

Town of Chincoteague

WATER SUPPLY PLAN



Approved
October 4, 2010

Table of Contents

- Introduction
 - a. Regulation Background

- I. Existing Water Sources
 - a. Description
 - b. Community Water System (groundwater supply)
 - c-g. Other Water Systems (n/a)
 - h. Water Use Agreement (outside of groundwater planning area)
 - i-j. Other Water Systems (n/a)
 - k. Summary of Water Master Plan (2003)

- II. Existing Water Use
 - a. Description
 - b. Use History
 - c. Recent Use History

- III. Existing Water Resource Conditions
 - a. Description
 - b. Geology
 - c. Hydrogeology
 - d. Meteorology

- IV. Projected Water Demand
 - a. Description
 - b. Service Area
 - c. Population Projection
 - d. Population Calculations
 - e. Projected Demand
 - f. Demand Calculations

- V. Water Management Actions
 - a. Water Demand Management
 - b. Conservation Practices
 - c. Drought Response and Contingency Plans

- VI. Statement of Need
 - a. Description
 - b. Justification
 - c. Capital Improvement Plan

- VII. Alternatives Analysis
 - a. Description
 - b. NASA Surplus

- VIII. Appendices
 - a. Water Conservation Management Plan

INTRODUCTION

Regulation Background

The Commonwealth of Virginia is rich in water resources, both in terms of number and diversity. However, as the impacts of the recent drought have demonstrated this resource cannot be taken for granted. The Commonwealth and its localities must work together to manage and protect our water resources to meet long term human and environmental needs. Improved coordination of drought response and water resources management activities at the local, regional and state levels are essential to guarantee Virginia's water supplies will meet the current and future needs of Virginia's citizens in an environmentally sound manner.

Regulation

The Code of Virginia, as amended by Senate Bill 1221 in 2003 (Section 62.1-44.38:1) requires the development of a comprehensive statewide water supply planning process to (1) ensure that adequate and safe drinking water is available to all citizens of the Commonwealth, (2) encourage, promote, and protect all other beneficial uses of the commonwealth's water resources, and (3) encourage, promote, and develop incentives for alternative water sources, including, but not limited to desalinization.

The new regulation affecting the development of water supply plans in the Commonwealth is the Local and Regional Water Supply Planning Regulation (9 VAC 25-780), which became effective on November 2, 2005. The regulation requires that all counties, cities, and towns in the Commonwealth of Virginia submit a local water supply plan or participate in a regional planning unit in the submittal of a regional water supply plan to the State Water Control Board.

The program was designed as a statewide partnership, localities having the lead role in identifying their future demands and the state providing technical support and oversight

Due dates for Water Supply Plans

The regulation establishes a schedule for submittal of the Local and Regional Water Supply Plans based on a locality's latest population figures from the most recent U.S. Census. Plans are due:

- **November 2008** for Local Governments with Populations in Excess of 35,000 preparing a local (individual) plan.
- **November 2009** for Local Governments with Populations in Excess of 15,000 but No More Than 35,000 preparing a local (individual) plan.
- **November 2010** for Local Governments with Populations Less Than or Equal To 15,000 preparing a local (individual) plan.

- **November 2011** for Regional Water Supply Plans – Local Governments electing to participate in a Regional (more than one locality) Water Supply Plans must notify DEQ of the intent to participate in a Regional Plan by **November 2008**.

Local and Regional Water Supply Planning Requirements

The regulation details the information to be included in a region's/locality's water supply plan, including:

- * Existing Water Source;
- * Existing Water Use;
- * Existing Water Resource;
- * Water Demand Management, or current conservation practices;
- * Drought Response and Contingency Plans;
- * Projected Water Demand Information;
- * Statement of Need based on the adequacy of existing water sources to meet current and projected water demand over the planning period (a minimum of 30 years to a maximum of 50 years).

This information may be derived from existing, readily available information and additional detailed studies shall not be required.

SECTION 1

EXISTING WATER SOURCES

***Refer to 9 VAC 25-780-70**

Section 1 consists of a collection of current data on the existing groundwater sources for the Town of Chincoteague. Section 3 is included later in this plan to describe in greater detail the regional groundwater resource and its relationship to the point of withdrawal.

Groundwater Source Description

The Town of Chincoteague is surrounded on all sides by saltwater, has no streams of any substantial size, has no significant source of surface water and therefore must depend on groundwater as its sole source of drinking water. Groundwater sources available on the Island are typically not suitable as a drinking water supply due to nutrient/septic system contamination (shallow) or brackish water intrusion (deep). A community water supply system has been constructed to serve the entire Island and is currently supplied by existing wells located on the mainland of Accomack County. Five miles of transmission lines carry water from these wells across the marshes to Chincoteague Island.



Figure 1: Chincoteague Location Map in Accomack County

*Town of Chincoteague
Water Supply Plan*

Based on a draft Regional Water Supply Plan prepared by Malcolm Pirnie (April 2010), preliminary regional data indicates that the Town of Chincoteague is one of eleven (11) community water systems in Accomack County. The combined public water systems account for approximately 16% of permitted groundwater withdrawals in 2007. The Town of Chincoteague’s permitted use accounts for approximately half of the community water systems or 8% of total County permitted groundwater withdrawal. (By comparison, half of the total County permitted groundwater withdrawal is allocated to two major industrial uses)

Community Water Systems Using Ground Water - 9 VAC 25-780-70.B

A Community Water System (CWS) is defined as “a waterworks that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents, and is regulated by the Virginia Department of Health Waterworks Regulation (12 VAC 5-590).” In the Town of Chincoteague, there is only one Community Water System utilizing groundwater to supply its residents:

- Town of Chincoteague, Inc.

The attached map shows the location of the Town of Chincoteague (red) and the Wallops Island (yellow) well fields. Additional test wells (blue) are located in the area to monitor groundwater quality and elevation information.

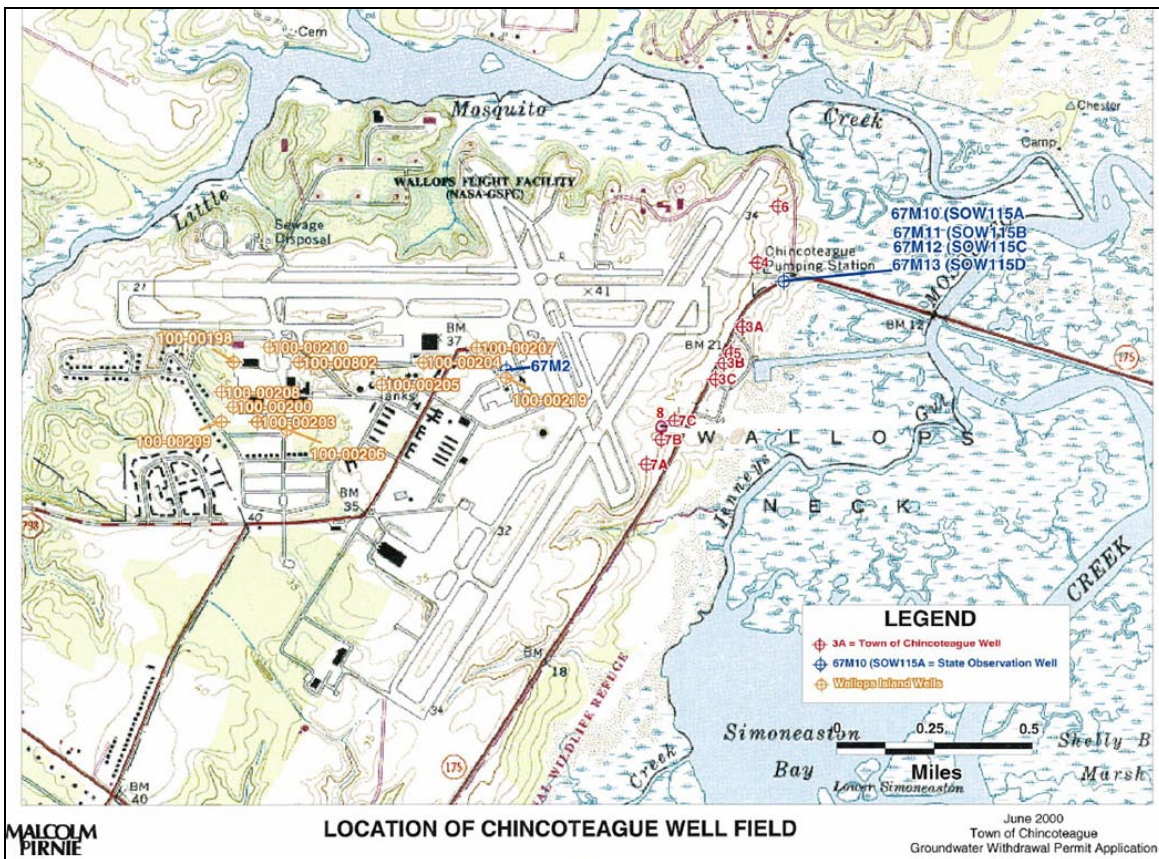


Figure 2: Chincoteague Groundwater Management Area

The source of the Town of Chincoteague's drinking water is high quality ground water from the Columbia, Upper and Middle Yorktown-Eastover Aquifers. The Columbia Aquifer is unconfined and located within the water table. It ranges in depth from 20 to 60 feet and has a recharge rate of 12-15 inches per year. The Yorktown-Eastover aquifer is confined at depths from 100 to 250 feet and has a much slower recharge rate of approximately 0.5 inch per year. See Section 3 for more detailed description.

The ground water is accessed by three wells (3A, 3B, 3C) pumping from the Columbia Aquifer, and four wells (4, 5, 6, 8) pumping from the Middle Yorktown-Eastover Aquifer. Production wells 4, 6 and 8 are operated preferentially first, followed by wells 3A through 3C, followed by well 5. Wells 7A and 7B are not currently operational.

All of the Town's wells are located on land owned by the Town of Chincoteague or within a perpetual easement located on NASA property. Raw water is pumped from the mainland to Chincoteague Island for treatment, storage and distribution.

Groundwater well details for the Town's 7 active wells (i.e. Well ID, depth, casing and screen depth) are provided in Table 1.

Table 2, below, summarizes the VDEQ permitted annual and maximum monthly withdrawals, as well as the VDH permitted capacities of the Community Water System in the Town of Chincoteague.

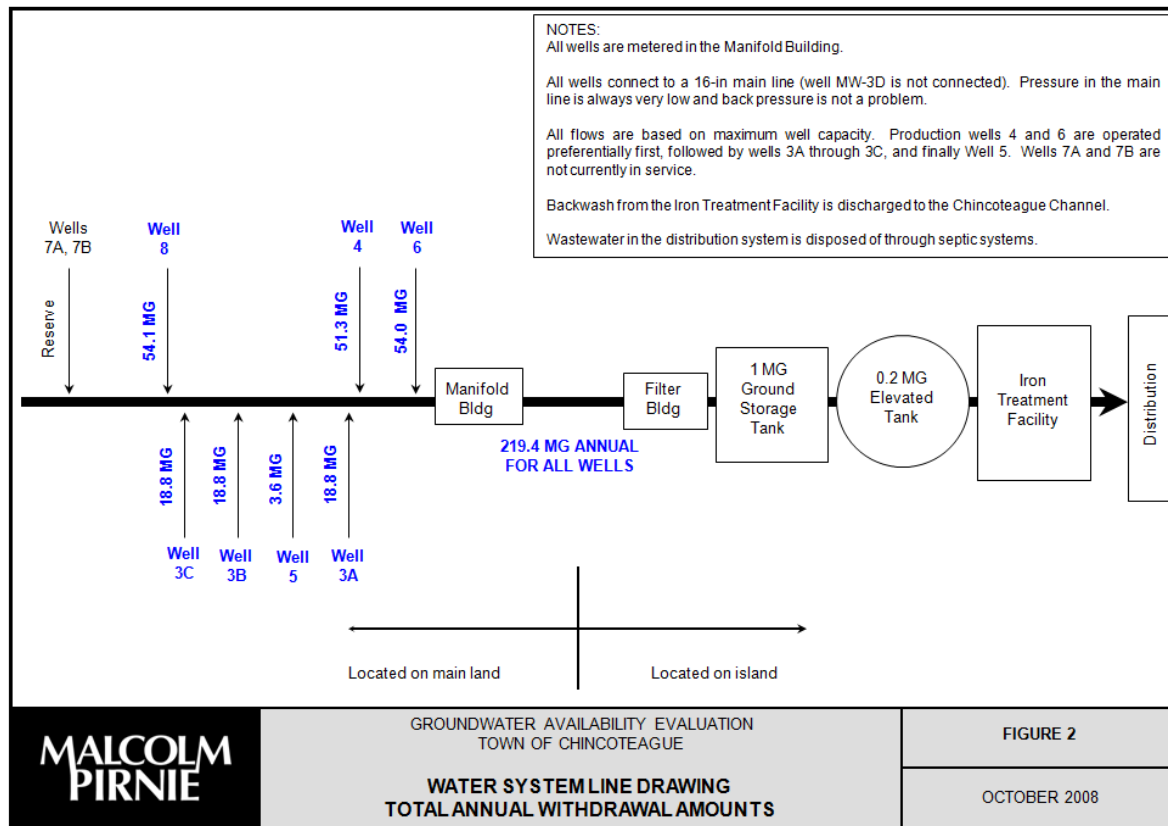
EXISTING WATER SOURCES									
DESCRIPTION									
Town ID	State ID	Depth	Casing	Screen	Diameter		Capacity avg. gpd	Capacity max. gpd	Status
3A	100-850	55'	40'	15'	6"		43,900	100,800	active
3B	100-851	59'	44'	15'	6"		43,900	100,800	active
3C	100-852	60'	40'	20'	6"		43,900	100,800	active
4	100-28	244'	216'	28'	8"		122,300	532,000	active
5	100-32	256'	223'	33'	8"		5,300	259,200	active
6	100-320	225'	154'	71'	6"		192,600	360,000	active
7A	100-493	107'	97'	10'	6"		0	0	reserve
7B	100-494	106'	96'	10'	6"		0	0	reserve
8	100-945	255'	215'	40'	8"		88,100	374,400	active
Total							540,000	1,827,000	
				Mg/day	Mg/mo.	Mg/yr.			
System Permitted Capacity (VDH)				1.00	30.4167	365.0			
System Permitted Capacity (DEQ)				1.34	34.1	219.4			

**Table 1:
Town of Chincoteague CWS: Well System**

Water System Name	VDEQ Permitted Withdrawals		VDH Design Capacity (GPD)
	Total Annual Withdrawal (MG)	Max. Monthly Withdrawal (MG)	
CHINCOTEAGUE, TOWN OF	219.40 ¹	34.1 ¹	1,000,000

¹ Permit amounts are based on amounts requested in Permit Application

**Table 2:
Town of Chincoteague CWS: Permitted Withdrawals**



**Figure 3:
Town of Chincoteague CWS: Well System Diagram**

Large Self-Supplied Users

Non-community water systems, or self-supplied users, of greater than 300,000 gallons per month are categorized into non-agricultural and agricultural users. There are no such users in the Town of Chincoteague.

- Community Water Systems Using Surface Water Reservoirs (9 VAC 25-780-70.C)
N/A
- Community Water Systems Using Stream Intake (9 VAC 25-780-70D)
N/A
- Self-supplied Nonagricultural Users >300,000 Gallons per Month
From Surface Water Sources (9 VAC 25-780-70E)

N/A

From Ground Water Sources (9 VAC 25-780-70F)

N/A

- Self-supplied Agricultural Users >300,000 Gallons per Month

N/A

Water Purchased Outside Local Boundaries (9 VAC 25-780-70G)

- Water Agreements Between Participating Localities
N/A
- Water Agreements Outside Participating Localities
The Town of Chincoteague and NASA Wallops Island have agreed to and installed a water system interconnection with a manual valve located in the Town wellfield manifold building. This connection would allow for emergency use of alternate water sources.

Water Available for Purchase beyond Local Boundaries - 9 VAC 25-780-70H

There are no agreements or plans for purchase of water from another source at this time. The Town's Water Master Plan identifies excess capacity available at the NASA Wallops Island well field, however this may be allocated for use at the County Research Park facility.

Self-Supplied Agricultural Users <300,000 Gallons per Month - 9 VAC 25-780-70I

There are no known self-supplied agricultural uses within the Town or in the vicinity of the Town's groundwater management area that are not connected to the community water system.

Self-Supplied Nonagricultural Users <300,000 Gallons per Month - 9 VAC 25-780-70J

There are no known self-supplied nonagricultural users of less than 300,000 gallons per month within the Town or in the vicinity of the Town's groundwater management area. All households and businesses are on the Town's community water system.

Summary of Findings from Wellhead and Source Water Protection Programs - 9 VAC 25-780-70K

The Eastern Shore of Virginia was designated a Ground Water Management Area in 1976 and any withdrawal of 300,000 gallons per month or more in this area requires a ground water withdrawal permit from DEQ. At the local level, the Eastern Shore of Virginia Ground Water Committee was formed in 1990 to assist local governments and residents in understanding, protecting and managing the ground water resource. The Ground Water Supply Protection and Management Plan for the Eastern Shore of Virginia (1992) provides the basis and guidelines for protecting the ground water resource.

In addition to the Ground Water Committee, Accomack and Northampton counties have adopted provisions in their ordinances that provide protection to the ground water resource. In November 1998, Accomack County passed an ordinance that includes provisions specific to ground water resource protection. In June 2003, Accomack County passed an ordinance requiring that certain new developments implement specific measures designed to protect and preserve the water resource (Source: <http://www.a-npdc.org/groundwater>).

According to the Department of Health, Office of Drinking Water (VDH ODW) website:

The Virginia Department of Health (VDH), as the Commonwealth's agency regulating public drinking water, was required by the 1996 Amendments to the [Safe Drinking Water Act](#) (SDWA) to develop a Source Water Assessment Program (SWAP).

The goal of the SWAP is to establish procedures and provide a foundation of support for protecting the Commonwealth's drinking water resources from degradation. This degradation can be the result of residential, industrial, commercial, agricultural, waste management, or transportation's: accidental introduction of contaminants; improper land use practices; illegal material handling practices; and other conditions. These conditions and practices can threaten the drinking water resources of the Commonwealth.

The SWAP includes delineating assessment boundaries of a drinking water source, performing an inventory of land use activities, and determining a relative susceptibility of the drinking water source to these activities. The assessment of public drinking water sources is available to waterworks owners and the public.

On November 13, 2008 there were 2,936 active public water systems in Virginia, serving safe drinking water to more than 80% of Virginia's population. Assessments indicate that some drinking water sources have high levels of protection. While other public water systems are not in control of the land use activities in their surrounding areas. The Office of Drinking Water (ODW) encourages public waterworks to purchase land and/or establish conservation easements to increase the protection of vital drinking water resources.

The SWAP has identified future land use development in source water protection areas as a predominant risk to the viability of public waterworks. The ODW has been working with a number of other state agencies to distribute and share SWAP data in an effort to bring more awareness to source water protection areas.

A full copy of the SWAP report can be found on the VDH ODW website. Table 35 summarizes the report findings for the Town.

Table 11. SWAP Summary Findings for Town of Chincoteague

High Susceptibility	Moderate Susceptibility	Low Susceptibility
4	0	6

The Town of Chincoteague’s public water supply is managed in conformance with Town Code Section 62 – Utilities, Water Master Plan (WRA October 2003), Town Waterworks Operations & Maintenance Manual, as well as applicable State groundwater withdrawal permits.

Location of the Town groundwater management area on the NASA Wallops Island property adjacent to large areas of National Fish and Wildlife Service property provides a high level of security, visibility and protection of the wellheads and surrounding watershed from future land use development that may impact groundwater sources.

Note : Section 3 of this plan identifies the importance of a regional groundwater recharge spine located within Accomack and Northampton counties that may influence the long term groundwater recharge of the Town of Chincoteague well field.

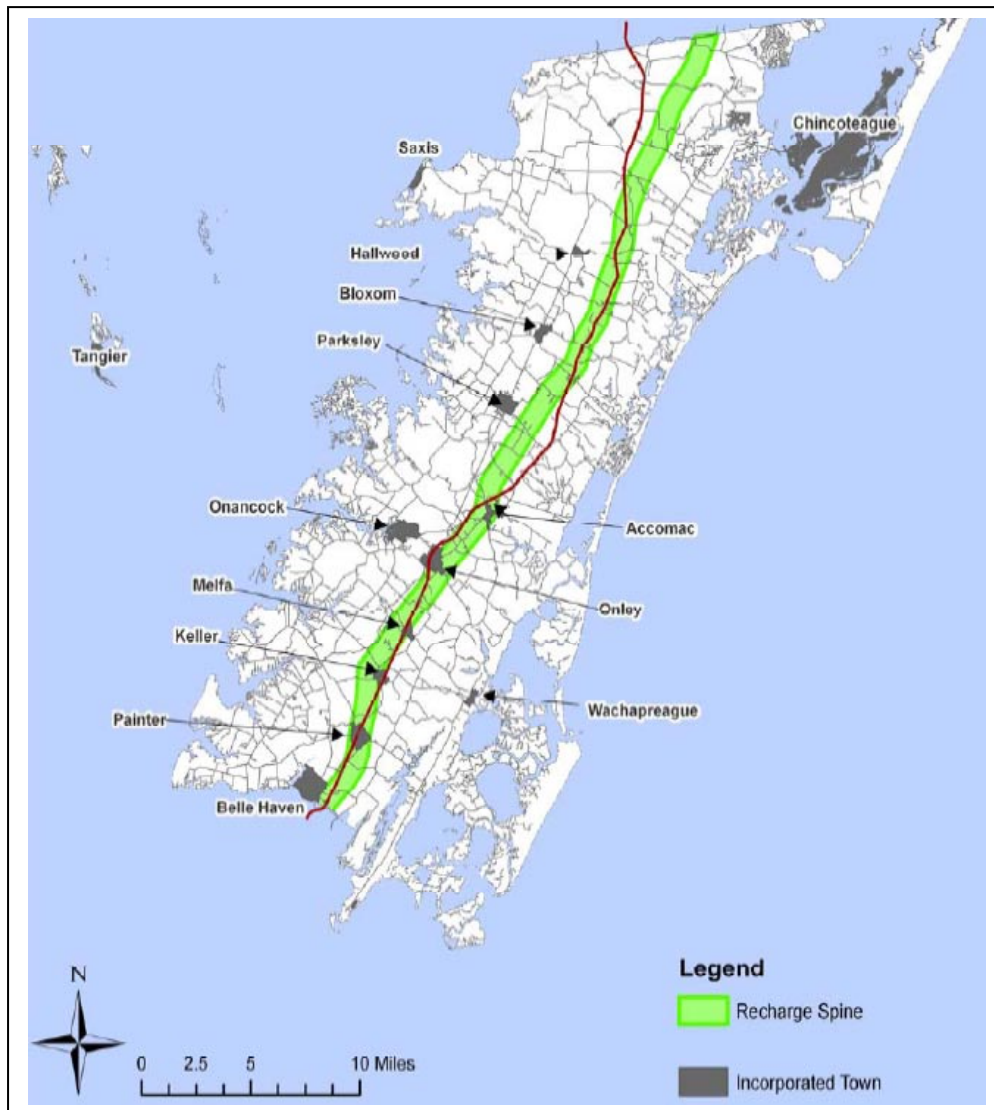


Figure 4:
Accomack County: Groundwater Recharge Spine Map

SECTION 2

EXISTING WATER USE INFORMATION

***Refer to 9 VAC 25-780-80**

This section will describe the existing water use in the Town of Chincoteague, in accordance with the provisions of 9 VAC 25-780-80. Water use is broken down into the following user categories:

- Community Water Systems – including residential use, commercial, institutional and light industrial use, heavy industrial use, military use, water production, unaccounted for water losses, and sales to other community water systems.
- Self-Supplied Non-Agricultural Users of more than 300,000 gallons per month
- Self-Supplied Agricultural Users of more than 300,000 gallons per month
- Self-Supplied Users of less than 300,000 gallons per month

Information contained in this section was derived from a number of sources including 2009 VDH waterworks permit/water use reports, individual groundwater permit applications and VDEQ data.

Local Populations and Water Connections - 9 VAC 25-780-80.B.1. and B.2

Community Water Systems

The following information is required for all Community Water Systems (CWS), as stated in 9 VAC 25-780-80.B:

- **Population within CWS service area.** The year-round population served by the system is 4,324 (2000 Census American Factfinder) and the average seasonal population from Memorial Day to Labor Day is approximately 15,000 with as many as 30,000+ on Memorial Day, July 4th and Pony Penning weekends.
- **Number of connections within CWS service area.** The system currently supplies approximately 3,550 connections with water. This includes 2,514 residential, 1,002 commercial (includes seasonal residential rentals), 1 connection to the National Fish and Wildlife Service property, and 33 public/semi-public connections.
- **Average and maximum daily withdrawal for each CWS.** The average daily withdrawal of water in the system based on 2009 records is 518,780 gallons; the maximum daily withdrawal recorded was 0.522 million gallons from well #4 in May 2009.
- **The amount of water used within the CWS service area on an average annual basis and on an average monthly basis.**

VDH and Town of Chincoteague groundwater withdrawal records are available for 1995 – 2009. For the purpose of this study, calculations of average values are based on the last 5 years in order to more closely evaluate current and future use.

The total average annual use over this time period was 190.73 MG per year, with an average daily withdrawal of 0.523 MGD (Table 3). The average monthly use is presented in Table 4, which shows a maximum average monthly withdrawal of 27.86 MG during July.

	2005	2006	2007	2008	2009	Average
Total Annual Use (MG)	198.54	188.00	197.14	180.60	189.35	190.73
Total Daily Use (MGD)	0.544	0.515	0.540	0.495	0.519	0.523

Table 3:
Town of Chincoteague CWS: VDH-Reported Total Annual and Average Daily Use

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2005	13.77	13.07	13.49	13.66	18.16	19.45	27.67	25.33	18.30	14.47	11.46	9.72
2006	9.19	8.41	10.42	13.12	18.58	18.90	27.20	26.59	15.99	15.95	13.53	10.09
2007	9.70	10.47	9.73	13.27	18.38	21.19	28.97	27.61	19.20	15.28	12.73	10.60
2008	10.08	8.19	9.89	12.02	16.14	19.42	27.29	25.37	16.41	13.89	11.30	10.60
2009	12.56	10.02	11.44	13.70	18.13	20.54	28.20	24.20	16.53	12.94	10.94	10.14
Average Monthly Use (MG)	11.06	10.03	10.99	13.15	17.88	19.90	27.86	25.82	17.28	14.50	11.99	10.23

Table 4:
Town of Chincoteague CWS: VDH-Reported Average Monthly Use:

■ **Peak daily water use by month**

This information is provided from a previous draft plan.

Peak Use. The peak day water use by month for the system is as listed:

- January 27th = 0.586 Mg
- February 10th = 0.486 Mg (Valentine's Day)
- March 26th = 0.461 Mg
- April 15th = 0.591 Mg (Easter weekend)
- May 28th = 0.968 Mg (Memorial Day weekend)
- June 28th = 0.938 Mg
- July 28th = 1.322 Mg (Pony Penning)
- August 5th = 1.062 Mg
- September 3rd = 0.916 Mg (Labor Day weekend)
- October 7th = 0.677 Mg (Columbus Day weekend)
- November 29th = 0.536 Mg (Thanksgiving)
- December 14th = 0.462 Mg

Estimates of the disaggregated amounts of water use by different user types. The Town of Chincoteague separates water accounts into 4 user types:

- C1 – commercial uses including seasonal residential rentals,
- C2 – commercial use to Wildlife Refuge ,
- R1 – residential uses,
- NC – non charge for town owned properties, churches, library, etc. Any remaining difference is unaccounted for water use or loss and may include fire department or other non-metered uses.

Year	C-1 Commercial	C-2 Commercial	R-1 Residential	NC No-Charge	Unbilled/ Unaccounted for Water Use	Total MG (gallons)
2005	79,738,000	604,000	78,048,000	1,912,000		198.54
2006	79,793,000	966,000	74,220,000	1,775,000		188.0
2007	87,497,000	794,000	77,033,000	704,000		197.14
2008	81,069,000	495,000	68,021,000	1,214,000		180.6
2009	85,460,000	692,000	71,845,075	1,197,000		189.35
Avg	82,711,400	710,200	73,833,400	1,360,400	32,114,600	190.73

Table 5. Disaggregated Amounts of Water

Existing In-stream Beneficial Uses – 9 VAC 25-780-80.B.10

There are no stream intakes or other water sources used to supply the Town of Chincoteague CWS.

SECTION 3

EXISTING RESOURCE INFORMATION

*Refer to 9 VAC 25-780-90

Geologic/Hydrologic/Meteorological Conditions

Chincoteague Island is commonly believed to be an ancient barrier island. It was formed 2,500 to 3,500 years ago, as the forces of wind, waves, and ocean deposited sand parallel to the Eastern Shore mainland. Erosion formed breaks in these barrier Islands and allowed the still rising sea to flood the flatlands behind the Island. These flats are now the marshes, channels and bays between Chincoteague and the mainland.

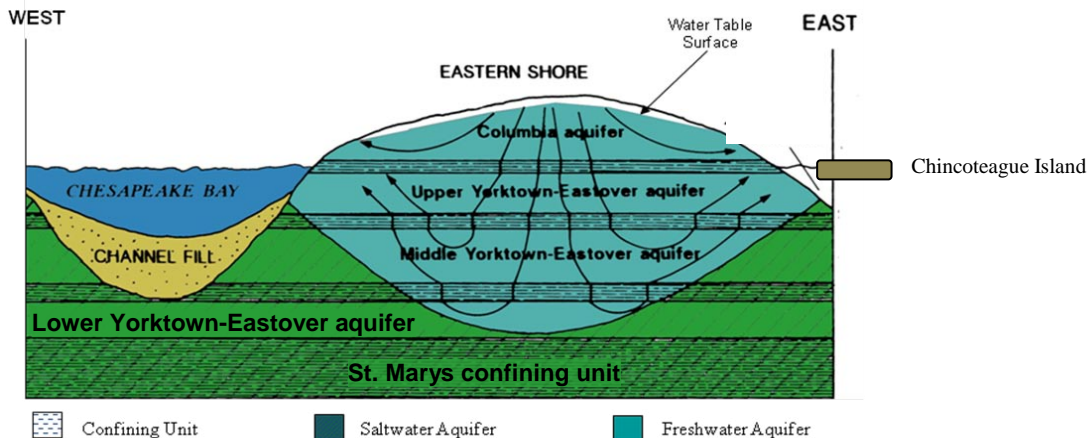
Chincoteague Ground Water Resource

Chincoteague Island residents are totally dependent upon underground wells on the mainland for drinking water. Five miles of transmission lines carry water from these wells across the marshes to the Island.

Seven separate wells serve the pumping station. Well depths vary from 63 to 256 feet. Danger of contamination of these wells is considered minimal, however, vigilant monitoring of activities on land near the wells is critical. The Town must ensure future activities, on or around Wallops Flight Facility's property, do not pose a danger to the wells.

Fresh groundwater is present in a series of four major aquifers predominantly comprised of sand, gravel, and shell material. The four major aquifers are present in the majority of the County and are, in order of increasing depth below ground surface, the Columbia aquifer (unconfined), and the upper, middle, and lower Yorktown-Eastover (confined) aquifers. Aquifers deeper than the lower Yorktown-Eastover contain salty water and are currently not used as a source of water. The four freshwater aquifers are generally separated by sedimentary confining units comprised largely of very fine sand, silt, and clay, with each confining unit being named after the underlying aquifer.

Figure 5: Conceptual Groundwater Flow System of the Virginia Eastern Shore



The low permeability confining units restrict downward ground water movement. Fresh ground water generally occurs only in the upper 300 feet of sediments and at shallower depths along the coastlines of the Eastern Shore and is limited to the Columbia and Yorktown aquifers. These aquifers have been designated by the EPA as the sole source aquifers for the Eastern Shore, excluding Tangier and Chincoteague Islands.

The majority of drinking water needs in the County are met through withdrawals from groundwater water wells screened in the (confined) Yorktown-Eastover aquifers, while the rest is met through withdrawals from groundwater wells screened in the (surficial) Columbia aquifer. Groundwater availability in the Columbia Aquifer is characterized by relatively high recharge rates, low aquifer storage, and a high susceptibility to contamination; conversely, groundwater availability in the Yorktown-Eastover Aquifers is characterized by relatively low recharge rate, higher aquifer storage and lower susceptibility to contamination.

There are a total of thirty tidal creeks in Accomack County, which are largely supplied from runoff and groundwater discharge. Although surface water is not used as a source of drinking water in the County, it is an important resource for irrigation water and for shellfish, finfish, and other wildlife habitat.

The entirety of Accomack County (and therefore its aquifers) is located within the Eastern Shore Groundwater Management Area (ESGWMA) as defined by the Virginia Ground Water Management Act of 1992, which requires a permit from DEQ for any person or entity wishing to withdraw in excess of 300,000 gallons per month from a declared GWMA.

Climate

Chincoteague Island has a humid climate with no distinct dry season. The relative humidity (measured at nearby Wallops Flight Facility) averages 76%. Surface winds are highly variable and frequent. Winds are predominately from the south or southwest in the summer, and westerly or northwesterly in the winter. The average wind velocity is 9 to 10 mph in the summer and 11 to 13 mph in winter. Average precipitation for Chincoteague is 45-46 inches per year.

Two general types of storms affect the area: hurricanes and northeasters. On average, once a year, a tropical storm of hurricane force passes within 250 miles of Chincoteague. Hurricanes are a threat from May through November. Hurricanes cause damage from winds and tidal surge. Northeasters are storms with strong on-shore winds from a northeast direction. The winds are persistent, causing above normal tides for long periods of time. The March 1962 northeaster caused 10 to 15 foot waves, persisted for five tide cycles, and caused inundation and wave damage for 60 hours.

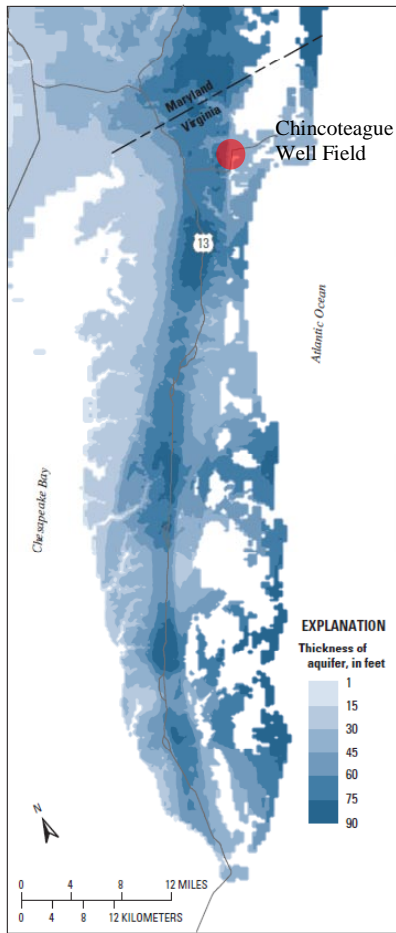
Accomack Ground Water Resource

(Excerpts taken from Draft Regional Water Supply Plan – Malcolm Pirnie April 2010)

Columbia Aquifer

The Columbia aquifer is the uppermost aquifer and is unconfined over most of the area. Thickness of the Columbia aquifer and depth to water vary with topography.

Figure 6: Thickness of the (surficial) Columbia Aquifer



Source: Sanford, et al, 2009 Error! Bookmark not defined.

Beneath most of the Eastern Shore of Virginia, thickness of the Columbia aquifer generally ranges from 20 feet near the coast to 60 feet inland. Thickness near the central corridor of the Eastern Shore can exceed 100 feet in some areas, and depth to ground water is typically within 10 feet of the surface.

Transmissivities reported for the Columbia aquifer range from 1,000 to 4,000 ft²/day.

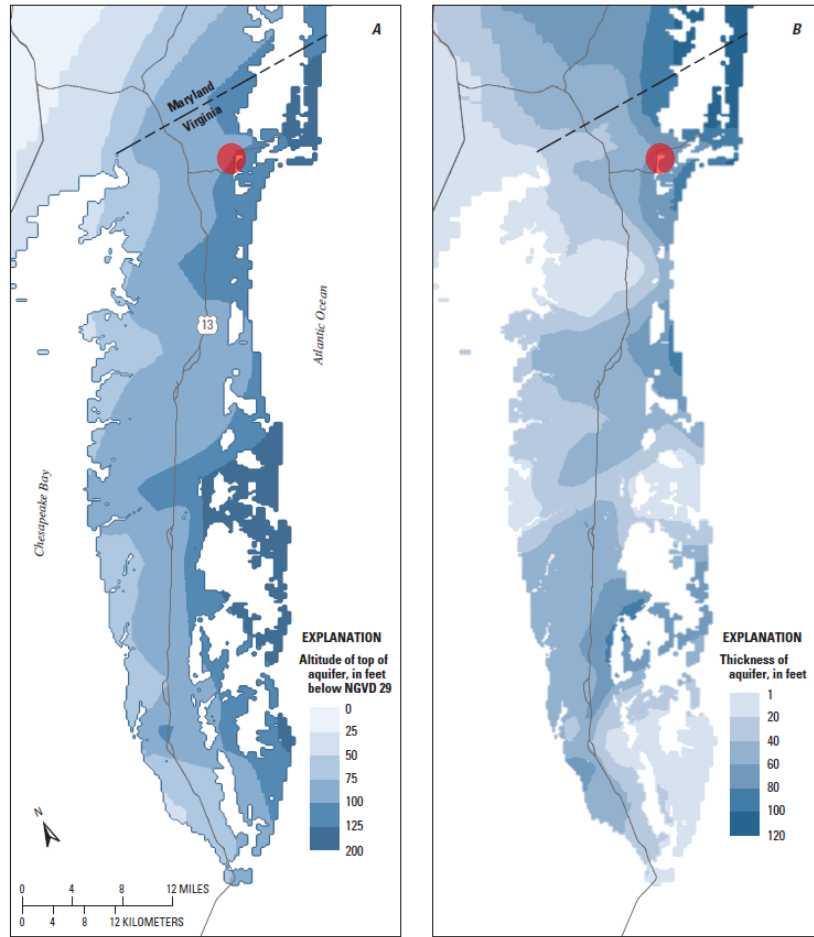
Water levels in the Columbia aquifer on the Eastern Shore are generally subparallel to surface topography. The highest elevations on the Eastern Shore are along the central ridge, with maximum elevations of +45 feet (ft) above mean sea level (msl) in the central portion of the peninsula decreasing toward the coastline to approximately +10 ft msl near the tidal marshes. Overall, it appears that depth to ground water is between 10 and 20 ft below ground surface (bgs) for the upland areas and 5 to 10 ft bgs beneath the lower terrace deposits.

The Columbia aquifer on the Eastern Shore subcrops into the Chesapeake Bay to the west and Atlantic Ocean to the east. Where it subcrops, freshwater discharges directly from the aquifer into the estuarine and ocean water, respectively.

Upper Yorktown Aquifer

The upper Yorktown aquifer is the uppermost unit of the Yorktown-Eastover aquifer system, and is generally defined as the first significant sand unit occurring below the unconformity separating the basal Columbia Group sediments from the Chesapeake Group sediments. Surficial recharge to the upper Yorktown aquifer occurs along a northeast striking belt, called the “recharge spine”, approximately 1.5 to 4 miles wide. This recharge area is present along the length of the Eastern Shore and provides freshwater recharge through the overlying confining unit.

Figure 7: Top elevation (a) and thickness (b) of the Upper Yorktown Aquifer



Source: Sanford, et al, 2009

The upper Yorktown aquifer is typically thinner to the west, where more of the sediments were eroded, and thickens to the east. On the Eastern Shore, the thickness of the upper Yorktown ranges between 15 feet in southwest Northampton County to greater than 100 feet near Assateague Island and is typically between 30 and 60 feet thick.

Transmissivity for the upper Yorktown aquifer is generally lower than the Columbia aquifer, and has a lower variability. Transmissivity for this aquifer typically ranges from 1,000 to 5,000 ft²/day.

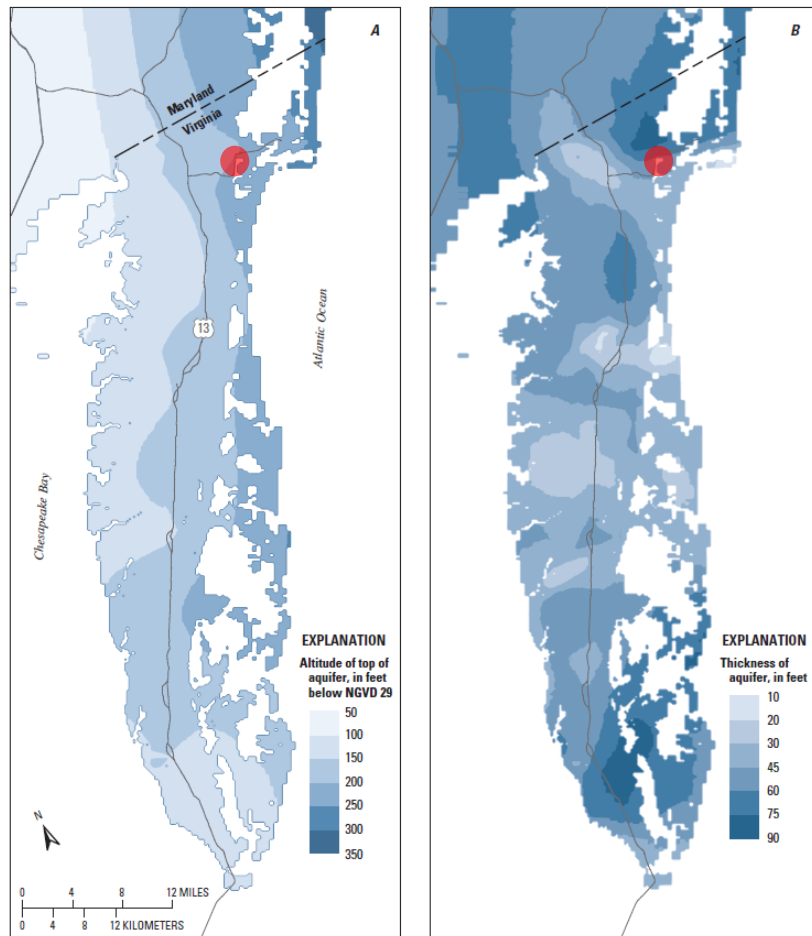
Ground water levels on the Eastern Shore follow the same general pattern as the overlying Columbia aquifer, since recharge to this aquifer is from the Columbia. Because the confining unit separating the two aquifers is consistently present over most of the area, there is significant head loss between the two aquifers. At the eastern and western coastline, ground water level decreases to approximately +5 ft msl. A short distance offshore, vertical ground water flow direction is expected to reverse, with fresh ground water flow from the upper Yorktown aquifer into the overlying Columbia aquifer. There are several prominent cones of depression resulting from significant ground water withdrawals centered around Temperanceville (Tyson Food), Accomack (Perdue), Exmore, and Cape Charles.

Middle Yorktown Aquifer

The middle Yorktown aquifer, over most of its extent on the Eastern Shore is a gray fine sand to silty fine sand with shell fragments prevalent. Thickness of the middle Yorktown aquifer typically ranges from 30 ft to 60 ft. The top of the aquifer on the Eastern Shore is between -225 and -250 ft msl along the eastern side. Transmissivities for the middle Yorktown on the Eastern Shore range between 1,000 and 3,000 ft²/day.

Ground water levels for the middle Yorktown aquifer on the Eastern Shore are only slightly lower in the central portion than the upper Yorktown, with a maximum ground water elevation between +20 and +25 ft msl near Accomac. At the coast and a short distance offshore, the ground water level in the middle Yorktown is expected to be slightly higher than the upper Yorktown, with the vertical ground water flow reversed to an upward direction.

Figure 8: Top elevation (a) and thickness (b) of the Middle Yorktown Aquifer



Source: Sanford, et al, 2009^{Error! Bookmark not defined.}

There are two major concerns regarding groundwater in Accomack County, quantity and quality. Groundwater quantity is limited by the nature of the aquifers and must be carefully managed to prevent overuse that can result in saltwater intrusion. Groundwater quality depends on proper management of land use activities that can contaminate aquifers. In recognition of the limited groundwater supply and the potential for

contamination, the U.S. Environmental Protection Agency designated the Eastern Shore of Virginia a Sole Source Aquifer in 1997. The designation provides protection to the Shore’s water supply by requiring the EPA to review proposed projects on the Shore that are receiving federal financial assistance to ensure they do not endanger the water supply. The EPA Sole Source Aquifer designation excludes Tangier and Chincoteague Islands.

Hydrologic Setting

The Eastern Shore is drained by a total thirty small creeks flowing bayward or seaward from the drainage divide which passes the length of the peninsula. The lower reaches of the creeks form tidal estuaries fed by narrow, meandering branches. Because of the low topography and low inflow of freshwater, the creeks are brackish to saline everywhere except for the upper reaches. The estuaries are more pronounced on the Chesapeake Bay side and receive more of the surface and ground water drainage than the smaller creeks on the ocean side.

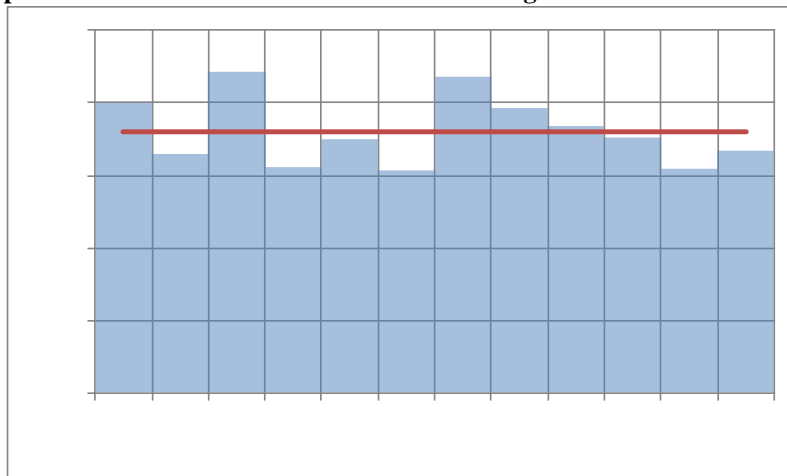
Between the mainland and the barrier islands are extensive tidal marshes flooded regularly by saltwater and drained by an extensive system of creeks. These systems accept ground water discharge.

The central portion of the Eastern Shore peninsula forms a broad, low ridge which trends northeast-southwest and stands at an elevation ranging from +25 to +50 ft msl. This central highland area is the principal fresh ground water recharge area for the peninsula and is referred to as the “recharge spine” of the Eastern Shore.

Meteorologic Setting

The average annual precipitation on the Eastern Shore is approximately 45 inches. The precipitation normals vary seasonally between 3.0 and 4.5 inches per month; with the highest months being March and July and the lowest being June and November . Aquifers of the Eastern Shore are recharged by precipitation; however the majority of the precipitation is lost to runoff and evapotranspiration.

Figure 9: Precipitation Normals for the Eastern Shore of Virginia



Source: NOAA, 2002.

Ground water recharge can be divided into a number of components. Total ground water recharge is the amount of precipitation which is not lost as runoff or evaporation (and evapotranspiration in the unsaturated zone). Of the total ground water recharge to the saturated zone, the principal losses are through evapotranspiration or discharge to surface waters. Loss through evapotranspiration and surface water discharge is most significant in the low lying areas where the water table aquifer is near the surface. The remaining recharge water goes into storage (in the water table aquifer) or recharges the underlying confined aquifers.

There have been a number of ground water recharge values previously estimated for the Eastern Shore that range from 8.5 to 26 inches per year. Fresh groundwater recharge to the underlying confined Yorktown aquifer is generally restricted to the central “spine recharge” area of the peninsula. Some of the water that recharges near the center of the peninsula flows vertically through the water table aquifer and underlying confining units to recharge the confined aquifers. This downward flow component decreases with distance from the central recharge area. Ground water flow in the confined aquifers is also primarily horizontal, with some downward flow in the central peninsula and upward flow in coastal discharge areas.

Existing Environmental Conditions

The water supply plan may describe existing environmental conditions that affect instream flow, instream uses, and sources that provide the current supply. Although the Town of Chincoteague water supply relies on the sole source aquifer rather than stream intakes, certain land use and development activities on the mainland may affect the recharge and water quality of the water supply. Review of any changes in the area should consider the following:

- Threatened and Endangered Species
- Significant Fisheries
- State Scenic River Status
- Sites of Historical or Archeological Significance
- Unusual geology or soil types
- Wetlands
- Riparian Buffers and Conservation Easements
- Land Use and Impervious Coverage
- Impaired Streams and Rivers
- Point Source Discharges
- Potential Threats to Water Quality and Quantity
(Saltwater Intrusion, NASA, Recharge)

SECTION 4

Projected Water Demand

(9 VAC 25-780-100)

Estimates of populations in the Town of Chincoteague, and the water needed to serve them, are made in ten year increments from 2010 to 2040, thirty years into the future. Projections include considerations of both all sources of water. As discussed below, some of the projections are based on values and/or methodologies presented in the respective groundwater withdrawal permit applications.

Land Use History

With respect to the original Town's physical development, 1988 land use data indicated that 52% of Chincoteague's total area was devoted to residential development, 13% to commercial enterprise, 8% to industrial activity, 8% to public and semipublic uses, and 19% (97 acres) remained vacant. A large portion of the vacant land is situated on tracts, which have questionable development potential. In light of this fact, the Town had an extremely limited amount of vacant land suitable for future development.

Recent land use data for the area of the Island incorporated in 1989 reveals that exclusive of tidal waters (33.2 square miles), 14% of the area is devoted to residential development, uses, with 47% remaining vacant.

The intensity of development of the area is illustrated by the fact that based on its population estimate and land area of 8.8 square miles, the Town has an overall population density of 263 persons per square mile, or nearly five times the density of the county (generally 53.7 persons per square mile).

A large number of commercial businesses, many of them tourist related, are also located along the waterfront side of Main Street. The commercial businesses on the fast-land side of Main Street, within 3-4 blocks of the causeway, combine with the stores, shops, and seafood businesses on the waterfront to create Chincoteague's unique downtown area. This downtown area provides goods and services to local residents and tourists alike. It is also an important center for social and civic life in Town.

A second commercial area is located on Maddox Boulevard: the road to Assateague Island. Unlike the older Main Street shopping area, this shopping district is oriented more towards the automobile than the pedestrian and more toward the tourist than the year-round resident. Nearby motels and campgrounds strengthen the role of this area as an auto-oriented, seasonal tourist center.

Much of the remaining land on the Island is either in residential use or is vacant. Businesses and tourist facilities are scattered among some areas designated as "Residential" and many residents pursue secondary and even primary businesses out of their homes (home occupations). In addition many residential structures are located in areas zoned "Commercial." Several distinct residential neighborhoods have evolved in

Town. For example, three of the Town's seven churches are located among the homes around Church Street.

Service Area/Water System Plan

The Town of Chincoteague CWS serves all of Chincoteague Island plus one commercial user on Assateague Island (Wildlife Refuge). The estimated population of 4,324 was projected to the year 2040 planning horizon by developing an average population trend over the period between 1950 and 2002. The average trend indicates a linear growth rate of approximately 0.9 percent (38.62 inhabitants) per year which is fairly consistent with the countywide trend. Therefore, the projected population for the Town of Chincoteague is estimated to be 5,825 at the 2040 planning horizon.

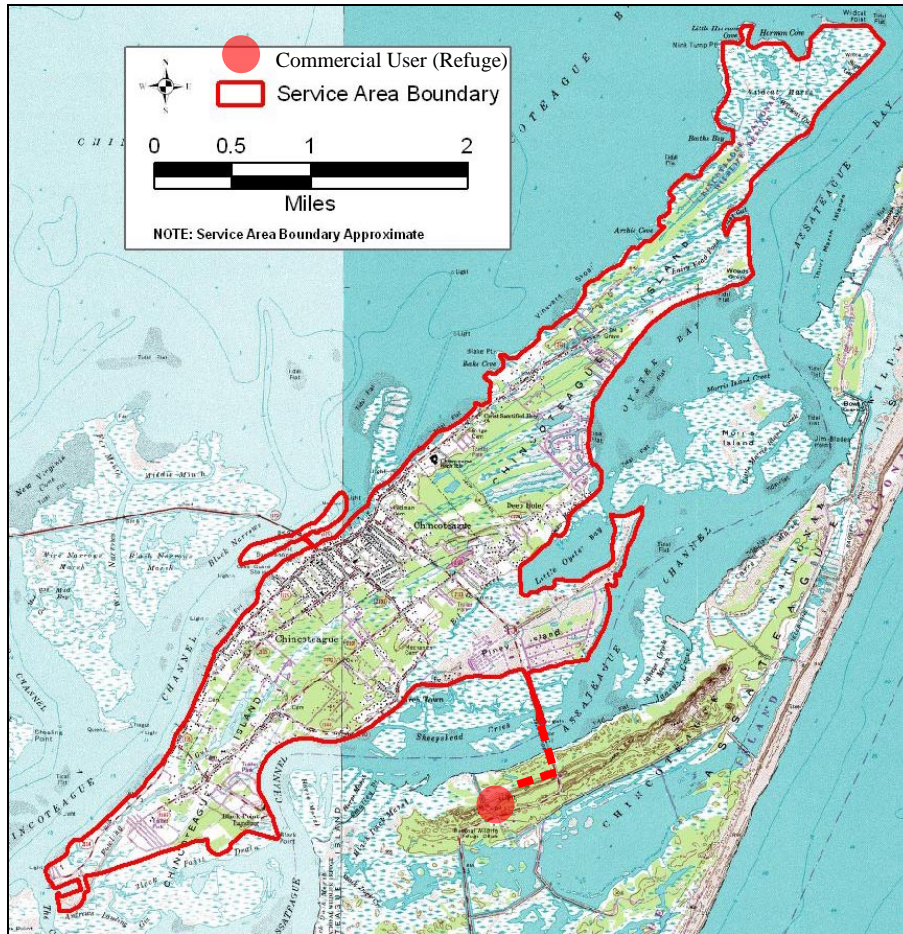


Figure 10: Town of Chincoteague Water Service Area

Average annual demand projections incorporate an increase of 1.86 million gallons per year and were based on a linear interpolation of historical data. Average annual demands were extrapolated from the requested amounts for 2015 and 2025 in the most recent groundwater withdrawal permit (256 MG and 285 MG, respectively).

Population Projections - 9 VAC 25-780-100A

Current population data is not yet available from the 2010 Census. Population projections based on the 2000 Census estimate of 4,324 have been influenced by the current economy and lack of regional employment growth to remain stable in recent years. For this reason, a straight line projection of average seasonal water demand was used in 2003 as the primary means of estimating future needs.

With the increasing importance of tourism, any population increase may be seasonal; part-year residents attracted to the Island's summer job market, weather, or cultural atmosphere. Further, new dwellings may take the form of manufactured homes, may be conversions of existing homes to apartments, or may be new hotels or townhouse type structures of higher density than existing homes on the Island. Given continued economic growth on the Island, hopefully, both the old downtown commercial area and the newer Maddox Boulevard area can continue to grow in future years, even though at a much slower rate than earlier projected.

The community continues to consider potential public sewer service to serve primarily commercial uses in a first phase and additional residential density in later phases. If this occurs during the planning period, additional study and revision may be required to water demand estimates to allow for increased restaurant, hotel, entertainment uses, and the potential for new and enlarged residential structures on Chincoteague Island. In the short term, the capacity of the public water system should be considered with any new development proposals.

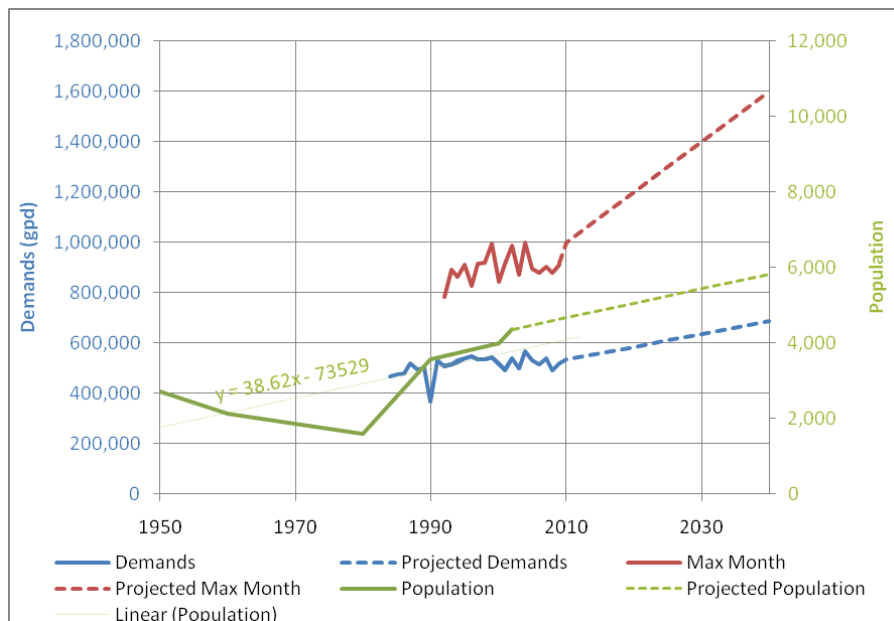


Figure 11: Town of Chincoteague Population and Water Demand Projections

Projected Water Demand - 9 VAC 25-780-100B, C, D1, and D2

Based on historical water usage delineated in the Town’s capital improvement program that was developed by Whitman, Requardt & Associates (WRA) and reconfirmed in the Town’s current application for a permit to withdraw ground water, projections for ground water withdrawals to the year 2050 using average increases of 1.86 Mg/year and 0.33 Mg/month are as follows:

YEAR	POPULATION	ANNUAL AVERAGE (MG)	PEAK MONTH (MG)
Projected Data			
2010	4,710	194.8	25.2
2020	5,052	213.4	28.5
2030	5,438	232.0	31.8
2040	5,825	250.6	35.1
2050	6,267	269.2	38.4

Table 6:
Town of Chincoteague Estimated Population and Demand Projections

These estimates can vary considerably due to the influence of factors such as:

- significant increases or decreases in population,
- a boom or bust in the building of new residences,
- the introduction of businesses or industries that would require large supplies of drinking water,
- the loss of large water consumers like motels, campgrounds or restaurants, and
- the future construction of a waste water treatment system

Projected Water Demand Disaggregated- 9 VAC 25-780-100D3

Note: Disaggregated projections of future water use and demand is not currently available. Water use data provided in Table 5 from the last 5 years does not indicate a trend or pattern that could be used to project individual user needs at this time.

This level of analysis should be included in the next regular update to the Town Water Master Plan. Annual review of existing water use should track sudden or significant changes in disaggregated categories of use.

Projection of Water Demand for Existing and Proposed Self-Supplied Nonagricultural Users >300,000 gallons per month - 9 VAC 25-780-100E

Not Applicable

Projection of Water Use for Existing and Projected Self-Supplied Agricultural Users >300,000 gallons per month - 9 VAC 25-780-100G

Not Applicable

Information Developed Pursuant to 9 VAC 25-780-140G - 9 VAC 25-780-100H

At this time, no information has been provided by the state via the State Water Resources Plan. When such information is made available to the region, it will be included to facilitate continuous water resources planning efforts.

Explanation of Projected Needs for Domestic Consumption, In-Stream Uses, and Economic Development - 9 VAC 25-780-100I

The linear projection of increased water demand is supported by the needs of new development and redevelopment of existing properties in particular. The realignment of Route 175 into Town along the Maddox Boulevard corridor has created a new focus for accommodating tourism in the #1 Beach Town in America (AOL Travel 2010). A Main Street Revitalization project and programmed activities at the Downtown Park have also encouraged reinvestment in the historic downtown. Continued incremental growth of residential use is anticipated to continue at recent average annual rates.

SECTION 5

WATER DEMAND MANAGEMENT

***Refer to 9 VAC 25-780-110**

Water demand management involves both an increase in the efficiency of water use and a reduction of water losses. The net result is a decrease in demand for treated water that can defer development of new resources and reduce the cost of future water service. Each gallon of water conserved is one less requiring storage, treatment, and distribution. It may also represent one less gallon that has to be heated for washing or bathing, thus saving energy costs, or that must pass through a wastewater conveyance system and treatment before it is returned to the environment.

Conservation is an important complement to new supply sources. In some cases, conservation may eliminate the need for new sources of supply. Fresh water, like other natural resources, is a limited commodity which must be managed wisely to preserve the well-being of future generations. Efforts to conserve existing supplies and efficient allocation of water resources are important during each stage of the water supply planning process.

The Town of Chincoteague's current Groundwater Withdrawal Permit application includes a draft Water Conservation and Management Plan (WCMP). The WCMP is included as an enforceable part of the permit to withdraw groundwater. Because groundwater is the sole source of water for public, commercial, and a majority of the industrial water supplies in Accomack County, the WCMPs that are part of the Groundwater Withdrawal Permit fulfill the Water Demand Management requirement under this section.

An approved WCMP must include:

- Use of water-saving plumbing and processes including, where appropriate, the use of water-saving fixtures in new and renovated plumbing as provided under the Uniform Statewide Building Code (USBC).
- A water loss reduction program.
- A water use education program.
- An evaluation of potential water reuse options.

There are also requirements for mandatory use reductions during water shortage emergencies, including, where appropriate, ordinances prohibiting the waste of water generally.

The Chincoteague WCMP is included in this plan as Appendix A

Information Describing More Efficient Water Use Practices - 9 VAC 25-780-110A.1

Water Saving Equipment and Processes

The Building Officials and Code Administrators (BOCA) organization is a nonprofit organization which develops a series of performance-oriented model codes (BOCA, 1990). These codes were adopted by the Commonwealth of Virginia as part of the

Virginia Uniform Statewide Building Code (USBC, 2006). These codes directly specify the use of water conservation fixtures in commercial and residential applications.

The USBC applies to all new construction and some remodeling of existing structures. The USBC requires that:

When reconstruction, renovation, or repair of existing buildings is undertaken, existing materials and equipment may be replaced with materials and equipment of similar kind or replaced with greater capacity equipment in the same location when not considered a hazard; however, when new systems, materials, and equipment that were not part of the original existing building are added, the new systems, materials, and equipment shall be subject to the edition of the USBC in effect at the time of their installation. Existing parts of such buildings not being reconstructed, renovated, or repaired need not be brought into compliance with the current edition of the USBC.

Information Describing Water Conservation Measures - 9 VAC 25-780-110A.2

Water Use Education Program

Public education concerning the importance of water conservation is a key factor in reducing excessive water use. Education programs will include information about how drinking water is produced and why it is important to conserve. Providing consumers with a better understanding of the reasons conservation is necessary allows them to better appreciate and participate in conservation activities.

Information Describing Practices to Reduce Unaccounted for Water Loss - 9 VAC 25-780-110A.3

Water Loss Audit

Annually a simplified water loss audit will be conducted to determine the volume and nature of lost and unaccounted-for water within the water supply system. The purpose of this audit is to identify sources of demand, such as those below, that would normally escape detection by the metering system and recommend methods for loss reduction.

- Fire Fighting.
- Main Flushing.
- Theft.
- Main Breaks.
- Tank Drainage.
- Unmetered Services.
- Leaks.
- Meter Errors.
- Equipment Calibration.

Leak Repair Program

The owner of any residential unit, commercial establishment, or industrial establishment who is found, based on the water loss audit or by other methods, to be an excessive user of water due to leakage from water lines or plumbing fixtures on the premises will be notified by the Town. These owners will be required to repair and stop such leakage within a reasonable period of time or will be subject to financial penalties.

Current Conservation Practices, Techniques, and Technologies - 9 VAC 25-780-110B

The Town of Chincoteague has adopted basic elements of water conservation management planning that address the following:

- *Town Code Section 62 standards regarding curtailed water use during shortages;*
- *Billing practices that result in more efficient use of water;*
- *Adoption and enforcement of the Virginia Uniform Statewide Building Code that requires the use of lowwater use fixtures in all new construction;*
- *Adopted Town procedures for water use data collection;*
- *Annual Water Quality Report sent to all Town residents for public education;*
- *Adopted Waterworks Operations & Maintenance Manual;*
- *Policies about clear responsibility for construction and extension of the water system, and*
- *Maintenance of the water system to identify and minimize unaccounted water loss.*

A proposed Water Conservation Management Plan has been included with the current DEQ groundwater withdrawal permit application.

Drought Response and Contingency Plan - 9 VAC 25-780-120.1

In accordance with Water Supply Planning Regulations, Section 9 VAC 25-780-120, the following discussion presents a Drought Response and Contingency Plan (DRCP) that has been prepared for Accomack County to be included as a component of the Water Supply Plan (WSP) for the Town of Chincoteague.

A drought is a period of unusually dry weather, including lower than normal levels of precipitation, which persists long enough to cause serious problems such as water supply shortages and/or crop damage. The present DRCP is focused on identifying drought conditions and implementing appropriate responses in order to maintain adequate water supplies in Accomack County. The successful response to drought conditions in the Planning Region largely depends upon public education and involvement.

The DRCP outlines a regional approach to responding to drought, while recognizing that drought conditions will vary across the County, and specific response and contingency actions will be made based on local conditions. The plan recognizes the unique characteristics of water sources within the region, as well as the beneficial uses of the water.

The DRCP includes four graduated stages of responses to the onset of drought conditions within the Planning Area:

DRCP STAGE	VDEQ DROUGHT MONITOR CONDITIONS	CONDITIONS	MAJOR RESPONSE
■ Normal Conditions	--	Normal Conditions	--
	D0	Abnormally dry (short-term)	
■ Drought Watch	D1	Moderate Drought	Public awareness campaign
■ Drought Warning	D2	Severe Drought	Voluntary restrictions
■ Drought Emergency	D3	Extreme Drought	Mandatory restrictions
	D4	Exceptional Drought	

The plan is based on enacted local ordinances and procedures for the implementation and enforcement of the plan, in accordance with 9 VAC 25-780-120.3. Furthermore, the DRCP acknowledges the role of the Commonwealth in monitoring and responding to drought conditions as outlined in the Virginia Drought Assessment and Response Plan, dated March 28, 2003, while reserving the right to respond to those conditions and enforce the actions presented in this plan based on local conditions and local procedures.

A drought condition may be localized and it would be preferable to provide the flexibility to discrete community water supply systems that local groundwater water levels may be used as indicators of local drought conditions and severity for each system or portions of the County including the Town of Chincoteague. The recommended indicator of a drought emergency for a community groundwater water supply system is either a water level less than 5 ft above the intake or 80 percent of available drawdown in a production well field. For systems where production well water level measurements are impracticable, a nearby observation well may also be used.

The Town of Chincoteague will coordinate with regional approaches to Drought Response and has adopted the following section of the Town Code that describes actions to be taken during periods of drought and severe water shortages.

DIVISION 4. WATER USAGE PLAN

Sec. 62-116. Normal operation.

The town's water supply and distribution system shall be operated by a qualified operator and division supervisor under the purview of the director of public works and town manager. The supervisor/operator shall report routine operations and daily water usage to the director of public works and town manager. The town manager shall further advise the public works committee of the town council and the mayor.

(Code 1977, § 15-5-1; Ord. of 4-5-1999, § 15-5-1)

Sec. 62-117. Water shortages.

For the purposes of this division, categories of water shortages shall be as follows:

(1) Category I: major water leaks or mechanical failures. If a major leak or mechanical failure occurs, repairs shall be immediately initiated by the department, and the town manager shall immediately be notified of such. In conjunction with the town manager and public works committee chair, the waterworks supervisor and the director of public works shall determine if a water shortage will occur as a result of the leak or mechanical failure.

(2) Category II: serious water shortage. If, through department review, a serious water shortage will occur, the town manager shall be immediately notified. After consultation with the mayor and public works committee chair, a public announcement shall be made to curtail car washing, lawn watering, garden watering, and usage by swimming pools and other recreational facilities, all on a voluntary basis.

(3) Category III: critical water shortage. In critical water shortages the public announcement shall curtail the water usage as provided in subsection (2) of this section and additionally restrict the use by motels, hotels, tourist homes, campgrounds, trailer parks and all commercial establishments. Such establishments shall be required to notify their customers and restrict water usage for bathing and

CHINCOTEAGUE CODE

CD62:10

other purposes to a bare minimum. Restaurants and food service establishments will provide water to customers only when requested. All curtailments during the critical water shortage will be mandatory. During critical water shortages a moratorium shall be placed on all new water service connections.

(Code 1977, § 15-5-2; Ord. of 4-5-1999, § 15-5-2)

Sec. 62-118. Public announcements.

All announcements of water shortage shall be made through local radio stations or through the town's EOC established procedures. Announcements shall establish restrictions and assign an effective date for restrictions. Restrictions shall not be removed until so announced by radio.

(Code 1977, § 15-5-3; Ord. of 4-5-1999, § 15-5-3)

Sec. 62-119. Enforcement.

The town police and/or special police shall issue tickets to violators of subsection 62-117(3). Upon conviction, a violator shall be guilty of a class 4 misdemeanor, and each incident shall be considered a separate offense.

(Code 1977, § 15-5-4; Ord. of 4-5-1999, § 15-5-4)

The purpose of this DRCP is to provide a contingency plan to:

- Manage the use of water resources for the Town of Chincoteague in the event of drought conditions or other water supply emergencies,
- Establish an enforceable programmed response for each drought stage that will reduce water consumption with the least adverse impact on the residents and businesses of Chincoteague
- Respond to non-climate related water supply emergencies, such as contamination or equipment failure, which may result in the need to restrict water use until water service can be restored.

As a contingency in the event of sudden contamination or failure of the community water system, the Town enjoys a mutually beneficial relationship with NASA in which the two water systems are connected with a cut-off valve and backflow prevention device. The connection is used only in an instance of a catastrophic loss of water supply to the Town.

SECTION 6

STATEMENT OF NEED AND ALTERNATIVES

***Refer to 9 VAC 25-780-130**

This purpose of this section is to review the research generated by this plan to determine the adequacy of the existing water sources and whether they meet current demand. Further, this section will utilize the projected water demand data to determine which systems may need additional capacity to meet future demand

Statement of Need - 9 VAC 25-780-130A

Within the Town of Chincoteague, the ground water quality of the Columbia Aquifer and the Yorktown-Eastover Aquifers is degraded due to contamination by septic systems and brackish water intrusion. Therefore, development of wells on the Island is not feasible because of costly advanced treatment. The Town obtains its water from a well field that is located approximately 5 miles inland, at the Wallops Island NASA facility.

The Town of Chincoteague operates a potable water system with a capacity rated by the Virginia Department of Health (VDH) of 1.0 MGD based on the capacity of the existing iron treatment system under permit # 3001175. The Virginia Department of Environmental Quality (DEQ) has issued a permit to withdraw ground water at a rate of 1.34 million gallons per day (mgd) under permit # ES-061. DEQ is in the process of revising the Town's permit. The revised permit will limit withdrawals to a maximum annual pumpage amount, with a month of maximum use.

The Town's primary wells include #3A, 3B, and 3C which are screened in the Columbia Aquifer; wells 5, 6, and 8 that are screened in the Middle Yorktown-Eastover Aquifer. Wells 7A, and 7B are currently not in operation and are screened in the Upper Yorktown-Eastover Aquifer. During the summer months, the system is often operated at capacity and any problems with the production wells, or the storage system, have the potential to result in water shortages. The combination of Town staff management of the groundwater supply by utilizing pumping combinations from different aquifers, and the seasonal nature of peak demand versus non-peak recharge, has allowed for consistent and sustained use and water quality of the groundwater resource.

The Engineering Description Sheet of the Chincoteague Waterworks prepared for VDH (April 18, 2008) provides an indication of limits within the community water system that will require potential improvements in order to meet future demand including potential need for new well or pump capacity, treatment system capacity, storage capacity or improvements to the conveyance, distribution and metering system.

Additional groundwater resources will be needed over the historical amount to meet projected demands up to the year 2040. Analysis completed by the Town's consultant, WR&A (August 2004), includes recommendations for incremental increases in groundwater withdrawal through the development of new wells and supporting infrastructure.



**GROUND WATER WITHDRAWAL PERMIT APPLICATION
SUGGESTED WITHDRAW REQUEST FOR 2015/2025
CALCULATIONS**

Based on Figure III – 1 from October 2003 Master Plan		Based on 2015 Projections		Based on 2025 Project
*Summer Maximum Day Demand (Projected)		1.5 mgd		1.8 mgd
Month of Maximum Use (using max day demand)		45 mg/mn. (1.5 mgd x 30 days/mn)		54 mg/mn (1.8 mgd x 30 days/mn)
*Summer Average Day Demand (Projected)		1.1 mgd		1.3 mgd
Month of Maximum Use (using summer average day demand)		33mg/mn (1.1 mgd x 30 days/mn)		39 mg/mn (1.3 x 30 days/mn)
*Annual Average Day Demands (Historically 60% of summer average - from Fig. 2 – Demand Projections Memorandum in CIP Appendix)		0.70 mgd (0.60 x 1.1 mgd)		0.78 mgd (0.60 x 1.3)
*Annual Withdraw (million gallons/year)		256 mg/year (0.70 mgd x 365 days)		285 mg/year (0.78 mgd x 365)
Current application Look at Ratios -34/219 = 15.5% Proposed 45/255 = 17.6% (2015) Proposed 54/285 = 18.9% (2025)				

Mgd = million gallons per day
Mg = million gallons
Mn – month

Range of request for month of maximum use 39 to 54 mg/m.
Range of request for annual average day 256 to 285 mg/year.

**Table 7:
Town of Chincoteague Estimated Groundwater Needs**

Analysis of Alternatives - 9 VAC 25-780-130B

Projected water use after the year 2015 is expected to be greater than the Town is currently capable of supplying, therefore several possible alternative water sources have been considered in the Town of Chincoteague Water Master Plan:

1. Identify, test and develop up to three new wells in the Town's easement at NASA, expand water system infrastructure through a proposed Capital Improvements Program;
2. Purchase of additional raw water supply from NASA (or other mainland water source) and delivery of the same through an existing protected cross-connection of the two systems.
3. Expand existing groundwater treatment system to compensate for potential increase in brackish water intrusion in the Yorktown-Eastover Aquifer, or degradation of water quality in the Columbia Aquifer from increased pumping of existing wells;
4. Replace or supplement the current groundwater supply with a deep well (approximately 600') into a slightly brackish aquifer under Chincoteague Island with construction of a Town deslination facility;

Consideration of the proposed alternatives for expanding the Town of Chincoteague community water supply system will also include short term improvements such as:

- Sytematic replacement of water meters to reduce water losses and unbilled water use
- Regular inspection and repair of all water system components to improve efficiency and reduce water loss
- Increase storage capacity to mitigate peak day demands and improve system water pressures
- Continue to evaluate the balanced use of the Columbia Aquifer to maximize use of the groundwater source with the highest natural recharge rate

Appendices

- A. Water Conservation Management Plan
- B. Public Hearing Record