

WATER RESOURCES ELEMENT

INTRODUCTION

North Beach lies within Calvert County, a peninsula in southern Maryland, along the Chesapeake Bay. Anne Arundel County shares a northern boundary with the Town, while Chesapeake Beach is the Town's southern boundary and Calvert County the western boundary. The beautiful Chesapeake Bay that provides the town and tourists with recreational opportunities is the eastern town boundary.

North Beach is in the West Chesapeake Beach Bay drainage basin. The Aquia aquifer is the main source of potable water for the Town, which is treated at two well sites to serve its residents. Based on the semi-annual ground water withdrawal reports, the Town pumps an average of 133,000 gallons per day, with no appreciable increases during the summer months. The potable water supply is provided by two eight inch wells that safely yield approximately 400,000 gallons per day each from the aquifer. Well # 1 is located at Public Work's Property at 11th and Dayton Avenue and Well # 2 is located at 8th and Greenwood Avenue. The elevated steel storage tank at 11th Avenue and Dayton Avenue has a storage capacity of 250,000 gallons. The Town water system has adequate pressure for potable use and fire protection. Fire hydrants are located throughout the Town system and each customer's water supply is metered. The existing water distribution system for North Beach is physically interconnected to the water system of Chesapeake Beach by way of a manually operated valve for use in emergencies.

The Town sewerage treatment is provided by the Chesapeake Treatment Plant in Chesapeake Beach. Calvert and Anne Arundel counties and the towns of North Beach and Chesapeake Beach entered into a four party inter-jurisdictional agreement, which governs cost sharing and the number of taps that can be allocated to each jurisdiction. As of May 2008, the treatment plant served approximately 8,900 people and had a design capacity of 1.18 million gallons a day. Although the treatment plant is currently being updated, the allocation of taps for North Beach will remain at 1,251 as stated in the inter-jurisdictional agreement as amended and restated in May of 1990. Some of these taps have been already allotted to projects since that time. The Water Resources Analysis will indicate approximately how many taps are available in early 2009 and the projections of needed taps based on projected housing units to be constructed during the planning period.

The Town follows their adopted Storm Water Management Ordinance; however, there are a number of properties within the town where improvements were constructed many years before adoption of this ordinance. Therefore, there were some citizens who completed the Comprehensive Plan public survey that was conducted in the Fall of 2008 that indicated that they had problems with water flooding parts of their yards. There are some goals and policies that follow that help to address localized ponding and improve quality of runoff.

The Water Resources Mandate of House Bill 1141

Due to water quality concerns and shell fish decline in the Chesapeake Bay, House Bill 1141 was approved by the Maryland Legislature and signed by the Governor in 2006 which resulted in a mandate to provide a Water Resources Element in all future Comprehensive Plans. The purpose of this element is to analyze long-term water needs and supplies for the land uses in North Beach, to analyze the sewerage and stormwater generated in the community, and to provide goals, policies, and strategies for conservation, pollution reduction, and prevention of water quality degradation in the

Town during the planning period. Efforts to make North Beach a more sustainable community will require participation from the public and private sector with assistance from the citizens in the community.

Current Statistics and Future Projections

The Town of North Beach is currently home to 1,880 residents and 803 households, which are projected to grow to a population of 2,295 residents and 981 households by 2030.

Future growth will result from infill development or redevelopment all within the current municipal boundaries. Opportunities for annexation are severally limited resulting from limitations imposed by existing adjacent development. The southern boundary is shared by the incorporated Town of Chesapeake Beach. The eastern boundary is the Chesapeake Bay. The northern boundary is Anne Arundel County and the western boundary is existing developed land in Calvert County that is currently served by a public water and sewer system.

Box WR-1

The Purpose of the Water Resource Element (WRE) is to ensure that future municipal comprehensive plans take into account the opportunities and limitations presented by local and regional water resources. The WRE planning process will assist local governments in protecting public health, safety, and welfare; in meeting State Smart Growth policies; and in protecting Maryland's land and water resources.

Table **WR-1** below provides the population and household **projections in five year increments through 2030.**

WR 1 – Population and Household Projections for 2030

Year	<i>North Beach Population</i>	<i>Population Change Yearly</i>	<i>Households</i>	<i>Household Change Yearly</i>
2000	1,880	-	803	-
2005	1,862	-18	795	-8
2010	1,920	58	821	26
2015	2,008	88	858	37
2020	2,099	91	897	39
2025	2,195	96	938	41
2030	2,295	100	981	43

Drinking Water Supply Assessment

The residents of **North** Beach receive their drinking water from two (2) 8-inch wells supplied by groundwater in the Aquia aquifer. Each well is capable of pumping 300 gallons per minute (GPM) or 400,000 gallons per day (GPD) via 30 horsepower submersible pumps which alternate use providing pressure of 70 psi. Raw water is treated at each well site with liquid hypochlorite for disinfection and a sequestering agent for iron removal. A 5,000-gallon chlorine tank provides contact time for disinfection to occur prior to distribution to customers. The existing state groundwater appropriation permit limits withdrawal to an average daily flow of 185,000 GPD and 300,000 GPD during the month of maximum use.

The Aquia aquifer, from which North Beach obtains its' water supply, provides an adequate quantity and quality of drinking water to meet the needs of the residents. According to the Maryland Geological Survey, Southern Water Supply Report updated in 2005, the projected water demand in Calvert and St. Mary's Counties through 2030 could be met by increased pumpage in the Aquia aquifer (without shifting withdrawals to deeper aquifers) without reducing water levels below the 80-percent management level. The raw water is calcium carbonate type with pH levels from 7.3 – 8.0 and iron concentration from 0.15 to 4.5 mg/l. Withdrawals from the Aquia aquifer are projected to increase to 8.2 Mgal/day over the planning period. While arsenic is not an immediate problem for North Beach, elevated arsenic levels may be problematic in the future. Should arsenic levels exceed the maximum contaminate level of 10ppm, new wells may be needed drawing from the deeper Patapsco aquifer.

The Town's potable water storage is provided by one (1) 250,000 gallon elevated water storage tank located at Eleventh Street and Dayton Avenue. The elevation of the tank overflow provides adequate pressure and volume throughout the distribution system for domestic and fire suppression needs. The Town's water distribution piping consists of pipe ranging in size from 4-inches to 12-inches with fire hydrants spaced strategically throughout the public street system.

According to the Town's water production records, the average daily water use for the Town is 133,000 GPD or 70 gallons per capita per day. The maximum daily demand is 171,000 GPD. The average day drought demand (average day of 133,000 GPD + 10%) is 146,500 GPD. By subtracting this value from the 185,000 GPD allowed by the existing groundwater appropriation permit, an excess average daily capacity of 38,500 GPD exists in the system or approximately 192 taps using 200 GPD/EDU (historical use is 165 GPD/EDU). With the ability of the well field to pump and treat 400,000 GPD, which is in excess of the permit limit of 300,000 GPD in the month of maximum use, the limiting factor in providing water supply is the average day permit limit of 185,000 GPD currently imposed by the State.

The projected population as indicted in Table 1 is 2,295 persons. The projected average day demand based on the historical usage of 70 GPDC is 160,650 GPD. Adding 10% for drought conditions the average day flow is projected to be 176,715 GPD, which remains less than the current permitted allocation of 185,000 GPD.

Using the State of Maryland's conservative estimate of 250 GPD/dwelling **for new development**, the projected 2030 increase in households of **178** dwellings, the increase in average day use would be **41,150** GPD or **174,150** GPD total. Increasing this by 10% for drought conditions would yield an average day use of **191,565** GPD necessitating an increase in the permitted allocation by **6,565** GPD. This worse case scenario would therefore require the Town to seek and obtain an increase in the existing appropriation permit to **191,565** GPD by 2030.

The Town has indicated that projects in the development review pipeline reflect an increase in average daily use of 27,000 GPD to 40,000 GPD, which would remain within the available allocated average daily flow limitations.

Table **WR 2** below provides the projected water and sewer demand up to the year 2030 in five-year increments.

WR 2 – Water/Sewer Demand and Population and Household Projections for 2030

	2000	2005	2010	2015	2020	2025	2030	Change %
Population	1,800	1,862	1,920	2,008	2,099	2,195	2,295	0.9%/yr
Household	803	795	821	858	897	938	980	0.9%/yr
Water Demand (GPD) ¹	126,000	130,340	134,400	143,650	153,400	163,650	174,150	1.30%/yr
Wastewater Flow (GPD) ¹	209,531	210,748	223,500	232,750	242,500	252,750	263,250	0.85%/yr

¹ Average day demand at 250 GPD/EDU for future flows beyond 2010 based on MDE criteria.

The Town’s existing water storage consists of one (1) 250,000 gallon elevated storage tank. Analyzing the sufficiency of the existing storage requires a judgment involving the quantity and duration of fire flow. Given the nature of development in town of residential, relatively small-scale multi-family and commercial, and the ability of the existing 12-inch main to convey flow, a value of 1,500 GPM for two (2) hours was used. An analysis of the existing storage volume given the existing and 2030 projected population is provided below in Table **WR-3**. **Although the analysis illustrates a deficiency in storage volume**, the Town has the option of using water (and storage) provided by Chesapeake Beach through an emergency interconnection should it become necessary.

WR 3 – Water Storage Analysis

YEAR	POP	1 EDU’s	2 Average Daily Demand (GPD)	3 Equalizing Storage (GAL)	4 Fire Flow (GAL)	5 Emergency Reserve (GAL)	6 Required Storage (GAL)	7 Existing Storage (GAL)	8 Storage (GAL) Surplus (+) or Deficit (-)
2000	1,800	803	126,000	32,760	180,000	70,920	283,680	250,000	- 33,680
2005	1862	795	130,340	33,888	180,000	71,297	285,185	250,000	- 35,185
2010	1920	821	134,400	34,944	180,000	71,648	286,592	250,000	- 36,592
2015	2008	858	143,650	37,349	180,000	72,451	289,800	250,000	- 39,800
2020	2099	897	153,400	39,884	180,000	73,294	293,178	250,000	- 43,178
2025	2195	938	163,650	42,549	180,000	74,183	296,732	250,000	- 46,732
2030	2,295	980	174,150	45,279	180,000	75,093	300,372	250,000	- 50,372

Column 2 – From Table WR-2

Column 3 – Equalizing storage is 20% of maximum daily demand – Maximum daily demand is assumed at 1.3 x average daily demand.

Column 4 – Fire Flow at 2 hours duration (per AWWA Manual M31) at 1,500 GPM

Column 5 – Emergency Reserve is 25% of total storage.

Column 6 – Required Storage is Column 3 + 4 + 5

NOTE: North Beach is interconnected to Chesapeake Beach water system for emergency use.

Wastewater Treatment Assessment

The Town of North Beach is currently served by the Chesapeake Beach Wastewater Treatment Plant designed for 1.18 MGD. The Chesapeake Beach Wastewater Treatment Plant currently serves four (4) entities including: Chesapeake Beach; North Beach; Calvert County; and Anne Arundel County (Rose Haven and Holland Point). An inter-jurisdictional Agreement provides for the shared responsibilities and a flow allocation to each entity. The flow allocation is shown in Table WR-4 below.

WR 4 – Wastewater Treatment Allocation

Jurisdiction	Allocation [Flow in GPD (# of Taps)]	Percentage
Calvert County	302,325 (1,512 Taps)	25.6%
North Beach	250,200 (1,251 Taps)	21.2%
Chesapeake Beach	489,975 (2,450 Taps)	41.5%
Anne Arundel	137,500 (550 Taps)	11.7%
Total Flow	1,180,000 (5,763 Taps)	100.0%

The existing 1.18 MGD Chesapeake Beach Wastewater Treatment Plant currently serves a population of 8,933 people and discharges effluent via a 30-inch gravity outfall offshore in the Chesapeake Bay (Tributary Basin #02139998). The plant is currently designed for biological nutrient removal utilizing a cyclic nitrogen removal process. Recent improvements completed in 2008 include replacement of the outfall and the addition of a surge tank for shellfish protection and interim expansion. In addition to the cyclic nitrogen removal process, the plant includes three (3) clarifiers and disinfection using chlorine gas (150 lb. cylinders) and sulfur dioxide gas for dechlorination.

A new project to retrofit the plant for enhanced nutrient removal (ENR) is planned but has not yet begun. The ENR process, when completed will limit the nitrogen loading to 18,273 lbs/year and the phosphorus loading to 1,371 lbs/year with a total treatment capacity of 1.5 MGD. Upon completion of the upgrade, the plant will be capable of achieving an effluent with a total nitrogen goal of 3 mg/l and a total phosphorus goal of 0.3 mg/l. It is anticipated the project will begin in early 2011 and be completed in 2013.

The Town of North Beach's wastewater collection system consists of gravity sewer lines ranging in size from 6 inches to 12 inches, force mains from 4 inches to 8 inches and four pumping stations. The Bay Avenue pumping station is designed to pump at a rate of 120 GPM at 28 feet of total dynamic head using duplex 3 ½ HP submersible pumps in a 6 foot x 6 foot wet well. The station is equipped with an emergency generator and separate valve vault. The pumping station conveys on average 26,000 GPD via a 4 inch force main.

The Chesapeake Avenue pumping station, which conveys about 70% of all flow from the town, is designed to pump at a rate of 750 GPM using two-15 Hp pumps in a dry well/wet well configuration

with a 10 foot diameter wet well and equipped with an emergency generator. A new programmable logic controller and control panel with transducer was recently installed. The pump station conveys on average 150,000 GPD of flow via an 8-inch force main.

The Greenwood Avenue pumping station consists of duplex 5-Hp submersible pumps in a 5 foot diameter wet well pumping at a rate of 100 GPM at 34 feet of total dynamic head through a 4-inch force main. The station is equipped with an emergency generator and a recently installed transducer and control panel for level control. The station pumps on average 67,000 GPD. The San Francisco pump station, recently installed as part of a new residential multi-family development, consists of duplex 3 ½ Hp submersible pumps at a rate of 130 GPM through a 4 inch force main. The station is equipped with an emergency generator and emergency pump around connection.

The Town currently has no septic tanks or grinder pumps within the Town. It is suspected, based on the pump station flow data, that excessive inflow and infiltration exists in the sewer collection system. In order to potentially increase the number of sewer taps and reduce operational costs for the pumping stations, an inflow/infiltration study and rehabilitation project is recommended.

The historical wastewater flow from the Chesapeake Beach treatment plant for the past three (3) years (2006 – 2008) is 810,000 GPD. The design capacity of the plant is 1,180,000 GPD. The plant is scheduled for an ENR upgrade as well as a capacity increase to 1,500,000 by year 2013.

Based on the existing inter-jurisdictional Agreement, the Town of North Beach has been allocated 1,251 taps or 21.2% of the plant's flow. According to the Town's accounting, the existing number of sewer taps used and committed to development is 1,114. The remaining taps available are therefore 137 taps based on the existing plant capacity of 1,180,000 GPD. The number of taps needed to provide for development projected in year 2030 is 177. Assuming actual growth is consistent with or greater than the projected growth, the Town will exceed its current allocation by 2024. The Town will need to participate in the planned upgrade of the plant to 1.5 MGD in order to obtain an increased allocation of taps to provide for all projected development over the planning period.

At the present time, North Beach does not meter sewer flows that are conveyed by the Town to the Chesapeake Beach Wastewater Treatment Plant. The number of taps accounted for as new development is considered for approval based on the number of homes or equivalent dwelling units in the case of commercial development. Flows from portions of Calvert County also pass through the Town's sewer system un-metered. At this time, it is not possible to determine precisely the actual quantity of flow contributing to the treatment plant from North Beach. Table WR-2 summarizes the projected wastewater service demands over the planning period..

STORMWATER MANAGEMENT ASSESSMENT

The Town of North Beach is located along the Chesapeake Bay and within the critical area with surface storm water runoff directed towards the Bay. As discussed previously, the Town's boundaries are envisioned to remain in tact with little opportunity for expansion in the future. Future development will be limited to infill on remaining lots or redevelopment on existing lots. Because of the flat terrain and low lying roads, storm water collection and conveyance relies on storm water pump stations and conventional storm drain and inlets. A storm water pump station is located at Fifth Street consisting of duplex 15 Hp submersible pumps discharging into the Bay with tide flex check valves to prevent backwater. A second submersible duplex 5 Hp pump station is located at Ninth Street and Atlantic Avenue. Neither station is equipped with screening capability. A third

pump station is planned at Seventh Street and Atlantic with a 54 inch discharge pipe to the Bay to relieve localized flooding.

The Town currently enforces storm water management regulations for new or redevelopment using the State of Maryland 2000 Maryland Design guidelines. Addressing water quality is the main emphasis. **The Town is mandated by the State to adopt the 2007 amendments to the stormwater management design guidelines by May 4, 2010 which will require a greater emphasis on environmental site design to the maximum extent possible. Although the majority of the Town was developed prior to the implementation of stormwater regulations, future development will be guided by the new regulations.**

In urban sub water sheds, such as North Beach, American Forests recommend an overall twenty-five percent tree canopy and fifteen percent in commercial areas. Tree canopies intercept and absorb rainfall, filter pollutants, and reduce temperatures at the ground that is important especially where heat islands are created due to asphalt and roofs absorption of the sun's rays. Encouraging planting of trees within the Town can have a beneficial effect and assist reducing rain water, providing a cooler environment, and reduce storm water.

North Beach is currently about twenty-percent impervious. Maintaining impervious surfaces to less than twenty-five percent can achieve certain goals" such as having swim able, fishable waters, and reducing nutrient loads to a point that precludes algal blooms. In order to accommodate growth and lower pollutant loads the goals, policies, and strategies **found at the end of this chapter** are offered.

Stormwater runoff from the Town of North Beach drains to the east to the Chesapeake Bay. There is no current TMDL wasteload allocation for the area of the Town draining to the Chesapeake Bay; however the Town recognizes the importance of minimizing nitrogen and phosphorous runoff to the waters of the Bay.

A summary of impervious and pervious land cover by drainage area is presented below in Table WR 5. The percent impervious values for the zoning categories below are based on the 2006 "TMDL Implementation Guidance for Local Governments." The typical single-family lot in the R-1 category is at least 1/3-acre and often 1/2-acre or larger; 1/2 acre was used as a conservative value, as pervious urban area contributes larger quantities of nitrogen and phosphorous runoff (see analysis in the following paragraphs).

WR 5 - Current Land Cover

Zoning	Usage/ Estimated Land Cover	Total Area (acres)	Pervious Area (acres)	Impervious Area (acres)
C-1 C-2	Commercial/ 85% Impervious	19.44	2.92	16.52
Waterfront District	Commercial/ 85% Impervious	7.05	1.06	5.99
R-1	1/2 acre- Residential/ 25% Impervious	130.70	98.03	32.67

R-2	< 1/8 acre- Residential/ 65% Impervious	18.43	6.45	11.98
R-3	Mixed Single Family and Commercial/55% Impervious	10.34	4.65	5.69
PR	Mixed Open/Pervious	36.79	36.79	-
TOTAL AREA		222.75	149.90*	72.85

*113.11 acres “Pervious Urban”

Nonpoint source nitrogen and phosphorous loading values based on land cover were determined based on the most recent (2008) Western Shore, MD watershed data in the “Watershed Model Output Data” available from the Chesapeake Bay Program. The total nitrogen and phosphorous loading for each land use in the watershed were divided by the total acreage for each use, with the resulting values being the nitrogen and phosphorous loading in pounds per acre per year for each type of land use. Based on the Watershed Model Output Data classifications, land use within the Town of North Beach is virtually all either “Pervious Urban” or “Impervious Urban,” with proportions equivalent to the pervious and impervious percentages as shown in the preceding table.

Table WR 6 below summarizes current nitrogen and phosphorous loading by drainage area based on the previously determined loading values and land cover. There are no septic systems in the Town.

WR 6 - Current Non-Point Source Loading

Cover/Source	Area (acres)	Average Nitrogen Loading (lbs/acre year)	Average Phosphorous Loading (lbs/acre year)	Nitrogen Loading (lbs/year)	Phosphorous Loading (lbs/year)
Pervious Urban	113.11	10.59	1.45	1,197.83	164.01
Impervious Urban	72.85	7.17	0.45	522.33	32.78
Mixed Open	36.79	4.24	0.68	155.99	25.02
Total Non- Point Loading				1,876.15	221.81

The total current non-point source loading to the Chesapeake Bay from the Town is approximately 1,876.15 lb/year of nitrogen and 221.81 lb/year of phosphorous. The population growth projected in the previous sections will occur as infill within the residential or mixed use

zoned areas of the Town. Although it is planned that the zoning for the Town will be changed as described in previous sections, the land use should not significantly change other than some infill. The infill and associated new infrastructure will result in a net increase in impervious cover, which based on the historical trends in the Watershed Model should decrease nitrogen and phosphorous loading. Thus, the values calculated above represent probable maximum non-point nitrogen and phosphorous loading for the projected growth period; future development trends along with implementation of best management practices in stormwater design should help reduce the ultimate loadings to the Chesapeake Bay from the Town. It is difficult to quantify the amount of impervious increase to due to infill development, so a more precise estimate for the future non-point source loading cannot be made with confidence.

There are no septic systems within the Town that would add to the nonpoint source loadings calculated herein. Additionally, since the wastewater treatment is not within or controlled by the Town, there are no point source nutrient loadings.

WATER RESOURCES GOALS

1. To ensure the quality of water and protect the public health, safety, and welfare of its citizens.
2. To protect North Beach and the States' land and water resources and meet Smart Growth policies.
3. To participate with other jurisdictions to preserve and improve the conditions of the Chesapeake Bay, its marshes, and other waters of the State.
4. To minimize nutrient runoff and erosion and practice Best Management Practices to reduce impacts from development.
5. Maintain fishable and swim **safe** status.

POLICY AND IMPLEMENTATION STRATEGIES

Policy WR.1: In order to minimize nutrient runoff and erosion, Best Management Practices including **environmental site design to the maximum extent possible to reduce impact from development is recommended to be **implemented**. Such techniques include the following implementation strategies.**

Implementation Strategies

1. Minimizing disturbance by clustering development and preserving open space.
2. Vegetative filter strips and other multi-functional landscape areas.
3. Utilizing roof top storage.
4. Develop bioretention **or microbioretention** facilities in appropriate places such as parking lots.
5. Use drywells onsite.
6. Encourage the planting of street trees and landscaping to reduce temperature and enhance nutrient reduction.
7. Use infiltration trenches.
8. Limit overall impervious surfaces to twenty-five percent or less.
9. Update Storm Water Management Ordinance using the latest model ordinance from the State of Maryland.

10. Promote living shorelines, green roofs, sand filters, and tidal marshes.

11. Rainwater harvesting.

Policy WR.2: Major capital and operational improvements that address long-range needs for public water and sewer must be utilized.

Implementation Strategies

1. Initiate an inflow and infiltration study and subsequent sewer system rehabilitation program to reduce excessive inflow/infiltration and potentially increase the number of available sewer taps and reduce operational expenses associated with operating pumping stations.
2. Replace sewer lines in Fifth Street between Bay Avenue and Chesapeake Avenue to increase slope and self-cleaning velocity.
3. Replace sewer line in First Street from Chesapeake Avenue to Dayton Avenue to eliminate a low point and create a continuous pipe slope to reduce maintenance costs.
4. Replace aging pumps at Pumping Station number 2.
5. Replace aging pumps at Chesapeake Avenue Pumping Station and install an emergency pump around the connection.
6. Install emergency generator at the existing storm sewer pumping stations.
7. Install emergency generator at well number 1.
8. Consider the installation of permanent meters to continuously monitor sewer flows to the Chesapeake Beach Wastewater Treatment Plant to monitor actual flows from Town and at strategic locations throughout the sewer system to monitor areas of excessive inflow and infiltration.
9. Add Backflow Preventers to individual water services for existing customers to prevent potential contamination of the water supply. (New development is required to do this as part of the existing Town's water and sewer policy).
10. Initiate the Enhanced Nutrient Reduction Program at the wastewater treatment plant to lower nitrogen and phosphorus loadings into the Chesapeake Bay.
11. Develop a system for allocating and monitoring sewer taps.
12. Since there is a limited amount of taps allocated to North Beach, the Town should consider a Sunshine Policy where the taps must be used in a certain time period or they must be placed back into the tap pool to be available for other applicants.