4.0 WASTEWATER COLLECTION/TREATMENT SYSTEM ANALYSIS

4.1 Thornburg Development District

Thornburg Development District Boundary

The Spotsylvania County 2000 Comprehensive Plan designates the area along Route 1 south of the primary settlement area as the Thornburg Development District. The area includes sub-basins of the Ni River, Po River and Matta River drainage basins which front Route 1. The 2000 Comprehensive Plan proposes that commercial and industrial develop predominate in this area, with less than 50% of the area designated for residential development. The Plan proposes capability to implement new water and sewer service to the area in response to requirements of industrial prospects or customers and envisions industrial water/sewer demands that cannot be met by the Thornburg WWTP. Consequently, a new sewage collection and treatment option is required for the Thornburg Development District.

Thornburg WWTP

The original Thornburg WWTP began operation in 1972 as a 60,000-gpd aerated lagoon. The WWTP was expanded in 1990 to 345,000 gpd capacity. The 1986 Engineering Report for the WWTP expansion determined that subsequent expansion beyond a capacity of 345,000 gpd on the current WWTP site is impractical. Current flow to the Thornburg WWTP averages a little more than 100,000 gpd.

Thornburg WWTP VPDES Permit

The Thornburg WWTP VPDES Permit No. VA0029513 was renewed on October 1, 1999. Effluent limits for a 345,000-gpd design flow are 20 mg/l BOD_5 and TSS, year-around ammonia limits of 2.3 mg/l, year-around TKN limits of 6 mg/l, and non-detectable Total Residual Chlorine. The new permit also includes limits of 63 ppb total recoverable zinc and 9.05 ppb total recoverable copper. Metals limits are based on the detection of zinc and copper in the effluent and are not based on receiving stream standards. The WWTP effluent discharges to an unnamed tributary to the Po River, in the York River Basin.

Thornburg Development District Flow Projections

Average annual flow to the Thornburg WWTP has increased from 90,000 gpd in 1995 to 118,000 gpd in 1999. During this 5-year period, Riverview Elementary School and Thornburg Middle School were constructed; sewage from the schools is pumped to the Thornburg WWTP collection system. Additional residential, commercial or industrial contributions to the collection system have been minimal.

Build-out sewage flow in the Thornburg area were projected based on sewering the Thornburg Development District in accordance with the Spotsylvania County 2000 Comprehensive Plan. Development is proposed at present zoning designations and at development densities provided by Spotsylvania County's Zoning Build-out Analysis, except properties currently zoned for

agriculture (RU) have been changed to commercial/industrial (C2) and residential (R1) land uses. Approximately 50% of the resulting land use in the Thornburg Development District becomes commercial/industrial, to represent an increased industrial development in the area.

To the above residential/commercial average daily flow projections were added a reserved industrial flow contribution of 3 mgd from the existing Thornburg industrial site. The quantity of reserve industrial capacity was defined by assessing the incremental cost of providing reserve capacity in sewage collection and pumping systems proposed to serve the Thornburg Development District.

Another development scenario, based on sewering the entire Ni River, Po River, and portions of the Matta River drainage basins in the former Spotsylvania County secondary settlement area, was evaluated to determine the maximum effect of development using the zone changing scenarios. Under this evaluation, all agricultural and rural residential properties were changed to R1 land use, maximizing residential density throughout the secondary settlement area. This scenario is inconsistent with the Spotsylvania County Comprehensive Plan, and the 1997 Spotsylvania Courthouse Area Plan. Accordingly, this scenario represents an ultimate future build-out and is not proposed or anticipated to occur. The resulting build-out water demand would approach 9 mgd.

Average annual water demand projections for build-out of the Thornburg Development District are shown on Table 4.1. Current flows are tabulated from metered water consumption and represent the average annual dry weather water demands and sewage flows. Also tabulated are maximum monthly sewage flows, used for defining wastewater treatment capacity requirements.

Table 4.1 – Thornburg Development District Water Demands and Sewage Flows

Source of Flow	Current Annual Water Demand	Build-out Annual Water Demand	Build-out Maximum Month Sewage Flow
Ni River Basin	0.09 mgd	0.99 mgd	1.49 mgd
Po River Basin	0.04 mgd	1.29 mgd	1.94 mgd
Matta River Basin	0.01 mgd	0.47 mgd	0.71 mgd
Subtotal	0.14 mgd	2.75 mgd	4.14 mgd
Industrial Flow		3.00 mgd	3.00 mgd
Total Flow	0.14 mgd	5.75 mgd	7.14 mgd

Maximum monthly sewage flows are 1.5 times the average annual water demand, based on historic flow data for the existing Thornburg wastewater treatment plant in 1999 and 2000 (assuming the minimum monthly sewage flow to be equivalent to the average annual water demand). Full development of the Thornburg Development District will result in a maximum monthly sewage flow of approximately 7.0 mgd.

Thornburg Development District Wastewater Treatment Options

Two options for wastewater treatment in the proposed Thornburg Development District were investigated. They include:

- Abandon the existing Thornburg WWTP and provide a new 7-mgd WWTP on the Po-Ni River, with a pumping station to convey sewage from the Matta River basins to the new WWTP. Discharge treated effluent to the Po-Ni River.

- Abandon the existing Thornburg WWTP and pump all wastewater from the Po, Ni and portion of the Matta River basins to the Massaponax WWTP. Expand the Massaponax WWTP to provide an additional 6-mgd treatment capacity.

The Virginia Department of Environmental Quality has advised that effluent limits for an expanded or relocated wastewater treatment plant discharging to the Po or Po-Ni River will likely be 10 mg/l BOD_5, 10 mg/l TSS, and 3 mg/l TKN (10/10/3 limits), all year around. These limits are standard for "Non-Modeled Small Receiving Streams" and are the most severe effluent limits that would be imposed regardless of the WWTP flow or location. The 10/10/3 effluent limits can reliably be achieved using the treatment process currently used at the Spotsylvania County Thornburg and FMC wastewater treatment plants – single stage nitrification followed by effluent filtration.

The Virginia Department of Environmental Quality also advised that phosphorus limits will be in the range of 0.18 to 2.0 mg/l and that total nitrogen reduction, although not currently mandated in the York River Basin, will likely be required in the future. For evaluation of regional wastewater treatment options, effluent standards of 10 mg/l BOD_5 and TSS, 3 mg/l TKN, 8 mg/l total nitrogen, 1 mg/l phosphorus, and non-detectable total residual chlorine were utilized. The concept treatment process is similar to the treatment process proposed for the upgraded and expanded Massaponax WWTP – anoxic and aerobic basins for total nitrogen reduction, followed by chemical phosphorus reduction, and effluent filtration. Disinfection by chlorination-dechlorination was utilized for evaluation of the new Po-Ni WWTP.

4.2 Primary Settlement Area

The primary settlement area is served by the FMC WWTP and the Massaponax WWTP. Each WWTP and corresponding sewage collection system are described herein.

Existing FMC WWTP

The original FMC industrial WWTP had operated from 1967 to 1978 to treat up to 8 mgd of process wastewater from the production of cellophane. In 1978, the FMC Corporation viscose plant ceased production and the industrial WWTP was shut down and abandoned. In 1985, the plant was purchased by Spotsylvania County and upgraded for municipal wastewater treatment service for a design flow of 2.619 mgd. Sand filters were added in 1992, to increase WWTP

capacity to 4 mgd. In 1995 the FMC WWTP was further upgraded to enable the plant to achieve new TKN limits at a 4 mgd capacity.

The FMC WWTP has a minimal drainage area. A 250-gpm industrial park pump station delivers flow from the Bowman Industrial Park to the WWTP. The FMC WWTP also receives flow from the Spotsylvania County Deep Run pump station. All other flow originates from the City of Fredericksburg WWTP; the City pumps to the FMC WWTP a quantity of raw sewage equivalent to the quantity of sewage flowing from Spotsylvania County into the City's Hazel Run Trunk Sewer and meter station, plus up to 1.5 mgd of sewage generated in the City, according to the 1983 City-County Annexation Agreement.

With the exception of the chlorine contact tanks, chlorination/dechlorination equipment, and sludge handling facilities, all treatment processes and components of the FMC WWTP already have a 6-mgd capacity and the plant can achieve the current permit effluent limits for a design flow of 6 mgd. Plant expansion beyond 6-mgd capacity would require major construction.

FMC WWTP VPDES Permit

The FMC VPDES Permit No. VA0068110 expires October 4, 2006. Effluent limits for a 4.0 mgd design flow are 15 mg/l $CBOD_5$ and TSS, May-October TKN of 3 mg/l, total phosphorus of 2.0 mg/l and 0.016 mg/l total residual chlorine. The WWTP discharges directly to the Rappahannock River. Expansion of the FMC WWTP would result in a reduction in permitted effluent concentrations for each parameter. The permit includes limits for expansion to 5.4 mgd.

Existing Massaponax WWTP

The original Massaponax WWTP began operation in 1975 as a 3-mgd secondary plant. In 1985 the design flow in the re-issued VPDES permit was modified to 1.472 mgd In 1987, the plant was expanded to 6.0-mgd capacity, to achieve permitted BOD_5 and TSS effluent limits. In 1991 chemical feed systems were added to enable the WWTP to meet new effluent total phosphorus limits. Construction began in November 2000 for expansion of the WWTP to 8.0-mgd capacity and to upgrade the WWTP to meet ammonia and TKN effluent limits. The WWTP expansion is scheduled for start-up in November 2002.

Massaponax WWTP VPDES Permit

The Massaponax VPDES Permit No. VA0025658 expires October 4, 2006. Effluent limits for a 6.0-mgd design flow were 10 mg/l $CBOD_5$ and TSS, May 1 – October 31 TKN limits of 9.0 mg/l, 2.0 mg/l Total Phosphorus, and 0.016 mg/l total residual chlorine. The WWTP effluent discharges directly to the Rappahannock River. Expansion of the Massaponax WWTP would result in a reduction in permitted effluent concentrations for each parameter. The permit also contains effluent limits for the expanded and upgraded 8 mgd plant.

Massaponax Creek Sewage Collection

The existing Massaponax Creek sewage collection system consists of a central interceptor along Massaponax Creek and multiple trunk mains and connector sewers. The Massaponax Creek

Interceptor consists of a 12.5-mile long gravity sewer ranging from 30 inches to 18 inches in diameter. The interceptor runs down-gradient from Route 3 at Chancellor Elementary School to the Massaponax Creek Wastewater Treatment Plant, next to the Rappahannock River.

The area drained by the Massaponax Creek sewage collection system is primarily single family residential. However, near Route 3 and Route 1 the sewer flows are affected by commercial property and a large industrial development exists to the south of U.S. Route 17.

Previous studies have divided the Massaponax Creek Interceptor into three systems - the Upper Massaponax Creek system, the Middle Massaponax Creek system, and the Lower Massaponax Creek system. The Upper Massaponax Creek Interceptor parallels Massaponax Creek and consists of approximately 21,000 feet of 18-inch diameter pipe between Route 208 (Courthouse Road) near the Millgarden subdivision and the connection of the American Central pump-over near Gordon Road. An additional 4000 feet of 15-inch diameter pipe extends between Gordon Road and Chancellor Elementary School. The Upper Massaponax Creek system collects wastewater from an extensive residential population and small commercial interests along Route 3. Several trunk mains and connector sewers, 10-, 12-, and 15-inch in diameter, connect to the Upper Massaponax Creek Interceptor.

The Middle Massaponax Creek Interceptor parallels Massaponax Creek and consists of 8600 feet of 18-inch diameter pipe system, stretching from Route 208 to Route 1. The Middle Massaponax Creek system collects wastewater from primarily residential sources, with some commercial growth along Route 1 and Route 208. Several trunk mains and connector sewers, 8-inch through 16-inch in size connect to the Middle Massaponax Creek Interceptor.

The Lower Massaponax Creek Interceptor includes 32,000 feet of 24-inch pipe between Route 1 and Route 2, and 6000 feet of 30-inch pipe between Route 2 and the Massaponax Wastewater Treatment Plant. The Lower Massaponax Creek Interceptor parallels Massaponax Creek until it nears Ruffin's Pond. The interceptor then follows an abandoned Richmond, Fredericksburg, and Potomac railroad bed to the Massaponax Wastewater Treatment Plant. This region is not currently highly developed. A large portion, adjacent to Route 17, has been designated for industrial development. This system also includes the Tidewater Trail interceptor, which can receive flow from the Deep Run drainage basin via the Deep Run pumping station.

Two outside drainage basins are (or shortly will be) pumped into the Massaponax Creek drainage basin - the American Central drainage basin and the Spotsylvania Courthouse drainage basin. The American Central system collects sewer flow from the residential communities surrounding Fawn Lake. The sewage is pumped by a series of pumping stations from Fawn Lake into the Massaponax Creek drainage area, connecting to the Upper Massaponax Creek Interceptor. Currently six pump stations are used to convey the existing flow. Upon complete development of the Fawn Lake and surrounding region, additional pump stations will be required. Table 4.2 lists the existing pump stations in the American Central system.

Table 4.2 – American Central System Sewage Pumping Stations

Existing Pump Station Number	Master Plan Pump Station No.	Design Capacity (gpd)	Actual Capacity (gpd) [1]	Remarks
20	Not needed	700	952.0	
22	PS-601	700	690.0	
23	PS-602	700	714.0	
24	PS-603	700	551.9	
25	PS-604	700	1451.0	Under designed
26	PS-605	600	906.3	At 600 gpm, pump operates at 50% efficiency At 900 gpm, pump operates at 70% efficiency

[1] As field measured by Spotsylvania County

The Spotsylvania Courthouse drainage basin serves residential and commercial development surrounding the Spotsylvania County Courthouse. The region naturally drains to the Ni and Po River drainage basins. Revisions to Water/Sewer Master Plan for Courthouse Area, dated March 1999 and incorporated into this 2002 Water/Sewer Master Plan Revisions, recommends abandonment of the Wishner Wastewater Treatment Plant and transfer of sewage, via pumping stations, to the Massaponax Creek drainage basin. Five sub basins drain or are pumped into a central Courthouse Area pump station. The Courthouse Area master plan is currently being implemented. Construction documents for the new Courthouse Sewage Pumping Station have been prepared and may be advertised for construction during 2002. Construction documents for a new gravity collection system for the Courthouse Area are anticipated to be prepared in 2002.

Hazel Run Sewage Collection

The existing Hazel Run sewage collection system does not drain by gravity to an interceptor; a Hazel Run Interceptor does not exist in the Spotsylvania County portion of the drainage basin. The Hazel Run drainage area is a residential region with residential- supported commercial development along major corridors. The area was developed over the last 20 to 30 years by numerous developers, without the benefit of a development plan. Consequently, individual wastewater collection systems were provided for individual developments, rather than for the entire drainage basin. Sewage from the drainage basin is collected by a series of pump stations and pumped either to a trunk main or another pump station, depending on proximity. Fifteen pump stations are scattered throughout the Hazel Run drainage basin.

Four pump stations serve residential and commercial property north of Route 3. These properties naturally drain toward the Rappahannock River where no sewer service is available; thus, these pump stations are necessary to convey sewage to the Hazel Run drainage basin.

Eleven pump stations within the Hazel Run drainage basin, south of Route 3, could be replaced with a gravity interceptor and trunk main system.

The existing Hazel Run collection system flows into the City of Fredericksburg through a gravity sewer adjacent to Route 1 and along an unnamed tributary adjacent to the City limits until it reaches Hazel Run. The City of Fredericksburg Hazel Run Interceptor conveys City and County sewage to the City of Fredericksburg wastewater treatment plant. The interceptor ranges in size from 15-inch to 36-inch diameter.

Sewer water from Spotsylvania County enters the City of Fredericksburg collection system at four locations. The City monitors the quantity of sewage at two of these locations and an equal amount of sewage is pumped by the City of Fredericksburg to the Spotsylvania County FMC wastewater treatment plant.

The 1994 Spotsylvania County Water/Sewer Master Plan identified deficiencies in the City of Fredericksburg Hazel Run Trunk Sewer, which conveys sewage from Spotsylvania County to the City WWTP. Specifically identified was limited capacity (only 3.64 mgd) in the existing double 12-inch inverted siphon under Hazel Run. As part of this Master Plan Revision, Whitman, Requardt and Associates prepared a report (using an existing City of Fredericksburg sanitary sewage model) to document improvements needed in the City of Fredericksburg Hazel Run Interceptor. The report identified separately improvements required to accommodate growth in the City of Fredericksburg from improvements required to handle Spotsylvania County build-out flows.

Deep Run Sewage Collection

The existing Deep Run Interceptor extends up gradient along Deep Run from the Deep Run pump station to Route 1. The interceptor consists of approximately 6500 feet of 15-inch sewer and 9300 feet of 18-inch sewer parallel to Deep Run. The Deep Run Interceptor drains by gravity to the Deep Run Pump station, located on the east side of Route 2. The pump station pumps through existing force mains to send wastewater to either the FMC Wastewater Treatment Plant or the Massaponax Creek Interceptor.

The Deep Run pump station has two 10-inch Gorman Rupp belt-driven sewage pumps, each with a 1500 gpm capacity, with the ability to upgrade to 3000-gpm capacity by replacing only the pump belts, sheaves, and motors. The force main to the FMC Wastewater Treatment Plant is 12-inch. A second 16-inch force main to the Massaponax Creek Interceptor enables sewage from the Deep Run drainage basin to be conveyed to either the FMC or Massaponax WWTP for treatment.

One existing collector main drains along a tributary to the Deep Run Interceptor. This collector includes 2000 feet of 8-inch pipe and 1000 feet of 12-inch pipe. A future 8-inch collector will be required to drain an area to the west of Route 2 and north of the military park.

Flow Projections to FMC WWTP

The FMC WWTP has a minimal drainage area. A 250-gpm industrial park sewage pumping station delivers flow from the Bowman Industrial Park to the WWTP. The FMC WWTP also receives flow from the Spotsylvania County Deep Run pump station. Measured sewage flows to the FMC WWTP during the past five years are shown on Table 4.3.

Table 4.3 – FMC Wastewater Treatment Plant Measured Sewage Flows

Source of Flow	1995	1996	1997	1998	1999
Deep Run	0.71 mgd	1.49 mgd	1.24 mgd	1.29 mgd	1.17 mgd
Hazel Run	1.21 mgd	1.31 mgd	0.86 mgd	1.05 mgd	1.14 mgd
Total	1.92 mgd	2.68 mgd	2.10 mgd	2.34 mgd	2.31 mgd

In late 1999, Spotsylvania County discovered a significant source of inflow to the Deep Run sewage pumping station. This inflow source may have contributed an average of 300,000 gpd to the Deep Run drainage basin flow. The source of inflow has been eliminated.

Current and build-out annual average daily sewage flows in the Deep Run and Spotsylvania County portion of Hazel Run/Long Branch drainage basins, which could be conveyed to the FMC WWTP, are shown on Table 4.4. Current annual average flow is tabulated from metered water consumption. Also tabulated are build-out maximum month sewage flows, used for defining wastewater treatment capacity requirements.

Table 4.4 – Build-Out Sewage Flow to FMC Wastewater Treatment Plant

Drainage Basin	Current Average Water Demand	Build-out Average Water Demand	Build-out Maximum Month Sewage Flow
Hazel Run	1.33 mgd	2.30 mgd	3.45 mgd
Deep Run	0.32 mgd	1.37 mgd	2.06 mgd
City of Fredericksburg	0.50 mgd	1.50 mgd	1.50 mgd
Total Flow	2.15 mgd	5.17 mgd	7.01 mgd

Maximum month sewage flows are 1.5 times the average annual water demand (actual historic maximum monthly sewage flow was more than 2 times average annual sewage flow at FMC wastewater treatment plant in 1999 and 2000, probably because the treatment capacity was available). Full development of the Deep Run and Spotsylvania County portion of Hazel Run/Long Branch drainage basins will result in a maximum month sewage flow of approximately 7 mgd.

Expansions of FMC WWTP

The FMC WWTP VPDES Permit includes monthly average $CBOD_5$ and TSS limits of 227.1 kg/day (500 lb/day), TKN limits of 45.4 kg/day (100 lb/day), and total phosphorus limits of 30.3 kg/day (66.6 lb/day). These daily mass loadings cannot be altered without revisions to the areawide wasteload allocations. Therefore, plant expansion to accommodate the 7-mgd build-out flow would require a corresponding reduction in the effluent concentrations of these parameters, as shown in Table 4.5. The existing permit includes discharge limits up to an expansion to 5.4 mgd.

Table 4.5 – FMC Wastewater Treatment Plant Required Effluent Concentrations

Design Flow	Concentrations		
	$CBOD_5$ and TSS	TKN	Phosphorus
4 mgd	15 mg/l	3.0 mg/l	2.0 mg/l
6 mgd	10 mg/l	2.0 mg/l	1.33 mg/l
7 mgd	8.6 mg/l	1.7 mg/l	1.14 mg/l

As discussed in Section 5.6, expansion to the FMC WWTP beyond 6-mgd capacity is impractical and not cost-effective. Therefore, 1 mgd of the 7-mgd total build-out sewage flow from Hazel Run, Deep Run and the City of Fredericksburg should be pumped to the Massaponax WWTP. The Deep Run pump station already includes force mains to facilitate sewage pumping to both the FMC and Massaponax WWTP.

Flow Projections to Massaponax WWTP

The Massaponax WWTP currently receives flow from the Massaponax Creek drainage basin, from the American Central drainage basin, and from eight small areas draining directly to the Rappahannock River. It also receives flow from three sub-basins of the Hazel Run drainage basin. Measured flow to the Massaponax WWTP has increased during the past five years from 2.719 mgd in 1995 to 3.761 mgd in 2000. The 1999 dry weather sewage flow was approximately 2.7 mgd - the measured flow during the dry-weather month of July 1999.

Current and build-out average annual water demands in the Massaponax Creek drainage basin are shown in Table 4.6. Current flow is tabulated from metered water consumption. Also tabulated are build-out maximum month sewage flows, used for defining wastewater treatment capacity requirements. Maximum month sewage flows are 1.5 times the average annual water demand (actual 1995 through 2000 historic flow data for the existing Massaponax wastewater treatment plant demonstrate that maximum monthly flow is approximately 1.4 times minimum monthly flow). Full development of the Massaponax Creek drainage basins will result in a maximum month sewage flow of approximately 16.5 mgd.

Table 4.6 – Massaponax Wastewater Treatment Plant Build-Out Sewage Flow

Drainage Basin	Current Flow Projection	Build-out Average Water Demand	Build-out Maximum Month 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
Total Flow	2.78 mgd	10.37 mgd	16.57 mgd

Table 4.6 reflects that current sewage production from the Courthouse Area is treated at the Wishner WWTP; the Wishner WWTP will be closed in 2002 and the flow will be pumped to the Massaponax Creek interceptor. Future demand scenarios include flows from the abandoned Wishner WWTP (Courthouse Area) being included in the Massaponax Creek Interceptor and treated at the Massaponax Wastewater Treatment Plant. Sewage from the Hazel Run drainage basin flows to the City of Fredericksburg WWTP; from there, it is pumped to the FMC WWTP. However, sewage from three Hazel Run sub-basins is currently and will continue to be pumped to the Massaponax Creek interceptor.

To the above maximum month sewage flows would be added a sewage contribution of up to 7 mgd from the Thornburg Development District, should the existing Thornburg WWTP be abandoned and the wastewater pumped to the Massaponax WWTP.

Planned Expansions of Massaponax WWTP

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 of the Phase I expansion and upgrade to 8-mgd capacity began in November 2000 for start-up in November 2002.

Spotsylvania County is implementing WWTP expansion simultaneous with plant upgrade to incorporate total nitrogen reduction, enabling the County to participate in the Virginia Water Quality Improvement Fund. The upgraded WWTP will conform to current BOD_5, TSS and phosphorus limits, plus must meet a voluntary limit of 8 mg/l TN annual average. The fund will pay up to 50% of the cost of that portion of the plant expansion related to total nitrogen reduction.

Future Effluent Limits for Massaponax WWTP

The Massaponax WWTP VPDES Permit includes monthly average TSS limits of 227.1 kg/day (500 lb/day) and total phosphorus limits of 45.4 kg/day (100 lb/day). These daily wasteload allocations cannot be altered without revisions to the areawide wasteload allocations. Therefore, any plant expansion will require a corresponding reduction in effluent concentrations of these parameters. If the FMC WWTP were removed from service and the wasteload currently allocated for that plant transferred to the Massaponax WWTP, then the Massaponax WWTP would have monthly average TSS limits of 454.2 kg/day (1000 lb/day) and total phosphorus limits of 75.7 kg/day (167 lb/day). Effluent concentrations, with and without the FMC WWTP in service, are shown in Table 4.7.

Table 4.7 – Massaponax Wastewater Treatment Plant Required Effluent Concentrations

Design Flow	Concentrations FMC WWTP in Service		Concentrations FMC WWTP out of Service	
	TSS	Phosphorus	TSS	Phosphorus
6 mgd	10 mg/l	2.0 mg/l	20 mg/l	3.3 mg/l
8 mgd	7.5 mg/l	1.5 mg/l	15 mg/l	2.5 mg/l
12 mgd	5 mg/l	1.0 mg/l	10 mg/l	1.7 mg/l
15 mgd	4 mg/l	0.8 mg/l	8 mg/l	1.3 mg/l
22 mgd	2.7 mg/l	0.54 mg/l	5.4 mg/l	0.9 mg/l