2. Existing Water Sources
(9 VAC 25-780-70)

This section summarizes water source information for Accomack County, and provides more detailed descriptions of water source information within each of the jurisdictions, in accordance with 9 VAC 25-780-70. The Eastern Shore peninsula contains no major streams or other surface water supplies capable of acting as a potable water supply; therefore, ground water is the primary resource for water needs in Accomack County. This section provides available well information for Community Water Systems and large self-supplied non-agricultural users, as well as a list of large agricultural users, and an estimate of the population served by individual wells using less than 300,000 gallons per month.

2.1. Community Water Systems

A Community Water System 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 Accomack County, the following Community Water Systems utilize groundwater to supply their residents:

- Arcadia Nursing Center
- Captains Cove Subdivision
- Town of Chincoteague
- NASA Wallops Island Flight Center
- Town of Onancock
- Town of Parksley
- Rolling Acres Subdivision
- Shore Life Care at Parksley
- Town of Tangier
- Trails End Utility
- Triangle Enterprises Mobile Home Park

Groundwater well details (i.e. Well ID, depth, casing and screen depth) are provided in Appendix A. In some cases, specific well information was not readily available after reasonable search and is therefore listed as N/A in the tables in Appendix A. The locations of these Community Water Systems are shown on Figure 2-1. Table 2-1, below, summarizes the VDEQ permitted annual and maximum monthly withdrawals, as well as the VDH permitted capacities of the Community Water Systems in the County.

Table 2-1:
Accomack County CWS: Permitted Withdrawals

Water System Name	VDEQ Permitted Withdrawals		VDH Design Capacity (GPD)
	Total Annual Withdrawal (MG)	Max. Monthly Withdrawal (MG)	
ARCADIA NURSING CENTER[2]			10,052
CAPTAINS COVE SUBDIVISION	65.00 [1]	12.00 [1]	226,080
CHINCOTEAGUE, TOWN OF	219.40 [1]	34.1 [1]	1,000,000
NASA WALLOPS FLIGHT CENTER	13.30	3.94	700,000
ONANCOCK, TOWN OF	80.62	8.08	377,600
PARKSLEY, TOWN OF	32.80 [1]	4.00 [1]	182,000
ROLLING ACRES SUBDIVISION[2]			17,333
SHORE LIFE CARE AT PARKSLEY	6.80	0.80	29,315
TANGIER, TOWN OF[2]			130,000
TRAILS END	15.70	2.60	122,800
TRIANGLE ENTERPRISES MHP	9.70	1.20	17,400

[1] Permit amounts are based on amounts requested in Permit Application

[2] No VDEQ Groundwater Withdrawal Permit

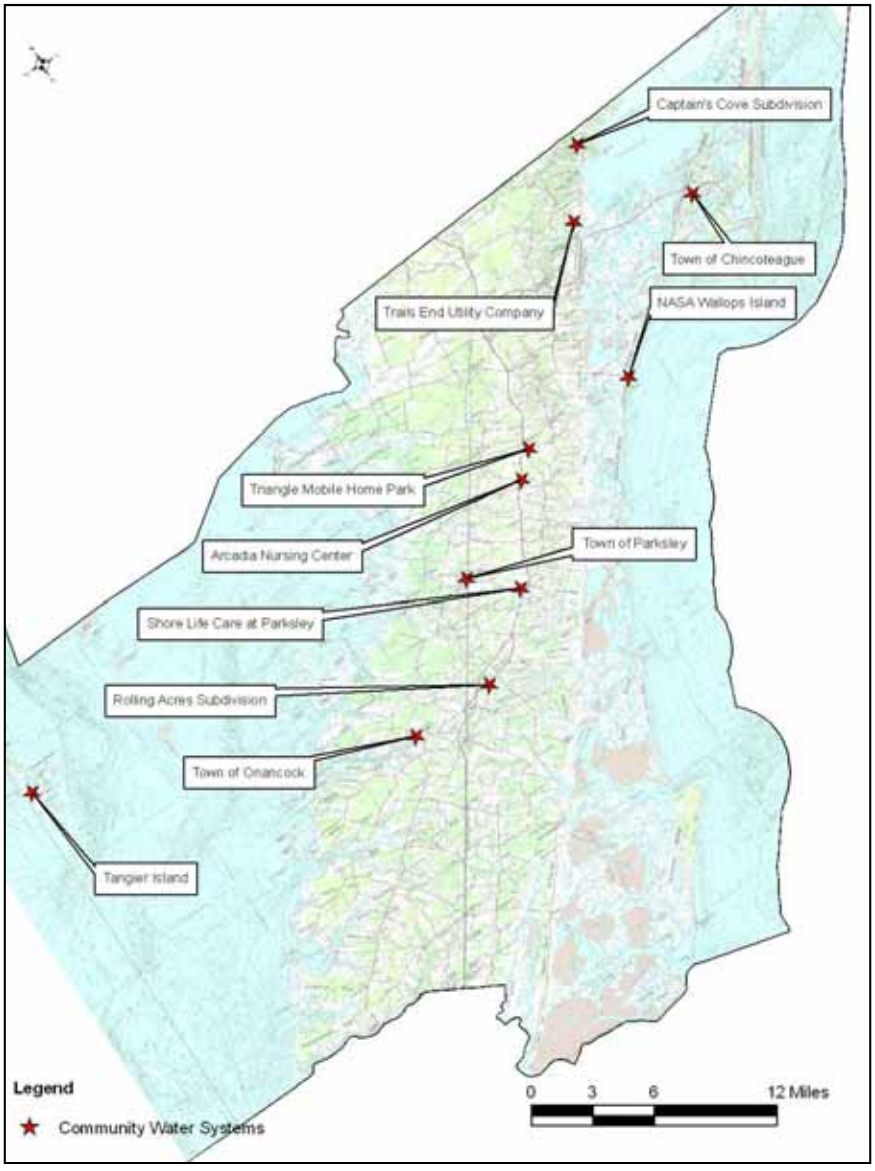
2.2. Purchased Water Source

No community water systems in Accomack County purchase water from outside of the County. Availability of water for community purchase outside of the County region was not evaluated as part of this water supply plan because the primary source of water in the County is groundwater, which typically serves the population in the immediate area.

2.3. 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. The following sections provide information regarding the large self-supplied users in Accomack County. The majority of large self-supplied users in the County use groundwater as their primary source, however some agricultural users utilize surface water sources.

Figure 2-1: Community Water Systems in Accomack County



2.3.1. Non-Agricultural Large Self-Supplied Users

All non-agricultural large self-supplied users in Accomack County utilize groundwater as their primary source. The six large non-agricultural self supplied users of more than 300,000 gallons of groundwater per month that were identified in the County are as follows:

- Commonwealth Chesapeake Power Station
- Eastern Shore Yacht and Country Club
- Integrated Fisheries International Limited
- KMX Chemical Corporation
- Perdue
- Tyson Foods Incorporated

Groundwater well details (i.e. Well ID, depth, casing and screen depth) are provided in Appendix B. In some cases, specific well information was not readily available after reasonable search and is therefore listed as N/A in the tables in Appendix B. Table 2-2 summarizes the VDEQ permitted annual and maximum monthly withdrawals, as well as the VDH permitted capacities for the large, non-agricultural self-supplied users of groundwater in the County.

Table 2-2:
Non-Agricultural Large Self-Supplied Users: Permitted Withdrawals

Water System and Well Name	VDEQ Permitted Withdrawals		VDH Design Capacity (GPD)
	Total Annual Withdrawal (MG)	Max. Monthly Withdrawal (MG)	
Commonwealth Chesapeake Power Station[1]	61.40	10.80	
Eastern Shore Yacht and Country Club	25.00	6.50	
Integrated Fisheries International Limited	95.00	10.50	
KMX Chemical Corporation	76.44	8.77	
Perdue*	700.00	78.00~~73~~	
Tyson Foods Incorporated*[2]	675.00	46.00	1,584,000

[1] No VDH Permit
*[2]Annual and monthly amounts are requested, final permits pending

2.3.2. Agricultural Large Self Supplied Users

Agriculture is the dominant land use in Accomack County, and groundwater is the primary source of irrigation for crops, nurseries and livestock operations. In some cases, groundwater is used to refill irrigation ponds. Some agricultural users utilize surface water for irrigation purposes, and both use types will be discussed in the following sections.

2.3.2.1. Groundwater Sources

A total of 43 large agricultural self-supplied users were identified in the County that use more than 300,000 gallons per month of groundwater for irrigation. Table 2-3 lists the large agricultural groundwater users in the County, as well as the annual and monthly permitted withdrawal amounts for each user. As shown in this table, the total permitted agricultural groundwater use in the County is 1.4 billion gallons (BG) per year.

Table 2-3.
Large Self-Supplied Agricultural Users of Groundwater

	Annual Permitted Withdrawal (gallons)	Monthly Permitted Withdrawal (gallons)
FACILITY/SYSTEM NAME		
AL Mathews	41,904,000	14,142,000
Ames Farm	65,000,000	16,250,000
Bethel Church	32,400,000	16,200,000
Bobtown Nursery	10,900,000	4,000,000
Bowen Farm	42,620,000	16,000,000
Broadleaf Farms	3,700,000	1,000,000
Byrd Farm	22,650,000	9,910,000
Christian/Ames Farm	56,091,000	21,034,125
David Van Dessel Farm	4,500,000	1,200,000
Dennis Azaleas	2,700,000	500,000
Dennis Nursery	5,000,000	900,000
Drummond Farm	31,000,000	11,000,000
East Coast Brokers and Packers	13,500,000	2,400,000
Ed Goin	34,320,000	11,583,000
Evans or Oaks Farm	120,072,000	26,568,000
Gillespe Farm	28,000,000	12,500,000
Gunter Farm	12,500,000	6,300,000
Hagan Farm	17,000,000	5,700,000
Hickory Hill	34,560,000	17,280,000
Hogneck Farm	13,000,000	5,500,000
Home Farm	8,400,000	6,500,000
James Farm	54,000,000	7,900,000
Kelley Farm	30,124,000	14,300,000
Lang	51,840,000	12,960,000
Lewis Farm	24,300,000	11,500,000
Liberty Hall Farm	4,400,000	1,000,000
Mathews Farm	10,900,000	3,114,290
Melfa Farm	30,360,000	11,400,000
Middleton Farm	185,000,000	37,000,000
Mutton Hunk Fen Natural Area Preserve	40,340,000	19,100,000
Northam Somers	37,800,000	11,812,500
Painter Farm	18,400,000	8,520,000
Peach Orchard	42,600,000	8,520,000

Rew Farm	49,000,000	16,300,000
Robert Van Dessel Farm	3,400,000	900,000
Simpson Farm	21,517,000	10,193,000
Sommers Farm	24,300,000	11,500,000
Sterling	93,060,000	44,080,000
~~Tidewater Growers~~	~~1,800,000~~	~~600,000~~
Weaver Farm	32,900,000	11,000,000
Wes Powers	20,160,000	5,040,000
Wessells Farm	21,517,000	10,193,000
Wessells/ Watkinson Farm	13,500,000	3,375,000
Total Permitted Withdrawals (MG)	**1,411.04**	**466.77**

2.3.2.2. Surface Water Sources

A number of farms and nurseries in the County utilize surface water sources such as ponds for irrigation. While these withdrawals are not permitted by the state, they are required to report their surface water withdrawals. Table 2-4 lists the large agricultural self-supplied users of surface water in the County, as well as the average annual reported use between 2001 and 2006.

Table 2-4.
Large Self-Supplied Agricultural Users of Surface Water

User Name	Average Annual Use (MG)
AL WESSELLS\BOB WATKINSON	14.01
BOBTOWN NURSERY	41.48
DUBLIN FARMS INC	506.00
EASTERN SHORE AGR. EXP. STN.	0.91
ED GOIN	32.04
F.A. HOLLAND & SONS	40.88
GODWIN'S NURSERY/PENINSULA PRO	0.35
GREEN ACRES FARMS	9.50
JOHN H DUER III	151.20
KELLEY FARM	21.98
KLUIS' NURSERIES	8.11
MATTHEWS FARM	21.74
NOCK FARM	5.47
PEACH ORCHARD FARM	12.50
STURGIS FARM	56.19
VAN KESTEREN FARMS INC	139.85
W.T. HOLLAND SONS INC	33.56
WEAVER FARM	28.12
WESSELLS FARM	11.59

2.4. Small Self-Supplied Users

The Water Supply Planning regulations require that "a water plan shall include an estimate of the number of residents and business that are self-supplied by individual wells withdrawing less than 300,000 gallons per month and an estimate of the population served by individual wells" (9 VAC 25-780-70.J).

The estimate of small self-supplied residential users is 30,006 persons. This estimate was developed by subtracting total population served by the Community Water Systems (see Section 3.0 below) from the estimated 2010 population in Accomack County (as reported in the Accomack County Comprehensive Plan, Page 3-7, forecast based on "trend plus" rate):

County Population	–	CWS Population Served	=	Population served by individual wells
(39,630	–	9,624	=	30,006 persons)

For planning purposes, it was assumed than an average of 2.5 persons occupy a residence (Accomack County Comprehensive Plan, page 3-20); therefore, based on a population served of 9,189 persons, there are an estimated 12,002 small, self supplied residential wells.

Estimating the number of businesses that are self-supplied by groundwater in the County is a bit more difficult. A review of the VDH groundwater permit holders in the County showed that a total of 25 non-transient, non-community small users and 53 transient non-community small users rely on groundwater as their primary water source. Tables 2-5 and 2-6 contain a list of the transient and non-transient small self-supplied businesses, respectively, along with the population served and the water system ID number.

Table 2-5:
Small Self-Supplied Groundwater Users and Population Served
(Transient, Non-Community)

	No. of Service Connections	Service Area Population
WATER SYSTEM NAME		
ACCOMAC AREA HEADQUARTERS	40	VA3001001
ACCOMAC RESIDENCY OFFICE	36	VA3001030
AMERICA`S BEST VALUE INN (ONLEY)	103	VA3001034
BURGER KING (ONLEY)	300	VA3001059
CAPTAIN`S QUARTERS	50	VA3001103
CLINTON SUMMER MLC	28	VA3001075
COMFORT INN	175	VA3001178
EAST COAST BROKERS & PACKERS	296	VA3001551
EASTERN SHORE MOTEL	30	VA3001631
EASTERN SHORE PUBLIC LIBRARY	300	VA3001211

WATER SYSTEM NAME	No. of Service Connections	Service Area Population
ECBP PACKING HOUSE MLC	120	VA3001651
ELKS LODGE #1766	400	VA3001043
EXMORE MOOSE #683	360	VA3001432
FRED HALL MLC	45	VA3001077
ISLAND HOUSE RESTAURANT	200	VA3001892
KELLY MLC	160	VA3001074
KUZZENS (AMES FARM COMPLEX QUAD 1)	80	VA3001400
KUZZENS (AMES FARM COMPLEX QUAD 2)	80	VA3001401
KUZZENS (AMES FARM COMPLEX QUAD 3)	28	VA3001402
KUZZENS (AMES FARM COMPLEX QUAD 4)	28	VA3001403
KUZZENS PACKING INC	150	VA3001796
LAKEVIEW MLC	70	VA3001702
LITTLE ACRES CAMPGROUND	25	VA3001040
MAPPSVILLE MLC	100	VA3001078
MCDONALDS (ONLEY)	500	VA3001430
NEW CHURCH INFORMATION CENTER	504	VA3001550
OCCOHANNOCK ON THE BAY	100	VA3001588
OCEANWAY MARKET	500	VA3001611
PARKSLEY FAMILY RESTAURANT	50	VA3001776
PEERLESS VIRGINIA (SOMERS FARM MLC)	60	VA3001789
PIZZA HUT (OAK HALL)	350	VA3001715
RAYS SHANTY	96	VA3001010
RICK HALL (JUDGE GUNTER HOUSE MLC)	40	VA3001731
SAGE DINER	184	VA3001720
SHORE SEAFOOD	30	VA3001054
SHUCKER`S ROADHOUSE	250	VA3001880
STUCKEYS (MAPPSVILLE)	50	VA3001810
SUBWAY (OAK HALL)	50	VA3001053
SUNRISE BAR & GRILL	100	VA3001717
TALL PINES CAMPGROUND	100	VA3001820
TAMMY & JOHNNYS	54	VA3001830
TAYLOR & FULTON (PACKING HOUSE)	250	VA3001837
TAYLOR & FULTON (TASLEY MLC)	70	VA3001862
TEMPERANCEVILLE AREA HQ	40	VA3001850
T`S CORNER	500	VA3001885
VIRGINIA LANDING	630	VA3001600
WACHAPREAGUE MOTEL	35	VA3001894
WATKINSON EAST MLC	104	VA3001081
WATKINSON WEST MLC	38	VA3001082
WATTSVILLE MALONE MLC	50	VA3001076
WENDY`S (ONLEY)	88	VA3001895
WHISPERING PINES MOTEL	100	VA3001970
WRIGHTS SEAFOOD RESTAURANT	325	VA3001980

Table 2-6:
Small Self-Supplied Groundwater Users and Population Served
(Non-Transient, Non-Community)

	No. of Service Connections	Service Area Population
WATER SYSTEM NAME		
ACCAWMACKE ELEMENTARY SCHOOL	634	VA3001791
ACCOMACK COUNTY HEALTH DEPT	95	VA3001003
ACCOMACK COUNTY INDUSTRIAL PK	92	VA3001006
ACCOMACK COUNTY OFFICE BUILDINGS	400	VA3001004
ACCOMACK NORTHAMPTON ELECTRIC COOPERATIVE	35	VA3001014
ACCOMACK SOCIAL SERVICES	170	VA3001018
ARCADIA SCHOOLS	1600	VA3001015
ATLANTIC COMMUNITY HEALTH CENTER	40	VA3001036
BOJANGLE`S (ONLEY)	38	VA3001065
CHESAPEAKE SQUARE	60	VA3001150
EASTERN SHORE COMM COLLEGE	890	VA3001212
EASTERN SHORE FAMILY YMCA	385	VA3001982
FOUR CORNERS PLAZA NORTH	50	VA3001739
FOUR CORNERS PLAZA SOUTH	100	VA3001650
FRESH PRIDE	25	VA3001290
HEAD START - ACCOMAC	350	VA3001331
KEGOTANK ELEMENTARY SCHOOL	635	VA3001560
NANDUA SCHOOLS	1500	VA3001488
OAK HALL SHOPPING CENTER	90	VA3001575
ONLEY COMMUNITY HEALTH CENTER	75	VA3001625
ONLEY PRESCHOOL	53	VA3001428
PARKSLEY MIGRANT HEAD START	200	VA3001658
PEEBLES DEPT STORE	35	VA3001690
PUNGOTEAGUE ELEMENTARY SCHOOL	610	VA3001790
ST PAUL`S DAY CARE CENTER	120	VA3001210

2.5. Source Water Assessment Plans or Wellhead Protection Programs

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, the two 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).

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3. Existing Water Use
(9 VAC 25-780-80)

This section will describe the existing water use in Accomack County, 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.

3.1. 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
- Number of connections within CWS service area
- Average and maximum daily withdrawal for each CWS
- The amount of water used within the CWS service area on an average annual basis and on an average monthly basis
- The peak daily use by month
- Disaggregated estimates of water use by different user types (i.e. residential, commercial institutional and light industrial, heavy industrial, etc).

Table 3-1 contains the population and current number of service connections within the service area of each CWS, as reported by VDH. The total population served by

Community Water Systems in Accomack County is 9,624 across 8,468 service connections.

Table 3-1.
Community Water System Service Area Connections and Population

	No. of Service Connections	Service Area Population
WATER SYSTEM NAME		
ARCADIA NURSING CENTER	2	92
CAPTAINS COVE SUBDIVISION	635	720
CHINCOTEAGUE, TOWN OF	3255	3500
NASA WALLOPS FLIGHT CENTER	250	1625
ONANCOCK, TOWN OF	720	1525
PARKSLEY, TOWN OF	483	925
ROLLING ACRES SUBDIVISION	38	170
SHORE LIFE CARE AT PARKSLEY	1	150
TANGIER, TOWN OF	324	650
TRAILS END	2680	115
TRIANGLE ENTERPRISES MHP	80	152
Total:	**8468**	**9624**

Historical use for Community Water Systems was extracted from several sources. Total annual use (MG), average daily use and average monthly use was calculated for use reported to the VDEQ between 2003 and 2009 for the following CWS:

- NASA Wallops Island Flight Center
- Town of Onancock
- Trails End Utility Company

Tables 3-2, 3-3 and 3-4 present the total annual use, average daily use, and average monthly use, respectively.

Table 3-2:
VDEQ-Reported Total Annual Use (MG): CWS

	2003	2004	2005	2006	2007	2008	2009
Community Water Systems							
NASA Wallops Island Flight Center	45.39	13.03	14.41	9.97	9.11	8.33	8.58
Onancock, Town of	62.54	59.11	50.42	47.04	50.44	44.33	34.18
Trails End	15.70	16.45	18.59	19.88	21.17	21.77	18.36

Table 3-3:
VDEQ-Reported Average Daily Use (MGD): CWS

	2003	2004	2005	2006	2007	2008	2009
Community Water Systems							
NASA Wallops Island Flight Center	0.124	0.036	0.039	0.027	0.025	0.023	0.023
Onancock, Town of	0.171	0.162	0.138	0.129	0.138	0.121	0.094
Trails End	0.043	0.045	0.051	0.054	0.058	0.060	0.050

Table 3-4:
VDEQ-Reported Average Monthly Use (MG): CWS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Community Water Systems												
NASA Wallops Island Flight Center	1.58	1.43	1.33	1.31	1.49	1.63	1.62	1.83	1.29	1.56	1.64	1.77
Onancock, Town of	1.15	0.98	1.10	1.07	1.21	1.17	1.37	1.28	1.16	1.11	1.02	1.07
Trails End	0.28	0.31	0.36	0.46	0.63	0.76	0.88	0.71	0.71	0.51	0.38	0.28

Recent VDEQ water use records were not available for the following Community Water Systems in Accomack County:

- Arcadia Nursing Center
- Captain's Cove Subdivision
- Town of Chincoteague
- Town of Parksley
- Shore Life Care at Parksley
- Triangle Enterprises Mobile Home Park

Historic VDH water use records were available for these systems, and were used to calculate total annual use, average daily use and average monthly use (see Tables 3-5 though 3-16).

3.1.1. Arcadia Nursing Center

VDH monthly water use records were available for 2000 – 2002. The total average annual use over this time period was 3.22 MG per year, with an average daily withdrawal of 0.009 MGD (Table 3-5). The average monthly use is presented in Table 3-6, which shows a maximum monthly withdrawal of 0.524 MG in the month of July.

Table 3-5:
VDH-Reported Total Annual and Average Daily Use: Arcadia Nursing Center

	2000	2001	2002	Average
Total Annual Use (MG)	3.36	3.37	2.95	**3.22**
Average Daily Use (MGD)	0.009	0.009	0.008	**0.009**

Table 3-6:
VDH-Reported Average Monthly Use (MG): Arcadia Nursing Center

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Monthly Use (MG)	0.273	0.266	0.214	0.252	0.237	0.134	0.524	0.318	0.233	0.201	0.312	0.261

3.1.2. Captain's Cove Subdivision

VDH monthly water use records were available for 1995 - 2002. The total average annual use over this time period was 20.83 MG per year, with an average daily withdrawal of 0.057 MGD (Table 3-7). The average monthly use is presented in Table 3-8, which shows a maximum monthly withdrawal of 2.989 MG in the month of July.

Table 3-7:
VDH-Reported Total Annual and Average Daily Use: Captain's Cove Subdivision

	1995	1996	1997	1998	1999	2000	2001	2002	Average
Total Annual Use (MG)	24.75	19.73	18.17	16.60	19.22	21.83	21.46	24.86	**20.83**
Average Daily Use (MGD)	0.068	0.054	0.050	0.045	0.053	0.060	0.059	0.068	**0.057**

Table 3-8:
VDH-Reported Average Monthly Use (MG): Captain's Cove Subdivision

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Monthly Use (MG)	1.420	1.252	1.446	1.719	1.909	2.188	2.989	2.365	1.625	1.422	1.289	1.206

3.1.3. Town of Chincoteague

VDH monthly water use records were available for 1995 - 2002. The total average annual use over this time period was 193.94 MG per year, with an average daily withdrawal of 0.531 MGD (Table 3-9). The average monthly use is presented in Table 3-10, which shows a maximum monthly withdrawal of 28.34 MG in the month of July.

Table 3-9:
VDH-Reported Total Annual and Average Daily Use: Town of Chincoteague

	1995	1996	1997	1998	1999	2000	2001	2002	Average
Total Annual Use (MG)	196.71	200.29	195.32	195.08	198.82	188.88	180.06	196.40	**193.94**
Average Daily Use (MGD)	0.539	0.549	0.535	0.534	0.545	0.517	0.493	0.538	**0.531**

Table 3-10:
VDH-Reported Average Monthly Use (MG): Town of Chincoteague

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Monthly Use (MG)	10.74	9.95	11.77	13.69	17.06	20.39	28.34	26.39	17.40	15.31	12.87	10.04

3.1.4. Town of Parksley

VDH monthly water use records were available for 1995 - 2002. The total average annual use over this time period was 26.96 MG per year, with an average daily withdrawal of 0.074 MGD (Table 3-11). The average monthly use is presented in Table 3-12, which shows a maximum monthly withdrawal of 2.59 MG in the month of July.

Table 3-11:
VDH-Reported Total Annual and Average Daily Use: Town of Parksley

	1995	1996	1997	1998	1999	2000	2001	2002	Average
Total Annual Use (MG)	24.49	22.83	24.44	25.34	30.51	29.50	27.99	30.61	**26.96**
Average Daily Use (MGD)	0.067	0.063	0.067	0.069	0.084	0.081	0.077	0.084	**0.074**

Table 3-12:
VDH-Reported Average Monthly Use (MG): Town of Parksley

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Monthly Use (MG)	2.15	1.98	2.14	2.19	2.34	2.43	2.59	2.58	2.25	2.10	2.12	2.09

3.1.5. Shore Life Care of Parksley *(formerly Accomack County Nursing Home)*

VDH monthly water use records were available for 1995 - 2002. The total average annual use over this time period was 5.16 MG per year, with an average daily withdrawal of 0.014 MGD (Table 3-13). The average monthly use is presented in Table 3-14, which shows a maximum monthly withdrawal of 0.457 MG in the month of December.

Table 3-13:
VDH-Reported Total Annual and Average Daily Use: Shore Life Care at Parksley

	1995	1996	1997	1998	1999	2000	2001	2002	Average
Total Annual Use (MG)	4.46	4.39	4.97	5.22	5.21	6.26	5.52	5.24	**5.16**
Average Daily Use (MGD)	0.012	0.012	0.014	0.014	0.014	0.017	0.015	0.014	**0.014**

Table 3-14:
VDH-Reported Average Monthly Use (MG): Shore Life Care at Parksley

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Monthly Use (MG)	0.433	0.388	0.426	0.393	0.432	0.416	0.444	0.443	0.441	0.443	0.444	0.457

3.1.6. Town of Tangier

VDH monthly water use records were available for 1995 – 2009. The total average annual use over this time period was 26.9 MG per year, with an average daily withdrawal of 0.087 MGD (Table 3-15). The average monthly use is presented in Table 3-16, which shows a maximum monthly withdrawal of 0.131 MGD.

Table 3-155:
VDH-Reported Total Annual and Average Daily Use: Town of Tangier

	1995	1996	1997	1998	1999[1]	2000	2001	2002
Total Annual Use (MG)	37.23	27.03	23.20	15.10	NA	35.92	18.99	36.81
Average Daily Use (MGD)	0.102	0.111	0.064	0.071	NA	0.098	0.062	0.101

	2003	2004	2005[1]	2006[1]	2007[1]	2008	2009	Average
Total Annual Use (MG)	33.95	18.71	NA	NA	NA	23.08	25.51	**26.9**
Average Daily Use (MGD)	0.093	0.088	NA	NA	NA	0.063	0.104	**0.087**

[1] A full year of data was not recorded

Table 3-166:
VDH-Reported Average Monthly Use (MG): Town of Tangier

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Monthly Use (MG)	2.54	2.51	2.72	2.37	2.50	2.52	2.71	2.83	2.53	2.39	2.35	2.61

~~3.1.6.~~3.1.7. Triangle Enterprises Mobile Home Park

VDH monthly water use records were available for 1989 - 1997. The total average annual use over this time period was 10.28 MG per year, with an average daily withdrawal of 0.028 MGD (Table 3-15). The average monthly use is presented in Table 3-16, which shows a maximum monthly withdrawal of 1.254 MG in the month of September. According to documentation contained in the June 2005 Application for Groundwater Withdrawal Permit, withdrawal data collected prior to January 2004 is known to be inaccurate. Withdrawal data collected during 2006 shows a total annual withdrawal of 8.21 MG, with an average daily withdrawal of 0.022 MGD. During 2006, the maximum monthly withdrawal was 1.047 MG, which occurred during the month of September (consistent with maximum month presented in Table 3-16).

Table 3-1715:
VDH-Reported Total Annual and Average Daily Use:
Triangle Enterprises Mobile Home Park

	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
Total Annual Use (MG)	7.25	10.05	9.79	10.29	28.89	7.23	9.96	5.03	4.05	**10.28**
Average Daily Use (MGD)	0.020	0.028	0.027	0.028	0.079	0.020	0.027	0.014	0.011	**0.028**

Table 3-1816:
VDH-Reported Average Monthly Use (MG):
Triangle Enterprises Mobile Home Park

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Average Monthly Use (MG)	0.759	1.051	0.593	0.666	0.649	0.162	1.123	0.876	1.254	0.613	0.982	0.739

Water use records were not available for the following Community Water Systems in Accomack County:

- Rolling Acres Subdivision
- ~~Town of Tangier~~

Maximum day and peak day water use by month data were not available for any of the Community Water Systems in the County. Water use records are reported to the VDEQ and VDH on a monthly basis, so peak day use is not able to be calculated using existing records.

There are no large, self-supplied non-agricultural or agricultural users of groundwater or surface water within the service areas of the Community Water Systems. All users within the service area boundaries rely on water supplied by the CWS.

According to information available through VDEQ groundwater withdrawal permits, the primary use type for Community Water Systems in the County is residential use, with the exception of the following:

- Town of Onancock: 93% Residential Use, 1% Fire Protection and 6% WWTP Process Water

It is assumed that Unaccounted for Water Losses are present in each CWS; however, precise estimates of this use were not readily available.

3.2. Large Self-Supplied Non-Agricultural Users

In accordance with 9 VAC 25-780-80.C, this section provides an estimate of the water used on an average annual basis by all self-supplied non-agricultural users (outside of the Community Water System service areas) of more than 300,000 gallons per month of surface water and groundwater. As discussed earlier, all large self-supplied non-agricultural users in Accomack County rely on groundwater for their water supply needs. Based on VDEQ reported withdrawals, the three of the six large-self supplied groundwater users in the County used a total of 14.89 MG in 2009, which was down substantially from the previous six years of use. Table 3-17 presents the total annual use (in MG) reported to the VDEQ between 2003 and 2009.

Table 3-1917:
Total Annual Use by Large-Self Supplied Non-Agricultural Groundwater Users

	2003	2004	2005	2006	2007	2008	2009
Self-Supplied Non-Agricultural Users							
Commonwealth Chesapeake Power Station	13.91	9.64	6.55	3.28	3.80	3.10	2.10
Eastern Shore Yacht and Country Club	6.13	5.38	9.30	9.15	17.87	8.48	12.70
Integrated Fisheries International Limited	58.99	55.81	43.85	11.37	12.93	4.83	0.09
Total (MG)	**79.03**	**70.83**	**59.71**	**23.80**	**34.60**	**16.41**	**14.89**

Recent VDEQ water use records were not available for the following Large Self-Supplied Non-Agricultural Users:

- KMX Chemical Corporation
- Perdue
- Tyson Foods

3.2.1. Tyson Foods

The 2005 Application for a Groundwater Withdrawal Permit contains annual reports of water withdrawals for Tyson Foods wells between 1998 and 2002, which are presented in Table 3-18. Newer data were also available for the period between 2001 and 2005 through the VDEQ water use database. Over this period of time, the average total annual withdrawal was 422.3 MG, which is approximately 62.6 percent of the amount requested in their VDEQ Permit Application.

Table 3-2018:
Average Annual Groundwater Use: Tyson Foods, Inc.

	1998	1999	2000	2001	2002	2003	2004	2005	Average
Total Annual Use (MG)	419.0	418.0	420.0	425.8	430.7	424.6	458.33	382.16	**422.3**

3.2.2. Perdue

Water usage data for Perdue was obtained from the VDEQ Water Use Database, shown in Table 3-19. The average total annual usage between 2001 and 2005 was 674 MG,

which is approximately 96 percent of the amount requested in their 2007 VDEQ Permit Application.

Table 3-~~21~~19:
Average Annual Groundwater Use: Perdue

	2001	2002	2003	2004	2005	Average
Total Annual Use (MG)	674.61	679.55	666.195	663.151	687.04	**674.1**

3.2.3. KMX Chemical Corporation

No withdrawal information was available for this user.

3.3. Large Self-Supplied Agricultural Users

In accordance with 9 VAC 25-780-80.D, this section provides an estimate of the water used on an average annual basis by all self-supplied agricultural users (outside of the Community Water System service areas) of more than 300,000 gallons per month of surface water and groundwater. Average annual surface water use by agricultural large self-supplied users was presented previously in Table 2-4. These use estimates were calculated as the average annual use between 2001 and 2006, based on withdrawals reported to the VDEQ.

Table 3-19 presents the total annual groundwater withdrawals that were reported to the VDEQ between 2003 and 2008 by large, self-supplied agricultural users in the County.

Table 3-~~20~~20:
Total Annual Use by Large-Self Supplied Agricultural Groundwater Users

	2003	2004	2005	2006	2007	2008
Agricultural User						
AL Mathews Farm			2,604,000	39,477,000	31,800,259	10,773,301
Ames	13,937,000		256,217	15,805,459	26,809,221	892,089
Bobtown Nursery	8,437,004	7,048,765	10,485,399	9,559,211	9,461,384	
Bowen Farm					37,578,995	1,060,000

Broadleaf Farms	3,112,600	4,622,400	5,623,200	3,181,680	3,110,160	1,739,040
Byrd Farm					9,632,000	
Christian/Ames Farm				77,132	35,677,387	93,000
Dennis Nursery	3,385,100	4,213,300	4,017,090	4,681,350	4,975,080	1,634,060
Drummond Farm	9,226,300	12,904,800	10,039,700	14,267,600	22,744,400	
Ed Goin Farm				9,222,000		
Gunter Farm	12,373,000	7,305,000	17,000	6,000	64,000	24,000
Hickory Hill Farm[1]	0	0	0	0	0	0
Hogneck Farm	10,752,800	1,690,500	13,094,000		36,935	
Home Farm					450,283	
Lang Farm					10,864,799	1,444,069
Lewis Farm	6,490,600	1,557,600	1,276,100	2,900,500	5,857,100	
Machipongo Farm					15,209,000	
Mathews Farm[1]	0	0	0	0	0	0
Melfa Farm				85,700	7,397,753	1,874,000
Mutton Hunk Fen Natural Area Preserve			10,495,890	6,235,510	10,914,800	
Northam Somers Farm			2,274,000	33,264,000	12,436,513	292,557
Painter Farm				7,863,600	25,956,674	3,793,000
Rew Farm	8,933,400	2,843,500	7,748,500	22,000	3,920,100	820,000
Simpson Farm[1]	0	0	0	0	0	0
Sommers Farm	7,728,300	4,975,600	12,230,200	4,258,900	7,966,500	
Taylor & Fulton Gillespe Farm	4,757,600	3,451,600	8,699,500	11,195,900	6,862,400	
Wessells Farm			12,236,100	6,638,100	9,984,500	
Wessells Watkinson Farm				8,733,000		
Total Use (MG)	**89.13**	**50.61**	**101.10**	**177.47**	**329.71**	**24.44**

[1] No use reported.

3.4. Small Self-Supplied Use Outside of the Community Service Areas

In accordance with 90 VAC 25-780-80.E, this section contains an estimate of water use by small self-supplied users of groundwater that are outside of the Community Service Areas. This use includes residential and business use and is calculated as follows:

- Residential Use: Estimate of Population Served by Individual Wells * Average Per Capita Use Rate of 75 gpcd
  - 30,006 persons * 75 gpcd = 2.25 MGD

- Business Use: Estimate of Total Population Served (as presented in Tables 2-5 and 2-6) * Average Per Capita Use Rate
  - 16,734 persons served * 50 gpcd = 0.84 MGD

- Total Small Self-Supplied Use: Residential Use plus Business Use
  - 2.25 MGD + 0.84 MGD = 3.09 MGD

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4. Existing Water Resource Conditions
(9 VAC 25-780-90)

This section is divided into two parts, which contain: 1) a description of the physical environment pertaining to the geologic, hydrology, and meteorological conditions in Accomack County and 2) a description of existing environmental conditions that pertain to, or may affect sources that provide the current supply in fulfillment of requirements of 9 VAC 25-780-90. Potential environmental resource issues pertaining to new water supplies are discussed Section 8.2.**Error! Reference source not found.**~~**Error! Reference source not found.**~~. Special attention is given to the potential effects of water usage on current environmental conditions and to mitigating strategies and which reduce or avoid such potential effects.

4.1. Physical Environment

4.1.1. Geologic/Hydrogeologic Setting

There have been a substantial number of local and regional studies on the geologic and hydrologic characteristics of the sediments on the Eastern Shore of Virginia and adjacent areas of Maryland. Many of these studies have dealt principally with geologic descriptions of the formational units. The geology of the Eastern Shore consists of unconsolidated deposits of interbedded clay, silt, sand, and gravel, with variable amounts of shell material. These deposits thicken and slope eastward, and form a system of layered aquifers and confining units. The total sediment thickness ranges from approximately 2,000 feet in the western areas to as much as 7,000 feet to the east[1]. These sediments generally overlie a bedrock basement that also dips northeastward.

The aquifers are comprised of sand, gravel, and shell material, and confining units are comprised of clay and silt and are divided into the unconfined Columbia aquifer (water table aquifer), and a series of confined aquifers and intervening semi-confining units (Figure 4-1). The low permeability confining units restrict downward ground water movement. The confined aquifers, in order of increasing depth, are: Yorktown-Eastover (includes upper, middle, and lower Yorktown aquifers), St. Marys Choptank aquifer, Brighteast aquifer, and upper, middle, and lower Potomac aquifers. 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

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5. Projected Water Demand
(9 VAC 25-780-100)

This section consists of projections to estimate future water demands. Estimates of populations in the County and the water needed to serve them are made in ten year increments from 2010 to 2040, thirty years into the future. The projections include considerations of both public and private 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. The relevant permit applications are presented in Appendix C.

5.1. Population Projections

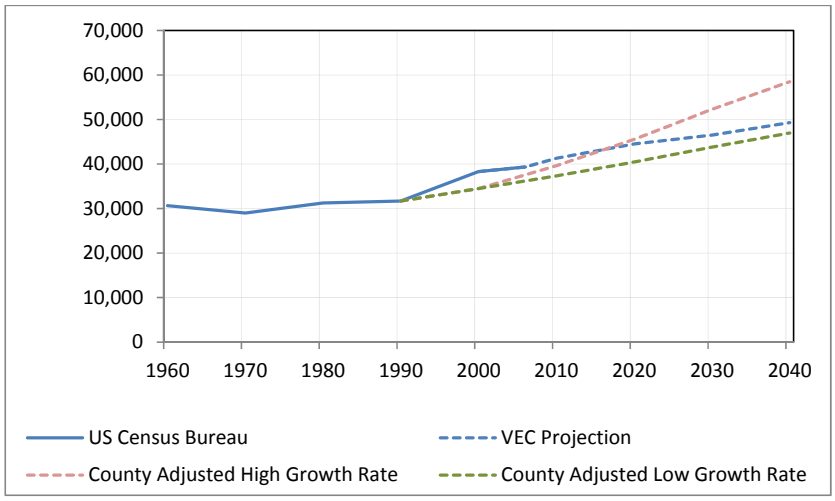
Population projections for Accomack County were estimated by the Virginia Employment Commission (VEC). Base year data for 2000 and population estimates for 2006 were compiled by the U.S. Census Bureau. The projections for 2010 through 2030 were estimated by VEC using the component cohort method. As part of its Comprehensive Plan, the County also provided lower and upper estimates of population growth to 2030 based on its corrected estimates of the 2000 Census population total and high and low growth rates of 1.4 percent and 0.8 percent, respectively. Projections for 2040 were not available and the growth rates predicted by VEC and the County were nearly linear ($R^2 \geq 0.98$), therefore a straight line interpolation was used to extrapolate the Accomack County population projections to 2040. Population projections for Accomack County are shown in Table 5-1 and in Figure 5-1. Overall, population in the County is projected to grow at an average annual rate of approximately 0.65 percent.

Table 5-1:
Accomack County Population Projections

SOURCE / YEAR	US CENSUS BUREAU	VEC PROJECTION	COUNTY-ADJUSTED LOWER GROWTH	COUNTY-ADJUSTED HIGHER GROWTH
1960	30,635			
1970	29,004			
1980	31,268			
1990	31,703			
2000	38,305		34,488	34,488
2006	39,345			
2010		41,300	37,350	39,630
2020		44,500	40,446	45,540
2030		46,500	43,800	52,300
2040†		49,300	46,982	58,493
Average Annual Growth Rate	0.99%*	0.65%	0.8%	1.4%

* based on 1980-2000 growth
† Malcolm Pirnie, Inc. estimate

Figure 5-1: Accomack County Population Projections



5.2. Public Water Sources

Future water demands and service area populations were projected for each of the public water systems in Accomack County based extrapolations of recent historical data.

5.2.1. Arcadia Nursing Center

The Arcadia Nursing Center (Figure 5-2) currently has a population of 100 including occupants and on-site staff. Based on recent population data and assuming only modest expansion, the Center is expected to grow to an approximate total population of 112 occupants and on-site staff by 2040, as shown in Figure 5-3 and Table 5-2. Based on the projected population and a recent average use rate of 95 gallons per capita per day, the 2040 water demands are projected to be approximately 10,656 gallons per day. Water demands for Arcadia Nursing Center are considered to be 100 percent residential for the entire planning period. Maximum month demands were estimated by multiplying the historical ratio of maximum month demands to average month demands for a given year (1.5) by the projected average demands. The VDEQ groundwater withdrawal permit and application were not available at the time of writing of this report.

Figure 5-2: Arcadia Nursing Center Service Area

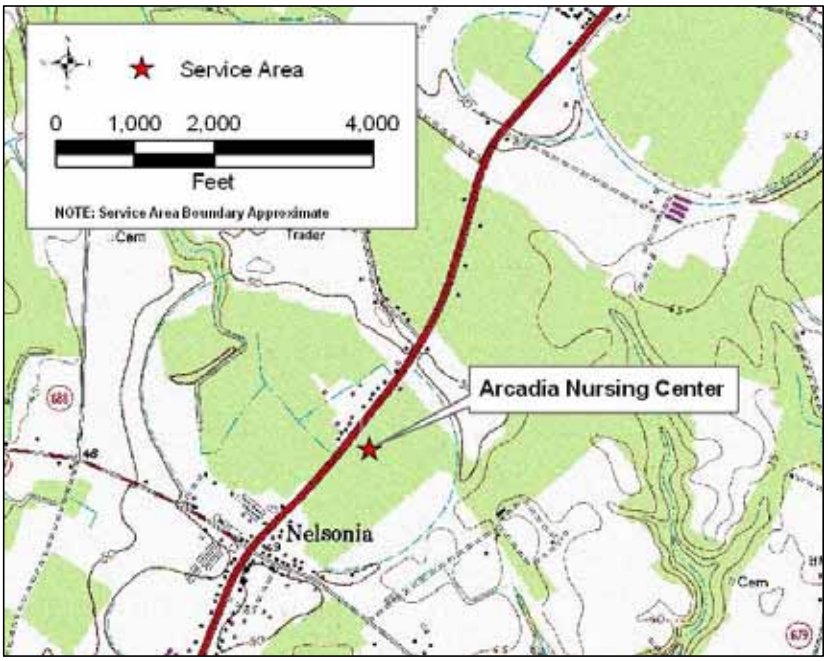


Figure 5-3: Arcadia Nursing Center Population and Demand Projections

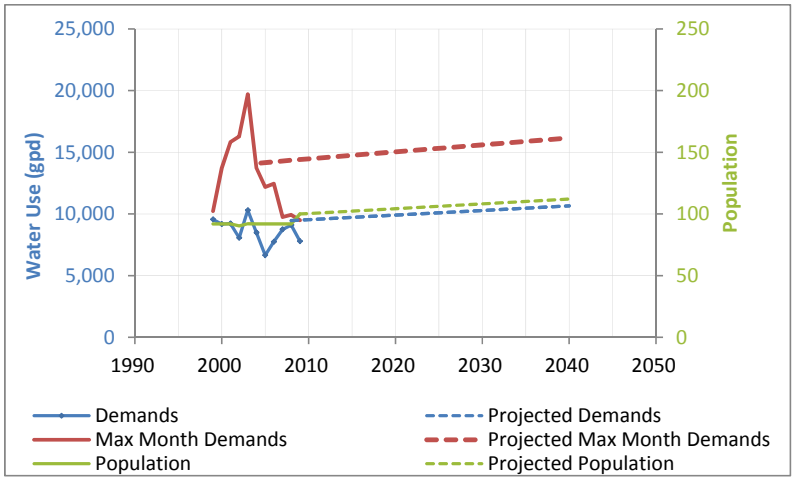


Table 5-2:
Arcadia Nursing Center Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMANDS (GPD)	MAX MONTH DEMANDS (GPD)
Projected Data			
2010	100	9,537	14,470
2020	104	9,910	15,036
2030	108	10,283	15,601
2040	112	10,656	16,167

5.2.2. Captain's Cove Subdivision

The Captain's Cove Subdivision consists of 4,816 lots, 855 of which are currently connected to the subdivision's water supply system (Figure 5-4). The most recent projection of the population at Captain's Cove is included in the groundwater withdrawal permit. The projection indicates that the number of connections in the subdivision will increase by between 100 and 250 units per year until the expiration of the current permit in 2017. Projected values are presented in Table 5-3 and Figure 5-5. Demands are based on an assumed rate of 155 gpd per connection. Projections are adjusted from the values in the permit and are based on the existing number connections and the assumed number of new connections predicted in the permit application for values until 2020. Projections beyond 2020 are linearly extrapolated until buildout (all 4,816 lots are connected) occurs

by approximately 2030. Demands are projected to remain relatively constant following buildout until the 2040 planning horizon. Maximum month demands are projected based on the historical max month to average demand ratio of approximately 1.87 until the withdrawal permit expiration in 2017 (20.2 MG/month). Following 2017, the max month to average demand ratio is anticipated to fall to approximately 1.6 based on planned conservation measures.

Figure 5-4: Captain's Cove Service Area

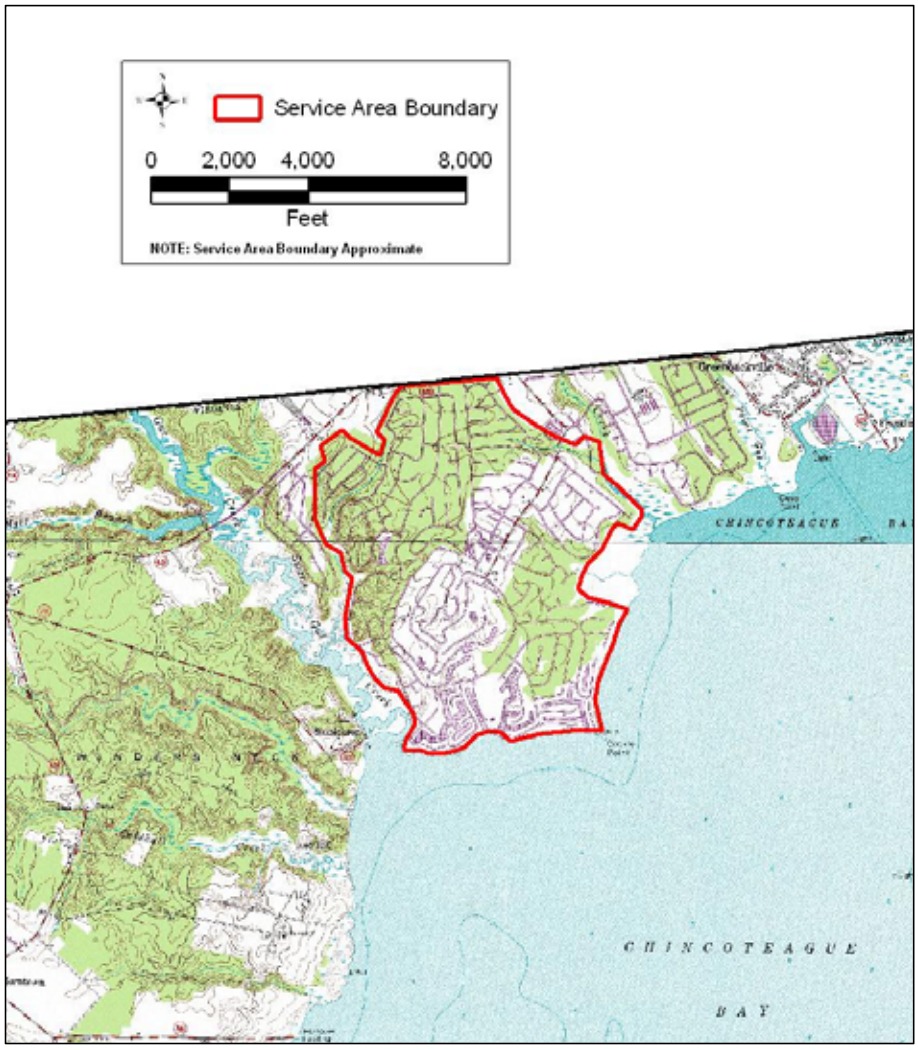
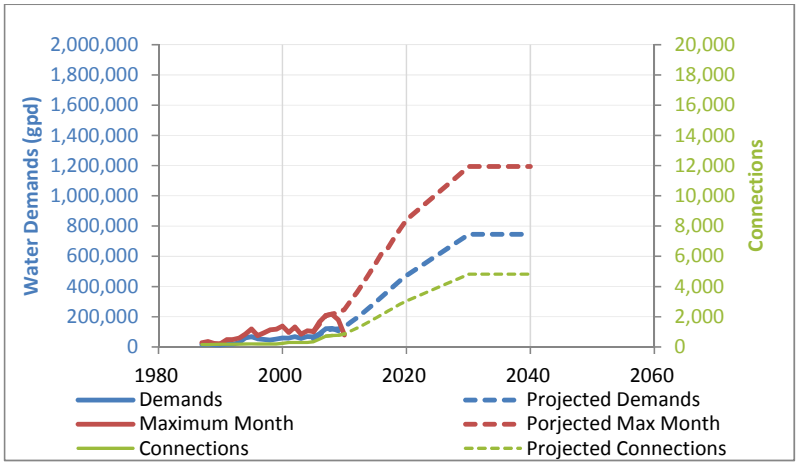


Figure 5-5: Captains' Cove Population and Demand Projections



Demands also include an estimated average of 1,630 gallons per day for the marina, gas station, and other commercial spaces in the subdivision. Therefore, demands are greater than 99 percent residential and less than 1 percent commercial, industrial, and/or light industrial (CIL).

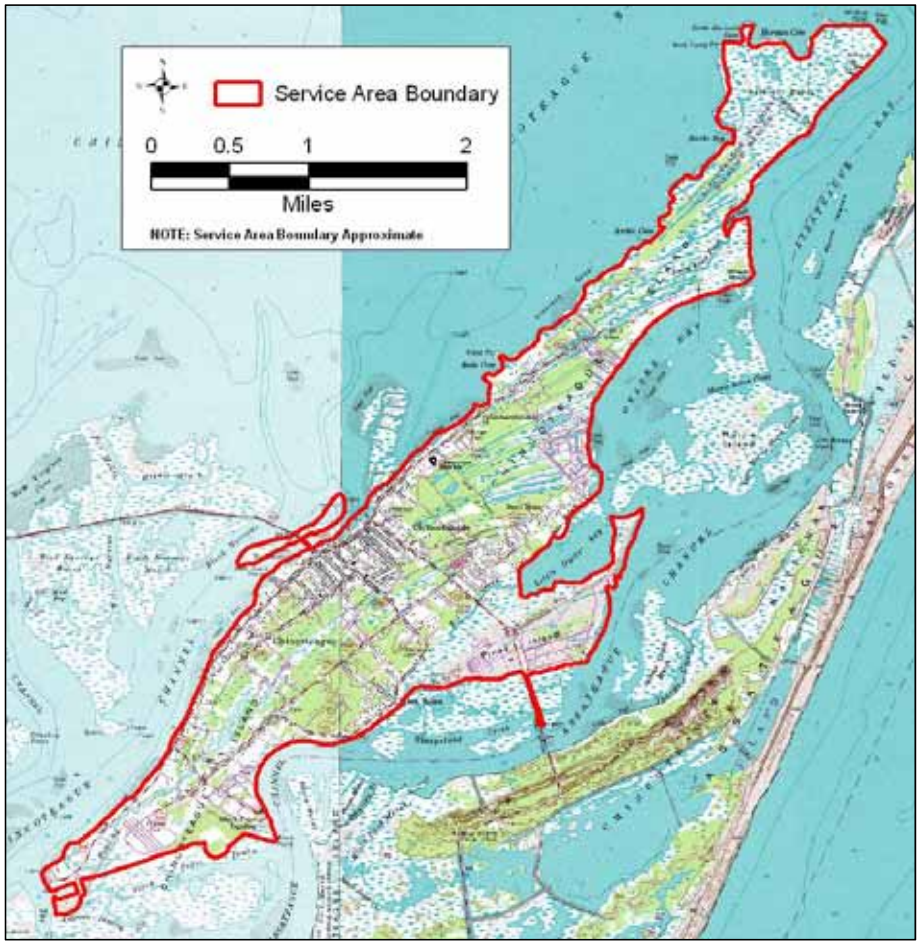
Table 5-3:
Captain's Cove Subdivision Population and Demand Projections

YEAR	CONNECTIONS	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data			
2010	855	132,525	100,442
2011	1,053	163,215	151,750
2012	1,246	193,130	206,728
2013	1,453	225,215	219,041
2014	1,672	259,160	224,643
2015	1,900	294,500	247,725
2016	2,135	330,925	305,093
2017	2,372	367,660	361,013
2018	2,606	403,930	420,988
2019	2,833	439,115	484,441
2020	3,048	472,440	550,501
2030	4,814	746,170	618,589
2040	4,814	746,170	654,435

5.2.3. Town of Chincoteague

The Town of Chincoteague had a population of approximately 4,357 in 2002 and serves the residents of the Chincoteague Island (Figure 5-7). The population was projected to the 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 5-6: Town of Chincoteague Water Service Area



Demands were projected as part of the Town's (draft) local water supply plan to 2040. Average annual demand projections incorporate an average annual demand increase of 1.86 million gallons per year and were based on a linear interpolation of historical data. Maximum monthly demands were extrapolated from the requested amounts for 2015 and 2025 in the most recent groundwater withdrawal permit (1.1 MGD and 1.3 MGD, respectively).

Figure 5-7: Town of Chincoteague Population and Demand Projections

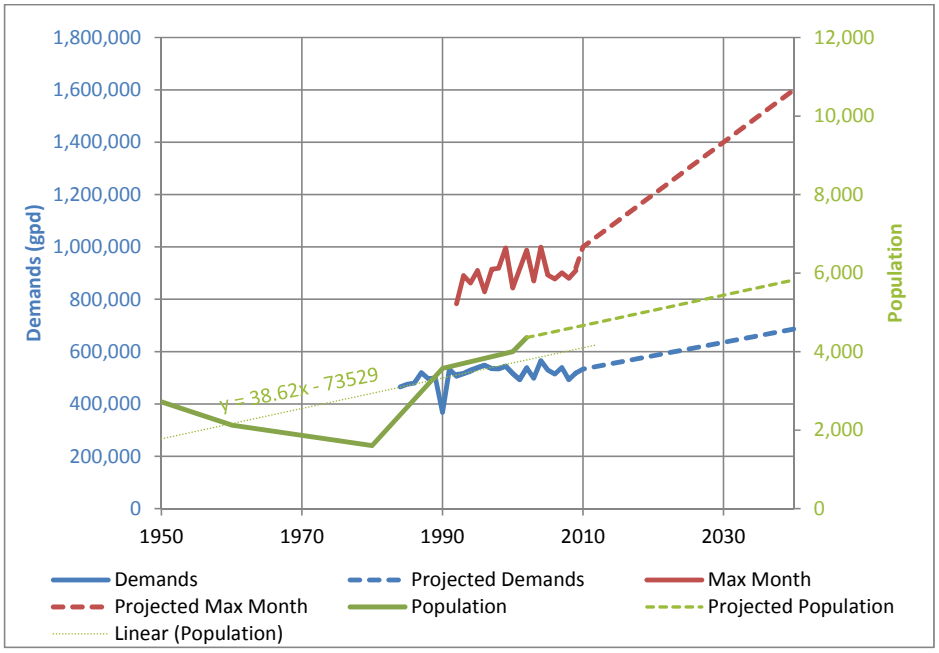


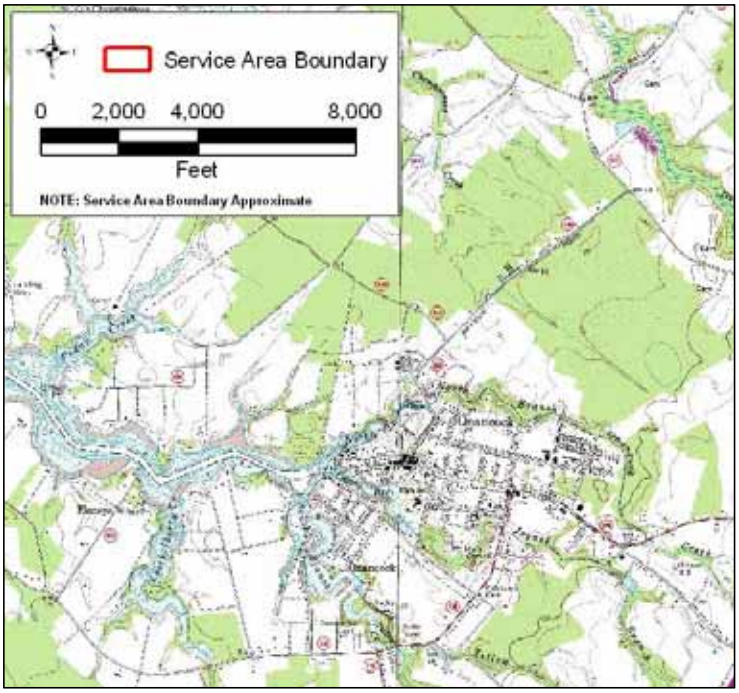
Table 5-4:
Town of Chincoteague Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data			
2010	4,666	648,484	1,000,000
2020	5,052	721,474	1,200,000
2030	5,438	794,484	1,400,000
2040	5,825	867,474	1,600,000

5.2.4. Town of Onancock

The Onancock Water Service Area serves a population of approximately 1,525 people (Figure 5-8). The population was projected to the 2040 planning horizon by developing an average population trend of VDH reported data over the period between 1987 and 2009. The average trend indicates a linear growth rate of approximately 0.21 percent (3.26 inhabitants) per year which is fairly consistent with the lower range of countywide trends. Therefore, the projected population for the Town of Onancock is estimated to be approximately 1,623 at the 2040 planning horizon (Table 5-5 and Figure 5-9).

Figure 5-8: Town of Onancock Water Service Area



Demands were projected as part of the Town's most recent groundwater withdrawal permit. Demands were projected for the permit application based on a linear

interpolation of historical demands in the between 1987 and 2003. Since more recent data has not shown an increase in demands, the projection was adjusted by assuming a same growth rate (i.e. slope of trendline), but offsetting the trendline intercept such that the projection continues from the (2003) historical maximum annual demand in 2010. Average annual demand projections incorporate an average annual demand increase of 1.58 million gallons per year and were based on a linear interpolation of historical data. Maximum monthly demands were projected by multiplying the average annual demands by the historical ratio of maximum month demands to average annual demands (1.23). Therefore, the 2040 projected average annual and maximum month demands are approximately 316,000 and 388,000 gallons per day, respectively.

Figure 5-9: Town of Onancock Projected Water Demands

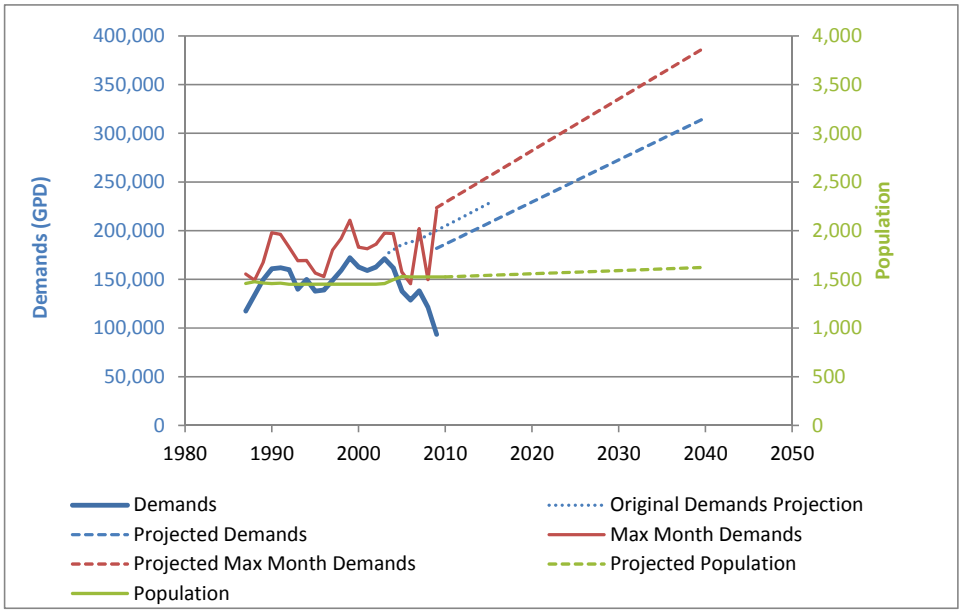


Table 5-5:
Onancock Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data			

2010	1,525	186,116	228,922
2020	1,558	229,361	282,114
2030	1,590	272,606	335,306
2040	1,623	315,852	388,498

The most recent available demand data for the breakdown of average annual demands by type was for the period between 2003 and 2004 and was as follows: residential (54.2 percent), commercial/industrial and light industrial (33.6 percent), fire protection (1.0 percent), unmetered/unaccounted for water (11.2 percent).

5.2.5. Town of Parksley

The Parksley Water Service Area serves a population of approximately 929 people (Figure 5-10). The population was projected to the 2040 planning horizon by developing an average population trend of VDH reported data over the growth period between 1995 and 2009. The average trend indicates a linear growth rate of approximately 0.39 percent (3.62 inhabitants) per year which is fairly consistent with the lower range of countywide trends. Therefore, the projected population for the Town of Parksley is estimated to be approximately 1,040 at the 2040 planning horizon (Table 5-6 and Figure 5-11).

Demands were projected as part of the Parksley's most recent groundwater withdrawal permit. Demands were projected for the permit application based on a linear interpolation of historical demands in the between 1988 and 2003. Water demands were extrapolated based on the projection methodology used in the groundwater withdrawal permit. The maximum annual withdrawal (2002) was used as a baseline demand for 2010, while demands were anticipated to grow at a rate of approximately 1.46 percent (1,104 GPD) per year. The growth rate was based on planned development in the service area. Maximum monthly demands were projected using the same method – the 2010 baseline maximum monthly demand was based on the historical maximum (120,161 GPD in August 2002) and a growth rate of 1.46 percent (1,710 GPD) was applied to future. Therefore, the 2040 projected average annual and maximum month demands are approximately 114,032 and 176,596 gallons per day, respectively.

Figure 5-10: Town of Parksley Water Service Area

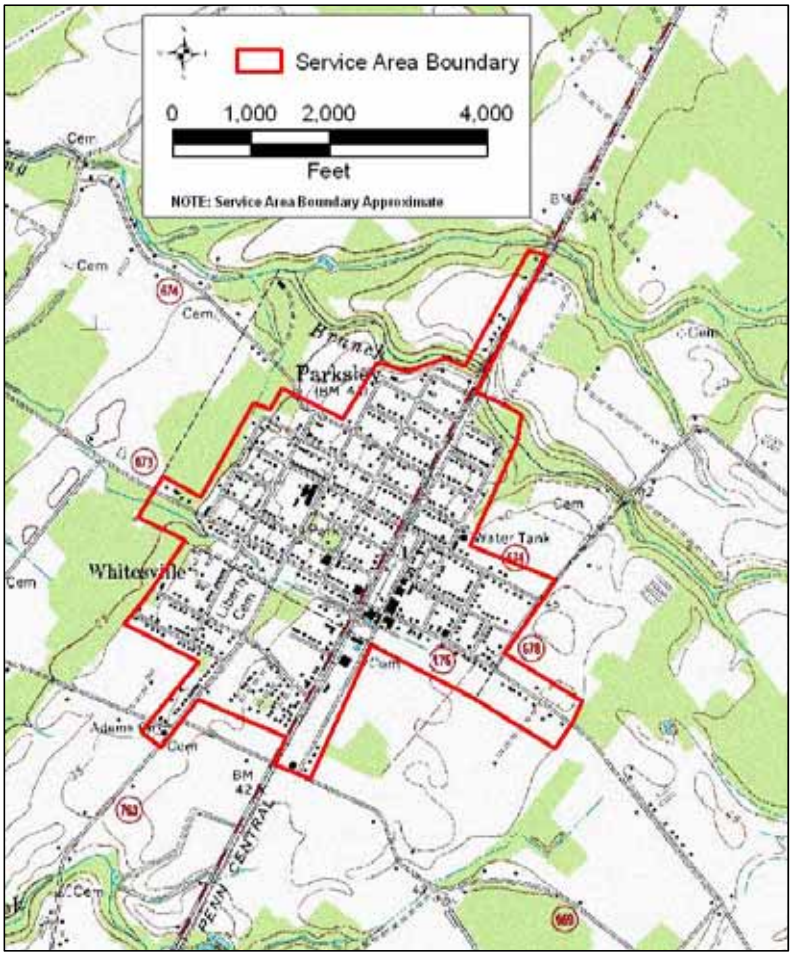
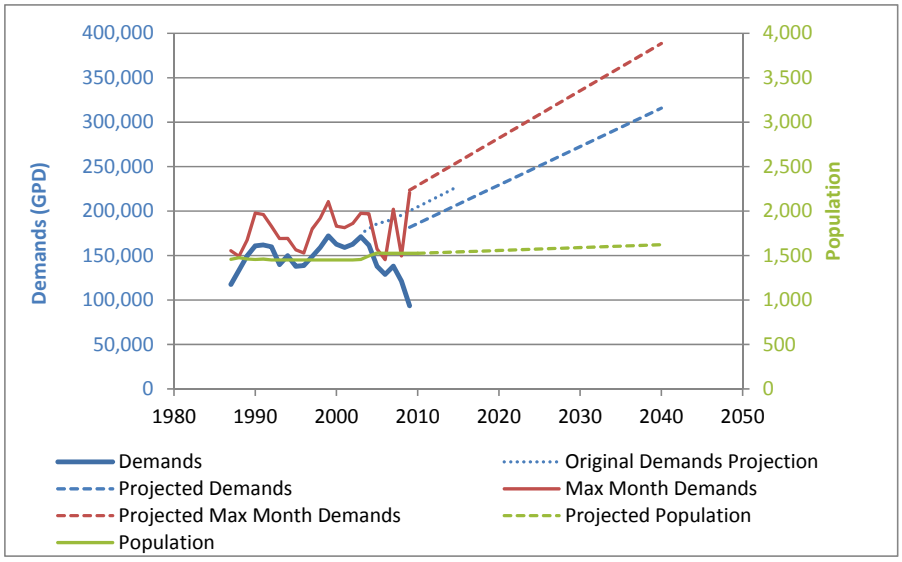


Table 5-6:
Parksley Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data			
2010	932	80,904	125,292
2020	968	91,946	142,393
2030	1,004	102,989	159,494
2040	1,040	114,032	176,596

Figure 5-11: Town of Parksley Projected Water Demands



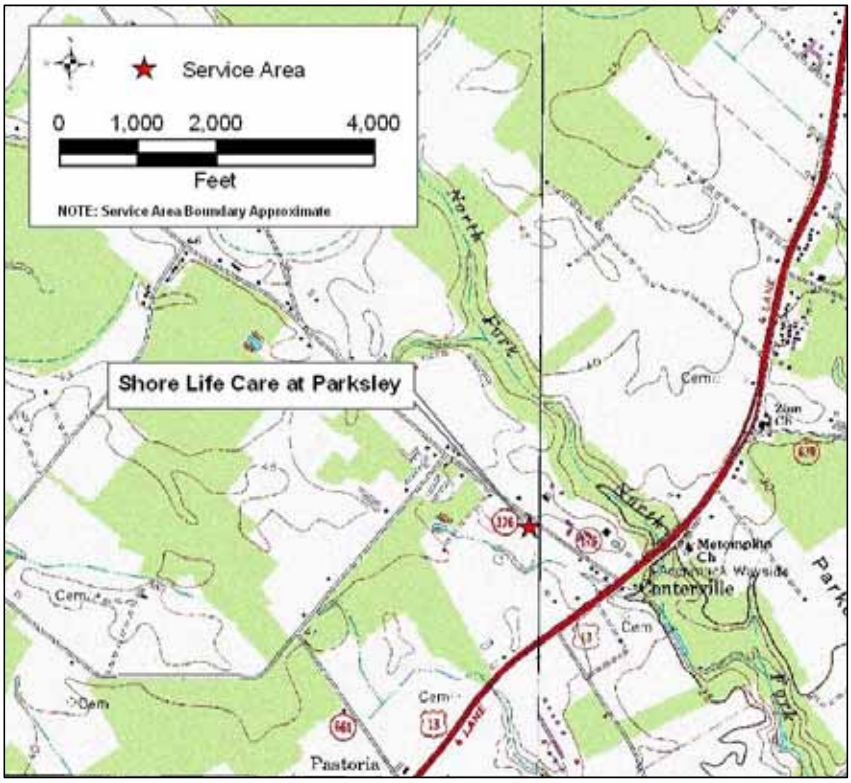
5.2.6. Shore Life Care of Parksley (formerly Accomack County Nursing Home)

Formerly Accomack County Nursing Home, the Shore Life Care of Parksley has recently had an average occupancy of 124 residents (in the period between 2001 and 2007) and a maximum occupancy of 137 residents (Figure 5-12). The facility has been operating for over thirty years and has no plans to expand other than to maintain and/or maximize occupancy. Therefore, the maximum projected population of Shore Life Care is expected to remain at or below 137 residents until 2040. Therefore, without future plans to expand the facility, the annual average demand was estimated based on the average demand data for the period between 2001 and 2007 and pro-rated to full occupancy as follows:

$$Average\ Annual\ Demands\ x\ \frac{full\ occupancy}{average\ occupancy} = Projected\ Average\ Annual\ Demands$$

$$4{,}660{,}285\ MGY\ x\ \frac{137}{124} = 5{,}149614\ MGY$$

Figure 5-12: Shore Life Care of Parksley Water Service Area



Assuming the facility does not expand prior to 2040, the projected maximum month demands are anticipated to remain at or below the historical maximum monthly value of 591,000 gallons per month. Increases in occupancy are expected to be offset by improvements in water conservation measures. Water use at the facility is almost entirely residential, although a nominal amount is used for landscape irrigation - approximately 1,900 gallons/month in the period between April and September, which is less than one percent of total water use.

5.2.7. Tangier Island

Tangier Island (Figure 5-13) currently has an approximate population of approximately 650 residents, according to VDH records. The habitable area on the island is limited and the number or residents has been constant or declining since 1995. The maximum population reported to VDH was 750 residents (Table 5-7 and Figure 5-14). Given the spatial limitations of the island, the population of the island is projected to remain at or below 750 with the 2040 planning horizon. Over the same period VDH reported demands have varied between approximately 59,000 gpd and 111,000 gpd and shown a declining trend. Given that the population is anticipated to remain at or below it recent historical maximum, it is assumed that the maximum historical annual and monthly uses of 110,771 gpd and 125,618 gpd, respectively are representative of a reasonable upper bound of demands within the planning horizon. A breakdown of usage by type was not available at the writing of this report; however, it is assumed that the majority of water demands are residential in nature, with a limited amount of commercial demands.

Figure 5-13: Tangier Island Water Service Area

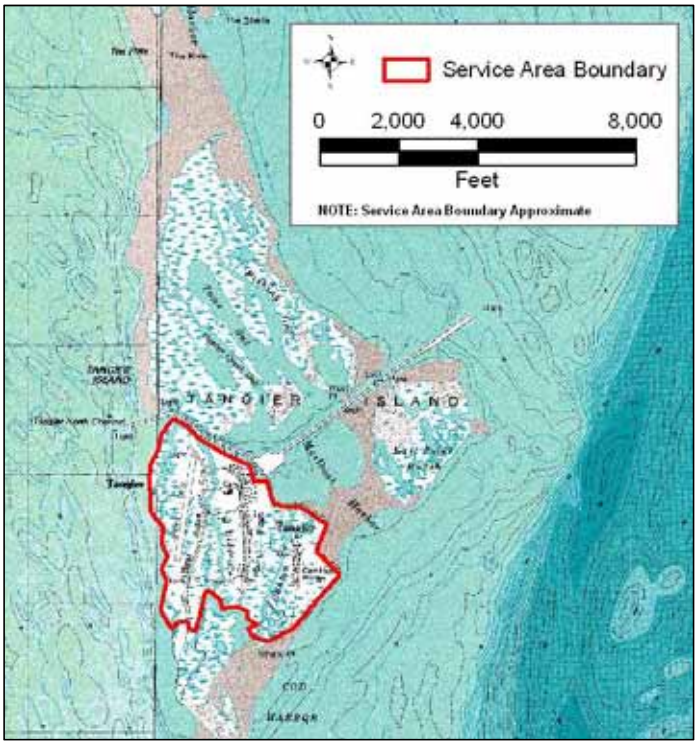


Figure 5-14: Tangier Island Projected Population and Water Demands

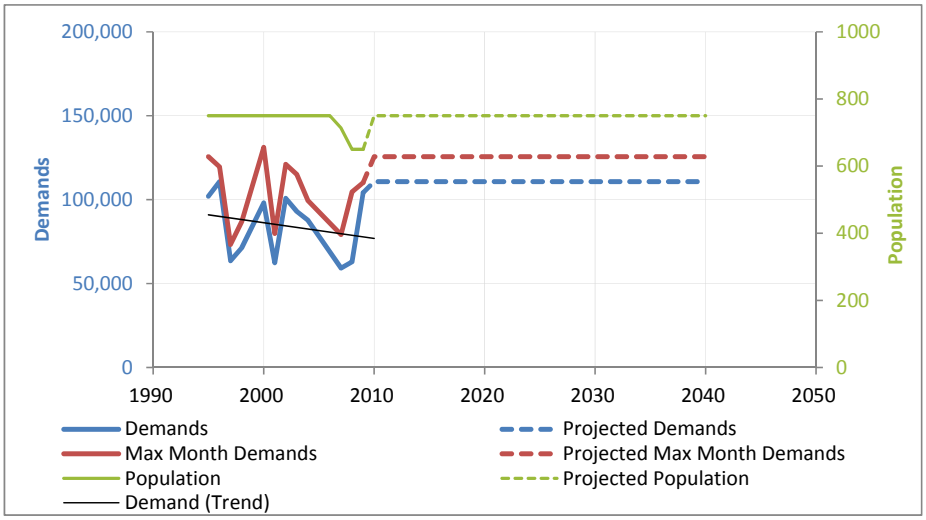


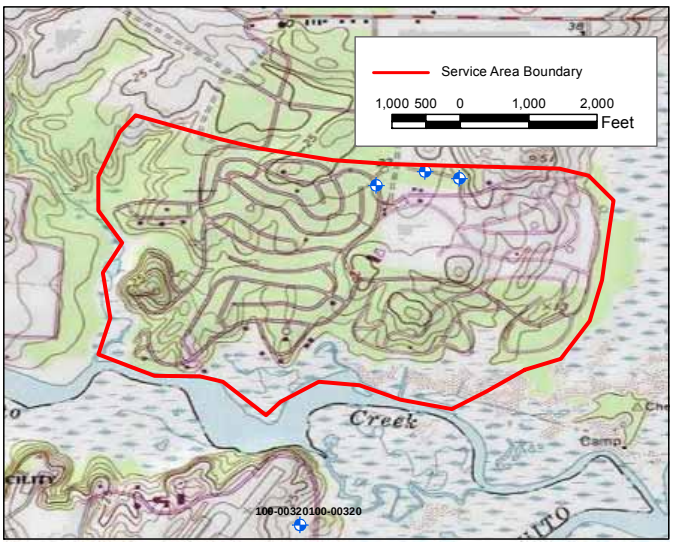
Table 5-7:
Tangier Island Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data			
2010	750	110,771	125,618
2020	750	110,771	125,618
2030	750	110,771	125,618
2040	750	110,771	125,618

5.2.8. Trails End Utility Company

Trails End Utility Company provides water to the Trails End Campground located approximately 1-mile southeast of Horntown. Trails End currently has reached build-out conditions with 173 active sites and 2,427 transient sites (Figure 5-15). Use is for potable uses as wells as minor non-potable uses such as refilling pools and washing boats. Water is not used for landscape irrigation.

Figure 5 15: Trails End Utility Company Service Area



While the Campground has reached build-out, there is anticipation that some of the transient and dormant sites will become active sites, increasing demand over time. Based on historic use since 1998, water use has increased steadily on an annual basis. This use trend is expected to continue for the foreseeable future. Use projections are based on actual 2012 use, permitted annual and maximum month amounts through the year 2023, linearly extrapolated for the remainder of the use projection (Figure 5-16).

Figure 5 16: Trails End Utility Company Projected Water Demands

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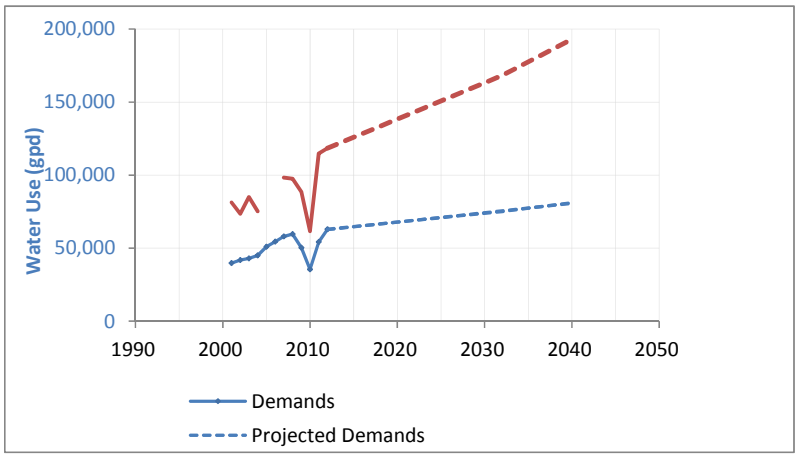
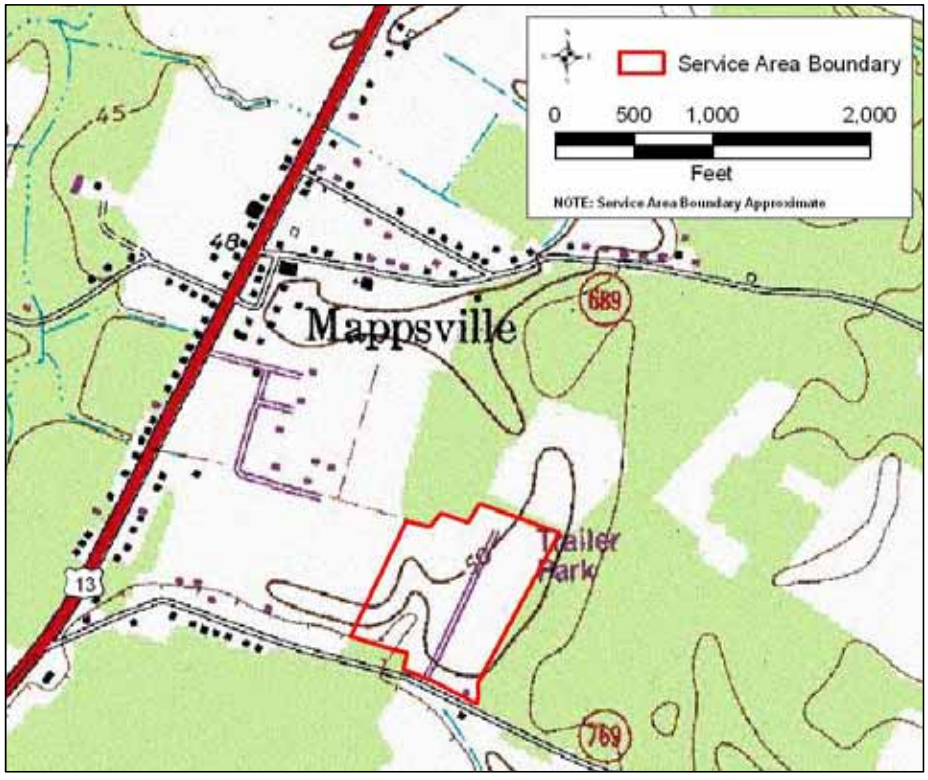


~~5.2.8.~~5.2.9. Triangle Enterprises Mobile Home Park

Triangle Enterprises Mobile Home Park currently has 64 active connections and a maximum of 72 connections (Figure 5-15~~Figure 5-157~~). The average population residing at the facility over the period between August 2006 and December 2006 was 244, which results in an average occupancy of 3.8 persons per connection. There are no plans to expand the number of connections at the Park; therefore, the number of occupants at the Park is likely to remain at or below 274 people (72 connections x 3.8 persons/connection).

Figure 5-15~~15~~: Triangle Enterprises Mobile Home Park Water Service Area



Based on the experience of facility management, water usage data for the 2006 calendar year was considered to be the most representative data available to determine average and maximum monthly use rates. The average annual and maximum monthly per capita water use rates at the Park were estimated to be 97 and 147 gallons per capita per day, respectively. Therefore, without future plans to expand the facility, the average annual and maximum monthly demands were estimated by multiplying the maximum likely occupancy by the respective use rates as follows:

$$\begin{aligned} Maximum\ Likely\ Average\ Annual\ Demands &= Maximum\ Likely\ Occupancy \times Average\ Annual\ Use\ Rate \\ &= 274\ occupants \times 97\ \frac{gallons}{occupant \cdot day} \\ &= 26{,}578\ \frac{gallons}{day} \end{aligned}$$

$$\begin{aligned} Maximum\ Likely\ Maximum\ Month\ Demands &= Maximum\ Likely\ Occupancy \times Maximum\ Month\ Use\ Rate \\ &= 274\ occupants \times 147\ \frac{gallons}{occupant \cdot day} \\ &= 40{,}278\ \frac{gallons}{day} \end{aligned}$$

Water usage at the facility was assumed to be residential only.

5.3. Large Self-Supplied Non-Agricultural Users

5.3.1. Accomack County Buildings

The Accomack County Buildings are a collection of fourteen buildings including the County Administration Building, Courthouse, Jail, law office and associated buildings (Figure 5-16~~Figure 5-168~~).

Figure 5-1616: Accomack County Office Buildings

The most recent available water usage data for the Accomack County Building Water was obtained from the 2002 groundwater withdrawal permit. Average usage ranged between 10,300 and 136,000 gpd. The County Jail and its occupants account for the largest proportion of water demands in the complex and the Jail's population can fluctuate significantly over time. The groundwater withdrawal permit indicated that by 2012 annual water demands were anticipated to increase by as much as ten percent (one percent per year) to approximately 15,000 gpd, primarily due to the potential expansion of the County Jail. Beyond 2012, water demands were projected by assuming that demands would grow at the same linear rate as the County (0.65 percent per year). A similar process was used for maximum month demands, which were projected to reach 20,000 gpd by 2012 (Table 5-8 and Figure 5-17~~Figure 5-179~~).

Figure 5-1717: Accomack County Buildings Projected Water Demands

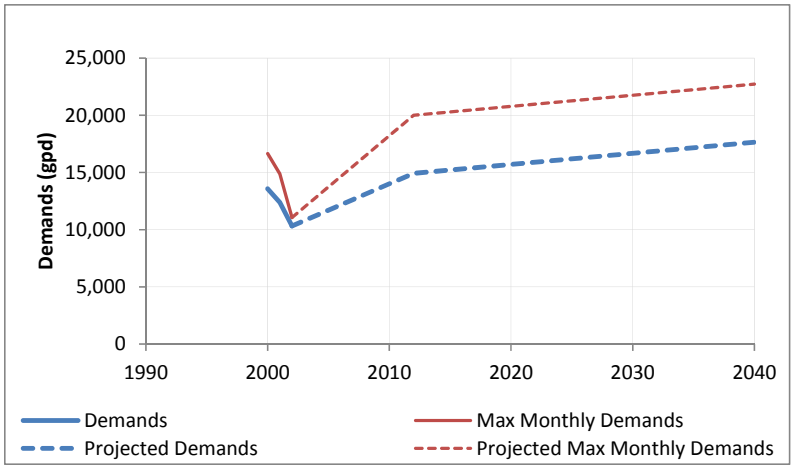


Table 5-8:
Accomack County Buildings Demand Projections

YEAR	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data		
2010	14,008	18,212
2020	15,705	20,776
2030	16,675	21,747
2040	17,645	22,717

5.3.2. Chesapeake Power Station

The Chesapeake Power Station is a 312 megawatt oil fired combustion turbine that is operated as a peaking power plant. As such, the plant is operated on an intermittent basis to provide additional power during periods of peak demand.

The most recent available water use data for the Chesapeake Power Station was obtained from the 2009 groundwater withdrawal permit application, the VDEQ groundwater withdrawal database, and the VDEQ VWUDS database. Annual use over the period 2007 through 2012 ranged between 6,000 and 20,400 gpd. As expected with the peaking operation the highest groundwater use is the month of July with an average use of 36,000 gpd, which is approximately two times higher than the next highest months (June and August). The groundwater withdrawal permit application indicated that based on contractual obligations groundwater use could increase for a period of time by approximately one order of magnitude over the historical use, with an estimated maximum month use of 360,000 gpd and an annual total of 170,000. The period of high use is not expected to be sustained and on the long term, historical use is expected to represent overall trends for this withdrawal (Table 5-8 and Figure 5-1720).

Figure 5-20 Chesapeake Power Station Projected Demands

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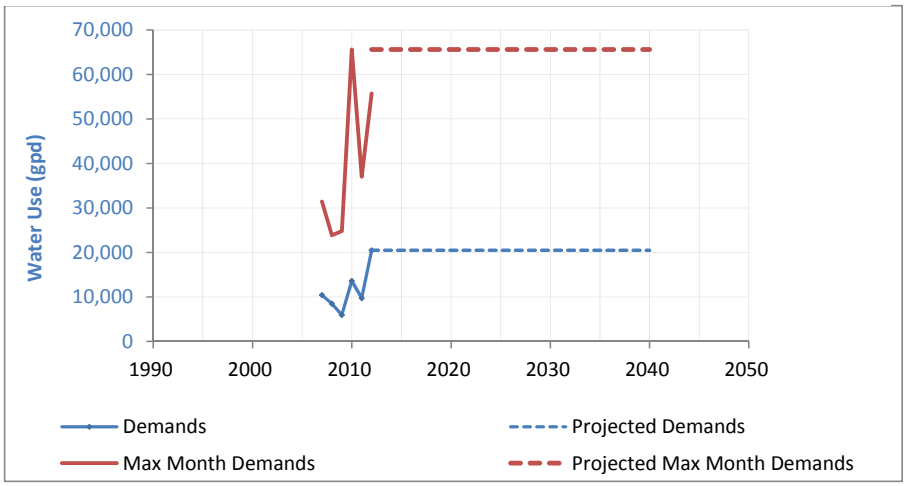

Table 5-8:
Chesapeake Power Station Demand Projections

YEAR	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data		
2010	13,600	65,600
2020	20,500	65,600
2030	20,500	65,600
2040	20,500	65,600

5.3.3. Integrated Fisheries – NASA Wallops Island

Integrated Fisheries International (IFI), formerly Eastern Shore Seafood Products (ESSP), is a seafood (clam) processing plant. After ESSP ceased clam shucking and chopped clam and clam juice canning operations in 2006, water use decreased significantly.

The most recent available water use data for the Integrated Fisheries International was obtained from the VDEQ VWUDS database. Annual use over the period 2007 through 2012 ranged between 35,500 gpd in 2007 to 90 gpd in 2012. Maximum monthly withdrawals over this period varied between 21,600 gpd and 64,700 gpd. The groundwater withdrawal permit application is requesting an annual total of 50,000,000 gallons (137,000 gpd average) and maximum month of 6,250,000 gallons (208,000 gpd average), which is approximately one order of magnitude over the historical use. There is no projected increase in use over them, therefore for the purpose of projecting long term use, the permit requested annual and maximum month amounts are used (Table 5-89 **and** Figure 5-17).

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Figure 5-21 ICI Projected Demands

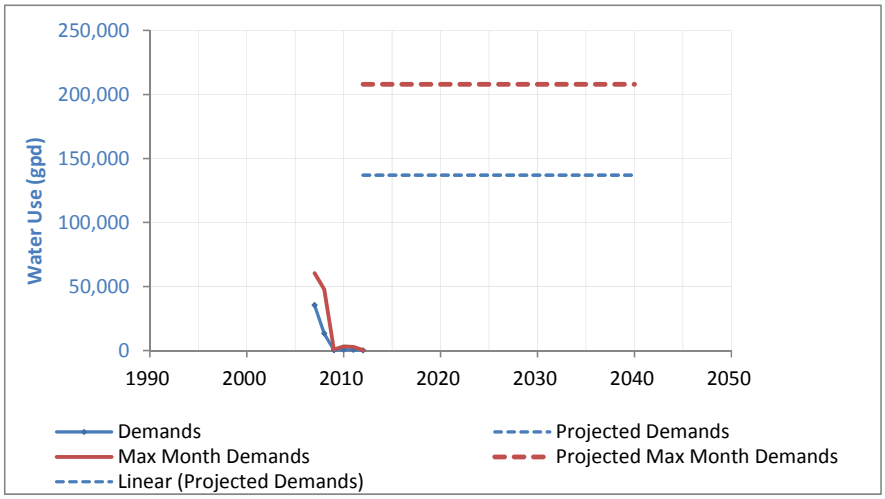

Table 5-9:
ICI Demand Projections

YEAR	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data		
2010	550	3,300
2020	137,000	65,600
2030	137,000	65,600

2040	137,000	65,600

~~5.3.2.~~5.3.4. KMX Chemical Corporation

Data for the KMX Chemical Corporation was not available at the time this report was written to use as a basis for water demand projections, it was assumed that the current permitted amounts of 60 million gallons per year and 6.5 million gallons per month will meet water demands to the 2040 planning horizon. Barring additional information, this assumption is supported by the fact that the previous annual permitted amount was 76.44 million gallons per year indicating a recent decreasing trend in water demands.

~~5.3.3.~~5.3.5. Perdue

The Perdue facility projected average annual and maximum monthly use of 700 million gallons per year (1.916 mgd) and 78 million gallons per month (2.6 mgd) for the expiration of the groundwater withdrawal permit in 2017. It was assumed that facility demands would continue to grow based on increased production associated with domestic and emerging market growth as mentioned in the permit application. The assumed growth rate was a linear interpolation between recent facility average demand levels and the 2017 projections, which results in estimated annual and maximum monthly demands of 2.156 and 4.126 mgd, respectively by 2040 (~~Table 5-9~~ Table 5- and ~~Figure 5-18~~Figure 5-182).

Figure 5-~~18~~18: Perdue Projected Water Demands

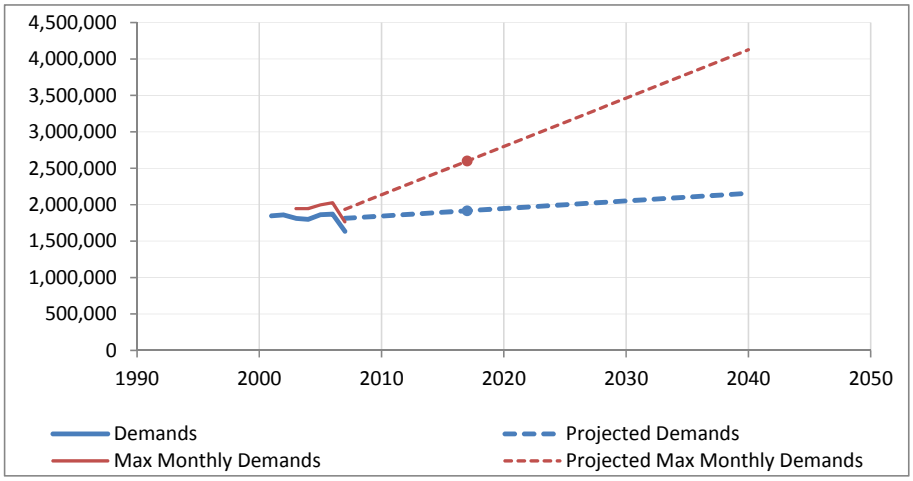

Table 5-~~9~~10:
Perdue Demand Projections

YEAR	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data		
2010	1,843,603	2,135,603
2020	1,947,735	2,799,027
2030	2,051,868	3,462,451
2040	2,156,001	4,125,876

~~5.3.4.~~5.3.6. Tyson Foods

The Tyson facility projected average annual demands of 675 million gallons per year (1.848 mgd) for the expiration of the groundwater withdrawal permit in 2015. It was assumed that facility demands would continue to grow based on anticipated product demand increases and corporate plans for growth as mentioned in the permit application. The assumed growth rate was a linear interpolation between recent facility average demand levels and the 2015 projection, which results in an estimated annual average demand of 4.125 mgd by 2040 (Table 5-9~~Table 5-10~~ and Figure 5-19~~Figure 5-19~~).

Figure 5-~~19~~19: Tyson Projected Water Demands

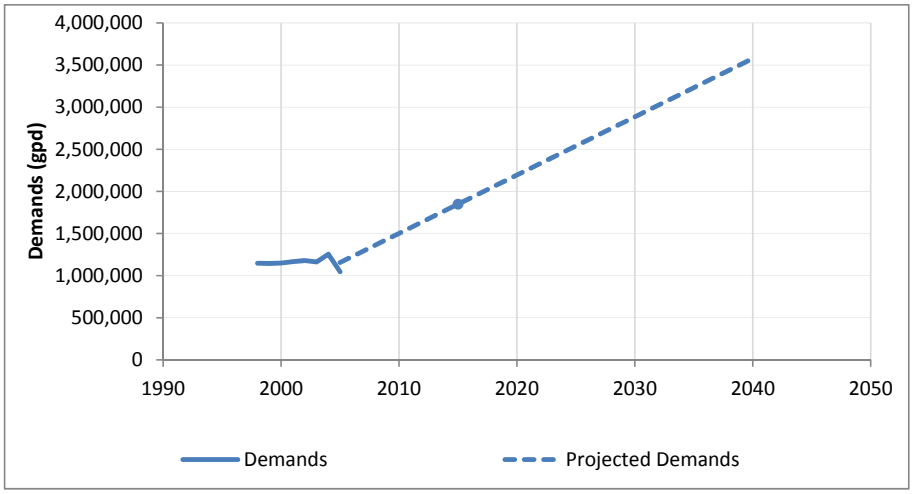

Table 5-~~9~~10:
Tyson Demand Projections

YEAR	AVERAGE DEMAND (GPD)	MAX MONTH DEMAND (GPD)
Projected Data		
2010	1,502,154	--
2020	2,193,944	--
2030	2,885,734	--
2040	3,577,524	--

5.4. Large Self-Supplied Agricultural Users

No detailed historical usage was available upon which to base a series of projections for large agricultural demands at individual facilities. Furthermore, the USGS estimates of water usage for the County for the period between 1985 and 2005 indicate a level or declining trend in agricultural demands[12]. Therefore, it was assumed that, on average, the current permitted amounts for each facility will likely be sufficient to meet demands within the 2040 planning horizon (Table 5-10~~Table 5-11~~ and Table 5-11~~Table 5-12~~).

Table 5-~~10~~11.
Projected Large Self-Supplied Agricultural Groundwater Demands

	Annual Permitted Withdrawal (gallons)	Monthly Permitted Withdrawal (gallons)
FACILITY/SYSTEM NAME	*Assumed 2010-2040 Demands*	*Assumed 2010-2040 Demands*
AL Mathews	41,904,000	14,142,000
Ames Farm	65,000,000	16,250,000
Bethel Church	32,400,000	16,200,000
Bobtown Nursery	10,900,000	4,000,000
Bowen Farm	42,620,000	16,000,000
Broadleaf Farms	3,700,000	1,000,000
Byrd Farm	22,650,000	9,910,000
Christian/Ames Farm	56,091,000	21,034,125
David Van Dessel Farm	4,500,000	1,200,000
Dennis Azaleas	2,700,000	500,000
Dennis Nursery	5,000,000	900,000
Drummond Farm	31,000,000	11,000,000
East Coast Brokers and Packers	13,500,000	2,400,000
Ed Goin	34,320,000	11,583,000
Evans or Oaks Farm	120,072,000	26,568,000
Gillespe Farm	28,000,000	12,500,000
Gunter Farm	12,500,000	6,300,000
Hagan Farm	17,000,000	5,700,000
Hickory Hill	34,560,000	17,280,000
Hogneck Farm	13,000,000	5,500,000
Home Farm	8,400,000	6,500,000
James Farm	54,000,000	7,900,000
Kelley Farm	30,124,000	14,300,000
Lang	51,840,000	12,960,000
Lewis Farm	24,300,000	11,500,000
Liberty Hall Farm	4,400,000	1,000,000
Mathews Farm	10,900,000	3,114,290
Melfa Farm	30,360,000	11,400,000
Middleton Farm	185,000,000	37,000,000
Mutton Hunk Fen Natural Area Preserve	40,340,000	19,100,000
Northam Somers	37,800,000	11,812,500
Painter Farm	18,400,000	8,520,000
Peach Orchard	42,600,000	8,520,000
Rew Farm	49,000,000	16,300,000
Robert Van Dessel Farm	3,400,000	900,000
Simpson Farm	21,517,000	10,193,000
Sommers Farm	24,300,000	11,500,000
Sterling	93,060,000	44,080,000
~~Tidewater Growers~~	~~1,800,000~~	~~600,000~~
Weaver Farm	32,900,000	11,000,000
Wes Powers	20,160,000	5,040,000
Wessells Farm	21,517,000	10,193,000
Wessells/ Watkinson Farm	13,500,000	3,375,000
Total Permitted Withdrawals (MG)	**1,411.04**	**466.77**

Table 5-1112.
Projected Large Self-Supplied Agricultural Surface Water Demands

	Average Annual Use (MG)
User Name	*Assumed 2010-2040 Demands*
AL WESSELLS\BOB WATKINSON	14.01
BOBTOWN NURSERY	41.48
DUBLIN FARMS INC	506.00
EASTERN SHORE AGR. EXP. STN.	0.91
ED GOIN	32.04
F.A. HOLLAND & SONS	40.88
GODWIN'S NURSERY/PENINSULA PRO	0.35
GREEN ACRES FARMS	9.50
JOHN H DUER III	151.20
KELLEY FARM	21.98
KLUIS' NURSERIES	8.11
MATTHEWS FARM	21.74
NOCK FARM	5.47
PEACH ORCHARD FARM	12.50
STURGIS FARM	56.19
VAN KESTEREN FARMS INC	139.85
W.T. HOLLAND SONS INC	33.56
WEAVER FARM	28.12
WESSELLS FARM	11.59

5.5. Small Self-Supplied Use Outside of the Community Service Areas

Based on USGS estimates of small self-supplied population and water demands outside of the community service area, the County-wide trends for the period between 1985 and

2005 are decreasing[12]. The USGS data were extrapolated to 2040 using a linear interpolation for population and water demands (Table 5-12~~Table 5-134~~ and Figure 5-20~~Figure 5-20~~).

Figure 5-20~~20~~: Small Self-Supplied Water Demands Outside of the Community Service Areas

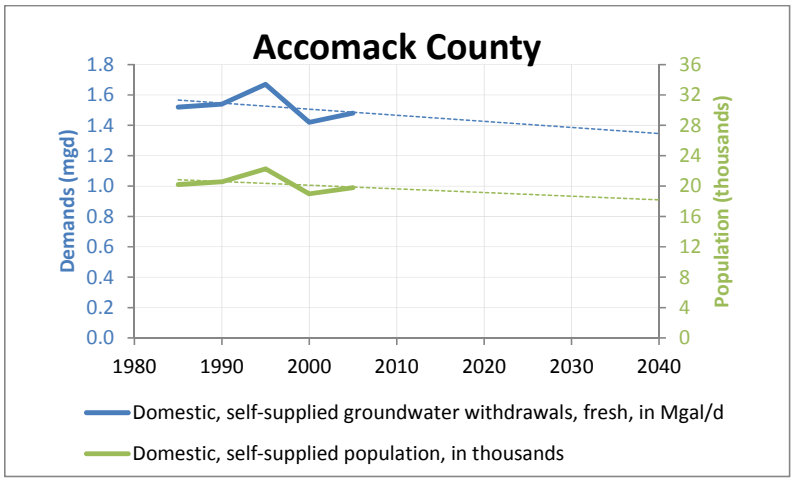

Table 5-12~~13~~:
Small Self-Supplied Water Demand Projections

YEAR	POPULATION	AVERAGE DEMAND (GPD)
Projected Data		
2010	19,635	1,466,000
2020	19,151	1,426,000
2030	18,667	1,386,000

2040	18,183	1,346,000