

## 6.0

## WASTEWATER COLLECTION/TREATMENT CIP

Included in the Capital Improvements Plan (CIP) are the highest priority sewer capital projects required to enable the Spotsylvania County wastewater treatment and collection systems to meet build-out demands. The CIP projects are recommended for implementation within 5 years. Other sewer projects are recommended for implementation within the next 20 years, as wastewater flows increase. Capital costs for all sewer projects are tabulated herein.

### 6.1 Thornburg Development District Wastewater Collection and Treatment

The recommended wastewater collection and treatment alternative for the Thornburg Development District consists of a new sewage pump station located near the confluence of the Ni and Po Rivers, a force main to allow the sewage flow to be pumped from the Ni/Po drainage basin into the Massaponax Creek drainage basin, a new Route 17 gravity sewer to collect the pumped flow and transport it to the Massaponax Creek Interceptor, and a system of interceptors and trunk mains to convey sewage from the Ni River, Po River and Matta River drainage basins to the new pump station. In addition, expansion of the existing Massaponax Wastewater Treatment Plant is required to handle sewage from the Thornburg Development District. The conveyance system and pump station will be adequate to handle build-out sewage flows in the three drainage basins, sewage flows currently treated at the Thornburg and Indian Acres WWTP, and a future undesignated 3-mgd industrial demand located at the Thornburg industrial area.

The following components 1 through 5 of the Thornburg Development District sewage collection and treatment system are essential for conveyance of existing sewage flows to the new Thornburg pump station and, thus, should be implemented integrally.

1. A 2100-gpm Thornburg Pump Station located near the confluence of the Po and Ni Rivers, east of I-95 and accessible from Route 632. The pump station will be expandable to 8700 gpm in the future, as the Thornburg development District grows toward build out or a large industrial facility is located there.
2. A 14" Thornburg force main extending 22,000 feet from the Thornburg Pump Station, northeast to drainage area MC-10 (PS-1 to T-3). This force main will convey sewage from the Thornburg Development District to the Massaponax Creek drainage area.
3. A 48" Route 17 Interceptor extending up gradient 19,000 feet from the Massaponax Creek Interceptor (near the Route 17 and Route 2 intersection) to the Thornburg force main point of discharge (M-3 to T-3). In addition to conveying sewage from the Thornburg area, the Route 17 Interceptor will be adequately sized to serve build-out flows from residential and industrial development along the Route 17 corridor, east of Interstate 95.
4. A 42" Lower Po River Interceptor extending up gradient 5,700 feet along the Po River to the west side of I-95 (PS-1 to T-4).
5. A 30" Thornburg Trunk Main extending up gradient from the termination of the Lower Po River Interceptor 6,700 feet to the south to Route 606, to pick up the existing Thornburg

WWTP collection system and wastewater generated in the Matta River drainage basin (T-4 to T-5)

The following components 6 through 15 of the Thornburg Development District sewage collection and pumping system relate to sewage collection and can be implemented in the future as growth occurs.

6. Expand the Thornburg Pump Station to build-out capacity of 8700 gpm.
7. A 30" Thornburg force main extending 22,000 feet, parallel to the existing 14" force main. The combined capacities of the two force mains will convey build-out sewage flows from the Thornburg Development District to the Massaponax Creek drainage basin.
8. An 18" to 24" Upper Po River Interceptor extending up gradient from the termination of the Lower Po River Interceptor 11,800 feet along the Po River to the upper limit of the Thornburg Development District (T-4 to T-203). The interceptor would serve Indian Acres and allow the existing Indian Acres WWTP to be taken out of service.
9. A 10" to 24" Ni River Interceptor extending up gradient 15,600 feet to the west from the Thornburg Pump Station to the upper limit of the Thornburg Development District (PS-1 to T-103).
10. A 10" to 18" trunk main extending from the Ni River Interceptor up gradient 4,600 feet to the north (T-102 to T-106) and a 10" trunk main extending up gradient 3,800 feet to the south (T101 to T-104). These trunk mains allow full development of the portion of the Ni River drainage basin between Route 1 and I-95.
11. A 10" trunk main extending up gradient from the Po River Interceptor 3,600 feet to the north (T-202 to T-206) and a 10" to 12" trunk main extending up gradient 5,000 feet to the south (T-201 to T-205). These trunk mains allow full development of the Po River drainage basin.
12. A 3200 gpm Matta River Pump Station on the Matta River at the Caroline County line and an 18" force main extending from the Matta Sewage Pumping Station to the Thornburg Trunk Main (PS-2 to T-5), to convey sewage from the Matta River drainage basin to the Thornburg Trunk Main. The pumping station and force main would be adequate to accommodate build-out wastewater demands in the Matta River drainage basin, plus an additional 3-mgd undesignated industrial demand.
13. A 18" Matta River Force Main extending from the Matta River Pump Station, 7,500 feet to a point of discharge in the Po River drainage basin collection system (PS-2 to T-5).
14. A 24" Matta River Trunk Main extending from the Matta River Pump Station up gradient 3,000 feet to the north parallel to the Caroline County line. This trunk main serves the existing Thornburg industrial area and would accommodate build-out demands in the Matta River drainage basin, plus an additional 3-mgd undesignated industrial demand (T-301 to PS-2).

15. A 12” Matta River Interceptor extending from the Matta Sewage Pumping Station up gradient 4,700 feet to the west to the upper limit of the Route 1-Thornburg Industrial Development Area (PS-2 to T-302).

Capital Costs

Below is a tabulation of capital costs for the five high priority components and remaining ten additional components of the Thornburg Development District sewage collection and treatment system. Costs are in 2000 dollars and include engineering, but not property acquisition.

Table 6.1 - Capital Costs For Thornburg Development District CIP

Project	Component	Capital Cost
1	2100 gpm Thornburg Pump Station	\$1,070,000
2	14” Thornburg Force Main	\$1,899,000
3	Route 17 Interceptor	\$6,068,000
4	Lower Po River Interceptor	\$1,441,000
5	Thornburg Trunk Main	\$1,279,000
Total Cost		\$11,757,000

Table 6.2 - Capital Costs For Additional Thornburg Development District Improvements

Project Number	Component	Capital Cost
6	Thornburg Pump Station Expansion to 8700 gpm	\$1,063,000
7	30” Thornburg Force Main	\$3,223,000
8	Upper Po River Interceptor	\$1,232,000
9	Ni River Interceptor	\$1,496,000
10	Ni River Trunk Mains	\$766,000
11	Po River Trunk Mains	\$749,000
12	3200 gpm Matta River Pump Station	\$1,074,000
13	Matta River Force Main	\$664,000
14	Matta River Trunk Main	\$334,000
15	Matta River Interceptor	\$431,000
Total Cost		\$11,032,000

## 6.2 Hazel Run-Long Branch Interceptors

The proposed Hazel Run Interceptor project includes a new gravity sewer interceptor parallel to Hazel Run from Route 3 to points of discharge into the City of Fredericksburg wastewater collection system. In addition, upgrade of the City of Fredericksburg Hazel Run Interceptor is required and is included in the projects described in this section. The interceptor will facilitate immediate elimination of seven pump stations (Nos. 10, 15, 16, 17, 18, 45, and 58) and should lead to future elimination of up to eleven other pump stations when trunk mains are constructed.

### Within Spotsylvania County

The Hazel Run Interceptor, Route 3 Trunk Main, and Long Branch Interceptor in Spotsylvania County have been defined by twelve sewer projects. Another seven projects inside the City of Fredericksburg have been defined, to increase the capacity of the City's Hazel Run Interceptor consistent with build-out flows from Spotsylvania County and projected growth inside the City of Fredericksburg.

Because very little of the Hazel Run Interceptor exists, a priority ranking for the Hazel Run components is not possible. Rather, the nineteen projects must be implemented systematically, beginning downstream and proceeding up gradient. Using this implementation strategy, the following projects have high priority.

1. 2600 feet of 30-inch sewer, extending up gradient from the connection of the Hazel Run Interceptor to the City of Fredericksburg Hazel Run Interceptor (H-1) to the connection of the Hazel Run Interceptor and Long Branch Interceptor at the City/County border (H-2). This pipe segment conveys sewage from the Spotsylvania County Hazel Run and Long Branch Interceptors to the City of Fredericksburg Hazel Run Interceptor. The sewer is located within the City of Fredericksburg and will be maintained by the City.
2. 10,400 feet of 24-inch sewer along Hazel Run, extending up gradient from the connection of the Hazel Run Interceptor and the Long Branch Interceptor (H-2) to a point midway between Interstate 95 and Harrison Road (H-4).
3. 6,000 feet of 18-inch sewer along Hazel Run, extending up gradient from H-4 to the Hazel Run bridge at Rutherford Drive (H-6).
4. 1,300 feet of 12-inch sewer along Hazel Run, extending up gradient from the Hazel Run bridge at Rutherford Drive (H-6) to Calhoun Drive (H-7).
5. 2,000 feet of 10-inch sewer along Hazel Run, extending up gradient from Calhoun Drive (H-7) to the Hazel Run bridge at Route 3 (H-8). This pipe replaces an existing inch pipe which receives flow from existing pump stations north of Route 3.
6. Route 3 interceptor, 5,800 feet of 10-inch sewer, extending up gradient from the City/County border where the pipe crosses under Interstate 95 (H-9) to Glazebrook Drive

(H-10). The sewer discharges to the City of Fredericksburg Upper Hazel Run Interceptor.

In addition to the main interceptor and trunk main projects listed as CIP projects 1 through 6, smaller collector projects, listed as secondary projects 7 through 12 can be implemented according to sewage service priority.

7. 400 feet of 8-inch sewage collector main connecting to the Hazel Run Interceptor at Rutherford Drive (H-6).
8. 1,800 feet of 8-inch sewage collector main connecting to the Hazel Run Interceptor near Kingswood Boulevard (H-3).
9. 6,300 feet of 24-inch sewer, along Long Branch, extending up gradient from the junction of the Hazel Run Interceptor and the Long Branch Interceptor (H-2) to the Harrison Road bridge over Long Branch (L-2).
10. 4,300 feet of 18-inch sewer, along Long Branch, extending up gradient from the Harrison Road bridge (L-2) to upstream of the Interstate 95 bridge (L-4).
11. 4,800 feet of 12-inch sewer, along Long Branch, extending up gradient from the Interstate 95 bridge (L-4) to Carriage Hill Lane bridge (L-5).
12. 2,000 feet of 10-inch sewage collector main connecting to the Long Branch Interceptor near Interstate 95 (L-3).

#### Within the City of Fredericksburg

Build-out sewer service to the Spotsylvania County Hazel Run/Long Branch drainage basin requires upgrade of the City of Fredericksburg Hazel Run Interceptor. The upgraded City of Fredericksburg Hazel Run Interceptor would have required capacity to handle future sewage flow from the City of Fredericksburg and build-out flow from Spotsylvania County. Because interceptor upgrade would benefit both Spotsylvania County and the City of Fredericksburg, the project should be coordinated with and funded by both jurisdictions. Listed herein are only the projects that would benefit Spotsylvania County. Pipe size projections are based on information from the 2001 Whitman, Requardt and Associates report.

13. 950 feet of 48-inch sewer, along Hazel Run, up gradient from the City of Fredericksburg Hazel Run Pump Station (MH PS) to MH 0002. This pipe would parallel an existing 39-inch gravity sewer. Spotsylvania County's contribution to the future wastewater flow will be 5.75 mgd (14 % of the total future flow in the pipe).
14. 6,100 feet of 42-inch sewer, along Hazel Run, up gradient from MH 0002 to MH 4007. This pipe would parallel an existing 24-inch, 27-inch, and 30-inch gravity sewer. Spotsylvania County's contribution to the future wastewater flow will be 5.75 mgd (22 % of the total future flow in the pipe).

15. 2,625 feet of 36-inch sewer, along Hazel Run, up gradient from MH 4007 to MH 4401. This pipe would parallel an existing 24-inch gravity sewer. Spotsylvania County contribution to the future flow is 5.75 mgd (26 % of the total future flow in the pipe).
16. 1,273 feet of 30-inch sewer, along Hazel Run, up gradient from MH 4401 to MH 4407. This pipe would parallel an existing 24-inch gravity sewer. Spotsylvania County's contribution to the future flow is 5.75 mgd (37 % of the total future flow in the pipe).
17. 2,670 feet of 24-inch sewer, along Hazel Run, up gradient from MH 4407 to MH 4421. This pipe would parallel an existing 24-inch gravity sewer. Spotsylvania County's contribution to the future flow is 5.75 mgd (37 % of the total future flow in the pipe).
18. 950 feet of 15-inch sewer, along Hazel Run, up gradient from MH 9011 to MH 9014. This pipe would parallel an existing 15-inch gravity sewer. Spotsylvania County's contribution to the future flow is 0.675 mgd (22 % of the total future flow in the pipe).
19. 500 feet of 15-inch sewer in the Upper Hazel Run Interceptor, up gradient from MH 9022 to MH 9024. This pipe would parallel an existing 15-inch gravity sewer. This pipe will receive flows from the Route 3 Interceptor and not from Spotsylvania County's Hazel Run Interceptor. Spotsylvania County's contribution to the future flow is 0.675 mgd (25% of the total future flow in the pipe).

### Capital Costs

Below is a tabulation of capital costs for the Hazel Run Interceptor and Route 3 trunk main included in the CIP. Costs are in 2000 dollars and include engineering, but not property acquisition. A detailed cost estimate is included in Appendix F.

Table 6.3 - Capital Costs For Hazel Run Drainage Basin CIP

Project Number	Component	Capital Cost
1	Hazel Run Interceptor, 30-inch RCP (H-1 to H-2)	\$496,000
2	Hazel Run Interceptor, 24-inch PVC (H-2 to H-4)	\$1,156,000
3	Hazel Run Interceptor, 18-inch PVC (H-4 to H-6)	\$582,000
4	Hazel Run Interceptor, 12-inch PVC	\$119,000
5	Hazel Run Interceptor, 10-inch PVC	\$169,000
6	Route 3 Interceptor, 10-inch PVC	\$491,000
Total Cost, CIP Improvements		\$3,013,000

Below is a tabulation of costs for connector sewers draining into the Hazel Run Interceptor and for the Long Branch Interceptor and connectors. Costs are in 2000 dollars and include engineering, but not property acquisition. A detailed cost estimate is included in Appendix F.

Table 6.4 - Capital Costs For Secondary Hazel Run Drainage Basin Improvements

Project Number	Component	Capital Cost
7	Hazel Run connector sewer, Rutherford Drive (H-12 to H-6)	\$32,000
8	Hazel Run connector sewer, Kingswood Blvd (H-11 to H-3)	\$143,000
9	Long Branch Interceptor, 24" PVC (H-2 to L-2)	\$700,000
10	Long Branch Interceptor, 18" PVC (L-2 to L-4)	\$417,000
11	Long Branch Interceptor, 12" PVC (L-4 to L-5)	\$440,000
12	Long Branch connector sewer, Interstate 95	\$169,000
Total Cost, Secondary Improvements		\$1,901,000

Below is a tabulation of costs for upgrade to the City of Fredericksburg Hazel Run Interceptor. The "Incremental Cost to Serve County" is the cost of the additional pipe or pipe size required to serve Spotsylvania County. The "County Proportional Share of Cost" is the Spotsylvania County share of all interceptor improvement costs, times the percentage of total future/build-out flow attributable to Spotsylvania County. Costs are in 2000 dollars and include engineering, but not property acquisition. A detailed cost estimate is included in Appendix F.

Table 6.5 - Capital Costs For Improvements to City of Fredericksburg Hazel Run Interceptor

Project Number	Component	Total Project Cost	Incremental Cost to Serve County	County Proportional Share of Cost
13	Hazel Run, 48"	\$280,000	\$0	\$39,200
14	Hazel Run, 42"	\$1,655,000	\$270,000	\$364,100
15	Hazel Run, 36"	\$595,000	\$80,000	\$154,700
16	Hazel Run, 30"	\$256,000	\$102,000	\$94,700 <sup>(1)</sup>
17	Hazel Run, 24"	\$332,000	\$298,000	\$122,800 <sup>(2)</sup>
18	Hazel Run, 15"	\$96,000	\$0	\$21,100
19	Route 3, 15"	\$54,000	\$0	\$13,500
Total Cost		\$3,268,000	\$750,000	\$810,100

<sup>(1)</sup> County share for 37% of the overall cost is less than the cost required to increase the pipe size from 24-inch to 30-inch. Because the pipe size increase is required solely to meet Spotsylvania County flows, it can be expected that Spotsylvania County would finance the incremental cost.

<sup>(2)</sup> The majority of this pipe length is only inadequate for build-out Spotsylvania County flows. It is expected that Spotsylvania County would finance the incremental cost.

### 6.3 Deep Run Interceptor and Trunk Mains

Flow capacity of the existing Deep Run Interceptor was compared to build-out flows. Much of the existing sewer is already adequate to handle the build-out flows. The few projects required in the Deep Run drainage basin would be implemented according to sewage service priority.

1. 7,700 feet of 24-inch sewer, along Deep Run, extending up gradient from the Deep Run Pump Station (PS-1) to Lansdowne Road (D-3). This pipe would replace an existing 18-inch gravity sewer.
2. 2,100 feet of 18-inch sewer, along Deep Run, extending up gradient from Lansdowne Road near Teton Drive to near Longwood Drive (D-8). This pipe would replace an existing 15-inch gravity sewer.
3. 3,300 feet of 10-inch sewer collector, connecting to the Deep Run Interceptor system at the Deep Run Pump Station (PS-1). This project would be implemented as property west of Route 2 is developed.
4. 1,000 feet of 12-inch sewer collector, connecting to the Deep Run Interceptor at Lansdowne Road (D-3). This pipe would replace an existing 8-inch gravity sewer.

#### Capital Costs

Table 6.6 shows capital costs for the Deep Run Interceptor. Costs are in 2000 dollars and include engineering, but not property acquisition. Detailed cost estimate is in Appendix F.

Table 6.6 – Capital Costs for Deep Run Drainage Basin CIP

Project Number	Component	Capital Cost
1	Deep Run Interceptor, 24-inch	\$855,703
2	Deep Run Interceptor, 18-inch	\$203,621
3	Deep Run connector sewer, Deep Run Pump Station	\$279,000
4	Deep Run connector sewer, Lansdowne Road	\$92,000
Total Cost		\$670,000

## 6.4 American Central System

The existing American Central system includes a series of pump stations, force mains, and gravity sewers to collect and pump sewage from a remote location into the Massaponax Creek drainage area. Due to sparse residential development and zoning that prohibits commercial and industrial development, the existing wastewater collection system is generally adequate to need build-out sewage demands.

However, many of the existing sewage pumps are undersized and minor modifications to the American Central conveyance system will be required. These projects are not critical at this time and can be implemented into the CIP according to the sewage service priority.

1. Install a new pump station, labeled PS-612, at Fawn Lake. Install duplex pump station with two pumps rated for 160 gpm. Construct 3,340 feet of 4-inch force main from PS-612 discharging into PS-611. This pump station will incorporate development around Fawn Lake into the American Central conveyance system.
2. Install a new pump station, labeled PS-611, at Fawn Lake. Install duplex pump station with two pumps rated for 245 gpm. Construct 1,400 feet of 6-inch force main from PS-611 discharging into PS-610. This pump station will incorporate development around Fawn Lake into the American Central conveyance system.
3. Install a new pump station, labeled PS-610, at Fawn Lake. Install duplex pump station with two pumps rated for 290 gpm. Construct 1,670 feet of 6-inch force main from PS-610 discharging into PS-609. This pump station will incorporate development around Fawn Lake into the American Central conveyance system.
4. Install a new pump station, labeled PS-609, at Fawn Lake. Install duplex pump station with two pumps rated for 410 gpm. Construct 2,150 feet of 8-inch force main from PS-609 discharging into PS-608. This pump station will incorporate development around Fawn Lake into the American Central conveyance system.
5. Install a new pump station, labeled PS-608, near Fawn Lake. Install duplex pump station with two pumps rated for 730 gpm. Construct 4,370 feet of 10-inch force main from PS-608 discharging into PS-607. This force main replaces an existing 6-inch force main. This pump station will collect flow from development not directly adjacent to Fawn Lake as well as receive flow from PS-609.
6. Install a new pump station, labeled PS-607, near Fawn Lake. Install duplex pump station with two pumps rated for 1020 gpm. Construct 3,030 feet of 12-inch force main from PS-607 discharging into a gravity sewer system draining into PS-606. This pump station will collect flow from development not directly adjacent to Fawn Lake as well as receiving flow from PS-608. Construct 1,680 feet of 18-inch gravity sewer draining into PS-606. This pipe will replace an existing 15-inch gravity sewer.

7. Replace pump station PS-606. Install duplex pump station with two pumps rated for 1030 gpm. Reuse existing 12-inch force main from PS-606 to PS-605. This pump station will collect flow from development not directly adjacent to Fawn Lake as well as receiving flow from PS-607.
8. Replace pump station PS-605. Install duplex pump station with two pumps rated for 1050 gpm. Reuse existing 12-inch force main from PS-605 discharging into a gravity sewer system draining to PS-604. Reuse existing 18-inch gravity sewer draining into PS-604.
9. Replace pump station PS-604. Install duplex pump station with two pumps rated for 1090 gpm. Reuse existing 12-inch force main from PS-604 discharging into a gravity sewer system draining to PS-603. Reuse existing 18-inch gravity sewer draining into PS-603.
10. Replace pump station PS-603. Install duplex pump station with two pumps rated for 1200 gpm. Reuse existing 12-inch force main and 15-inch gravity main from PS-603 discharging into PS-602.
11. Replace pump station PS-602. Install duplex pump station with two pumps rated for 1240 gpm. Construct 4,650 feet of 12-inch force main from PS-602 discharging into an existing 18-inch gravity line draining to PS-601. Reuse the 18-inch gravity sewer.
12. Replace pump station PS-601. Install duplex pump station with two pumps rated for 1400 gpm. Construct 4,060 feet of 12-inch force main from pump to gravity discharge to Massaponax Creek drainage basin. Reuse existing 18-inch gravity sewer connecting to Massaponax Creek drainage basin.
13. Install a new pump station, labeled PS-613. Install duplex pump station with two pumps rated for 115 gpm. Construct 1,600 feet of 4-inch force main into pump station PS-601.

Capital Costs

Capital costs for the American Central conveyance system are listed below. Costs are in 2000 dollars and include engineering, but not property acquisition. Detailed cost estimate is included in Appendix F.

Table 6.7 - Capital Costs For Secondary American Central System Improvements

Project No.	Component	Capital Cost
1	Construct pump station PS-612 and force main	\$255,000
2	Construct pump station PS-611 and force main	\$219,000
3	Construct pump station PS-610 and force main	\$229,000
4	Construct pump station PS-609 and force main	\$269,000

5	Construct pump station PS-608 and force main	\$380,000
6	Construct pump station PS-607, force main and gravity sewer	\$488,000
7	Replace pump station PS-606 (#26)	\$205,000
8	Replace pump station PS-605 (#25)	\$205,000
9	Replace pump station PS-604 (#24)	\$205,000
10	Replace pump station PS-603 (#23)	\$208,000
11	Replace pump station PS-602 (#22) and force main	\$414,000
12	Replace pump station PS-601 (#20) and force main	\$397,000
13	Construct pump station PS-613	\$225,000
Total Cost		\$3,699,000

### 6.5 Massaponax Creek Replacement Interceptor

Size and capacity of each pipe segment of the existing Massaponax Creek Interceptor were compared to the size and capacity required to accommodate build-out sewage flows. This calculation revealed that the majority of the existing interceptor is inadequate for build-out flows. Therefore, almost total replacement of the Massaponax Creek Interceptor will be required.

To prioritize replacement of the most deficient segments of the Massaponax Creek Interceptor, a growth factor was computed for each interceptor segment as defined in Section 5.10. The growth factor is the ratio of the existing pipe capacity to the existing sewage flow. Sewage flow growth factor of one or less indicates that the current flow exceeds the design capacity of the existing pipe. Those segments with the lowest growth factor, indicating that they will reach maximum capacity first, have been given the highest priority and should be included in the CIP. Other segments have lesser priority and would be implemented as growth proceeds.

The required new Massaponax Creek replacement interceptor is defined by twelve segments, based on pipe diameter and priority. The following seven projects have highest priority:

1. 9,800 feet of 72-inch sewer, extending up gradient from the Massaponax Creek Wastewater Treatment Plant (M-1) to the manhole into which sewage from the Thornburg Development District discharges into the Massaponax Creek Interceptor (M-3). This project replaces an existing 30-inch gravity sewer and is included in the CIP.
2. 3,100 feet of 60-inch sewer, extending up gradient from the Thornburg Development District point of discharge into the Massaponax Creek Interceptor (M-3) to a manhole east of the railroad bridge over Massaponax Creek (M-4). This project would replace an existing 24-inch gravity sewer, and is included in the CIP.
3. 2,300 feet of 54-inch sewer, extending up gradient from a manhole east of the Interstate 95 bridge (M-10) to point of discharge of a trunk main sewer on the interceptor between

Route 1 and Interstate 95 (M-11). This project would replace an existing 24-inch gravity sewer, with 50% reserve capacity for growth, and is currently under design. Because the project has been financed for construction in 2001, it is not incorporated into the CIP.

4. 490 feet of 48-inch sewer, extending up gradient from a manhole between Route 1 and Interstate 95 (M-11) to point of discharge of two trunk mains on the interceptor west of the Route 1 bridge (M-12). This project would replace an existing undersized 24-inch gravity sewer, and is currently under design. Because the project has been financed for construction in 2001, it is not incorporated into the CIP.
5. 5,200 feet of 48-inch sewer, extending up gradient from a manhole at the Route 1 bridge (M-12) to a manhole near Leavells Road (M-13). This project would replace an existing 24-inch gravity sewer, and is currently under design. Because the project has been financed for construction in 2001, it is not incorporated into the CIP.
6. 3,250 feet of 48-inch sewer, extending up gradient from a manhole near Leavells Road (M-13) to a manhole near the end of Rock Creek Road (M-14). This project would replace an existing 24-inch gravity sewer, and is incorporated into the CIP.
7. 6,300 feet of 42-inch sewer, extending up gradient from a manhole near the end of Rock Creek Road (M-14) to a manhole near Oak Grove Drive (M-15). This project would replace an existing 24-inch gravity sewer, and is incorporated into the CIP.

The following five projects would complete replacement of the entire Massaponax Creek Interceptor. These pipe segments have greater capacity to handle existing sewage flows. These projects should be implemented on an as needed basis, or according to sewage service priority.

8. 16,700 feet of 54-inch sewer, extending up gradient from a manhole east of the railroad bridge over Massaponax Creek (M-4) to a manhole east of the Interstate 95 bridge (M-10). This project would replace an existing 24-inch gravity sewer.
9. 3,500 feet of 42-inch sewer, extending up gradient from a manhole near Oak Grove Drive (M-15) to near Wild Goose Lane (M-16). This project would replace an existing 18-inch gravity sewer.
10. 2,800 feet of 36-inch sewer, extending up gradient from near Wild Goose Lane (M-16) to a manhole near the Deerfield subdivision (M-18). This project replaces an 18-inch gravity sewer.
11. 9,000 feet of 36-inch sewer, extending up gradient from a manhole near the Deerfield subdivision (M-18) to a manhole at Gordon Road (M-21). This project replaces a 15-inch and 18-inch gravity sewer.
12. 7,800 feet of 24-inch sewer, extending up gradient from Gordon Road (M-21) to the Route 3 bridge over Massaponax Creek (M-22). This project replaces a 15-inch gravity sewer.

In addition to the main Massaponax Interceptor projects, several trunk mains and collector sewers discharging to the Massaponax Creek Interceptor will need to be constructed or upgraded. Eighteen additional projects have been identified for the connecting sewers and trunk mains. The existing sewers are adequate to handle the current flows; therefore, each of these projects should be implemented on an as needed basis, or according to sewage service priority.

13. 4,500 feet of 8-inch gravity collector sewer, extending up gradient from the Massaponax Wastewater Treatment Plant (M-1) to Briarwood Lane (M-101).
14. 2,600 feet of 10-inch gravity collector sewer, extending up gradient from the Massaponax Creek Interceptor at Route 2 (M-2) to Jim Morris Road (M-102A).
15. 9,800 feet of 8-inch gravity collector sewer, extending up gradient from the Massaponax Creek Interceptor at Route 2 (M-2) to the New Post Area (M-102C)
16. 2,100 feet of 10-inch gravity collector sewer, extending up gradient from the Massaponax Creek Interceptor at the railroad crossing (M-5) to Benchmark Road (M-103).
17. 1,400 feet of 10-inch gravity collector sewer, extending up gradient from the Massaponax Creek Interceptor at M-6 to near the Massaponax Business Park and Lee Hill Park (M-104).
18. 750 feet of 10-inch gravity collector sewer, extending up gradient from the Massaponax Creek Interceptor between Route 1 and Interstate 95 (M-11) toward Route 17 (M-105).
19. 2,900 feet of 12-inch gravity collector sewer, extending up gradient from the Massaponax Creek Interceptor at Route 1 (M-12) northward along Interstate 95 (M-301).
20. 5,400 feet of 30-inch trunk main, extending up gradient from the Massaponax Creek Interceptor at Route 1 (M-12) southward along Route 1 (M-201).
21. 3,800 feet of 24-inch trunk main, extending up gradient along Route 1 from (M-201) to (M-203).
22. 1,600 feet of 12-inch gravity collector sewer, extending up gradient from the Route 1 trunk main (M-203) across Interstate 95 (M-206).
23. 1,400 feet of 10-inch gravity collector sewer, extending up gradient from Interstate 95 (M-206) into the 95 Business Park (M-207).
24. 1,500 feet of 8-inch gravity collector sewer, extending up gradient from (M-209) toward Smith Station Road (M-210) near the South Oaks subdivision.
25. 8,400 feet of 12-inch Smith Station Trunk Main, extending up gradient from the Massaponax Creek Interceptor (M-14) to the point of discharge of the Courthouse Area

force main at Smith Station Road near Courtland High School (M-401). Part of the trunk main is already 12-inch. This project replaces existing 8-inch sewer.

26. 4,900 feet of 10-inch gravity collector sewer, extending up gradient from the Massaponax Creek Interceptor at Camelot Way (M-20) to Harrison Road (M-504).
27. 5,600 feet of 8-inch gravity collector sewer, extending up gradient from an existing gravity sewer at Harrison Road (M-504) to the point of discharge from the Five Mile Road pump stations (PS-501).
28. 9,400 feet of 24-inch American Central Trunk Main, extending up gradient from the Massaponax Creek Interceptor at Gordon Road (M-21) to the point of connection of the American Central force main (M507).
29. 6,790 feet of 8-inch force main from the pump stations north of Route 3 (PS-102) connecting to the Massaponax Creek Interceptor near Andora Drive (M-22). This force main and pump station drain the Lick Run drainage area.
30. 3,600 feet of 8-inch gravity collector sewer, extending up gradient from the pump station north of Route 3 (PS-102) to the Lick Run drainage basin (M-23).

Capital Costs

Table 6.8 summarizes capital costs for the Massaponax Creek Interceptor. Costs are in 2000 dollars and include engineering, but not property acquisition. Detailed cost estimate is included in Appendix F.

Table 6.8 - Capital Costs For Massaponax Creek Drainage Basin CIP

Project Number	Component	Capital Cost
1	Massaponax Creek Interceptor, 72-inch	\$6,417,000
2	Massaponax Creek Interceptor, 60-inch	\$1,454,000
3	Massaponax Creek Interceptor, 54-inch	Financed FY 2001
4	Massaponax Creek Interceptor, 48-inch	Financed FY 2001
5	Massaponax Creek Interceptor, 48-inch	Financed FY 2001
6	Massaponax Creek Interceptor, 48-inch	\$931,000
7	Massaponax Creek Interceptor, 42-inch	\$1,593,000
Total Cost, CIP Improvements		\$10,395,000

Table 6.9 summarizes capital costs for collector sewers and trunk mains for the Massaponax Creek Interceptor. Costs are in 2000 dollars and include engineering, but not property acquisition. Detailed cost estimate is included in Appendix F.

Table 6.9 - Capital Costs For Secondary Massaponax Creek Drainage Basin Improvements

Project No.	Component	Capital Cost
8	Massaponax Creek Interceptor, 54-inch	\$6,174,000
9	Massaponax Creek Interceptor, 42-inch	\$885,000
10	Massaponax Creek Interceptor, 36-inch	\$619,000
11	Massaponax Creek Interceptor, 36-inch	\$1,988,000
12	Massaponax Creek Interceptor, 30-inch	\$867,000
Total, Balance of Massaponax Creek Interceptor Replacement		\$10,533,000
13	Massaponax Creek collector sewer, WWTP	\$357,000
14	Massaponax Creek collector sewer, Jim Morris Road	\$220,000
15	Massaponax Creek collector sewer, New Post	\$777,000
16	Massaponax Creek collector sewer, Benchmark Road	\$178,000
17	Massaponax Creek collector sewer, Lee Hill Park	\$121,000
18	Massaponax Creek collector sewer, Interstate 95 South	\$64,000
19	Massaponax Creek collector sewer, Interstate 95 North	\$266,000
20	Route 1 trunk main, 30-inch	\$1,031,000
21	Route 1 trunk main, 24-inch	\$423,000
22	Route 1 trunk main collector sewer, 12-inch at Interstate 95	\$147,000
23	Route 1 trunk main collector sewer, 10-inch at Interstate 95	\$118,000
24	Route 1 collector sewer, near South Oaks.	\$117,000
25	Massaponax Creek collector sewer, Courthouse area	\$770,000
26	Massaponax Creek collector sewer, Harrison Road	\$415,000
27	Massaponax Creek collector sewer, 5 Mile Road	\$444,000
28	American Central Trunk Main, 24-inch	\$1,045,000
29	Lick Run force main, 8" FM Andora Drive	\$489,000
30	Massaponax Creek collector sewer, 8" Andora Drive	\$285,000
Total Collector and Trunk Main Improvements, Massaponax Creek Drainage Basin		\$7,267,000

## Spotsylvania Courthouse Area

The 1999 Revisions to Water/Sewer Master Plan for Courthouse Area defined and prioritized the projects within the Courthouse Area. The projects of highest priority are those required to be completed prior to abandonment of the Wishner WWTP. These projects should be included in the 5-year CIP. Construction of these projects will have an impact on the projects in the Massaponax Creek drainage basin, due to increased flow.

The following four projects have highest priority:

1. New wastewater pumping station located along the Ni River, downstream from the existing Wishner WWTP (PS-401).
2. 10,000 feet of force main, from the new Courthouse Area pumping station along the Ni River (PS-401) to a discharge point near Courtland High School (M-401).
3. 3000 feet of 8-inch gravity sewer extending up-gradient from the new Courthouse Area pumping station (PS-401) to the Wishner WWTP. This gravity sewer will collect sewage discharging to the Wishner WWTP and convey it to the new pump station.
4. Demolish existing Wishner WWTP.

In addition to the Courthouse pump station projects, several collection mains, pump stations, and force mains will need to be constructed. Eighteen additional projects have been identified for the Courthouse area. Much of this region is undeveloped and where development exists, the existing sewers are adequate to handle the current flows. Therefore, each of these projects should be implemented on an as-needed basis, or according to sewage service priority.

5. 9000 feet of 12-inch gravity sewer extending up-gradient from the new Courthouse Area pump station (PS-401) to the connections of the Spotslee force main (M-403). As a part of this project, existing pump station #28 will be abandoned.
6. New wastewater pump station near the future Route 208 bypass (PS-404) and 2100 feet of force main connecting to the existing gravity sewer in the Plantation Forest subdivision (M-404).
7. New wastewater pump station downstream of the Spotslee subdivision (PS-402) and 4600 feet of force main connecting to the existing gravity sewer system next to Route 208 (M-403). As a part of this work, existing pump station #42 will be abandoned.
8. New wastewater pump station at the discharge point of undeveloped property southwest of the Spotslee subdivision (PS-403) and 3100 feet of force main connecting to PS-402.

## Capital Costs

Table 6.10 summarizes capital costs for the Courthouse Area.

Table 6.10 - Capital Costs For Courthouse Area CIP

Project No.	Component	Capital Cost
1	Courthouse Area pump station	Financed FY 2001
2	Courthouse Area pump station, force main	Financed FY 2001
3	Gravity sewer to pump station, 8-inch	Financed FY 2001
4	Abandon Wishner WWTP	Financed FY 2001

Table 6.11 summarizes capital costs for collector sewers and trunk mains for the Massaponax Creek Interceptor. Costs are in 2000 dollars and include engineering, but not property acquisition. Detailed cost estimate is included in Appendix F.

Table 6.11 – Estimated Capital Costs For Secondary Courthouse Area Improvements

Project No.	Component	Capital Cost
5	Courthouse Interceptor, 12-inch gravity	Financed FY 2001
6	PS-404, and force main	\$243,000
7	PS-402, and force main	\$442,000
8	PS-403, and force main	\$365,000
Total Secondary Improvements, Courthouse Area		\$1,050,000

#### 6.6 FMC Wastewater Treatment Plant Expansion

To meet build-out sewage flows in the Deep Run drainage basin, the Spotsylvania County portion of the Hazel Run drainage basin, the Bowman Industrial Park, and up to 1.5 mgd of sewage generated in the City, according to the 1983 City-County Annexation Agreement, the FMC WWTP will be expanded to 6-mgd capacity and upgraded to meet total nitrogen limits of 8 mg/l. Capital cost to expand the FMC WWTP is estimated at \$1,741,000.

#### 6.7 Massaponax Creek Wastewater Treatment Plant Expansion

In 1999 an Engineering Report for BNR Upgrade and Expansion of the Massaponax WWTP was completed. The report defines requirements for upgrade and expansion of the WWTP in three phases. Phase I expands the WWTP to 8-mgd capacity, Phase II to 12-mgd capacity, and Phase III to 16-mgd capacity. Construction for the Phase I expansion and upgrade to 8-mgd capacity began in September 2000 for start-up in November 2002. The project is funded in the Spotsylvania County FY 2000 budget. As indicated in Table 6.12, further Massaponax Creek

WWTP expansion to at least 16.5-mgd capacity is required to meet build-out wastewater treatment requirements.

Table 6.12 – Massaponax Wastewater Treatment Plant Build-Out Capacity Requirements

Drainage Basins	Current Average Water Demand	Water Demand	Sewage Flow
Massaponax Creek	2.50 mgd	8.45 mgd	12.68 mgd
American Central	0.19 mgd	0.59 mgd	0.89 mgd
Courthouse Area	0.00 mgd	0.80 mgd	1.20 mgd
Hazel Run	0.02 mgd	0.10 mgd	0.15 mgd
Rappahannock River	0.07 mgd	0.43 mgd	0.65 mgd
Transfer from FMC	0.00 mgd		1.00 mgd
Thornburg Development District	0.00 mgd	5.75 mgd	7.14 mgd
Total Flow	2.78 mgd	16.12 mgd	23.71 mgd

The Stage I Design Preliminary Engineering Report for the project includes the following capital costs, in 1999 dollars, for WWTP expansion:

Table 6.13 – Costs of Massaponax Wastewater Treatment Plant Expansion

Plant Expansion	Capital Cost	Annual O&M Cost
Expand Existing 6-mgd WWTP to 8 mgd	\$23,000,000	\$2,000,000
Expand 8-mgd WWTP to 12 mgd	\$12,000,000	\$2,500,000
Expand 12-mgd WWTP to 16 mgd	\$12,000,000	\$3,000,000
Expand 16-mgd WWTP to 24 mgd	\$24,000,000	\$4,000,000

Expansion of the Massaponax WWTP beyond 8-mgd capacity is not required at this time and is not included in the CIP.

6.8 Wastewater Collection/Treatment Capital Improvements Plan

Table 6.14 summarizes the CIP improvements and their respective costs:

Table 6.14 – Summary of Sewer System CIP Projects and Capital Costs

Drainage Basin/ Project Number	Project Description	Capital Cost
Thornburg #1	2100 gpm Thornburg Pump Station at Po/Ni confluence	\$1,070,000
Thornburg #2	14” Thornburg force main from Thornburg Development District to Massaponax Creek Drainage Basin	\$1,899,000
Thornburg #3	48” Route 17 Interceptor from the Massaponax Creek Interceptor to the Thornburg force main point of discharge	\$6,068,000
Thornburg #4	42” Lower Po River Interceptor along the Po River to the west side of Interstate 95	\$1,441,000
Thornburg #5	30” Thornburg trunk main from the termination of the Lower Po River Interceptor to pick up existing Thornburg WWTP and Matta River drainage basin flows	\$1,279,000
Hazel Run #1	30” Hazel Run Interceptor from junction H1 to H2	\$496,000
Hazel Run #2	24” Hazel Run Interceptor from junction H2 to H4	\$1,156,000
Hazel Run #3	18” Hazel Run Interceptor from junction H4 to H6	\$582,000
Hazel Run #4	12” Hazel Run Interceptor from junction H6 to H7	\$119,000
Hazel Run #5	10” Hazel Run Interceptor from junction H7 to H8	\$169,000
Hazel Run #6	10” Route 3 Interceptor from junction H9 to H10	\$491,000
Massaponax Creek #1	72” Massaponax Creek Interceptor from M1 to M3	\$6,417,000
Massaponax Creek #2	60” Massaponax Creek Interceptor from M3 to M4	\$1,454,000
Massaponax Creek #3	54” Massaponax Creek Interceptor from M10 to M11	Financed FY 2001
Massaponax Creek #4	48” Massaponax Creek Interceptor from M11 to M12	Financed FY 2001
Massaponax Creek #5	48” Massaponax Creek Interceptor from M12 to M13	Financed FY 2001
Massaponax Creek #6	48” Massaponax Creek Interceptor from M13 to M14	\$931,000
Massaponax Creek #7	42” Massaponax Creek Interceptor from M14 to M15	\$1,593,000