Chapter 11: Water Resources Element / Mineral Resources Element (text only)

~~The State of~~ Maryland Land Use Code Sec. 3-102 lists required comprehensive plan elements: 3-106 requires all Maryland municipalities~~jurisdictions with zoning authority~~ to ~~prepare~~ include a water resources element ~~to be added to~~in the comprehensive plan; and~~.~~ ~~This directive comes from House Bill 1141.~~ Section 3-107 requires the preparation of a mineral resources element if geologic information is available. For coastal Maryland areas, these subjects are a related story with layers of sand and clay separating groundwater aquifers.

The water resources element must address the following topics:

1. ~~Water supply needs for the present and future population of Ocean City.~~Drinking water and other water resources that will be adequate for the needs of existing and future development proposed in the land use element of the plan; and
2. ~~Wastewater treatment, septic supply (not applicable to Ocean City), stormwater management capacity to meet current and future needs.~~Suitable receiving waters and land areas to meet stormwater management and wastewater treatment and disposal needs of existing and future development proposed in the land use element of the plan.
3. ~~The impact of meeting these needs on water resources.~~

The~~is is the~~ water resources element for the Town of Ocean City, Maryland~~'s~~ Comprehensive Plan was originally adopted in ~~September~~October 2009~~06~~ and has been updated and combined with a new mineral resources element with this Plan. ~~(adopted month September, 2006). It~~ The chapter presents analyses of land ~~consumption~~ use and facilities ~~impacts~~ that can be expected as a result of the projected growth of the Town's year-round population and seasonal peak use periods. The water resources/mineral resources element provides a strategy to sustain the water needs and coastal protection for Ocean City's population through the year 2035 and beyond. ~~The "planning period" extends up to and through the year 2035~~25. ~~By this action the water resources element becomes part of the *Comprehensive Plan of the Town of Ocean City, Maryland*.~~ The comprehensive plan contains the following goal and objectives that relate to the water resources and mineral resources element:

Goal:

Maintain and protect the town's current water resources for their ecological and water supply benefits and to understand and mitigate, to the extent possible, ~~the~~ adverse effects of future growth on these resources. Maintain and protect the structure and resilience of Maryland's barrier island coastline, and the Ocean City Inlet through coordinated Federal, State and Local management of sand resources. ~~The water resources/mineral resources element provides a strategy to sustain the water needs and coastal protection for Ocean City's population through the year 2035 and beyond25.~~

Objectives:

In order to achieve the water resources/mineral resources goal, the following objectives are adopted:

11.1 ~~Provide adequate public health, safety, social, recreation, and waste disposal services~~Maintain the highest possible drinking water quality through consistent monitoring of the groundwater supply and the infrastructure used to acquire and treat water.

11.2 Protect ~~drinking water supplies~~and preserve groundwater resources as the primary water supply for the present and future population of Ocean City.

11.3 ~~Preserve and protect natural resources and their ecological functions~~Manage peak season groundwater withdrawal in compliance with State permits and sustainable practices.

11.4 ~~Accommodate future growth and redevelopment with standards designed to minimize environmental disruption, create an attractive theme, allow architectural variety, retain identifiable neighborhoods, and preserving special and historic buildings using incentives.~~Coordinate with State and Federal agencies to meet regional standards for source water protection of critical watersheds, groundwater recharge areas, wells and treatment facilities.

11.5 Continue and enhance land management practices including beneficial use of dredge material, allocation of ocean sand resources, balanced approach of natural system management that provides protection of barrier island system and wildlife habitats.

11.6 Actively participate with the Maryland Coastal Bays Program in seeking management of the Coastal Bays Estuary which maintains navigable waterways, channels and water depth to support a healthy and diverse ecosystem that meets State water quality standards.

11.7 Identify sand resources necessary for long term beach replenishment, and potential emergency dune or breach repairs.

11.8 Prepare strategy for incrementally raising land elevation to minimize flood risk within the municipal limits as redevelopment occurs.

11.~~7~~5 Provide for adequate ~~public~~ municipal water, wastewater and stormwater services to facilitate the desired amount ~~-~~and pattern ~~—~~of growth.

Section 1 - Coastal Geology and Groundwater Resources

Ocean City is located in the Coastal Plain, and occupies the southern end of a barrier island named Fenwick Island. Such land forms are dynamic in their development and continue to be active. Fenwick Island, like most barrier islands, was formed through wave, wind, and tidal

action.

Beginning at the surface, the soils of the Coastal Barrier Islands are predominantly sediments consisting of loose sand and shells. No arable soils have developed. These soils are suitable for only the most tolerant vegetation and present limitations for urban development.

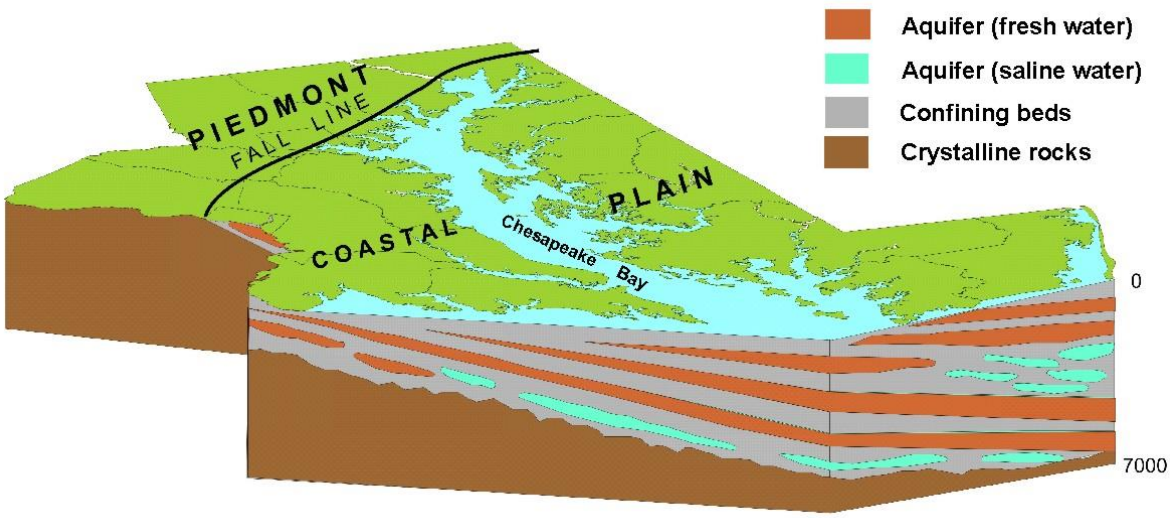
Maryland's Atlantic coast is rich in natural resources. We prize these natural assets for their intrinsic ecological, industrial and recreational value. Mineral resources from this region are used as construction materials, and in agriculture and aquiculture. Water resources include habitats for wildlife, shellfish and fin fish, and sources of potable and irrigation water. Land resources are managed as wildlife habitats and for agriculture. We also enjoy the recreational benefits of these priceless resources. It would be impossible to hike, fish, play, hunt, boat, surf or swim without them.

Natural resources must be used and maintained wisely. Maryland Geological Survey conducts many studies that explore the evolution, current state, and behavior of geologic environments that comprise our natural resources. Sand is an important resource that is found on Maryland's Atlantic coast. Sand is used in the construction industry, and for restoring and protecting eroding beaches. The Coastal and Estuarine Geology Program at MGS is currently assessing potential offshore sand resources.
http://www.mgs.md.gov/coastal_geology/offshore.html

Mineral Resources

The Town of Ocean City overlays substantial deposits of sand and some gravel. Extraction of these resources is limited by economic and environment restraints,~~.~~ -s~~S~~ince the Town is fully developed, commercial excavation of sand and/or gravel deposits is precluded. Moreover, traditional impacts associated with quarrying activity, e.g., heavy trucking, dust and noise, are not consistent with the town's character. Ample sources of these materials, to support community needs for them, exist nearby in more rural areas of Worcester and Wicomico Counties. Presently, the Zoning Code of Ocean City does not permit mining within the town. This is due to the disruptive effect such activities would have on the town's tourism dependent economy.

Extraction of materials from beneath the bay~~,~~s or near shore coastal areas, other than for normal maintenance dredging poses similar difficulties. Environmental impacts~~damage~~ to wildlife habitats, as well as the sport and commercial fisheries must be considered along with potential impacts on tourism. In light of ~~the~~ potential problems with energy exploration and mineral extraction, proposals for such activity should be approached with much caution and full consideration of environmental and economic externalities. ~~By and large, such activities should not be encouraged in or near Ocean City.~~The US Army Corps of Engineers has completed the necessary study and permits for many beneficial use and navigation projects along the Maryland coast, the Ocean City Inlet and the Coastal Bays.



Coastal Plain sediments thicken from northwest to southeast, increasing from a few feet at the Fall Line to greater than 7,000 feet at Ocean City. Most aquifers in the Coastal Plain are overlain by low permeability clay layers (forming confined or artesian aquifers) which prevents surface contaminants from reaching the aquifers. In the Coastal Plain physiographic province, groundwater flows through pore spaces between sand and gravel particles – known as intergranular flow. Wells in the Coastal Plain commonly have moderate to very high yields. Groundwater levels are not affected significantly by short-term variations in climate (droughts and wet periods), but typically do respond readily to increased groundwater withdrawals.

http://www.mgs.md.gov/groundwater/md_groundwater.html

Groundwater

Four groundwater aquifers underlie Ocean City. The upper two, the Pleistocene and Pocomoke, suffer from vulnerability to salt intrusion. The lower aquifers, Ocean City and the Manokin, are used for water supply, although portions of the Manokin, between 28th Street and about 80th Street, contain brackish water.

The Ocean City and Manokin aquifers provide good quality water, but could be threatened by salt water intrusion. Intrusion can occur either vertically or horizontally. Vertically, brine could move from leaks in the upper aquifers or be drawn up from the salty St. Mary's aquifer. Studies performed in the past by the U.S. Geological Survey indicates that vertical intrusion is not currently a problem. Above the water supply aquifers lies a confining layer which prevents inter-aquifer leakage. The St. Mary's formation below is very dense and requires a high pressure differential for leakage to occur which is not considered likely.

However, horizontal intrusion could come from the salt water being drawn in from the ocean. The probability of this occurring has not been scientifically determined, but if Ocean City is similar to other Atlantic Coast situations there is no imminent danger. In any case, the location of the offshore "salt wedge" should be monitored so an accurate picture can be drawn for future policy decisions.

The water supply aquifers are recharged in the Manokin subcrop. This subcrop is a seven mile wide band beginning northwest of Salisbury in the Hebron area and spreading northeast through Laurel, Georgetown, and ending at the coast at Broadkill Beach in Delaware.

Section 2 - ~~Section 1 -~~ Land Use Plan Analysis and Growth Projection

~~State and local governments establish regulations for governing the development and use of land within their jurisdictions. The goal of these land use regulations is generally to promote sound physical, social, and economic development.~~

~~The Ocean City Comprehensive Plan, Land Use Chapter, states the need to maintain and encourage development of commercial uses and promote mixed use projects with the intent of sustaining the distribution of commercial restaurant, retail, and service uses. Also, we will promote mixed-use projects to reduce the strain on the transportation system's infrastructure and services by reducing the need for driving to commercial establishments. Through the use of design standards we hope to maintain and create more open space. Industrial and utility projects are considered inappropriate uses due to their adverse impacts on adjacent properties.~~

~~Presently, town streets occupy about 25% of the town's land area. Redevelopment may decrease that amount and allow for more open space. For over forty years, our land use pattern has remained "natural", meaning that it is driven by market forces. This pattern will continue into the future as the economy and other factors affect why visitors come to the beach.~~

~~The character of the ocean block has become increasingly multifamily with a rise in the number and size of individual units within condominium projects developed in recent years. There is a great variation in the density of residential development. The oceanfront areas range from 20 units per acre to over 80 units per acre in completely developed blocks. In these areas most blocks average from 40 to 70 units per acre.~~

~~The majority of land on the bayside is developed at less than ten units to the acre. Much of the bayside is being used for commercial uses and also has a number of residential neighborhoods that have remained for decades, improving with time. New commercial uses include breweries/distillery which will increase water demand and create new wastewater treatment needs.~~

~~The aging of the United States population will offer unprecedented~~ new ~~challenges and opportunities. The arrival~~ aging ~~of the Baby-Boom generation is creating unparalleled~~ an ~~urgency for understanding the need for geriatric services and making ADA code compliance in the homes being built in Ocean City all that more important. With people age 65 and older constituting 20% of the national population by 2030, Ocean City will meet their water demands and the wastewater infrastructure needed to support this changing culture. The high-rise condominiums and privately-owned homes built during the 1960s through the 1980s are being replaced~~ or renovated ~~with multi-use projects and more efficient residential units together with commercial amenities. Preserving the character and quality of development with a focus on design variety is one of our main objectives.~~

The comprehensive plan anticipates a slow rate of population growth consistent with the last 10 years and a ~~steady increase in~~trend toward retirees with multifamily units continuing to be the majority of housing structures. There is a lack of land available for future development. A demand for seasonal use and multi unit housing will persist throughout the planning period.

Single-family detached housing has been and ~~should~~ will continue to be less than 10% of the total housing ~~stock~~supply because of limited land area for development.

The lack of affordable employee housing is ~~the main housing problem~~being~~ginning to be~~ addressed through the conversion of older structures and new mixed use development. Some recommendations to accommodate the future employee population of Ocean City include employer-provided housing, a seasonal housing community in West Ocean City, and on-site housing provided within the larger commercial developments. Otherwise, Ocean City has the housing capacity to absorb year-round growth with existing housing stock and available infrastructure, excluding changes to our infrastructure and services.

Upgrades to our infrastructure will occur as needed. Recent trends to use single family housing for short term rentals and conversion of residential housing to work force housing should be studied for possible impacts to water demand quantity and peak use periods. New commercial uses include brewery~~ies~~/distillery which will increase water demand and create new wastewater treatment needs.

The existing land use map (Chapter Three, Land Use and Community Character~~, 2006 Comprehensive Plan~~) indicates existing residential and commercial development. Commercial uses on the Oceanside of Coastal Highway ~~should~~ may be increased to provide services to residents on that side of the road. There are desirable services that cannot be found in Ocean City. In those cases, shoppers must travel outside the town to West Ocean City, Berlin, and Salisbury.

The future land use map (Chapter Three, Land Use and Community Character~~, 2006 Comprehensive Plan~~) proposes a majority of residential ~~projects~~ land use east of Coastal Highway which may include multi-use projects. Larger ~~department stores~~commercial uses will remain west of Ocean City due to the lack of developable land in Ocean City.

~~Current land uses and regulations have limited commercial development along the east side of Coastal Highway, and many of those commercial uses do not sustain visitor's basic daily needs. There is a great variation in the density of residential development. The oceanfront areas have blocks averaging from 40 to 70 units per acre.~~

~~An increase in mixed-use developments will provide Ocean City's residents and visitors with the basic necessities. With the appropriate zoning in place it will be possible for commercial use to be more prominent on both sides of Coastal Highway. However, supermarkets, hardware stores, and big box retailers will continue to be situated along U.S. Route 50, within a few miles of Ocean City.~~

Year Round Population

Very little increase in residents occurred between 1930 and 1970 (Table 1-1). The largest increase in residents happened between 1970 and 1980 when over 3,000 new residents moved to Ocean City. The year round population ~~was determined to be~~remained stable at 7,102~~37~~ in 2010~~04~~ (U.S. Census Bureau) ~~and could easily reach 9,000 by 2025~~ (Figure 1-1). Nevertheless, we will focus on the impact of the seasonal population as it affects water demand

and wastewater treatment since we must maintain effective infrastructure to support the maximum demands of the summer seasonal population.

~~Given~~ In the past, the unique c~~C~~haracteristics of Ocean City as a resort community ~~it is~~made it difficult to develop a year-round resident population forecast that can be considered reliable. After 15 years of all metrics demonstrating stability in the year round population, the long range projection has been modified to accommodate our local share of projected State and County population growth at an estimated rate of 1.5%.

Seasonal Population

Seasonal population has traditionally been~~is~~ estimated by a formula called "Demoflush", which estimates population based on wastewater flows using a pre-determined number of gallons per person per day. The equation contains adjustments to account for infiltration and "day trippers" who do not use the wastewater system to any great extent.

The formula for figuring the demoflush population is:

The number of gallons of wastewater flow minus infiltration into the system is divided by the number of gallons per person per day (36.04). Infiltration is estimated to be 570,00 gallons per day. Example: If the wastewater flow on a Saturday is 10,000,000 gallons, subtract 570,000 and divide by 36.04 and the result is 261,654 people for that day. The 36.04 results from an assumption of the gallons per person per day attributed to permanent residents (60), overnight visitors (40), and day visitors (7), and the percentage of each of these groups (4%, 86%,10% respectively).

The peak demoflush population (Table 1-2) is more important in our planning efforts than the year-round population estimate from the U.S. Census. It has been relatively stable in recent years, increasing by only about .22% per year. This plan projects the peak weekend population to continue to rise slightly through the next planning period. (Figure 1-1)

~~The Town's ability to provide vital services must be coordinated with seasonal population growth and certain demographic aspects of the population, such as age, gender, and educational levels.~~

"Adjusted" population figures, which are 85 percent of the demoflush population, are discussed in Chapter 1 – Population, of the Comprehensive Plan, and in the Municipal Growth Element. For the purposes of projecting future water and wastewater need, however, the full demoflush estimate is used.

Figure 1-2 projects future total population through 2035~~25~~ based on historic demoflush population figures. It is likely that much of the increase in the peak seasonal population will be influenced by Town's redevelopment policies rather than new development over the next 20 years.

New metrics are needed in the future to provide an alternative to the demoflush calculations.

Recommendations

The water resources element provides the Town with an assessment of its water resources and how future growth will affect them. The assessment assists the Town in determining the needs of its residents and visitors and helps avoid unnecessary future expenses. The 2016~~06~~ update to the comprehensive plan anticipates about 6,000 new residents by 2035~~25~~ and a slight but steady increase in the seasonal population. There are no anticipated annexations outside municipal boundaries during the planning period. ~~Clean water sources are sufficient to handle the population's needs with ample water supply to last past the planning period.~~Based on previous calculations and advanced planning, it is not anticipated that population growth or significant development activities will exceed the design capacity of the Ocean City's water supply system.

~~Section 2 –~~ Water Supply

Introduction

Ocean City's water supply system includes 3 water treatment plants which treat raw water to remove iron, manganese, and chlorinate the water. The 15th Street plant was constructed in the mid-1990's and replaced two old plants. Ocean City supports a proactive approach to public health. One of the Town's goals is to maintain the highest possible drinking water quality through consistent monitoring of the ground water supply and the infrastructure used to acquire and treat water. A comprehensive water study was performed by the consulting firm of Whitman, Requardt, and Associates in 1997 and updated in 2005. The firm was directed to conduct an investigation of the drinking water treatment and distribution system. The study indicated that the water supply within the Manokin and Ocean City aquifers had been and will remain safe and adequate to supply the Town of Ocean City, Maryland's safe drinking water needs beyond the planning period, ending in 2025.

There are extreme seasonal differences in population served with approximately 7,000 year-round residents augmented by over 250,000 visitors during a peak summer weekend; in essence, two completely different treatment and distribution system scenarios.

Ocean City Water System - Ownership

The Ocean City Water System is owned by the Mayor and City Council of Ocean City, Maryland, and operated by the Town of Ocean City Municipal Water Department. The system is comprised of 24 production wells (Figure 2-1), 3 treatment plants, 7 elevated water storage tanks and 1 ground storage tank. A well maintenance program is also in place to ensure that the wells maintain their productivity and reliability.

Supply and Demand

The Ocean City Water System must have adequate capacity to serve the peak seasonal population. In ~~1994~~ 2008 the system served an estimated population of ~~330,133~~300,000 during

the peak season. The maximum daily demand was 14.41 MG. The ultimate build-out population has been projected to be approximately 381,000 in the year 2025 as estimated by the Town's consulting engineers. This figure differs from the lower estimate of about 360,000 projected using Demoflush. Historical data for recent years indicates the maximum day per capita demand of 44.0 GPD. The corresponding maximum days system demand at build-out is projected to be 16.8 MGD.

Future water system requirements were evaluated in 1997 on the projected Year 2020, 16.6 MGD maximum day demand. Recent evaluation of demand by Whitman, Requardt and Associates indicates that adding allowance for additional development at year 2005 may place demand in the year 2020 somewhat higher at 17.12 MGD The existing raw water supply consists of 15 wells in the Ocean City aquifer and 9 wells in the Manokin aquifer (Figure 2-2) distributed along the length of Ocean City corresponding to the distribution of existing and projected development.

The use of low flow water fixtures wherever possible by property owners can reduce the waste of additional water resources. Broken water lines within unoccupied units have been reported to the Building Office in order that repairs can be made and water saved. Rationing of outdoor water use could be an option if supplies become short.

Water Quality, Capacity and Treatment

The Ocean City Aquifer has a 7,900,000 gallon month of maximum use withdrawal. The Manokin Aquifer has a 9,700,000 gallon month of maximum use withdrawal.

The Ocean City Water System consists of 3 water treatment plants. The first plant, located at 15th Street, using wells in the Ocean City aquifer, is a 6.0 MGD plant. The second plant, located on 44th Street, uses water from the Ocean City aquifer and is a 4.0 MGD plant. The third WTP is located in North Ocean City at Gorman Avenue with wells in the Manokin aquifer and is an 8.0 MGD plant.

The Town conducts required regulatory water quality monitoring. According to Whitman, Requardt recommendations, additional monitoring sites within the distribution system should follow when budgetary conditions allow. Rising chloride levels in an Ocean City aquifer well serving the 44th Street plant had raised concerns about intrusion of salt water into the fresh water aquifers, but this appears to have stabilized.

Continuing improvements in desalination technology have led to a change in philosophy with respect to the possible salt-water intrusion problem. The preferred approach would be to continue to pump water from the existing well fields and, if the water became brackish, to treat it by using either the reverse osmosis procedure or the electro-dialysis reversal process installed only when needed. This approach is judged to be more cost-effective, and more environmentally acceptable because it would prevent further westward movement of the salt-water front.

Desalination, if required in the future, could be constructed at the 15th Street Plant on the site. Additional land would be required to add desalination at 44th Street. At the Gorman Avenue

Plant, desalination facilities could be constructed on the site previously occupied by the police station, or could be located offsite. Due to the naturally protected characteristics of the confined aquifers, Ocean City water supply is not susceptible to the other inorganic compounds. The wells serving Ocean City water supply pump water from confined aquifers. Confined aquifers are naturally well protected from activity on the land surface due to the conforming layers that provide a barrier for water movement from the surface into the aquifer below. A properly constructed well with casing extended to the confining layer above the aquifer and with sufficient grout should be well protected from contamination at the land surface.

Research indicates that rising sea levels resulting from climate change could result in increased saltwater intrusion into the groundwater in coastal regions. This is cause for concern and should be studied in depth over the next few years. The Town is prepared to deal with desalination when the time comes.

Saltwater Intrusion

A threat to Ocean City's water supply is saltwater intrusion, which is the horizontal movement of saltwater into the freshwater aquifer from the ocean or the bay. It could also occur from a vertical movement by downward leakage from the ocean or bay, or upward leakage from lower aquifers.

Testing in the past had shown a rise in chloride levels in the 44th Street area. This is caused by heavy year round water use in the area and leakage between the Ocean City aquifer and the saltier Manokin aquifer in this area. The upconing of salt water at the 44th street plant stabilized after much of the pumpage was shifted to the Gorman Avenue Plan in 1989 and 1990, indicating a state of equilibrium may have been reached. Saltwater intrusion is occurring in localized parts of the unconfined Columbia Aquifer, but it is not considered a major threat. However, it is still possible that a salt front is moving in from the oceanside or bayside near 44th Street.

The "Comprehensive Water Supply Study" recommends spacing future wells to distribute drawdown from the aquifers and relieve the salt intrusion in any particular area. The study also notes that any future water supply production wells should probably be located in the northern part of the Town where the hydrogeologic conditions are more favorable with respect to available drawdown and saltwater intrusion. The Study also states that future planning must recognize the possibility of saltwater intrusion, and flexibility in design of the water supply system must be provided so that the problem may be addressed if and when intrusion occurs.

An increasingly attractive solution to salt intrusion is the rapidly developing technology and operating methods of desalination of brackish water. Desalination could be accomplished as needed by converting existing water treatment plans. By employing desalination, the saltwater intrusion could be contained at the coastline indefinitely.

Water direction frequently reverses at many points in the distribution system as treated water is pumped into the system from different plants. These reversals generally contribute to improved water quality by limiting biofilm accumulation.

Storage/Maintenance

The Town has 7 elevated tanks and 1 ground level tank with a total useable storage capacity of 6.30 million gallons (Figure 2-3). The present storage facilities have adequate capacity to support a maximum day demand of 18.00 MG. Under normal operation, water levels in the tanks do not significantly fluctuate. Mains are typically flushed twice each year to remove debris and iron sediment. The pipes, themselves, are in acceptable condition with little evidence of corrosion. No new storage towers are expected to be erected during the planning period.

Potential Service Area

The Town of Ocean City extends from the Ocean City Inlet to the Maryland/Delaware line and is separated from West Ocean City by the Isle of Wight Bay. The existing Ocean City Water System covers the entire municipal area. Maps of the water lines are shown as Attachment "A" and were part of the 2005 Water Study done by the firm of Whitman, Requardt, and Associates. A West Ocean City connection to the Ocean City water system does not seem necessary or likely.

Appropriations for the Ocean City aquifer are 3.6 mgd/daily average. Appropriations for the Manokin aquifer are 4.4 mgd/daily average. The total average is 8 mgd. 80% of which is 6.4 mgd. The average withdrawal was 5.49 mgd, less than 6.4 mgd (2008). By the end of the planning period Ocean City will have reached total build-out of available lands. It has been estimated that approximately 381,000 people will need about 16.8 mgd. The maximum possible water withdrawal is 18 mgd.

The maximum per day per capita demand for water in 1997 was approximately 60 gallons per day. The corresponding maximum day system demand at build out was projected in 1997 to be 16.6 million gallons per day (MGD). Future water system requirements were evaluated in 1997 on the year 2020's 16.6 MGD maximum day demand. Recent evaluation of demand indicates that adding allowance for additional development at year 2005 may place demand in the year 2020 somewhat higher at 17.12 MGD (Figure 2-4), acceptably less than the 18 MGD limit. A water usage rate of 44 gallons per capita per day was applied to the peak weekend population projections, resulting in a 2025 maximum water demand of 16.8 MGPD (44gpcd x 381,114 = 16,769,016), per Whitman, Requardt, and Associates.

Conclusion

The projected maximum peak population may require 17.2 mgd, and water withdrawal will not surpass the maxiumum withdrawal of 18 mgd through the year 2020. Ocean City has more than ample quantities of groundwater resources available from the Ocean City and Manokin aquifers for its projected growth and development. Clean water sources are sufficient to handle the needs of future populations.

Upgrades to the municipal water withdrawal and treatment systems should be correlated with population changes and as equipment warrants replacement. Ocean City should continue to

work with Worcester County government and the Maryland Coastal Bays Program to assure that the goals of the Isle of Wight subwatershed plan are realized. The Town will continue to implement the Maryland Coastal Bays Critical Areas Program actions, promote effective Stormwater Management techniques, and encourage Environmentally Sensitive Design standards to protect the source water for the town's future.

There are operational issues in Ocean City that may not be present with other drinking water utilities with more stable consumer populations. Ocean City's future withdrawals from its wells will have little to no impact on the water resources.

It is recommended that: Well drawdown and recovery levels are monitored, inappropriate development does not occur in aquifer recharge areas, groundwater quality is monitored, and the threat of saltwater intrusion is minimized.

Section 3 - Wastewater

Introduction - Treatment

In 1994, the Town of Ocean City assumed control of the Ocean City wastewater system from the Worcester County Sanitary Commission. The system has collection, treatment and disposal capabilities. The service area includes~~is, for the most part,~~ the boundaries of the Town of Ocean City, Maryland (See Chapter 10 for Tier 1 Map). ~~There are currently no maps of the wastewater service area to include in this report.~~ The treatment plant at 64th Street was constructed in 1969, with expansions and secondary treatment upgrades completed in 1974, 1981, 1990 and 1992, and 1998.

The plant's wastewater treatment design capacity is currently 14 million gallons per day (MGD). Additional sludge handling capabilities constructed in 1998 increased the capacity from 12 to 14 MGD. The plant will serve the same ~~-~~physical land area of Ocean City throughout the planning period with no anticipated decreases or increases in service area coverage. (Figure 3-1)

Maximum month wastewater treated has ranged from 10.4 to 11.6 MGD for the period 1990 through 2003. The available, or unused treatment capacity, has fluctuated between 2.4 MGD (17% of the total capacity) in 1994 and approximately 3.59 MGD (25% of the total) in 2003. The average flow treated during the maximum month through the period was 11.2 MGD representing roughly 80 percent of total capacity. The average daily flow treated during the maximum month between 2003 and 2008 was 10.87 MGD in July of 2006. The available or unused capacity has averaged 23.6% during this time.

Year 2020 maximum wastewater treatment flows are projected to increase to approximately 12.14 MGD for the Town of Ocean City and West Ocean City combined. Work is currently being conducted by the City to evaluate needs for future wastewater treatment plant improvements.

Ocean City is looking into adding a fourth secondary clarifier at which point, we would have the capability of treating 16 MGD. We are currently permitted for 14 MGD. The limit for expansion of the current treatment plant is about 16 MGD. If our permit were to change and

require us to begin nitrogen and phosphorous removal, we would require that some equipment changes and additions be made. Currently, we are only required to monitor these levels.

~~The~~ Sunset Island was the most recent new development with an increase in ~~development has a~~ sewer demand of 200,000 GPD with no limits to the amount of flow.

Wastewater Discharge

Discharge point "001" is the Atlantic Ocean off of 64th St. between 3600 ft. & 4600 ft. from shore. Diffusers are located near the ocean floor at 50 foot intervals. Outfall point "002" is located at the Northwest corner of the treatment plant complex on the Assawoman Bay. This outfall would only be used in an emergency situation. To date, the Assawoman outfall has never been used. If it ever does the treatment level to the bay would be "secondary" only. This level of treatment would not be adequate and we would have to repair the ocean outfall as quickly as possible. We do flush the bay outfall annually, in February, to keep the line clear. Our NPDES permit allows us to perform this annual maintenance. We must notify MDE in advance of the date and time. The Atlantic Ocean is and shall remain the most suitable receiving water body for discharge. These discharge points will not change in the foreseeable future. Presently, our NPDES permit does not require us to report nutrient loads. ~~There is no~~A total maximum daily load for nutrients (TMDL) was adopted for the Coastal Bays by EPA in 2014. Worcester County is currently working on a Watershed Implementation Plan to achieve minimum State water quality standards in partnership with Ocean City, Maryland Coastal Bays Program and others. ~~TMDL for wastewater nor any impairments of our receiving waters. There is a TMDL for the Assawoman Bay that is incomplete. The Isle of Wight main bay TMDL is currently being established.~~ Herring Creek and Turville Creek have previously established TMDL's. ~~(engineering staff). Since Assawoman Bay has no TMDL, the suitability of receiving waters cannot be determined at this time.~~

Liquid and solid wastes leave the plant after treatment. Treated secondary effluent (liquid) is pumped from the treatment plant to the Atlantic Ocean through a 30" diameter pipeline. Treated Class "A" biosolids (solid) are transported to local farms by OC tractor trailers for land application on a daily basis during the summer season and less frequently during the winter months. Any solid waste that does not meet Class "A" criteria is transported to the Worcester County Landfill for final disposal. Ocean City does have the capacity to continue these practices through the planning period.

We are in the process of renewing our NPDES permit for operating the plant through MDE. Our current permit is good through January, 2011, and the next permit is good for five years from it's issuance. We do not anticipate any changes to the new permit.

Septic Systems

Ocean City has no septic systems in use at the present time.

Future Land Use and Capacity

Future land use patterns will involve redevelopment throughout the Town as existing uses are re-evaluated and replaced. This development will have very little impact on resources as the Town's wastewater treatment capacity will remain sufficient to handle the projected increase.

Wastewater treatment capacity limits are currently and will continue to be set in anticipation of maximum peak summer populations through the planning period. There will be sufficient wastewater treatment capabilities to handle projected population increases to the year 2032~~2~~5.

The Municipal Growth Element (Chapter 10) contains a more detailed discussion of future growth and needs.

Wastewater Treatment Milestones

• Reach 11.2 MGD (80% of rated capacity) –Triggers planning for future growth

• Reach 12.6 MGD (90% of rated capacity) – Triggers construction for future growth

• At 16 MGD – Probable maximum month capacity –With planned improvements

• At 14 MGD - treatment plant MDE - rated capacity

Section 4

Stormwater and Non-Point Source Pollution

The Ocean City Stormwater Management Ordinance, Article III, Section 30-141 of the City Code was adopted ~~June 18, 2001~~May 17, 2010: "The purpose of this article is to protect, maintain and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to control the adverse impacts associated with increased stormwater runoff. Proper management of stormwater runoff will minimize damage to public and private property, reduce the effects of development on land~~, control stream channel erosion~~, reduce local flooding, and maintain after development, as nearly as possible, the pre-development runoff characteristics."

Non-point source pollution comes from many sources. This pollution is caused by rainfall moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into wetlands, coastal waters, and even our underground sources of drinking water. Non-point source pollution is the leading cause of water quality problems. The effects of non-point source pollutants on specific waters vary. These pollutants have harmful effects on drinking water supplies, recreation, and wildlife.

To a large extent, the amount of non-point source pollution is determined by a municipality's land use. Impervious surfaces are an environmental concern because runoff amounts increase as impervious surfaces increase, causing a strain on existing stormwater control systems. Ocean City's annual rainfall averages forty-nine inches, which translates to approximately 200,000 gallons per acre or 23,000 gallons on a 5,000 square foot lot. Depending on the land cover, it either percolates into the soil or becomes runoff. The more land that is covered by impervious surface, the more runoff results.

Impervious surface coverage can be limited by restricting land use density or increasing requirements for pervious cover. Restricting density causes land elsewhere to be developed to accommodate the growing population (see Figure 4-1). In a designated growth area such as Ocean City, construction practices and open space requirements can decrease runoff while still allowing sufficient development within the coastal area limitations of shallow depth to water table and tidal influence.

It is desirable to maximize infiltration of rainwater. This water serves to replenish the groundwater, thereby helping to hold back the salt water wedge. Also, less runoff reduces nuisance flooding and the adverse impacts of stormwater on water quality. The original sandy soils of Ocean City can absorb about eight times as much water as normal Eastern Shore soils. Such soils lend themselves to the use of infiltration practices for stormwater management.

The efforts of the Town of Ocean City to minimize impervious surfaces and control stormwater runoff are vital to our goals of decreasing polluted stormwater from reaching the coastal bays. The coastal bays and the Atlantic Ocean are and will remain the primary receiving waters for stormwater run-off. The best management practices we are using in these efforts will significantly reduce the impact of future development. Our practices are listed in the Isle of Wight Subwatershed section below.

Ocean City has no septic systems or agricultural activities. The Town does not operate under NPDES Permit MS4 for stormwater management due to the Town not being a Phase II community ~~(engineering staff)~~.

Isle of Wight Bay Subwatershed (from Worcester County Comprehensive Plan)

This subwatershed includes Ocean City, Ocean Pines, some of West Ocean City, and most of the Route 50 commercial corridor. The headwaters are near Selbyville, Delaware, north of Bishopville, and contain agricultural lands and a planned industrial area. This area has been the traditional focus of population growth and development in Worcester County because of employment opportunities and access to Ocean City and the near-by state and national parks.

In the Isle of Wight Subwatershed, development and redevelopment should be located in the priority funded/smart growth area. Ocean City is completely within these designations. Allocations of pollutant loads should be designated first to these areas. In determining water quality impacts to the watershed resulting from development and redevelopment in Ocean City, the Town ~~uses the WRE non-point source spreadsheet to assess the impacts.~~maintains a database of all BMPs and requires periodic maintainance. Ocean City is virtually completely urban and developed. Most development activity is and will remain re-development.

Redevelopment activities in Ocean City are subject to Stormwater Management and adopted~~the~~ Critical Area Program regulations. Thus, all development is subject to improving water quality per MDE and DNR guidelines as adjusted for Ocean City. Environmentally Sensitive Design is recommended in treating the Water Quality volume. These designs include Bio-swale, rain gardens, infiltration trenches, rooftop gardens, pervious paving material, cisterns for water re-use, and/or reducing impervious surfaces. The overall post construction pollutant loads will be 10% below pre-construction loads with a minimum 50% reduction of impervious surface. With only 496 acres (Table below) of developable land in the town, current

regulations and required stormwater management practices will continue to help protect our groundwater resources.

Ocean City Non-Point Source Loading

Pollution by nutrients causes many problems, such as algal growth and oxygen reduction. Aquatic life is directly affected by this type of pollution. Total loadings are calculated below by land cover types.

The calculations for future loading are the same for the current loadings because future development of Ocean City will primarily be redevelopment of existing, already developed properties. Even so, we anticipate that efforts to require more open space, increased pervious land coverage, and improved stormwater management, together with Coastal Bays Critical Areas Program ~~restrictions~~ implementation ~~on~~ along with future redevelopment projects, will reduce nutrient loading in the future.

Conclusion

In order for Ocean City to remain a viable and successful community, adequate infrastructure must be available. Meeting the demand for high quality potable water, properly treating wastewater, and protecting water quality by managing stormwater runoff are essential for our future. The Town is committed to achieving these mandates as evidenced by the continual monitoring of the systems, by the periodic updating of the *Comprehensive Water Supply Study*, and rigorous enforcement of environmental regulations.