

Several major projects have been proposed and are currently being implemented to provide protection to the environment and to provide additional capacity for the cities wastewater collection systems and the treatment plant.

**Wastewater Treatment Plant Upgrades:**

The City of Hagerstown began a major construction program to expand wastewater treatment capacity and upgrade its wastewater treatment facilities to comply with Biological Nutrient Removal (BNR) treatment goals in 1995. An engineering report titled Capacity and Nutrient Removal Evaluation for the Hagerstown Water Pollution Control Plant was completed in April 1996. The report recommended a four phase capital improvements program for rehabilitation of existing treatment facilities, upgrading treatment for biological nitrogen and phosphorus removal to comply with BNR treatment goals established in a 1996 BNR Agreement between the City and MDE, and expansion of treatment capacity from 8 mgd to 10.5 mgd to handle projected wastewater loads through the year 2015. The capital improvements program included the following four phases of plant improvements:

Phase 1 - Biological Nutrient Removal and Existing Facility Improvements

Phase 2 - Biological Treatment Capacity Expansion

Phase 3 - Effluent Filter Replacement and Disinfection Improvements

Phase 4 – Headworks and Existing facility Rehabilitation

Construction of the Phase 1 improvements was completed in October 2000.

Construction of the Phase 2 improvements was completed in March 2006. Engineering design development for the Phase 3 improvements was started in 2002 and suspended at the 90 percent completion milestone in February 2003 after it became clear that MDE needed to develop a new state-wide strategy for additional nutrient reductions from municipal wastewater treatment plants and that it was likely that the new strategy would have impact on the City's plans for constructing new effluent filters for the Hagerstown WWTP.

The Hagerstown Phase 1 BNR improvements were constructed with cost sharing grant assistance from MDE with the objective of reducing effluent nitrogen concentrations to less than 8 mg/L on an annual average basis and reducing effluent phosphorus discharges to less than 2 mg/L on a monthly basis. The Bay Restoration Act, signed by Governor Ehrlich in 2004, will require the City to meet new ENR treatment goals of 3.0 mg/L TN and 0.3 mg/L TP on an annual basis and establishes specific annual discharge mass loading caps for both nitrogen and phosphorus based on 4 mg/L TN and 0.3 mg/L of TP at the plant's April 30, 2003 MDE approved design capacity of 8 mgd.

Design plans for the suspended Phase 3 WWTP improvements included plans for constructing new up flow continuous backwash secondary (UCB) filters to replace existing effluent polishing pressure filters. Deep bed versions of UCB filters have been used to a limited extent with methanol addition as denitrification filters for reducing effluent nitrate-nitrogen concentrations from nitrified secondary effluent. However, the performance capability of the filters for consistently meeting the very low effluent

nitrate-nitrogen concentrations (< 1 mg/L NO<sub>3</sub>-N) is not well documented. Additionally, since ferric chloride or alum will likely need to be dosed ahead of the filters to assure compliance with new effluent TP limits, a serious question arises concerning whether the low effluent phosphorus concentration could adversely affect the growth of bacteria needed for denitrification in the filters. While there are many existing denitrification filters in treatment plants (primarily in the southeastern US) that are capable of meeting an effluent TN limit of 3 mg/L, as well as many plants that can achieve effluent TP concentrations lower than 0.3 mg/L, there are very few plants that are capable of achieving both low TN and low TP concurrently.

### **New Phase 3 - Effluent Filter Replacement and Disinfection Improvements**

A pilot study was used to determine the feasibility of using upflow continuous backwash (UCB) filter technology for enhanced nutrient removal from secondary biological nutrient removal (BNR) effluent from the Hagerstown WWTP to achieve Maryland Department of the Environment defined ENR requirements for Total Nitrogen (TN) concentration reduction to 3 mg/l and Total Phosphorous (TP) concentration reduction to 0.3 mg/l on an annual basis. The study included development and execution of a pilot scale testing program using the Parkson Corporation Dynasand filter process technology to evaluate treatment performance capabilities, process loading response, chemical dosage requirements, and process control requirements necessary to achieve ENR treatment goals. In addition to pilot testing the UCB process technology, design criteria and facility requirements for full scale application of the technology were developed for the Hagerstown WWTP. Estimates of capital and operating cost for the full scale UCB facilities were prepared for determining the cost-effectiveness of the technology compared with other technologies capable of achieving ENR treatment performance and providing a preliminary estimate of grant funding required from the Bay Restoration Fund for design and construction of the required ENR improvements for the Hagerstown WWTP.

After the completion of the pilot study and the acceptance of the study results by MDE, the City of Hagerstown entered into a contract with Black & Veatch for Design and Construction phase services. The notice to proceed with the design was issued June 4, 2007.

This project will include:

- New deep-bed, upflow, continuous backwash filter complex, including distribution channel, seven filter basins with 10 filter modules per basin, a filtered effluent collection channel, and a filter backwash pumping station.
- New methanol feed and storage facilities
- Addition of two new rotary screw air compressor units in acoustical enclosures, compressed air dryers, and air receiving tank
- A multi-parameter nutrient analyzer and sampling pumps
- Approximately 150 feet of new 48 inch outfall pipeline to convey finished water to the Antietam Creek.

In addition to the ENR filter construction project the City has also contracted with Black & Veatch for design and construction management services for upgrades of the Hagerstown WWTP disinfection system from the current method using ozone to ultra-violet light disinfection. This project will run concurrent with the ENR project.

This project will include:

- New UV disinfection basin complex consisting of an influent flow distribution channel, three parallel UV effluent disinfection channels, motorized level control gates for each UV channel, a disinfection effluent collection channel, a maintenance pad for lamp cleaning and a roof canopy with under-hung monorail hoist system.
- New pre-cast concrete building to house electrical and control systems for the equipment.
- New concrete cascade step aeration chamber
- New high purity oxygen injection system for effluent re-aeration to meet MDE dissolved oxygen limits of a minimum of 8.0 mg/l at any time.
- Add an engine driven 480 Volt 3-Phase electrical powered generator to provide backup power for critical process equipment in the Effluent area.

The construction project for both ENR and Disinfection System upgrades are currently scheduled to be completed by November 2010

#### **Phase 4 - Headworks and Existing facility Rehabilitation**

The City of Hagerstown employed the services of Black & Veatch for design and construction management of Headworks and Primary Treatment Improvements. The design for this project began in December 2007. The construction is be completed by May 2010.

This project will include

- Replacing the existing mechanically cleaned bar screen and the addition of a second mechanically cleaned bar screen to allow total redundancy in the Headworks operation.
- Screening washer and compactors will be provided to handle screenings from both screens.
- Replacement of two grit removal systems and the associated blowers used with the systems
- Replacement of aluminum slide gates with new cast iron sluice gates
- Rehab and repaint all painted carbon steel parts in the Primary Clarifiers
- Install new ultrasonic level monitoring devices
- Addition of third vertical wet pit solids handling pump for wet weather flows
- Add an engine driven 480 Volt 3-Phase electrical powered generator to provide backup power for critical process equipment in the Headworks area.
- Modify BNR concrete baffle walls

- Replace existing temporary wet weather diversion piping with permanent ductile iron pipe with isolation valves.

**Wastewater Collections Systems Upgrades:**

In January 2005, the City of Hagerstown entered into a Consent Judgment with the Maryland Department of Environment (MDE) to minimize the discharge of raw sewerage overflows from collection systems and partially treated sewer overflows from the treatment plant.

The City agreed to undertake a system wide study to determine the sources of excess flow and remediation steps to either eliminate and/or reduce these flows. The initial step of this comprehensive study was I & I study that was performed by Black & Veatch, Inc.

The I & I report identified 11 Sanitary Sewer Districts for Infiltration and Inflow and 4 Sanitary Sewer Districts for Inflow out of 34 to be the major contributors of excessive flow to the collection system.

The second step of the study is Sanitary Sewer Evaluation System that will focus on the 13 sewer districts identified under I & I study.

In this stage all the districts will be divided to sub-districts to pinpoint the exact source(s) excess flow. This will be accomplished by Flow Monitoring, Closed Captioned Television, Manhole Inspection and Smoke or Dye Testing programs.

Listed below is a table that reflects our proposed schedule based on sanitary sewer district observed I/I during the SSES investigations.

Budget Year	Districts	Estimated I/I Reduction	Estimated Cost
09/10	7, 8, 9	460,980	\$1,100,000
10/11	17, 22	115,840	\$1,100,000
11/12	2,3,10,20, 34	59,400	\$880,000
12/13	4, 6, 9	18,720	\$350,000
13/14	5, 13, 21		\$300,000

Some of the visual estimates for I/I are low due to the timing of the study, about half way through the study we began a period of drought, however the visible inspection of the CCTV reports indicated areas of the most concern. We have also review prior flow meter data to help us determine our priority order.

The work will include lining of mains, laterals and connection points of the mains and laterals, open cut repairs, and manhole sealing, grouting and lining when necessary. Additionally we will continue to work with our citizens to eliminate findings found during the recent smoke testing.