Lower Stevenson Creek

Project 2A. Palmetto Street Sediment Sump

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Demolition and Disposal of Existing Structure	EA	1	$5,000	$5,000
210A	Excavation of Sediment Sump	CY	7,500	$15	$112,500
220A	Sod (bahia)	SY	1,900	$1.50	$2,850
	Large Control Weir	LS	1	$50,000	$50,000
	Concrete Sheet Pile Retaining Wall	LF	350	$220	$77,000
	Diversion of Flow / BMP Measure	LS	1	$20,000	$20,000
	Maintenance of Traffic	LS	1	$500	$500
	Mobilization	LS			$26,785
	Total Estimated Construction Cost				$294,635
	Engineering and Contingency (30% of construction)				$88,391
	Right-of-Way Acquisition				$117,300
	Acquisition of Drainage Easement	SF	13,400	$3.30	$44,220
	ESTIMATED TOTAL COST				**$544,546**

Project 2B. North Missouri Avenue and Palmetto Street Drainage Improvements (Alt. 1)

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	60" RCP	LF	1,300	$170.00	$221,000
230B	Pavement Removal and Restoration	SY	1,120	$42.00	$47,040
	Junction Box	LS	6	$3,500.00	$21,000
	Remove and dispose of Existing Pipe	LF	1,300	$12.50	$16,250
	Maintenance of Traffic				$10,000
	Utility Relocation and Miscellaneous Demolition and Restoration				$25,000
	Mobilization				$34,029
	Total Estimated Construction Cost				$374,319
	Engineering and Contingency (30% of construction)				$112,296
	ESTIMATED TOTAL COST				**$486,615**

Project 2B. North Missouri Avenue and Palmetto Street Drainage Improvements (Alt. 2)

Item	Description	Unit	Quantity	Unit Cost	Total Cost
Lo	60" RCP	LF	435	$170.00	$73,950
	36" RCP	LF	860	$65.00	$55,900
230B	Pavement Removal and Restoration	SY	1,120	$42.00	$47,040
	Junction Box	LS	6	$3,500.00	$21,000
	Remove and dispose of Existing Pipe	LF	435	$12.50	$5,438
	Maintenance of Traffic				$10,000
	Utility Relocation and Miscellaneous Demolition and Restoration				$25,000
	Mobilization				$23,833
	Total Estimated Construction Cost				$262,160
	Engineering and Contingency (30% of construction)				$78,648
	ESTIMATED TOTAL COST				**$340,808**

Project 2C. Installation of CDS units at strategic outfall locations

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Install CDS Units	LS	3	$135,000	$405,000
	Total Estimated Construction Cost				$405,000
	Engineering and Contingency (30% of Construction)				$121,500.00
	ESTIMATED TOTAL COST				**$526,500**

Project 2D. Overbrook Avenue Detention Pond

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Demolition/ Offsite Disposal of Existing Structures	LS	1	$30,000	$30,000
210D	Excavation and Offsite Disposal (clean material)	CY	51,000	$7.00	$357,000
	43" x 68" ERCP	LF	1,110	$140	$155,400
	38" x 60" ERCP	LF	625	$120	$75,000
	48" RCP	LF	450	$95	$42,750
	36" RCP	LF	260	$65	$16,900
	18"-24" RCP	LF	400	$40	$16,000
	Inlet Structures	EA	16	$3,500	$56,000
	Pavement Removal and Restoration	SY	2,700	$42.00	$113,400
220D	Sod (bahia)	SY	7,700	$1.50	$11,550
	Control Structure	LS	1	$10,000.00	$10,000
	Maintenance of Traffic	DY	60	$300	$18,000
	Mobilization				$90,200
	Total Estimated Construction Cost				$992,200
	Engineering and Contingency (30% of construction)				$297,660
	Real Property Acquisition				$466,000
	ESTIMATED TOTAL COST				**$1,755,860**

Note: Cost estimate does not include any environmental remediation measures that may be necessary.
Cost for property acquisition is based on 2001 assessed value times a factor of 1.5.

Total Cost for Lower Stevenson Creek Proposed Projects

Project	Cost
A	$544,546
B	$486,615
C	$526,500
D	$1,755,860
TOTAL	**$3,313,520**

3. Middle Stevenson Creek

Project 3A. Stormwater detention basins on Stevenson Creek within the Glen Oaks Golf Course

Item	Description	Unit	Quantity	Unit Cost	Total Cost
310A	Excavation (large pond)	CY	225,000	$5.00	1,125,000
311A	Excavation (small pond)	CY	81,300	$3.00	243,900
320A	Sod (bahia)	SY	46,000	$1.50	69,000
	Large Control Weir w/Bleeder	LS	1	$50,000	50,000
	Control Structure for Small Pond	LS	1	$10,000	10,000
	Construct 36" RCP	LF	350	$65.00	22,750
	Mitred Endwall	LS	2	$2,500.00	5,000
	Junction Box	LS	3	$3,500.00	10,500
	Wetland Plantings	AC	6.5	$3,500	22,750
	Organic Mulch	CY	5,300	$3.00	15,900
	Mobilization	LS	1	$120,000	120,000
	Total Estimated Construction Cost				1,694,800
	Engineering and Contingency (30% of construction)				508,440
	ESTIMATED TOTAL COST				**2,203,240**

Total Cost for Middle Stevenson Creek Proposed Projects

Projects	**Cost**
3A	2,203,240
Total	**2,203,240**

4. Upper Stevenson Creek

Project 4A. High-Flow Bypass culvert from Browning Street to Linn Lake

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Construct 6.5' x 11' Concrete Box Culvert	LF	1,900	$650.00	$1,235,000
	Construct 5' x 12' Concret Box Culvert	LF	40	$625.00	$25,000
	Relocate Sanitary Sewer Mains	LF	700	$50.00	$35,000
430A	Pavement Removal and Restoration	SY	5,300	$42.00	$222,600
	High Flow diversion Weir	LS	1	$10,000.00	$10,000
	Removal of Vegetation in Creek	LS	1	$7,500.00	$7,500
	Remove and Replace retaining wall	LF	150	$350.00	$52,500
420A	Sod (bahia)	SY	2,500	$1.50	$3,750
	Maintenance of Traffic	LS	1	$500	$500
	Utility Relocation and Miscellaneous Domolition and Restoration				$15,919
	Mobilization				$160,777
	Total Estimated Construction Cost				$1,768,545
	Engineering and Contingency (30% of construction)				$530,564
	ESTIMATED TOTAL COST				**$2,299,109**

Project 4B. Stevenson Creek Stabilization from Lakeview Avenue to Bellevue Blvd.

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Clearing and Grubbing	AC	3.2	$6,000	$19,200
	Channel Excavation and Shaping	CY	12,000	$12.00	$144,000
	Low Retaining Wall (Gabions or Geoweb)	LF	6,000	$120	$720,000
	Endwalls	EA	5	$2,500	$12,500
	42" RCP	LF	100	$85	$8,500
	30" RCP	LF	300	$50	$15,000
	24" RCP	LF	60	$40	$2,400
	Inlet Structures	EA	5	$4,000	$20,000
	Small Rip-Rap Weir Structures	EA	2	$7,500	$15,000
	Sod (bahia)	SY	12,200	$1.50	18,300.00
	12'-15' Trees, on 50' Centers	EA	80	$190.00	$15,200
	Mobilization				$99,010
	Total Estimated Construction Cost				$1,089,110
	Engineering and Contingency (30% of construction)				$326,733
	ESTIMATED TOTAL COST				**$1,415,843**

Project 4C. Stevenson Creek Restoration from Bellevue Blvd. To St. Thomas Drive

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Demolition/ Offsite Disposal of Existing Structures	EA	10	$5,000	$50,000
	Remove and Dispose of 54" CMP	LF	950	$12.50	$11,875
	Excavation	CY	23,000	$8.00	$184,000
	58" x 91" ERCP	LF	100	$190	$19,000
	Pavement Removal and Restoration	SY	130	$42.00	$5,460
	Headwall for 58" x 91" ERCP	EA	2	$4,000	$8,000
	Large Control Structures	EA	2	$10,000	$20,000
420C	Sod (bahia)	SY	8,170	$1.50	$12,255
	Understory Plantings	AC	1.0	$3,500	$3,500
	12'-15' Trees, on 50' Centers	EA	40	$190.00	$7,600
440C	Organic Mulch	CY	850	$3.00	$2,550
	Maintenance of Traffic	LS	1	$1,000	$1,000
	Mobilization				$32,424
	Total Estimated Construction Cost				$357,664
	Engineering and Contingency (30% of construction)				$107,299
	Total Property Acquisition				$1,336,950
	ESTIMATED TOTAL COST				**$1,801,913**

Total Cost for Upper Stevenson Creek Proposed Projects

Projects	Cost
4A	$2,299,109
4B	$1,415,843
4C	$1,801,913
Total	**$5,516,865**

5. Hammond Branch

Project 5A. Improvement of ditch along north side of Flagler Railroad from Linwood Drive and Sharondale Drive to Gentry Street

Item	Description	Unit	Quantity	Unit Cost	Total Cost
510A	Excavation / Enbankment Fill and Compaction	CY	8,500	$15.00	$127,500
	Rip Rap	CY	520	$40.00	$20,800
	72" RCP	LF	292	$185	$54,020
	60" RCP	LF	420	$170	$71,400
	6' x 10' Box Culvert	LF	120	$525	$63,000
	Double 5' x 7' Box Culvert	LF	50	$650	$32,500
	Endwall for twin 72" RCP	EA	2	$4,500	$9,000
	Pavement Removal and Restoration	SY	1,200	$42	$50,400
	Remove and Dispose of Existing Culvert	LF	635	$12.50	$7,938
	Special Inlet and Junction Structures	EA	3	$4,500	$13,500
	Special Concrete Control Structures	EA	2	$15,000	$30,000
520A	Sod (bahia)	SY	7,300	$1.50	$10,950
	Maintenance of Traffic	DY	90	$300.00	$27,000
	Mobilization				$49,101
	Total Estimated Construction Cost				$567,108
	Engineering and Contingency (30% of construction)				$170,132
	ESTIMATED TOTAL COST				**$737,241**

Project 5B. Drainage improvements in the area of Palmetto Street and Kings Highway

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Construct 54" RCP	LF	1,900	$130.00	$247,000
	Junction Boxes and Inlets	LS	35	$3,500.00	$122,500
130A	Pavement Removal and Restoration	SY	2,533	$42.00	$106,386
520B	Sod (bahia)	SY	1,700	$1.50	$2,550
	Maintenance of Traffic	DY	120	$300	$36,000
	Mobilization				$51,444
	Total Estimated Construction Cost				$565,880
	Engineering and Contingency (30% of construction)				$169,764
	ESTIMATED TOTAL COST				**$735,643**

C. Drainage/water quality improvements in the area of Saturn Ave. and Sherwood Street

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	24" RCP	LF	70	$40.00	$2,800
	36" RCP	LF	920	$65.00	$59,800
	38" x 60" ERCP	LF	270	$120.00	$32,400
	Remove and dispose of Existing Pipe	LF	1,190	$12.50	$14,875
530C	Pavement Removal and Restoration	SY	1,590	$42.00	$66,780
	Junction Box	EA	2	$3,500.00	$7,000
	Special Inlets	EA	7	$4,000.00	$28,000
	Maintenance of Traffic	LS	1	$500	$500
	Mobilization				$21,216
	Total Estimated Construction Cost				$233,371
	Engineering and Contingency (30% of construction)				$70,011
	ESTIMATED TOTAL COST				**$303,382**

D. Drainage/water quality improvements in the area of Smallwood Circle and Rosemere Road

Item	Description	Unit	Quantity	Unit Cost	Total Cost
550D	Fill existing 24" CMP	CY	44	$50.00	$2,200
	Construct 24" x 38" Elliptical Concrete Culvert	LF	310	$65.00	$20,150
	Construct 36" RCP	LF	690	$70.00	$48,300
	Construct 30" RCP	LF	350	$65.00	$22,750
	Pavement Removal and Restoration	SY	50	$42.00	$2,100
	Junction Box	LS	4	$3,500.00	$14,000
	Utility Relocation + Misc Demo and Restoration				$3,285
	Mobilization				$11,279
	Total Estimated Construction Cost				$124,064
	Engineering and Contingency (30% of construction)				$37,219
	Drainage Easement				
	ESTIMATED TOTAL COST				**$161,283**

Project 5E. Replace Lake Hobart Outfall Structure

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Control Structure	LS	1	$10,000.00	$10,000
	Mobilization				$1,000
	Total Estimated Construction Cost				$11,000
	Engineering and Contingency (30% of construction)				$3,300
	ESTIMATED TOTAL COST				**$14,300**

Total Cost for Hammond Branch Proposed Projects

Projects	Cost
5A	$737,241
5B	$735,643
5C	$303,382
5D	$161,283
5E	$14,300
Total	**$1,951,848**

6. Lake Bellevue Branch

Project 6A. Expansion of Lake Bellevue

Item	Description	Unit	Quantity	Unit Cost	Total Cost
610A	Excavation of the 8-acre expansion	CY	109,520	$6.00	$657,120
630A	Pavement Removal and Restoration	SY	1,300	$50.00	$65,000
611A	Low Berm	CY	500	$10.00	$5,000
	36" RCP	LF	250	$65.00	$16,250
	54" Dia. Jack and Bore Casing	LF	150	$455.00	$68,250
	29" x 45" ERCP	LF	200	$70.00	$14,000
620A	Sod (bahia)	SY	21,100	$1.50	$31,650
	Large Control Structure (Weir w/Bleeder)	LS	1	$25,000	$25,000
	Wetland Plantings	AC	7.0	$3,500	$24,500
640A	Organic Mulch	CY	5,700	$3.00	$17,100
	BMP Measure	LS	1	$2,000.00	$2,000
	Miscellaneous Domolition and Restoration	LS			$9,259
	Maintenance of Traffic	LS	1	$500	$500
	Mobilization				$93,513
	Total Estimated Construction Cost				$1,029,142
	Engineering and Contingency (30% of construction)				$308,742
	ESTIMATED TOTAL COST				**$1,337,884**

Project 6B. Turner Street Box Culvert

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Large Control Structure (Weir)	LS	1	$50,000	$50,000
	Construct 5' x 9' Concrete Box Culvert	LF	180	$361.00	$64,980
	Construct 6' x 11' Concrete Box Culvert	LF	1,530	$530.00	$810,900
630B	Pavement Removal and Restoration	SY	3,400	$42.00	$142,800
620B	Sod (bahia)	SY	1,900	$1.50	$2,850
	Utility Relocation and Misc Demo and Restoration				$10,715
	Maintenance of Traffic	LS	1	$5,000	$5,000
	Mobilization				$108,725
	Total Estimated Construction Cost				$1,195,970
	Engineering and Contingency (30% of construction)				$358,791
	ESTIMATED TOTAL COST				**$1,554,761**

Total Cost for Bellevue Branch Proposed Projects

Projects	**Cost**
7A	$1,337,884
7B	$1,554,761
Total	**$2,892,645**

7. Jeffords Street Branch

Project 7A. Crest Lake Expansion

Item	Description	Unit	Quantity	Unit Cost	Total Cost
710A	Excavation of the 6-acre expansion	CY	58,000	$6.00	$348,000
	Wetland Plantings	AC	6.0	$3,500	$21,000
	Organic Mulch	CY	5,700	$3.00	$17,100
	36" RCP	LF	1,370	$65.00	$89,050
	24" RCP	LF	400	$40.00	$16,000
	Inlet Structures	EA	9	$3,500	$31,500
730A	Pavement Removal and Restoration	SY	1,830	$42.00	$76,860
720A	Sod (bahia)	SY	10,000	$1.50	$15,000
	Endwall	LS	1	$1,400	$1,400
	Erosion Control Measures	LS	1	$500	$500
	Mobilization				$61,641
	Total Estimated Construction Cost				$678,051
	Engineering and Contingency (30% of construction)				$203,415
	ESTIMATED TOTAL COST				**$881,466**

Project 7B. Duncan Avenue / Turner Street Detention Pond

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Demolition/ Offsite Disposal of Existing Structures	EA	9	$5,000	$45,000
710B	Excavation of 2.5-acre Wet Pond	CY	45,441	$6.00	$272,646
	Control Structure w/Bleeder	LS	1	$10,000	$10,000
720B	Sod (bahia)	SY	5,300	$1.50	$7,950
	Mobilization				$33,560
	Total Estimated Construction Cost				$369,156
	Engineering and Contingency (30% of construction)				$110,747
	Total Property Acquisition				$1,015,050
	ESTIMATED TOTAL COST				**$1,494,952**

Project 7C. Jeffords Street / Barry Road Detention Pond

Item	Description	Unit	Quantity	Unit Cost	Total Cost
	Demolition/ Offsite Disposal of Existing Structures	EA	9	$5,000	$45,000
710C	Excavation of 2.5-acre Wet Pond	CY	26395	$6.00	$158,370
	Control Structure w/Bleeder	LS	1	$10,000	$10,000
	Construct 60" HDPE	LS	1200	$75.00	$90,000
	Construct 48" x 76" ERCP	LS	320	$175.00	$56,000
	Construct 36" RCP	LS	210	$65.00	$13,650
	Construct 30" RCP	LS	400	$52.00	$20,800
	Wetland Plantings	AC	2.5	$3,500	$8,750
740C	Organic Mulch	CY	2,000	$3.00	$6,000
730C	Pavement Removal and Restoration	SY	180	$42.00	$7,560
720C	Sod (bahia)	SY	5,300	1.50	$7,950
	Mobilization				$42,408
	Total Estimated Construction Cost				$466,488
	Engineering and Contingency (30% of construction)				$139,946
	Total Property Acquisition				$1,084,200
	ESTIMATED TOTAL COST				**$1,690,634**

Total Cost for Jeffords Street Branch Proposed Projects

Projects	Cost
7A	$881,466
7B	$1,494,952
7C	$1,690,634
Total	**$4,067,053**

Final Report

Bacterial Source Tracking Using Antibiotic Resistance Analysis of Fecal Coliforms

Stevenson Creek, Clearwater, Florida

June – December, 2000

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March 20, 2001

Introduction

Various bacteria are found in the digestive tracts and feces of wild and domestic animals and humans. Some of these bacteria including fecal coliforms and fecal streptococci are used as indicators of fecal contamination when present in natural waters. Unfortunately, the mere presence of these indicator bacteria is not informative as to the source of fecal pollution, an important factor for risk-assessment and remediation. Consequently, several methods collectively known as bacterial source tracking (BST) methods have been developed to "fingerprint" fecal indicator bacteria in order to determine their host or source (e.g. human, dog, wild animal) and may be based on either the genetic make-up of the bacteria, or on physiological characteristics such as resistance to various antibiotics. Using antibiotic resistance analysis (ARA), it is possible to assess the source of indicator organisms based on a much larger subset of the bacterial population than is currently possible using genetic methods. ARA was used to determine the source of fecal contamination in this study essentially as described in Harwood et. al 2000.

In any BST method, a database of fingerprints, or patterns, of bacteria isolated from the feces of known source animals (e.g. humans, dogs, wild animals) must first be constructed and tested for its predictive accuracy. This database is called the calibration data set. Discriminant analysis, a multivariate statistical test, is used to analyze the data. The ability of the database to accurately predict the source of indicator organisms is assessed using isolates from known sources as "unknown" or test isolates. The database can also be self-crossed, that is, the database isolates are used as both the calibration data set and the test data set.

The database used in this study consists of 3309 fecal coliform isolates from six sources, humans (domestic wastewater), dogs, cattle, chickens, pigs and wild animals (mainly raccoons and birds). The average rate of correct classification (ARCC) is a measure of the predictive accuracy of the database, and is obtained by self-crossing the database, adding the number of correctly classified isolates in all source categories, and dividing by the total number of isolates. The ARCC of this data set is 57.2% when 6 source categories are used in the analysis. The chance of an isolate falling into one of 6 categories by chance if categorization were random is 16.7%, therefore the antibiotic resistance patterns of fecal coliforms have substantial predictive capacity with respect to bacterial sources (Harwood *et al.*, 2000).

In any database, some percent of isolates from other sources will misclassify as human isolates. The rate of misclassification of isolates into the human category can be used to develop a cut-off point for significant levels of human isolates. In this database, about 20% of wild animal isolates are misclassified as human, and wild animal isolates have the highest rate of misclassification as human of all sources. The conservative rate of 25% is used as the cut-off point for identification of a significant percentage of isolates from human sources in any sample.

Stevenson Creek

This study was initiated in order to identify the dominant source(s) of fecal contamination to Stevenson Creek in Clearwater, Florida. Five sites were chosen to represent areas where routine monitoring has shown high levels of fecal coliforms. Two of the sites were located at the composite samplers previously installed for the project (Comp1 and Comp2). Comp1 is located at the golf course on the main branch of Stevenson Creek; Comp 2 is located on Spring Branch off King Highway. Sites previously designated for monitoring efforts were sampled: STC1 at Spring Branch, STC2 at Hammond's Branch and STC5 at Evergreen.

Sampling dates were June 27, July 25, August 22, September 19, October 23, November 13, and December 27, 2000. Isolation of fecal coliforms was poor from November with samples yielding only an estimate of population density and no information as to source of contamination. Consequently, additional samples were collected in December.

Results

The dominant sources of fecal coliform isolates obtained from the five sites over the course of this study were wild animal, dog and human. The overall trend was for wild animal isolates to comprise the majority of fecal coliforms obtained when colony forming units (CFU) counts exceeded the acceptable limit of 200CFU/100ml. STC1 and STC2 sampled on 6/27/00 were the only observations where exceedingly high CFU counts co-occurred with a majority of human isolates. On 8/22/00 at STC1, the majority of isolates were dog and the CFU count was 300/100ml. Samples from the month of September yielded a majority of human isolates from all sites while densities of coliforms were low, ranging from 7-26 CFU/100ml. The above results suggest that source most frequently contributing to excessive fecal coliform counts was wild animals followed by human and dog isolates.

Some statistically significant relationships were apparent between the CFU counts and classification of isolates. The percentages of isolates from specific sources were compared to CFU/100ml using a regression analysis. There was a significant, inverse relationship between the percentage human isolates and the CFU count for Comp2, i.e. as the CFU count went down over the study period, the percentage of human isolates went up , $P=0.019$, $r^2= 0.87$ (Fig. 9). While this relationship was not observed for the other four sites examined individually, it was observed when data from all sites were pooled, $P=0.001$, $r^2=0.34$ (Fig 11). This indicates enough of an overall trend among the sites to maintain a significant inverse relationship between CFU and percent human. Likewise, when the percentage of wild isolates was compared to CFU counts in a similar test, a significant direct relationship was observed at STC 1, $P<0.001$, $r^2= 0.96$. The CFU count decreased along with the percent of wild isolates, Fig 10. Again, a significant relationship was not observed for any of the other four sites when examined individually. However, when the five sites were pooled the regression was significant, $P<0.001$, $r^2=0.60$ (Fig. 12). These results support the notion that wild animals are the predominant contributors to fecal contamination marked by elevated fecal coliform levels.

The relative importance of specific wild animals as contributors to high fecal coliform numbers is difficult to assess with confidence but is likely related to factors such as population size and density and their utilization of the territory adjacent to the sample sites. During the course of the study, birds were the most frequently observed wild vertebrates. Great white egrets, snowy egrets, little blue herons, and anhingas were frequently present in low densities during sample collection i.e one or two individuals. Waterfowl such as gallinules, coots and ducks, were observed in slightly higher densities (three or four individuals), but not as frequently. The largest aggregates of wild animals observed during the study period were flocks of migratory birds such as European starlings and boat-tailed grackles. These birds, however, were observed during the late fall months when fecal coliform densities were low. Gulls common to the coastal areas such as the black-headed gull and herring gull were not observed frequently near the sampling sites.

While human input may not be the major cause of elevated fecal coliform levels for most of the samples analyzed for this study, the domination of small populations by human isolates suggests that human sources contribute to low-level background contamination. This occurs when FC populations are low, near the transition to dry season and perhaps few isolates are washed into surface waters from draining storm water. Lowering water tables may also draw wastewater from small, otherwise innocuous leaks. Overall, there was little evidence of acute human fecal contamination on a large scale across the five site examined. However, there may be considerable human source influencing STC1 and STC2, which is detectable despite the presence of fecal coliforms from other sources. These sites were impacted by human fecal sources with the highest frequency and magnitude of the five sites. They were more frequently over 25% human and exhibited a higher mean % human than the other sites. The most pronounced human contamination of STC1 and 2 occurred in June where 56.7% and 47.7% of isolates examined were human. The density of human isolates at STC1 and STC2 may be approximated from the fecal coliform density using the percent classified as humans. This yields 11400 ‘human’CFU/100ml for STC1 and 2400 ‘human’CFU/100ml for STC 2, both of which exceed the limit of 200CFU/ml. Consequently, unlike any other sampling event in this study, the human input for these two sites in June were high enough to cause violation considering only human isolates.

References

V. J. Harwood, J. Whitlock and V. H. Withington**.** 2000. Classification of the antibiotic resistance patterns of indicator bacteria by discriminant analysis: use in predicting the source of fecal contamination in subtropical Florida waters. Appl. Environ Microbiol. 66:3698-3704.

Table 1. Density of fecal coliforms from the five sites as determined by membrane filtration

	Colony Forming Units/100ml						
Site	June	July	August	September	October	November	December
STC 1	20000	13000	300	26	35	1	6
STC 2	5000	2200	68	7	1	1	70
STC 5	1600	6400	115	7	1	1	24
Comp 1	12000	18000	110	9	6	30	17
Comp 2	20000	12000	0	16	960	10	120
Mean	11720	10320	118.6	13	200.6	8.6	47.4

Table 2. Percent wild isolates at Stevenson Creek sites, June – December

Site	June	July	August	Sept	Oct	Nov	Dec	Mean
Comp1	100.0	62.7	76.2	0	34.1	NA	0	45.5
Comp2	100.0	62.1	30.5	0	63.4	NA	0	42.7
STC1	43.3	42.1	21.7	3.1	0	NA	0	18.9
STC2	40.9	43.2	10.5	16.7	NA	NA	0	22.3
STC5	80.6	67.7	46.7	6.3	NA	NA	0	40.3

Table 3. Percent human isolates at Stevenson Creek sites, June – December

Site	June	July	August	Sept	Oct	Nov	Dec	Mean	# > 25%
Comp1	0	3.7	4.8	62.5	20.5	NA	75	27.8	2
Comp2	0	6.9	25.4	93.3	15.9	NA	90.5	38.7	3
STC1	56.7	31.6	13.3	90.6	12.5	NA	71.4	46.0	4
STC2	47.7	16.2	10.5	83.3	NA	NA	75	46.5	3
STC5	0	22.6	10	75	NA	NA	82.5	38.0	2

Table 4. Percent dog isolates at Stevenson Creek sites, June – December

Site	June	July	August	Sept	Oct	Nov	Dec	Mean
Comp1	0	0	19.1	37.5	36.4	NA	25	19.6
Comp2	0	0	42.4	6.7	2.3	NA	9.5	10.15
STC1	0	18.4	65.0	3.1	87.5	NA	28.6	33.7
STC2	0	18.9	79.0	0	NA	NA	25	24.6
STC5	0	6.5	43.3	18.8	NA	NA	17.5	17.2

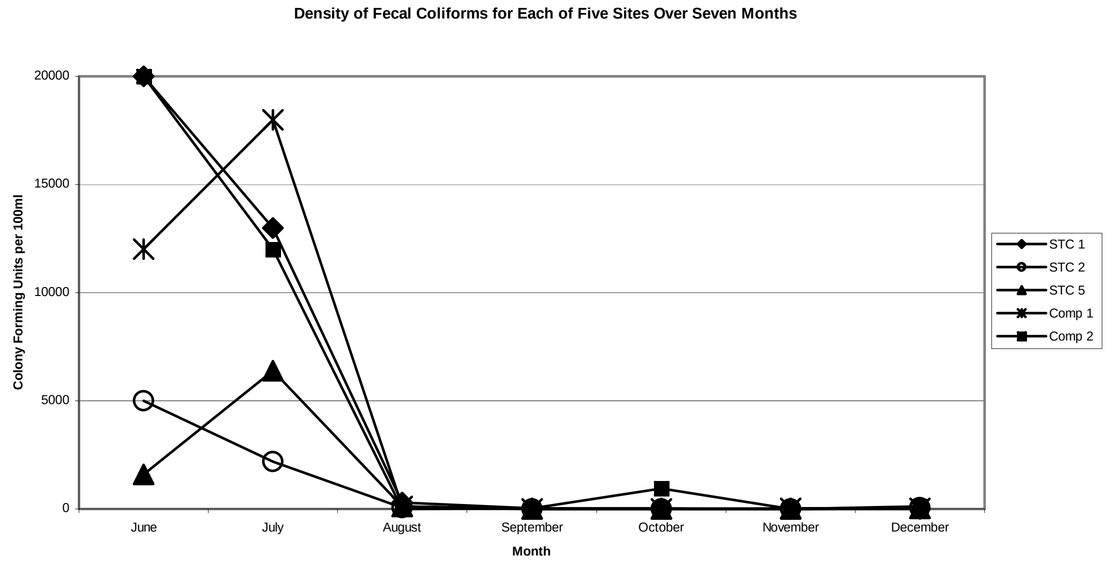


Figure 1. CFU/100ml from the five sites over seven months.

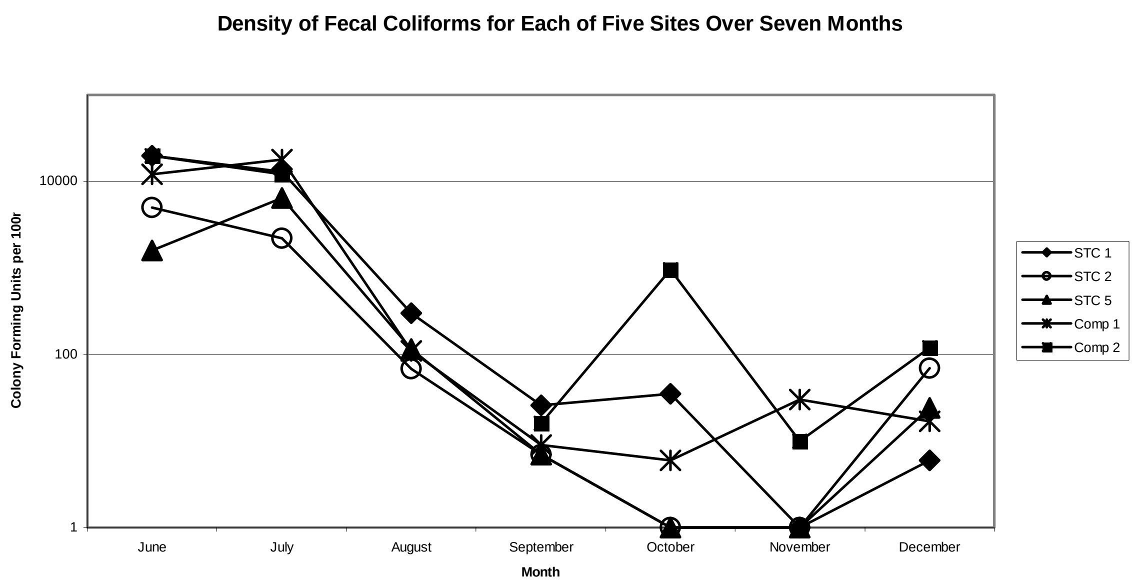


Figure 2. CFU/100ml from the five sites over seven months, graphed on a log scale.

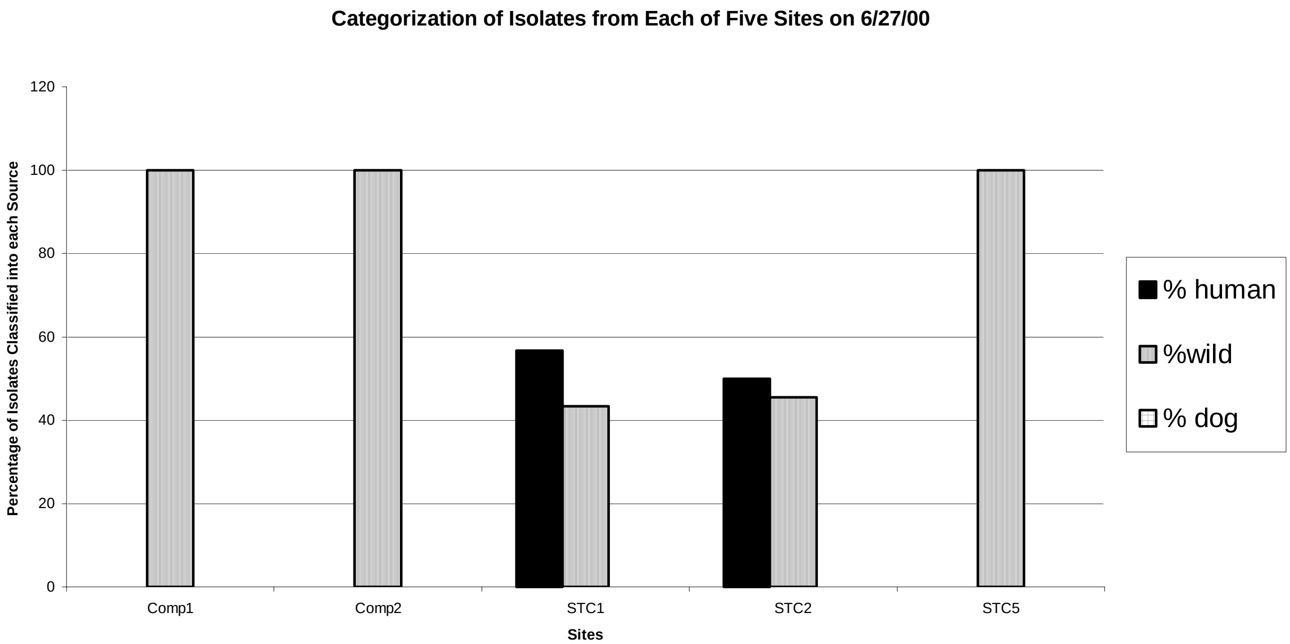


Figure 3

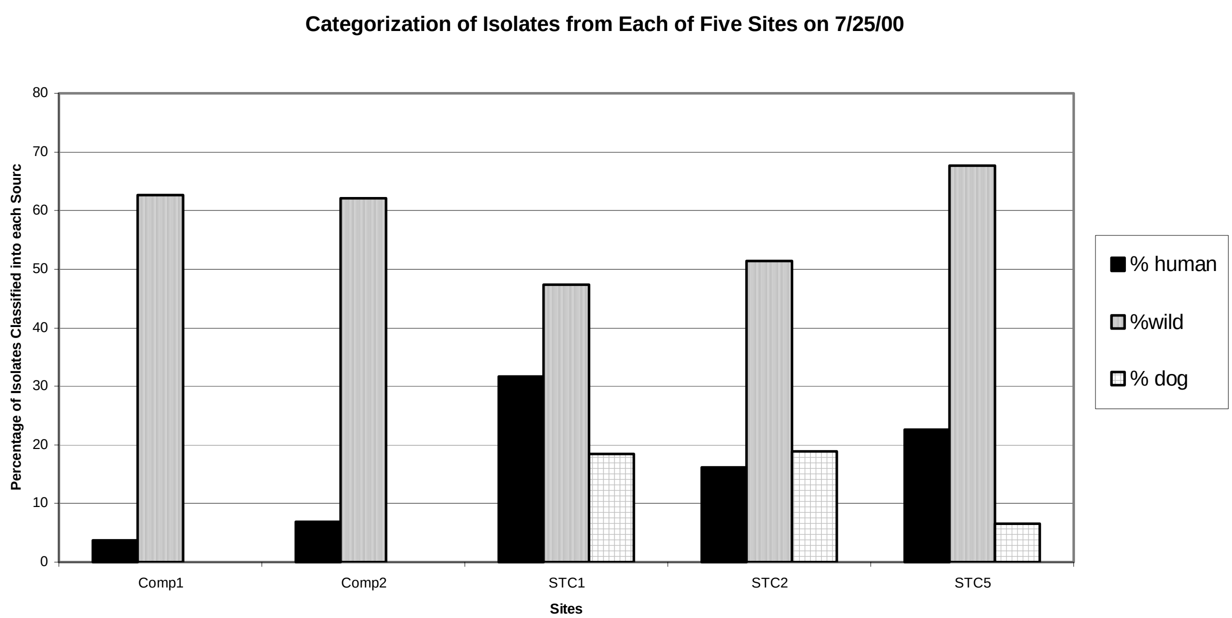


Figure 4.

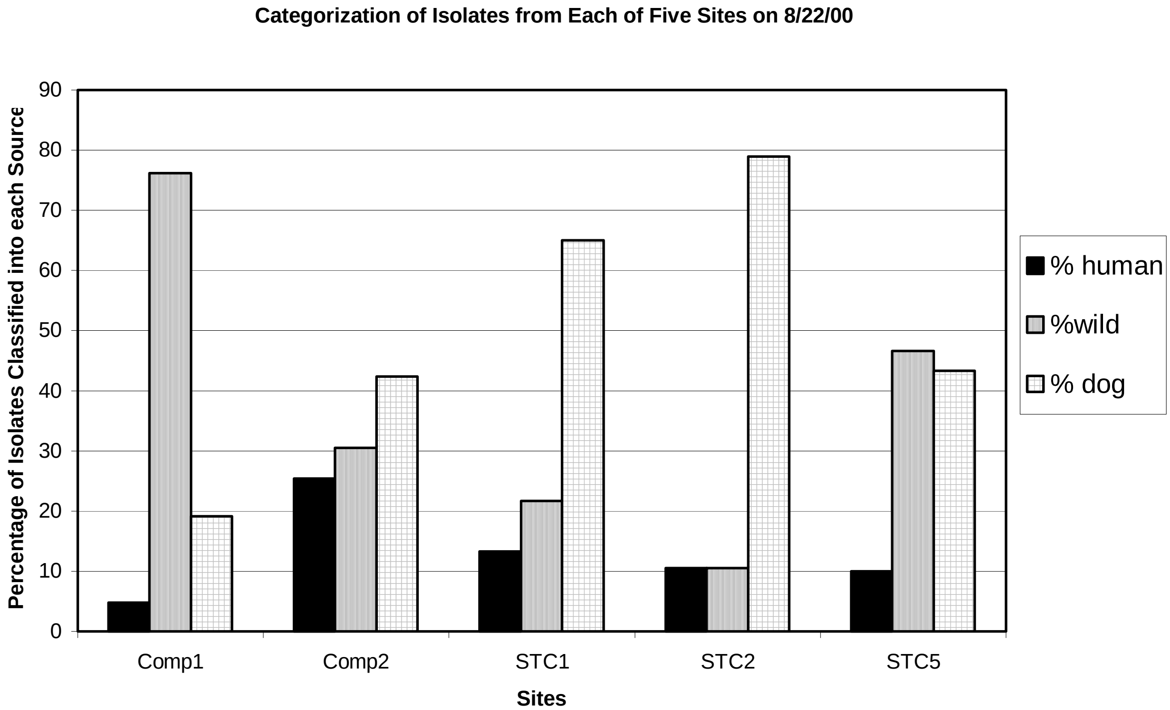


Figure 5.

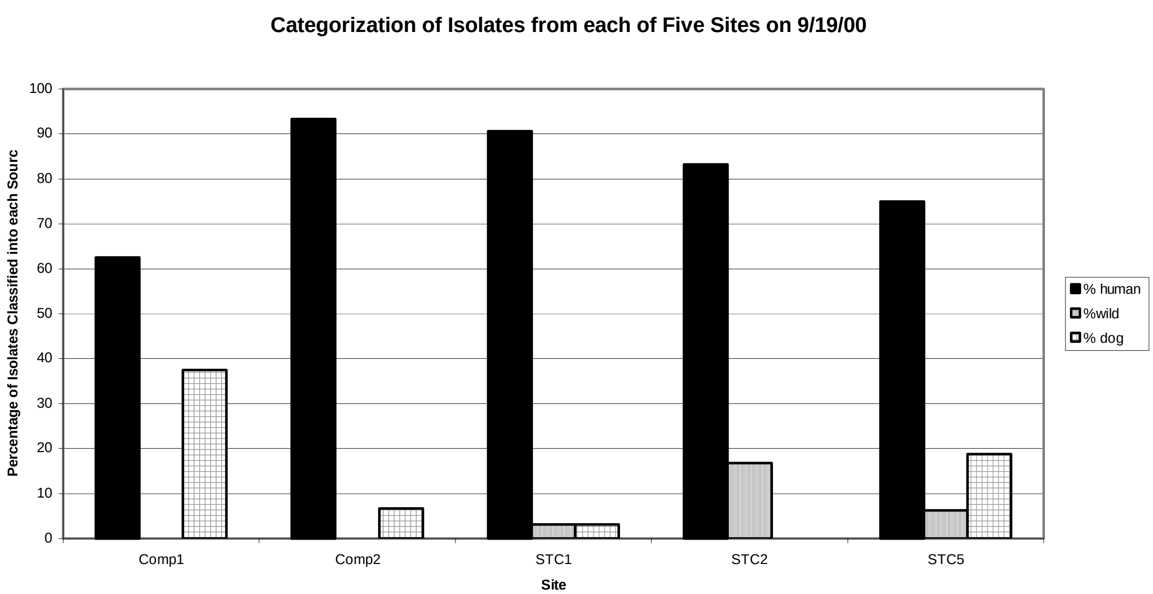


Figure 6.

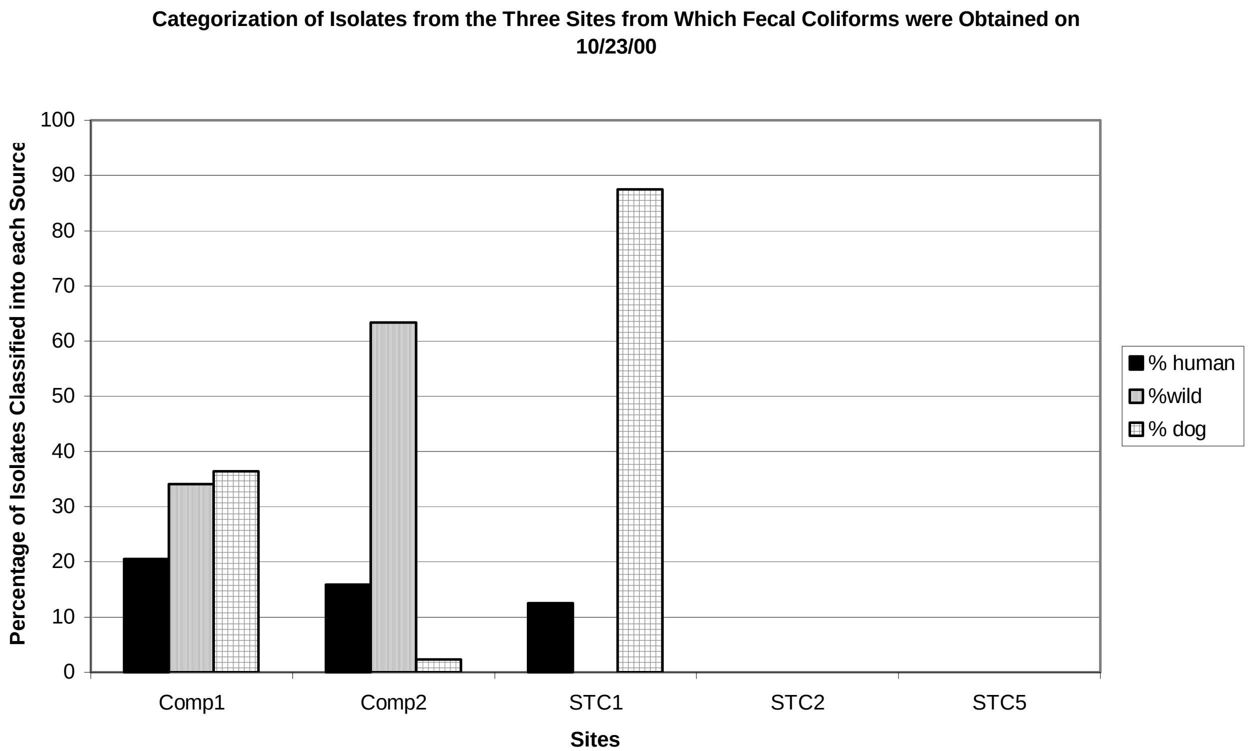


Figure 7.

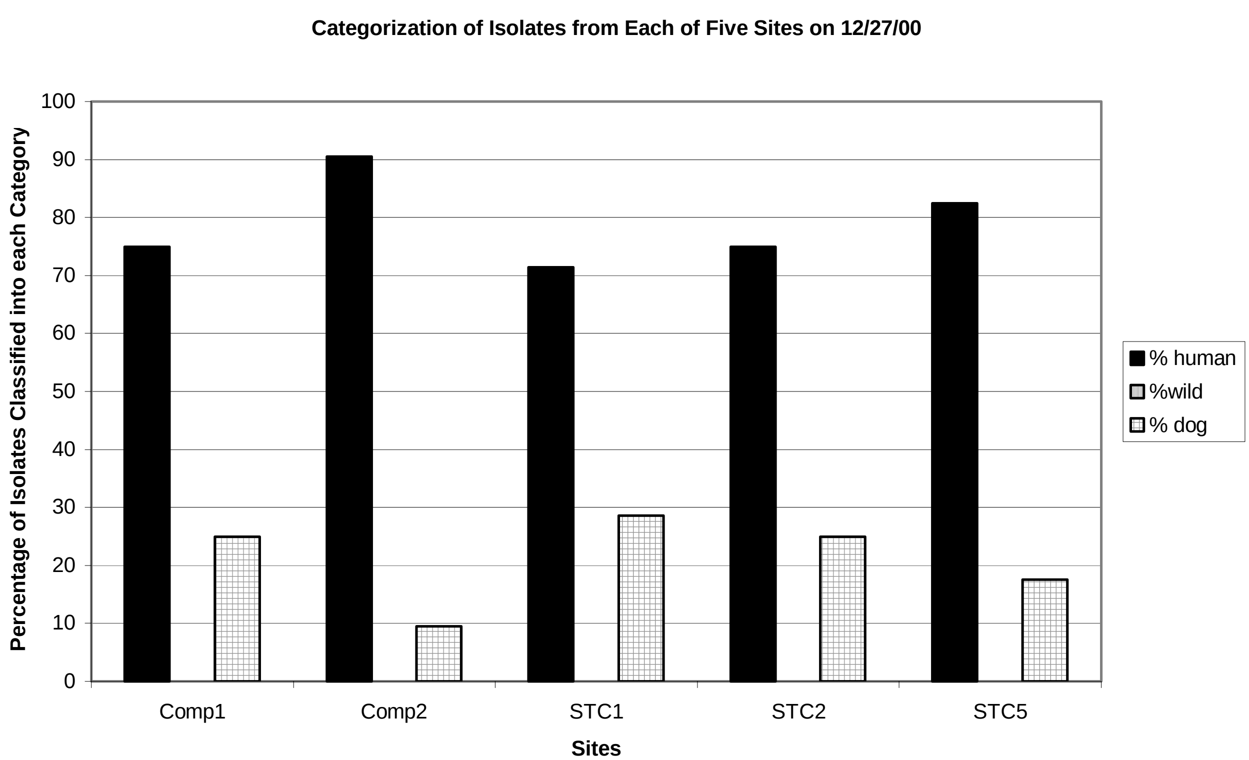


Figure 8.

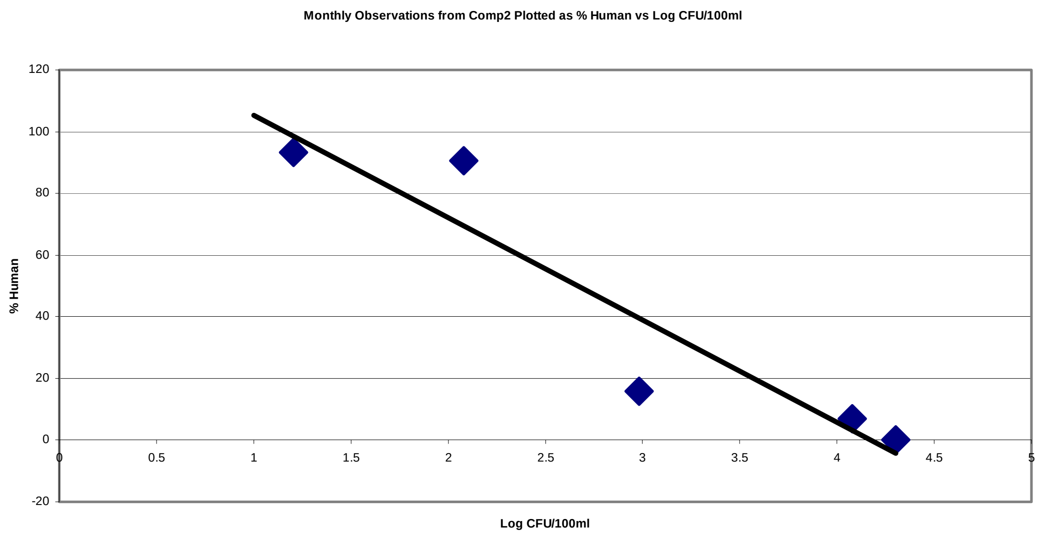


Figure 9.

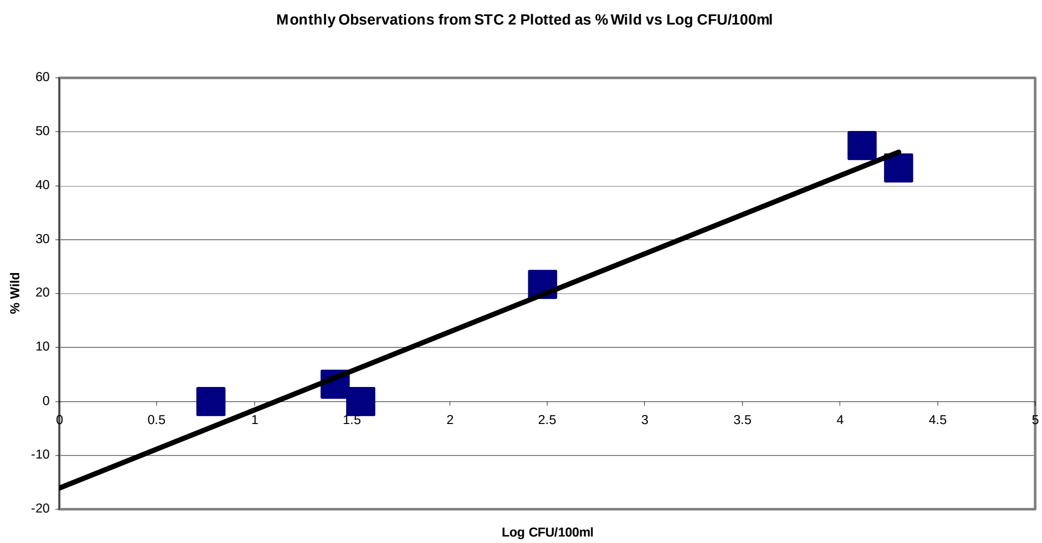


Figure 10.

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)					
Name	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN
Hammond Branch	913.2180	1023	0.242	10	80	36,441	46,777	903	3,861
Jeffords Street	651.4446	754	0.250	5	38	26,273	29,436	574	2,790
Lake Belleview	653.7598	1033	0.341	15	118	37,515	73,482	1,080	3,903
Lower Spring	463.7520	471	0.219	4	36	17,527	22,031	451	1,831
Lower Stevenson	822.1520	1065	0.280	11	75	33,941	49,546	817	3,715
Middle Stevenson	535.3692	799	0.322	13	104	31,534	61,338	903	3,172
Upper Spring	1673.4679	2092	0.270	36	325	84,074	147,929	2,907	9,021
Upper Stevenson	574.9511	677	0.254	6	49	26,642	33,141	633	2,704
				100	826	293,948	463,680	8,269	30,997

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)					
Name	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN
Hammond Branch	913.2180	1023	0.242	1	9	3,049	6,362	104	236
Jeffords Street	651.4446	754	0.250	1	5	2,889	4,090	74	208
Lake Belleview	653.7598	1033	0.341	5	27	8,861	24,454	274	554
Lower Spring	463.7520	471	0.219	1	8	2,250	4,379	78	188
Lower Stevenson	822.1520	1065	0.280	-	-	-	-	-	-
Middle Stevenson	535.3692	799	0.322	0	2	678	1,734	19	68
Upper Spring	1673.4679	2092	0.270	10	71	15,068	39,186	607	1,048
Upper Stevenson	574.9511	677	0.254	1	6	1,781	4,936	48	101
				20	128	34,576	85,142	1,205	2,403

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)					
Name	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
Hammond Branch	913.2180	1023	0.242	9	71	33,393	40,415	799	3,625
Jeffords Street	651.4446	754	0.250	4	34	23,384	25,345	500	2,582
Lake Belleview	653.7598	1033	0.341	10	90	28,654	49,028	807	3,349
Lower Spring	463.7520	471	0.219	3	29	15,277	17,651	373	1,644
Lower Stevenson	822.1520	1065	0.280	11	75	33,941	49,546	817	3,715
Middle Stevenson	535.3692	799	0.322	13	102	30,856	59,604	884	3,104
Upper Spring	1673.4679	2092	0.270	25	254	69,006	108,743	2,300	7,974
Upper Stevenson	574.9511	677	0.254	4	43	24,861	28,205	585	2,603
				80	697	259,372	378,538	7,064	28,594

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)																	
Basin ID	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B1340	12.19	28.09	0.50	0.80	8.70	1,258.48	3,051.49	68.82	152.54	0.30	2.61	314.62	1,144.31	20.65	22.88	0.50	6.09	943.86	1,907.18	48.17	129.66
B1310	15.64	16.90	0.23	0.30	3.26	742.78	1,408.52	29.92	81.71	0.02	0.19	36.29	103.23	1.76	2.39	0.28	3.07	706.49	1,305.29	28.17	79.32
B1970	17.77	25.27	0.31	1.40	6.94	1,265.52	2,461.61	22.43	93.88	0.04	0.16	24.14	70.42	0.51	1.08	1.36	6.78	1,241.38	2,391.19	21.92	92.81
B1320	29.59	26.56	0.19	0.28	3.01	1,111.25	1,429.37	33.57	118.48	0.02	0.16	49.03	94.59	1.78	3.14	0.26	2.85	1,062.22	1,334.78	31.79	115.34
B1300	7.15	5.90	0.18	0.04	0.36	191.85	316.43	5.33	20.89	0.00	0.02	9.37	23.19	0.31	0.61	0.04	0.34	182.48	293.24	5.02	20.28
B1280	10.09	10.87	0.23	0.06	0.44	311.50	392.16	7.88	36.47	0.02	0.13	77.88	147.06	2.36	5.47	0.04	0.31	233.62	245.10	5.51	31.00
B1290	15.91	20.97	0.29	0.51	5.61	1,006.36	2,125.80	47.10	113.52	0.04	0.33	49.17	155.79	2.76	3.33	0.47	5.29	957.20	1,970.01	44.34	110.19
B1990	19.36	27.02	0.30	0.19	1.19	783.13	968.31	17.70	90.01	0.07	0.36	195.78	363.12	5.31	13.50	0.12	0.84	587.34	605.20	12.39	76.51
B1950	12.82	21.47	0.36	0.42	3.34	805.70	2,198.56	27.92	81.61	0.01	0.08	15.37	62.90	0.64	0.94	0.41	3.26	790.33	2,135.66	27.28	80.67
B1980	4.81	3.59	0.16	0.01	0.11	143.85	107.63	2.72	14.47	-	0.00	2.74	3.08	0.06	0.17	0.01	0.11	141.10	104.55	2.66	14.31
B1270	9.10	7.75	0.18	0.03	0.29	309.33	283.36	6.09	30.97	0.01	0.09	77.33	106.26	1.83	4.64	0.02	0.20	232.00	177.10	4.26	26.32
B1930	12.93	21.59	0.36	1.00	5.23	1,032.24	2,235.30	20.60	80.16	0.75	3.14	516.12	1,676.48	12.36	24.05	0.25	2.09	516.12	558.83	8.24	56.11
B1260	10.95	16.40	0.32	0.52	2.87	731.45	1,473.39	15.52	61.92	0.39	1.72	365.73	1,105.04	9.31	18.58	0.13	1.15	365.73	368.35	6.21	43.35
B1910	16.47	27.25	0.36	0.94	5.29	1,241.81	2,542.78	27.48	104.76	0.70	3.17	620.90	1,907.09	16.49	31.43	0.23	2.11	620.90	635.70	10.99	73.33
B1920	20.76	33.56	0.35	0.73	7.74	1,528.56	2,998.63	65.91	170.93	0.26	2.19	361.35	1,063.30	18.70	24.25	0.47	5.54	1,167.21	1,935.33	47.21	146.69
B1900	2.93	5.57	0.41	0.16	0.98	241.30	592.61	6.07	21.06	0.06	0.29	60.33	222.23	1.82	3.16	0.10	0.68	180.98	370.38	4.25	17.90
B1230	144.39	245.55	0.37	4.57	36.64	8,783.15	16,030.99	307.84	972.82	1.71	10.99	2,195.79	6,011.62	92.35	145.92	2.86	25.65	6,587.36	10,019.36	215.49	826.90
B1240	4.10	8.56	0.45	0.17	1.44	315.87	770.26	11.77	34.39	0.13	0.87	157.94	577.69	7.06	10.32	0.04	0.58	157.94	192.57	4.71	24.07
B1870	40.11	33.36	0.18	0.38	2.48	1,206.65	1,812.79	29.62	119.33	0.31	1.98	965.32	1,450.23	23.70	95.46	0.08	0.50	241.33	362.56	5.93	23.86
B1880	9.47	20.64	0.47	0.86	4.50	898.20	1,985.86	18.55	72.93	0.65	2.70	449.10	1,489.40	11.13	21.88	0.21	1.80	449.10	496.47	7.42	51.05
B1600	17.19	19.90	0.25	0.25	2.65	881.34	1,241.85	27.65	92.31	0.02	0.12	34.01	71.88	1.28	2.14	0.23	2.52	847.34	1,169.98	26.37	90.18
B1610	53.46	101.23	0.41	3.09	33.64	5,284.53	12,989.03	265.87	587.46	0.18	1.56	203.90	751.77	12.31	13.60	2.91	32.08	5,080.62	12,237.27	253.56	573.86
B1790	9.72	21.38	0.48	0.67	7.50	1,069.57	2,632.83	58.82	125.81	0.15	1.37	163.46	603.54	10.79	11.54	0.52	6.12	906.11	2,029.29	48.04	114.28
B1780	9.38	16.92	0.39	0.53	5.94	902.13	2,120.92	47.04	102.38	0.20	1.78	225.53	795.34	14.12	15.36	0.33	4.16	676.60	1,325.57	32.93	87.02
B1820	27.45	44.25	0.35	1.02	11.30	2,058.96	4,211.06	95.34	234.79	0.38	3.39	514.74	1,579.15	28.60	35.22	0.64	7.91	1,544.22	2,631.91	66.74	199.58
B1620	11.16	15.96	0.31	0.25	1.88	297.02	1,496.69	18.52	42.68	0.20	1.51	237.62	1,197.35	14.82	34.14	0.05	0.38	59.41	299.34	3.70	8.54
B1830	9.52	6.43	0.15	0.02	0.19	257.40	192.93	4.87	25.88	0.01	0.12	128.70	144.69	2.92	7.77	0.01	0.08	128.70	48.23	1.95	18.12
B1850	15.40	11.45	0.16	0.03	0.34	458.60	343.13	8.68	46.13	0.03	0.20	229.30	257.35	5.21	13.84	0.01	0.14	229.30	85.78	3.47	32.29
B1800	11.52	26.29	0.49	0.75	8.23	1,198.21	2,894.45	65.30	144.42	0.28	2.47	299.55	1,085.42	19.59	21.66	0.47	5.76	898.66	1,809.03	45.71	122.76
B1760	4.77	8.11	0.37	0.25	2.76	388.39	978.89	21.55	46.56	0.09	0.83	97.10	367.09	6.46	6.98	0.16	1.93	291.29	611.81	15.08	39.57
B1750	9.21	12.20	0.29	0.66	3.26	489.18	1,017.79	9.58	40.79	0.25	0.98	122.30	381.67	2.87	6.12	0.41	2.28	366.89	636.12	6.71	34.67
B1180	31.02	57.02	0.40	0.33	1.62	1,092.74	1,136.76	28.95	158.67	0.12	0.49	273.18	426.28	8.68	23.80	0.21	1.13	819.55	710.47	20.26	134.87
B1840	5.54	3.74	0.15	0.01	0.11	149.58	111.91	2.83	15.05	0.01	0.07	74.79	83.94	1.70	4.51	0.00	0.04	74.79	27.98	1.13	10.53
B1540	12.17	13.14	0.23	0.06	0.61	497.60	519.85	11.11	51.38	0.00	0.03	19.20	30.09	0.51	1.19	0.06	0.58	478.41	489.76	10.59	50.20
B1590	33.60	34.60	0.22	0.11	1.08	1,373.07	1,076.01	26.45	138.57	0.01	0.05	52.98	62.28	1.23	3.21	0.10	1.03	1,320.09	1,013.73	25.23	135.36
B1580	16.62	21.38	0.28	0.07	0.55	660.52	489.42	13.65	75.39	0.03	0.16	165.13	183.53	4.10	11.31	0.05	0.38	495.39	305.89	9.56	64.08
B1550	25.55	26.24	0.22	0.08	0.80	1,050.97	800.54	19.95	105.67	0.00	0.04	40.55	46.33	0.93	2.45	0.07	0.76	1,010.42	754.21	19.02	103.22
B1190	21.23	14.87	0.15	0.05	0.21	306.11	176.98	7.23	41.17	0.01	0.04	48.46	42.02	1.37	3.91	0.04	0.17	257.65	134.96	5.85	37.26
B1220	30.14	20.22	0.15	0.06	0.60	802.99	598.97	15.25	80.74	0.01	0.12	127.10	142.21	2.90	7.67	0.04	0.49	675.89	456.76	12.35	73.08
B1210	1.25	0.69	0.12	0.00	0.02	24.91	17.93	0.49	2.49	-	0.00	3.94	4.26	0.09	0.24	0.00	0.02	20.97	13.67	0.40	2.26
B1860	22.99	18.23	0.17	0.11	0.81	635.47	682.18	14.07	67.36	0.08	0.65	508.38	545.75	11.25	53.89	0.02	0.16	127.10	136.44	2.81	13.47
B1570	23.69	22.90	0.21	0.07	0.68	917.14	686.21	17.35	92.26	0.00	0.03	35.39	39.72	0.80	2.14	0.06	0.65	881.75	646.49	16.55	90.12
B0900	19.23	18.44	0.21	0.05	0.55	738.55	552.59	13.97	74.29	0.00	0.03	28.50	31.98	0.65	1.72	0.05	0.52	710.05	520.60	13.33	72.57
B1530	20.50	25.52	0.27	0.08	0.54	759.98	529.23	15.49	87.82	0.00	0.02	29.32	30.63	0.72	2.03	0.08	0.52	730.66	498.60	14.77	85.79
B1560	10.44	10.52	0.22	0.03	0.31	421.22	315.16	7.97	42.37	0.00	0.01	16.25	18.24	0.37	0.98	0.03	0.30	404.97	296.92	7.60	41.39
B1170	3.54	2.58	0.16	0.01	0.07	87.02	60.73	1.79	8.68	-	0.00	1.35	1.42	0.03	0.08	0.01	0.07	85.67	59.32	1.76	8.60
B1172	3.17	1.94	0.13	0.00	0.05	60.85	40.94	1.30	6.05	-	0.00	0.95	0.95	0.02	0.06	0.00	0.05	59.90	39.98	1.28	5.99
B1160	5.31	4.67	0.19	0.01	0.14	179.72	132.52	3.46	18.05	-	0.00	2.79	3.09	0.07	0.17	0.01	0.13	176.93	129.44	3.40	17.88
B1720	31.19	27.40	0.19	0.08	0.70	943.44	687.79	18.56	101.06	0.06	0.42	471.72	515.84	11.14	30.32	0.02	0.28	471.72	171.95	7.42	70.74
B0890	18.58	19.04	0.22	0.13	1.44	775.88	814.10	19.69	81.01	0.04	0.36	160.60	252.77	4.89	10.06	0.09	1.08	615.28	561.33	14.80	70.95
B1150	10.58	9.25	0.19	0.06	0.70	372.69	389.89	9.59	38.34	0.00	0.01	5.79	9.09	0.18	0.36	0.06	0.69	366.90	380.80	9.41	37.98
B1520	25.08	23.82	0.21	0.16	1.45	963.21	1,201.51	21.38	95.81	0.00	0.03	14.97	28.01	0.40	0.89	0.16	1.42	948.24	1,173.50	20.99	94.91
B1120	30.26	51.70	0.37	0.83	7.32	2,181.53	4,914.57	67.61	215.44	0.02	0.14	33.90	114.57	1.26	2.01	0.81	7.19	2,147.63	4,800.00	66.35	213.43
B1710	39.96	44.84	0.24	0.94	10.35	2,073.33	3,955.98	89.73	231.59	0.70	6.21	1,036.67	2,966.98	53.84	69.48	0.23	4.14	1,036.67	988.99	35.89	162.11

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)																	
Basin ID	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B1140	2.79	4.30	0.33	0.11	1.18	216.84	441.78	9.91	24.04	0.00	0.02	3.37	10.30	0.19	0.22	0.10	1.16	213.47	431.48	9.73	23.81
B0880	2.62	3.37	0.28	0.09	1.01	173.67	371.40	8.30	19.39	0.03	0.25	35.95	115.32	2.06	2.41	0.06	0.76	137.72	256.08	6.24	16.98
B0860	10.67	9.99	0.20	0.03	0.30	400.12	299.37	7.57	40.25	0.01	0.07	82.82	92.95	1.88	5.00	0.02	0.22	317.30	206.42	5.69	35.25
B1130	20.43	40.81	0.43	0.99	9.90	1,919.67	4,829.46	80.82	201.39	0.02	0.18	29.83	112.58	1.51	1.88	0.97	9.71	1,889.83	4,716.88	79.31	199.51
B1060	9.91	9.14	0.20	0.13	1.46	397.14	605.44	13.62	41.19	0.00	0.03	6.45	14.74	0.27	0.40	0.13	1.44	390.69	590.70	13.35	40.78
B1080	10.62	20.91	0.43	0.64	7.10	1,050.06	2,539.61	56.11	121.99	0.24	2.13	262.51	952.35	16.84	18.30	0.40	4.97	787.54	1,587.26	39.28	103.69
B1090	17.55	37.57	0.46	1.15	12.59	1,896.36	4,741.29	99.10	216.18	0.03	0.24	29.47	110.53	1.85	2.02	1.13	12.35	1,866.89	4,630.76	97.25	214.16
B1100	1.61	3.36	0.45	0.06	0.45	136.83	356.45	4.00	13.00	0.00	0.01	2.13	8.31	0.08	0.12	0.06	0.44	134.70	348.14	3.92	12.88
B1680	43.54	38.86	0.19	0.74	7.84	1,449.70	2,837.75	63.78	165.02	0.56	4.70	724.85	2,128.32	38.27	49.51	0.19	3.14	724.85	709.44	25.51	115.51
B1700	20.66	9.86	0.10	0.09	0.78	285.57	317.76	6.85	27.90	0.06	0.47	142.78	238.32	4.11	8.37	0.02	0.31	142.78	79.44	2.74	19.53
B0920	12.71	15.90	0.27	0.07	0.51	470.85	468.82	10.74	54.46	0.02	0.13	97.46	145.56	2.67	6.76	0.05	0.39	373.38	323.25	8.08	47.69
B0855	1.75	1.27	0.16	0.00	0.04	47.02	34.80	0.91	4.90	0.00	0.01	11.75	13.05	0.27	0.74	0.00	0.02	35.26	21.75	0.63	4.16
B1640	7.28	13.29	0.39	0.46	5.18	733.47	1,824.95	40.29	83.76	0.01	0.10	11.40	42.54	0.75	0.78	0.45	5.09	722.08	1,782.41	39.54	82.98
B0850	8.37	6.96	0.18	0.02	0.21	278.52	208.39	5.27	28.02	0.01	0.06	69.63	78.15	1.58	4.20	0.01	0.15	208.89	130.24	3.69	23.82
B1660	34.86	49.35	0.31	1.36	15.06	2,508.46	5,506.07	122.51	282.20	0.03	0.28	38.99	128.36	2.29	2.63	1.32	14.78	2,469.47	5,377.71	120.22	279.57
B0800	22.95	35.85	0.34	0.18	1.17	1,036.17	1,070.45	22.77	120.71	0.07	0.35	259.04	401.42	6.83	18.11	0.11	0.82	777.13	669.03	15.94	102.60
B1070	42.42	44.76	0.23	0.64	5.92	1,519.81	3,460.08	57.38	166.57	0.02	0.12	24.67	84.25	1.12	1.62	0.62	5.80	1,495.14	3,375.83	56.26	164.94
B0830	7.95	7.93	0.22	0.02	0.24	317.54	237.58	6.01	31.94	0.01	0.07	79.38	89.09	1.80	4.79	0.02	0.17	238.15	148.49	4.21	27.15
B1650	13.35	10.97	0.18	0.09	0.92	464.42	505.46	12.07	47.97	0.00	0.02	7.22	11.78	0.23	0.45	0.08	0.90	457.20	493.68	11.84	47.53
B1670	55.91	41.62	0.16	0.40	2.79	1,659.78	1,561.36	32.63	159.20	0.01	0.05	25.80	36.40	0.61	1.48	0.39	2.74	1,633.99	1,524.96	32.02	157.72
B0810	13.25	13.62	0.22	0.04	0.41	545.23	407.95	10.31	54.85	0.02	0.12	136.31	152.98	3.10	8.23	0.03	0.28	408.93	254.97	7.22	46.62
B1690	20.74	37.68	0.39	1.03	11.25	1,698.49	3,976.36	89.33	200.69	0.77	6.75	849.25	2,982.27	53.60	60.21	0.26	4.50	849.25	994.09	35.73	140.48
B1050	20.36	17.58	0.19	0.16	1.19	442.35	922.81	12.16	44.00	0.00	0.02	7.18	22.47	0.24	0.43	0.15	1.16	435.17	900.34	11.93	43.57
B1040	9.69	8.11	0.18	0.06	0.56	301.22	376.10	7.08	29.72	-	0.01	4.89	9.16	0.14	0.29	0.06	0.55	296.33	366.94	6.94	29.43
B0780	30.11	31.13	0.22	0.10	0.98	1,241.29	972.09	23.73	124.67	0.01	0.09	92.75	108.96	2.13	5.59	0.09	0.89	1,148.54	863.14	21.60	119.08
B0790	1.24	1.07	0.19	0.00	0.03	37.90	27.06	0.76	3.79	-	0.00	2.83	3.03	0.07	0.17	0.00	0.03	35.07	24.03	0.69	3.62
B1030	3.60	5.85	0.35	0.16	1.80	295.88	654.10	14.68	33.31	0.00	0.03	4.80	15.93	0.29	0.33	0.16	1.77	291.07	638.18	14.39	32.99
B1020	9.35	7.85	0.18	0.07	0.76	330.70	389.38	9.25	34.68	0.00	0.02	5.37	9.48	0.18	0.34	0.07	0.75	325.34	379.90	9.07	34.34
B1350	8.83	6.78	0.17	0.02	0.19	260.35	193.67	4.97	26.68	-	0.00	4.23	4.72	0.10	0.26	0.02	0.19	256.12	188.95	4.88	26.42
B1360	19.21	22.62	0.25	0.42	4.56	1,037.09	1,980.58	40.80	110.87	0.01	0.09	16.84	48.23	0.79	1.08	0.41	4.47	1,020.25	1,932.36	40.00	109.79
B0760	35.34	23.32	0.14	0.17	1.63	802.13	832.72	22.47	87.90	0.02	0.15	59.94	93.33	2.01	3.94	0.15	1.49	742.19	739.38	20.45	83.96
B1370	31.34	30.92	0.21	0.59	6.53	1,461.52	2,584.76	58.85	159.42	0.02	0.13	23.72	62.94	1.15	1.55	0.57	6.40	1,437.80	2,521.82	57.71	157.86
B1510	41.52	36.40	0.19	0.22	1.85	1,232.16	1,664.41	30.78	132.33	0.17	1.11	616.08	1,248.31	18.47	39.70	0.06	0.74	616.08	416.10	12.31	92.63
B1000	55.28	65.23	0.26	0.86	9.34	2,787.21	4,088.60	94.85	302.42	0.02	0.18	45.24	99.55	1.85	2.95	0.84	9.16	2,741.97	3,989.05	93.01	299.47
B0620	18.95	20.75	0.24	0.41	4.16	756.66	1,853.11	35.37	86.38	-	-	-	-	-	-	0.41	4.16	756.66	1,853.11	35.37	86.38
B0770	5.10	5.04	0.21	0.01	0.15	197.45	146.56	3.77	19.84	0.00	0.01	14.76	16.43	0.34	0.89	0.01	0.14	182.70	130.14	3.44	18.95
B0910	33.04	33.98	0.22	0.10	1.01	1,360.80	1,018.16	25.74	136.89	0.01	0.09	101.68	114.12	2.31	6.14	0.09	0.92	1,259.12	904.04	23.43	130.75
B1010	1.47	2.62	0.39	0.07	0.78	126.02	280.93	6.32	14.57	0.00	0.02	2.05	6.84	0.12	0.14	0.07	0.76	123.97	274.09	6.20	14.43
B0580	31.01	28.18	0.20	0.08	0.84	1,128.54	844.38	21.35	113.52	-	-	-	-	-	-	0.08	0.84	1,128.54	844.38	21.35	113.52
B0750	5.47	2.58	0.10	0.01	0.05	77.78	47.11	1.54	8.64	-	-	-	-	-	-	0.01	0.05	77.78	47.11	1.54	8.64
B1390	8.25	7.78	0.20	0.02	0.23	311.68	233.20	5.90	31.35	-	0.01	5.06	5.68	0.12	0.31	0.02	0.23	306.62	227.52	5.78	31.05
B1500	20.90	21.31	0.22	0.06	0.63	853.58	638.65	16.15	85.86	0.00	0.01	13.86	15.55	0.32	0.84	0.06	0.62	839.73	623.10	15.83	85.03
B1440	2.12	2.10	0.21	0.01	0.06	84.06	62.89	1.59	8.46	-	0.00	1.37	1.53	0.03	0.08	0.01	0.06	82.69	61.36	1.56	8.37
B1430	33.08	47.05	0.31	0.16	0.84	1,151.18	786.28	24.86	148.43	0.06	0.25	287.80	294.85	7.46	22.26	0.10	0.59	863.39	491.42	17.40	126.16
B1490	3.73	4.53	0.26	0.02	0.10	130.88	92.76	2.69	15.41	0.01	0.03	32.72	34.78	0.81	2.31	0.01	0.07	98.16	57.97	1.88	13.10
B0610	11.38	11.24	0.21	0.08	0.53	357.40	479.18	8.04	38.46	-	-	-	-	-	-	0.08	0.53	357.40	479.18	8.04	38.46
B1410	4.92	4.04	0.18	0.01	0.12	161.71	120.99	3.06	16.27	-	0.00	2.63	2.95	0.06	0.16	0.01	0.12	159.08	118.05	3.00	16.11
B1400	14.33	14.74	0.22	0.04	0.44	590.15	441.55	11.16	59.36	0.00	0.01	9.58	10.75	0.22	0.58	0.04	0.43	580.57	430.80	10.95	58.79
B0510	29.74	32.28	0.23	0.14	1.24	1,200.25	1,172.69	25.39	124.15	-	-	-	-	-	-	0.14	1.24	1,200.25	1,172.69	25.39	124.15
B1450	7.99	8.22	0.22	0.02	0.25	329.16	248.23	6.24	33.10	0.00	0.01	5.34	6.05	0.12	0.32	0.02	0.24	323.82	242.19	6.11	32.78
B0570	7.99	8.56	0.23	0.04	0.37	342.83	353.42	6.92	34.12	-	-	-	-	-	-	0.04	0.37	342.83	353.42	6.92	34.12
B0010	38.77	74.36	0.41	0.29	1.13	1,238.30	953.64	30.82	200.02	-	-	-	-	-	-	0.29	1.13	1,238.30	953.64	30.82	200.02
B1420	1.99	2.03	0.22	0.01	0.06	81.47	60.96	1.54	8.20	-	0.00	1.32	1.48	0.03	0.08	0.01	0.06	80.15	59.47	1.51	8.12
B0030	50.41	77.29	0.33	0.26	1.47	2,001.11	1,384.17	42.45	249.93	-	-	-	-	-	-	0.26	1.47	2,001.11	1,384.17	42.45	249.93
B1470	5.90	6.27	0.23	0.02	0.22	251.02	216.66	4.88	25.14	-	0.00	4.08	5.28	0.10	0.25	0.02	0.22	246.95	211.38	4.78	24.90

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)																	
Basin ID	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B0020	66.38	91.90	0.30	0.49	3.58	2,878.55	3,294.84	63.08	321.33	-	-	-	-	-	-	0.49	3.58	2,878.55	3,294.84	63.08	321.33
B0650	39.31	44.53	0.24	0.65	6.73	1,914.69	3,001.78	64.35	201.36	-	-	-	-	-	-	0.65	6.73	1,914.69	3,001.78	64.35	201.36
B0690	63.35	54.42	0.19	0.84	5.20	2,018.37	3,074.00	43.51	188.71	0.08	0.39	124.75	284.99	3.23	7.00	0.77	4.82	1,893.62	2,789.01	40.28	181.71
B1460	4.60	8.02	0.38	0.13	0.96	266.05	818.46	8.93	27.18	0.00	0.02	4.32	19.93	0.17	0.26	0.12	0.94	261.73	798.53	8.76	26.91
B1480	64.20	73.26	0.25	0.49	4.04	2,903.51	3,738.73	62.01	287.34	0.01	0.08	47.13	91.03	1.21	2.80	0.47	3.97	2,856.38	3,647.69	60.80	284.54
B0700	5.24	7.26	0.30	0.20	1.21	191.76	696.22	7.79	20.75	0.16	0.97	153.41	556.98	6.24	16.60	0.04	0.24	38.35	139.24	1.56	4.15
B0710	3.19	3.63	0.25	0.05	0.36	76.26	285.79	3.50	9.21	0.04	0.28	61.01	228.63	2.80	7.37	0.01	0.07	15.25	57.16	0.70	1.84
B0720	11.67	10.38	0.19	0.14	1.06	208.50	861.32	10.62	26.84	0.01	0.08	12.89	79.85	0.79	1.00	0.13	0.98	195.62	781.46	9.83	25.84
B0730	1.70	2.03	0.26	0.03	0.21	41.63	168.59	2.05	5.20	0.02	0.17	33.30	134.87	1.64	4.16	0.01	0.04	8.33	33.72	0.41	1.04
B2420	12.75	21.60	0.37	0.40	3.53	879.91	2,262.44	31.02	89.23	0.00	0.04	7.87	30.36	0.33	0.48	0.39	3.50	872.04	2,232.08	30.68	88.75
B2400	10.09	10.38	0.22	0.06	0.58	394.35	444.37	9.38	40.97	-	0.01	3.53	5.96	0.10	0.22	0.06	0.58	390.82	438.41	9.28	40.75
B0670	11.85	18.71	0.34	0.45	4.87	789.59	1,731.13	38.74	91.09	0.36	3.89	631.67	1,384.90	31.00	72.88	0.09	0.97	157.92	346.23	7.75	18.22
B2220	38.87	38.52	0.21	0.69	4.02	1,380.77	2,183.74	31.32	131.84	-	-	-	-	-	-	0.69	4.02	1,380.77	2,183.74	31.32	131.84
B2460	30.72	28.58	0.20	0.26	1.67	1,181.22	1,047.92	21.97	114.35	0.00	0.02	10.57	14.06	0.23	0.61	0.26	1.65	1,170.65	1,033.85	21.74	113.74
B2410	15.39	27.21	0.38	0.88	9.95	1,477.61	3,536.46	78.47	167.98	0.01	0.11	13.22	47.45	0.84	0.90	0.87	9.84	1,464.39	3,489.01	77.63	167.08
B0060	57.29	82.56	0.31	2.40	12.37	3,253.72	5,291.08	63.46	293.10	-	-	-	-	-	-	2.40	12.37	3,253.72	5,291.08	63.46	293.10
B0050	20.51	32.63	0.34	0.17	0.88	858.02	647.55	18.02	105.34	-	-	-	-	-	-	0.17	0.88	858.02	647.55	18.02	105.34
B2210	20.33	19.78	0.21	0.09	0.80	774.76	721.32	15.75	77.98	-	-	-	-	-	-	0.09	0.80	774.76	721.32	15.75	77.98
B2390	25.18	31.69	0.27	0.25	2.05	1,188.83	1,842.08	28.25	119.64	0.00	0.02	10.63	24.72	0.30	0.64	0.25	2.03	1,178.20	1,817.36	27.95	119.00
B0210	6.53	6.72	0.22	0.02	0.20	269.01	201.27	5.09	27.06	-	-	-	-	-	-	0.02	0.20	269.01	201.27	5.09	27.06
B0220	27.52	31.60	0.25	0.19	1.58	1,195.26	1,457.01	26.57	121.63	-	-	-	-	-	-	0.19	1.58	1,195.26	1,457.01	26.57	121.63
B2140	23.14	20.03	0.19	0.51	3.82	767.56	1,875.20	18.51	61.88	0.01	0.04	6.87	25.16	0.20	0.33	0.51	3.78	760.69	1,850.04	18.31	61.55
B2130	8.91	12.63	0.31	0.14	1.05	506.18	912.42	11.87	48.65	0.00	0.01	4.53	12.24	0.13	0.26	0.14	1.04	501.65	900.18	11.74	48.38
B2200	13.61	14.00	0.22	0.04	0.42	560.56	419.42	10.60	56.39	-	-	-	-	-	-	0.04	0.42	560.56	419.42	10.60	56.39
B2120	3.64	3.66	0.22	0.01	0.11	146.77	110.05	2.78	14.76	-	0.00	1.31	1.48	0.03	0.08	0.01	0.11	145.45	108.57	2.75	14.68
B2030	36.52	41.68	0.25	0.19	1.53	1,420.91	1,421.15	31.03	152.48	0.05	0.32	245.24	367.92	6.43	15.79	0.14	1.21	1,175.67	1,053.23	24.61	136.69
B2440	15.60	28.46	0.39	0.49	3.45	1,083.84	2,686.30	29.70	103.30	0.01	0.04	9.70	36.05	0.32	0.56	0.49	3.41	1,074.14	2,650.26	29.38	102.74
B2110	11.49	11.39	0.21	0.04	0.37	457.78	349.22	8.64	45.86	-	0.00	4.10	4.69	0.09	0.25	0.04	0.37	453.69	344.53	8.55	45.61
B2570	9.13	14.57	0.35	0.22	1.66	572.59	1,444.99	15.13	53.10	0.18	1.33	458.07	1,155.99	12.10	42.48	0.04	0.33	114.52	289.00	3.03	10.62
B2100	11.13	11.19	0.22	0.03	0.33	448.00	335.19	8.48	45.06	-	0.00	4.01	4.50	0.09	0.24	0.03	0.33	443.99	330.70	8.38	44.82
B0200	2.95	3.04	0.22	0.01	0.09	121.65	91.02	2.30	12.24	-	-	-	-	-	-	0.01	0.09	121.65	91.02	2.30	12.24
B2090	3.83	3.93	0.22	0.01	0.12	157.50	117.85	2.98	15.84	-	0.00	1.41	1.58	0.03	0.09	0.01	0.12	156.10	116.26	2.95	15.76
B0230	3.27	3.37	0.22	0.01	0.10	134.80	100.86	2.55	13.56	-	-	-	-	-	-	0.01	0.10	134.80	100.86	2.55	13.56
B0090	10.28	17.10	0.36	0.20	1.54	665.63	1,366.32	16.60	64.47	-	-	-	-	-	-	0.20	1.54	665.63	1,366.32	16.60	64.47
B0080	26.74	43.44	0.35	0.81	5.05	1,449.26	3,379.25	39.51	146.88	-	-	-	-	-	-	0.81	5.05	1,449.26	3,379.25	39.51	146.88
B2510	9.38	8.69	0.20	0.03	0.26	344.62	256.21	6.44	34.45	-	0.00	3.08	3.44	0.07	0.18	0.03	0.26	341.54	252.77	6.37	34.27
B2020	6.38	6.57	0.22	0.02	0.20	262.68	196.51	4.97	26.44	-	-	-	-	-	-	0.02	0.20	262.68	196.51	4.97	26.44
B2080	13.96	14.75	0.23	0.11	0.73	603.89	512.44	11.27	59.10	0.00	0.01	5.40	6.88	0.12	0.32	0.11	0.73	598.49	505.57	11.15	58.78
B2040	6.32	8.78	0.30	0.03	0.17	231.44	160.88	4.88	28.62	-	0.00	2.07	2.16	0.05	0.15	0.03	0.17	229.37	158.72	4.83	28.47
B2580	2.68	5.40	0.44	0.08	0.55	188.01	476.61	5.18	18.85	0.06	0.44	150.41	381.29	4.14	15.08	0.02	0.11	37.60	95.32	1.04	3.77
B2470	11.92	12.25	0.22	0.04	0.37	490.49	366.99	9.28	49.34	-	0.00	4.39	4.92	0.10	0.27	0.04	0.36	486.10	362.06	9.18	49.07
B2000	21.97	22.72	0.22	0.07	0.67	903.95	676.83	17.13	91.18	-	-	-	-	-	-	0.07	0.67	903.95	676.83	17.13	91.18
B2520	18.54	17.61	0.21	0.05	0.52	704.46	527.18	13.33	70.88	0.00	0.01	6.30	7.07	0.14	0.38	0.05	0.52	698.16	520.10	13.18	70.50
B0240	0.68	0.74	0.24	0.00	0.03	27.42	29.67	0.61	2.84	-	-	-	-	-	-	0.00	0.03	27.42	29.67	0.61	2.84
B0250	10.08	11.43	0.25	0.06	0.55	428.88	511.24	9.56	43.88	-	-	-	-	-	-	0.06	0.55	428.88	511.24	9.56	43.88
B2010	16.85	16.72	0.21	0.05	0.50	664.45	496.61	12.59	67.07	-	-	-	-	-	-	0.05	0.50	664.45	496.61	12.59	67.07
B0292	9.56	10.22	0.23	0.04	0.37	409.07	360.23	7.98	40.94	-	-	-	-	-	-	0.04	0.37	409.07	360.23	7.98	40.94
B2070	19.70	20.59	0.23	0.12	0.87	836.15	676.99	15.67	82.67	0.00	0.01	7.48	9.08	0.17	0.44	0.12	0.86	828.67	667.91	15.51	82.22
B2480	51.63	63.71	0.27	0.28	1.91	1,767.65	1,694.99	39.34	206.44	0.10	0.57	441.91	635.62	11.80	30.97	0.18	1.33	1,325.74	1,059.37	27.54	175.47
B2150	34.21	23.24	0.15	0.08	0.59	587.86	570.47	13.14	75.73	-	0.01	5.26	7.66	0.14	0.41	0.08	0.58	582.60	562.82	13.00	75.32
B0100	13.76	22.01	0.35	0.20	1.71	679.21	1,408.71	18.69	74.02	-	-	-	-	-	-	0.20	1.71	679.21	1,408.71	18.69	74.02
B0290	4.81	7.83	0.35	0.16	1.08	175.60	757.30	8.88	21.68	-	-	-	-	-	-	0.16	1.08	175.60	757.30	8.88	21.68
B2540	11.53	11.71	0.22	0.62	2.95	444.88	914.63	7.65	36.91	0.01	0.03	3.98	12.27	0.08	0.20	0.61	2.92	440.89	902.36	7.57	36.71
B0310	28.57	35.09	0.27	0.30	2.43	1,096.51	2,107.14	32.93	121.05	-	-	-	-	-	-	0.30	2.43	1,096.51	2,107.14	32.93	121.05
B0370	71.04	85.07	0.26	0.65	5.46	3,272.36	4,561.91	71.60	324.07	-	-	-	-	-	-	0.65	5.46	3,272.36	4,561.91	71.60	324.07

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)																	
Basin ID	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B0340	10.72	17.00	0.34	0.24	2.10	666.57	1,448.00	20.74	67.80	-	-	-	-	-	-	0.24	2.10	666.57	1,448.00	20.74	67.80
B2350	36.44	37.98	0.23	0.20	1.52	1,538.38	1,228.04	28.88	152.59	0.01	0.05	39.20	46.94	0.88	2.33	0.19	1.47	1,499.17	1,181.10	28.00	150.25
B0110	22.14	24.24	0.24	0.09	0.77	891.02	750.61	17.98	92.99	-	-	-	-	-	-	0.09	0.77	891.02	750.61	17.98	92.99
B0330	17.74	29.23	0.36	0.74	8.20	1,476.67	3,119.61	68.21	163.43	-	-	-	-	-	-	0.74	8.20	1,476.67	3,119.61	68.21	163.43
B2170	11.47	7.22	0.14	0.03	0.13	37.65	107.77	2.02	16.00	0.01	0.04	9.41	40.41	0.61	2.40	0.02	0.09	28.24	67.36	1.42	13.60
B2230	11.18	10.85	0.21	0.03	0.32	434.44	325.05	8.22	43.70	-	-	-	-	-	-	0.03	0.32	434.44	325.05	8.22	43.70
B2500	63.84	95.09	0.32	0.40	2.15	2,351.08	1,773.47	50.65	300.93	0.15	0.65	587.77	665.05	15.20	45.14	0.25	1.51	1,763.31	1,108.42	35.45	255.79
B0400	2.09	2.85	0.29	0.04	0.26	71.46	220.00	2.99	8.72	-	-	-	-	-	-	0.04	0.26	71.46	220.00	2.99	8.72
B2240	12.04	13.63	0.24	0.05	0.35	432.23	317.90	8.64	48.42	0.02	0.11	108.06	119.22	2.59	7.26	0.03	0.25	324.18	198.69	6.05	41.16
B2180	7.20	5.46	0.16	0.02	0.08	30.51	62.98	1.48	12.02	0.01	0.02	7.63	23.62	0.44	1.80	0.01	0.05	22.89	39.36	1.04	10.21
B2160	19.45	12.18	0.14	0.12	1.05	264.19	570.40	14.40	38.59	0.00	0.01	2.36	7.65	0.16	0.21	0.12	1.03	261.83	562.75	14.25	38.38
B2345	10.20	10.57	0.22	0.07	0.48	428.70	354.11	8.02	42.24	0.00	0.02	10.93	13.54	0.25	0.65	0.07	0.47	417.77	340.58	7.78	41.60
B2490	17.54	16.56	0.20	0.21	1.19	430.88	683.91	10.32	50.72	0.08	0.36	107.72	256.47	3.10	7.61	0.13	0.83	323.16	427.45	7.22	43.11
B0410	6.44	8.23	0.28	0.09	0.68	224.67	577.72	8.27	26.37	-	-	-	-	-	-	0.09	0.68	224.67	577.72	8.27	26.37
B0440	25.13	26.25	0.23	0.10	0.52	425.63	483.29	11.12	72.84	-	-	-	-	-	-	0.10	0.52	425.63	483.29	11.12	72.84
B0420	6.46	6.06	0.20	0.03	0.23	93.23	197.27	3.21	16.41	-	-	-	-	-	-	0.03	0.23	93.23	197.27	3.21	16.41
B0120	23.47	24.10	0.22	0.07	0.69	898.39	692.77	17.33	93.60	-	-	-	-	-	-	0.07	0.69	898.39	692.77	17.33	93.60
B0435	4.32	4.38	0.22	0.06	0.56	88.58	228.60	4.79	15.12	-	-	-	-	-	-	0.06	0.56	88.58	228.60	4.79	15.12
B2550	5.21	5.96	0.25	0.37	1.79	267.20	541.12	4.37	19.95	0.01	0.02	2.39	7.26	0.05	0.11	0.37	1.77	264.81	533.86	4.32	19.85
B0350	20.46	27.65	0.29	0.35	3.12	919.94	2,165.55	24.16	94.55	-	-	-	-	-	-	0.35	3.12	919.94	2,165.55	24.16	94.55
B2250	0.83	1.10	0.29	0.06	0.27	41.22	83.03	0.72	3.48	-	-	-	-	-	-	0.06	0.27	41.22	83.03	0.72	3.48
B2270	7.44	7.65	0.22	0.02	0.23	306.42	229.27	5.80	30.82	0.00	0.01	7.81	8.76	0.18	0.47	0.02	0.22	298.61	220.50	5.62	30.35
B0130	7.71	7.74	0.22	0.03	0.13	38.55	112.92	2.08	17.03	-	-	-	-	-	-	0.03	0.13	38.55	112.92	2.08	17.03
B2260	14.30	14.76	0.22	0.12	0.62	290.95	364.44	6.64	41.79	0.00	0.02	7.41	13.93	0.20	0.64	0.11	0.60	283.54	350.51	6.44	41.15
B2290	21.40	22.06	0.22	0.07	0.69	884.96	669.15	16.72	88.82	0.00	0.02	22.55	25.58	0.51	1.36	0.07	0.67	862.41	643.57	16.21	87.47
B0430	43.87	56.30	0.28	0.86	8.20	1,902.84	4,631.10	48.93	188.65	-	-	-	-	-	-	0.86	8.20	1,902.84	4,631.10	48.93	188.65
B2560	22.06	18.95	0.19	0.14	1.03	204.47	477.98	10.74	49.99	0.05	0.31	51.12	179.24	3.22	7.50	0.09	0.72	153.35	298.74	7.52	42.49
B0140	17.30	16.77	0.21	0.11	0.48	106.46	310.85	4.80	37.63	-	-	-	-	-	-	0.11	0.48	106.46	310.85	4.80	37.63
B2530	22.10	51.30	0.50	1.39	15.04	2,194.93	5,283.84	120.02	270.09	0.52	4.51	548.73	1,981.44	36.01	40.51	0.87	10.53	1,646.20	3,302.40	84.01	229.57
B2280	13.87	16.67	0.26	0.46	2.36	751.98	935.10	13.17	65.18	0.02	0.07	19.16	35.75	0.40	1.00	0.44	2.28	732.82	899.35	12.77	64.19
B2300	25.37	24.52	0.21	0.07	0.72	961.96	709.96	17.75	95.67	0.00	0.02	24.52	27.14	0.54	1.46	0.07	0.70	937.45	682.82	17.21	94.21
B0170	19.81	19.14	0.21	0.22	1.06	268.51	501.29	6.78	46.81	-	-	-	-	-	-	0.22	1.06	268.51	501.29	6.78	46.81
B0150	3.20	3.62	0.24	0.08	0.40	65.74	144.22	1.53	9.33	-	-	-	-	-	-	0.08	0.40	65.74	144.22	1.53	9.33
B0180	46.66	46.50	0.22	0.16	1.15	1,208.08	1,093.29	25.47	150.80	-	-	-	-	-	-	0.16	1.15	1,208.08	1,093.29	25.47	150.80
B0480	51.13	62.12	0.26	0.80	5.39	2,562.57	3,434.71	52.30	242.53	-	-	-	-	-	-	0.80	5.39	2,562.57	3,434.71	52.30	242.53
B0470	26.32	27.62	0.23	0.16	1.21	1,119.85	933.37	21.13	110.69	-	-	-	-	-	-	0.16	1.21	1,119.85	933.37	21.13	110.69
B0460	13.52	14.04	0.22	0.06	0.52	566.71	444.14	10.66	56.44	-	-	-	-	-	-	0.06	0.52	566.71	444.14	10.66	56.44
B0450	4.51	4.71	0.23	0.03	0.19	191.10	153.75	3.58	18.92	-	-	-	-	-	-	0.03	0.19	191.10	153.75	3.58	18.92
B3000	64.67	74.97	0.25	0.94	5.65	2,468.22	3,558.33	53.00	262.20	-	-	-	-	-	-	0.94	5.65	2,468.22	3,558.33	53.00	262.20
B2310	40.21	39.01	0.21	0.21	1.58	1,537.92	1,215.88	27.83	149.73	0.01	0.05	39.19	46.48	0.85	2.29	0.21	1.53	1,498.73	1,169.40	26.98	147.45
B2330	5.54	7.04	0.27	0.25	1.25	329.03	453.80	5.64	27.27	0.01	0.04	8.39	17.35	0.17	0.42	0.24	1.21	320.65	436.45	5.47	26.85
B3020	24.71	36.25	0.32	0.65	4.05	1,469.41	2,650.84	33.24	136.98	-	-	-	-	-	-	0.65	4.05	1,469.41	2,650.84	33.24	136.98
B2340	30.12	31.98	0.23	0.29	1.82	1,292.59	1,152.57	24.10	126.45	0.01	0.06	32.94	44.06	0.74	1.93	0.28	1.76	1,259.65	1,108.51	23.36	124.52
B3030	71.34	114.94	0.35	2.23	14.08	4,768.71	9,473.98	109.94	436.17	-	-	-	-	-	-	2.23	14.08	4,768.71	9,473.98	109.94	436.17
B4426	25.44	26.97	0.23	0.10	0.94	1,079.90	920.99	20.93	108.20	0.01	0.07	66.76	85.41	1.55	4.01	0.09	0.87	1,013.13	835.58	19.38	104.19
B3040	39.51	77.80	0.43	1.44	10.35	3,129.03	7,777.17	85.74	293.29	-	-	-	-	-	-	1.44	10.35	3,129.03	7,777.17	85.74	293.29
B4360	58.33	83.47	0.31	0.32	1.36	1,241.86	1,153.28	33.10	222.19	0.24	0.82	620.93	864.96	19.86	66.66	0.08	0.54	620.93	288.32	13.24	155.53
B4424	18.03	20.73	0.25	0.12	0.99	829.66	931.15	17.07	82.28	0.01	0.07	51.29	86.35	1.27	3.05	0.10	0.92	778.36	844.80	15.81	79.22
B3070	41.39	78.87	0.41	1.95	18.46	3,638.05	8,695.96	147.42	379.76	-	-	-	-	-	-	1.95	18.46	3,638.05	8,695.96	147.42	379.76
B3060	3.11	6.71	0.47	0.09	0.68	236.38	597.34	6.49	23.57	-	-	-	-	-	-	0.09	0.68	236.38	597.34	6.49	23.57
B3090	27.72	50.98	0.40	1.46	9.90	2,091.34	5,204.02	64.07	195.42	-	-	-	-	-	-	1.46	9.90	2,091.34	5,204.02	64.07	195.42
B2360	3.23	4.95	0.33	0.16	0.85	222.87	406.18	4.48	18.82	-	-	-	-	-	-	0.16	0.85	222.87	406.18	4.48	18.82
B3100	53.69	69.72	0.28	1.06	6.56	2,703.67	4,196.61	58.60	260.86	-	-	-	-	-	-	1.06	6.56	2,703.67	4,196.61	58.60	260.86
B3080	10.29	11.40	0.24	0.14	1.18	287.80	701.02	10.86	32.76	-	-	-	-	-	-	0.14	1.18	287.80	701.02	10.86	32.76
B3530	33.00	71.97	0.47	1.68	16.44	3,235.07	8,194.08	134.36	341.76	0.12	0.91	149.02	566.16	7.43	9.44	1.56	15.53	3,086.06	7,627.92	126.93	332.31

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)																	
Basin ID	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B3510	2.92	5.94	0.44	0.24	1.32	275.02	635.83	5.91	22.01	-	-	-	-	-	-	0.24	1.32	275.02	635.83	5.91	22.01
B3500	17.01	35.89	0.46	0.84	7.80	1,637.53	4,118.24	63.29	166.92	-	-	-	-	-	-	0.84	7.80	1,637.53	4,118.24	63.29	166.92
B3110	27.62	47.82	0.37	1.08	11.02	1,982.07	4,813.52	89.94	226.91	-	-	-	-	-	-	1.08	11.02	1,982.07	4,813.52	89.94	226.91
B3135	14.53	15.04	0.22	0.06	0.27	151.09	243.20	5.09	36.96	0.02	0.08	37.77	91.20	1.53	5.54	0.04	0.19	113.32	152.00	3.56	31.42
B4310	16.48	19.45	0.26	0.12	1.00	778.30	935.04	16.29	76.95	-	-	-	-	-	-	0.12	1.00	778.30	935.04	16.29	76.95
B4420	26.59	32.41	0.26	0.28	2.24	1,296.08	2,031.15	29.23	126.34	0.03	0.17	80.13	188.36	2.17	4.69	0.25	2.07	1,215.95	1,842.79	27.06	121.65
B4300	30.56	32.70	0.23	0.35	2.15	1,356.39	1,269.41	25.23	130.14	-	-	-	-	-	-	0.35	2.15	1,356.39	1,269.41	25.23	130.14
B3520	28.31	49.57	0.38	1.81	9.79	2,263.72	4,691.29	47.10	186.13	-	-	-	-	-	-	1.81	9.79	2,263.72	4,691.29	47.10	186.13
B4140	33.50	39.13	0.25	0.23	1.98	1,557.02	1,838.77	32.62	154.50	-	-	-	-	-	-	0.23	1.98	1,557.02	1,838.77	32.62	154.50
B4410	23.59	23.46	0.22	0.07	0.70	939.47	702.92	17.77	94.50	0.01	0.05	58.08	65.19	1.32	3.51	0.06	0.65	881.39	637.73	16.45	91.00
B3120	14.69	14.46	0.21	0.05	0.38	456.64	379.68	9.26	51.83	-	-	-	-	-	-	0.05	0.38	456.64	379.68	9.26	51.83
B3140	10.63	12.75	0.26	0.15	1.59	537.74	734.38	17.07	57.87	-	-	-	-	-	-	0.15	1.59	537.74	734.38	17.07	57.87
B4000	45.54	47.30	0.22	0.14	1.39	1,869.68	1,396.38	35.47	189.17	-	-	-	-	-	-	0.14	1.39	1,869.68	1,396.38	35.47	189.17
B3540	22.06	41.27	0.40	1.11	11.98	2,059.99	4,848.75	96.69	225.22	0.08	0.66	94.89	335.02	5.34	6.22	1.04	11.31	1,965.10	4,513.73	91.34	219.00
B3130	42.90	51.51	0.26	0.16	1.39	1,869.59	1,378.26	36.18	196.65	-	-	-	-	-	-	0.16	1.39	1,869.59	1,378.26	36.18	196.65
B3550	31.96	47.50	0.32	0.48	3.98	1,807.83	3,121.33	45.94	182.99	0.36	2.39	903.91	2,341.00	27.57	54.90	0.12	1.59	903.91	780.33	18.38	128.09
B4290	26.67	27.38	0.22	0.29	2.07	826.30	1,583.41	24.34	92.25	-	-	-	-	-	-	0.29	2.07	826.30	1,583.41	24.34	92.25
B4200	25.12	28.88	0.25	0.16	2.37	1,104.10	1,731.59	25.19	109.36	-	-	-	-	-	-	0.16	2.37	1,104.10	1,731.59	25.19	109.36
B4380	12.96	18.40	0.31	0.06	0.40	539.78	383.69	11.04	63.07	0.01	0.03	33.37	35.58	0.82	2.34	0.06	0.37	506.40	348.10	10.22	60.73
B4400	13.95	14.35	0.22	0.04	0.43	574.62	429.93	10.87	57.80	0.00	0.03	35.53	39.87	0.81	2.14	0.04	0.40	539.10	390.06	10.06	55.66
B4490	14.41	15.62	0.23	0.25	1.37	661.87	675.49	12.03	61.64	0.19	0.82	330.94	506.62	7.22	18.49	0.06	0.55	330.94	168.87	4.81	43.14
B4510	11.69	13.41	0.25	0.07	0.44	456.09	354.07	8.93	49.08	0.05	0.27	228.05	265.56	5.36	14.73	0.02	0.18	228.05	88.52	3.57	34.36
B3150	8.67	8.91	0.22	0.03	0.27	356.94	267.07	6.75	35.91	-	-	-	-	-	-	0.03	0.27	356.94	267.07	6.75	35.91
B4145	34.93	54.80	0.34	0.89	8.00	2,069.75	4,954.23	71.66	220.51	-	-	-	-	-	-	0.89	8.00	2,069.75	4,954.23	71.66	220.51
B3160	7.22	7.43	0.22	0.02	0.22	297.36	222.49	5.63	29.91	-	-	-	-	-	-	0.02	0.22	297.36	222.49	5.63	29.91
B4150	6.84	7.13	0.23	0.06	0.43	242.87	388.28	5.66	25.77	-	-	-	-	-	-	0.06	0.43	242.87	388.28	5.66	25.77
B3650	23.70	32.22	0.29	0.29	2.33	1,288.61	2,103.07	29.43	125.29	0.02	0.13	59.36	145.31	1.63	3.46	0.27	2.20	1,229.25	1,957.77	27.81	121.83
B4500	8.44	6.86	0.18	0.04	0.31	275.24	226.05	5.17	27.23	0.03	0.18	137.62	169.54	3.10	8.17	0.01	0.12	137.62	56.51	2.07	19.06
B4390	1.75	1.72	0.21	0.01	0.05	68.95	51.59	1.31	6.94	-	0.00	4.26	4.78	0.10	0.26	0.00	0.05	64.69	46.81	1.21	6.68
B4220	22.54	29.05	0.28	0.10	0.64	867.78	619.00	17.66	100.45	0.03	0.16	181.27	193.96	4.43	12.59	0.07	0.48	686.50	425.04	13.23	87.86
B4240	11.43	13.54	0.26	0.10	0.82	440.91	724.50	12.22	47.98	0.03	0.21	92.10	227.02	3.06	6.01	0.07	0.62	348.81	497.48	9.16	41.97
B3170	11.07	12.00	0.23	0.05	0.46	480.24	445.29	9.47	47.98	-	-	-	-	-	-	0.05	0.46	480.24	445.29	9.47	47.98
B4205	5.36	5.25	0.21	0.02	0.16	210.27	157.32	3.98	21.15	-	-	-	-	-	-	0.02	0.16	210.27	157.32	3.98	21.15
B3180	20.48	21.11	0.22	0.06	0.63	845.38	632.52	15.99	85.04	-	-	-	-	-	-	0.06	0.63	845.38	632.52	15.99	85.04
B3190	25.89	54.56	0.46	1.31	13.00	2,553.99	6,418.68	106.43	267.19	-	-	-	-	-	-	1.31	13.00	2,553.99	6,418.68	106.43	267.19
B4260	11.91	13.97	0.25	0.32	1.68	608.06	730.60	11.09	54.49	0.12	0.50	152.01	273.98	3.33	8.17	0.20	1.18	456.04	456.63	7.76	46.32
B3575	4.53	9.60	0.46	0.33	3.77	531.13	1,325.20	29.28	60.71	0.02	0.21	24.47	91.56	1.62	1.68	0.31	3.56	506.66	1,233.64	27.66	59.03
B4160	12.36	12.84	0.22	0.04	0.36	486.46	361.14	9.32	50.17	-	-	-	-	-	-	0.04	0.36	486.46	361.14	9.32	50.17
B4180	2.07	2.50	0.26	0.01	0.06	80.57	58.28	1.61	8.98	-	-	-	-	-	-	0.01	0.06	80.57	58.28	1.61	8.98
B4230	3.53	3.63	0.22	0.01	0.11	145.48	108.85	2.75	14.63	0.00	0.03	30.39	34.11	0.69	1.83	0.01	0.08	115.09	74.74	2.06	12.80
B4210	23.07	33.82	0.32	0.11	0.69	922.88	654.88	19.31	112.01	0.04	0.21	230.72	245.58	5.79	16.80	0.07	0.48	692.16	409.30	13.52	95.21
B3200	2.15	4.68	0.47	0.07	0.56	186.71	487.76	5.08	17.46	-	-	-	-	-	-	0.07	0.56	186.71	487.76	5.08	17.46
B4370	14.11	14.51	0.22	0.04	0.43	581.18	434.84	10.99	58.46	-	-	-	-	-	-	0.04	0.43	581.18	434.84	10.99	58.46
B3580	2.44	4.10	0.36	0.09	0.91	184.36	443.96	7.37	18.93	0.01	0.05	8.49	30.67	0.41	0.52	0.09	0.86	175.87	413.28	6.96	18.41
B4250	5.36	7.91	0.32	0.07	0.50	185.29	423.19	6.60	23.84	0.03	0.15	46.32	158.69	1.98	3.58	0.04	0.35	138.97	264.49	4.62	20.26
B3210	3.52	7.65	0.47	0.12	0.92	305.52	797.62	8.30	28.54	0.10	0.73	244.41	638.09	6.64	22.84	0.02	0.18	61.10	159.52	1.66	5.71
B4010	10.08	11.20	0.24	0.04	0.37	403.62	354.28	8.31	42.48	-	-	-	-	-	-	0.04	0.37	403.62	354.28	8.31	42.48
B3600	16.71	28.72	0.37	0.44	3.32	903.40	2,806.27	31.11	93.61	0.03	0.18	41.61	193.90	1.72	2.59	0.41	3.13	861.79	2,612.37	29.39	91.02
B3220	6.34	14.22	0.48	0.20	1.44	495.36	1,255.77	13.64	49.67	0.16	1.15	396.29	1,004.62	10.91	39.74	0.04	0.29	99.07	251.15	2.73	9.94
B4280	2.95	4.18	0.31	0.01	0.08	106.98	73.87	2.28	13.45	0.01	0.02	26.75	27.70	0.68	2.02	0.01	0.06	80.23	46.17	1.60	11.43
B3670	4.15	7.29	0.38	0.10	0.75	291.31	662.04	7.48	27.62	0.01	0.04	13.42	45.74	0.41	0.76	0.09	0.71	277.89	616.30	7.07	26.85
B3700	28.27	36.09	0.28	0.32	2.52	1,366.71	2,243.71	32.40	136.16	0.02	0.14	62.95	155.02	1.79	3.76	0.30	2.38	1,303.76	2,088.68	30.61	132.40
B4020	12.51	16.48	0.28	0.15	1.21	527.02	1,048.40	15.49	57.18	-	-	-	-	-	-	0.15	1.21	527.02	1,048.40	15.49	57.18
B3710	197.28	299.52	0.33	2.47	19.76	8,257.82	13,453.40	229.09	990.97	0.93	5.92	2,064.46	5,045.02	68.73	148.64	1.54	13.83	6,193.37	8,408.38	160.36	842.32
B4480	18.53	20.65	0.24	0.33	1.85	882.95	907.76	16.01	81.88	0.10	0.46	184.44	284.44	4.01	10.26	0.23	1.39	698.51	623.32	11.99	71.62

Information				Average Annual Loads (pounds, G=Gross, R=Removed, N=Net)																	
Basin ID	Area (ac)	Runoff Volume (ac-ft)	Composite Runoff Coefficient	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B4460	3.46	3.88	0.24	0.01	0.10	130.69	95.27	2.58	14.24	0.01	0.03	32.67	35.73	0.77	2.14	0.01	0.07	98.02	59.54	1.80	12.11
B4040	48.71	75.47	0.33	1.65	17.98	3,610.76	7,282.53	154.01	393.31	-	-	-	-	-	-	1.65	17.98	3,610.76	7,282.53	154.01	393.31
B4470	75.71	73.10	0.21	0.22	2.15	2,869.04	2,142.30	54.17	289.76	0.01	0.11	119.41	133.74	2.70	7.24	0.21	2.04	2,749.63	2,008.56	51.46	282.53
B4430	8.52	8.87	0.23	0.03	0.24	320.24	236.04	6.20	33.76	0.00	0.02	23.90	26.43	0.56	1.51	0.03	0.22	296.34	209.61	5.65	32.25
B4440	22.24	20.78	0.20	0.06	0.62	832.29	622.72	15.74	83.72	0.01	0.06	62.12	69.72	1.41	3.75	0.06	0.56	770.16	553.00	14.34	79.97
B4060	73.88	77.14	0.23	0.28	2.59	3,069.89	2,502.54	58.73	307.60	-	-	-	-	-	-	0.28	2.59	3,069.89	2,502.54	58.73	307.60
B4122	7.52	7.73	0.22	0.02	0.23	309.73	231.74	5.86	31.16	-	-	-	-	-	-	0.02	0.23	309.73	231.74	5.86	31.16
B4050	48.72	50.76	0.23	0.15	1.49	1,998.68	1,491.92	37.95	202.57	-	-	-	-	-	-	0.15	1.49	1,998.68	1,491.92	37.95	202.57
B4125	30.68	52.06	0.37	1.34	7.19	1,956.05	3,533.16	40.88	180.13	1.00	4.31	978.02	2,649.87	24.53	54.04	0.34	2.87	978.02	883.29	16.36	126.09
B4450	19.00	18.24	0.21	0.05	0.52	704.14	524.14	13.43	72.01	0.01	0.05	60.07	67.07	1.38	3.69	0.05	0.47	644.07	457.07	12.06	68.32
B3800	39.87	48.46	0.26	0.33	2.78	1,923.63	2,557.08	41.49	189.37	0.13	0.83	480.91	958.90	12.45	28.41	0.21	1.95	1,442.72	1,598.17	29.04	160.97
B4070	2.69	2.76	0.22	0.01	0.08	110.70	82.83	2.09	11.14	-	-	-	-	-	-	0.01	0.08	110.70	82.83	2.09	11.14
B4080	104.83	111.03	0.23	0.40	3.76	4,423.51	3,700.76	85.52	444.47	-	-	-	-	-	-	0.40	3.76	4,423.51	3,700.76	85.52	444.47
B4126	5.42	5.58	0.22	0.02	0.17	223.29	167.07	4.22	22.46	-	-	-	-	-	-	0.02	0.17	223.29	167.07	4.22	22.46
B4132	4.57	7.16	0.34	0.09	0.70	286.17	622.95	7.23	27.23	0.01	0.04	14.42	47.10	0.44	0.82	0.08	0.66	271.74	575.85	6.79	26.41
B4135	4.23	3.99	0.20	0.04	0.29	153.33	259.37	3.40	14.46	0.00	0.02	7.73	19.61	0.21	0.44	0.04	0.28	145.60	239.76	3.19	14.02
B3730	2.36	2.60	0.24	0.01	0.10	101.71	94.09	2.02	10.26	0.00	0.03	25.43	35.29	0.61	1.54	0.01	0.07	76.28	58.81	1.41	8.72
B3790	137.80	230.99	0.36	3.59	23.03	8,340.85	16,511.14	202.10	823.37	2.69	13.82	4,170.43	12,383.35	121.25	247.01	0.90	9.21	4,170.43	4,127.78	80.84	576.35
B4136	6.89	12.79	0.40	0.20	1.50	510.05	1,310.18	13.77	47.76	0.15	0.90	255.02	982.64	8.26	14.33	0.05	0.60	255.02	327.55	5.51	33.43
B3740	10.42	13.42	0.28	0.11	0.90	496.90	809.26	12.18	50.35	0.04	0.27	124.22	303.47	3.66	7.55	0.07	0.63	372.67	505.79	8.53	42.80
B4137	3.58	7.00	0.42	0.11	0.83	279.32	729.70	7.60	26.12	0.08	0.50	139.66	547.27	4.56	7.84	0.03	0.33	139.66	182.42	3.04	18.28
B4130	5.94	7.82	0.28	0.09	0.71	257.72	593.46	6.85	24.63	0.01	0.04	12.99	44.87	0.41	0.74	0.09	0.66	244.73	548.59	6.43	23.88
B3750	6.06	7.32	0.26	0.06	0.47	230.55	407.69	6.65	25.38	0.02	0.14	57.64	152.88	1.99	3.81	0.04	0.33	172.92	254.81	4.65	21.57
B4090	25.96	32.21	0.27	0.16	1.30	1,057.25	1,176.57	23.92	113.82	0.01	0.08	53.29	88.96	1.45	3.44	0.15	1.23	1,003.96	1,087.61	22.48	110.38
B4131	3.26	5.14	0.34	0.07	0.51	195.41	440.05	4.93	18.31	0.01	0.03	9.85	33.27	0.30	0.56	0.06	0.48	185.56	406.77	4.64	17.76
B3760	14.88	18.50	0.27	0.13	1.42	716.51	1,131.88	16.33	70.61	0.05	0.43	179.13	424.45	4.90	10.59	0.08	1.00	537.38	707.42	11.43	60.02
B4133	2.68	3.81	0.31	0.05	0.41	148.80	356.97	3.94	14.02	0.00	0.03	7.50	26.99	0.24	0.42	0.05	0.38	141.30	329.98	3.70	13.59
B3810	30.03	41.79	0.30	0.38	4.34	1,601.98	3,323.76	40.05	155.16	0.14	1.30	400.50	1,246.41	12.01	23.27	0.24	3.04	1,201.48	2,077.35	28.03	131.88
B4100	31.55	32.38	0.22	0.10	0.96	1,296.68	970.18	24.53	130.44	0.01	0.06	65.36	73.36	1.48	3.94	0.09	0.91	1,231.32	896.83	23.05	126.49
B4138	15.68	14.68	0.20	0.07	0.62	563.32	587.97	11.51	57.10	0.01	0.07	53.35	83.53	1.31	3.25	0.06	0.55	509.96	504.43	10.20	53.85
B4128	1.92	3.04	0.34	0.01	0.05	65.59	43.35	1.48	9.09	0.00	0.02	16.40	16.26	0.44	1.36	0.01	0.03	49.20	27.10	1.03	7.72
B4110	27.50	28.28	0.22	0.08	0.84	1,132.65	847.45	21.43	113.94	0.01	0.05	57.09	64.08	1.30	3.45	0.08	0.79	1,075.56	783.38	20.13	110.49
B4120	50.61	61.51	0.26	0.47	3.83	2,193.21	3,411.37	54.34	225.77	0.04	0.23	110.55	257.93	3.29	6.83	0.43	3.60	2,082.66	3,153.43	51.05	218.94

Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)					
Name	Area (ac)	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN
Hammond Branch	913	0.011	0.088	39.904	51.222	0.989	4.228
Jeffords Street	651	0.008	0.059	40.331	45.185	0.882	4.282
Lake Belleview	654	0.023	0.180	57.383	112.399	1.652	5.970
Lower Spring	464	0.009	0.079	37.795	47.505	0.973	3.949
Lower Stevenson	822	0.013	0.092	41.283	60.264	0.993	4.518
Middle Stevenson	535	0.025	0.194	58.902	114.571	1.686	5.924
Upper Spring	1673	0.021	0.194	50.239	88.397	1.737	5.391
Upper Stevenson	575	0.010	0.085	46.339	57.642	1.102	4.704

Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)					
Name	Area (ac)	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN
Hammond Branch	913	0.002	0.010	3.338	6.967	0.114	0.259
Jeffords Street	651	0.002	0.007	4.435	6.279	0.114	0.319
Lake Belleview	654	0.007	0.042	13.554	37.405	0.418	0.848
Lower Spring	464	0.002	0.016	4.853	9.443	0.169	0.405
Lower Stevenson	822	0.000	0.000	0.000	0.000	0.000	0.000
Middle Stevenson	535	0.001	0.004	1.267	3.239	0.036	0.127
Upper Spring	1673	0.006	0.043	9.004	23.416	0.363	0.626
Upper Stevenson	575	0.002	0.011	3.098	8.585	0.084	0.176

Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)					
Name	Area (ac)	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
Hammond Branch	913	0.010	0.078	36.566	44.255	0.875	3.970
Jeffords Street	651	0.006	0.052	35.896	38.906	0.768	3.964
Lake Belleview	654	0.016	0.138	43.829	74.994	1.234	5.122
Lower Spring	464	0.007	0.062	32.942	38.062	0.804	3.544
Lower Stevenson	822	0.013	0.092	41.283	60.264	0.993	4.518
Middle Stevenson	535	0.025	0.190	57.634	111.332	1.650	5.797
Upper Spring	1673	0.015	0.152	41.236	64.981	1.375	4.765
Upper Stevenson	575	0.008	0.074	43.241	49.057	1.018	4.527

Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)																
Name	Area (ac)	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B1340	12.19	0.066	0.713	103.204	250.243	5.644	12.510	0.025	0.214	25.801	93.841	1.693	1.877	0.041	0.499	77.403	156.402	3.951	10.633
B1310	15.64	0.019	0.208	47.503	90.078	1.914	5.226	0.001	0.012	2.321	6.602	0.112	0.153	0.018	0.196	45.182	83.477	1.801	5.073
B1970	17.77	0.079	0.391	71.202	138.498	1.262	5.282	0.002	0.009	1.358	3.962	0.029	0.061	0.076	0.382	69.844	134.536	1.233	5.222
B1320	29.59	0.010	0.102	37.554	48.304	1.134	4.004	0.001	0.005	1.657	3.197	0.060	0.106	0.009	0.096	35.897	45.108	1.074	3.898
B1300	7.15	0.006	0.050	26.817	44.231	0.745	2.920	0.000	0.003	1.310	3.242	0.044	0.086	0.006	0.048	25.507	40.990	0.701	2.834
B1280	10.09	0.006	0.044	30.870	38.864	0.781	3.614	0.002	0.013	7.718	14.574	0.234	0.542	0.004	0.031	23.153	24.290	0.546	3.072
B1290	15.91	0.032	0.353	63.261	133.630	2.961	7.136	0.002	0.021	3.091	9.793	0.174	0.209	0.030	0.332	60.170	123.837	2.787	6.927
B1990	19.36	0.010	0.062	40.459	50.026	0.914	4.650	0.004	0.019	10.115	18.760	0.274	0.698	0.006	0.043	30.344	31.267	0.640	3.953
B1950	12.82	0.033	0.261	62.865	171.543	2.178	6.367	0.001	0.006	1.199	4.908	0.050	0.073	0.032	0.255	61.666	166.635	2.128	6.295
B1980	4.81	0.002	0.022	29.880	22.356	0.565	3.006	-	0.001	0.570	0.640	0.013	0.035	0.002	0.022	29.310	21.717	0.552	2.971
B1270	9.10	0.003	0.032	34.005	31.150	0.669	3.404	0.001	0.010	8.501	11.681	0.201	0.511	0.002	0.022	25.504	19.469	0.468	2.894
B1930	12.93	0.078	0.405	79.854	172.921	1.594	6.201	0.058	0.243	39.927	129.691	0.957	1.860	0.019	0.162	39.927	43.230	0.638	4.341
B1260	10.95	0.047	0.262	66.787	134.532	1.417	5.654	0.035	0.157	33.393	100.899	0.850	1.696	0.012	0.105	33.393	33.633	0.567	3.958
B1910	16.47	0.057	0.321	75.385	154.363	1.668	6.360	0.043	0.193	37.693	115.772	1.001	1.908	0.014	0.128	37.693	38.591	0.667	4.452
B1920	20.76	0.035	0.373	73.643	144.468	3.175	8.235	0.012	0.106	17.409	51.228	0.901	1.168	0.023	0.267	56.234	93.241	2.275	7.067
B1900	2.93	0.054	0.333	82.336	202.208	2.072	7.187	0.021	0.100	20.584	75.828	0.622	1.078	0.033	0.233	61.752	126.380	1.451	6.109
B1230	144.39	0.032	0.254	60.828	111.023	2.132	6.737	0.012	0.076	15.207	41.634	0.640	1.011	0.020	0.178	45.621	69.389	1.492	5.727
B1240	4.10	0.042	0.353	77.119	188.056	2.873	8.396	0.031	0.211	38.559	141.042	1.723	2.519	0.010	0.141	38.559	47.014	1.149	5.878
B1870	40.11	0.010	0.062	30.080	45.191	0.739	2.975	0.008	0.049	24.064	36.153	0.591	2.380	0.002	0.012	6.016	9.038	0.148	0.595
B1880	9.47	0.091	0.476	94.888	209.791	1.960	7.704	0.068	0.285	47.444	157.343	1.176	2.311	0.023	0.190	47.444	52.448	0.784	5.393
B1600	17.19	0.014	0.154	51.283	72.261	1.609	5.372	0.001	0.007	1.979	4.182	0.075	0.124	0.014	0.147	49.304	68.078	1.534	5.247
B1610	53.46	0.058	0.629	98.845	242.954	4.973	10.988	0.003	0.029	3.814	14.062	0.230	0.254	0.055	0.600	95.031	228.892	4.743	10.734
B1790	9.72	0.069	0.771	110.028	270.842	6.051	12.942	0.016	0.141	16.815	62.087	1.110	1.187	0.054	0.630	93.213	208.755	4.942	11.756
B1780	9.38	0.057	0.633	96.146	226.041	5.013	10.911	0.021	0.190	24.037	84.765	1.504	1.637	0.035	0.443	72.110	141.275	3.510	9.274
B1820	27.45	0.037	0.412	75.012	153.417	3.474	8.554	0.014	0.124	18.753	57.531	1.042	1.283	0.023	0.288	56.259	95.886	2.431	7.271
B1620	11.16	0.022	0.169	26.615	134.113	1.660	3.824	0.018	0.135	21.292	107.291	1.328	3.059	0.005	0.034	5.323	26.823	0.332	0.765
B1830	9.52	0.002	0.020	27.040	20.267	0.511	2.719	0.002	0.012	13.520	15.200	0.307	0.816	0.001	0.008	13.520	5.067	0.205	1.903
B1850	15.40	0.002	0.022	29.773	22.276	0.563	2.995	0.002	0.013	14.886	16.707	0.338	0.898	0.001	0.009	14.886	5.569	0.225	2.096
B1800	11.52	0.065	0.714	104.028	251.296	5.670	12.539	0.024	0.214	26.007	94.236	1.701	1.881	0.041	0.500	78.021	157.060	3.969	10.658
B1760	4.77	0.052	0.578	81.354	205.047	4.513	9.752	0.020	0.173	20.339	76.893	1.354	1.463	0.033	0.404	61.016	128.154	3.159	8.289
B1750	9.21	0.071	0.354	53.127	110.535	1.041	4.430	0.027	0.106	13.282	41.451	0.312	0.665	0.045	0.248	39.845	69.085	0.729	3.765
B1180	31.02	0.011	0.052	35.227	36.646	0.933	5.115	0.004	0.016	8.807	13.742	0.280	0.767	0.007	0.037	26.420	22.904	0.653	4.348
B1840	5.54	0.002	0.020	27.020	20.216	0.511	2.718	0.001	0.012	13.510	15.162	0.307	0.815	0.001	0.008	13.510	5.054	0.205	1.903
B1540	12.17	0.005	0.050	40.873	42.700	0.912	4.221	0.000	0.002	1.577	2.471	0.042	0.098	0.005	0.048	39.296	40.228	0.870	4.123
B1590	33.60	0.003	0.032	40.868	32.026	0.787	4.124	0.000	0.002	1.577	1.854	0.037	0.096	0.003	0.031	39.291	30.172	0.751	4.029
B1580	16.62	0.005	0.033	39.742	29.447	0.821	4.536	0.002	0.010	9.935	11.043	0.246	0.680	0.003	0.023	29.806	18.404	0.575	3.856
B1550	25.55	0.003	0.031	41.128	31.328	0.781	4.135	0.000	0.001	1.587	1.813	0.036	0.096	0.003	0.030	39.541	29.514	0.744	4.039
B1190	21.23	0.002	0.010	14.421	8.338	0.340	1.940	0.001	0.002	2.283	1.980	0.065	0.184	0.002	0.008	12.138	6.358	0.276	1.755
B1220	30.14	0.002	0.020	26.643	19.874	0.506	2.679	0.001	0.004	4.217	4.719	0.096	0.254	0.002	0.016	22.426	15.155	0.410	2.425
B1210	1.25	0.002	0.016	19.968	14.374	0.396	1.999	-	0.002	3.161	3.413	0.075	0.190	0.001	0.012	16.807	10.961	0.321	1.809
B1860	22.99	0.005	0.035	27.644	29.676	0.612	2.930	0.004	0.028	22.115	23.741	0.490	2.344	0.001	0.007	5.529	5.935	0.122	0.586
B1570	23.69	0.003	0.029	38.721	28.971	0.733	3.895	0.000	0.001	1.494	1.677	0.034	0.090	0.003	0.028	37.227	27.294	0.699	3.805
B0900	19.23	0.003	0.029	38.404	28.734	0.727	3.863	0.000	0.001	1.482	1.663	0.034	0.089	0.003	0.027	36.922	27.071	0.693	3.774
B1530	20.50	0.004	0.026	37.071	25.815	0.755	4.284	0.000	0.001	1.430	1.494	0.035	0.099	0.004	0.025	35.641	24.321	0.720	4.185
B1560	10.44	0.003	0.030	40.337	30.180	0.763	4.058	0.000	0.001	1.556	1.747	0.035	0.094	0.003	0.029	38.780	28.433	0.728	3.964
B1170	3.54	0.001	0.019	24.556	17.139	0.505	2.450	-	0.000	0.382	0.400	0.009	0.023	0.001	0.019	24.175	16.740	0.496	2.427
B1172	3.17	0.001	0.015	19.178	12.902	0.410	1.905	-	0.000	0.298	0.301	0.008	0.018	0.001	0.015	18.880	12.602	0.403	1.888

Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)																	
Name	Area (ac)	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B1160	5.31	0.002	0.025	33.863	24.970	0.653	3.400	-	0.000	0.526	0.582	0.012	0.032	0.002	0.025	33.337	24.388	0.640	3.369
B1720	31.19	0.003	0.023	30.246	22.050	0.595	3.240	0.002	0.014	15.123	16.537	0.357	0.972	0.001	0.009	15.123	5.512	0.238	2.268
B0890	18.58	0.007	0.077	41.754	43.811	1.059	4.360	0.002	0.019	8.643	13.603	0.263	0.541	0.005	0.058	33.112	30.208	0.796	3.818
B1150	10.58	0.006	0.066	35.212	36.836	0.906	3.622	0.000	0.001	0.547	0.859	0.017	0.034	0.006	0.065	34.665	35.978	0.889	3.588
B1520	25.08	0.007	0.058	38.401	47.902	0.853	3.820	0.000	0.001	0.597	1.117	0.016	0.036	0.006	0.057	37.804	46.785	0.837	3.784
B1120	30.26	0.028	0.242	72.100	162.427	2.235	7.120	0.001	0.005	1.121	3.786	0.042	0.066	0.027	0.238	70.980	158.641	2.193	7.054
B1710	39.96	0.023	0.259	51.882	98.992	2.245	5.795	0.018	0.155	25.941	74.244	1.347	1.739	0.006	0.104	25.941	24.748	0.898	4.057
B1140	2.79	0.038	0.423	77.710	158.320	3.552	8.614	0.001	0.008	1.208	3.691	0.066	0.080	0.037	0.414	76.502	154.630	3.486	8.534
B0880	2.62	0.034	0.385	66.254	141.685	3.168	7.398	0.011	0.096	13.714	43.992	0.787	0.919	0.024	0.289	52.540	97.693	2.381	6.479
B0860	10.67	0.003	0.028	37.506	28.062	0.710	3.773	0.001	0.007	7.763	8.713	0.176	0.469	0.002	0.021	29.743	19.349	0.533	3.304
B1130	20.43	0.048	0.484	93.948	236.352	3.955	9.856	0.001	0.009	1.460	5.510	0.074	0.092	0.047	0.475	92.488	230.843	3.882	9.764
B1060	9.91	0.014	0.148	40.070	61.087	1.374	4.156	0.000	0.003	0.650	1.487	0.027	0.041	0.013	0.145	39.420	59.600	1.347	4.115
B1080	10.62	0.060	0.669	98.904	239.205	5.285	11.490	0.023	0.200	24.726	89.702	1.586	1.724	0.038	0.468	74.178	149.503	3.700	9.767
B1090	17.55	0.066	0.717	108.034	270.107	5.646	12.315	0.002	0.013	1.679	6.297	0.105	0.115	0.064	0.704	106.355	263.810	5.540	12.201
B1100	1.61	0.035	0.279	84.969	221.353	2.482	8.073	0.001	0.005	1.321	5.160	0.047	0.075	0.034	0.274	83.648	216.193	2.436	7.998
B1680	43.54	0.017	0.180	33.299	65.181	1.465	3.790	0.013	0.108	16.649	48.886	0.879	1.137	0.004	0.072	16.649	16.295	0.586	2.653
B1700	20.66	0.004	0.038	13.821	15.379	0.332	1.350	0.003	0.023	6.910	11.534	0.199	0.405	0.001	0.015	6.910	3.845	0.133	0.945
B0920	12.71	0.006	0.040	37.037	36.878	0.845	4.284	0.002	0.010	7.666	11.450	0.210	0.532	0.004	0.030	29.371	25.427	0.635	3.752
B0855	1.75	0.002	0.020	26.806	19.839	0.516	2.791	0.001	0.006	6.701	7.440	0.155	0.419	0.001	0.014	20.104	12.399	0.361	2.372
B1640	7.28	0.063	0.712	100.762	250.704	5.534	11.506	0.002	0.013	1.566	5.844	0.103	0.107	0.062	0.699	99.196	244.860	5.431	11.399
B0850	8.37	0.003	0.025	33.288	24.906	0.630	3.349	0.001	0.007	8.322	9.340	0.189	0.502	0.002	0.017	24.966	15.566	0.441	2.846
B1660	34.86	0.039	0.432	71.961	157.954	3.514	8.096	0.001	0.008	1.118	3.682	0.066	0.076	0.038	0.424	70.842	154.271	3.449	8.020
B0800	22.95	0.008	0.051	45.153	46.646	0.992	5.260	0.003	0.015	11.288	17.492	0.298	0.789	0.005	0.036	33.864	29.154	0.695	4.471
B1070	42.42	0.015	0.139	35.828	81.567	1.353	3.927	0.000	0.003	0.582	1.986	0.026	0.038	0.015	0.137	35.246	79.581	1.326	3.888
B0830	7.95	0.003	0.030	39.933	29.878	0.755	4.017	0.001	0.009	9.983	11.204	0.227	0.603	0.002	0.021	29.949	18.674	0.529	3.414
B1650	13.35	0.006	0.069	34.788	37.862	0.904	3.594	0.000	0.001	0.541	0.883	0.017	0.034	0.006	0.068	34.247	36.979	0.887	3.560
B1670	55.91	0.007	0.050	29.689	27.929	0.584	2.848	0.000	0.001	0.461	0.651	0.011	0.027	0.007	0.049	29.228	27.278	0.573	2.821
B0810	13.25	0.003	0.031	41.141	30.782	0.778	4.138	0.001	0.009	10.285	11.543	0.234	0.621	0.002	0.021	30.856	19.239	0.545	3.518
B1690	20.74	0.050	0.543	81.891	191.715	4.307	9.676	0.037	0.326	40.945	143.786	2.584	2.903	0.012	0.217	40.945	47.929	1.723	6.773
B1050	20.36	0.008	0.058	21.730	45.331	0.598	2.162	0.000	0.001	0.353	1.104	0.012	0.021	0.008	0.057	21.377	44.227	0.586	2.140
B1040	9.69	0.006	0.058	31.072	38.796	0.730	3.066	-	0.001	0.504	0.945	0.014	0.030	0.006	0.057	30.568	37.851	0.716	3.036
B0780	30.11	0.003	0.033	41.221	32.281	0.788	4.140	0.000	0.003	3.080	3.618	0.071	0.186	0.003	0.030	38.141	28.663	0.717	3.954
B0790	1.24	0.002	0.023	30.545	21.807	0.613	3.056	-	0.002	2.282	2.444	0.055	0.137	0.002	0.022	28.262	19.363	0.558	2.918
B1030	3.60	0.044	0.501	82.238	181.806	4.081	9.259	0.001	0.010	1.335	4.427	0.080	0.090	0.044	0.491	80.902	177.380	4.001	9.170
B1020	9.35	0.008	0.082	35.365	41.640	0.989	3.709	0.000	0.002	0.574	1.014	0.019	0.036	0.008	0.080	34.791	40.626	0.970	3.673
B1350	8.83	0.002	0.022	29.491	21.938	0.563	3.022	-	0.001	0.479	0.534	0.011	0.029	0.002	0.022	29.012	21.404	0.552	2.992
B1360	19.21	0.022	0.238	54.001	103.128	2.124	5.773	0.001	0.005	0.877	2.511	0.041	0.056	0.022	0.233	53.124	100.617	2.083	5.717
B0760	35.34	0.005	0.046	22.700	23.566	0.636	2.487	0.001	0.004	1.696	2.641	0.057	0.112	0.004	0.042	21.004	20.924	0.579	2.376
B1370	31.34	0.019	0.208	46.639	82.483	1.878	5.087	0.001	0.004	0.757	2.008	0.037	0.050	0.018	0.204	45.882	80.475	1.842	5.038
B1510	41.52	0.005	0.045	29.679	40.090	0.742	3.187	0.004	0.027	14.839	30.068	0.445	0.956	0.001	0.018	14.839	10.023	0.297	2.231
B1000	55.28	0.016	0.169	50.424	73.968	1.716	5.471	0.000	0.003	0.819	1.801	0.034	0.053	0.015	0.166	49.605	72.167	1.683	5.418
B0620	18.95	0.022	0.219	39.936	97.805	1.867	4.559	-	-	-	-	-	-	0.022	0.219	39.936	97.805	1.867	4.559
B0770	5.10	0.003	0.029	38.735	28.751	0.740	3.893	0.000	0.003	2.895	3.222	0.067	0.175	0.003	0.027	35.840	25.529	0.674	3.718
B0910	33.04	0.003	0.031	41.189	30.818	0.779	4.143	0.000	0.003	3.078	3.454	0.070	0.186	0.003	0.028	38.111	27.364	0.709	3.958
B1010	1.47	0.047	0.529	85.867	191.420	4.306	9.926	0.001	0.010	1.394	4.661	0.083	0.097	0.046	0.519	84.473	186.759	4.223	9.830
B0580	31.01	0.003	0.027	36.393	27.230	0.689	3.661	-	-	-	-	-	-	0.003	0.027	36.393	27.230	0.689	3.661
B0750	5.47	0.002	0.008	14.214	8.610	0.282	1.579	-	-	-	-	-	-	0.002	0.008	14.214	8.610	0.282	1.579

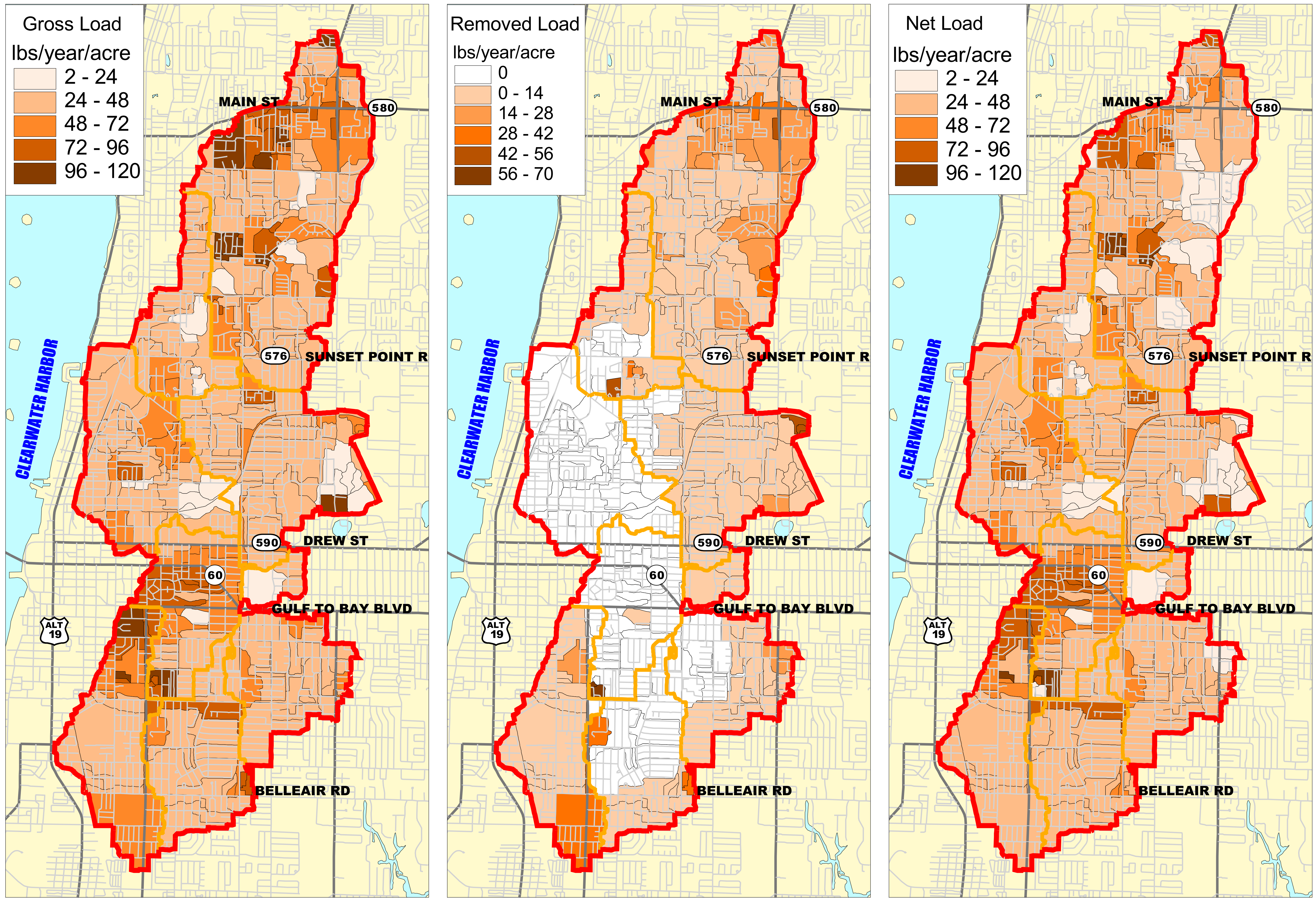
Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)																	
Name	Area (ac)	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B1390	8.25	0.003	0.028	37.760	28.252	0.714	3.798	-	0.001	0.613	0.688	0.014	0.037	0.003	0.028	37.147	27.565	0.700	3.761
B1500	20.90	0.003	0.030	40.848	30.563	0.773	4.109	-	0.001	0.663	0.744	0.015	0.040	0.003	0.030	40.185	29.818	0.758	4.069
B1440	2.12	0.003	0.029	39.585	29.617	0.749	3.982	-	0.001	0.643	0.722	0.015	0.039	0.003	0.029	38.942	28.897	0.734	3.943
B1430	33.08	0.005	0.026	34.804	23.772	0.752	4.487	0.002	0.008	8.701	8.915	0.226	0.673	0.003	0.018	26.103	14.858	0.526	3.814
B1490	3.73	0.004	0.026	35.098	24.875	0.721	4.133	0.001	0.008	8.775	9.328	0.216	0.620	0.003	0.018	26.324	15.547	0.505	3.513
B0610	11.38	0.007	0.047	31.394	42.091	0.706	3.378	-	-	-	-	-	-	0.007	0.047	31.394	42.091	0.706	3.378
B1410	4.92	0.002	0.025	32.883	24.603	0.622	3.307	-	0.000	0.534	0.599	0.012	0.032	0.002	0.024	32.349	24.004	0.610	3.276
B1400	14.33	0.003	0.031	41.189	30.818	0.779	4.143	0.000	0.001	0.669	0.750	0.015	0.040	0.003	0.030	40.520	30.067	0.764	4.103
B0510	29.74	0.005	0.042	40.360	39.433	0.854	4.175	-	-	-	-	-	-	0.005	0.042	40.360	39.433	0.854	4.175
B1450	7.99	0.003	0.031	41.191	31.064	0.780	4.143	0.000	0.001	0.669	0.757	0.015	0.040	0.003	0.030	40.522	30.307	0.765	4.102
B0570	7.99	0.005	0.047	42.933	44.260	0.866	4.273	-	-	-	-	-	-	0.005	0.047	42.933	44.260	0.866	4.273
B0010	38.77	0.008	0.029	31.938	24.596	0.795	5.159	-	-	-	-	-	-	0.008	0.029	31.938	24.596	0.795	5.159
B1420	1.99	0.003	0.031	40.882	30.588	0.773	4.112	-	0.001	0.664	0.745	0.015	0.040	0.003	0.030	40.218	29.843	0.759	4.072
B0030	50.41	0.005	0.029	39.700	27.461	0.842	4.958	-	-	-	-	-	-	0.005	0.029	39.700	27.461	0.842	4.958
B1470	5.90	0.004	0.038	42.569	36.741	0.827	4.264	-	0.001	0.691	0.895	0.016	0.042	0.004	0.037	41.878	35.847	0.811	4.222
B0020	66.38	0.007	0.054	43.365	49.636	0.950	4.841	-	-	-	-	-	-	0.007	0.054	43.365	49.636	0.950	4.841
B0650	39.31	0.017	0.171	48.710	76.365	1.637	5.123	-	-	-	-	-	-	0.017	0.171	48.710	76.365	1.637	5.123
B0690	63.35	0.013	0.082	31.861	48.525	0.687	2.979	0.001	0.006	1.969	4.499	0.051	0.111	0.012	0.076	29.892	44.027	0.636	2.868
B1460	4.60	0.027	0.208	57.811	177.845	1.940	5.906	0.001	0.004	0.938	4.330	0.038	0.057	0.027	0.203	56.872	173.515	1.903	5.848
B1480	64.20	0.008	0.063	45.224	58.233	0.966	4.476	0.000	0.001	0.734	1.418	0.019	0.044	0.007	0.062	44.490	56.816	0.947	4.432
B0700	5.24	0.039	0.231	36.573	132.783	1.487	3.958	0.031	0.184	29.258	106.226	1.189	3.166	0.008	0.046	7.315	26.557	0.297	0.792
B0710	3.19	0.015	0.111	23.937	89.701	1.098	2.891	0.012	0.089	19.150	71.761	0.878	2.312	0.003	0.022	4.788	17.940	0.219	0.578
B0720	11.67	0.012	0.091	17.867	73.807	0.910	2.300	0.001	0.007	1.104	6.843	0.067	0.085	0.011	0.084	16.762	66.964	0.843	2.215
B0730	1.70	0.016	0.123	24.522	99.314	1.210	3.066	0.013	0.098	19.618	79.451	0.968	2.452	0.003	0.025	4.905	19.863	0.242	0.613
B2420	12.75	0.031	0.277	69.017	177.456	2.433	6.999	0.000	0.003	0.617	2.381	0.026	0.038	0.031	0.274	68.399	175.075	2.407	6.961
B2400	10.09	0.006	0.058	39.103	44.062	0.930	4.062	-	0.001	0.350	0.591	0.010	0.022	0.006	0.057	38.753	43.471	0.920	4.041
B0670	11.85	0.038	0.411	66.650	146.127	3.270	7.689	0.030	0.329	53.320	116.901	2.616	6.152	0.008	0.082	13.330	29.225	0.654	1.538
B2220	38.87	0.018	0.103	35.520	56.177	0.806	3.392	-	-	-	-	-	-	0.018	0.103	35.520	56.177	0.806	3.392
B2460	30.72	0.009	0.054	38.458	34.117	0.715	3.723	0.000	0.001	0.344	0.458	0.008	0.020	0.008	0.054	38.113	33.660	0.708	3.703
B2410	15.39	0.058	0.646	96.028	229.831	5.100	10.917	0.001	0.007	0.859	3.084	0.055	0.059	0.057	0.640	95.169	226.747	5.045	10.858
B0060	57.29	0.042	0.216	56.799	92.364	1.108	5.116	-	-	-	-	-	-	0.042	0.216	56.799	92.364	1.108	5.116
B0050	20.51	0.008	0.043	41.828	31.568	0.879	5.135	-	-	-	-	-	-	0.008	0.043	41.828	31.568	0.879	5.135
B2210	20.33	0.004	0.039	38.104	35.475	0.775	3.835	-	-	-	-	-	-	0.004	0.039	38.104	35.475	0.775	3.835
B2390	25.18	0.010	0.081	47.210	73.151	1.122	4.751	0.000	0.001	0.422	0.982	0.012	0.026	0.010	0.081	46.787	72.169	1.110	4.726
B0210	6.53	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B0220	27.52	0.007	0.057	43.425	52.934	0.965	4.419	-	-	-	-	-	-	0.007	0.057	43.425	52.934	0.965	4.419
B2140	23.14	0.022	0.165	33.173	81.044	0.800	2.674	0.000	0.002	0.297	1.088	0.009	0.014	0.022	0.163	32.876	79.956	0.791	2.660
B2130	8.91	0.015	0.118	56.785	102.358	1.332	5.457	0.000	0.001	0.508	1.374	0.014	0.029	0.015	0.116	56.277	100.985	1.317	5.428
B2200	13.61	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B2120	3.64	0.003	0.030	40.345	30.250	0.763	4.056	-	0.000	0.361	0.406	0.008	0.022	0.003	0.030	39.984	29.844	0.755	4.035
B2030	36.52	0.005	0.042	38.913	38.919	0.850	4.176	0.001	0.009	6.716	10.076	0.176	0.432	0.004	0.033	32.197	28.844	0.674	3.743
B2440	15.60	0.032	0.221	69.473	172.189	1.904	6.621	0.000	0.002	0.622	2.310	0.020	0.036	0.031	0.219	68.851	169.879	1.883	6.586
B2110	11.49	0.004	0.033	39.829	30.383	0.752	3.990	-	0.000	0.356	0.408	0.008	0.021	0.004	0.032	39.473	29.976	0.744	3.969
B2570	9.13	0.024	0.182	62.744	158.340	1.657	5.819	0.019	0.145	50.195	126.672	1.326	4.655	0.005	0.036	12.549	31.668	0.332	1.164
B2100	11.13	0.003	0.030	40.256	30.120	0.762	4.049	-	0.000	0.360	0.404	0.008	0.022	0.003	0.030	39.896	29.715	0.753	4.028
B0200	2.95	0.003	0.031	41.190	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.190	30.818	0.779	4.143
B2090	3.83	0.003	0.031	41.084	30.740	0.777	4.133	-	0.000	0.368	0.412	0.008	0.022	0.003	0.030	40.717	30.327	0.769	4.110

Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)																	
Name	Area (ac)	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B0230	3.27	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B0090	10.28	0.020	0.150	64.772	132.957	1.615	6.274	-	-	-	-	-	-	0.020	0.150	64.772	132.957	1.615	6.274
B0080	26.74	0.030	0.189	54.208	126.397	1.478	5.494	-	-	-	-	-	-	0.030	0.189	54.208	126.397	1.478	5.494
B2510	9.38	0.003	0.028	36.725	27.304	0.686	3.671	-	0.000	0.328	0.366	0.007	0.020	0.003	0.027	36.397	26.938	0.678	3.652
B2020	6.38	0.003	0.031	41.176	30.803	0.779	4.144	-	-	-	-	-	-	0.003	0.031	41.176	30.803	0.779	4.144
B2080	13.96	0.008	0.053	43.262	36.711	0.807	4.234	0.000	0.001	0.387	0.493	0.009	0.023	0.008	0.052	42.875	36.218	0.799	4.211
B2040	6.32	0.005	0.027	36.600	25.442	0.772	4.526	-	0.000	0.327	0.341	0.008	0.024	0.005	0.027	36.273	25.100	0.764	4.502
B2580	2.68	0.028	0.204	70.146	177.819	1.932	7.034	0.022	0.163	56.116	142.255	1.545	5.627	0.006	0.041	14.029	35.564	0.387	1.407
B2470	11.92	0.003	0.031	41.136	30.778	0.778	4.138	-	0.000	0.368	0.413	0.008	0.022	0.003	0.030	40.768	30.365	0.770	4.116
B2000	21.97	0.003	0.031	41.140	30.804	0.780	4.150	-	-	-	-	-	-	0.003	0.031	41.140	30.804	0.780	4.150
B2520	18.54	0.003	0.028	38.003	28.440	0.719	3.824	0.000	0.000	0.340	0.382	0.008	0.021	0.003	0.028	37.663	28.058	0.711	3.803
B0240	0.68	0.006	0.047	40.174	43.485	0.891	4.165	-	-	-	-	-	-	0.006	0.047	40.174	43.485	0.891	4.165
B0250	10.08	0.006	0.055	42.528	50.694	0.948	4.351	-	-	-	-	-	-	0.006	0.055	42.528	50.694	0.948	4.351
B2010	16.85	0.003	0.029	39.423	29.464	0.747	3.980	-	-	-	-	-	-	0.003	0.029	39.423	29.464	0.747	3.980
B0292	9.56	0.004	0.039	42.787	37.678	0.835	4.282	-	-	-	-	-	-	0.004	0.039	42.787	37.678	0.835	4.282
B2070	19.70	0.006	0.044	42.454	34.374	0.796	4.197	0.000	0.001	0.380	0.461	0.009	0.023	0.006	0.044	42.075	33.912	0.787	4.175
B2480	51.63	0.005	0.037	34.234	32.827	0.762	3.998	0.002	0.011	8.559	12.310	0.229	0.600	0.003	0.026	25.676	20.517	0.533	3.398
B2150	34.21	0.002	0.017	17.186	16.678	0.384	2.214	-	0.000	0.154	0.224	0.004	0.012	0.002	0.017	17.032	16.454	0.380	2.202
B0100	13.76	0.015	0.125	49.370	102.396	1.359	5.380	-	-	-	-	-	-	0.015	0.125	49.370	102.396	1.359	5.380
B0290	4.81	0.034	0.225	36.514	157.476	1.847	4.509	-	-	-	-	-	-	0.034	0.225	36.514	157.476	1.847	4.509
B2540	11.53	0.054	0.256	38.586	79.330	0.664	3.201	0.001	0.003	0.345	1.064	0.007	0.017	0.053	0.253	38.241	78.265	0.657	3.184
B0310	28.57	0.011	0.085	38.384	73.761	1.153	4.237	-	-	-	-	-	-	0.011	0.085	38.384	73.761	1.153	4.237
B0370	71.04	0.009	0.077	46.066	64.220	1.008	4.562	-	-	-	-	-	-	0.009	0.077	46.066	64.220	1.008	4.562
B0340	10.72	0.022	0.196	62.200	135.116	1.935	6.327	-	-	-	-	-	-	0.022	0.196	62.200	135.116	1.935	6.327
B2350	36.44	0.005	0.042	42.214	33.698	0.793	4.187	0.000	0.001	1.076	1.288	0.024	0.064	0.005	0.040	41.138	32.410	0.768	4.123
B0110	22.14	0.004	0.035	40.254	33.910	0.812	4.201	-	-	-	-	-	-	0.004	0.035	40.254	33.910	0.812	4.201
B0330	17.74	0.042	0.462	83.246	175.866	3.845	9.213	-	-	-	-	-	-	0.042	0.462	83.246	175.866	3.845	9.213
B2170	11.47	0.003	0.012	3.281	9.393	0.176	1.394	0.001	0.003	0.820	3.522	0.053	0.209	0.002	0.008	2.461	5.871	0.124	1.185
B2230	11.18	0.003	0.029	38.845	29.064	0.735	3.908	-	-	-	-	-	-	0.003	0.029	38.845	29.064	0.735	3.908
B2500	63.84	0.006	0.034	36.826	27.779	0.793	4.714	0.002	0.010	9.207	10.417	0.238	0.707	0.004	0.024	27.619	17.362	0.555	4.007
B0400	2.09	0.017	0.125	34.137	105.103	1.428	4.166	-	-	-	-	-	-	0.017	0.125	34.137	105.103	1.428	4.166
B2240	12.04	0.004	0.029	35.904	26.408	0.718	4.022	0.002	0.009	8.976	9.903	0.216	0.603	0.003	0.020	26.928	16.505	0.503	3.419
B2180	7.20	0.003	0.010	4.239	8.749	0.206	1.669	0.001	0.003	1.060	3.281	0.062	0.250	0.002	0.007	3.179	5.468	0.144	1.419
B2160	19.45	0.006	0.054	13.585	29.331	0.741	1.984	0.000	0.001	0.122	0.394	0.008	0.011	0.006	0.053	13.464	28.938	0.733	1.974
B2345	10.20	0.007	0.047	42.017	34.707	0.786	4.140	0.000	0.002	1.071	1.327	0.024	0.063	0.006	0.046	40.946	33.381	0.762	4.077
B2490	17.54	0.012	0.068	24.568	38.996	0.588	2.892	0.004	0.020	6.142	14.623	0.177	0.434	0.007	0.047	18.426	24.372	0.412	2.458
B0410	6.44	0.013	0.106	34.901	89.744	1.285	4.096	-	-	-	-	-	-	0.013	0.106	34.901	89.744	1.285	4.096
B0440	25.13	0.004	0.021	16.938	19.233	0.442	2.899	-	-	-	-	-	-	0.004	0.021	16.938	19.233	0.442	2.899
B0420	6.46	0.005	0.035	14.432	30.537	0.497	2.541	-	-	-	-	-	-	0.005	0.035	14.432	30.537	0.497	2.541
B0120	23.47	0.003	0.030	38.272	29.513	0.738	3.987	-	-	-	-	-	-	0.003	0.030	38.272	29.513	0.738	3.987
B0435	4.32	0.013	0.130	20.500	52.906	1.108	3.498	-	-	-	-	-	-	0.013	0.130	20.500	52.906	1.108	3.498
B2550	5.21	0.072	0.343	51.327	103.945	0.839	3.833	0.001	0.004	0.459	1.395	0.009	0.021	0.071	0.339	50.868	102.551	0.830	3.812
B0350	20.46	0.017	0.152	44.972	105.865	1.181	4.622	-	-	-	-	-	-	0.017	0.152	44.972	105.865	1.181	4.622
B2250	0.83	0.066	0.320	49.794	100.289	0.866	4.203	-	-	-	-	-	-	0.066	0.320	49.794	100.289	0.866	4.203
B2270	7.44	0.003	0.031	41.189	30.818	0.779	4.143	0.000	0.001	1.050	1.178	0.024	0.063	0.003	0.030	40.140	29.640	0.755	4.080
B0130	7.71	0.004	0.017	4.998	14.638	0.270	2.207	-	-	-	-	-	-	0.004	0.017	4.998	14.638	0.270	2.207
B2260	14.30	0.008	0.044	20.343	25.481	0.464	2.922	0.000	0.001	0.518	0.974	0.014	0.045	0.008	0.042	19.824	24.507	0.450	2.877

Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)																	
Name	Area (ac)	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B2290	21.40	0.003	0.032	41.348	31.265	0.781	4.150	0.000	0.001	1.054	1.195	0.024	0.063	0.003	0.031	40.294	30.069	0.757	4.087
B0430	43.87	0.020	0.187	43.374	105.563	1.115	4.300	-	-	-	-	-	-	0.020	0.187	43.374	105.563	1.115	4.300
B2560	22.06	0.006	0.047	9.269	21.667	0.487	2.266	0.002	0.014	2.317	8.125	0.146	0.340	0.004	0.033	6.952	13.542	0.341	1.926
B0140	17.30	0.006	0.028	6.154	17.968	0.278	2.175	-	-	-	-	-	-	0.006	0.028	6.154	17.968	0.278	2.175
B2530	22.10	0.063	0.681	99.333	239.125	5.432	12.223	0.023	0.204	24.833	89.672	1.629	1.833	0.039	0.477	74.500	149.453	3.802	10.389
B2280	13.87	0.033	0.170	54.210	67.411	0.950	4.699	0.001	0.005	1.382	2.577	0.029	0.072	0.032	0.165	52.829	64.834	0.921	4.627
B2300	25.37	0.003	0.029	37.911	27.980	0.700	3.770	0.000	0.001	0.966	1.070	0.021	0.058	0.003	0.028	36.945	26.910	0.678	3.713
B0170	19.81	0.011	0.053	13.554	25.305	0.342	2.363	-	-	-	-	-	-	0.011	0.053	13.554	25.305	0.342	2.363
B0150	3.20	0.026	0.125	20.538	45.056	0.478	2.916	-	-	-	-	-	-	0.026	0.125	20.538	45.056	0.478	2.916
B0180	46.66	0.003	0.025	25.889	23.429	0.546	3.232	-	-	-	-	-	-	0.003	0.025	25.889	23.429	0.546	3.232
B0480	51.13	0.016	0.105	50.120	67.178	1.023	4.744	-	-	-	-	-	-	0.016	0.105	50.120	67.178	1.023	4.744
B0470	26.32	0.006	0.046	42.543	35.458	0.803	4.205	-	-	-	-	-	-	0.006	0.046	42.543	35.458	0.803	4.205
B0460	13.52	0.005	0.038	41.911	32.846	0.789	4.174	-	-	-	-	-	-	0.005	0.038	41.911	32.846	0.789	4.174
B0450	4.51	0.006	0.043	42.346	34.070	0.794	4.193	-	-	-	-	-	-	0.006	0.043	42.346	34.070	0.794	4.193
B3000	64.67	0.015	0.087	38.164	55.019	0.820	4.054	-	-	-	-	-	-	0.015	0.087	38.164	55.019	0.820	4.054
B2310	40.21	0.005	0.039	38.250	30.240	0.692	3.724	0.000	0.001	0.975	1.156	0.021	0.057	0.005	0.038	37.275	29.084	0.671	3.667
B2330	5.54	0.045	0.225	59.350	81.856	1.017	4.918	0.002	0.007	1.513	3.129	0.031	0.075	0.043	0.218	57.837	78.727	0.986	4.843
B3020	24.71	0.026	0.164	59.474	107.293	1.345	5.544	-	-	-	-	-	-	0.026	0.164	59.474	107.293	1.345	5.544
B2340	30.12	0.010	0.060	42.915	38.266	0.800	4.198	0.000	0.002	1.094	1.463	0.025	0.064	0.009	0.059	41.822	36.804	0.776	4.134
B3030	71.34	0.031	0.197	66.843	132.796	1.541	6.114	-	-	-	-	-	-	0.031	0.197	66.843	132.796	1.541	6.114
B4426	25.44	0.004	0.037	42.442	36.196	0.823	4.252	0.000	0.003	2.624	3.357	0.061	0.158	0.004	0.034	39.818	32.840	0.762	4.095
B3040	39.51	0.037	0.262	79.189	196.823	2.170	7.423	-	-	-	-	-	-	0.037	0.262	79.189	196.823	2.170	7.423
B4360	58.33	0.006	0.023	21.289	19.771	0.568	3.809	0.004	0.014	10.645	14.828	0.341	1.143	0.001	0.009	10.645	4.943	0.227	2.666
B4424	18.03	0.006	0.055	46.006	51.634	0.947	4.562	0.001	0.004	2.844	4.788	0.070	0.169	0.006	0.051	43.162	46.846	0.877	4.393
B3070	41.39	0.047	0.446	87.891	210.085	3.562	9.175	-	-	-	-	-	-	0.047	0.446	87.891	210.085	3.562	9.175
B3060	3.11	0.030	0.220	76.084	192.268	2.088	7.587	-	-	-	-	-	-	0.030	0.220	76.084	192.268	2.088	7.587
B3090	27.72	0.053	0.357	75.438	187.718	2.311	7.049	-	-	-	-	-	-	0.053	0.357	75.438	187.718	2.311	7.049
B2360	3.23	0.049	0.265	69.069	125.879	1.387	5.834	-	-	-	-	-	-	0.049	0.265	69.069	125.879	1.387	5.834
B3100	53.69	0.020	0.122	50.356	78.162	1.091	4.859	-	-	-	-	-	-	0.020	0.122	50.356	78.162	1.091	4.859
B3080	10.29	0.013	0.114	27.960	68.105	1.055	3.182	-	-	-	-	-	-	0.013	0.114	27.960	68.105	1.055	3.182
B3530	33.00	0.051	0.498	98.040	248.324	4.072	10.357	0.004	0.028	4.516	17.158	0.225	0.286	0.047	0.471	93.524	231.167	3.847	10.071
B3510	2.92	0.084	0.453	94.292	217.998	2.026	7.546	-	-	-	-	-	-	0.084	0.453	94.292	217.998	2.026	7.546
B3500	17.01	0.049	0.458	96.246	242.050	3.720	9.811	-	-	-	-	-	-	0.049	0.458	96.246	242.050	3.720	9.811
B3110	27.62	0.039	0.399	71.752	174.252	3.256	8.214	-	-	-	-	-	-	0.039	0.399	71.752	174.252	3.256	8.214
B3135	14.53	0.004	0.019	10.399	16.738	0.350	2.544	0.001	0.006	2.600	6.277	0.105	0.382	0.003	0.013	7.799	10.461	0.245	2.162
B4310	16.48	0.007	0.061	47.225	56.735	0.988	4.669	-	-	-	-	-	-	0.007	0.061	47.225	56.735	0.988	4.669
B4420	26.59	0.011	0.084	48.736	76.377	1.099	4.751	0.001	0.006	3.013	7.083	0.082	0.176	0.010	0.078	45.723	69.294	1.018	4.575
B4300	30.56	0.012	0.071	44.384	41.538	0.825	4.259	-	-	-	-	-	-	0.012	0.071	44.384	41.538	0.825	4.259
B3520	28.31	0.064	0.346	79.965	165.719	1.664	6.575	-	-	-	-	-	-	0.064	0.346	79.965	165.719	1.664	6.575
B4140	33.50	0.007	0.059	46.481	54.892	0.974	4.612	-	-	-	-	-	-	0.007	0.059	46.481	54.892	0.974	4.612
B4410	23.59	0.003	0.030	39.823	29.796	0.753	4.006	0.000	0.002	2.462	2.763	0.056	0.149	0.003	0.027	37.361	27.033	0.698	3.857
B3120	14.69	0.003	0.026	31.087	25.848	0.630	3.529	-	-	-	-	-	-	0.003	0.026	31.087	25.848	0.630	3.529
B3140	10.63	0.014	0.150	50.605	69.110	1.606	5.446	-	-	-	-	-	-	0.014	0.150	50.605	69.110	1.606	5.446
B4000	45.54	0.003	0.031	41.059	30.665	0.779	4.154	-	-	-	-	-	-	0.003	0.031	41.059	30.665	0.779	4.154
B3540	22.06	0.051	0.543	93.376	219.785	4.383	10.209	0.004	0.030	4.301	15.186	0.242	0.282	0.047	0.513	89.075	204.600	4.140	9.927
B3130	42.90	0.004	0.032	43.581	32.128	0.843	4.584	-	-	-	-	-	-	0.004	0.032	43.581	32.128	0.843	4.584
B3550	31.96	0.015	0.125	56.563	97.659	1.438	5.725	0.011	0.075	28.281	73.244	0.863	1.718	0.004	0.050	28.281	24.415	0.575	4.008

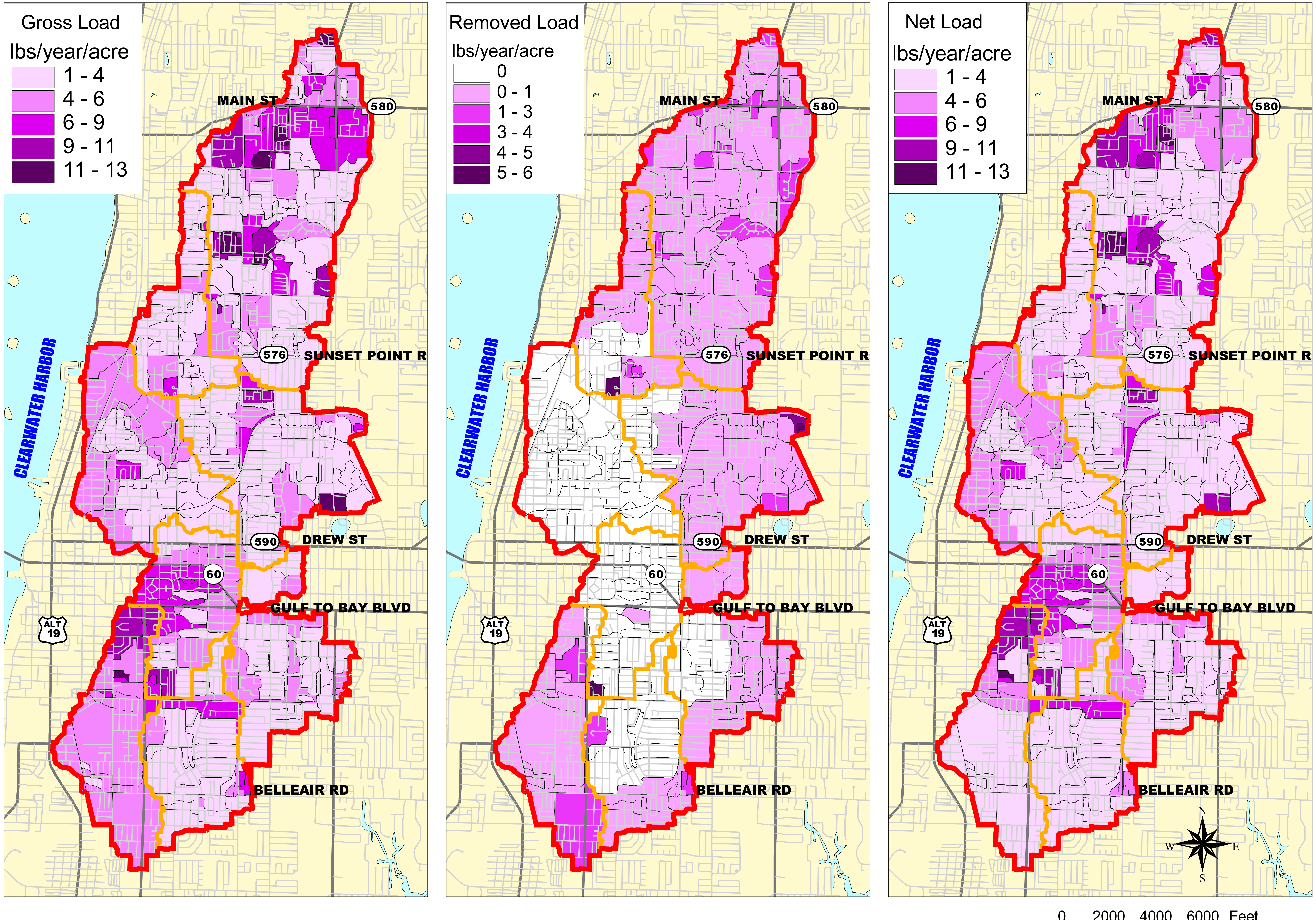
Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)																	
Name	Area (ac)	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B4290	26.67	0.011	0.078	30.987	59.380	0.913	3.459	-	-	-	-	-	-	0.011	0.078	30.987	59.380	0.913	3.459
B4200	25.12	0.006	0.094	43.956	68.937	1.003	4.354	-	-	-	-	-	-	0.006	0.094	43.956	68.937	1.003	4.354
B4380	12.96	0.005	0.031	41.640	29.599	0.852	4.865	0.000	0.002	2.574	2.745	0.063	0.181	0.004	0.029	39.066	26.854	0.788	4.685
B4400	13.95	0.003	0.031	41.189	30.818	0.779	4.143	0.000	0.002	2.546	2.858	0.058	0.154	0.003	0.028	38.643	27.960	0.721	3.990
B4490	14.41	0.017	0.095	45.932	46.877	0.835	4.277	0.013	0.057	22.966	35.158	0.501	1.283	0.004	0.038	22.966	11.719	0.334	2.994
B4510	11.69	0.006	0.038	39.022	30.294	0.764	4.199	0.004	0.023	19.511	22.720	0.458	1.260	0.001	0.015	19.511	7.573	0.306	2.940
B3150	8.67	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B4145	34.93	0.026	0.229	59.257	141.840	2.052	6.313	-	-	-	-	-	-	0.026	0.229	59.257	141.840	2.052	6.313
B3160	7.22	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B4150	6.84	0.008	0.063	35.493	56.743	0.827	3.766	-	-	-	-	-	-	0.008	0.063	35.493	56.743	0.827	3.766
B3650	23.70	0.012	0.098	54.372	88.738	1.242	5.287	0.001	0.005	2.505	6.131	0.069	0.146	0.011	0.093	51.867	82.607	1.173	5.141
B4500	8.44	0.005	0.037	32.631	26.799	0.612	3.229	0.004	0.022	16.316	20.099	0.367	0.969	0.001	0.015	16.316	6.700	0.245	2.260
B4390	1.75	0.003	0.029	39.333	29.429	0.744	3.956	-	0.002	2.432	2.729	0.055	0.147	0.002	0.027	36.901	26.700	0.689	3.810
B4220	22.54	0.004	0.028	38.498	27.461	0.783	4.456	0.001	0.007	8.042	8.605	0.196	0.559	0.003	0.021	30.456	18.856	0.587	3.898
B4240	11.43	0.009	0.072	38.579	63.393	1.069	4.198	0.003	0.018	8.059	19.864	0.268	0.526	0.006	0.054	30.520	43.529	0.801	3.672
B3170	11.07	0.005	0.042	43.379	40.222	0.855	4.334	-	-	-	-	-	-	0.005	0.042	43.379	40.222	0.855	4.334
B4205	5.36	0.003	0.029	39.204	29.332	0.742	3.944	-	-	-	-	-	-	0.003	0.029	39.204	29.332	0.742	3.944
B3180	20.48	0.003	0.031	41.282	30.887	0.781	4.153	-	-	-	-	-	-	0.003	0.031	41.282	30.887	0.781	4.153
B3190	25.89	0.050	0.502	98.643	247.910	4.111	10.320	-	-	-	-	-	-	0.050	0.502	98.643	247.910	4.111	10.320
B4260	11.91	0.027	0.141	51.049	61.338	0.931	4.575	0.010	0.042	12.762	23.002	0.279	0.686	0.017	0.099	38.287	38.336	0.652	3.889
B3575	4.53	0.074	0.832	117.128	292.243	6.457	13.388	0.005	0.046	5.395	20.192	0.357	0.370	0.069	0.786	111.733	272.051	6.100	13.018
B4160	12.36	0.003	0.029	39.344	29.208	0.754	4.057	-	-	-	-	-	-	0.003	0.029	39.344	29.208	0.754	4.057
B4180	2.07	0.004	0.029	38.911	28.144	0.776	4.336	-	-	-	-	-	-	0.004	0.029	38.911	28.144	0.776	4.336
B4230	3.53	0.003	0.031	41.190	30.818	0.779	4.143	0.001	0.008	8.604	9.657	0.195	0.519	0.002	0.023	32.585	21.162	0.584	3.624
B4210	23.07	0.005	0.030	40.006	28.388	0.837	4.855	0.002	0.009	10.001	10.645	0.251	0.728	0.003	0.021	30.004	17.743	0.586	4.127
B3200	2.15	0.034	0.259	86.853	226.897	2.362	8.121	-	-	-	-	-	-	0.034	0.259	86.853	226.897	2.362	8.121
B4370	14.11	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B3580	2.44	0.038	0.371	75.570	181.980	3.019	7.760	0.002	0.021	3.481	12.573	0.167	0.215	0.035	0.351	72.089	169.406	2.853	7.546
B4250	5.36	0.013	0.094	34.546	78.899	1.230	4.445	0.005	0.028	8.637	29.587	0.369	0.667	0.008	0.065	25.910	49.312	0.861	3.778
B3210	3.52	0.034	0.260	86.890	226.847	2.360	8.118	0.028	0.208	69.512	181.477	1.888	6.494	0.007	0.052	17.378	45.369	0.472	1.624
B4010	10.08	0.004	0.037	40.038	35.143	0.824	4.214	-	-	-	-	-	-	0.004	0.037	40.038	35.143	0.824	4.214
B3600	16.71	0.026	0.199	54.056	167.915	1.861	5.601	0.002	0.011	2.490	11.602	0.103	0.155	0.025	0.188	51.566	156.314	1.758	5.446
B3220	6.34	0.031	0.227	78.134	198.074	2.151	7.835	0.025	0.182	62.507	158.459	1.721	6.268	0.006	0.045	15.627	39.615	0.430	1.567
B4280	2.95	0.005	0.026	36.267	25.042	0.772	4.559	0.002	0.008	9.067	9.390	0.232	0.684	0.003	0.019	27.200	15.651	0.541	3.875
B3670	4.15	0.024	0.181	70.203	159.547	1.803	6.655	0.002	0.010	3.234	11.024	0.100	0.184	0.022	0.171	66.970	148.524	1.704	6.471
B3700	28.27	0.011	0.089	48.339	79.358	1.146	4.816	0.001	0.005	2.227	5.483	0.063	0.133	0.011	0.084	46.113	73.875	1.083	4.683
B4020	12.51	0.012	0.096	42.128	83.806	1.238	4.571	-	-	-	-	-	-	0.012	0.096	42.128	83.806	1.238	4.571
B3710	197.28	0.013	0.100	41.858	68.195	1.161	5.023	0.005	0.030	10.465	25.573	0.348	0.754	0.008	0.070	31.394	42.622	0.813	4.270
B4480	18.53	0.018	0.100	47.658	48.997	0.864	4.419	0.006	0.025	9.956	15.353	0.217	0.554	0.012	0.075	37.703	33.644	0.647	3.866
B4460	3.46	0.004	0.028	37.808	27.560	0.745	4.120	0.001	0.008	9.452	10.335	0.224	0.618	0.002	0.020	28.357	17.225	0.522	3.502
B4040	48.71	0.034	0.369	74.132	149.516	3.162	8.075	-	-	-	-	-	-	0.034	0.369	74.132	149.516	3.162	8.075
B4470	75.71	0.003	0.028	37.894	28.295	0.715	3.827	0.000	0.001	1.577	1.766	0.036	0.096	0.003	0.027	36.316	26.529	0.680	3.732
B4430	8.52	0.003	0.028	37.607	27.719	0.729	3.965	0.000	0.003	2.807	3.103	0.065	0.178	0.003	0.025	34.800	24.616	0.663	3.788
B4440	22.24	0.003	0.028	37.416	27.995	0.708	3.764	0.000	0.003	2.793	3.134	0.063	0.169	0.003	0.025	34.623	24.861	0.644	3.595
B4060	73.88	0.004	0.035	41.552	33.873	0.795	4.164	-	-	-	-	-	-	0.004	0.035	41.552	33.873	0.795	4.164
B4122	7.52	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B4050	48.72	0.003	0.031	41.020	30.620	0.779	4.158	-	-	-	-	-	-	0.003	0.031	41.020	30.620	0.779	4.158

Information		Loading Rates (pounds/acre/average year, G=Gross, R=Removed, N=Net)																	
Name	Area (ac)	G_PB	G_ZN	G_BOD5	G_TSS	G_TP	G_TN	R_PB	R_ZN	R_BOD5	R_TSS	R_TP	R_TN	N_PB	N_ZN	N_BOD5	N_TSS	N_TP	N_TN
B4125	30.68	0.044	0.234	63.751	115.152	1.333	5.871	0.033	0.140	31.876	86.364	0.800	1.761	0.011	0.094	31.876	28.788	0.533	4.110
B4450	19.00	0.003	0.028	37.068	27.593	0.707	3.791	0.000	0.003	3.162	3.531	0.072	0.194	0.003	0.025	33.906	24.062	0.635	3.597
B3800	39.87	0.008	0.070	48.249	64.137	1.041	4.750	0.003	0.021	12.062	24.051	0.312	0.713	0.005	0.049	36.187	40.086	0.728	4.037
B4070	2.69	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B4080	104.83	0.004	0.036	42.196	35.302	0.816	4.240	-	-	-	-	-	-	0.004	0.036	42.196	35.302	0.816	4.240
B4126	5.42	0.003	0.031	41.189	30.818	0.779	4.143	-	-	-	-	-	-	0.003	0.031	41.189	30.818	0.779	4.143
B4132	4.57	0.020	0.154	62.647	136.375	1.582	5.962	0.002	0.009	3.158	10.311	0.096	0.180	0.018	0.145	59.489	126.064	1.487	5.781
B4135	4.23	0.009	0.070	36.269	61.353	0.804	3.421	0.001	0.004	1.828	4.639	0.049	0.103	0.008	0.065	34.441	56.714	0.755	3.317
B3730	2.36	0.005	0.041	43.061	39.837	0.853	4.344	0.002	0.012	10.765	14.939	0.256	0.652	0.003	0.028	32.296	24.898	0.597	3.692
B3790	137.80	0.026	0.167	60.531	119.823	1.467	5.975	0.020	0.100	30.265	89.867	0.880	1.793	0.007	0.067	30.265	29.956	0.587	4.183
B4136	6.89	0.029	0.217	73.979	190.033	1.997	6.927	0.022	0.130	36.989	142.525	1.198	2.078	0.007	0.087	36.989	47.508	0.799	4.849
B3740	10.42	0.011	0.087	47.669	77.635	1.169	4.830	0.004	0.026	11.917	29.113	0.351	0.725	0.007	0.061	35.752	48.522	0.818	4.106
B4137	3.58	0.031	0.232	77.937	203.604	2.120	7.288	0.023	0.140	38.968	152.703	1.272	2.186	0.008	0.093	38.968	50.901	0.848	5.101
B4130	5.94	0.016	0.119	43.368	99.864	1.152	4.144	0.001	0.007	2.186	7.551	0.070	0.125	0.015	0.111	41.182	92.313	1.082	4.019
B3750	6.06	0.009	0.078	38.066	67.312	1.098	4.190	0.004	0.023	9.517	25.242	0.329	0.628	0.006	0.055	28.550	42.070	0.768	3.562
B4090	25.96	0.006	0.050	40.732	45.329	0.922	4.385	0.001	0.003	2.053	3.427	0.056	0.133	0.006	0.047	38.679	41.902	0.866	4.252
B4131	3.26	0.020	0.156	59.950	135.000	1.513	5.617	0.002	0.010	3.022	10.207	0.092	0.170	0.019	0.146	56.929	124.792	1.422	5.447
B3760	14.88	0.008	0.096	48.161	76.081	1.098	4.746	0.003	0.029	12.040	28.530	0.329	0.712	0.005	0.067	36.121	47.551	0.768	4.034
B4133	2.68	0.020	0.152	55.591	133.368	1.471	5.237	0.002	0.009	2.802	10.084	0.089	0.158	0.018	0.143	52.789	123.284	1.382	5.078
B3810	30.03	0.013	0.145	53.353	110.696	1.334	5.167	0.005	0.043	13.338	41.511	0.400	0.775	0.008	0.101	40.015	69.185	0.934	4.392
B4100	31.55	0.003	0.031	41.100	30.751	0.778	4.134	0.000	0.002	2.072	2.325	0.047	0.125	0.003	0.029	39.029	28.426	0.731	4.009
B4138	15.68	0.005	0.040	35.916	37.488	0.734	3.641	0.001	0.005	3.402	5.326	0.083	0.207	0.004	0.035	32.514	32.162	0.650	3.434
B4128	1.92	0.006	0.025	34.177	22.589	0.769	4.735	0.002	0.008	8.544	8.471	0.231	0.711	0.003	0.018	25.633	14.118	0.538	4.025
B4110	27.50	0.003	0.031	41.189	30.818	0.779	4.143	0.000	0.002	2.076	2.330	0.047	0.125	0.003	0.029	39.113	28.488	0.732	4.018
B4120	50.61	0.009	0.076	43.338	67.409	1.074	4.461	0.001	0.005	2.185	5.097	0.065	0.135	0.009	0.071	41.153	62.312	1.009	4.326



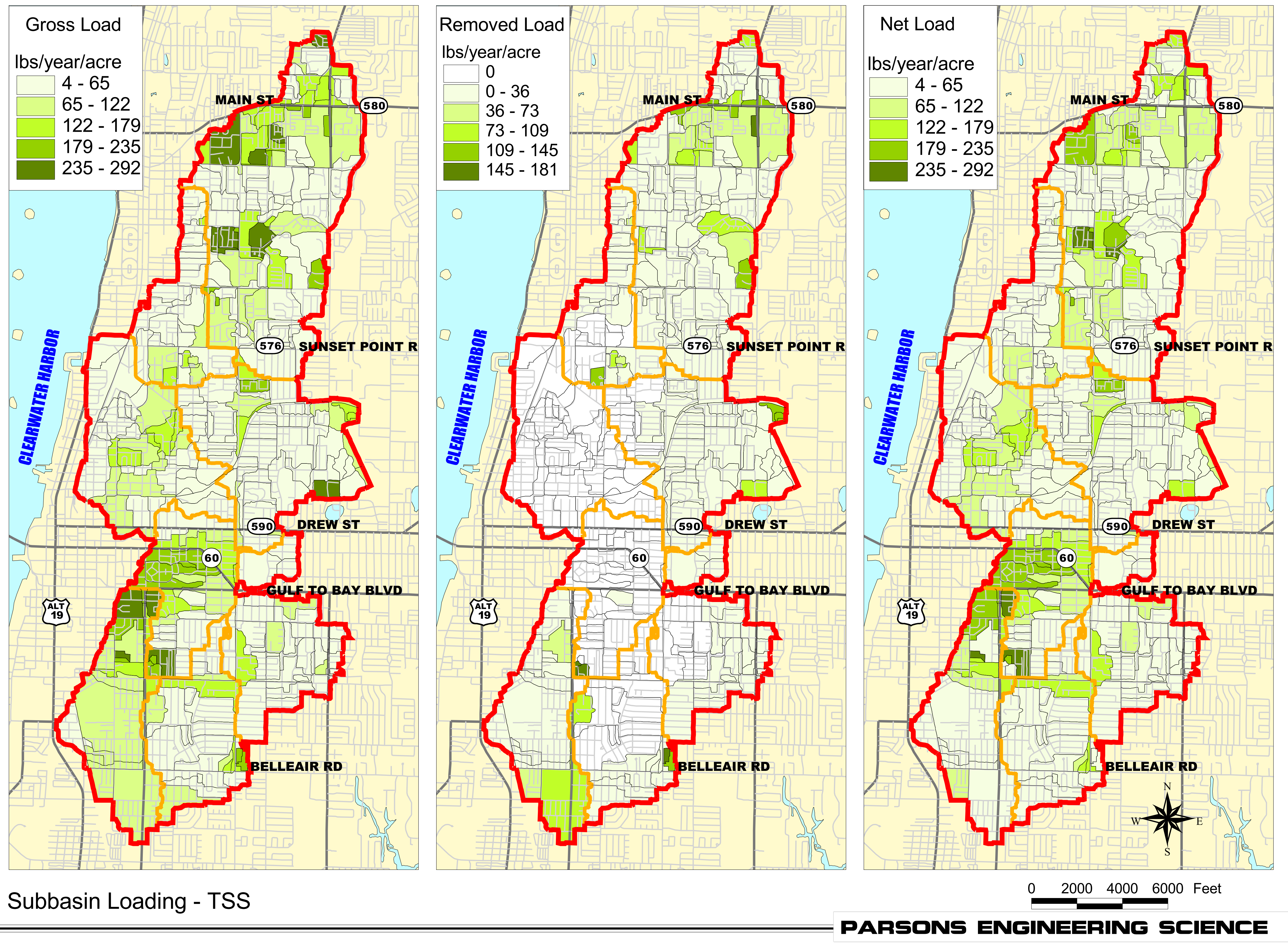
Subbasin Loading - BOD

PARSONS ENGINEERING SCIENCE

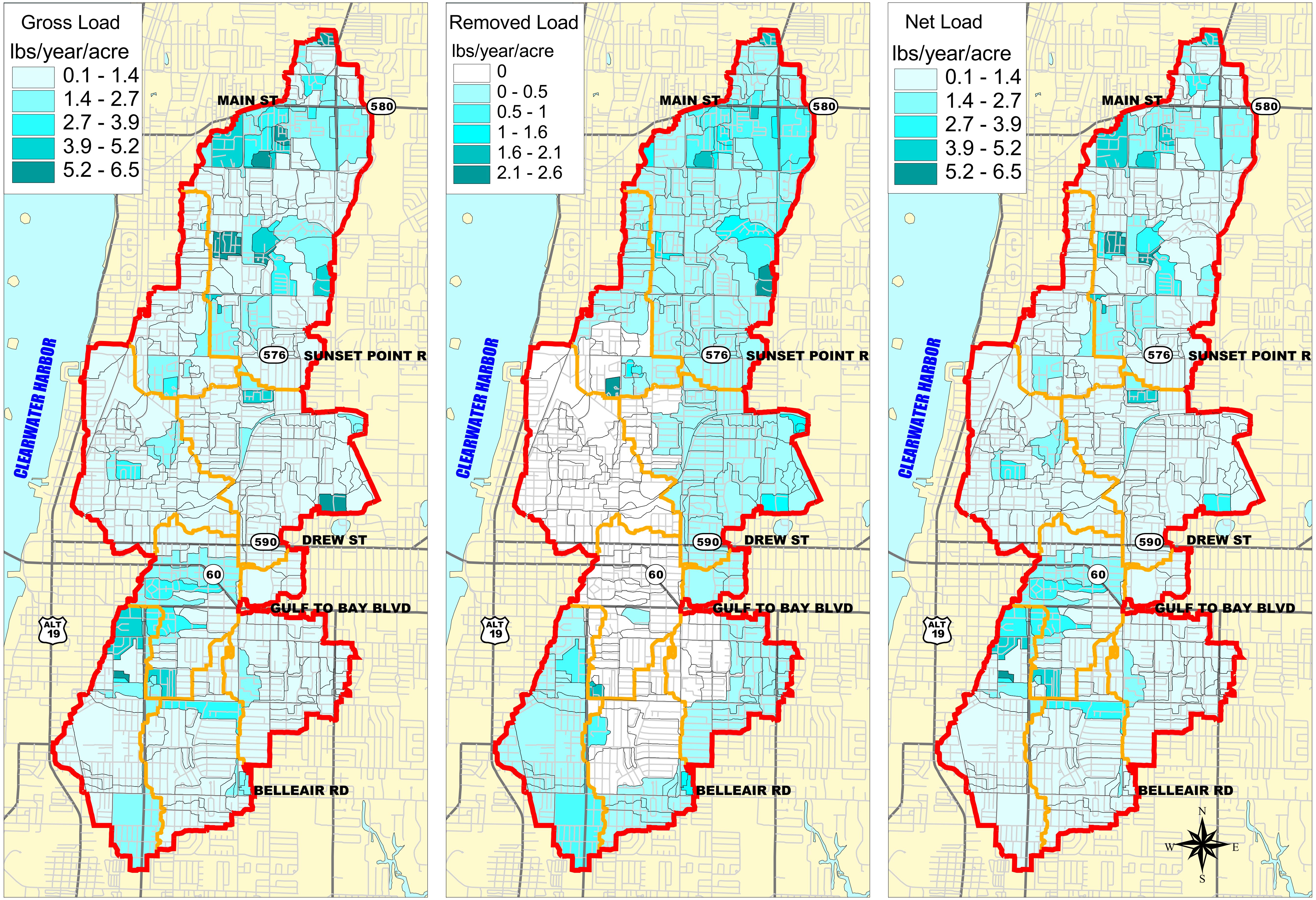


Subbasin Loading - Nitrogen

PARSONS ENGINEERING SCIENCE

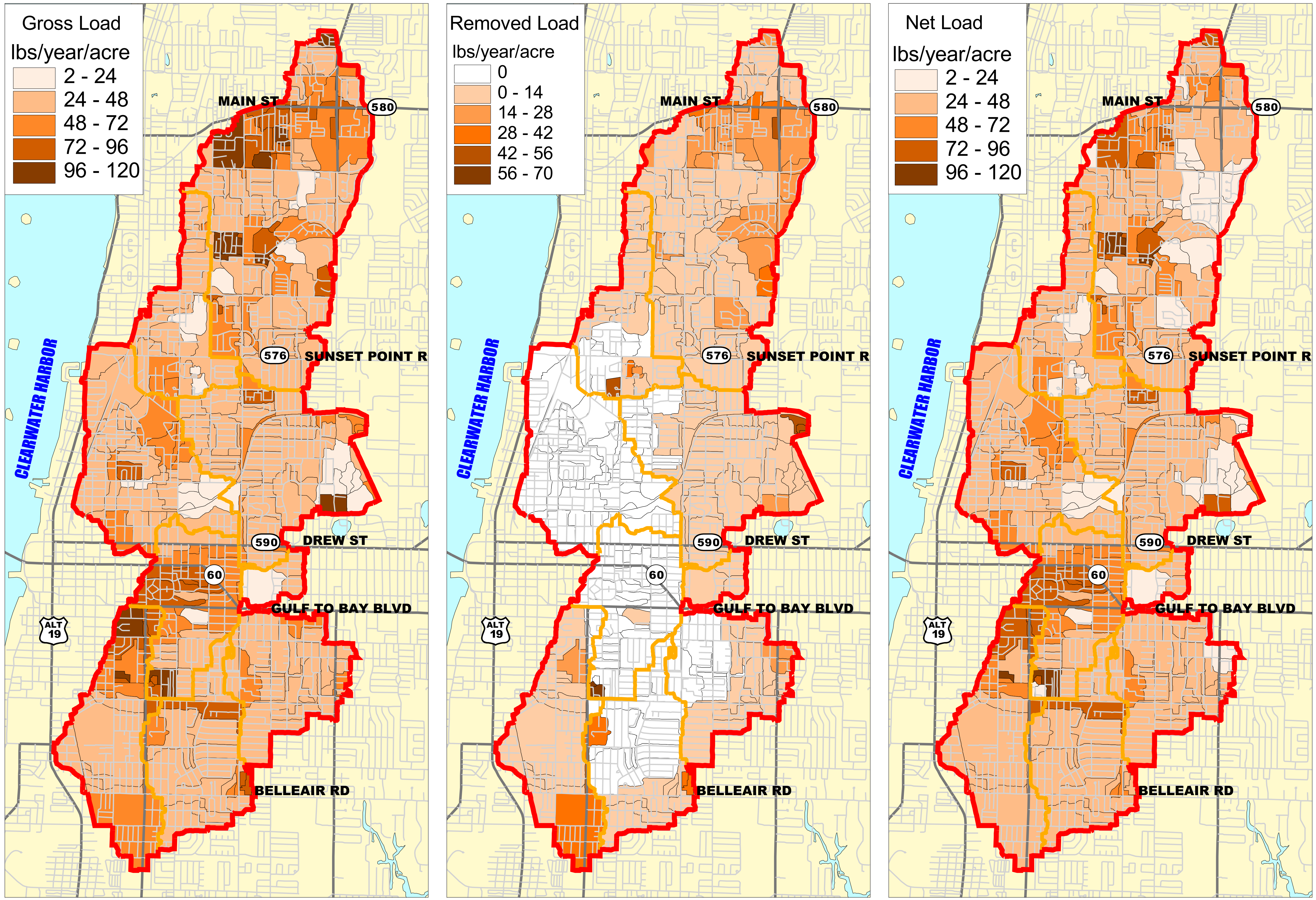


Subbasin Loading - TSS



Subbasin Loading - Phosphorus

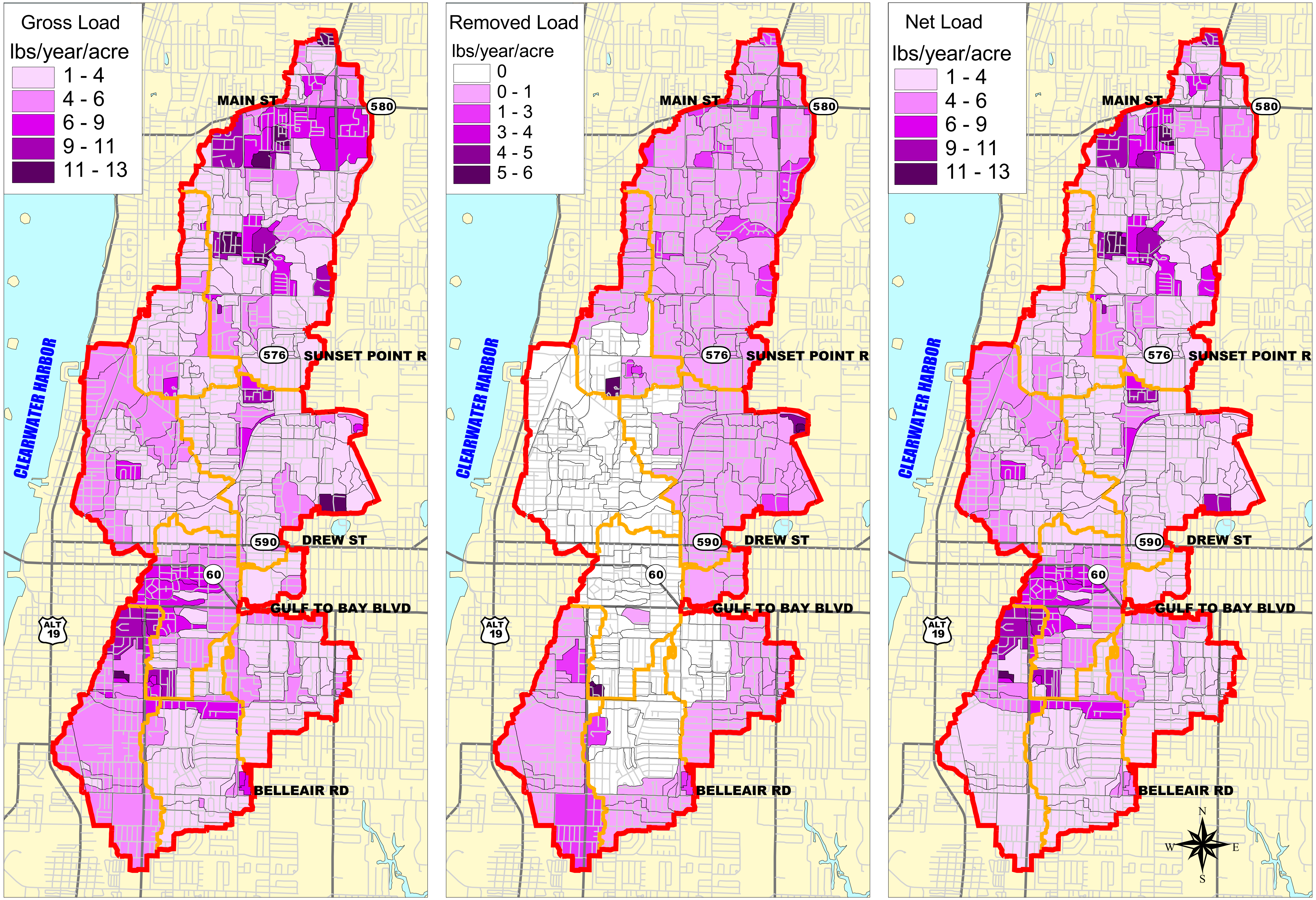
PARSONS ENGINEERING SCIENCE



Subbasin Loading - BOD

0 2000 4000 6000 Feet

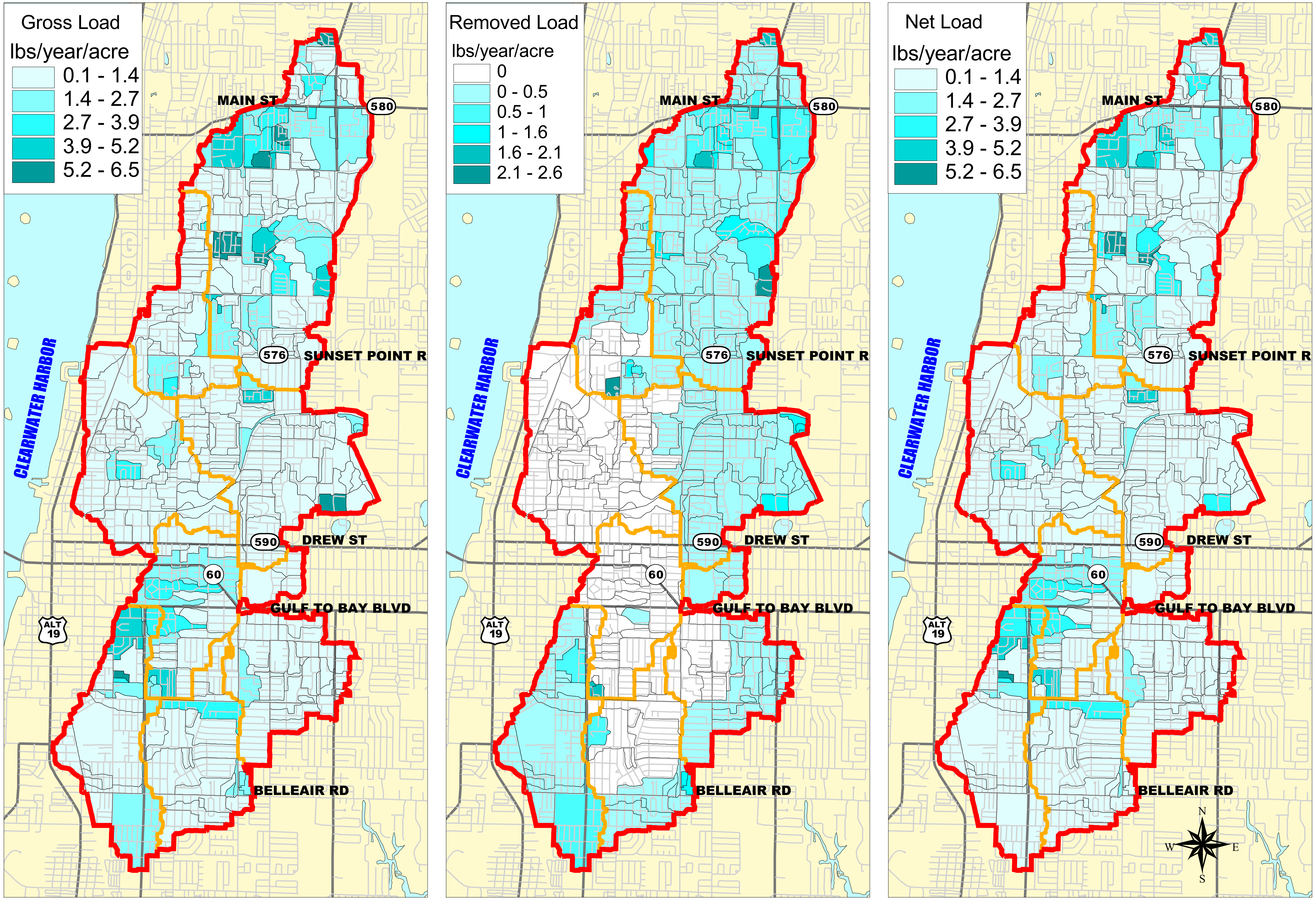
PARSONS ENGINEERING SCIENCE



Subbasin Loading - Nitrogen

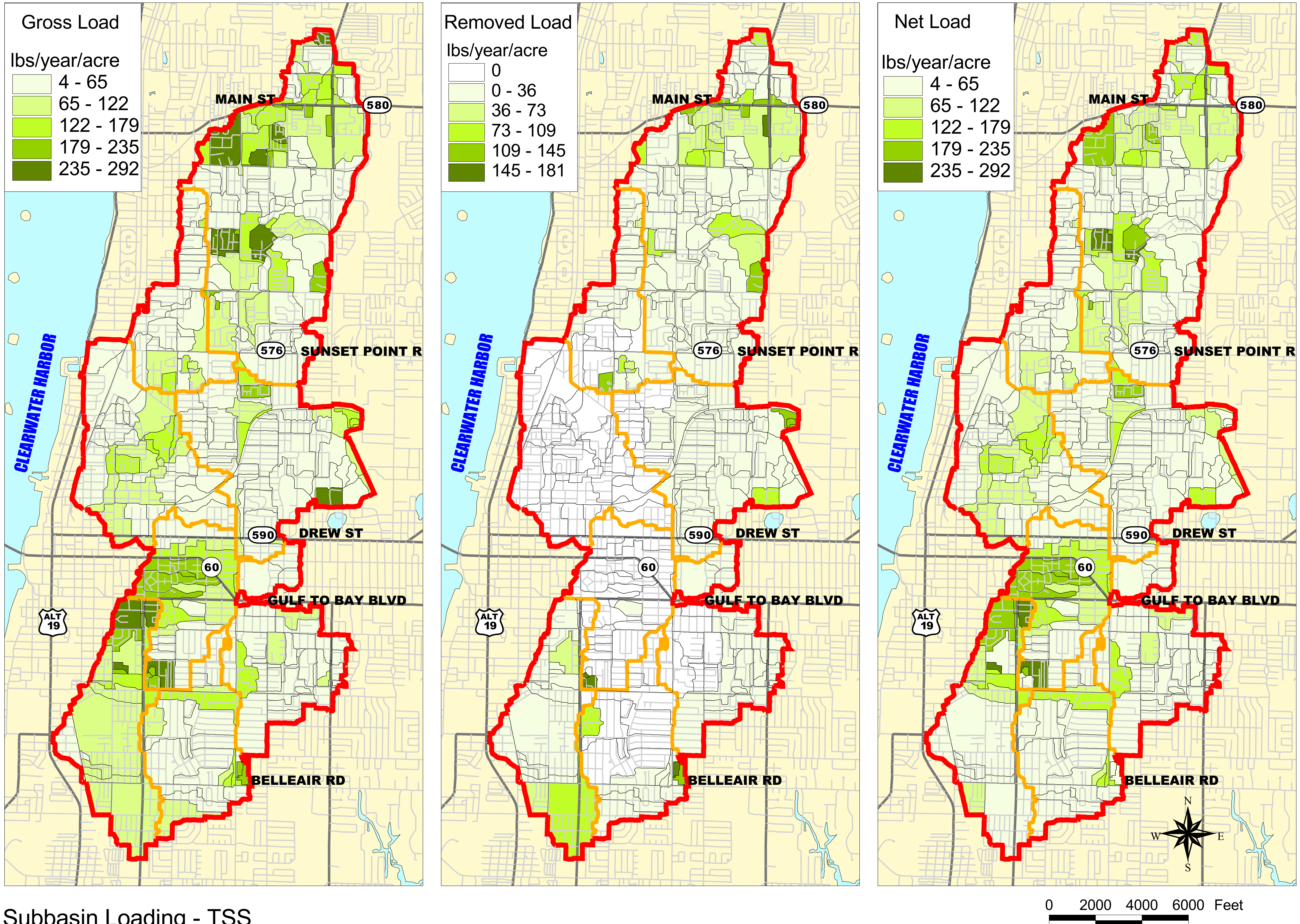
0 2000 4000 6000 Feet

PARSONS ENGINEERING SCIENCE



Subbasin Loading - Phosphorus

PARSONS ENGINEERING SCIENCE



Subbasin Loading - TSS

PARSONS ENGINEERING SCIENCE