



**HRSD**  
**Facilities Management Plan**  
**2006**

Prepared By  
Interceptor Systems Department  
Planning and Analysis Division  
March 2006

## TABLE OF CONTENTS

### 1.0 INTRODUCTION

### 2.0 SERVICE AREAS

South Shore Service Areas  
North Shore Service Areas  
Small Communities Service Areas

### 3.0 FLOW UPDATE

2005 South Shore Current Conditions  
South Shore Proposed Diversion Plan for 2007  
2005 North Shore Current Conditions  
North Shore Proposed Diversion Plan for 2008

### 4.0 SOUTH SHORE FACILITIES

#### 4.1 ARMY BASE

##### 4.1.1 Interceptor System

- 4.1.1.a Capacity
- 4.1.1.b Infiltration/Inflow
- 4.1.1.c Diversions
- 4.1.1.d Improvements

##### 4.1.2 Treatment Plant

- 4.1.2.a Capacity
- 4.1.2.b Flow Projection
- 4.1.2.c BOD and TSS Projections
- 4.1.2.d Improvements

#### 4.2 ATLANTIC

##### 4.2.1 Interceptor System

- 4.2.1.a Capacity
- 4.2.1.b Infiltration/Inflow
- 4.2.1.c Diversions
- 4.2.1.d Improvements

##### 4.2.2 Treatment Plant

- 4.2.2.a Capacity
- 4.2.2.b Flow Projection
- 4.2.2.c BOD and TSS Projections
- 4.2.2.d Improvements

- 4.3 CHESAPEAKE-ELIZABETH
  - 4.3.1 Interceptor System
    - 4.3.1.a Capacity
    - 4.3.1.b Infiltration/Inflow
    - 4.3.1.c Diversions
    - 4.3.1.d Improvements
  - 4.3.2 Treatment Plant
    - 4.3.2.a Capacity
    - 4.3.2.b Flow Projection
    - 4.3.2.c BOD and TSS Projections
    - 4.3.2.d Improvements
- 4.4 NANSEMOND
  - 4.4.1 Interceptor System
    - 4.4.1.a Capacity
    - 4.4.1.b Infiltration/Inflow
    - 4.4.1.c Diversions
    - 4.4.1.d Improvements
  - 4.4.2 Treatment Plant
    - 4.4.2.a Capacity
    - 4.4.2.b Flow Projection
    - 4.4.2.c BOD and TSS Projections
    - 4.4.2.d Improvements
- 4.5 VIRGINIA INITIATIVE PLANT
  - 4.5.1 Interceptor System
    - 4.5.1.a Capacity
    - 4.5.1.b Infiltration/Inflow
    - 4.5.1.c Diversions
    - 4.5.1.d Improvements
  - 4.5.2 Treatment Plant
    - 4.5.2.a Capacity
    - 4.5.2.b Flow Projection
    - 4.5.2.c BOD and TSS Projections
    - 4.5.2.d Improvements
- 4.6 SOUTH SHORE FLOW, BOD, AND TSS PROJECTIONS
- 4.7 ADMINISTRATION AND MAINTENANCE
  - 4.7.1 South Shore Operations Center
    - 4.7.1.a Improvements

## 5.0 NORTH SHORE FACILITIES

### 5.1 BOAT HARBOR

#### 5.1.1 Interceptor System

- 5.1.1.a Capacity
- 5.1.1.b Infiltration/Inflow
- 5.1.1.c Diversions
- 5.1.1.d Improvements

#### 5.1.2 Treatment Plant

- 5.1.2.a Capacity
- 5.1.2.b Flow Projection
- 5.1.2.c BOD and TSS Projections
- 5.1.2.d Improvements

### 5.2 JAMES RIVER

#### 5.2.1 Interceptor System

- 5.2.1.a Capacity
- 5.2.1.b Infiltration/Inflow
- 5.2.1.c Diversions
- 5.2.1.d Improvements

#### 5.2.2 Treatment Plant

- 5.2.2.a Capacity
- 5.2.2.b Flow Projections
- 5.2.2.c BOD and TSS Projections
- 5.2.2.d Improvements

### 5.3 WILLIAMSBURG

#### 5.3.1 Interceptor System

- 5.3.1.a Capacity
- 5.3.1.b Infiltration/Inflow
- 5.3.1.c Diversions
- 5.3.1.d Improvements

#### 5.3.2 Treatment Plant

- 5.3.2.a Capacity
- 5.3.2.b Flow Projection
- 5.3.2.c BOD and TSS Projections
- 5.3.2.d Improvements

### 5.4 YORK RIVER

#### 5.4.1 Interceptor System

- 5.4.1.a Capacity
- 5.4.1.b Infiltration/Inflow
- 5.4.1.c Diversions
- 5.4.1.d Improvements

- 5.4.2 Treatment Plant
  - 5.4.2.a Capacity
  - 5.4.2.b Flow Projection
  - 5.4.2.c BOD and TSS Projections
  - 5.4.2.d Improvements

5.5 NORTH SHORE FLOW, BOD, AND TSS PROJECTIONS

5.6 ADMINISTRATION AND MAINTENANCE

- 5.6.1 North Shore Operations Center
  - 5.6.1.a Improvements

5.7 COMBINED SOUTH AND NORTH SHORE IMPROVEMENTS

- 5.7.1 Geographic Information Systems (GIS)
- 5.7.2 Computerized Maintenance Management System (CMMS)
- 5.7.3 Interceptor System Metering

**6.0 SMALL COMMUNITIES**

6.1 KING WILLIAM

- 6.1.1 Collection System
  - 6.1.1.a Capacity
  - 6.1.1.b Infiltration/Inflow
  - 6.1.1.c Diversions
  - 6.1.1.d Improvements
- 6.1.2 Treatment Plant
  - 6.1.2.a Capacity
  - 6.1.2.b Flow Projection
  - 6.1.2.c BOD and TSS Projections
  - 6.1.2.d Improvements

6.2 MATHEWS

- 6.2.1 Collection System
  - 6.2.1.a Capacity
  - 6.2.1.b Infiltration/Inflow
  - 6.2.1.c Diversions
  - 6.2.1.d Improvements
- 6.2.2 Treatment Plant
  - 6.2.2.a Capacity
  - 6.2.2.b Flow Projection
  - 6.2.2.c BOD and TSS Projections
  - 6.2.2.d Improvements

6.3 URBANNA

6.3.1 Collection System

- 6.3.1.a Capacity
- 6.3.1.b Infiltration/Inflow
- 6.3.1.c Diversions
- 6.3.1.d Improvements

6.3.2 Treatment Plant

- 6.3.2.a Capacity
- 6.3.2.b Flow Projection
- 6.3.2.c BOD and TSS Projections
- 6.3.2.d Improvements

6.4 WEST POINT

6.4.1 Collection System

- 6.4.1.a Capacity
- 6.4.1.b Infiltration/Inflow
- 6.4.1.c Diversions
- 6.4.1.d Improvements

6.4.2 Treatment Plant

- 6.4.2.a Capacity
- 6.4.2.b Flow Projection
- 6.4.2.c BOD and TSS Projections
- 6.4.2.d Improvements

6.5 SMALL COMMUNITIES FLOW, BOD, AND TSS PROJECTIONS

**7.0 HRSD SOUTH SHORE, NORTH SHORE, AND SMALL COMMUNITIES FLOW,  
BOD, AND TSS PROJECTIONS**

## 1.0 INTRODUCTION

HRSD serves the local jurisdictions by providing needed wastewater interceptor and treatment facilities in a timely manner. Providing these facilities when needed requires HRSD to monitor growth, needs and changing conditions. The Facilities Management Plan is used as a reference document to monitor these growth needs and changing conditions and to present a flexible time schedule for providing new facilities.

The Facilities Management Plan 2006 evaluates existing conditions in HRSD's interceptor systems and wastewater treatment plants, projects future conditions and needs for the next eight years, and supplements the Development Plan 2000. The Development Plan 2000 describes HRSD's long-range needs and plans to expand and upgrade HRSD facilities in phases. The Facilities Management Plan is used to determine when the facilities identified in the Development Plan are actually needed. These facilities are then placed in the five-year Capital Improvement Program for implementation.

The required implementation time for a new project can be lengthy. The process of selecting an engineer, preparing a preliminary engineering report, designing the project, obtaining regulatory review and approval, advertising and bidding, construction, and start up of a project usually requires approximately two years to complete for a pump station or interceptor line and approximately six years to complete for a treatment plant. Therefore, by looking eight years into the future, HRSD is given a six-year lead-time to undertake a pump station or interceptor line project and a two-year lead-time to undertake a treatment plant project. Thus, the Facilities Management Plan provides for planning and implementing new projects well before existing facilities exceed their intended capacity.

The existing capacity of the interceptor system and treatment plants are evaluated for the Facilities Management Plan using the Interceptor Systems Computer Model with actual water consumption flows for the previous year. This evaluation indicates if any part of the interceptor system or any treatment plants are reaching capacity. If necessary, the Facilities Management Plan presents a plan to divert flows, construct a parallel or new interceptor line, construct a pressure reducing station (PRS), or expand a treatment plant. The model is also used to analyze the diversion capabilities existing within the interceptor system taking into account the capacities of the interceptor system and treatment plants.

The actual flow, hydraulic loadings, TSS loadings, and BOD loadings for each treatment plant are shown graphically along with the projections of these items based on the most recent rate of growth predicted by the Hampton Roads Planning District Commission and the Middle Peninsula Planning District Commission. The growth trends for each interceptor system are reviewed annually and updated as needed to simulate the actual growth as closely as possible for planning purposes. The BOD and TSS loading design capacity in addition to the more conventional hydraulic design capacity are also checked.

## **2.0 SERVICE AREAS**

The plats on the following pages show the planned service areas for HRSD's existing and future interceptor lines. These plats show both the areas already served by existing interceptor lines and the areas HRSD is currently planning to serve in the future.

Interceptor lines are designed to carry a given amount of wastewater flow from a specific planned service area. Development outside the planned service area may cause the existing interceptors to become overloaded, thus requiring construction of new force mains.

The Interceptor Systems Department is installing pressure and flow meters throughout the North and South Shore Systems. The meters will help with infiltration and inflow (I/I) abatement, operating and maintenance of the interceptor system, and planning and model calibration.

The Interceptor Systems Department is working on providing an enterprise geographic information system (GIS) designed to serve a wide range of purposes across the departments within HRSD.

**See separate documents to view maps of South Shore, North Shore, and Middle Peninsula Service Areas.**

### 3.0 FLOW UPDATE

The Facilities Management Plan 2006 uses the actual water consumption flows from the previous year to update the current status of the interceptor system and treatment plants. The current status also accounts for any flow diversions currently taking place. The Facilities Management Plan 2006 uses the Interceptor System Computer Model to analyze the interceptor system. Physical parameters of the interceptor system itself and each customer's water consumption and point of discharge into the HRSD interceptor system are input into the model. HRSD uses potable water meter readings taken by the local jurisdictions as the basis for water consumption and customer billings for sewerage service. It has been assumed, for the purpose of this Plan, that all potable water has been returned to HRSD. This is a conservative approach because the water discharged will typically be somewhat less than the actual water consumption for billing purposes.

In order to determine where wastewater enters HRSD's interceptor system, each customer's billing account is given a code number corresponding to the local jurisdiction or HRSD pump station receiving the wastewater and pumping it directly into the HRSD interceptor system. The water consumption data is accumulated and averaged to obtain the average water consumption flow for a year at each pump station. Thus, the flow from each local jurisdiction or HRSD pump station is input in the computer model. The model peaks the flow with a 2.4 peaking factor to account for the normal peak flows and normal infiltration and inflow (I/I). If I/I is excessive in the interceptor system, the model may not represent the highest peak conditions actually seen when the system is receiving excessive I/I.

The graphs showing projected flows for each system in the following sections are actually based on the flows seen at the plants plus the growth rate. These flows are representative of the actual I/I received at the plants. The growth rate is based on the HRPDC growth rate. The current Max Month's Flow from each of the systems was used to balance the Interceptor System Computer Model to provide a representative Max Month flow at the individual plants. Using this figure to simulate the amount of flow a plant will receive when diverting flows precludes exceeding the plant's capacity. The model is checked for any diversions to ensure HRSD's policy for a peaking factor of 2.4 is not exceeded. If the Max Month scenario exceeds the 2.4 peaking factor scenario, then the capacity of the system is being seriously exceeded. The Average Monthly Flow and Peak 3-Month Flow are indicators of current flow

conditions. The Peak 3-Month Flow has been determined to be representative of the sustained Max Month flow, whereas the actual Max Month flow can be unrepresentative due to an unusual wet weather event.

Results of recent work on a Solids Strategy for HRSD treatment plants indicated the BOD concentration has been climbing over the past few years. This can be expected from the decrease in potable water use due to conservation. The effect on HRSD plants though is that they may be nearing capacity based on this BOD loading even though hydraulically they are still in good shape. This became particularly evident at the Atlantic Treatment Plant where a diversion of flow away from the Atlantic Treatment Plant is planned until the plant is expanded.

The following plates are updates of the Phase I plates from the Development Plan 2000, indicating the actual 2005 conditions for both the South Shore and North Shore. Any problems in the system will be shown on these plates and discussed in the system information shown in the following sections.

The South Shore System has been operating in a "float" condition over the past few years. As more capacity is created with new pipelines, this "float" should eventually be discontinued. Due to temporary system constraints, two short-term diversions are planned for the South Shore. The first will last for three months, beginning in July 2006. The second will last for nine months, beginning in October 2006. Because of BOD loading problems at the Atlantic Treatment Plant, a diversion is planned to take flow off the Atlantic Treatment Plant until it can be expanded. This planned diversion is shown on the following drawing and should take effect in July 2007. Flow will then be diverted off of the Chesapeake-Elizabeth and Nansemond Treatment Plants to the Atlantic Treatment Plant and Virginia Initiative Plant. These diversions will also be discussed under each system affected in the next section.

A diversion is planned to take flow off the James River and York River Treatment Plants in the North Shore System. This planned diversion should take effect in 2008. It will also be discussed under each system affected in the next section.

Since 2000, flows for Small Communities System's King William Treatment Plant have been trucked to the West Point Treatment Plant in that same system. It is anticipated that this will not continue much longer.

**See separate documents to view maps of South Shore Current Conditions, South Shore Proposed Diversion, North Shore Current Conditions, and North Shore Proposed Diversion.**

## 4.0 SOUTH SHORE FACILITIES

### 4.1 ARMY BASE

#### 4.1.1 Interceptor System

##### 4.1.1.a Capacity

The capacity of the Army Base System is currently sufficient for the existing flows.

##### 4.1.1.b Infiltration/Inflow

In support of the City of Norfolk's ongoing efforts to reduce I/I, the Interceptor Reliability Section is conducting long-term flow monitoring at three locations in the Army Base system: on the suction leg at HRSD's Terminal Avenue PRS; on HRSD's force main from Dovercourt Road Pump Station; and on the discharge force main from Norfolk's Pump Station #27. This flow monitoring will continue throughout 2006.

A data logger has also been installed in Taussig Boulevard Pump Station to obtain continuous flow data from the station's three effluent magmeters. This data collection will continue next year.

A CIP Project has been submitted for the rehabilitation of HRSD's Little Creek Road Extension Force. Interceptor Reliability Section personnel have developed a long-term and temporary metering plan for flow/pressure at critical locations in the HRSD system in Norfolk. Implementation of the plan should begin in early 2006.

##### 4.1.1.c Diversions

There are no diversions currently in the Army Base System nor are any planned during the next year.

##### 4.1.1.d Improvements

No major improvements are planned for the Army Base Interceptor System.

#### 4.1.2 Treatment Plant

##### 4.1.2.a Capacity

The current design capacity of the Army Base Treatment Plant is 18 MGD. The average plant flow for FY 2005 was 12.56 MGD. Due to site restrictions, the Army Base Treatment Plant cannot be expanded to increase its flow capacity.

##### 4.1.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Army Base Treatment Plant through the year 2014 based on a currently projected population growth of 0.083%. The graph shows that the plant has sufficient capacity to treat flows.

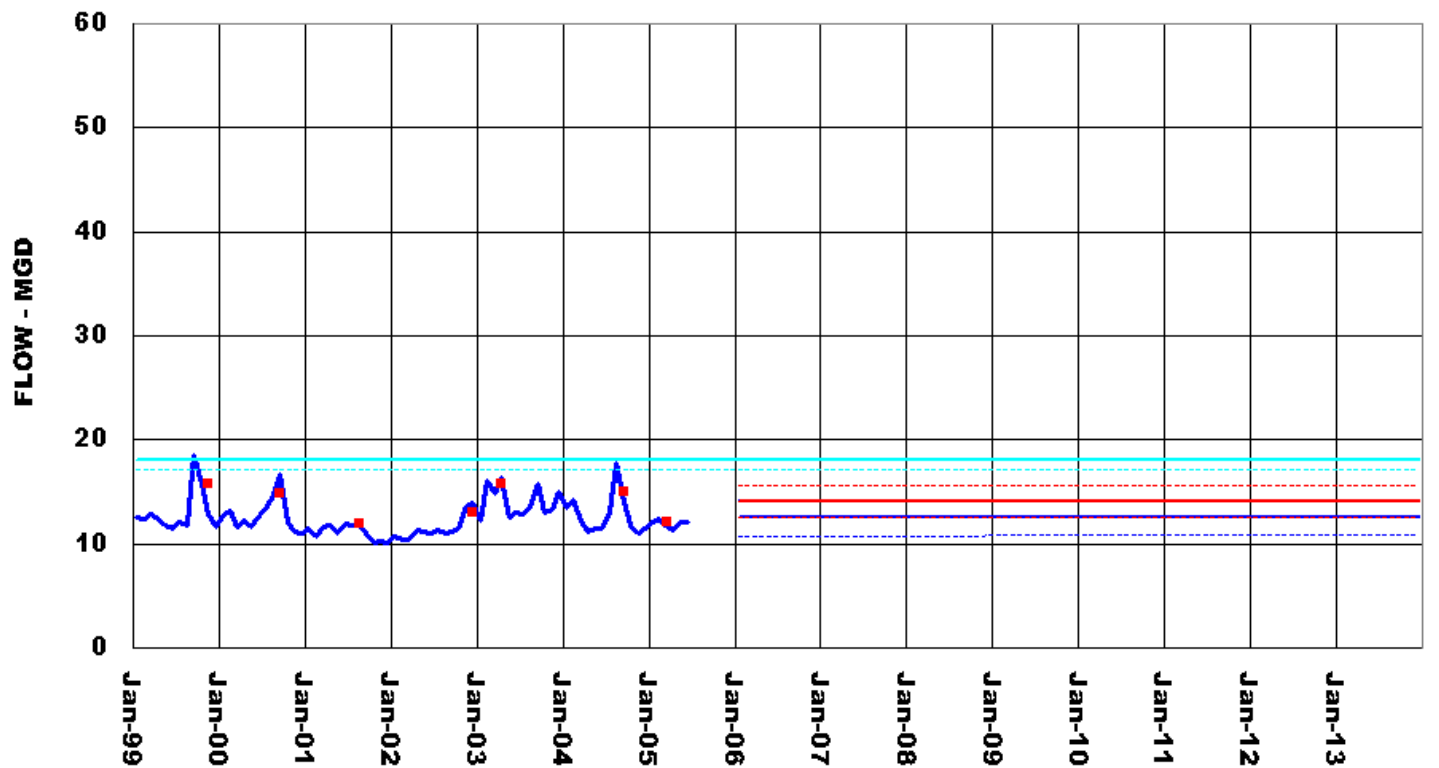
##### 4.1.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the Army Base Treatment Plant is expected to be within design limits for BOD and TSS through the year 2014.

##### 4.1.2.d Improvements

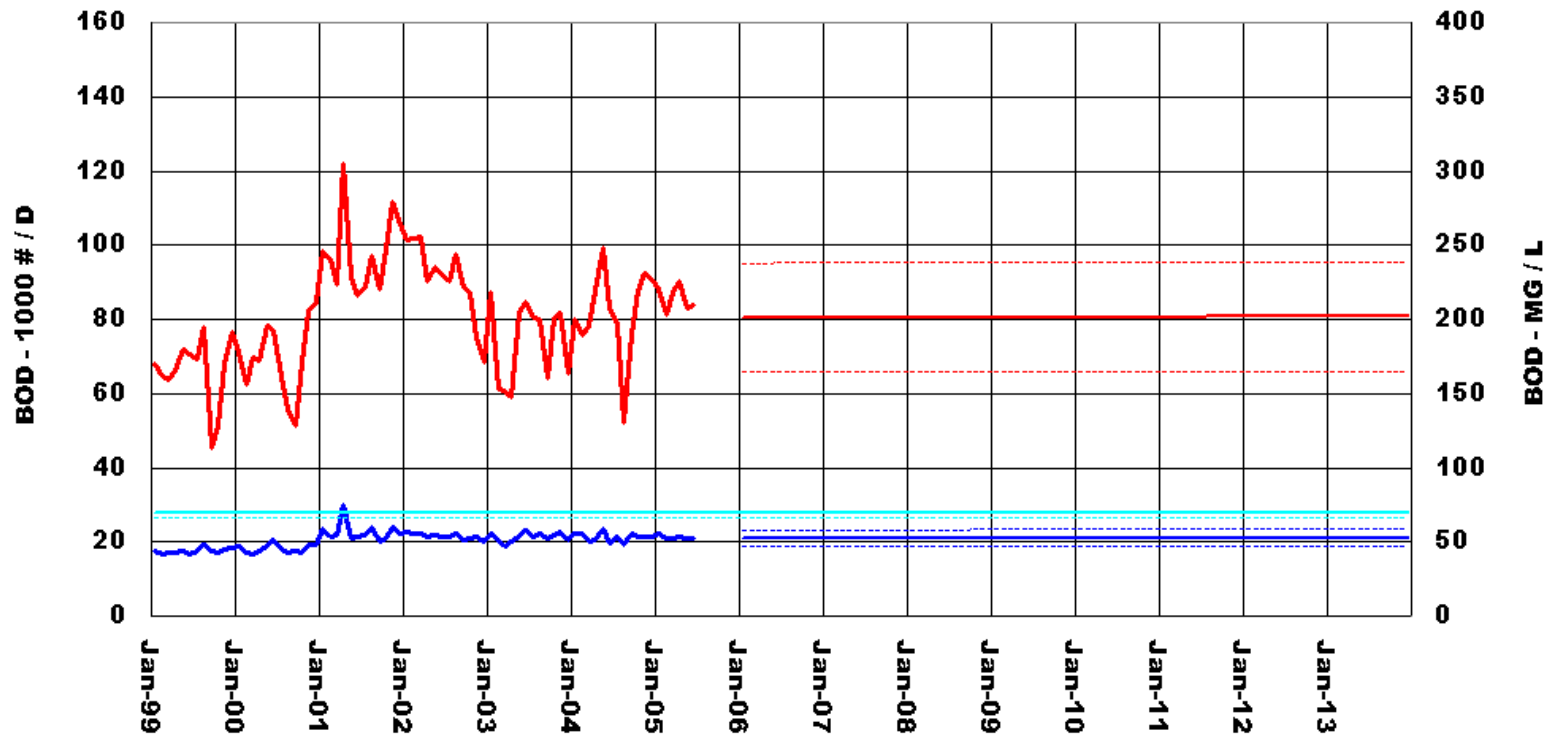
No major improvements are planned or underway for the Army Base Treatment Plant.

## ARMY BASE TREATMENT PLANT FLOW PROJECTION



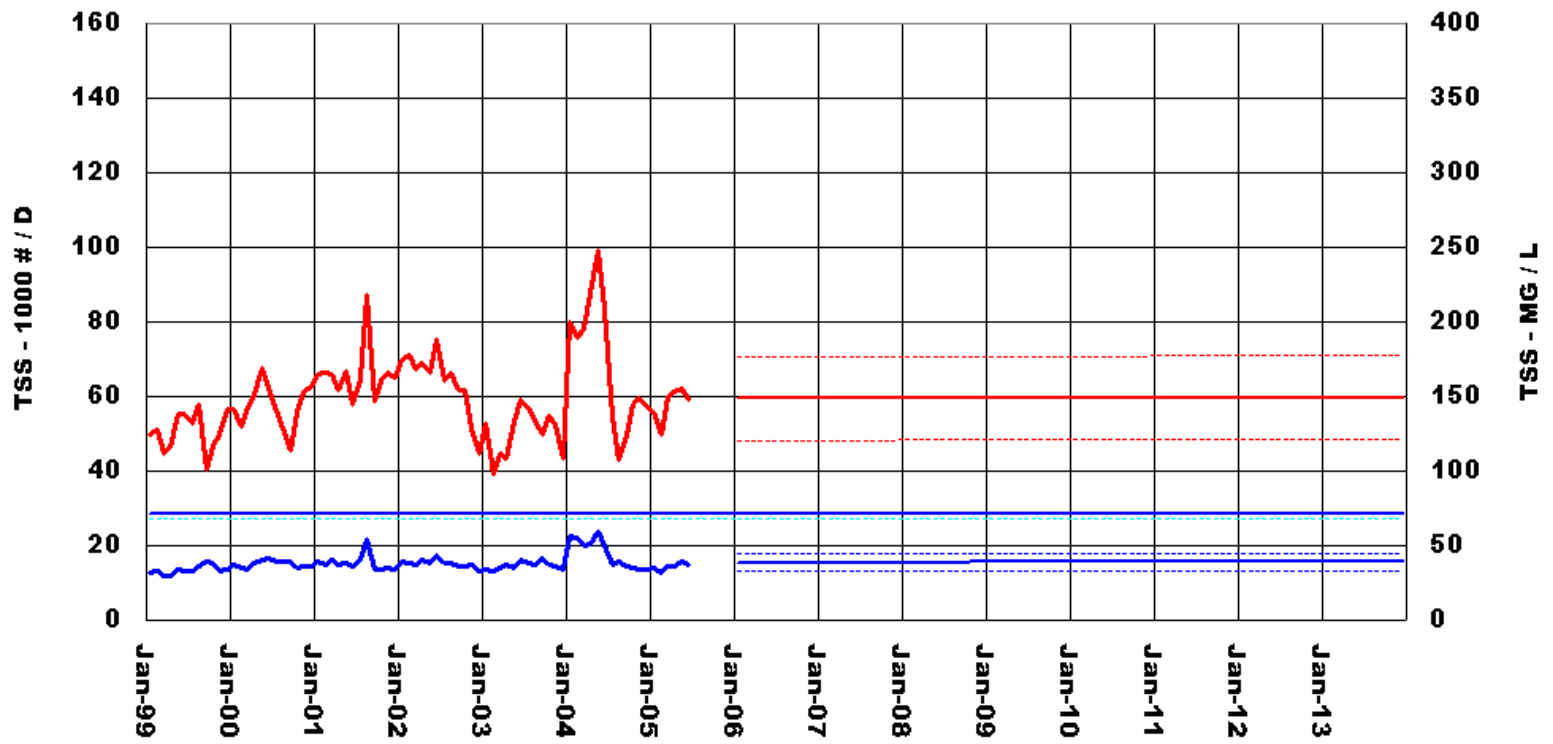
- ACTUAL AVG MO FLOW
- PROJECTED AVG MO FLOW
- PROJECTED AVG PEAK 3 MO FLOW
- ACTUAL PEAK 3 MO FLOW
- PLANT FLOW CAPACITY
- PROJECTED MAX MO FLOW
- PROJECTED MAX PEAK 3 MO FLOW
- 95% PLANT FLOW CAPACITY
- PROJECTED MIN MO FLOW
- PROJECTED MIN PEAK 3 MO FLOW

## ARMY BASE TREATMENT PLANT BOD PROJECTION



- ACTUAL AVG MO BOD - # / D
 — PLANT BOD CAPACITY - # / D
- - - 95% PLANT BOD CAPACITY - # / D
- PROJECTED AVG MO BOD - # / D
 - - - PROJECTED MAX MO BOD - # / D
- - - PROJECTED MIN MO BOD - # / D
- PROJECTED AVG MO BOD - MG / L
 - - - PROJECTED MAX MO BOD - MG / L
- - - PROJECTED MIN MO BOD - MG / L
- ACTUAL AVG MO BOD - MG/L

## ARMY BASE TREATMENT PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D    | <span style="color: blue;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: blue;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">—</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO TSS - MG/L      |  |  |

## 4.2 ATLANTIC

### 4.2.1 Interceptor System

#### 4.2.1.a Capacity

Pressures have been high in the Mount Pleasant Road area of Chesapeake due to development. This will be corrected when the Lake Ridge Interceptor Force Main (IFM) is completed and flows can be sent to it from the recently completed Elbow Road Interceptor Force Main.

Velocities are high in the London Bridge area of Virginia Beach. This will be corrected when the Hilltop/Point O'Woods Parallel IFM is constructed. A parallel force main to the East Princess Anne Force Main is planned to help reduce pressures in the future. The force main will be constructed by the City of Virginia Beach as a part of their road project in that location.

#### 4.2.1.b Infiltration/Inflow

The Interceptor Reliability Section continues remote monitoring of pressure at various locations in Chesapeake and Virginia Beach within the Atlantic system. A new in-line magmeter will be installed as part of the Elbow Road Interceptor Force Main project and will monitor flow from Chesapeake to the Atlantic Treatment Plant. The Section does not plan to conduct I/I studies in the Atlantic system in the next year.

#### 4.2.1.c Diversions

High TSS and BOD at the Atlantic Treatment Plant will necessitate taking some of the flow off of the plant until a plant expansion can be completed. Flow will be diverted to the Nansemond and VIP Treatment Plants. In order to divert flows to these plants, several other immediate projects will need to be completed to accommodate additional flows. (See Section 3.0.) After the expansion is complete, flow will be diverted off of the Nansemond and Chesapeake-Elizabeth Treatment Plants to the Atlantic Treatment Plant and the Virginia Initiative Plant.

#### 4.2.1.d Improvements

The Lake Ridge Interceptor Force Main is being constructed to accommodate new flows in Virginia Beach and to carry flows from the Elbow Road and Southeastern Interceptor Force Mains to the Atlantic Treatment Plant. In conjunction with a VDOT road project, design has begun on a new parallel interceptor force main along Laskin Road in Virginia Beach from the intersection of Laskin and Great Neck Roads to Freemac Drive to reduce high velocities and pressures in the London Bridge area of Virginia Beach.

Also in conjunction with a City of Virginia Beach Road Project for Nimmo Parkway, the City will be moving our East Princess Anne Trunk Force Main. A new parallel force main was scheduled in this same location in Phase III of the Development Plan. The City has asked that we allow them to build this new line at the same time as the road project. This will result in savings to HRSD and avoid tearing up a relatively new road in a few years to install the line.

In order to divert flows from the Atlantic Treatment Plant to the Nansemond and VIP Treatment Plants while the Atlantic Treatment Plant is being expanded, the yard piping for the Providence Road Pressure Reducing Station needs to be modified to allow the station to pump in the reverse direction towards Quail Pressuring Reducing Station (PRS). This modification will allow for more flexibility in diverting flows toward Virginia Initiative Plant and Nansemond Treatment Plant. The modification should be sized to allow the full capacity of the pump station to be reversed.

## 4.2.2 Treatment Plant

### 4.2.2.a Capacity

The current average design capacity of the Atlantic Treatment Plant is 36 MGD. The average plant flow for FY 2005 was 31.13. The Atlantic Treatment Plant is nearing hydraulic capacity.

### 4.2.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Atlantic Treatment Plant through the year 2014 based on a currently projected population growth of 0.905%. The flow projections show that the plant has sufficient capacity to treat flow with the expansion.

### 4.2.2.c BOD and TSS Projections

The BOD and TSS Projections are shown on the following pages. The Atlantic Treatment Plant is expected to be within design limits for TSS through the year 2014, but currently is at capacity of BOD.

The BOD levels coming in the plant are higher than originally designed for, but the treatment efficiency of the plant process has been successful in removing the required BOD before discharge. Plant expansion will provide for additional capacity to handle BOD in the future.

Until then, a flow diversion is scheduled in approximately 2007 that should enable the plant to meet the BOD demand until the expansion is complete. The plant is also installing chemical feed equipment to enhance BOD removal.

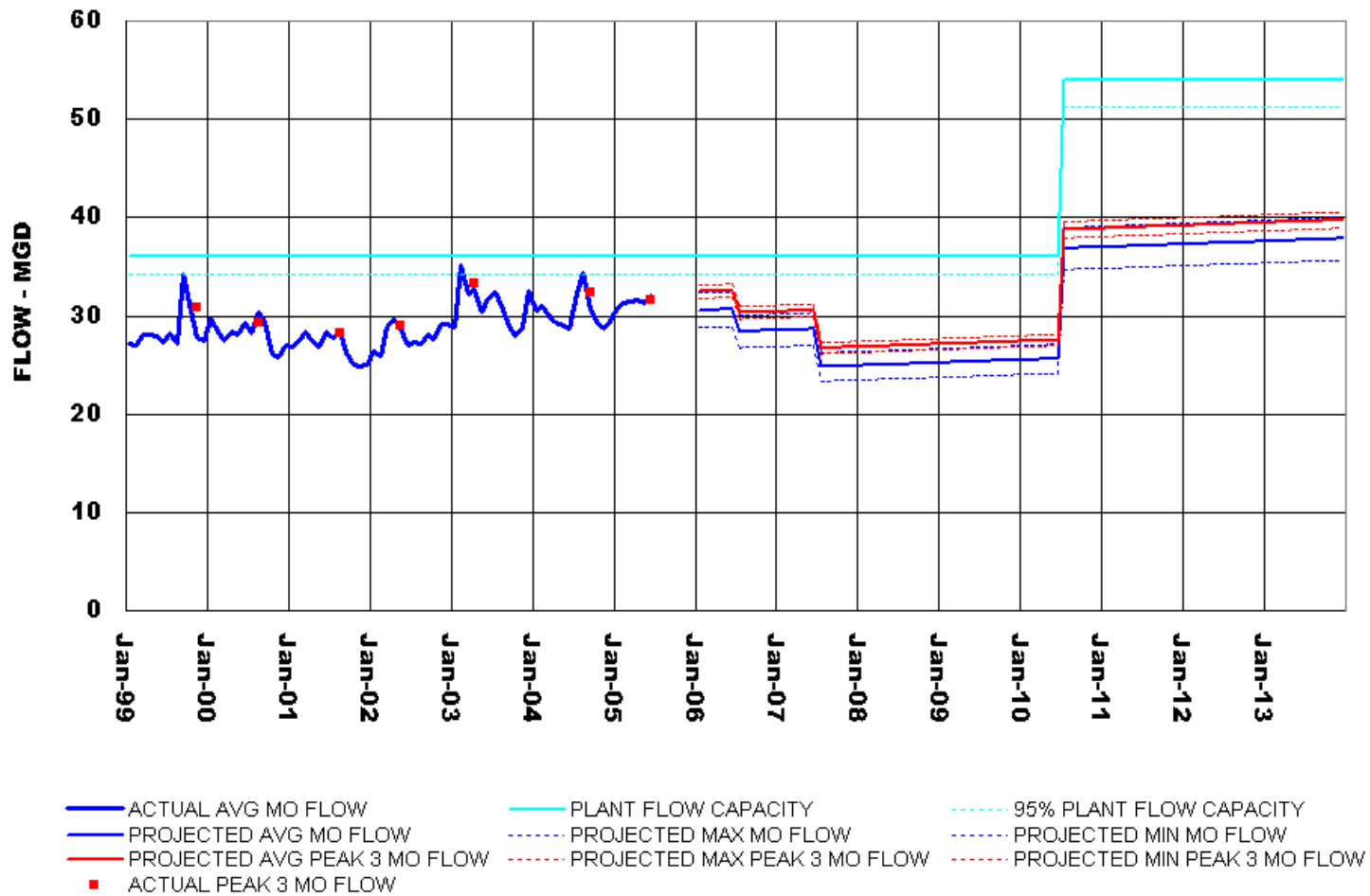
### 4.2.2.d Improvements

A major expansion of the plant is underway to increase the capacity to 54 MGD and improve internal processes. The expansion is scheduled for completion in 2010. Plant capacity upon completion of the expansion will be 54 MGD. The ultimate treatment capacity of the plant will be 72 MGD.

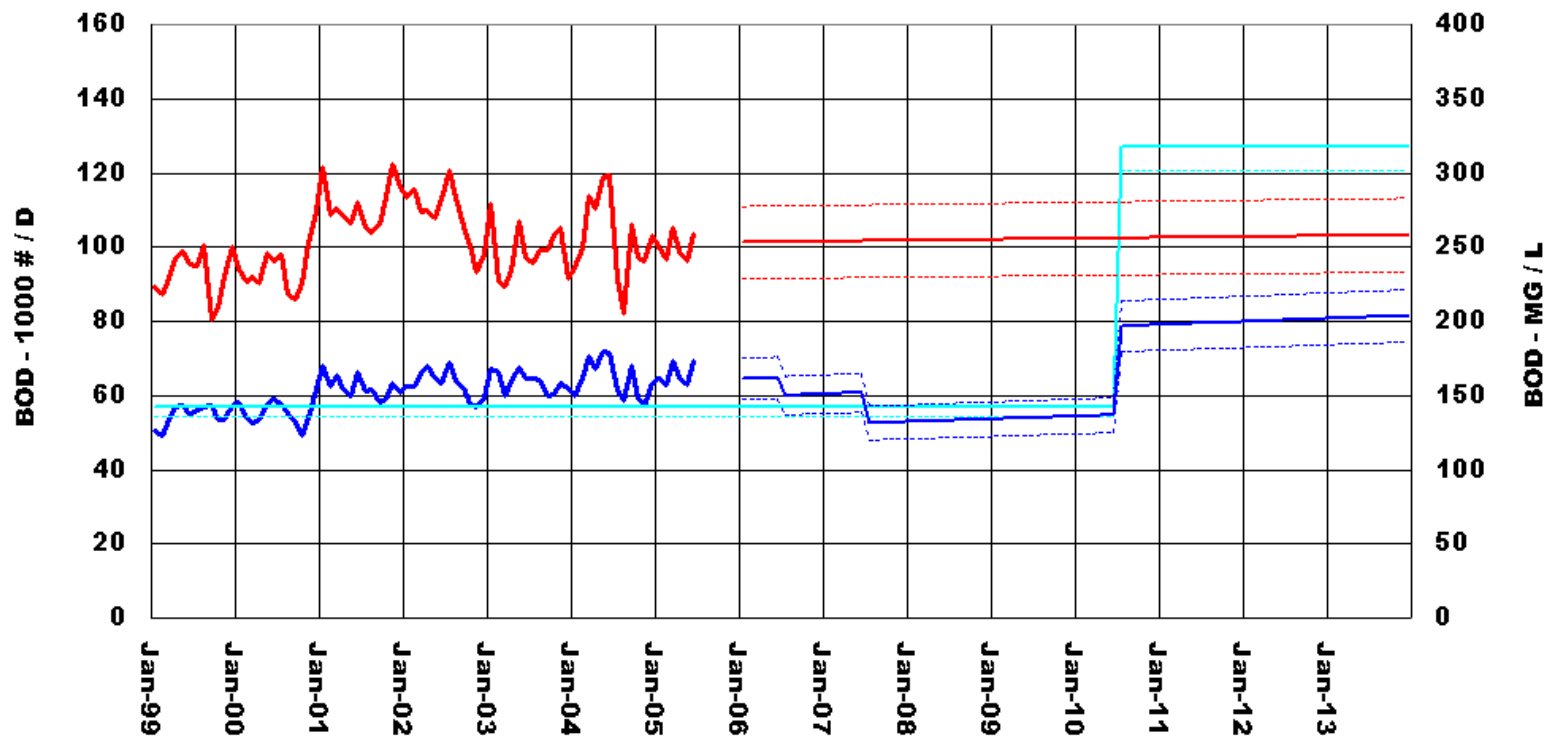
A study is being conducted to evaluate the impact of biosolids on heavy metals in the soil to determine the potential for groundwater contamination at the Progress Farm. Results may refute critics' claims and help support the continuation of land application.

A project is in progress to develop an Environmental Management System (EMS) for the Atlantic Treatment Plant. This system will allow the plant's land application program to be certified.

## ATLANTIC TREATMENT PLANT FLOW PROJECTION

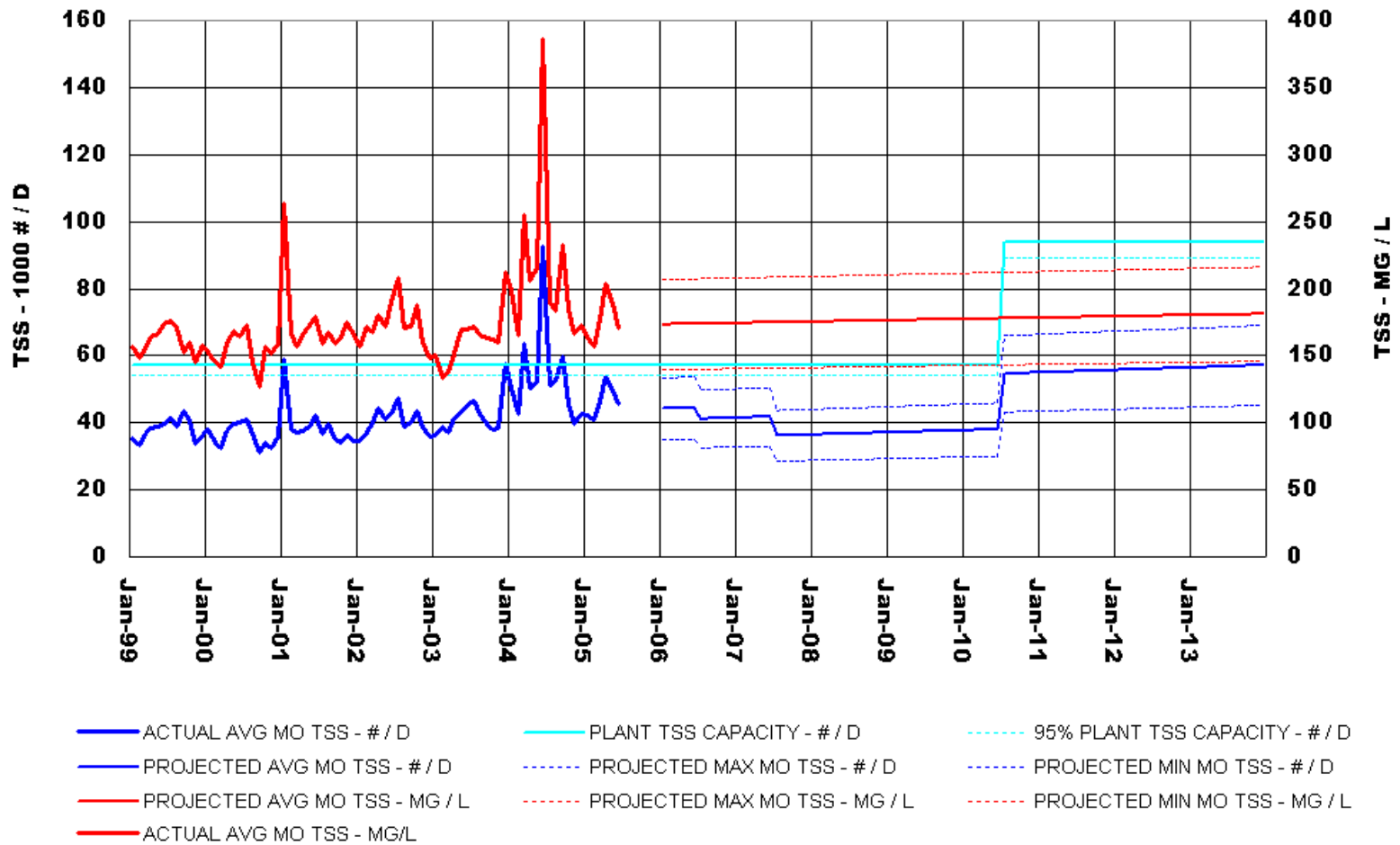


## ATLANTIC TREATMENT PLANT BOD PROJECTION



<span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D	<span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D	<span style="color: cyan;">- - -</span> 95% PLANT BOD CAPACITY - # / D
<span style="color: blue;">- - -</span> PROJECTED AVG MO BOD - # / D	<span style="color: blue;">- - -</span> PROJECTED MAX MO BOD - # / D	<span style="color: blue;">- - -</span> PROJECTED MIN MO BOD - # / D
<span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L	<span style="color: red;">- - -</span> PROJECTED MAX MO BOD - MG / L	<span style="color: red;">- - -</span> PROJECTED MIN MO BOD - MG / L
<span style="color: red;">- - -</span> ACTUAL AVG MO BOD - MG / L		

## ATLANTIC TREATMENT PLANT TSS PROJECTION



### 4.3 CHESAPEAKE-ELIZABETH

#### 4.3.1 Interceptor System

##### 4.3.1.a Capacity

The capacity of the Chesapeake-Elizabeth System is currently sufficient for the existing flows.

##### 4.3.1.b Infiltration/Inflow

Interceptor Reliability Section personnel have developed a long-term and temporary metering plan for flow/pressure at critical locations in the HRSD system in Norfolk. Implementation of the plan should begin in early 2006.

##### 4.3.1.c Diversions

Flow will be taken off the Chesapeake-Elizabeth system for 3 months beginning in July 2006 for temporary system adjustments. In October 2006 flow will be shifted to the Chesapeake-Elizabeth Treatment Plant from the Atlantic Treatment Plant for nine months for temporary system adjustments. In July 2007, 3.06 MGD will be permanently shifted off of the Chesapeake-Elizabeth Treatment Plant.

##### 4.3.1.d Improvements

No improvements are currently scheduled for the Chesapeake-Elizabeth Interceptor System.

#### 4.3.2 Treatment Plant

##### 4.3.2.a Capacity

The current design capacity of the Chesapeake-Elizabeth Treatment Plant is 24 MGD. The average plant flow for FY 2005 was 21.02 MGD. The Chesapeake-Elizabeth Treatment Plant can ultimately be expanded to 30 MGD, but it is not anticipated that expansion will be needed before the year 2014.

#### 4.3.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Chesapeake-Elizabeth Treatment Plant through the year 2014 based on a currently projected population growth of 0.677%.

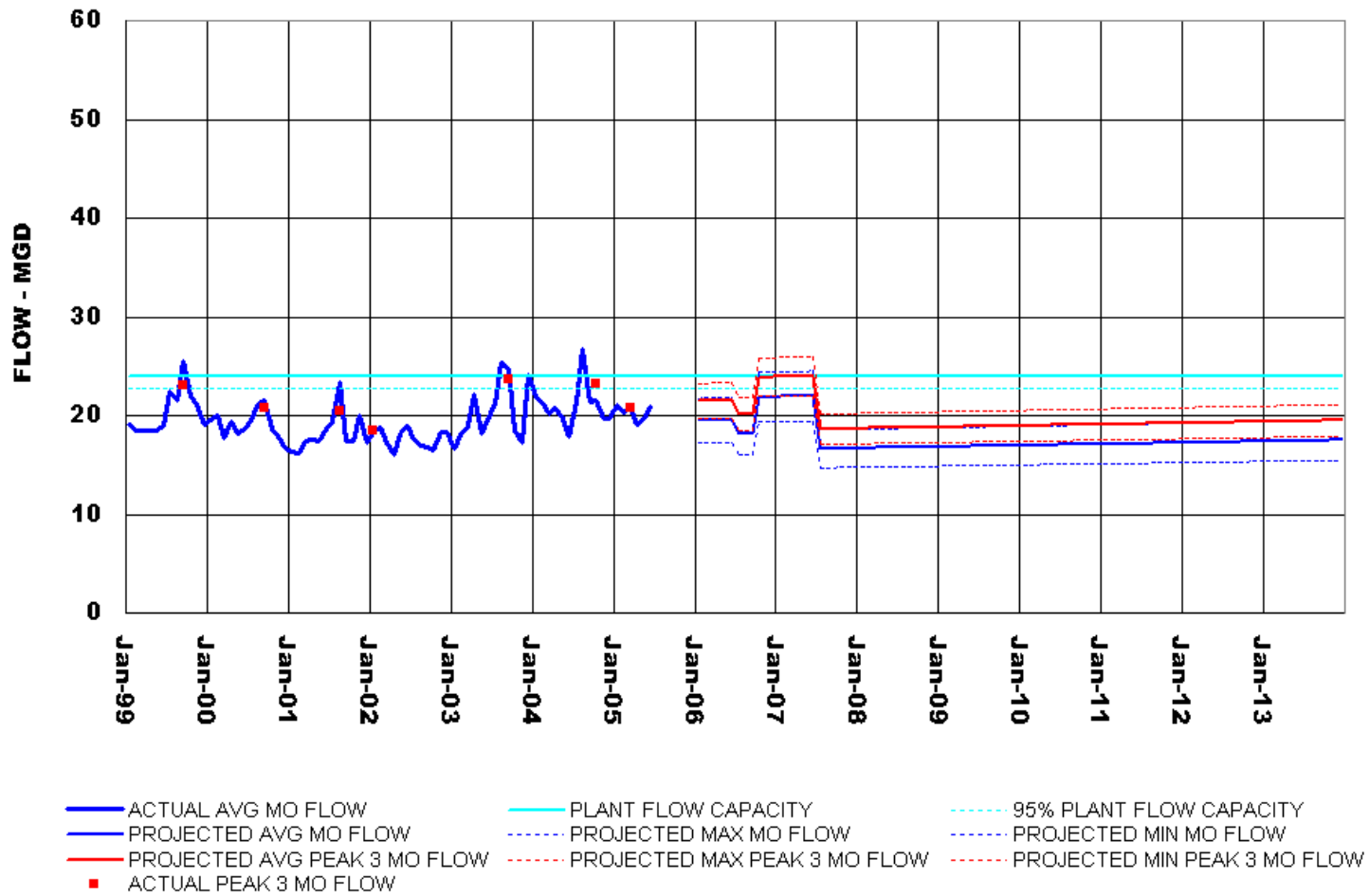
#### 4.3.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the Chesapeake-Elizabeth Treatment Plant is expected to be within design limits for TSS through the year 2014 as a result of the diversion. BOD capacity will be increased upon completion of the plant upgrade, currently in progress. A slight decrease in TSS capacity will result from the current upgrade.

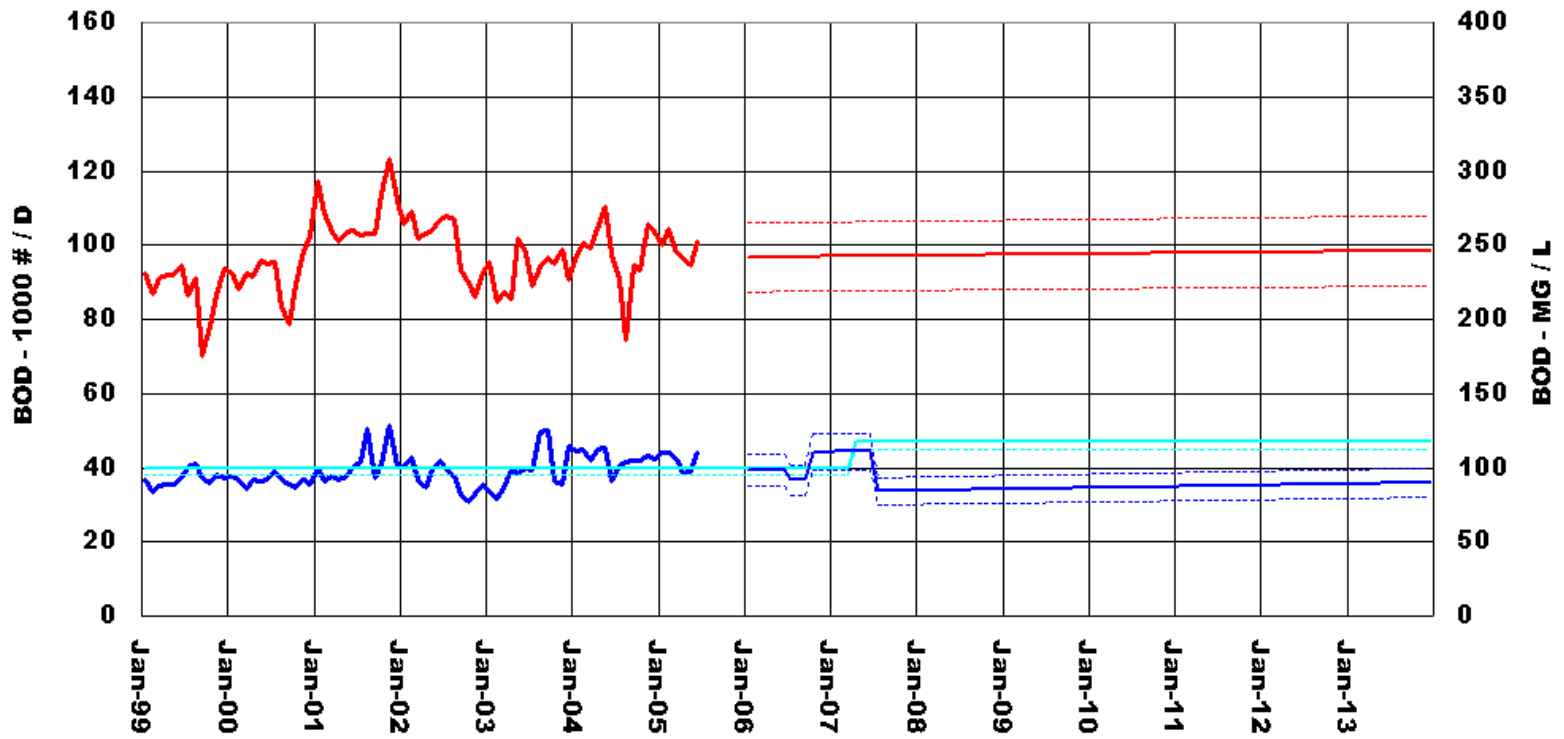
#### 4.3.2.d Improvements

The plant is currently undergoing a major improvement project. This project will not expand treatment capacity, but will improve treatment quality. Piping, screening, flow splitting, and odor control problems are being addressed. The Gaseous Chlorine and Sulfur Dioxide facilities are being converted to liquid Sodium Hypochlorite and Sodium Bisulfate facilities.

## CHESAPEAKE - ELIZABETH TREATMENT PLANT FLOW PROJECTION

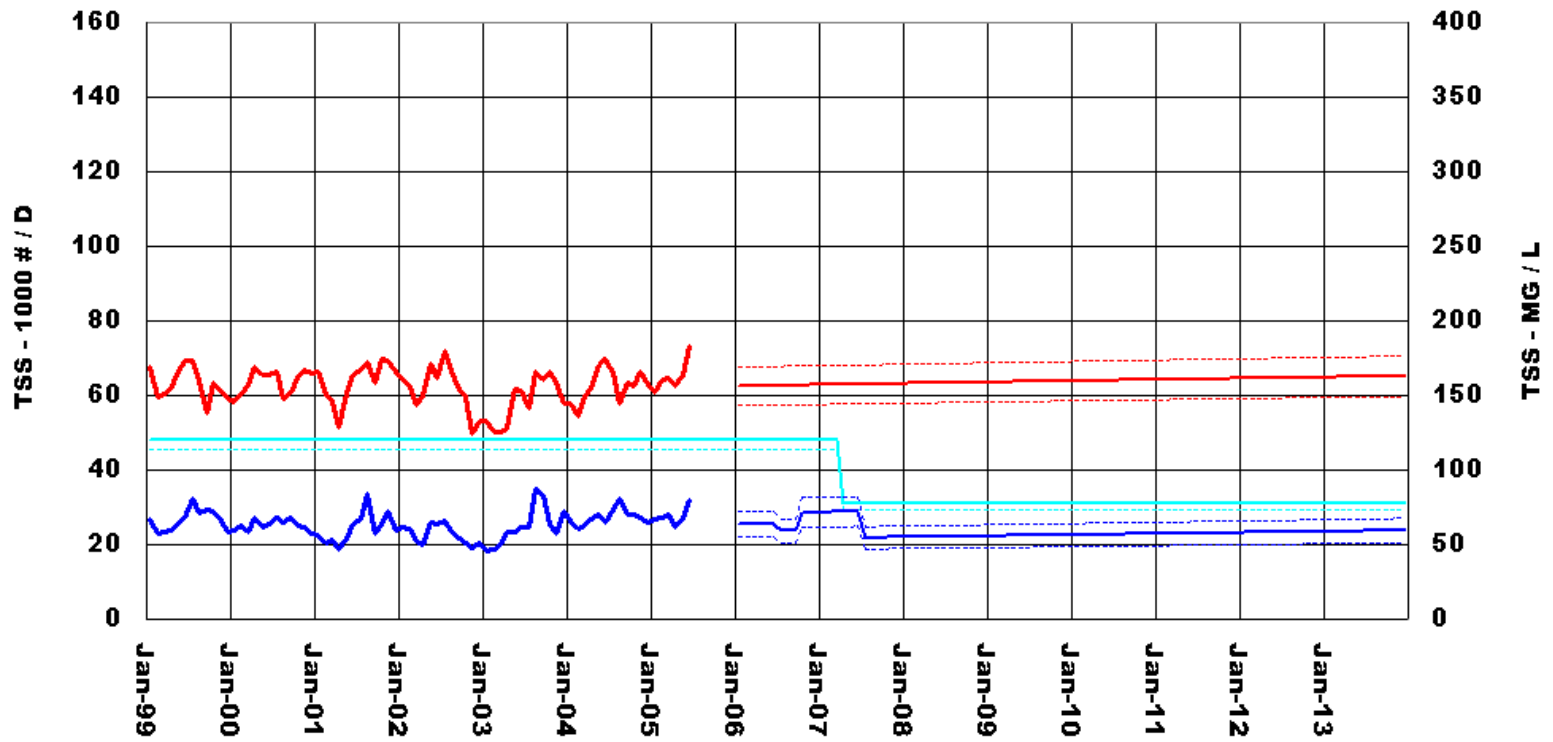


## CHESAPEAKE - ELIZABETH TREATMENT PLANT BOD PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D        | <span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT BOD CAPACITY - # / D |
| <span style="color: blue;">- - -</span> PROJECTED AVG MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO BOD - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L     | <span style="color: red;">- - -</span> PROJECTED MAX MO BOD - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO BOD - MG / L   |
| <span style="color: red;">- - -</span> ACTUAL AVG MO BOD - MG/L      |  |  |

## CHESAPEAKE - ELIZABETH TREATMENT PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D        | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">- - -</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L     | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">- - -</span> ACTUAL AVG MO TSS - MG/L      |  |  |

#### 4.4 NANSEMOND

##### 4.4.1 Interceptor System

###### 4.4.1.a Capacity

The capacity of the Nansemond System is currently sufficient for the existing flows.

###### 4.4.1.b Infiltration/Inflow

The Interceptor Reliability Section continues data collection from the following HRSD permanent flow meters: the 30-inch magmeter site near Smithfield High School; the 8-inch magmeter site near Gatling Pointe; and the flow meter at Smithfield Foods. Using data from these meters, Town of Smithfield flow contribution to Nansemond Treatment Plant can be calculated.

The Interceptor Reliability Section also continues pressure monitoring at various locations along the Smithfield Interceptor Force Main. The Section is not currently conducting I/I studies in the Nansemond system nor are any planned in the next year.

###### 4.4.1.c Diversions

High TSS and BOD at the Atlantic Treatment Plant will necessitate taking some of the flow off of the plant until a plant expansion can be completed. Flow also needs to be taken from the Chesapeake-Elizabeth Treatment Plant. Flow from these two plants will be diverted to the Nansemond Treatment Plant and the Virginia Initiative Plant until expansion of the Atlantic Treatment Plant is complete. In order to divert flows to these plants, several other immediate projects will need to be completed to accommodate additional flows. When the expansion of the Atlantic Treatment Plant is complete in 2010, it will be necessary to divert flow off of the Nansemond Treatment Plant to the Atlantic Treatment Plant.

#### 4.4.1.d Improvements

Two projects in the Nansemond system are needed to accommodate the diversion of flows from the Atlantic Treatment Plant. The first is the construction of the Route 337 Pressure Reducing Station to reduce pressures in the Bower's Hill Interceptor. This PRS was planned to be constructed in Phase IV of the Development Plan 2000, but diversion capability is currently required to take flow from the Atlantic system to Nansemond, thus necessitating the need for the PRS to maximize the amount of flow that can be diverted.

The second project is to modify the Shell Road Interceptor Force Main coming from the Deep Creek area that currently connects on the discharge side of the Deep Creek PRS to take a 24" branch to the suction side of the Deep Creek PRS. This will allow Deep Creek PRS to lower the pressure in the Great Bridge area of Cedar Road, thus allowing more flow to be diverted to the Nansemond Treatment Plant. The pumps in the existing Deep Creek and Bowers Hill Pressure Reducing stations need to be evaluated to ensure they have the capacity necessary to pump peak flows and reduce pressure. If not, they will be replaced.

#### 4.4.2 Treatment Plant

##### 4.4.2.a Capacity

The current design capacity of the Nansemond Treatment Plant is 30 MGD. The average plant flow for FY 2005 was 20.74 MGD. The Nansemond Treatment Plant ultimate expansion will be to 100 MGD.

##### 4.4.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Nansemond Treatment Plant through the year 2014 based on a currently projected population growth of 1.469%. The graph shows that the plant has sufficient capacity to treat flows.

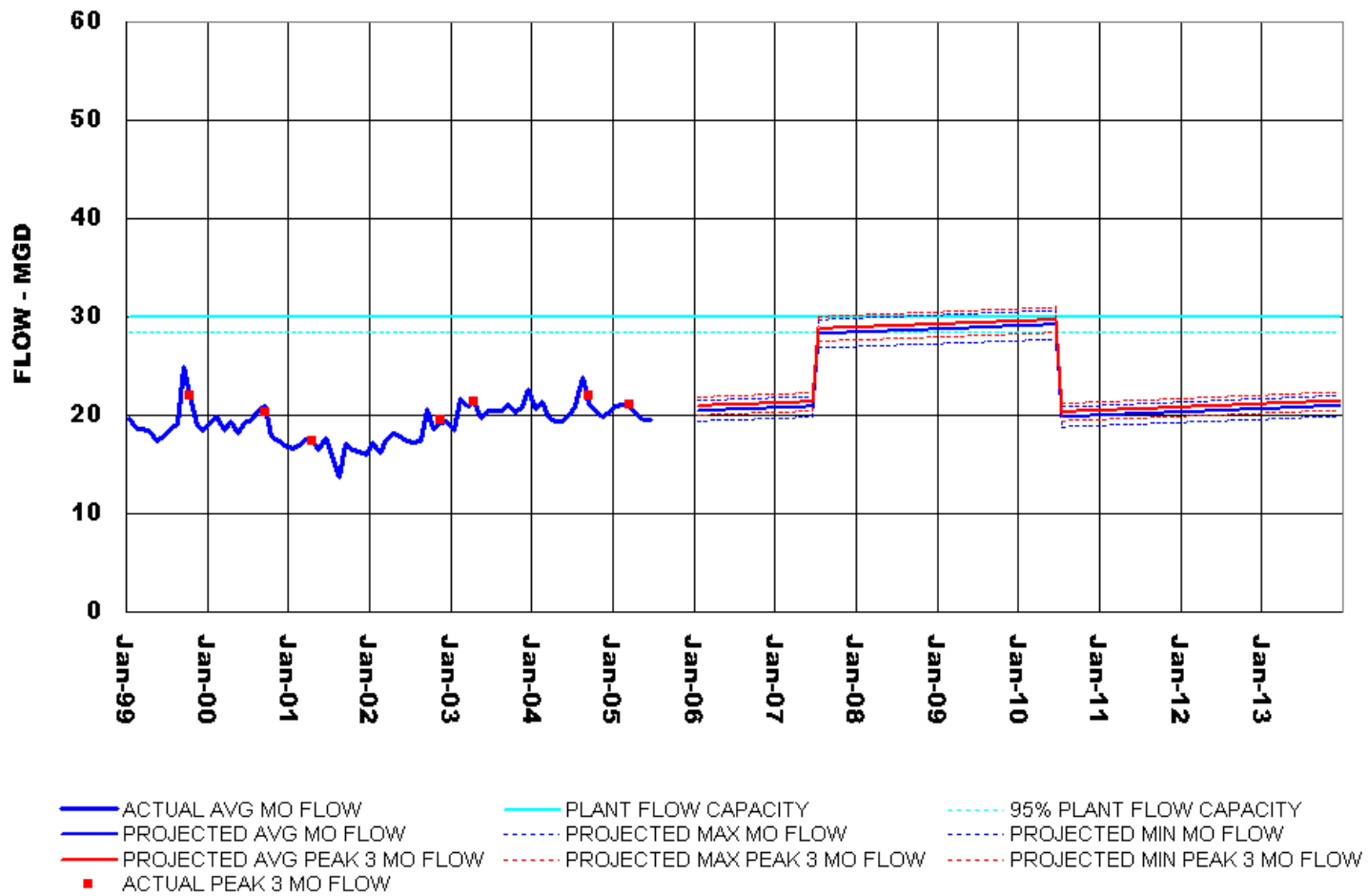
#### 4.4.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show that the plant has sufficient capacity to treat BOD and TSS.

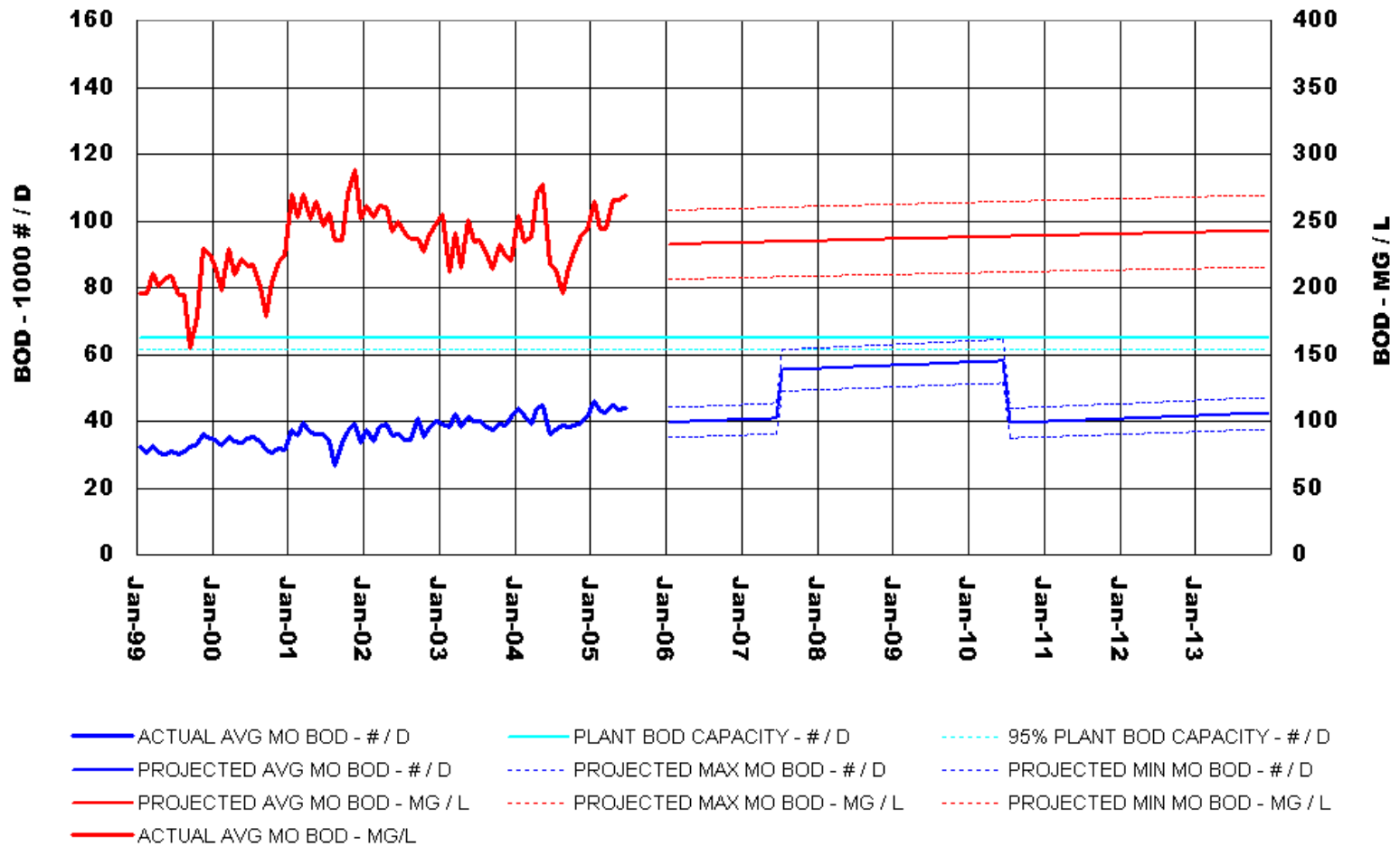
#### 4.4.2.d Improvements

New solids handling facilities to handle all solids for 2020 design flows are being designed and constructed for the Nansemond Treatment Plant. Plans have been made to build a regional grit and grease off-loading facility at the Nansemond Treatment Plant.

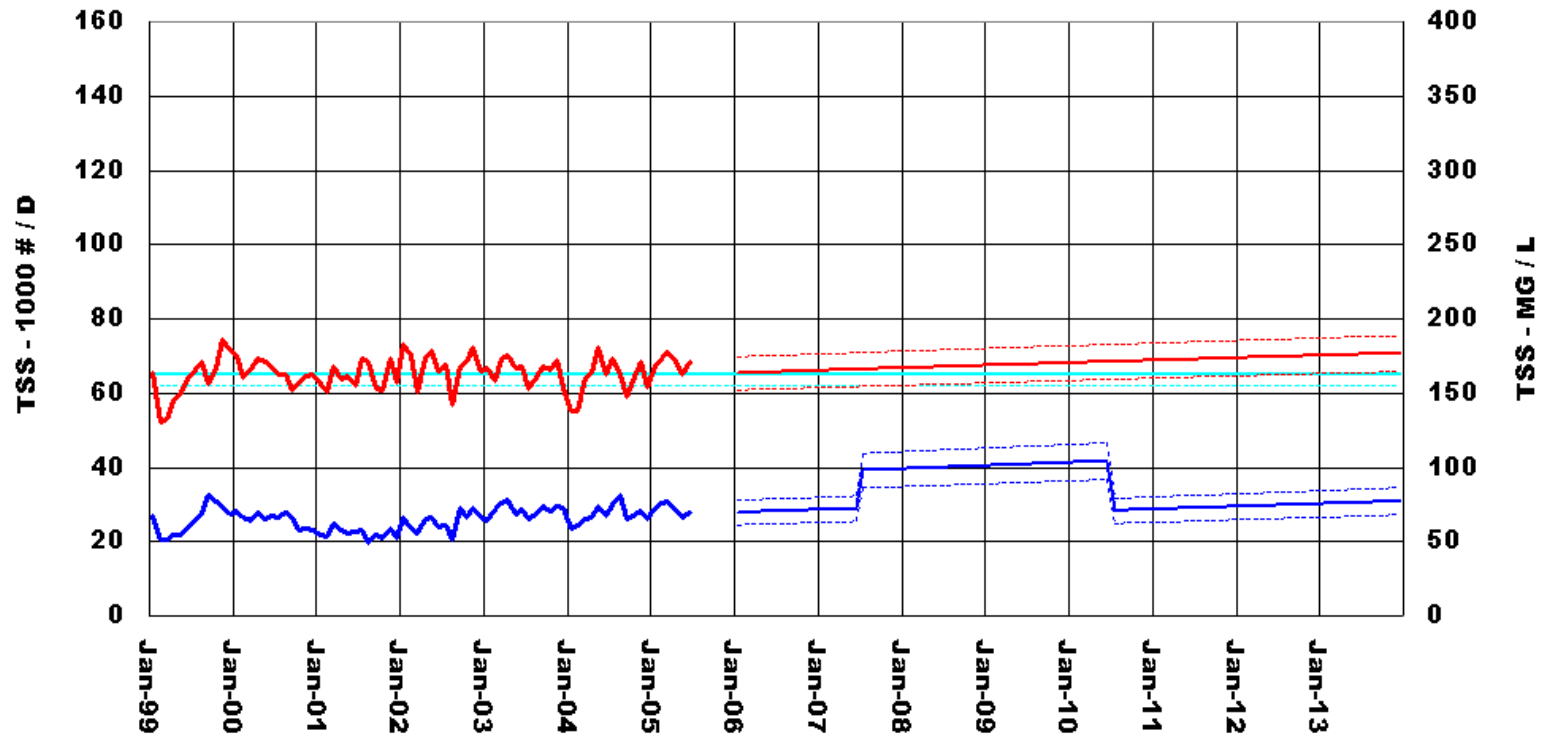
## NANSEMOND TREATMENT PLANT FLOW PROJECTION



## NANSEMOND TREATMENT PLANT BOD PROJECTION



## NANSEMOND TREATMENT PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D        | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">- - -</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L     | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">- - -</span> ACTUAL AVG MO TSS - MG/L      |  |  |

#### 4.5 VIRGINIA INITIATIVE PLANT

##### 4.5.1 Interceptor System

###### 4.5.1.a Capacity

The capacity of the VIP System is currently sufficient for the existing flows.

###### 4.5.1.b Infiltration/Inflow

As part of the Norfolk/HRSD Consent Special Order issued by Department of Environmental Quality (DEQ), Interceptor Reliability Section personnel completed CCTV inspection of all gravity mains in the City of Norfolk. In the next year, execution of pipeline rehabilitation projects and flow monitoring will continue. The largest project associated with the Consent Special Order is the rehabilitation of the Lamberts Point Influent Reinforcement pipeline, one of two major gravity pipelines to the Virginia Initiative Plant (VIP). The project to line this 54-inch gravity line was completed in April 2004.

Long-term flow monitoring continues at Luxembourg Avenue and State Street Pump Stations. Short-term monitoring will also continue at Chesapeake Boulevard Pump Station in the next year. Two in-line magmeters (30-inch and 48-inch) provide additional long-term flow metering capability.

The 30-inch magmeter, installed as part of the Elizabeth River Crossing Replacement project, monitors flow from the South Norfolk and Berkley areas of Chesapeake and Norfolk. The 48-inch magmeter, installed as part of the VDOT Pinners Point Interchange project, monitors flow coming from the City of Portsmouth. Another long-term flow monitor was installed in conjunction with a project that replaced a portion of South Norfolk Trunk Sewer Section Y; it monitors flow from Chesapeake along Bainbridge Boulevard.

City of Norfolk personnel completed a Sanitary Sewer Evaluation Survey (SSES) for their collection system, and they are pursuing numerous system rehabilitation projects identified as part of the SSES. This effort will continue throughout the next year.

Interceptor Reliability Section personnel have developed a long-term and temporary metering plan for flow/pressure at critical locations in the HRSD system in Norfolk. Implementation of the plan should begin in early 2006. In the next year, the Interceptor Reliability Section plans to conduct follow-up flow monitoring in the City of Portsmouth to determine the effects of the I/I abatement efforts by the City.

#### 4.5.1.c Diversions

Flow will need to be shifted off of the Atlantic and Chesapeake-Elizabeth Treatment Plants to Virginia Initiative Plant for a temporary, three-month system adjustment beginning in July 2006. High TSS and BOD at the Atlantic Treatment Plant will necessitate taking some of the flow off of the plant until a plant expansion can be completed. Flow also needs to be taken from the Chesapeake-Elizabeth Treatment Plant. Flow from these two plants will be diverted to Nansemond Treatment Plant and Virginia Initiative Plant. In order to divert flows to these plants, several other immediate projects will need to be completed to accommodate additional flows. Most of the diversion will be reversed when the Atlantic Treatment Plant expansion is complete in 2010.

#### 4.5.1.d Improvements

Pressures are high on the discharge side of the Bowers Hill PRS going towards the Nansemond Treatment Plant. The construction of a new 16 MGD PRS, the Route 337 Pressure Reducing Station, will take care of this.

### 4.5.2 Treatment Plant

#### 4.5.2.a Capacity

The current design capacity of the Virginia Initiative Plant is 40 MGD. The average plant flow for FY 2005 was 29.01 MGD. It is not anticipated that the Virginia Initiative Plant will need to be ultimately expanded to 50 MGD before the year 2014.

#### 4.5.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Virginia Initiative Plant through the year 2014 based on a currently projected population growth of 0.206%. The flow projections show that the plant has sufficient capacity to treat flow.

#### 4.5.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the Virginia Initiative Plant is expected to be within design limits for BOD and TSS through the year 2014.

#### 4.5.2.d Improvements

A project is planned to modify the Virginia Initiative Plant grit system to correct deficiencies with the current grit, drain, and piping systems and upgrade them to handle 80 MGD maximum flow. This is necessary because the quantity of grit entering Virginia Initiative Plant is higher than originally designed.

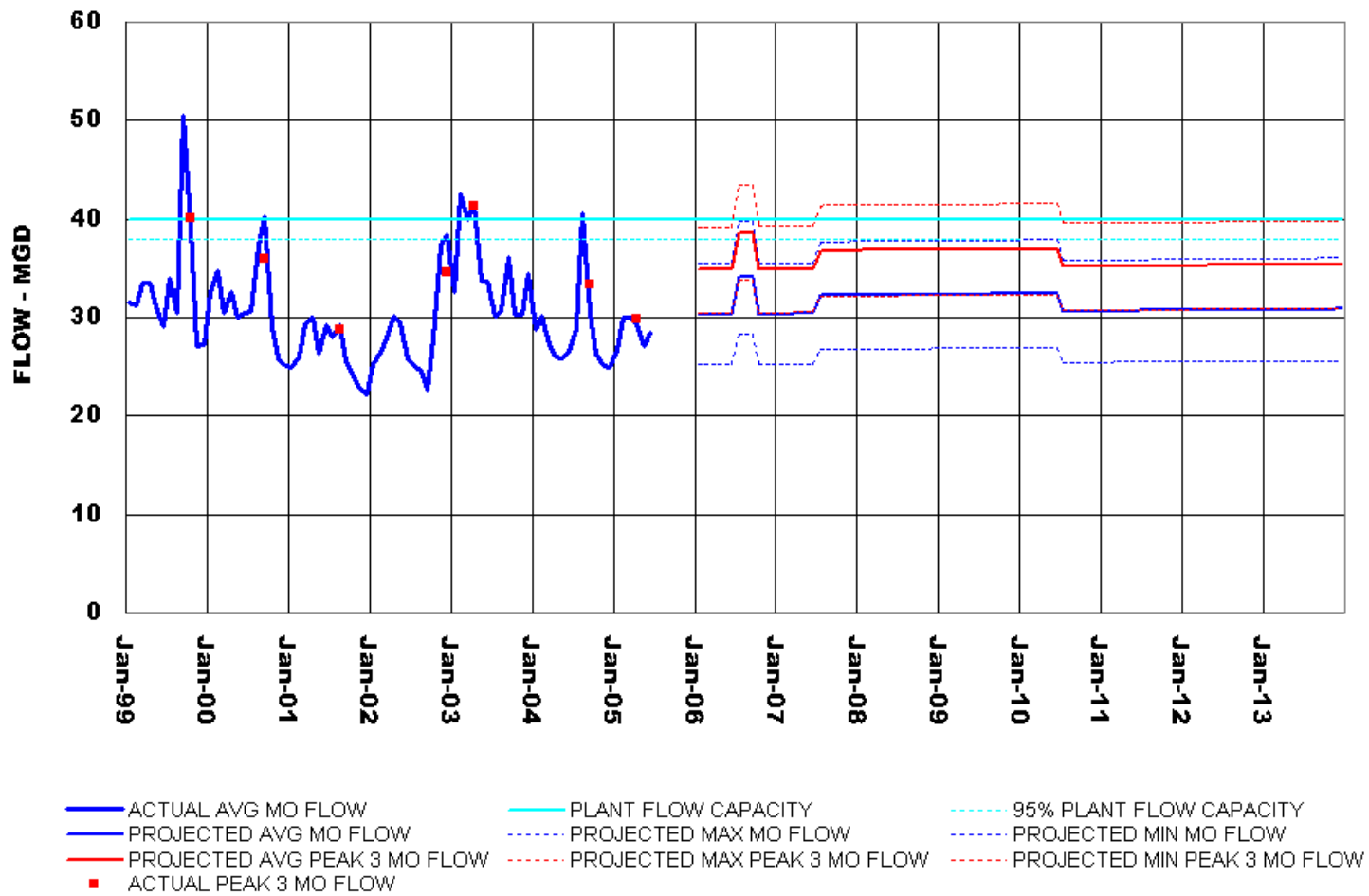
A project is planned to install an afterburner at the Virginia Initiative Plant incinerator facility to provide enhanced incinerator emission control and increase incinerator capacity.

Construction is underway for a new monitoring and control system for the Virginia Initiative Plant. The new system will include the Solids Handling building and the Generator Building, which are not on the current systems. This system will provide a reliable and improved integrated monitoring and control system.

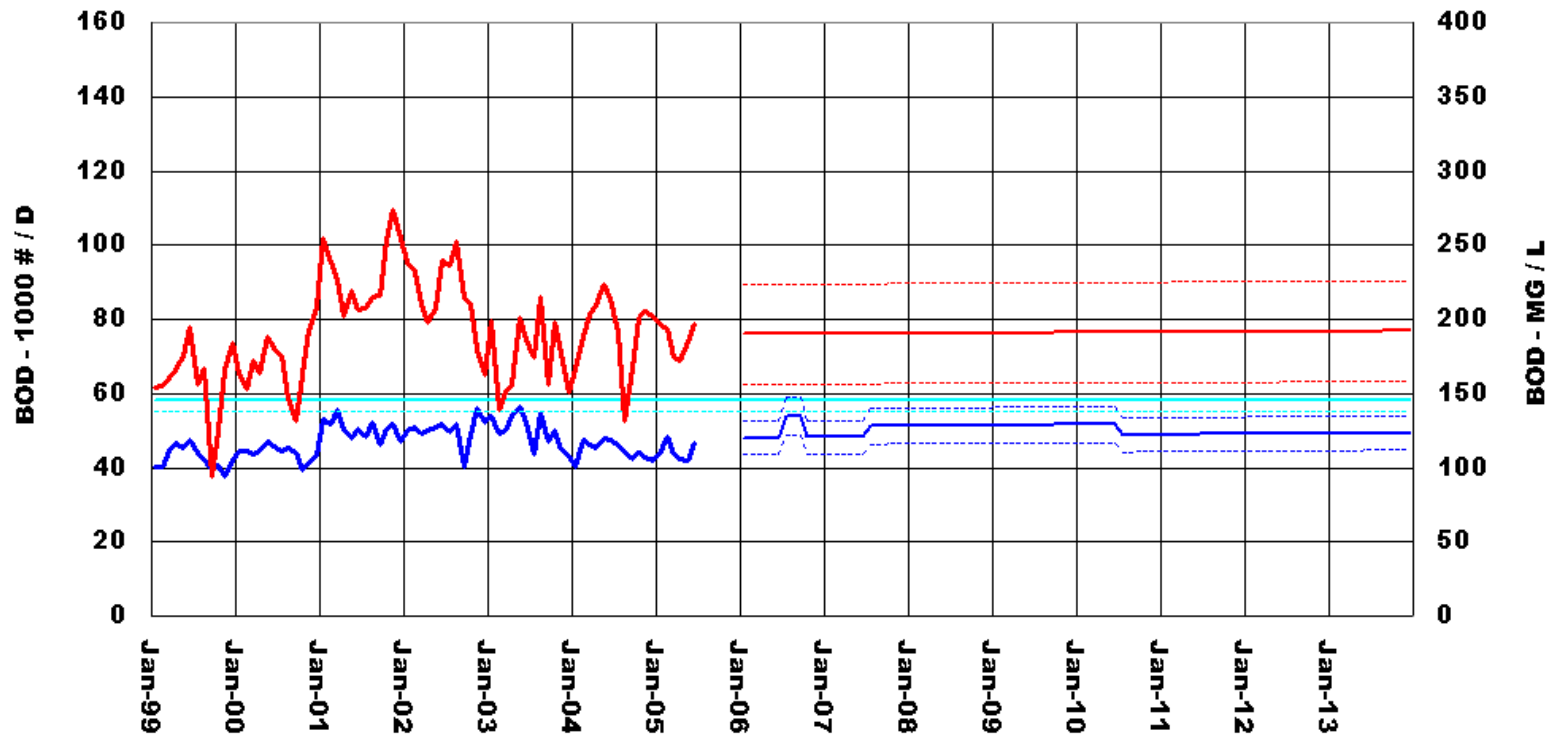
A study to identify sources of off-site odors from the plant and to determine how to eliminate them has just been completed. Design of the system will begin soon.

A study is underway to determine the type of turf grasses and ornamental plants that can be irrigated with the unique effluent water from Virginia Initiative Plant.

## VIRGINIA INITIATIVE PLANT FLOW PROJECTION

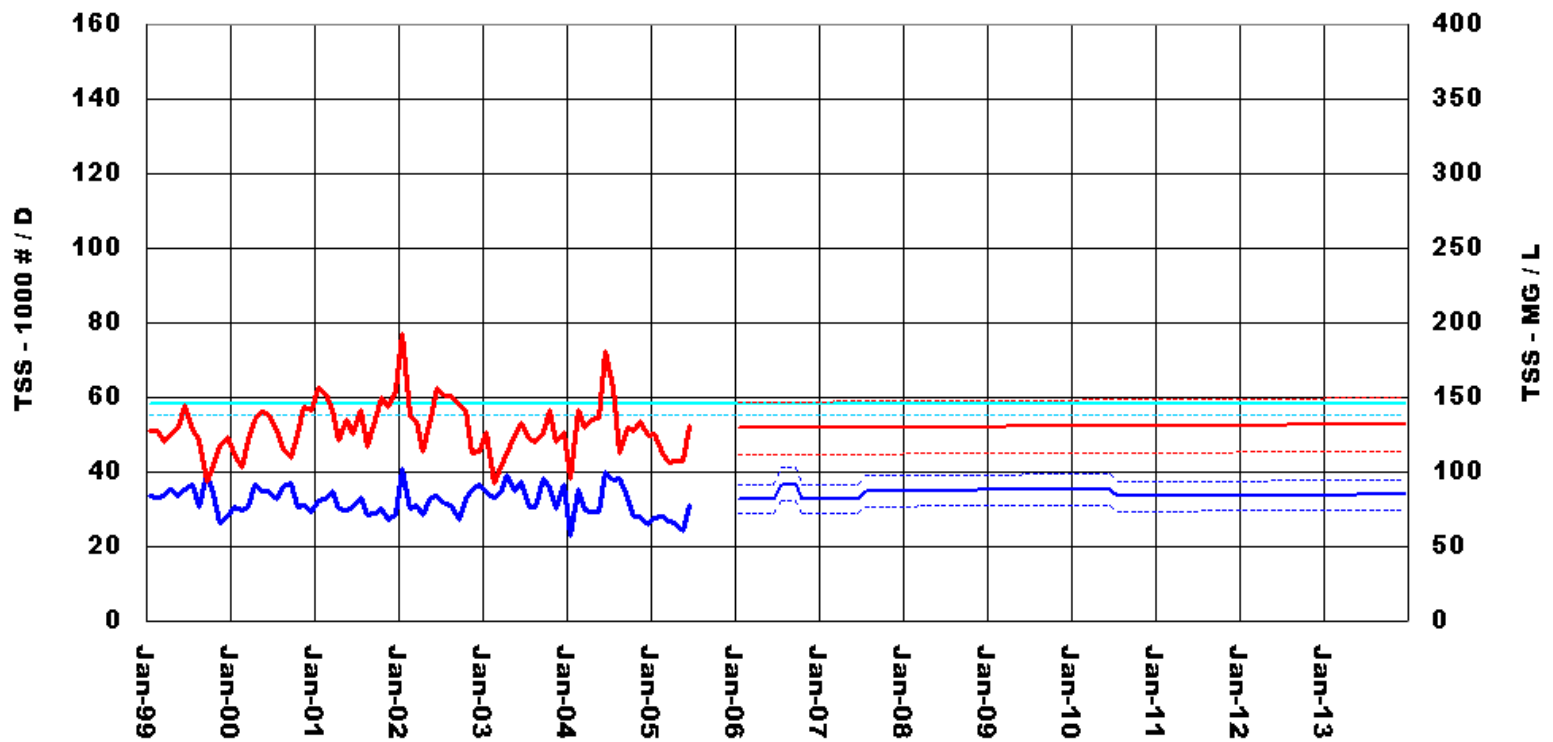


## VIRGINIA INITIATIVE PLANT BOD PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D    | <span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT BOD CAPACITY - # / D |
| <span style="color: blue;">—</span> PROJECTED AVG MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO BOD - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L | <span style="color: red;">- - -</span> PROJECTED MAX MO BOD - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO BOD - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO BOD - MG/L      |  |  |

## VIRGINIA INITIATIVE PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D    | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">—</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO TSS - MG/L      |  |  |

#### 4.6 SOUTH SHORE FLOW, BOD, AND TSS PROJECTIONS

The following pages show the projected average flows, BOD, and TSS for the South Shore Treatment Plants through the year 2014 based on a currently projected population growth of 0.678%.

#### 4.7 ADMINISTRATION AND MAINTENANCE

##### 4.7.1 South Shore Operations Center

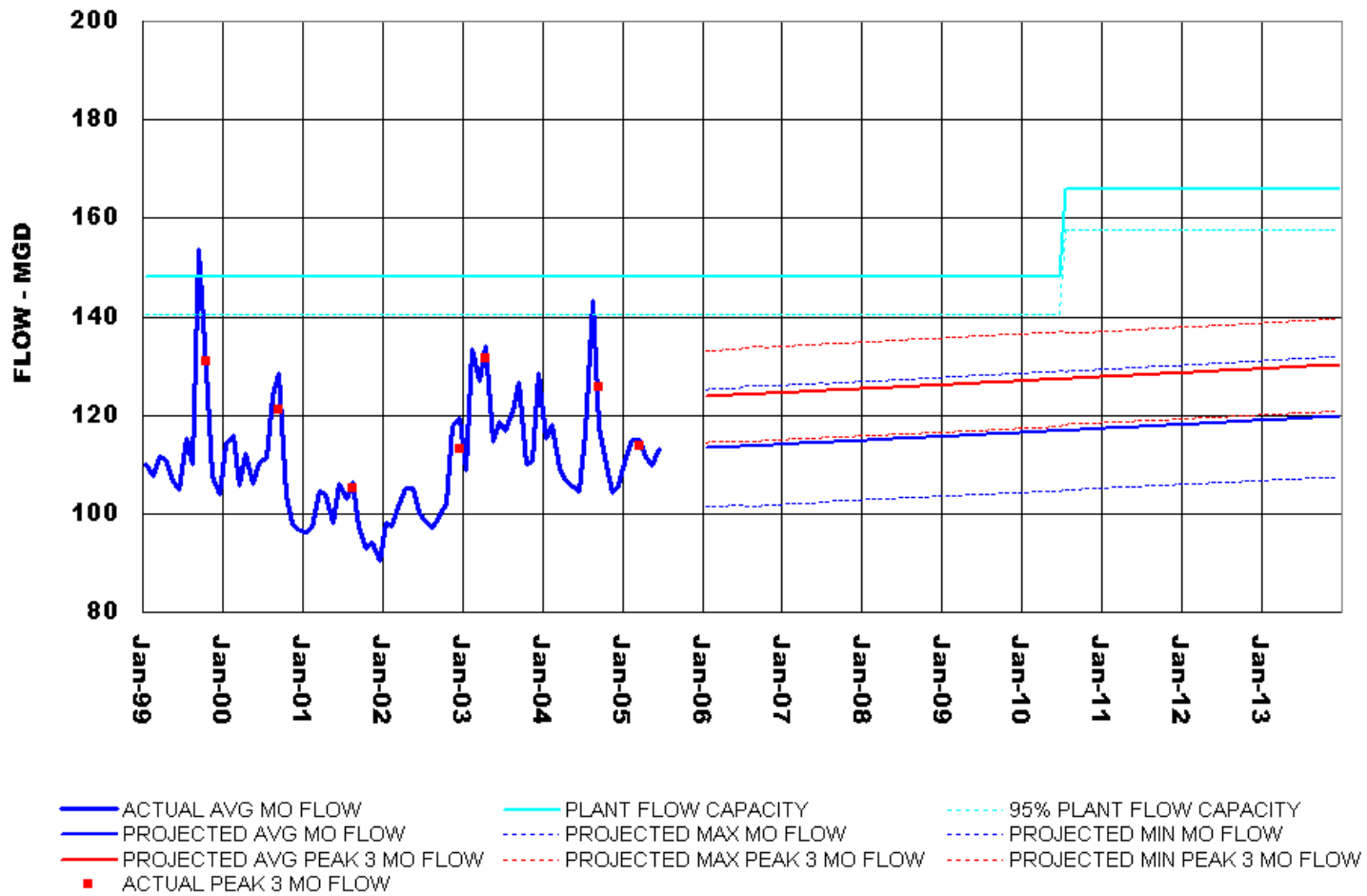
##### 4.7.1.a Improvements

The emergency generator in the Central Environmental Laboratory will be upgraded to increase needed emergency power capacity. Mobile emergency generators will be purchased to supply emergency power for the South Shore Administration area.

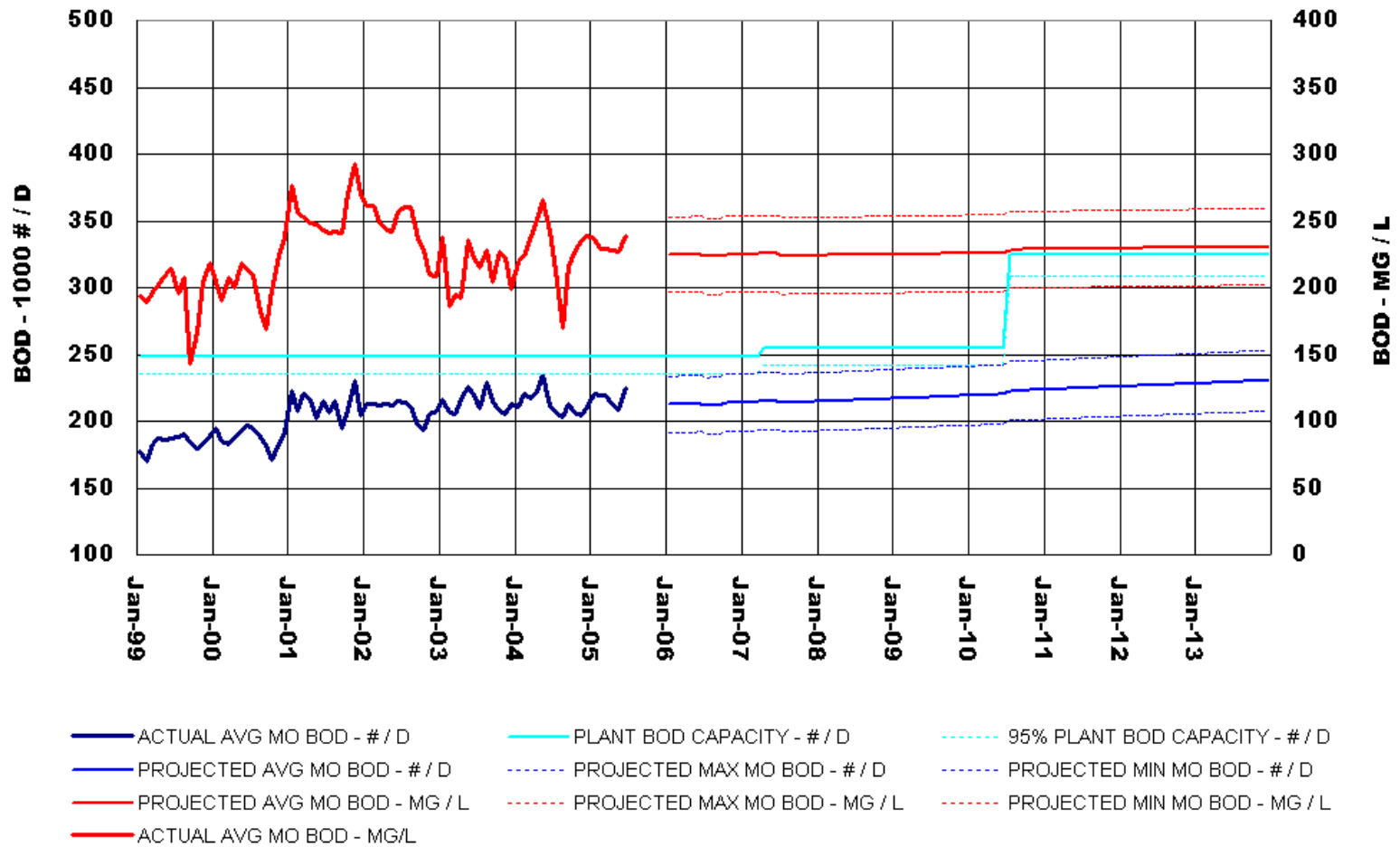
A project is planned to provide a new equipment building to house Interceptors Operations' equipment that is now exposed to harmful weather conditions and to construct conditioned file storage space in the warehouse at the South Shore Operations Center.

Treatment is in the process of purchasing the software necessary to implement a Computerized Maintenance Management System (CMMS) for all operating departments. This system will replace the labor-intensive paper system and improve the inventory system.

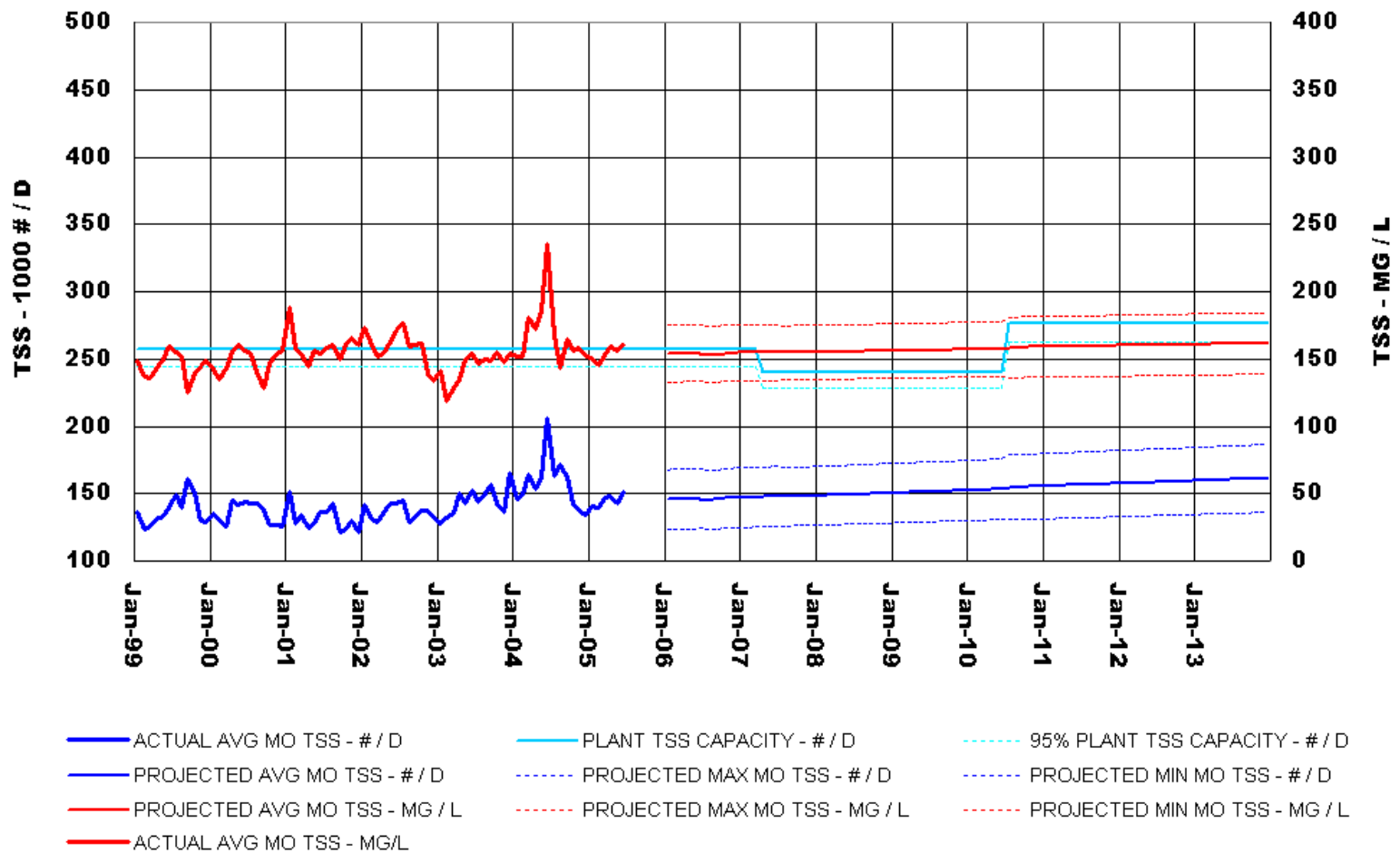
## SOUTH SHORE TREATMENT PLANTS FLOW PROJECTION



## SOUTH SHORE TREATMENT PLANTS BOD PROJECTION



## SOUTH SHORE TREATMENT PLANTS TSS PROJECTION



## 5.0 NORTH SHORE FACILITIES

### 5.1 BOAT HARBOR

#### 5.1.1 Interceptor System

##### 5.1.1.a Capacity

The capacity of the Boat Harbor System is currently sufficient for the existing flows.

##### 5.1.1.b Infiltration/Inflow

In support of the City of Hampton's ongoing efforts to reduce I/I, the Interceptor Reliability Section collects flow data from HRSD's permanent flow meters at the following locations: Copeland Park Pump Station, Orcutt Avenue and 80th Street, Big Bethel PRS, the flow meter vault on 16th Street in Newport News, Bridge Street Pump Station, and Hampton Pump Station #1. These meters determine the flow contribution from the City of Hampton to Boat Harbor Treatment Plant. Portable flow meters are being used to further characterize I/I contributions within the Bridge Street Pump Station service area. Data is shared with City of Hampton personnel on a regular basis to assist in determining long-term trends of I/I reduction.

In conjunction with the Hampton/HRSD Consent Special Order issued by DEQ, City of Hampton personnel continue to conduct extensive pipeline CCTV inspections and installation of magnetic flow meters at pump stations in the Claremont Avenue and Bridge Street Pump Station service areas. They also continue work on correcting identified I/I deficiencies.

In Newport News, a CIP Project has been submitted for the rehabilitation of HRSD's 58th Street gravity line between Warwick Boulevard and Jefferson Avenue in Newport News. Previous I/I flow monitoring indicates that a significant I/I problem exists upstream of this HRSD line. In advance of HRSD's rehabilitation effort, the City of Newport News is pursuing projects to rehabilitate/replace various lines and eliminate inflow sources in its system.

#### 5.1.1.c Diversions

Currently there are no diversions in the Boat Harbor System nor are any planned during the next year.

#### 5.1.1.d Improvements

Planning is underway to replace the Pine Chapel Pump Station. After completion, the pump station and some connecting gravity lines will be turned over to the City of Hampton.

### 5.1.2 Treatment Plant

#### 5.1.2.a Capacity

The current design capacity of the Boat Harbor Treatment Plant is 25 MGD. The average plant flow for FY 2005 was 15.28 MGD. Due to site restrictions, the Boat Harbor Treatment Plant cannot be expanded to increase its flow capacity.

#### 5.1.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Boat Harbor Treatment Plant through the year 2014 based on a currently projected population growth of 0.655%. The flow projections show that the plant has sufficient capacity to treat flow.

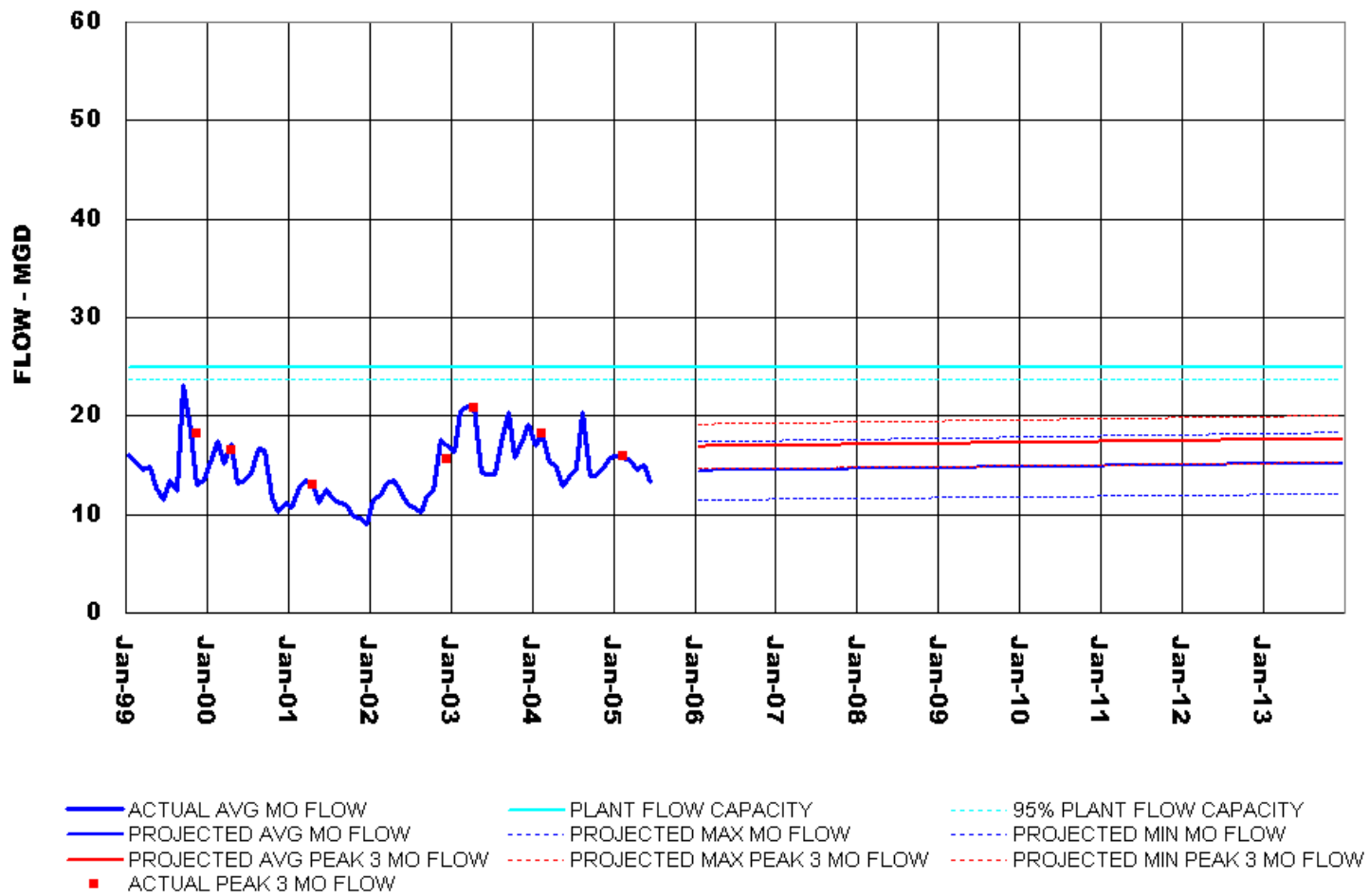
#### 5.1.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the Boat Harbor Treatment Plant is expected to be within design limits for BOD and TSS through the year 2014.

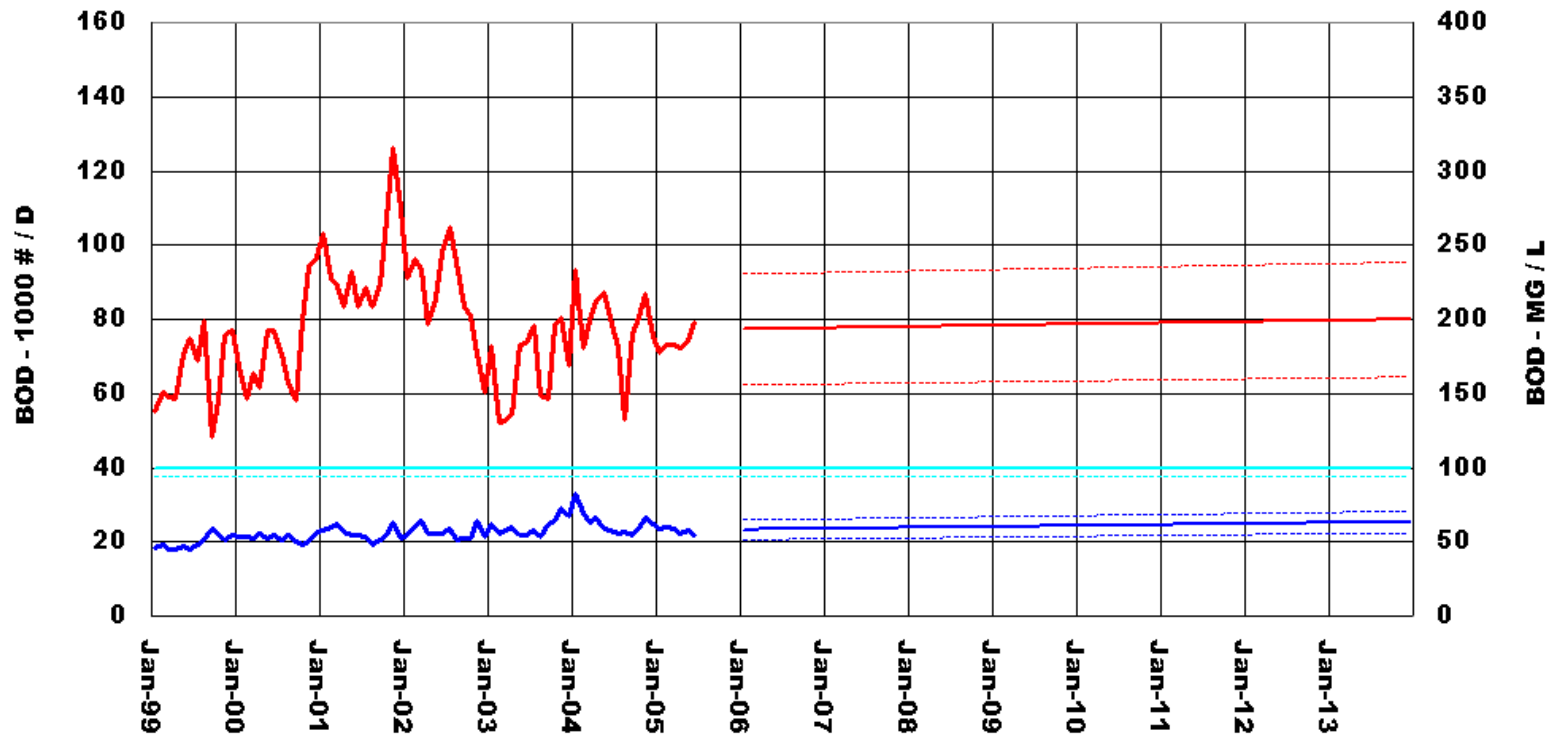
#### 5.1.2.d Improvements

To provide enhanced incinerator emission control and increase incinerator capacity, an afterburner will be installed at the Boat Harbor incinerator facility.

## BOAT HARBOR TREATMENT PLANT FLOW PROJECTION

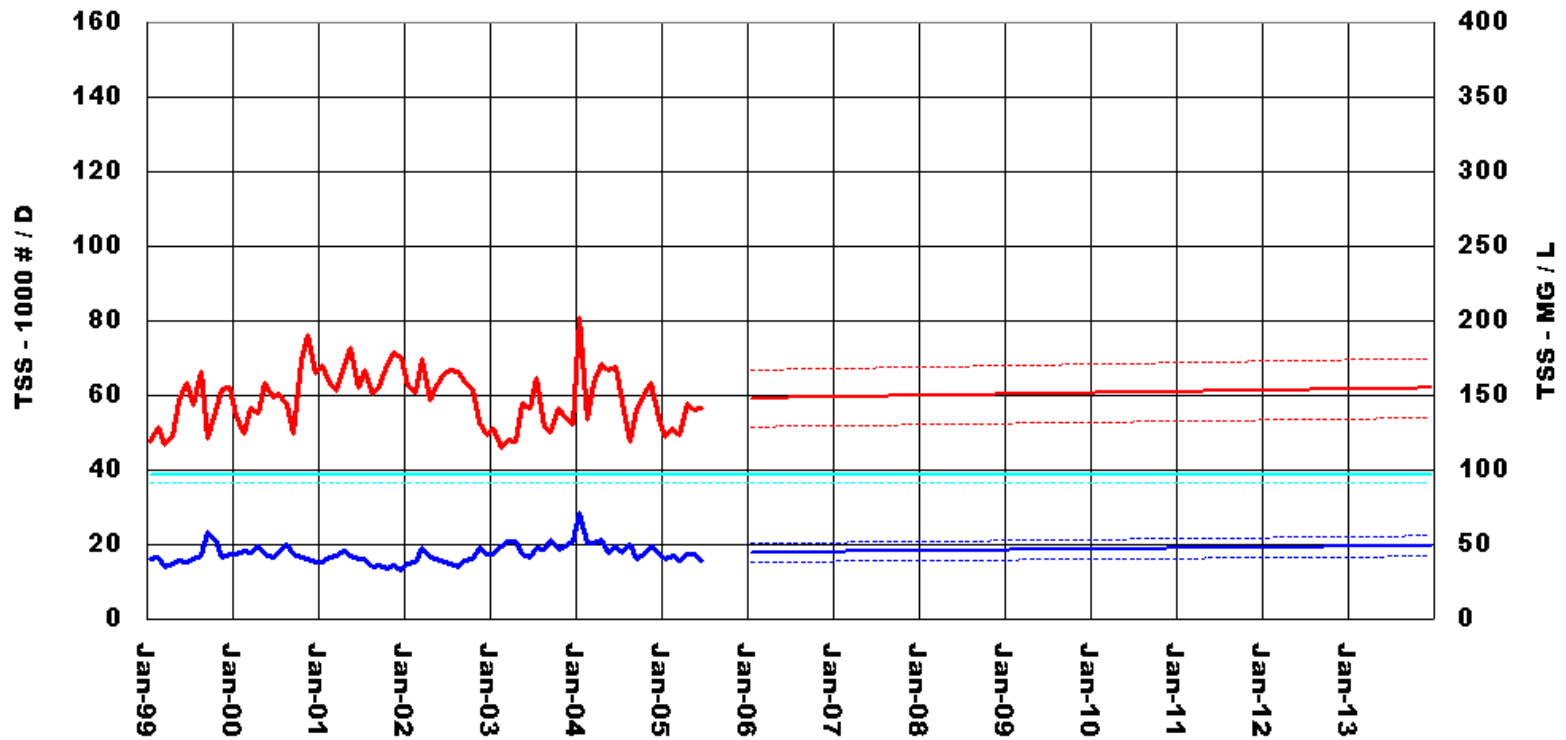


## BOAT HARBOR TREATMENT PLANT BOD PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D        | <span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT BOD CAPACITY - # / D |
| <span style="color: blue;">- - -</span> PROJECTED AVG MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO BOD - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L     | <span style="color: red;">- - -</span> PROJECTED MAX MO BOD - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO BOD - MG / L   |
| <span style="color: red;">- - -</span> ACTUAL AVG MO BOD - MG/L      |  |  |

## BOAT HARBOR TREATMENT PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D        | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">- - -</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L     | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">- - -</span> ACTUAL AVG MO TSS - MG/L      |  |  |

## 5.2 JAMES RIVER

### 5.2.1 Interceptor System

#### 5.2.1.a Capacity

The capacity of the James River System is currently sufficient for the existing flows.

#### 5.2.1.b Infiltration/Inflow

The Interceptor Reliability Section continues to work with Newport News personnel in an ongoing effort to identify and eliminate I/I problems in the Center Avenue Pump Station service area. An in-line magmeter in Center Avenue Pump Station's discharge force main provides long-term flow monitoring for the service area. Portable gravity meters are being used to isolate areas with significant I/I contribution.

At Center Avenue Pump Station, wet well level, pump cycles, and system pressure are also being recorded. City of Newport News personnel have executed several pipeline rehabilitation projects in this service area and have identified additional pipeline rehabilitation projects in this service area for VRLF funding in 2006.

During the next year, the Interceptor Reliability Division will continue to work with the City of Newport News to abate I/I in the Center Avenue Pump Station service area.

#### 5.2.1.c Diversions

Diversions are planned to reduce flows going to the James River and York River Treatment Plants and send them to the Williamsburg Treatment Plant. In order to divert these flows, the Kiln Creek IFM and the Route 171 IFM need to be constructed. Diversions will begin in 2008 when construction is scheduled to be complete.

#### 5.2.1.d Improvements

No major improvements are planned for the James River Interceptor System.

## 5.2.2 Treatment Plant

### 5.2.2.a Capacity

The current design capacity of the James River Treatment Plant is 20 MGD. The average plant flow for FY 2005 was 15.29 MGD. The James River Treatment Plant can ultimately be expanded to 30 MGD but with the planned diversions expansion is not anticipated to be needed before the year 2014.

### 5.2.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the James River Treatment Plant through the year 2014 based on a currently projected population growth of 0.779%.

### 5.2.2.c BOD and TSS Projections

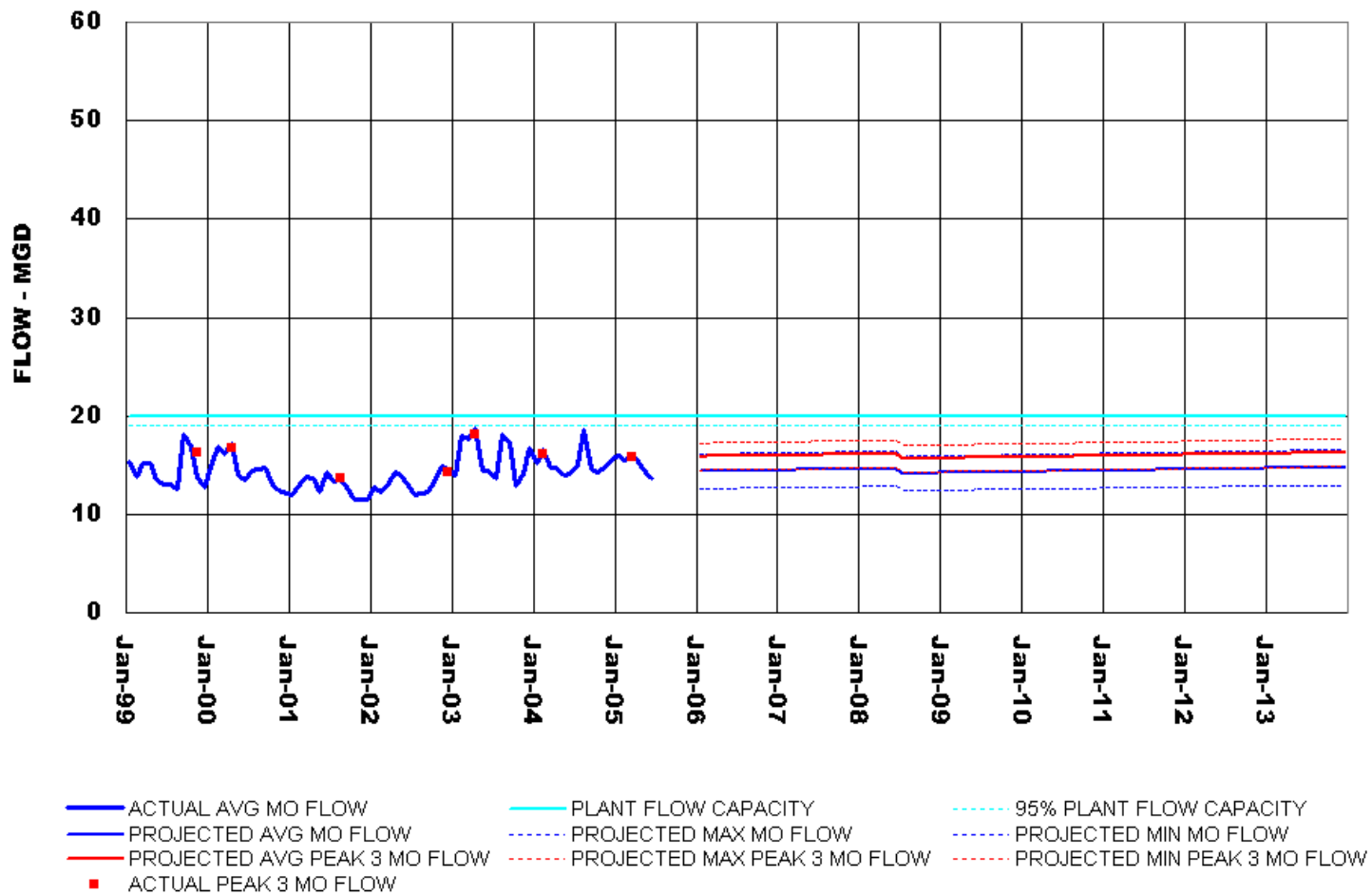
The BOD and TSS Projections on the following pages show the James River Treatment Plant is nearing capacity of design limits for BOD. Scheduled plant improvements are completed. The plant should be able to treat the BOD and TSS sufficiently through the year 2014.

### 5.2.2.d Improvements

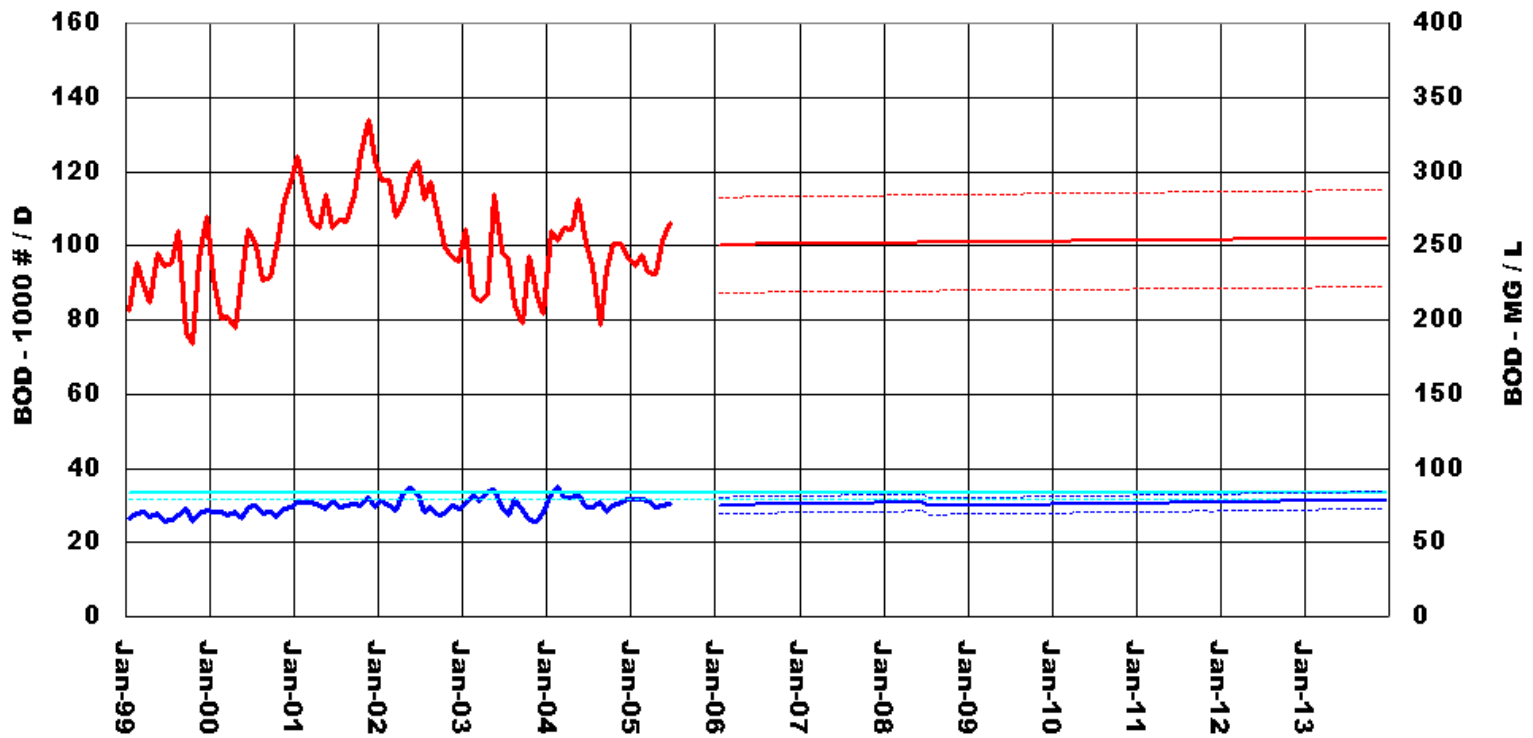
A major project will soon begin design for the James River Treatment Plant. This project will undertake various facility improvements, as recommended by the James River Treatment Plant Capacity Study, to provide reliable treatment for 20 MGD. The potential improvements include larger capacity process piping, enlarged aeration tank influent channel, increased aeration blower capacity, and replacement of the two original final clarifiers.

A project is also planned to control off-site odors originating from the aeration tanks, secondary clarifiers, dewatering building, solids handling scrubber, and other identified odor sources.

## JAMES RIVER TREATMENT PLANT FLOW PROJECTION

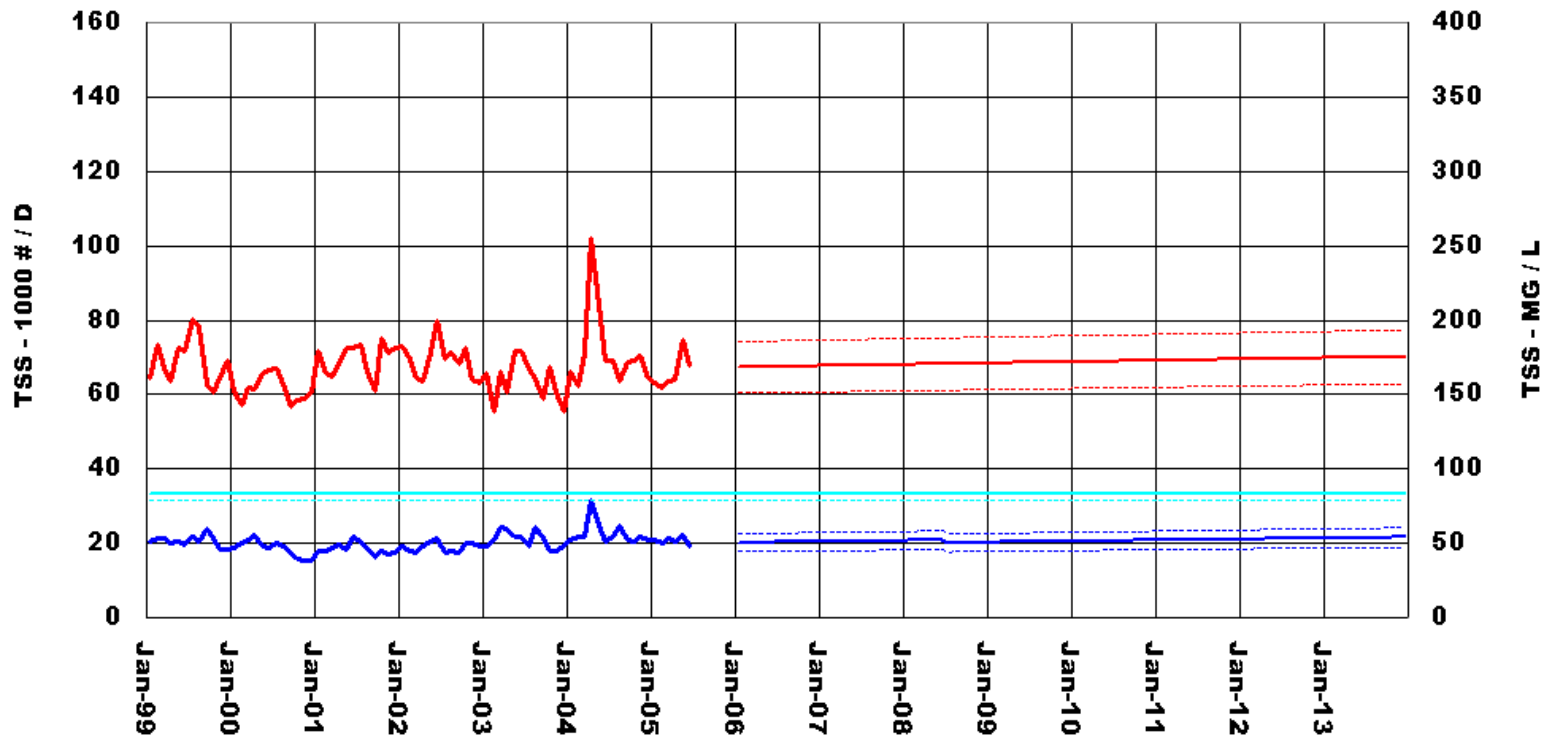


## JAMES RIVER TREATMENT PLANT BOD PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D    | <span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT BOD CAPACITY - # / D |
| <span style="color: blue;">—</span> PROJECTED AVG MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO BOD - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L | <span style="color: red;">- - -</span> PROJECTED MAX MO BOD - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO BOD - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO BOD - MG/L      |  |  |

## JAMES RIVER TREATMENT PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D        | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">- - -</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L     | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO TSS - MG/L          |  |  |

### 5.3 WILLIAMSBURG

#### 5.3.1 Interceptor System

##### 5.3.1.a Capacity

The capacity of the Williamsburg system is currently sufficient for the existing flows.

##### 5.3.1.b Infiltration/Inflow

The Interceptor Reliability Section continues long-term I/I flow monitoring at Colonial Williamsburg Pump Station using an in-line magmeter installed in the discharge force main of the pump station. Open channel flow meters have previously confirmed excessive I/I in this service area.

During the next year, the Interceptor Reliability Section anticipates working with the City of Williamsburg to abate I/I in the Colonial Williamsburg Pump Station service area. As part of the first phase of the Interceptor Master Metering Plan, three in-line magmeters monitor flows in the three major force mains to the Williamsburg Treatment Plant. Long-term flow monitoring is also being conducted at Fort Eustis with an in-line magmeter.

##### 5.3.1.c Diversions

Diversions are planned to reduce flows going to the James River and York River Treatment Plants and send them to the Williamsburg Treatment Plant. In order to divert these flows, the Kiln Creek IFM and the Route 171 IFM need to be constructed. Diversions will begin in 2008 when construction is scheduled to be complete.

##### 5.3.1.d Improvements

The Colonial Williamsburg Pump Station is being replaced with an upgraded station to meet present and future flow loading. A generator is being installed in the Kingsmill Pump Station to allow continuous operation at the Anheuser-Busch Brewery, the single largest private customer on the Peninsula.

The Lightfoot Interceptor Force Main Part 2 project will design and construct an additional 3,600 linear feet of force main, connecting to the Lightfoot Interceptor Force Main Part 1. The Rolling Hills IFM Parallel project, currently under study, would construct a parallel 16-inch force main from the Williamsburg IFM Contract B (near Kingsmill) to the Rolling Hills Pump Station, if needed, to reduce flows and pressures in the existing line. When needed, an additional 19,500 linear feet of force main will be designed and constructed as part of the Lackey Force Main Section B project and will connect to Lackey Interceptor Force Main Section A.

### 5.3.2 Treatment Plant

#### 5.3.2.a Capacity

The current design capacity of the Williamsburg Treatment Plant is 22.50 MGD. The average plant flow for FY 2005 was 15.03 MGD. The Williamsburg Treatment Plant can ultimately be expanded to 30 MGD, but expansion is not anticipated to be needed before the year 2014.

#### 5.3.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Williamsburg Treatment Plant through the year 2014 based on a currently projected population growth of 1.571%. The flow projections show that the plant has sufficient capacity to treat flow.

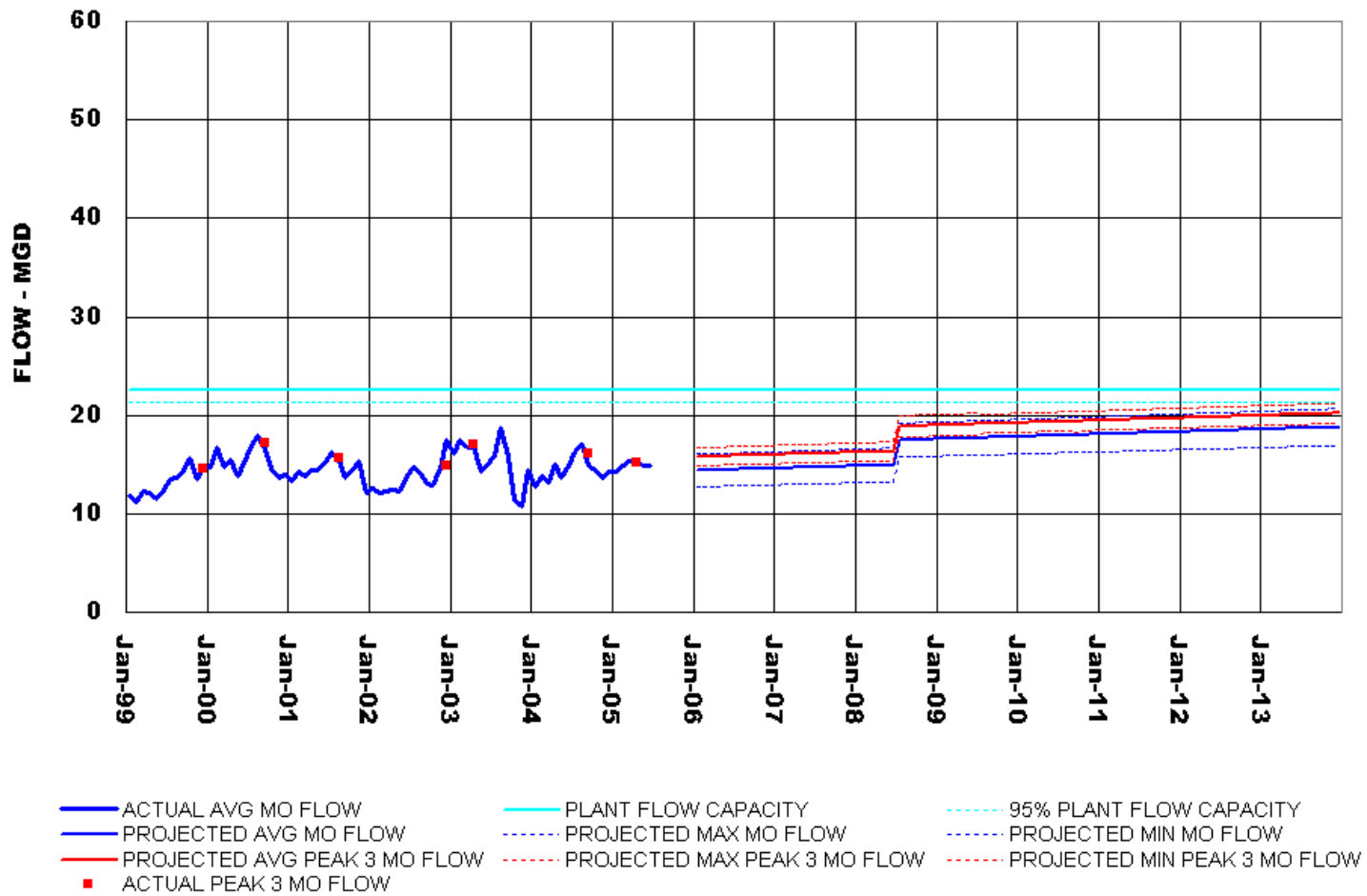
#### 5.3.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show Williamsburg Treatment Plant BOD exceeding the design limits. The Treatment Department is studying the capability of intermediate treatment at Williamsburg to determine if in fact the plant is capable of treating a much larger amount of BOD. TSS projections are expected to be within design limits through 2014.

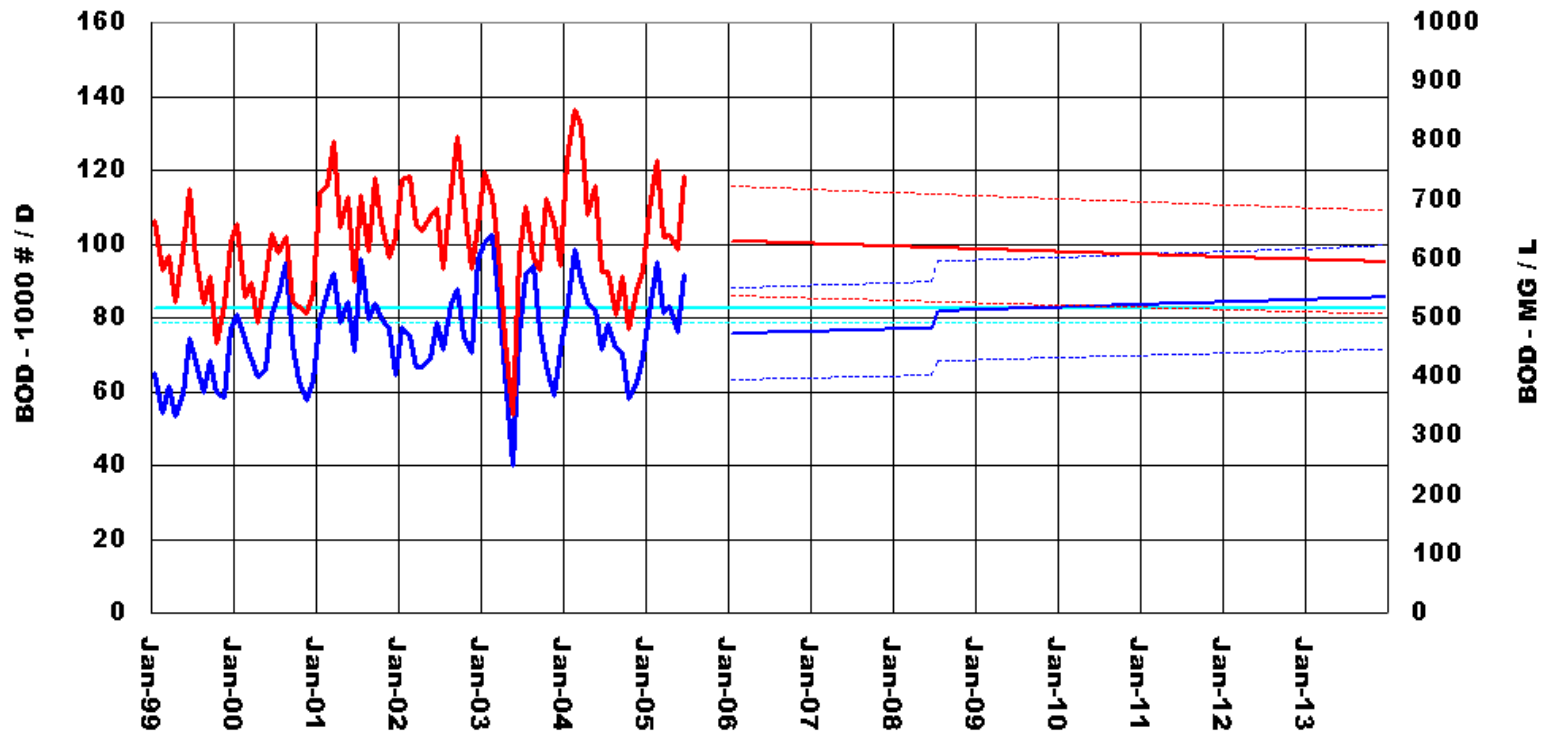
5.3.2.d Improvements

No major improvements are planned for the Williamsburg Treatment Plant.

## WILLIAMSBURG TREATMENT PLANT FLOW PROJECTION

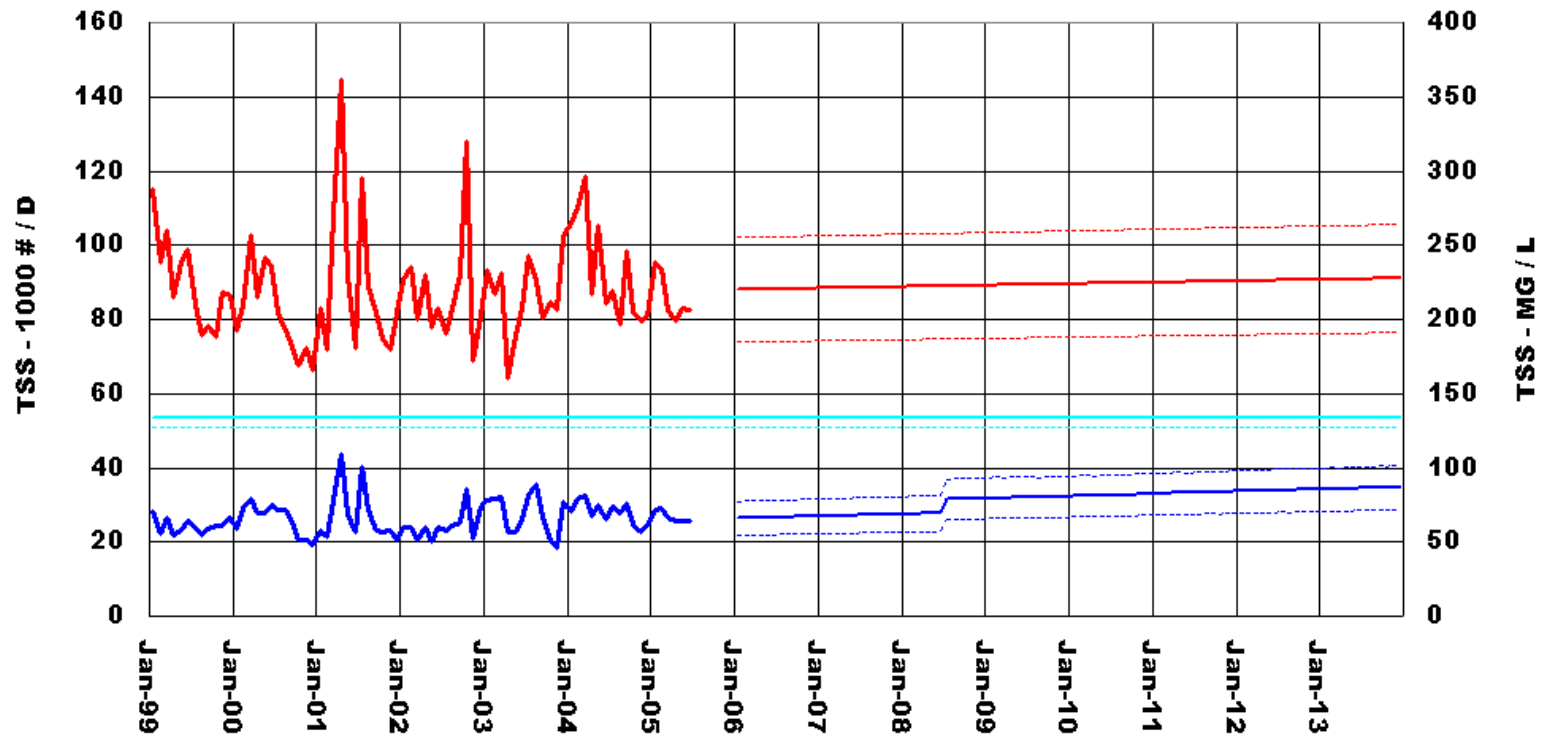


## WILLIAMSBURG TREATMENT PLANT BOD PROJECTION



- |  |   |  |
|--|---|--|
| <span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D   | <span style="color: red;">- - -</span> 95% PLANT BOD CAPACITY - # / D | <span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D        |
| <span style="color: blue;">—</span> PROJECTED AVG MO BOD - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO BOD - # / D  | <span style="color: blue;">· · ·</span> PROJECTED MIN MO BOD - # / D |
| <span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L | <span style="color: red;">- - -</span> PROJECTED MAX MO BOD - MG / L  | <span style="color: red;">· · ·</span> PROJECTED MIN MO BOD - MG / L |
| <span style="color: red;">—</span> ACTUAL AVG MO BOD - MG/L      |   |  |

## WILLIAMSBURG TREATMENT PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D    | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">—</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO TSS - MG/L      |  |  |

## 5.4 YORK RIVER

### 5.4.1 Interceptor System

#### 5.4.1.a Capacity

The capacity of the York River System is currently sufficient for the existing flows.

#### 5.4.1.b Infiltration/Inflow

The Interceptor Reliability Section continues pressure monitoring at various locations in York County and in Gloucester. The Division is not currently conducting I/I studies in the York River system nor are any planned in the next year.

#### 5.4.1.c Diversions

Diversions are planned to reduce flows going to the James River and York River Treatment Plants and send them to the Williamsburg Treatment Plant. In order to divert these flows, the Kiln Creek IFM and the Route 171 IFM need to be constructed. Diversions will begin in 2008 when construction is scheduled to be complete.

#### 5.4.1.d Improvements

Design of a new pressure reducing station in the City of Hampton near Coliseum Drive to relieve high pressures in the Mercury/Magruder Interceptor Force Main is scheduled to be started soon. The Tabb Pressure Reducing Station is planned for construction, when needed, to provide adequate operating pressures in the York County area.

The Kiln Creek IFM and the Route 171 IFM are scheduled to be constructed by 2008. These projects will allow the diversion of flows from the James River and York River Treatment Plants to the Williamsburg Treatment Plant. These force mains will also assist Poquoson in handling high flows. Poquoson, however, will need to address their I/I issues.

## 5.4.2 Treatment Plant

### 5.4.2.a Capacity

The current design capacity of the York River Treatment Plant is 15 MGD. The average plant flow for FY 2005 was 13.15 MGD. The York River Treatment Plant is planned to ultimately be expanded to 45 MGD. Flows will be diverted off of the York River Treatment Plant to the Williamsburg Treatment Plant beginning in July 2008, until an expansion of the York River Treatment Plant can be completed.

### 5.4.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the York River Treatment Plant through the year 2014 based on a currently projected population growth of 0.919%. The flow projections show that the plant has sufficient capacity to treat flow now, but will need to be expanded in the near future.

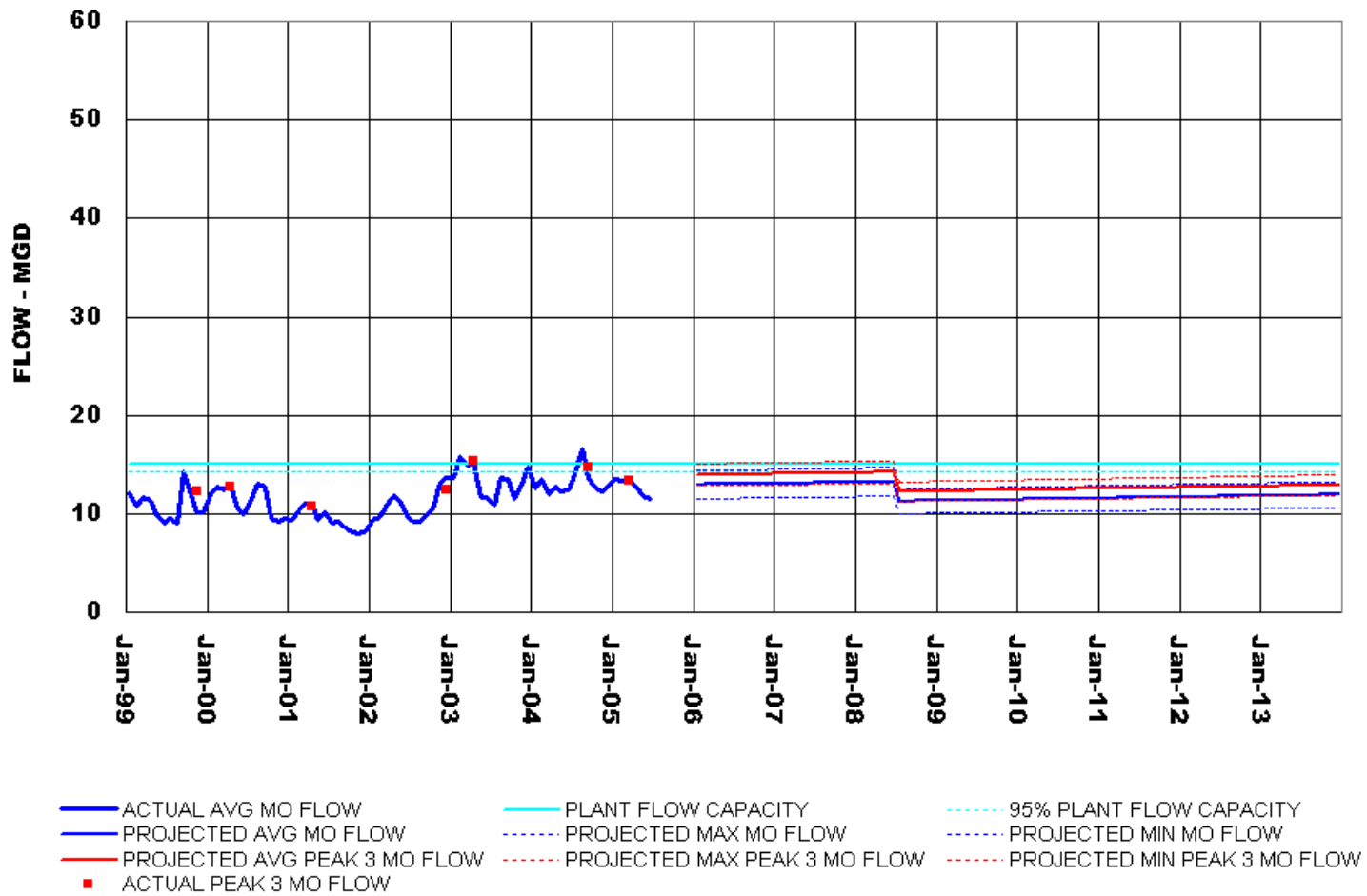
### 5.4.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the York River Treatment Plant is expected to be within design limits for BOD and TSS through the year 2014.

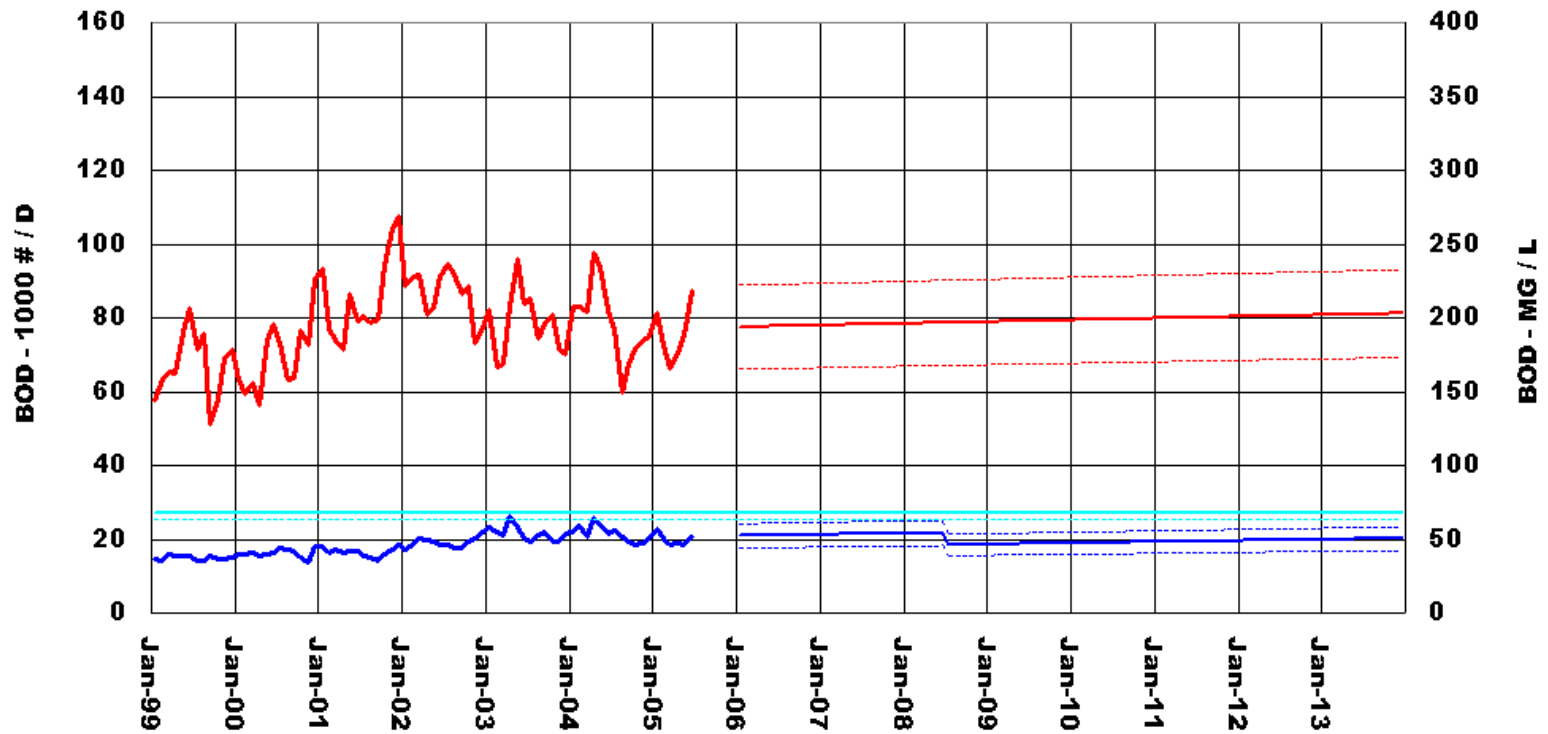
### 5.4.2.d Improvements

A study is being conducted to determine current plant limitations and requirements for expansion of the plant from 15 MGD to 30 MGD. Consideration is being given to increasing the capacity of the new York River Treatment Plant Effluent Polishing System from 0.5 MGD to 1.0 MGD to provide reuse effluent for Giant Industry.

## YORK RIVER TREATMENT PLANT FLOW PROJECTION

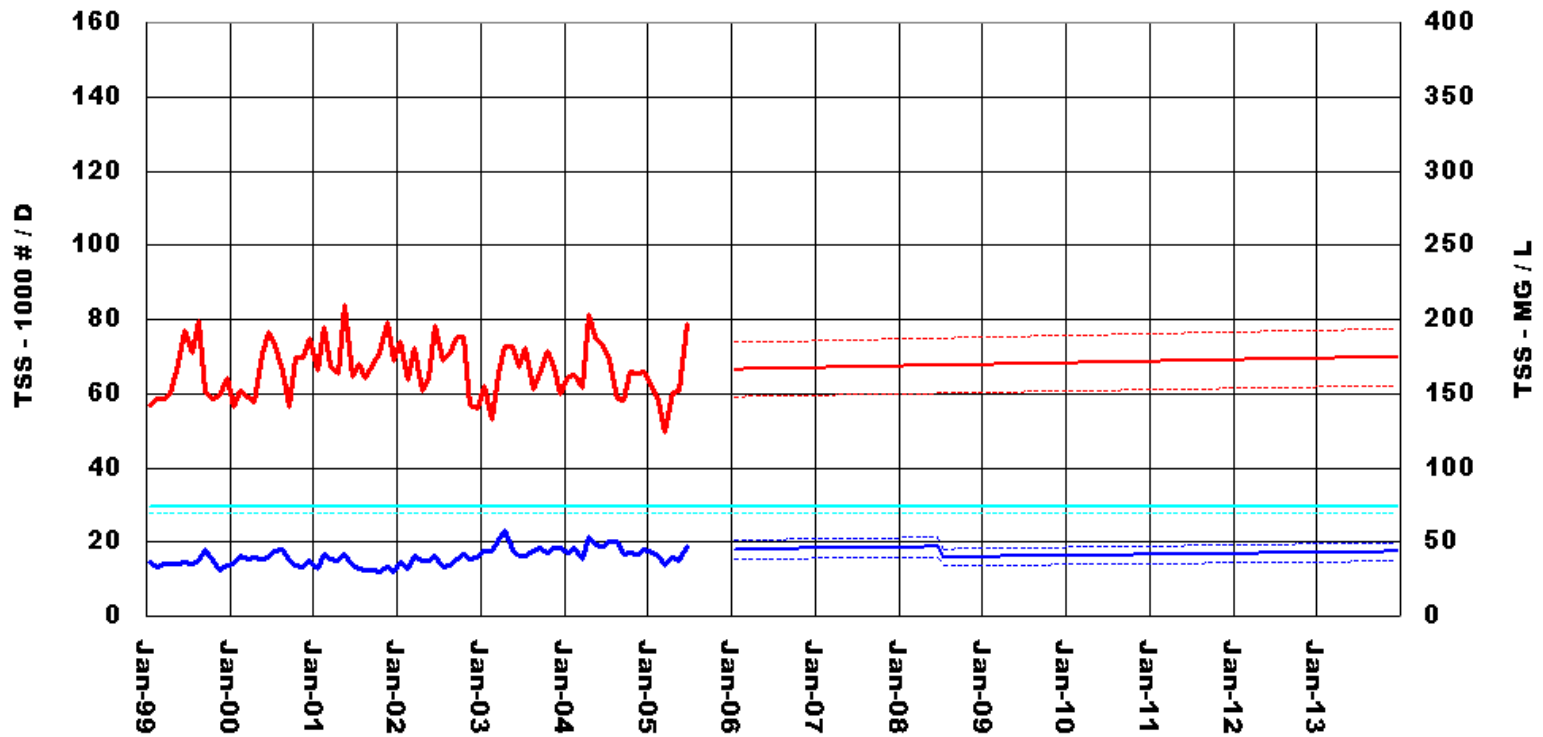


## YORK RIVER TREATMENT PLANT BOD PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D    | <span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D                                   | <span style="color: red; border-bottom: 1px dashed red;">—</span> 95% PLANT BOD CAPACITY - # / D |
| <span style="color: blue;">—</span> PROJECTED AVG MO BOD - # / D | <span style="color: blue; border-bottom: 1px dashed blue;">—</span> PROJECTED MAX MO BOD - # / D | <span style="color: blue; border-bottom: 1px dashed blue;">—</span> PROJECTED MIN MO BOD - # / D |
| <span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L | <span style="color: red; border-bottom: 1px dashed red;">—</span> PROJECTED MAX MO BOD - MG / L  | <span style="color: red; border-bottom: 1px dashed red;">—</span> PROJECTED MIN MO BOD - MG / L  |
| <span style="color: red;">—</span> ACTUAL AVG MO BOD - MG/L      |  |  |

## YORK RIVER TREATMENT PLANT TSS PROJECTION



- |                               |                               |                                |
|-------------------------------|-------------------------------|--------------------------------|
| ACTUAL AVG MO TSS - # / D     | PLANT TSS CAPACITY - # / D    | 95% PLANT TSS CAPACITY - # / D |
| PROJECTED AVG MO TSS - # / D  | PROJECTED MAX MO TSS - # / D  | PROJECTED MIN MO TSS - # / D   |
| PROJECTED AVG MO TSS - MG / L | PROJECTED MAX MO TSS - MG / L | PROJECTED MIN MO TSS - MG / L  |
| ACTUAL AVG MO TSS - MG/L      |                               |                                |

## 5.5 NORTH SHORE FLOW, BOD, and TSS PROJECTIONS

The projections on the following pages show the projected average flows, BOD, and TSS for the North Shore Treatment Plants through the year 2014 based on a currently projected population growth of 0.984%.

## 5.6 ADMINISTRATION AND MAINTENANCE

### 5.6.1 North Shore Operations Center

#### 5.6.1.a Improvements

Mobile emergency generators will be purchased to supply emergency power for the North Shore Administration area.

A new equipment building is planned to house Interceptors Operations' equipment that is now exposed to harmful weather conditions. An addition is planned to the administration building for offices for staff and a training room for the use by all departments located on the North Shore.

## 5.7 COMBINED SOUTH AND NORTH SHORE IMPROVEMENTS

### 5.7.1 Geographic Information Systems (GIS)

An enterprise geographic information system (GIS) is being designed to serve a wide range of purposes across the departments within HRSD. The GIS will provide information needed to make a decision, information for strategic planning, and information to assist in business decisions. Output usually will take the form of maps, reports, graphs, lists or any combination thereof.

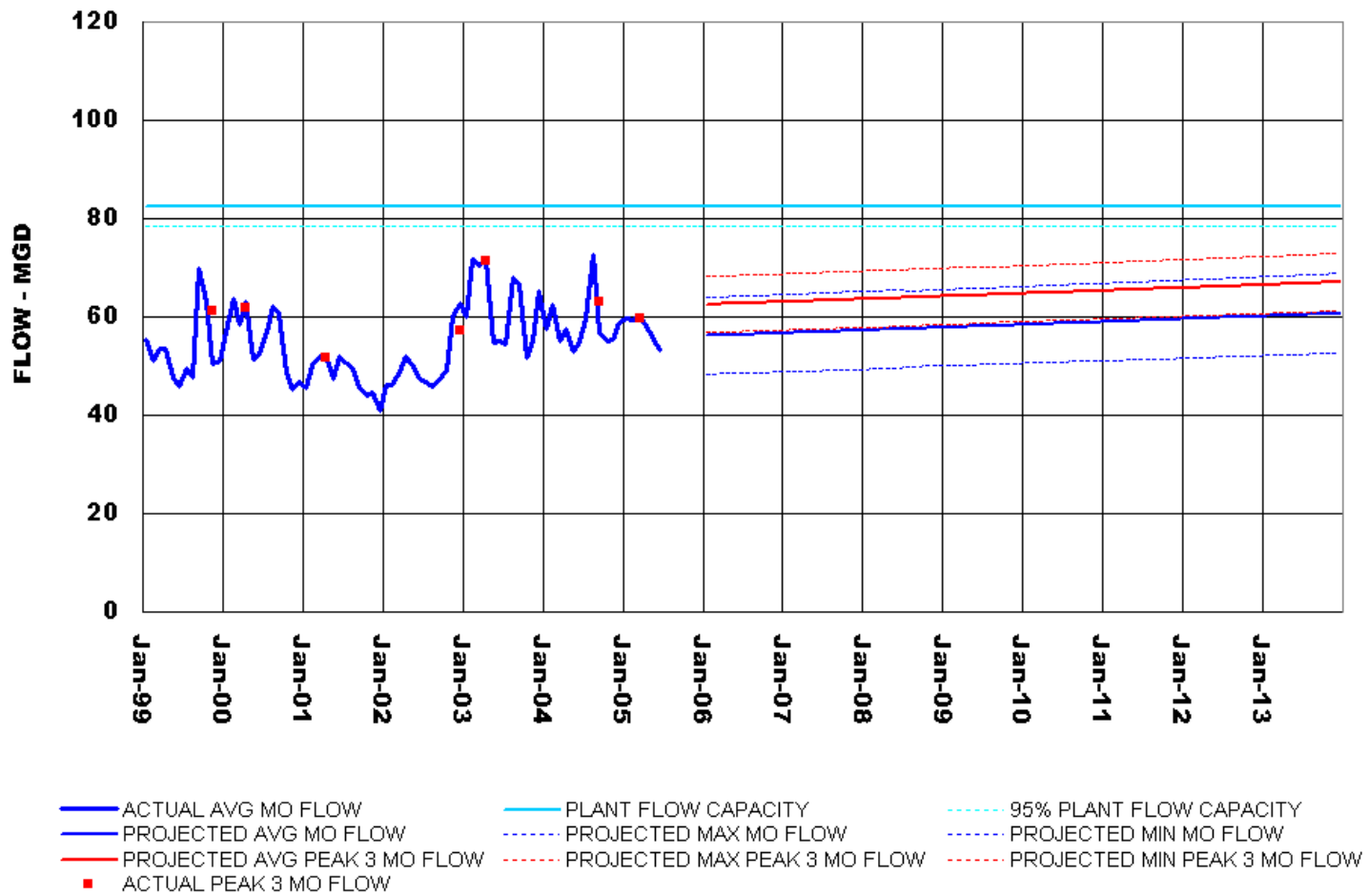
### 5.7.2 Computerized Maintenance Management System (CMMS)

A Computerized Maintenance Management System (CMMS) is being setup for all operating departments. It will contain an inventory control system. This computerized system will replace the labor-intensive paper system.

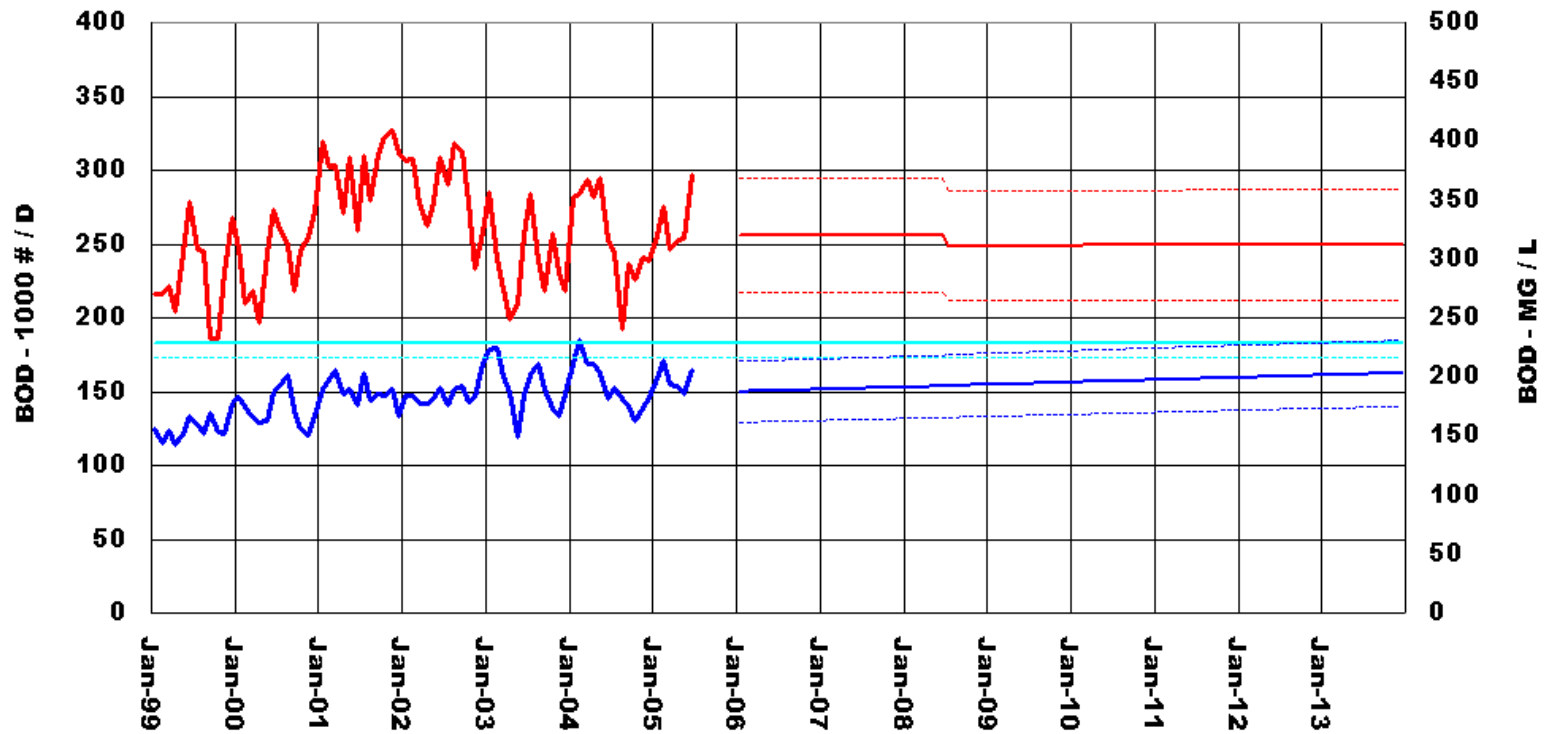
### 5.7.3 Interceptor System Metering

Phases I and II of a project to install flow meters and pressure sensors in the Interceptor System at sites selected by an in-house team as well as at sites requested by the jurisdictions have been completed. Phase III is underway now to further develop the software platform and provide for the installation of flow/pressure sensors and/or telemetry equipment in Norfolk. Phase IV will provide for the installation of flow/pressure sensors and telemetry equipment at additional sites on the North and South Shores.

## NORTH SHORE TREATMENT PLANTS FLOW PROJECTION

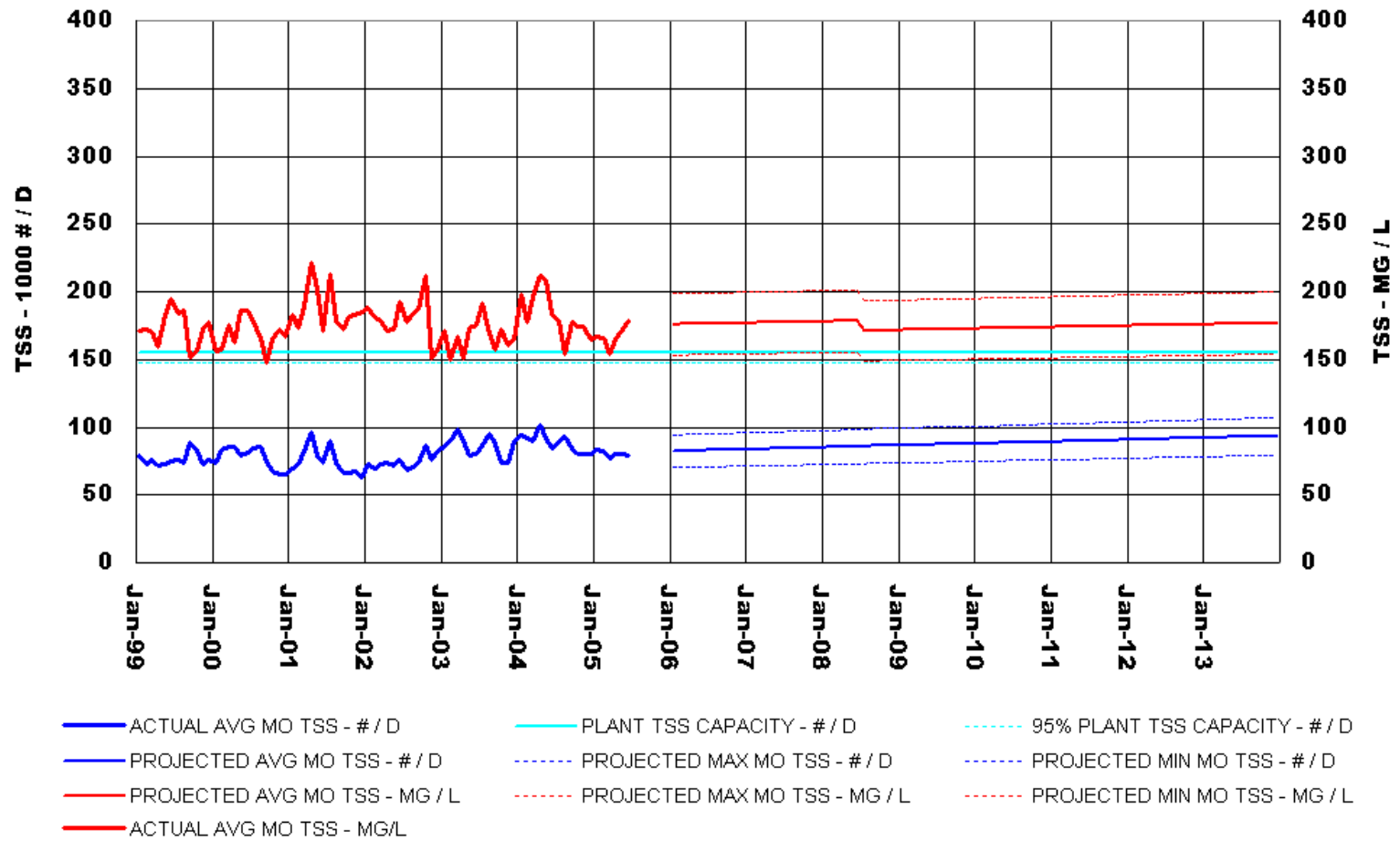


## NORTH SHORE TREATMENT PLANTS BOD PROJECTION



- ACTUAL AVG MO BOD - # / D
- PROJECTED AVG MO BOD - # / D
- PROJECTED AVG MO BOD - MG / L
- ACTUAL AVG MO BOD - MG/L
- PLANT BOD CAPACITY - # / D
- PROJECTED MAX MO BOD - # / D
- PROJECTED MAX MO BOD - MG / L
- 95% PLANT BOD CAPACITY - # / D
- PROJECTED MIN MO BOD - # / D
- PROJECTED MIN MO BOD - MG / L

## NORTH SHORE TREATMENT PLANTS TSS PROJECTION



## 6.0 SMALL COMMUNITIES FACILITIES

### 6.1 KING WILLIAM

#### 6.1.1 Collection System

##### 6.1.1.a Capacity

The capacity of the King William System is currently sufficient for the existing flows.

##### 6.1.1.b Infiltration/Inflow

The Small Communities Division is not currently conducting I/I studies in the King William System nor are any planned during the next year.

##### 6.1.1.c Diversions

Currently, flows for the King William Treatment Plant are being hauled to the West Point Treatment Plant.

##### 6.1.1.d Improvements

Developers are designing several expansions of the King William Collection System.

#### 6.1.2 Treatment Plant

##### 6.1.2.a Capacity

The current design capacity of the King William Treatment Plant is 0.025 MGD. Currently, plant flows are not sufficient to be efficiently treated at the plant and are trucked to West Point. The flows are accounted for separately. The average plant flow trucked in FY 2005 was 0.010 MGD. However, King William County has established a wastewater service area around the Central Garage area of the County and requires all commercial establishments and residences in the service area to be connected to both the sewer system and their new water system.

Developers are moving forward with developments in the service area that will utilize the remaining capacity of the existing treatment plant, making a plant expansion necessary. Plans are currently being implemented for the first phase of a multi-phased expansion of the treatment plant. Planned future development flows have been added to the graph during the time they are expected to start entering the system.

#### 6.1.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the King William Treatment Plant through the year 2014 based on a currently projected population growth of 2.254% and planned future development.

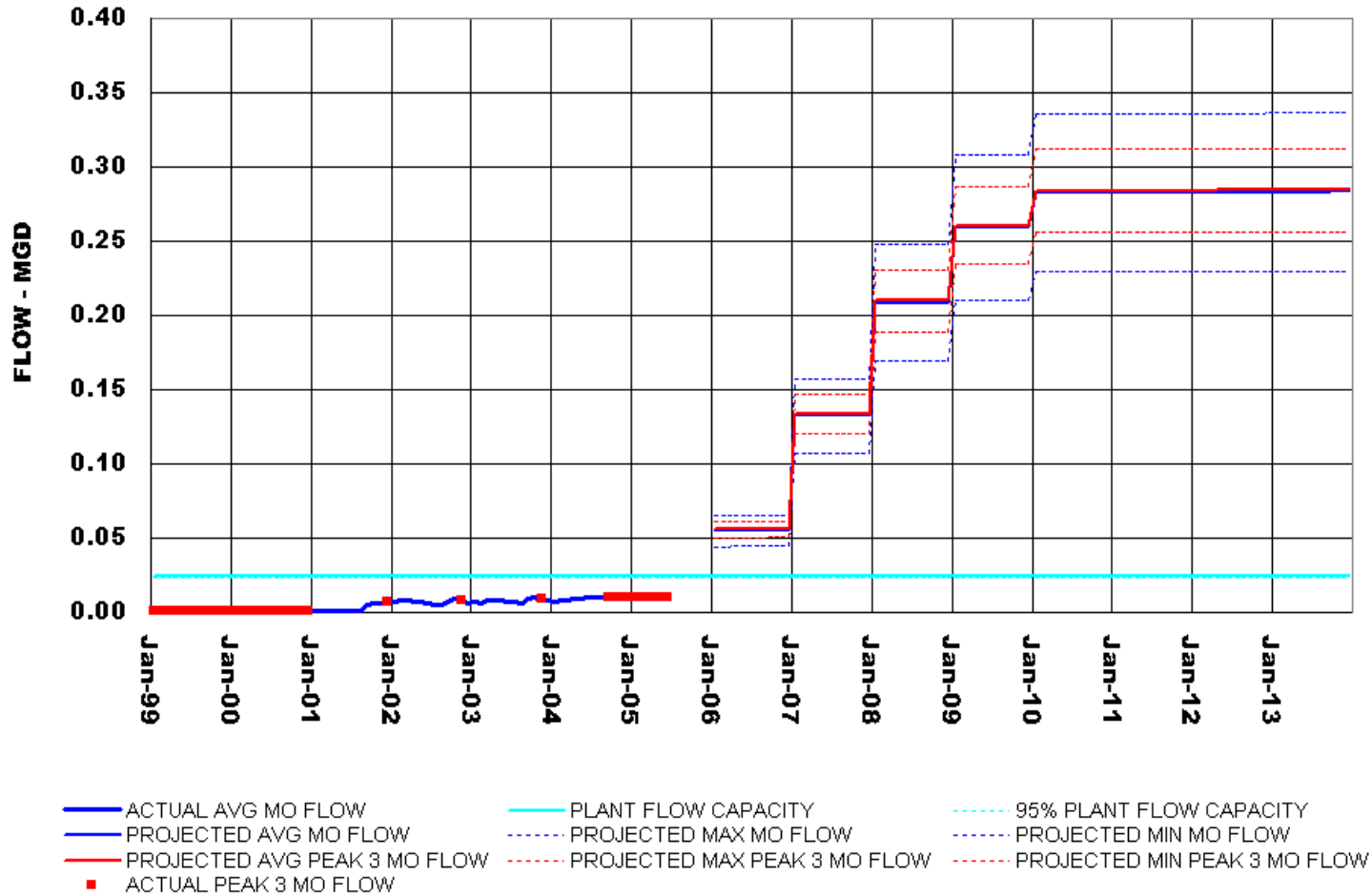
#### 6.1.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the King William Treatment Plant is expected to be within design limits for BOD and TSS through the year 2014.

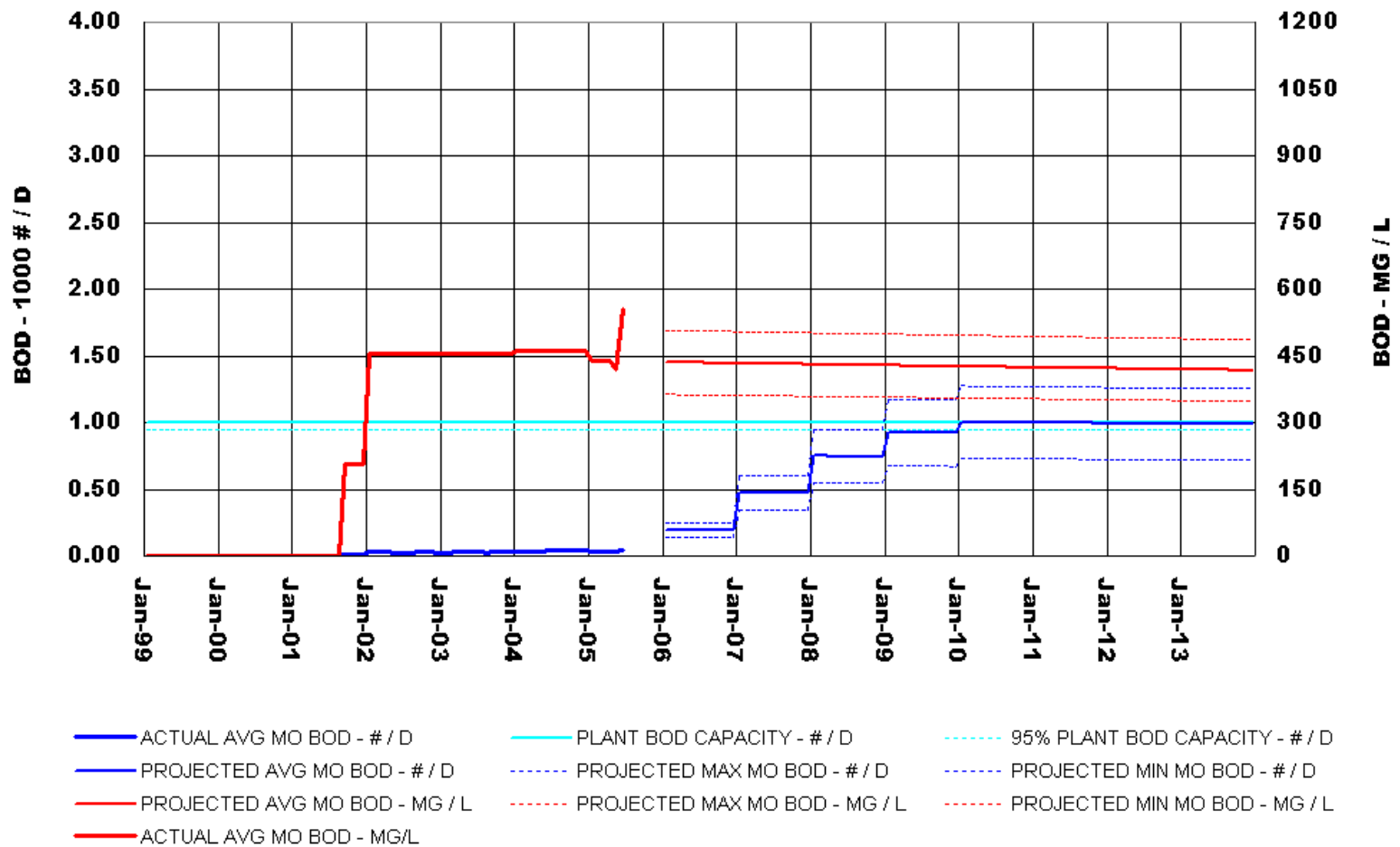
#### 6.1.2.d Improvements

A phased expansion of the capacity of the King William Treatment Plant from 0.025 to 0.15 MGD is planned. The first phase to 0.05 MGD is currently being implemented.

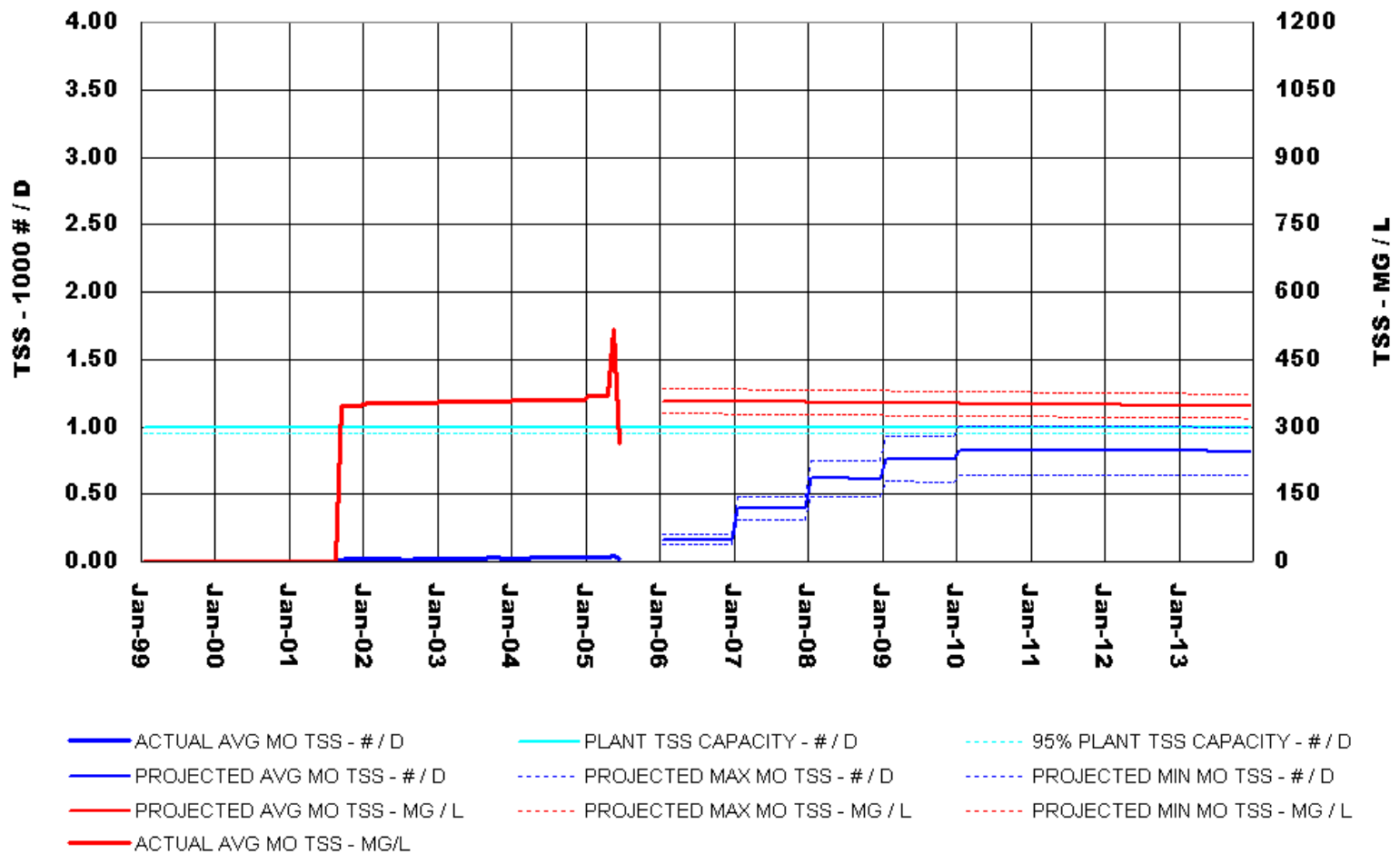
## KING WILLIAM TREATMENT PLANT FLOW PROJECTION



## KING WILLIAM TREATMENT PLANT BOD PROJECTION



## KING WILLIAM TREATMENT PLANT TSS PROJECTION



## 6.2 MATHEWS

### 6.2.1 Collection System

#### 6.2.1.a Capacity

The capacity of the Mathews System is currently sufficient for the existing flows.

#### 6.2.1.b Infiltration/Inflow

The Small Communities Division is not currently conducting I/I studies in the Mathews System and none are planned during the next year.

#### 6.2.1.c Diversions

There are no diversions currently in the Mathews System but a future diversion of flows from the Mathews Treatment Plant to the York River Treatment Plant is being considered.

#### 6.2.1.d Improvements

The vacuum pumps in the collection system are currently being upsized to improve system reliability.

### 6.2.2 Treatment Plant

#### 6.2.2.a Capacity

The current design capacity of the Mathews Treatment Plant is 0.1 MGD. However, due to nitrification requirements the practical treatment capacity may be as low as 0.075 MGD. The average plant flow for FY 2005 was 0.057 MGD.

#### 6.2.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Mathews Treatment Plant through the year 2014 based on a currently projected population growth of 2.165%.

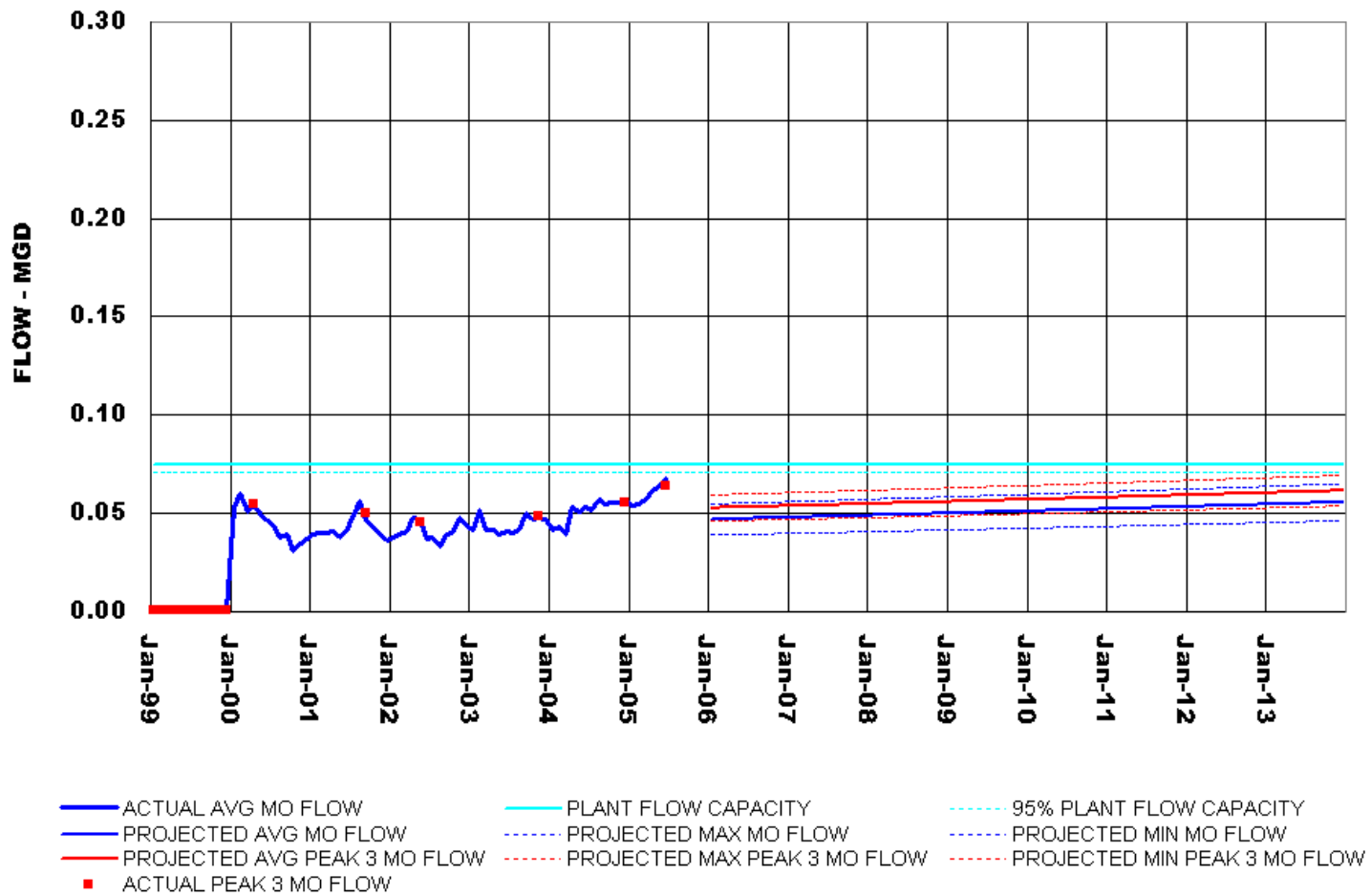
#### 6.2.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the Mathews Treatment Plant is expected to be within design limits for BOD and TSS through the year 2014.

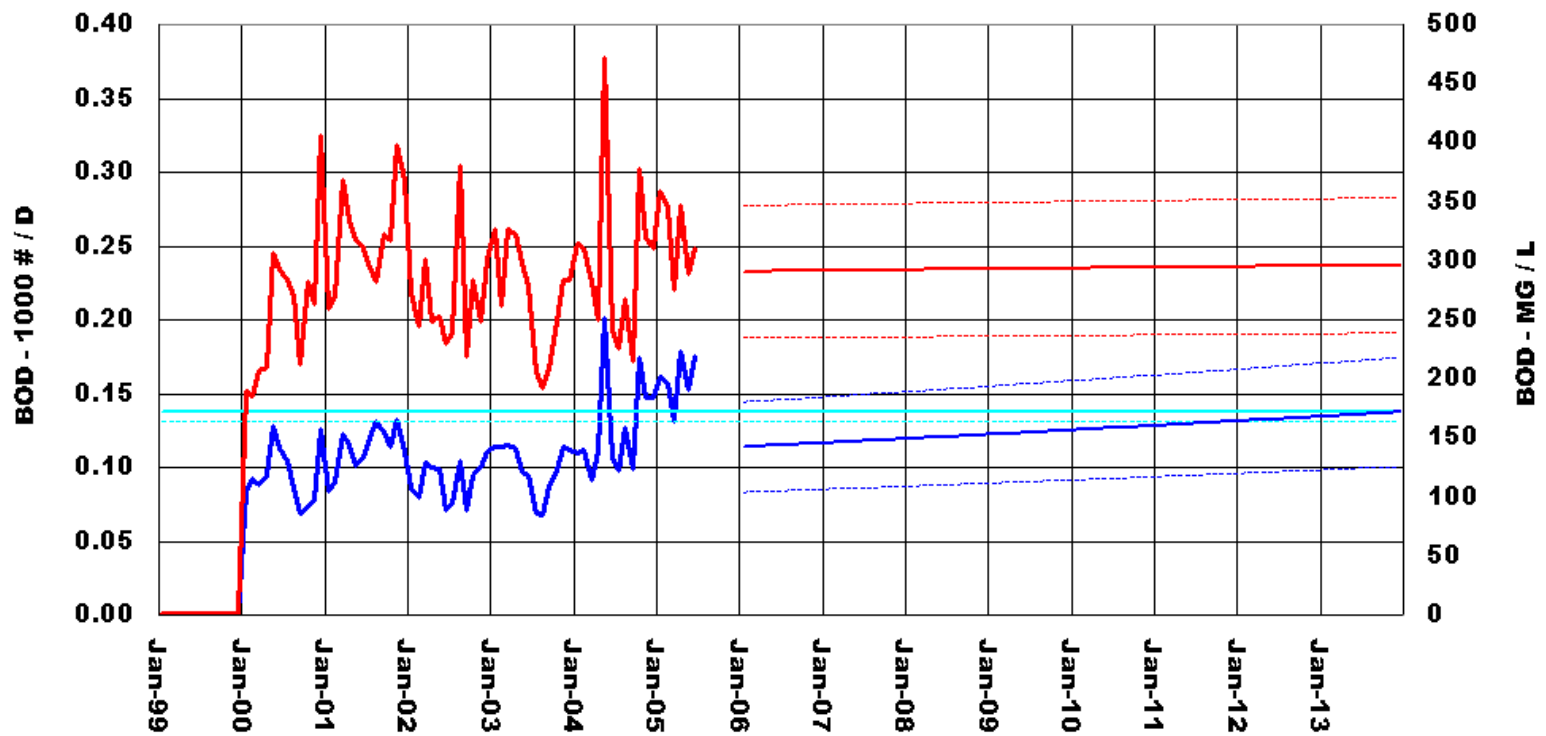
#### 6.2.2.d Improvements

No improvements are currently scheduled for the Mathews Treatment Plant. However, the renewed VPDES permit is expected to include requirements to remove nitrogen and phosphorous which will require a major plant upgrade, a new facility, or a transmission force main.

## MATHEWS TREATMENT PLANT FLOW PROJECTION

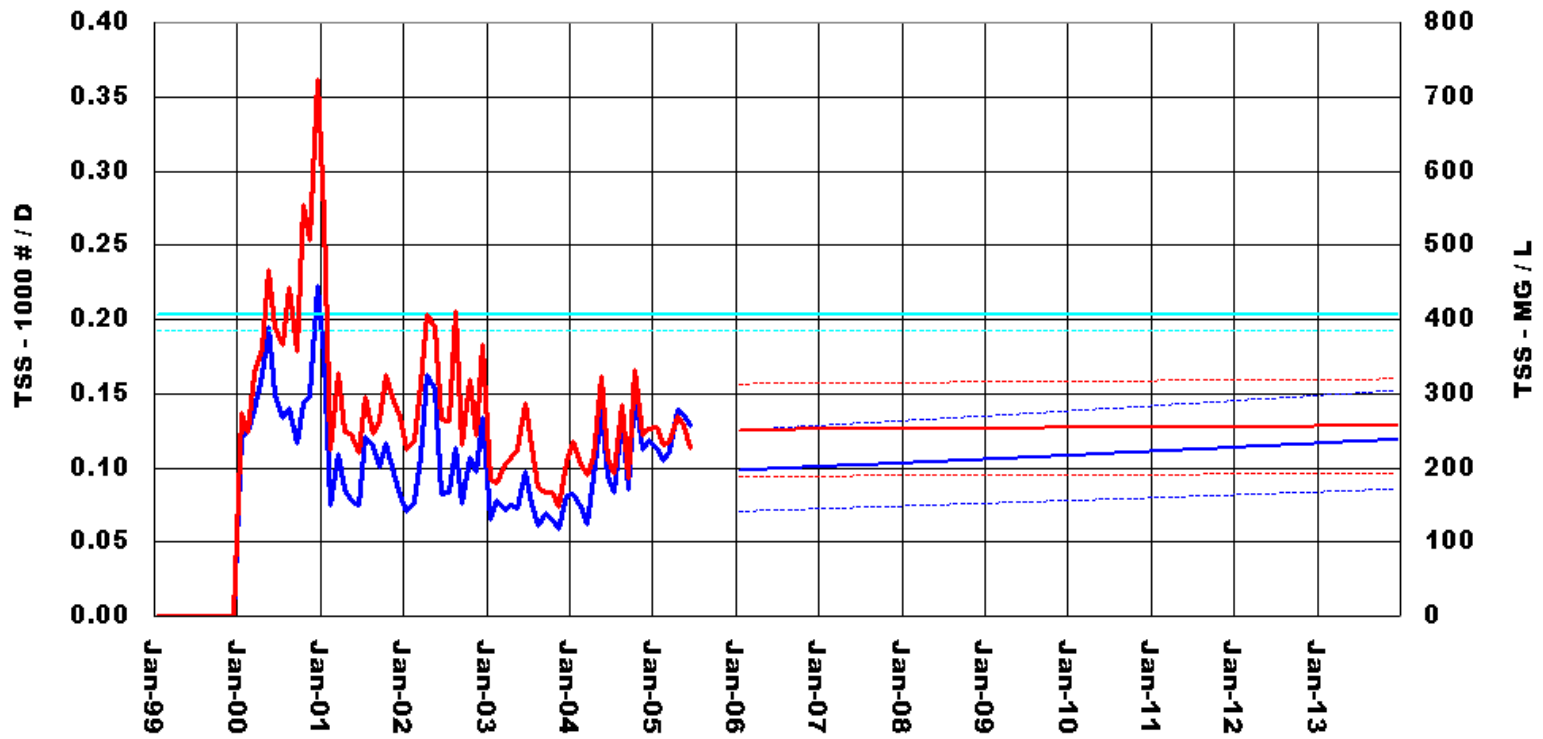


## MATHEWS TREATMENT PLANT BOD PROJECTION



- ACTUAL AVG MO BOD - # / D
- - - PROJECTED AVG MO BOD - # / D
- PROJECTED AVG MO BOD - MG / L
- ACTUAL AVG MO BOD - MG/L
- PLANT BOD CAPACITY - # / D
- - - PROJECTED MAX MO BOD - # / D
- - - PROJECTED MAX MO BOD - MG / L
- - - 95% PLANT BOD CAPACITY - # / D
- - - PROJECTED MIN MO BOD - # / D
- - - PROJECTED MIN MO BOD - MG / L

## MATHEWS TREATMENT PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D    | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">—</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO TSS - MG / L    |  |  |

### 6.3 URBANNA

#### 6.3.1 Collection System

##### 6.3.1.a Capacity

The capacity of the Urbanna System is currently sufficient for the existing flows.

##### 6.3.1.b Infiltration/Inflow

The Small Communities Division is not currently conducting I/I studies in the Urbanna System and none are planned during the next year.

##### 6.3.1.c Diversions

There are no diversions currently in the Urbanna System nor are any planned during the next year.

##### 6.3.1.d Improvements

There are no major improvements planned for the Urbanna Interceptor System.

#### 6.3.2 Treatment Plant

##### 6.3.2.a Capacity

The current design capacity of the Urbanna Treatment Plant is 0.1 MGD. However, due to nitrification requirements, the practical treatment capacity may be as low as 0.095 MGD. Average plant flow for FY 2005 was 0.054 MGD. Expansion is not anticipated to be needed before the year 2014.

##### 6.3.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the Urbanna Treatment Plant through the year 2014 based on a currently projected population growth rate of 2.184%.

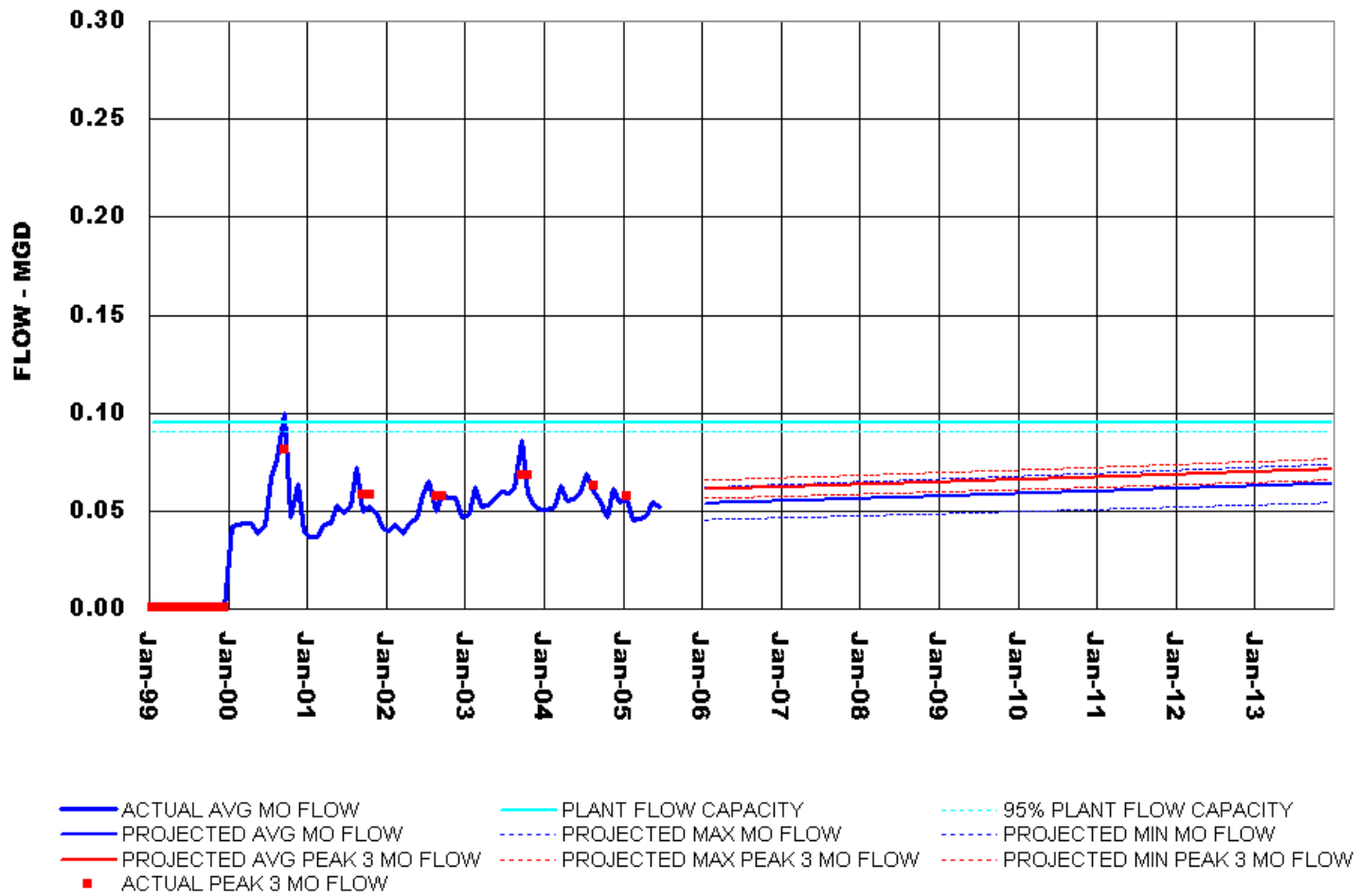
#### 6.3.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the Urbanna Treatment Plant is expected to be within design limits for BOD and TSS through the year 2014.

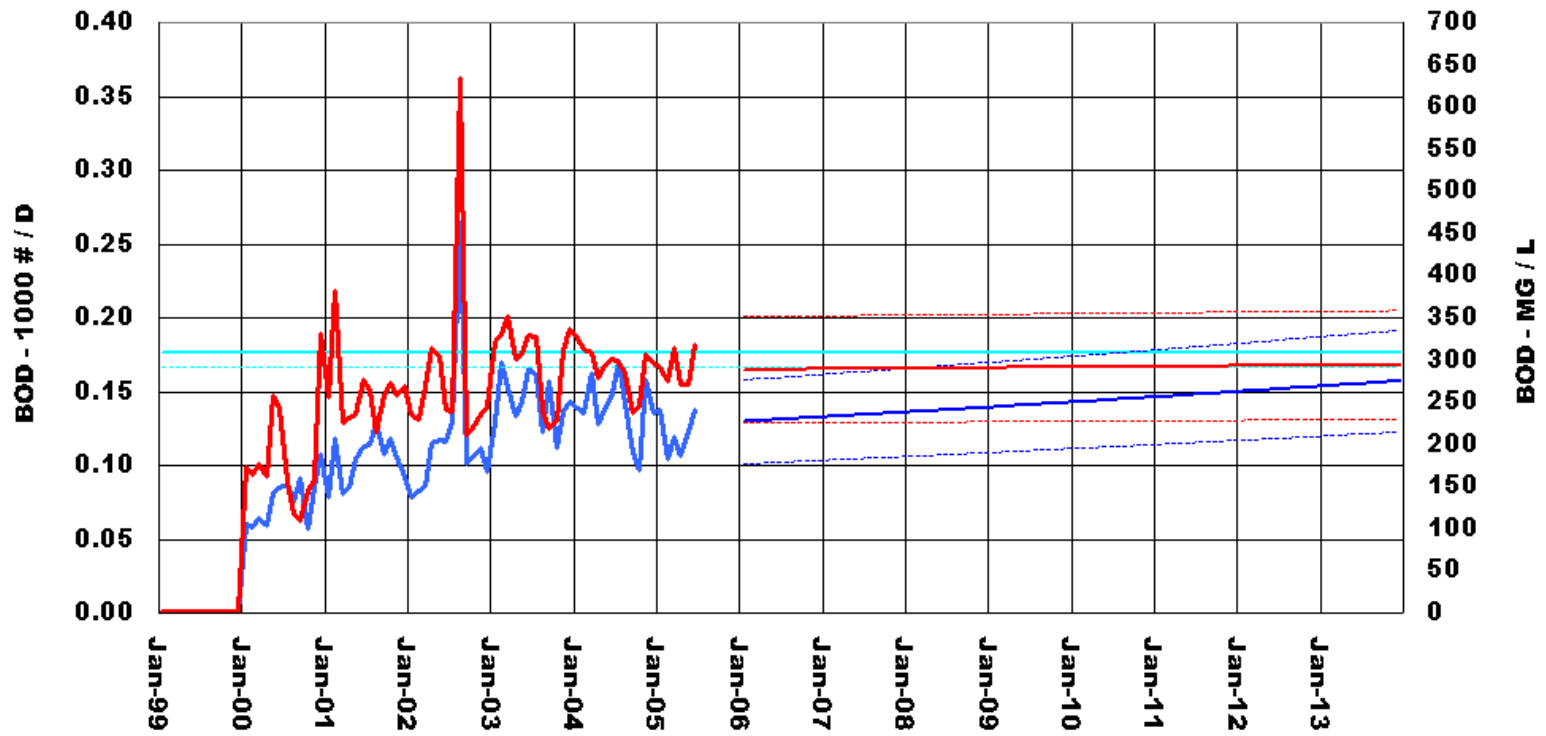
#### 6.3.2.d Improvements

No improvements are currently scheduled for the Urbanna Treatment Plant. However, the renewed VPDES permit is expected to include requirements to remove nitrogen and phosphorous, which will require a major plant upgrade, a new facility, or a transmission force main.

## URBANNA TREATMENT PLANT FLOW PROJECTION

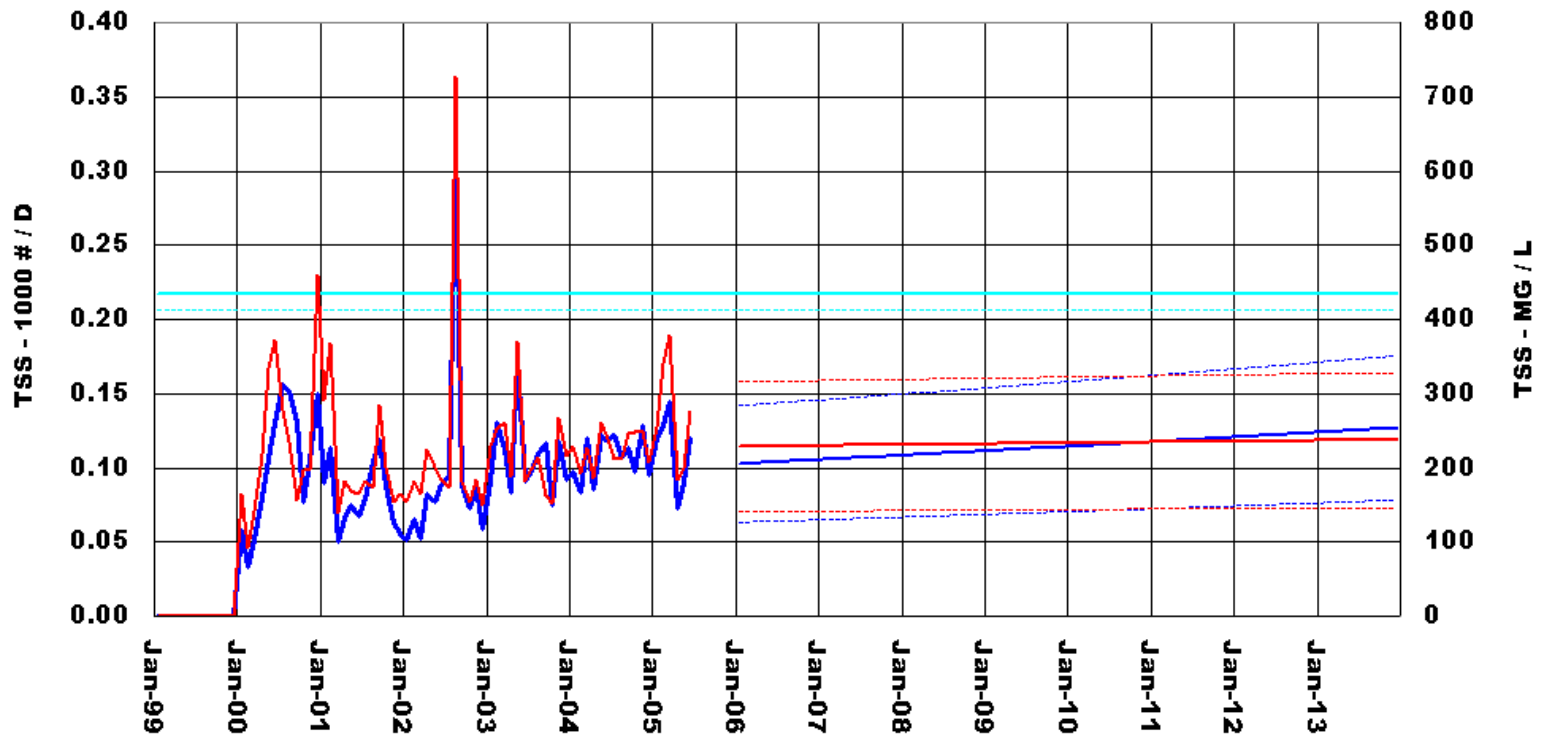


## URBANNA TREATMENT PLANT BOD PROJECTION



- |  |  |  |
|--|--|--|
| <ul style="list-style-type: none"> <li><span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D</li> <li><span style="color: blue;">—</span> PROJECTED AVG MO BOD - # / D</li> <li><span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L</li> <li><span style="color: red;">—</span> ACTUAL AVG MO BOD - MG/L</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D</li> <li><span style="color: blue;">- - -</span> PROJECTED MAX MO BOD - # / D</li> <li><span style="color: red;">- - -</span> PROJECTED MAX MO BOD - MG / L</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: cyan;">- - -</span> 95% PLANT BOD CAPACITY - # / D</li> <li><span style="color: blue;">- - -</span> PROJECTED MIN MO BOD - # / D</li> <li><span style="color: red;">- - -</span> PROJECTED MIN MO BOD - MG / L</li> </ul> |
|--|--|--|

## URBANNA TREATMENT PLANT TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D    | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">—</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">. . .</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">. . .</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO TSS - MG/L      |  |  |

## 6.4 WEST POINT

### 6.4.1 Collection System

#### 6.4.1.a Capacity

The capacity of the West Point System is currently sufficient for the existing flows.

#### 6.4.1.b Infiltration/Inflow

The Small Communities Division is currently planning I/I studies in the West Point System this year. Improvements are needed in the collection system to prevent overflows from excessive I/I. The Chief of Small Communities and the Director of Treatment are currently addressing this issue. A plan has been submitted to DEQ to correct several deficiencies that contribute I/I to the collection system.

#### 6.4.1.c Diversions

There are currently no diversions in the West Point System.

#### 6.4.1.d Improvements

There is an existing CIP Project to abate a major source of inflow in the Pamunkey Subsystem. A similar project may be required in the Thompson Subsystem. A project has been designed to replace the 2<sup>nd</sup> Street Pump Station Discharge Force Main and replace a section of 10-inch diameter corrugated gravity sewer.

### 6.4.2 Treatment Plant

#### 6.4.2.a Capacity

The current design capacity of the West Point Treatment Plant is 0.6 MGD. The average plant flow for FY 2005 was 0.577 MGD.

#### 6.4.2.b Flow Projection

The Flow Projection on the following page shows the projected average flows for the West Point Treatment Plant through the year 2014 based on a currently projected population growth of 2.254%. The flow projections show that capacity issues will need to be addressed in the near future.

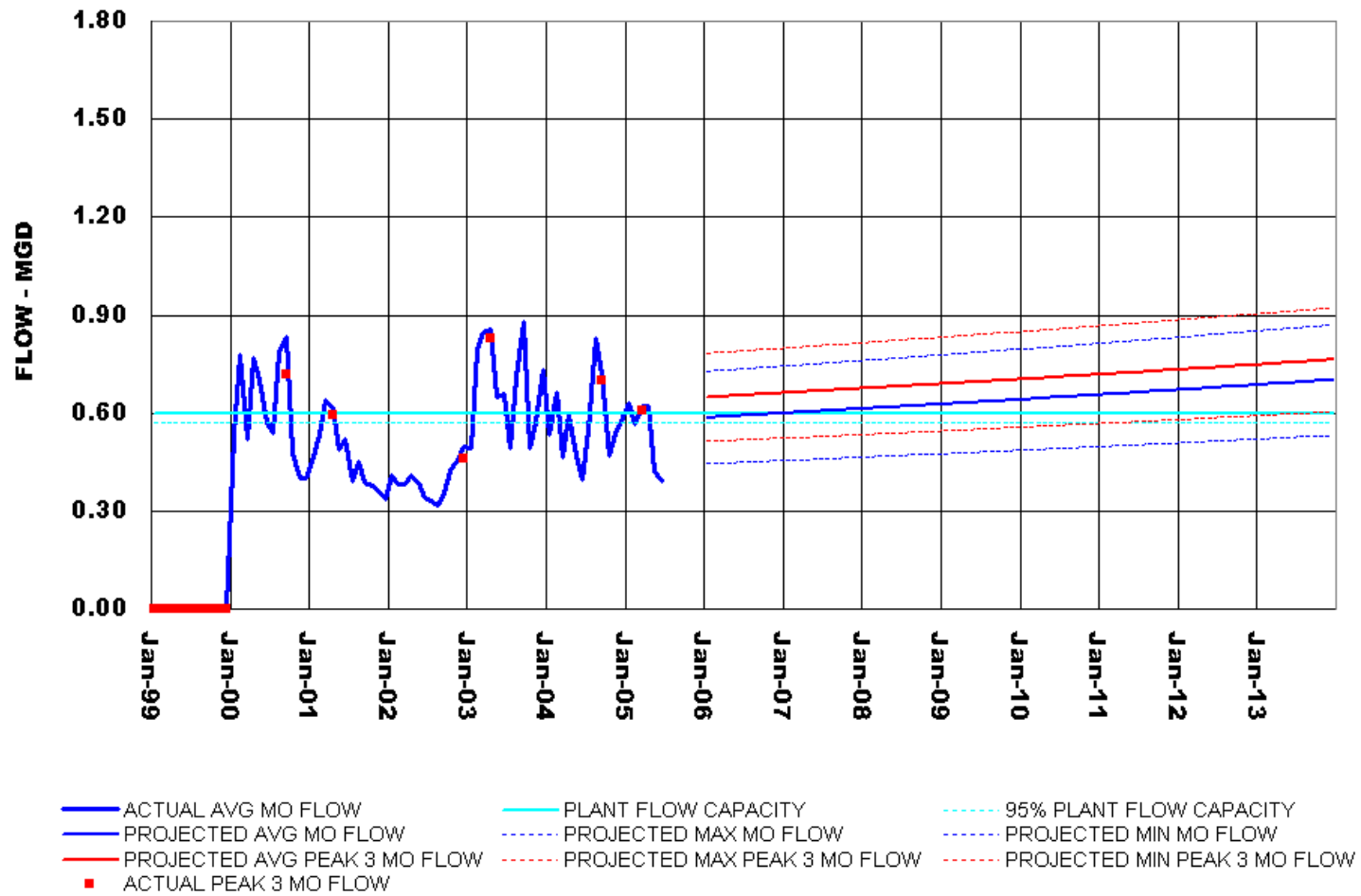
#### 6.4.2.c BOD and TSS Projections

The BOD and TSS Projections on the following pages show the West Point Treatment Plant is expected to be within design limits for BOD and TSS through the year 2014.

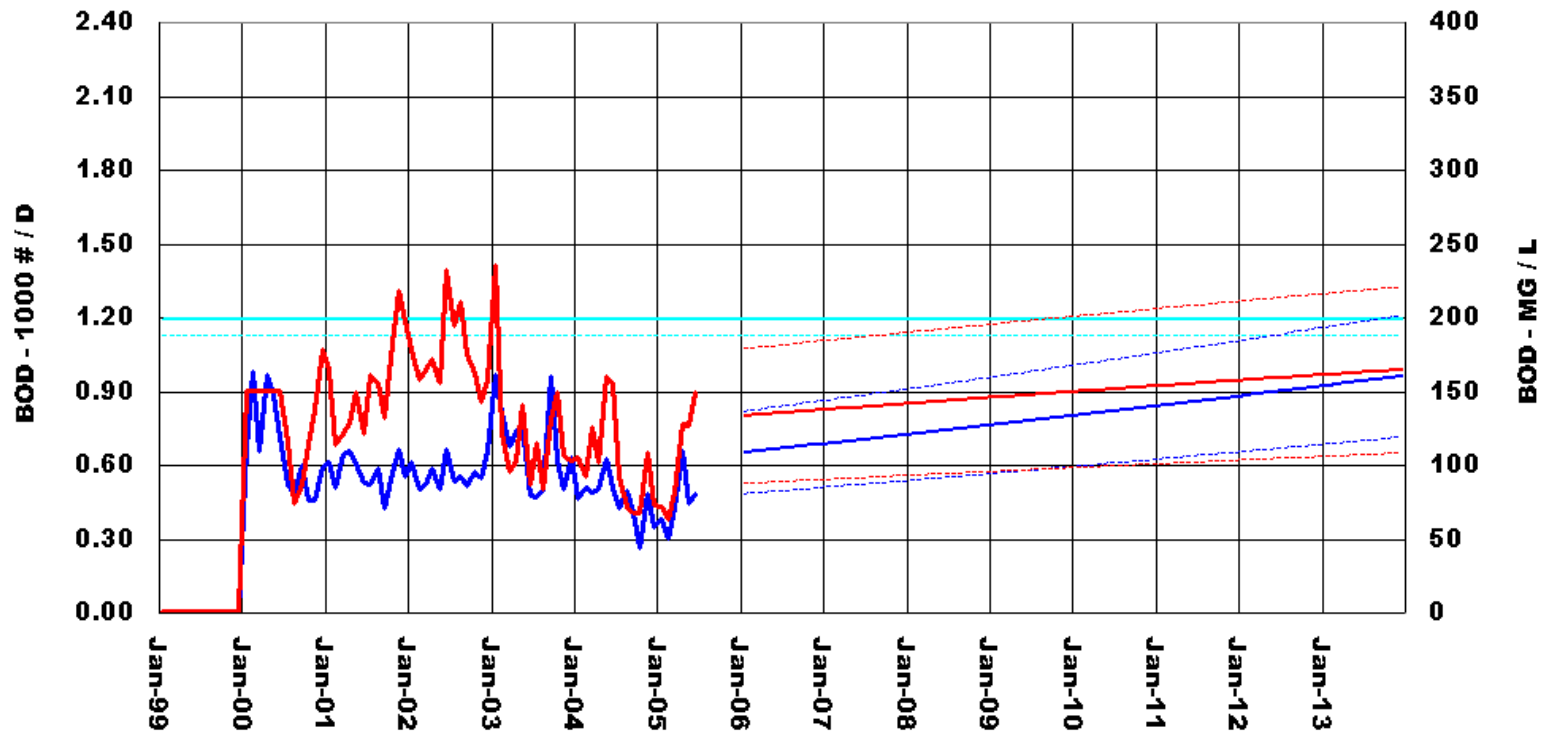
#### 6.4.2.d Improvements

No improvements are currently scheduled for the West Point Treatment Plant. However, the renewed VPDES permit is expected to include requirements to remove nitrogen and phosphorous, which will require a major plant upgrade, a new facility, or a transmission force main.

## WEST POINT TREATMENT PLANT FLOW PROJECTION

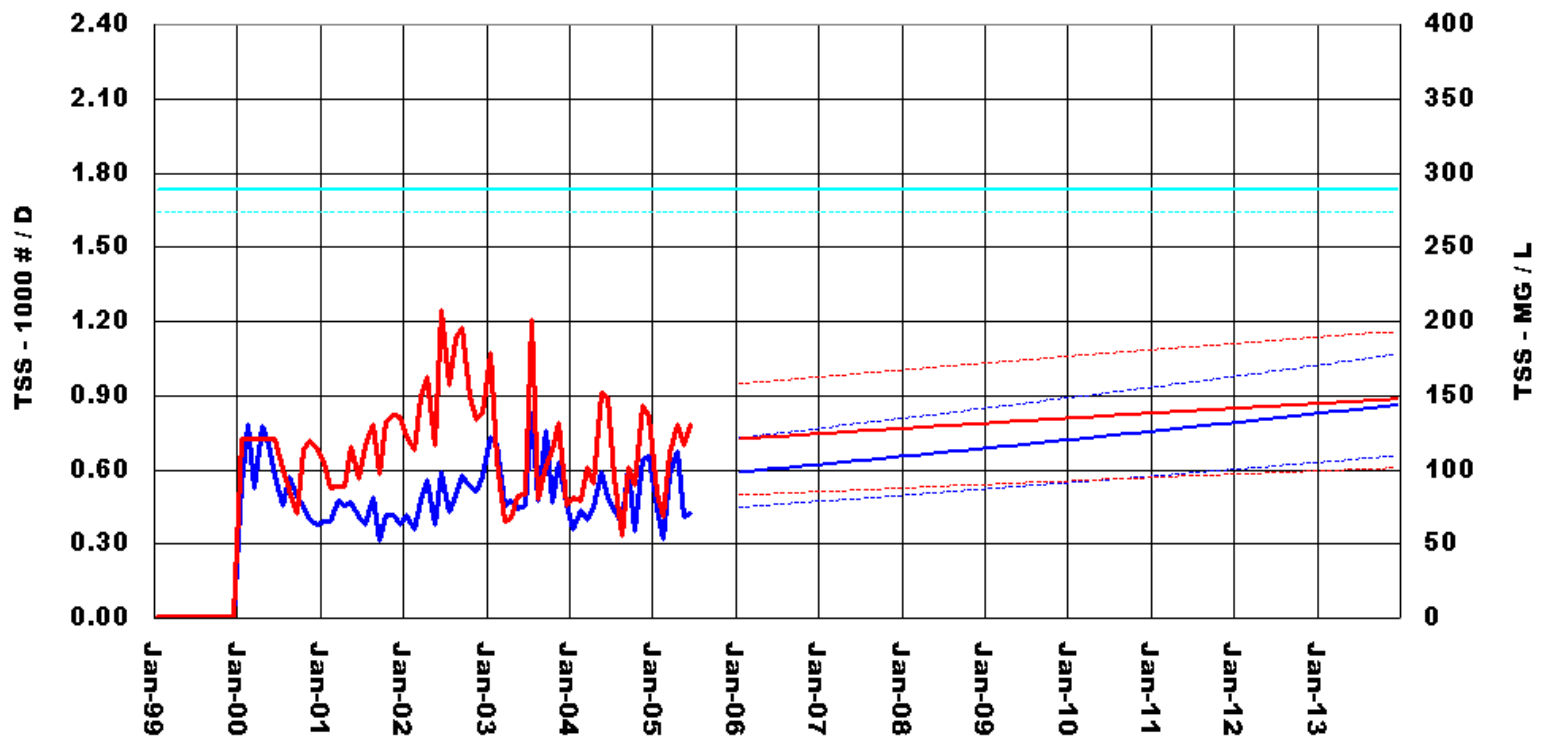


## WEST POINT TREATMENT PLANT BOD PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: cyan;">—</span> PLANT BOD CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT BOD CAPACITY - # / D | <span style="color: blue;">—</span> ACTUAL AVG MO BOD - # / D        |
| <span style="color: blue;">- - -</span> PROJECTED AVG MO BOD - # / D | <span style="color: blue;">. . .</span> PROJECTED MAX MO BOD - # / D   | <span style="color: blue;">- . .</span> PROJECTED MIN MO BOD - # / D |
| <span style="color: red;">—</span> PROJECTED AVG MO BOD - MG / L     | <span style="color: red;">. . .</span> PROJECTED MAX MO BOD - MG / L   | <span style="color: red;">- . .</span> PROJECTED MIN MO BOD - MG / L |
| <span style="color: red;">—</span> ACTUAL AVG MO BOD - MG / L        |  |  |

## WEST POINT TREATMENT PLANT TSS PROJECTION

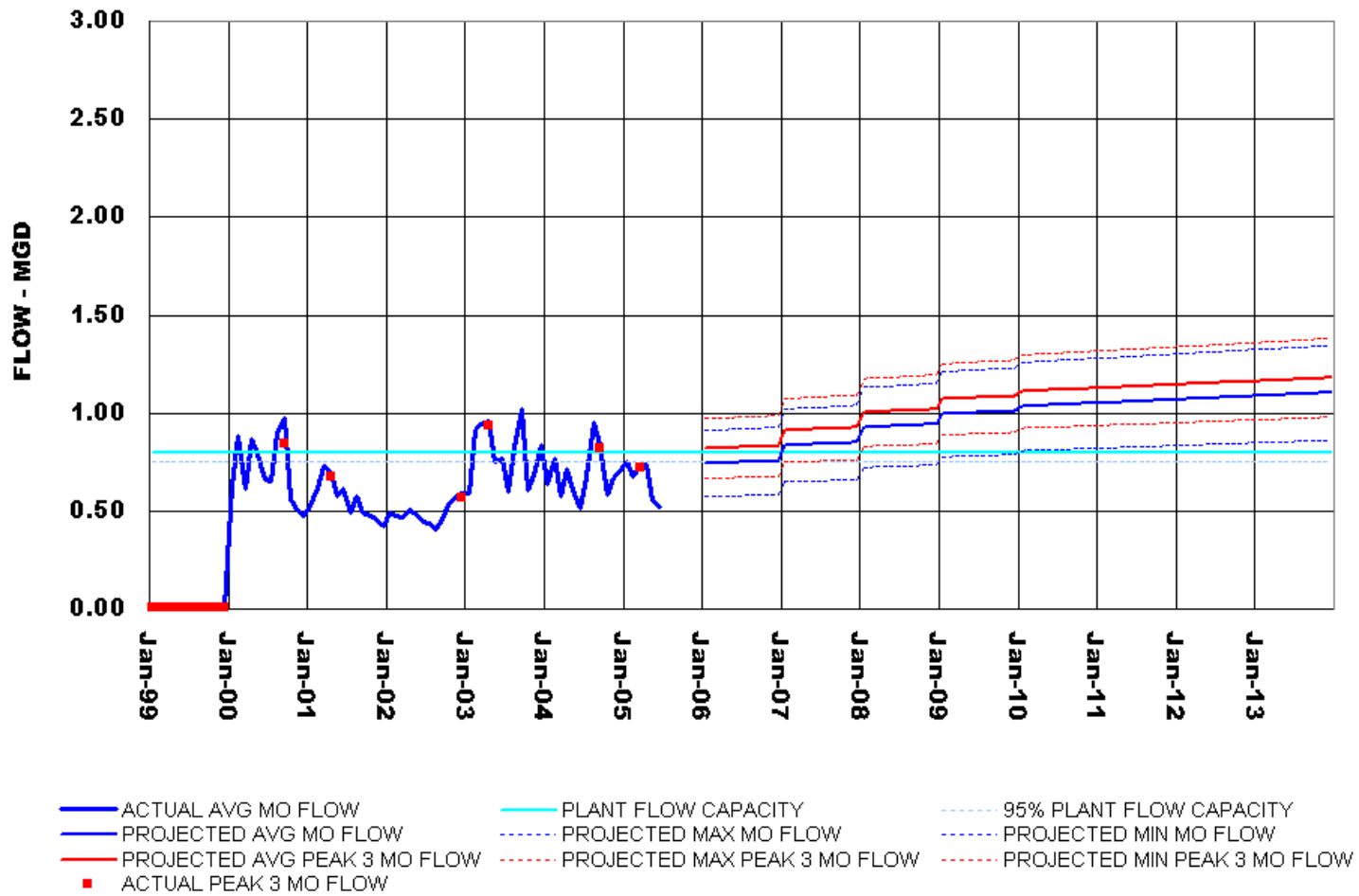


- ACTUAL AVG MO TSS - # / D
- PROJECTED AVG MO TSS - # / D
- PROJECTED AVG MO TSS - MG / L
- ACTUAL AVG MO TSS - MG / L
- PLANT TSS CAPACITY - # / D
- PROJECTED MAX MO TSS - # / D
- PROJECTED MAX MO TSS - MG / L
- 95% PLANT TSS CAPACITY - # / D
- PROJECTED MIN MO TSS - # / D
- PROJECTED MIN MO TSS - MG / L

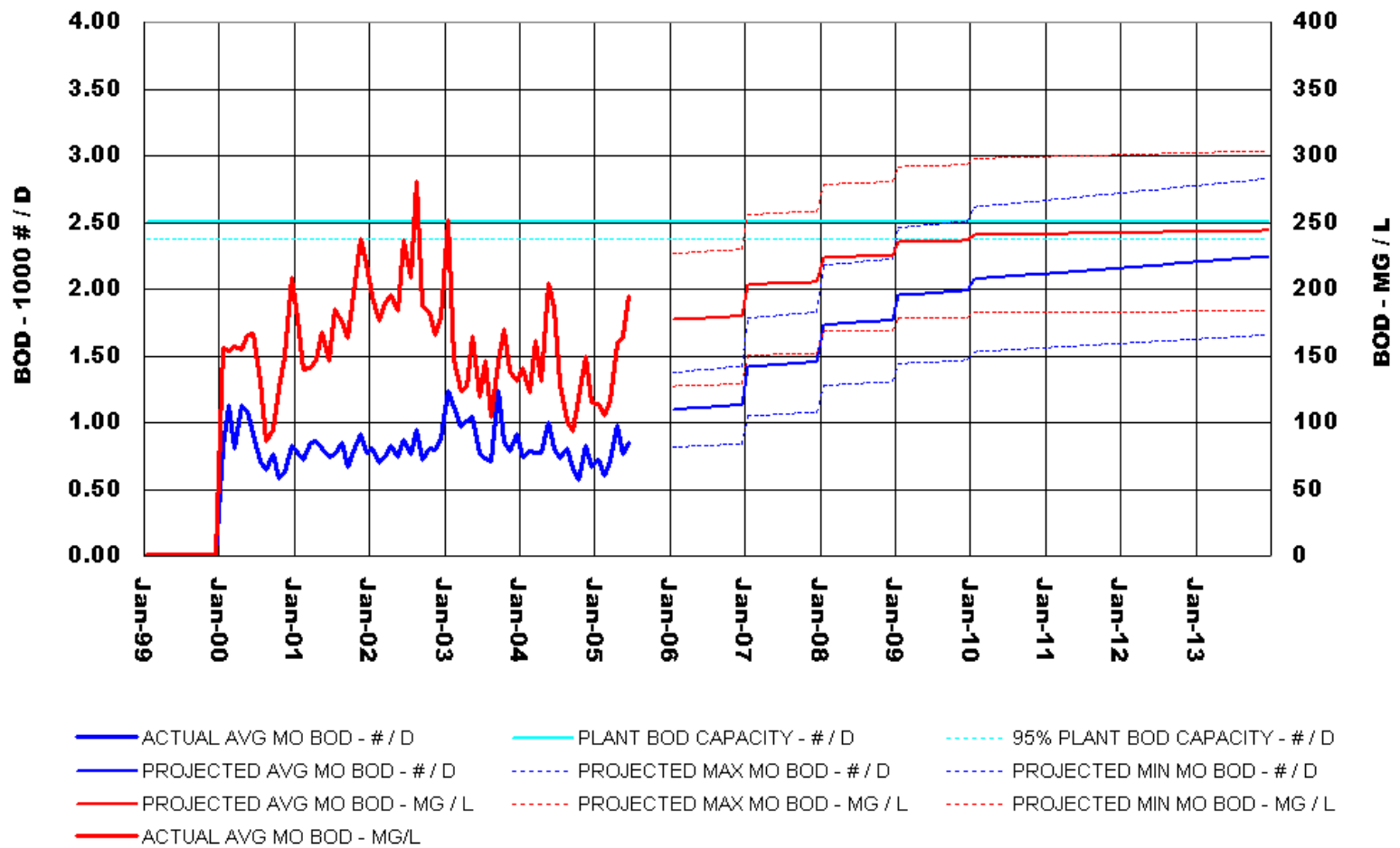
6.5 SMALL COMMUNITIES FLOW, BOD, AND TSS PROJECTIONS

The following pages show the projected average flows, BOD, and TSS for the Small Communities Treatment Plants through the year 2014 based on a currently projected population growth of 2.242%.

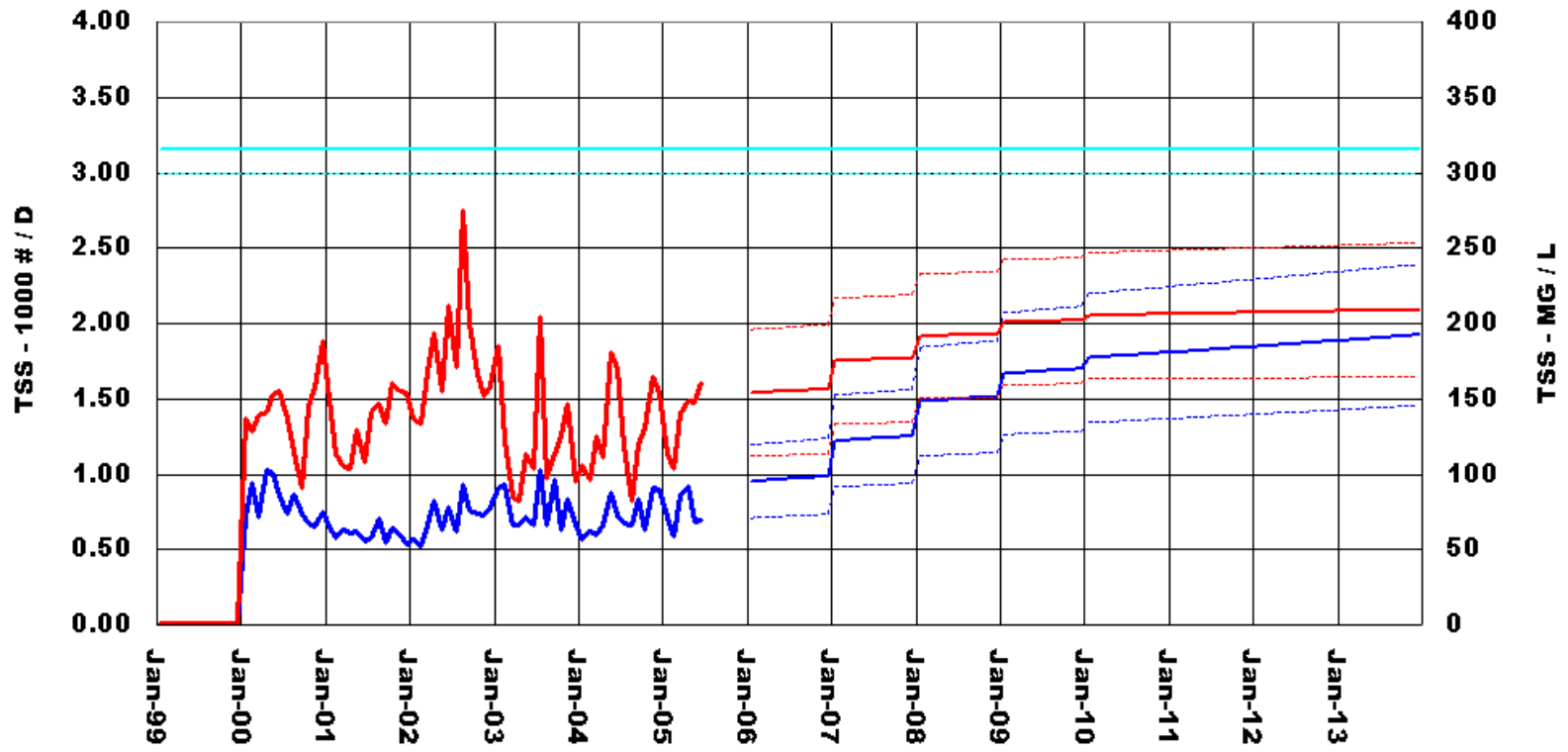
## SMALL COMMUNITIES TREATMENT PLANTS FLOW PROJECTION



## SMALL COMMUNITIES TREATMENT PLANTS BOD PROJECTION



## SMALL COMMUNITIES TREATMENT PLANTS TSS PROJECTION



- |  |  |  |
|--|--|--|
| <span style="color: blue;">—</span> ACTUAL AVG MO TSS - # / D        | <span style="color: cyan;">—</span> PLANT TSS CAPACITY - # / D       | <span style="color: cyan;">- - -</span> 95% PLANT TSS CAPACITY - # / D |
| <span style="color: blue;">- - -</span> PROJECTED AVG MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MAX MO TSS - # / D | <span style="color: blue;">- - -</span> PROJECTED MIN MO TSS - # / D   |
| <span style="color: red;">—</span> PROJECTED AVG MO TSS - MG / L     | <span style="color: red;">- - -</span> PROJECTED MAX MO TSS - MG / L | <span style="color: red;">- - -</span> PROJECTED MIN MO TSS - MG / L   |
| <span style="color: red;">—</span> ACTUAL AVG MO TSS - MG/L          |  |  |

## **7.0 HRSD SOUTH SHORE, NORTH SHORE, AND SMALL COMMUNITIES FLOW, BOD, AND TSS PROJECTIONS**

The following pages show the combined projected average flows, BOD, and TSS for all HRSD South Shore, North Shore, and Small Communities Treatment Plants through the year 2014.

The graphs show an increase in BOD capacity in 2007 due to the planned upgrade of the Chesapeake-Elizabeth Treatment Plant. This also results in a slight decrease in the TSS design capacity.

The graphs show an increase in flow, BOD and TSS capacity in 2010 due to the planned upgrade of the Atlantic Treatment Plant.