HG 225-06 City WWTP ~~Expansion~~
Site Plan

MSA.S.1829-5820

Comment
4/19/06
MT 8/24/07

Martin O'Malley
Governor

Anthony G. Brown
Lt. Governor

Margaret G. McHale
Chair

Ren Serey
Executive Director

STATE OF MARYLAND
CRITICAL AREA COMMISSION
CHESAPEAKE AND ATLANTIC COASTAL BAYS
1804 West Street. Suite 100. Annapolis, Maryland 21401
(410) 260-3460 Fax: (410) 974-5338
www.dnr.state.md.us/criticalarea/

MEMORANDUM

To: Mr. George Keller, Program Administrator, MDE Water Management Administration

From: Marshall Johnson, Natural Resources Planner, Critical Area Commission

Date: August 24, 2007

RE: FONSI # 107, Havre De Grace Wastewater Treatment Plant Upgrade/Expansion Harford County

This office has received the notice of a project for City of Havre De Grace wastewater treatment plant upgrade and expansion. This proposal is required to comply with COMAR 27.02.02 - State and Local Agency Actions Resulting in Development of Local Significance on Private Lands or Lands Owned by Local Jurisdictions. A previous review by this office of an upgrade and expansion of the plant resulted in concurrence that the project is consistent with the City's Critical Area Program. However, as stated in the May 15, 2006 letter from my office (attached), any changes in the development plan described in that letter, or expansion of disturbance area on this site, will require additional review by my office. In order to be consistent with the City Program, development activity proposed in the Critical Area must meet all requirements of the Town's Ordinance and COMAR, including the policies and criteria for habitat protection areas in COMAR 27.01.09. The proposed project is in the IDA (Intensely Developed Area) of the Critical Area, which requires documentation that the 10% pollution reduction standard will be met.

Thank you for the opportunity to comment. Please contact me at (410) 260-3479 if you have any questions.

cc: HG 225-06

(Attachment)

STATE OF MARYLAND
CRITICAL AREA COMMISSION
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1804 West Street, Suite 100, Annapolis, Maryland 21401
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May 15, 2006

Mr. Jay Bautz
Deputy Director
Department of Economic and
and Planning
City of Havre de Grace
Havre de Grace, Maryland 21078

RE: City of Havre de Grace
Wastewater Treatment Plant Consistency Report

Dear Mr. Bautz:

Thank you for providing "Notification of Certification" that the above project is consistent with the City's Critical Area program. The City's Department of Public Works is proposing to expand an existing wastewater treatment plant in order to accommodate new development in the City. The project will be built in two phases. The first phase will include the addition of a tank, compost storage pad, pumping station and flow equalization vault. Site clearing will take place in the southern portion of the site to allow for construction of the flow equalization and compost pad storage area and the oxidation ditch reactor. The second phase will include additional structures such as aerations tanks, filters and pumping stations. The plant is in an Intensely Developed Area; the expansion will not impact the 100-foot Buffer.

This office understands:

1. That stormwater will be mitigated on-site by reducing pollutant loadings. Dry swales will meet the 10 % pollutant reduction requirement; and,

2. The City is proposing to use an open space area at the site for tree planting to offset the impacts of clearing 4.45 acres.

The Commission staff has determined that the above proposed development: 1) has environmental or economic consequences that will largely be confined to the immediate area of the site on which the development is located, 2) does not substantially affect the Critical Area program of the local jurisdiction, and 3) is not considered by the Commission as major development. *(See COMAR: Chapter Two, Regulations for Development in the Critical Area Resulting from State and Local Agency Programs).*

Therefore, approval of the above project by the Commission is not necessary. If there are any changes in development that may affect the habitat within the area on site, this office would like to be notified immediately at (410) 260-3483.

Sincerely,

Dawnn McCleary
Natural Resources Planner

cc: Al Henry
Regina Esslinger
HG 225-06

City of Havre de Grace

225-06

711 PENNINGTON AVENUE, HAVRE DE GRACE, MARYLAND 21078
www.havredegracemd.com

(410) 939-1800
(410) 575-7043
FAX(410) 939-3692

May 1, 2006

Ms. Dawnn McCleary
State of Maryland
Chesapeake Bay Critical Area Commission
1804 West Street
Annapolis, MD 21401

RE: City of Havre de Grace
Waist Water Treatment Plant Expansion
Project Consistency with Local Critical Area Program

Dear Ms. McCleary:

The City of Havre de Grace is proposing to expand its existing waist water treatment plant (WWTP) located with the Chesapeake Bay Critical Area. The tremendous residential growth taking place in the City is estimated at approximately 3,500 dwelling units between the years 2004 and 2012. The current processing ability of the WWTP is 1.89 million gallon per day (mgd). Build out of the proposed dwelling increase will require the WWTP processing to be increased to about 3 mgd. The proposed expansion will provide a processing capacity of 3.3 mgd.

The existing WWTP is located in the Intensely Developed Area of the Critical Area and a very small section within the 100 foot buffer. No portion of the expansion of the WWTP is proposed within the buffer zone. The WWTP is classified as a Water Dependent Facility by the intrinsic nature of its design and use. The impacts of storm water associated with the expansion will be mitigated on-site through Best Management Practices (BMPs) in accordance with the 2000 Maryland Stormwater Design Manual to achieve compliance with the 10% pollutant reduction requirements within the Critical Area.

Clearing of 4.45 acres is not located in a non-tidal wetland, riparian forest, Critical Area Buffer or region of threatened or endanger wildlife. The City is considering utilizing the minimal available open space on the project property for tree planting to off-set the impacts of the clearing.

In conclusion, a review of the WWTP project finds the proposal to be compliant and consistent with the City of Havre de Grace Critical Area Program. Should you have any questions regarding this matter, please contact me at 410-939-1800 extension 120.

Sincerely,

Donald J. Bautz Jr.
Deputy Director
Department of Economic Development and Planning

CC: Al Henry, Director, Dept. of Economic Development and Planning
Donna Costango, Deputy Director, Dept. of Public Works

City of Havre de Grace

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April 5, 2006

Dawnn McCleary
State of Maryland
Chesapeake Bay Critical Area Commission
1804 West Street, Suite 100
Annapolis, MD 21401

RE: City of Havre de Grace
Waist Water Treatment Plant (WWTP)
Enhanced Nutrient Removal Expansion Project

Dear Ms. McCleary:

Enclosed please find a report prepared by a consulting engineer, Stearns & Wheler, LLC on behalf of the City of Havre de Grace which outlines a proposal to expand the existing City WWTP in order to accommodate proposed new development in the City. The WWTP currently has a capacity of 1.89 million gallons per day treatment; the expansion will increase this to 3.3 million gallons per day treatment.

A majority of the development expansion comes from several residential projects including:

• Bulle Rock	2,129 dwellings	15% built
• Greenway Farms	692 dwellings	
• Scenic Manor	90 dwellings	
• Chesapeake Townhomes	114 dwellings	
• Bulle Rock Yacht Club	37 dwellings	
• Grace Manor	78 dwellings	built out
• Havre de Hills	96 dwellings	85 % built
• Fenner	44 dwellings	
• Mount Pleasant	11 dwellings	
• Tranquility Redevelopment	330 dwellings	100 units net increase
• Heron Harbor	60 dwellings	2% built

In addition to the above there are several single in-fill residential dwellings proposed and a new retail shopping center on Pulaski Highway comprising of 18 businesses and one food chain retailer.

Build out of the above projects would exceed the current capacity of the City's WWTP and the timing for the plant expansion completion would accommodate the number of units listed. The WWTP is located in the Intensely Development Area of the City's Critical Area and is a water dependant facility. The City requests that your agency review this report as it applies to Critical Area regulation and provide comment in a written response to me at your earliest convenience. This project is scheduled to begin construction in July, 2006. A meeting with the consultant, City staff and Critical Area staff can be arranged to further discuss the project if so desired. Should you have any immediate questions, please contact me at 410-939-1800 extension 1120.

Sincerely,

Donald J. Bautz Jr.
Deputy Director
Department of Economic Development and Planning

CC: Al Henry – Director Department of Economic Development and Planning
Donna Costango – Deputy Director, Department of Public Works

Havre de Grace Wastewater Treatment Plant

ENR Upgrade and Expansion

City of Havre de Grace
Contract No. 1-45-9010-06

Critical Area Report

Submitted to:
Department of Economic Development & Planning
City of Havre de Grace

Submitted by:
STEARNS & WHELER, LLC
4201 Northview Drive
Suite 404
Bowie, MD 20716

March 24, 2006

S&W No. 40139.30

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* Note that drawings are presented under separate cover. These 50% design drawings represent the "Interim Improvements for Facility Re-Rating" project only.

EXECUTIVE SUMMARY

The Havre de Grace Wastewater Treatment Plant (HDG WWTP) is located in Harford County, Maryland. The ENR Upgrade and Expansion Project was initiated by the City of Havre de Grace Department of Public Works in response to a projected increase in flow (1.89 mgd to 3.3 mgd) and to meet enhanced nutrient reduction (ENR) standards under the Bay Restoration Act. The project will be built in two phases – an interim expansion phase which will expand the plant capacity from 1.89 mgd to 2.3 mgd (Phase I) followed by the ENR Upgrade and Expansion (Phase II) which will upgrade the existing biological nutrient removal (BNR) plant for enhanced nutrient removal (ENR) and expand the WWTP to 3.3 mgd.

1. INTRODUCTION

The ENR Upgrade and Expansion project will include an upgrade of the existing BNR plant for ENR and expansion of capacity from 1.9 mgd to 3.3 mgd. The project will be built in two phases – an interim expansion phase (Phase I) followed by the ENR Upgrade and Expansion (Phase II). During the Interim Improvements Project all clearing necessary for both construction projects will take place. The project schedules are as outlined below:

Phase I- Interim Improvements Project

- Bid Documents – May 2006
- Bids Received – May 2006
- Notice to Proceed – June 2006
- Construction Completed – January 2007 (7 months)

Phase II- ENR Upgrade and Expansion

- Bid Documents – August 2006
- Bids Received – October 2006
- Notice to Proceed – January 2007
- Construction Completed – January 2009 (24 months)

These schedules show that Phase II will begin almost immediately after Phase I is completed.

1.1 Property Description

The Havre de Grace WWTP is 19.4-acre site located at 1 Jerry Foster Way in Havre de Grace, MD. The site is owned and operated by the City of Havre de Grace and is used for municipal wastewater treatment.

1.2 Building/Structure Description

The following structures/buildings will be constructed as part of the Interim Improvements Project as well as ENR Upgrade and Expansion Project, and are presented on the Drawings.

Table 1: Structures

Construction Phase	Structure	Covered / Uncovered
Phase I Interim Improvements	Flow Equalization Tank	Uncovered Open Tank
	Compost Storage Pad	Uncovered
	Compost Pad Pumping Station	Covered
	Flow Equalization Metering Vault	Covered
Phase II ENR Upgrade and Expansion	Headworks	Covered (enclosed building)
	Oxidation Ditch (Reactor)	Uncovered Open Tank
	Post Anoxic – Re-Aeration Tank	Uncovered Open Tank
	Final Clarifier Distribution Box	Uncovered Open Tank
	Final Clarifiers	Uncovered Open Tank
	Effluent Filters	Covered
	UV System	Covered
	Chemical Storage Facility	Covered
	Methanol Storage Building	Uncovered
	Blower and Electrical Building	Covered (enclosed building)
	Filter Reject Pumping Station	Covered
	Influent Flow Metering Vault	Covered

Description of Main Process Flow Structures

- Headworks and Grit Removal Tank
    - Influent screening channels and a grit removal tank will be built to facilitate the removal of larger debris and grit before the wastewater is sent to the biological treatment process.
- Oxidation Ditch (Reactor)
    - Following screening and grit removal, flow will be conveyed to the reactor for biological treatment. The reactor is an open tank structure that will be constructed under the ENR Upgrade and Expansion Project.
- Post Anoxic – Re-Aeration Tank
    - Once treated in the oxidation tank the process continues to another open tank structure, the post anoxic re-aeration tank. Here the wastewater will go through

an anoxic zone to promote denitrification. Then the wastewater will enter the re-aeration tank where nitrogen gas will be released from the process.

- Final Clarifier Flow Distribution Box
    - Flow will enter the final clarifier distribution box from the post anoxic re-aeration tank where flow will be split between the final clarifiers. This structure will also house a scum pump which will pump scum from the two new final clarifiers to the waste sludge holding tank.
- Final Clarifiers
    - Two new 80 ft final clarifiers will be constructed. These two new tanks will process approximately 2/3 of the flow while the other 1/3 will be offloaded to the existing final clarifiers. The final clarifiers will separate the biomass from the treated effluent.
- Effluent Filters
    - New effluent filters will be constructed. The effluent filters are required to achieve the states ENR goal for phosphorus reduction to 0.3 mg/L. This structure will be covered.
- UV System
    - After exiting the filters the process will enter a UV disinfection system which will decrease the fecal concentration to permitted levels before entering the Chesapeake Bay. The UV structure will also be covered.

Other Process Structures

- Flow Equalization Tank
    - In order to help offload peak flows from the process, a new 1.65 million gallon flow equalization tank will be constructed. This tank will be built during the Interim Improvements Project to provide additional process flexibility until the ENR Upgrade and Expansion Project is completed. During storms, peak flows can be offloaded to the flow equalization tank and then metered slowly back through the system.

- Chemical Storage Facility
    - A chemical storage area will be constructed under the ENR Upgrade and Expansion Project for storage of the following chemicals: sodium hypochlorite, alum and caustic. All chemicals will be located in a single open walled structure under a common roof. Each chemical will be located in a chemical storage tank and surrounded by a separate concrete containment area. The chemicals will be fed into the process at various locations to aid in the treatment process.
- Methanol (Supplemental Carbon) Storage Facility
    - A methanol storage facility will be built adjacent to the Chemical Storage Facility. This structure will contain a methanol storage tank and on a concrete pad. Methanol will be fed by a chemical feed pump to the post anoxic zone.
- Blower and Electric Building
    - A new building labeled as the Blower and Electric Building will be built under the ENR Upgrade and Expansion Project and will house three different rooms: a chemical pump room, a blower room and an electric room. The chemical pumps will pump chemicals from the chemical storage tanks into the process stream. The blower room will house the re-aeration blowers which will feed air to the re-aeration zone as well as an air compressor which will feed compressed air to the effluent filters. The building will also contain an electrical room.
- Compost Storage Pad
    - Under the Interim Improvements Project a new 55,000 square foot compost storage pad will be built to facilitate the storage of wood chips, sludge, and finished piles. The compost storage pad will be a contained system that drains to the compost pad pumping station.
- Compost Pad Pumping Station
    - In order to ensure runoff from the compost pad is directed back into the process, the compost pad pumping station will be built during the Interim Improvements Project. This pump station will pump all flow from the compost pad into the flow equalization tank. From the flow equalization, tank the flow can then be directed back into the process.

- Filter Reject Pumping Station
    - As part of the effluent filter process a filter reject (backwash) pump station must be built. This pump station will direct any filter reject back to the headworks and re-entered into the process stream.
- Below grade vaults:
    - Flow Equalization Metering Vault – Flows from the equalization tank will be measured.
    - Influent Flow Measuring Vault - This vault will be used to meter the influent flows from the pumps stations that feed the plant.

1.3 Site Clearing

As part of the Interim Improvements Project all site clearing necessary for construction for the Interim Improvements project as well as the ENR Upgrade and Expansion Project will be completed. Site clearing will take place primarily on the southern portion of the site (Refer to Photo Key in Appendix B). The majority of the clearing will take place to allow for construction of the flow equalization and compost pad storage area (constructed under the Interim Improvements Project) and the oxidation ditch reactor (constructed under the ENR Upgrade and Expansion Project). The clearing will include approximately 194,000 square feet (4.45 acres) of tree removal in a sparsely populated region. Refer to photos in Appendix B.

2. METHODOLOGY

2.1 Chesapeake Bay Critical Area (CBCA)

The Maryland General Assembly passed the CBCA in 1984 to address the noticeable decline in the natural resources associated with the Chesapeake Bay and its tributaries. The Act created a 27-member Commission and gave it authority to regulate activities within the Critical Area. The Commission requires all State agencies to minimize adverse impacts to water quality caused by stormwater as required by applicable State laws.

The project is located within the CBCA, which is defined as all land within 1,000 feet of the Mean High Water Line of tidal waters or the landward edge of tidal wetlands and all waters of and lands under the Chesapeake Bay and its tributaries. The Critical Area Buffer (Buffer) consists of all land within 100 feet landward from the Mean High Water Line of tidal waters or the edge of tidal wetlands and tributary streams.

In the Critical Area in Maryland, development or redevelopment activities in Intensely Developed Areas (IDAs) must be designed with appropriate Best Management Practices (BMPs) that must achieve at least a 10% reduction of pre-development pollutant loadings (10% rule). Because the project is designated in an IDA zone, the development plan is required to comply with the 10% rule. The "Maryland Chesapeake and Atlantic Coastal Bays, Critical Area 10% Rule Guidance Manual" published in 2003 and the Maryland Department of the Environment (MDE) "2000 Maryland Stormwater Design Manual" were used as a basis for this report.

2.2 Site Information

Existing site topography shown on the Drawings is based on a 2005 topographic survey performed by MRA, Inc. and obtained from available contract and record drawings. Anticipated surface water flow is to the east, towards the Chesapeake Bay.

The *Soil Survey of Harford County, Maryland* was utilized for information regarding soils within the property limits. The majority of the soil types within the property limits include Matapeake silt loam (MkA and MkB), and Sassafras and Joppa soils SsD and SsE, which are classified in hydrologic group "B". A small percentage of the soil type includes Mattapex silt loam (M1A) which is classified in hydrologic soil group "C".

The Federal Emergency Management Agency (FEMA) floodplain maps for this area indicate that the 100-year flood elevation is approximately 11.5-feet above mean sea level. Therefore, all proposed development is not within the 100-year floodplain.

2.3 Drainage Areas

The property limits comprise of approximately 19.4 acres (approximately 10 acres are within the limit of disturbance). The proposed site consists of 20 individual drainage areas; only seven of these require stormwater management to treat runoff from the proposed impervious areas. Because there is no disturbance in the other 13 drainage areas, a stormwater management quality waiver will be requested. Also, because this project has direct discharge to tidally influenced receiving waters, a quantity volume (channel protection volume) waiver will be requested as well. The seven drainage areas total 4.71 acres. Because the property area is considerably larger than the proposed impervious area, these seven drainage areas were used to break-up the site into workable units (as described in Section 7.0 of the guidance manual).

The drainage areas were delineated for existing and proposed drainage areas using site topography and the locations of the proposed impervious areas. Table 2 presents the drainage area number, size, existing and proposed impervious areas, and the total area requiring water quality treatment.

Table 2: Drainage Areas

Drainage Area No.	Site Drainage Area (ac)	Impervious Area (ac)		Total Area Requiring Water Quality Treatment (ac)
		Existing	Proposed	
1	0.45	0.36	0.36	0
2	0.73	0.12	0.16	0.04
3	0.88	0	0.35	0.35
4	0.57	0	0.22	0.22
5	1.90	0.12	0.51	0.39
6	0.25	0	0.04	0.04
11	1.09	0.35	0.38	0.03

The remaining drainage areas were not analyzed because either the areas drained directly to the compost pad/plant drain system or to open tanks. These collection systems direct the runoff back through the wastewater treatment plant. All stormwater entering these systems will be collected, treated, and discharged through the treatment plant outfall. The WWTP will be designed to achieve an effluent total phosphorus concentration of less then 0.3 mg/L. Therefore, these areas

were not included in the drainage area calculations. There are approximately 2.47 acres of compost pad/plant drain area and 2 acres of open tank area.

3. RESULTS

3.1 Summary of Unified Sizing Criteria

For conceptual sizing of the Stormwater Management (SWM) Best Management Practices (BMPs), the water quality (WQv) and recharge (Rev) volume requirements for each of the seven drainage areas were calculated according to MDE's 2000 Maryland Stormwater Design Manual See Table 3 below for the summary of these requirements.

Table 3: Unified Sizing Criteria

Drainage Area No.	Site Drainage Area (ac)	Site Drainage Area (sf)	WQv (cf)	Rev (cf)
1[1]	0.45	19,795	330	19
2	0.73	31,799	530	61
3	0.88	38,333	1,318	342
4	0.57	25,046	822	213
5	1.90	82,764	1,648	428
6	0.25	10,822	191	50
11	1.09	47,480	791	78

Note:
1. Drainage area does not include any new impervious areas. Water quality requirement based on changes in grading only.

3.2 Critical Area 10% Rule

Worksheet A for development within the CBCA was completed for each drainage area as individual workable units. Dry swales will provide both water quality treatment and phosphorus removal required by the 10% rule. See required removal rates for each drainage area and associated loading removal rates in the table below.

Table 4: Phosphorus Removal Rates

Drainage Area No.	Site Drainage Area (ac)	Removal Requirement (lbs/yr of total P)	Load Removed (lbs/yr of total P)	Requirement met?
1[1]	0.45	---	0.55	---
2	0.73	0.12	0.29	Yes
3	0.88	0.48	0.57	Yes
4	0.57	0.30	0.36	Yes
5	1.90	0.50	0.88	Yes
6	0.25	0.01	0.08	Yes
11	1.09	0.16	0.16	Yes
TOTAL	**5.87**	**1.57**	**2.89**	**Yes**

Note:
1. Drainage Area No. 1 does not include any new impervious areas.

The total removal requirement is 1.57 lbs/yr of total phosphorus. Using dry swales, the total load removed is 2.89 lbs/yr of total phosphorus. This results in a removal surplus of 1.32 lbs/year.

4. CONCLUSIONS

The proposed development is located in the CBCA. The proposed dry swales, throughout the affected drainage areas, will treat stormwater as well as exceed the phosphorus removal requirements set forth by the Commission.

Appendix A

Worksheet A: Standard Application Process

Stearns & Wheler L.L.C	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 1	BSR	mmw
		Comp By	Checked By

Worksheet A: Standard Application Process

Calculating Pollutant Removal Requirements*

Step 1: Calculate Existing and Proposed Site Imperviousness

A. Calculate Percent Imperviousness

1) Site Area within the Critical Area IDA, A = 0.45 acres

2) Site Impervious Surface Area, Existing and Proposed, (See Table 4.1 for details)

	a) Existing (acres)	b) Proposed (acres)
Roads	0.36	0.36
Parking Lots	0	0
Driveways	0	0
Sidewalks/paths	0	0
Rooftops	0	0
Decks	0	0
Swimming pools/ponds	0	0
Other	0	0
Impervious Surface Area	0.36	0.36

3) Imperviousness (I)

Existing Imperviousness, I_{pre} = Impervious Surface Area/Site Area
= (Step 2a)/(Step 1) = 80.00 %

Post Imperviousness, I_{post} = Impervious Surface Area/Site Area
= (Step 2b)/(Step 1) = 80.00 %

B. Define Development Category (circle)

1) New Development: Existing imperviousness less than 15% I (Go to Step 2A)

2) Redevelopment: **Existing imperviousness of 15% I or more (Go to Step 2B)**

3) Single Lot Residential Development: Single lot being developed or improved; single family resdential development; and more than 250 square feet of impervious area and associated disturbance (Go to Section 5, Residential Approach, for detailed criteria and requirements).

*NOTE: All acreage used in this worksheet refer to areas within the IDA of the Critical Area only.

Step 2: Calculate the Pre-development Load (Lpre)

A. New Development

L_{pre} = (0.5) * (A)
= N/A lbs / year of total phosphorus

where:

L_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)

0.5 = Annual total phosphorus load from undeveloped land (lbs/acre/year)

A = Area of the site wihtin the Critical Area IDA (acres)

Stearns & Wheler LLC	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 1	BSR	mmw
		Comp By	Checked By

Step 5: Identify Feasible Urban BMP(s)

Select BMP Options using the screening matrices provided in the Chapter 4 of the 2000 Maryland Stormwater Design Manual. Calculate the load removed for each option.

BMP Type	(L_{post})	X	(BMP_{RE})	X	(% DA Served)	=	LR	
Dry Swale	0.85	X	65%	X	100%	=	0.55	lbs/year
		X		X		=	0	lbs/year
		X		X		=	0	lbs/year
					Load **Removed**, LR (total)	=	**0.55**	**lbs/year**
					Pollutant Removal Requirement, RR (from Step 4)	=	0.08	lbs/year

where:

Load Removed, LR = Annual total phosphorus load removed by the proposed BMP (lbs/year)

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

BMP_{RE} = BMP removal efficiency for total phosphorus, Table 4.8 (%)

% DA Served = Fraction of the site area within the critical area IDA served by the BMP (%)

RR = Pollutant removal requirement (lbs/year)

If the Load Removed is equal to or greater than the Pollutant Removal Requirement computed in Step 4, then the on-site BMP complies with the 10% Rule.

Has the RR (pollutant removal requirement) been met? Yes

Stearns & Wheler LLC	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 2	BSR	mmw
		Comp By	Checked By

B. Redevelopment

$L_{pre} = (R_v)(C)(A)(8.16)$

$R_v = 0.05 + 0.009\ (I_{pre})$

$= 0.197945$

$L_{pre} =$ **0.35 lbs/year of total phosphorus**

where:

L_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)

R_v = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff

I_{pre} = Pre-development (existing) site imperviousness (i.e., I=75 if site is 75% impervious)

C = Flow-weighted mean concentration of the pollutant (total phosphorus) in urban runoff (mg/l) = 0.30 mg/l

A = Area of the site within the Critical Area IDA (acres)

8.16 = Includes regional constants and unit conversion factors

Step 3: Calculate the Post-development Load (Lpost)

A. New Development and Redevelopment:

$L_{post} = (R_v)(C)(A)(8.16)$

$R_v = 0.05 + 0.009\ (I_{post})$

$= 0.24726$

$L_{post} =$ **0.44 lbs/year of total phosphorus**

where:

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

R_v = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff

I_{post} = Post-development (proposed) site imperviousness (i.e., I=75 if site is 75% impervious)

C = Flow weighted mean concentration of the pollutant (total phosphorus) in urban runoff (mg/l) = 0.30 mg/l

A = Area of the site within the Cirtical Area IDA (acres)

8.16 = Includes regional constants and unit conversion factors

Step 4: Calculate the Pollutant Removal Requirement (RR)

$RR = L_{post} - (0.9)(L_{pre})$

$=$ **0.12 lbs/year of total phosphorus**

where:

RR = Pollutant removal requirement (lbs/year)

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

I_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)

Stearns & Wheler LLC	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 3	BSR	mmw
		Comp By	Checked By

Worksheet A: Standard Application Process

Calculating Pollutant Removal Requirements*

Step 1: Calculate Existing and Proposed Site Imperviousness

A. Calculate Percent Imperviousness

1) Site Area within the Critical Area IDA, A = 0.880 acres

2) Site Impervious Surface Area, Existing and Proposed, (See Table 4.1 for details)

	a) Existing (acres)	b) Proposed (acres)
Roads	0	0.35
Parking Lots	0	0
Driveways	0	0
Sidewalks/paths	0	0
Rooftops	0	0.000
Decks	0	0
Swimming pools/ponds	0	0
Other	0	0
Impervious Surface Area	0	0.35

3) Imperviousness (I)

Existing Imperviousness, I_{pre} = Impervious Surface Area/Site Area
= (Step 2a)/(Step 1) = 0.00 %

Post Imperviousness, I_{post} = Impervious Surface Area/Site Area
= (Step 2b)/(Step 1) = 39.77 %

B. Define Development Category (circle)

1) New Development: **Existing imperviousness less than 15% I (Go to Step 2A)**
2) Redevelopment: Existing imperviousness of 15% I or more (Go to Step 2B)
3) Single Lot Residential Development: Single lot being developed or improved; single family resdential development; and more than 250 square feet of impervious area and associated disturbance (Go to Section 5, Residential Approach, for detailed criteria and requirements).

*NOTE: All acreage used in this worksheet refer to areas within the IDA of the Critical Area only.

Step 2: Calculate the Pre-development Load (Lpre)

A. New Development

L_{pre} = (0.5) * (A)
= **0.44 lbs / year of total phosphorus**

where:

L_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)
0.5 = Annual total phosphorus load from undeveloped land (lbs/acre/year)
A = Area of the site wihtin the Critical Area IDA (acres)

Stearns & Wheler LLC	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 3	BSR	MMW
		Comp By	Checked By

Step 5: Identify Feasible Urban BMP(s)

Select BMP Options using the screening matrices provided in the Chapter 4 of the 2000 Maryland Stormwater Design Manual. Calculate the load removed for each option.

BMP Type	(L_{post})	X	(BMP_{RE})	X	(% DA Served)	=	LR	
Dry Swale	0.88	X	65%	X	100%	=	0.57	lbs/year
		X		X		=	0	lbs/year
		X		X		=	0	lbs/year
					Load Removed, LR (total)	**=**	**0.57**	**lbs/year**
					Pollutant Removal Requirement, RR (from Step 4)	=	0.48	lbs/year

where:

Load Removed, LR = Annual total phosphorus load removed by the proposed BMP (lbs/year)

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

BMP_{RE} = BMP removal efficiency for total phosphorus, Table 4.8 (%)

% DA Served = Fraction of the site area within the critical area IDA served by the BMP (%)

RR = Pollutant removal requirement (lbs/year)

If the Load Removed is equal to or greater than the Pollutant Removal Requirement computed in Step 4, then the on-site BMP complies with the 10% Rule.

Has the RR (pollutant removal requirement) been met? Yes

Stearns & Wheler LLC	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 4	BSR	mmw
		Comp By	Checked By

B. Redevelopment

$L_{pre} = (R_v)(C)(A)(8.16)$

$R_v = 0.05 + 0.009 (I_{pre})$

$= 0.05$

$L_{pre} =$ N/A lbs/year of total phosphorus

where:

L_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)

R_v = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff

I_{pre} = Pre-development (existing) site imperviousness (i.e., I=75 if site is 75% impervious)

C = Flow-weighted mean concentration of the pollutant (total phosphorus) in urban runoff (mg/l) = 0.30 mg/l

A = Area of the site within the Critical Area IDA (acres)

8.16 = Includes regional constants and unit conversion factors

Step 3: Calculate the Post-development Load (Lpost)

A. New Development and Redevelopment:

$L_{post} = (R_v)(C)(A)(8.16)$

$R_v = 0.05 + 0.009 (I_{post})$

$= 0.397368$

$L_{post} =$ **0.55 lbs/year of total phosphorus**

where:

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

R_v = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff

I_{post} = Post-development (proposed) site imperviousness (i.e., I=75 if site is 75% impervious)

C = Flow weighted mean concentration of the pollutant (total phosphorus) in urban runoff (mg/l) = 0.30 mg/l

A = Area of the site within the Cirtical Area IDA (acres)

8.16 = Includes regional constants and unit conversion factors

Step 4: Calculate the Pollutant Removal Requirement (RR)

$RR = L_{post} - (0.9)(L_{pre})$

$=$ **0.30 lbs/year of total phosphorus**

where:

RR = Pollutant removal requirement (lbs/year)

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

I_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)

Stearns & Wheler LLC	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 5	BSR	mmw
		Comp By	Checked By

Worksheet A: Standard Application Process

Calculating Pollutant Removal Requirements*

Step 1: Calculate Existing and Proposed Site Imperviousness

A. Calculate Percent Imperviousness

1) Site Area within the Critical Area IDA, A = 1.90 acres

2) Site Impervious Surface Area, Existing and Proposed, (See Table 4.1 for details)

	a) Existing (acres)	b) Proposed (acres)
Roads	0.09	0.46
Parking Lots	0	0
Driveways	0	0
Sidewalks/paths	0	0
Rooftops	0.03	0.03
Decks	0	0
Swimming pools/ponds	0	0
Other	0	0.02
Impervious Surface Area	0.12	0.51

3) Imperviousness (I)

Existing Imperviousness, I_{pre} = Impervious Surface Area/Site Area
= (Step 2a)/(Step 1) = 6.32 %

Post Imperviousness, I_{post} = Impervious Surface Area/Site Area
= (Step 2b)/(Step 1) = 26.84 %

B. Define Development Category (circle)

1) New Development: Existing imperviousness less than 15% I (Go to Step 2A)
2) Redevelopment: Existing imperviousness of 15% I or more (Go to Step 2B)
3) Single Lot Residential Development: Single lot being developed or improved; single family resdential development; and more than 250 square feet of impervious area and associated disturbance (Go to Section 5, Residential Approach, for detailed criteria and requirements).

*NOTE: All acreage used in this worksheet refer to areas within the IDA of the Critical Area only.

Step 2: Calculate the Pre-development Load (Lpre)

A. New Development

$L_{pre} = (0.5) * (A)$
= **0.95 lbs / year of total phosphorus**

where:

L_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)
0.5 = Annual total phosphorus load from undeveloped land (lbs/acre/year)
A = Area of the site wihtin the Critical Area IDA (acres)

Stearns & Wheler LLC	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 5	BSR	mmw
		Comp By	Checked By

Step 5: Identify Feasible Urban BMP(s)

Select BMP Options using the screening matrices provided in the Chapter 4 of the 2000 Maryland Stormwater Design Manual. Calculate the load removed for each option.

BMP Type	(L_{post})	X	(BMP_{RE})	X	(% DA Served)	=	LR	
Dry Swale	1.36	X	65%	X	100%	=	0.88	lbs/year
		X		X		=	0	lbs/year
		X		X		=	0	lbs/year
					Load Removed, LR (total)	=	**0.88**	**lbs/year**
					Pollutant Removal Requirement, RR (from Step 4)	=	0.50	lbs/year

where:

Load Removed, LR = Annual total phosphorus load removed by the proposed BMP (lbs/year)

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

BMP_{RE} = BMP removal efficiency for total phosphorus, Table 4.8 (%)

% DA Served = Fraction of the site area within the critical area IDA served by the BMP (%)

RR = Pollutant removal requirement (lbs/year)

If the Load Removed is equal to or greater than the Pollutant Removal Requirement computed in Step 4, then the on-site BMP complies with the 10% Rule.

Has the RR (pollutant removal requirement) been met? Yes

Stearns & Wheler LLC	Havre de Grace WWTP	3/6/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 6	BSR	mmw
		Comp By	Checked By

B. Redevelopment

$L_{pre} = (R_v)(C)(A)(8.16)$

$R_v = 0.05 + 0.009 (I_{pre})$

$= 0.05$

$L_{pre} =$ N/A lbs/year of total phosphorus

where:

L_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)

R_v = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff

I_{pre} = Pre-development (existing) site imperviousness (i.e., I=75 if site is 75% impervious)

C = Flow-weighted mean concentration of the pollutant (total phosphorus) in urban runoff (mg/l) = 0.30 mg/l

A = Area of the site within the Critical Area IDA (acres)

8.16 = Includes regional constants and unit conversion factors

Step 3: Calculate the Post-development Load (Lpost)

A. New Development and Redevelopment:

$L_{post} = (R_v)(C)(A)(8.16)$

$R_v = 0.05 + 0.009 (I_{post})$

$= 0.194$

$L_{post} =$ **0.12 lbs/year of total phosphorus**

where:

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

R_v = Runoff coefficient, which expresses the fraction of rainfall which is converted into runoff

I_{post} = Post-development (proposed) site imperviousness (i.e., I=75 if site is 75% impervious)

C = Flow weighted mean concentration of the pollutant (total phosphorus) in urban runoff (mg/l) = 0.30 mg/l

A = Area of the site within the Cirtical Area IDA (acres)

8.16 = Includes regional constants and unit conversion factors

Step 4: Calculate the Pollutant Removal Requirement (RR)

$RR = L_{post} - (0.9)(L_{pre})$

$=$ **0.01 lbs/year of total phosphorus**

where:

RR = Pollutant removal requirement (lbs/year)

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

I_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)

Stearns & Wheler LLC	Havre de Grace WWTP	3/21/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 11	BSR	mmw
		Comp. By	Checked By

Worksheet A: Standard Application Process

Calculating Pollutant Removal Requirements*

Step 1: Calculate Existing and Proposed Site Imperviousness

A. Calculate Percent Imperviousness

1) Site Area within the Critical Area IDA, A = 1.09 acres

2) Site Impervious Surface Area, Existing and Proposed, (See Table 4.1 for details)

	a) Existing (acres)	b) Proposed (acres)
Roads	0.07	0.1
Parking Lots	0	0
Driveways	0	0
Sidewalks/paths	0.01	0.01
Rooftops	0.26	0
Decks	0	0
Swimming pools/ponds	0	0
Other	0.01	0.01
Impervious Surface Area	0.35	0.38

3) Imperviousness (I)

Existing Imperviousness, I_{pre} = Impervious Surface Area/Site Area
= (Step 2a)/(Step 1) = 32.11 %

Post Imperviousness, I_{post} = Impervious Surface Area/Site Area
= (Step 2b)/(Step 1) = 34.86 %

B. Define Development Category (circle)

1) New Development: Existing imperviousness less than 15% I (Go to Step 2A)

2) **Redevelopment: Existing imperviousness of 15% I or more (Go to Step 2B)**

3) Single Lot Residential Development: Single lot being developed or improved; single family resdential development; and more than 250 square feet of impervious area and associated disturbance (Go to Section 5, Residential Approach, for detailed criteria and requirements).

*NOTE: All acreage used in this worksheet refer to areas within the IDA of the Critical Area only.

Step 2: Calculate the Pre-development Load (Lpre)

A. New Development

$L_{pre} = (0.5) * (A)$

= N/A lbs / year of total phosphorus

where:

L_{pre} = Average annual load of total phosphorus exported from the site prior to development (lbs/year)

0.5 = Annual total phosphorus load from undeveloped land (lbs/acre/year)

A = Area of the site wihtin the Critical Area IDA (acres)

Stearns & Wheler LLC	Havre de Grace WWTP	3/21/2006	40139
Environmental	Subject	Date	Job No
Engineers and Scientists	Critical Area Calculations - DA 11	BSR	mmw
		Comp By	Checked By

Step 5: Identify Feasible Urban BMP(s)

Select BMP Options using the screening matrices provided in the Chapter 4 of the 2000 Maryland Stormwater Design Manual. Calculate the load removed for each option.

BMP Type	(L_{post})	X	(BMP_{RE})	X	(% DA Served)	=	LR	
Dry Swale	0.97	X	65%	X	25%	=	0.16	lbs/year
		X		X		=	0	lbs/year
		X		X		=	0	lbs/year
					Load Removed, LR (total)	**=**	**0.16**	**lbs/year**
					Pollutant Removal Requirement, RR (from Step 4)	=	0.16	lbs/year

where:

Load Removed, LR = Annual total phosphorus load removed by the proposed BMP (lbs/year)

L_{post} = Average annual load of total phosphorus exported from the post-development site (lbs/year)

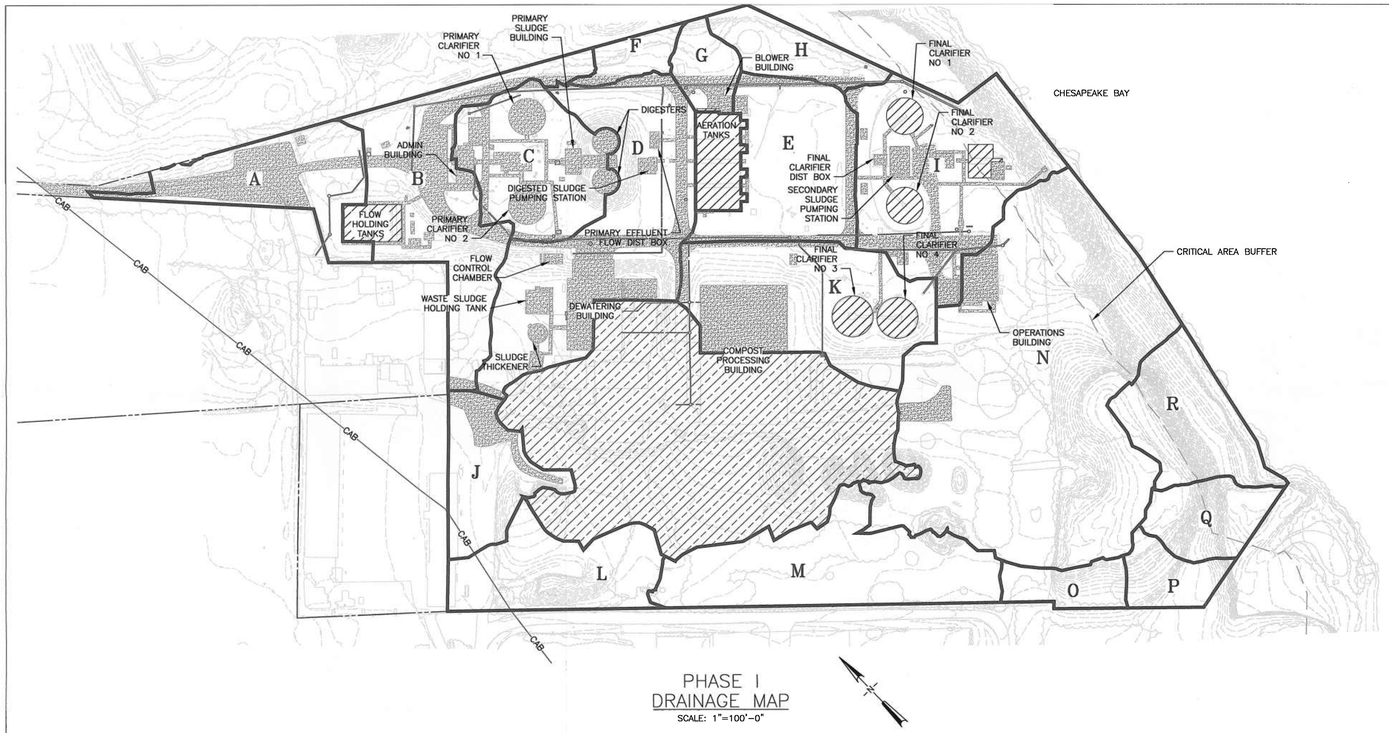
BMP_{RE} = BMP removal efficiency for total phosphorus, Table 4.8 (%)

% DA Served = Fraction of the site area within the critical area IDA served by the BMP (%)

RR = Pollutant removal requirement (lbs/year)

If the Load Removed is equal to or greater than the Pollutant Removal Requirement computed in Step 4, then the on-site BMP complies with the 10% Rule.

Has the RR (pollutant removal requirement) been met? Yes



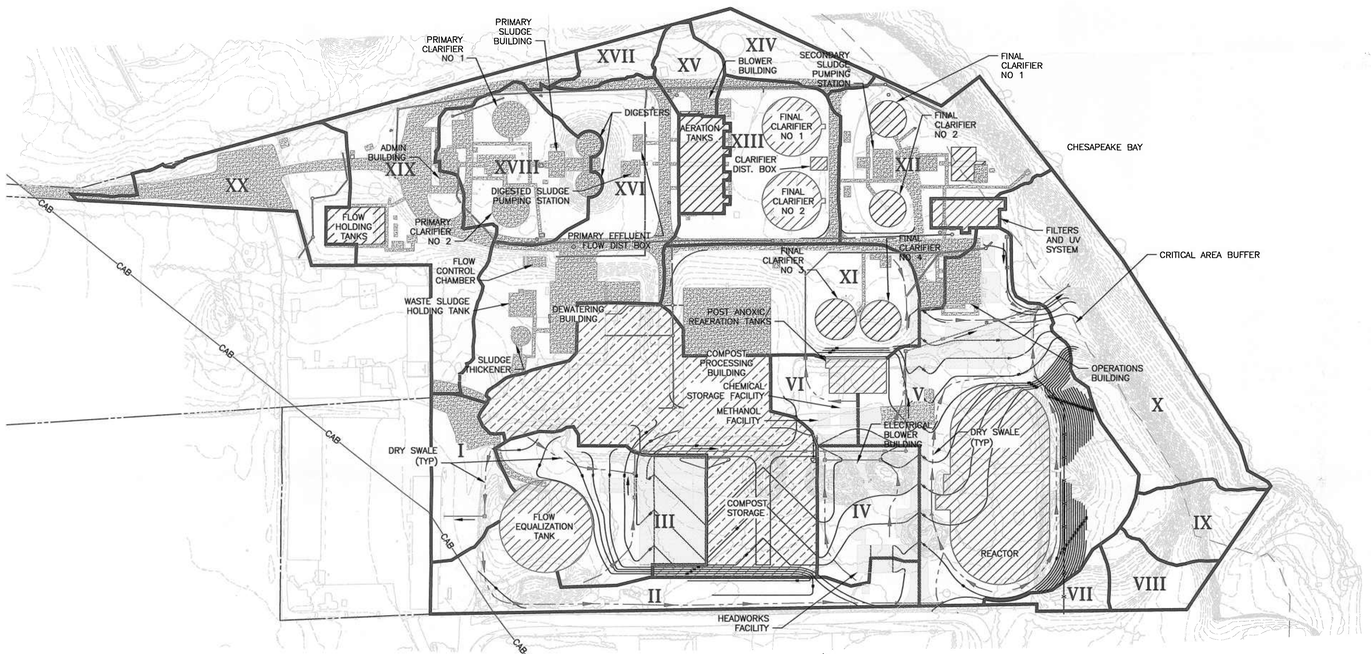
PHASE I
DRAINAGE MAP
SCALE: 1"=100'-0"

PHASE I DRAINAGE AREAS	
DRAINAGE AREA NO.	AREA (ACRES)
A	0.68
B	1.13
C	0.83
D	1.54
E	0.89
F	0.16
G	0.21
H	0.31
I	1.22
J	0.52
K	1.11
L	0.70
M	1.11
N	3.49
O	0.23
P	0.24
Q	0.37
R	0.66
PLANT DRAIN	3.02
*OPEN TANKS	0.56
TOTALS	18.98

*OPEN TANK STRUCTURES HAVE BEEN INCLUDED FOR QUANTITATIVE PURPOSES.

IMPERVIOUS AREA CALCULATIONS			
TYPE	EXISTING (ACRES)	PROPOSED (ACRES)	TOTAL (ACRES)
ROADWAYS	1.45	0.52	1.97
PARKING	0.22	0.18	0.40
BUILDINGS	0.62	0.41	1.03
SIDEWALKS	0.19	N/A	0.19
MISC. STRUCTURES	0.28	0.05	0.33
TOTALS	2.76	1.16	3.92

NOTE:
COMPOST PAD AND OPEN TANK STRUCTURES ARE EXCLUDED FROM IMPERVIOUS AREA CALCULATIONS.



PHASE II
DRAINAGE MAP
SCALE: 1"=100'-0"

PHASE II DRAINAGE AREAS			
DRAINAGE AREA NO.	AREA (ACRES)	BMP DEVICE	% OF DA SERVED (OVERALL SITE)
I	0.45	DRY SWALE	1.2%
II	0.73	DRY SWALE	3.8%
III	0.88	DRY SWALE	4.6%
IV	0.57	DRY SWALE	3%
V	1.90	DRY SWALE	10%
VI	0.25	DRY SWALE	1.3%
VII	0.14	N/A	N/A
VIII	0.25	N/A	N/A
IX	0.37	N/A	N/A
X	1.53	N/A	N/A
XI	1.09	DRY SWALE	1.4%
XII	1.29	N/A	N/A
XIII	0.63	N/A	N/A
XIV	0.31	N/A	N/A
XV	0.21	N/A	N/A
XVI	1.54	N/A	N/A
XVII	0.16	N/A	N/A
XVIII	0.83	N/A	N/A
XIX	1.13	N/A	N/A
XX	0.68	N/A	N/A
COMPOST PAD AND PLANT DRAIN	2.04	N/A	N/A
*OPEN TANKS	2.00	N/A	N/A
TOTALS	18.98	N/A	25.3%

*OPEN TANK STRUCTURES HAVE BEEN INCLUDED FOR QUANTITATIVE PURPOSES.

NOTES:

1. OPEN TANKS AND COMPOST PAD AREAS CREATE ZERO RUNOFF ON SITE AND HAVE BEEN EXCLUDED FROM IMPERVIOUS AREA CALCULATIONS.
2. PLANT DRAIN SYSTEM AND COMPOST PAD AREA DRAINAGE WILL BE CAPTURED AND TREATED THROUGH THE PROPOSED WASTEWATER TREATMENT PROCESS ON-SITE.

*PARTIAL LEGEND

- 21 — EXISTING CONTOUR LINE
- 21 — NEW CONTOUR LINE
- SD — SD — PROPOSED STORM DRAIN
- EXISTING PLANT AND STORM DRAINS
- PROPERTY LINE
- DRY SWALE
- DRAINAGE DIVIDE
- CAB — CAB — CRITICAL AREA BOUNDARY
- CRITICAL AREA BUFFER
- EXISTING IMPERVIOUS AREA
- NEW IMPERVIOUS AREA
- EXISTING OPEN TANKS
- NEW OPEN TANKS
- COMPOST PAD AND PLANT DRAIN SYSTEM

*SEE DWG C-1 FOR COMPLETE SITE GRADING PLAN LEGEND.

1"=100'-0" 100 0 100 200

3/21/2006 BRADLEY ROWE
P:\SHARED PROJECTS\40139\30\ENGINEERING\PERMITS\DRAWINGS\40139C-SWM-PLDWG

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APR 10 2006
CRITICAL AREA COMMISSION
Chesapeake & Atlantic Coastal Bays

ISSUE NO.	DRAWN	DATE	CHECKED	DESIGNER	APPROVED	DATE
1	BSR	02/06	MMW	BSR		
	50% REVIEW					

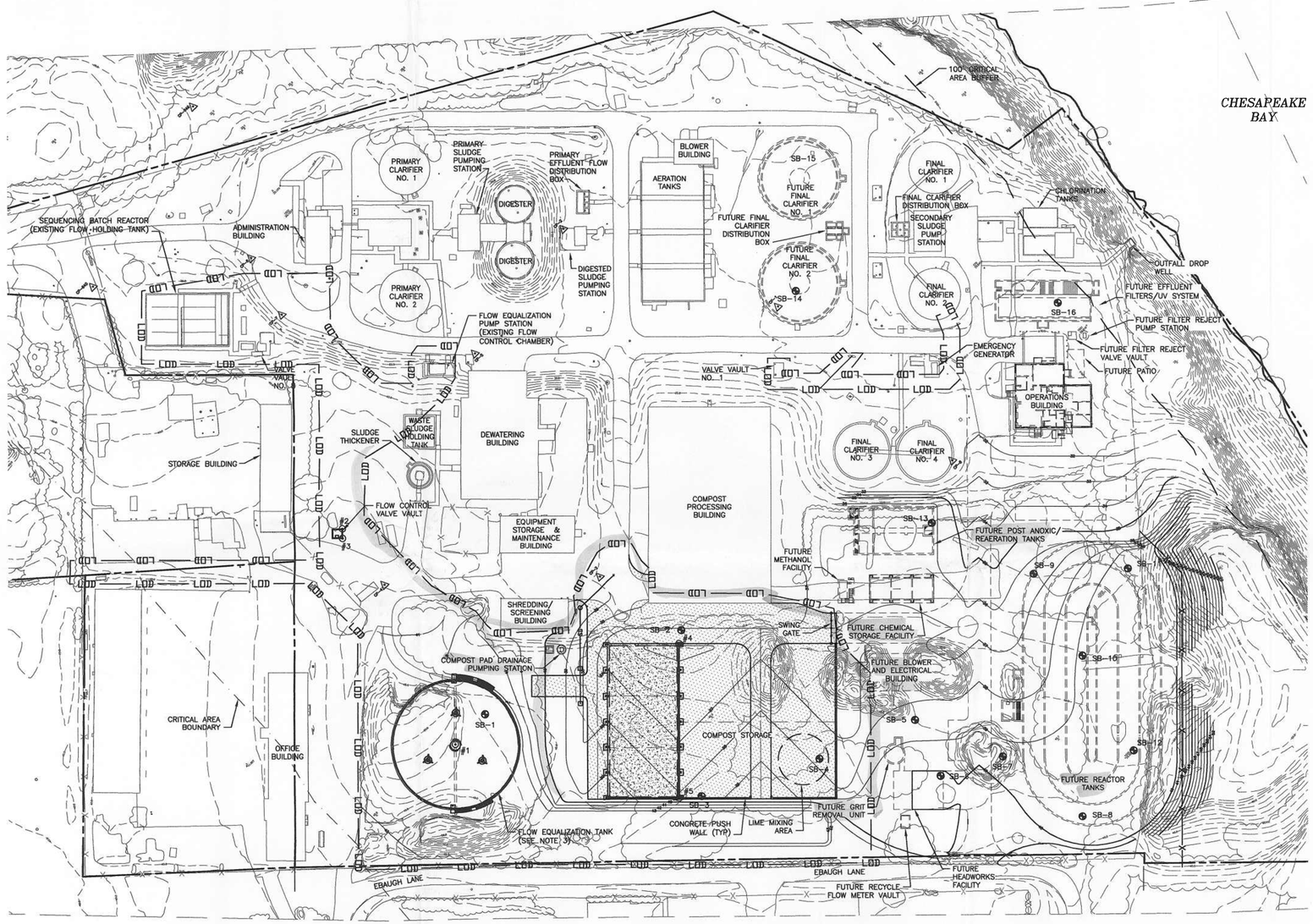
PROJECT SUPERVISOR _____ DEPARTMENT SUPERVISOR _____

PRELIMINARY – FOR REVIEW ONLY

Stearns & Wheler, LLC
Environmental Engineers and Scientists
BOWIE, MARYLAND

CITY OF HAVRE DE GRACE, MARYLAND
INTERIM IMPROVEMENTS FOR FACILITY RE-RATING
CRITICAL AREA AND STORMWATER MANAGEMENT DRAINAGE AREA AND CONCEPTUAL PLAN

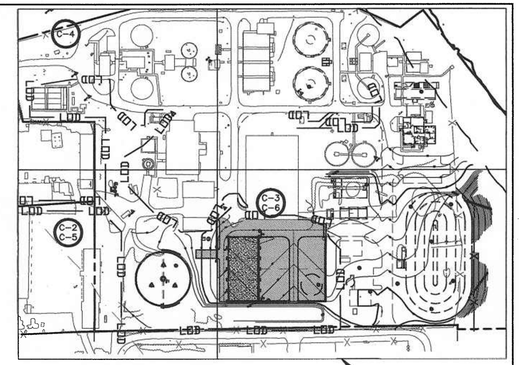
JOB NO. 40139.31 | CONTRACT 1-45-9010-06 | SHEET FIGURE 1



SITE PLAN
SCALE: 1"=60'-0"

NOTES:

1. LOCATION OF NORTHING AND EASTING ON NON-CIRCULAR STRUCTURES ARE BASED ON OUTSIDE FACE OF WALLS.
2. LOCATION OF NORTHING AND EASTING ON CIRCULAR STRUCTURES ARE BASED ON CENTER OF STRUCTURE.
3. FLOW EQUALIZATION TANK SHALL BE FURNISHED AND INSTALLED BY OTHERS UNDER A SEPARATE CONTRACT. SEE SPECIFICATIONS FOR COORDINATION.
4. A BOUNDARY SURVEY WAS NOT PERFORMED FOR THIS PROJECT. BOUNDARY LINE WAS GENERATED FROM LATEST AVAILABLE PLAT OF RECORD AND SHOULD BE CONSIDERED APPROXIMATE.



KEY PLAN
NOT TO SCALE

BUILDING STRUCTURES

POINT NO.	DESCRIPTION	NORTHING (Y)	EASTING (X)
1	FLOW EQUALIZATION TANK	680537.63	1565939.83
2	FLOW CONTROL VALVE VAULT	680768.88	1566008.49
3		680762.20	1566001.98
4	*COMPOST STORAGE FACILITY	680453.28	1566167.74
5		680344.80	1566061.98

*STRUCTURE POINT LOCATIONS FOR COMPOST STORAGE FACILITY ARE BASED ON LOCATION OF CONCRETE PUSH WALL.

SURVEY CONTROL POINTS

POINT NO.	DESCRIPTION	NORTHING (Y)	EASTING (X)	ELEVATION (ft)
CP-1	PIN & CAP SET	680622.99	1566471.97	29.77
CP-2	BM XCUT FOUND	680826.51	1566373.89	30.45
CP-3	TR-MAGSET	680555.37	1566158.53	38.90
CP-4	TR-MAGSET	680699.84	1565999.44	44.19
CP-5	TR-MAGSET	680800.15	1566225.06	31.25
CP-6	TR-MAGSET	681023.48	1566131.09	30.66
CP-7	TR-MAGSET	680962.35	1566113.93	31.31
CP-8	XCUTSET BM	680393.88	1566489.83	32.45
CP-640	FP	681112.66	1565999.65	35.47
CP-649	FP	681170.23	1566194.82	32.42

LEGEND
(APPLIES TO ALL "C" DWGS)

- LOD LOD — LIMITS OF DISTURBANCE
- X X — FENCE
- 30 — EXISTING CONTOUR LINE
- 30 — NEW CONTOUR LINE
- SD — EXISTING STORM DRAIN
- SD — PROPOSED STORM DRAIN
- E E — EXISTING UNDERGROUND ELECTRIC
- OHE OHE — EXISTING OVERHEAD ELECTRIC
- TIDAL WETLAND BOUNDARY
- WOODS
- EDGE OF WOODED AREA
- PROPERTY LINE
- 100 YR FLOOD ELEVATION
- CRITICAL AREA BOUNDARY
- 100' CRITICAL AREA BUFFER
- SOILS BOUNDARY

- EXISTING STRUCTURE, PAVEMENT OR SIDEWALK
- NEW STRUCTURE
- FUTURE STRUCTURE
- REPAIR/REPLACE PAVEMENT
- DEMOLITION
- NEW PAVEMENT
- REPAIR/REPLACE SIDEWALK
- NEW CONCRETE SIDEWALK
- SEAL PAVEMENT
- GRAVEL
- NEW CONCRETE PAVEMENT

- YH — YARD HYDRANT
- MH — MANHOLE (MHEL – ELECTRICAL; MHSS – SANITARY SEWER; MHSW – STORM WATER; MHCH – CHEMICAL)
- LP — LIGHT POLE
- UTILITY POLE
- TREE
- SB-101 — SOIL BORING
- FH — FIRE HYDRANT
- CB — CATCH BASIN
- SURVEY CONTROL POINT
- GM — GROUND WATER MONITORING WELL
- BM — BENCH MARK
- CO — CLEANOUT
- VB — VALVE BOX
- SIP — STANDARD INLET PROTECTION
- P — PIPE BOLLARD

GENERAL NOTES (APPLY TO ALL DRAWINGS)

1. EXISTING FACILITIES AND PIPING SHOWN LIGHT. NEW FACILITIES AND PIPING SHOWN DARK.
2. EXISTING CONDITIONS SHOWN ON THESE CONTRACT DRAWINGS ARE BASED ON A 2005 TOPOGRAPHIC SURVEY PERFORMED BY MRA, INC. AND OBTAINED FROM AVAILABLE CONTRACT AND RECORD DRAWINGS. THEREFORE, LOCATIONS MUST BE CONSIDERED APPROXIMATE ONLY.
3. 100-YEAR FLOOD ELEVATION IN THIS AREA IS APPROXIMATELY 11.5-FEET ABOVE MEAN SEA LEVEL.
4. SOIL BORINGS MADE NOVEMBER 2005 BY GTA, INC. AND USED AS BASIS FOR JANUARY 2006 GEOTECHNICAL ENGINEERING REPORT.
5. ALUMINUM IN CONTACT WITH CONCRETE SHALL BE PAINTED WITH BITUMINOUS COATING IN ACCORDANCE WITH SPECIFICATION SECTION 09900.
6. CONTRACTOR SHALL FIELD VERIFY AND COORDINATE ALL EXISTING PIPING ELEVATIONS, LOCATIONS, SIZE AND TYPE OF MATERIAL WITH NEW PIPING PRIOR TO CONSTRUCTION. CONTRACTOR SHALL FIELD VERIFY AND COORDINATE ALL EXISTING EQUIPMENT, BUILDING, ROOM, AND TANK DIMENSIONS AND ELEVATIONS PRIOR TO ORDERING NEW EQUIPMENT. REPORT DISCREPENCIES TO THE ENGINEER IMMEDIATELY.
7. FOR PIPE HANGERS AND SUPPORTS, SEE SPECIFICATION SECTION 15140.
8. MOWING STRIPS NOT SHOWN FOR CLARITY. CONTRACTOR SHALL PROVIDE MOWING STRIPS AROUND ALL NEW STRUCTURES AND PIPING IN ACCORDANCE WITH THE DETAIL SHOWN ON DRAWING C-XX.
9. ELEVATIONS OF V-NOTCH WEIRS ARE BASED ON THE BOTTOM OF THE NOTCH.
10. CONTRACTOR SHALL PERFORM EXPLORATORY EXCAVATIONS AS NECESSARY TO VERIFY LOCATIONS OF EXISTING UNDERGROUND PIPING AND UTILITIES PRIOR TO CONSTRUCTING NEW FACILITIES.
11. CONTRACTOR SHALL SUPPLY HANDRAIL AS SHOWN ON STRUCTURAL AND MECHANICAL DRAWINGS.
12. WHERE OPENINGS ARE LEFT IN STRUCTURE WALLS FROM DEMOLITION OF EQUIPMENT, CONTRACTOR SHALL SEAL WITH MATERIALS THAT MATCH THE EXISTING CONSTRUCTION. TOOTH ALL MASONRY CONSTRUCTION TO EXISTING.
13. WHEN NEW ELECTRICAL CONDUIT IS SHOWN ON PROFILES, IT IS FOR INFORMATION ONLY. REFER TO ELECTRICAL DRAWINGS FOR LOCATION, SIZE AND NUMBER. NOT ALL NEW CONDUIT IS SHOWN ON THE PROFILES.
14. WHERE SHEETING IS SHOWN, CONTRACTOR IS REQUIRED TO INSTALL SHEETING TO PROTECT EXISTING FACILITIES, UTILITIES, WETLANDS, ETC. WHERE SHEETING IS NOT SHOWN, SHEETING SHALL BE USED AT THE DISCRETION OF THE CONTRACTOR. REFER TO SPECIFICATION SECTION 02161 – SHEETING AND BRACING FOR OTHER REQUIREMENTS.
15. CONTRACTOR SHALL REPLACE ALL PAVEMENT THAT IS 1) SHOWN AS REPAIR/REPLACE ON THE CONTRACT DRAWINGS, 2) IMPACTED BY NEW CONSTRUCTION, AND 3) IMPACTED BY CONTRACTOR'S OPERATIONS.
16. PAINT PARKING LINES AT THE OPERATIONS BUILDING AS SHOWN ON THE SITE PLAN. HANDICAPPED PARKING SPACES SHALL BE MARKED IN ACCORDANCE WITH MARYLAND DOT REGULATIONS.
17. CONTRACTOR SHALL NOTE THERE ARE SEVERAL INSTANCES WHERE NEW UNDERGROUND PIPING IS CONNECTED TO EXISTING UNDERGROUND PIPING. CONTRACTOR IS REQUIRED TO PERFORM EXPLORATORY EXCAVATIONS IN THESE AREAS, AS REQUIRED, TO CONFIRM EXISTING PIPING LOCATIONS AND ELEVATIONS. REFER TO SPECIFICATION SECTION 01010.

60 0 60 120
1"=60'-0"

24.02.2006 KRIS LARSON
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Chesapeake & Atlantic Coastal Bays

ISSUE NO.	DRAWN	DATE	CHECKED	DESIGNER	APPROVED	DATE
1	BSR	02/06		BSR	SBC	2/23/06

50% REVIEW

PROJECT SUPERVISOR — DEPARTMENT SUPERVISOR

PRELIMINARY – FOR REVIEW ONLY

Stearns & Wheler, LLC
Environmental Engineers and Scientists
BOWIE, MARYLAND

CITY OF HAVRE DE GRACE, MARYLAND
INTERIM IMPROVEMENTS FOR FACILITY RE-RATING
OVERALL SITE AND GRADING PLAN

JOB NO. 40139.31 | CONTRACT 1-45-9010-06 | SHEET C-1