

2.0 Existing System Characterization

This section describes Newport's existing conveyance systems for wastewater and stormwater.

2.1 Collection System Background

Newport's wastewater collection system dates to the late 1800's, and its construction materials reflect its age. Vitrified clay, asbestos cement (transite), and brick pipe make up the older portions of the system, while reinforced concrete and PVC pipes can be found in more recently constructed sections. The collection system consists of gravity sewers and force mains ranging in diameter from 6 to 84 inches. In addition, there are three permitted combined sewer overflows, fourteen pump stations, two combined sewer overflow treatment facilities and one wastewater treatment facility serve the City of Newport, all of which will be discussed in greater detail in later sections.

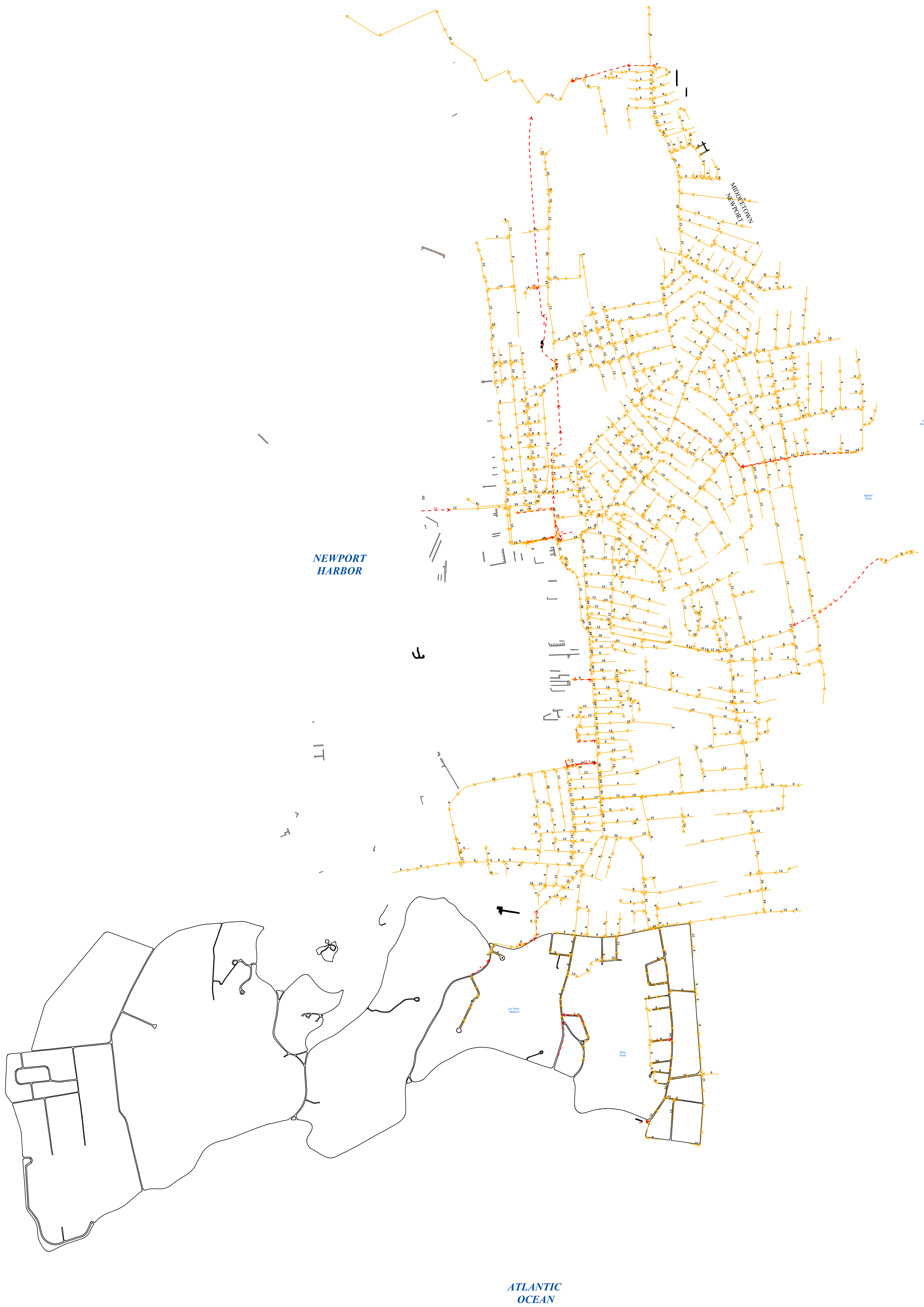
Newport's collection system was originally designed and constructed to function as a combined system, conveying both wastewater and stormwater, until the 1970's. At that time, the original combined sewer was left in place to serve as a sanitary sewer, and catch basins in the areas separated at that time were disconnected from this system and connected to separate, newly constructed storm drains. A summary of the City's sewer separation projects is presented in section 2.1.3. However, some catch basins in these areas remained connected to the sanitary sewer due to utility conflicts or were outside of the areas in which sewer separation was performed. In addition, roof leaders, sump pumps, and area drains on private property were not disconnected, therefore, the sanitary sewer system still conveyed storm water flows.

2.1.1 Sanitary/Combined Sewer System

The sanitary sewer system in the City of Newport currently consists of approximately 43,700 feet (8 miles) of publicly owned sewer force main and approximately 417,000 feet (79 miles) of publicly owned gravity sewer. Private force mains account for an additional approximately 48,000 feet (9 miles) of pipe in the City. See Figure 2.1, Sanitary Sewer System, for an overview.

A major flow conduit in the southern part of the City is the Thames Street Interceptor (TSI). It is an egg shaped brick and mortar structure measuring approximately three feet by four feet with a length of 6,200 feet. At its most upstream point, it receives flow at Morton Avenue. Further flow is contributed by the Narragansett Avenue Storage Conduit, which also serves as a relief and detention sewer. The Narragansett Avenue Storage Conduit is 2,000 feet long and 84 inches in diameter, providing 73,000 cubic feet (0.55 mg) of storage. This storage is regulated by an 18 inch automatic gate valve at the downstream end. Should this gate valve fail to open, flooding is prevented by a 12 inch overflow to the 18 inch sewer at the eastern end of Narragansett Avenue.

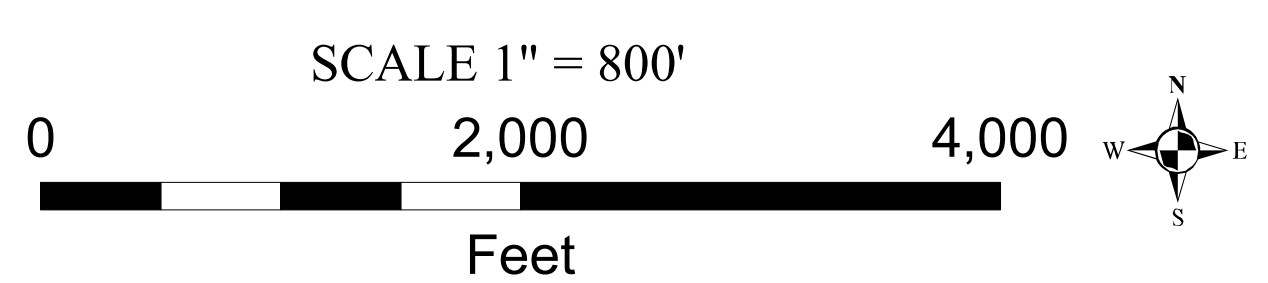
Farther downstream at Wellington Avenue, flows that exceed the regulated capacity of the Thames Street Interceptor are diverted at a regulation structure by means of a plate and a weir to the Wellington Avenue Pump Station and CSO Facility. Combined flows up to 1,000 gpm are pumped back to the Thames Street Interceptor. If the flows are in excess of 1,000 gpm, the flow is screened, disinfected and are then discharged to Newport Harbor.



NEWPORT HARBOR

ATLANTIC OCEAN

MIDDLE TOWN
NEWPORT



Sanitary Pipes
 - - - Force Main
 -> Gravity Main

FIGURE 2.1
SANITARY SEWER SYSTEM
NEWPORT, RHODE ISLAND
PHASE 2 CSO CONTROL PLAN

A major downstream component of flow to the Thames Street Interceptor is located on Memorial Boulevard and consists of a flow from the force main from Middletown's Wave Avenue Pump Station and additional flow capacity from the America's Cup Relief Sewer. Flows from the Wave Avenue Pump Station are conveyed by a forcemain and gravity sewer from the pump station location in Middletown to the Town's sewer connection to the Newport system at the intersection of Thames Street and Memorial Boulevard West. This location also permits high flows from the Thames Street Interceptor to discharge to the 42-inch relief sewer in America's Cup Avenue and are conveyed to the Long Wharf Pump Station, bypassing the northern end of the Thames Street Interceptor. At Washington Square, flows from Thames Street and the Broadway Interceptor (an interceptor carrying flows from the northeastern and eastern portions of Newport) converge and flow to the Long Wharf Pump Station via the Washington Square-Long Wharf connecting sewer, which consists of two 54-inch channels side by side. At each structure on the connecting sewer, the channels are separated by weirs. In dry weather, the sanitary flows do not top the weir and are thus carried in only one channel, while storm flows can top the weir height and enter the stormwater conduit. Figure 2.2 presents a schematic of the major components of the Newport sewer system.

All flows from both conduits up to 16 mgd are directed to a 36 inch interceptor connected to the Long Wharf Pump Station, while flows greater than 16 mgd are sent to the Washington Street CSO Facility.

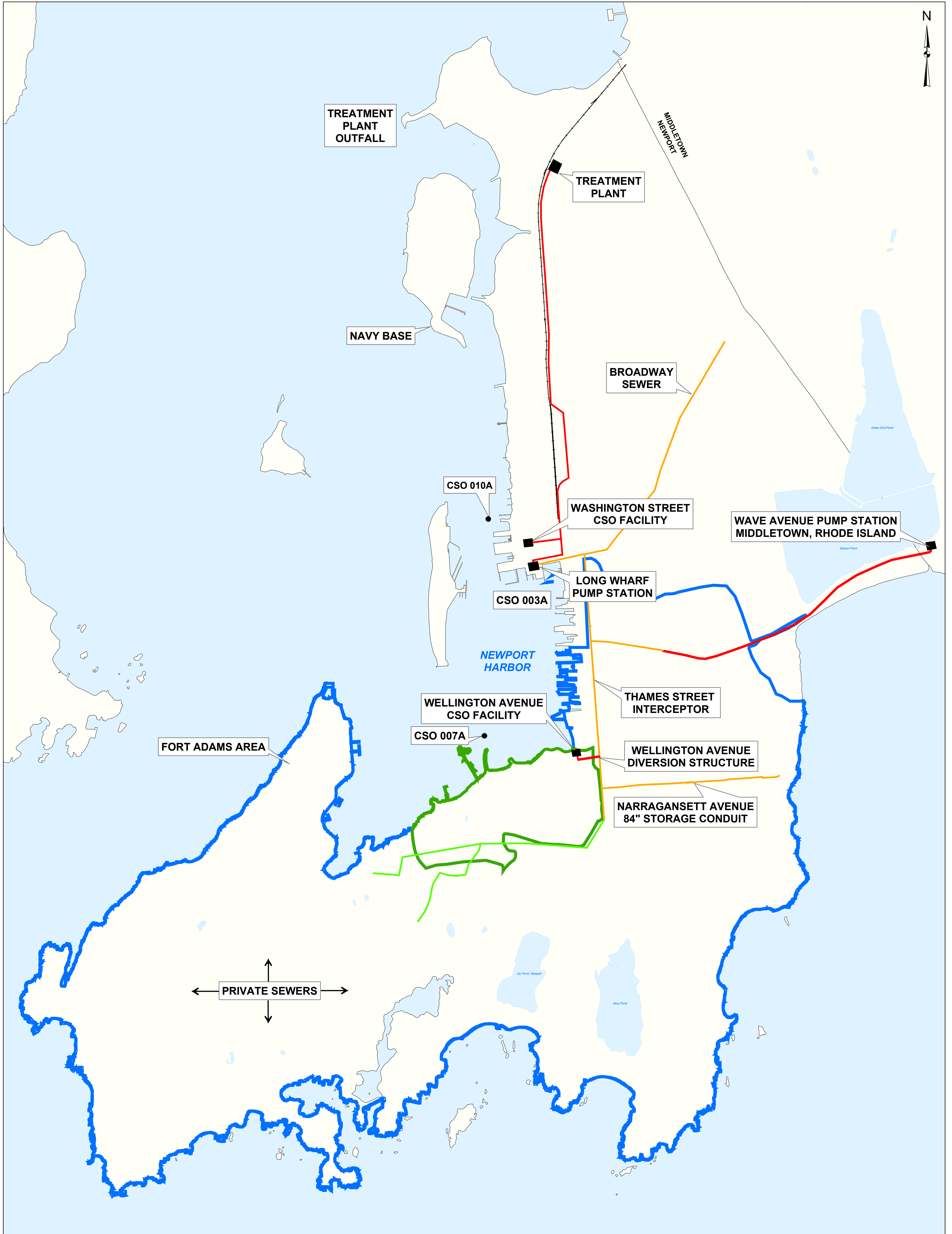
The Long Wharf Pump Station also receives up to 6 mgd from two 18-inch gravity sewers in Washington Street. Flows from these sewers in excess of 6 mgd are directed to the Washington Street CSO Treatment Facility. The Long Wharf Pump Station can pump approximately 24 mgd to the Newport WPCP.

The Long Wharf Pump Station regulates flow by means of a 36-inch gate in the Pump Station yard, which backs up flow and controls levels in wet wells. In high flow situations, it causes the 36-inch and 18-inch incoming sewers to surcharge and overflow to the Washington Street CSO facility.

2.1.2 Pump Stations

The City of Newport is served by fifteen pump stations that maintain flow in situations where gravity flow is not possible. The Long Wharf Pumping Station is the low point in the sewer system and the primary Pump Station in the City; it was designed to convey up to 24 mgd to the Water Pollution Control Plant.

The Town of Middletown's Wave Avenue pump station conveys sewage from neighboring Middletown to Long Wharf. The Wave Avenue Pump Station contributes flow to Newport's sewer system. A review of data recorded by the WPCP's SCADA system between November 2008 through February 2009 indicated a flow range from the Wave Avenue Pump Station between 1.5 mgd and 7.25 mgd

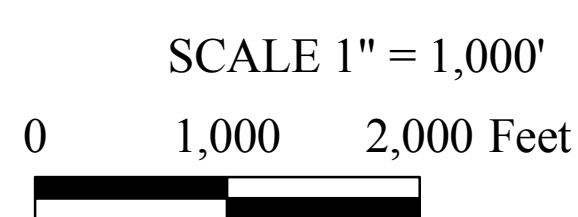


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LEGEND:

- Gravity Sewer Main
- Force Main
- Private Force Main
- Dry Catchment Area
- Wet Catchment Area



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FIGURE 2.2
SYSTEM SCHEMATIC
NEWPORT, RHODE ISLAND
PHASE 2 CSO CONTROL PLAN

The following summarizes the pump stations in Newport's sewer network:

- Alpond Drive Pump Station was originally constructed in 1980. It was upgraded to a submersible pump station in 2001 with two single-phase 80 gallon per minute (gpm) submersible pumps.
- Beach (Memorial Blvd) Pump Station was originally constructed in 1997. It was upgraded in 1994 with two 200 gpm submersible pumps.
- Bliss Mine Road Pump Station was originally constructed in 1978. The station was upgraded in 2002 with a new control panel, SCADA, Variable Frequency Drives (VFDs) and three 2,300 gpm dry pit submersible pumps.
- Carroll Avenue Pump Station was constructed in 1980 and has one 50 gpm pumps. It is classified as an ejector station.
- Coddington Wharf Pump Station was constructed in 1978 and features two 350 gpm pumps.
- Dyre Street Pump Station was constructed in 1958. The station was upgraded in 2002 with a new control panel, backup generator, and two 435 gpm dry pit submersible pumps.
- Goat Island Pump Station was constructed in 1966. The station was upgraded in 2002 with a new control panel, SCADA and two 1,200 gpm dry pit submersible pumps.
- Hazard Road Pump Station was constructed in 1969. The station was upgraded to a submersible pump station in 2008 with two 40 gpm submersible pumps.
- Lee's Wharf Pump Station was constructed as an ejector pump station in 1977. It was upgraded to a submersible pump station in 2006 with two 60 gpm submersible pumps.
- Long Wharf Pump Station was originally constructed in 1956 and upgraded in 1974, 2003 with three 5,600 gpm dry pit submersible pumps and in 2007 with three 5,600 gpm close coupled centrifugal pumps.
- Maple Avenue Pump Station was constructed in 1941 with two 400 gpm pumps. It was upgraded in 1999 with a new generator and two 320 gpm submersible pumps and a bypass wet well with a 320 gpm submersible pump.
- Murray Place (Almy Pond) Pump Station was constructed in 1970 with two 50-gallon ejector pumps. The control panel and ejector pump air compressors were upgraded in 2001.
- Ruggles Avenue Pump Station was constructed 1952. The station was upgraded in 1994 with two 40 gpm submersible pumps.

- Wellington Avenue Pump Station was constructed in 1978 with three 640 gpm pumps. It was upgraded with variable frequency drives (VFD) for the sanitary pumps and improvements to use the microstrainer chamber as a chlorine contact chamber in 2001.
- Ranger Road Pump Station was constructed in 2003 with two 340 gpm submersible pumps and a 10,000 gallon overflow tank.

2.1.3 Storm Drainage System

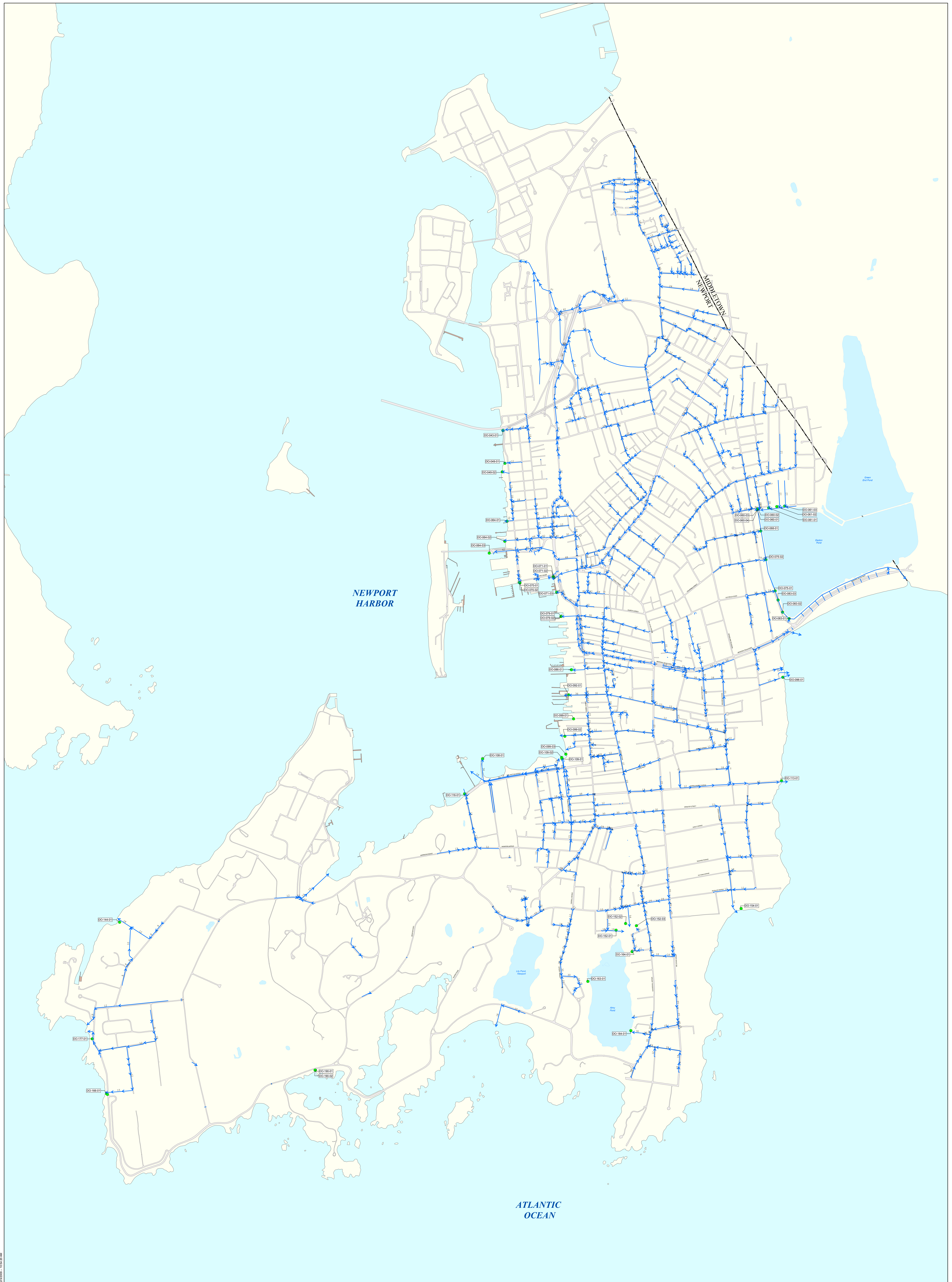
As part of a comprehensive sewer separation program funded by the United States Environmental Protection Agency's Infiltration/Inflow Program, Newport's storm drainage system was largely separated from the sanitary sewer system in the 1970's by connecting catch basins to newly constructed, separate storm drains. However, some roof leaders, sump pumps, basement drains, and area drains on private property still discharge to the sanitary sewer system in some locations. There are presently approximately 267,000 feet (50 miles) of drain pipe, culvert and open channels serving the City of Newport. There are 2,700 catch basins in the City of Newport. Figure 2.3 provides a map of Newport's storm drainage system.

The sewer separation program was implemented for the City by Fenton G. Keyes Engineering. The designs were completed between 1974 and 1976, with construction following. Record drawings were generally received between 1978 and 1979. The sewer separation contracts included the following:

- Contract S-1: Historic Hill 1975
- Contract 1: Washington Street Connecting Sewer 1974
- Contract 2: Alterations to Long Wharf Pump Station 1974
- Contract 4: Bliss Mine Road 1975
- Contract 5: Broadway Sewer 1974
- Contract 7: Long Wharf Force Main
- Contract 9: Lawrence Avenue Sewer Separation 1978 (As Built)
- Contract 10: Thames Street Sewer Separation 1974 (1978 As Built) - Lee's Wharf South
- Contract 11: Almy Pond Sewer 1975 - Courts Streets east of Almy Pond
- Contract 12: Washington Street Sewer Separation 1974
- Contract 13: Coggeshall Avenue Sewer Separation 1975
- Contract 14: Narragansett Street Sewer Separation 1975 (1978 As Built)
- Contract 16: Wellington Avenue Sewer Separation 1974 (1978 As Built)

2.2 Combined Sewer Overflow Facilities

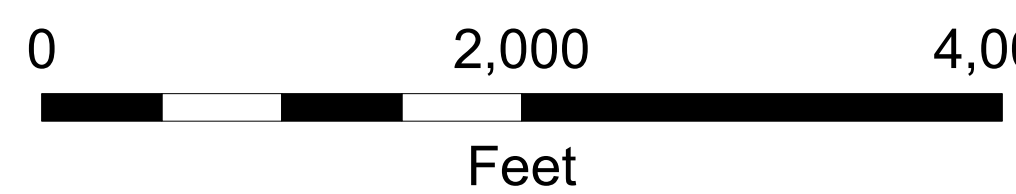
The City of Newport features two CSO treatment and discharge facilities, the Washington Street CSO Facility and the Wellington Avenue CSO Facility. The Wellington Avenue CSO Facility was constructed in 1978 to provide flow storage when needed, as well as to screen and disinfect effluent prior to discharge. The facility was designed to provide screening and pumping of wastewater flows up to 1.44 mgd during dry weather, and 25 mgd of treatment using microstrainers and chlorination during wet weather events. The microstrainers had been inoperative for several years. In 2003, improvements were made involving replacement of coarse bar screens with fine (0.25 inch) bar screens. Additional improvements included new variable frequency drives (VFDs) for the 640 gpm sanitary sewage pumps and SCADA upgrades. The microstrainer chambers were converted to a chlorine contact chamber and to



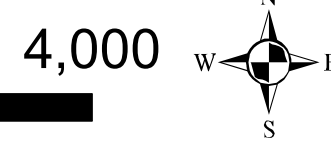
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This map contains data from historical plans provided by the City of Newport, field observations and data collection, and recent aerial mapping and is subject to revision as more detailed information becomes available.



SCALE 1" = 800'



● Outfalls
 → Drainage Pipes

FIGURE 2.3
STORM DRAIN SYSTEM
NEWPORT, RHODE ISLAND
PHASE 2 CSO CONTROL PLAN

provide additional storage during high flow periods. The microstrainer backwash pumps are used to provide additional pumping capacity to the Thames Street Interceptor during wet weather and for dewatering the microstrainer chamber after the wet weather event. The facility discharges screened, chlorinated effluent to Newport Harbor east of Ida Lewis Rock at Kings Park Beach.

Figure 2.4 presents the volume of combined sewer overflow (with trend line in red) and total rainfall collected at the WPCP for the period of 2001 to 2008 at the Wellington Avenue CSO Facility.

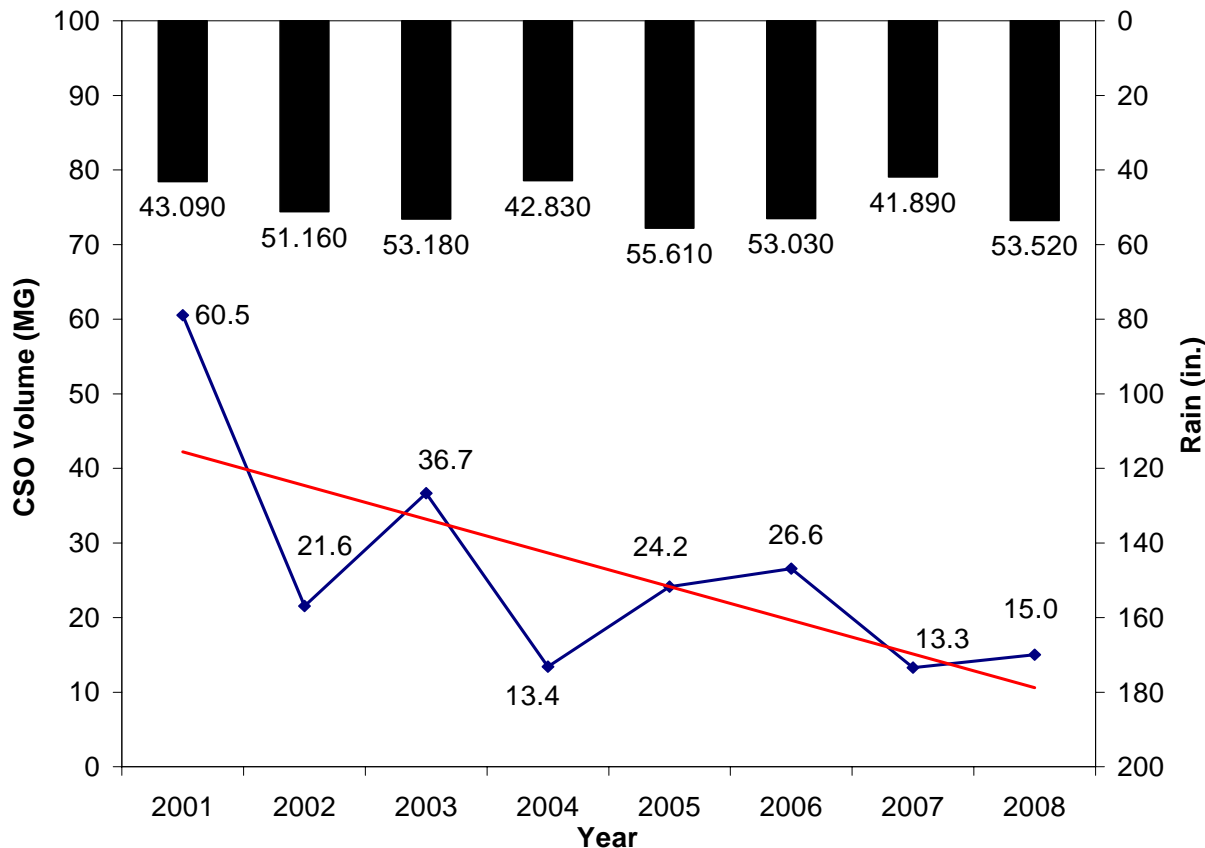


Figure 2.4
Wellington Avenue CSO Facility
CSO Volume and Total Rainfall 2001-2008

The following is noted based on review of the figure:

- The overall trend line indicates a reduction in overflow volume for the years 2001 to 2008 which is attributed to improvements to the operation of the Wellington Avenue CSO Facility and to the improvements to the Narragansett Avenue Storage Conduit in 2001.
- In addition, recent sewer separation activities in 2007 and 2008 have included roof leader disconnection, catch basin separation and disconnection of sump pumps. These sewer separation activities are described in Section 3. It is noted that 2008 was a wet year with over 50 inches of total rainfall. However, the volume of overflow, 15 mg, is significantly less than the overflow volume recorded in the previous years of 2002, 2003, 2005, and 2006, which received similar amounts of rainfall.

The Washington Street CSO Facility was placed into service in 1991. Large precipitation events are screened, treated for settleable solids in settling tanks, disinfected, and discharged as a CSO event to Newport Harbor. Liquid sodium hypochlorite is used for disinfection. The combined wastewater is detained and then pumped to the Water Pollution Control Plant. The Washington Street CSO Facility provides approximately 1,000,000 gallons of storage and has a maximum pumping capacity of approximately 45 mgd.

2.3 Water Pollution Control Plant

The Newport Water Pollution Control Plant serves the City of Newport, Town of Middletown, and the United States Naval Station Newport. It is permitted to process monthly average flows of 10.7 mgd and maximum daily flows of 19.7 mgd. Primary treatment is accomplished through two aerated grit chambers (total unit volume 71,100 gal) and six primary clarifiers (total unit volume 1,264,000 gal). Secondary treatment by means of activated sludge occurs in four aeration tanks (total unit volume 2,244,000 gal), followed by four final clarification tanks (total unit volume 2,283,496 gal). Disinfection and dechlorination take place in two contact chambers (total unit volume 147,100 gal). Sodium hypochlorite is used for disinfection, and sodium bisulfite is used for dechlorination. Sludge is dewatered by a gravity belt filter press and transported to SYNAGRO organic residuals management service.

The following table summarizes the WPCP discharge limitations.

**TABLE 2.1
WPCP DISCHARGE LIMITATIONS**

Characteristic	Quantity		Concentration		
	Average Monthly	Maximum Daily	Average Monthly	Average Weekly	Maximum Daily
Flow	10.7 MGD	19.7 MGD			
TSS	2,677 lbs/day	4,462 lbs/day	30 mg/L	45 mg/L	50 mg/L
TSS Removal			85%		
BOD	2,677 lbs/day	4,462 lbs/day	30 mg/L	45 mg/L	50 mg/L
BOD Removal			85%		
Fecal Coliform			200	400	400
Residual Chlorine			590 ug/L	MPN/100 ml	MPN/100 ml
PH			6 (min)		9 (max)

The following table summarizes the hydraulic capacity of the Newport WPCP.

TABLE 2.2
NEWPORT WPCP UNIT PROCESS VOLUMES

Item	Unit Volumes (gal)	Number of Tanks	Total Volume (gal)
Aerated Grit Chambers	35,500	2	71,100
Septage Receiving Facilities	16,500	2 (1 offline)	16,500
Primary Clarifiers, Tanks 1-4	158,000	4	632,000
Primary Clarifiers, Tanks 5-6	316,000	2	632,000
Aeration Tanks	561,000	4	2,244,000
Final Clarifiers	570,874	4	2,283,496
Contact Chambers	73,500	2	147,100