Charlotte County Utilities

Wastewater Service Program: Area 1 Preliminary Engineering Report

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I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Florida.

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CHAPTER 1 – INTRODUCTION

In June of 2009, Charlotte County Utilities (CCU) made a presentation to the Charlotte County Board of County Commissioners (BCC) providing an overview of a proposed centralized wastewater service program initiative. The BCC recommended that, to further evaluate the feasibility of some form of a centralized wastewater solution, a Preliminary Engineering Report (PER) be completed to analyze various collection and treatment alternatives that address existing Onsite Treatment and Disposal Systems (OSTDS), primarily serving residential properties within the service area identified as Area 1. See Exhibit I.1: Location Map and Exhibit I.2: Area 1 Wastewater Service Program map in Appendix I.

This PER represents a compilation of all the information gathered and analyzed since the BCC's authorization to proceed in June 2009. Upon review of this PER, CCU is requesting the BCC to consider approval in accordance with the report's recommendations. If approved, CCU is ready to proceed with this project and begin design immediately. Construction would then be anticipated to begin in 2012 and be completed by the end of 2022.

Area 1 was selected as the initial geographic region to evaluate the feasibility of a centralized wastewater solution due to the number of Onsite Treatment and Disposal Systems (OSTDS) currently in use in the area and the area's immediate close proximity to the Charlotte Harbor estuary and tributary water bodies. Given the current state of the existing OSTDS throughout Area 1, coupled with the impact these systems are having on the environment and water bodies, CCU has explored seven (7) alternatives from a cost benefit perspective to determine the best approach to addressing the long term ecological impact from inadequately treated wastewater. The seven (7) alternatives are briefly outlined below and more fully reviewed in this report.

- Leave Existing System In-Place (Do Nothing)
- Upgrade or Replace Existing Onsite Treatment and Disposal Systems
- Decentralized Systems
- Low Pressure Sewer
- Gravity Sewer
- Hybrid Gravity Sewer
- Vacuum Sewer

As part of this overall evaluation, research on the existing condition and location of other existing utilities and public works facilities was completed. The Comprehensive Plan's Goals and Objectives Policies (GOPs) require the simultaneous extension of potable water and wastewater services. This report endorses that concept and is being used as an opportunity to explore economies of scale as part of this expansion effort since the public perceives all of these facilities to be taken care of by the County.

CHAPTER 2 – Project Drivers

2.1 Health, Sanitation and Security

Area 1 wastewater treatment is comprised primarily of aging OSTDSs, which left as-is, allow the introduction of untreated wastewater pollutants into the groundwater. Water quality data from a variety of sources including CCU field testing, Health Department testing, The Charlotte Harbor National Estuary Program (CHNEP), The Charlotte Harbor Environmental Center (CHEC), and The South West Florida Water Management District (SWFWMD) all clearly indicate that pollutant levels exceed acceptable public health limits and Clean Water Act standards.

Evidence of this pollution is indicated by the number of Port Charlotte Beach Complex closings and by the fact that Charlotte Harbor, Myakka River and Peace River have been identified as 'impaired' water bodies by the EPA.

In summary, the OSTDS impacts are attributable to the following Area 1 OSTDS characteristics:

- High urban density, which limits the treatment zone, thereby reducing treatment effectiveness
- Non-Compliant OSTDS in Area 1; Half were installed prior to 1984 and do not meet current requirements
- OSTDS are not effectively treating nutrients (Total Nitrogen - TN, Total Phosphorus - TP) not to mention emerging pollutants (resulting in impaired water bodies)

The overall effect is that OSTDS are not effectively treating wastewater, resulting in pollutants directly entering the groundwater system and ultimately traversing to adjoining Charlotte County waterbodies at a rate causing deterioration of water quality in the receiving waters.

2.2 System Operations & Maintenance

Most homes and businesses are presently served by privately owned OSTDS where the property owners are individually responsible for all operation and maintenance. This PER explores other options that provide solutions to reduce reliance on individual property owners to maintain/rehabilitate/replace OSTDS and work toward a centralized/managed solution that reduces the overall pollutants into the environment. In numerous cases, the rehabilitation/replacement of the current OSTDS are more expensive than other alternatives and provide a shorter life cycle than centralized solutions. These alternatives range from doing nothing to a variety of fully centralized wastewater options that are much more effective in managing and minimizing the pollutants introduced into the environment than what is currently being done in Area 1.

2.3 Growth

The growth projections for the service area are detailed in Chapter 3, Section 3.2. The seasonal nature of Charlotte County is also addressed in relation to growth capacity. Area 1 is identified as a key in-fill area of the Urban Service Area (USA) in the Smart Charlotte 2050 program. It is well known that extending central water and wastewater service precedes and promotes development. Area 1 is designated primarily as a revitalizing area neighborhood in the neighborhoods framework identified in the Smart Charlotte 2050 program (See Exhibit I.4: Growth Management 2050 Neighborhoods Framework). The extension of centralized utilities services will aid in the growth and revitalization of Area 1.

The proposed Murdock Village development, designated as a future central downtown area, abuts Area 1. The population of Area 1 will directly feed Murdock Village and the future development of Murdock Village will promote the development of Area 1.

2.4 Economic Benefits

Based upon the U.S. Bureau of Labor and Statistics, Article, "Employment created by Construction Expenditures", it is anticipated that over 4,700 jobs over the life of the project will be created by the Wastewater Service Program both locally and overall. Furthermore, CCU anticipates that residential home construction in Area 1 will occur at a faster pace if central utility services are expanded to the entire Area versus no action at all. What this means is that 17,372 new homes will be built in Area 1 by 2050 versus 8,721 if no utilities expansion were to occur. Based upon the National Association of Home Builders, Article, "The Direct Impact of Home Building and Remodeling on the U.S. Economy", on average, 3.05 new jobs are created for every new home built in the U.S. The net additional 8,651 new homes, anticipated as a result of the infrastructure initiative, will generate 26,383 of the 31,086 jobs, as identified in Table 2.4.1 below. In addition to job growth, there are tax benefits to the County.

Table 2.4.1: Anticipated Employment Created by Wastewater Service Program	
Sewer Works	
Construction Industries *	**# Jobs**
Onsite	1,860
Offsite	100
Other Industries *	
Manufacturing	1,620
Trade, Transportation and Services	780
All Other	340
**Residential Homes Construction through 2050 (8651) ** **	26,386
- Based on 3.05 jobs created/home built	
Total New Jobs Created =>	**31,086**
* US Bureau of Labor and Statistics, Article, "Employment Created by Construction Expenditures"	
** National Association of Home Builders, Article, "The Direct Impact of Home Building and Remodeling on the U.S. Economy"	

CHAPTER 3 – PROJECT PLANNING AREA

3.1 Location

The project planning area is shown on Exhibit I.3: Area 1 Features map which includes topography, roads/street locations and other features of this area. The planning area is generally the homes and businesses in the center of Charlotte County south of 776, west of US 41, east of the Myakka River and most notably directly north of the Peace River and Charlotte Harbor Estuary. Some additional homes adjoining and/or between these areas are also in the project planning area.

3.2 Population Characteristics and Projections

Population characteristics and projections will be necessary to determine the growth impacts in Area 1 as related to treatment capacity and long term capital requirements.

In order to obtain existing Area 1 population and property counts and characteristics, CCU leveraged various resources including a full review of Area 1 properties via property appraiser data, CCU customer billing records, GIS data and Growth Management population projections as detailed in the Smart Charlotte 2050 plan.

Future population growth in Area 1 was determined by applying the growth rates used by Growth Management population projections for Mid-County to the existing Area 1 population, determined by CCU. Table 3.2.1 below shows the results of this analysis for Area 1.

It is anticipated that the population of Charlotte County will increase over the next 40 years overall. For planning purposes, it will be assumed that the number of dwelling units in Area 1 will grow at the same rate as Mid-County at an average rate approximately of 1.3% over the next 40 years assuming no growth impact from the construction of new infrastructure. However, growth may increase to an average of 2.5% per year over the next 40 years, assuming that new utilities infrastructure will stimulate growth in Area 1, which is shown on the bottom of Table 3.2.1.

Table 3.2.1: Charlotte County Utilities Service Area Seasonal Population Growth Projections

Year	2010	2015	2020	2025	2030	2035	2040	2045	2050
Area I:* (Normal Projections)	17,039	17,733	18,603	19,663	20,905	22,241	23,362	24,755	25,760
Mid-County*:	79,221	84,032	90,001	97,234	105,502	114,153	121,284	128,416	135,548
Service Area*:	110,615	119,622	130,895	144,638	160,559	177,495	191,994	206,493	220,992
Area 1 (New Infrastructure Impact):	17,039	18,462	20,202	22,843	24,804	27,478	29,720	32,506	34,516

* Charlotte County Growth Management population estimates.

For the purposes of this engineering report, it is assumed that wastewater facilities will be designed to accommodate the higher seasonal population component as though they were residents for the entire year.

3.3 Land Use/Zoning

Area 1 is comprised primarily of residential properties. However, commercial properties are located on the northern outer boundaries of the area. Table 3.3.1: Area 1 Land Use/Zoning Summary below provides a high level land use breakdown providing both the gross and net counts for each high level category. The Gross Lot Count includes all properties identified in the Area 1 boundaries. The Net Lot Count only includes properties that can be assessed for this MSBU:

Table 3.3.1: Area 1 Land Use Summary		
Land Use	**Gross Lot Count**	**Net Lot Count**
Single Family	7,985	7,448
Vacant Residential	8,684	8,219
Multi-family	35	31
Vacant Multi-family Residential	286	286
Miscellaneous Residential	87	85
Churches	43	11
Professional Services	12	8
Office Building	32	11
Retirement Homes	3	2
Vacant Commercial	680	523
County/Government	16	6
Roads	359	0
Total Lots =>	**18,222**	**16,630**

3.4 Growth Management Neighborhoods Framework

Charlotte County identifies a variety of neighborhoods in the Smart Charlotte 2050 plan. The neighborhoods framework attempts to describe/characterize parts of the Urban Service Area and thus protect and enhance existing neighborhoods, while targeting others for intensified, mixed-use redevelopment. Area 1 is identified as a Revitalizing Neighborhood. **As such, the concept of providing central wastewater and water services in Area 1 is consistent with the planning objective to promote new investment in the area. See Exhibit I.4: Growth Management's 2050 Neighborhoods Framework.**

3.5 Environmental Resources Present

The proposed project area in Exhibit I.2: Area 1 Wastewater Service Program has been shared with County environmental staff to determine future impacts to threatened and endangered species and natural habitat including wetlands. While the project will impact existing environmental conditions during construction, no negative long-term impacts are anticipated. Nearly all of the construction activity is expected to occur within previously disturbed areas and measures will be incorporated in the design and construction phases to minimize or avoid long-term environmental damage or harm.

Potential concerns identified by Charlotte County environmental staff include:

- Scrub jay
- Gopher tortoise
- Wetlands

- Heritage Trees

If any of the above would be impacted by construction, mitigation procedures will be implemented following regulatory guidelines. Potential cost impacts could include permit fees, specialized environmental expertise, relocation expenses, and mitigation fees. Once design begins and location specifics are determined, environmental expertise will be sought to finalize specific environmental impacts and related costs for mitigation. An allowance for these environmental impacts have been provided for in the project costs.

Upon approval of this preliminary report, the proposed project conceptual plans will be shared with interested/affected local, state and federal agencies and will be made available to the general public. Any concerns or questions expressed by these interested parties will be addressed at that time. Another environmental evaluation will be completed immediately prior to construction to confirm there is no change from the time the initial environmental evaluation was completed.

3.6 Historical Or Archeological Artifacts

A preliminary evaluation for significant historical and archaeological resources was completed for Area 1. Approximately 12 known historical structures, which are recorded in the Florida Master Site File, have been identified in western sections of the project area. Sections in the south and east may include burial mounds, habitation-campsites or shell middens. During the design phase, a detailed report will be prepared with the specific issues that could be encountered during construction.

Consistent with the County's Historic Preservation Ordinance, a historical review of projects within a 300-foot buffer of a known historical resource will be required and a professional archaeologist will be required to monitor excavations in areas where the Charlotte County Archaeological Predictive Model indicates a high or medium probability of archaeological sites.

3.7 Design Criteria

A strong consideration for the engineering design of this project is the current population and population growth as related to wastewater flows for both collection and treatment. The infrastructure component of the project must be designed and constructed to account for all properties in Area 1 upon full build-out. Proper sizing of the infrastructure in order to have sufficient capacity in the treatment and collection system is based upon the number of existing homes, the growth rate for the unoccupied lots, and the construction phasing schedule. Based upon these factors, table 3.7.1 below provides the projected wastewater flow increase over the next 25 years at the East Port Water Reclamation Facility (WRF).

Table 3.7.1: East Port WRF Wastewater Flow Projections	Year				
East Port WRF	Prior to 2010	2010-2015	2015-2020	2020-2025	2025-2035
A - # New Area 1 Connections (Existing Occupied at time of MSBU Assessment)	0	3,772	2,489	1,283	0
B - # New Connections - Mid-County (Population/2.18 pph) 1,2,5	28,560	2,207	2,738	3,318	7,761
C -# New Connections due to New Infrastructure Impact 10	0	653	798	1,211	2,126
D -Total Cumulative East Port WRF Connections	**28,560**	**35,192**	**41,217**	**47,029**	**56,916**
Future Plant Capacity Needs and Total Flow Based on AADF 7,9		* Re-Rate of WRF			* Plant Expansion
East Port Anticipated AADF Permitted Capacity 6	6,000,000	8,000,000	8,000,000	8,000,000	12,000,000
Cumulative East Port flows (previous Years Roll-up)	3,898,440	4,853,708	5,676,121	6,469,459	7,819,034
Other Committed and/or Unanticipated Capacity (gpd)	50,000	50,000	50,000	50,000	50,000
Remaining Capacity at Eastport	**2,051,560**	**3,096,292**	**2,273,880**	**1,480,542**	**4,130,966**
Future Plant Capacity Needs and Total Flow Based on MDF 8		* Re-Rate of WRF			* Plant Expansion
East Port Anticipated MDF Permitted Capacity	16,800,000	22,400,000	22,400,000	22,400,000	33,600,000
Cumulative East Port Anticipated 12-month MDF	14,200,000	6,826,480	7,971,230	9,075,510	10,954,040
Other Committed and/or Unanticipated Capacity	140,000	140,000	140,000	140,000	140,000
Remaining Capacity at Eastport	**2,460,000**	**15,433,520**	**14,288,770**	**13,184,490**	**22,505,960**
Notes					
1 - Mid-County population projections from Growth Management. Includes any projected new growth in Area 1					
2 - Mid-County Connections determined by using a divisor of 2.18 pph to total population projected for Mid-County					
3 - 136.5 gpd represent actual AADF flows compared to actual # of services					
4 - 190 gpd represents maximum daily flow per household including inflow and infiltration (I&I)					
5 - Assumes all new Mid-County development will connect to CCU wastewater system					
6 - East Port WRF AADF and MDF Re-rating anticipated by 2012; Plant Expansion will occur in 2025					
7 - AADF - Average Annual Daily Flow					
8 - MDF - Maximum Daily Flow (AADF increased by a design factor of 2.8)					
9 - The current AADF will continue to lower to some degree due to continue efforts to eliminate Infiltration/Inflow (I/I) from the system					
10-Accelerated additional growth as a direct result of new utilities infrastructure in Area 1 (see table 3.2.1					

Area 1 is mainly residential with some commercial businesses. There is no large scale or small scale industry within Area 1 that would impact wastewater constituent loads or flows. Area 1 is considered residential only for planning purposes.

The collection system design shall comply with the “Recommended Standards for Sewage Works” (Ten State Standards) and all Florida Department of Environmental Protection (FDEP) regulations. The treatment systems shall comply with all requirements of the current FDEP regulations pertinent to the treatment process and the discharge permit limitations.

CHAPTER 4 – EXISTING FACILITIES

4.1 Wastewater

An analysis of wastewater facilities includes all existing methods of collection and treatment used in the area.

4.1.1 OSTDS and Wastewater Location Map

Exhibit I.2: Area 1 Wastewater Service Program in Appendix I shows the areas that currently have central wastewater service available. Any developed properties outside of these centrally served wastewater areas are assumed to be using OSTDS for treatment.

4.1.2 OSTDS

4.1.2.1 OSTDS Historic Data and Statistics Summary

Table 4.1.2.1.1: Charlotte County OSTDS Permit Summary by Year below provides a comprehensive breakdown by year of OSTDS construction permits for all of Charlotte County. While not specific to Area 1, the table demonstrates that on a County-Wide basis the majority of OSTDS were installed during the '70s and '80s.

Table 4.1.2.1.1: Charlotte County OSTDS Permit Summary

Years	New Permits	Repairs
Pre-1971	9,330	0
1971-1980	12,521	0
1981-1990	14,201	0
1991-2000	5,090	973
2001-2008	4149	1544
Totals	45,291	2517

A breakdown of the properties that currently are served by central wastewater (as shown in Exhibit I.2) and OSTDS in Area 1 are shown below in Table 4.1.2.1.2: Wastewater Type Usage Summary in Area 1.

Table 4.1.2.1.2: Wastewater Type Usage Summary in Area 1

Total # Developed Properties	Properties on OSTDS	# Properties on Central WW
8056	7544	512

Reviewing the history of existing OSTDS installations in Area 1, most OSTDS were constructed pre-1995 as a standard OSTDS (not performance-based such as Aerobic Treatment Units (ATUs)). Exhibit I.5: Area 1 Aging of Structures map located in Appendix I, indicates the following:

- approximately 53% of properties developed occurred prior to 1984*
- approximately 80% of properties developed occurred prior to 1990
- approximately 87% of properties developed occurred prior to 1995

* 1984 was first year the Florida Statutes (FS64E-6.002, page 6, #51) required OSTDS 24-inch separation from Seasonal High Water Table

Based on the above percentiles as determined from Exhibit I.5: Area 1 Aging of Structures map; data provided by The Department of Health (DOH) on the managed septic system program and repair/replace reports; and the data summarized from the draft assessment roll for this effort, the summarized information in Table 4.1.2.3 below presents an approximate picture of the age, useful life and status of the existing OSTDS in operation in Area 1.

Table 4.1.2.1.3: Area 1 OSTDS Summary

Description	Count	Comment
# of OSTDS in Area 1	7544	
# of OSTDS Enrolled in Managed Septic Pgm	7220	
# of ATUs installed since 2000	322	
# of w/ no Proof of Pumpout in past 5 yrs	1973	
# of Repairs since 2000	1028	66% of all repairs County Wide
# of New Systems installed since 2000	466	
# of OSTDS built prior to 1984	3998	53% of OSTDS in Area 1
# of OSTDS built prior to 1990	6035	80% of OSTDS in Area 1
# of OSTDS built prior to 1995	6563	87% of OSTDS in Area 1

4.1.2.2 Design Factors

The proceeding sections summarize information gathered by CCU, specific to OSTDS and OSTDS conditions in Area 1. CCU staff performed research and data gathering from a number of regulatory and environmental organizations, as well as performed its own research, through an overall test site sampling program specific to soil conditions and water quality (see Exhibits I.6 through I.11). The main geophysical design factors which cause OSTDS to have a negative impact on Charlotte Harbor water bodies are:

- Inadequate setbacks from surface waters
- Inadequate separation from seasonal high water table
- The presence of rock within the required effective soil depth
- Soil types with low and high percolation rates
- Inadequate separation from adjacent systems

4.1.2.2.1 Inadequate setbacks from surface waters

The general location of an OSTDS in Area 1 is in the front of homes. The average drain field is a trench type of system with a concrete tank. Most drainfields prior to 1984 were installed in the existing (native/fill) soil; whereas more modern OSTDS drain fields were raised using a suitable soil that was imported to the site. The average OSTDS set back from a domestic well is 50 to 75 feet. Current regulations require 100 foot setbacks from surface waters, whereas previous regulations allowed for 50 foot setbacks. Many of OSTDs in Area 1 are pre-1990 and located too close to waterbodies. These OSTDS are not meeting current set back regulations.

4.1.2.2.2 Inadequate separation from seasonal high water table

Due to the age of many of the OSTDS in Area 1, the present groundwater separation requirements between the bottom of the drainfield and the Seasonal High Water Table are not being met. CCU made a determination as to where existing groundwater levels were occurring for a number of test sites in Area 1. Samples were taken during the dry season (Early November, 2009) and under drought conditions. Along with existing ground water levels as shown in Exhibit I.6 Ground Water Results, CCU investigated a sub-set of the groundwater level test sites and found that soil mottling was occurring. CCU recorded the level at which the mottling was identified for each of these sites. The mottling determinations showed that the seasonal high water table was higher than the level of the physical ground water observed by a range of 1” to 38” (see Exhibit I.7 Soil Mottling). These results indicate that drainfields are too close to the seasonal high water table in Area 1, since the bottoms of the drainfield trenches do not have the required 24” separation from the seasonal high water table.

4.1.2.2.3 The presence of rock within the required effective soil depth

Through CCU's test program, a number of test sites showed the presence of rock and/or shell in the bore holes. This rock is a limiting condition which may require that (1) a larger drainfield be installed; (2) the construction of a mound system; (3) or removal of this limiting rock barrier.

4.1.2.2.4 Soil types with low and high percolation rates

For soil beneath the drainfield to properly treat effluent, it must be suitably-textured, aerated, and deep enough to allow for the proper filtration and treatment processes to perform this function on the effluent before it is released into the ground water. The ideal soil condition under regulations is described as 'Slightly limited' where the percolation rate is less than 2 minutes per inch. Most of the soils in Area 1 are not virgin soils and have been modified with fill material due to development activities. Therefore, there is no way of reliably predicting the soil conditions that will be encountered. Many times, as CCU test results show, moderately limiting and severely limiting conditions (clay and rock) have been encountered. See Exhibit I.8, General Soil Textures, for sites where moderately limiting and severely limiting soil textures were found during CCU's test program. A review of Area 1 septic permits supports these statements. A standard septic system evaluated under current regulations is difficult to permit without modifications such as imported soil in Area 1.

4.1.2.2.5 Inadequate separation from adjacent systems

In Area 1 a standard OSTDS cannot be constructed on a lot less than 10,000 square feet (typical lot size in Area 1) because of something known as a "plume." A "plume" is the area of soil beneath and in the general vicinity of an OSTDS containing effluent/pollutants released from the said OSTDS. Effluent/pollutant "plumes" extend beyond the drainfield foot print to outside the lot itself in Area 1. Untreated combined effluent/pollutants plumes from adjacent OSTDS that overlap are saturating the soil with pollutants that will not be treated. CCU test results show that areas with high density also show presence of bacteria levels. Exhibits I.9 November 2009 Water Usage at Test Sites and I.10 November 2009 Water Usage at Test Sites Detail show the amount of water used by homes in close proximity to the CCU test sites. An analysis of the data shows that fecal coli form is present in the groupings of homes with medium to high water usage and is traveling through the ground water table.

County Code requires a 100-foot set back from water bodies, thus inferring that OSTDS' should be 200-feet apart to prevent the overlapping of treatment areas ("plumes") which prevents proper treatment. The FDEP permit for removing the Manchester Lock identified all OSTDS within 300 feet of the surface water to be part of the managed septic program, specifically addressing the "plume" influence. This setback requirement would restrict home construction to every other lot and possibly every two lots in Area 1 if it were enforced area-wide.

4.1.2.2.6 Design Factors Summary

Many of the existing OSTDS are not effectively treating wastewater, resulting in pollutants directly entering and loading the groundwater system and ultimately traversing to Charlotte County water bodies at a rate causing deterioration of the water quality in the receiving waters.

4.1.2.3 OSTDS Impacts

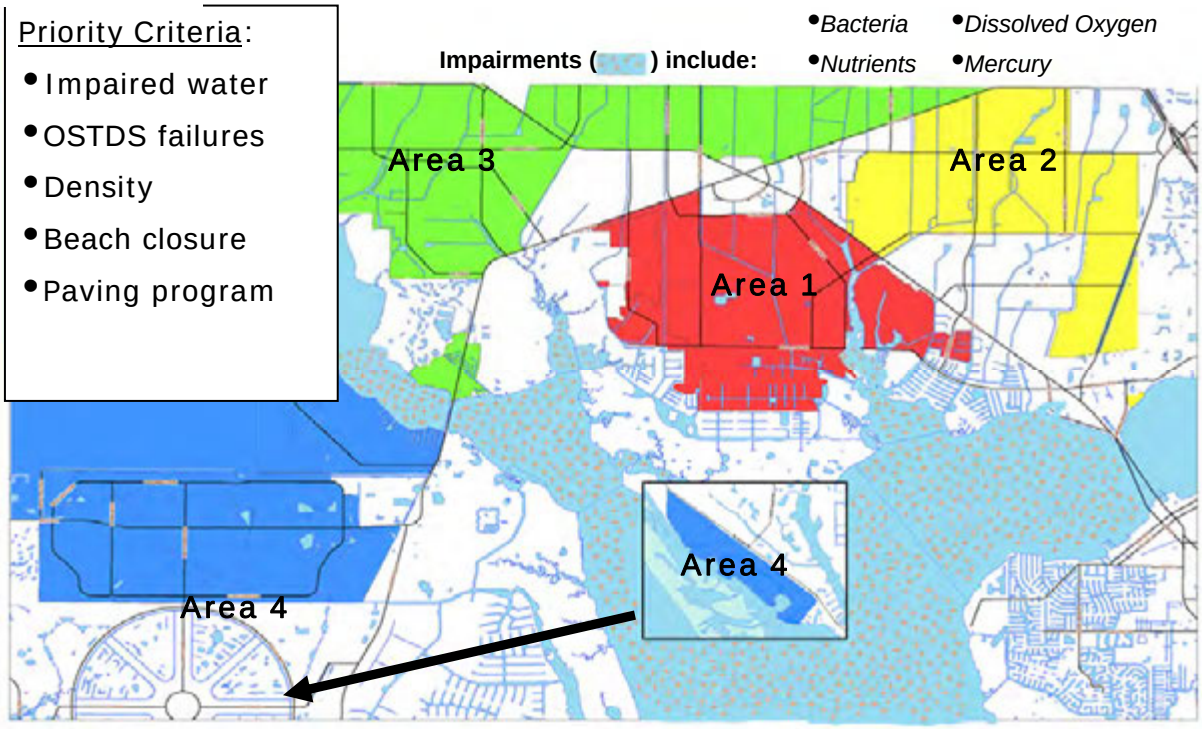
Based upon research and data gathered from a number of regulatory and environmental organizations, as well as CCU's own research, the OSTDS in Area 1 are having a negative impact on the ecology of Charlotte Harbor resulting in water body impairments. The permit to remove the Manchester Lock, located in Area 1, states specifically that the Alligator Bay drainage basin (located in Area 1) has 'been identified as having on-site disposal systems that do not treat wastewater to current standards (i.e. those on-site disposal systems built prior to 1983).' The permit further states that removal of OSTDS will 'provide an improvement to water quality by decreasing nutrient loading from removing the septic (OSTDS) systems.'

Sample results compiled by CCU show fecal coli form, nitrates and nitrites contamination within the groundwater of Area 1 attributable to failing OSTDS. Exhibit I.6 in Appendix I is a map of the Ground Water Results as performed by CCU in late 2009. In general, CCU found ground water levels within 48" of the surface 50% of the time. As well, fecal coli form was detected at over 40% of the water quality test sites (see Exhibit I.11 Fecal Coli Form). Some results were as extreme 290 col/100 ml and 2600 col/100 ml. These samples were collected in the dry season and during a period of prolonged drought. It is anticipated that if the samples were collected during the wet season test results would yield higher values at a higher frequency.

OSTDS do not treat household pollutants such as cleaners, beauty products, grease/fats/cooking oils, cat litter, cigarette butts, inorganic material and many other items. These materials should never be put into a septic system. They may disrupt bacterial digestion and pass from the tank and contaminate groundwater directly. We have reason to believe that these pollutants are entering the OSTDS and either impairing performance or entering the groundwater as untreated pollutants.

The beaches directly south of Area 1 have been closed many times due to high bacteria levels making it unsafe to swim. The EPA has identified Area 1's surrounding water bodies as impaired due to bacteria, low dissolved oxygen levels, mercury, and nutrients (TN, TP). Furthermore, due to a lawsuit by the Florida Wildlife Federation, the EPA has published stringent criteria for nutrients (TN, TP) for fresh water in January 2010 which will be followed soon by criteria for estuaries expected in January 2011. Figure 4.1.2.3.1 below depicts a map highlighting these impaired waters. It is likely that the Area 1 surrounding water bodies will not meet the new nutrient criteria and corrective action will need to be taken to address the polluting source of nutrients. With the water bodies surrounding Area 1 impaired for nutrients and the waters unsafe to swim, indicators are that OSTDS are causing serious ecological damage.

Fig. 4.1.2.3.1: **SURR0UNDING WATER BODIES WITH IMPAIRMENTS**



In summary, the OSTDS impacts are attributable to the following Area 1 OSTDS characteristics:

- High urban density, which limits the treatment zone, thereby reducing treatment effectiveness

- Non-Compliant OSTDS in Area 1; Half were installed prior to 1984 and do not meet current requirements
- OSTDS are not effectively treating nutrients (TN, TP) not to mention emerging pollutants (resulting in impaired water bodies)

4.1.3 Wastewater System

Of those properties within Area 1 connected to central sewer, the primary infrastructure servicing these properties is in good to fair condition requiring only normal maintenance. However, the capacity of existing trunk lines and lift stations is close to 100% used. Exhibit I.12 displays the existing infrastructure within Area 1 and, as well, identifies the East Port WRF.

The existing East Port WRF that serves Area 1 is at 65% of the permitted Average Annual Daily Flow (AADF) of 6 Million Gallons Per Day (MGD) and 38% of the permitted Maximum Daily Flow (MDF) of 16.8 MGD. However, re-rating of this capacity is being initiated, that will increase the AADF and MDF ratings of the plant to approximately 8 MGD AADF and 22.5 MDF. These needed incremental capacity improvements will be implemented over the next few years. There is sufficient capacity between existing flows and anticipated rerated capacity to handle Area 1 capacity requirements as shown in the section on Growth Projections. All of the alternatives requiring centralized treatment detailed in the subsequent chapters will be treated at the East Port WRF. Additionally, it is anticipated the East Port WRF will under go an expansion to 12 MGD AADF (33.6 MDF) in 2025.

4.1.4 Financial Status of Any Existing OSTDS and Wastewater Facilities

The existing OSTDS are privately owned. Existing centralized wastewater facilities serving Area 1 are owned by Charlotte County Utilities.

4.2 Stormwater

Area 1 stormwater is collected and treated via a system of grassy swales and canals retrofitted with control structures to provide preliminary stormwater treatment. The overall stormwater system was designed and installed more than 30 years ago and over the years, the system has deteriorated and is not working as effectively. An assessment of the existing stormwater system shows that improvements are required to restore the system to original design parameters. Additionally, current regulations and impaired water bodies are dictating that upgrades in stormwater treatment be implemented. The Public Works (PW) department is embarking on a detailed process to identify the pollutants and loading levels to determine how to improve water body impairments. CCU will cooperate with PW in their efforts to address these issues in conjunction with the wastewater improvements.

Any stormwater features impacted by this project will be restored in-kind. At the time of preparing construction plans, specific corrective upgrades will be incorporated as determined by CCU and PW. The methods to finance improvements will be allotted appropriately between PW and CCU assessments.

4.3 Paving

Public Works prepares a county-wide paving improvements and repair schedule on an annual basis. Priority is given to areas with the oldest roads on a 20-year cycle. Some of the roads in Area 1 have been resurfaced/repaved within the last 10 years while other Area 1 roads are on the priority list to be repaved, including the Spring Lakes area and an area immediately south of Cochran. CCU has been coordinating with PW to schedule wastewater improvements, based upon the paving improvement program to realize as much of the road life as possible.

Any paving features impacted by this project will be restored to PW standards. At the time of preparing construction plans, specific corrective upgrades will be incorporated. The method to finance improvements will be allocated proportionately between PW and CCU assessments.

CHAPTER 5 - GENERAL CONSIDERATIONS

5.1 Centralized Infrastructure

All of the centralized alternatives require a central collection and transmission 'backbone' system and wastewater treatment plant capacity. The proposed plans to address these needs are outlined below.

5.1.1 Central Transmission 'Backbone' System

A central gravity interceptor and force main transmission 'backbone' system is proposed to collect all of the wastewater in Area 1 and transport it to the East Port WRF. This system is comprised of a combination of large diameter gravity interceptors and two master lift stations with 24-inch force mains stretching across the mid section of Area 1 to collect wastewater from all the residences in the area. This transmission system is also sized to collect future flows from proposed future wastewater service areas.

The two (2) master lift stations will have telemetry systems for remote monitoring and control, more sophisticated electronics, higher electrical power requirements, and stand-by generators.

The construction of this backbone system will be phased to meet the increasing wastewater flows from Area 1 as residences are connected, or to meet coordination efforts with PW projects such as the Midway Blvd. expansion effort.

5.1.2 Water Reclamation Facility Capacity

The East Port Water Reclamation Facility (WRF) located east of Area 1, currently rated for 6 MGD AADF, and 16.8 MGD Maximum Daily Flow (MDF), is undergoing improvements to address major upgrade issues while also increasing capacity at its pre-treatment train/stage. The projected capacity is sufficient to serve all of the Area 1 existing residents and projected growth in the County. As wastewater service is provided to future wastewater service areas, the East Port WRF will require an expansion to achieve additional capacity. Once the improvements of the pre-treatment train/stage, collection system rehabilitation and other projects are finished, the re-rate of this plant capacity will be submitted for final FDEP approval. These improvements will increase the ability of the East Port WRF to treat higher volumes of wastewater on an average annual basis.

5.2 Construction Problems

5.2.1 High Water Table

Dewatering, a preparatory technique for eliminating ground water from a construction site, is a factor throughout the project area. The groundwater table is only a few feet below the surface in many areas which increases the amount of time and, therefore, cost to prepare for construction.

As described in Chapter 4, section 1, OSTDS require a certain vertical separation from the groundwater table. Due to the high ground water table, any OSTDS alternative will require a partial-fill or mound type system in Area 1.

Lift station facilities may need to be raised to be above the 25 year and 100 year flood level.

5.2.2 Seasonal High Water Table – Presence of Mottled Soil

Replacement OSTDS would need to be mound systems due to the close proximity of mottled soil (within 36-inches) below the surface indicating a high seasonal water table. As described in Chapter 4, Section 1, OSTDS require a certain vertical separation from the groundwater table. Due to the high ground water table, any OSTDS alternative will require a partial-fill or mound type system in Area 1.

5.2.3 Access

Many of the homes are located on minimal width roadways. Access for safety equipment and personnel still must be maintained to a reasonable level during construction. Furthermore, homeowners need a means of ingress and egress to their homes on a fairly regular basis even though temporary parking locations are provided. Therefore, some level of access needs to be restored and maintained by the Contractor in a timely manner at all times during the construction process.

5.2.4 County Road/ Highway Areas

A considerable portion of the wastewater facilities will be located within county road and state highway right of way. The construction activities along these roadways will require considerable signage to meet safety requirements as part of the permit process. It is anticipated that certain sections of the roadway system will be restored for local traffic only for a temporary period of time during the underground construction.

5.2.5 Wooded Areas

Many of the facilities are located in areas where protected trees may be located. A limited construction zone is proposed to minimize tree removal and preserve the natural features. A tree survey is required as part of the construction process.

5.2.6 Threatened and Endangered Species and Protected Habitats

Many of the facilities are located in areas where protected species and habitats are located. A limited construction zone is proposed to minimize tree removal and preserve the natural features and protected species. A detailed environmental survey is required during the design phase and immediately prior to construction to identify and address these issues. Issues could involve permit applications, permit fees, mitigation fees, and identifying relocation and/or mitigation sites.

5.2.7 Utility Replacement

Some portion of the water distribution and stormwater infrastructure will have to be replaced due to the construction process for wastewater. The degree of the replacement is based upon the type of material existing, the impact/conflict with the wastewater installation, cost efficiency of repair versus replacement, previous problems, maintenance experience, regulatory requirements, and other factors.

CHAPTER 6 – ALTERNATIVES CONSIDERED

The following alternatives on the following pages have been considered and evaluated to address the current situation and associated problems. A description of each alternative follows.

6.1 "DO NOTHING" ALTERNATIVE

6.1.1 Overview

This alternative would leave OSTDS systems in place as-is and allow future wastewater treatment to be handled only by OSTDS. Centralized wastewater service expansion will only continue on the basis of existing CCU policies.

6.1.2 Related Figures, Tables and Exhibits

NA

6.1.3 Land Requirements

There are no immediate land requirements for this option. In the future, if system repairs/replacements are required and the system must be brought into compliance with current regulations, additional land area may be required on a case-by-case basis. The responsibility of land acquisition would be the property owners'. Further, due to the effluent plume, OSTDS may not be able to built on every lot, but, rather, alternating lots, thereby impacting the build-ability of all vacant lots in Area 1.

6.1.4 Costs

See Chapter 8 for a cost comparison analysis of the alternatives.

6.1.5 Advantages/Disadvantages

The Health Department programs, policies, and procedures will dictate the on-going inspection program. CCU will continue its current policy for line extensions and maintain its current standards for operational performance of its existing systems. As clearly discussed in Chapter 4 of this report regarding OSTDS, there are serious environmental and ecological concerns relating to the status-quo of OSTDS within Area 1. The negative ecological impacts will continue to accumulate at the current rate.

The immediate cash outlay to most individual property owners will be minimized. However future repair and replacement cost will be born by the individual property owners. These costs include the actual repair or replacement costs and the applicable standard OSTDS or ATU operation permit fees and, for those with ATU's, the on-going maintenance contract fees. Future growth would be hindered by development orders limiting the density of OSTDSs in certain parts of Area 1. FDEP has the right to issue a consent order if the permit requirements for centralizing sewer are not met in the Manchester Lock removal permit. In addition, the Florida Department of Health is considering future discharge fees for OSTDS due to the pollutant loads introduced by these systems.

As discussed in section 4.1.2.3, the EPA is establishing stringent nutrient criteria to cleanup Florida waterways. The costs associated with meeting these new criteria and to clean up Charlotte County waterways will continue to increase if nothing is done about it. The EPA currently estimates that it will cost 102 Million dollars to 130 Million dollars per year to address the issues with all of Florida's waterways.

6.2 "UPGRADE OR REPLACE EXISTING INDIVIDUAL OSTDS"

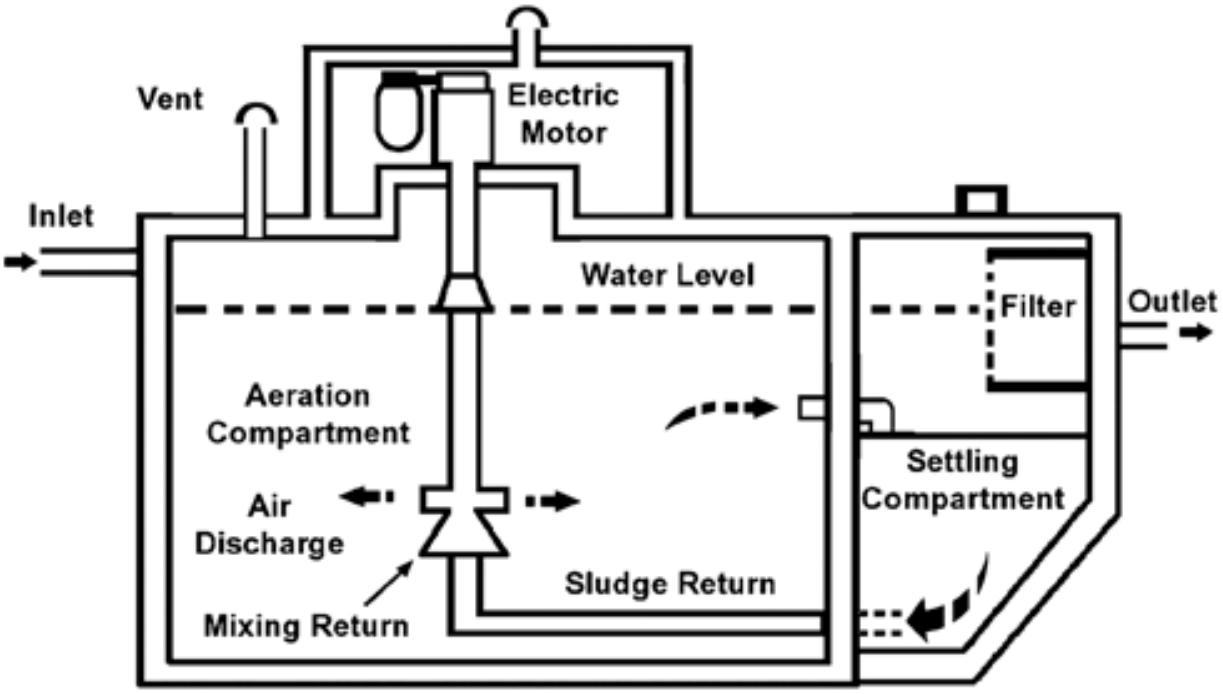
6.2.1 "AEROBIC TREATMENT UNITS (ATUs)" ALTERNATIVE

6.2.1.1 Overview

This alternative would replace all existing individual OSTDS to bring them in compliance with current codes and regulations (FAC 64e-6). Each property would continue to have its own OSTDS in the form of an Aerobic Treatment Unit (ATU) with a properly designed drainfield. As discussed in Chapter 4, Section 1, there are a number of challenges to meet current design criteria in Area 1 for a standard OSTDS. An ATU would be the alternative OSTDS approach to bring these properties into compliance. Once ATU systems are installed, inspection of these systems would be performed annually by a qualified Health Department inspector and a licensed maintenance contractor semi-annually.

6.2.1.2 Related Figures, Tables and Exhibits

Figure 6.2.2.1.1: *Conceptual Overview Aerobic Treatment Unit*



6.2.1.3 Land Requirements

Generally, there is sufficient land area for ATUs since drainfield land area requirements are approximately 25% less than for a standard OSTDS.

6.2.1.4 Costs

See Chapter 8 for a cost comparison analysis of the alternatives.

The immediate cash outlay to most individual property owners vary to some extent, but in most cases approach $14,000, the approximate cost of an ATU system. The repair and replacement cost will be born by the individual property owners. These costs include the actual repair or replacement costs and the applicable standard ATU operation permit fees and, the on-going maintenance contract fees. FDEP has the right to issue a consent order if the permit requirements for centralizing sewer are not met in the Manchester Lock removal permit. The Florida Department of Health is considering future discharge fees for OSTDS due to the pollutant loads introduced by these systems.

6.2.1.5 Advantages/Disadvantages

In addition to the arguments outlined above, ATU OSTDS systems have further drawbacks. While ATU land requirements are less than for standard systems, due to the introduction of mechanical and electrical components to the OSTDS, the initial construction/installation, maintenance and permit/inspection costs are higher for an ATU type system.

The cost of construction is increased in a majority of the locations due to the vertical and horizontal setbacks that must be maintained from existing buildings, surface, and ground water. The original soil at the property may not be suitable. Soil may need to be transported to the construction site at an additional cost. In addition, a dedicated electrical service must be installed.

Environmental impact costs contribute to the long term ownership costs of ATUs versus a municipal system. Furthermore, future discharge fees are being considered for ATUs due to the pollutant loads introduced by these systems to help meet Clean Water Act requirements. When incorporating a 'pollution tax' into the cost estimate, the cost for an ATU increases even more.

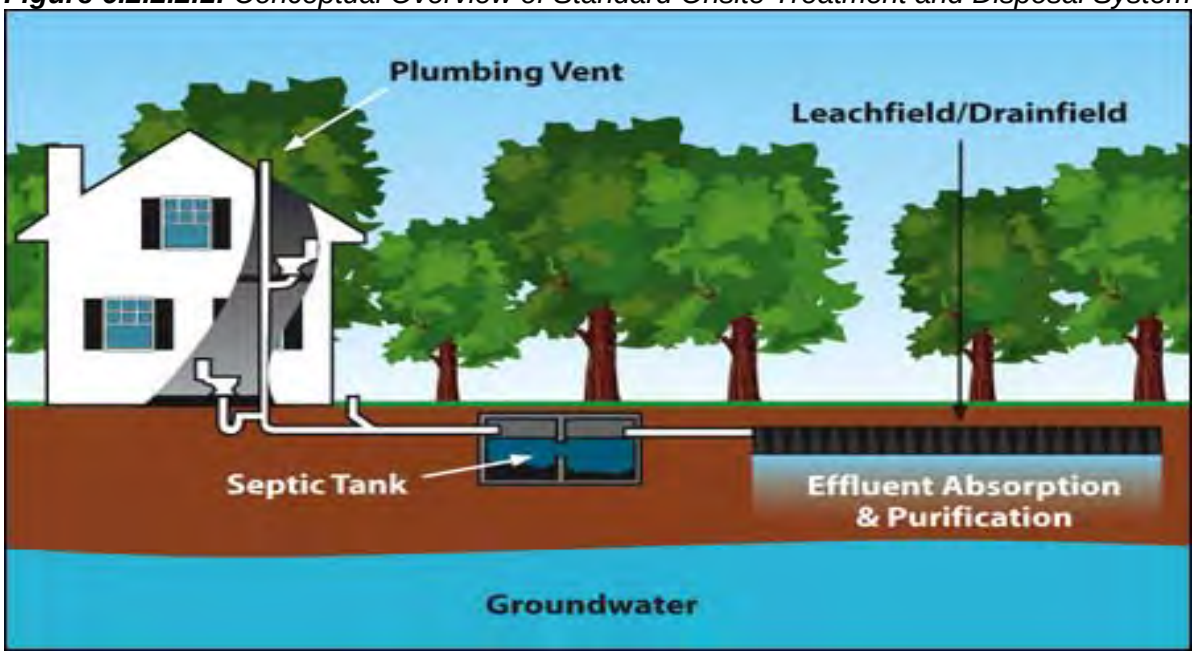
6.2.2 "STANDARD OSTDS SYSTEM" ALTERNATIVE

6.2.2.1 Overview

This alternative would replace all existing individual OSTDS to bring them in compliance with the current codes and regulations (FAC 64E-6). Each property would continue to have its own OSTDS in the form of a standard OSTDS with a properly designed drainfield. As discussed in Chapter 4, Section 1, there are a number of challenges to meet current design criteria in Area 1 for a standard OSTDS. Additional land area would need to be set aside for each property to decrease the density of OSTDS in the area. This land would need to be adjacent to or within proximity of the property.

6.2.2.2 Related Figures, Tables and Exhibits

Figure 6.2.2.2.1: *Conceptual Overview of Standard Onsite Treatment and Disposal System*



6.2.2.3 Land Requirements

To install compliant OSTDS, sufficient land area is needed to meet design and operational standards. In many instances in Area 1, the existing site area/lot area is insufficient and no assurances exist that suitable land area will be available to accommodate each OSTDS. The land area required must be evaluated on a case-by-case basis.

6.2.2.4 Costs

See Chapter 8 for a cost comparison analysis of the alternatives.

The immediate cash outlay to most individual property owners will vary somewhat, depending upon the existing condition of their OSTDS and the necessary repairs to meet current regulations. The repair and replacement cost will be born by the individual property owners. These costs include the actual repair or replacement costs and the applicable standard OSTDS operation permit fees. Future growth would be hindered by development orders limiting the density of OSTDSs in certain parts of Area 1. FDEP has the right to issue a consent order if the permit requirements for centralizing sewer are not met in the Manchester Lock removal permit. In addition, the Florida Department of Health is considering future discharge fees for OSTDS due to the pollutant loads introduced by these systems.

6.2.2.5 Advantages/Disadvantages

Many OSTDS in Area 1 do not meet the criteria for a properly functioning OSTDS. To rectify this problem, this option replaces all individual OSTDS with systems that meet current criteria. This OSTDS option has advantages and disadvantages. Overall, it is costly in the long term. See Table 6.2.2.4.2 for a cost comparison. As noted previously, it is questionable if the standard OSTDS systems can be installed for most lots in Area 1. More likely, the more expensive ATU-OSTDS systems will be required to meet current standards.

The Health Department programs, policies, and procedures will dictate the on-going inspection program required for the long term monitoring of these systems. CCU will continue its current policy for line extensions and maintain its current standards for operational performance of its existing systems. The option will always be available to properties within proximity of CCU services to voluntarily connect at a cost.

The cost of construction is increased in a majority of the locations due to the vertical and horizontal setbacks that must be maintained from existing buildings, surface, and ground water. The original soil at the property may not be suitable. Soil may need to be transported to the construction site at an additional cost.

Environmental impact costs contribute to the long term ownership costs of OSTDS versus a municipal system. Furthermore, future discharge fees are being considered for OSTDS due to the pollutant loads introduced by these systems to help meet Clean Water Act requirements. When incorporating a 'pollution tax' into the cost estimate, the cost for an OSTDS increases even more.

Standard OSTDS systems have further drawbacks. Given CCU findings described in Chapter 4 of this report coupled with the permit requirements for new on-site wastewater treatment systems, it will be very difficult, if not impossible, to realistically and economically construct some 7,544 new replacement standard OSTDSs. Upgrading each system to a standard system is cost prohibitive when taking into account the additional land required (lot size must be greater than 10,000 sq ft) and the larger drainfield requirement. The "standard" platted lot size in Area 1 measures 80' x 120' for a total area of 9,600 square feet. In many cases, for standard OSTDS, it may be necessary to locate additional land where sufficient separation will be required to meet Florida Statutes. By allocating this additional property for OSTDS, future growth corridors will be limited thereby eliminating additional lots for development and it is questionable whether acceptable vacant land is available adjacent to or near each home. Further, due to the seasonal high water table, many of the drainfields will be required to be mound systems. The elevated approach also is a consideration as to its effect on the property.

6.3 "GRAVITY" ALTERNATIVE

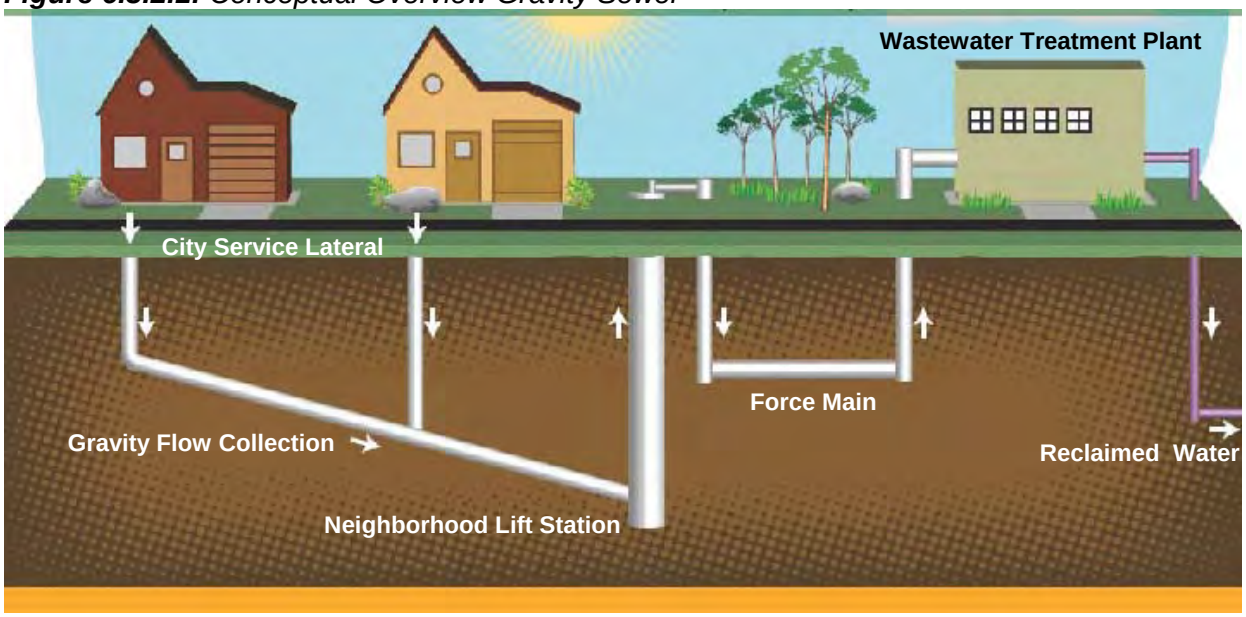
6.3.1 Overview

This alternative will provide central wastewater service using a conventional gravity collection system. Wastewater is collected from individual homes and transported by gravity through a series of 8-inch to 15-inch or larger collection lines made of PVC and pre-cast lined manholes to localized lift stations in the area. This system of lift stations and force mains are used to transport wastewater collected by gravity to the wastewater plant for treatment. In this alternative, all OSTDS would be properly abandoned per regulations. All existing homes would be connected to the gravity sewer system.

The gravity collection system will be constructed in the center of the existing roads, thus requiring the removal and replacement of all roads. Other existing utilities currently installed in the right-of-ways may or may not be affected depending upon location, depth, type of material and other factors specific to the impacted utility. The force mains are constructed in the existing County right-of-ways. Service stub-outs for unoccupied lots will be added.

6.3.2 Related Figures, Tables and Exhibits

Figure 6.3.2.1: *Conceptual Overview Gravity Sewer*



6.3.3 Land Requirements

Property for the lift stations would need to be acquired. In addition, various easements would be needed for the collection system (areas outside public right of ways) and the lift station facilities. The force main facilities are intended to be constructed in the county road and state highway right-of-ways through a permit process.

6.3.4 Costs

See Chapter 8 for a cost comparison analysis of the alternatives.

6.3.5 Advantages/Disadvantages

The gravity alternative has low maintenance and life cycle costs. The individual property owner no longer requires an electrical service to operate their wastewater system nor provide room for a tank. System components would be maintained by CCU. The gravity mains transport wastewater by use of gravity and minimize electricity.

While the long term maintenance and life cycle costs for gravity are lower, the construction costs are

higher and the logistics more complicated. Gravity construction requires the removal of the existing road system since gravity mains and manholes are in the center of the existing roads. Existing utilities located in the road such as water mains and storm sewer may need to be replaced as a result of removing the road. Major dewatering operations are required for the pipe installation.

The construction process is more disruptive to the existing residents due to the removal of the road system. However, the construction methods are well established and materials are readily available.

There are fewer odors with gravity systems since the whole wastewater effluent is exposed to the air and the bacteria have an opportunity to begin the treatment process prior to reaching the treatment plant. There is additional storage in the gravity system mains and manholes which allows more response time during power outages.

The original gravity system design completed as a part of the CDM Charlotte County 1990s sewer expansion study is available and can be leveraged for part of this effort.

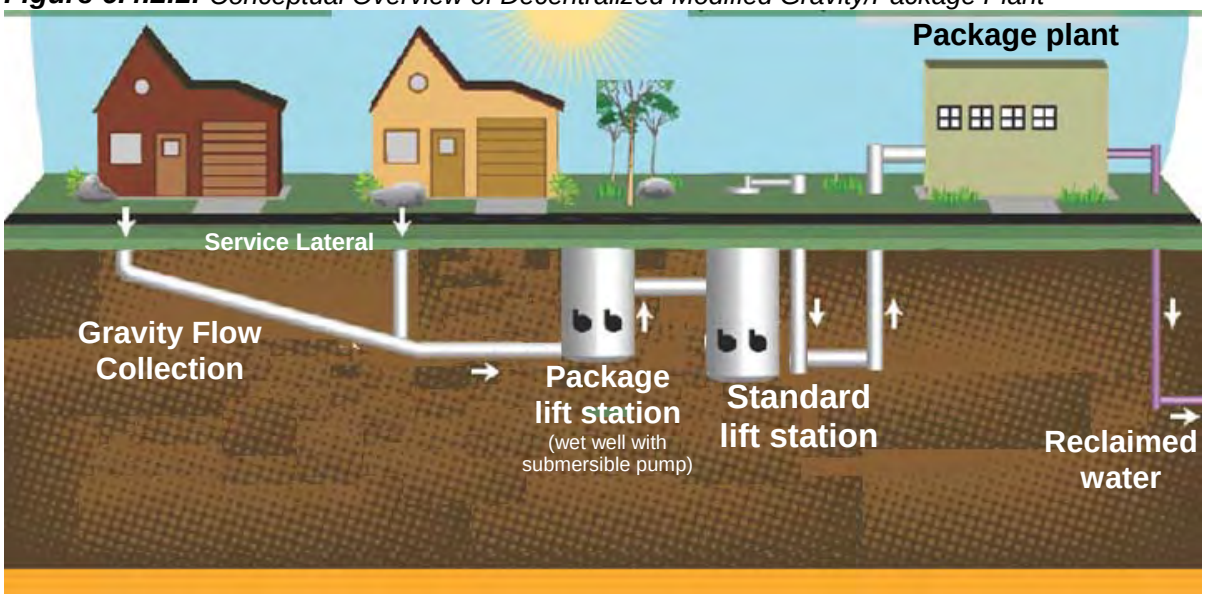
6.4 "DECENTRALIZED SYSTEMS – PACKAGE PLANT WITH HYBRID GRAVITY" ALTERNATIVE

6.4.1 Overview

This alternative would provide an interim option to neighborhoods that want to introduce central wastewater service, before the overall program would reach their own neighborhood. A neighborhood survey may reveal this alternative to be a desired option. The proposed solution would be to construct a package plant to serve approximately 2116 homes. Wastewater would be collected via a hybrid gravity system and grinder pump/force main system and delivered to the package treatment plant providing secondary level treatment. The gravity and pump/force main system will be designed and constructed in a manner to facilitate future connection to the central transmission system to the East Port WRF when central wastewater service becomes available to the neighborhood.

6.4.2 Related Figures, Tables and Exhibits

Figure 6.4.2.1: *Conceptual Overview of Decentralized Modified Gravity/Package Plant*



6.4.3 Land Requirements

Land acquisition is required to construct and operate a package plant. Various easements would be needed for the collection system (areas outside public right of ways) and the lift station facilities. The force main facilities are intended to be constructed in the county road and state highway through a permit process

6.4.4 Costs

For the purposes performing a cost comparison of the alternatives, the decentralized solution was expanded upon to incorporate all of Area 1 to evaluate its cost effectiveness. See Chapter 8 for a cost comparison analysis of the alternatives.

6.4.5 Advantages/Disadvantages

A package plant presents an opportunity to provide a centralized wastewater treatment service option to a geographically remote location in a more cost effective fashion where it is impractical and very expensive to extend central wastewater service to address the immediate needs of the community. Such an option would provide an equivalent level of treatment as a municipal permitted treatment plant. Furthermore, this option eliminates or extends start dates for major plant expansions and eliminates the need to extend lines through unpopulated areas where there is no customer base to support such

facilities. These facilities provide the county the flexibility to potentially, in the future, connect this remote neighborhood to a centralized transmission system and treatment plant provided that at this future time it is more cost effective to do so.

While CCU explored this option for Area 1, it became readily apparent that such a solution was not justified. There are no remote areas in Area 1 where it would be practical or cost effective to construct a package plant. Rather it is feasible to serve Area 1 with a major transmission line throughout the area because there is sufficient population density or customer base to serve along the entire transmission main alignment. The population density and distribution throughout Area 1 is optimal for connection to a major central transmission system.

The expense per ERU is higher for constructing and managing a package plant due to economies of scale. The cost to add the treatment component is more expensive than the cost to transmit the waste to East Port WRF. There is also the additional concern or perception regarding the future of the plant once the centralized transmission system becomes available to the area. After making such a large investment in a package plant to an area that will receive public wastewater service in the near term, in addition to demolition costs, there may be a perception that money was poorly spent.

6.5 "LOW PRESSURE SEWER (LPS)" ALTERNATIVE

6.5.1 Overview

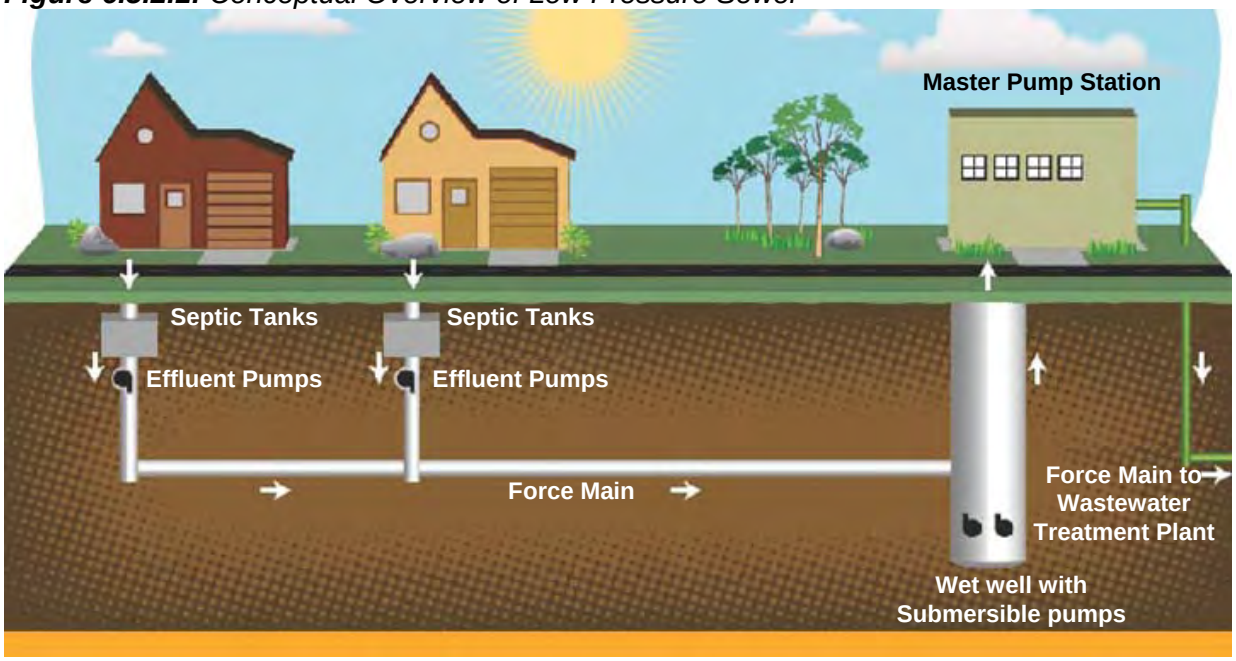
This alternative would provide central wastewater service by using a septic tank effluent pump (STEP) based low pressure sewer collection system. The Low Pressure Sewer System consists of an interceptor tank and a chamber unit, which houses a small, submersible electrical pump. The tank is installed below ground, much like a septic tank in the front yard of each individual property. Substantial organic waste collection is provided energy-free in the interceptor tank. The liquid in the tank, or effluent, is pumped automatically through a small pressure line (typically 2-inch minimum to 4 or 6-inches) that transports it through a system of low pressure force main collection lines, lift stations and transmission force mains ultimately reaching the wastewater plant for treatment.

Each intermediate or master lift station system is fed by a master manhole. The PVC low pressure force main and force main piping is installed approximately three feet below grade in the existing County rights-of-way. The existing roads do not have to be completely removed and replaced and will only be cut open a sufficient width to allow a pipe installation at pipe road crossings.

Services to the unoccupied lots will be added at the time of the request for sewer by the property owner. Each system requires a pump control panel and a dedicated electric service from the customer. The existing, more recently installed OSTDS tanks, meeting current standards, will be inspected and retrofitted or replaced at the property, along with the installation of a small submersible pump in a pump chamber. As noted previously, many, if not most, tanks are old and will require replacement. The tank solids are periodically removed from the low pressure tank in the same manner as with a septic tank.

6.5.2 Related Figures, Tables and Exhibits

Figure 6.5.2.1: *Conceptual Overview of Low Pressure Sewer*



6.5.3 Land Requirements

Property for the lift stations would need to be acquired. In addition, various easements would be needed for the collection system (areas outside public right of ways) and the lift station facilities. The force main facilities are intended to be constructed in the county road and state highway right-of-ways through a permit process.

6.5.4 Costs

See Chapter 8 for a cost comparison analysis of the alternatives.

6.5.5 Advantages/Disadvantages

There are many advantages to the Low Pressure Sewer option. The main benefits are related to less expensive construction costs and simplified logistics. LPS does not require the removal of the existing road system for construction since the collection sewer mains are in the County right-of-ways minimizing disruption to existing residents during construction. Furthermore, there are minimal maintenance responsibilities to the property owner. CCU maintains the onsite system throughout the life of the system. The property owner, however, must bear the cost of installing an electric service to power the individual low pressure sewer pump as well as ongoing electric power costs, which are minimal. CCU is accustomed to this design alternative by currently maintaining 6,000 existing low pressure connections, although additional resources will be required for on-going maintenance. Contractors in the area are also accustomed to installation of this type of design having created efficiencies and various techniques which have reduced the overall price per foot for installation.

While the capital costs for this option are lower than other options, the long term maintenance and ownership of a low pressure solution is much higher than other centralized alternatives outlined in this report. The long term maintenance of LPS is complicated by the requirement that CCU maintain all low pressure tanks and pumps installed on individual properties. The system relies heavily on the use of power to transport wastewater effluent and there is less storage in the system than a gravity system which reduces the amount of time available to react to a power outage. These higher O&M costs will effectively necessitate future CCU wastewater rate increases to offset the additional O&M costs.

The effluent from the low pressure sewer tanks quickly becomes anaerobic (“without oxygen”) creating hydrogen sulfide and other gases, which are more detrimental to the system components and increase O&M costs with a need to address unpleasant odors and the increased corrosion rate of lift station components made of metal, plastic, and concrete versus other central sewer options. This type of effluent also provides negative downstream effects on the central wastewater treatment plant when received in bulk, usually when the seasonal population returns for the winter season.

If zoning densities should increase, the low pressure system typically has less capacity for the additional flow and this system is not amenable to high density multi-family developments with respect to sizing tanks and handling peak flows or commercial properties where grease becomes an issue.

6.6 "VACUUM SEWER" ALTERNATIVE

6.6.1 Overview

This alternative would provide central wastewater service using a central vacuum system. A vacuum sewer system uses the differential pressure between atmospheric pressure and a partial vacuum maintained in the piping network and vacuum station collection vessel. This differential pressure allows a central vacuum station to collect the wastewater of several thousand individual homes, depending on terrain and the local situation.

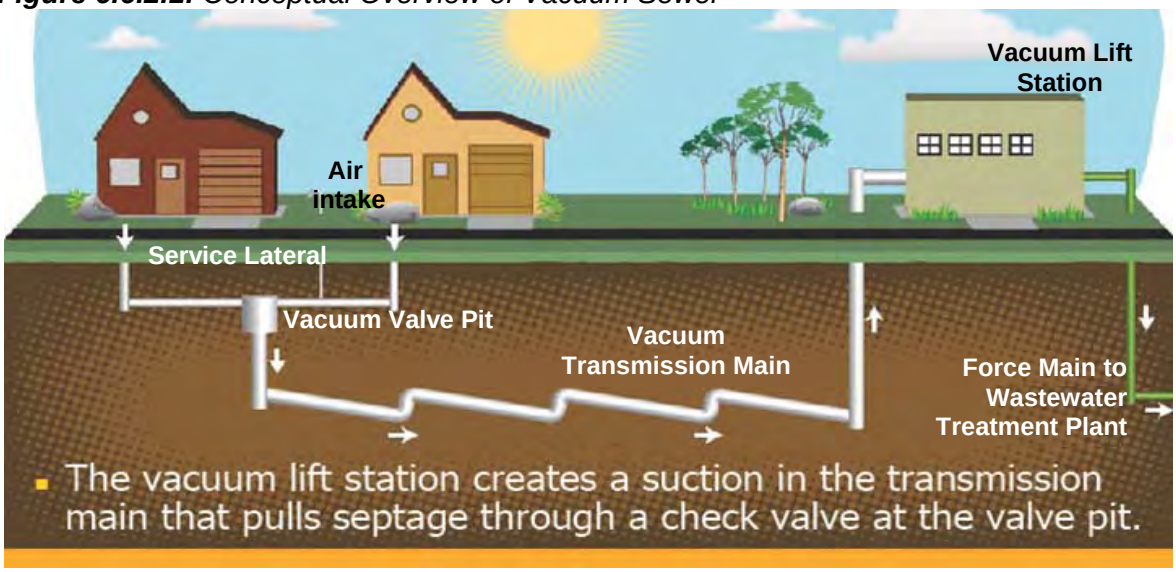
The vacuum system consists of a gravity service from each property to a nearby valve pit installed in the edge of the road right-of-way. The valve pits are activated by a pressure sensitive valve to determine when wastewater enters the collection system, which is under constant negative pressure or vacuum. The vacuum collection piping system is installed at a negative 0.2% grade and at a minimum of three feet below grade in Charlotte County right-of-ways. In order to maintain the negative 0.2% grade over long distances, up-lifts made of 45 degree PVC bends allow the force main to extend for longer distances. The wastewater is transported by vacuum until it ultimately discharges into the vacuum collection station. The vacuum collection station takes the place of a conventional pump station by collecting, storing, and discharging the sewage via pressure pumps thru a force main to an off-site treatment plant.

Buffer (storage) tanks are required for multiple customers in a single building which may be required in only a few instances for existing properties in Area 1. Service stub outs for the unoccupied lots will be added to the vacuum collection mains during construction to facilitate the addition of a new service at the time of the request for sewer by the property owner.

Road removal is on a limited basis for constructing the valve pits and pipe crossings. The existing roads will be open cut a sufficient width to allow installation of the vacuum pipe main and force main crossings. The vacuum collection station is enclosed in a permanent building housing the control electronics, storage tanks, vacuum pumps, an odor control system, and pressure pumps. The station has a standby generator.

6.6.2 Related Figures, Tables and Exhibits

Figure 6.6.2.1: *Conceptual Overview of Vacuum Sewer*



6.6.3 Land Requirements

Property for the Vacuum lift stations would need to be acquired. In addition, various easements would be needed for the collection system (areas outside public right of ways) and the lift station and vacuum pit facilities. The force main facilities are intended to be constructed in the county road and state highway right-of-ways through a permit process.

6.6.4 Costs

See Chapter 8 for a cost comparison analysis of the alternatives.

6.6.5 Advantages/Disadvantages

Vacuum sewers take advantage of available natural slope in the terrain and are most economical in flat to gently rolling terrains where groundwater is found several feet from the surface. This alternative requires little to no removal of the existing road system for construction, since the collection sewer mains are in the County right-of-ways minimizing disruption to existing residents. There are medium maintenance and life cycle costs of the vacuum collection mains and force mains. Construction costs are higher than low pressure sewer since it is critical that the collection mains be installed at a specific grade. Also driving up the construction costs is the fact that several of the components are proprietary and not interchangeable with other manufacturers. Additional plumbing is required to connect the property to the vacuum collection system.

CCU will maintain the vacuum system. However, CCU will initially require additional resources for training and possibly hiring experienced personnel to address the unique operational issues surrounding the vacuum system such as different trouble shooting techniques. CCU would also need to stock proprietary parts for replacement when and if required. Power requirements are higher since additional vacuum pumps are required in addition to the normal discharge lift station pumps.

The effluent from the vacuum sewer alternative has a lower concentration of hydrogen sulfide and as such odors will be minimized and the corrosion rate reduced. The entire effluent is transported very quickly throughout the system. Individual property owners are not required to install an additional electrical service to operate the system nor will CCU require access to individual properties to maintain the system.

6.7 "HYBRID GRAVITY" ALTERNATIVE

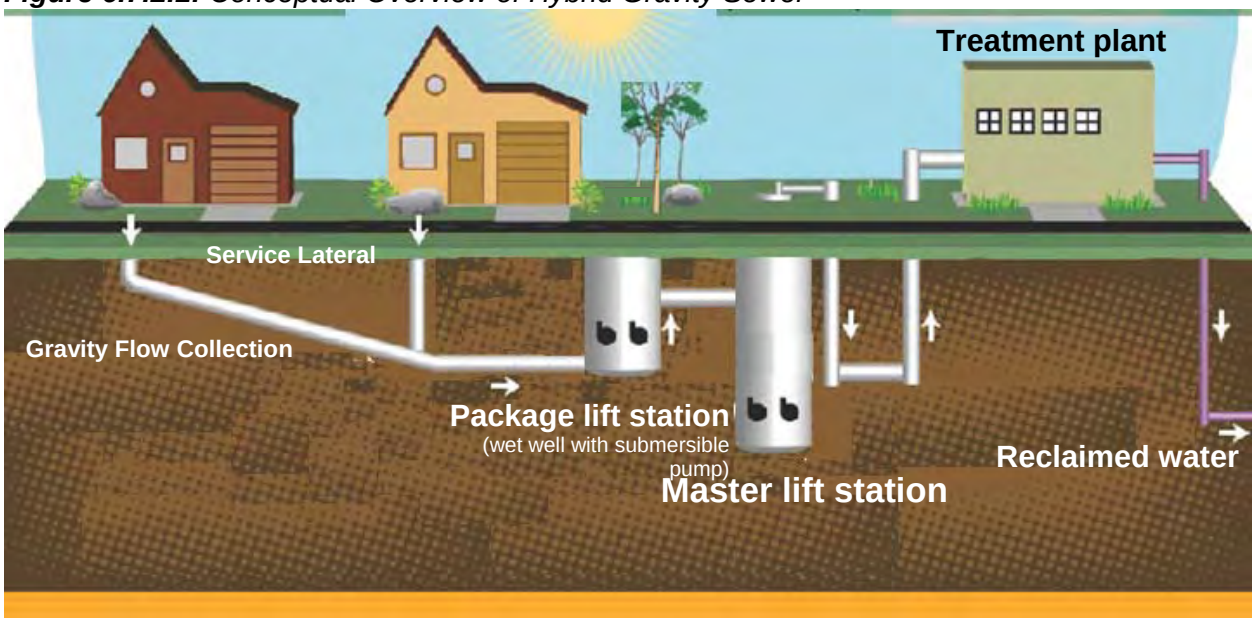
6.7.1 Overview

The Hybrid Gravity system replaces OSTDSs with a gravity collection system that is installed at shallower depths, versus a conventional gravity system. These shallower gravity collection service mains and manholes are connected by multiple small or package lift stations. The package lift stations transport waste using small diameter force mains to a master pump station which sends flow to the East Port WRF. The ability to construct at shallower depths addresses the high construction costs required to handle high groundwater tables that are found in Area 1. In this alternative all OSTDS would be properly abandoned per regulations.

The gravity collection system will be constructed in the center of the existing roads thus requiring the removal and replacement of all roads to a certain degree. The shallower depths will reduce the overall road and right-of-way restoration costs since the construction zone is decreased. Other existing utilities currently installed in the right-of-ways may or may not be affected depending upon location, depth, type of material and other factors specific to the impacted utility. The force mains are constructed in the existing County right-of-ways.

6.7.2 Related Figures, Tables and Exhibits

Figure 6.7.2.1: *Conceptual Overview of Hybrid Gravity Sewer*



6.7.3 Land Requirements

Property for the lift stations would need to be acquired. In addition, various easements would be needed for the collection system (areas outside public right of ways) and the lift station facilities. The force main facilities are intended to be constructed in the county road and state highway right-of-ways through a permit process.

6.7.4 Costs

See Chapter 8 for a cost comparison analysis of the alternatives.

6.7.5 Advantages/Disadvantages

The Hybrid Gravity alternative provides a modified approach to a traditional gravity alternative by minimizing depths. Further, the Hybrid Gravity system incorporates small package lift stations staged throughout Area1, versus the use of individual property low pressure pumps and storage as required for the LPS system. The construction costs will be slightly higher than the low pressure sewer alternative since there is a gravity collection system component that will require removal of the existing road system and some dewater operations. Existing utilities will be replaced as needed.

This process will be disruptive to existing residents while the roads and utilities are disturbed. However, construction costs are lower since the gravity collection system will not be as deep as the conventional gravity system. There will be small package pump stations at optimal intervals to assist with transporting the effluent from one elevation to another. Service stub-outs for unoccupied lots will be added.

CCU maintenance costs, in general, will be lower than the LPS alternative since the system is centralized and components will not be located at individual properties. However, since this alternative is comprised of a force main component connecting a series of small gravity collection systems via small package stations, the maintenance of this system is slightly more complex and costlier than for a conventional gravity system. Power requirements for this alternative are greater than for a conventional gravity system but less than an LPS system.

Odor and corrosion issues will be minimized since air is introduced into the wastewater while collecting via gravity to the package lift stations. The force main length will be much shorter, decreasing the transportation time impacting the wastewater quality and odor conditions.

CHAPTER 7 – OPERATIONS AND MAINTENANCE COST ANALYSIS

Due the fact that O&M and replacement costs are recovered through utility rates, fees and charges to its customers, all alternatives were examined for the long term financial consequences of operating and maintaining each of the alternative systems. The standard OSTDS and ATU OSTDS alternatives also have long term O&M and replacement costs which are incurred directly by the property owners responsible for making sure their systems are functioning properly at all times, as well as having them inspected and pumped out on are regular basis. Therefore a present worth analysis was completed to accomplish this evaluation.

The present worth analysis for each of the 7 alternatives was completed using the capital and operations and maintenance (O&M) costs previously discussed. The results are presented in Table 7.1 below. The present worth analysis was based on Federal Government procedures outlined in the USDA's finance proposal evaluation for comparison of alternatives. The assumptions were as follows:

- A 100 year analysis period was used.
- The real interest rate used was 3.0%. This is the rate, rounded up, and published in the Office of Management and Budget Circular No. A-94 for 30 or more year analyses.
- The useable life span for lift stations and vacuum pits was 50 years.
- The useable life span for piping and manholes was assumed to be 100 years.
- The life span for pumps varied by size and was assumed to be 10, 15, or 20 years.
- The life span for controls was assumed to be 5 years.
- The life span for low pressure systems was assumed to be 50 years.
- The life span of onsite systems was assumed to be 40 years.
- The costs associated with the purchase of land were 100% salvageable. Site work and land improvements had no salvage value.
- Wastewater treatment costs were incorporated in the centralized alternatives using variable treatment costs identified in CCU's current rate resolution dated October, 1 2009 ($3.86/1,000 gallons).

Table 7.1: Comparison of O&M and Replacements Costs
(all $ Amounts are in Millions)

Alternatives (In Ranked Order)	O&M	Replacement	Total O&M and Replacement Costs
Hybrid Gravity	$153.7	$4.5	**$158.2**
Vacuum	$198.0	$15.1	**$213.1**
OSTDS - Standard	$181.9	$84.4	**$266.3**
Low Pressure	$245.9	$18.4	**$264.3**
Standard Gravity	$182.2	$7.2	**$189.4**
Decentralized	$224.4	$32.9	**$257.3**
OSTDS - ATU	$367.0	$99.9	**$466.9**
Do Nothing *	NA	NA	**NA**

* This option does not address the problems and issues being encountered and therefore is not considerered a viable alternative.

CHAPTER 8 – SELECTION OF AN ALTERNATIVE

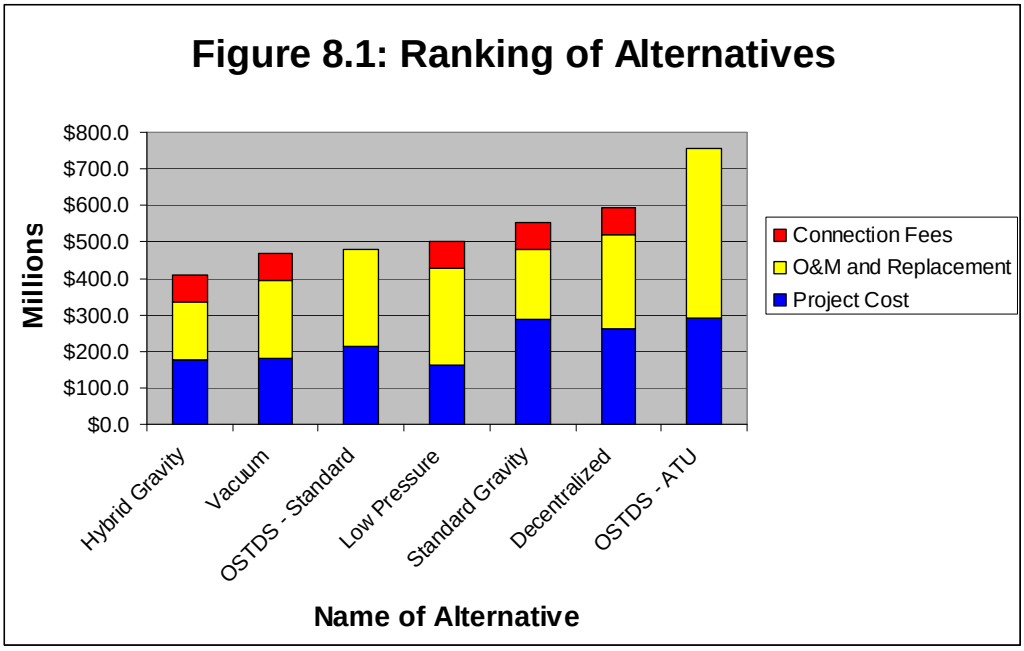
The alternatives were evaluated based upon the overall construction cost and present worth of the long term operations, maintenance, and replacement costs. In addition, connection fees are included for all centralized sewer alternatives.

Costs were determined by first performing a detailed design/cost estimate for the Spring Lake Area. This Area was considered a worst case scenario as to overall design complexity and cost. The results were then expanded to the remainder of Area 1 in order to finalize the overall costs. See Appendix II, Exhibit II.1 through Exhibit II.7, for detailed cost estimates. Table 8.1 and Figure 8.1 below summarize the costs and provide the overall ranking of the alternatives.

Table 8.1: Comparison of Alternatives by Cost and Other Factors
(In order of ranking with lowest priced option listed first)
(all $ Amounts are in Millions)

Alternatives (In Ranked Order)	Project Cost	O&M and Replacement	Connection Fees	Total Project Cost
Hybrid Gravity (Exhibit II.1)	$178.2	$158.2	$73.7	**$410.1**
Vacuum (Exhibit II.2)	$181.2	$213.1	$73.7	**$468.0**
OSTDS - Standard (Exhibit II.3)	$212.8	$266.3	$0.0	**$479.1**
Low Pressure (Exhibit II.4)	$163.0	$264.3	$73.7	**$501.0**
Standard Gravity (Exhibit II.5)	$288.3	$189.4	$73.7	**$551.4**
Decentralized (Exhibit II.6)	$262.8	$257.3	$73.7	**$593.8**
OSTDS - ATU (Exhibit II.7)	$289.8	$466.9	$0.0	**$756.7**
Do Nothing *	NA	NA	NA	**NA**

* This option does not address the problems and issues being encountered and therefore is not considered a viable alternative. It is an unranked alternative.



The project (construction) cost for each alternative ranged from approximately $163 million for the Low Pressure Sewer option to the most expensive project cost of $289.8 million for the OSTDS – ATU option. The cost for the 'Do Nothing' alternative was not considered since this does not address the serious problems and issues that are being encountered in the area in a timely fashion. The main distinction between the highest and lowest cost central wastewater systems is the amount of restoration that is required when installing the Low Pressure Sewer system, versus the Standard Gravity system. The Standard Gravity system requires full road replacement while the Low Pressure System lines are installed in the existing Right-of-Way.

Looking at present worth of the Operations and Maintenance (O&M) and Replacement Costs for the OSTDS alternatives, the lowest cost alternative was the Standard OSTDS system at $266.3 million with the most expensive alternative being the ATU OSTDS system at $466.9 million. However, as mentioned previously in the report, due to the physical constraints in the area, the Standard OSTDS system is not a feasible option. As such, the ATU system would be the most likely OSTDS system to be installed. The lowest O&M and replacement cost for a central wastewater alternative was Hybrid Gravity at $158.2 million and the highest was the Low Pressure Sewer option at $264.3 million, both of which are lower than the on-site ATU system at $466.9 million. The Low Pressure Sewer option requires additional maintenance to manage the on-site STEP tank and pump that are located on each individual property. This quickly drives up its O&M costs in relation to other alternatives which don't have to address issues at individual properties.

Overall, when coupling the total Project Cost with the total Present Worth cost for Operations and Maintenance and Replacement Cost of each alternative, the Hybrid Gravity alternative had the lowest overall cost at $410.1 million. The project with the highest overall expense was the ATU OSTDS system at $756.7 million. **Therefore, the Hybrid Gravity alternative provides the least overall cost for the Area 1 residents.**

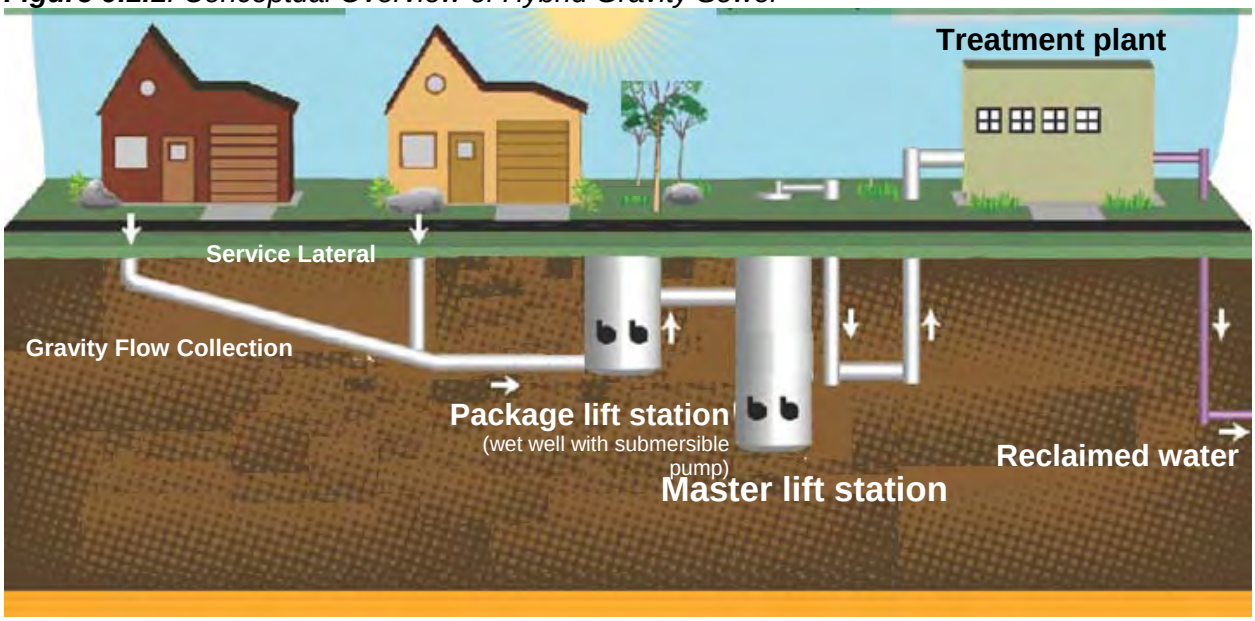
The Hybrid Gravity alternative has fewer lift stations to maintain than the Low Pressure Sewer option when taking into account the individual Low Pressure Sewer systems located at each property. The Hybrid Gravity system mains are shallower due to the number of package lift stations, so the estimated line inspection and cleaning costs will be lower than the Standard Gravity option. The overall project (construction) cost was lower than the Standard Gravity option due to the shallower depth of the gravity mains.

CHAPTER 9 – PREFERRED PROJECT – HYBRID GRAVITY

9.1 Overview

CCU is recommending to the BCC that the preferred wastewater service solution in terms of cost, long term operation and maintenance costs, and ecological benefits is the Hybrid Gravity alternative (see figure 9.1.1 below for conceptual overview of the recommended solution). This alternative is the lowest overall cost option when combining the construction cost coupled with the cost of operation and maintenance. This alternative also addresses the ecological concerns in a global centralized fashion thus providing a simple, structured approach to resolving the impairments affecting the Charlotte Harbor Estuary, Peace River and Myakka River water bodies.

***Figure 9.1.1**: Conceptual Overview of Hybrid Gravity Sewer*



9.2 Project Design

9.2.1 Collection System Layout

The collection system has 3000 manholes, approximately 890,000 linear feet of gravity mains, approximately 135,000 linear feet of force mains and160 package pump stations. The system collects wastewater from residences via gravity through 8-inch to 15-inch gravity sanitary sewer lines.

Homes will be served by either a four (4) inch service lateral where only a single service is required, or a six (6”) inch service lateral will be used for existing and future double service needs. See Exhibit II.1 for a detailed cost estimate and quantities of these components.

9.2.2 Pumping Stations and Transmission System

The pumping stations for this project are small package lift stations strategically located to elevate and transport the wastewater to the next gravity collection area or to a master lift station. The forcemain from each of these stations will be four (4) inches minimum in size. Either single or three phase power will be needed to serve these pumping stations. Each pumping station will include two (2) pumps for backup/duplication purposes.

The hybrid gravity collection system and package lift stations will pump or collect to one of two master lift stations or to the gravity interceptor that is to be constructed along the mid-section of Area 1.

9.2.3 Treatment

All the wastewater would ultimately collect and be treated at the East Port WRF

9.3 Project Finance Overview

As previously identified in chapters 7 and 8, the total project costs for the hybrid gravity solution including construction, operations, maintenance, replacement, and connection fees are **$410.1 million dollars**.

CCU's vision for the Area 1 wastewater service program initiative is to provide a turnkey, high quality solution to the residents of Area 1 with a low long term cost of ownership and no maintenance inconveniences typical of some wastewater treatment alternatives. No hidden costs, nor any action on the residents' part, other than paying the annual assessment fees and the eventual CCU monthly charges, will be required. Furthermore, property owners will not be financially burdened with lump-sum up-front capital outlays such as utility connection fees (to be paid via an annual assessment). Project costs will be distributed across the Area 1 property owners, subject to any cost savings identified via other funding sources (e.g. CCU Customer Environmental Benefit Charge, Area 1 wastewater usage charge). Approximately **16,500 properties** (7,600 developed, 8900 vacant) equating to approximately **17,000 Equivalent Residential Units (ERUs)** will be assessed**.**

9.3.1 Project Finance Highlights

9.3.1.1 OSTDS Rebates and Funding Source Options

The recommended scenario offers an OSTDS rebate program to provide some relief to customers with systems that were replaced or received major repairs within the last 7 years (See Table 9.3.1.1.1). Further, the program includes CCU funding of remedial repairs necessary to extend the life of the OSTDS until connection to the system is available. This rebate applies only to homes built prior to October 1, 2010. Rebates will be issued at the time of central wastewater service connection. The rebate will appear on the customer's first monthly bill and will be applied to the account charges until the available funds are exhausted.

Table 9.3.1.1.1: OSTDS 7 Year Rebate Program

Age at Time of Connection	Standard Credit Amt$	ATU Credit Amt$
1 years	5,000	7,000
2 years	5,000	7,000
3 years	5,000	7,000
4 years	5,000	7,000
5 years	3,750	5,250
6 years	2,500	3,500
7 years	1,250	1,750

CCU is reviewing several funding mechanisms that could eventually reduce the per ERU cost for property owners in Area 1 as follows:

- CCU is proposing a customer fee ("Environmental Benefit Charge") to contribute to the clean-up of the Charlotte Harbor Estuary and Peace and Myakka Rivers.
- Second, CCU and PW are currently working on the proportionate share that will be contributed to the project for road restoration.
- CCU collects monthly wastewater usage charges, a portion of which will be applied toward the cost of this project. Once these funding sources are applied to the project expenses the per ERU cost will be reduced accordingly.

9.3.1.2 Timeline/Phasing

The anticipated assessment window for the construction effort is 20 years which will begin with the FY 2011 property tax assessments and end with the 2031 assessments. The assessment window for connection fees begin in 2012 and will continue through 2032. Project activities will begin in 2011 and proceed in a phased fashion for 11 years through 2022. The overall wastewater service program is structured to provide service to the approximate 16,500 properties over an 11 year period in nine phases (phases will overlap in certain years). The first connections will occur in 2013. Each phase will cover a 3 year period to include design, permitting, and construction and service connections to approximately 7,600 occupied properties and service stub-outs to the remaining 8,900 vacant properties. Finalization of this approach is being reviewed and verified by financial model with CCU's rate consultant PRMG.

This phased initiative lends itself to a "self financing" approach. By structuring the construction program timelines in a phased fashion to optimally use collected assessment fees and, as well, by introducing alternative funding sources, a cash flow scenario has been devised that will reduce the overall need to seek outside financing and thereby reducing interest expenses attributable to the project.

Below is a summary timeline that identifies preliminary project milestones:

Table 9.3.1: Project Time line Summary

Event	Fiscal Year
Begin Construction Assessment	FY 2011
Begin Engineering and Design	FY 2011
Begin Connection Fee Assessment	FY 2012
Begin Construction	FY 2012
Begin Service Connections	FY 2013
Ongoing Project Activities	FY 2013-2022
Complete Project	FY 2022
Complete OSTDS Rebate Program	FY 2022
Complete Construction Assessment	FY 2031
Complete Connection Fee Assessment	FY 2032

9.3.1.3 MSBU

A Municipal Services Benefit Unit (MSBU) will be created to begin collecting the assessment revenue required to accomplish this project. A full assessment roll will be published via the Municipal Services Benefit Unit Department and a copy will be available for review upon request.

The MSBU Department, with participation from CCU will perform a thorough review of property appraiser records for the properties in Area 1. Items determined during the review process included:

- A thorough count of occupied and unoccupied properties
- Land-use compilations
- Services availability
- Services currently provided
- ERU counts
- Conservation areas

The final cost distribution or ERU assessment per property owner is being evaluated and there are a number of properties (approximately 5%) where a final determination is required. CCU staff will present these findings to the Board for evaluation and final policy determination on the most equitable method for distributing the costs of the project. The per ERU cost will adjust based upon the final ERU count determination. The ERU Cost Summary Table 9.3.1.3.1 for the Hybrid Gravity System was based upon only an estimated ERU count.

Table 9.3.1.3.1 ERU Cost Summary For Hybrid Gravity System		
Item	**Total $s**	**Per ERU Cost (16,500 ERUs) 2**
1 - Wastewater Service Program		
A - Gross Estimated Project (Construction) Cost: 1	**$178,220,700**	**$10,801**
Estimated Reductions		
i - Enviro. Benefit Charge $1 per month (for first 10 years) *3*	$7,700,000	$467
ii- PW Contributions $980 per ERU	$16,170,000	$980
B -Total Estimated Reductions (i+ii above):	**$23,870,000**	**$1,447**
Net Estimated Cost with Reductions (A - B above):	**$154,350,700**	**$9,355**
Connection Fees:	**$71,511,000**	**$4,334**
Total Estimated MSBU Assessments w/ Reductions:	**$225,861,700**	**$13,689**
Assessment (20 year collection window)		**$684**
Monthly Per/ERU cost Project and Connection Fe		**$57**
2 - Optional Reclaim Proposal		
Provide Reclaim Water Service 4	$32,340,000	$1,960
Reclaim Water Annual Assessment (20 Years)		**$98**
Reclaim Water Monthly Per/ERU Cost		**$8**
3 - Combine Assessment (1 & 2 Above)		
Assessment (20 year collection window)		***$782***
Monthly Per/ERU cost incl Project, Connection Fees and Reclaim Water:		***$65***

Notes:

1 - CCU will provide funds to offset finance costs

2 - Estimated 16,500 ERUs will be Assessed for this Project

3 - Environmental Benefit Charge will be applied to all Current and Future CCU Customer Accounts

4- Customer will realize payback within 6 years assuming 1" of irrigation/week on an average of 5,000 sq ft of pervious irrigatable land per 0.25 acre lot for the dry season. Based upon a simple comparison of potable water (tier 1 residential use only - $4.67/1000 gpd)) and reclaim water rates ($0.31/1000 gpd) customers can see at a minimum, a $52.50 per month savings in water usage for the 6 month dry season (potential $324 per year usage saving).

Based upon the assumptions outlined above, the projected monthly cost outlay for each CCU customer connection amounts to approximately $57 in addition to other normal CCU monthly usage charges. CCU anticipates that while the $57 will be a fixed goal, the allocations will vary throughout the life of the MSBU. If Reclaim Water is included in the project then the monthly cost to the customer is approximately $65.00 per month.

CHAPTER 10 – CONCLUSIONS AND RECOMMENDATIONS

It is CCU's conclusion that the Hybrid Gravity system is the preferred solution to centralize wastewater service to Area 1. This preferred alternative provides a long term solution to address the negative impact of OSTDS on the ecology of Charlotte Harbor, Myakka River and Peace River which are named in the EPA National Estuary Program. The preferred Hybrid Gravity system has the lowest overall long term cost of ownership compared to the other alternatives while minimizing operational and maintenance requirements. The program that CCU seeks to put in place is designed to minimize both the financial and logistical impacts to the Area 1 residents and, as well, to minimize the long term costs to the residents.

This project is feasible, cost effective and will benefit the area served. If the Charlotte County Board of Commissioners concurs with these findings regarding the preferred hybrid gravity solution then CCU is requesting approval to move forward with the critical tasks required to prepare for final approval of the MSBU in September, 2010. These tasks are as follows:

- Public outreach
- Apply for Financing
- Final report addendum based upon board and public comment
- Finalize any affected ordinances and resolutions
- Finalize MSBU assessments

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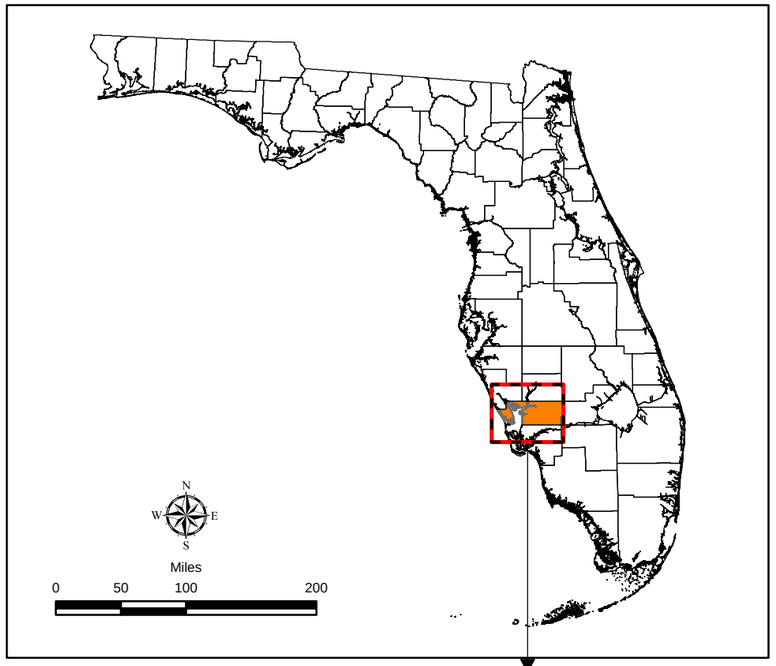
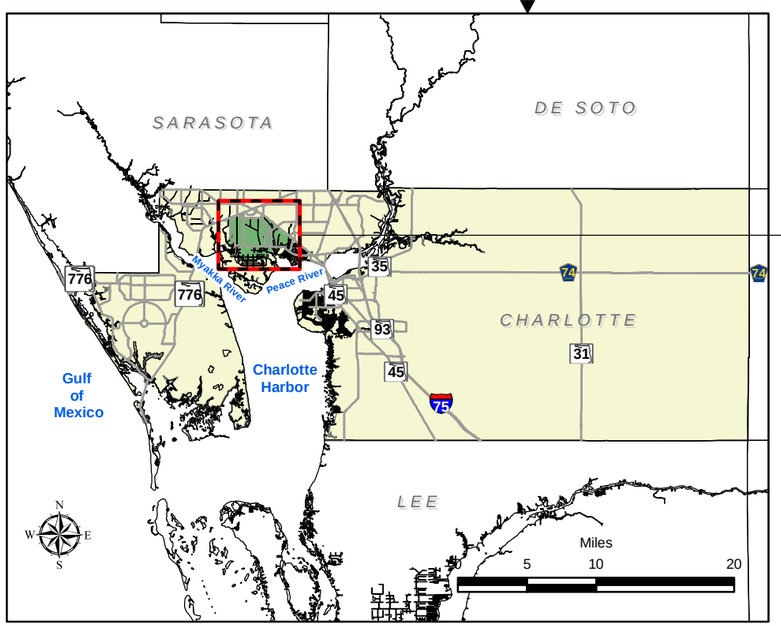
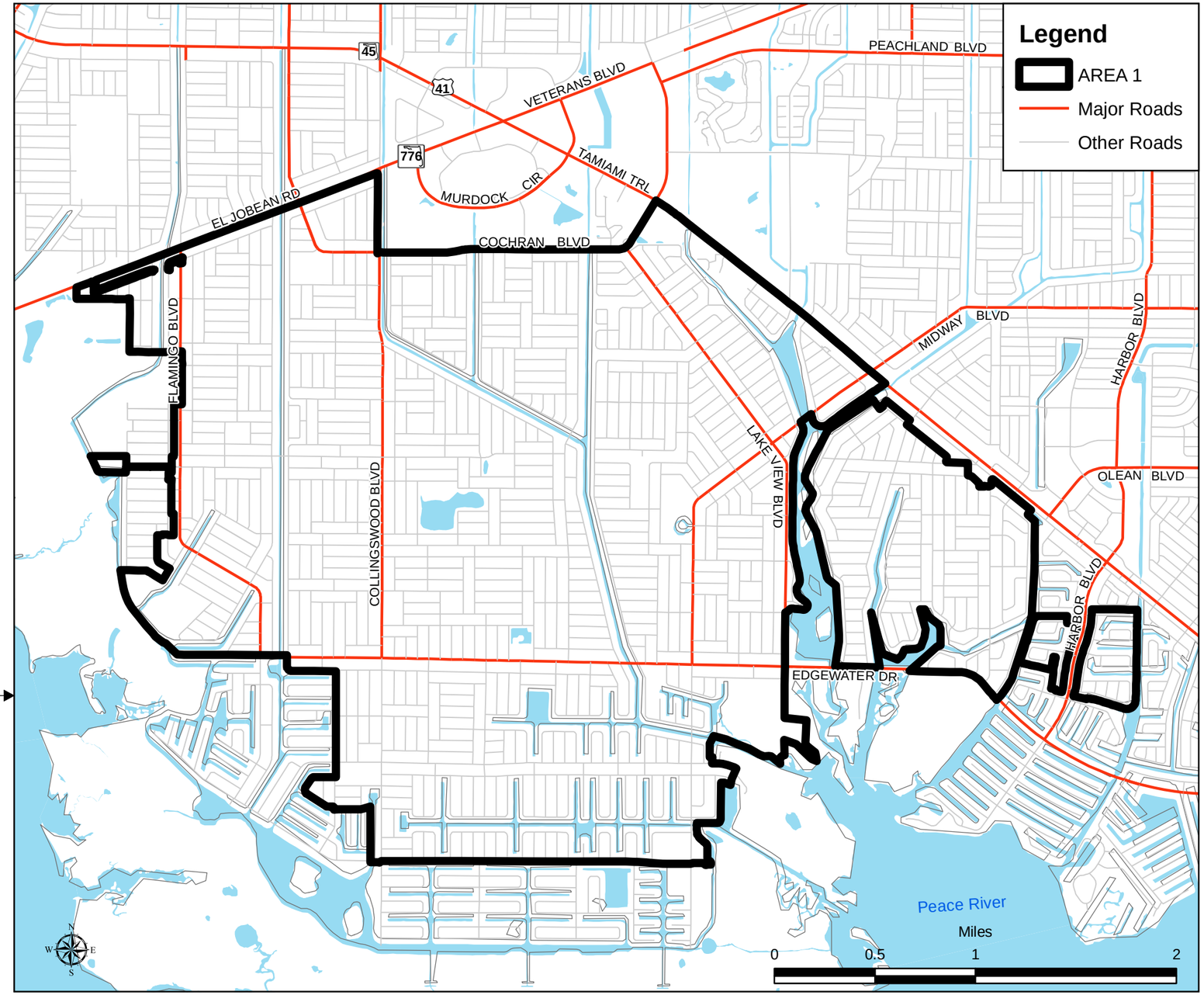
APPENDIX I: MAPS AND LARGE PRINT EXHIBITS

Exhibit I.1: Location Map







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Title: LOCATION MAP AREA 1-FINAL
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770

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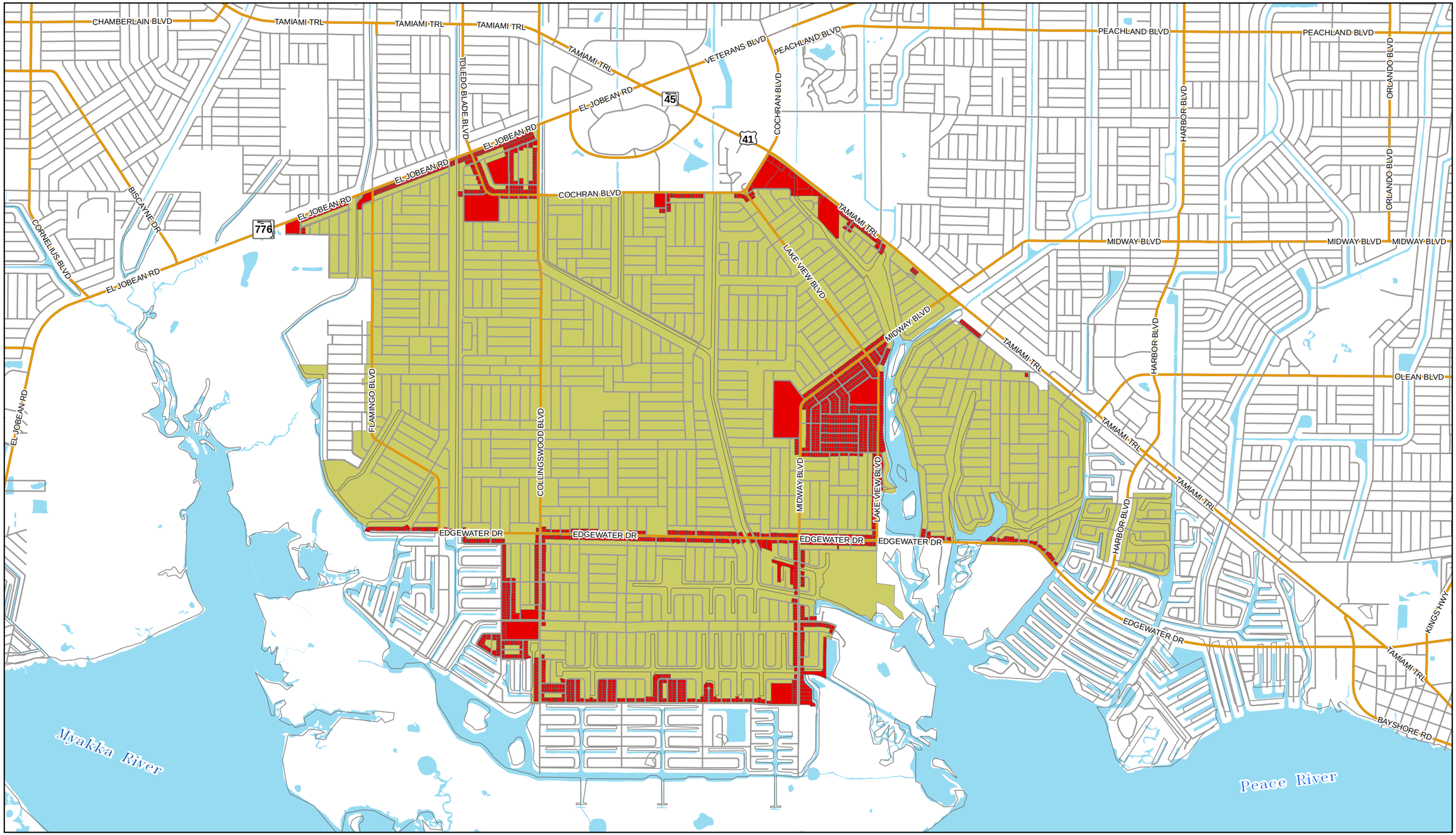
AREA 1

Location Map

Exhibit I.1

Exhibit I.2: Area 1 Wastewater Service Program

File Location: W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\02-WASTEWATER_SERVICE_AREA_1.mxd) Designed by D. Cain. produced on 03/15/2010



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Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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N W E S

Miles

0 0.25 0.5 1

Legend

- EXISTING SEWER AREAS
- AREA 1

AREA 1

Wastewater Service Program

Exhibit I.2

Exhibit I.3: Area 1 Features Map

File Location: W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\03-FEATURES AREA 1.mxd) Designed by D. Cain. produced on 03/15/2010

Printing Date: Monday, March 15, 2010
Title: FEATURES AREA 1-FINAL
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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N W E S

Miles
0 0.25 0.5 1

Legend

- Fire/EMS
- Government
- Library
- Public Works
- Sheriff/EM
- AREA 1
- Parks & Recreation
- Preservation/Resource Conservation
- Private Recreation

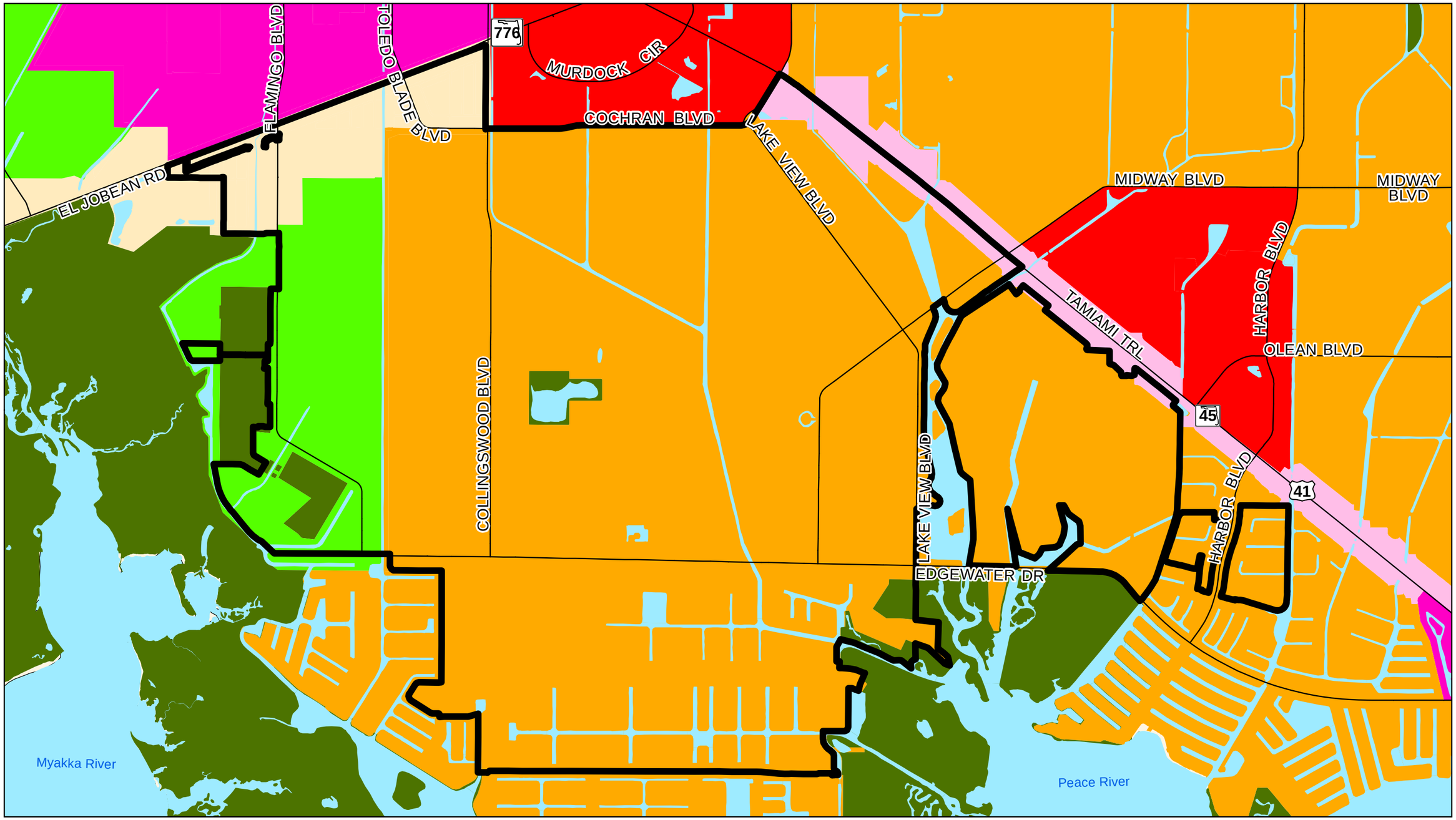
AREA 1

Features

Exhibit I.3

Exhibit I.4: Growth Management 2050 Neighborhoods Framework

File Location: W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\2050Framework.mxd) Designed by D. Cain, produced on 03/15/2010



Printing Date: Monday, March 15, 2010
Title: SAP
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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N W E S

Miles

0 0.25 0.5 1

- CRA
- Economic Center
- Revitalizing Center
- Corridor
- Economic District
- Emerging/Targeted Neighborhood
- Managed Neighborhood
- Maturing Neighborhood
- Revitalizing Neighborhood
- Conservation
- Outside the USA
- City

AREA 1

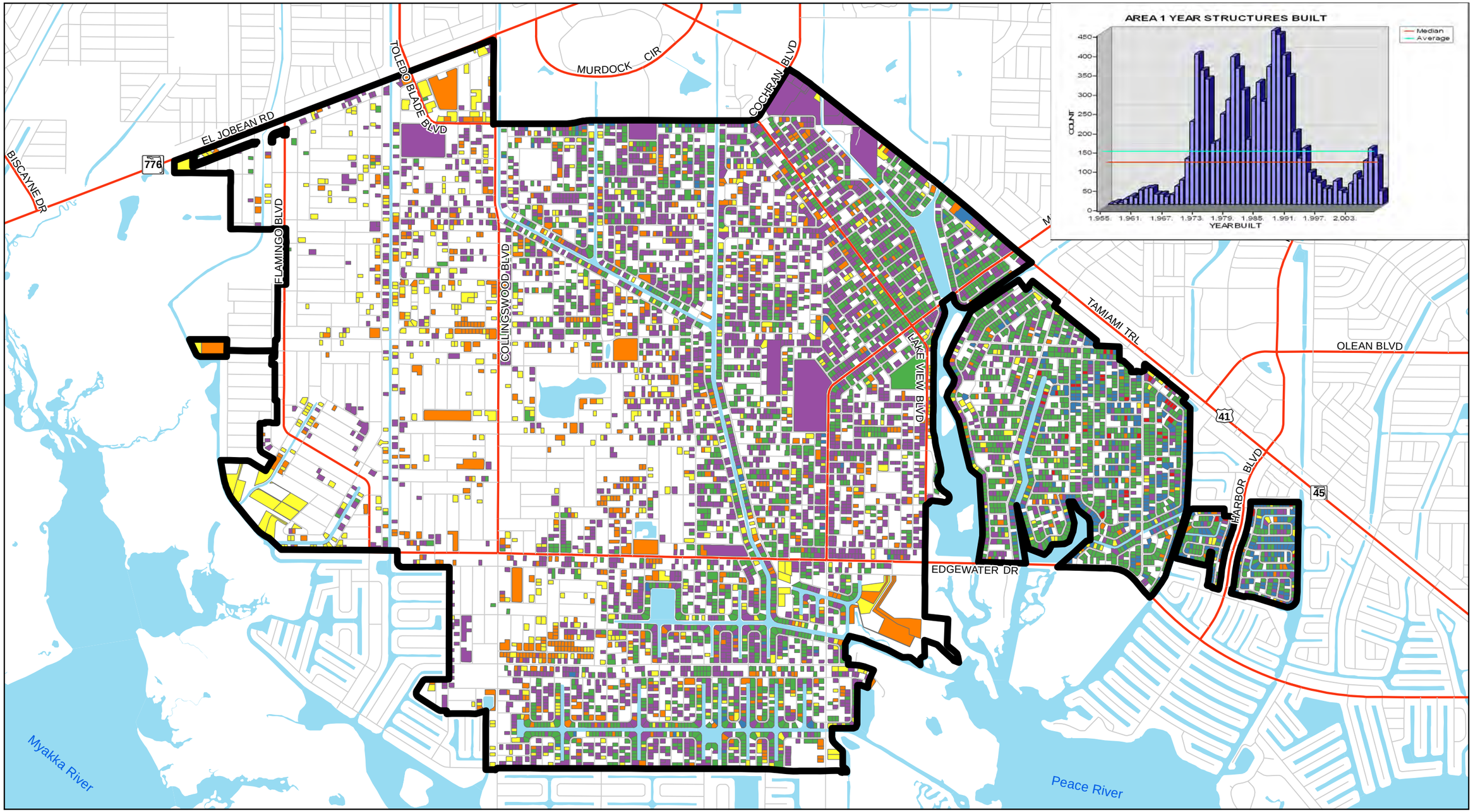
FUTURE LAND USE

2050 Framework

Exhibit I.4

Exhibit I.5: Area 1 Aging of Structures Map

File Location: W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\06-STRUCTURE_AGEING_AREA_1.mxd) Designed by D. Cain. produced on 03/15/2010



Printing Date: Monday, March 15, 2010
Title: AREA 1 STRUCTURE AGEING-FINAL
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770

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N W E S

Miles

0 0.25 0.5 1

Legend

AREA 1

AREA 1 YEAR STRUCTURES BUILT

YEARBUILT

- 1955 - 1960
- 1961 - 1970
- 1971 - 1980
- 1981 - 1990
- 1991 - 2000
- 2001 - 2008

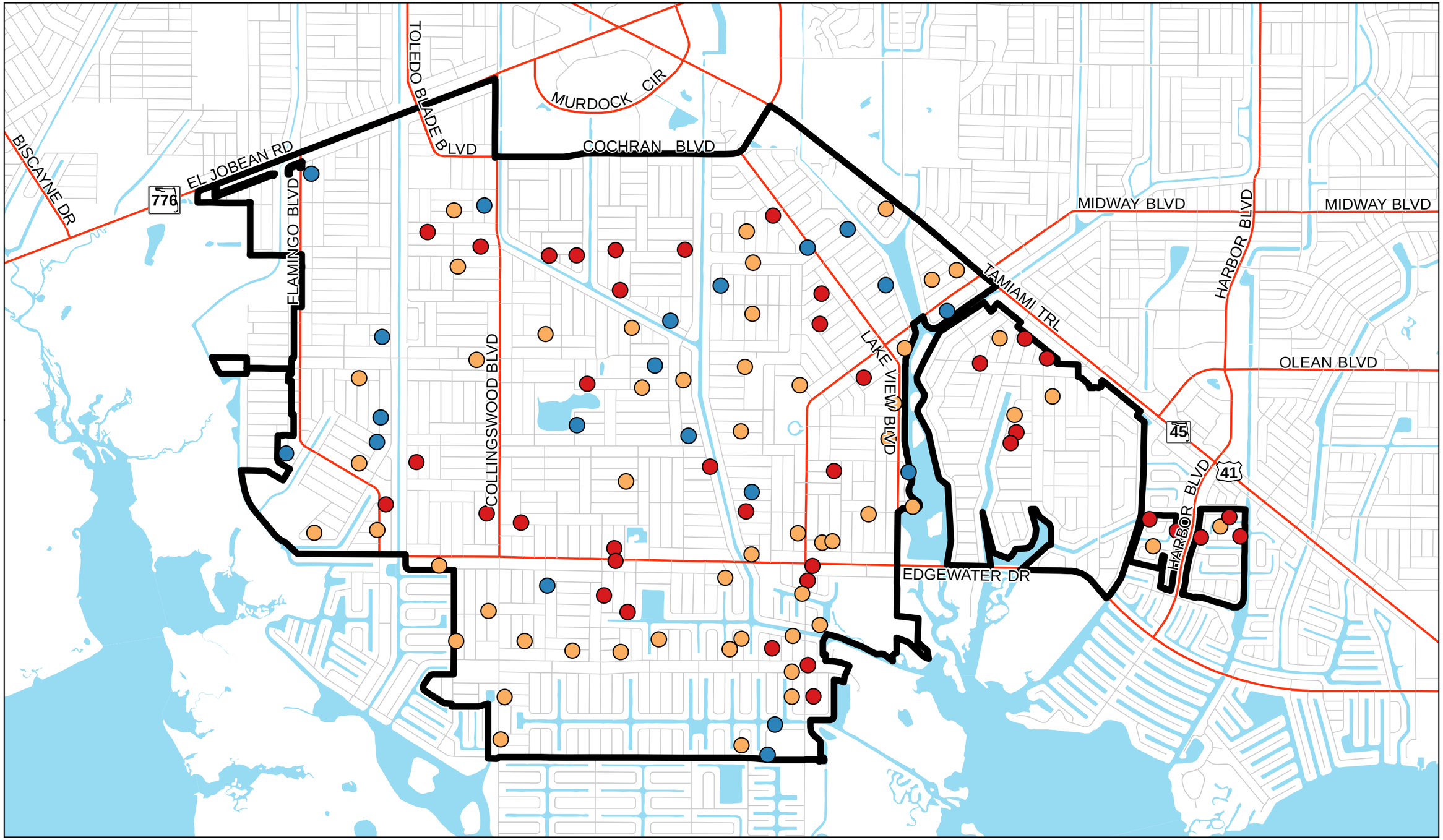
AREA 1

Aging of Structures

Exhibit I.5

Exhibit I.6: Ground Water Results

File Location: W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\04_C_GROUND WATER RESULTS.mxd) Designed by D. Cain. produced on March 16, 2010



Printing Date: Tuesday, March 16, 2010
Title: AREA 1 GROUND WATER RESULTS-FINAL
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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N
W E
S

Miles
0 0.25 0.5 1

AREA 1

WATER TABLE SITES

WATER DEPTH

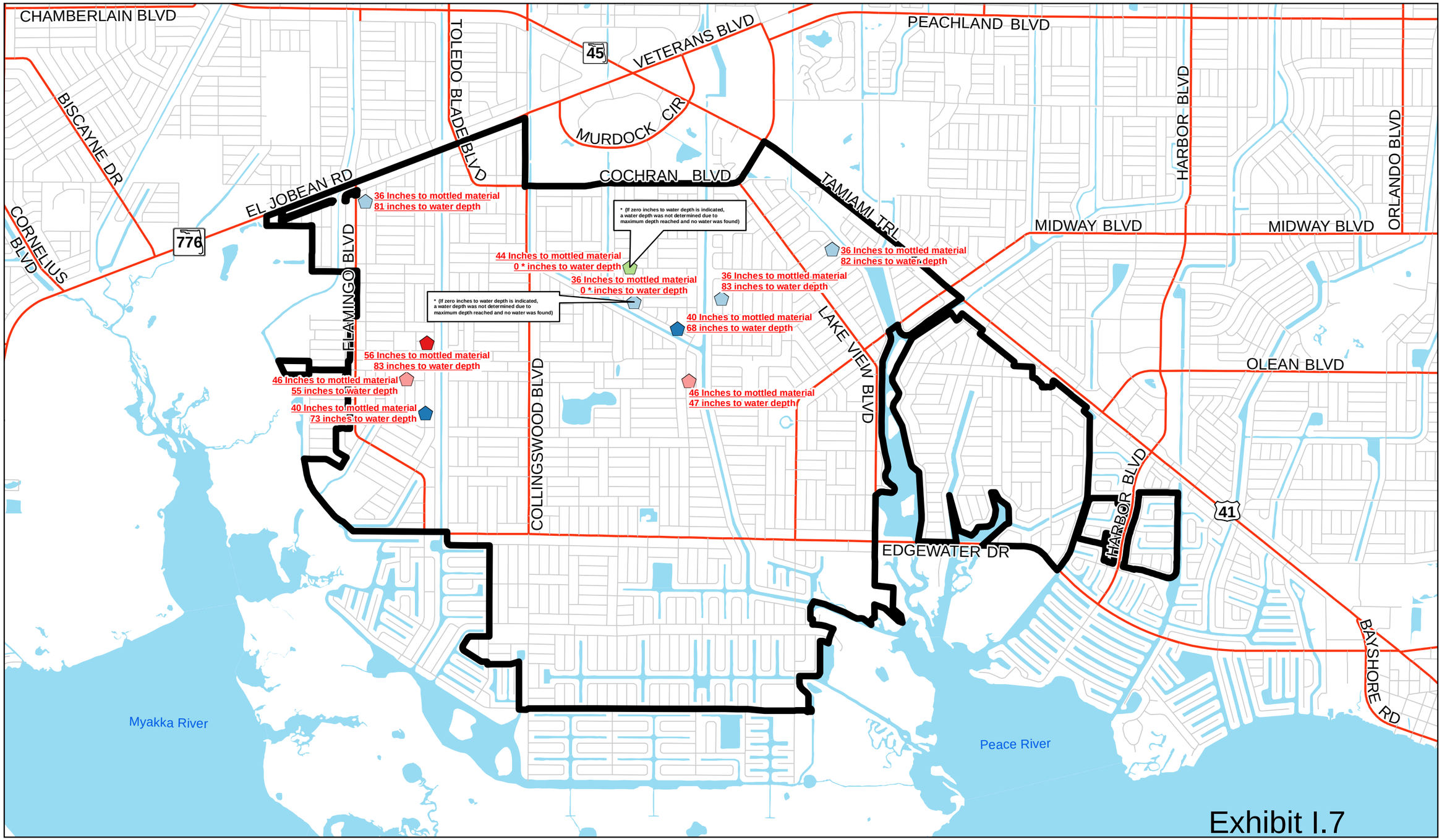
- 0 to 42 inches
- 43 to 67 inches
- 68 to 83 inches

AREA 1

Ground Water Results

Exhibit I.6

Exhibit I.7: Soil Mottling



File Location:W:\Projects\MSBU Future ones\AREA_1_PRESENTATION_MAPS\11X17\04_E_AREA_1_SOIL_MOTTLING.mxd)Designed by D. Cain,produced on 03/15/2010

Printing Date: Monday, March 15, 2010
Title: AREA 1 SOIL MOTTLING-FINAL
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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N
W E
S

Miles
0 0.3 0.6 1.2

SAMPLE POINT SOIL CHARACTERISTICS
DEPTH, CHARACTERISTIC
- 36, Mottled
- 40, Mottled
- 44, Mottled
- 46, Mottled
- 56, Mottled

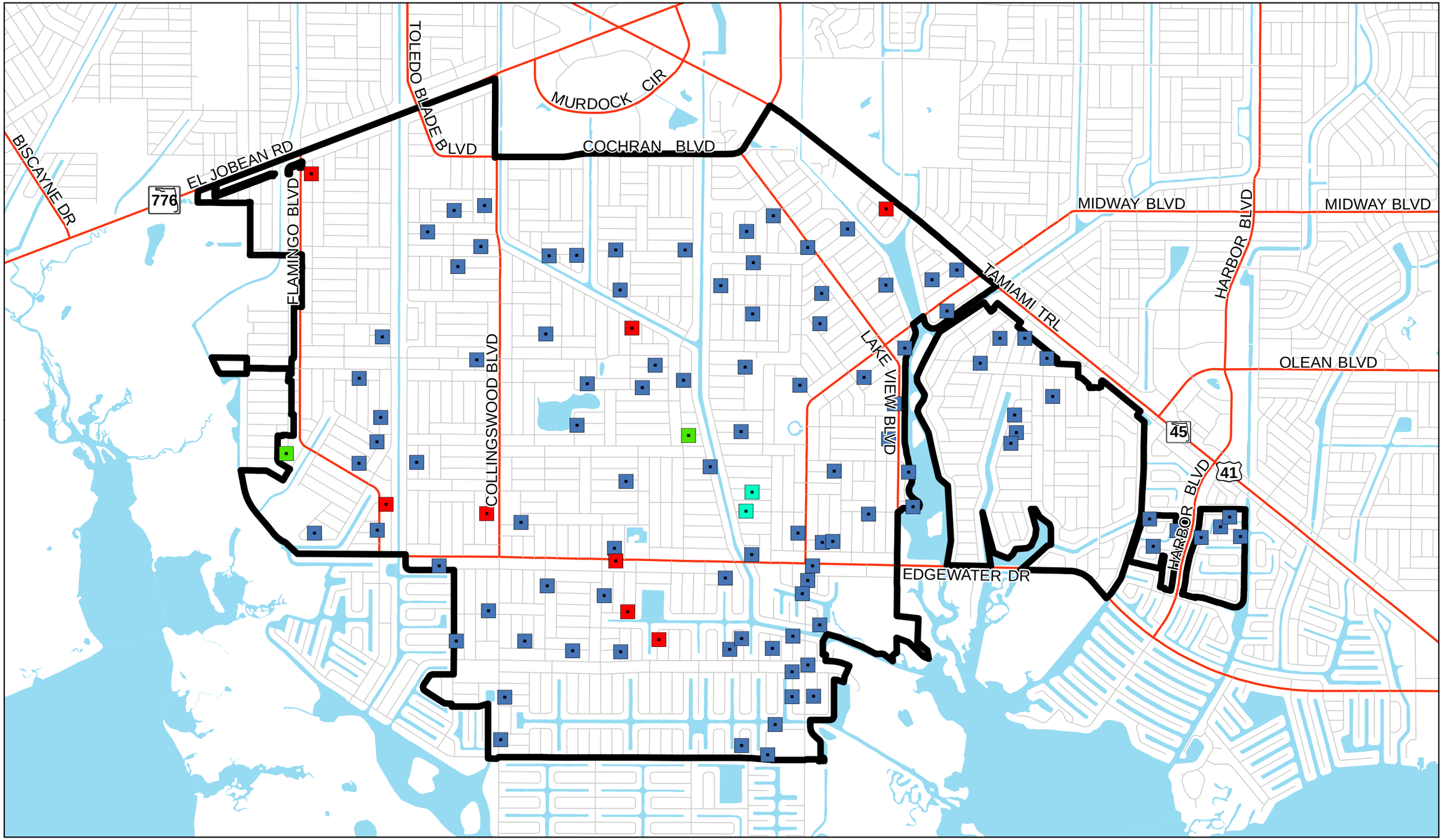
AREA 1

** Soil Mottling

** (WHERE SPOTS OF COLOR INTERMINGLE WITH THE GRAY, USUALLY INDICATES SEASONALLY SATURATED SOILS)

Exhibit I.8: General Soil Textures

File Location:W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\04_D_AREA_1_SOIL TEXTURES.mxd)Designed by D. Cain.produced on 03/15/2010



Printing Date: Monday, March 15, 2010
Title: AREA 1 SOIL TEXTURES-FINAL
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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N
W E
S

Miles
0 0.25 0.5 1

WATER TABLE SOIL

Soil Texture

- Sand
- Rock-Shell
- Sand/Clay
- Snd/Cly/Shell

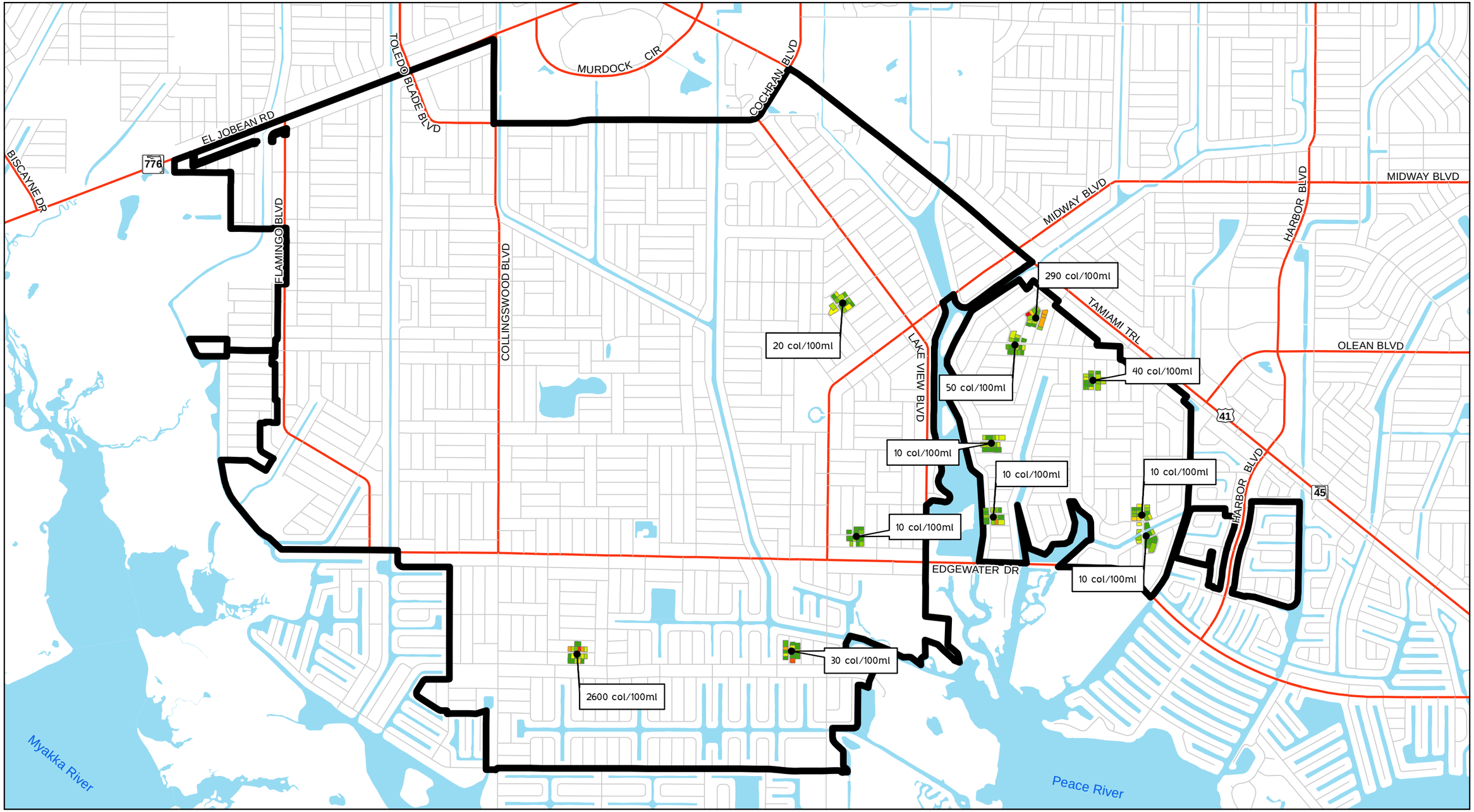
AREA 1

General Soil Textures

Exhibit I.8

Exhibit I.9: November 2009 Water Usage at Test Sites

File Location:W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\20-C-NOVEMBER-WATER_USAGE_AREA_1.mxd)Designed by D. Cain.produced on 03/15/2010



Printing Date: Monday, March 15, 2010
Title: AREA 1 WATER USAGE NOVEMBER 09 200 FT BUFFER WATER SAMPLES
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770

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N
W E
S

Miles

0 0.25 0.5 1

Legend

AREA 1

WATER QUALITY SAMPLES

200FT BUFFER SURROUNDING LOTS

November-09, 1,000 Gal

0
1
2
3
4
5
6
7
8
9
12
13
14

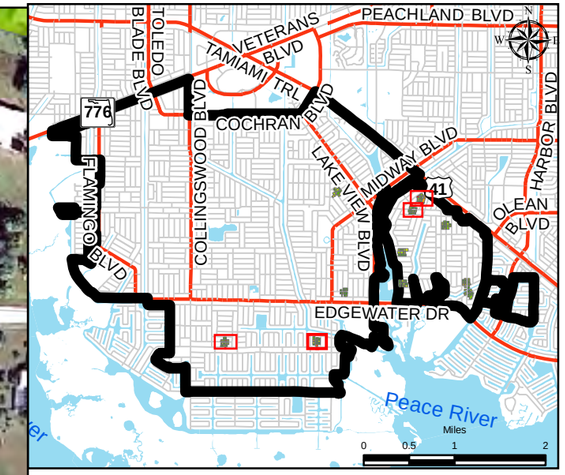
Exhibit I.9

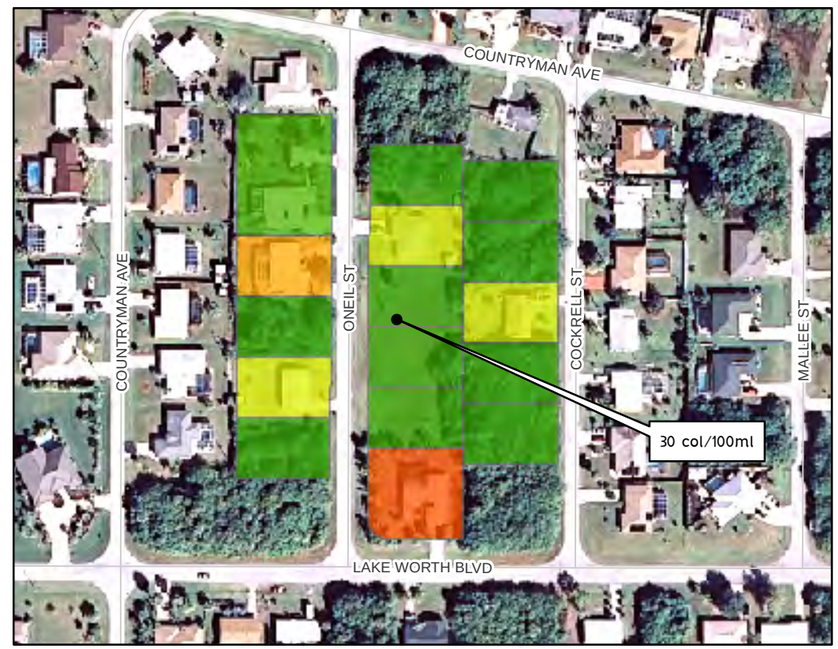
AREA 1

November 2009
Water Usage

Exhibit I.10: November 2009 Water Usage at Test Sites – Detail

File Location:W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\20-C-NOVEMBER-WATER_USAGE_AREA_1.mxd)Designed by D. Cain.produced on 03/15/2010





Printing Date: Monday, March 15, 2010
Title: AREA 1 WATER USAGE NOVEMBER 09 200 FT BUFFER WATER SAMPLES
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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Legend

AREA 1

200FT BUFFER SURROUNDING LOTS

November-09, 1,000 Gal

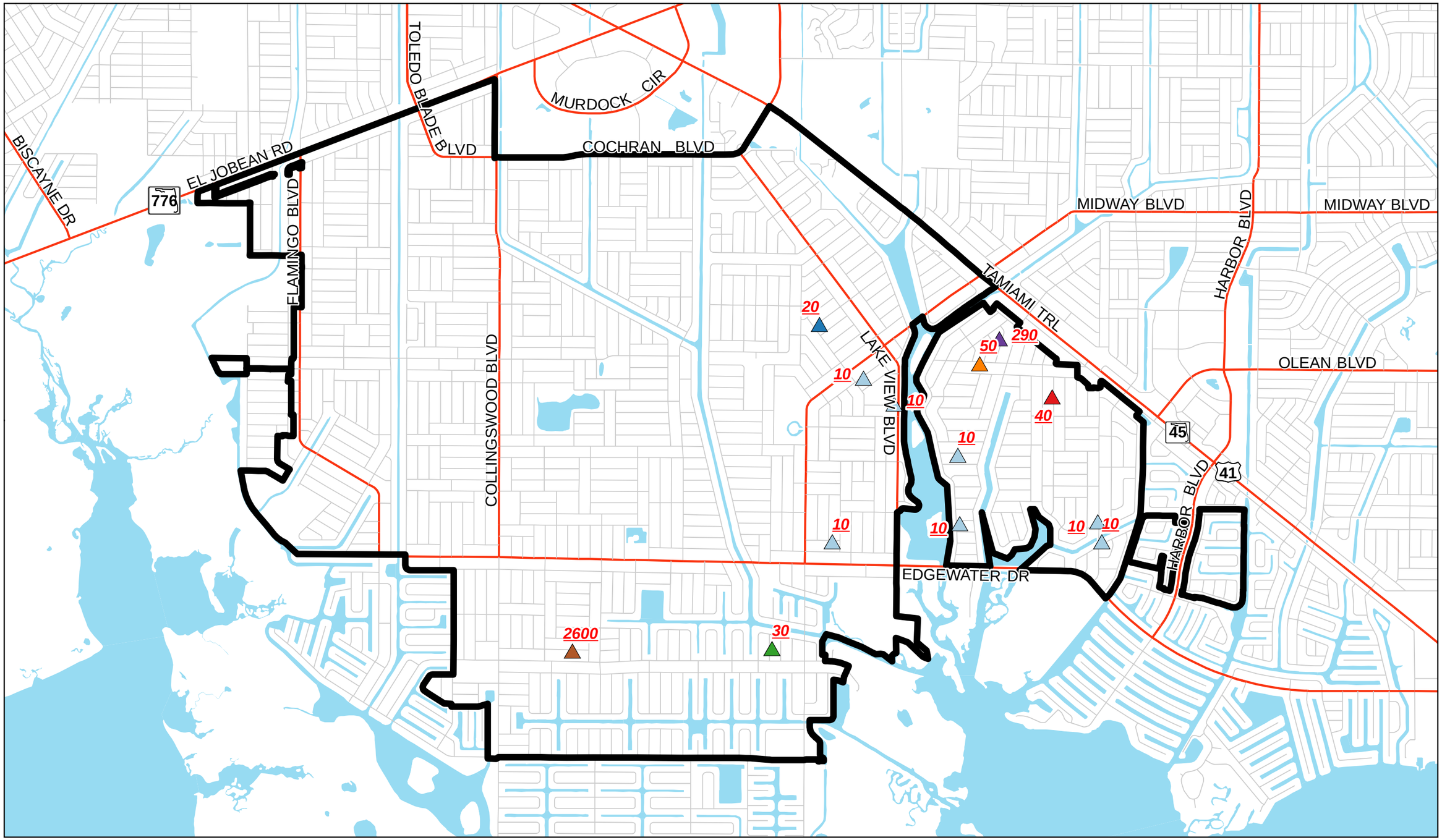
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 12
- 13
- 14

AREA 1

November 2009
Water Usage
Exhibit I.10

Exhibit I.11: Fecal Coli Form

File Location: W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\04_B_AREA 1 FECAL COLI FORM.mxd) Designed by D. Cain. produced on 03/15/2010



Printing Date: Monday, March 15, 2010
Title: AREA 1 FECAL COLI FORM SITES-FINAL
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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N
W E
S

Miles
0 0.25 0.5 1

Legend

WATER QUALITY SAMPLES

Fecal Coliform - col/ 100ml

- 10
- 20
- 30
- 40
- 50
- 290
- 2600

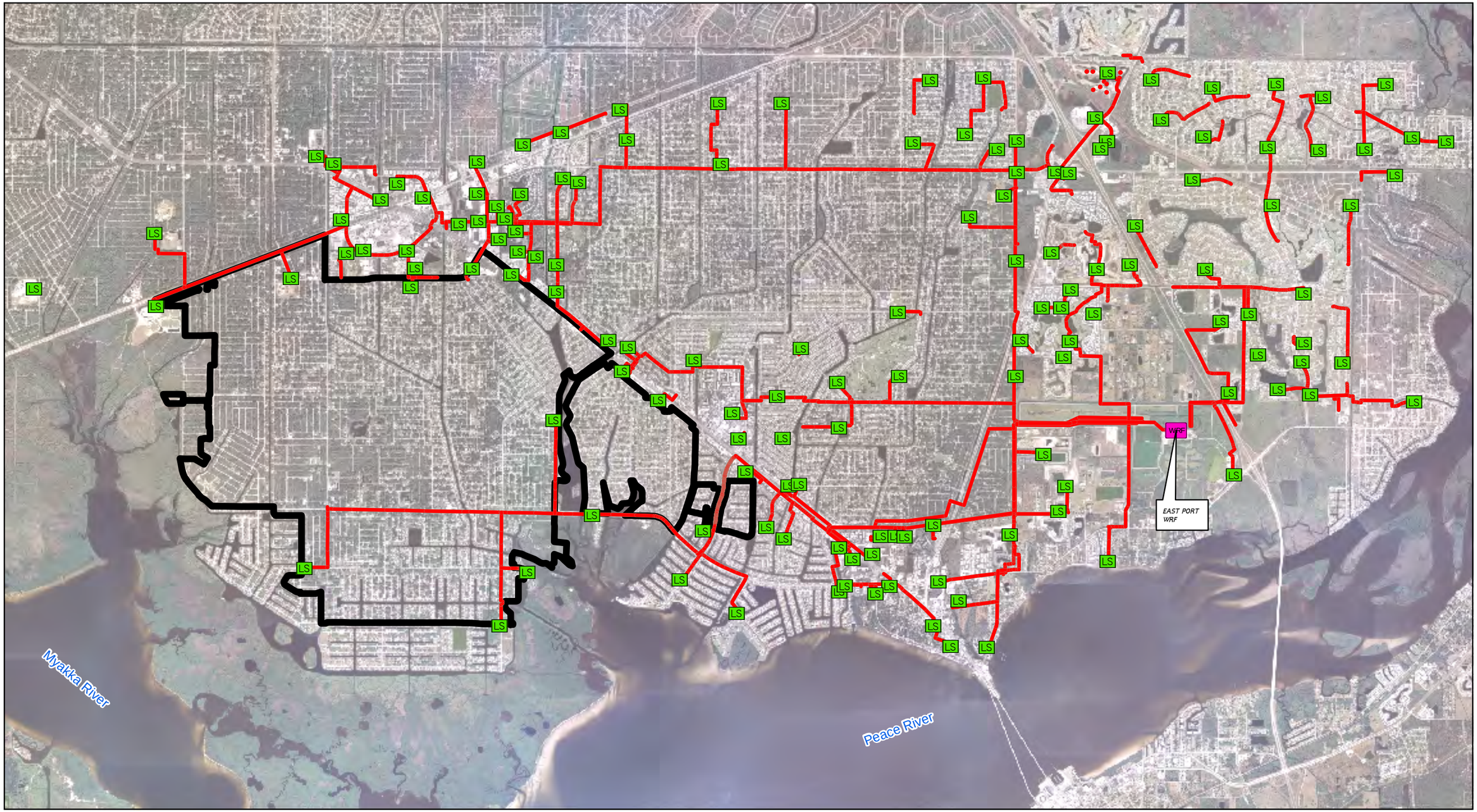
AREA 1

Fecal Coli Form

Exhibit I.11

Exhibit I.12: Wastewater Infrastructure Central County

File Location:W:\Projects\MSBU Future Zones\AREA_1_PRESENTATION_MAPS\11X17\08-WW_INFRASTRUCTURE_CENTRAL.mxd)Designed by D. Cain.produced on 03/15/2010



Printing Date: Monday, March 15, 2010
Title: WASTEWATER INFRASTUCTURE CENTRAL COUNTY-FINAL
Prepared By: Cain, David
Coordinate System:
NAD 1983 StatePlane Florida West FIPS 0902 Feet
Operating System: Microsoft Windows XP Professional
ArcMap Build Number: 9.3.1770
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N W E S

Miles

0 0.5 1 2

Legend

- AREA 1
- FORCE MAIN
- LS LIFT STATION
- WRF CCU WASTEWATER PLANT

CHARLOTTE COUNTY FLORIDA 1921

WASTEWATER INFRASTUCTURE

CENTRAL COUNTY

Exhibit I.12

APPENDIX II: DETAILED COST ESTIMATES

EXHIBIT II.1: "HYBRID GRAVITY" ALTERNATIVE

Hybrid Gravity				Spring Lakes		Area 1		
Item	Description	Unit	Qty	Unit Price	Total	Quantity	Factor Applied	Total
1A	8" SDR 26 Gravity Main @ 4' to 6'	LF	48788	$ 30.00	$ 1,463,640.00	390304	8.00	$ 11,709,120.00
1B	8" SDR 26 Gravity Main @ 6' to 8'	LF	48788	$ 40.00	$ 1,951,520.00	390304	8.00	$ 15,612,160.00
1C	10" SDR 26 Gravity Main @ 6' to 8'	LF	12400	$ 42.00	$ 520,800.00	99200	8.00	$ 4,166,400.00
1D	4' Manhole With 4 to 6' Invert	EA	186	$ 2,300.00	$ 427,800.00	1488	8.00	$ 3,422,400.00
1E	4' Manhole With 6' to 8' Invert	EA	186	$ 2,800.00	$ 520,800.00	1488	8.00	$ 4,166,400.00
1F	Manhole Outside Drop Assembly	EA	45	$ 1,600.00	$ 72,000.00	360	8.00	$ 576,000.00
1G	Open Cut 4" Low Pressure Force Main	LF	90	$ 7.50	$ 675.00	720	8.00	$ 5,400.00
1H	Set Manhole Riser	EA	524	$ 100.00	$ 52,400.00	4192	8.00	$ 419,200.00
1I	Low Pressure Systems	EA	1	$ 2,800.00	$ 2,800.00	8	8.00	$ 22,400.00
1J	Remove Existing Septic Tank	EA	1570	$ 600.00	$ 942,000.00	8478	5.40	$ 5,086,800.00
1K	On Site Sewer Connection	EA	1570	$ 700.00	$ 1,099,000.00	8478	5.40	$ 5,934,600.00
1L	Double Gravity Service	EA	1378	$ 500.00	$ 689,000.00	11024	8.00	$ 5,512,000.00
1M	Gravity Service Riser	EA	689	$ 100.00	$ 68,900.00	5512	8.00	$ 551,200.00
1N	Silt Fence	LF	128868	$ 1.50	$ 193,302.00	1030944	8.00	$ 1,546,415.00
1O	Maintenance of Traffic (MOT)	LS	1	$ 60,000.00	$ 60,000.00	8	8.00	$ 480,000.00
				Piping Total	**$ 8,064,637.00**		**Piping Total**	**$ 59,210,495.00**
2A	Package Pump Station	EA	19	$ 30,000.00	$ 570,000.00	152	8.00	$ 4,560,000.00
2B	Open Cut 4" DR-18 Force Main	LF	16550	$ 7.50	$ 124,125.00	132400	8.00	$ 993,000.00
2C	Directional Bore 4" Force Main	LF	200	$ 27.00	$ 5,400.00	1600	8.00	$ 43,200.00
2D	4" Force Main DI Fittings	LB	1686	$ 4.50	$ 7,587.00	13488	8.00	$ 60,695.00
2E	4" MJ Plug Valve Assembly	EA	38	$ 875.00	$ 33,250.00	304	8.00	$ 266,000.00
2F	4" Force Main Sewer Marker Balls	EA	110	$ 20.00	$ 2,200.00	880	8.00	$ 17,600.00
2G	FPL Power	EA	19	$ 4,000.00	$ 76,000.00	152	8.00	$ 608,000.00
2H	Package Pump Station Easement	EA	19	$ 3,000.00	$ 57,000.00	152	8.00	$ 456,000.00
				Pump Station Total	**$ 875,562.00**		**Pump Station Total**	**$ 7,004,495.00**
3A	Road Restoration	SY	0	$ 22.50	$ -	0	8.00	$ -
3B	Road Construction Base Preparation	SY	320000	$ 10.00	$ 3,200,000.00	2560000	8.00	$ 25,600,000.00
3C	Road Construction (Bituminous)	SY	290000	$ 7.00	$ 2,030,000.00	2320000	8.00	$ 16,240,000.00
3D	Road Demolition	SY	300810	$ 1.00	$ 300,810.00	2406480	8.00	$ 2,406,480.00
3E	ROW and Easement Restoration	SY	230022	$ 2.00	$ 460,044.00	1840176	8.00	$ 3,680,350.00
				Restoration Total	**$5,990,854.00**		**Restoration Total**	**$47,926,830.00**
4	Water System Crossings	EA	2300	$ 625.00	$ 1,437,500.00	14950	6.50	$ 9,343,750.00
5	Mobilization	5%			$ 818,427.65			$ 6,174,278.50
				Total Construction Cost	**$ 17,186,980.65**		**Total Construction Cost**	**$ 129,659,848.50**
6A	Engineering	15%			$ 2,363,115.00			$ 19,448,975.00
6B	Environmental and Mitigation	3%			$ 472,625.00			$ 3,889,795.00
6C	Contingencies	5%			$ 787,705.00			$ 6,482,990.00
6D	Collection Fees	2.5%			$ 393,855.00			$ 3,241,495.00
6E	Miscellaneous	1%			$ 157,540.00			$ 1,296,600.00
6F	Statutory Uncollectible	6.325%			$ 996,450.00			$ 8,200,985.00
6G	Other Costs							$6,000,000.00
				Total Cost	**$ 22,358,270.65**		**Total Cost**	**$ 178,220,688.50**

EXHIBIT II.2 "VACUUM SEWER" ALTERNATIVE

Vacuum				Spring Lakes		Area 1		
Item	Description	Unit	Qty	Unit Price	Total	Quantity	Factor Applied	Total
1A	Open Cut 4" PVC DR-18 Vacuum Main	LF	98830	$ 23.00	$ 2,273,090.00	790640	8.00	$ 18,184,720.00
1B	4" Saw Tooth Vacuum Main Lift	EA	146	$ 90.00	$ 13,140.00	1168	8.00	$ 105,120.00
1C	Open Cut 6" PVC DR-18 Vacuum Main	LF	15330	$ 25.00	$ 383,250.00	122640	8.00	$ 3,066,000.00
1D	6" Saw Tooth Vacuum Main Lift	EA	31	$ 100.00	$ 3,100.00	248	8.00	$ 24,800.00
1E	Installed Vacuum Pit Package	EA	919	$ 7,900.00	$ 7,260,100.00	7352	8.00	$ 58,080,800.00
1F	4' Vacuum Main Gate Valve Assembly	EA	20	$ 825.00	$ 16,500.00	160	8.00	$ 132,000.00
1G	6" Vacuum Main Gate Valve Assembly	EA	11	$ 1,100.00	$ 12,100.00	88	8.00	$ 96,800.00
1H	Vacuum Main Sewer Marker Ball	EA	588	$ 20.00	$ 11,760.00	4704	8.00	$ 94,080.00
1I	Remove Existing Septic Tank	EA	1570	$ 600.00	$ 942,000.00	8478	5.40	$ 5,086,800.00
1J	On Site Sewer Connection	EA	1570	$ 700.00	$ 1,099,000.00	8478	5.40	$ 5,934,600.00
1K	Silt Fence	LF	88160	$ 1.50	$ 132,240.00	705280	8.00	$ 1,057,920.00
1L	Maintenance of Traffic	LS	1	$ 60,000.00	$ 60,000.00	8	8.00	$ 480,000.00
				Piping Total	**$ 12,206,280.00**		**Piping Total**	**$ 92,343,640.00**
2A	Standard Vacuum Station	EA	1	$ 1,000,000.00	$ 1,000,000.00	8	8.00	$ 8,000,000.00
2B	Open Cut 6" PVC DR-18 Force Main	LF	5050	$ 12.00	$ 60,600.00	40400	8.00	$ 484,800.00
2C	6" Force Main DI Fittings	LB	312	$ 4.50	$ 1,404.00	2496	8.00	$ 11,230.00
2D	6" MJ Plug Valve Assembly	EA	3	$ 1,100.00	$ 3,300.00	24	8.00	$ 26,400.00
2E	6" Force Main Sewer Marker Balls	EA	34	$ 20.00	$ 680.00	272	8.00	$ 5,440.00
2F	FPL Power	EA	1	$ 50,000.00	$ 50,000.00	8	8.00	$ 400,000.00
2G	Vacuum Station Lot Purchase	EA	1	$ 30,000.00	$ 30,000.00	8	8.00	$ 240,000.00
				Pump Station Total	**$ 1,145,984.00**		**Pump Station Total**	**$ 9,167,870.00**
3A	Road Restoration	SY	3456	$ 22.50	$ 77,760.00	27648	8.00	$ 622,080.00
3B	Concrete Driveway Restoration	SY	25024	$ 24.00	$ 600,576.00	200192	8.00	$ 4,804,610.00
3C	Driveway Culvert Replacement	EA	785	$ 900.00	$ 706,500.00	6280	8.00	$ 5,652,000.00
3D	ROW and Easement Restoration	SY	230021	$ 2.00	$ 460,042.00	1840168	8.00	$ 3,680,335.00
				Restoration Total	**$1,844,878.00**		**Restoration Total**	**$14,759,025.00**
4	Water System Crossings	EA	2300	$ 625.00	$ 1,437,500.00	14950	6.50	$ 9,343,750.00
5	Mobilization	5%			$ 831,732.10			$ 6,280,715.00
				Total Construction Cost	**$ 17,466,374.10**		**Total Construction Cost**	**$ 131,895,000.00**
6A	Engineering	15%			$ 2,363,115.00			$ 19,784,250.00
6B	Environmental and Mitigation	3%			$ 472,625.00			$ 3,956,850.00
6C	Contingencies	5%			$ 787,705.00			$ 6,594,750.00
6D	Collection Fees	2.5%			$ 393,855.00			$ 3,297,375.00
6E	Miscellaneous	1%			$ 157,540.00			$ 1,318,950.00
6F	Statutory Uncollectible	6.325%			$ 996,450.00			$ 8,342,358.75
6G	Other Costs							$ 6,000,000.00
				Total Cost	**$ 22,637,664.10**		**Total Cost**	**$ 181,189,533.75**

EXHIBIT II.3 "STANDARD OSTDS SYSTEM" ALTERNATIVE

	OSTDS - Standard				
Item	**Description**	**Unit**	**Qty**	**Unit Price**	**Total**
1	Standard OSTDS System Installation*	EA	8,500	$ 10,000.00	$ 85,000,000.00
2	Remove Existing OSTDS	EA	8,500	$ 600.00	$ 5,100,000.00
3	Silt Fence	LF	1,020,500	$ 1.50	$ 1,530,750.00
4	Maintenance of Traffic	LS	5	$ 5,000.00	$ 27,000.00
5	Mobilization (5%)	5.000%			$ 4,582,887.50
				Total Construction Cost	**$ 96,240,637.50**
6	Engineering (15%)	15.000%			$ 14,436,095.63
7	Mitigation & Environmental (3.0%)	3.000%			$ 2,887,219.13
8	Contingencies (5%)	5.000%			$ 4,812,031.88
9	Collection Fees (2.5%)	2.500%			$ 2,406,015.94
10	Miscellaneous (1%)	1.000%			$ 962,406.38
11	Statutory Uncollectible (6.325%)	6.325%			$ 6,087,220.32
				Total Current Cost	**$ 127,831,626.76**
12	New Homes (growth)	EA	8,500	$ 10,000.00	$ 85,000,000.00
				Total Cost	**$ 212,831,626.76**

* Does not include costs due to modifications required to meet design criteria as is anticipated in Area 1.

EXHIBIT II.4 "LOW PRESSURE SEWER (LPS)" ALTERNATIVE

Low Pressure Sewer System				Spring Lakes		Area 1		
Item	Description	Unit	Qty	Unit Price	Total	Quantity	Factor Applied	Total
1A	Open Cut 3" HDPE SDR 11 LPFM	LF	50450	$ 17.50	$ 882,875.00	403600	8.00	$7,063,000.00
1B	3" MJ Plug Valve Assembly	EA	98	$ 825.00	$ 80,850.00	784	8.00	$646,800.00
1C	Open Cut 4" PVC DR-18 LPFM	LF	54700	$ 20.00	$ 1,094,000.00	437600	8.00	$8,752,000.00
1D	4" MJ Plug Valve Assembly	EA	82	$ 875.00	$ 71,750.00	656	8.00	$574,000.00
1E	Open Cut 6"PVC DR-18 LPFM	LF	9575	$ 22.00	$ 210,650.00	76600	8.00	$1,685,200.00
1F	6" MJ Plug Valve Assembly	EA	32	$ 1,100.00	$ 35,200.00	256	8.00	$281,600.00
1G	3" Low Pressure Clean-out	EA	38	$ 1,125.00	$ 42,750.00	304	8.00	$342,000.00
1H	Low Pressure Force Main Sewer Marker Ball	EA	745	$ 20.00	$ 14,900.00	5960	8.00	$119,200.00
1I	Low Pressure Systems	EA	2116	$ 2,800.00	$ 5,924,800.00	16928	8.00	$47,398,400.00
1J	Remove Existing Septic Tank	EA	1570	$ 600.00	$ 942,000.00	8478	5.40	$5,086,800.00
1K	On Site Sewer Connection	EA	1570	$ 700.00	$ 1,099,000.00	8478	5.40	$5,934,600.00
1L	Silt Fence	LF	114725	$ 1.50	$ 172,087.50	917800	8.00	$1,376,700.00
1M	Maintenance of Traffic	LS	1	$ 60,000.00	$ 60,000.00	8	8.00	$480,000.00
				Piping Total	**$ 10,630,862.50**		**Piping Total**	**$79,740,300.00**
2A	Standard Pump Station	EA	2	$ 367,500.00	$ 735,000.00	16	8.00	$5,880,000.00
2B	Open Cut 8" PVC DR-18 Force Main	LF	8175	$ 20.00	$ 163,500.00	65400	8.00	$1,308,000.00
2C	8" HDPE DR-11 FM Directional Bore	LF	200	$ 50.00	$ 10,000.00	1600	8.00	$80,000.00
2D	8" Force Main DI Fittings	LB	728	$ 4.50	$ 3,276.00	5824	8.00	$26,208.00
2E	8" MJ Plug Valve Assembly	EA	6	$ 1,700.00	$ 10,200.00	48	8.00	$81,600.00
2F	8" Force Main Sewer Marker Balls	EA	55	$ 20.00	$ 1,100.00	440	8.00	$8,800.00
2G	FPL Power	EA	2	$ 50,000.00	$ 100,000.00	16	8.00	$800,000.00
2H	Standard Pump Station Lot Purchase	EA	2	$ 30,000.00	$ 60,000.00	16	8.00	$480,000.00
2I	Automatic Air Release	EA	1	$ 2,000.00	$ 2,000.00	8	8.00	$16,000.00
2J	Master Manhole	EA	2	$ 2,800.00	$ 5,600.00	16	8.00	$44,800.00
				Pump Station Total	**$ 1,090,676.00**		**Pump Station Total**	**$8,725,408.00**
3A	Road Restoration	SY	3456	$ 22.50	$ 77,760.00	27648	8.00	$622,080.00
3B	Concrete Driveway Restoration	SY	25024	$ 24.00	$ 600,576.00	200192	8.00	$4,804,608.00
3C	Driveway Culvert Replacement	EA	785	$ 900.00	$ 706,500.00	6280	8.00	$5,652,000.00
3D	ROW and Easement Restoration	SY	230021	$ 2.00	$ 460,042.00	1840168	8.00	$3,680,336.00
				Restoration Total	**$ 1,844,878.00**		**Restoration Total**	**$14,759,024.00**
4	Water System Crossings	EA	2300	$ 625.00	$ 1,437,500.00	14950	6.50	$9,343,750.00
5	Mobilization	5%			$ 750,195.83			$5,628,424.10
				Total Construction Cost	$ 15,754,112.33		**Total Construction Cost**	**$118,196,906.10**
6A	Engineering	15%			$ 2,363,115.00			$17,729,535.00
6B	Environmental and Mitigation	3%			$ 472,625.00			$3,545,905.00
6C	Contingencies	5%			$ 787,705.00			$5,909,845.00
6D	Collection Fees	2.5%			$ 393,855.00			$2,954,925.00
6E	Miscellaneous	1%			$ 157,540.00			$1,181,970.00
6F	Statutory Uncollectible	6.325%			$ 996,450.00			$7,475,955.00
5G	Other Costs							$6,000,000.00
				Total Cost	**$ 20,925,402.33**		**Total Cost**	**$162,995,041.10**

EXHIBIT II.5 "GRAVITY" ALTERNATIVE

	Standard Gravity			Spring Lakes		Area 1		
Item	Description	Unit	Qty	Unit Price	Total	Quantity	Factor Applied	Total
1A	8" SDR 26 Gravity Main @ 4' to 6'	LF	10031	$ 41.00	$ 411,271.00	80248	8.00	$ 3,290,170.00
1B	8" SDR 26 Gravity Main @ 6' to 8'	LF	47833	$ 45.00	$ 2,152,485.00	382664	8.00	$ 17,219,880.00
1C	8" SDR 26 Gravity Main @ 8' to 10'	LF	25130	$ 51.00	$ 1,281,630.00	201040	8.00	$ 10,253,040.00
1D	8" SDR 26 Gravity Main @ 10' to 12'	LF	16967	$ 57.00	$ 967,119.00	135736	8.00	$ 7,736,950.00
1E	8" SDR 26 Gravity Main @ 12' to 14'	LF	5851	$ 63.00	$ 368,613.00	46808	8.00	$ 2,948,905.00
1F	8" SDR 26 Gravity Main @ 14' to 16'	LF	1464	$ 75.00	$ 109,800.00	11712	8.00	$ 878,400.00
1G	10" SDR 26 Gravity Main @ 6' to 8'	LF	171	$ 47.00	$ 8,037.00	1368	8.00	$ 64,295.00
1H	12" SDR 26 Gravity Main @ 6' to 8'	LF	2377	$ 51.00	$ 121,227.00	19016	8.00	$ 969,815.00
1I	12" SDR 26 Gravity Main @ 8' to 10'	LF	610	$ 61.00	$ 37,210.00	4880	8.00	$ 297,680.00
1J	12" SDR 26 Gravity Main @ 12' to 14'	LF	69	$ 75.00	$ 5,175.00	552	8.00	$ 41,400.00
1K	15" SDR 26 Gravity Main @ 10' to 12'	LF	300	$ 67.00	$ 20,100.00	2400	8.00	$ 160,800.00
1L	15" SDR 26 Gravity Main @ 12' to 14'	LF	217	$ 75.00	$ 16,275.00	1736	8.00	$ 130,200.00
1M	4' Manhole With 4' to 6' Invert	EA	173	$ 2,300.00	$ 397,900.00	1384	8.00	$ 3,183,200.00
1N	4' Manhole With 6' to 8' Invert	EA	151	$ 2,800.00	$ 422,800.00	1208	8.00	$ 3,382,400.00
1O	4' Manhole With 8' to 10' Invert	EA	113	$ 3,600.00	$ 406,800.00	904	8.00	$ 3,254,400.00
1P	4' Manhole With 10' to 12' Invert	EA	55	$ 4,600.00	$ 253,000.00	440	8.00	$ 2,024,000.00
1Q	4' Manhole With 12' to 15' Invert	EA	32	$ 5,800.00	$ 185,600.00	256	8.00	$ 1,484,800.00
1R	Manhole Outside Drop Assembly	EA	45	$ 1,600.00	$ 72,000.00	360	8.00	$ 576,000.00
1S	Open Cut 4" Low Pressure Force Main	LF	90	$ 7.80	$ 702.00	720	8.00	$ 5,615.00
1T	Set Manhole Riser	EA	524	$ 100.00	$ 52,400.00	4192	8.00	$ 419,200.00
1U	Low Pressure Systems	EA	1	$ 2,800.00	$ 2,800.00	8	8.00	$ 22,400.00
1V	Remove Existing Septic Tank	EA	1570	$ 600.00	$ 942,000.00	8478	5.40	$ 5,086,800.00
1W	On Site Sewer Connection	EA	1570	$ 700.00	$ 1,099,000.00	8478	5.40	$ 5,934,600.00
1X	Double Gravity Service	EA	1378	$ 500.00	$ 689,000.00	11024	8.00	$ 5,512,000.00
1Y	Gravity Service Riser	EA	689	$ 400.00	$ 275,600.00	5512	8.00	$ 2,204,800.00
1Z	Silt Fence	LF	157674	$ 1.50	$ 236,511.00	1261392	8.00	$ 1,892,090.00
1AA	Maintenance of Traffic (MOT)	LS	1	$ 60,000.00	$ 60,000.00	8	8.00	$ 480,000.00
				Piping Total	**$ 10,595,055.00**		**Piping Total**	**$ 79,453,840.00**
2A	Standard Pump Station	EA	6	$ 467,500.00	$ 2,805,000.00	48	8.00	$ 22,440,000.00
2B	Open Cut 6" DR-18 Force Main	LF	17675	$ 11.70	$ 206,797.50	141400	8.00	$ 1,654,380.00
2C	Directional Bore 6" Force Main	LF	200	$ 30.00	$ 6,000.00	1600	8.00	$ 48,000.00
2D	6" Force Main DI Fittings	LB	2336	$ 4.50	$ 10,512.00	18688	8.00	$ 84,095.00
2E	6" MJ Plug Valve Assembly	EA	25	$ 1,100.00	$ 27,500.00	200	8.00	$ 220,000.00
2F	6" Force Main Sewer Marker Balls	EA	118	$ 20.00	$ 2,360.00	944	8.00	$ 18,880.00
2G	FPL Power	EA	6	$ 50,000.00	$ 300,000.00	48	8.00	$ 2,400,000.00
2H	Standard Pump Station Lot Purchase	EA	6	$ 30,000.00	$ 180,000.00	48	8.00	$ 1,440,000.00
			Pump Station Total		**$ 3,538,169.50**		**Pump Station Total**	**$ 28,305,355.00**

EXHIBIT II.5 "GRAVITY" ALTERNATIVE, CONTINUED

3A	Road Construction Base Preparation	SY	320000	$ 15.00	$ 4,800,000.00	2560000	8.00	$ 38,400,000.00
3B	Road Construction (Bituminous)	SY	290000	$ 7.00	$ 2,030,000.00	2320000	8.00	$ 16,240,000.00
3C	Road Demolition	SY	300810	$ 1.00	$ 300,810.00	2406480	8.00	$ 2,406,480.00
3D	Concrete Driveway Restoration	SY	50048	$ 24.00	$ 1,201,152.00	400384	8.00	$ 9,609,215.00
3E	Driveway Culvert Replacement	EA	1570	$ 900.00	$ 1,413,000.00	12560	8.00	$ 11,304,000.00
3F	ROW and Easement Restoration	SY	460000	$ 2.00	$ 920,000.00	3680000	8.00	$ 7,360,000.00
				Restoration Total	**$10,664,962.00**		**Restoration Total**	**$85,319,695.00**
4	Water System Crossings	EA	2300	$ 625.00	$ 1,437,500.00	14950	6.50	$ 9,343,750.00
5	Mobilization	0.05			$ 1,311,784.33			$ 10,121,132.00
		Total Construction Cost			**$ 27,547,470.83**	**Total Construction Cost**		**$ 212,543,772.00**
6A	Engineering	15%			$ 2,363,115.00			$ 31,881,565.80
6B	Environmental and Mitigation	3%			$ 472,625.00			$ 6,376,313.16
6C	Contingencies	5%			$ 787,705.00			$ 10,627,188.60
6D	Collection Fees	2.5%			$ 393,855.00			$ 5,313,594.30
6E	Miscellaneous	1%			$ 157,540.00			$ 2,125,437.72
6F	Statutory Uncollectible	6.325%			$ 996,450.00			$ 13,443,393.58
6G	Other Costs							$6,000,000.00
				Total Cost	**$ 32,718,760.83**		**Total Cost**	**$ 288,311,265.16**

EXHIBIT II.6 "DECENTRALIZED – PACKAGE PLANT WITH HYBRID GRAVITY" ALTERNATIVE

Decentralized				Spring Lakes		Area 1		
Item	Description	Unit	Qty	Unit Price	Total	Quantity	Factor Applied	Total
0A	Pkg Wastewater Plant 0.532 MGD AADF*	EA	1	$ 10,453,040.00	$ 10,453,040.00	8	8.00	$ 83,624,320.00
0B	Land Acquisition	AC	1	$ 120,000.00	$ 120,000.00	8	8.00	$ 960,000.00
							Plant Total	**$ 84,584,320.00**
1A	8" SDR 26 Gravity Main @ 4' to 6'	LF	48788	$ 30.00	$ 1,463,640.00	390304	8.00	$ 11,709,120.00
1B	8" SDR 26 Gravity Main @ 6' to 8'	LF	48788	$ 40.00	$ 1,951,520.00	390304	8.00	$ 15,612,160.00
1C	10" SDR 26 Gravity Main @ 6' to 8'	LF	12400	$ 42.00	$ 520,800.00	99200	8.00	$ 4,166,400.00
1D	4' Manhole With 4 to 6' Invert	EA	186	$ 2,300.00	$ 427,800.00	1488	8.00	$ 3,422,400.00
1E	4' Manhole With 6' to 8' Invert	EA	186	$ 2,800.00	$ 520,800.00	1488	8.00	$ 4,166,400.00
1F	Manhole Outside Drop Assembly	EA	45	$ 1,600.00	$ 72,000.00	360	8.00	$ 576,000.00
1G	Open Cut 4" Low Pressure Force Main	LF	90	$ 7.50	$ 675.00	720	8.00	$ 5,400.00
1H	Set Manhole Riser	EA	524	$ 100.00	$ 52,400.00	4192	8.00	$ 419,200.00
1I	Low Pressure Systems	EA	1	$ 2,800.00	$ 2,800.00	8	8.00	$ 22,400.00
1J	Remove Existing Septic Tank	EA	1570	$ 600.00	$ 942,000.00	8478	5.40	$ 5,086,800.00
1K	On Site Sewer Connection	EA	1570	$ 700.00	$ 1,099,000.00	8478	5.40	$ 5,934,600.00
1L	Double Gravity Service	EA	1378	$ 500.00	$ 689,000.00	11024	8.00	$ 5,512,000.00
1M	Gravity Service Riser	EA	689	$ 100.00	$ 68,900.00	5512	8.00	$ 551,200.00
1N	Silt Fence	LF	128868	$ 1.50	$ 193,302.00	1030944	8.00	$ 1,546,415.00
1O	Maintenance of Traffic (MOT)	LS	1	$ 60,000.00	$ 60,000.00	8	8.00	$ 480,000.00
				Piping Total	**$ 8,064,637.00**		**Piping Total**	**$ 59,210,495.00**
2A	Package Pump Station	EA	19	$ 30,000.00	$ 570,000.00	152	8.00	$ 4,560,000.00
2B	Open Cut 4" DR-18 Force Main	LF	16550	$ 7.50	$ 124,125.00	132400	8.00	$ 993,000.00
2C	Directional Bore 4" Force Main	LF	200	$ 27.00	$ 5,400.00	1600	8.00	$ 43,200.00
2D	4" Force Main DI Fittings	LB	1686	$ 4.50	$ 7,587.00	13488	8.00	$ 60,695.00
2E	4" MJ Plug Valve Assembly	EA	38	$ 875.00	$ 33,250.00	304	8.00	$ 266,000.00
2F	4" Force Main Sewer Marker Balls	EA	110	$ 20.00	$ 2,200.00	880	8.00	$ 17,600.00
2G	FPL Power	EA	19	$ 4,000.00	$ 76,000.00	152	8.00	$ 608,000.00
2H	Package Pump Station Easement Purchase	EA	19	$ 3,000.00	$ 57,000.00	152	8.00	$ 456,000.00
				Pump Station Total	**$ 875,562.00**		**Pump Station Total**	**$ 7,004,495.00**
3A	Road Restoration	SY	0	$ 22.50	$ -	0	8.00	$ -
3B	Road Construction Base Preparation	SY	320000	$ 10.00	$ 3,200,000.00	2560000	8.00	$ 25,600,000.00
3C	Road Construction (Bituminous)	SY	290000	$ 7.00	$ 2,030,000.00	2320000	8.00	$ 16,240,000.00
3D	Road Demolition	SY	300810	$ 1.00	$ 300,810.00	2406480	8.00	$ 2,406,480.00
3E	ROW and Easement Restoration	SY	230022	$ 2.00	$ 460,044.00	1840176	8.00	$ 3,680,350.00
				Restoration Total	**$ 5,990,854**		**Restoration Total**	**$ 47,926,830.00**
4	Water System Crossings	EA	2300	$ 625.00	$ 1,437,500.00	14950	6.50	$ 9,343,750.00
5	Mobilization	5%	0%	$ -	$ 818,427.65	0		$ 6,174,278.50
				Total Construction Cost	**$ 17,186,981**		**Total Construction Cost**	**$ 214,244,168.50**
6A	Engineering	15%			$ 2,363,115.00			$ 19,448,975.00
6B	Environmental and Mitigation	3%			$ 472,625.00			$ 3,889,795.00
6C	Contingencies	5%			$ 787,705.00			$ 6,482,990.00
6D	Collection Fees	2.5%			$ 393,855.00			$ 3,241,495.00
6E	Miscellaneous	1%			$ 157,540.00			$ 1,296,600.00
6F	Statutory Uncollectible	6.325%			$ 996,450.00			$ 8,200,985.00
6G	Other Costs							$ 6,000,000.00
				Total Cost	**$ 22,358,270.65**		**Total Cost**	**$ 262,805,008.50**

EXHIBIT II.7 "AEROBIC TREATMENT UNITS (ATUs)" ALTERNATIVE

	OSTDS - ATU				
Item	**Description**	**Unit**	**Qty**	**Unit Price**	**Total**
1	Aerobic OSTDS System Installation	EA	8500	$ 14,000.00	$ 119,000,000.00
2	Remove Existing OSTDS	EA	8500	$ 600.00	$ 5,100,000.00
3	Silt Fence	LF	894900	$ 1.50	$ 1,342,350.00
4	Maintenance of Traffic	LS	9	$ 5,000.00	$ 42,500.00
5	Mobilization (5%)	5.000%			$ 6,274,242.50
				Total Construction Cost	**$ 131,759,092.50**
6	Engineering (15%)	15.000%			$ 17,850,000.00
7	Mitigation & Environmental (3.0%)	3.000%			$ 3,570,000.00
8	Contingencies (5%)	5.000%			$ 5,950,000.00
9	Collection Fees (2.5%)	2.500%			$ 2,975,000.00
10	Miscellaneous (1%)	1.000%			$ 1,190,000.00
11	Statutory Uncollectible (6.325%)	6.325%			$ 7,526,750.00
				Total Current Cost	**$ 170,820,842.50**
12	New Homes (growth)	EA	8500	$ 14,000.00	$ 119,000,000.00
				Total Cost	**$ 289,820,842.50**

* Does not include costs due to modifications required to meet design criteria as is anticipated in Area 1.