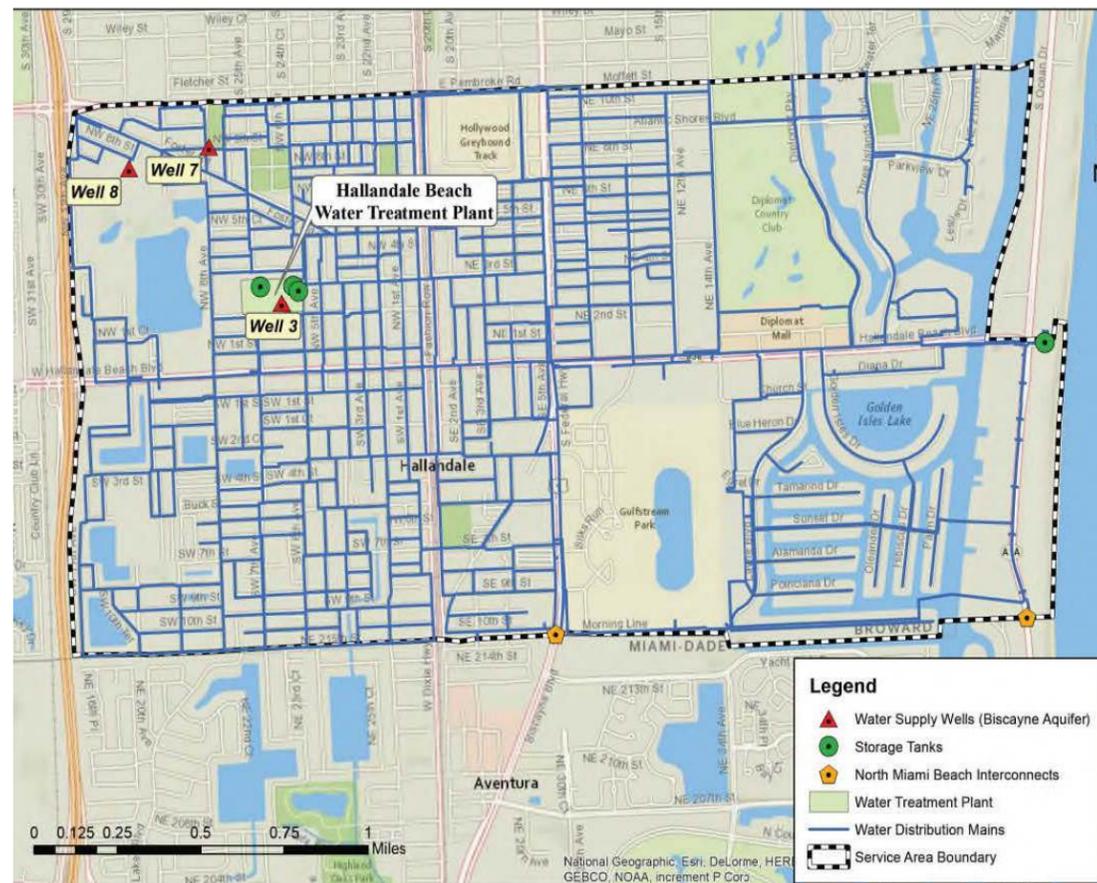


Water Distribution

Section V

a. Introduction

The City of Hallandale Beach provides potable water to all 2,816 acres in the City with the exception of the Diplomat Golf Course, which is irrigated with reuse water from the City of Hollywood. The City water distribution system consists of approximately seventy (70) miles of two-inch (2") to twenty-four-inch (24") diameter water mains that convey the finished water from the treatment plant to the individual customers. In general, the larger diameter transmission mains radiate from the treatment plant and decrease in size as they extend throughout the service area. The City operates three (3) supply wells plus receives raw water from the Brian Piccolo well fields supply the water for the City. The City is currently in the process of adding a well to their supply. The City of Hallandale Beach owns and operates an existing potable water distribution system. The Hallandale Beach Water Treatment Plant (HBWTP) was originally constructed in 1951, with expansions in 1968, 1981 and 2008. Plant capacity is currently six (6) million gallons per day (MGD) through two 3 MGD skids that are rotated daily.



b. Scope of Work

Water Distribution

Craven Thompson & Associates, Inc. (CTA) identified a conceptual design and potential potable water distribution system improvements based upon the following Reports/Studies prepared by Hazen and Sawyer for the City: The “Summary of Water Supply Alternatives Investigations for the Broward County Integrated Water Resource Plan (IWRP)”, dated June 2010; and “Water Model Update”, dated March 2015 and updated February 24, 2016. Recommended Improvements to the Water Distribution System were based on the findings within the Reports/Studies. Activities under this subtask included:

- Identify potable water demand requirements.
- Identify the existing water distribution network to determine suitable connection points.
- Prepare a conceptual water distribution system network in the project area.
- Determine fire protection requirements and locations of proposed fire hydrants.
- Provide the anticipated flow and pressure requirements at peak hour, fire flow and average day demand at all connecting points with the existing water distribution system.
- Any modeling related information provided within this section is based upon reports/studies prepared by other consultants.

Reclaimed Water

CTA evaluated the potential for a reclaimed water distribution system within the project area based on the Reports/Studies prepared for the City of Hallandale Beach by Hazen and Sawyer titled “Reuse System Master Plan”, dated December 2007, and “The 10-Year Water Facilities Work Plan”, dated December 2014. Recommended Improvements to the Water Distribution System shall be based on the findings within the Report. No modeling of the system was performed for this Task. Activities under this subtask included:

- Determination of potential reclaimed water demand within the project area.
- Preparation of a conceptual reclaimed water distribution system network for the project area.

c. Existing Water Distribution System

The distribution network includes four million gallons (4 MG) of storage capacity at the water treatment plant with a high service pumping station that provides a firm capacity of 18.5 mgd. The distribution network also includes the North Beach elevated storage tank (0.35 MG) at an elevation of 130-feet and 400,000 linear feet of distribution system piping. **Figure V-1** presents the existing water distribution system.

The City of Hallandale Beach has an existing water distribution system, water treatment plant, ground storage tanks, elevated storage tanks and high service pumps.

The existing water main distribution system consists of the following materials: Cast Iron (CI), Polyvinyl Chloride (PVC), and Asbestos Cement (AC). The existing pipe sizes consist of the following:

- one-inch (1")
- two-inch (2")
- three-inch (3")
- four-inch (4")
- six-inch (6")
- eight-inch (8")
- ten-inch (10")
- twelve-inch (12")
- fourteen-inch (14")
- sixteen inch (16")
- eighteen-inch (18")
- twenty-inch (20")
- twenty-four-inch (24")

d. Design Criteria

Fire Hydrant Spacing Requirements

Utilizing the City of Hallandale Code of Ordinances, Section 32-97, the following fire hydrant spacing is required on all water distribution systems:

- 1) For single-family and two-family residential areas, fire hydrants shall be spaced such that the radius of protection will not be more than 500-feet. Each hydrant shall be required to deliver the volume of water per minute and duration of flow in accordance with standards outlined in the most recent edition of the National Fire Protection Handbook.
- 2) For business and multi-family residential areas, fire hydrants shall be placed every 400-feet along the Right-of-Way with a minimum of 200-feet to the last unit. Each hydrant shall be required to deliver the volume of water per minute and duration of flow in accordance with standards outlined in the Fire Protection Handbook, 14th Edition (National Fire Protection Association).
- 3) For industrial areas, fire hydrants shall be placed every 300-feet along the Right-of-Way with a minimum 150-feet to the last lot. Each hydrant shall be required to deliver the volume of water per minute and duration of flow in accordance with standards outlined in the Fire Protection Handbook, 14th Edition (National Fire Protection Association).
- 4) For industrial areas, fire hydrants shall be placed every 300-feet along the Right-of-Way with a minimum of 150-feet to the last lot. A minimum total flow of 1,000 GPM from two (2) fire hydrants at the same time shall be required.

Through the use of the City's Atlas, Zoning Map and field observations the existing fire hydrants spacing was evaluated to determine compliance with Code requirements. Refer to **Figure V-3** for existing and proposed fire hydrant coverage that meet the spacing requirements set forth above.

All the information presented in the following Sections e. through o., have been taken from the Hazen and Sawyer Water Model Update in 2015 and again in 2016.

e. Potable Water Demand Requirements

The City of Hallandale Beach provides potable water to its residents through its water distribution system. The projected customer demand for the years 2015, 2020, 2025, 2030, and 2035, recommended system improvements are referenced from the report, "Draft 2015 Water Model Update" dated March 17, 2015 and updated February 24, 2016 by Hazen and Sawyer. Future population growth was shown to be relatively stagnant as provided by the Broward County Planning and Redevelopment Division, see table below.

Table V-1

Service Area Population Projections	
Year	Number of Residents
2015	38,892
2020	39,712
2025	39,606
2030	40,267
2035	40,189

The average plant production requirement is summarized below and estimated through the year 2035.

Table V-2

Current and Projected Water Consumption (Based on Billed Water Consumption)		
Year	Daily Water Demand (mgd)	Annual Water Demand (mgy)
2014	5.21	1,902
2015	5.39	1,967
2020	5.62	2,051
2025	5.59	2,040
2030	5.63	2,055
2035	5.60	2,044

*mgd = million gallons per day
mgy = million galons per year*

The flow data below was utilized in the model provided by the City. A coefficient of 10 percent (10%) was used for estimating expected water plant production (consistent with City's historical records, as well as, industry standards). The rates below are provided on both an Average Day Flow (ADF) basis and a Maximum Day Flow (MDF) basis.

Table V-3

Projected Water Treatment Plant Production		
Year	Plant Finished Water Annual Average Day Flow (mgd)	Plant Finished Water Maximum Day Flow (mgd)
2015	5.93	7.47
2020	6.18	7.79
2025	6.15	7.75
2030	6.19	7.80
2035	6.16	7.76

mgd = million gallons per day

In the model provided by the City, a Peak Hour Flow (PHF) demand was utilized to estimate the highest hourly flow recorded during the maximum day of the modeling period or record. The peaking factor utilized in the City model was 1.26 in order to determine MDF and a peaking factor of 2.50 was used for determining PHF.

The following criteria was used to identify network deficiencies:

Table V-4

Hydraulic Model Evaluation Criteria	
Performance Criteria	Value
Maximum pipe velocity, fps	8
Maximum pipe head loss, feet per 1,000 feet	10
Minimum system pressure, psi	35
Minimum system pressure during fire flow events, psi	20
Minimum fire flow at 20 psi residual system pressure, gpm	500
Minimum fire flow for multi-story complex, gpm	3,500
Minimum fire flow for Commercial District, gpm	2,000
Minimum fire flow for multi-family residential, gpm	1,500
Minimum fire flow for single family residential, gpm	500

fps = feet per second

psi = pounds per square inch

gpm = gallons per minute

f. Water System Modeling

Assumptions applied to the development of the water distribution system model and subsequent model runs include the following:

- Piping and hydrant layers detailing the water system accurately reflect the current state of the water distribution network.

- Annual average day demands provide the basis for the system’s Average Day Flow (ADF) demand, Maximum Day Flow (MDF) demand, and Peak Hour Flow (PHF) demand.
- Hydrant laterals are six-inches (6”) in diameter.
- Hydrants are installed at approximately eighteen-inches (18”) above grade.
- Distribution network pipes are installed approximately three-feet (3’) below grade.
- Distribution network pipes included in the model are limited to those with diameters of six-inches (6”) or greater. Pipes with diameters of four-inches (4”) are included if they represent critical loops within the network.
- The City’s water treatment plant maintains a distribution pressure of fifty-eight-pounds per square inch (58 psi), measured at the boundary of the plant.
- Evaluations of potential system improvements identified as part of this project are based on the assumption that water treatment plant high service pump improvements recommended in *High Service Pump Efficiency Evaluation* (Hazen and Sawyer, 2014) will be fully implemented. It is assumed that the high service pumping system will provide sufficient capacity and a stable distribution pressure of seventy pounds per square inch (70 psi), measured at the boundary of the plant.

g. Modeling Results

General System Performance

General system performance was evaluated at each time step to determine if modeled distribution system pressures, pipe velocities, and pipe head loss meet the minimum system criteria outlined in **Table V-4**. The results of all scenarios modeled show no improvements are required to address general system performance issues within the water distribution network. Based on the results, the minimum pressure requirement of thirty-five pounds per square inch (35 psi) across the system was met for all nodes. It is noted that the sixteen-inch (16”) transmission line leaving the City’s water treatment plant will experience head loss exceeding the minimum system criteria of ten-feet (10’) per 1,000 feet. However, since the head loss is only slightly exceeded at fourteen-feet (14’) per 1,000 feet during peak hour flow conditions, it is not recommended at this time to upgrade this short section of pipe for hydraulic reasons only. Should other factors dictate replacement of this pipe (such as age and/or consideration of future higher water treatment plant discharge pressures) the City may want to consider a larger diameter (per Hazen Sawyer report). Please note: Since this transmission line is older than fifty (50) years, CTA recommends this pipe be upgraded with a new twenty-four-inch (24”) pipe (refer to **Figure V-4 - NW Section**).

System Wide Hydrant Fire Flows

Individual fire flow runs were executed on the 830 fire hydrants added to the model as part of the updating process. The runs utilized the automated sequential fire flow analysis function that is part of the WaterCAD V8 software used to model the City’s distribution system. With the sequential fire flow functionality, the City’s hydrants are evaluated on an individual basis to

determine the minimum flow available at the hydrant nozzle when the local system pressure equals twenty pounds per square inch (20 psi).

Conservation & Sustainability

Conservation is a proven strategy for delaying implementation of expensive alternative water supply technologies. The City will be able to provide the necessary water to meet future demands simply by continuing its current water conservation measures.

The City of Hallandale Beach has a formal water conservation program that has been submitted as part of the City's Consumptive Water Use Permit Application (CUP) with the SFWMD. A typical water conservation program is composed of five (5) elements: develop/maintain an accurate database of water consumption to reduce municipal water waste; a retro-fit program; the modification of relevant City Codes (plumbing, irrigation, landscaping); the promotion of Florida Friendly landscaping; and public information and education programs. Data from the City indicates that the water conservation program has saved 200 million gallons in the past seven (7) years through education, plumbing system retrofits, and toilet replacements. The following subsections summarize the City of Hallandale Beach's ongoing conservation initiatives.

Broward Water Partnerships

The City of Hallandale Beach is a member of the Broward Water Partnership, which is a government service consisting of nineteen (19) municipalities and water utilities that collaborate on water conservation implementation. This partnership has the goal of saving a total of thirty million gallons per day (30 MGD) countywide.

Conservation Pay\$ Program

The City of Hallandale Beach participates in a water conservation incentive program through an inter-local agreement (ILA) with Broward County marketed under the program name "Conservation Pay\$".

The program provides rebates, and free water-conserving devices to qualifying water customers, and it has a focused outreach and education component. Rebate dollars are used for the replacement of older, wasteful toilets, in addition, to the distribution of other water efficient fixtures and devices such as aerators and commercial pre-rinse spray valves. A consistent marketing and media campaign advances water conservation efforts. The program goal is to reach a sustained minimum ten percent (10%) reduction in water use countywide over twenty (20) years.

In Fiscal Year 2014 (October 1, 2013 - September 30, 2014) the City of Hallandale Beach issued rebates for ninety-one (91) high efficiency toilets that use 1.28 gallons per flush.

NatureScape Irrigation Services

Broward County's NatureScape Irrigation Service (NIS) is a water conservation program offered in partnership with eighteen (18) local water utilities. The goal of the NIS is to reduce urban water consumption and improve the quality of surface waters through efficient irrigation and environmentally-friendly landscape practices. The NIS program targets large properties, such as government facilities, parks, schools, and multi-family residential complexes, where water conservation efforts can produce the greatest water savings.

The City has endorsed and proactively promoted Broward County's NatureScape irrigation Program and concept, implementing environmentally sound landscaping practices to reduce the irrigation demands. City locations in the NatureScape program include:

- City Hall
- Hallandale Beach Cemetery (South)
- Hallandale Beach Cemetery (North)
- Cultural Center
- Bluesten Park
- Community Center
- Foster Park

Conservation Rate Structure

The City of Hallandale Beach maintains a utilities (water / sewer) rate structure supporting economic incentives for water conservation (progressively higher rates as water usage increases).

Xeriscape Ordinance

City Resolution 87-14 outlining the use of Xeriscape plants and landscaping design details to promote and expand its use according to recommended landscaping planting guidelines intended to reduce or eliminate the need for supplemental irrigation.

Rain Sensor Device Ordinance

The City adopted a Rain Sensor Device Ordinance, whereby the City requires any person applying for an irrigation system permit to install, operate and maintain rain sensor devices or to provide for automatic switching mechanisms that will stop the irrigation system with the occurrence of adequate rainfall.

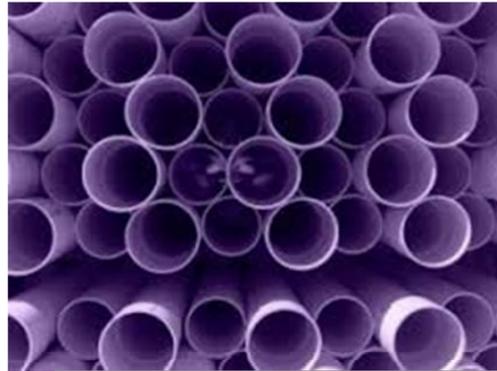
Permanent Irrigation Ordinance

The City has adopted an Irrigation Ordinance, City Ordinance 2007-04, Chapter 30 / Section 30-49, enforcing the South Florida Water Management District's (SFWMD) Phase I guidelines, which restricts the watering of landscaping to two (2) days a week.

Leak Detection Program

The City's Public Works Department maintains a Water Utility Leak Detection Program, whereby all water meters are replaced on a five (5) year schedule and the large meters are checked and calibrated for accuracy annually.

In addition, Public Works also maintains a Water Distribution System Leakage Program, whereby the monthly reports for the water piping distribution system are examined to compare the water pumped vs. the water billed and identify any excessive unaccounted volumes. Historically, the City's water distribution system has unaccounted water losses averaging less than four percent (4%), considerably less than the ten percent (10%) the South Florida Water Management District allows for coastal communities.

**Ultra-Low Volume Plumbing Fixture Ordinance**

The City adopted an Ultra-Low-Volume Plumbing Fixture Ordinance - City Ordinance Chapter 8, Article 1, Section 8-1, recognizing the Florida Building Code as the enforceable Building Code for the City and codifying the Building Code requirements for ultra-low-volume plumbing fixtures on all new construction.

Water Conservation Education Program

The City has maintained a continuous water conservation informational program for its residents, whereby the City periodically issues water conservation messages through newsletters, such as Hallandale Happenings, the annual Water Quality Report, and other means available to convey the need and importance of water conservation.

Reclaimed Water

Effluent from the City of Hallandale Beach is transmitted to the City of Hollywood Regional Waste Water Treatment Plant where a portion of the wastewater is processed into reclaimed water and used by the City of Hollywood to irrigate golf courses, parks, median strips and other areas.

Florida law supports reuse efforts. Florida's utilities, local governments, and water management districts have led the nation in the quantity of reclaimed water reused and public acceptance of reuse programs. Section 373.250(1) F.S. provides "the encouragement and promotion of water conservation and reuse of reclaimed water, as defined by the department, are state objectives and considered to be in the public interest." In addition, Section 403.064(1), F.S., states "reuse is a critical component of meeting the state's existing and future water

supply needs while sustaining natural systems."

Effluent reuse can be of substantial benefit to the area for a number of reasons, the most important of which is to use reclaimed water for irrigation to reduce competition for water supplies with the City's wells or for recharge of the surficial aquifer system using reclaimed water by injection. Carefully designed applications of reclaimed water to critical areas of the surficial aquifer could protect freshwater sources. However, the City currently has an agreement with the City of Hollywood to treat and dispose of its wastewater at Hollywood's disposal facilities. The only potential is to extend reclaimed water piping from Hollywood to Hallandale Beach.

The City of Hollywood's regional wastewater treatment plant has been in operation since the 1940s and has been upgraded and expanded over the years. The current wastewater treatment plant is a Category II, Class A activated sludge plant that has the capacity to treat and dispose of 48.75 million gallons per day of industrial, commercial and domestic sewage in an environmentally acceptable manner. The City of Hollywood also has a four million gallons per day (4 MGD) reclaimed water system for effluent reuse via golf course and public area irrigation.

Local Government Specific Actions, Programs, Regulations, or Opportunities

Historically, the wastewater collected throughout the City of Hallandale Beach has been transmitted to the City of Hollywood for treatment and disposal. Thus, the wastewater needed to produce reclaimed water is out of the City's control. However, reuse is a stated goal of the State Comprehensive plan, so the City is desirous of meeting reuse goals by providing irrigation water to certain public access sites from its nanofiltration concentrate stream. The City has piloted a program to use the concentrate from the membrane softening system in the water treatment plant produce reclaimed water. The City desires to use this resource to develop a Public Access Reuse system. The City has proposed a concentrate reuse system with over 0.5 MGD of potential customers consisting of mostly City parks and schools.

The City is also coordinating with the City of Hollywood to use a portion of its reuse water for irrigation purposes in the Three Islands area, including Joseph Scavo Park and the area medians.

Recommended Water Distribution System Improvements

All existing pipes identified as fifty (50) years or older are recommended to be replaced due to declining structural conditions. Also, existing pipes identified as Asbestos Cement are recommended for replacement. Pipe age and material are identified through the use of City provided utility atlas. Refer to **Figure V-2** for existing water mains recommended for replacement.

Removal of existing Asbestos Cement pipe is costly as handling and hauling is strictly regulated and the material must be properly disposed of at an authorized special waste disposal facility. It is recommended that Asbestos Cement pipe be abandoned in-place whenever possible.

Referencing the report, “2015 Water Model Update,” by Hazen and Sawyer; the following improvements are recommended in order to provide adequate pressure and service for future development throughout the City:

- 1) System-wide hydrant fire flow simulations revealed deficiencies in the area of Hibiscus Drive and Sunset Drive. These deficiencies can be resolved by interconnecting the six-inch (6”) main on Hibiscus Drive with the sixteen-inch (16”) transmission line on Sunset Drive. Refer to **Figure V-4** for proposed improvement.
- 2) Improvements to address fire flow deficiencies at the hydrants serving Hallandale High School include the replacement of approximately 3,330 linear feet of existing four-inch (4”) water mains and six-inch (6”) water mains with proposed eight-inch (8”) mains. The mains to be replaced run along NW 9th Street between NW 9th Avenue and NW 7th Terrace and along Foster Road between NW 9th Avenue and NW 6th Avenue. The main along Foster Road is comprised of asbestos cement pipe so it is recommended to abandon this main in place and run a parallel main in this location. Refer to **Figure V-4** for proposed improvement.
- 3) To address fire flow deficiencies for the site in the northwest corner of the City’s service area, (multi-family residential complex at NE 10th Street and Parkview Drive), approximately 1,420 linear feet of twelve-inch (12”) transmission main is proposed along Parkview Drive between Leslie Drive and NE 10th Street. The proposed main would be installed parallel to existing twelve-inch (12”), ten-inch (10”) and eight-inch (8”) water mains. Refer to **Figure V-4** for proposed improvement.

Reclaimed Water Improvements

Currently, the City of Hallandale Beach utilizes reclaimed water to irrigate the Diplomat Golf Course. The site is fed from the north by the City of Hollywood. The City has provided draft plans prepared by EAC Consulting, Inc., dated May 29, 2015, that proposes an extension of a reclaimed water line to irrigate Three Islands Park. The proposed eight-inch (8”) irrigation line will tie into an existing twenty four-inch (24”) irrigation main within Wiley Street, run south on Diplomat Parkway, east on Atlantic Shores Boulevard and ultimately tie into Three Islands Park (Joseph Scavo Park). The line will be designed for a capacity of 200,000 gallons per day. Refer to **Figure V-5** for location of future reclaimed water irrigation main.

In addition to the reclaimed water usage at Three Islands Park, the City would like to incorporate the irrigation connection with various medians within the vicinity. Referencing the “Irrigation Distribution Design Limits” exhibit by Miller-Legg, the following medians are proposed to utilize reclaimed water for irrigation purposes:

- 1) Three Islands Drive from Hallandale Beach Boulevard north to City Limit; the approximate median area is 26,726 square feet, resulting in an approximate water usage of 2,380 gallons per day.

- 2) Atlantic Shores Boulevard from Diplomat Parkway east to Three Islands Drive; the approximate median area is 6,408 square feet, resulting in an approximate water usage of 571 gallons per day.
- 3) Parkview Drive from its origin at Three Islands Drive east then north for its full limits ending at the cul-de-sac; the approximate median area is 12,644 square feet, resulting in an approximate water usage of 1,126 gallons per day.
- 4) Leslie Drive from its origin at Parkview Drive for its full limits ending at the cul-de-sac; the approximate median area is 1,457 square feet, resulting in an approximate water usage of 130 gallons per day.

Refer to **Figure V-5** for location of proposed reclaimed water irrigation main, as well as, landscape islands to utilize the reclaimed water.