

a proposed pump station on Plainfield Pike. Also connected to the pump station will be all new proposed 12-inch gravity sewer pipes within Plainfield Pike up to Peck Hill Road serving residents and businesses north of Plainfield Pike. Another municipal pump station proposed on Shun Pike will serve residents and businesses on the north and south of Shun Pike from Green Hill Road to Peck Hill Road. The use of individual grinder pumps with 2-inch force main is proposed for the dwellings located in the residential area southwest of Simmons Reservoir and units located west of Peck Hill Road on Plainfield Pike.

The improvements will include a total use of 24,800 linear feet of 8-inch gravity pipe, 8,400 linear feet of 12-inch pipe, three separate locations requiring the use of individual grinder pumps and 6,900 linear feet of 2-inch force main piping, and two municipal pump stations requiring approximately 4,450 linear feet of 4-inch force main.

Costs associated with these improvements are shown in Table 6-24 below.

TABLE 6-24				
SEWERSHED 25 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
10-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	5,000	\$ 53.35/LF	\$	366,759.26
b. Gravity Line Installation (12-inches)	8,400	\$ 64.87/LF	\$	712,895.56
c. Force Main Installation (2-inches)	2,900	\$ 42.03/LF	\$	122,472.37
d. Force Main Installation (4-inches)	650	\$ 47.45/LF	\$	30,973.70
2.Maholes	70	\$ 2,500.00/EACH	\$	175,000.00
3.Rock Removal (5%)	1,207	\$ 100.00/CY	\$	120,700.00
4.Pavement Restoration (town)	7,602	\$ 100.00/TON	\$	760,213.89
5.Traffic Protection	326	\$ 960.00/DAY	\$	312,960.00
6.New Service Connection by Gravity	95	\$ 4,000.00/EACH	\$	380,000.00
7.New Service Connection with Grinder Pump	40	\$ 9,000.00/EACH	\$	360,000.00
8.Pump Station Construction (500k GPD)	1	\$ 583,000.00/LS	\$	583,000.00
9.Pump Station Telemetry	1	\$ 10,000.00/LS	\$	10,000.00
10.Legal Fees for Easement Development	0	\$ 10,000.00/PARCEL	\$	-
			Sub-Total \$	3,934,974.78
11.Mobilization/Demobilization (10%)			\$	393,000.00
12.Utility Coordination (5%)			\$	197,000.00
13.Engineering/Design/Permitting/Construction Admin (10 %)			\$	393,000.00
14.Contingency (20%)			\$	984,000.00
			10-year TOTAL \$	5,900,000.00
20-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	19,800	\$ 53.35/LF	\$	1,452,366.67
b. Force Main Installation (2-inches)	4,000	\$ 42.03/LF	\$	168,927.41
c. Force Main Installation (4-inches)	3,800	\$ 47.45/LF	\$	181,077.04
2.Maholes	112	\$ 2,500.00/EACH	\$	280,000.00
3.Rock Removal (5%)	1,763	\$ 100.00/CY	\$	176,300.00
4.Pavement Restoration (town)	11,100	\$ 100.00/TON	\$	1,110,005.56
5.Traffic Protection	476	\$ 960.00/DAY	\$	456,960.00
6.New Service Connection by Gravity	66	\$ 4,000.00/EACH	\$	264,000.00
7.New Service Connection with Grinder Pump	22	\$ 9,000.00/EACH	\$	198,000.00
8.Pump Station Construction (200k GPD)	1	\$ 433,000.00/LS	\$	433,000.00
9.Pump Station Telemetry	1	\$ 10,000.00/LS	\$	10,000.00
10.Legal Fees for Easement Development	0	\$ 10,000.00/PARCEL	\$	-
			Sub-Total \$	4,730,636.67
11.Mobilization/Demobilization (10%)			\$	473,000.00
12.Utility Coordination (5%)			\$	237,000.00
13.Engineering/Design/Permitting/Construction Admin (10 %)			\$	473,000.00
14.Contingency (20%)			\$	1,183,000.00
			20-year TOTAL \$	7,100,000.00
			SEWERSHED TOTAL \$	13,000,000.00



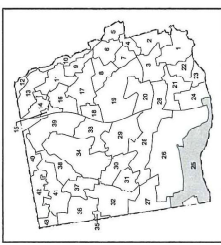
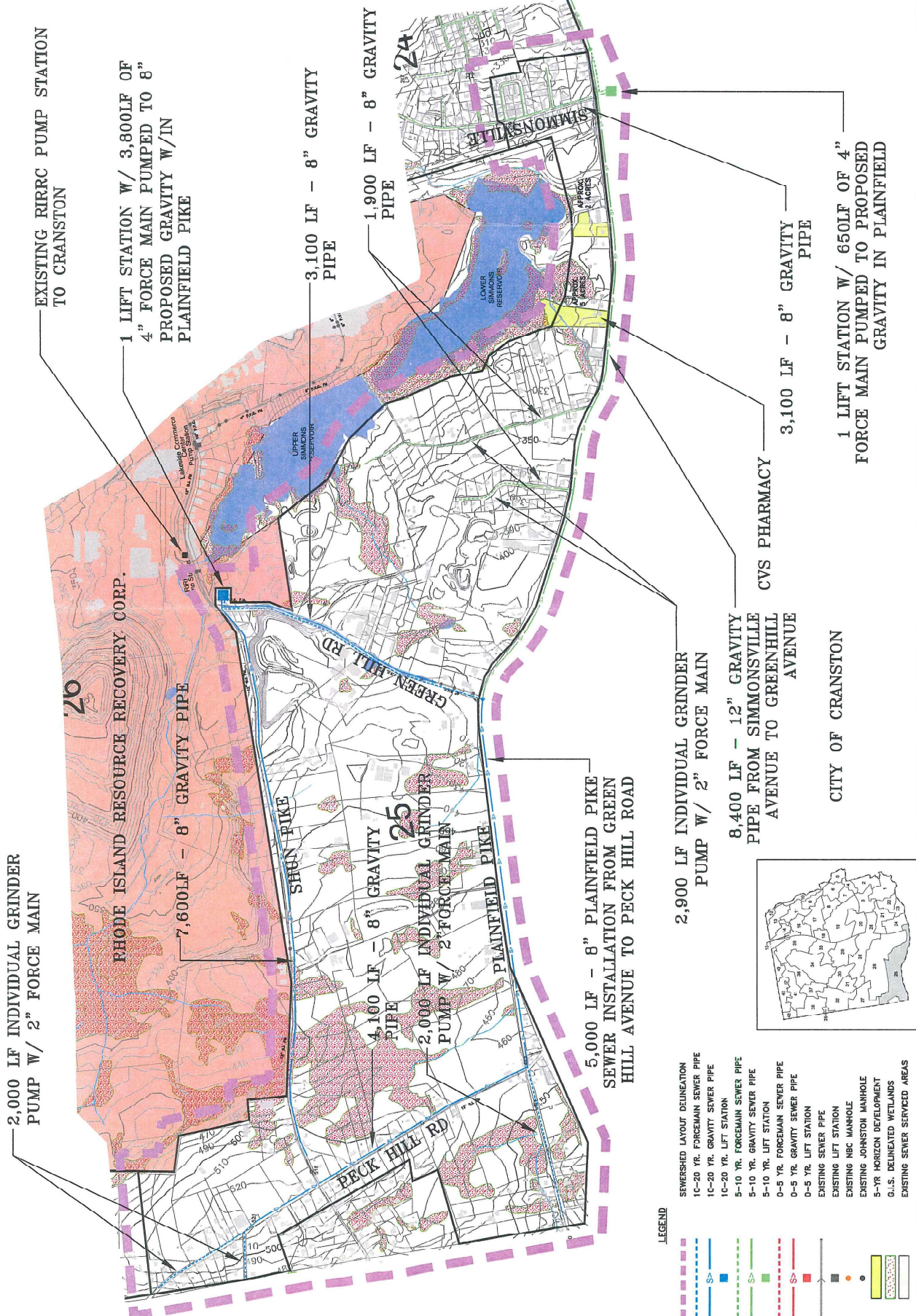
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TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 PECK HILL RD, SHUN PIKE, SIMMONSVILLE AVE

SCALE: 1" = 1200'
 FIGURE:

6-20



LEGEND

[Pink dashed line]	SEWERED LAYOUT DELINEATION
[Blue dashed line]	10-20 YR. FORCEMAIN SEWER PIPE
[Blue solid line]	10-20 YR. GRAVITY SEWER PIPE
[Green dashed line]	10-20 YR. LIFT STATION
[Green solid line]	5-10 YR. FORCEMAIN SEWER PIPE
[Green solid line]	5-10 YR. GRAVITY SEWER PIPE
[Green solid line]	5-10 YR. LIFT STATION
[Red dashed line]	0-5 YR. FORCEMAIN SEWER PIPE
[Red solid line]	0-5 YR. GRAVITY SEWER PIPE
[Red solid line]	0-5 YR. LIFT STATION
[Black line]	EXISTING SEWER PIPE
[Black line]	EXISTING LIFT STATION
[Black line]	EXISTING N/C MANHOLE
[Black line]	EXISTING JOHNSTON MANHOLE
[Black line]	5-YR. HORIZON DEVELOPMENT
[Black line]	G.U.S. DELINEATED WETLANDS
[Black line]	EXISTING SEWER SERVICED AREAS

6.1.21 Sewershed No.28

Sewershed 28 is located in the central western section of the Town. The majority of sewershed 28 is located west of I-295, with some residential development located east of I-295. The entire sewershed encompasses approximately 895 acres of land, of which only a small portion is currently served by sanitary sewers. Approximately 67 acres (8 percent) of the overall sewershed are RIGIS delineated wetlands, with a portion of the Jillson Reservoir encroaching into the north-central section of the sewershed.

The topography of sewershed 28 is moderately sloped from the high point at elevation 502 feet on Central Pike to the low point at the intersection of Central Avenue and Atwood Avenue at elevation 123 feet.

Currently, the majority of the sewershed utilizes onsite wastewater treatment systems for sanitary wastewater disposal. There are two streets adjacent to Atwood Avenue that are served with sanitary sewers. The sewershed is predominately developed with residential dwellings and some commercial development along the fronting lots of Atwood Avenue. Some areas of vacant land are present within the sewershed and are marked for potential development. The majority of vacant parcel are adjacent to the Central Landfill. The nearest existing sewer is located within Atwood Avenue.

Pending development projects identified by the Town include one single-family residence associated with Mangiarelli's Deli, projected to occur within the 0 – 5 Year Planning Horizon. The build-out of vacant parcels identified the potential for an additional 37 residential units (Bishop Hill Road/ R-15 Zone) within the 5 – 10 Year Planning Horizon and two projects identified by the Town are an additional 33 residential units (Reservoir Avenue/ R-15) and Briarecliff Gardens, an assisted Living Facility proposed within the 10 – 20 Year Planning Horizon. In addition, the evaluation of new sewers in this area was conducted with the assumption that the RIRRC may connect to the NBC collection system on Central Avenue in the next 0 – 5 year timeframe, in lieu of pumping to Cranston. The RIRRC flow is anticipated to consist of flow from the Central Landfill and the Lakeside Commerce Center. This flow is anticipated to discharge through a connection on Central Avenue.

The proposed improvements to sewershed 28 include the installation of sewer pipe within Central Avenue and neighborhoods to the north and south. The Central Avenue extension from the Atwood Avenue 27-inch interceptor will consist of a 24-inch sewer pipe from Atwood Avenue to Old Pocasset Road, a 15-inch sewer pipe from Old Pocasset Road to Reservoir Avenue, and 1,900 linear feet within Reservoir to Peppermint Lane. The existing neighborhood east of Interstate 295, such as Falcon Crest Drive, Dawn Drive, Young Lane, Earl Drive, Power Avenue, and Barbara Court, will be served with 8-inch sewer pipes from the Central Avenue Extension. Roadways such as Linwood Drive, Tevers Drive and Lillian Road will require an 8-inch extension from the existing sewers in Old Road and Brown Drive. Extensions west of 295 consist of 8-inch pipes on Old Pocasset Road, Apple Tree Lane and into the residential neighborhoods of Reservoir Avenue and Bishop Hill Avenue.

The improvements will include a total use of 35,100 linear feet of 8-inch pipe, 6,000 linear feet of 15-inch, and 6,300 linear feet of 24-inch gravity sewer pipe. Legal fees for the development of one utility easement through one private parcel and permitting for a wetlands alteration with the RI DEM would be a part of the improvements to this sewershed for a cross-country sewer installation as indicated in Figure 6-21 for the residential dwelling on Old Pocasset Road north of Central Avenue. The piping layout within Figure 6-21 allows for a section of 20-foot deep sewer at the intersection of Reservoir Avenue and Central Avenue, but becomes shallow further east on Central Avenue. To avoid a sewer depth of 20-feet, sewershed 28 would require the use of an additional pump station as an alternative.

Future sewers to approximately 120 existing residential structures (R-40 Zone) east of I-295 are projected to occur within the 5 – 10 Year Planning horizon, with 273 residential structures and 5 commercial units (R-40 Zone) projected to occur within the 10 – 20 Year Planning Horizon and 10 – 20 Year Planning Horizon. Costs associated with these improvements are shown in Table 6-25.

TABLE 6-25				
SEWERSHED 28 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
20-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	35,100	\$ 53.35	/LF	\$ 2,574,650.00
b. Gravity Line Installation (15-inches)	6,000	\$ 78.96	/LF	\$ 593,736.11
c. Gravity Line Installation (24-inches)	6,300	\$ 107.22	/LF	\$ 801,476.67
2.Maholes	206	\$ 2,500.00	/EACH	\$ 515,000.00
3.Rock Removal (5%)	3,511	\$ 100.00	/CY	\$ 351,100.00
4.Pavement Restoration (town)	22,107	\$ 100.00	/TON	\$ 2,210,683.33
5.Traffic Protection	948	\$ 960.00	/DAY	\$ 910,080.00
6.New Service Connection	450	\$ 4,000.00	/EACH	\$ 1,800,000.00
7.Pump Station Construction	0	-	/LS	\$ -
8.Legal Fees for Easement Development	1	\$ 10,000.00	/PARCEL	\$ 10,000.00
			Sub-Total	\$ 9,766,726.11
9.Mobilization/Demobilization (10%)				\$ 977,000.00
10.Utility Coordination (5%)				\$ 488,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)				\$ 977,000.00
12.Contingency (20%)				\$ 2,442,000.00
			SEWERSHED TOTAL	\$ 14,700,000.00



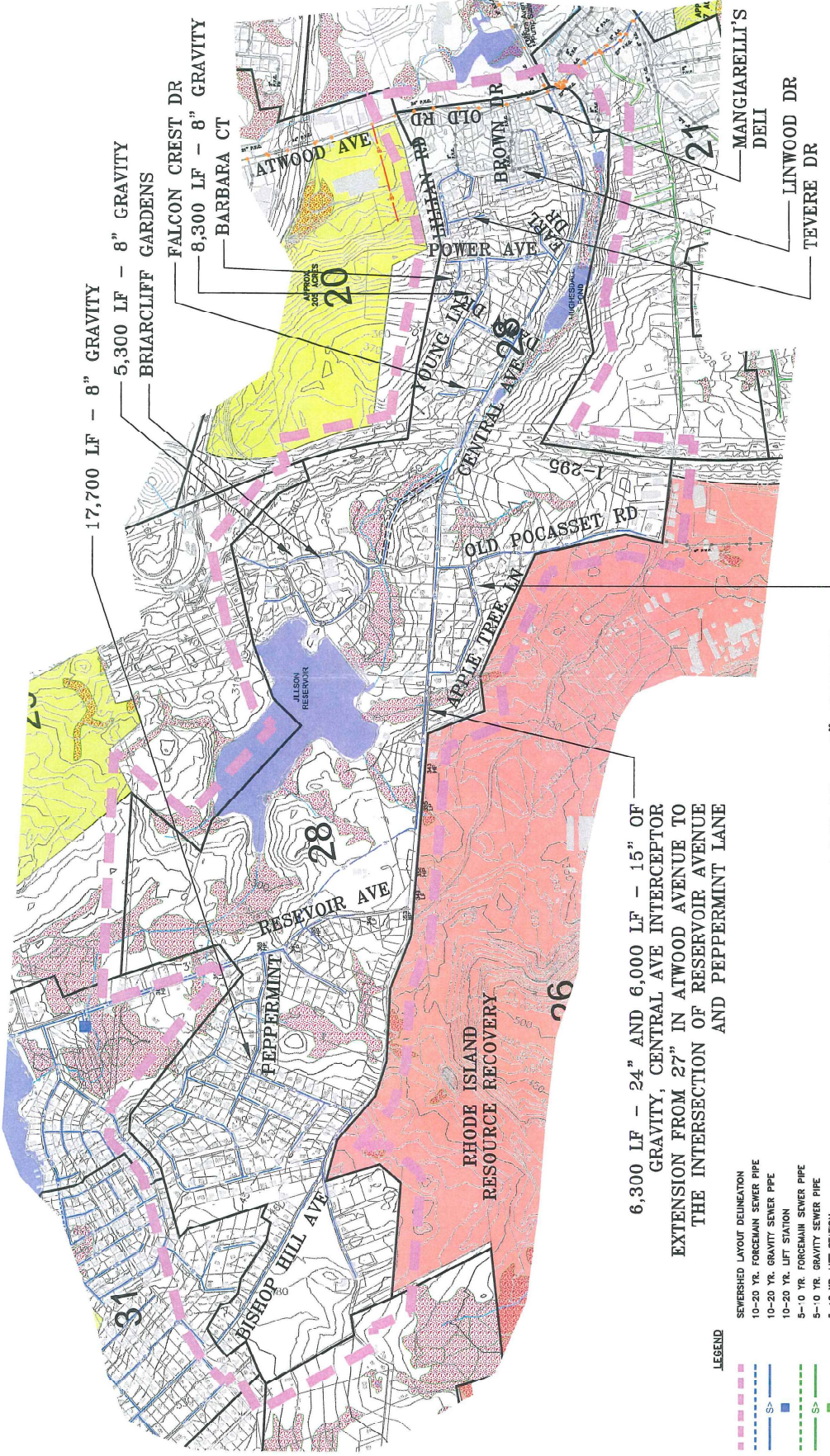
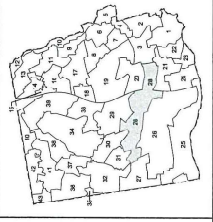
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TOWN OF JOHNSTON FACILITIES PLAN
SEWER IMPROVEMENTS
SEWERED NO. 28
BISHOP HILL, RESEVOIR AVE & CENTRAL AVE

SCALE: 1" = 1200'
FIGURE:

6-21



17,700 LF - 8" GRAVITY

5,300 LF - 8" GRAVITY

BRIARCLIFF GARDENS

FALCON CREST DR

8,300 LF - 8" GRAVITY

BARBARA CT

ATWOOD AVE

1-295

POWER AVE

BROWN DR

21

MANGIARELLI'S DELI

LINWOOD DR

TEVERE DR

20

ALFORD 207 ACRES

YOUNG LN

28

CENTRAL AVE

1-295

OLD POCASSET RD

APPLE TREE LN

26

RHODE ISLAND RESOURCE RECOVERY

28

RESEVOIR AVE

PEPPERMINT

28

BISHOP HILL AVE

31

6,300 LF - 24" AND 6,000 LF - 15" OF GRAVITY, CENTRAL AVE INTERCEPTOR EXTENSION FROM 27" IN ATWOOD AVENUE TO THE INTERSECTION OF RESEVOIR AVENUE AND PEPPERMINT LANE

4,000 LF - 8" GRAVITY

LEGEND

- SEWERED LAYOUT DELINEATION
- 10-20 YR. FORCEMAIN SEWER PIPE
- 10-20 YR. GRAVITY SEWER PIPE
- 10-20 YR. LIFT STATION
- 5-10 YR. FORCEMAIN SEWER PIPE
- 5-10 YR. GRAVITY SEWER PIPE
- 5-10 YR. LIFT STATION
- 0-5 YR. FORCEMAIN SEWER PIPE
- 0-5 YR. GRAVITY SEWER PIPE
- 0-5 YR. LIFT STATION
- EXISTING SEWER PIPE
- EXISTING LIFT STATION
- EXISTING NBC MANHOLE
- EXISTING JOHNSTON MANHOLE
- 5-YR HORIZON DEVELOPMENT
- C.I.S. DELINEATED WETLANDS
- EXISTING SEWER SERVICED AREAS

6.1.22 Sewershed No.29

Sewershed 29 is located west of I-295 along the Hartford Avenue corridor. The entire sewershed encompasses approximately 530 acres of land, of which none (0 acres) are currently served by sanitary sewers. Approximately 74 acres (14 percent) of the overall sewershed are RIGIS delineated wetlands, with a portion of the Jillson Reservoir encroaching into the southwestern section of the sewershed. Constraints for future development within the sewershed include RI DEM regulated streams, wetlands, and a reservoir. Refer to Figure 6-22.

The topography of Sewershed 29 is moderately sloped. The high point of the sewershed is roughly in the center at elevation at 415 feet. Topography slopes away from the high point in a westerly, southerly, and easterly direction. The lowest point in the sewershed is at 226 feet near Jillson Reservoir.

The sewershed is sparsely developed with only a few commercial developments on Hartford Avenue. The nearest existing sewers are located within Hartford Avenue at the intersection of Hartford Avenue and Memorial Drive or directly east of I-295.

Pending development projects identified by the Town include Johnston Commons, a large-scale commercial development project located along Hartford Avenue and projected within the 0 – 5 Year Planning Horizon.

An addition of 4,900 linear feet of 15-inch pipe will be required from the Hartford Avenue extension of 15-inch pipe installed during sewershed 19 improvements picked up at Interstate 295 and installed to the Hartford Avenue Service Road to serve the projected and existing development generated wastewater flows.

Future sewers to approximately 9 existing residential structures and 4 commercial units fronting along Hartford Avenue are also projected to occur within the 0 – 5 Year Planning Horizon. Costs associated with these improvements are shown in Table 6-26.

TABLE 6-26				
SEWERSHED 29 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
5-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (15-inches)	4,900	\$ 78.96	/LF	\$ 484,884.49
2.Manholes	25	\$ 2,500.00	/EACH	\$ 62,500.00
3.Rock Removal (5%)	363	\$ 100.00	/CY	\$ 36,300.00
4.Pavement Restoration (town)	2,285	\$ 100.00	/TON	\$ 228,530.56
5.Traffic Protection	98	\$ 960.00	/DAY	\$ 94,080.00
6.New Service Connection	29	\$ 4,000.00	/EACH	\$ 116,000.00
7.Pump Station Construction	0	-	/LS	\$ -
8.Legal Fees for Easement Development	0	\$ 10,000.00	/PARCEL	\$ -
			Sub-Total	\$ 1,022,295.05
9.Mobilization/Demobilization (10%)			\$	102,000.00
10.Utility Coordination (5%)			\$	51,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)			\$	102,000.00
12.Contingency (20%)			\$	255,000.00
			SEWERSHED TOTAL	\$ 1,600,000.00



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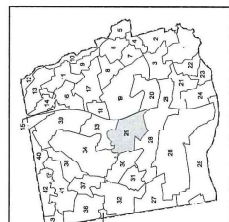
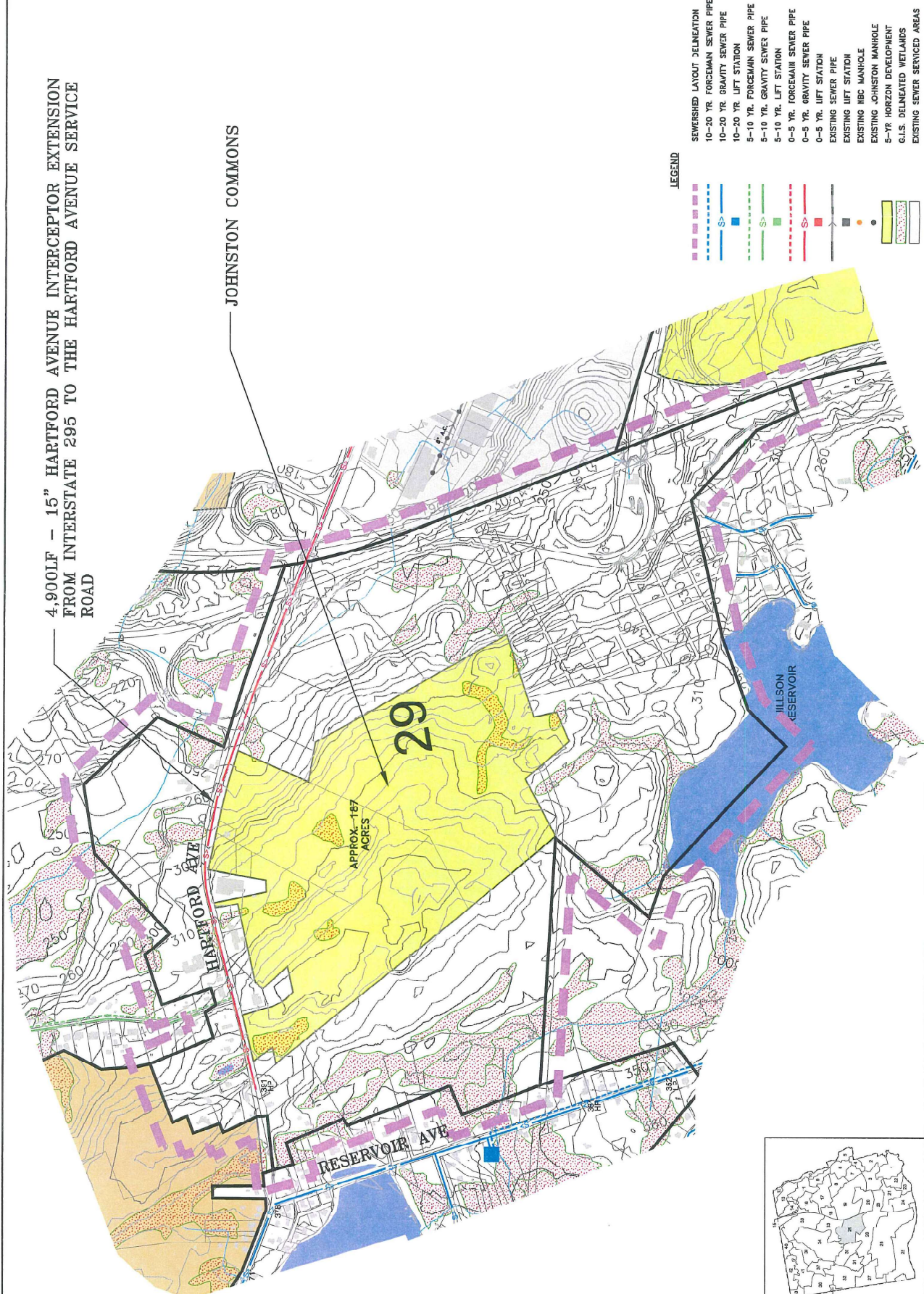
TOWN OF JOHNSTON FACILITIES PLAN
SEWER IMPROVEMENTS
SEWERED NO. 29
RESERVOIR AVE AND HARTFORD AVE

SCALE: 1" = 800'
FIGURE:

6-22

4,900LF - 15" HARTFORD AVENUE INTERCEPTOR EXTENSION
FROM INTERSTATE 295 TO THE HARTFORD AVENUE SERVICE
ROAD

JOHNSTON COMMONS



6.1.23 Sewershed No.30

Sewershed 30 is located immediately adjacent of Oak Swamp Reservoir in a densely developed residential neighborhood that is fully built out. The entire sewershed encompasses approximately 270 acres of land, of which none (0 acres) are currently served by sanitary sewers. Approximately 107 acres (36 percent) of the overall sewershed is the Oak Swamp Reservoir or wetlands associated with the reservoir. Constraints for future improvements include RI DEM regulated streams, wetlands and the Oak Swamp Reservoir.

The topography of Sewershed 30 is moderately sloped, generally downward from high points north of Hartford Avenue along Byrd Street (elevation of 450 feet) and south of the reservoir on Hill Top Drive (elevation of 440 feet). The sewershed is generally shaped like a bowl and drains to Oak Swamp Reservoir.

The sewershed is almost completely built out with residential development (R-20/R-40 Zones). The nearest existing sewers are located within Hartford Avenue approximately 2.0 miles east of the sewershed eastern limits.

Proposed improvements to sewershed 30 will include the use of a pump station that will serve all existing development within the sewershed. Neighborhoods northwest and southeast of the reservoir will be sewerred by 8-inch gravity lines, which will discharge to the pump station. The pump station will discharge all sanitary flows to the proposed 24-inch in Central Avenue requiring approximately 2,400 linear feet of 4-inch force main. The sewerred of neighboring sewersheds will require the use of additional lift stations, which will ultimately discharge to sewershed 30. Therefore, the sewer attributes of sewershed 30 were sized to handle additional flows from other contributing sewersheds, such as sewersheds 31, 32, 35, 36, 37, and 38. Although sewersheds 35, 36, 37, and 38 are not planned to be part of the overall 20-year Planning Horizon, all proposed sewer pipes were conceptually sized for their eventual connection.

The improvements to sewershed 30 will include a total use of 8,850 linear feet of 8-inch gravity pipe, 4,900 linear feet of 12-inch gravity pipe, one pump station and approximately 3,200 linear feet of 4-inch force main. The piping layout within Figure 6-23 illustrates the use of the 12-inch gravity pipe within Hartford Avenue and Reservoir Avenue. This 12-inch pipe will also convey predetermined future sanitary flows to the pump station from neighboring sewersheds [32, 35, 36,

37, 38]. A small section of this 12-inch pipe may reach a depth of 20-feet for an approximate length of 600-feet, however, reaching more desirable depths shortly downstream. An alternate strategy would be to install a pump station at the bottom of Scenic View Drive and pump wastewater up to Hartford Avenue. Although, given the cost of an additional pump station, and the additional force main required, it doesn't appear to be cost effective.

Future sewers to approximately 109 existing residential structures within the sewershed are projected to occur within the 10 – 20 Year Planning Horizon. Costs associated with these improvements are shown in Table 6-27, provided below.

TABLE 6-27 SEWERSHED 30 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
20-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	8,850	\$ 53.35	/LF	\$ 649,163.89
a. Gravity Line Installation (12-inches)	4,900	\$ 64.87	/LF	\$ 415,855.74
d. Force Main Installation (4-inches)	2,400	\$ 47.45	/LF	\$ 114,364.44
2.Manholes	77	\$ 2,500.00	/EACH	\$ 192,500.00
3.Rock Removal (5%)	1,019	\$ 100.00	/CY	\$ 101,900.00
4.Pavement Restoration				
a. Town owned Road	4,641	\$ 100.00	/TON	\$ 464,056.94
b. State owned Road	3,035	\$ 100.00	/TON	\$ 303,472.22
5.Traffic Protection	275	\$ 960.00	/DAY	\$ 264,000.00
6.New Service Connection	109	\$ 4,000.00	/EACH	\$ 436,000.00
7.Pump Station Construction (500k GPD)	1	\$ 583,000.00	/LS	\$ 583,000.00
8.Pump Station Telemetry	1	\$ 10,000.00	/LS	\$ 10,000.00
9.Legal Fees for Easement Development	0	\$ 10,000.00	/PARCEL	\$ -
			Sub-Total \$	3,534,313.24
10.Mobilization/Demobilization (10%)			\$	353,000.00
11.Utility Coordination (5%)			\$	177,000.00
12.Engineering/Design/Permitting/Construction Admin (10 %)			\$	353,000.00
13.Contingency (20%)			\$	883,000.00
			SEWERSHED TOTAL \$	5,400,000.00



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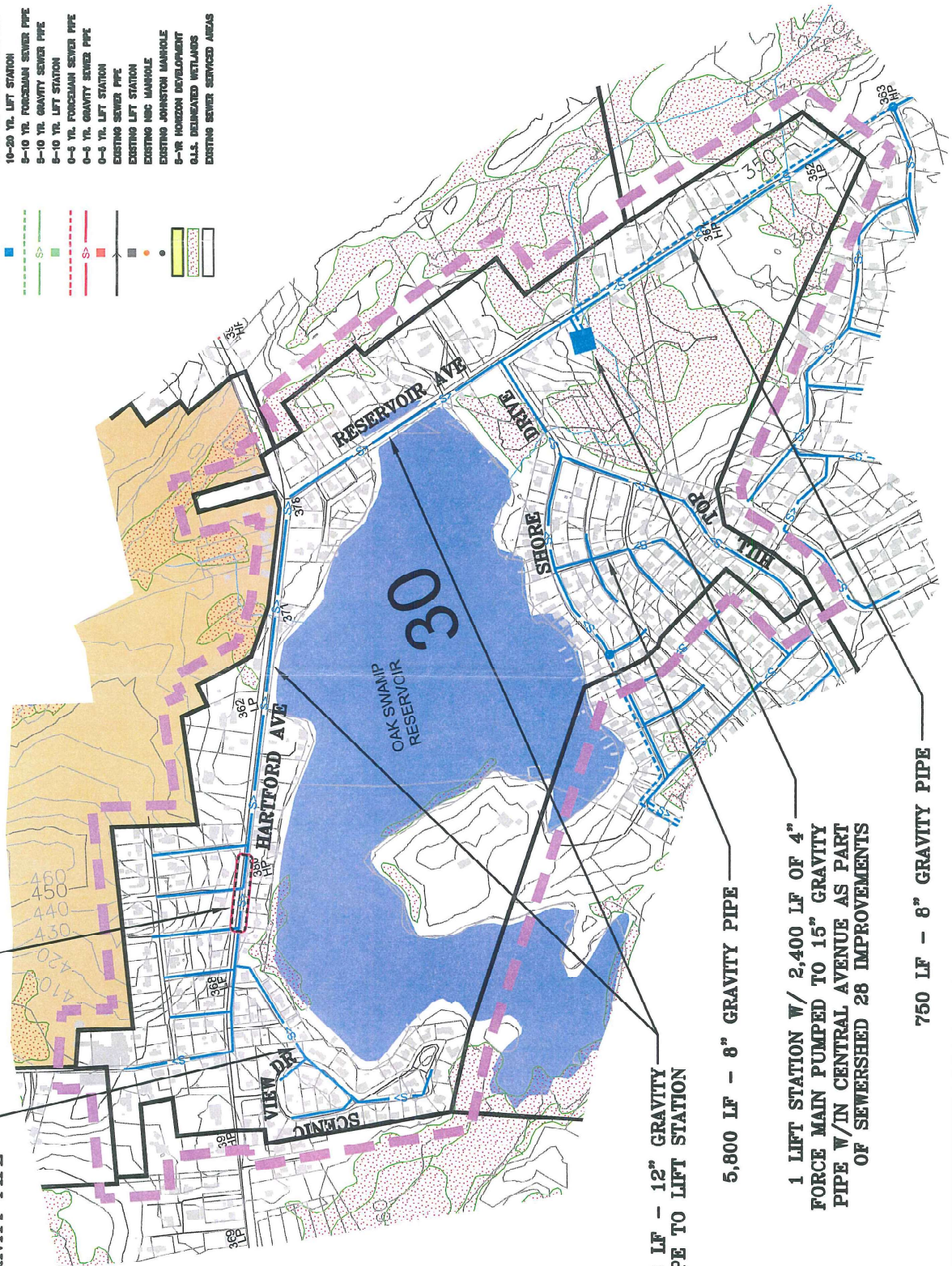
TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 SEWERSHED NO. 30
 HARTFORD AVE, RESERVOIR AVE, & SHORE DR

SCALE: 1" = 600'
 FIGURE:

6-23

- LEGEND**
- SEWERSHED LAYOUT DELINEATION
 - 10-20 YR. FORCEMAIN SEWER PIPE
 - 10-20 YR. GRAVITY SEWER PIPE
 - 10-20 YR. LIFT STATION
 - 5-10 YR. FORCEMAIN SEWER PIPE
 - 5-10 YR. GRAVITY SEWER PIPE
 - 5-10 YR. LIFT STATION
 - 0-5 YR. FORCEMAIN SEWER PIPE
 - 0-5 YR. GRAVITY SEWER PIPE
 - 0-5 YR. LIFT STATION
 - EXISTING SEWER PIPE
 - EXISTING LIFT STATION
 - EXISTING INPc MANHOLE
 - EXISTING JOHNSTON MANHOLE
 - 5-YR. HORIZON DEVELOPMENT
 - C.L.S. DELINEATED WETLANDS
 - EXISTING SEWER SERVED AREAS

SECTION OF PIPE >15 FT DEEP
 2,300 LF - 8" GRAVITY PIPE

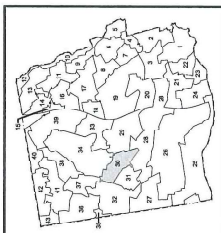


4,900 LF - 12" GRAVITY PIPE TO LIFT STATION

5,800 LF - 8" GRAVITY PIPE

1 LIFT STATION W/ 2,400 LF OF 4" FORCE MAIN PUMPED TO 15" GRAVITY PIPE W/IN CENTRAL AVENUE AS PART OF SEWERSHED 28 IMPROVEMENTS

750 LF - 8" GRAVITY PIPE



6.1.24 Sewershed No.31

Sewershed 31 is located south of the Oak Swamp Reservoir in a densely developed residential neighborhood that is almost completely built out. The entire sewershed encompasses approximately 211 acres of land, of which none are currently served by sanitary sewers. Approximately 12 acres (6 percent) of the overall sewershed are RIGIS delineated wetlands, with a portion (19 acres) of the Oak Swamp Reservoir encroaching into the northern section of the sewershed.

The topography of Sewershed 31 is moderately to steeply sloped south to north from high points along South Golden View Drive (elevation 545 feet) and areas within Camelot Circle (elevation 490 feet) downward towards the reservoir and associated wetland bodies. Constraints for future improvements include RI DEM-regulated streams, wetlands, and the Oak Swamp Reservoir.

The sewershed is almost completely built out with residential development (R-20/R-40 Zones). The nearest existing sewers are located within Hartford Avenue approximately 2.0 miles east of the sewershed eastern limits.

Pending development projects identified by the Town include Boulder Drive Estates, a residential development project (8 single-family units/ R-40) located south of the Oak Swamp Reservoir, projected within the 0 – 5 Year Planning Horizon of the Town's Facility Plan.

Proposed improvements to sewershed 31 will include the use of a pump station that will serve all existing development within the sewershed utilizing two separate gravity piping networks. These two 8-inch gravity pipe networks will be combined at the intersection of Hilltop Drive and Forest Drive via a cross-country connection pipe at the end of Boulder Avenue. The pump station has been positioned at the lowest elevation available to combine sanitary flows from both neighborhoods. The pump station will discharge all sanitary flows to the proposed 8-inch pipe through a 3-inch force main.

The improvements will include a total use of 19,300 linear feet of 8-inch gravity pipe, one pump station, and approximately 1,200 linear feet of 3-inch force main. The piping layout within Figure 6-24 includes the use of one cross-country connection that requires easements to private property.

Future sewers to existing development for approximately 244 residential structures within the sewershed are projected to occur within the 10 – 20 Year Planning Horizon. Costs associated with these improvements are shown in Table 6-28 below.

TABLE 6-28 SEWERSHED 31 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
20-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	19,300	\$ 53.35	/LF	\$ 1,415,690.74
b. Force Main Installation (3-inches)	1,200	\$ 45.30	/LF	\$ 54,602.22
2.Manholes	101	\$ 2,500.00	/EACH	\$ 252,500.00
3.Rock Removal (5%)	1,430	\$ 100.00	/CY	\$ 143,000.00
4.Pavement Restoration				
a. Town owned Road	9,001	\$ 100.00	/TON	\$ 900,130.56
5.Traffic Protection	386	\$ 960.00	/DAY	\$ 370,560.00
6.New Service Connection	252	\$ 4,000.00	/EACH	\$ 1,008,000.00
7.Pump Station Construction (200k GPD)	1	\$ 333,000.00	/LS	\$ 333,000.00
8.Pump Station Telemetry	1	\$ 10,000.00	/LS	\$ 10,000.00
9.Legal Fees for Easement Development	2	\$ 10,000.00	/PARCEL	\$ 20,000.00
			Sub-Total	\$ 4,507,483.52
10.Mobilization/Demobilization (10%)				\$ 451,000.00
11.Utility Coordination (5%)				\$ 225,000.00
12.Engineering/Design/Permitting/Construction Admin (10 %)				\$ 451,000.00
13.Contingency (20%)				\$ 1,127,000.00
			SEWERSHED TOTAL	\$ 6,800,000.00



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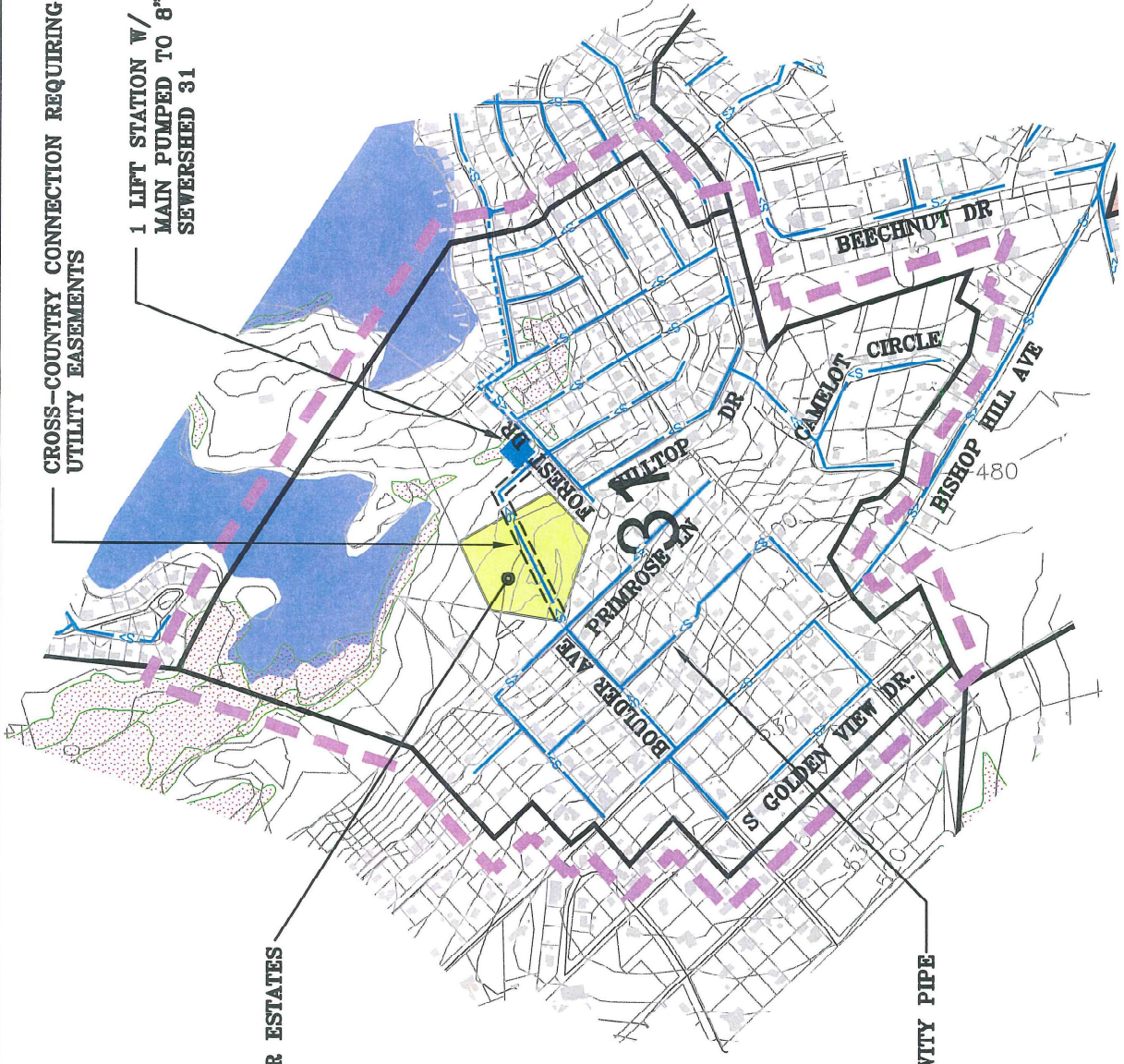
TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 SEWERSHED NO. 31
 BISHOP HILL AVE & HILLTOP DR

SCALE: 1" = 600'
 FIGURE:

6-24

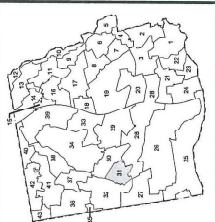
CROSS-COUNTRY CONNECTION REQUIRING
 UTILITY EASEMENTS

1 LIFT STATION W/ 1,200LF OF 3" FORCE
 MAIN PUMPED TO 8" GRAVITY PIPES W/IN
 SEWERSHED 31



LEGEND

[Pink dashed line]	SEWERSHED LAYOUT DELINEATION
[Blue dashed line]	10-20 YR. FORCEMAIN SEWER PIPE
[Blue solid line]	10-20 YR. GRAVITY SEWER PIPE
[Blue dashed line with square]	10-20 YR. LIFT STATION
[Green dashed line]	5-10 YR. FORCEMAIN SEWER PIPE
[Green solid line]	5-10 YR. GRAVITY SEWER PIPE
[Green dashed line with square]	5-10 YR. LIFT STATION
[Red dashed line]	0-5 YR. FORCEMAIN SEWER PIPE
[Red solid line]	0-5 YR. GRAVITY SEWER PIPE
[Red dashed line with square]	0-5 YR. LIFT STATION
[Black line]	EXISTING SEWER PIPE
[Black line with square]	EXISTING LIFT STATION
[Black line with circle]	EXISTING REC MANHOLE
[Black line with triangle]	EXISTING JOINTION MANHOLE
[Black line with diamond]	0-YR. HORIZON DEVELOPMENT
[Black line with square]	0-YR. DELINEATED WETLANDS
[Black line with circle]	EXISTING SEWER SERVICED AREAS



BOULDER ESTATES

19,300LF - 8" GRAVITY PIPE

6.1.25 Sewershed No.33

Sewershed 33 is located north of Hartford Avenue, east of Snake Den State Park state conservation area and just west of Interstate 295. The entire sewershed encompasses approximately 364 acres of land, of which none (0 acres) are currently served by sanitary sewers. Approximately 30 percent of the overall sewershed are RIGIS-delineated wetlands and streams. Constraints for future improvements include RI DEM-regulated streams and wetlands.

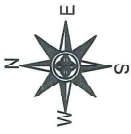
The topography of sewershed 33 is sloped moderately to steeply north to south and west to east. The high point is located along the western perimeter at the Hartford Avenue and Belfield Drive intersection (elevation of 380 feet). The low point is located at Interstate 295 (elevation 212 feet). The nearest existing sewers are located within Hartford Avenue approximately 2.0 miles east of the sewershed eastern limits.

Pending development consist of one residential dwelling addition to the overall residential neighborhood, comprised of approximately 45 dwellings. Proposed improvements to sewershed 33 will include a total use of 2,600 linear feet of 8-inch gravity pipe, one pump station, and approximately 2,500 linear feet of 3-inch force main, illustrated in Figure 6-25.

Future sewers to approximately 31 of the existing residential structures and one vacant parcel (R-40 Zone) on Belfield Drive are projected to occur within the 5 – 10 Year Planning Horizon. Based on a review of the sewershed layout and the scarcity of development along Belfield Drive, it appears to be cost effective to sewer only the first ½-mile of Belfield Drive north of Hartford Avenue. Beyond that, development is very sparse and topography and physical constraints, such as stream crossings, would make sewer installation difficult and expensive. Therefore, this area of Belfield Drive would be best suited for continued on-site wastewater treatment.

Costs associated with these improvements are shown in Table 6-29 below.

TABLE 6-29				
SEWERSHED 33 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
10-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	2,600	\$ 53.35	/LF	\$ 190,714.81
b. Force Main Installation (3-inches)	2,500	\$ 45.30	/LF	\$ 113,754.63
2.Manholes	22	\$ 2,500.00	/EACH	\$ 55,000.00
3.Rock Removal (5%)	193	\$ 100.00	/CY	\$ 19,300.00
4.Pavement Restoration				
a. Town owned Road	1,213	\$ 100.00	/TON	\$ 121,261.11
5.Traffic Protection	52	\$ 960.00	/DAY	\$ 49,920.00
6.New Service Connection	46	\$ 4,000.00	/EACH	\$ 184,000.00
7.Pump Station Construction (200k GPD)	1	\$ 333,000.00	/LS	\$ 333,000.00
8.Pump Station Telemetry	1	\$ 10,000.00	/LS	\$ 10,000.00
9.Legal Fees for Easement Development	0	\$ 10,000.00	/PARCEL	\$ -
			Sub-Total \$	1,076,950.56
10.Mobilization/Demobilization (10%)			\$	108,000.00
11.Utility Coordination (5%)			\$	54,000.00
12.Engineering/Design/Permitting/Construction Admin (10 %)			\$	108,000.00
13.Contingency (20%)			\$	269,000.00
			SEWERSHED TOTAL \$	1,700,000.00



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TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 HARTFORD AVE & BELFIELD DR

SCALE: 1" = 80'

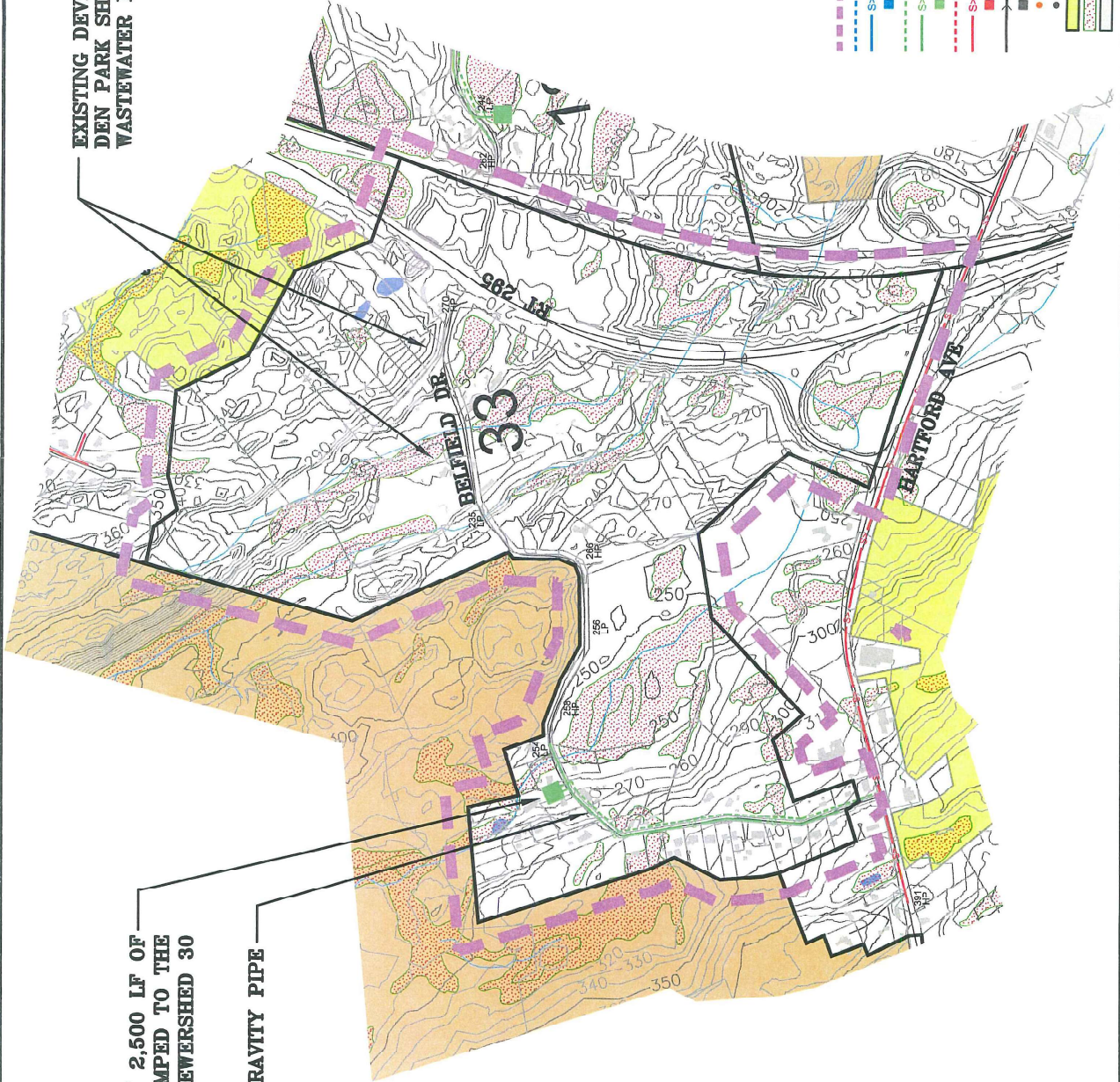
FIGURE:

6-25

EXISTING DEVELOPMENT EAST OF SNAKE
 DEN PARK SHALL UTILIZE ON-SITE
 WASTEWATER DISPOSAL SYSTEMS

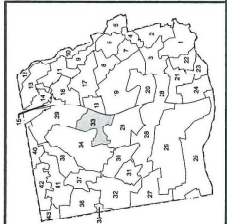
1 LIFT STATION W/ 2,500 LF OF
 3" FORCE MAIN PUMPED TO THE
 15" OF SEWERED 30

2,600 LF - 8" GRAVITY PIPE



LEGEND

- SEWERED LAYOUT DELINEATION
- 10-20 YR. FORCEMAIN SEWER PIPE
- 10-20 YR. GRAVITY SEWER PIPE
- 10-20 YR. LIFT STATION
- 0-5 YR. FORCEMAIN SEWER PIPE
- 0-5 YR. GRAVITY SEWER PIPE
- 0-5 YR. LIFT STATION
- 0-5 YR. FORCEMAIN SEWER PIPE
- 0-5 YR. GRAVITY SEWER PIPE
- EXISTING LIFT STATION
- EXISTING SEWER PIPE
- EXISTING INC MANHOLE
- EXISTING JOHNSON MANHOLE
- 0-YR. HORIZON DEVELOPMENT
- 0-YR. DELINEATED WETLANDS
- EXISTING SEWER SERVICED AREAS



6.1.26 Sewershed No.39

Sewershed 39 is located in the north-central section of Johnston, west of I-295 and north and east of Snake Den State Park. The entire sewershed encompasses approximately 580- acres of land, of which none (0 acres) are currently served by sanitary sewers. Approximately 98.2 acres (17 percent) of the overall sewershed are RIGIS-delineated wetlands. Constraints for future development include RI DEM-regulated streams and wetlands, and considerable bedrock/slope considerations.

The topography of Sewershed 39 is steeply sloped from high points along the northeast sewershed boundary (elevation 425 feet) and southeast boundary (elevation 350 feet). The sewershed's low point is located at the Interstate 295 overpass at Greenville Avenue where Assapomset Brook crosses into sewershed 16. The nearest existing sewers are located within Greenville Avenue approximately 1.5 miles away.

Pending development projects identified by the Town include Pines Condominiums (144 two and three bedroom multi-family units) and Poppy Hills (9 single-family residential units), both located west of I-295 and south of Greenville Avenue, projected to occur within the 0 – 5 Year Planning Horizon. The build-out of vacant parcels identified the potential for an additional 12 residential units (R-39 Zone), the future development of which is considerably constrained by the presence of bedrock and steep slope considerations, but projected to occur within the 10 – 20 Year Planning Horizon.

Proposed improvements to sewershed 39 will require an extension of the Greenville Avenue secondary branch beyond Interstate 295 to Brown Avenue. The initial extension proposed to occur during the 0 – 5 Year horizon will be a continuation of the 12-inch sewer extension as previously discussed within sewersheds 16 & 17 descriptions. The 12-inch sewer then extends to Brown Avenue later during the 10 – 20 Year horizon. Poppy Hill Drive, Brown Avenue, and neighboring roadways will be served 8-inch gravity sewers as indicated in Figure 6-26.

The improvements will include a total of 5,400 linear feet of 8-inch gravity pipe and 6,900 linear feet of 12-inch gravity pipe. Future sewers to existing development for approximately 65 residential structures (south of Greenville Avenue/R-39 Zone) and approximately 23 residential

structures and 10 commercial units (fronting along Greenville Avenue (R-39 Zone) are projected to occur within the 0 – 5 Year, and 10 – 20 Year Planning Horizons, respectively. Costs associated with these improvements are shown in Table 6-30 below.

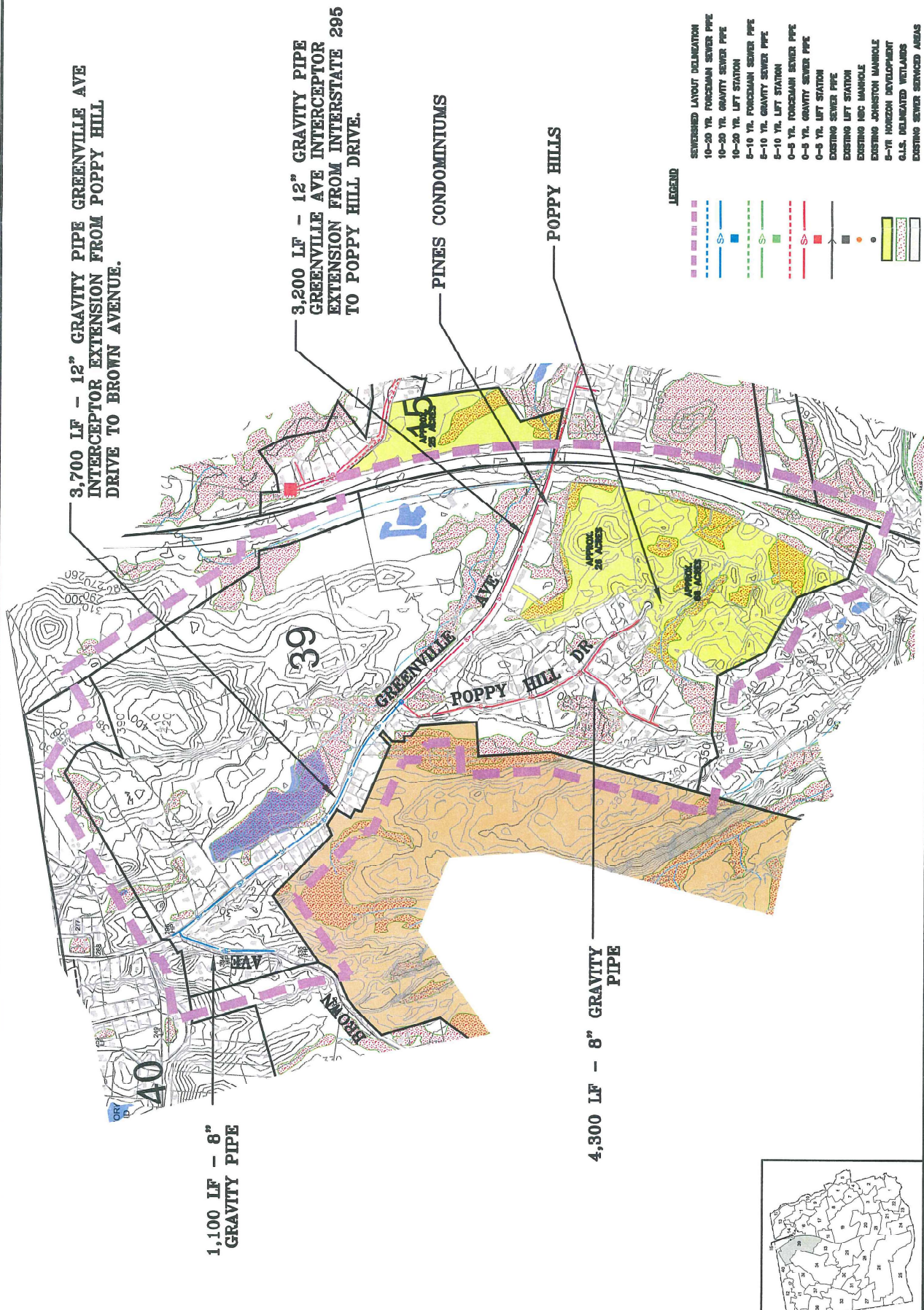
TABLE 6-30				
SEWERSHED 39 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
5-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	4,300	\$ 53.35	/LF	\$ 315,412.96
b. Gravity Line Installation (12-inches)	3,200	\$ 64.87	/LF	\$ 271,579.26
2.Manholes	38	\$ 2,500.00	/EACH	\$ 95,000.00
3.Rock Removal (5%)	556	\$ 100.00	/CY	\$ 55,600.00
4.Pavement Restoration				
a. Town owned Road	2,005	\$ 100.00	/TON	\$ 200,547.22
b. State owned Road	2,556	\$ 100.00	/TON	\$ 255,555.56
5.Traffic Protection	150	\$ 960.00	/DAY	\$ 144,000.00
6.New Service Connection	93	\$ 4,000.00	/EACH	\$ 372,000.00
7.Pump Station Construction	0	-	/LS	\$ -
8.Legal Fees for Easement Development	0	\$ 10,000.00	/PARCEL	\$ -
			Sub-Total \$	1,709,695.00
9.Mobilization/Demobilization (10%)			\$	171,000.00
10.Utility Coordination (5%)			\$	85,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)			\$	171,000.00
12.Contingency (20%)			\$	427,000.00
			5-year TOTAL \$	2,600,000.00
20-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	1,100	\$ 53.35	/LF	\$ 80,687.04
b. Gravity Line Installation (12-inches)	3,700	\$ 64.87	/LF	\$ 314,013.52
2.Manholes	24	\$ 2,500.00	/EACH	\$ 60,000.00
3.Rock Removal (5%)	356	\$ 100.00	/CY	\$ 35,600.00
4.Pavement Restoration				
a. Town owned Road	513	\$ 100.00	/TON	\$ 51,302.78
b. State owned Road	2,955	\$ 100.00	/TON	\$ 295,486.11
5.Traffic Protection	96	\$ 960.00	/DAY	\$ 92,160.00
6.New Service Connection	60	\$ 4,000.00	/EACH	\$ 240,000.00
7.Pump Station Construction	0	-	/LS	\$ -
8.Legal Fees for Easement Development	0	\$ 10,000.00	/PARCEL	\$ -
			Sub-Total \$	1,169,249.44
9.Mobilization/Demobilization (10%)			\$	117,000.00
10.Utility Coordination (5%)			\$	58,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)			\$	117,000.00
12.Contingency (20%)			\$	292,000.00
			20-year TOTAL \$	1,800,000.00
			SEWERSHED TOTAL \$	4,400,000.00



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TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 BROWN AVE, GREENVILLE AVE, & POPPY HILL DR

SCALE: 1" = 1000'
 FIGURE:
6-26



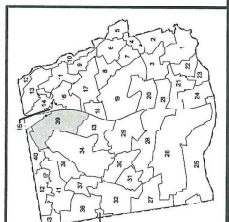
3,700 LF - 12" GRAVITY PIPE GREENVILLE AVE
 INTERCEPTOR EXTENSION FROM POPPY HILL
 DRIVE TO BROWN AVENUE.

3,200 LF - 12" GRAVITY PIPE
 GREENVILLE AVE INTERCEPTOR
 EXTENSION FROM INTERSTATE 295
 TO POPPY HILL DRIVE.

1,100 LF - 8" GRAVITY PIPE

4,300 LF - 8" GRAVITY PIPE

- LEGEND**
- SEWERED LAYOUT DELINEATION
 - 10-20 YR. FORCEMAIN SEWER PIPE
 - 10-20 YR. GRAVITY SEWER PIPE
 - 10-20 YR. LIFT STATION
 - 5-10 YR. FORCEMAIN SEWER PIPE
 - 5-10 YR. GRAVITY SEWER PIPE
 - 0-5 YR. LIFT STATION
 - 0-5 YR. FORCEMAIN SEWER PIPE
 - 0-5 YR. GRAVITY SEWER PIPE
 - EXISTING LIFT STATION
 - EXISTING SEWER PIPE
 - EXISTING M3C MANHOLE
 - EXISTING JOHNSTON MANHOLE
 - 5-YR. HORIZON DEVELOPMENT
 - CLS. DELINEATED WETLANDS
 - EXISTING SEWER SERVICED AREAS



6.2 ENVIRONMENTAL ASSESSMENT OF THE PREFERRED ALTERNATIVE

In general, the overall impact of the preferred alternative is anticipated to be minor. The vast majority of the proposed wastewater infrastructure will be constructed within the public right-of-way, which will reduce disturbance in previously undisturbed areas. Specific environmental impacts are discussed below.

6.2.1 *Traffic, Business, and Daily Activities*

As with any utility construction project, the implementation of the preferred alternative will cause minor disruptions to traffic, business, and daily activities. However, the impacts will be localized to limited areas in Town as construction happens and will be temporary in nature. Traffic impacts will be mitigated through traffic protection and maintenance via signage, police details, traffic detours, etc. Some businesses may be impacted as construction occurs along their street; however, the disruption should be temporary and short-term. Each local project will be subject to review and approval of the Town, and some cases the Rhode Island Department of Transportation (RI DOT). Each project will have an approved traffic protection plan, which should limit the overall impact of the project on traffic and business.

6.2.2 *Historical, Archeological, Cultural, and Recreational Areas*

The preferred alternative is not anticipated to have an impact on any historical, archeological, or cultural sites. However, in the event that any archeological sites are identified during the construction activity, an archeological review can be implemented and alternate routes developed.

Some minor disturbances to town-owned recreational areas are anticipated; however, they will be temporary and short-term. Specifically, the ball fields at the intersection of Central Avenue and Reservoir Avenue are anticipated to be the location of a new gravity line to serve that area of Town. While the ball fields will likely be disrupted during the installation of the sewer, construction could be phased such that any disruption happens in early spring or late fall, outside the timeframe of the ball fields' peak use.

6.2.3 *Sensitive Ecosystems*

The implementation of the preferred alternative is not anticipated to have a substantial impact on any sensitive ecosystems. The expansion of sewers will not encourage or induce development into environmental sensitive areas because the Town's CCP does not allow for development in those areas. In addition, where sewers are anticipated to cross water bodies, or to encroach on wetland buffers, the construction will be done in accordance with applicable federal and state requirements. No permanent disturbance is anticipated in those areas, and no significant temporary impact is envisioned.

6.2.4 *Pollution and Runoff*

Pollution of surface waters due to runoff will be mitigated through the use of erosion control barriers parallel to the trench alignment, such as silt fence and hay bales. In addition, construction will be stages such that only the minimum trench length needed will be open at one time, thereby limiting the exposure of stockpiled or excavated material from eroding. When stockpiled, excess soil will be covered or contained within erosion control barriers.

6.2.5 *Water Quality Impacts during Construction*

Wastewater effluent discharges during construction will not be allowed. Raw wastewater will either be bypass pumped during construction or pumped into a tank truck and shipped off-site. In the event that construction dewatering is necessary, effluent discharges from the dewatering operating will be conveyed to a settling basin, filter basin, frac tank, etc. before being allowed to discharge into a closed storm water drainage system or surface water body.

6.2.6 *Displacement of Households, Businesses, or Services*

The implementation of the preferred alternative is not anticipated to displace any households or businesses, or to disrupt public services to town residents.

6.2.7 *Air Pollutants, Noise, and Visual Impacts*

Air and noise pollutants during construction will be those typical of any utility construction project. Air pollutants will include dust from the excavation activities and exhaust from the construction equipment. Dust can be mitigated through typical dust control measures. The exhaust from the equipment will be carefully monitored for public complaints. In the event that exhaust becomes a nuisance in residential or commercial areas, construction activities will either be staged or limited to certain hours of the day in order to minimize the impact that exhaust will have on the public.

The primary components of the preferred alternative that are anticipated to have long-term odor concerns are the proposed pump stations. Odor at wastewater pump stations is a concern in general, but can be mitigated through careful design and site selection. During the design of these pump stations, care should be taken to reduce hydraulic residence time in the wet wells, which will reduce the generation of odors. In addition, careful site selection can reduce exposure to odors. Finally, if odors become an issue, there are numerous odor control measures that can be employed, such as carbon filters, masking agents, chemical oxidation, etc.

Visual impacts of the project will be minor. During construction, there will be temporary visual impacts at each construction site, but those will be limited to the construction duration. In general, the buried sewer lines will have almost no permanent visual impact. The proposed pump stations will be visible on a permanent basis. In some cases, small stations will be installed below ground, in order to reduce their overall visual impact. However, some large stations may require aboveground structures. Those structures will be designed to reduce their overall visual impact by providing aesthetic façades and vegetative buffers. Overall, the implementation of the preferred alternative is not anticipated to have a significant impact on the overall aesthetic quality of the Town or the aesthetic quality of any particular neighborhood.

6.2.8 *Demographic and Public Service Changes as a Result of Preferred Alternative*

There will likely be a change in demographics as the preferred alternative is implemented; however, that is partially the intent of the preferred alternative. The CCP and the State Guide

Plan identify the use or public utilities, including sewer, as a means of promoting economic development in Johnston (or the urban service area, as designated in the State Guide Plan).

As a result of the preferred alternative, and the subsequent economic development in town, there may be an increase in air and noise pollution, solid waste production, demand for potable water, and demand for public services. However, these are indirect results of the preferred alternative and more direct results of the desired economic development of the Town, they are somewhat outside the scope of this Facility Plan. These issues are addressed on a town-wide basis in the Town's CCP.

6.2.9 Potential Discovery of Contaminated Soil and/or Groundwater

In areas where there may be a substantial likelihood of contamination in soil and/or groundwater, such as areas around the Central Landfill or areas around listed EPA CERCLA sites, a subsurface investigation may be conducted prior to the sewer or pump station installation. The need for an investigation will be based on the field observations made during the geotechnical investigation (if conducted) or the results of a due diligence evaluation, such as a Phase I Environmental Site Assessment.

In the event that contaminated soil and or groundwater is encountered during the subsurface investigation or during the construction of a future sewer main or pump station, the Rhode Island Department of Environmental Management (RI DEM) Office of Waste Management, Site Remediation Group will be notified in accordance with the section 5 of the RI DEM Site Remediation Regulations. From that point forward, the discovery of the release will be addressed in accordance with the Site Remediation Regulations, Sections 7 and 8. Contaminated soil or groundwater encountered during construction will be handled and disposed of in accordance with the RI DEM-approved Remedial Action Work Plan developed for each specific release.

6.3 INDIRECT IMPACTS OF THE PREFERRED ALTERNATIVE

Expanding sewer service into presently unsewered areas of town will likely increase land use pressures, particularly where soil conditions have previously limited the use of on-site wastewater treatment systems. These increased pressures could result in less stringent enforcement of local codes and bylaws, particularly when it comes to economically viable or publicly popular development projects. Increased urbanization can lead to an increase in air pollution, noise,

traffic, and a reduction in public services. However, as discussed in previous sections, expanding public utilities, particularly sewer, in Johnston is consistent with the Town's CCP and the State Guide Plan. Therefore, the Town anticipates the increased pressures and resulting urbanization that will accompany an expanded wastewater collection system and is preparing to address those issues through the continued development of their CCP.

SECTION 7.0

PRELIMINARY DESIGN AND COST ESTIMATES

7.1 DESIGN CRITERIA

The preferred alternative was evaluated and conceptually designed using industry standard guidelines. Those guidelines include, but were not limited to;

1. Rhode Island Department of Environmental Management, Office of Water Resources, *Flow Estimation Policy for the Design of Sanitary Sewers*.
2. New England Interstate Water Pollution Control Commission, Technical Report #16, *Guide for the Design of Wastewater Treatment Works*, 1998 Edition (TR-16).
3. Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, *Recommended Standards for Wastewater Facilities*, 1997 Edition (Ten State Standards).

Specific criteria for the conceptual design of certain components of the preferred alternative are provided below.

7.1.1 Gravity Sewer

Typically, 8-inch diameter pipes are the smallest diameter pipes installed for public wastewater collection systems. Pipes larger than 8-inches were evaluated against the future anticipated peak flow. For sizing purposes, it was assumed that the sewers would be installed at or close to their minimum slopes, as provided in TR-16, which would provide the lowest capacity in each line, and therefore provide a conservative estimate of the necessary pipe size. Steeper slopes would result in greater pipe capacity and would reduce the need for large diameter pipes. The capacity was then estimated for various pipe sizes installed at their minimum slopes (e.g., 12-inch pipe installed at a slope of 0.0022 ft/ft) and then compared to the anticipated flow in order to establish a pipe size for that line. It was assumed that during peak flows, the pipe should be flowing no more than 50 percent full, as measured relative to the depth of flow over the pipe diameter (i.e., d/D). This would allow for some limited expansion of the customer base in each sewershed in the future. This would also provide some capacity in the line for future I/I, should that become a

problem. The 50 percent d/D was threshold was used as a guideline, not as a rigorous design requirement. In some cases, the estimated d/D slightly exceeded 50 percent of the proposed line. Table 7-1 shows the capacity threshold for each pipe size up to 42-inches.

TABLE 7-1: Threshold Capacities for Varying Pipe Sizes		
Pipe Diameter (inches)	Minimum Slope (ft/100 ft)	Threshold Capacity (gpm)
8	0.4	223
12	0.22	487
15	0.15	729
18	0.12	1,061
21	0.1	1,461
24	0.08	1,866
27	0.067	2,337
30	0.058	2,880
36	0.046	4,171
42	0.037	5,643

Typically, sewers are buried no less than 4 to 5 feet below grade. In most locations, sewers will be buried as shallow as practical in order to keep costs down. However, it is anticipated that some very limited portions of sewer will be as deep as 20 feet. In addition, some sewers will be buried lower than the minimum depths in order to avoid utilities and to tie into existing sewers. Therefore the average depth of burial assumed for this project was 8-feet. The average trench width was assumed to be 5 feet.

TR-16 recommends that manholes be installed no more than every 400 feet for sewers 15-inches or smaller, and no more than 500 feet for sewers 18-inches to 30 inches. However, manholes are also needed at changes in grade, size, alignment, or intersections, which typically means they are installed at a frequency much higher than 1 every 400 feet. For cost estimating purposes, it was assumed that the installation frequency for this project would be approximately 1 every 200 feet of pipe. This may vary significantly from one sewershed to another, and would be addressed during the design of the collection system in each sewershed.

7.1.2 Pressure Sewers

Pump Stations

Future pump stations would be sized and designed in accordance with industry standard guidelines, such as TR-16 or Ten States Standards. In addition, future pump stations would be designed in accordance with local and State building codes. As part of the project, the pump stations were only conceptually sized based on the estimated peak inflow rate of the contribution sewershed. The type or style pump station that would be utilized in any particular sewershed would be based on the contributing flow, the site available for installation, environmental constraints, aesthetic considerations, etc. Each of these conditions will be evaluated on a case-by-case basis during the implementation of the preferred alternative. However, at a minimum each pump station will meet certain minimum design criteria, such as:

- Each station will have a minimum of two pumps, with each pump sized to accommodate the estimated peak flow.
- Each station will have the capacity to pass a minimum 3-inch diameter sphere or will be provided with a grinder style pump or a comminutor at the inlet to the wet well.
- The average hydraulic residence time will not exceed 30 minutes (to control odors).
- Adequate pump protection will be provided to prevent damage from grit, solids, or short cycling.
- Controls will be provided to cycle the pumps and to provide alarm conditions when any one pump fails to start, or wet well levels fall below or rise above safe levels.
- Pump stations will be adequately ventilated to prevent the build-up of sewer gas.
- Electrical components will be design to prevent transient voltage that could result in a short circuit. Electrical components in the wet well will be explosion proof.
- Pump stations will have some type of telemetry system to communicate alarm conditions to the operators. The nature of the telemetry is not yet determined at this time.

Force Main

Future force mains will be constructed from ductile iron, PVC (minimum SDR 21 pressure rating or greater), or high-density polyethylene. Force mains will be sized to provide no less than 3 feet/sec. When serving a solids handling pump, the force main shall be no less than 4-inches in diameter. When serving a submersible grinder pump, or a station with a comminutor, the force main shall be no less 2-inches in diameter.

As far as possible, the alignment of the force main shall have a consistent upward profile. Air release manholes will be provided as necessary at high points in the force main. Clean-out manholes will be installed no less than every 300 feet along the force main alignment.

7.2 CAPITAL COSTS

The capital cost to expand the sewer in Johnston, in accordance with the preferred alternative, is estimated to be approximately \$101 M. This cost includes construction, design and engineering, permitting, and a 20 percent contingency. The costs are presented in 2010 dollars and do not reflect inflation. The current ENR cost index as of October 2010 is 8.920.45. A detailed breakdown of cost per sewershed is provided in Section 6 of this Facility Plan. The costs are summarized by planning horizon in Table 7-2, provided below.

TABLE 7-2 - OPINION OF PROBABLE CONSTRUCTION COSTS PER SEWERSHED**							
Sewershed	0-5 Year Horizon		5-10 Year Horizon		10-20 Year Horizon		Total Cost per Sewershed
	Town Costs	NBC Costs	Town Costs	NBC Costs	Town Costs	NBC Costs	
1	\$1,000,000	\$0	\$1,500,000	\$0	\$0	\$2,800,000	\$5,300,000
3	\$1,000,000	\$0	\$28,000	\$0	\$0	\$0	\$1,028,000
4	\$0	\$0	\$710,000	\$0	\$0	\$0	\$710,000
6	\$8,000	\$0	\$300,000	\$0	\$0	\$900,000	\$1,208,000
8	\$0	\$0	\$520,000	\$0	\$390,000	\$0	\$910,000
9	\$540,000	\$0	\$0	\$0	\$0	\$0	\$540,000
13	\$0	\$0	\$3,100,000	\$0	\$0	\$0	\$3,100,000
14	\$0	\$0	\$1,600,000	\$0	\$0	\$0	\$1,600,000
15	\$1,700,000	\$0	\$0	\$0	\$0	\$0	\$1,700,000
16	\$1,600,000	\$0	\$2,200,000	\$0	\$0	\$0	\$3,800,000
17	\$1,070,000	\$0	\$3,700,000	\$0	\$0	\$0	\$4,770,000
18	\$0	\$0	\$1,500,000	\$0	\$0	\$0	\$1,500,000
19	\$3,000,000	\$0	\$3,600,000	\$0	\$0	\$1,100,000	\$7,700,000
20	\$90,000	\$0	\$0	\$0	\$0	\$0	\$90,000
21	\$103,000	\$0	\$3,600,000	\$0	\$0	\$900,000	\$4,603,000
22	\$610,000	\$0	\$1,200,000	\$0	\$0	\$2,400,000	\$4,210,000
23	\$0	\$0	\$2,000,000	\$0	\$0	\$0	\$2,000,000
24	\$0	\$0	\$8,100,000	\$0	\$0	\$0	\$8,100,000
25	\$0	\$0	\$5,900,000	\$0	\$7,100,000	\$0	\$13,000,000
28	\$0	\$0	\$0	\$0	\$14,700,000	\$0	\$14,700,000
29	\$1,600,000	\$0	\$0	\$0	\$0	\$0	\$1,600,000
30	\$0	\$0	\$0	\$0	\$5,400,000	\$0	\$5,400,000
31	\$0	\$0	\$0	\$0	\$6,800,000	\$0	\$6,800,000
33	\$0	\$0	\$1,700,000	\$0	\$0	\$0	\$1,700,000
39	\$2,600,000	\$0	\$0	\$0	\$1,800,000	\$0	\$4,400,000
TOTAL	\$14,900,000	\$0	\$41,300,000	\$0	\$36,200,000	\$8,100,000	\$100,500,000

**** Construction costs for sewers will be borne by the developer of the home association proposing the sewers. The Narragansett Bay Commission or the Town of Johnston will own the sewers upon completion of construction.**

SECTION 8.0

PLAN IMPLEMENTATION

8.1 PLAN IMPLEMENTATION

The first step in implementing the preferred plan is to investigate sources of I/I in the existing collection system, and then make upgrades to the system as necessary. The next step is to upgrade existing infrastructure to accommodate future anticipated flows. The final step is to expand the existing infrastructure to unsewered areas of town.

8.1.1 Inflow and Infiltration Investigation

Specific recommendations for I/I investigations include.

1. Conduct closed-circuit television (CCTV) inspections in JSI-U to further evaluate excessive infiltration contributions from the basin. CCTV inspections should be isolated to local sewers within the basin since NBC-owned interceptors have been inspected and appear to be in good condition.
2. Focused inflow investigations be conducted in Johnston-South Interceptor basins JSI-X, JSI-Y, JSI-R, JSI-S and JSI-V first and then in Johnston-North Interceptor meter basins JNI-A, JNI-I, JNI-J, and JNI-G. Preliminary inflow investigations should consist of field investigations to determine if catch basins and downspouts are tied into storm drains or sanitary sewer. Potential inflow sources identified on Table 3-1 should also be included in this preliminary investigation. Based on the findings of the preliminary investigation, a decision will be made as to whether or not further investigation using smoke testing should be conducted.
3. Damaged or leaking manholes identified in Chapter 3 [of the SSES] be repaired.

8.1.2 Upgrade Existing Infrastructure for Future Flows

To accommodate future flow, and in some cases address existing system deficiencies, the following upgrades to the NBC-owned interceptors are recommended.

1. Upgrade the existing 30-inch interceptor on and parallel to Plainfield Street with a new 42-inch pipe. This would include approximately 6,900 feet of pipe between manholes J100056 and J190017.
2. Upgrade the existing 27-inch interceptor on Atwood Avenue from Central Avenue to Plainfield Street with a new 36-inch pipe. This would include approximately 5,900 feet of pipe between manholes I90022 and H110020.
3. Upgrade the existing 8-inch secondary interceptor on Hartford Avenue with a new 12-inch pipe. This would include approximately 2,700 feet of pipe between manholes H130023 and H130019.
4. Upgrade the existing 8-inch and 10-inch secondary interceptor on Borden Avenue with a new 12-inch pipe. This would include approximately 2,200 feet of pipe between manholes I130012 and I130002.

8.2 INSTITUTIONAL RESPONSIBILITIES

The Town is responsible for the existing collection system, with the exception of the major interceptors. The Town took ownership of the collection system in 1972 when the Johnston Sanitary District was dissolved and the Town took possession of their assets and control of their responsibilities (refer to Appendix H). In addition, the Town is required to provide support, through the implementation of an On-site Wastewater Management Program, to those areas of Town that do not have sewers.

Treatment of collected wastewater is the responsibility of NBC, and is done at their Field's Point Wastewater Treatment Facility. In addition, NBC is responsible for the major interceptors in Johnston. In 1983, the ownership of the interceptors in Johnston was conveyed to NBC through an Acquisition Agreement by and between the Town of Johnston and the Narragansett Bay Water Quality Management District Commission (refer to Appendix B).

8.3 IMPLEMENTATION SCHEDULE

Public approval and acquisition of adequate funding are the two critical items for moving this project forward and will ultimately drive the implementation schedule. However, for planning purposes, a hypothetical implementation schedule is provided as Figure 8-1.

8.4 OPERATION AND MAINTENANCE

Operation and maintenance of town-owned sewers is the responsibility of the Town. Operation and maintenance of the interceptor system within town is the responsibility of NBC. NBC will continue to be responsible for all capital improvements relating to the interceptor system, while the Town will be responsible for all capital improvement or expansion of the town-owned system.

8.4.1 Staffing Plan

The staffing plan for NBC is not anticipated to change significantly as a result of the implementation of the preferred alternative. The physical components of NBC's infrastructure, such as the interceptors and treatment plant are not anticipated to expand as a result of this plan. Therefore, the number of operation and maintenance personnel is not anticipated to increase. The most substantial impact to NBC staffing will likely be on an administrative basis to address the increase in sewer accounts and the corresponding increase in billings.

The amount of wastewater infrastructure in the town will gradually over many years double as a result of the preferred alternative. Therefore, it is anticipated that the Town will need to add operation and maintenance staff to address the increase in infrastructure. Additional staff members will likely be necessary to provide operation and maintenance of the expanded collection system, the additional staff won't be required immediately, but will likely be phased in as needed over time as the system is expanded.

8.5 CAPITALIZED COSTS

The capital costs for the preferred alternative could be addressed in one of several ways. The Town could issue a bond or apply for a low interest loan, individual neighborhoods could form

NBC - JOHNSTON SEWER EVALUATION FACILITY PLAN

FIGURE 8-1

	0-5 Year Horizon	5-10 Year Horizon	10-20 Year Horizon
1	Phase 1	Phase 2	
2	Phase 1	Phase 2	
3	Phase 1	Phase 2	
4	Phase 1	Phase 2	
5	Phase 1	Phase 2	
6	Phase 1	Phase 1	
7	Phase 1	Phase 1	
8	Phase 1	Phase 1	
9	Phase 1	Phase 1	
10	Phase 1	Phase 2	
11	Phase 1	Phase 2	
12	Phase 1	Phase 1	
13	Phase 1	Phase 2	
14	Phase 1	Phase 1	
15	Phase 1	Phase 2	
16	Phase 1	Phase 1	
17	Phase 1	Phase 1	
18	Phase 1	Phase 1	
19	Phase 1	Phase 1	Phase 2
20	Phase 1	Phase 1	Phase 1
21	Phase 1	Phase 1	Phase 2
22	Phase 1	Phase 1	Phase 1
23	Phase 1	Phase 1	Phase 1
24	Phase 1	Phase 1	Phase 2
25	Phase 1	Phase 1	Phase 2

Phase 1
Phase 2

In certain sewersheds, the proposed capital improvements have been divided into two phases. Phase 1 denotes the first phase of construction in a particular sewershed, while Phase 2 denotes the second phase of construction. It is anticipated that construction will occur in phases to correspond with the anticipated progression of the Town's buildout. The buildout and subsequent capital improvements for each sewershed are described in detail in Section 6.1 of the report.

sewer districts or homeowner associations, or individual homeowners or developers could participate in the construction of individual sewer lines.

8.5.1 *Town Bonding*

The Town can bond for each individual sewer project and then establish a special assessment program to ensure each benefited user pays their share of the cost. This could be an option for large improvements, such as the sewer line expansion along Central Avenue. The bond would typically be issued for a term of 20 to 30 years.

The Town could also apply for a low interest loan through the Rhode Island Clean Water Finance Agency's State Revolving Loan Fund. This may provide an opportunity for the Town to secure a low interest loan for the construction, which may reduce the overall costs to the citizens. As with a bond, the Town would establish a special assessment program to ensure each benefited user pays their share of the costs.

Under this scenario, the Town would own the infrastructure and would be responsible for operation and maintenance.

8.5.2 *Sewer Districts and Homeowner Associations*

Individual neighborhoods could take it upon themselves to install the proposed wastewater collection system. Each neighborhood could form a sewer district or a homeowner's association and then hire an engineer and contractor to implement the preferred alternative. This would be a viable alternative for neighborhoods that have a collective interest in the preferred alternative, such as the neighborhood around Oak Swamp Reservoir. As with the Town bonding or low-interest loan, the homeowners would establish a special assessment program and would pay an annual fee to the district or association. Typically the debt service period is 20 to 30 years, after which the homeowners could opt to dissolve the association or district and turn their assets over to the Town.

Under this scenario, the homeowners would own the infrastructure and would be responsible for operation and maintenance. However, the homeowners could establish an agreement with the Town to operate and maintain the sewers, usually for a fee.

8.5.3 *Individual Participation*

For some areas of Town, it may make sense for individual homeowners or developers to contribute to the implementation of the preferred alternative. In cases where the preferred alternative has an overwhelming benefit to one entity, as is the case in sewer shed 15 with the Killian Estates development, it would be prudent of the Town to seek significant participation from a particular entity, in order to defray the cost to the public.

APPENDIX A

Existing Conditions Plan



APPENDIX B

Acquisition Agreement



APPENDIX C

Figures from 2007 Comprehensive Community Plan



APPENDIX D

NBC Fields Point RIPDES Permit



APPENDIX E

Plan of Apparent System Deficiencies



APPENDIX F

Phased Buildout Project Plans



APPENDIX G

Wastewater Flow Projections per Sewershed



APPENDIX H

Johnston Enabling Legislation



APPENDIX I

Sewer System Evaluation Study



APPENDIX J

ADS Flow Monitoring Report



APPENDIX K

***Intergovernmental Agency Review Comments/Public
Participation Information***

