CHAPTER 6
INFRASTRUCTURE ELEMENT

INTRODUCTION

This chapter presents data and analysis on the key infrastructure components that serve existing and future anticipated development while protecting the fragile natural surface water and groundwater resources of the region. These components or sub-elements of the Infrastructure Element include: (1) stormwater management; (2) solid waste; (3) sanitary sewer; (4) potable water; and (5) natural groundwater/aquifer recharge. These data and analysis provide the foundation and framework for the updating and revision of specific goals, objectives, and policies for each of these sub-elements of the Comprehensive Plan.

STORMWATER MANAGEMENT SUB-ELEMENT

The purpose of the Stormwater Management Sub-element is to summarize the natural conditions that affect the quantity and quality of stormwater runoff, inventory and analyze existing stormwater management facilities to identify needed stormwater policy and implementation strategies, including needed improvements to stormwater management facilities over the next 10 or more years. This end result of this effort is to provide the framework for the consideration of specific amendments to the existing set of goals, objectives, and policies (GOPs) for stormwater management in the Comprehensive Plan update.

Historical Background

In the early part of the last century, the special drainage districts were created in Indian River County by the Florida Legislature. The purpose of these special districts was for the construction of drainage projects so that land could be used for the citrus and other crops. Using its taxing authority the Indian River Farms Water Management District constructed a network of drainage canals that altered the natural drainage patterns of the County. Basically, the strategy of "ditch it and drain it" was designed to protect development from flooding by modifying natural systems to convey stormwater runoff away from developed sites more rapidly.

This alternation of natural drainage patterns was not a major problem until significant growth occurred in Indian River County, including the City of Vero Beach. Development has further altered natural drainage patterns and with the amount of impervious surfaces, such as streets, parking lots, and buildings, has increased discharge rates.

Over the last several decades, increased growth has been met with more stringent and comprehensive federal, state, and local stormwater management regulations. These regulations have helped maintain the capacity of the County's and City's stormwater system capacity, other than periodic isolated local flooding in low lying areas and areas that drain poorly.

Unfortunately the past strategy of "ditch it and drain it" produced adverse impacts on water quality. Increased velocity and discharge of stormwater runoff disrupted natural drainage

patterns and contributed to sediment loading changes to the land surface resulting from urban development's increased pollutant loadings to the main receiving body, the Indian River Lagoon.

Through the City's development approval process, projects are required to control the quantity and quality of stormwater runoff. To be effective stormwater management requires the use of structural and non-structural facilities to ensure that the volume, rate, timing and pollutant loading of post-development stormwater runoff is similar to that which occurred prior to development.

Overall the objective is to utilize a combination of both techniques to provide adequate pollution removal and flood protection in the most cost-efficient manner. Although such techniques may be economically applied in most cases to development of vacant lands; their application is more difficult and costly in retrofitting existing lands that were developed prior to more stringent stormwater regulations. As most development in the City involves infill or redevelopment of properties, the application of the proper mix of management techniques in an economical and effective manner is a critical consideration in the development process.

Regulatory Agencies Involved with Stormwater Management

A number of governmental agencies at all levels of government are involved in stormwater management in the City of Vero Beach. The following is a brief description of some of the roles of participating agencies.

Federal Agencies.

Federal Emergency Management Agency (FEMA): FEMA indirectly regulates stormwater management and flood protection through the National Flood Insurance Program. The flood insurance rate study prepared in 1988 by that agency based on stormwater computer models established the limits of coastal flood zones, and the 100-year flood and 500-year flood plain. This information along with aerial radar imaging resulted in an updating of Flood Insurance Rate Maps (FIRM) with an effective date of December 4, 2012. These maps are used in conjunction with the City's floodplain regulations to regulate any development within special flood hazard areas.

Natural Resources Conservation Service (NRCS): As one of its principal responsibilities, this agency surveys and prepares detailed soil surveys for all counties throughout the nation. The latest survey for Indian River County was prepared in 1987. The soil survey for that portion of that portion of the County occupied by the City of Vero Beach is depicted in Figure 3. The drainage characteristics of various soils are an important consideration for stormwater management.

Environmental Protection Agency (EPA): The EPA has a regulatory role through the review of dredge and fill permit applications under the U.S. Army Corps of Engineers (ACOE) permitting authority. Both agencies monitor and permit fill activity in wetlands along the Indian River Lagoon. Under the Clean Water Act (CWA) of 1987, the EPA is responsible for issuing National Pollutant Discharge Elimination System (NPDES) permits for point and non-point

sources discharges. The City has a NPDES permit required under the Clean Water Act for its municipal separate storm sewer system (MS4).

As part of the CWA of 1987, the National Estuary Program (NEP) was established. Under this program, the Indian River Lagoon was identified as being an estuary of national significance threatened by pollution, overuse, and development. The Indian River Lagoon National Estuary Program (IRLNEP) was established by EPA in 1991 and charged with developing a Comprehensive Conservation and Management Plan to ensure preservation of the IRL's ecosystem through consensus-driven decision making and problem solving.

In 2015, a regional council of local government and state representatives was established to sponsor and carryout the goals of the IRLNEP. The IRLNEP was established in that year as a special district of Florida. A staff was hired to support the council. A major responsibility of the regional council will be in the administration of state and federal grant funds to be available for eligible projects.

Subsequently to the establishment of the regional council, Indian River County opted out of membership. In response to ensure local participation in this multi-jurisdictional effort, the governing bodies of Vero Beach, Sebastian, and Fellsmere voted to join the regional council and were accepted by the regional council as a voting member.

State Agencies.

Florida Department of Environmental Protection (FDEP): Under the Florida Administrative Code, the FDEP review and permits stormwater discharge into State waters to ensure state water quality standards are not exceeded. In 1986, permit authority was delegated to the St. Johns River Water Management District. FDEP continues to administer the permitting of docks in waters of the state and establishes specific requirements to protect water quality and the water ecosystem.

FDEP administers the Total Maximum Daily Load (TMDL) program, which is a statewide watershed-based management approach to restore and protect water quality in Florida. As part of this program Basin Management Action Plans (BMAPs) have been or are being prepared throughout the state to address key elements required by the Florida Watershed Restoration Act. The Indian River Lagoon is covered by four BMAPs.[1]

The adopted BMAP (2013) for the Central Indian River Lagoon, which includes the City of Vero Beach, establishes specific reductions in the yearly discharge of nitrogen and phosphorus into the Indian River Lagoon.[2] Specific target reductions for individual jurisdictions have yet to be established; however, the City of Vero Beach has been actively addressing this reduction, which is discussed in the Analysis section.

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[1] BMAPs must be adopted by Secretarial Order to be enforceable.

[2] *Basin Management Action Plan for the Indian River Lagoon Basin Central Indian River Lagoon,* developed by Central Indian River Lagoon stakeholders in cooperation with the FDEP, 2013.

St. Johns Water Management District (SJRWMD): Under the provisions of the Florida Administrative Code, the SJRWMD regulates the management and storage of ground and surface waters within the St. Johns River Basin. The majority of the Indian River Lagoon is included within the SJRWMD jurisdiction.

Florida Department of Transportation (FDOT): The FDOT owns and maintains numerous facilities which provide drainage for major roadways within the City of Vero Beach. Stormwater runoff from many of the older roadways, such as US 1, is conveyed through outfall ditches and canals. FDOT permits connections to stormwater management facilities within FDOT rights-of-way.

Local Agencies.

City of Vero Beach: The City has the authority to construct and maintain stormwater management facilities in City-owned easements, rights-of-way, and property. The City has enacted in Land Development Regulations specific authority for regulating stormwater management practices and stormwater standards, including erosion and sediment control and discharges to the City's municipal separate stormwater sewer system (MS4). The City Public Works Department is responsible for administering the stormwater management regulations.

As required under the National Pollutant Discharge Elimination System (NPDES), the City of Vero Beach, as an owner of a Municipal Separate Storm Sewer System (MS4) is responsible for the quality of stormwater discharge to receiving waters. Pursuant to its NPDES permit, the City of Vero has been working to maintain and retrofit its stormwater drainage system (MS4) to improve the quality of runoff discharges to receiving waters.

As a participant in the National Flood Insurance Program, the City has enacted floodplain regulations that place certain restrictions on development in special flood hazard zones. The Planning and Development Department is responsible for administering the floodplain regulations. A discussion of the City's floodplain regulations and specific issues that need to be addressed to further protect property during storm events and sea level rise are presented in the Coastal Management Element.

Indian River County: Within the City of Vero Beach, Indian River County has the primary jurisdiction over specific outfalls and stormwater facilities within county road rights-of-way.

Indian Farms Water Control District (IFWCD): The IFWCD has the authority to construct and maintain primary drainage facilities within its special district boundaries.

Private Systems: Private developments within the City of Vero Beach, such as gated communities, own and maintain private stormwater management facilities.

Existing Drainage System

This section describes the existing drainage system and stormwater management system in the City of Vero Beach. Figure 16 depicts a map of the three basins related to major drainage and outfalls. A description of the typography, soils, geology, and flood prone areas that affect the type and scope of flood protection measures and stormwater management facilities is presented in Chapter 2, Land Use Element. Wetlands, natural and conservation lands within these basins are not served by stormwater facilities and are not considered within the urban watershed served by the City municipal separate stormwater sewer system (MS4).

M-Series Drainage Basin. The M-Series Basin is contained within the Indian River Farms IRFWCD jurisdiction. The district, which contains 49,915 acres with 320 miles of drainage canals, provides primary drainage to the Indian River Lagoon for over two-thirds of urbanized Indian River County. The primary drainage area of this basin is land west of the Atlantic Coastal Ridge that is overlain by the Florida East Coast Railroad and U.S. 1.

The sub-laterals and lateral drainage canals are shielded from outside inflow by a system of levees. Within the City of Vero Beach, the IRFWCD's system of sub-laterals and laterals are linked to the Main Relief Canal that empties to the Indian River Lagoon. Within the M-Series Basin, the City has responsibility for the maintenance and provision of secondary drainage swales, ditches and culverts that eventually led to IRFWCD laterals and drainage canals. The County has such responsibilities for County right-of-way and County-owned lands.

To prevent saltwater intrusion and control water levels, water control structures are located on the relief canal system. Recent modifications to the water control structures were made to reduce sediment passing through the structures. Overall, the District's approach has been to maintain discharge on a status quo basis.

The capacity of the IRCFWD Main Relief Canal is to handle a peak discharge capacity for a ten year/24 hour event (3.3 inches) is 2595 cubic feet per second (CFS). The IRCFWD standard for discharge to its drainage system is 2 inches for a 24 hour, 25-year storm event. Therefore any new connections to the IRCFWD system must meet this standard.

In coordination with the IRCFWD, Indian River County constructed PC Main in 2008 in the Main Relief Canal. This facility removes floating and suspended material from the Main Relief Canal preventing these materials to enter the Indian River Lagoon. The materials removed include aquatic plants that if they reach the Lagoon, the plants will die and create muck deposits on the Lagoon's bottom and release unwanted nitrogen and phosphorous assimilated in their tissue.

R-Series Drainage Basin. This basin is located entirely within the City of Vero Beach, most which is east, north, and south of the IRFWCD (M-Series Basin) and west of the Indian River Lagoon. Except for the portion of the basin located north of the Main Relief Canal, which consists mainly of marsh and wetlands, this drainage basis is highly urbanized.

Stormwater management jurisdiction and operational responsibility lies with the City of Vero Beach for drainage facilities within the basin. Drainage flows through a system of ditches and pipes into the Indian River Lagoon. Drainage systems are generally designed for the ten-year/24-hour storm event (8.2 inches). Indian River County has stormwater jurisdiction and responsibility for County right-of-way and on County-owned lands.

Beach Series Drainage Basin. The beach series basin is located entirely within incorporated area of the City of Vero Beach along the barrier island between the Indian River Lagoon and Atlantic Ocean. The barrier island is dominated by an old sand dune located approximately 300 from the Atlantic Ocean. The sand ridge soil types are excessively drained with high percolation rates that affect the amount of storm runoff that may drain directly into the Indian River Lagoon on the west.

Analysis

Over the years flood control become a high priority to protect development from flooding by modifications to the natural systems to convey stormwater runoff away from urbanized areas. Except for isolated cases, the existing network of drainage systems has provided this protection, but at the cost of increased adverse impacts to the water quality of the Indian River Lagoon.

Over the last 20 years, the primary emphasis of the City of Vero Beach has been to reduce pollutant loading from its stormwater system and the amount of stormwater discharging to the Indian River Lagoon. Almost all new development since the 1980's has been required to include on-site stormwater treatment facilities. Typically these stormwater treatment facilities are designed to limit both the volume and rates of stormwater discharge to receiving waters, as well as, very importantly, reducing the amount of pollutants in the discharge.

While the conveying of stormwater is important in protection of development and public infrastructure, the most pressing issue for stormwater facing the City of Vero Beach, Indian River County, and other jurisdictions within the Indian River Lagoon basin is the quality of stormwater entering the Indian River Lagoon. The Indian River Lagoon is impaired for the nutrients total nitrogen (TN) and total phosphorous (TP) due primarily to these pollutants entering the lagoon through stormwater discharges from urban and agricultural sources; however, another significant source for nitrogen pollutants is from groundwater conveying these nutrients from septic systems.

The Indian River Lagoon is a valuable ecological and economic asset for the State of Florida and the numerous communities bordering the water body and its tributaries. The need to protect and enhance this valuable resource has become a major focus of the City of Vero Beach and other jurisdictions within the Lagoon's watershed. Therefore, this analysis focuses primarily on the topics and issues related to protecting and enhancing this significant resource through specific stormwater management strategies and capital improvements proposed by the Public Works Department over the next 10 years.

Basin Management Action Plan. Section 403.067(1), Florida Statutes, requires the development of a total maximum daily load (TMDL) program for state waters pursuant to

Section 303(d) of the Clean Water Act, Pub. L. No. 92-500, 33 U.S.C. ss. 1251 et seq. The TMDL program is a statewide management approach to restore and protect water quality in Florida. TMDLs are water quality targets, based on state water quality standards, for specific pollutants including nutrients such as nitrogen and phosphorous.

Development, allocation, and implementation of the TMDL is through a phased approach that includes the development of a Best Management Action Plan (BMAP) for each basin. Each BMAP contains a comprehensive set of strategies for restoring impaired waters by reducing pollutant loadings from point and non-point sources to meet the numerical standards established for specific pollutants.

BMAPs are broad-based plans that developed in coordinated with local stakeholders and rely on both local input and commitment for implementation. Each BMAP must address key elements required by the Florida Watershed Restoration Act. To be enforceable, the BMAP must be adopted by Secretarial Order. Across the State of Florida, 20 BMAPs have been adopted. Portions of the Indian River Lagoon are addressed in four adopted BMAPs including the BMAP for the Central Indian River Lagoon.

The implementation of each BMAP is through the application of appropriate Best Management Practices (BMPs) used to achieve satisfactory water quality at a minimum cost. Structural BMPs emphasize preservation and/or simulation of natural drainage features to promote infiltration, filtration, and reduced peak discharges. Examples include: retention/detention ponds, infiltration trenches/basins and grassed swales. Nonstructural BMPs include watershed management, facilities, maintenance, land use planning and public education.

The TMDLs enacted in each BMAP will go through three five-year iterations. If reductions are required from stakeholders, these reductions for point sources, both wastewater treatment facilities (WWTF) and municipal separate storm sewer systems (MS4s) will be enforced by the Florida Department of Environmental Protection (FDEP) through the National Pollutant Discharge Elimination System (NPDES) permits.

As recognized in the 2015 document, *Impediments of Implementation of the Indian River Lagoon Basin Management Action Plans,* water quality degradation is the single "most important issue impacting the lagoon."[3] This decline in water quality is "attributed to an increase in nutrient input, sedimentation, turbidity, atmospheric deposition, nutrient releases from legacy muck deposits, and changes in salinity due to freshwater discharges." This decline in water quality is visibly characterized by loss of seagrass coverage and depth, algal blooms, and decrease in the amount and diversity of wildlife.

The watershed of the Indian River Lagoon within the city limits of Vero Beach is contained in the Central Indian River Lagoon BMAP. The goal of the Central Indian River Lagoon is to both meet implementation schedule for load reductions in total nitrogen (TN) and total phosphorous (TP) and to recover deeper seagrass habitats.

[3] *Impediments to Implementation of the Indian River Lagoon Basin Management Action Plans,* prepared by the East Central Florida Regional Planning Council and the Treasure Coast Regional Planning Council for the Florida Department of Economic Opportunity, May 27, 2015.

In the first five-year reiteration of the Central Indian River Lagoon BMAP (2013) it was determined based on FDEP evaluation of sea grass over five years, that median seagrass depth limit criteria were being met; therefore, although TMDLs were established for the basin, stakeholders (such as the City of Vero Beach) were not required to meet the TMDL target levels or make reductions in nutrient loadings and were not assigned allocations in this first reiteration.

Subsequently, evaluation of seagrass survey data has revealed that the seagrass depth limit criteria were not met in 2010 and 2011; therefore, it is anticipated that further reductions in nutrient loading will be required in the next reiteration of the BMAP scheduled for completion and adoption in 2018.

In May 2015, the FDEP prepared preliminary set of TMDL allocation and nutrient reduction target levels. Preliminary allocations by nutrient were established for the seven entities, including the City of Vero Beach, located within Zone B watershed. The preliminary data document that total nitrogen (TN) is the major pollutant affecting water quality in the Indian River Lagoon. The preliminary allocation calls for a 58% reduction in TN and 52% reduction in total phosphorous (TP) for the City.

Table 6-1 presents the preliminary allocations prepared by the FDEP that was sent to various permitting entities in Zone B of the Central Indian River Lagoon:

Table 6-1. Preliminary TMDL Allocations, Zone B, Central Indian River Lagoon

Entity	TP Loads (lbs/year)	Target TP Loads (lbs/year)	TN Loads (lbs/year)	Target TN Loads (lbs/year)
Agriculture	44,647	22,981	186,836	107,965
Vero Beach	10,160	4,830	54,069	22,692
FDOT	3,066	882	10,123	4,142
Indian River County	11,185	5,030	54,703	23,631
IRFWCD	22,388	13,369	129,111	62,806
Sebastian River ID	48	25	266	117
Indian River Shores	2,160	1,466	12,479	6,887
Totals	93,654	48,583	447,587	228,240

Source: Florida Department of Environmental Protection, April, 2015

The preliminary pollutant loadings are currently being reviewed by the City of Vero Beach staff as the numbers in Table 6-1 are higher than those produced by the staff based on City land use data using FDEP methodology (Florida Simple Stormwater Annual Pollutant Loading Spreadsheet) in 2014.

The TMDL allocations shown in Table 6-1 are only preliminary subject to further review and negotiation by stakeholders and FDEP; however, it is evident that further reductions in the City's pollutant loadings will be necessary. The magnitude of these reductions or the time frame established to be meet these target levels has still to be determined especially recognizing that

changes in criteria (i.e., seagrass depth) applied to set target levels may also be subject to future changes. Furthermore, the success and effectiveness the proposed allocation system will require a comprehensive water quality monitoring program funded and administered by FDEP, as recommended by stakeholders in the report *Impediments to Implementation of the Indian River Lagoon Basin Management Action Plans.*

Stormwater Regulations. The majority of City of Vero Beach was developed prior to any effective stormwater management regulations requiring on-site retention and treatment. At the time of their development many of the subdivisions had little or no requirements for installation of stormwater management systems prior to development.

In an effort to partially address this existing problem (see discussion in next section), the City upgraded its stormwater regulations in 2010 for both new and existing development undergoing substantial improvements or significant increases in the amount of impervious area. These upgrades included requiring multiple-family and nonresidential development to meet on-site retention standards of the first 1.5 inches of rainfall.

In 2012, the City enacted a "Florida Friendly Fertilizer Ordinance" that strictly prohibits the application of fertilizers containing nitrogen and/or phosphorous during June 1 through September 30th. The ordinance establishes "fertilizer free" zones within 10 feet from any water body. This ordinance if enforced and properly followed will reduce nutrients entering into the stormwater runoff.

However, many of the older residential properties on canals, such as Vero Isles, have grass lawns that extend all the way to their seawalls. Therefore, nothing prevents runoff along with pollutants directly entering the canals and the lagoon.

To address this issue, the staff recommends consideration of policies to address this in the Conservation Element of the update to the Comprehensive Plan. Such regulations may include specific setback requirements, vegetative filter strips, and structural barriers to prevent or attenuate stormwater entering canals. Such regulations should address how they will be applied to both existing and new development.

Stormwater Outfall Program. In 2007-2008, the City Public Works Department instituted the Stormwater Outfall Retrofit Capital Improvement Program (CIP). This program provides a framework for the upgrading and retrofitting of the City's stormwater outfalls with pollution prevention/reduction facilities. This program anticipated probable mandated reductions in pollutants under the City's NPDES permit for its MS4.

In 2014, the engineering staff undertook a watershed study to indentify individual watersheds and identify those watersheds with the highest nutrient loading rates. Of the 128 identified watersheds, outfall pipes from 34 have been retrofitted with some type of pollution prevention/reduction measure.[4]

[4] *Nutrient Loading –Task 3B,* technical memorandum prepared by the Vero Beach Public Works Department to City Manager O'Connor, dated March 7, 2014.

Based on this effort, the Stormwater Outfall Retrofit Capital Improvement Program (CIP) was revised to establish a new priority framework and schedule for stormwater nutrient reduction projects. The basic guiding principle was to focus on those measures that provided the greatest nutrient reductions possible on a dollar per pound of nutrients removed. As significant element of this updated and revised CIP was the recognition that the program must recognize the need for necessary repair, remediation, and replacement projects.

The primary focus of this CIP has been on End of Pipe (EOP) retrofits. As explained in a staff report to the Public Works Director, retention and/or detention of stormwater is very effective in preventing pollution of receiving waters, because pollutant laden stormwater only discharges to receiving waters during less frequent, more intense rainfall events.

Unfortunately, such systems require relatively large areas to implement (often 10-15% of the total area being served) and are most cost effective when implemented as part of a new stormwater system. Therefore, these improvements would be limited to new development or retrofitting of existing stormwater systems, the most cost-effective option for the City is the EOP retrofit approach.

The City has installed Type II Baffle Boxes at more than 20 of its outfalls, which capture floatables and suspended debris. These Type II Baffle Boxes with a filter cartridge provide reductions of up to 19% for TN and 15.5% for TP. However, they are limited as their effectiveness is significantly reduced when the outfall pipe elevation is lower than receiving water. Additionally, maintenance of these baffle boxes is not only labor intensive but requires relatively expensive equipment, filter cartridges. While effective in reducing pollutants, it is relatively expensive when evaluated on the dollar per pound of pollutant removed.

In further evaluating the results of the watershed study, the staff identified that nutrient loads from residential areas are almost double of commercial and industrial areas. Based on a study conducted in Brevard County, the reason for this difference is most likely the high organic loads due to the presence of tree canopies, lawns, and landscaping in residential areas. This finding led to the conclusion that the most cost-effective pollutant reduction would be by trapping and collecting organic debris before it enters the stormwater system.

The Public Works' staff is working with new technologies involving permeable pavement inlet fillers to capitalize on this finding. Permeable pavement is any material structurally sound to carry vehicle traffic, while allowing stormwater runoff to drain through the pervious material and trap conveyed pollutants for eventual removal and disposal.

The benefits of this system include lower installation and maintenance costs than the Type II Baffle Box system. These permeable pavement inlets will be cleaned with street sweeping equipment. Collected debris through street sweeping will be disposed of at an approved disposal facility. It is anticipated that this technology will reduce TN, TP, TSS (Total Suspended Solids) and BOD (Biological Oxygen Demand) in stormwater runoff by over 80%.

<u>Future Needed Capital Projects.</u> The Public Works staff has identified 16 stormwater capital projects necessary to meet state nutrient reduction goals, local stormwater system

improvements needs, and repair and replacement of existing stormwater facilities. The projects are arranged in priority based on budgetary constraints and potential benefits (both flood prevention and pollution abatement). Table 6-2 provides a list of the 16 proposed projects, which are graphically shown by location or area in Figure 17 by their reference number.

Table 6-2. Proposed Stormwater Capital Projects

Project Name	Total Estimated Cost ($)	Pollution Control Cost ($)	Repair and Replacement Cost ($)
1. Vero Isles(outfall pipe replacement and inlet retrofits)	200,000	100,000	100,000
2. 12th Avenue Interconnect	125,000	25,500	100,000
3. Lateral E inlet retrofits	1,500,000	1,500,000	-
4. Townside Pip Rehab	1,000,000	-	1,000,000
5. Tulip Lane outfall-inlet retrofits	90,000	90,000	-
6. Royal Palm Place and Pointe	1,000,000	330,000	670,000
7. McAnsh Park (inlet retrofit)	285,000	285,000	-
8. Additional Repair/Replacement Projects -			
16th Street Crossings	90,000	-	90,000
27th Avenue Outfall Repair	100,000	-	100,000
20th Avenue Crossings	90,000	-	90,000
Airport West Crossings	60,000	-	60,000
9. Causeway Boulevard (inlet retrofit)	47,500	47,500	-
10. Bay Drive SR A1A (inlet retrofit)	195,000	195,000	-
11. Mockingbird Drive/Iris (inlet retrofit)	215,000	215,000	-
12. Beachland Blvd/Bridge Plaza Road (inlet retrofit)	142,500	142,500	-
13. Mango Road at Bethel Creek House (inlet retrofit)	250,000	250.000	-
14. US 1 at Main Canal (inlet retrofit)	110,000	110.000	-
15. Royal Palm Pointe (inlet retofit)	110,000	110,000	-
16. Cove Drive Outfall (inlet retrofit)	27,500	27,500	-
Totals for All Recommended Projects	5,637,500	3,427,500	2,210.000

Source: City of Vero Beach Public Works Department, memorandum to Director Monte Falls dated July 31, 2014.

Implementation of the first seven stormwater quality projects would further increase the treated portion of the urban watershed from 1,600 to 2,500 acres or almost 50% of the urban watershed identified for the City of Vero Beach by FDEP in the preliminary TMDL allocation data base.[5] Implementation of the remaining projects would increase the treated portion of the urban watershed from 2,500 acres to 3,000 acres. However, it would be difficult to expanded treated coverage beyond this acreage due to the isolated nature of many of the remaining drainage systems.

It is recommended by staff that policies be considered in the update to this Comprehensive Plan which provides guidance on the establishment of stormwater project

[5] The FDEP preliminary allocation data base lists 5,127 acres within the urban watershed for City of Vero Beach..

priorities and BMPs and milestones for expanding coverage of treated portion of the urban watershed.

Funding. A critical constraint on the successful implementation of BMPs to improve water quality of the Indian River Lagoon is funding. Local funds are the main funding source for carrying out TMDL reduction strategies. Funding sources to augment and defray local costs include the Clean Water State Revolving Loan Fund, the TMDL Water Quality Grant Restoration Grant Program, the EPA Section 319(h) Grant program, and grant funding through the Indian River Lagoon National Estuary Program. However, these loans and grants are competitive and, for grants, may require local matching funds of 30% or more.

Over the last several years the amount of funding for stormwater improvements in the City's Five Year Capital Program has steadily decreased due to other competing priorities including debt service that must rely on General Fund Revenues (such as ad valorem taxes, gas taxes, sales taxes, and revenue sharing). The magnitude of the discrepancy between available revenues and project needs is very apparent when the total costs of the 16 stormwater capital projects are compared with annual General Fund Revenues allocated to such project. Based on the historical average of $300,000 allocated for new stormwater projects, it would take almost 20 years to complete the $5.6 million list of projects without taking into account increases in labor and materials costs.

To address this funding issue and provide better certainty in completing needed projects, the City is investigating the establishment of a stormwater utility to fund capital stormwater projects. To initiate this investigation, the City hired an engineering consulting firm that prepared a preliminary report outlining the possible options for such a utility.[6]

Stormwater projects could be funded through the application of fees to the utilities bill or a non-ad valorem tax to properties. Such fees would be based on the benefit received by each individual property. Unlike the ad valorem tax, which is applied to property based on its appraised taxable value or taxes based on sales, utility fees are based on the use and benefits provided by the stormwater system. The burden or impact that a property has on the City's stormwater system is related to such factors as:

- The peak rate of runoff from the property;
- The volume of runoff from the property; and
- The pollutants in the runoff from the property.

Further, these "user fees" may also be applied to properties exempt from ad valorem taxes (44% of the property in the City of Vero Beach). These tax-exempt properties all contribute to stormwater runoff to the City's stormwater system, benefit from the flood mitigation provided by the system, and benefit from clean waterways.

In adopting the City's 2015-16 Annual Budget and Five Year Capital Program, the City Council established a "Stormwater Utility Fund," as a temporary measure in the budget until a

[6] *Preliminary Report, Stormwater Utility Study*, prepared by Collective Water Resources Team, January 22, 2016.

consultant study to determine specific fee options for the establishment of a stormwater utility is completed. Once the study is completed, the City Council will make a decision on moving forward on the establishment of the Stormwater Utility. It is expected, the City Council may also require a voter referendum on the measure, which would delay its implementation until at least 2017.

Based on preliminary stormwater utility study being prepared for the City, the potential revenues from utility fees, based on an Equivalent Residential Unit (ERU) charge of $5 per month, would be over $1.0 million annually. Of course, the amount of utility fees and the fee rate schedule will be established by the specific options selected by the City Council for calculating such fees.[7]

The preliminary revenue projections from utility fees could fund all or a significant portion of the 16 stormwater capital projects in Table 6-2 in less than ten years. This estimate doesn't include grant funds to supplement local funding or other specific capital stormwater capital projects that may be identified.

The staff supports consideration of this initiative as a funding option. It is a much more equitable method to fund stormwater projects than from ad valorem or sales taxes, as properties pay fees based on the benefits received from the use of and access to the City's stormwater system. Furthermore, tax exempt properties, which currently benefit from the stormwater system, but pay no taxes to maintain or improve the stormwater system, would have to pay user fees, similar to what these properties do for solid waste disposal, water and sewer, and power.

Should the City Council make a favorable decision to establish a Stormwater Utility, specific policies related to the utility should be included in any update to the Comprehensive Plan. These policies should include specific milestones related to expanding the treated portion of the City's urban watershed to provide a benchmark for evaluating progress in improving water quality of the Indian River Lagoon.

Major Capital Improvements. The major stormwater projects to be funded over a five-year period are provided in Chapter 11, Capital Improvements Schedule (CIS) of the Capital Improvements Element in the Policy Document. The CIS, which identifies capital projects to be funded over the next five years, is required to be updated annually as an element of the Capital Improvements Element. As projects are completed, they will be dropped from the list of capital improvements and new projects will be added as needed.

SOLID WASTE SUB-ELEMENT

The purpose of the Solid Waste Sub-element is to identify and analyze the City's existing solid waste and hazardous waste management services and facilities, project future waste generation levels, assess the adequacy of current facilities. This analysis is intended to provide the

[7] An Equivalent Residential Unit (ERU) is typically the basic unit for computing stormwater service charges or rates and represents the hydrologic burden placed on the City's stormwater system by the median single-family residential property in the City as characterized by a combination of the average impervious area and average pervious areas for all single family residential properties in the City.

framework for updating and revising goals, objectives and policies for solid waste in the Comprehensive Plan.

Existing Services and Facilities

The following is a description of solid waste services provided within the City of Vero Beach:

Garbage Collection. The City of Vero Beach's Solid Waste Division is the sole provider of garbage collection services to residential and commercial customers within its city limits. The City's garbage collection and yard waste collection services are funded through fees applied in the City's utility bills. The monthly fee (2016) for single family and duplex residences is $ 14.62 per month.

Residential garbage service is provided door-to-door, twice a week. For commercial and multiple-family customers, non-dumpster garbage pickup is provided five times a week. Dumpster garbage pick-up varies from two to six days a week depending on the customer's needs. The City also manages roll-off container franchise agreements with private haulers for collection of commercial waste.

The City has 7,121 residential and 1,650 commercial accounts. The City provides garbage pick-up services to 653 dumpsters serving commercial and multi-family properties. The yearly annual tonnage is 7,769 tons of residential garbage (includes yard waste) and 10,539 tons of commercial garbage for a total yearly tonnage of 18,308 tons.

Based on the estimated permanent and seasonal population, this tonnage results in a figure of an average of 4.63 lbs of garbage (excludes yard waste) generated per person per day. This daily per capita figure is based on dividing the permanent and seasonal population by total garbage tonnage collected, both from residential and commercial sources.

The City's Solid Waste Division, staffed by 23 employees, has 5 front-loading trucks for commercial service and 8 rear-loading trucks for residential service, along with 6 trucks for specialty pickups.

Yard Waste Collection. The City of Vero Beach provides once-a-week curb-side collection of residential yard waste. For an additional fee, special pickup of yard waste may be provided by the City. The amount of residential yard waste collected in FY 2013-14 was 2,169 tons**.** Yard waste collected by the City is collected and hauled to the INEOS waste-to-energy plant, which has an agreement with the SWDD.

Yard waste not produced by the resident or property owner that is created by a landscaping, lawn maintenance of tree service firm must be removed by that firm and disposed at the County landfill. Such yard waste is not eligible for collection by the City in its residential yard waste collection program.

Special Waste Collection. Special waste is construction and demolition debris, white goods, and waste tires. For an additional fee, the City collects white goods and other bulky

waste items. The collection of construction and demolition debris and waste tires for disposal at the County Land fill operated by the Indian River Solid Waste Disposal District (SWDD) is the responsibility of the waste generators.

Hazardous Waste Collection. Indian River County SWDD has established storage facilities for hazardous waste at the County's landfill. This facility only accepts residentially generated hazardous waste. Small quantity commercial or industrial generators, including medical waste, must contract individually with license hazardous waste haulers for disposal of their hazardous waste materials.

Recycling Collection. Collection of recyclable materials is provided once-a-week to single family and duplex residences by a private hauler under a franchise agreement with the SWDD. The collection was recently changed at the end of 2015 from a multi-stream to a single-stream collection process that is intended to increase the recycling participation rate.

Customers are assessed for recycling and land disposal programs of the SWDD through an annual non-ad valorem assessment on the basis of a WGU (waste generated per unit). WGU is defined as a basic unit of waste generation equivalent to 1 ton per year. The assessment for single family residences (1.6 WGU) was $102.61 in 2015.

The 1988 Florida Solid Waste Management Act provided the catalyst for the creation of the Indian River county SWDD that serves both incorporated and unincorporated Indian River County. Subsequent action by the Florida Legislature established a recycling goal of 50 percent by 2015 and 75 percent by 2020 for Florida counties. In 2014, the SWDD reported that it was recycling at a rate of 37%. Should the County be unable to achieve the legislative recycling goals, the Florida Department of Environmental Protection may require mandatory recycling for multi-family and commercial waste generators. The amount of tons recycled in 2014 was approximately 77,000 tons.

The Indian River County 2030 Comprehensive Plan established as a recycling objective of 30% of the total solid waste stream. However, with the passage of the new legislation, this objective will need to be revised to reflect the legislative mandates.

The Indian River 2014 Sold Waste Management Plan adopted by the SWDD in September, 2014, recommended a phased approach to meeting the recycling goals. One of the major findings in a waste composition study completed was that 46.5 percent of recyclable materials can be diverted from disposal in the County landfill. This phased approach is intended to increase the rate of recycling, decrease material entering the landfill, and extend the landfill capacity and useful life through 2068 (assuming a 50 percent recycling rate) or through 2101 (assuming a 75 percent recycling rate). At the current rate of 37%, the landfill capacity (Segment III covering 76.3 acres) will be depleted by 2058.

Solid Waste Disposal. Solid waste from the City of Vero Beach is disposed at the Indian River County landfill located in the southern portion of the county, except for non-residential hazardous waste and residual sludge from the City's Wastewater Treatment Plant (WWTP).

Sludge is processed and is currently disposed of in the County landfill; the City is studying the composting of this residual waste to eliminate its landfill disposal.

The County landfill site occupies approximately 600 acres. Solid waste operations at the landfill facility include Class I waste (municipal waste) disposal, construction and debris (C&D) disposal, recyclable materials processing and transfer operations, temporary storage of household hazardous wastes, waste tire processing, and ancillary operations.

Construction and demolition (C&D) waste is now comingled with Class 1 (organic) waste, which is disposed in land fill cells lined to prevent the accidental release of contaminated leachate into the groundwater. It was determined that this co-mingling of waste and other reduction and compacting techniques have reduced the required solid waste disposal airspace for Class 1 and C&D waste.

The new Segment 3 Class 1 and C&D waste disposal area has an estimated capacity of 13.5 million cubic yards (CY). When eventually completed Segment3 will cover 79 acres with 8 cells disposal areas. The first of eight cells covering 10.4 acres is currently operational. The remaining seven cells are to be constructed in accordance with a phasing schedule with the second cell anticipated to be constructed by 2020.

Adjacent to the landfill site is the former INEOUS waste-to-energy (WTE) plant, which closed in early 2016 due to operational and financial problems. Under an agreement with the SWDD, the facility was utilizing yard and other vegetative waste to produce 8 million gallons of year of ethanol. In calendar year 2013, the WTE plant processed over 56,000 tons for use as landfill cover and to produce renewable energy using gasification and fermentation technologies.

Analysis

In evaluating the City of Vero Beach's solid waste system, three key components should be considered. These components include: (1) solid waste generation and future demand; (2) solid waste collection; and (3) landfill capacity. This analysis concludes with a brief discussion related to major capital improvements.

Solid Waste Generation and Future Demand. In evaluating and projecting solid waste generation, the 1992 Comprehensive Plan used a standard of pounds per day per capita based on historical data on residential and commercial garbage collected by the City's Solid Waste Division. This standard did not include yard waste, C&D waste, land clearing debris, and residential hazardous waste. It was used as a level of service standard for solid waste in the 1992 Comprehensive Plan.

The Indian River County's 2030 Comprehensive Plan adopted a level of service for solid waste generation based on two components, which was based on information provided by the SWDD. The first component standard is based on the estimate of all waste (Class 1 and C&D waste) generated by tonnage per person per year. The second component is based on utilization of landfill space, which is based on the per capita landfill utilization rate measure in cubic yards per year.

After careful review it was the decision of the staff to revise the level of service standard by recommending adoption of the two component standard as adopted by Indian River County based on the latest SWDD Solid Waste Master Plan. This approach more accurately addresses the most critical factor related to solid waste management, this is, land fill capacity.

Class I and C&D Waste Generation: Based on Solid Waste Division's data and estimates of the City's permanent and seasonal population in Chapter 1, the daily garbage generated per day per person is approximately 4.6 pounds based on the residential and commercial garbage collected.[8] This figure converts to .83 tons per capita per year or 1.12 cubic yards per capita per year using the assumptions in the 2014 SWDD Solid Waste Management Plan (see next section).

Although no figures are available for C&D waste for the City of Vero Beach, the SWDD 2014 Solid Waste Management Plan uses a per year figure of .6 tons per capita or .42 cubic yards per capita. Adding the figures for C&D waste to the above figures for Class I waste, the total combined figures are 1.43 tons per capita per year or 1.54 cubic yards per capita per year. The standards for solid waste in the update Comprehensive Plan should be revised to adopt this tow-component level of service standard.

Except for employment growth over the next 20 years, the City is not expected to experience any appreciable increase in population, assuming no unforeseen large scale development or annexation occurs. Therefore, the amount of garbage generated is only expected to increase slightly, tempered by increased efforts to reduce waste through recycling and other waste diversion measures. In updating the Solid Waste GOPs, special attention should be given to waste reduction and diversion in support of the SWDD's efforts.

The City's Solid Waste Division has sufficient existing staffing and equipment to handle any reasonable increase in garbage demand during the 20-year planning period based on the growth projections in Chapter 1. However, any significant increases due to unforeseen large scale development or annexation would require re-evaluation of existing resources to adequately handle projected demand.

Solid Waste for Land Fill Disposal: The County's 2030 Comprehensive Plan adopted a per capita standard of 2.4 tons per permanent population plus weighted seasonal population per year or 4 cubic yards per capita plus weighted seasonal population per year in Policy 1.3 of the Solid Waste Sub-Element. The 4 cubic yards per capita standard is a landfill capacity utilization rate use for determining amount of waste volume in cubic yards per year for disposal in the land fill. This standard applies to the entire population of the County including municipalities.

With the adoption of the 2014 Solid Waste Management Plan by the Indian River SWDD on September 23, 2015, the land fill utilization standard of 4 cubic yards (CY) per year will be revised in an amendment to the County's Comprehensive Plan to 1.70 CY per capita per year

[8] It should be noted that total tonnage of garbage collection has been fairly stable since 1986.

based on the current recycling rate of 37%. This revised standard of 1.28 CY per capita per year for Class I waste and 0.42 for C&D waste is based on a 37% recycling rate, co-mingling of Class 1 and C&D waste, and a reduction in materials entering the landfill

Using the updated population projections since the adoption of the 2030 Comprehensive Plan, it is projected that an additional 13.5 million CY of waste will need to be disposed through 2058. Segment 3 landfill disposal area will have sufficient capacity to accommodate this level of landfill disposal demand. Should the recycling rate be increased to bring the County into line with the recycling goals established by the Florida Legislature, the life span of Segment 3 landfill disposal area may be extended through the year 2068 with a 50% recycling rate and through the year 2101 with a recycling rate of 75%.

Policy 1.2 of the Solid Waste Sub-Element of the 2030 Indian River County Comprehensive Plan establishes a concurrency standard that "if the active segment of the landfill is at 90% of its capacity and a new segment is not ready, additional development shall not be permitted. This concurrency standard needs to be considered in the City Comprehensive Plan update.

The Solid Waste Sub-Element GOPs of the 2030 Indian River County Comprehensive Plan and the 2014 Solid Waste Management Plan need to be reviewed and, where appropriate, specific GOPs incorporated in the update of the Vero Beach Comprehensive Plan.

Major Capital Improvements. Capital projects related to solid waste management are generally tied to new or replacement of garbage and waste collection vehicles. These projects may include projects to be funded by the SWDD for needed improvements to its landfill site.

The major capital projects for solid waste management to be funded over a five-year period are provided in the Capital Improvements Schedule (CIS) of the Capital Improvements Element in the policy document. The CIS, which identifies capital projects to be funded over the next five years, is required to be updated annually as an element of the Capital Improvements Element. As projects are completed, they will be dropped from the list of capital improvements and new projects will be added as needed.

SANITARY SEWER SUB-ELEMENT

The purpose of the Sanitary Sewer Sub-element is to:

- Identify and analyze existing and projected demand and need for sanitary sewer facilities based on the service population, existing and future land use, capacity of existing facilities (sewage collection, treatment, and disposal) and any future changes to these facilities.

- Identify and analyze specific operational, regulatory, and funding issues related to provision of existing and future service including septic systems.

The analysis of the sanitary sewer system serves as the basis for identifying wastewater policy and implementation strategies including needed improvements to existing facilities over the next 10 or more years and the expansion of central sewerage to replace existing septic systems. The end result is to provide the framework for consideration of specific amendments to the existing set of goals, objectives, and policies (GOPs) for wastewater in the Comprehensive Plan update.

Historical Background

The City of Vero Beach has had a central sewer system that began in the 1920's. This system served the most densely developed and developed urban areas of Indian River County. Until the late 1970's, outside the central sewer area served by the City, unincorporated Indian River County had no access to central sewer service.

The alternatives to central sewer service have historically been privately owned sewer facilities. These facilities were either package systems to individual projects or subdivisions or on-site septic systems for individual lots. In the 1970's, state regulations were becoming more stringent with the intent to discourage use of individual septic system and small package systems.

In 1985, the City of Vero Beach purchased privately-owned central sewer system owned by Hutchinson Island Utilities serving the Moorings on the barrier island south of the City limits. Subsequently, the City was granted a 30-year franchise agreement by the County to provide sewer service to the south barrier island area. This agreement was followed with a series of territorial and franchise agreements with Indian River County and eventually Town of Indian River Shores to provide central sewer outside the City limits, including reuse water to the town.

In the last few years, Indian River County Commission expressed its desire to acquire the City's water and sewer system. This proposal has not advanced any further due to financial and other issues of concern to the City of Vero Beach.

A dispute with Indian River County has arisen over the provision of water and sewer services by the City to South Beach and other portions of unincorporated Indian River County beyond the expiration of the franchise agreement in 2017. It's the City's firm contention that a May 1989 territorial agreement with the County established the permanent allocation and delineation of service territories. Therefore, the City believes it has the right to continue to provide such services unless the City and Indian River County would enter into a new franchise agreement that would include buy-out provisions.

Regulatory Framework

Wastewater collection, treatment, and disposal is regulated by various agencies at all levels of government. The roles and responsibilities of each level are described in the following sections:

Federal. The Federal Water Pollution Control Act of 1972 (PL 92-500) and its amendments through the Clean Water Acts of 1977 and 1981 are the basis for pollution control regulation in the nation. The goal of these acts is the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters.

The act established a national policy to implement wastewater treatment and management programs to achieve the goal established in the federal legislative acts. Federal grants are made available to local governments directly or through the state to construct facilities to treat "point sources" of pollution. The U.S. Environmental Protection Agency is responsible for implementing the acts.

State. The Florida Department of Environmental Protection (DEP) is the agency responsible for ensuring that Florida carries out the requirements of PL 92-500. DEP has adopted in the Florida Administrative Code rules for regulating wastewater facilities that treat flows exceeding 10,000 gallons per day (GPD).

The Florida Department of Health (DOH) regulates septic tanks and drainfield installations through its local county offices. Regulations for septic tanks have been adopted by rule in Chapter 64E-6, Florida Administrative Code (FAC). Chapter 64E-6 does not set criteria for septic tank effluent quality, but it does set installation standards based on soil, water table, and setbacks from wells and surface water. It requires septic tanks and drain fields to be installed in such a manner that with reasonable maintenance, they will not create a health hazard or endanger the safety of any domestic water supply.

Section 381.0065, Florida Statutes, and Chapter 64-E, F.A.C., also establishes criteria for mandatory connections to wastewater and potable water systems. An onsite wastewater treatment system must connect to a central system within 365 days after written notification that the system is "available" for connection or 90 days if the onsite treatment and disposal systems needs repair or modification to function in a sanitary manner or to comply with the statutory requirements or administrative rules.

Local. The regulations governing wastewater treatment, distribution, and collection facilities within the city limits are established in Chapter 78 of the City Code of Ordinances. Section 78-64 of the Code requires that connection with the central sanitary sewer system is mandatory for any lot or parcel or combination, the use of which:

- Produces an estimated wastewater flow of 600 gallons or less per day, if a gravity line, force main, lift station, or a low pressure sewage collection system exists in a public easement or right of way the abuts the property;

- Produces more than an estimated wastewater flow of 600 gallons per day, if a sewer line, force main, lift station, or low pressure sewage collection system exists in a public easement or right-of-way which abuts the property or is within 100 feet of the property; or

- Requires development approval.

Notwithstanding the above, a parcel or lot with an existing, functioning and permitted on-site wastewater treatment system (septic system) is not required to connect to the central gravity system even if sanitary sewer is available. The only exception is if the on-site system should fail

an inspection conducted by a licensed septic tank contractor in conjunction with the required pump out to be done at least every five years. If system fails the inspection and central sewer is available, the DOH requires hook-up to the central system.

Recently, the City of Vero Beach enacted regulations to establish a septic tank effluent pump (STEP) program. This program, which is discussed under the Analysis section, is an innovative and less costly approach than reliance on the traditional gravity sewer to collect and transmit wastewater to the wastewater treatment plant.

The Water and Sewer Department administers and enforces provisions of Chapter 78, Article III, Sanitary Sewer System, of the City of Vero Beach Code that establishes uniform requirements for users of the central sewer system. As part of these regulations are requirements to prevent introduction of pollutants into the system that interferes with the wastewater treatment plant's operations or allow pollutants that will pass through the facility with little or no treatment.

Existing Public Wastewater Facilities

The City of Vero Beach Water and Sewer Department is the agency of the City that operates the City's central wastewater treatment system. The City's central wastewater treatment system provides service within the corporate limits and to the Town of Indian River Shores and portions of unincorporated Indian River County including South Beach on the barrier island as shown in Figure 4.

The only remaining private wastewater treatment systems within the city limits are individual septic systems. More than 1,500 such systems exist in the city.

Collection/Transmission System. The City's wastewater collection/transmission systems consists of gravity sewer mains (132 miles), manholes (2,700) , force mains (65 miles), lift stations (127), and other associated facilities. The gravity lines collect and convey wastewater to the lift stations and the lift stations pump the collected wastewater to the wastewater treatment plant (WWTP) by force mains. The estimated population served is 30,850.

Treatment. After collection wastewater is processed at the City of Vero Beach wastewater treatment plant (WWTP) located along the Indian River Lagoon. The design and permitted capacity is 4.5 million gallons per day (MGD) annual average daily flow (AADF). In 2014, the AADF was 3.54 MGD with a three month average daily peak flow of 3.844 MGD. The AADF ranged from 2.754 MGD in 2009 to 3.284 MGD in 2012, and 3.028 MGD in 2013. These numbers are influenced by major rainfall events.

The estimated average daily flows into the City of Vero Beach WWTP on a jurisdictional basis are:[9]

- City of Vero Beach - ~2.14 MGD

[9] The distribution of sewage treated by jurisdiction is based on estimates provided by the Vero Beach Water and Sewer Department and modified by the Planning and Development Department based on 2014 total AADF of 3.54 MGD.

- Unincorporated Indian River County - ~0.86 MGD
- Town of Indian River Shores - ~0.54 MGD

The City of Vero Beach WWTP is a complete-mix activated sludge, tertiary treatment facility consisting of influent screening, grit removal, biological nutrient removal, clarification, tertiary filtration and disinfection by gas chlorination. Influent wastewater is treated to meet reclaimed water standards for use as irrigation water for recreation areas, residential lawns, golf courses, urban landscapes, and road medians.

By-Product Disposal. The treated effluent is distributed to the reuse system. Substandard reuse water and excess quantities of reclaimed water that can't be stored produced during periods of decreased customer demand are disposed of in the deep well injection system with a capacity of 9.72 MGD.

The reuse system which distributes reclaimed water through pumping system has a permitted capacity of 4.5 MGD. The average daily consumption of reclaimed water is 2.34 MGD. The reuse system has three reuse storage tanks. A 5.0 million gallon (MG) and 3.0 MG storage tank is located at the WWTP site and a 1.0 MG storage tank is located in the Town of Indian River Shores.

The City has a permit from the St. Johns River Water Management District (SJRWMD) to withdraw 365 million gallons per year (1 MGD annual average) of stormwater from the Main Relief Canal for purposes of supplementing its reclaimed water system when it is available. Additionally, the City has a consumptive use permit issued by the SJRWMD that allocates a back-up groundwater allocation of 40 million gallons year (MGY) from the Floridan aquifer to augment the reuse system during periods of high demand. These supplemental sources are used during periods of low rainfall when the supply reclaimed water is insufficient to meet increased customer demands for irrigation water.

Sludge, which is the solid by-product of wastewater treatment, has been processed through two rotating drum thickeners and two aerobic digesters for sludge management. Twice-a-year the City contracts with a sludge handler to bring in a dewatering trailer to dewater and haul the sludge to the County landfill.

The City recently invested $1.5 million to modernize its sludge management operations by adding a sludge recycling facility. The proposed system disinfects, eliminates odor and enhances dewatering of secondary sludge without the need for aerobic digestion, odor-control systems. It will increase by five percent or more in the amount of total cake solids, which will allow the resultant dewatered material access to a greater number of disposal outlets and beneficial use strategies. These options will allow the City to investigate the composting of sludge with yard waste rather than disposal at the County landfill.

Funding. The City sanitary sewer system is operated as a proprietary function, which is financed by user fees, impact fees, tap and lateral connection fees, grants, low-interest loans, and various miscellaneous charges. A portion (approximately 6%) of the annual revenues is returned to the City's General Fund as a return on investment.

In 2011, the City hired an engineering consulting firm to conduct a system and financial optimization study of both the water and sanitary sewer system.[10] The City Water and Sewer Department is implementing many of the study's recommendations that have led to implementing specific optimization measures in terms of operational and cost efficiencies and changes in user fees and charges.

Existing Septic Systems

The City has approximately 1,500 privately-owned individual on-site septic systems that generally serve one individual residence. Approximately 2/3 of these systems are located on the barrier island.

A septic tank system consists of two components. One is the septic tank that receives the sewage and provides a period of settling, during which time a significant portion of the solids settle out. The treatment process is done by bacteria which gradually decompose the solids which have settled to the bottom of the septic tank.

The other component is the drain field. The remaining liquids from the septic tank are discharged through underground pipes into the drain field and percolate into the soil. Once in the soil the microorganisms and filtration process purify the liquids. Every three to five years the solids must be removed from the septic tank and transported to the county landfill for disposal.

A problem with the proper functioning of septic tanks in the City of Vero Beach is hindered by the high water table on the barrier island that reduces filtration of the effluent. Furthermore, the density of development with septic tank with lots of 15,000 square feet or less increases the possibility of groundwater contamination that leads to the transmission of these contaminates to the Indian River Lagoon.

In particular, recent water quality monitoring and studies conducted for the Indian River Lagoon and interconnected canals have shown a high concentration of nutrient and phosphate entering through groundwater in areas with a high concentration of septic systems.[11] Therefore the eventual elimination of these septic systems and the connection of residences to the central sewer would be a significant benefit to the health and well being of the Indian River Lagoon.

Analysis

The analysis of the Sanitary Sewer Sub-Element focuses on the following: collection/transmission system, septic tanks, treatment facilities, and disposal. The analysis concludes with a proposed list of major sanitary sewer projects anticipated to be funded and constructed over the next 5 years.

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[10] *Water, Wastewater, and Reuse System Operational and Financial Optimization Report,* prepared by GAI Consultants, Inc., for the City of Vero Beach, August, 2011.

[11] *The Effects of On-site Sewage Treatment and Disposal Systems on the Relief Canals of Indian River County, the St. Sebastian River, and the Central Indian River Lagoon,* prepared by Marie E. Tarnosowski, as a thesis for partial fulfillment of the requirements for the Degree of Master of Science (Florida Atlantic University), December, 2014.

Collection/Transmission System. The collection/transmission system has been expanded as the City grew. Older portions of the gravity mains contain vitrified clay pipe (VCP), which under on-going repair and replacement. The new portions of the system are constructed with polyvinyl chloride (PVC) and ductile iron pipe. The new materials are used in the replacement of older, obsolete VCP pipe.

The City has an agreement with the County on the water and sewer service area. Other than minor amendments to the service area boundaries, it is unlikely that the City sewer will expand beyond its current services area as shown in Figure 4. Although, Indian River County has made proposals to purchase the City's sewer system, the City has not found it in its best interest or the interests of its utility customers to do so, especially as the County system has significantly more capacity than required to serve both its existing and anticipated future development.

Other than the on-going replacement of obsolete and damaged lines and efforts to optimize the collection/transmission system, the other focus of the City is to continue to expand central sewer within its existing service and developed areas. This effort is in coordination with the STEP program to eliminate septic systems.

It is the intent of the City to eventually connect all wastewater discharges to central sewer. A central system is more reliable and regulated than private on-site treatment and disposal systems and allows for a higher level of treatment including reuse of treated effluent. It is estimated that more than 99% of the nitrogen and phosphorous rich septic system effluent that is now being discharged to ground water would be eliminated with connection to the central sewer system.

Recognizing that the costs to retrofit permitted on-site waste disposal and treatment systems to individual property owners and the costs to the City to install gravity lines to serve these properties are expensive, the City has primarily pursued incentive approaches to obtaining connections to the City's central sewer system including financial assistance,

Septic Systems. Septic systems have been identified as a significant source of groundwater contamination, especially in areas of the City with a high water table and dense concentration of septic tanks. The contaminated groundwater conveys nitrogen, phosphate, and other pollutants to the Indian River Lagoon that contribute the degradation of this significant estuary.

As mentioned previously, recent changes in the City's regulations require that all septic systems be inspected and pumped-out at least every five years. Where such systems fail and can't be repaired or replaced as determined by the Department of Health, these on-site systems must be connected to the City's central sewer system.

In addressing the problem of the presence of at least 1,500 septic tanks within the city limits, the City Water and Sewer Department came forth with an innovative program to reduce the costs of connection to both property owners and the City. This innovative program is called

the Hybrid Septic Tank Effluent Pump [STEP] System.[12] The jump-start of the program was aided by grant funds from the SJRWMD that help fund the program including financial incentives for property owner participation.

The total cost, including availability and connection of the STEP System is approximately 1/2 the price of a conventional gravity sewer or vacuum style sewer system. The availability cost of the STEP system, such as installation of mains, valves, etc., in City ROW is less than 10 percent of the cost of a conventional gravity sewer or a vacuum style system. This lower cost provides the opportunity for the City to make central sewer available to more residents more quickly and at much lower costs.

Effluent is conveyed by gravity to the septic tank through the plumbing line from the residence. Liquid waste is pumped under pressure to the central sewer system. Solids remain in the septic tank where it naturally decomposes and is eventually pumped out by the City every eight years if needed.

The STEP system on an individual's property is owned by the City of Vero Beach. An easement is put in place to allow City Water and Sewer Department access to perform maintenance and repairs.

The costs to provide collection and transmission of effluent from STEP System properties is dramatically lower than conventional gravity sewer due to the use of small-diameter mainlines laid at a constant depth to follow the contour of the land. These small diameter lines may be installed through boring without tearing up the roads to install 8-inch diameter sewer mains in conjunction with manholes and service laterals to the property.

In 2015, the estimated cost to install a gravity system to connect the 1,500 residences with septic systems to central sewer was $22.5 million. Figure 18 shows the location of the 1,500 septic tank systems grouped by priority areas for implementation numbered from 1 to 7.

It should be noted that several public sand and shell roads are located in area number 3. Section 71.14 of the Land Development Regulations prohibits the installation of utilities along, on, or under these roads to protect the existing Live Oaks. The horizontal boring system and piping size used in the STEP eliminates this concern. Therefore, the Water and Sewer Department has prepared an amendment to regulations governing City right-of-way to allow the STEP system to be implemented for properties accessed by these roads.

The availability cost to make mains available to residences for connections was estimated at $18.5 million of the total $22.5 million.[13] The estimated cost for the STEP System to serve these same residents is $11.0 million with an availability cost of less than $1.0 million.

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[12] *Talking Points of a Hybrid Septic Tank Effluent Pump (STEP) System*, prepared by the Vero Beach Water and Sewer Department as a public information handout, 2015.

[13] Availability cost is defined by the City Water and Sewer Department as the cost of making sewer available to all residents by installing just the main lines and components (excluding the on-lot portion of the system.)

Specific GOPs should be considered in the update of the Comprehensive Plan. These GOPs should consider numerical target(s) and date(s) for elimination of existing septic systems and connection to the central sewer system.

Treatment Facilities. The evaluation of the significant issues related to the WWTP and its future operation are discussed below:

Projected Demand: In making a projection of future demands on the City's WWTP capacity, it is assumed that the City of Vero Beach's sewer system will continue to serve customers within its corporate limits and the City's sewer services areas within the Town of Indian River Shores and unincorporated Indian River County during the 20-year period of this Comprehensive Plan.

Using this information, the average gallons per capita per day (gpcd) usage is approximately 114 based on a 3.54 MGD average annual daily flow (ADF). This figure is not consistent with the current Level of Service Standard of 99 gpcd in the Comprehensive Plan. This LOS standard, based on the number of gallons per capita per day, is not germane to projecting demand and evaluating system capacity.

A more appropriate Level of Service Standard is 250 gallons per day (GPD) per ERC figure based the GAI consulting group's optimization study and industry standards.[14] This figure represents the basic volume of wastewater conveyed from a single-family residence. This planning LOS tool used in conjunction with the treatment capacity of the City's wastewater treatment plant serves as much better standard for measuring level of service.[15]

In making its demand projections, the staff took into account the potential impact of the STEP program, development projects under review, and the projected nonresidential development forecast in the Land Use Element. The demand projections are consistent with the forecasts of population, employment, land use, dwelling units and nonresidential floor space provided in Introductory and Land Use Elements.

Table 6-3 presents the projected total wastewater demand for the planning horizon year of 2035.

Table 6-3. Projected Potential Wastewater Demand for 2035

Description	ERC[1]	Demand (MGD)
1,500 STEP Connections to Service[2]	1,500	0.375
600 Dwelling Units[3]	600	0.150
Non-residential Development[4]	774	0.194
Existing Wastewater Demand (2014)	14,160[5]	3.540

[14] In the GAI optimization study, a 250 GPD per ERC (amount of sewer flow from a typical single family household) was used to estimate wastewater demand based on a review of utility billing records. This standard is also used by Indian River County's Comprehensive Plan.

[15] It should be noted that the City Water and Sewer Department uses both ERC and gallons per capita per day in projecting and evaluating capacity; however, the projections prepared in this document are generally consistent with the methodology applied by the department..

Total Demand	17,034	4.260

Source: City of Vero Beach Planning and Development Department, 2016
Notes:

1. Each ERC is 250 GPD.
2. Assumes that all 1,500 residences eligible properties for the STEP program will be connected to central sewer by 2035, based on information provided by the City Water and Sewer Department. The assumption is that 750 residences will connected every 10 years of the planning program.
3. Assumes some partial development of the 333-acre vacant tract in the western sections of the City and other smaller miscellaneous projects under development review in 2016 including development outside the City's corporate limits in unincorporated Indian River County and Town of Indian River Shores.
4. Assumes increase in non-residential development based on employment growth through 2035. This assumption is based on a projected 2.6 million square feet increase in nonresidential floor space (see Chapter 2) and a generic (commercial office) ERC of 0.3 applied per 1,000 square feet of nonresidential floor space. It does not take into account differing uses that have widely varying water usage rates.
5. ADF of 3.54 MG divided by 250 gallons.

Capacity Analysis: The projected total average daily demand of 4.26 MGD would be slightly more than 94% of the capacity of the existing wastewater treatment plant if this demand were to materialize.

While this projected potential future demand is unlikely and growth in demand on the system has historically been slow, it does point out some value of having a general policy in place that would trigger follow-on procedures to evaluate the need for increase plant capacity and necessary planning, design, financial, and permitting implementation steps.[16] Such a policy could be triggered when a specific percentage of the plant's capacity is utilized.[17]

Any future decision to potentially have to increase the treatment capacity of the WWTP is complicated by the current location and vulnerability of the plant. A discussion of the plant relocation is addressed in the following section.

Wastewater Treatment Plant Vulnerability to Flooding and Its Relocation: The existing WWTP was built in 1958 and has been expanded and improved on various occasions over the years. The WWTP's benefited from its location to the Indian River Lagoon, as this water body served as the discharge destination for treated wastewater effluent.

However, with changes in water quality laws and regulations, discharges from the WWTP are either transmitted to the reuse system or to groundwater injection at the Vero Beach Regional Airport. Therefore, the location of the WWTP is no longer dependent upon its adjacency to the Indian River Lagoon.

A major issue with the current plant site is that the WWTP is located with the AE-5, Special Flood Hazard Zone. Most of the treatment plant facilities are a half a foot or more below the base flood elevation. As a category III structure pursuant to ASCE 24-05, the WWTP is

[16] It should noted that as part of the WWTP permitting process the City has requirements to plan for needed upgrades to treatment capacity. A general policy for incorporation in the Comprehensive Plan to address this issue would still have some merit as it makes such decisions more transparent for the general public.

[17] As requirement of it s FDEP permit, the City Water and Sewer Department prepares a capacity analysis of its plant every five years during the permit renewal process.

required to have any finished floors and all electrical and mechanical equipment protected up to one foot above base flood elevation.

The flood waters from the two 2004 hurricanes caused several failures to key systems. Subsequently, flood protection panels were install above the flood elevation and installed floor proof doors at the entrances to the electrical and control rooms. Two fully enclosed emergency generators provide backup power to operate the WWTP.

With no longer a need to discharge to the Indian River Lagoon and concerns about the aesthetics of the plant along the waterfront and its vulnerability to floodwaters, the community has been discussing the possible relocation of the WWTP to the airport where the deep injection well is located.

A cost estimate prepared for the City Water and Sewer Department in February, 2016, provided a price tag of $35 million to demolish and build a new plant at a site near the Vero Beach Regional Airport. It would take an estimated six years from concept and design to completion.

As this project would have to be paid primarily by utility users, even if financially supplemented by grants, State Revolving Loan Fund, or revenue bonds, it is highly unlikely any major decision would be made on any decision to relocate the WWTP until the debt on the plant is retired. If it were determined that the treatment capacity of the plant is needed to be increased such a decision may drive a decision to relocate the plant to the airport location. A policy may be considered for inclusion in the Comprehensive Plan that calls for continued evaluation of this possible relocation.

Treated Wastewater Disposal/Reuse. The reuse system has a capacity of 4.5 MGD. Annually consumption is approximately 2.388 MGD (2014). As discussed previously, treated wastewater effluent that is acceptable for reuse is transmitted to the two on-site storage tanks of 8 MGD and one storage tank in Indian River Shores of 1 MGD for future transmission to the reuse system. All the remaining treated wastewater is transmitted to the deep injunction well for disposal.

The recent optimization study conducted by GAI Consultants recommended specific measures to more fully utilize and upgrade the system and increase the number of customers. Specific policy or policies should be considered in the Comprehensive Plan related to expanding customer base and system coverage.

Sludge Disposal. As mentioned previously, the City has installed a new sludge handling equipment, which will result in a more cost effective process. The resulting product is nutrient rich and safe for land application or composting. A policy should be considered to utilize the sludge for either land application or composting to reduce disposal into the landfill.

Major Capital Improvements. Over the next five years starting in 2015, the Water and Sewer Department has identified $5.9 million of projects in the City's Five Year Capital Program for Fiscal Years Ending 2016-2020 for upgrades and replacement of components to the

collection system, treatment plant, and reuse system. These upgrades include $2.45 million for the STEP system and $1.5 million for sludge handling modifications.

A list of the sanitary sewer capital improvements to be funded over a five-year period is provided in the Capital Improvements Schedule (CIS) of the policy document to this Comprehensive Plan. The City's CIS as an element of the Capital Improvements Element must be updated annually. As projects are completed, they will be dropped from the list of capital improvements and new projects will be added as needed.

POTABLE WATER SUB-ELEMENT

The purpose of the Potable Water Sub-element is to:

- Identify and analyze existing and projected demand and need for potable water facilities based on the service population, existing and future land use, capacity of existing facilities (potable water production wells, treatment, and transmission lines) and any further changes to these facilities.

- Identify and analyze specific operational, regulatory, and funding issues related to the provision of existing and future service.

The analysis of the potable water system serves as the basis for identifying potable water policy and implementation strategies including needed improvements to existing facilities over the next 10 or more years. The end product is to provide the framework for consideration of amendments to the goals, objectives and policies (GOPs) for potable water in the Comprehensive Plan update.

Historical Background

The City of Vero Beach has had a central water system since the early part of the last century. This system served the most densely developed and intensively developed urban areas. Outside the central water area served by the City, unincorporated Indian River County had no access to central water service until the late 1960's.

The alternatives to public central water service have historically been private individual wells or central privately-owned and operated central water systems drawing from the surficial aquifer. As demands on the shallow aquifer increased over time due to the new development, access to central public water systems became the more economical and practical alternative.

In the late 1960's, the Moorings development on the barrier island south of the City limits, entered into agreement with the City of Vero Beach that the Moorings would construct a water from the South City boundary to the Moorings and upon completion the facilities would be transferred to the City which would provided water service. This followed with a series of territorial and franchise agreements beginning in the 1970s with Indian River County and eventually the Town of Indian River Shores to provide central water service to portions of unincorporated Indian River Count and Town of Indian River Shores. [The disagreement with the Indian River County is briefly discussed under the Sanitary Sewer Sub-Element.]

Regulatory Framework

Potable water is regulated by various agencies at all levels of government. The roles and responsibilities of each level are described in the following sections:

Federal. Minimum potable water quality standards are set by the federal government, which include regulations governing operating standards and quality controls. These regulations are incorporated in the Safe Water Drinking Water Act, Public Law 93-253.

The U.S. Environmental Protection Agency (EPA) is the agency designated by this law to establish minimum drinking water standards. These standards are divided into "primary" and "secondary" standards. "Primary" standards relate to the health quality of the water, while "secondary" standards concern the aesthetic quality of the water.

State Agencies.

Florida Department of Environmental Protection: Pursuant to federal government standards, the Florida Legislature adopted the Safe Florida Drinking Water Act, Sections 403.850-403.864, Florida Statutes (F.S.). The Florida Department of Environmental Protection (FDEP) is the agency response for promulgating rules classifying and regulating public water systems, which are incorporated within Chapter 62-550, FAC. The "primary" and "secondary" standards of the Federal Safe Water Drinking Water Act are mandatory in Florida.

St. Johns River Water Management District: The St. Johns River Water Management District (SJRWMD) is responsible for managing water sources to ensure existing and future demand can be met. The SJWMD allocates and manages consumptive use of water resources through its consumptive use permitting system. It issues well construction permits and reviews the construction of all wells, including public water systems.

Section 373.709, F.S., requires that each water management district prepare regional water supply plans based on a 20-year period. Such plans are required to quantify the water supply component for each water supply planning region identified by the district that quantifies the water supply needs for all existing and future reasonable-beneficial uses; water supply options both traditional and alternative; a water resource development; and recovery and prevention strategy; and specific technical data surface and groundwater resources.

Sections 373.709, and 163.3177(6)(c)3, F.S., require that local governments water supply and work plan be updated within 18 months after a water management district's governing board approves an updated regional water supply plan. The purpose of the update is to reflect any changes in the regional plan that affect the local water supply and work plan.

The SJRWMD's 2005 District Water Supply Plan designated 39% of the district as a Priority Water Resource Caution Area (PWRCA). Indian River County is not designated with a PWCRA, which means that existing water supply sources and water supply development plans are considered reasonably adequate to meet projected needs while sustaining water quality and protecting wetland and aquatic systems. Therefore, the City is not required to prepare a ten-year

water supply facilities plan at this time; however, this element does evaluate projected demand and needed improvements to the potable water system, as discussed under "Analysis" section

Florida Department of Health: The Florida Department of Health (DOH) through its local county offices regulates all water systems not subject by the Florida State Drinking Water Act. The DOH regulations are contained in the Florida Administrative Code. This agency investigates drinking water complaints.

Local. The City Water and Sewer Department is responsible for providing centralized potable water service within the City of Vero Beach and portions of unincorporated Indian River County and the Town of Indian River Shores. The Water and Sewer Department is responsible for planning upgrading and expansion of existing water treatment and transmission facilities; operating and maintaining the existing treatment and transmission facilities; establishing design and construction standards for connections to the system; and administering and enforcing provisions of Chapter 78, Article IV, Water System that requires connection to the City centralized potable water system and establishes specific rules and procedures governing the system and connections to the system.

Existing Public Potable Water Facilities

The City of Vero Beach Water and Sewer Department is the agency of the City that operates and maintains the City's central water system. The City's central water system provides service within its corporate limits and to the Town of Indian River Shores and portions of unincorporated Indian River County including South Beach on the barrier island as shown in Figure 4. The area immediately outside the City's service territory is served by Indian River County's central water system.

Water Treatment Plants. The City of Vero Beach has two separate water treatment plants (WTP) on the same site, a Lime Softening WTP and a Reverse Osmosis (RO) WTP. The treated water from the two WTPs is blended prior to storage and transmission to the High Service Pumps (HSPs). The blending of water from the Lime Softening and RO WTPs is a dynamic process, which is dependent upon the variable changes in potable water demand.

RO WTP: The RO WTP is designed and permitted at a capacity of 3.3 MGD. The plant is operated on a daily basis to produce 2.0 MGD of treated water from 2.35 MGD of raw (untreated) water. The plant utilizes a reverse osmosis treatment process and chloramination to treat water from the three Floridan aquifer wells.

The water from the Floridan aquifer production wells is of lesser quality than water withdrawn from the surficial aquifer. The reverse osmosis process effectively removes these chlorides and other impurities from the well water to produce high quality potable water. Particulate matter and other substandard reuse water is disposed of in the deep injection well used for discharge of treated affluent from the WWTP.

Lime Softening WTP: The lime softening WTP has a rated and permitted capacity of 12.99 MGD. The plant produces approximately 3.57 MGD of treated water. The WTP uses a

combination of lime softening, coagulation, filtration, recarbonation and chloramination to treat water primarily withdrawn from the surficial aquifer. The treatment processes remove naturally occurring color compounds from the raw water, reduce the hardness, and stabilize the waste byproduct and disinfect it. Ten of the surficial aquifer production wells have been identified with water that has high limits of Volatile Organic Compounds (VOCs) and are treated by two offsite air-stripping towers prior to transmission to the WTP.

Potable Water Distributed: Waters from both the RO WTP and lime softening WTP are blended together to produce the potable water sent to City customers. Supplemental fluoride is added to that naturally occurring in the water to increase the level of this element to the optimum concentration recommended by health authorities to promote dental health. The WTPs utilize nine High Service Pumps for distribution of potable water throughout the service area.

The average daily flow (ADF) for the potable water system was 5.573 MGD in 2014 with a daily peak flow of 8.09 MGD. The estimated average daily flows of potable water distributed on a jurisdictional basis are as follows:[18]

- City of Vero Beach - ~3.36 MGD ADF
- Unincorporated Indian River County - ~1.38 MGD ADF
- Town of Indian River Shores - ~0.83 MGD ADF

Production Wells. The City of Vero Beach draws on groundwater from the Upper Floridan aquifer (referred simply as the "Floridan aquifer") and surficial aquifer for treatment in its central potable water system. The maximum daily amount of water than may be withdrawn is based on the consumptive use permit issued by SJRWMD. [Note: The reader is referred to the next section, Natural Groundwater/Aquifer Recharge Sub-Element and Conservation Element for a detailed description of the Floridan and surficial aquifers as to both water quality and quantity parameters and issues.]

According to the report prepared by the SJRWMD staff in review of the City's Consumptive Use Permit Application in 2014, the City's use of groundwater has significantly declined from historic levels due to water conservation and enhanced reuse.[19] During the period 2000-2013 potable water consumption decreased by 24 percent.

The use and reliance on the surficial aquifer has significantly declined with a decrease from 8.4 MGD before 1992 (the year the RO WTP was constructed) to approximately 4 to 4.5 MGD in recent years. It anticipated that this decrease will continue, especially as the City Water and Sewer Department expands the RO WTP. Reducing reliance on the surficial aquifer further improves the resilience of the potable water system in drought periods.

[18] The distribution of potable water by jurisdiction is based on estimates provided by the Vero Beach Water and Sewer Department and modified by the Planning and Development Department based on 2014 total ADF of 5.573 MGD.

[19] "*Consumptive Use Technical Staff Report, Application #2-061-10705-7*, prepared by the SJWMD staff dated July 9, 2014.

Floridan Aquifer Production Wells: Seven production wells access to the Floridan aquifer of which three of the wells supply the reverse osmosis water treatment plant on a daily basis. The remaining four production wells are backup wells used infrequently to supplement the surficial aquifer water, which is the main source of supply for the lime softening plant. Withdrawals from the Floridan aquifer averaged 2.08 million gallons per day (MGD) in 2014.

Surficial Aquifer Production Wells: Twenty-five production wells withdraw water from the surficial aquifer. These wells produce a daily average of 3.80 MGD raw water for the lime softening treatment.

Consumptive Use Permit: The City was issued a 20-year consumptive use permit (CUP) in 2014 by SJRWMD. The permit establishes the maximum amount of groundwater that may be withdrawn by the City from the surficial and Floridan aquifers during each year of the 20-year permit period for potable water use. This limit was set at 2,648.92 million gallons per year (MGY) in 2014, which translates to an average daily flow of approximately 7.358 MGD. This limit will annually increase to 2,717.90 MGY by 2025 and 2,763.46 MGY by 2034. The 2014 limit on average daily withdrawal is significantly above the average daily withdrawal from both aquifers of approximately 5.88 MGD.

In addition to other requirements to obtain the CUP, the City had to demonstrate that it met the District conservation requirements. These conservation efforts are detailed in the Natural Groundwater/Aquifer Recharge Sub-Element of this chapter.

Water Storage Facilities. The water system has five storage tanks. All are above ground tanks. Three tanks of 2 million gallons (MG), 1 MG, and 1MG are located at the water treatment plant site. Two other tanks of 1 MG and 2 MG capacity respectively, are located in the water system service territory. Total tank storage capacity is 5.75 MG.

Water Transmission/Distribution System. The water transmission/distribution system includes two ground storage tanks (see above under Water Storage Facilities) and pump stations. These facilities increase the City's capability to maintain minimum system pressure of 40 pounds per square inch (psi) and provide reliable service to customers through the service territory.

The City's existing transmission/distribution system consists of approximately 290-miles of pipe ranging in diameter from 2 to 30-inches. Older portions of the water mains are mainly asbestos concrete and cast iron pipe. New water mains are mainly PVC, high density polyethylene (HDPE), and ductile iron pipe. The City's water system has approximately 1,160 fire hydrants and 77 reduce pressure backflow preventers.

Funding. The City water system is operated as a proprietary function, which is financed by user fees, impact fees, tap and connection fees, grants, low-interest loans, and various miscellaneous charges. A portion (approximately 6%) of the annual revenues is returned to the City's General Fund as a return on investment.

As noted in the Sanitary Sewer Sub-Element, the City hired GAI Consultants, Inc. to conduct a system and financial optimization study of both the water and sanitary sewer system.

The City Water and Sewer Department is implementing many of the study's recommendations that have led to implementing specific optimization measures in terms of operational and cost efficiencies and changes in user fees and charges.

Analysis

The analysis of the Potable Water Sub-Element focuses on the following: water treatment facilities; production wells; transmission/distribution lines; and storage facilities; and water treatment facilities and production wells. The analysis concludes with a list of major water system projects programmed for implementation through FY 2020.

Water Treatment Facilities. The evaluation of the significant issues related to the WTPs and future operation are discussed below:

Projected Demand: In making a projection of future demands on the City's WTP capacity, it is assumed that the City of Vero Beach's water system will continue to serve customers within its corporate limits and the existing water service areas within the Town of Indian River Shores and unincorporated Indian River County during the 20-year planning horizon.

Based on an estimated population served of 38,000, the average gallons per capita per day (gpcd) usage is approximately 146 gpcd based on a 5.573 MGD average annual daily flow. This figure is not consistent with the current level of service (LOS) standard of 181 gpcd in the Comprehensive Plan. This LOS standard, based on the average number of gallons per capita per day, is not germane to projecting demand and evaluating system capacity.

A more appropriate level of service standard is the use of 275 GPD per ERC figure based the GAI consulting group's optimization study and industry standards.[20] This figure represents the basic volume of water used by a single-family residence. This planning LOS tool used in conjunction with the total treatment capacity of the City's WTPs serves as a much better standard for measuring level of service.[21]

Table 6-3 presents the projected total demand for potable water by the planning horizon year of 2035.

Table 6-3, Projected Total Potable Water Demand for 2035

Description	ERC[1]	Demand (MGD)
600 Dwelling Units[2]	600	0.165
Non-residential Development[3]	850	0.234
Existing Water Demand (2014)[4]	20,265	5.573

[20] In the GAI optimization study, a figure of 275 gallons per day per ERC (amount of water a typical single family household uses each day) was used to determine water demand. This standard is also used by Indian River County's Comprehensive Plan.

[21] It should be noted that the City Water and Sewer Department uses both ERC and gallons per capita per day in projecting and evaluating capacity; however, the projections prepared in this document are generally consistent with the methodology applied by the department.

Total Demand	21,715[5]	5.972[6]

Source: City of Vero Beach Planning and Development Department, 2016

Notes:

1. Each ERC is 275 GPD.
2. Assumes some partial development of the 333-acre vacant tract in the western sections of the City and other smaller miscellaneous projects under development review in 2016 including development outside the City's corporate limits in unincorporated Indian River County and Town of Indian River Shores.
3. Assumes increase in non-residential development based on employment growth through 2035. This assumption is based on a projected 2.6 million square feet increase in nonresidential floor space (see Chapter 2, Land Use Element) and a generic (commercial office) ERC of 0.33 (110% of sewer ERC) applied per 1,000 square feet of nonresidential floor space. It does not take into account differing uses that have widely varying water usage rates.
5. ADF of 5.972 MG divided by 275 gallons.
6. Increased expansion of the City's reuse system may further dampen potable water demand.

Raw Water Availability (CUP): The City's water system is operating under a 20-year Consumption Use Permit that will gradually expand the average daily amount of water that may be daily withdrawn from both the surficial and Florida aquifers from 7.26 MGD in 2014 to 7.57 MGD in 2034. In 2014, the average daily amount of raw water to produce 5.573 MG of potable water was 5.88 MG.

The Water and Sewer Department intends to reduce the amount of water to be withdrawn from the surficial aquifer and increase the amount from the Floridan aquifer over the next 20 years. The increase withdrawal of water from the Floridan aquifer will necessitate an increase in the withdrawal of groundwater to produce the final potable water product due to the presence of minerals, chlorides, and other impurities. [22]

Using data provided in the staff report prepared by the SJRWMD for the City's consumptive use permit (CUP), it is anticipated that 2.15 MGD of water will eventually be withdrawn from surficial aquifer compared to 3.57 MGD in 2014 and the remainder will be from the Floridan aquifer. The expansion of the use of Floridan aquifer water will require an expansion to the RO WTP.

Based on the project potable water demand from Table 6-3, the total potable water demand by 2035 will be 5.972 MGD. Using the assumption the 2.15 MGD of water will be withdrawn from the surficial aquifer, the remaining 3.8 MGD will be from the Floridan aquifer.

Assuming that the only 85 percent of the water withdrawn from the Floridan aquifer will result in a finished product, it is estimated that 4.47 MGD will need to be withdrawn to produce 3.8 MGD of potable water. Adding 4.47 MGD to the 2.15 MGD (water withdrawn from surficial aquifer) results in a total average daily water withdrawal by 2035 of 6.62 MGD. This figure is significantly below the 2034 CUP average daily flow withdrawal of approximately 7.257 MGD.

Capacity Analysis: The RO WTP is currently undergoing an expansion of its treatment capacity to 4.5 MGD of finished product requiring 5.29 MGD of raw water. This $4.1 million expansion is anticipated to be completed by 2017. As part of a $550,000 expansion of the odor

[22] Approximately 85% of the water drawn from the Floridan aquifer results in a final product for transmission in the water system due to minerals, chlorides, and other impurities.

control facilities has been completed including other upgrading and replacement of aging facilities.

This expansion of the RO WTP treatment capacity will provide sufficient capacity to treat water drawn from the Floridan Aquifer during the 20-year planning period. The treatment capacity of the Lime Softening WTP will remain at 12.99 MGD, although only a portion of this capacity will be needed on a daily basis.

Production Wells. With the expansion of the RO WTP, two existing Florida Aquifer production wells are to be re-piped ($675,000) by 2017 to supply the plant. Additionally, a new Floridan production well ($800,000) is required with the RO WTP expansion based on a hydraulic model that confirmed the need for an additional production well for redundancy as required by the FDEP permitting requirements.

Transmission/Distribution Lines. The transmission/distribution system expanded as the City grew. The water mains of the older portions of the system made of asbestos concrete and cast iron pipe are being replaced with PVC, HDPE, and ductile iron pipe. The Water and Sewer Department expend an average of $250,000 per year as part of a water service line replacement program. This figure is proposed to be expanded to $400,000 per year by Fiscal Year 2018-2019.

As discussed previously under the Sanitary Sewer Sub-Element, the City has a territorial agreement with the County and Town of Indian River Shores on both water and sewer service areas. It is unlikely, that the City will expand beyond its current service areas as shown in Figure 4. Although Indian River County made proposals to purchase the City's water system, the City has not found it in its best interest or the interests of its utility customers to do so.

Major Capital Improvements. Over the next five years starting in 2015, the Water and Sewer Department has identified $8.4 million of projects in the City's Five Year Capital Program for Fiscal Years Ending 2016-2020 for expansion of the RO WTP, new Floridan aquifer production well and upgrades and replacement of components to the treatment plant, production wells and transmission and distribution system.

A list of the sanitary sewer capital improvements to be funded over a five-year period is provided in the Capital Improvements Schedule (CIS) of the policy document to this Comprehensive Plan. The City's CIS as an element of the Capital Improvements Element must be updated annually. As projects are completed, they will be dropped from the list of capital improvements and new projects will be added as needed.

NATURAL GROUNDWATER/AQUIFER RECHARGE SUB-ELEMENT

The surficial and Floridan aquifers underlying Indian River County and City of Vero Beach, comprise the primary water supply sources for the city and Indian River County. The aquifers are generally recharged as precipitation percolates downward through surface soils and underlying layers. The rate of aquifer recharge varies from location to location due to the variable permeability of different soils. Those areas with the greatest permeability have the highest recharge rates and constitute the prime "recharge areas." The presence of underlying

confining geological layers also determines the location and effectiveness of these recharge areas.

These aquifers are essential for sustaining urban development. However, these resources are threatened by development such as the creation of imperious surfaces, reducing the area available for rainfall percolation and altering the total rate and volume of recharge. Furthermore, these groundwater resources are also affected by urban runoff, saltwater intrusion, and disposal of chemical waste and pollutants that can affect the quality of groundwater.

The purpose of the Natural Groundwater/Aquifer Recharge Sub-Element is to identify and analyze the functions and policy issues related to natural groundwater resources that serve as the City's sole source of potable water including natural features, groundwater recharge areas, and groundwater water use and quality. The analysis of the natural groundwater/aquifer recharge provides the framework for consideration of the amendments to the goal, objectives and policies (GOPs) for this element, which due to the reasons stated in the previous paragraph, are closely related to and coordinated with the GOPs of the Land Use and Conservation Elements of the Comprehensive Plan.

Natural Features, Stratigraphy, and Aquifer Recharge

This section describes the physiographic features, stratigraphy, and aquifers which establishment the dynamic framework for groundwater resources in Indian River County and City of Vero Beach.

Natural Features. The typography of the City of Vero Beach is generally flat; however, running parallel to the coastline is a sand ridge. This ridge is the historic coastline that serves as an important aquifer recharge area. Known as the Atlantic Coastal Ridge, the ridge is located approximately one-half mile west of the Indian River Lagoon generally paralleling US Highway 1. Over the years, the ridge has been reduced in elevation from its historical height of over 50 feet due to excavation associated with sand mining and development.

Between the Atlantic Coastal Ridge and as second ridge, known as the Ten Mile Ridge located roughly along I-95 is a flat shallow depression referred to as the inter-ridge basin. It is currently traversed by a network of drainage canals.

Stratigraphy. Within Indian River County and the City of Vero Beach are three important sub-surface strata. The first strata, extending from the surface to approximately 200 feet below ground, contain Pleistocene sands situated above confining strata. The Pleistocene sands contain the surficial aquifer.

The second strata, known as the Hawthorn Formation, consist of a low permeability confining unit that separates the surficial aquifer from the Floridan aquifer. The confining strata range in thickness from 150 to 200 feet.

The third strata, containing the Floridan aquifer, extend from several hundred feet to 3,000 feet below the surface. These strata consist of the Oldsmar, Lake City and Avon Park limestone formations, the Ocala Group, and the Undifferentiated Oligocene Rock layer.

Aquifer Recharge. Of the two aquifers, only the surficial aquifer is recharged within the corporate limits of Vero Beach. The primary source of recharge is percolation of rainfall along the Atlantic Coastal Sand Ridge. In the inter-ridge basin, wetlands contribute to the surficial aquifer recharge.

The Floridan aquifer is recharged by rainfall occurring primarily west and northwest of Indian River County. Within Indian River County, the primary recharge area for the aquifer is west of Blue Cypress Lake. The top of the Floridan aquifer is oriented towards the southeast and consists of a limestone strata of low permeability, water moves eastward through aquifer and eventually discharges into the Atlantic Ocean.

Existing Conditions

In this section the existing conditions affecting natural groundwater recharge areas, water use, and water quality are described.

Groundwater Aquifer Recharge Areas. The surficial aquifer ranges in a depth from several feet to approximately 150 feet below the surface. The high percolation rate of the Atlantic Coastal Ridge identifies it as an important recharge area for the surficial aquifer. The probable primary recharge areas for the surficial aquifer are shown in Figure 3.[23] In 2006, the surficial aquifer had an annual recharge rate of 16 inches. In addition to these recharge areas, wetlands and seepage from drainage canals, and water percolation from the Floridan aquifer contribute to the recharge of the surficial aquifer.

The upper zone of the Floridan aquifer ranges in depth from approximately 350 to 600 feet below the surface. The lower zone of the aquifer descends to a depth of approximately 2,000 feet or more. The recharge of rate is estimated to be 0 to 4 inches annually. The recharge principally occurs outside of the boundaries of Indian River County.

Water Use. The predominate source of water used for potable water and other uses is derived from groundwater. According the 2015 annual survey of water conducted by the SJRWMD, the average daily water use in Indian River County was 81.39 MGD including reuse.[24] Water used for public water and domestic self-supply accounted for a little of 20 percent of this total while water used for agricultural self-supply accounted for almost 50 percent.

Prior to 1992, the City's water production was almost entirely from the surficial aquifer. With the construction of the RO WTP in 1992, reliance on the surficial aquifer decreased from 8.4 MGD to approximately 4 to 4.5 MGD. During the last 10 years, the City's average daily

[23] The primary recharge areas that are already fully developed or under development are not designated as recharge areas in Figure 2-3.

[24] *2015 Survey of Estimated Annual Water Use for St. Johns Water Management District*, Technical Fact Sheet SJ2016-FS3, St. Johns Water Management District.

potable water use decreased from 8.19 MGD in 2004 to 5.88 MGD in 2014 due to conservation measures and the expansion of the City's reclaimed (reuse) water system.

Priority Water Resource Caution Areas. As discussed previously, Priority Water Resource Caution Areas (PWRCAs) are areas designated by the SJRWMD where existing and anticipated water supply may not meet projected future demand without unacceptable adverse impacts on water resources. Based on the most recent groundwater model runs, it has been determined that the Floridan aquifer in Indian River County can sustain development in Indian River County into the 2030s. Therefore, the SJRWMD does not anticipate that Indian River County and, therefore, the City of Vero Beach, will be designated within a PWRCA in the next five to ten years. The issuance of a consumptive use permit in 2014 to the City of Vero Beach for withdrawing groundwater through the year 2034 reflects this determination.

The SJRWMD has established specific regulations related to prohibiting the irrigation of lawns and landscapes. Watering restrictions limit lawn and landscape irrigation to 2 days a week during rainy season and once a week during dry (winter) season. Enforcement of these restrictions is the responsibility of SJRWMD.

Additionally, as a requirement of its consumptive use permitting process, SJRWMD require that applications for permits satisfy conservation requirements. As part of the application the applicant must submit a water conservation plan, providing measures to reduce water use and preserve water resources for other beneficial uses.

Water Quality. Water quality in the surficial aquifer is generally potable; however, it contains high concentrations of minerals which require treatment to meet drinking water standards and acceptability. The surficial aquifer is susceptible to horizontal salt water intrusion from the Indian River Lagoon and from infiltration of pesticides, fertilizer, and seepage from septic drainage fields. Increased loss of pressure due to over-pumping may led to vertical saltwater intrusion from the Floridan aquifer depending upon intervening confining strata.

Water quality in the Florida aquifer is not generally suitable for drinking water without treatment as it contains various minerals and chlorides. Salt water is present everywhere in Floridan aquifer below the freshwater. Saltwater intrusion in the Floridan aquifer occurs when wells are drilled too deep or when too much freshwater is pumped from the aquifer, allowing salt water to replace freshwater. As it is less susceptible to contamination than the surficial aquifer, the Floridan aquifer is the preferred source for water.

Analysis

In this section the policy and regulatory issues affecting natural groundwater recharge areas, water use, and water quality are analyzed. The section concludes with a discussion of major capital improvements proposed in the next five years.

Groundwater Aquifer Recharge Areas. As noted previously, the Atlantic Coastal Sand Ridge is the primary recharge area for the Surficial Aquifer. No recharge areas for the Floridan aquifer are located within or in the vicinity of the corporate limits.

Development along the Atlantic Coastal Ridge has compromised the functions of the aquifer recharge by disrupting the natural percolation process with the expansion of impervious surfaces and by allowing contaminants to enter the groundwater. To limit future impacts, the City should continue to enforce its well field regulations and protection of aquifer recharge areas through its land use planning and Land Development Regulations.

The primary surficial aquifer recharge areas are located on publicly-owned lands that are designated Conservation on the Future Land Use Map. Several well fields are located in these areas, which also contain the critical habitat for the Florida Scrub Jay. The remainder of the areas is either designated for airport operations with resource protection zones that prohibit development or industrial lands containing the City's WTP, and ancillary structures for the City's water and sewer operations.

Potential recharge areas located outside City-owned property are not designated as recharge areas in Figure 3 as these areas are already compromised by development patterns. The City has yet to adopt specific regulations governing aquifer recharge areas for private lands, but does take into consideration protection of these recharge areas in any development proposed on public lands.

The Water and Sewer Department has implemented the "Wellhead Protection" measures of Chapter 62-651, F.A.C. Wellhead Protection Areas of 500 foot radius have been established around the City's production wells. Figure 19 depicts the location of these Wellhead Protection Areas.[25] Any development in these Wellhead Protection Areas is required to meet the standards of Section 62.521.400, F.A.C., as part of the development review and approval process in the City's Land Development Regulations.

Water Use. As documented in the SJRWMD staff report on the City of Vero Beach's CUP application, the average daily water use has decreased from 8.19 MGD in 2004 but decreased to 5.99 MGD in 2013 due to an aggressive water conservation program and expansion of the City's reclaimed water system. The per capita water use has declined to approximately 146.6 gpcd, based on an estimated population served in 2015 of 38,000, compared to the estimated 288 gpcd in the 1992 Comprehensive Plan and 181 gpcd in 2006.

The City of Vero Beach has instituted the following water conservation measures to meet the conservation requirements set forth by SJRWMD of CUP applicants:

- Performance of annual system-wide audits and calibration of water meters to address and monitor unaccounted-for water loss;
- Provision of an educational outreach program and distribution of water conservation information to customers via newsletter and utility billings;
- Implementation of a water service line replacement program;
- Meeting and accurate tracking of water utility type usage;

[25] These Wellhead Protection Areas have been designated administratively by the Water and Sewer Department, but are not officially designated by the Florida Department of Environmental Protection.

- Adoption and implementation of requirements in City's Land Development Regulations for requiring drought-tolerant and native species for all non-single family development and a Tree Protection Ordinance;
- Implementation and expansion of reclaimed water system that has significantly reduced potable water usage for irrigation purposes; and
- Adoption of tiered water conservation rate structure with inclining rates to encourage efficient water use.

The most recent update of the SJRWMD groundwater model indicates that no significant reduction in the quantity or quality of water available in Florida aquifer is anticipated through 2030 and beyond. The CUP issued to the City in 2014 allows for the withdrawal of 7.57 MGD by 2034, which is almost 2 MGD greater than the average daily use by the City in 2015. As noted in the Potable Water Sub-Element, the projected water withdrawal to meet projected 2035 potable water demand is well below this figure.

The City Water and Sewer Department will continue to closely monitor water supply data and take action as necessary should the projected need for water withdrawal exceed CUP limits or if water quantity or quality of the aquifers significantly changes. Should the water quantity and supply conditions adversely change for the aquifers, City water system, the City should explore other water supply alternatives with Indian River County and other localities along with a more aggressive expansion of its reclaimed water system.

As noted in the previous section, the SJRWMD has adopted additional restrictions on the number of times per week during wet and dry season and on the hours for irrigation of lawns and landscapes. The City has followed the County's position in not enforcing the SJRWMD's watering restrictions due to personnel shortages. The City has instead relied upon promoting public education on water conservation measures, its tiered water conservation rate structure, expansion of its reclaimed water system, and requiring native, drought tolerate species for new non-single family development.

Water Quality. All potable water produced and transmitted from the City's WTP meets or exceeds all federal and state standards for safe drinking water. However, saltwater intrusion is a concern for both the surficial and Floridan aquifers, although it is more of a concern for the City wells drawing from the later aquifer.[26] Most of the water drawn from the Floridan aquifer exceeds federal and state chloride level standard, which must be removed through the reverse osmosis treatment at the City's WTP to bring the chloride levels well within these maximum standards.

[26] Most of the water from the surficial aquifer contains less than the federal and state chloride level standard of 250 milligrams per liter.