

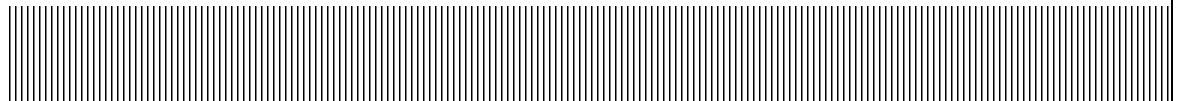


**Northampton County**  
Water Supply Plan

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# Appendix A

## Northampton County Community Water System Well Summary



# Northampton County - Community Water System Well Summary

Water System and Well Name	Well Completion Date	Well Depth (ft)	Pumping Level (ft)	Diameter (in)	Casing Depth (ft)	Screen Depth (ft)	Annual Permitted Withdrawal (Gallons)	Max. Monthly Permitted Withdrawal (Gallons)
<b>Arlington Plantation</b>								
Missing Well Information	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
<b>Bayview</b>								
Missing Well Information	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
<b>Cape Charles Municipal Corporation</b>								
East Well(165-00123)	11/6/1976	230	87	n/a	n/a	n/a	153,000,000	15,550,000
Tower Well(165-00387)	11/21/1996	210	88	n/a	n/a	n/a	153,000,000	15,550,000
<b>Eastville, Town of</b>								
backup well(165-00445)	1/8/1952	135	n/a	n/a	n/a	n/a	23,700,000	2,900,000
Main well(165-00038)	9/15/1972	165	128	n/a	n/a	n/a	23,700,000	2,900,000
<b>Exmore, Town of</b>								
Well #1(165-00015)	9/1/1950	200	52	n/a	160	190	60,800,000	9,920,000
Well #2(165-00014)	6/1/1965	228	100	n/a	160	212	60,800,000	9,920,000
<b>Holiday Acres Mobile Home Park</b>								
Missing Well Information	n/a	n/a	n/a	n/a	n/a	n/a	8,212,500	n/a
<b>Kiptopeake Condominiums</b>								
Missing Well Information	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
<b>Northampton County Government Complex</b>								
Well #1(165-149)	n/a	n/a	n/a	n/a	n/a	n/a	16,206,000	2,025,750
Well #2(165-150)	n/a	n/a	n/a	n/a	n/a	n/a	16,206,000	2,025,750
Well #3(165-151)	n/a	n/a	n/a	n/a	n/a	n/a	16,206,000	2,025,750
<b>Shore Memorial Hospital</b>								
#1(165-00025)	10/31/1952	304	88	n/a	n/a	n/a	18,555,000	3,370,000
#2(165-00001)	2/13/1969	305	139.3	n/a	n/a	n/a	18,555,000	3,370,000

Source : VDEQ Data (Well and System Info.xls) and paper copies of DEQ withdrawal permits

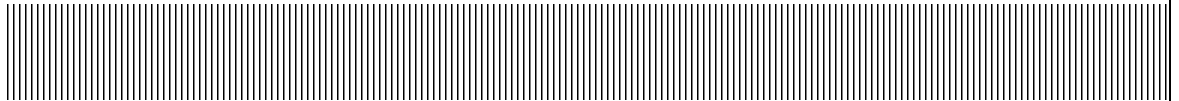


**Northampton County**  
Water Supply Plan

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# Appendix B

## Northampton County Large Non-Agricultural User Well Summary



Northampton County - Large Non-Agricultural User Well Summary

Water System and Well Name	Well Completion Date	Well Depth (ft)	Pumping Level (ft)	Diameter (in)	Casing Depth (ft)	Screen Depth (Top & Bottom) or Water Zones (ft)	Annual Permitted Withdrawal (Gallons)	Max. Monthly Permitted Withdrawal (Gallons)
<b>Bayshore Concrete Products Corp Cape Charles</b>								
#1 Shop(165-00381)	9/26/1986	122	60	n/a	n/a	n/a	27,700,000	2,800,000
#10-A, Boiler near new office(165-00465)	12/16/1998	200	35	n/a	n/a	n/a	27,700,000	2,800,000
#10-B, New Boiler Room(165-00466)	2/2/2000	220	40	n/a	n/a	n/a	27,700,000	2,800,000
#11, New bathroom(165-00467)	1/27/2000	200	40	n/a	n/a	n/a	27,700,000	2,800,000
#12, Aggregate Bins well(165-00468)	10/19/2002	200	35	n/a	n/a	n/a	27,700,000	2,800,000
#3 Bkfld(165-00383)	7/1/1992	120	0	n/a	n/a	n/a	27,700,000	2,800,000
#4 Washout(165-00111)	4/11/1973	200	64	n/a	n/a	n/a	27,700,000	2,800,000
#5 Propane(165-00382)	1/22/1989	200	48	n/a	n/a	n/a	27,700,000	2,800,000
#5b Girder(165-00390)	7/8/1997	200	30	n/a	n/a	n/a	27,700,000	2,800,000
#6 Poles(165-00384)	5/10/1994	220	0	n/a	n/a	n/a	27,700,000	2,800,000
#7 Welding(165-00389)	10/16/1998	220	152	n/a	n/a	n/a	27,700,000	2,800,000
Girder #5C(165-00464)	10/16/2002	200	40	n/a	n/a	n/a	27,700,000	2,800,000
<b>Best Western Sunset Beach Resort</b>								
Well #1(165-00260)	1/1/1966	70	42	4	0-50	50-70	7,650,000	1,420,000
Well #2(165-00042)	8/1/1974	70	26	n/a	n/a	n/a	7,650,000	1,420,000
Well #3(165-00112)	7/11/1991	240	0	n/a	n/a	n/a	7,650,000	1,420,000
Well #4(165-00401)	7/7/1999	240	n/a	n/a	n/a	n/a	7,650,000	1,420,000
Well #5(165-00404)	8/21/1995	210	n/a	4	0-190	190-210	7,650,000	1,420,000
Well #6(165-00402)	n/a	60	n/a	n/a	n/a	n/a	7,650,000	1,420,000
Well #7(165-00403)	n/a	60	n/a	n/a	n/a	n/a	7,650,000	1,420,000
<b>Cherrystone Family Camping Resort</b>								
W1(165-00357)	2/10/1981	265	n/a	n/a	n/a	n/a	8,600,000	2,655,000
W10(165-00456)	n/a	n/a	n/a	n/a	n/a	n/a	11,100,000	3,310,000
W11(165-00457)	1/1/1985	n/a	n/a	n/a	n/a	n/a	11,100,000	3,310,000
W2(165-00356)	2/15/1988	266	123	n/a	n/a	n/a	8,600,000	2,655,000
W3(165-00082)	12/10/1974	260	30	n/a	n/a	n/a	8,600,000	2,655,000
W4(165-00027)	6/2/1970	260	n/a	n/a	n/a	n/a	8,600,000	2,655,000
W5(165-00453)	1/1/1974	n/a	n/a	n/a	n/a	n/a	11,100,000	3,310,000
W6(165-00454)	1/1/1980	n/a	n/a	n/a	n/a	n/a	11,100,000	3,310,000
W7(165-00097)	2/25/1974	n/a	11	n/a	n/a	n/a	11,100,000	3,310,000
W8(165-00096)	2/20/1970	268	27	n/a	n/a	n/a	11,100,000	3,310,000
<b>YMCA Family Campground</b>								
Well #1(165-00395)	9/18/1998	220	140	4	n/a	200-220	5,500,000	1,100,000
Well #2(165-00396)	7/7/1967	220	192	6	n/a	200-220	5,500,000	1,100,000

Source : VDEQ Data (Well and System Info.xls) and paper copies of DEQ withdrawal permits



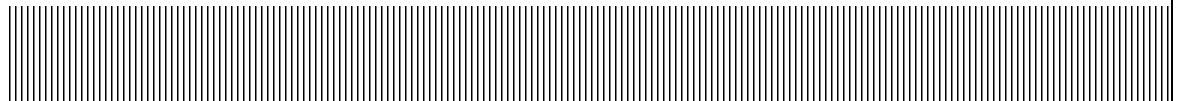


**Northampton County**  
Water Supply Plan

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# Appendix C

## **Northampton County Groundwater Withdrawal Permits and Demand Management Plans**





# COMMUNITY WATER SUPPLY SYSTEMS



**MALCOLM  
PIRNIE**



# Bayview



**MALCOLM  
PIRNIE**

Current Status Time Scheduled Report as of 8/15/2006 9:56:05

AM

Device: 3970 Model: XR-50 Description: Bayview Pump

Station Local Time: 10/26/2006 4:54:13 PM

**Address:** Bayview Circle Cheriton, VaNote: A Bold condition indicates the latest change. A Red condition indicates a status in the alarm state.  
Click on Device Update button for the latest status.

## Digital Inputs

#	Description	Current Condition	# of State Changes	Last
1	Wet Well High Level	5.26.06 11:14 PM Normal	10	5/
2	Wet Well Low Level	1.5.06 10:10 AM Normal	21	1.
3	Power Fail	6.22.06 3:01 PM Normal	28	6
4	Battery Fail	7.31.03 11:10 AM Normal	0	7/
5	Pump 1 Fail	9.29.04 3:55 PM Normal	6	9
6	Pump 2 Fail	9.29.04 3:55 PM Normal	4	9
7	Seal Fail Pump 1	1.30.05 1:24 PM Normal	0	1.
8	Seal Fail Pump 2	1.30.05 1:24 PM Normal	0	1.

## Pump Runtimes

#	Description	Number Starts	Elapsed Runtime (Hrs:Min:Secs)	Pump GPM	Amount: Total Gallons
9	Pump 1 Cycles	8987	545:40:00	120	3,928,800
10	Pump 2 Cycles	9036	612:60:00	120	4,413,600

## General Alarms

Description	Status	Last Stat
Celluar Signal Strength	Acceptable	8/4/2004

Device Setup Device Activity Runtime History

Device Update	Reset Pump Runtime
Reset State Changes	Alarm Acknowledge

☐ Device List
 ☐ Main Menu
 ☐ Support
 ☐ Help
 ☐ Log-Off
Send mail to [webmaster@omni-site.net](mailto:webmaster@omni-site.net) with questions or comments about this web site.  
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Last State Change

5.26.06 11:14 PM  
 1/5/05 10:10 AM  
 6.22.06  
 7.31.03  
 9.29.04

8,000  
 12.348 = 99 bina.

Bayview

	Pump Station Cycles	Treatment Plant Cycles	Amt. Pumped #VALUE!	Amt. Disposed #VALUE!		
9/30/2005	18	4	10332	7040		
9/29/2005	16	6	9184	10560		
9/28/2005	16	5	9184	8800		
9/27/2005	17	6	9758	10560		
9/26/2005	20	6	11480	10560		
9/25/2005	19	6	10906	10560		
9/24/2005	17	6	9758	10560		
9/23/2005	15	4	8610	7040		
9/22/2005	20	8	11480	14080		
9/21/2005	16	4	9184	7040		
9/20/2005	16	6	9184	10560		
9/19/2005	18	6	10332	10560		
9/18/2005	17	4	9758	7040		
9/17/2005	17	6	9758	10560		
9/16/2005	16	6	9184	10560		
9/15/2005	16	4	9184	7040		
9/14/2005	17	6	9758	10560		
9/13/2005	18	6	10332	10560		
9/12/2005	18	6	10332	10560		
9/11/2005	17	4	9758	7040		
9/10/2005	16	6	9184	10560		
9/9/2005	16	6	9184	10560		
9/8/2005	17	4	9758	7040		
9/7/2005	18	6	10332	10560		
9/6/2005	19	6	10906	10560		
9/5/2005	19	6	10906	10560		
9/4/2005	18	6	10332	10560		
9/3/2005	17	4	9758	7040		
9/2/2005	16	6	9184	10560		
9/1/2005	16	4	9184	7040		
					9254.194	220.3379
	516	163	296184	286880	9254.194	220.3379
			296184	286880	9554.323	227.4839
					9254.193548	231.3548

	Pump Station Cycles	Treatment Plant Cycles	Amt. Pumped	Amt. Disposed
9/30/2004	10	2	5780	3520
9/29/2004	10	4	5780	7040
9/28/2004	9	2	5202	3520
9/27/2004	10	4	5780	7040
9/26/2004	15	4	8670	7040
9/25/2004	9	4	5202	7040
9/24/2004	8	2	4624	3520
9/23/2004	9	4	5202	7040
9/22/2004	9	2	5202	3520
9/21/2004	8	2	4592	3520
9/20/2004	8	2	4592	3520
9/19/2004	11	4	6314	7040
9/18/2004	8	4	4592	7040
9/17/2004	8	2	4592	3520
9/16/2004	10	4	5740	7040
9/15/2004	8	2	4592	3520
9/14/2004	8	2	4592	3520
9/13/2004	12	4	6888	7040
9/12/2004	8	4	4592	7040
9/11/2004	24	8	13776	14080
9/10/2004	17	4	9758	7040
9/9/2004	13	4	7462	7040
9/8/2004	21	8	12054	14080
9/7/2004	9	4	5166	7040
9/6/2004	9	2	5166	3520
9/5/2004	9	2	5166	3520
9/4/2004	15	6	8610	10560
9/3/2004	10	4	5740	7040
9/2/2004	12	2	6888	3520
9/1/2004	12	4	6888	7040
8/31/2004	22	8	12628	14080
8/30/2004	10	4	5740	7040
8/29/2004	10	2	5740	3520
8/28/2004	11	4	6314	7040
8/27/2004	11	4	6314	7040
8/26/2004	11	4	6314	7040
8/25/2004	11	4	6314	7040
8/24/2004	12	4	6888	7040
8/23/2004	13	4	7462	7040
8/22/2004	25	8	14350	14080
8/21/2004	14	4	8036	7040

9/29/2004	10	4	5780	7040
9/28/2004	9	2	5202	3520
9/27/2004	10	4	5780	7040
9/26/2004	15	4	8670	7040
9/25/2004	9	4	5202	7040
9/24/2004	8	2	4624	3520
9/23/2004	9	4	5202	7040
9/22/2004	9	2	5202	3520
9/21/2004	8	2	4592	3520
9/20/2004	8	2	4592	3520
9/19/2004	11	4	6314	7040
9/18/2004	8	4	4592	7040
9/17/2004	8	2	4592	3520
9/16/2004	10	4	5740	7040
9/15/2004	8	2	4592	3520
9/14/2004	8	2	4592	3520
9/13/2004	12	4	6888	7040
9/12/2004	8	4	4592	7040
9/11/2004	24	8	13776	14080
9/10/2004	17	4	9758	7040
9/9/2004	13	4	7462	7040
9/8/2004	21	8	12054	14080
9/7/2004	9	4	5166	7040
9/6/2004	9	2	5166	3520
9/5/2004	9	2	5166	3520
9/4/2004	15	6	8610	10560
9/3/2004	10	4	5740	7040
9/2/2004	12	2	6888	3520
9/1/2004	12	4	6888	7040
8/31/2004	22	8	12628	14080
8/30/2004	10	4	5740	7040
8/29/2004	10	2	5740	3520
8/28/2004	11	4	6314	7040
8/27/2004	11	4	6314	7040
8/26/2004	11	4	6314	7040
8/25/2004	11	4	6314	7040
8/24/2004	12	4	6888	7040
8/23/2004	13	4	7462	7040
8/22/2004	25	8	14350	14080
8/21/2004	14	4	8036	7040

8/20/2004	11	4	6314	7040		
8/19/2004	17	6	9758	10560		
8/18/2004	13	4	7462	7040		
8/17/2004	18	6	10332	10560		
8/16/2004	19	6	10906	10560		
8/15/2004	15	6	8610	10560		
8/14/2004	9	2	5166	3520		
8/13/2004	8	2	4592	3520		
8/12/2004	6	2	3444	3520		
8/11/2004	9	4	5166	7040		
8/10/2004	8	2	4592	3520		
8/9/2004	8	2	4592	3520		
8/8/2004	8	4	4592	7040		
8/7/2004	13	4	7462	7040		
8/6/2004	13	4	7462	7040		
8/5/2004	18	2	10332	3520		
8/4/2004	9	4	5166	7040		
8/3/2004	18	6	10332	10560		
8/2/2004	11	4	6314	7040		
8/1/2004	9	2	5166	3520		
7/31/2004	13	6	7462	10560	189420	186560
7/30/2004	26	8	14924	14080	6018 avg.	
7/29/2004	8	2	4592	3520	188/dwelling	
7/28/2004	8	2	4592	3520	per	
7/27/2004	10	4	5740	7040		
7/26/2004	7	2	4018	3520		
7/25/2004	8	4	4592	7040		
7/24/2004	10	2	5740	3520		
7/23/2004	8	2	4592	3520		
7/22/2004	6	2	3444	3520		
7/21/2004	10	4	5740	7040		
7/20/2004	12	4	6888	7040		
7/19/2004	11	2	6314	3520		
7/18/2004	7	2	4018	3520		rain
7/17/2004	7	2	4018	3520		rain
7/16/2004	15	6	8610	10560		
7/15/2004	15	6	8610	10560		
7/14/2004	11	2	6314	3520		rain event
7/13/2004	13	6	7462	10560		
7/12/2004	18	6	10332	10560		
7/11/2004	11	2	6314	3520		
7/10/2004	14	6	8036	10560		
7/9/2004	10	2	5740	3520		
7/8/2004	12	4	6888	7040		
7/7/2004	10	2	5740	3520		rain event
7/6/2004	9	4	5166	7040		
7/5/2004	8	2	4592	3520		
7/4/2004	9	2	5166	3520		rain event
7/3/2004	8	4	4592	7040		
7/2/2004	7	2	4018	3520		rain event
7/1/2004	9	2	5166	3520		
6/30/2004	8	4	4592	7040	140630	144320

6/29/2004	12	4	6888	7040	4811 avg.
6/28/2004	6	2	3444	3520	150/dwe
6/27/2004	13	4	7462	7040	
6/26/2004	10	2	5740	3520	
6/25/2004	6	2	3444	3520	rain event
6/24/2004	6	2	3444	3520	
6/23/2004	6	2	3444	3520	
6/22/2004	6	2	3444	3520	
6/21/2004	10	4	5740	7040	
6/20/2004	7	2	4018	3520	
6/19/2004	9	2	5166	3520	
6/18/2004	7	2	4018	3520	
6/17/2004	5	2	2870	3520	
6/16/2004	6	2	3444	3520	
6/15/2004	7	2	4018	3520	
6/14/2004	6	2	3444	3520	
6/13/2004	8	2	4592	3520	
6/12/2004	8	4	4592	7040	
6/11/2004	13	4	7462	7040	
6/10/2004	6	2	3444	3520	
6/9/2004	6	2	3444	3520	
6/8/2004	7	2	4018	3520	
6/7/2004	7	2	4018	3520	
6/6/2004	8	2	4592	3520	
6/5/2004	15	4	8610	7040	
6/4/2004	7	2	4018	3520	
6/3/2004	6	2	3444	3520	
6/2/2004	15	6	8610	10560	
6/1/2004	9	6	5166	10560	
5/31/2004	8	4	4592	7040	133760
5/30/2004	8	2	4592	3520	4315 avg.
5/29/2004	6	2	3444	3520	135/dwelling
5/28/2004	11	4	6314	7040	
5/27/2004	16	6	9184	10560	
5/26/2004	9	2	5166	3520	
5/25/2004	8	2	4592	3520	
5/24/2004	6	2	3444	3520	
5/23/2004	6	2	3444	3520	
5/22/2004	6	2	3444	3520	
5/21/2004	8	2	4592	3520	
5/20/2004	6	2	3444	3520	
5/19/2004	7	4	4018	7040	
5/18/2004	6	2	3444	3520	
5/17/2004	6	2	3444	3520	
5/16/2004	9	2	5166	3520	
5/15/2004	7	2	4018	3520	
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5/13/2004	6	2	3444	3520	
5/12/2004	5	4	2870	7040	
5/11/2004	7	2	4018	3520	
5/10/2004	8	2	4592	3520	
5/9/2004	7	2	4018	3520	



5/8/2004	7	2	4018	3520
5/7/2004	7	2	4018	3520
5/6/2004	6	2	3444	3520
5/5/2004	6	2	3444	3520
5/4/2004	10	4	5740	7040
5/3/2004	6	2	3444	3520
5/2/2004	7	2	4018	3520
5/1/2004	6	2	3444	3520

1523	496	874558	872960
		874202	872960

VIRGINIA DEPARTMENT OF HEALTH  
ENGINEERING DESCRIPTION SHEET

DATE: September 7, 2005

WATERWORKS NAME: Bayview CERTIFIED CLASS: VI

COUNTY/CITY: Northampton County TYPE: Community

LOCATION: This waterworks is located on off state route 684 (Bayview Road) approximately 0.5 miles south of intersection of state route 684 and state route 184 to Cheriton.

OWNER: Bayview Citizens for Social Justice  
21186 North Bayside Road  
P.O. Box 527  
Cheriton, Virginia 23316  
C/O Ms. Alice Coles, President  
(757) 331-1840

OPERATOR: Bayview Citizens for Social Justice  
P.O. Box 527  
Cheriton, Virginia 23316  
C/O Ms. Alice Coles, President  
(757) 331-1840

PERMIT NO.: 3131061

DATE ISSUED: September 7, 2005

TYPE OF TREATMENT: None

SOURCE: 2 Wells

DESIGN CAPACITY: 29,000 GPD

DESCRIPTION OF PROPOSED PROJECT

The proposed waterworks project consists of two wells, a 15,000-gallon ground storage tank, a 5,000-gallon hydropneumatic tank, two transfer pumps, and the distribution system.

North Well: The drilling of this well started on December 5, 2000 and was completed on January 3, 2001, to a total depth of 260 feet. The drill hole size is 15 inches from 0 to 50 feet and 11-inches from 50 to 260 feet. The well is provided with a 12-inch diameter steel outer casing from 0 to 50 feet and the annular space around the outer casing is grouted with neat cement grout from 0 to 50 feet. The 6-inch diameter inner steel casing extends from +2 feet to 205 feet followed by 30 feet of 6-inch diameter stainless screen (mesh size .020) followed by 10 feet of 6-inch diameter steel casing. The inner casing is grouted from 0 to 174 feet with neat cement grout and from 174 to 184 feet with bentonite. The well is gravel packed from 205 feet to 237 feet with U.S. Silica No. 1 and 237 feet to 245 feet with U.S. Silica No. 2. During a 48-hour simultaneous yield and drawdown test of the North and South Well, the North Well yield was 39.6 gpm with water level falling from 24.8 feet (static) to 182.9 feet (dynamic). The well is equipped with a submersible pump rated at 30 gpm at 205 feet TDH and is powered by a 2 H.P. motor.

South Well: The drilling of this well started on December 5, 2000 and was completed on January 12, 2001, to a total depth of 260 feet. The drill hole size is 15 inches from 0 to 50 feet and 11-inches from 50 to 260 feet. The well is provided with a 12-inch diameter steel outer casing from 0 to 50 feet and the annular space around the outer casing is grouted with neat cement from 0 to 50 feet. The 6-inch diameter inner steel casing extends from +2 feet to -205 feet followed by 30 feet of 6-inch diameter stainless screen (mesh size .020) followed by another 10 feet of 6-inch diameter steel casing. The inner casing is grouted from 0 to 183 feet with neat cement grout and from 183 to 193 feet with bentonite. The well is gravel packed from 193 feet to 237 feet with U.S. Silica No. 1, and from 237 feet to 245 feet with U.S. Silica No. 2. During a 48-hour simultaneous yield and drawdown test of the North and South Well, the South Well yield was 35.3 gpm with water level falling from 24.5 feet (static) to 190.4 feet (dynamic). The well is equipped with a submersible pump rated at 28 gpm at 210 feet TDH and is powered by a 2 H.P. motor.

Storage is provided by a 15,000-gallon ground tank and a 5,000-gallon (effective capacity 1,667 gallons) hydropneumatic tank. Duplicate transfer pumps, each rated at 80 gpm at 140 feet and 225 gpm at 112 feet TDH, transfer water from the 15,000-gallon ground tank to the 5,000-gallon hydropneumatic tank.

### EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERCs). One ERC for will utilize 360 gallons per day. This system's capacity is evaluated as follows:

#### I. Source Capacity

##### A. Source Yield

##### 1. Number of Sources

- a. Required = 1 up to 49 ERCs, more than 1 for 50 or more ERCs
- b. Provided = 2 wells

2. Yield:	<u>Well Number</u>	<u>Well Yield (gpm)(over a 48 hour test)</u>	<u>Pump</u>
	North Well (No.1)	39.6	30
	South Well (No.2)	<u>35.3</u>	<u>28</u>
	Total =	75	Total = 58 gpm

- B. Well yield: 75 gpm/(.5 gpm/ERC) = 150 ERCs  
150 ERC \* 360 gpd/ERC = 54,000 gpd

- C. Well Pump Capacity: 58 gpm \*1440 minutes/day = 83,520 gpd

#### II. Transfer Pump Capacity

- A. Total Pumping Capacity = 80 + 80 = 160 gpm (assume worse case)

- B. Capacity =  $Q = 11.4 N^{0.544}$   
160 gpm =  $11.4 N^{0.544}$   
N= 128 ERC

- C. Pumping Equivalent: 128 ERC \* 360 gpd/ERC = 46,030 gpd

III. Storage Capacity

A. Total Storage = 15,000 gal. + 5,000 gal. = 20,000 gallons (effective storage = 12,800+1666)

B. Storage Capacity =  $\frac{14,466 \text{ gallons}}{180 \text{ gal./ERC}} = 80.37 \text{ ERCs}$

C. Equivalent:  $80.37 \text{ ERC} * 360 \text{ gpd/ERC} = 28,930$

IV. Limiting Case

A. Storage Capacity = 80.37 ERCs

B. Capacity Equivalent =  $80.37 \text{ ERCs} \times 360 \text{ gpd/ERC} = 28,933 \text{ gpd}$  (say 29,000 gpd)

Therefore, based on the critical values discussed above, the proposed waterworks has a design capacity of 29,000 gpd or 80 ERC.

DWT/mw



# Town of Cape Charles



# **SECTION 5**

## **JUSTIFICATION OF AMOUNT OF WITHDRAWAL REQUESTED**

### **INTRODUCTION**

The Town of Cape Charles owns and operates a public water supply system that provides potable water to its residential and commercial customers within the Historic Town and surrounding areas including the Bay Creek residential development and the Sustainable Technologies Industrial Park (STIP). Under its existing Groundwater Withdrawal Permit (GWWP No. GW0041200), Cape Charles is permitted to withdrawal up to 252,200,000 gallons per year. Water demand projections for the next 10-year permit cycle indicate that this amount is adequate to meet the future water supply needs. Therefore, the town is applying for reissuance of the existing Groundwater Withdrawal Permit without modification of the requested withdrawal amount.

Water is supplied from two groundwater wells (Tower Well 1 and East Well 1). East Well 1 is currently not being used due to a hole in the well casing and will be replaced by East Well 3, which is being drilled on the same well lot as East Well 1. Two additional wells, Tower Well 2 and East Well 2, have been drilled and will be incorporated into the Town's water system during 2008. Water from all wells is conveyed to the Town's water treatment plant (WTP) located on Route 184 adjacent to the 300,000 gallon elevated water storage tank. Water treatment consists of oxidation and green sand filtration, and ionic exchange softening (partial flow) to treat elevated iron and hardness along with disinfection. Backwash from the filters is discharged to the Town's Wastewater Treatment Plant (WWTP). The Town of Cape Charles currently serves a population of 1,574 full time and part time residents through approximately 1,128 residential and commercial service connections. The service area and locations of the wells, treatment facilities and storage facilities are shown in Figures 5.1 and 5.2.

### **EXISTING WATER USE**

The following section discusses population trends, historic water demands, disaggregated water use, and water conservation efforts at the Town of Cape Charles to document that the amount of groundwater withdrawal requested is the smallest amount of withdrawal necessary to support the proposed beneficial use and that the amount is representative of similar uses.

## Town Population Trends

The 2007 Cape Charles Population Study (<http://www.capecharles.org/pop.htm>) was undertaken by the Planning Commission in order to better understand the Town's changing population characteristics and to help develop the Town's Comprehensive Plan. Each household within the Town boundaries was asked a series of questions to gather demographic, housing, and economic data. Cape Charles' population has changed dramatically in recent years with many new residents moving into the Town, while others have left the area.

Based on the 2007 study, the Town's full time population is about 972. This is a decrease of about 14 percent since 2000. The population decrease continues a trend which was also observed during the 1990s when the full time population decreased by 19 percent. As the full time population decreased in Cape Charles, part time residents have dramatically increased, continuing a trend of a steady increase in the part time population observed over the past several decades. The 2007 population of part time residents is 602. Many part time households live in Town seasonally or on weekends.

Of the full time population, Cape Charles has seen major decreases of up to 30% among the young to middle age population and many of the new full time residents are older retirees. The average full time household size has decreased to less than 2 persons per household as families have left the area. The part time population on the other hand shows a concentration of families of middle-aged adults and teenage children as well as older retirees. The average number of persons per part time household is slightly greater than 2.

The Population Study found a total of 984 housing units in Cape Charles. Between 2000 and 2007, the total number of housing units increased by 33.3 percent. Most of the new housing units are located in the Bay Creek development and include both single-family homes and multiple family units such as condominiums or duplexes. It appears most of the new units are either vacant or occupied on a part time basis. The number of units occupied on a full time basis decreased from 534 to 502 between 2000 and 2007. However, the number of units occupied on a part time basis increased from 82 to 239, and the number of vacant units increased from 122 to 243. The decreasing trend of full time residents is expected to reverse in the future. Increased permanent occupancy is expected both in the Historic District and within Bay Creek due to the planned enhancements to the community, increased job opportunity in the area, and increased baby boomer retirement.



## Historic Water Use Rates

Groundwater withdrawal data and water use at Cape Charles is available on a monthly basis from 1987 through 2007. An annual summary and statistical analysis of water withdrawal data and average annual water use per equivalent residential connection (gpd/ERC) is summarized in Table 5.1 and is illustrated in Figure 5.3. This information is derived from self-reported data from the Town's Water Supply Reports submitted to the Virginia Department of Health (VDH) and Quarterly Groundwater Withdrawal Reports submitted to the Virginia Department of Environmental Quality (DEQ). As shown, groundwater withdrawal/water use was significantly higher between 1987 and 1994 ranging up to 67.3 million gallons per year (MGY) and averaging 55.9 MGY. From 1995 through 2007, annual water use ranged up to 58.8 MGY in 2006 and averaged 47.1 MGY. The lower water use during the late 1990s and 2000s is attributed primarily to water conservation measures, a reduction of leaks and unaccounted for water losses, and possibly to a lower full time population within the town.

Between 1999 and 2006, water use was relatively stable and increased from a daily annual average of 117,401 gpd in 1999 to 161,146 gpd in 2006, representing an average increase of 4.7 percent per year. The number of connections increased from 742 in 1999 to 1,128 in 2007, representing an average increase of 6.5 percent per year. The average daily water use rate per connection decreased gradually from 158 gpd in 1999 to 153 gpd in 2006 with an average water use of 153 gpd per connection. The declining water use rate is in part due to a decrease in full time residents and an increase in the number of part time residential connections associated with the Bay Creek development. In 2007, water use declined significantly (i.e., 17.7% from 2006) averaging 132,544 gpd for a water use rate of approximately 118 gpd per connection. The overall average water use per connection between 1999 and 2007 is 149 gpd.

The decline in water use during 2007 is attributed to a number of activities implemented by the Town to reduce water losses, backwash water at the treatment plant, and unaccounted for water. The Town has also adapted higher water rates to promote water conservation and to further reduce water usage. The activities implemented by the Town to curb increasing water use included:

- Implemented water plant improvements to reduce backwash water
- Increased water rates to encourage water conservation
- Identified and began metering unmetered customers
- Located and repaired distribution system leaks
- Controlled construction activities better to reduce unmetered usage.

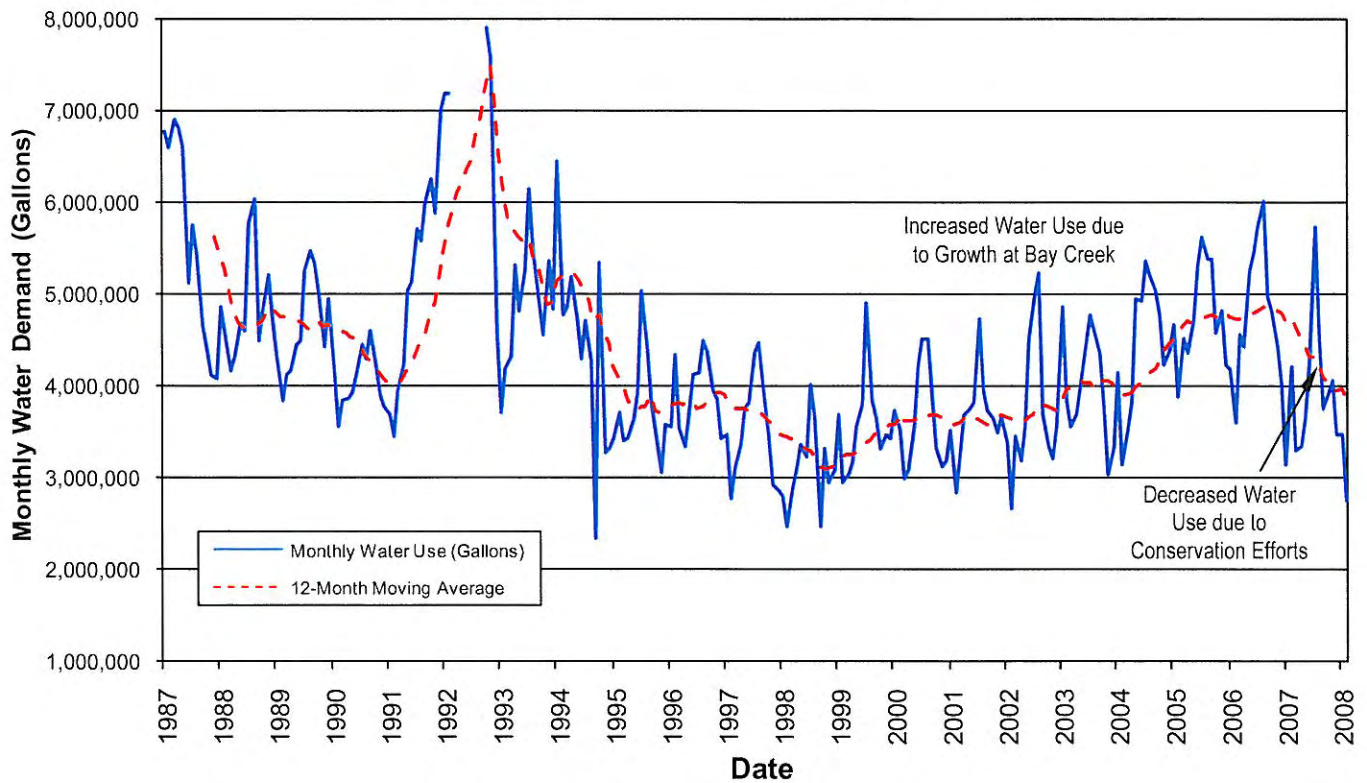


**TABLE 5.1**  
**HISTORICAL GROUNDWATER WITHDRAWALS**  
**TOWN OF CAPE CHARLES, VIRGINIA**

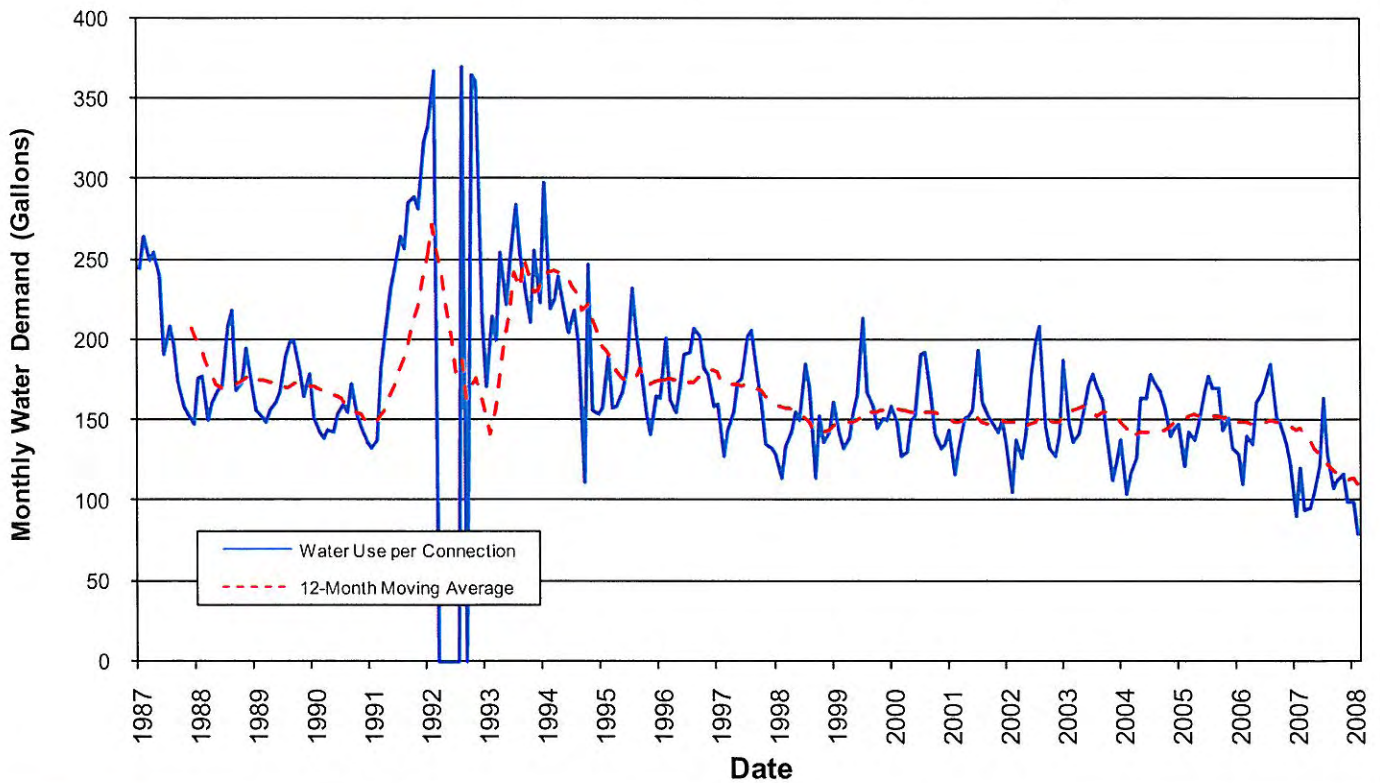
<b>Date</b>	<b>Annual Total Water Withdrawal<sup>1</sup> (gpd)</b>	<b>Annual Average Daily Demand (gpd)</b>	<b>Estimated<sup>2</sup> Average No. of Connections</b>	<b>Annual Use per Connection (gpd/ERC)</b>
1987	67,339,335	184,491	894	206
1988	58,129,228	159,258	894	178
1989	55,892,600	153,130	894	171
1990	48,750,300	133,562	894	149
1991	61,913,610	169,626	700	242
1992	42,477,500	116,377	700	166
1993	58,889,411	161,341	700	230
1994	53,581,200	146,798	700	210
1995	44,803,913	122,750	700	175
1996	46,926,504	128,566	700	184
1997	42,269,745	115,808	700	165
1998	37,369,542	102,382	700	146
1999	42,851,300	117,401	742	158
2000	43,199,900	118,356	762	155
2001	44,098,200	120,817	791	153
2002	44,807,300	122,760	813	151
2003	48,298,000	132,323	866	153
2004	53,524,759	146,643	973	151
2005	57,112,190	156,472	1,026	153
2006	58,818,170	161,146	1,053	153
2007	48,378,500	132,544	1,128	118
<b>Statistical Summary of Water Use (1999-2007)</b>				
Minimum	42,851,300	117,401	742	118
Maximum	58,818,170	161,146	1,128	158
Average	49,009,813	134,273	906	149
Median	48,298,000	132,323	866	153

- (1) Total measured withdrawal from West Well (DEQ 165-48), Tower Well 1 (DEQ 165-387) and East Well 1 (DEQ 165-123) as reported on VDH Water Supply Reports (1987-1998) and DEQ Groundwater Withdrawal Monitoring Reports (1999-2007). 1992 data is partial.
- (2) Estimated number of actual water connections (residual and commercial) billed in December of the given year. Prior to 1999, the number of connections is estimated and is derived from the VDH Water Supply Reports for Cape Charles

### Monthly Groundwater Withdrawal (1987-2007)



### Monthly Water Use per Connection (1987-2007)



DATE: 05/02/2008  
Project #: 063-6568  
Prepared By: PWN  
Reviewed By: BBW

Title:

**MONTHLY GROUNDWATER  
WITHDRAWAL (1987-2007)**

Town of Cape Charles, Virginia

**Figure  
No.  
5.3**

The maximum monthly water use between 1999 and 2007 ranged from approximately 4.5 to 6.6 million gallons occurring primarily during summer months. This amount is typically 1.2 to 1.4 times the average monthly water use and is primarily due to higher home occupancy rates, seasonal population increases and greater water use for lawn and shrub irrigation. The maximum monthly water use in 2006 of 6.6 million gallons exceeded the DEQ threshold of 5.8 million gallons specified under Special Condition 2 of the GWWP requiring Tower Well 2 to be connected to the water system and groundwater withdrawn for beneficial use. The maximum monthly water use in 2007 was less than 5.4 million gallons reflecting increased water efficiencies derived from the water loss reduction and water conservation actions implemented in 2007.

### **Disaggregated Water Use**

Cape Charles provides metered public water service to approximately 1,096 connections for residential, industrial, commercial, and municipal uses. Residential use represents the largest single use accounting for approximately 75% of total groundwater withdrawn in 2007. Residential use is broken down into single family (71.9%), condominiums (1.2%) and mixed use (1.9%). The mixed use category represents a mix of residential and commercial properties that have one meter for multiple units. The water use rate per connection for the residential and mixed use properties ranges from 95 to 115 gpd/ERC.

Commercial and industrial water use represented 10.5% of total withdrawals in 2007. There are approximately 86 active commercial and industrial connections in Cape Charles. Only 10 commercial connections use more than 500 gpd on an annual average basis, and only two commercial facilities use more than 1,000 gpd. The Village Cabana restaurant is located at the Bay Creek Marina Resort and has seating capacity for 150, and averaged 1,188 gpd water use in 2007. T&W Block is a ready-mix concrete and aggregate supplier and averaged 1,036 gpd water use in 2007. The Laundry Basket averaged 1,758 gpd; however, this facility utilizes its own well for water supply, which is metered for sewerage charges. Municipal water use includes water for public buildings such as the municipal building and the water and wastewater treatment plants.

Backwash water is calculated and represents the water used to backwash the filters at the water treatment plant. Unaccounted-for water is estimated by subtracting backwash and metered sales from the metered total withdrawals. Unaccounted-for water includes estimated unmetered uses, such as fire fighting, flushing pipes, fire protection, and water used by VDOT for stormwater flushing and street cleaning, as well as actual physical losses from leaky pipes, illegal hookups, and faulty or broken meters. Table 5.2 presents the water production and metered sales for 2007.



**TABLE 5.2**  
**2007 PUBLIC WATER USE**  
**TOWN OF CAPE CHARLES, VIRGINIA**

<b>Category</b>	<b>2007 Water Use (gallons)</b>	<b>Percentage</b>	<b># of Connections</b>	<b>Avg. Use per Connection (gpd/ERC)</b>
Well Production	48,378,500	100.0%		
Backwash <sup>1</sup>	3,690,380	7.6%		
Plant Production	44,688,120	92.4%		
Metered Sales <sup>2</sup>	41,714,119	86.2%		
<i>Residential</i>	34,805,088	71.9%	967	99
<i>Condo</i>	586,600	1.2%	17	95
<i>Commercial</i>	5,102,752	10.5%	86	163
<i>Municipal</i>	298,360	0.6%	4	204
<i>Mixed Use</i>	921,319	1.9%	22	115
Unaccounted For <sup>3</sup>	2,974,001	6.1%		
<i>System Flushing</i>	450,000	0.9%		
<i>Fire Protection</i>	104,000	0.2%		
<i>VDOT</i>	235,900	0.5%		
<i>Leaks/Other</i>	2,184,101	4.5%		

avg = 135

Source: Town of Cape Charles Condensed Meter Reading Report by Account ID for the period January through December 2007. Some discrepancies exist in the data. Notes:

1. Well production and backwash waste values are metered. Plant production is calculated by subtracting backwash waste from total well withdrawals.
2. Meter sales provided by the Town of Cape Charles by metered account type. Metered account type include residential (RES), condo (CND), commercial and industrial (COM), municipal (MUN), and mixed use (ZZZ).
3. Unaccounted water is the difference between total water produced from the treatment plant and the metered use. Unaccounted-for water included unmetered uses, such as fire fighting, flushing pipes, fire protection and VDOT uses which are estimated, illegal hookups or inaccurate meters; or actual physical losses from leaky pipes

## PROJECTED WATER DEMAND ESTIMATES

Future water demands have been estimated through 2040 for the Town of Cape Charles including the Historical Town, Bay Creek, the Sustainable Technology Industrial Park (STIP), and other planned developments such as the Harbor Redevelopment project. Figure 5.4 illustrates the area currently served by the Town of Cape Charles water

system. Future water demands were projected using various methods including population projections, per capita and per connection water use, past water demand growth rates, and water use per total developable acreage. Water demand estimates were developed by Stearns and Wheler (S&W) based on growth estimates provided by the Cape Charles Planning Department and by Bay Creek representatives. The results of the water demand projections were presented in two Technical Memorandums by S&W dated February 1, 2007 and October 16, 2007. Both documents are included as attachments to this section of the application.

Figure 5.5 presents a comparison of the various projections developed by S&W of average daily demands versus the current groundwater withdrawal permit of 690,485 gpd. As shown, based on the ERC and per capita projections, the projected water demand is expected to reach the current DEQ permit allocation by the end of the next permit cycle in 2018. The growth projections indicate by the end of 2018, the total ERCs serviced by the Town will be approximately 4,600 (October 16, 2007 Technical Memorandum Table 6). At an average water use of 150 gpd/ERC, the total projected demand in 2018 is estimated to be 690,000 gpd, just slightly greater than the current permitted withdrawal. The majority of the water demand increases are attributed to growth in Bay Creek based and other proposed developments discussed below.

### **Bay Creek Development**

In the late 1990s, Cape Charles annexed the land that is now Bay Creek forming a planned unit development (PUD) for over 3,000 future home sites. Over the past 10 years, Bay Creek has developed two golf courses, a club house, over 850 single family building lots, a marina, two restaurants, and some commercial space. The Bay Creek Marina, located in the North Tract of Bay Creek, includes 120 boat slips, as well as a restaurant and retail shops. Upon completion, Bay Creek Marina will have 224 boat slips. Additional amenities that will be constructed in Bay Creek include the Cabana Yacht Club and the Beach Club. The Cabana Yacht Club will be located near Bay Creek Marina, and will feature pools, a lounge, and meeting space. The Beach Club will be constructed near the Bayside Village subdivision and will include a fitness center, a restaurant, and beach access. As shown on Figure 5.4, Bay Creek has built out most of the major roads, trunk sewers, and water transmission mains that will allow it to easily expand to meet its growth projections. To date, about 300 homes have been built in the (subdivided) residential areas. The development of 187 new connections per year are projected between 2010 and 2015. There is a new direction in continued development of Bay Creek that would have significant impacts on water demands.



The new Bayside Village will require construction within a set time period from purchasing a lot. All of these developments will require a work force of people not currently living in the area.

### **Sustainable Technology Industrial Park**

The STIP built its first building in the late 1990s, but it was several years before any space was occupied. One tenant currently occupies the STIP representing about 1/6 of the original building projection. The STIP has been purchased by a local investor and new tenants have been signed up. The first building permits in 10 years have been issued for development of the property with the first new tenant to be an international yacht company. This project is expected to bring over 300 jobs to Cape Charles.

### **Harbor Area**

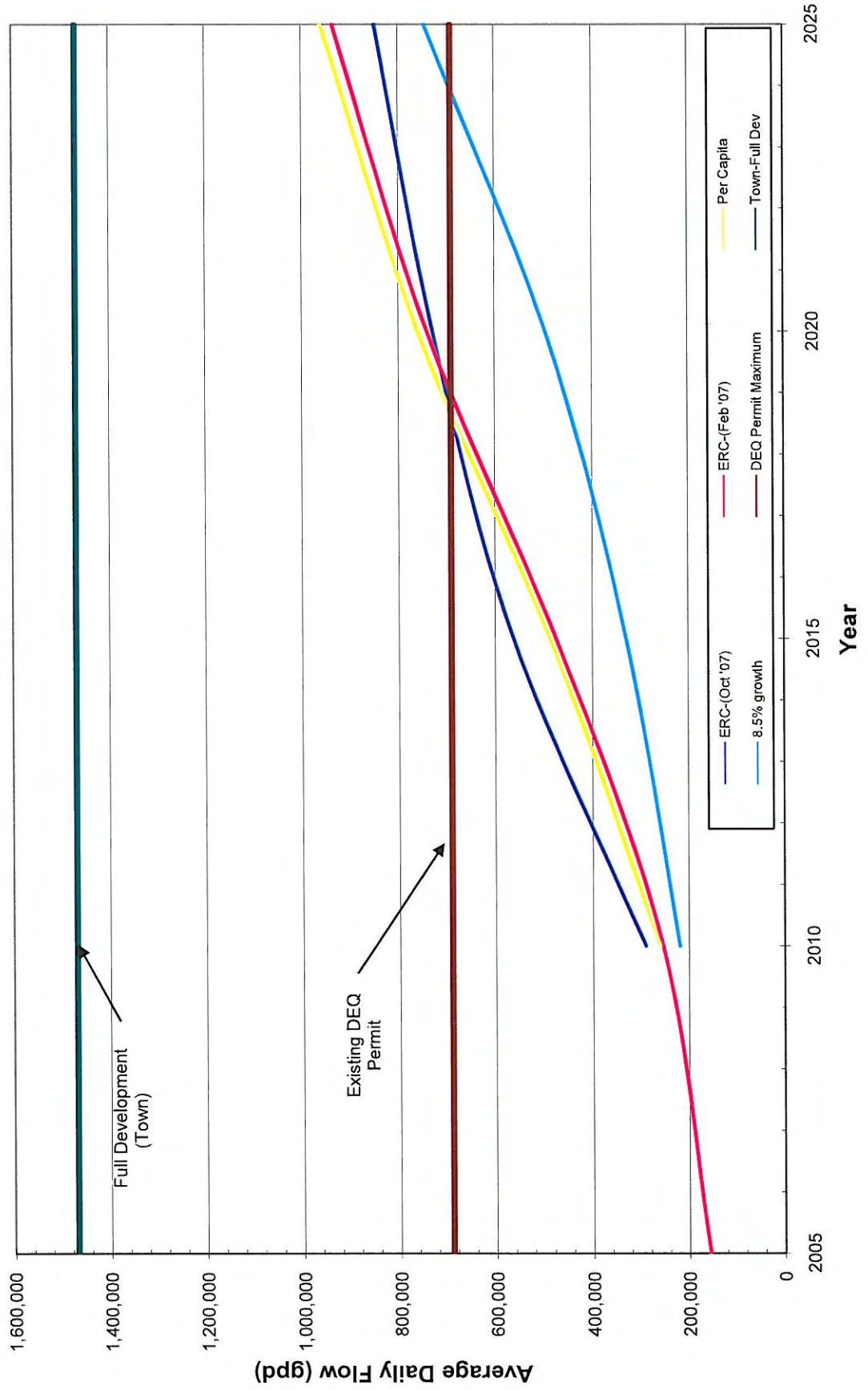
In addition, a 20-acre parcel on the Harbor has been rezoned for mixed use. This development is expected to have over 360 residential units, restaurants, retail space, a boatel (for storage of 460 boats), and a marina. Conditional use permits have been issued and the design is in progress with residential units, the hotel rooms and condominiums.

On the north side of the harbor, adjacent to Mason Avenue, another development has been presented to the Planning Commission. The developer is asking to build a hotel and condominiums along with retail spaces on ground level. This development is proposed to have 125 hotel units and 425 condominiums.

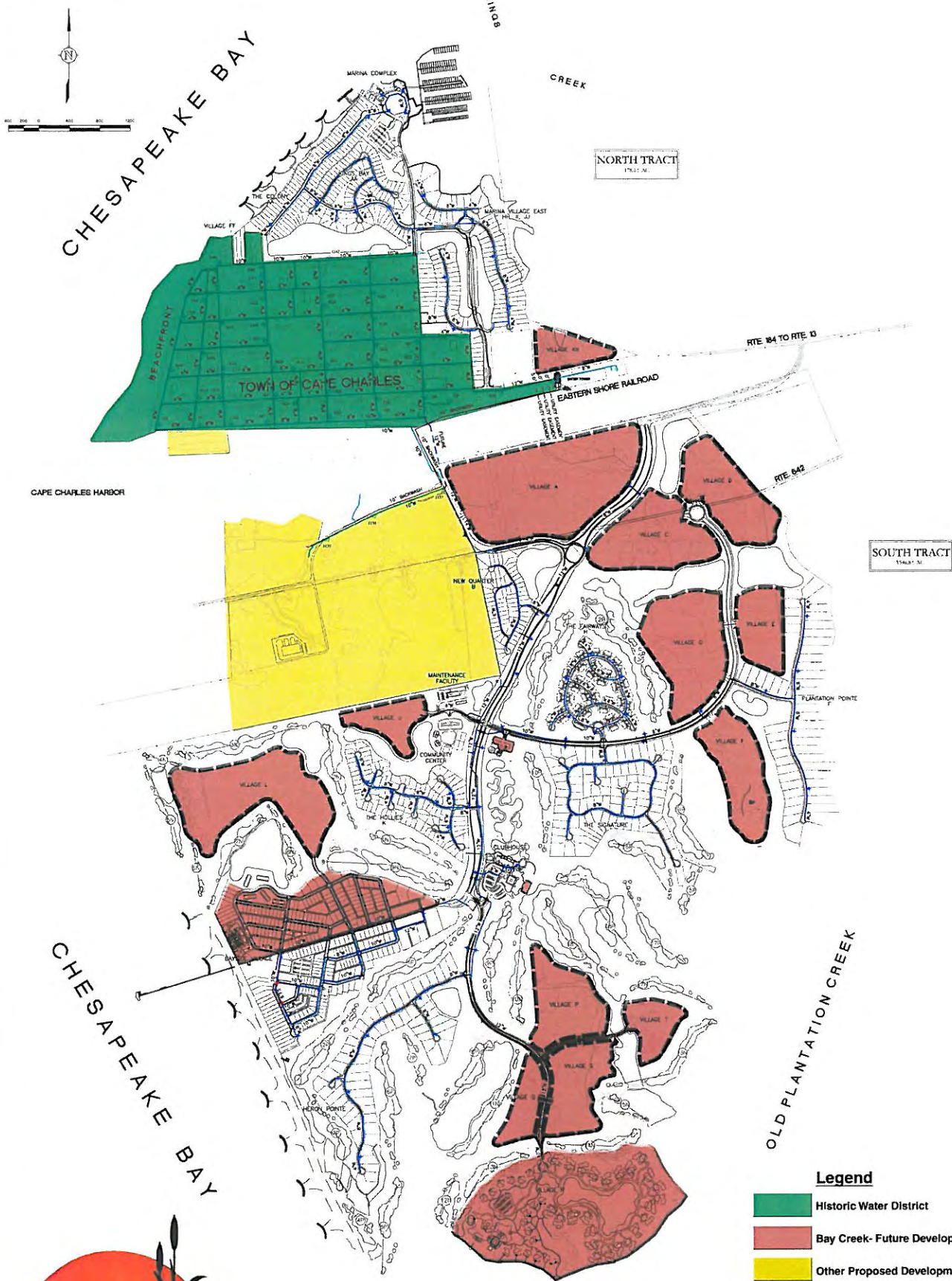
**Other Water Supply Needs** - In addition, recent events with adjacent areas and the County further support the need for the projected water demands for the Cape Charles water system. In recent months, the Town began meetings/communications with the County, Town of Cheriton, and developers in that area regarding regional water supply and wastewater treatment systems for this area. This could include development of new sources and expansion of water systems along the Route 13 corridor as previously projected in the "Expanded Town" areas discussed in the February 1, 2007 draft technical memorandum.

In addition, Northampton County recently completed a comprehensive plan which focuses development on a "Town Edge" areas. This focus will encourage future development in areas of the County and that are outside of the Towns where water and sewer service are currently available (like Cape Charles). This will increase the potential for expanding water and sewer service areas and demand.

Figure No. 5.5  
Comparison of Average Daily Demand Projections  
Town of Cape Charles







**Figure 5.4**  
**Cape Charles Water System**



NICKLAUS DESIGN





In addition, Northampton County recently completed a comprehensive plan which focuses development on a “Town Edge” areas. This focus will encourage future development in areas of the County and that are outside of the Towns where water and sewer service are currently available (like Cape Charles). This will increase the potential for expanding water and sewer service areas and demand.

In addition, Cape Charles and Bayshore Concrete are currently evaluating the feasibility of having the town provide both treated effluent from its wastewater treatment plant and potable water from its water treatment plant to Bayshore Concrete. Bayshore Concrete currently withdrawals groundwater from up to 13 wells to provide potable water for its facility located at 1134 Bayshore Road and process water for the production of concrete. Bayshore Concrete is permitted to withdraw up to 27.7 million gallons per year and has an average annual groundwater withdrawal of 12.5 million gallons (approximately 34,425 gpd).

## **REQUESTED WITHDRAWAL AMOUNT**

The combined total water demand estimate for the Town of Cape Charles in 2018 inclusive of the residential, recreational, and commercial water uses is estimated to be **690,000 gpd**. The estimate is based on the historical average daily needs of 150 gpd per ERC and a projected 4,600 ERCs. The total annual groundwater withdrawal needed to meet this projected water demand is 252,022,500 gallons (690,000 gpd X 365.25 days per year). For simplicity, Cape Charles requests to keep the existing annual permitted withdrawal amount of 252,200,000 gallons without modification (690,485 gpd). The existing maximum monthly withdrawal allocation for Cape Charles is 25,300,000. This is equivalent to 1.2 times the average monthly demand, which is close to the median ratio between maximum and average monthly demand of 1.24 (Table 3, S&W Memo, February 1, 2007).

## **APPORTIONMENT OF WITHDRAWAL**

### **Well Construction Details**

The Town of Cape Charles operates two active wells referred to as Tower Well 1 (DEQ 165-387) and East Well 1 (DEQ 165-123). **Tower Well 1** was drilled in 1996 to replace the original “West Well” (DEQ 165-48). It was drilled to a total depth of 210 feet and is constructed of 8-inch schedule 80 PVC casing and 20-slot PVC screens across the upper Yorktown Eastover (UYE) aquifer and the middle Yorktown Eastover (MYE) aquifer. Tower Well 1 was originally pumped tested at 250 gpm with a static water level of 11.75

feet, a measured drawdown after 48 hours of 75.92 feet, and a calculated specific capacity of 3.29 gpm per foot of drawdown (gpm/ft).

**East Well 1** (DEQ 165-123) was drilled in 1976 to a total depth of 220 feet and was constructed of 6-inch stainless steel screen and steel casing. The well is screened across the UYE and MYE aquifers. East Well 1 was originally pumped tested at 250 gpm with a static water level of 15 feet, a measured drawdown after 48 hours of 72 feet, and a calculated specific capacity of 3.47 gpm/ft.

Two additional wells (East Well 2 and Tower Well 2) were installed and yield tested in 2006. East Well 2 and Tower Well 2 will be brought on line in 2009. **East Well 2** (DEQ 165-480) was drilled to a total depth of 225 feet and is constructed with 12-inch steel well casing and 10-inch stainless steel screen from 170 to 210 feet below grade. East Well 2 is screened in the MYE aquifer and was pump tested at 70 gpm with a static water level of 12.76 feet, a measured drawdown after 24 hours of 75.30 feet, and a calculated specific capacity of 0.93 gpm/ft.

**Tower Well 2** (DEQ 165-479) was drilled to a total depth of 300 feet and was constructed with nominal 10-inch PVC (Certainteed Certa-Lok) well casing and 8-inch, 0.020 slot stainless steel screen from 235 to 250 feet below grade. The well is screened in upper portion of the lower Yorktown-Eastover (LYE) aquifer. Tower Well 2 was pumped tested at 59 gpm with a static water level of 12.43 feet, a measured drawdown after 24 hours of 167.70 feet, and a calculated specific capacity of 0.35 gpm/ft.

**East Well 3** (DEQ 165-558) was recently drilled to replace East Well 1. The well was constructed similar to East Well 1 with screen across the UYE and MYE aquifer from 100 to 120, 165 to 185, and 200 to 220 ft bg. East Well 3 was pumped at 245 gpm for 48 hours with a static water level of 12.5 feet, a measured drawdown of 76.4 feet, and a calculated specific capacity of 3.83 gpm/ft. Well construction details are summarized in Table 5.3. Well locations are shown in Figure 5.2. Water well completion reports and geophysical logs are provided in Section 8.

**TABLE 5.3**  
**WELL CONSTRUCTION DETAILS**  
**TOWN OF CAPE CHARLES, VIRGINIA**

WELL NAME	DEQ WELL #	WELL DEPTH (ft, bg)	SCREEN INTERVAL (ft, bg)	AQUIFER*	TEST RATE (gpm)	SPECIFIC CAPACITY (gpm/ft)	PUMP CAPACITY (gpm)
West Well 1 (abandoned)	165-48	204	65-85, 88-98, 105-115, 194-204	C, UYE & MYE	275	3.06	-
Tower Well 1	165-387	210	105-115, 194-204	UYE & MYE	250	3.29	235
East Well 1 (abandoned)	165-123	220	100-120, 165-185, 200-220	UYE & MYE	250	3.47	215
East Well 3	165-558	220	100-120, 165-185, 200-220	UYE & MYE	245	3.76	-
Tower Well 2	165-479	252	235-250	LYE	59	0.35	-
East Well 2	165-480	212	170-210	MYE	70	0.93	-

\* C – Columbia, UYE, MYE and LYE – upper, middle and lower Yorktown-Eastover aquifers  
ft, bg – feet below grade; gpm – gallons per minute; gpd – gallons per day

### **Apportionment of Withdrawal to Individual Wells**

Table 5.4 summarizes the monthly total and average withdrawals from East Well 1 and Tower Well 1, and indicates the percent apportionment from each well. The withdrawal from each well is daily with 48-49% derived from East Well 1 and 51-52% from Tower Well 1. It is presumed that East Well 3 will be operated at a similar rate and apportionment as East Well 1. Once East Well 2 and Tower Well 2, the pumping schedules will be managed to balance water quality and to comply with GWWP Special Conditions 2 and 3. Withdrawal from the lower Yorktown-Eastover aquifer is required when total withdrawals exceed 5.8 million gallons/month (Condition 2), and must constitute 10% of total monthly withdrawal when total withdrawals exceeds 10 million gallons per month (Condition 3). Tower Well 2 will be operated during peak summer months only initially and is estimated to be in daily operation by 2012, based on current water demand projections (S&W Memo dated October 16, 2007).



**TABLE 5.4**  
**WATER PRODUCTION DATA 2006 AND 2007**  
**TOWN OF CAPE CHARLES, VIRGINIA**

		MONTHLY TOTAL (gal)			AVERAGE FLOW (gpd)			APPORTIONMENT (%)	
	Month	East Well 1	Tower Well 1	Combined	East Well 1	Tower Well 1	Combined	East Well 1	Tower Well 1
2006	Jan	2,141,100	2,058,700	4,199,800	69,068	66,410	135,477	51%	49%
	Feb	1,833,500	2,399,000	4,232,500	65,482	85,679	151,161	43%	57%
	Mar	2,329,000	2,239,100	4,568,100	75,129	72,229	147,358	51%	49%
	Apr	2,172,500	2,088,700	4,285,000	72,417	69,623	142,833	51%	49%
	May	2,681,500	2,568,000	5,249,500	86,500	82,839	169,339	51%	49%
	Jun	2,766,500	2,686,300	5,452,800	92,217	89,543	181,760	51%	49%
	Jul	2,843,700	3,756,770	6,600,470	91,732	121,186	212,918	43%	57%
	Aug	2,993,200	3,009,900	6,003,100	96,555	97,094	193,648	50%	50%
	Sep	2,461,200	2,522,700	4,983,900	82,040	84,090	166,130	49%	51%
	Oct	2,384,300	2,429,700	4,814,000	76,913	78,377	155,290	50%	50%
	Nov	2,191,200	2,232,000	4,423,200	73,040	74,400	147,440	50%	50%
	Dec	1,985,200	2,020,600	4,005,800	64,039	65,181	129,219	50%	50%
	<b>Total</b>	<b>28,782,900</b>	<b>30,011,470</b>	<b>58,818,170</b>			<b>161,146</b>	<b>49%</b>	<b>51%</b>
2007	Jan	1,056,400	3,149,700	4,206,100	34,077	101,603	135,681	25%	75%
	Feb	1,399,600	1,907,000	3,306,600	49,986	68,107	118,093	42%	58%
	Mar	1,680,200	1,662,200	3,342,400	54,200	53,619	107,819	50%	50%
	Apr	1,839,200	1,803,500	3,642,700	61,307	60,117	121,423	50%	50%
	May	2,138,600	2,082,900	4,221,500	68,987	67,190	136,177	51%	49%
	Jun	2,326,300	2,302,000	4,628,300	77,543	76,733	154,277	50%	50%
	Jul	2,758,000	2,624,200	5,382,200	88,968	84,652	173,619	51%	49%
	Aug	2,290,800	2,128,000	4,418,800	73,897	68,645	142,542	52%	48%
	Sep	1,925,500	1,824,600	3,750,100	64,183	60,820	125,003	51%	49%
	Oct	2,013,900	1,914,600	3,928,500	64,965	61,761	126,726	51%	49%
	Nov	2,060,300	2,008,500	4,068,800	68,677	66,950	135,627	51%	49%
	Dec	1,753,100	1,729,400	3,482,500	56,552	55,787	112,339	50%	50%
	<b>Total</b>	<b>23,241,900</b>	<b>25,136,600</b>	<b>48,378,500</b>			<b>132,544</b>	<b>48%</b>	<b>52%</b>

Additional wells are proposed to supply the projected increased demand and to meet VDH source capacity requirements. Two wells (East Well 2U and East Well 2L) located at the East Well 2 site will likely be drilled and brought on line in 2008 or 2009. The wells will be screened in the upper and lower Yorktown-Eastover aquifers respectively. The proposed East Well 2L will be used in conjunction with the other wells to supplement water supply and reduce head differentials between the LYE and MYE aquifers. An additional well nest (East Well 4U and 4M) will be required to support the projected 2018 demand of 690,485 gpd and to provide sufficient excess source capacity to meet VDH's 80 percent capacity requirements. The location of the East Well 4 nest has not been identified yet but will likely be screened in the upper or middle Yorktown-Eastover aquifer and will be located east of the existing production wells.

Water from various wells will be blended to optimize water quality and improve water treatment efficiency (i.e. reduce backwash water). Initially, the four existing wells will need to be pumped for 5 to 8 hours per day to meet the estimated 2009 average daily demand of 180,450 gpd (estimated 1,200 ERCs X 150 gpd). By 2018, the existing and planned production wells will cycle on and off for up to 12 hours per day to meet the 2018 projected average demand of 690,485 gpd. The apportionment of the proposed withdrawal amongst the production wells is summarized in Table 5.5.

**TABLE 5.5**  
**APPORTIONMENT OF FUTURE WITHDRAWAL**  
**TOWN OF CAPE CHARLES, VIRGINIA**

Well ID	DEQ ID	Aquifer	Yield (gpm)	Apportionment	Average Water Use (gpd)	Daily Hours Pumped (hrs)
<b>2008 – Estimated Demand of 180,450 gpd</b>						
East Well 3	165-558	UYE, MYE	215	35%	63,158	4.9
Tower Well 1	165-387	UYE, MYE	235	35%	63,158	4.5
East Well 2 <sup>1</sup>	165-480	MYE	70 <sup>2</sup>	20%	36,090	8.6
Tower Well 2 <sup>1</sup>	165-479	LYE	50 <sup>2</sup>	10%	18,045	6.0
<b>Totals</b>			<b>570</b>	<b>100%</b>	<b>180,450</b>	
<b>2018 – Estimated Demand of 690,000 gpd</b>						
East Well 3	165-558	UYE, MYE	215	22%	152,220	11.8
Tower Well 1	165-387	UYE, MYE	235	24%	166,380	11.8
East Well 2 <sup>1</sup>	165-480	MYE	70	7%	49,560	11.8
Tower Well 2	165-479	LYE	50	5%	33,000	11.0
East Well 2U <sup>3</sup>	Future	UYE	135	14%	95,580	11.8
East Well 2L <sup>3</sup>	Future	LYE	50	9%	63,720	11.8
East Well 4 <sup>4</sup>	Future	UYE	135	22%	152,220	11.8
East Well 4 <sup>4</sup>	Future	MYE	90	24%	166,380	11.8
<b>Totals</b>			<b>980</b>	<b>100%</b>	<b>690,485</b>	

Notes:

1- existing well, requires connection to WTP; 2 - anticipated pumping rate; 3 - proposed wells at East Well 2 Site; 4 - proposed well nest at future new well site east of existing wells

## WATER USE LINE DIAGRAM

A line diagram and water balance is provided as Figure 5.6 showing the average water flow through the water system including wells, meter locations, water treatment, storage, and discharge points.



COMMONWEALTH of VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL QUALITY

APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT  
(FOR USE IN GROUND WATER MANAGEMENT AREAS)

PREAPPLICATION CONFERENCE DATE: \_\_\_\_\_

1. APPLICANT INFORMATION:

FIN/SSN: \_\_\_\_\_

Applicant: \_\_\_\_\_ Phone: \_\_\_\_\_

Applicant Address: \_\_\_\_\_  
(Street, City, State, Zip Code)

2. FACILITY INFORMATION:

Facility/System Name: \_\_\_\_\_

Facility Address: \_\_\_\_\_  
(If Applicable, Street, City, State, Zip Code)

Contact Name: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Location of Withdrawal Well or Well System: \_\_\_\_\_  
(County/City)

3. TYPE OF APPLICATION:

This application is for:

- ☐ Existing withdrawal, not previously permitted  
☐ New withdrawal  
☐ Expand or enlarge existing permit No. \_\_\_\_\_  
☐ Modification of permit No. \_\_\_\_\_  
☒ Reapplication for existing permit No. 0041200 with modification  
☐ Reissue existing permit No. \_\_\_\_\_ without modification

Existing withdrawal permit amount 252,200,000 gallons per Year (Day,Month,Year)

Date of expiration of existing Ground Water Withdrawal Permit November 30, 2008

Requested withdrawal amount 95,000,000 maximum gallons per year,  
11,875,000 maximum gallons per month

4. TYPE OF USE: (Check all that apply)

USE	%USE		%USE
<input type="checkbox"/> Public Water Supply	_____	<input type="checkbox"/> Aquaculture	_____
<input type="checkbox"/> Industrial	_____	<input type="checkbox"/> Golf Course Irrigation	_____
<input type="checkbox"/> Commercial	_____	<input type="checkbox"/> Landscape Irrigation	_____
<input type="checkbox"/> Fire Protection	_____	<input type="checkbox"/> Nursery	_____
<input type="checkbox"/> Drought Relief	_____	<input type="checkbox"/> Crop Irrigation	_____
<input type="checkbox"/> Livestock Watering	_____	<input type="checkbox"/> Other	_____

If type of use is public water supply;

Estimate the percentage of the withdrawal for human consumptive use \_\_\_\_\_ %;

Attach a complete copy of the Virginia Department of Health Water Works Operation Permit and Engineering Description Sheets or equivalent.

OFFICE USE ONLY

Application # \_\_\_\_\_

Date Application Received \_\_\_\_\_ Date Fee Received \_\_\_\_\_ Amount \_\_\_\_\_

Notice Date \_\_\_\_\_ LGOF Date \_\_\_\_\_ Returned \_\_\_\_\_ Date Complete \_\_\_\_\_

**5. JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED:**

Briefly describe the nature of the activity and the proposed beneficial use of ground water.

*The permitted withdrawal will provide necessary water for the Cape Charles public waterworks. This system supplies potable water to customers throughout the Town - approximately 90 % residential. Documentation of need is attached.*

**Documentation of beneficial use:** Attach documentation demonstrating that the annual and monthly amount of ground water withdrawal requested is the smallest amount of withdrawal necessary to support the proposed beneficial use and that the amount is representative to support similar uses when adequate conservation measures are employed.

Include a description of the product produced or the service provided, the unit of measure (acres, lbs., bushels, etc.) of the product or service, the unit of time that the product or service is produced (day, month, year), the amount of water (gallons) required to produce a unit of product or service, and the quantity of the product or service. Include all calculations showing the total amount of water required to produce a product or provide a service.

Attach a line drawing showing the water flow through the facility/system. Indicate wells, meter locations, sources of surface intake, and treatment, or other operations generating wastewater. Construct a water balance on the line drawing by showing average flows between intakes, treatment units and discharge points.

**Water demand projections:** Include documentation to support the intended beneficial use over a ten year permit cycle such as population and water demand projections and expansion plans. Describe special treatment (i.e. RO, EDR) when proposed.

**Apportionment of withdrawal to individual wells:** Attach an operational pumping schedule for applications with multiple wells. Indicate whether the withdrawal from each well is daily, seasonal or intermittent. Describe the frequency of use and pumping volume for each well for each month in a calendar year.

**6. WASTEWATER TREATMENT AND DISPOSAL:**

Will wastewater be generated as a result of the withdrawal of ground water?

☐ YES ☐ NO (If yes, check the appropriate box below.)

☐ Septic Tank and Drainfield

☐ Public Sewer \_\_\_\_\_  
(Name of system)

☐ State Waters \_\_\_\_\_  
(Name of water body)

Discharge Permit #

☐ Have applied for a discharge permit from the Department of Environmental Quality.

**7. WELL LOCATION(S):**

Locate all wells (existing, proposed, abandoned, out of service), facility property boundaries and/or water supply service area associated with the application on a (1) United States Geological Survey 7 1/2 minute topographic map, or copies of such maps, and (2) detailed location map of each existing and proposed well. The USGS map should contain the quadrangle name, the scale of the map, and a north arrow. The detailed location map must be of sufficient detail such that all wells may be easily located for site inspection.



January 25, 2010

Attachment to Sec. 5 of Ground Water Withdrawal Permit Application

Based on a review of the last two years of water withdrawals and recently updated growth projections, we request a permit for 95,000,000 gallons per year and a maximum of 11,875,000 gallons per month.

For 2008 and 2009 our withdrawals have averaged just over 40 million gallons per year, and a maximum of about 5 million gallons per month in July. During that time we have maintained approximately 1,245 equivalent residential connections (ERCs), equating to a yearly average of about 88 gallons per day (GPD) per ERC. This reflects our continuing efforts to improve our water production and distribution system, promotion of water conservation, and the changing nature of our town to primarily a resort community.

We have updated our growth projections (copy attached), taking into account the current economy and current development plans. We now project 2,576 ERCs in 2018. This reflects a more gradual build out of Bay Creek Resort and Club (an approved Planned Unit Development), as well as three planned mixed-use developments (Cape Harbor, South Port and Harbor Development Group). Conditional Use Permits have been approved for Cape Harbor and Harbor Development Group, for a total of 979 ERCs, about half of which are projected to be completed by 2018. South Port, a mixed-use yacht and industrial center, is still being planned by the developer and we have included a preliminary estimate in our projections.

We think it is prudent to use 100 GPD per ERC as a planning factor since a significant portion of our projected growth is associated with mixed-use development. The commercial component of these developments is likely to drive somewhat higher usage, particularly in the case of South Port where we anticipate a year-round employment center. Our request of 95,000,000 gallons per year is based on 2,576 ERCs @ 100 GPD in 2018. The requested maximum monthly withdrawal of 11,875,000 gallons reflects the same percentage increase as the annual amount.



# Cape Charles Growth Projection

January 2010

TIME PERIOD	Bay Creek - South Tract				Historic District, Harbor District, Bay Creek Marina								CUM TOTAL	250gpd / ERC	225gpd / ERC	200gpd / ERC	175gpd / ERC	150gpd / ERC	125gpd / ERC	100gpd / ERC		
	% GROWTH	UNITS / YEAR	AMENITY / YEAR	TOTAL PER CUMULATIVE YEAR	HIST DIST	CAPE HARBOR	SOUTH PORT	HARBOR DEV GRP	KECK	Marina Residential	Marina Amenity	TOTAL PER CUMULATIVE YEAR									ERC	
12/31/2009		250	8	258	258	855	0	0	0	0	68	67	990	1,248	312,000	280,800	249,600	218,400	187,200	156,000	149,760	124,800
2010	1.0%	24	0	24	282	2	0	10	0	0	6	3	21	1,011	323,330	290,997	258,664	226,331	193,998	161,665	155,198	129,332
2011	1.5%	36	0	36	319	2	0	10	0	0	3	3	19	1,030	337,100	303,390	269,680	235,970	202,260	168,550	161,808	134,840
2012	1.8%	43	20	63	381	2	0	0	0	0	4	3	9	1,039	355,040	319,536	284,032	248,528	213,024	177,520	170,419	142,016
2013	1.8%	43	20	63	444	3	55	20	100	12	4	3	19	1,236	419,980	377,982	335,984	293,986	251,988	209,990	201,590	167,992
2014	1.8%	43	20	63	506	3	0	0	0	0	4	6	13	1,249	438,920	395,028	351,136	307,244	263,352	219,460	210,682	175,568
2015	2.0%	49	20	69	575	3	55	20	50	12	4	4	148	1,397	493,080	443,772	394,464	345,156	295,848	252,245	251,755	209,796
2016	2.0%	49	20	69	644	3	0	0	0	0	4	50	57	1,454	524,490	472,041	419,592	367,143	314,694	262,245	310,700	248,560
2017	2.0%	49	20	69	712	3	175	20	102	12	4	3	319	1,773	644,060	579,654	515,248	450,842	386,136	322,030	309,149	257,624
2018	2.0%	49	20	69	781	3	0	0	0	12	4	3	22	1,795	703,760	633,384	563,008	492,632	422,256	351,880	337,805	281,504
2019	2.5%	61	20	81	862	3	65	20	52	12	6	8	158	2,153	738,390	664,551	590,712	516,873	443,034	369,195	354,427	295,356
2020	3.5%	85	30	115	977	3	0	0	0	12	8	10	23	1,977	820,360	738,324	655,288	574,252	492,216	410,180	383,773	328,144
2021	4.0%	97	40	137	1,114	4	65	0	100	12	11	11	27	2,194	864,420	777,978	691,536	605,094	518,652	432,210	414,922	345,768
2022	4.5%	109	40	149	1,264	4	0	0	0	12	11	11	27	2,369	945,480	850,932	756,384	661,636	567,288	472,740	453,830	378,192
2023	4.5%	109	40	149	1,413	4	0	0	100	12	12	12	16	3,782	990,380	891,342	792,304	693,266	594,228	495,190	475,382	396,152
2024	5.0%	124	40	164	1,577	4	0	0	0	12	12	12	16	4,141	1,035,280	931,752	828,224	724,696	621,168	517,640	496,934	414,112
2025	5.0%	124	40	164	1,740	4	0	0	0	12	12	12	16	4,414	1,080,180	972,162	864,144	756,126	648,108	540,090	518,486	432,072
2026	5.0%	124	40	164	1,904	4	0	0	0	12	12	12	16	4,632	1,120,580	1,008,522	896,464	784,406	672,348	560,290	537,878	448,232
2027	5.0%	124	22	146	2,050	4	0	0	0	12	12	12	16	4,844	1,155,480	1,039,932	924,384	808,636	693,288	577,740	554,630	462,192
2028	5.0%	124	0	124	2,173	4	0	0	0	12	12	12	16	4,922	1,190,130	1,071,117	952,104	833,091	714,078	595,065	571,262	476,052
2029	5.0%	124	0	124	2,297	3	0	0	0	12	11	11	14	4,761	1,220,940	1,098,846	976,752	854,658	732,564	610,470	586,051	488,376
2030	4.5%	109	0	109	2,406	3	0	0	0	12	11	11	13	5,006	1,251,500	1,126,350	1,001,200	876,050	750,900	625,750	600,720	500,900
2031	4.5%	109	0	109	2,516	2	0	0	0	12	10	10	10	5,113	1,278,220	1,150,398	1,022,576	894,754	766,932	639,110	613,546	511,288
2032	4.0%	97	0	97	2,613	0	0	0	0	12	10	10	10	5,250	1,304,940	1,174,446	1,043,952	913,458	782,964	652,470	626,371	521,976
2033	4.0%	97	0	97	2,710	0	0	0	0	12	10	10	10	5,327	1,331,660	1,198,494	1,065,328	932,162	798,996	665,830	639,197	532,664
2034	4.0%	97	0	97	2,807	0	0	0	0	12	9	9	9	5,258	1,358,130	1,222,317	1,086,504	950,691	814,878	679,065	651,902	543,552
2035	4.0%	97	0	97	2,905	0	0	0	0	12	9	9	9	5,433	1,384,600	1,246,140	1,107,680	969,220	830,760	692,300	664,608	553,840
2036	4.0%	97	0	97	3,002	0	0	0	0	12	7	7	7	5,536	1,407,730	1,266,957	1,126,184	985,411	844,638	703,865	675,710	563,092
2037	3.5%	85	0	85	3,087	0	0	0	0	12	7	7	7	5,644	1,426,100	1,283,490	1,140,880	998,270	855,660	713,050	684,528	570,440
2038	2.8%	67	0	67	3,154	0	0	0	0	12	7	7	7	5,704	1,426,100	1,283,490	1,140,880	998,270	855,660	713,050	684,528	570,440
	100.0%	2,694	460	3,154		925	475	100	504	96	305	145	2550	5,704								

NOTES / ASSUMPTIONS:

1. Up to 3,000 residential units allowed for Bay Creek.

2. 318 residential units constructed as of 12-31-09, 250 south & 68 marina.

3. Additional build out period assumed to be 30 years starting in 2009

4. Percent growth is the percent of total units to be built in a specific year

5. 38 Island Villas included in Marina Amenities. Marina hotel is 46 ERC in 2015

6. Water use for future south side amenities is projected to be equivalent to 460 ERC. This figure excludes pools, fountains, outdoor showers, HVAC, etc for the Beach Club and the Inn & Spa

7. Future amenities assumed to be built in 16 years, starting 2012 roughly keyed to residential growth

8. Lot sell out assumed to occur 4 to 5 years prior to build out

Cape Harbor reflects the approved conditional use permit.

South Port reflects a "best guess" in absence of a development plan.

Harbor Development Group reflects the approved conditional use permit

Keck assumes virtually all of the request under the approved rezoning.

## NOTES / ASSUMPTIONS:

- Up to 3,000 residential units allowed for Bay Creek.
  - 318 residential units constructed as of 12-31-09, 250 south & 68 marina.
  - Additional build out period assumed to be 30 years starting in 2009
  - Percent growth is the percent of total units to be built in a specific year
  - 38 Island Villas included in Marina Amenities. Marina hotel is 46 ERC in 2016.
  - Water use for future south side amenities is projected to be equivalent to 460 ERC. This figure excludes pools, fountains, outdoor showers, HVAC, etc for the Beach Club and the Inn & Spa
  - Future amenities assumed to be built in 16 years, starting 2012 roughly keyed to residential growth
  - Lot sell out assumed to occur 4 to 5 years prior to build out
- Cape Harbor reflects the approved conditional use permit.  
South Port reflects a "best guess" in absence of a development plan.  
Harbor Development Group reflects the approved conditional use permit.  
Keck assumes virtually all of the request under the approved rezoning.



COMMONWEALTH of VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL QUALITY

APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT  
(FOR USE IN GROUND WATER MANAGEMENT AREAS)

PREAPPLICATION CONFERENCE DATE: \_\_\_\_\_

1. APPLICANT INFORMATION:

FIN/SSN: \_\_\_\_\_

Applicant: \_\_\_\_\_ Phone: \_\_\_\_\_

Applicant Address: \_\_\_\_\_  
(Street, City, State, Zip Code)

2. FACILITY INFORMATION:

Facility/System Name: \_\_\_\_\_

Facility Address: \_\_\_\_\_  
(If Applicable, Street, City, State, Zip Code)

Contact Name: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Location of Withdrawal Well or Well System: \_\_\_\_\_  
(County/City)

3. TYPE OF APPLICATION:

This application is for:

- ☐ Existing withdrawal, not previously permitted  
☐ New withdrawal  
☐ Expand or enlarge existing permit No. \_\_\_\_\_  
☐ Modification of permit No. \_\_\_\_\_  
☒ Reapplication for existing permit No. 0041200 with modification  
☐ Reissue existing permit No. \_\_\_\_\_ without modification

Existing withdrawal permit amount 252,200,000 gallons per Year (Day,Month,Year)

Date of expiration of existing Ground Water Withdrawal Permit November 30, 2008

Requested withdrawal amount 95,000,000 maximum gallons per year,  
11,875,000 maximum gallons per month

4. TYPE OF USE: (Check all that apply)

USE	%USE	%USE
<input type="checkbox"/> Public Water Supply	_____	<input type="checkbox"/> Aquaculture
<input type="checkbox"/> Industrial	_____	<input type="checkbox"/> Golf Course Irrigation
<input type="checkbox"/> Commercial	_____	<input type="checkbox"/> Landscape Irrigation
<input type="checkbox"/> Fire Protection	_____	<input type="checkbox"/> Nursery
<input type="checkbox"/> Drought Relief	_____	<input type="checkbox"/> Crop Irrigation
<input type="checkbox"/> Livestock Watering	_____	<input type="checkbox"/> Other _____

If type of use is public water supply;

Estimate the percentage of the withdrawal for human consumptive use \_\_\_\_\_ %;

Attach a complete copy of the Virginia Department of Health Water Works Operation Permit and Engineering Description Sheets or equivalent.

OFFICE USE ONLY

Application # \_\_\_\_\_

Date Application Received \_\_\_\_\_ Date Fee Received \_\_\_\_\_ Amount \_\_\_\_\_

Notice Date \_\_\_\_\_ LGOF Date \_\_\_\_\_ Returned \_\_\_\_\_ Date Complete \_\_\_\_\_



RECEIVED - DEQ  
FEB 02 2010

Tidewater Regional  
Office

5. **JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED:**

Briefly describe the nature of the activity and the proposed beneficial use of ground water.

*The permitted withdrawal will provide necessary water for the Cape Charles public waterworks. This system supplies potable water to customers throughout the Town - approximately 90 % residential. Documentation of need is attached.*

**Documentation of beneficial use:** Attach documentation demonstrating that the annual and monthly amount of ground water withdrawal requested is the smallest amount of withdrawal necessary to support the proposed beneficial use and that the amount is representative to support similar uses when adequate conservation measures are employed.

Include a description of the product produced or the service provided, the unit of measure (acres, lbs., bushels, etc.) of the product or service, the unit of time that the product or service is produced (day, month, year), the amount of water (gallons) required to produce a unit of product or service, and the quantity of the product or service. Include all calculations showing the total amount of water required to produce a product or provide a service.

Attach a line drawing showing the water flow through the facility/system. Indicate wells, meter locations, sources of surface intake, and treatment, or other operations generating wastewater. Construct a water balance on the line drawing by showing average flows between intakes, treatment units and discharge points.

**Water demand projections:** Include documentation to support the intended beneficial use over a ten year permit cycle such as population and water demand projections and expansion plans. Describe special treatment (i.e. RO, EDR) when proposed.

**Apportionment of withdrawal to individual wells:** Attach an operational pumping schedule for applications with multiple wells. Indicate whether the withdrawal from each well is daily, seasonal or intermittent. Describe the frequency of use and pumping volume for each well for each month in a calendar year.

6. **WASTEWATER TREATMENT AND DISPOSAL:**

Will wastewater be generated as a result of the withdrawal of ground water?

☐ YES ☐ NO (If yes, check the appropriate box below.)

☐ Septic Tank and Drainfield

☐ Public Sewer \_\_\_\_\_  
(Name of system)

☐ State Waters \_\_\_\_\_  
(Name of water body)

Discharge Permit #

☐ Have applied for a discharge permit from the Department of Environmental Quality.

7. **WELL LOCATION(S):**

Locate all wells (existing, proposed, abandoned, out of service), facility property boundaries and/or water supply service area associated with the application on a (1) United States Geological Survey 7 1/2 minute topographic map, or copies of such maps, and (2) detailed location map of each existing and proposed well. The USGS map should contain the quadrangle name, the scale of the map, and a north arrow. The detailed location map must be of sufficient detail such that all wells may be easily located for site inspection.

January 25, 2010

Attachment to Sec. 5 of Ground Water Withdrawal Permit Application

Based on a review of the last two years of water withdrawals and recently updated growth projections, we request a permit for 95,000,000 gallons per year and a maximum of 11,875,000 gallons per month.

For 2008 and 2009 our withdrawals have averaged just over 40 million gallons per year, and a maximum of about 5 million gallons per month in July. During that time we have maintained approximately 1,245 equivalent residential connections (ERCs), equating to a yearly average of about 88 gallons per day (GPD) per ERC. This reflects our continuing efforts to improve our water production and distribution system, promotion of water conservation, and the changing nature of our town to primarily a resort community.

We have updated our growth projections (copy attached), taking into account the current economy and current development plans. We now project 2,576 ERCs in 2018. This reflects a more gradual build out of Bay Creek Resort and Club (an approved Planned Unit Development), as well as three planned mixed-use developments (Cape Harbor, South Port and Harbor Development Group). Conditional Use Permits have been approved for Cape Harbor and Harbor Development Group, for a total of 979 ERCs, about half of which are projected to be completed by 2018. South Port, a mixed-use yacht and industrial center, is still being planned by the developer and we have included a preliminary estimate in our projections.

We think it is prudent to use 100 GPD per ERC as a planning factor since a significant portion of our projected growth is associated with mixed-use development. The commercial component of these developments is likely to drive somewhat higher usage, particularly in the case of South Port where we anticipate a year-round employment center. Our request of 95,000,000 gallons per year is based on 2,576 ERCs @ 100 GPD in 2018. The requested maximum monthly withdrawal of 11,875,000 gallons reflects the same percentage increase as the annual amount.

# Cape Charles Growth Projection

January 2010

TIME PERIOD	% GROWTH	UNITS / YEAR	AMENITY / YEAR	South Tract	HIST DIST	CAPE HARBOR	SOUTH PORT	HARBOR DEV GRP	KECK	Marina Residential	Marina Amenity	TOTAL PER CUMULATIVE YEAR	ERC	CUM TOTAL	250gpd / ERC	225gpd / ERC	200gpd / ERC	175gpd / ERC	150gpd / ERC	125gpd / ERC	120gpd / ERC	100gpd / ERC
12/31/2009		250	8	258	258	855	0	0	0	68	67	990	990	1,248	312,000	280,800	249,600	218,400	187,200	156,000	149,760	124,800
2010	1.0%	24	0	24	282	2	0	0	0	6	3	21	1,011	1,293	323,330	290,937	258,664	226,331	193,998	161,665	129,332	129,332
2011	1.5%	36	0	36	319	2	0	0	0	4	3	19	1,030	1,349	337,000	303,360	269,680	235,970	202,260	169,550	161,808	134,840
2012	1.8%	43	20	63	381	2	0	0	0	4	3	9	1,039	1,420	355,040	319,536	284,032	246,528	213,024	177,520	170,419	142,016
2013	1.8%	43	20	63	444	3	55	100	12	4	3	197	1,236	1,680	419,980	377,992	335,984	293,968	251,968	209,990	201,590	167,992
2014	1.8%	43	20	63	506	3	0	0	0	4	6	13	1,249	1,766	438,920	395,028	351,136	307,244	263,352	219,460	210,662	175,668
2015	2.0%	49	20	69	575	3	55	20	50	4	4	148	1,397	2,088	493,080	443,772	394,464	345,156	295,848	246,540	236,678	197,232
2016	2.0%	49	20	69	644	3	0	0	0	4	50	57	1,454	2,486	524,490	472,041	419,592	367,143	314,694	262,245	251,755	209,796
2017	2.0%	49	20	69	712	3	175	102	12	4	3	319	1,773	2,486	621,400	559,260	497,120	434,960	372,840	310,700	298,272	248,560
2018	2.0%	49	20	69	781	3	0	0	0	4	3	22	1,795	2,576	644,060	579,654	515,248	450,842	386,436	322,030	309,149	257,624
2019	2.5%	61	20	81	862	3	65	52	12	6	3	158	1,953	2,815	703,760	633,384	563,008	492,632	422,256	351,880	337,805	281,504
2020	3.5%	85	30	115	977	3	0	0	0	8	3	23	1,977	2,954	738,390	664,551	590,712	516,873	443,034	369,195	354,427	295,356
2021	4.0%	97	40	137	1,114	4	65	0	100	10	10	191	2,167	3,281	820,360	738,324	656,288	574,252	492,216	410,180	393,773	328,144
2022	4.5%	109	40	149	1,264	4	0	0	12	11	11	27	2,194	3,466	864,420	777,978	691,536	605,094	518,652	432,210	414,922	345,768
2023	4.5%	109	40	149	1,413	4	60	100	12	11	11	175	2,369	3,962	945,480	850,932	756,384	661,836	567,288	472,740	453,830	378,192
2024	5.0%	124	40	164	1,577	4	0	0	0	12	12	16	2,385	3,962	990,380	891,342	792,304	693,266	594,228	495,190	475,382	396,152
2025	5.0%	124	40	164	1,740	4	0	0	0	12	12	16	2,401	4,141	1,035,280	931,752	828,224	724,696	621,168	517,640	496,934	414,112
2026	5.0%	124	40	164	1,904	4	0	0	0	12	12	16	2,417	4,321	1,080,180	972,162	864,144	756,126	648,108	540,090	518,486	432,072
2027	5.0%	124	22	146	2,050	4	0	0	0	12	12	16	2,433	4,482	1,120,580	1,008,522	896,464	784,406	672,348	560,290	537,878	448,232
2028	5.0%	124	0	124	2,173	4	0	0	0	12	12	16	2,449	4,622	1,155,480	1,039,932	924,384	808,836	693,288	577,740	554,630	462,192
2029	5.0%	124	0	124	2,297	3	0	0	0	12	12	15	2,464	4,781	1,190,130	1,071,117	952,104	833,091	714,078	595,065	571,262	476,052
2030	4.5%	109	0	109	2,406	3	0	0	0	11	11	14	2,478	4,884	1,220,940	1,098,846	976,752	854,658	732,564	610,470	586,051	488,376
2031	4.5%	109	0	109	2,516	2	0	0	0	10	10	13	2,490	5,006	1,251,500	1,126,350	1,001,200	876,050	750,900	629,750	600,720	500,600
2032	4.0%	97	0	97	2,613	2	0	0	0	10	10	10	2,500	5,113	1,278,220	1,150,398	1,022,576	894,754	766,932	638,110	613,546	511,288
2033	4.0%	97	0	97	2,710	2	0	0	0	10	10	10	2,510	5,220	1,304,940	1,174,446	1,043,952	913,458	782,964	652,470	626,371	521,976
2034	4.0%	97	0	97	2,807	2	0	0	0	10	10	10	2,519	5,327	1,331,660	1,196,494	1,065,328	932,162	798,996	665,630	639,197	532,664
2035	4.0%	97	0	97	2,905	2	0	0	0	9	9	9	2,528	5,433	1,358,130	1,222,317	1,086,504	950,691	814,878	679,065	651,902	543,252
2036	4.0%	97	0	97	3,002	2	0	0	0	9	9	9	2,536	5,538	1,384,600	1,246,140	1,107,680	969,220	830,760	692,300	664,608	553,840
2037	3.5%	85	0	85	3,087	2	0	0	0	7	7	7	2,544	5,631	1,407,730	1,266,957	1,126,184	985,411	844,638	703,865	675,710	563,092
2038	2.8%	67	0	67	3,154	2	0	0	0	7	7	7	2,550	5,704	1,426,100	1,283,490	1,140,880	998,270	855,660	713,050	684,528	570,440
2039	100.0%	2,694	460	3,154	925	475	100	504	96	305	145	2550	5,704	5,704								

## NOTES / ASSUMPTIONS:

- Up to 3,000 residential units allowed for Bay Creek.
  - 318 residential units constructed as of 12-31-09, 250 south & 68 marina.
  - Additional build out period assumed to be 30 years starting in 2009
  - Percent growth is the percent of total units to be built in a specific year
  - 38 Island Villas included in Marina Amenities. Marina hotel is 48 ERC in 2016.
  - Water use for future south side amenities is projected to be equivalent to 460 ERC. This figure excludes pools, fountains, outdoor showers, HVAC, etc for the Beach Club and the Inn & Spa.
  - Future amenities assumed to be built in 16 years, starting 2012 roughly keyed to residential growth.
  - Lot sell out assumed to occur 4 to 5 years prior to build out
- Cape Harbor reflects the approved conditional use permit.  
South Port reflects a "best guess" in absence of a development plan.  
Harbor Development Group reflects the approved conditional use permit.  
Keck assumes virtually all of the request under the approved rezoning.



## **SECTION 13**

# **WATER CONSERVATION & MANAGEMENT PLAN APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT GROUNDWATER WITHDRAWAL PERMIT NO. GW0041200**

**Municipal Corporation of Cape Charles  
2 Plum Street  
Cape Charles, VA 23310**



**May 2008**

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## **TOWN OF CAPE CHARLES WATER CONSERVATION & MANAGEMENT PLAN**

### **1.0 INTRODUCTION**

The Town of Cape Charles is aware of the need to conserve and manage effectively its valuable water resources. Without an effective and comprehensive plan aimed at reducing water loss and utilizing water use efficiency, the Town cannot hope to satisfy its much needed water demands into the next decade. The effects of an inadequate water supply are such that the entire Town would experience reduced economic development opportunities and the resulting reduction in needed revenues for Cape Charles to prosper beyond the year 2010. Every effort must be made to efficiently maximize currently available supplies thus reducing the need for additional sources.

The following constitutes the Town of Cape Charles's Water Conservation and Management Plan, which is designed to optimize water resources and to help reduce its need for future water demands. The Town of Cape Charles first developed a Water Conservation and Management Plan in 1998 to address the conservation needs, and continues to refine and develop the Plan as needed.

### **1.1 REGULATORY REQUIREMENTS**

In 1992, Virginia adopted the Groundwater Management Act (Title 62.1, Chapter 25, code of Virginia, 1950, as amended) regulating groundwater withdrawals in critical aquifer use areas. The Eastern Virginia and the Eastern Shore Groundwater Management Areas were established at that time due to a decline in groundwater levels of up to 200 feet in some places due to excessive groundwater use. In these management areas, a groundwater withdrawal permit is required for any application to initiate a new withdrawal or expand an existing withdrawal in the groundwater management area. As part of the Ground Water Withdrawal Permit (GWWP) application, a Water Conservation and Management Plan (WCMP) must be submitted with the GWWP application and becomes an enforceable part of the GWWP permit. In accordance with 9VAC25-610-100, a WCMP must include at a minimum the following items.

- The use of water saving plumbing and processes including, where appropriate, the use of water saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code;



- A water loss reduction program;
- A water use education program;
- An evaluation of potential water reuse options; and
- Requirements for mandatory water use restrictions during water shortage emergencies declared by the local governing body.

## **1.2 THE NEED FOR WATER CONSERVATION**

The Town of Cape Charles is situated on Virginia's Eastern Shore, a peninsula that is surrounded by saltwater on three sides. Groundwater represents the primary source of freshwater in the region and is derived from and limited by the amount of recharge the aquifers receive from precipitation. The fresh groundwater occurs as a shallow lens, approximately 250 feet thick in the Cape Charles area that floats on underlying brackish and saline groundwater. A delicate balance exists between the fresh groundwater lens beneath the peninsula and the surrounding saltwater. Over-pumping can cause intrusion of saltwater from lateral migration of the freshwater-saltwater boundary or upconing of saltwater from underlying brackish aquifers. Intrusion of saltwater can degrade groundwater quality to the point that groundwater can no longer be used as a direct, untreated source of fresh water for public consumption, commercial and agricultural uses. For this reason, the Town will have to carefully manage its future water supply needs to ensure a sustainable source of water can be developed without detrimental impact to the freshwater resources and those who depend on them.

Water conservation is a focused effort by a water user to reduce the use of water. This effort can minimize development of new resources and reduce the cost of future water service. Each gallon of water that is not used through conservation is one less that needs to be stored, treated, pumped and distributed. The reduction in the use of water may also result in energy savings if the water needs to be heated for washing or bathing or pass through a wastewater treatment system before it is returned to the environment.

Water conservation has reached a new level of awareness. Conservation may represent a practical alternative to developing and increasing the water supply or at least complement new water supply development projects until technologies evolve to meet the needs of an ever growing population. Clean water supplies, like other natural resources, are a limited resource, which must be managed carefully so that they are preserved for future generations. Efforts to conserve existing supplies and the efficient allocation of water resources need to be made at each stage of the water supply planning process.

### **1.3 OBJECTIVES**

The objective of the Water Conservation and Management Plan is to develop a documented, effective conservation and management strategy that is designed to minimize the demand for groundwater and comply with 9VAC25-610. The plan consists of operational programs and strategies that will be used every day in the management and maintenance of the water and wastewater utility. The specific conservation and management strategies are presented in the following sections and are briefly summarized in the conclusion.

## **2.0 WATER CONSERVATION DURING NORMAL CONDITIONS**

This section of the Water Conservation and Management Plan addresses low flow devices and fixtures that are required by the Virginia Uniform Statewide Building Code:

### **2.1 Flow Rates for Plumbing Fixtures**

The Town Manager will continue to work very closely with the Town's inspectors to ensure that low flow devices and fixtures are utilized in new construction and renovations in existing structures. In addition, the Town Manager will promote incentive programs to encourage existing households to retrofit with low flow devices.

The Town's inspectors will continue to implement the Comprehensive Water Conservation Program, first developed in 1998 as promulgated by the Commonwealth of Virginia via the Virginia Uniform Statewide Building Code. As listed below, these requirements are consistent with the Federal Energy Policy Act of 1992. In all new construction and in all remodeling and/or replacement of plumbing fixtures, only fixtures not exceeding the following flow rates and/or water consumption shall be permitted:

Lavatory nonpublic	2.2 gallon per minute at 60 psi
Lavatory public	0.5 gallon per minute at 80 psi
Lavatory public metering self-closing	0.25 gallon per metering cycle
Shower Head	2.5 gallon per minute at 80 psi
Sink faucet	2.2 gallon per minute at 60 psi
Urinal	1.0 gallon per flushing cycle
Water Closet	1.6 gallon per flushing cycle

Replacing older showerheads with low-flow fixtures, installing faucet aerators in older baths and kitchens, and water saving flappers in older toilet tanks can reduce household water use by approximately 10 to 15 percent.

#### **2.1.1 Public Lavatories**

Lavatories in a public facility restroom shall be equipped with standard valve or spring self-closing faucets having outlet devices that limit the flow rate to a maximum of 0.5 gallons per minute or self-closing metering valves which limit flow of 0.25 gallons per cycle.

#### **2.1.2 Car Washes**

No commercial car washing facilities are located within the service area. All new car wash installations shall be equipped with an approved water recycling system.

#### **2.1.3 Continuous Flow Equipment**

All new construction, all repair or replacement of continuous flow devices, any other water connector device or appliance requiring a continuous flow of five (5) gallons per minute or more shall be equipped with a recycling system or as approved by the Town Manager.

#### **2.1.4 Leak Repairs**

The owner of any residual dwelling, commercial, or industrial facility who is found to be an excessive user of water due to leakage from water lines or plumbing fixtures on the premises, and who fails to repair and stop such leakage during a reasonable period of time after notice by the Town Manager, shall be subject to the penalties for noncompliance.

The Town's employees shall observe customers piping which exists in and adjacent to the Public Works and Utility's facilities during meter reading for leaks on the customers plumbing. Employees shall make note of any leaks observed and report the leaks to the Utility. The Utility shall notify the customer in timely manner that a leak has been observed on their plumbing. The Utility will also notify a customer in a timely manner if abnormally high usage is indicated on the account which could indicate a possible leak.

#### **2.1.5 Water Reuse Evaluation**

For all new commercial or industrial construction, an evaluation by the owner for potential water reuse options will be studied and the results are to be submitted to the

Town Manager at the time construction plans are submitted for approval. In all instances where it is determined by the Town Manager to be feasible, such modifications will be incorporated into the design prior to approval by the Town.

As part of the new wastewater treatment expansion, the Town of Cape Charles will evaluate the reuse of high quality treated wastewater. The wastewater generated may be used for irrigation purposes, commercial reuse, or other uses allowed by the DEQ.

#### **2.1.6 Waste of Water (General)**

No person shall permit water to run from any hydrant, meter, valve, or fixture without proper care to prevent waste. All such use must be metered or an estimated use reported to the utilities clerk. Prior notification is required except for emergencies.

#### **2.1.7 Penalties for Noncompliance**

This section outlines the Town of Cape Charles specific penalties for noncompliance with the above listed provisions. The following penalties are addressed:

- A. Any person who shall violate any provision of this plan, or any of the conservation regulations promulgated by the Town Manager or his or her designee pursuant thereto, shall, upon conviction thereof, in addition to additional charges and/or other actions set forth herein, be fined not more than two hundred fifty dollars (\$250.00). Each act, or each day's continuation of a violation shall be considered a separate offense.
- B. In addition to the foregoing, the Town Manager or his or her designee may suspend water service to any person violating the provisions of this plan or the regulations promulgated hereunder. If water service is terminated, the person shall pay a reconnection fee or fifty dollars (\$50.00) plus all outstanding fines and fees before service will be restored.

### **3.0 WATER CONSERVATION DURING EMERGENCY CONDITIONS**

#### **3.1 Purpose**

The following section outlines the Town of Cape Charles specific water conservation requirements during emergency supply conditions. During emergency conditions the protection of the health, safety and welfare of the residents of the Town of Cape Charles

may require that certain uses of water, nonessential to public health, safety and welfare, be reduced, restricted or curtailed; and as the shortage of potable water may become increasingly more critical, conservation measures to further reduce consumption or curtail essential water use may be required.

During periods of water shortage emergencies, declared by the local governing body, DEQ Director, or the Town of Cape Charles, customers will be notified that there is a water shortage emergency and that water use reductions or restrictions are mandatory. The Town of Cape Charles will be responsible for enforcing penalties, such as imposing fines to customers using water for restricted purposes during water shortage emergencies. Requirements for mandatory use reductions during local or regional water shortage emergencies typically involve local ordinances, which detail restrictions and penalties that may be applied during a declared water shortage emergency, described below.

In the event a water shortage and an emergency is declared by the local governing body or the director of DEQ, all water usage shall be ceased except for sanitary and human consumptive uses.

### **3.2 Procedures**

1. The Town Council or the Director of the Commonwealth of Virginia Department of Environmental Quality finds that when there exists an immediate potential for a shortage of potable water in the Town of Cape Charles's water system that increasingly more restrictive conservation measures may be required to prevent a water shortage.
2. The Town Manager or his or her designee is hereby directed to implement conservation measures at such times by ordering the restricted use or absolute curtailment of the use of water for certain non-essential purposes for the duration of the water shortage in the manner hereinafter set out. In exercising his discretionary authority and making the determinations set forth herein, the Town Manager or his or her designee shall give due consideration to water storage, system purification and pumping capacity, daily water consumption data, fire service requirements, pipeline conditions including stoppages and leaks, estimates of minimum essential supplies to preserve public health and safety, and any other pertinent data.
3. The provisions of this plan or regulations promulgated hereunder by the Town Manager or his or her designee which are hereby authorized shall not apply to any governmental activity, institution facility, commercial business or industry which



shall be declared by the Town Manager, upon a proper showing, to be necessary for the public health,- safety and welfare, or the imposition of the provisions of this plan are reasonably determined to place a severe economic hardship on the establishment or cause a substantial loss of employment.

4. Upon Determination by the Town Manager of the existence of the following conditions, the Town Manager shall take the following actions:
  - a. Condition 1: Voluntary Use Restrictions (Drought Watch). When moderate but limited supplies of water are available, the Town Manager shall, through appropriate means, call upon the general public to employ prudent restraint in water usage, and to conserve water voluntarily by whatever means available.
  - b. Condition 2: Mandatory Use Restrictions (Drought Warning) When very limited supplies of water are available, the Town Manager shall order curtailment of less essential usage of water, including, but not limited to, one or more of the following:
    - 1) The watering of shrubbery, trees, lawns, grass, plants or any other vegetation, except indoor plantings, greenhouse or nursery stocks and except watering by commercial nurseries of freshly planted plants and once a week for five (5) weeks following planting.
    - 2) The washing of automobiles, trucks, trailers, boats, airplanes, or any other type of mobile equipment, with the exception of facilities operating with a water recycling system approved by the Town Manager; provided, however, that any facility operating with a water recycling system shall permanently display in public view a notice stating that such recycling system is in operation. In lieu of the provisions hereof, the Town Manager may curtail the hours of operation of commercial enterprises offering such services.
    - 3) The washing of streets, driveways, parking lots, service station aprons, office buildings, exteriors of homes or apartments, or other outdoor surfaces.
    - 4) The operation of any ornamental fountain or other structure requiring a similar use of water.
    - 5) The filling of swimming and/or wading pools, or the refilling of swimming and/or wading pools which were drained after the effective date of the Town Manager's order except for commercial use.

- 6) The use of water from hydrants for any purpose other than fire suppression or other public emergency or scheduled flushing if deemed necessary to maintain water quality in the distribution system.
- c. Condition 3: Water Rationing (Drought Emergency). When critically limited supplies of water are available, the Town Manager shall institute mandatory reductions to each customer as follows:
  - 1) Industrial, institutional, commercial, governmental, and all other non-residential customers shall be allotted a percentage reduction based on their average monthly billings over the preceding six-month period.
  - 2) Individual residential customers shall be limited to a specific volume or percentage reduction based on the same procedure noted above.
  - 3) If allotted monthly usage is exceeded, the customer shall be charged ten dollars (\$10.00) for every seven hundred and fifty (750) gallons of water consumed above the allotted volume. Where prior consumption data is not available, the Town Manager or his or her designee shall estimate allocations based on the best available data.
- d. Condition 4: When only limited supplies of water are available, the Town Manager or his or her designee shall restrict the use of water to purposes that are absolutely essential to life, health and safety.

### **3.3 Written Report Required**

When it is determined that Conditions 2, 3, and 4 are in existence, a written report will be prepared with supporting documentation. Each report shall be promptly filed with the Town Clerk who shall make the report available for public inspection. The Town Manager shall forthwith transmit a copy of said report to the Town Council.

### **3.4 Penalties for Noncompliance**

1. Any person who shall violate any provision of this plan, or any of the conservation regulations promulgated by the Town Manager pursuant thereto, shall, upon conviction thereof, in addition to additional charges and/or other actions set forth herein, be fined not more than two hundred fifty dollars (\$250.00). Each act or each day's continuation of a violation shall be considered a separate offense.
2. In addition to the foregoing, the Town Manager may suspend water service to any person violating the provisions of this plan or the regulations promulgated hereunder. If such water service is terminated, then the person shall pay a reconnection fee of

fifty dollars (\$50.00) plus all outstanding fines and fees before service will be restored.

### **3.5 Notice of Temporary or Final Ceasing of Emergency**

The Town Manager shall notify the Town Council when the resource shortage is over and the emergency situation no longer exists. Information regarding the temporary or final ceasing of emergency conditions will be made available to the public via posting notices in public buildings and utilizing other public information strategies.

## **4.0 WATER REUSE**

The Water Reuse and Reclamation Regulations (9 VAC 25-740) promote the reclamation and reuse of wastewater that are protective of state waters and public health as an alternative to directly discharging pollutants into state waters. The Chesapeake Bay Watershed Nutrient Credit Exchange Program also identifies the reuse and reclamation of wastewater as a means of reducing the Nitrogen and Phosphorus waste loads to the Chesapeake Bay.

Existing industrial water demands utilize a potable water source in their production needs. Future alternatives will be provided to possibly eliminate this dependency on potable water and allow for the conversion to a non-potable process water. The development of the Sustainable Technologies Industrial Park in the Town of Cape Charles is being promoted to demonstrate the potential of energy-efficient, water-conserving and nonpolluting industries. Proposed industrial water demands will promote the use of non-potable process water, reclaimed wastewater. These applications will dictate the advanced treatment and reuse of wastewater plant effluent as a way of reducing the demand of potable water sources.

This section discusses the opportunity for reducing potable water demands in the Town of Cape Charles by developing non-potable reuse and reclaimed wastewater supplies.

### **4.1 Construction Reuse Markets**

Non-potable water used for soil compaction, dust control and other construction purposes is a potential reuse option. Where workers or the public have access or exposure, it is not considered necessary for people to avoid contact. This usage would have to be approved by the DEQ and state and local Health departments. Truck drivers would need



instructions as to specific hauling requirements and the potential hazards involved with non-potable water. The following additional criteria would require adoption:

1. Tanker trucks and other equipment which contain non-potable water would have to be clearly identified with warning signs.
2. Tanker trucks used for non-potable water would have to be thoroughly cleaned of contaminants prior to use.
3. Use of non-potable water could not create any odor or other nuisance.
4. Ponding or runoff of non-potable water should not occur.
5. Non-potable water should be applied so as to minimize public or employee contact with the water.
6. Non-potable water must not be introduced into any part of a domestic water system.
7. After project is complete, tanker trucks should be cleaned and disinfected.
8. Tanker trucks used to transport non-potable water shall not be used to carry domestic water.

## **4.2 Irrigation Reuse Markets**

Bay Creek is developing the residential and recreational area south of Cape Charles, including two golf courses. The Bay Creek management has been open to the option of using the wastewater as a supplement for irrigation and augmenting storage in surface water features, provided no reclaimed water signage is required. The Town of Cape Charles will evaluate the potential uses of reclaimed water for Bay Creek that will comply with reuse regulations and Bay Creek's management requests.

## **4.3 Industrial Reuse Markets**

At the present time, there is only one large user of industrial process water in the Cape Charles area that could likely utilize treated effluent. Bayshore Concrete is located less than 1 mile from the Town's Wastewater Treatment Plant and uses up to 60,000 gpd for process water in the manufacturing of concrete structures, cooling, and dust control. Process water is currently supplied from individual water supply wells owned and permitted by Bayshore Concrete. Much of this process water could likely be supplied from wastewater and the drinking water at the facility could be supplied from the Town's public water system. Because Bayshore Concrete's wells are close to the Chesapeake Bay, reducing or eliminating the pumping from these wells will reduce the potential of

saltwater intrusion and water quality degradation, which could eventually impact the Town's wells.

The availability of treated effluent water supplies could be desirable in attracting other industries into the area without placing demands on the potable water supply. Cape Charles staff will continue to incorporate this option within its economic development program. The viability of the industrial reuse market is a function of many factors, including:

- Location of non-potable source
- Specific water quality requirements of the industry
- Degree of treatment required for the reclaimed water
- Cost of reclaimed water and availability of alternative supplies

## **5.0 PUBLIC EDUCATION PROGRAM**

A key factor in reducing water use by the general public is the development of a comprehensive education program. It is extremely important to educate water consumers on the various aspects of the water industry and information on how drinking water is produced and why we need to conserve. The goal of the water use education program will be to make the customer understand their water sources, the costs of supplying the water to the customer, the problems associated with supplying water, and how changes in consumer behavior can lower the cost of supplying water and result in a lower water bill for the customer. By understanding the environment that water suppliers are faced with on a daily basis, the public will have a better appreciation of water and the need to become directly involved in conservation programs. To achieve this goal, the Town of Cape Charles has selected the following items for the establishment of a comprehensive public education program:

- A. Bill Inserts - On an annual basis, inserts will be added to the outgoing water bills or the consumer confidence reports. These inserts will include water conservation techniques and leak detection strategies. This method can be useful in showing the consumer how water conservation is a winning deal for both the water customer and the Town. Consumers benefit by having lower water bills and the Town benefits by the preservation of its water resources.
- B. Brochures - During public events, water conservation brochures and pamphlets will be available for public distribution. These same items will be available on a continuous basis at the Town Hall.

- C. Video Tapes - A variety of water conservation video tapes will be available from the Town Hall to be checked out by the public free of charge. These tapes can be used for classroom instruction in schools or for other types of public meetings. These tapes will cover such subjects as water conservation, general lawn care, and efficient watering devices.
- D. Water Conservation Hot Line - A telephone number will be made available for residents to have their water conservation questions answered by a knowledgeable Town employee. In addition, requests for information on various water conservation topics will be coordinated through this function.
- E. News Releases - Greater emphasis will be placed on keeping the public informed through news releases by the print media, radio, and the Cape Charles website ([www.capecharles.org](http://www.capecharles.org)). This method of public education will not be used only during emergencies, but on a regular basis to keep the public informed on water related issues.

These programs will be targeted to representative age groups and will be given by Town staff and/or guest speakers. Information and assistance will be available to teachers who wish to develop their own water awareness program.

## **6.0 WATER USE REDUCTION PROGRAM**

### **6.1 Water Loss Audit**

The Town is actively upgrading the water system to provide 100% metering of all connections. The metering program will provide the Town with the tools to accurately assess water loss and audit water uses. The water distribution will be evaluated for leaks using the comparison of system water meters and the pump house master meter; thus, an unaccounted for water analysis will show any major leaks or discrepancies. For the purposes of this plan, the unaccounted for water analysis will occur annually at a minimum to establish the system base line for error within metering equipment. In addition, potential discrepancies between the amount of water produced and the amount sold to customers will be reviewed on a monthly to bimonthly basis once the majority of homes are metered. The current billing system will be modified and upgraded to assist in analyzing water usage and detecting possible leaks. Utility operators will also be able to detect leaks on the basis of daily and weekly review of water use data including well pump operational logs and wellhead meter readings which can detect possible leaks by a

general comparison to typical seasonal water use. More frequent reviews may be possible as new technologies are implemented within the meter reading systems.

The audit will also identify sources of water demand on the system that would normally escape detection through normal metering devices, in particular municipal uses. Examples of this type of demand are:

- Water for Fire Fighting
- Water Main Flushing
- Water Meter Errors
- Water Main Breaks
- Water Leak Detection
- Water Tank Drainage and Leaks
- Water Treatment Backwashing

Water for Fire Fighting: All hydrant use will be recorded at the water plant and reported to the utilities clerk either within 24 hours. The Town of Cape Charles Volunteer Fire Department will report water use (i.e. fire fighting, hydrant flushing, etc.) to the utilities clerk within 24 hours of said usage. Prior notice of water usage in excess of 1,000 gallons is required to be given the utilities clerk, except in emergency situations.

Water Main Flushing: All main flushing performed by the Utilities Department (i.e. water quality improvement, construction, etc.) will require the submittal of an estimate of water consumption.

Water Meter Errors: The Town of Cape Charles is currently installing and replacing meters as needed. Meter errors are evaluated based on historical use and unanticipated changes in water use rates, and visual inspections during meter reading. There are presently approximately 1160 meters in the Town. The town has recently purchased meter-testing equipment to check suspect meters for accuracy

Water Main Breaks: All main breaks will require the reporting of the estimated volume of water loss by the Utility Department.

Water Leak Detection: The Utilities Department will develop an ongoing leak detection program in conjunction with the water system metering upgrades. Water loss estimates will be quantified and water leaks may be estimated based on the ongoing water loss

audits. The Town will purchase leak detection equipment in 2008 to facilitate the program.

If a leak in the system occurs, it will be fixed within 24 hours. If the usage data or unaccounted for water analysis indicates a water leak which cannot be visually located, the system will be searched for leaks. Additionally, exceptionally high usage at customer's meters must be also be reviewed from billing department data. The location of leaks in the distribution system and the success of a repair program depend on the following factors:

- Pipe age and material;
- System operating pressures;
- Soil Type;
- Soil pH; and
- Pipeline depth

Generally, the initial searches for leaks include walking the system lines and looking for puddles or wet areas that could hint of a leak. For subsurface leaks in well-drained soils, electronic leak detection equipment will be employed.

Employees shall inspect all pump station piping for leaks during each visit and shall notify management of any leaks observed in the pump stations or in the distribution system in a timely manner.

The entire distribution system will be visually inspected on each meter reading cycle by walking and driving the system and reviewing the meter locations and searching for apparent leaks. Upon bill generation for customer bills, high usage bills will be reviewed carefully and may be re-read to verify the usage and look for customer leaks.

Upon notification that a leak exists in the pump station or on the distribution system, the leak(s) shall be repaired in a timely manner. Customers are responsible for home plumbing leaks and water usage may be discontinued by the Town until the repair is made if sufficient water is being wasted, the customer is not responsive, or the home is abandoned.

Water Tank Drainage and Leaks: All water system storage tank draining will be reported. Further, the Town will develop an inspection program for all water storage tanks which would include leak detection.



Water Treatment Backwashing: All backwashing operations conducted at the water treatment plant are metered. The backwash volumes are tabulated and are used to evaluate system performance. In conjunction with the water treatment system upgrades, the backwash operations will be monitored and will be used as required to improve the overall water treatment efficiency and minimize water loss.

All forms for reporting loss and unaccounted for loss will be maintained by the Utility Department.

## **6.2 Water Use Reduction through Future Rate Structures**

Water billing can be used as a means to disseminate water conservation information to water users and to provide incentives to customers to use water efficiently. The Town has adapted a water rate structure to promote water conservation. Conservation-based rate structures such as flat rates, increasing block rates, seasonal rates, or quantity-based surcharges encourage water conservation and discourage wasteful water use. Increasing rate structures are most effective and allow for average water use at a reasonable rate. However, above an allowable amount of normal household water usage, the rates become higher per unit of water used. Residents who use large amounts of water each month would pay substantially more than residents who do not.

## **6.3 Outdoor Water Use**

Outdoor water use increase significantly during the summer months primarily due to increased seasonal population and lawn and garden irrigation. As part of the water use education program and through conservation-based rate structures, the Town will help reduce excessive outdoor water use and promote better conservation and management practices by the customers. Developing proper grass watering practices and encouraging the use of drought tolerant landscaping can greatly reduce irrigation demands. Watering less frequently can better establish root systems, which make grass and shrubs more drought tolerant.

In addition, Bay Creek has adopted covenants that do not allow the use of town water for outside use such as lawn watering and car washing. However, Bay Creek also requires sod and extensive landscaping so irrigation is necessary. To accommodate the irrigation needs, all homes on larger lots require their own shallow well. For smaller lots (New Quarter, the Condos, Bayside Village), Bay Creek provides a central irrigation system with one shallow well for every 8 to 12 homes. All of Bay Creek's common areas are irrigated using water from their lake system.

VIRGINIA DEPARTMENT OF HEALTH  
ENGINEERING DESCRIPTION SHEET

DATE: June 27, 2008

WATERWORKS NAME:	Cape Charles, Town of	CERTIFIED CLASS: III
COUNTY/CITY:	Northampton County	TYPE: Community
LOCATION:	The plant and the wells are located 1/4 mile east of the Town of Cape Charles along Route 184 (approximately 1 mile west of intersection of Route 184 and US Route 13) in Northampton County.	
OWNER:	The Town of Cape Charles c/o Mr. Joe Vaccaro, Town Manager P.O. Box 391 Cape Charles, Virginia 23310 Phone: (804) 331-3259	
OPERATOR:	Certified Class III Operator Required	
PERMIT NO.:	3131120	
DATE ISSUED:	June 27, 2008	
TYPE OF TREATMENT:	Fluoridation, iron, and manganese removal, softening (ion exchange), pH adjustment and disinfection by hypochlorination.	
SOURCE:	Two Wells	
DESIGN CAPACITY:	416,000 gpd (0.416 mgd) or 1,040 equivalent residential connections	

DESCRIPTION OF SYSTEM

GENERAL

This waterworks consists of two wells, treatment, an elevated storage tank, and the distribution system. The treatment plant building houses the onsite laboratory and water treatment facilities for iron and manganese removal, water softening, pH adjustment, fluoridation, and disinfection.

## SOURCE

The Replacement East Well (2008) was drilled on April 15<sup>th</sup> and 16<sup>th</sup> 2008, to a total depth of 220 feet. The well was completed to a depth of 220 feet with 8 and 6-inch diameter PVC casing and screens, and it was grouted to 100 feet. The screens are shown at depths of 100-120; 165-185; and 200-220 feet. The static water level was 12.5 feet and the well yielded 245 gpm for a drawdown of 64 feet during a 48 hour drawdown test. The well is equipped with a submersible pump (driven by a 20 H.P. electric motor) rated at 243 gpm @ 260 feet TDH.

The West Well (originally named as deep well or Well No. 5) was drilled on February 27, 1973 and it was completed on August 15, 1973 to a total depth of 210 feet. The first 60 feet is grouted and cased with 14-inch diameter casing while the remaining of the well is equipped with 6-inch diameter casing, or screen. The screens are shown at depths of 65-85; 88-98; 105-115; and 194-204 feet. The static water level was 15 feet and the well yielded 275 gpm for a drawdown of 90 feet during a 30 hour yield and drawdown test. The submersible pump (driven by 20 H.P electric motor) in the well is rated at 275 gpm. The actual pumping rate under the system head conditions (elevated tank level 85% full) has been measured to be 236 gpm.

## TREATMENT

### Fluoridation:

Sodium fluoride is the first chemical fed to the raw water. The feed equipment consists of a single head metering pump (maximum capacity of 5.5 gph @ 150 psi), finished water make up line protected by an RPZ, and a 50 gallon upflow type saturator.

### Oxidation and disinfection chemical addition:

Both potassium permanganate and sodium hypochlorite are employed for the oxidation of iron and manganese in the raw water and for continuous regeneration of the greensand filter media. Potassium permanganate solution is applied upstream of the sodium hypochlorite application. The potassium permanganate feed equipment consists of a 100 gallon solution tank with a mixer mounted on top and a single head metering pump (maximum capacity of 1.83 gph @ 150 psi). Sodium hypochlorite feed equipment for oxidation (pre) and disinfection (post) consists of a dual head metering pump (maximum capacity of 3.66 gph combined) feeding pure liquid sodium hypochlorite from 55 gallon original containers to the raw water as well as the finished water lines. An automatic chlorine analyzer is located downstream of the chlorine injection point in the finished water line. Contact time for disinfection is provided by the riser pipe volume of the elevated storage tank.

### Iron and manganese removal filters:

This unit consists of two (steel, cylindrical-10 feet diameter x 7 feet side wall) greensand media filters with 158 sq. feet of filter area. Filters are provided with air scour, headloss gauges, and sampling ports. The filter media consists of 1.3 feet of support gravel, 2 feet of manganese green sand and 1 foot of anthracite. The backwash and rinse water is supplied by the elevated storage tank and the waste is discharged to the polishing pond at the Cape Charles wastewater treatment plant.

#### Softening (ion exchange):

This unit consists of an ion exchange water softener and a brine regeneration system. Partial flow from the green sand filters is treated by the softener and is blended with the bypassed water for a target hardness of 80 mg/l in the finished water. The softener is a cylindrical steel tank (10 feet diameter x 7 feet side wall) containing 3.5 feet of ion exchange resin supported on 1.25 feet of gravel. The brine system consists of a 1,500 gallon capacity fiber glass brine tank with manual salt and water feed system and a 525 gpm regenerant pump. Regeneration can be accomplished with either automatic or manual control. The regenerant and rinse waste stream are discharged to the polishing pond at the Cape Charles wastewater treatment plant.

#### pH adjustment:

The chemical feed equipment consists of a single head metering pump (maximum capacity of 1.83 gph @ 150 psi) and a 50 gallon chemical solution tank with a mixer mounted on top. Sodium carbonate (soda ash) solution is added to the finished water line downstream of the sodium hypochlorite addition for post disinfection. There is a provision to change the point of application of pH adjustment chemicals from the finished water to the raw water if necessary.

#### STORAGE

The storage is provided by a 300,000 gallon elevated tank which looks like a light house and is located right next to the treatment plant building. The tank floats on the distribution system with the exception of the riser pipe which provides the volume necessary for contact time for disinfection. Wet riser volume of approximately 27,500 gallons provides 68 minutes of contact time at 400 gpm treatment capacity.

The Department of Environmental Quality has issued a permit (No. GW 0037200) for this groundwater source public water system. Cape Charles is entrusted with resource use responsibilities via that permit, and is advised to be aware of any compliance requirements of that permit.

### EVALUATION OF SYSTEM

Design Basis: per *Waterworks Regulations*, one ERC = 400 gpd

1. Estimated Water Demand: (1,030 connections)(400 gpd/ERC) = 413,000 gpd

2. Source Capacity

Well	Well Yield (gpd) =gpm/(0.5 gpm/ERC)* 400gpd/ERC		Well Pump (gpd) = gpm * 1440 min/day		Limiting Capacity (gpd)
EWR 2008	245	196,000	243	349,920	196,000
Tower	275	220,000	236	339,840	220,000
Total					416,000

3. Storage Capacity:            300,000 gallon elevated tank = 300,000 gallons effective  
   300,000 gallons/ 200 gallons/ERC = 1,500 ERC  
   1,500 ERC \* 400 gpd/ERC = 600,000 gallons

4. Treatment Capacity:

1. Filter Capacity

- a. Filtration capacity = 474 gpm (158 sq.ft x 3 gpm/sq. ft.)
- b. Flow control set at = 400 gpm
- c. 400 gpm \* 1440 min/day = 576,000 gpd

Filter production = 400 gpm x 1440 min/day = 576,000 gpd

2. Softener Capacity (with 60:40, filter: by pass ratio)

- a. Softening actual capacity = 316 gpm (79 sq. ft x 4 gpm/sq.ft)
- b. Softener effective capacity =  $\frac{316 \text{ gpm} \times 1440 \text{ min/d}}{0.6 \text{ (ratio factor)}} = 758,400 \text{ gpd}$

Conclusion:            This waterworks is limited to a capacity of 416,000 gallons per day due to limited well yield.





# Town of Eastville



VIRGINIA DEPARTMENT OF HEALTH  
ENGINEERING DESCRIPTION SHEET

DATE: October 25, 1977

REVISED: June 7, 1984; March 29, 1996

WATERWORKS NAME:	Town of Eastville	CERTIFIED CLASS: N/A
COUNTY/CITY:	Northampton County	TYPE: Community
LOCATION:	Well #4 (main well) is located approximately 100 yards west of Route 13 and north of Route 631 at the intersection of Route 13 and Route 631. Well #3 (auxiliary well) is located at the southwest base of the elevated storage tank east of Business Route 13.	
OWNER:	Town of Eastville Mr. Edgar S. Sturgis, III, Mayor P.O. Box 447 16437 Courthouse Rd. Eastville, Virginia 23347	
OPERATOR:	Mr. James C. Sturgis P.O. Box 447 16437 Courthouse Rd. Eastville, Virginia 23347 Phone (804) 678-5183 (Northampton Insurance Agency, Inc.) FAX 678-SFAX (5329)	
PERMIT NO.:	3131200	
DATE ISSUED:	June 24, 1977	
TYPE OF TREATMENT:	None	
SOURCE:	Two Wells	
DESIGN CAPACITY	375 ERCs or 150,000 gpd	

DESCRIPTION OF SYSTEM

The system consists of two wells, a 75,000 gallon elevated storage tank, and the distribution system.

Well #3 (auxiliary well) was drilled starting on January 12, 1970, and was completed on February 4, 1970. The well bore is 320 feet deep, with cement grout extending from the surface to 100 feet. The well casing is 6-inches in diameter and extends to 300 feet, extending to 320 feet of 12-slot screen. The well is equipped with a turbine pump rated at 90 gpm, driven by a 7 1/2 H.P. motor. The well has a tested yield of 100 gpm, over a 24-hour period, with the water level dropping from 27 feet (static condition) to 42 feet (dynamic condition).

Well #4 (main well) was completed on September 15, 1972. The well bore is 175 feet, with cement grout extending from the surface to 60 feet. The galvanized well casing is 6-inches in diameter and extends to 145 feet, extending to 165 feet of stainless steel screen (7-slot). Gravel pack is installed from 140 feet to 175 feet. The well is equipped with a submersible pump rated at 110 gpm at 78 feet TDH, driven by a 7 1/2 H.P. motor. The well has yielded 110 gpm with the water level dropping from 70 feet to 78 feet during a 12 hour pump test. In another test of unknown duration, the well has yielded 30 gpm, with the water level dropping from 18 feet (static condition) to 30 feet (dynamic condition).

### EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERC). One ERC will utilize 400 gallons per day. This system's capacity is evaluated as follows:

#### I. Source Capacity

##### A. Source Yield

##### 1. Number of Sources

- a. Required = 1 up to 49 ERC, more than 1 for 50 or more ERCs
- b. Provided = 2 wells

2. Well Yield:  $100 \text{ gpm} + 110 \text{ gpm} = 210 \text{ gpm}$

3. Pump Yield:  $110 \text{ gpm} + 90 \text{ gpm} = 200 \text{ gpm}$

##### B. Production Capacity

$$\frac{200 \text{ gpm}}{0.5 \text{ gpm/ERC}} = 400 \text{ ERCs}$$

#### II. Storage Capacity

A. Effective Storage = 75,000 gallons

##### B. Storage Capacity

$$75,000 \text{ gallons} / (200 \text{ gal./ERC}) = 375 \text{ ERCs (Limiting Case)}$$

#### III. Limiting Case

A. Storage Capacity = 375 ERCs

$$375 \text{ ERCs} \times 400 \text{ gpd/ERC} = 150,000 \text{ gpd}$$

Therefore, based on the critical values discussed above, this waterworks was issued an operation permit for a design capacity of 150,000 gpd or 375 ERCs. It is stressed that the storage capacity is the limiting factor and that the permitted number of ERCs is only an indicator of when the flow restriction will be reached. Therefore, this system may exceed the permitted number of ERCs as long as the flow is within limits as indicated by proper reporting as determined by the Health Department engineers.



# Town of Exmore



# PERMIT PART 5

## JUSTIFICATION FOR

### WITHDRAWAL REQUESTED

The Town of Exmore, located in Northampton County, Virginia, owns and operates a Public Water Supply that serves the Town and surrounding environs. The water supply consists of two wells, a 200,000-gallon elevated storage tank and distribution piping.

The Town's Groundwater Withdrawal Permit (No. GW0038800) was issued by the Virginia Department of Environmental Quality (DEQ) on November 1, 1995 and expired on October 31, 2005. The Permit authorized the Town to withdraw 60,800,000 gallons per year and restricted the maximum withdrawal in a calendar month to not more than 9,920,000 gallons. DEQ has assigned Permit No. GW0050800 to the forthcoming renewed permit.

The table below presents a summary of water use for the past 10 years, based on reports submitted by the Town to the Virginia Department of Health (VDH).

Table 1					
Past Water Use Summary					
YEAR	Connections		Total Connections	Monthly Maximum (million gallons)	Reported Annual Total (million gallons)
	Commercial	Residential			
1999	n/a*	n/a	670 (est)	4.926 (Jul)	46.56
2000	n/a	n/a	690 (est)	4.792 (May)	46.91
2001	n/a	n/a	690 (est)	5.070 (Jul)	48.65
2002	n/a	n/a	690 (est)	6.799 (Jul)	56.69
2003	n/a	n/a	700 (est)	6.561 (Jul)	60.93
2004	n/a	n/a	700 (est)	5.931 (Aug)	61.32
2005	124	579	703	7.845 (May)	63.50
2006	122	579	701	5.996 (Aug)	57.74
2007	124	601	701	5.134 (Jan)	49.42
2008	124	601	725	5.061 (Jul)	49.68
n/a* - not available				Total	541.40
				Ten-Year Average	54.14

Water use for January – May 2009 is 19,935,300 gallons or approximately 3.99 million gallons/month.

### Examples of Growth

The Northampton County Comprehensive Plan (April 2009) identifies towns located within the Route 13 corridor as future growth areas. This growth includes commercial, industrial and residential development. Exmore, which is strategically located along Route 13 near the geographic center of the Eastern Shore, is envisioned as a primary growth area. Town growth over the past 5 years includes a shopping center; a new fast



**July 2009**

**PERMIT PART 5  
JUSTIFICATION FOR  
WITHDRAWAL REQUESTED**

food restaurant (Wendy's); a convenience store (Royal Farms); two motels (80-room Holiday Inn Express in 2008 and an 86-room Hampton Inn & Suites in July 2009); a 36-unit elderly-housing development; and major redevelopment of the New Road neighborhood (an area of low to moderate-income persons), which will experience new and renovated housing construction. The New Road development has potentially 100 housing units, many of which currently do not have indoor plumbing.

**Projected Increased Water Use**

In 2008, a 300-lot subdivision was proposed west of Route 13. The developer's marketing analysis indicated 60 connections per year, beginning in 2008 through 2012, or until build out. This would require an additional 10,500 gal/day each year or at build out, 52,500 gal/day (19.16 million gallons/year). Local approvals and development are on hold, due to the current economy. Start up is anticipated in 2011.

A biodiesel blending facility is planned for development within the Town limits on the former Dulaney Foods property. The owner hopes to "break ground" in October 2009. Chicken wastes from the nearby Perdue processing plants will be used in the blending process. Water use is estimated by the owner to be less than 300,000 gallons per month. For the purpose of this application, use is projected at 250,000 gallons per month or 3.0 million gallons/year.

**Population Projections**

According to U.S. Census Bureau, Exmore's population between 1990 and 2000 ranged from a low of 1,090 in 1998 to a high of 1,136 in 2000. The population in 2007 was 1,166 and 1,355 in 2009. For the 9-year period between 2000 and 2009 the population increased by 19.3% or approximately 2% per year. For the 2-year period between 2007 and 2009 the population increased by 16.2% or 8% per year.

The Town is in the process of negotiating with a company to bring broadband service to the community within the next 12 to 24 months. In addition, there are plans to upgrade the wastewater treatment facility within the next 24 to 36 months. The Town anticipates increased growth once these services are available.

Assuming economic conditions do not improve until the beginning of 2011, population growth is estimated at no more than 2% per year (2009 and 2010). Population growth is projected to increase annually thereafter by 5% per year (2011 through 2019) with an improved economy, the addition of broadband services, and the increased wastewater plant capacity.

July 2009

# PERMIT PART 5 JUSTIFICATION FOR WITHDRAWAL REQUESTED

## Projected Water Requirements

### 2009

- 2009 base usage = the 10 year average ..... 54.14 MG
- New Hampton Inn ..... 0.64 MG

Assume 75% occupancy for 100 days (May – September 2009)

86 rooms x 75% = 64.5 rooms at 65 gallons/room =

4,193 gallons/day x 100 days = 419,250 gallons

Assume 15% occupancy for 265 days (remainder of year)

86 rooms x 15% = 13 rooms at 65 gallons/room =

845 gallons/day x 265 days = 223,925 gallons

Total annual use = 643,175 gallons

- 2% growth in 2009 (1,355 x 2% = 27 persons) ..... 0.74 MG  
27 x 75 gpd/person = 2,025 gpd x 365 days = 739,125

**Total, 2009..... 55.52 MG**

### 2010

- 2010 base usage = 2009 Total ..... 55.52 MG
- Biodiesel facility use for 3 months x 250,000 gal/mo. = ..... 0.75 MG
- 2% growth in 2010 (1,382 x 2% = 28 persons)  
28 x 75 gpd/person = 2,100 gpd x 365 days = ..... 0.77 MG

**Total, 2010..... 57.04 MG**

### 2011

- 2011 base usage = 2010 Total ..... 58.19 MG
- Biodiesel facility use for 12 months x 250,000 gal/mo. .... 3.00 MG
- First year of 300-lot subdivision  
60 connections x 175 gpd/connection = 10,500 gpd x 365 days = ..... 3.83 MG  
(the projected 5% growth is accounted for in the subdivision  
at 3 persons per connection or 180 people)

**Total, 2011..... 63.87 MG**

July 2009

# PERMIT PART 5

## JUSTIFICATION FOR

### WITHDRAWAL REQUESTED

2012

- 2012 base usage = 2011 Total ..... 63.87 MG
  - Second year of 300 lot subdivision = ..... 3.83 MG  
(the projected 5% growth is accounted for in the subdivision)
- Total, 2012..... 67.70 MG**

2013

- 2013 base usage = 2012 Total ..... 67.70 MG
  - Third year of 300 lot subdivision = ..... 3.83 MG  
(the projected 5% growth is accounted for in the subdivision)
- Total, 2013..... 71.53 MG**

2014

- 2014 base usage = 2013 Total ..... 71.53 MG
  - Fourth year of 300 lot subdivision = ..... 3.83 MG  
(the 5% growth is accounted for in the subdivision)
- Total, 2014..... 75.36 MG**

2015

- 2015 base usage = 2014 Total ..... 75.36 MG
  - Fifth (final) year of 300 lot sub division = ..... 3.83 MG  
(the 5% growth is accounted for in the subdivision)
- Total, 2015..... 79.19 MG**

Note: The population at the end of 2015 is projected to be:  
 2011 = 1,410 + 300 subdivision units at 3 persons/unit =  
 900 persons for an end of 2015 total of 2,310 persons.

2016

- 2016 base usage = 2015 Total ..... 79.19 MG

July 2009

# PERMIT PART 5

## JUSTIFICATION FOR

### WITHDRAWAL REQUESTED

- 5% growth in 2016 ( $2,310 \times 5\% = 116$  persons)..... 3.18 MG  
 $116 \times 75 \text{ gpd/person} = 8,700 \text{ gpd} \times 365 \text{ days} = 3,175,500$

**Total, 2016..... 82.37 MG**

#### 2017

- 2017 base usage = 2016 Total ..... 82.37 MG
- 5% growth in 2017 ( $2,426 \times 5\% = 121$  persons)..... 3.31 MG  
 $121 \times 75 \text{ gpd/person} = 9,075 \text{ gpd} \times 365 \text{ days} = 3,312,375$

**Total, 2017..... 85.68 MG**

#### 2018

- 2018 base usage = 2017 Total ..... 85.68 MG
- 5% growth in 2018 ( $2,547 \times 5\% = 127$  persons)..... 3.48 MG  
 $127 \times 75 \text{ gpd/person} = 9,525 \text{ gpd} \times 365 \text{ days} = 3,476,625$

**Total, 2018..... 89.16 MG**

#### 2019

- 2019 base usage = 2018 Total ..... 89.16 MG
- 5% growth in 2019 ( $2,674 \times 5\% = 134$  persons)..... 3.67 MG  
 $134 \times 75 \text{ gpd/person} = 10,050 \text{ gpd} \times 365 \text{ days} = 3,668,250$

**Total, 2019..... 92.83 MG**

**say ..... 93.00 MG**

An evaluation of the public water system by the Virginia Department of Health (VDH) shows that the existing wells and storage tank are capable of providing a design capacity of 400,000 gpd (146 MG/yr).

This request to increase the permitted Groundwater Withdrawal to 93.00 million gallons is reasonable, based on existing and potential future growth in the Exmore area expected between 2009 and 2019, as described above.

Town of Exmore  
Historical Well Yields

Peak month per year											
Missing data											
YIELD IN GALLONS											
WELL	YIELD	YIELD	TOTAL	GPD	GPDPC	GAL/CON	POP	CONN	% OF	Annual	NOTES / ANNUAL
1	WELL 1	WELL 2	YIELD						PERMIT	Average of	TOTAL
										% of permit	
1	87	8,974,350	8,974,350	289,495	277	482	1,115	640	72%		
2	87	2,878,150	2,878,150	92,844	89	155	1,115	640	23%		
3	87	3,235,110	3,235,110	104,358	100	174	1,115	640	26%		
4	87	3,616,430	3,616,430	116,659	112	194	1,115	640	29%		
5	87	3,409,760	3,409,760	109,992	105	183	1,115	640	27%		
6	87	4,334,420	4,334,420	139,820	134	233	1,115	640	35%		
7	87	4,863,840	4,863,840	156,898	150	261	1,115	640	39%		
8	87		2,055,000	66,290	63	110	1,115	640	17%		
9	87		2,201,000	71,000	68	118	1,115	640	18%		
10	87	1,740,230	1,581,100	107,140	102	179	1,115	640	27%		
11	87	1,643,325	1,500,850	101,425	97	169	1,115	640	25%		Annual data incomplete
12	87	1,643,325	1,500,850	101,425	97	169	1,115	640	25%	NP	45,177,740
1	88	1,826,200	1,670,200	112,787	108	188	1,115	640	28%		
2	88	1,544,800	1,432,600	96,045	92	160	1,115	640	24%		
3	88	1,362,250	1,280,000	85,234	82	136	1,115	670	21%		
4	88	1,994,660	1,695,700	119,044	114	190	1,115	670	30%		
5	88	1,714,720	1,492,600	103,462	99	165	1,115	670	26%		
6	88	2,245,180	2,091,000	139,877	134	223	1,115	670	35%		
7	88	2,490,670	2,435,500	158,909	152	253	1,115	670	40%		
8	88	2,040,020	1,824,900	124,675	119	198	1,115	670	31%		
9	88	1,913,310	1,799,900	119,781	115	191	1,115	670	30%		
10	88	1,740,230	1,581,100	107,140	102	171	1,115	670	27%		
11	88	1,643,325	1,500,850	101,425	97	161	1,115	670	25%		
12	88	1,643,325	1,500,850	101,425	97	161	1,115	670	25%	NP	42,463,890
1	89	1,826,200	1,670,200	112,787	108	180	1,115	670	28%		
2	89	1,544,800	1,432,600	96,045	92	153	1,115	670	24%		
3	89	1,362,250	1,280,000	85,234	82	136	1,115	670	21%		
4	89	1,994,660	1,695,700	119,044	114	190	1,115	670	30%		
5	89	1,714,720	1,492,600	103,462	99	165	1,115	670	26%		
6	89	1,907,270	1,528,200	110,822	106	176	1,115	670	28%		
7	89	2,246,180	2,091,000	139,909	134	223	1,115	670	35%		
8	89		0	0	0	0	1,115	670	0%		data not available
9	89	2,048,620	2,020,700	131,268	126	209	1,115	670	33%		
10	89	1,739,430	1,675,100	110,146	105	175	1,115	670	28%		
11	89	2,799,390	535,400	107,574	103	171	1,115	670	27%		
12	89	3,063,360	1,017,600	131,644	126	210	1,115	670	33%	NP	38,685,980
1	90	1,945,950	1,133,500	99,337	95	158	1,114	670	25%		
2	90	1,574,300	1,515,600	99,674	95	159	1,114	670	25%		
3	90	1,724,890	1,659,600	109,177	105	174	1,114	670	27%		
4	90	1,756,530	1,651,700	109,943	105	175	1,114	670	27%		
5	90	1,688,840	1,801,800	112,601	108	179	1,114	670	28%		
6	90	1,821,720	1,945,600	121,526	116	193	1,114	670	30%		
7	90	2,238,510	2,414,100	150,084	144	239	1,114	670	38%		
8	90	2,128,360	2,130,400	137,379	132	219	1,114	670	34%		
9	90	1,998,020	1,825,100	123,326	118	196	1,114	670	31%		
10	90	1,825,670	1,771,120	116,025	108	179	1,114	670	29%		
11	90	1,632,996	1,509,900	101,384	94	156	1,114	670	25%		
12	90	1,331,841	1,413,999	88,575	82	137	1,114	670	22%	NP	42,440,046
1	91	1,775,230	1,619,000	109,491	102	169	1,112	670	27%		
2	91	1,665,870	1,453,000	100,609	93	155	1,112	670	25%		
3	91	1,640,060	1,536,701	102,476	95	158	1,112	670	26%		
4	91	1,756,160	1,778,201	114,012	106	176	1,112	670	29%		
5	91	2,053,746	2,052,200	132,450	123	204	1,112	670	33%		
6	91	2,335,481	2,258,808	148,203	138	229	1,112	670	37%		
7	91	7,172,620	5,016,800	393,207	365	606	1,112	670	98%		
8	91	7,761,140	1,978,000	314,166	292	485	1,112	670	79%		
9	91	2,568,310	1,283,800	124,262	115	192	1,112	670	31%		
10	91	1,837,440	2,019,000	124,401	116	192	1,112	670	31%		
11	91	1,504,170	1,476,700	96,157	89	148	1,112	670	24%		
12	91	1,596,090	1,498,500	99,825	93	154	1,112	670	25%	NP	57,637,027



Town of Exmore  
Historical Well Yields

		Peak month per year			Missing data						Annual Average of % of permit	NOTES / ANNUAL TOTAL
		YIELD IN GALLONS										
.R		YIELD WELL 1	YIELD WELL 2	TOTAL YIELD	GPD	GPDPC	GAL/CON	POP	CONN	% OF PERMIT		
1	92	1,790,760	1,629,200	3,419,960	110,321	103	170	1,111	670	28%		
2	92	1,499,740	1,439,800	2,939,540	94,824	88	146	1,111	670	24%		
3	92	1,557,130	1,521,100	3,078,230	99,298	92	153	1,111	670	25%		
4	92	1,647,930	1,528,600	3,176,530	102,469	95	158	1,111	670	26%		
5	92	1,531,660	1,647,100	3,178,760	102,541	95	158	1,111	670	26%		
6	92	1,819,710	1,978,900	3,798,610	122,536	114	189	1,111	670	31%		
7	92	2,259,530	2,136,900	4,396,430	141,820	132	219	1,111	670	35%		
8	92	1,853,650	1,909,500	3,763,150	121,392	113	187	1,111	670	30%		
9	92	1,647,150	1,966,900	3,614,050	116,582	108	180	1,111	670	29%		
10	92	1,733,320	1,833,500	3,566,820	115,059	107	177	1,111	670	29%		
11	92	1,803,880	1,789,900	3,593,780	115,928	108	179	1,111	670	29%		
12	92	1,740,720	1,614,000	3,354,720	108,217	101	167	1,111	670	27%	NP	41,880,580
1	93	1,605,670	1,461,500	3,067,170	98,941	92	153	1,110	670	25%		
2	93	1,691,630	1,401,800	3,093,430	99,788	93	154	1,110	670	25%		
3	93	1,800,460	1,689,600	3,490,060	112,583	105	174	1,110	670	28%		
4	93	1,696,740	1,592,600	3,289,340	106,108	99	164	1,110	670	27%		
5	93	1,674,700	1,357,400	3,032,100	97,810	91	151	1,110	670	24%		
6	93	2,331,900	2,177,300	4,509,200	145,458	135	224	1,110	670	36%		
7	93	2,560,300	2,287,700	4,848,000	156,387	146	241	1,110	670	39%		
8	93	2,477,990	2,175,500	4,653,490	150,113	140	232	1,110	670	38%		
9	93	2,088,460	1,902,500	3,990,960	128,741	120	199	1,110	670	32%		
10	93	1,820,950	1,706,500	3,527,450	113,789	106	175	1,110	670	28%		
11	93	1,921,500	1,710,600	3,632,100	117,165	109	181	1,110	670	29%		
12	93	1,590,070	1,573,600	3,163,670	102,054	95	157	1,110	670	26%	NP	44,296,970
1	94	2,622,330	2,457,700	5,080,030	163,872	153	253	1,106	670	41%		
2	94	2,192,400	2,008,600	4,201,000	135,516	127	209	1,106	670	34%		
3	94	2,288,900	2,177,400	4,466,300	144,074	135	222	1,106	670	36%		
4	94	2,109,520	2,212,900	4,322,420	139,433	130	215	1,106	670	35%		
5	94	2,675,120	2,542,900	5,218,020	168,323	157	260	1,106	670	42%		
6	94	2,648,840	2,876,500	5,525,340	178,237	167	275	1,106	670	45%		
7	94	2,650,540	2,723,700	5,374,240	173,363	162	267	1,106	670	43%		
8	94	2,799,100	2,819,000	5,618,100	181,229	169	280	1,106	670	45%		
9	94	2,916,840	2,453,300	5,370,140	173,230	162	267	1,106	670	43%		
10	94	2,558,580	2,376,300	4,934,880	159,190	149	246	1,106	670	40%		
11	94	2,454,280	2,166,200	4,620,480	149,048	139	230	1,106	670	37%		
12	94	2,489,470	2,173,400	4,662,870	150,415	141	232	1,106	670	38%	NP	59,393,820
1	95	2,409,930	2,176,000	4,585,930	147,933	138	228	1,107	670	37%		
2	95	1,730,600	1,646,000	3,376,600	108,923	102	168	1,107	670	27%		
3	95	2,102,300	1,949,900	4,052,200	130,716	122	202	1,107	670	33%		
4	95	1,879,700	1,805,400	3,685,100	118,874	111	183	1,107	670	30%		
5	95	2,379,760	2,188,900	4,568,660	147,376	138	227	1,107	670	37%		
6	95	2,571,640	2,254,700	4,826,340	155,688	145	240	1,107	670	39%		
7	95	2,900,000	2,737,200	5,637,200	181,845	170	280	1,107	670	45%		
8	95	2,832,600	2,709,000	5,541,600	178,761	167	276	1,107	670	45%		
9	95	2,151,600	1,892,200	4,043,800	130,445	122	201	1,107	670	33%		
10	95	4,469,600	3,284,100	7,753,700	250,119	233	386	1,107	670	63%	permit *	
11	95	1,858,600	1,588,200	3,446,800	111,187	104	171	1,107	670	28%		
12	95	1,802,560	1,634,000	3,436,560	110,857	103	171	1,107	670	28%	90.4%	54,954,490
1	96	1,859,160	1,720,000	3,579,160	115,457	108	178	1,102	670	29%		
2	96	1,765,710	1,568,500	3,334,210	107,555	101	166	1,102	670	27%		
3	96	1,791,250	1,612,000	3,403,250	109,782	103	169	1,102	670	27%		
4	96	2,262,690	1,792,200	4,054,890	130,803	123	202	1,102	670	33%		
5	96	2,052,560	1,821,100	3,873,660	124,957	117	193	1,102	670	31%		
6	96	2,249,070	2,055,700	4,304,770	138,864	130	214	1,102	670	35%		
7	96	2,659,200	2,300,700	4,959,900	159,997	150	247	1,102	670	40%		
8	96	1,889,700	1,900,300	3,790,000	122,258	115	189	1,102	670	31%		
9	96	2,037,800	1,881,200	3,919,000	126,419	119	195	1,102	670	32%		
10	96	2,184,720	1,548,000	3,732,720	120,410	113	186	1,102	670	30%		
11	96	1,759,690	1,428,100	3,187,790	102,832	96	159	1,102	670	26%		
12	96	1,866,990	1,519,400	3,386,390	109,238	102	168	1,102	670	27%	74.9%	45,525,740

Town of Exmore  
Historical Well Yields

		Peak month per year			Missing data						Annual Average of % of permit	NOTES / ANNUAL TOTAL
		YIELD IN GALLONS										
WELL	WELL	WELL 1	WELL 2	TOTAL YIELD	GPD	GPDP	GAL/CON	POP	CONN	% OF PERMIT		
1	97	1,760,910	1,640,800	3,401,710	109,733	104	169	1,095	670	27%		
2	97	1,549,690	1,434,500	2,984,190	96,264	91	148	1,095	670	24%		
3	97	1,900,300	1,594,400	3,494,700	112,732	106	174	1,095	670	28%		
4	97	1,576,260	1,392,900	2,969,160	95,779	90	148	1,095	670	24%		
5	97	2,363,710	2,255,200	4,618,910	148,997	141	230	1,095	670	37%		
6	97	2,473,060	2,236,400	4,709,460	151,918	143	234	1,095	670	38%		
7	97	3,162,670	3,432,600	6,595,270	212,751	201	328	1,095	670	53%		
8	97	3,151,390	1,547,500	4,698,890	151,577	143	234	1,095	670	38%		
9	97	2,624,290	2,404,100	5,028,390	162,206	153	250	1,095	670	41%		
10	97	2,215,010	2,003,700	4,218,710	136,087	128	210	1,095	670	34%		
11	97	1,561,680	1,389,500	2,951,180	95,199	90	147	1,095	670	24%		52,811,770
12	97	2,198,910	1,555,900	3,754,810	121,123	114	187	1,095	670	30%	86.9%	Well #2 meter broke 12/26/97
1	98	1,824,690	meter broke	1,824,690	58,861	56	91	1,090	670	15%		Well #2 meter still broke
2	98	1,587,240	877,900	2,465,140	79,521	75	123	1,090	670	20%		#2 meter back on line 2/13/98
3	98	1,891,020	1,682,500	3,573,520	115,275	109	178	1,090	670	29%		
4	98	2,185,360	1,532,800	3,718,160	119,941	114	185	1,090	670	30%		
5	98	1,737,500	1,814,500	3,552,000	114,581	109	177	1,090	670	29%		
6	98	2,592,509	2,236,000	4,828,509	155,758	148	240	1,090	670	39%		
7	98	2,527,300	2,542,100	5,069,400	163,529	155	252	1,090	670	41%		
8	98	2,525,500	2,172,000	4,697,500	151,532	144	234	1,090	670	38%		
9	98	2,224,210	2,238,600	4,462,810	143,962	136	222	1,090	670	36%		
10	98	2,448,190	2,213,900	4,662,090	150,390	143	232	1,090	670	38%		
11	98	1,917,920	1,671,600	3,589,520	115,791	110	179	1,090	670	29%		
12	98			0	0	0	0	1,090	670	0%	69.8%	42,443,339
1	99	1,901,000	1,825,700	3,726,700	120,216	113	185	1,099	670	30%		
2	99	1,651,600	1,681,400	3,333,000	107,516	101	161	1,099	692	27%		
3	99	1,718,000	1,656,600	3,374,600	108,858	102	163	1,099	692	27%		
4	99	1,737,700	1,850,000	3,587,700	115,732	109	173	1,099	692	29%		
	99	2,003,700	2,227,300	4,231,000	136,484	128	205	1,099	689	34%		
	99	2,262,000	2,546,200	4,808,200	155,103	146	233	1,099	689	39%		
	99	2,978,800	1,947,000	4,925,800	158,897	149	238	1,099	689	40%		
8	99	2,323,500	2,254,800	4,578,300	147,687	139	221	1,099	689	37%		
9	99	1,773,200	1,812,200	3,585,400	115,658	109	173	1,099	689	29%		
10	99	1,469,800	1,929,000	3,398,800	109,639	103	164	1,099	689	27%		
11	99	1,674,000	1,935,900	3,609,900	116,448	109	174	1,099	690	29%		
12	99	1,571,400	1,825,900	3,397,300	109,590	103	164	1,099	690	27%	76.6%	46,556,700
1	2000	1,563,200	2,015,800	3,579,000	115,452	105	173	1,136	690	29%		
2	2000	1,669,300	1,961,800	3,631,100	117,132	107	175	1,136	690	29%		
3	2000	1,597,100	1,974,700	3,571,800	115,219	105	173	1,136	690	29%		
4	2000	1,603,100	1,695,400	3,298,500	106,403	97	159	1,136	690	27%		
5	2000	2,159,100	2,632,600	4,791,700	154,571	141	231	1,136	690	39%		
6	2000	2,151,500	2,507,000	4,658,500	150,274	137	225	1,136	690	38%		
7	2000	2,236,700	2,343,300	4,580,000	147,742	134	221	1,136	690	37%		
8	2000	2,000,000	2,313,700	4,313,700	139,152	127	208	1,136	690	35%		
9	2000	1,880,900	1,769,100	3,650,000	117,742	107	176	1,136	690	29%		
10	2000	1,956,200	2,149,400	4,105,600	132,439	120	198	1,136	690	33%		
11	2000	1,882,300	1,563,300	3,445,600	111,148	101	166	1,136	690	28%		
12	2000	1,546,500	1,741,800	3,288,300	106,074	96	159	1,136	690	27%	77.2%	46,913,800
1	2001	1,703,700	1,807,300	3,511,000	113,258	103	170	1,140	690	28%		
2	2001	1,426,700	1,649,100	3,075,800	109,850	90	149	1,140	690	27%		
3	2001	1,523,500	1,790,000	3,313,500	106,887	97	160	1,140	690	27%		
4	2001	1,643,400	2,118,800	3,762,200	121,361	110	182	1,140	690	30%		
5	2001	1,979,100	2,414,800	4,393,900	141,739	128	212	1,140	690	35%		
6	2001	1,825,400	2,434,100	4,259,500	137,403	125	206	1,140	690	34%		
7	2001	2,083,600	2,986,000	5,069,600	163,535	148	245	1,140	690	41%		
8	2001	1,985,200	2,567,600	4,552,800	146,865	133	220	1,140	690	37%		
9	2001	1,829,800	2,290,700	4,120,500	132,919	120	199	1,140	690	33%		
10	2001	2,450,100	2,129,900	4,580,000	147,742	134	221	1,140	690	37%		
11	2001	1,736,700	2,246,200	3,982,900	128,481	116	192	1,140	690	32%		
12	2001	1,676,100	2,350,300	4,026,400	129,884	118	195	1,140	690	32%	80.0%	48,648,100

Town of Exmore  
Historical Well Yields

		Peak month per year			Missing data						Annual Average of % of permit	NOTES / ANNUAL TOTAL
		YIELD IN GALLONS			GPD	GPDPC	GAL/CON	POP	CONN	% OF PERMIT		
WELL	YEAR	WELL 1	WELL 2	TOTAL YIELD								
1	2002	1,767,200	2,161,500	3,928,700	126,732	114	190	1,144	690	32%		
2	2002	1,463,200	2,006,500	3,469,700	111,926	101	168	1,144	690	28%		
3	2002	1,482,000	2,144,800	3,626,800	116,994	106	175	1,144	690	29%		
4	2002	2,076,200	2,613,400	4,689,600	151,277	137	227	1,144	690	38%		
5	2002	2,409,200	2,283,300	4,692,500	151,371	140	227	1,114	690	38%		
6	2002	2,254,900	3,123,900	5,378,800	173,510	157	260	1,144	690	43%		
7	2002	2,803,600	3,995,000	6,798,600	219,310	198	328	1,144	690	55%		
8	2002	2,335,100	3,418,000	5,753,100	185,584	168	278	1,144	690	46%		
9	2002	2,172,200	2,807,600	4,979,800	160,639	145	241	1,144	690	40%		
10	2002	1,865,000	2,884,300	4,749,300	153,203	138	226	1,144	700	38%		
11	2002	1,559,300	2,070,900	3,630,200	117,103	106	173	1,144	700	29%		
12	2002	2,055,400	2,938,300	4,993,700	161,087	146	238	1,144	700	40%	93.2%	56,690,800
1	2003	1,955,300	2,833,200	4,788,500	154,468	138	228	1,158	700	39%		
2	2003	1,887,600	2,593,800	4,481,400	144,561	129	213	1,158	700	36%		
3	2003	1,850,100	2,500,800	4,350,900	140,352	125	207	1,158	700	35%		
4	2003	2,081,900	2,916,200	4,998,100	161,229	144	238	1,158	700	40%		
5	2003	2,180,700	3,208,900	5,389,600	173,858	155	257	1,158	700	43%		
6	2003	2,669,500	3,797,800	6,467,300	208,623	186	308	1,158	700	52%		
7	2003	2,649,200	3,911,400	6,560,600	211,632	189	312	1,158	700	53%		
8	2003	1,801,800	3,126,700	4,928,500	158,984	142	235	1,158	700	40%		
9	2003	2,001,500	2,890,700	4,892,200	157,813	141	233	1,158	700	39%		
10	2003	2,001,500	2,890,700	4,892,200	157,813	141	233	1,158	700	39%		
11	2003	1,739,300	2,089,300	3,828,600	123,503	110	182	1,158	700	31%		
12	2003	2,169,600	3,186,800	5,356,400	172,787	154	255	1,158	700	43%	100.2%	60,934,300
1	2004	2,228,200	2,824,300	5,052,500	162,984	146	241	1,152	700	41%		
2	2004	1,612,600	2,485,200	4,097,800	132,187	119	195	1,152	700	33%		
3	2004	2,005,400	2,968,800	4,974,200	160,458	144	237	1,152	700	40%		
4	2004	1,741,400	2,781,600	4,523,000	145,903	131	215	1,152	700	36%		
5	2004	1,957,900	2,943,600	4,901,500	158,113	142	233	1,152	700	40%		
6	2004	2,355,000	3,439,200	5,794,200	186,910	168	276	1,152	700	47%		
7	2004	2,192,800	3,275,800	5,468,600	176,406	158	260	1,152	700	44%		
8	2004	2,296,200	3,633,900	5,930,100	191,294	172	282	1,152	700	48%		
9	2004	2,000,200	3,175,700	5,175,900	166,965	150	246	1,152	700	42%		
10	2004	2,902,500	1,947,500	4,850,000	156,452	140	231	1,152	700	39%		
11	2004	1,950,100	3,154,700	5,104,800	164,671	148	243	1,152	700	41%		
12	2004	2,021,900	3,428,300	5,450,200	175,813	158	260	1,152	700	44%	100.9%	61,322,800
1	2005	1,959,800	3,493,600	5,453,400	175,916	157	260	1,156	700	44%		
2	2005	1,725,300	2,630,200	4,355,500	140,500	126	207	1,156	700	35%		
3	2005	1,873,200	2,698,300	4,571,500	147,468	132	218	1,156	700	37%		
4	2005	1,569,900	2,724,100	4,294,000	138,516	124	204	1,156	700	35%		
5	2005	2,963,900	4,881,400	7,845,300	253,074	226	374	1,156	700	63%		
6	2005	2,021,200	3,258,000	5,279,200	170,297	152	251	1,156	700	43%		
7	2005	2,196,800	3,422,300	5,619,100	181,261	162	268	1,156	700	45%		
8	2005	2,196,500	3,653,800	5,850,300	188,719	169	279	1,156	700	47%		
9	2005	2,140,300	3,559,000	5,699,300	183,848	164	271	1,156	700	46%		
10	2005	1,930,400	3,360,900	5,291,300	170,687	153	252	1,156	700	43%		
11	2005	1,882,200	2,831,100	4,713,300	152,042	136	224	1,156	700	38%		
12	2005	1,755,400	2,773,800	4,529,200	146,103	131	216	1,156	700	37%	104.4%	63,501,400
1	2006	1,855,700	2,896,200	4,751,900	153,287	137	226	1,160	700	38%		
2	2006	1,596,900	2,447,500	4,044,400	130,465	116	193	1,160	700	33%		
3	2006	1,813,400	3,008,000	4,821,400	155,529	139	230	1,160	700	39%		
4	2006	1,907,900	2,800,700	4,708,600	151,890	135	224	1,160	700	38%		
5	2006	2,041,700	3,045,400	5,087,100	164,100	146	242	1,160	700	41%		
6	2006	2,100,600	2,843,100	4,943,700	159,474	142	235	1,160	700	40%		
7	2006	1,960,500	3,579,100	5,539,600	178,697	159	264	1,160	700	45%		
8	2006	2,458,600	3,537,700	5,996,300	193,429	172	286	1,160	700	48%		
9	2006	1,738,200	2,698,100	4,436,300	143,106	127	211	1,160	700	36%		
10	2006	2,009,700	2,885,100	4,894,800	157,897	141	233	1,160	700	39%		
11	2006	1,707,600	2,753,800	4,461,400	143,916	128	212	1,160	700	36%		
12	2006	1,586,300	2,469,200	4,055,500	130,823	117	193	1,160	700	33%	95.0%	57,741,000

Town of Exmore  
Historical Well Yields

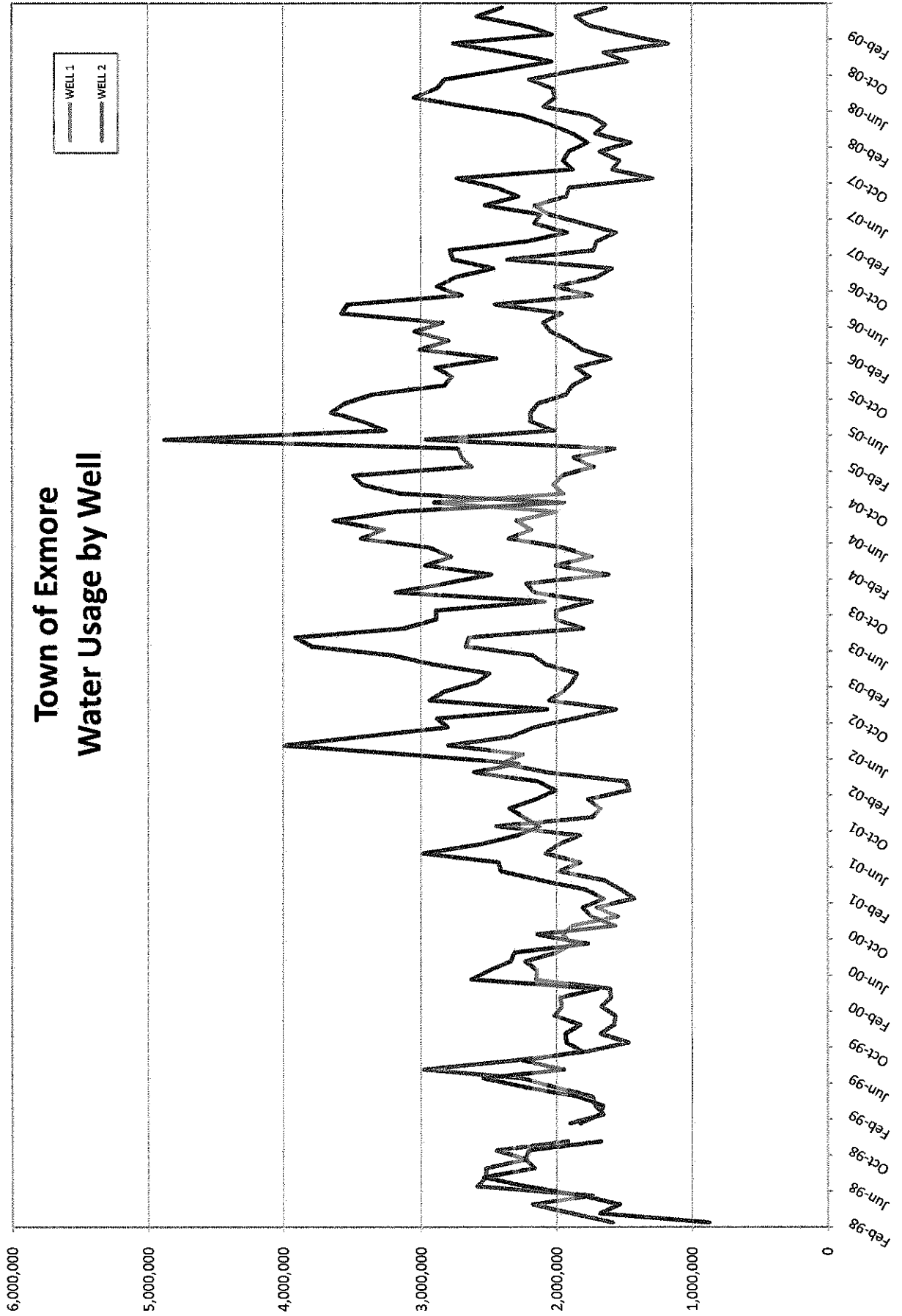
		Peak month per year										Missing data	
		YIELD IN GALLONS									Annual	NOTES / ANNUAL TOTAL	
.R		YIELD WELL 1	YIELD WELL 2	TOTAL YIELD	GPD	GPDP	GAL/CON	POP	CONN	% OF PERMIT	Average of % of permit		
1	2007	2,366,767	2,766,800	5,133,567	165,599	147	244	1,166	700	41%		New meters installed on wells in 2007.	
2	2007	1,727,600	2,788,200	4,515,800	145,671	129	215	1,166	700	36%			
3	2007	1,703,200	2,221,400	3,924,600	126,600	112	187	1,166	700	32%			
4	2007	1,557,800	1,919,300	3,477,100	112,165	99	166	1,166	700	28%			
5	2007	1,806,200	2,166,400	3,972,600	128,148	114	189	1,166	700	32%			
6	2007	2,049,900	2,121,800	4,171,700	134,571	119	199	1,166	700	34%			
7	2007	2,164,700	2,530,600	4,695,300	151,461	134	224	1,166	700	38%			
8	2007	1,928,200	2,282,900	4,211,100	135,842	120	201	1,166	700	34%			
9	2007	1,903,700	2,446,700	4,350,400	140,335	124	207	1,166	700	35%			
10	2007	1,288,700	2,736,100	4,024,800	129,832	115	192	1,166	700	32%			
11	2007	1,582,000	1,878,800	3,460,800	111,639	99	165	1,166	700	28%			
12	2007	1,531,500	1,948,100	3,479,600	112,245	99	166	1,166	700	28%	81.3%	49,417,367	
1	2008	1,678,300	1,907,100	3,585,400	115,658	95	171	1,260	700	29%			
2	2008	1,449,300	1,766,600	3,215,900	103,739	85	153	1,260	700	26%			
3	2008	1,711,000	1,883,200	3,594,200	115,942	95	171	1,260	700	29%			
4	2008	1,637,000	2,044,300	3,681,300	118,752	97	175	1,260	700	30%			
5	2008	1,752,000	2,246,800	3,998,800	128,994	106	190	1,260	700	32%			
6	2008	2,097,600	2,675,400	4,773,000	153,968	126	227	1,260	700	38%			
7	2008	2,008,100	3,052,800	5,060,900	163,255	134	241	1,260	700	41%			
8	2008	2,027,300	2,883,700	4,911,000	158,419	130	234	1,260	700	40%			
9	2008	2,205,300	2,828,100	5,033,400	162,368	84	240	1,260	700	41%			
10	2008	1,861,800	2,426,100	4,287,900	138,319	71	204	1,260	700	35%			
11	2008	1,474,900	2,033,500	3,508,400	113,174	58	167	1,260	700	28%			
12	2008	1,646,900	2,379,200	4,026,100	129,874	67	192	1,260	700	32%	81.7%	49,676,300	
1	2009	1,174,900	2,763,400	3,938,300	127,042	66	188	1,355	725	32%			
2	2009	1,480,600	2,032,000	3,512,600	113,310	59	167	1,355	725	28%			
3	2009	1,753,400	2,245,500	3,998,900	128,997	67	190	1,355	725	32%			
4	2009	1,859,200	2,590,800	4,450,000	143,548	74	212	1,355	725	36%			
5	2009	1,631,300	2,404,200	4,035,500	130,177	67	192	1,355	725	33%			
6	2009			0	0	0	0	1,355	725	0%			
7	2009			0	0	0	0	1,355	725	0%			
8	2009			0	0	0	0	1,355	725	0%			
9	2009			0	0	0	0	1,355	725	0%			
10	2009			0	0	0	0	1,355	725	0%			
11	2009			0	0	0	0	1,355	725	0%			
12	2009			0	0	0	0	1,355	725	0%			

Note: Population information taken from U.S. Census Bureau estimates, except for 1990 and 2000, which are confirmed numbers.

NP - Withdrawal not permitted

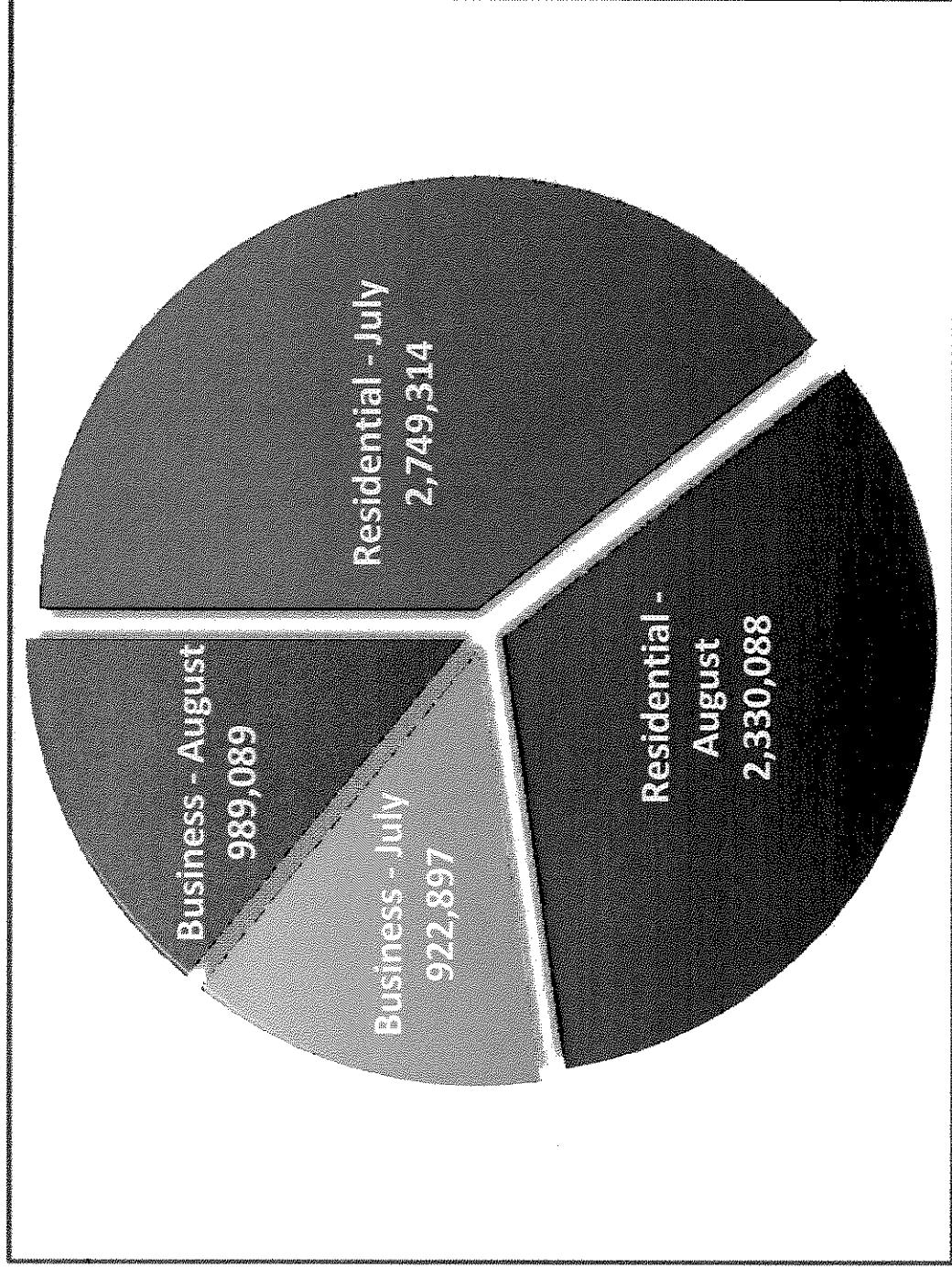
\* Permitted annual withdrawal = 60,800,000 gallons per year

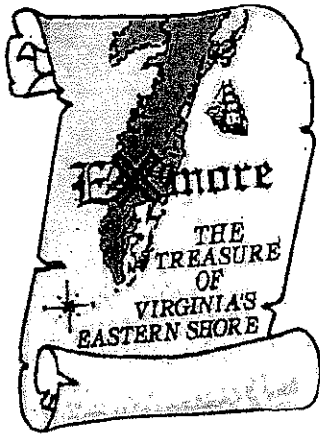
# Town of Exmore Water Usage by Well



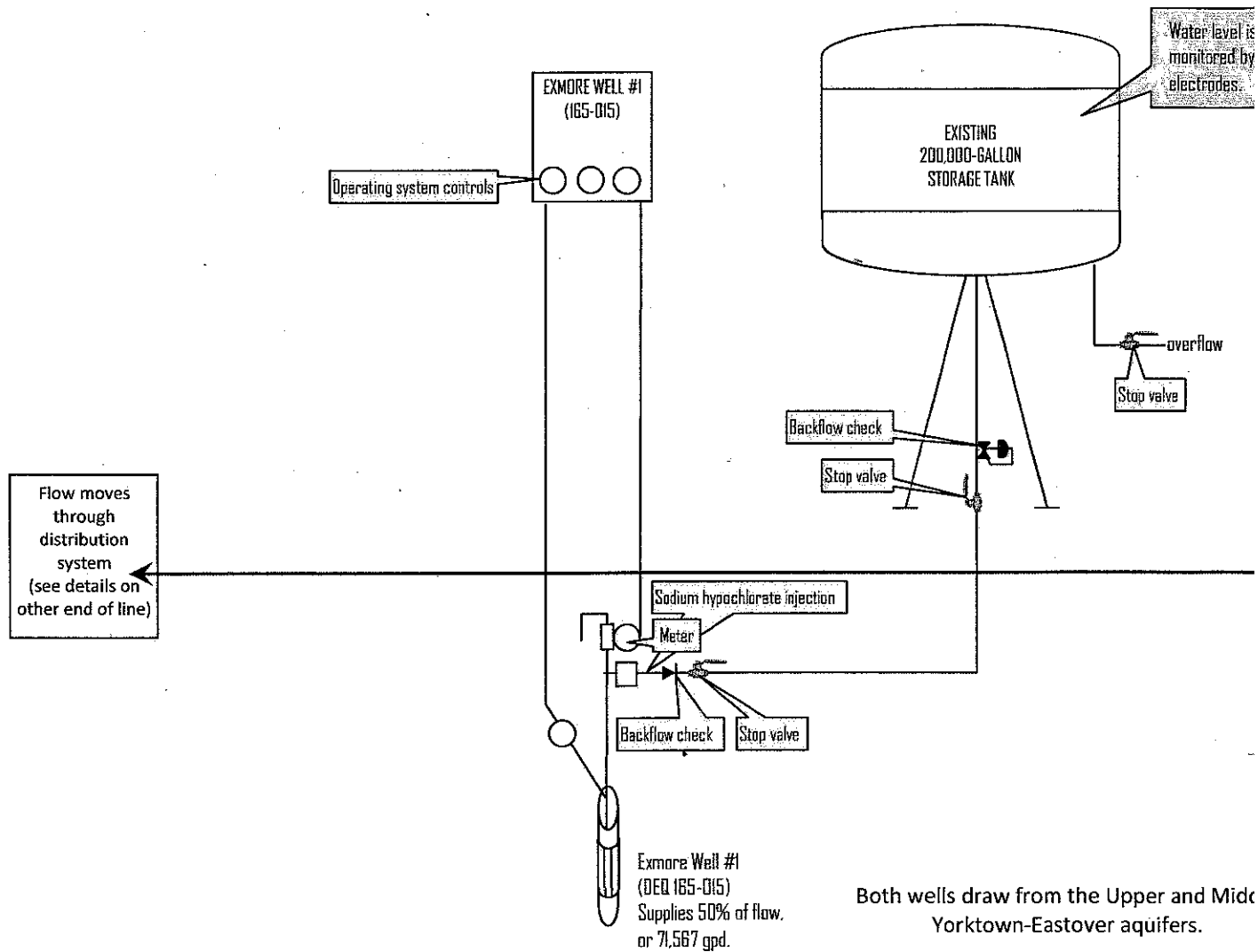


# **Residential-vs-Business Water Usage July and August 2008 Meter Readings**





# Town of Exmore Water System (current)



Drawing is not to scale.



**Draper Aden Associates**  
Engineering • Surveying • Environmental Services

Line Drawing of System (Current)

Client	Town of Exmore
Facility	Town of Exmore Water System
Location	Exmore, Virginia
Project	Groundwater Withdrawal Permit

Constructed in 2004, this system has a capacity of 60,000 gpd. It is currently operating at about 20% capacity. From this system, the flow discharges to a drip irrigation system in soil.



## Seaside WWTP

Private individual septic systems account for 54% of the discharge.

*private individual septic systems*

EXMORE WELL #2  
(165-014)

Operating system controls

37% (40,778 gpd) of discharge from residential users is designed to flow to the Seaside WWTP. The remainder flows to the New Roads drainfield (9% or 9,919 gpd), or private individual septic systems (54% or 59,513 gpd).

**Residential**  
77%  
(110,210 gpd)

Water is metered at all end users.

**Commercial**  
18%  
(25,762 gpd)

46% (11,851 gpd) of discharge from commercial users is designed to flow to the Seaside WWTP. The remainder flows to private individual septic systems (54% or 13,911 gpd).

148,329 gpd  
(10-year average)  
to distribution system

**Fire Protection**  
5%  
(7,161 gpd)

Discharge from fire protection is designed to enter the system via the regular discharge means used at the property where their services are required.

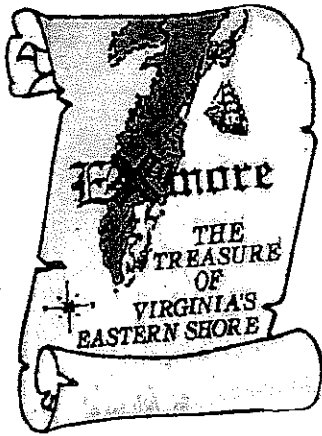
Constructed in 1999, this conventional mass drainfield system has a capacity of 50,000 gpd. It is currently operating at about 8% capacity.

Exmore Well #2  
(DEQ 165-014)  
Supplies 50% of flow,  
or 71,566 gpd.

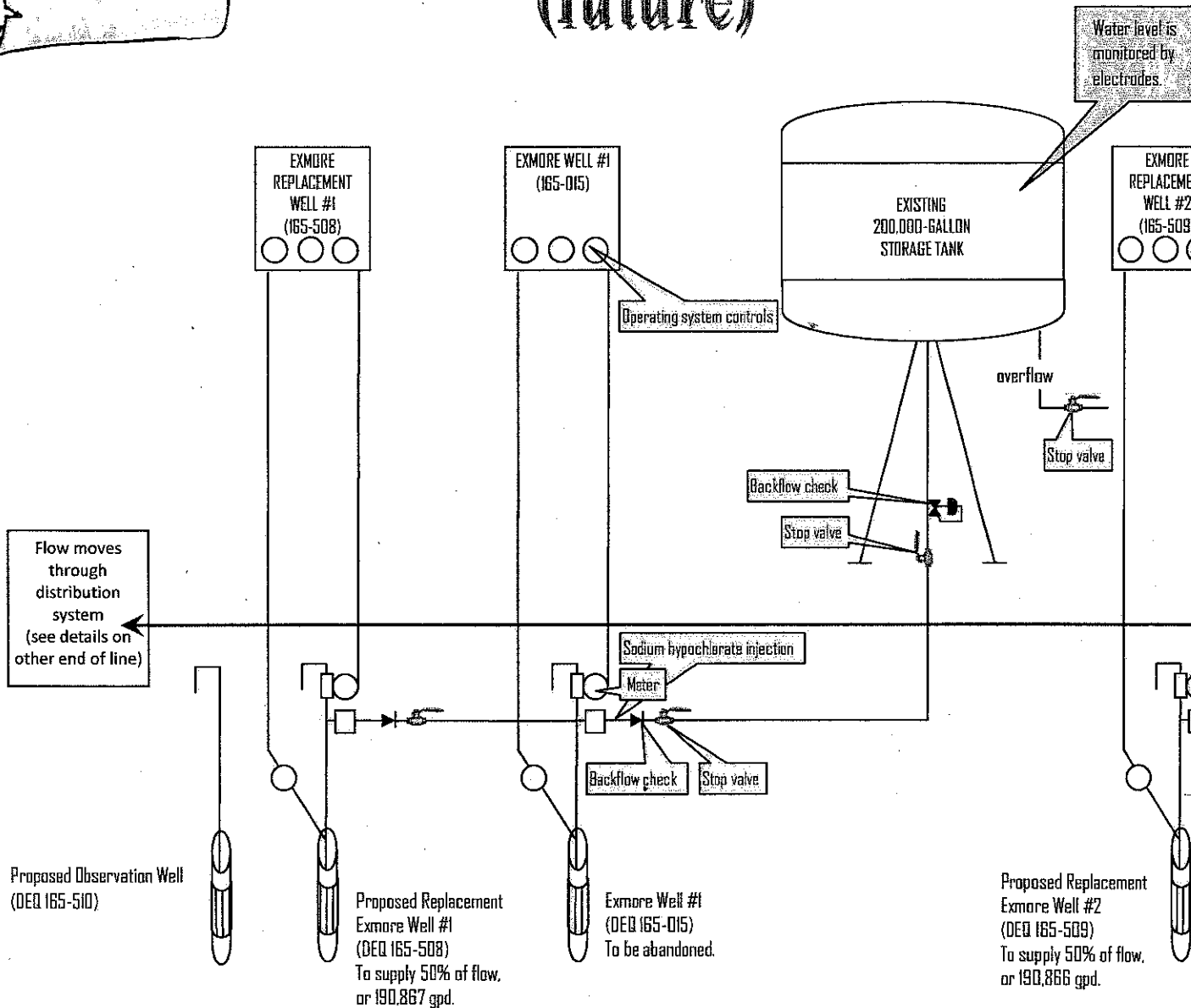


*New Roads drainfield*

nt)	DESIGNED	BHH	FIGURE
	DRAWN	BHH	
	CHECKED	SGW	
	DATE	10/20/08	
Application	DAA No.	R05329-01	



# Town of Exmore Water System (future)



Both proposed replacement wells are planned to draw from the Middle Yorktown-Eastover aquifer.

Drawing is not to scale.



**Draper Aden Associates**  
Engineering • Surveying • Environmental Services

Line Drawing of System (Future)

Client	Town of Exmore
Facility	Town of Exmore Water System
Location	Exmore, Virginia
Project	Groundwater Withdrawal Project

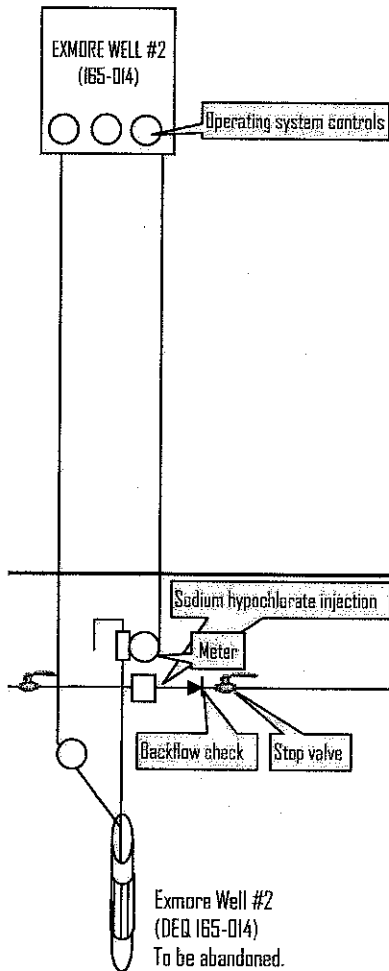
Constructed in 2004, this system has a capacity of 60,000 gpd. It is expected to reach capacity with the new withdrawal amounts. From this system, the flow discharges to a drip irrigation system in soil.



## Seaside WWTP

Private individual septic systems account for 60% of residential discharge, and 81% of commercial discharge.

### private individual septic systems



**Residential**  
77%  
(245,424 gpd)

20% (49,085 gpd) of discharge from residential users is designed to flow to the Seaside WWTP. The remainder flows to the New Roads drainfield (20% or 49,084 gpd), or private individual septic systems (60% or 147,255 gpd).

**Commercial**  
18%  
(57,372 gpd)

19% (10,901 gpd) of discharge from commercial users is designed to flow to the Seaside WWTP. The remainder flows to private individual septic systems (81% or 46,471 gpd).

**Fire Protection**  
5%  
(15,937 gpd)

Discharge from fire protection is designed to enter the system via the regular discharge means used at the property where their services are required.

Constructed in 1999, this conventional mass drainfield system has a capacity of 50,000 gpd. It is expected to reach capacity with the new withdrawal amounts.



## New Roads drainfield

3)	DESIGNED DRAWN CHECKED DATE DAA No.	BHH BHH SGW 10/20/08 R05329-01	FIGURE
Application			



## **1.0 INTRODUCTION**

### **1.1 NEED FOR CONSERVATION**

Water conservation involves both an increase in 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 wellbeing 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 Exmore recognizes the need to conserve and effectively manage its water resources. Only by optimizing water use efficiently and reducing water loss can the Town satisfy its projected water demands over the next five to ten years. While additional long-term supplies are required, every effort will be made to efficiently use currently available supplies.

### **1.2 REGULATORY REQUIREMENTS**

The Groundwater Management Act of 1992 (House Bill 488) was approved in April 1992. It requires a Groundwater Withdrawal Permit (GWP) for certain groundwater withdrawals within declared Groundwater Management Areas (GMAs). Groundwater Withdrawal Regulations adopted in June 1993 (VR 680-13-07) require that applications for new GWPs within GMAs include a water conservation plan approved by the Virginia Department of Environmental Quality, Division of Water (DOW). An approved conservation program 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.
- Requirements for mandatory use reductions during water shortage emergencies, including, where appropriate, ordinances prohibiting the waste of water.

# WATER CONSERVATION AND MANAGEMENT PLAN

## 1.3 PLAN OBJECTIVES

The primary objectives of this ***Water Conservation and Management Plan*** are to provide a documented, effective conservation strategy designed to reduce demand within the Town of Exmore and to demonstrate compliance with the Groundwater Management Act of 1992. This Plan will provide methods by which water use can be increased as well as procedures to guide the Town and its customers through water supply emergencies. Updates of this Plan are anticipated to be performed on an annual basis to document accomplishments and changes in individual conservation programs. A copy of the annual updates will be provided to the Department of Environmental Quality upon request.

Section 2.0 of this Plan describes the use of water-saving plumbing and processes within the service area. Water loss reduction, economic incentives, water use education, and water reuse are discussed in Sections 3.0 through 6.0. The final section of this report describes the Use Restrictions Plan for the Town of Exmore.

# WATER CONSERVATION AND MANAGEMENT PLAN

## 2.0 WATER-SAVING PLUMBING AND PROCESSES

### 2.1 UNIFORM STATEWIDE BUILDING CODE (USBC)

The Building Officials and Code Administrators (BOCA) organization is a non-profit organization, which developed a series of performance-related model codes (BOCA, 1990). These codes were adopted by the Commonwealth of Virginia as part of the Uniform Statewide Building Code (USBC) (DHCD, 1987). 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 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.*

The International Plumbing Code (IPC) sets maximum flow standards (Section 605.4) for a variety of fixtures and appliances. These standards are presented in the following table.

Plumbing Fixture or Fixture Setting	Maximum Flow Rate or Quantity <sup>1</sup>
Water Closet	1.6 gallons per flushing cycle
Urinal	1.0 gallon per flushing cycle
Shower Head	2.5 gpm at 80 psi
Lavatory, Private	2.5 gpm at 80 psi
Lavatory, Public	0.5 gpm at 80 psi
Lavatory, Public, metering or self-closing	0.25 gallons per metering cycle
Sink Faucet	2.5 gpm at 60 psi

<sup>1</sup> gpm = gallons per minute

The current standards set a maximum limit of 2.5 gallons per minute (gpm) at 80 pounds per square inch (psi) for showers and private lavatories. Water closets are limited to 1.6 gallons per flushing cycle, and urinals are limited to 1.0 gallons per cycle. In addition, lavatories in public facilities are limited to 0.5 gpm for those with standard

*August 2005*

*Revised October 2008*

## **WATER CONSERVATION AND MANAGEMENT PLAN**

valve or spring faucets and 0.25 gallons per cycle for self-closing metering valves (IPC, 1996).

The USBC in Virginia was adopted from the International Plumbing Code. States are permitted to develop plumbing codes that implement stricter measures than those imposed by the National Plumbing Code. However, localities in Virginia must obtain State authorization to develop a stricter code.

### **2.2 COMPLIANCE WITH USBC**

The Town of Exmore currently enforces the 1996 regulations. The Town will also evaluate incentive programs to encourage existing households to retrofit their homes with low-flow devices. An additional requirement will apply to car washes. Effective January 1999, all car washes must be equipped with an approved water recycling system.

# WATER CONSERVATION AND MANAGEMENT PLAN

## 3.0 WATER-LOSS REDUCTION PROGRAM

### 3.1 WATER-LOSS AUDIT

At the beginning of each fiscal year (July 1), a water-loss audit will be conducted by the Town of Exmore to determine the volume and nature of lost and unaccounted-for water within the Town's water supply system. The purpose of this audit is to identify sources of demand that would normally escape detection by the metering system. This type of demand includes:

- *Fire Fighting.* The Fire Department will submit an estimate of all water used on a monthly basis including water used for fire-fighting and for hydrant flushing.
- *Main Flushing.* All main flushing performed by the Town will require the submittal of a water consumption estimate.
- *Theft.* Any observed theft will be reported to the Town and the appropriate action will be taken. An estimate of the volume of water stolen will be submitted as part of the annual water-loss audit.
- *Main Breaks.* All main breaks will require the reporting by Town personnel of the estimated volume of water lost.
- *Tank Drainage.* All draining of storage tanks in the main distribution system will be reported.
- *Unmetered Services.* Every effort will be made to install meters on any portion of the system that is not yet metered, as soon as funding become available. Grants will be solicited to provide funding.
- *Leaks.* Upon completion of the first water-loss audit, the Town will develop a leak detection program, which will have as its goal, the complete survey of all distribution pipes and mains within the Town, to be phased in over the next five years.
- *Meter Errors.* The Town will replace meters at a rate such that a complete Town-wide meter turnover takes place every fifteen years, which is the typical warranty period for water meters. The size of meters requested by commercial and industrial customers will be evaluated and the developer will be consulted to help in determining the appropriate meter size for a particular site based on water use and the anticipated demand. Preventing the installation of oversized meters minimizes unwarranted waste of water.
- *Equipment Calibration.* All meters at the well heads will be calibrated on an annual basis. There will be service to check inaccurate meters. Large customer meters that are accessible will be field calibrated yearly. An on-going maintenance program will be implemented to locate and repair plant pipe leaks at the water treatment facilities.

All forms for reporting leaks and unaccounted-for water loss will be maintained by the Town. These forms will be reviewed by Town personnel on a daily basis so that measures can be taken to reduce unaccounted-for water loss.



**3.2 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 subjected to financial penalties.

# **WATER CONSERVATION AND MANAGEMENT PLAN**

## **4.0 ECONOMIC INCENTIVES PROGRAM**

### **4.1 EXISTING PROGRAM ELEMENTS**

Bills are currently issued bi-monthly by the Town. Bi-monthly billing allows more frequent and timely distribution of water conservation educational brochures to customers. It also helps customers become aware of leaks more quickly and recognize the cost of high seasonal water use. In addition, bi-monthly billing is useful in providing feedback on customer conservation efforts.

A one-block rate schedule has been implemented. This schedule encourages conservation by not providing a lower rate to high-volume water users. By charging large and small water users the same rate, large users have a greater incentive to conserve.

### **4.2 PLANNED PROGRAM ELEMENTS**

The Town will analyze its water rates annually. Rate setting goals will be as follows:

- Perpetuating Public Utilities self-sufficiency while maintaining the highest water quality standards.
- Recommending appropriate rates for water usage and special service charges that are equitable to all customers.
- Continuing a comprehensive water conservation policy by using public information and charges, which will discourage non-essential use of water.

# WATER CONSERVATION AND MANAGEMENT PLAN

## 5.0 WATER USE EDUCATION PROGRAM

### 5.1 PLANNED PROGRAM ELEMENTS

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

The public education program planned by the Town will include the following components:

- *Billing Inserts.* Inserts will be included with water bills on a quarterly basis. The inserts will include information concerning water conservation techniques and leak detection strategies.
- *Brochures.* Water conservation brochures and pamphlets will be made available to the public at Town government buildings and at exhibits set up during public events.
- *Video Tapes.* A variety of water conservation tapes will be available from the Town, free of charge. They will be made available to the general public, to schools for classroom instruction, and for public meetings. The videos will also be provided to cable television companies for showing on government channels.
- *Water Conservation Hot Line.* A telephone number will be available, through which residents can have their conservation questions answered by a knowledgeable Town employee. In addition, requests for information on various water conservation topics, speakers, or other personal contacts will be coordinated through this telephone line.
- *News Releases.* News releases to the print media, radio, and television will keep the public informed. This process will be used not only during emergencies, but also on a regular basis to keep the public informed about conservation-related issues.
- *School Education.* Programs will be available for presentation by Town staff at local schools. Programs will be targeted to specific age groups. Assistance will be made available for teachers who wish to develop their own water-awareness programs.
- *Speakers.* Town staff will be available for speaking engagements or personal contacts. These individuals will work with local clubs and organizations to develop public awareness concerning the need to conserve water along with other topics related to the water supply industry.
- *Irrigation.* Support of groundwater wells for irrigation of lawns and landscaping by residents, businesses, and industries within the service area. The use of well water for these activities helps to minimize the use of potable drinking water for uses which do not require it.

## **6.0 WATER RE-USE EDUCATION PROGRAM**

Water reuse may be either direct or indirect for potable or non-potable uses. Direct reuse involves introducing highly-treated, reclaimed water directly to a potable water distribution system. Indirect reuse involves returning treated wastewater to the environment for dilution and natural purification, and subsequent withdrawal for water supply. Potable reuse (which is referred to as "recycled" by the Virginia Department of Health [VDH]) is the specific use of treated wastewater as a drinking water source.

Indirect potable reuse occurs widely in the United States, each time treated wastewater effluent is discharged to a natural waterway upstream of a water supply intake. In most cases, it is unintentional. Past experience indicates that indirect reuse was acceptable because the application of water and wastewater treatment techniques the near-universal use of some form of disinfectant, and the natural dilution and purification that occurs in natural waterways of adequately treated water. However, in recent years the effectiveness of these measures in protecting against viral and trace organic contaminants has come under increasing scrutiny.

### **6.1 PLANNED PROGRAM ELEMENTS**

#### **6.1.1 POTABLE REUSE**

The Virginia Department of Health has prepared a *Recycle Issues* paper dated November 24, 1992. The VDH stated its opposition to both direct and indirect potable reuse projects when naturally occurring sources of water are available. The VDH insists that the highest quality, best source of water be selected when alternatives are available. The VDH also listed several other requirements, which would apply to a potable reuse project, pertaining to independent monitoring, dilution, liability, removal of biological hazards and toxics, and utilization of natural purification processes. Given the current position of the VDH, reuse of wastewater treatment plant effluent for potable purposes is not deemed a practicable reuse alternative.

#### **6.1.2 NON-POTABLE REUSE**

Many industrial water demands are for non-potable uses. One method of reducing demands on potable water sources is to supply non-potable demands using treated wastewater plant effluent. Detailed regulations for implementation of a water reuse project do not exist in the Commonwealth of Virginia. Permitting a water reuse project would most likely involve both the VDH and the Virginia Department of Environmental Quality (VDEQ). In addition, a Virginia Pollution Discharge Elimination System (VPDES) Permit would be required for discharge to State waters if the flow is not

## **WATER CONSERVATION AND MANAGEMENT PLAN**

contaminated during its use; if it is contaminated, the approval of VDH and/or VDEQ would be required.

Several states including California, Arizona, Texas, Utah and Florida have developed regulations and state statutes that specify the required minimum quality of reclaimed water, depending on the intended use of the water. In general, the requirements become more stringent as the likelihood of public contact increases. In California, if treated reclaimed water for industrial use meets the state's standards for full body contact recreation, workers are not required to avoid contact with the water or to wear protective clothing. However, precautions are required should the treated reclaimed water fail to meet these criteria. With the approval of State and local health departments, reclaimed water can be used for soil compaction, dust control, and other construction purposes.

As mentioned previously, recycling will be required in all new car washes and existing car washes will be required to be retrofitted. In addition, required recycling systems are being considered for all new construction and all repair or replacement of continuous flow devices, including any water connector, device, or appliance which requires a continuous flow of 5 gallons per minute or more.

Typically, non-potable markets for reused water include irrigation uses, industrial uses, and creation of recreational lakes. Many factors affect the market for reused water, including:

- Size and location of demand.
- Water quality requirements.
- Degree of treatment required for discharge.
- Cost of reclaimed water.
- Cost and availability of alternative supplies.

It is likely that additional reuse methodologies will be evaluated in the future. Industries within the service area that use large quantities of water are continually evaluating their processes and looking for ways to lower production costs. For these industries, water represents one of their greatest operating expenses. It is in the best interest of these industries to stay abreast of the latest reuse technologies and employ them whenever feasible.

### **6.2 FUTURE PROGRAM ELEMENTS**

The Public Utilities Department will evaluate its water conservation programs on a continual basis. As part of this process, new water reuse technologies will be researched and evaluated to determine their applicability in the service area. Continued communication with large water users will create possibilities for more efficient use of water resources.

## 7.0 WATER USE RESTRICTIONS

### 7.1 EMERGENCY USE RESTRICTION PLAN

Emergency situations, such as severe drought, may threaten the regional water supply. During these times, the implementation of use restrictions is necessary to protect the water supply from further depletion. Use restrictions are considered a form of conservation because they result in demand reductions, but they are implemented only during periods when the regional water supply is threatened. Such restrictions are reserved as contingency measures for emergency situations and are more restrictive than normal conservation measures, which are used continually to reduce demands. Use restrictions are commonly implemented using a tiered approach and are activated in relation to specific storage levels of a system's raw water supply.

The Town of Exmore adopted a Water Emergency ordinance in October, 2008 to prepare for water shortages. In the event of an actual or anticipated water shortage exists, the Town Manager, with the approval of the Mayor and Council or its subsequent ratification within 48 hours is authorized to declare water emergencies in the Town, as a whole or portions thereof, affecting the use of water. Mandatory water use restrictions with penalties may also be implemented during water shortage emergencies. The four tiers ("Conditions") of use restrictions are as follows:

- *Condition 1 – Voluntary Use Restrictions:* Voluntary Use Restrictions are employed as a first stage in reducing water demands during a potential water shortage. These restrictions are encouraged by the water utility, but compliance is not required. When Tier 1 is in effect, the public will be asked to employ restraint in water usage and to conserve water voluntarily by whatever methods available.
- *Condition 2 – Mandatory Use Restrictions:* Mandatory Use Restrictions are put into effect when very limited supplies of water are available. These restrictions focus on the eliminations of outdoor, non-essential uses of water. In Tier 2, compliance is mandated by a local ordinance and the restrictions are enforced with penalties for violations.
- *Condition 3 – Mandatory Reductions:* Mandatory Reductions in water use will be used to further reduce water usage under the most severe drought conditions. Non-residential users will be allotted a percentage reduction based on their average monthly and/or previous bi-monthly consumption. Residential customers will be limited to a specific volume or percentage reduction of water per quarter. A surcharge of ten dollars for every 100 cubic foot of water consumed above the allotted volume will be applied.



## WATER CONSERVATION AND MANAGEMENT PLAN

- *Condition 4 – Water Rationing:* When only crucial supplies of water are available, the Public Utilities Department will restrict water use to the purposes that are essential to life, health and safety.

When determining the level of use restriction to be implemented, the Town Manager will consider water levels, available storage, drawdown rates, projected supply capability, system purification and pumping capacity, daily and projected water consumption, prevailing and forecasted weather conditions, fire service requirements, pipeline conditions, supplementary source data, estimates of minimum essential supplies to reserve public health and safety, and other pertinent data. The restrictions do not apply to any governmental activity, institution, business, or industry which is declared by the Town Manager to be necessary for public health, safety or welfare, or on which the restrictions would place severe economic hardship or cause substantial loss of employment.

### 7.2 ENFORCEMENT

Any person convicted of violation of the provisions of the Water Emergency ordinance, or any of the conservation regulations promulgated by the Town shall be subject to a fine of \$250.00. Each act or each day of a continued violation will be considered a separate offense. In addition, the Town Manager can suspend water service to any person violating the use restrictions. If water service is terminated, a reconnection fee of \$50.00, plus all outstanding fees and fines must be paid before service is restored.

# **WATER CONSERVATION AND MANAGEMENT PLAN**

## **8.0 SUMMARY OF CONSERVATION PLAN**

The Conservation Management Plan will aid the Town in meeting its water supply needs over the next decade. The conservation plan includes a variety of elements to be implemented on a regular basis. Water saving plumbing, as described in the USBC, will be required. Economic incentives will encourage conservation. Annual water-loss audits and a leak reduction program will reduce water loss. An educational program will help the public to understand the importance of conservation and methods by which conservation can be achieved. Evaluation of the potential for reuse of treated wastewater, especially for industry, will be completed for all new facilities. In addition, a four-tiered approach to reducing water consumption during emergency conditions will protect the Town's water supplies during shortages.

A combination of the water conservation measures to be implemented under normal conditions and the emergency use restrictions described in this document will reduce finished water demand. Through a combination of new supply sources and water conservation, the Town will be able to supply predicted water demands into the future.

**ATTACHMENT 2**

**LOCAL GOVERNMENT  
ORDINANCE FORM**

ORDINANCE NO. 178

AN ORDINANCE TO ESTABLISH RULES AND REGULATIONS FOR  
WATER EMERGENCIES AND CONSERVATION

BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF EXMORE,  
VIRGINIA THAT:

*(a). Purpose and authority to declare water emergencies* For purposes of this ordinance, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated by the Town of Exmore.

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, the Town of Exmore may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of the Town of Exmore.

The Town Manager, with the approval of the Mayor and Council, or its subsequent ratification within forty-eight (48) hours is authorized to declare water emergencies in the town, as a whole or portions thereof, affecting the use of water.

*(b). Water conservations measures.* After the declaration of a water emergency and upon a determination by the Town Manager of the existence of the following one or more conditions, the Town Manager shall take the following actions which shall apply to any person whose water supply is furnished from the Town of Exmore public water utility system:

- (1) Condition 1.* When moderate but limited supplies of water are available, the Town Manager shall, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.
- (2) Condition 2.* The Town Manager is hereby further authorized during the duration of a water emergency for which voluntary measures would be insufficient to order the restriction or prohibition of any or all of the following uses of the water supply.
  - a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five (5) gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 pm and 8:00 am.
  - b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.

- NOV-06-2000 14:40 FROM: TOWN OFFICE 131 THE 7030 10:10042070113 P.3/3
- c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.
  - d. The operation of any ornamental fountain or other structure making a similar use of water.
  - e. The filling of swimming or wading pools requiring more than five (5) gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two (2) feet below normal, or water may be added to bring the level to two (2) feet below normal, or as necessary to protect the structure from hydrostatic damage.
  - f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.
  - g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the Town Manager.
  - h. The serving of drinking water in restaurants, except upon request.
  - i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) Condition 3. In addition to the restrictions and prohibitions authorized under subsection 2 above, the Town Manager is hereby further authorized during the duration of a water emergency to implement any or all of the following.

- a. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customers' average monthly water consumption for the same billing period of the previous calendar years' consumption.
- b. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.
- c. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

- (4) *Condition 4.* When crucially limited supplies of water are available, the Town Manager shall restrict the use of water to purposes, which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or man-made causes.
- (5) *Failure to address leaks.* It shall be unlawful for the owner of any residential Unit or units or the owner of any commercial or industrial establishment, which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the Town Manager or his agent.
- (6) *Effective date.* The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in the Town of Exmore, or broadcast upon any radio or television station serving the Town of Exmore.
- (7) *Appeals for exemptions.* Upon implementation of subsections (2), (3) or (4) above, the Town Manager shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The Town Manager shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsections (2), (3) or (4). The Town Manager shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption.
- Any person subject to a decision rendered by the Town Manager under this section may appeal such decision to the Mayor and Council. The appeal shall be in writing and shall be submitted to the Town Manager, as agent for and clerk to the Mayor and Council.

The Town Manager may issue temporary waivers or exemptions within the provisions of this section for such periods of time as may be necessary for the Mayor and Council to formally consider action on the appeal.

The Mayor and Council shall render on the appeal and may: affirm, with or without modification, the Town Manager's decision; or approve the requested exemption, with or without modification. The Mayor and Council may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.



Any decision rendered by the Mayor and Council shall be subject to remedies provided by statute.

(a.) *Penalty for violation.* Any person who shall violate any of the provisions of this ordinance, or of any of the conservation regulations promulgated by the Town of Exmore pursuant thereto, shall, upon conviction thereof, be subject to a fine of \$250.00. Each act or each day's continuation of a violation shall be deemed a separate offense.

In addition to the foregoing, the Town Manager may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder.

If such public water utility service is terminated, the person shall pay a reconnection fee of fifty (\$50.00) before service is restored.

(b.) *Declaration of end of water emergencies.* The Town Manager shall notify the Mayor and Council when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Mayor and Council, the water emergency shall be declared to have ended.

ORDAINED by the Mayor and Council at its regular meeting held on October 20, 2008.

Approved this 20<sup>th</sup> day of October, 2008.

APPROVED:   
Guy Lawson, Mayor

At the meeting held on October 20, 2008, by the motion made by Vice-Mayor William Moore and seconded by Councilman Charles Massey to adopt the amended Ordinance No. 178.

  
Ethel Parks, Town Clerk

VIRGINIA DEPARTMENT OF HEALTH  
ENGINEERING DESCRIPTION SHEET

DATE: June 7, 1984  
REVISED: July 14, 1988; June 22, 1995;  
September 5, 1995

WATERWORKS NAME: Town of Exmore CERTIFIED CLASS: IV  
COUNTY/CITY: Northampton County TYPE: Community  
LOCATION: Well No. 1 and the 200,000 gallon elevated storage tank are located on the east side of State Route 693. Well No. 2 is located on the north side of State Route 687, approximately 1/4 mile east of Route 693.  
OWNER: Town of Exmore  
The Honorable Bruce Manuel, Mayor  
P.O. Box 647  
3239 Main Street  
Exmore, Virginia 23350  
804/442-3114  
OPERATOR: Mr. Michael W. Thornes, Waterworks Operator (Class III)  
P.O. Box 647  
3239 Main Street  
Exmore, Virginia 23350  
804/442-3114  
PERMIT NO.: 3131210  
DATE ISSUED: June 30, 1977  
TYPE OF TREATMENT: None  
SOURCE: Two Wells  
DESIGN CAPACITY: 1,000 ERC or 400,000 gpd

DESCRIPTION OF SYSTEM

This waterworks consists of two drilled wells, a 200,000 gallon elevated storage tank, and the distribution system.

Well No. 1 was drilled to a total depth of 270 feet on May 30, 1950. It was completed to a total depth of 200 feet, with 80 feet of 18-inch diameter steel casing and neat cement grout. Enclosed inside the casing is 160 feet of 8-inch diameter steel pipe followed by 30 feet of bronze screen. The

annular space around the 8-inch pipe (and screen) is filled with gravel. The static water level was 34 feet and the well yielded 240 gpm for a drawdown of 13 feet during a drawdown test of unknown duration. This well is equipped with a turbine pump (20 H.P. electric motor) rated at 230 gpm at 206.5 feet TDH.

Well No. 2 was drilled to a total depth of 228 feet on May 12, 1965. It was completed to a total depth of 212 feet, with 89 feet of 20-inch casing and grout. Enclosed inside the casing is 150 feet of 8-inch diameter steel pipe followed by 62 feet of 8-inch stainless steel screen. The annular space around the 8-inch pipe (and screen) is filled with gravel. The static water level was 28 feet and the well yielded 285 gpm for a drawdown of 72 feet during a drawdown test of 25 hours. This well is equipped with a turbine pump (25 H.P. electric motor) rated at 285 gpm.

### EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERC). One ERC will utilize 400 gallons per day. This system's capacity is evaluated as follows:

#### I. Source Capacity

##### A. Source Yield

##### 1. Number of Sources

- a. Required = 1 up to 49 ERC, more than 1 for 50 or more ERC
- b. Provided = 2 wells

2. Well Yield:  $240 \text{ gpm} + 285 \text{ gpm} = 525 \text{ gpm}$

3. Pump Yield:  $230 \text{ gpm} + 285 \text{ gpm} = 515 \text{ gpm}$

##### B. Production Capacity

$$\frac{515 \text{ gpm}}{0.5 \text{ gpm/ERC}} = 1,030 \text{ ERC}$$

#### II. Storage Capacity

A. Effective Storage = 200,000 gallons

##### B. Storage Capacity

$$\frac{200,000 \text{ gal.}}{200 \text{ gal./ERC}} = 1,000 \text{ ERC}$$

#### III. Limiting Case

A. Storage Capacity = 1,000 ERC

B. Capacity Equivalent

$$1,000 \text{ ERC} \times 400 \text{ gpd/ERC} = 400,000 \text{ gpd}$$

Therefore, based on the critical values discussed above, this waterworks was issued an operation permit for a design capacity of 400,000 gpd or 1,000 ERC. It is stressed that the flow restriction is the limiting factor and that the permitted number of connections is only an indicator of when the flow restriction will be reached. Therefore, this system may exceed the permitted number of connections as long as the flow is within the limits as indicated by proper reporting, as determined by the Health Department engineers.

KOT/SSK/slh



# Holiday Acres Mobile Home Park



**MALCOLM  
PIRNIE**

**VIRGINIA DEPARTMENT OF HEALTH  
ENGINEERING DESCRIPTION SHEET**

DATE: November 16, 1978

REVISED: December 27, 2002

WATERWORKS NAME:	Holiday Acres Mobile Home Park	CERTIFIED: VI
COUNTY/CITY:	Northampton County	TYPE: Community
LOCATION:	Located on the west side of U.S. Route 13 at Weirwood approximately 2 miles south of Nassawadox.	
OWNER:	Mrs. Mary Riggin P.O. Box 45 Marionville, Virginia 23408 (757) 442-9275	
OPERATOR:	Mrs. Mary Riggin P.O. Box 45 Marionville, Virginia 23408 (757) 442-9275	
PERMIT NO.:	3131300	
DATE ISSUED:	January 25, 1980	
TYPE OF TREATMENT:	None	
SOURCE:	One well (installed – 2 <sup>nd</sup> well planned)	
DESIGN CAPACITY:	75 Trailer Connections	

**DESCRIPTION OF SYSTEM**

The system consists of one well, one ground storage tank, two transfer pumps, one hydropneumatic tank and the distribution system.

Well No. 1 is a 4-inch diameter well 178 feet deep with 4-inch diameter screens located from 158 feet to 178 feet. The well is equipped with a submersible pump with the intake set at 150 feet (rated at 30 gpm) which discharges to a 11,000 gallon water standpipe. Two booster pumps are provided, each capable of 110 gpm at 150 feet TDH, powered by a 7.5 H.P. electric motor. A 2,000 gallon pressure tank discharges to the distribution system consisting of 4-inch diameter PVC pipe.

The well was yield tested in May of 1978 at 25 gpm for 48 hours producing a draw down of 35.5 feet (20 ft. static – 55.5 ft dynamic). Specific yield = 0.7 gpm/sq.ft. Theoretical yield = 77 gpm  $[(158 - 20) \times .8 \times .7 \text{ gpm (depth to screens - static level) } \times \text{usable depth} \times \text{specific yield}]$ .



This system will be served by two wells in the future. The second well is to be drilled when the system reaches a service population of 50 connections.

### EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent trailer connections (ETCs). One ETC will utilize 300 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity (Groundwater)

A. Source Yield

1. Number of Sources

- a. Required = 1 up to 49 connections, more than 1 for 50 or more connections
- b. Provided = 1 well

2. Well Yields: 25 gpm pump test (77 theoretical)

3. Pump Yields: 30 gpm

B. Source Capacity

$$30 \text{ gpm} / .5 \text{ gpm/ETC} = 60 \text{ ETC}$$

II. Storage Capacity

A. Effective Storage

$$11,000 + 1/3 (2000) = 11,666$$

B. Storage Capacity

$$\frac{11,666 \text{ gal}}{150 \text{ gal/ETC}} = 77.8 \text{ trailer connections}$$

III. Limiting Case

A. Existing Situation = 50 Trailer Connections (current 1 well)

Therefore, based on the critical values discussed above, this waterworks was issued an operation permit for a design capacity of 75 Trailer Connections. The actual limiting case would be number of wells with a trailer limit of 50 with the understanding that a second well would be installed when 49 connections were made. Therefore, this system may not exceed the permitted number of connections.

DWT/mw



# Kiptopeke Condominiums





# Northampton County Government Complex



## **1. Water Demand Narrative and Documentation of Beneficial Use**

The County of Northampton, Virginia, has constructed a new governmental complex complete with a new public non-transient water supply and wastewater treatment facility to serve the following:

1. One 325 inmate regional jail facility
2. One Social Services Building (55 employees and 70 clients per day)
3. One Court Building housing General District, Circuit, and Juvenile and Domestic Relations Courts
4. One Sheriff's Office with 24 officers
5. Ancillary offices: Registrar, Commonwealth's Attorney, Juvenile Probation, Clerk of Court, Clerk of the Works, Public Services Director, etc.

At capacity, this facility can be expected to utilize up to 35,732 gallons per day or 13,042,180 gallons per year. The average monthly maximum use is estimated to be 1,086,848 gallons. Peak monthly gallonage is estimated to be 1,120,598 gallons (see Landscape Irrigation).

The major use of this water resource will be the new regional jail facility. Uses such as this one are well documented by the Virginia Department of Corrections (DOC) on similar facilities in Virginia. Representatives from the DOC furnished us the water use annual report, and recommended that we project water use at the Northampton facility based on water use data from the newer facilities in the Commonwealth. These facilities, including Red Onion State Prison, Wallens

Ridge State Prison, Cod Springs Correctional Unit 10, Fluvanna Correctional Center for Women, Haynesville Correctional Center, Sussex 1 State Prison and Sussex 2 State Prison, have water-saving devices installed and currently employ water-saving strategies. Normal water use is estimated by DOC as 120 gallons per day per inmate. This number is used for engineering estimates of infrastructure requirements and sizing. However, for the seven newer facilities, average annual water use was 97.5 gpd per inmate. It is also interesting to note that DOC recommends estimating staff water use as five employees equals one inmate. We have estimated employee use as 15 gpd, which is less than the comparable DOC estimate of 19.5 gpd (97.5 gpd/5 staff). According to Page 40 of the onsite Sewage handling and Disposal Regulations, the minimum flow rate for office facilities is 15 gallons per day per employee. However, understanding that the offices will only be open, on average, 5 days per week, we have updated all of the staff use by  $5/7^{\text{ths}}$ , or 71%. As such, staff use is estimated as 10.5 gpd for new facilities and 24.5 gpd for old facilities. Seven (7) day staff water use estimates remain unchanged. Visitor and Staff (5 and 7 day) usage totals are estimated to be 2,845 gpd or 8% of the total use.

There will be a small irrigation use for the courthouse green (< 2% of the total use when and if needed). There are 20 pop-up type sprinklers which will use 3.04167 gpm at normal system pressure. These sprinklers will be governed by timers which will allow for irrigation to occur during two one-half hour intervals (morning and evening) every other day during the 140 day irrigation season (typically May 21-October 7). There will be 70 days during this period that irrigation will take place if needed. Maximum water use during the irrigation period is expected to be approximately 255,500 gallons per year as shown in the following calculations.

## **LANDSCAPE IRRIGATION**

Landscape irrigation will occur during a (roughly) 140 day period beginning May 21st and ending October 7th of each year. Actual irrigation will occur on 70 of those days (every other day) if needed and for a period of 1 hour per day. Peak monthly water use will occur during the summer months when landscape irrigation is taking place.

That peak monthly amount can be calculated as follows:

### **Irrigation Gallonage Per Day (on days of operation)**

20 sprinklers X 3.04167 GPM X 60 minutes/day = 3650 gallons per day

### **Irrigation Gallonage Per Year (based on 70 days of the 140 day season)**

20 sprinklers X 3.04167 GPM X 60 min/day X 70 days/yr = 255,500 gallons/year

### **Irrigation Gallonage (yearly average GPD)**

255,500 gallons per year / 365 days per year = 700 gallons per day

### **Irrigation Gallonage (monthly peak GPD for June, July, or August)**

3650 gallons per day X 15 irrigation days = 54,750 gallons per month

### **Peak Use Resulting From Landscape Irrigation Practices**

Monthly Water Use = 1,086,848 GPD

Irrigation Monthly Average Water Use = 700 GPD X 30 days/month

= 21,000 gallons per month

Irrigation Monthly Peak Water Use = 3650 gallons per day X 15 irrigation days

= 54,750 gallons per month

Peak Use = Monthly Water Use – Irr. Monthly Average + Irr. Peak

1,086,848 – 21,000 + 54,750 = **1,120,598 gallons per month Peak Use**

### **Irrigation Percentage of Total Use**

<u>255,500 gallons per year</u>	=	2.1 % of total water use
13,042,180 gallons per year		

The waste water treatment plant will use up to 500 gallons per day of potable water for foam control, general washdown, and laboratory purposes (<1.4% of total use when and if needed).



## **2. Water Demand Projections**

Construction of the Northampton County Government Complex will be phased in over the next few years. The demand calculations are for the complex at full buildout and no further expansion is planned.

See the attached "Water Demand Estimates".

# NORTHAMPTON COUNTY GOVERNMENT COMPLEX - WATER DEMAND ESTIMATES

	Staff				Visitor				Total Flow
	# people	Unit flow (gpd)	7 day Flow (gpd)	5 day Flow (gpd)	# people	Unit flow (gpd)	7 day Flow (gpd)	5 day Flow (gpd)	
Dept. of Social Services	55	10.5	0	577.5	70	3	0	210	787.5
Clerk of Court	7	10.5	0	73.5	3	3	0	9	82.5
Circuit Court	4	10.5	0	42	100	3	0	300	342
General District Court	8	10.5	0	84	100	3	0	300	384
J&DR Court	4	10.5	0	42	80	3	0	240	282
Juvenile Probation	10	10.5	0	105	5	3	0	15	120
Commonwealth's Attorney	4	10.5	0	42	0	3	0	0	42
Registrar	4	10.5	0	42	5	3	0	15	57
Sheriff's Office	24	10.5	252	0	5	3	15		267
Jail	40	10.5	420	0	20	3	60		480
Jail (inmates) 325 capacity	325	97.5	31687.5	0	0	0	0		31687.5
Sub-Total			32359.5	1008			75	1089	34531.5
WWTP		500	500	0	0	0	0	0	500
Irrigation	20 heads	35	700	0	0	0	0	0	700
Total			33559.5	1008			75	1089	35731.5

Yearly water needs = 35,732 gpd X 365 days  
 = 13,042,180 gallons per year

# Documentation of Beneficial Use

## Water Demand Summary

Building/Office	STAFF		VISITOR			STAFF + VISITOR	
	# people	Unit demand (gpd)	Demand (gpd)	# people	Unit demand (gpd)	Demand (gpd)	Demand (gpd)
Dept. of Social Services	55	10.5	578	70	3	210	788
Clerk of Court	7	10.5	74	3	3	9	83
Circuit Court	4	10.5	42	100	3	300	342
General District Court	8	10.5	84	100	3	300	384
J&DR Court	4	10.5	42	80	3	240	282
Juvenile Probation	10	10.5	105	5	3	15	120
Commonwealth's Attorney	4	10.5	42	0	3	0	42
Registrar	4	10.5	42	5	3	15	57
Sheriff's Office	24	10.5	252	5	3	15	267
Jail	40	10.5	420	20	3	60	480
Jail (inmates)	325	97.5	31,688			0	31,688
Irrigation (Courthouse lawn)	20	35	700	0	0	0	700
Waste Water Treatment Plant	1	500	500	0	0	0	0

TOTAL

34,568

1,164

35,732

Average daily demand =

35,732 gal/day

Average monthly demand =

1,086,848 gal/month

Average yearly demand =

13,042,180 gal/year

Fire reserve storage is for onsite fire hydrants and sprinkler systems and routine use is not anticipated.

## Water Demand Projections

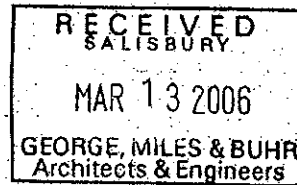
Construction of the Northampton County Government Complex will be phased over the next few years. The demand calculations are for the complex at full buildout and no further expansion is planned.

# Proposed Well Pumping Schedule

Rotating lead/lag/standby configuration for equal wear and runtime

Month	Well 165-459 (#1)			Well 165-460 (#2)			Well 165-461 (#3)		
January	use	lead or lag	gal/month	use	lead or lag	gal/month	use	lead or lag	gal/month
February	daily	lag	272,500	daily	lead	826,000	intermittent	n/a	< 1,000
March	intermittent	n/a	< 1,000	daily	lag	272,500	daily	lead	826,000
April	daily	lead	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
May	daily	lag	272,500	daily	lead	826,000	intermittent	n/a	< 1,000
June	intermittent	n/a	< 1,000	daily	lag	272,500	daily	lead	826,000
July	daily	lead	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
August	daily	lag	272,500	daily	lead	826,000	intermittent	n/a	< 1,000
September	intermittent	n/a	< 1,000	daily	lag	272,500	daily	lead	826,000
October	daily	lead	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
November	daily	lag	272,500	daily	lead	826,000	intermittent	n/a	< 1,000
December	intermittent	n/a	< 1,000	daily	lag	272,500	daily	lead	826,000
January	daily	lead	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
February	daily	lag	272,500	daily	lead	826,000	intermittent	n/a	< 1,000
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November	daily	lag	272,500	daily	lead	826,000	intermittent	n/a	< 1,000
December	intermittent	n/a	< 1,000	daily	lag	272,500	daily	lead	826,000
	daily	lead	826,000	intermittent	n/a	< 1,000	daily	lag	272,500

Intermittent use is designated for maintenance of lead or lag well and or associated equipment.



# **VIRGINIA DEPARTMENT OF CORRECTIONS**

## **ENVIRONMENTAL SERVICES UNIT**

### **MAJOR INSTITUTIONS**

### **FIELD UNITS**

### **ADULT COMMUNITY CENTERS**

### **WATER USE REPORT**



**FOR THE MONTH of DECEMBER, 2005**  
(Includes 2005 Yearly Report)

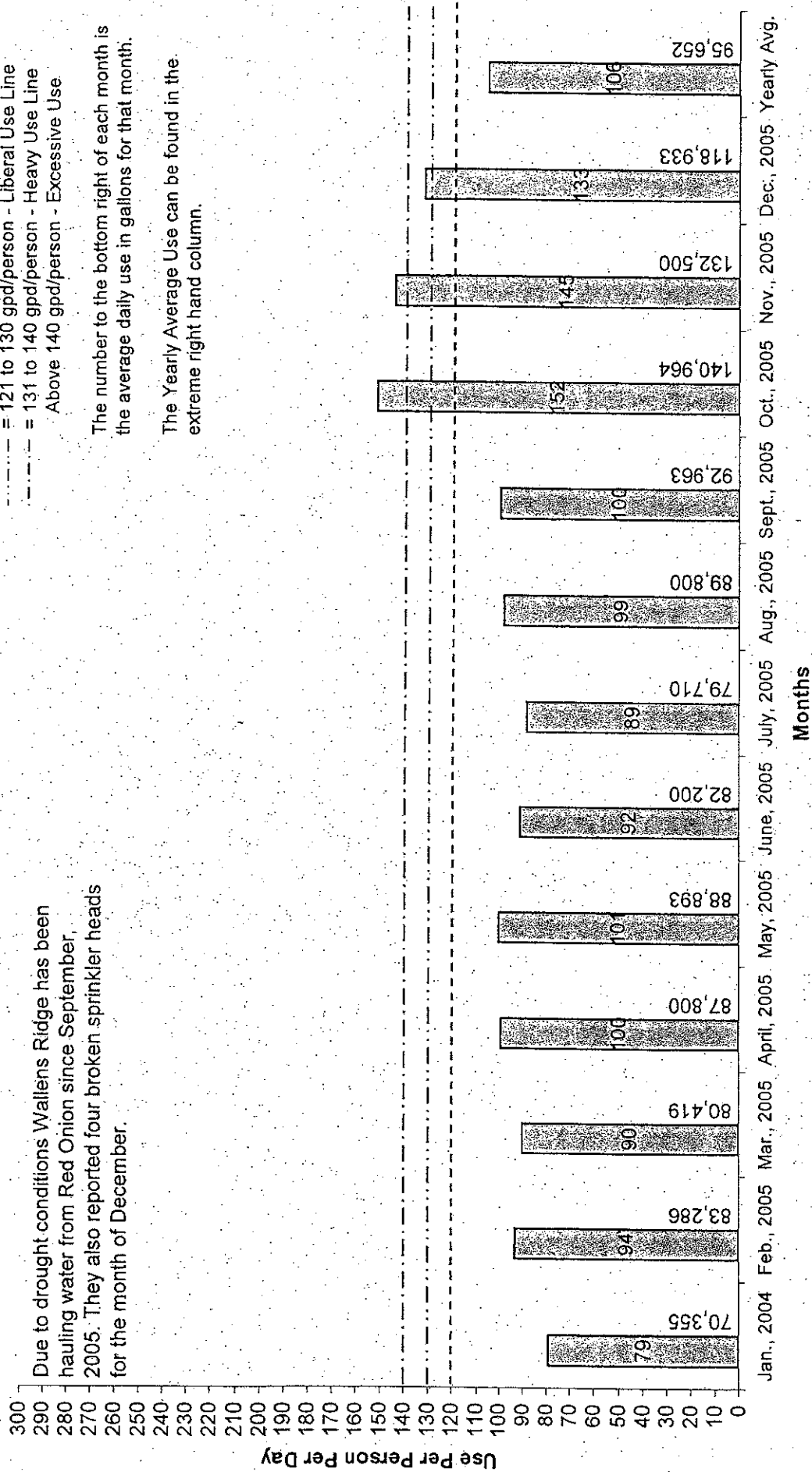
# Water Use Per Person Trend Chart - West Service Area Red Onion State Prison

- Below 120 gpd/person - Conservative Use
- Normal Use Line - 120 gpd/ person
- 121 to 130 gpd/person - Liberal Use Line
- 131 to 140 gpd/person - Heavy Use Line
- Above 140 gpd/person - Excessive Use

The number to the bottom right of each month is the average daily use in gallons for that month.

The Yearly Average Use can be found in the extreme right hand column.

Due to drought conditions Wallens Ridge has been hauling water from Red Onion since September, 2005. They also reported four broken sprinkler heads for the month of December.



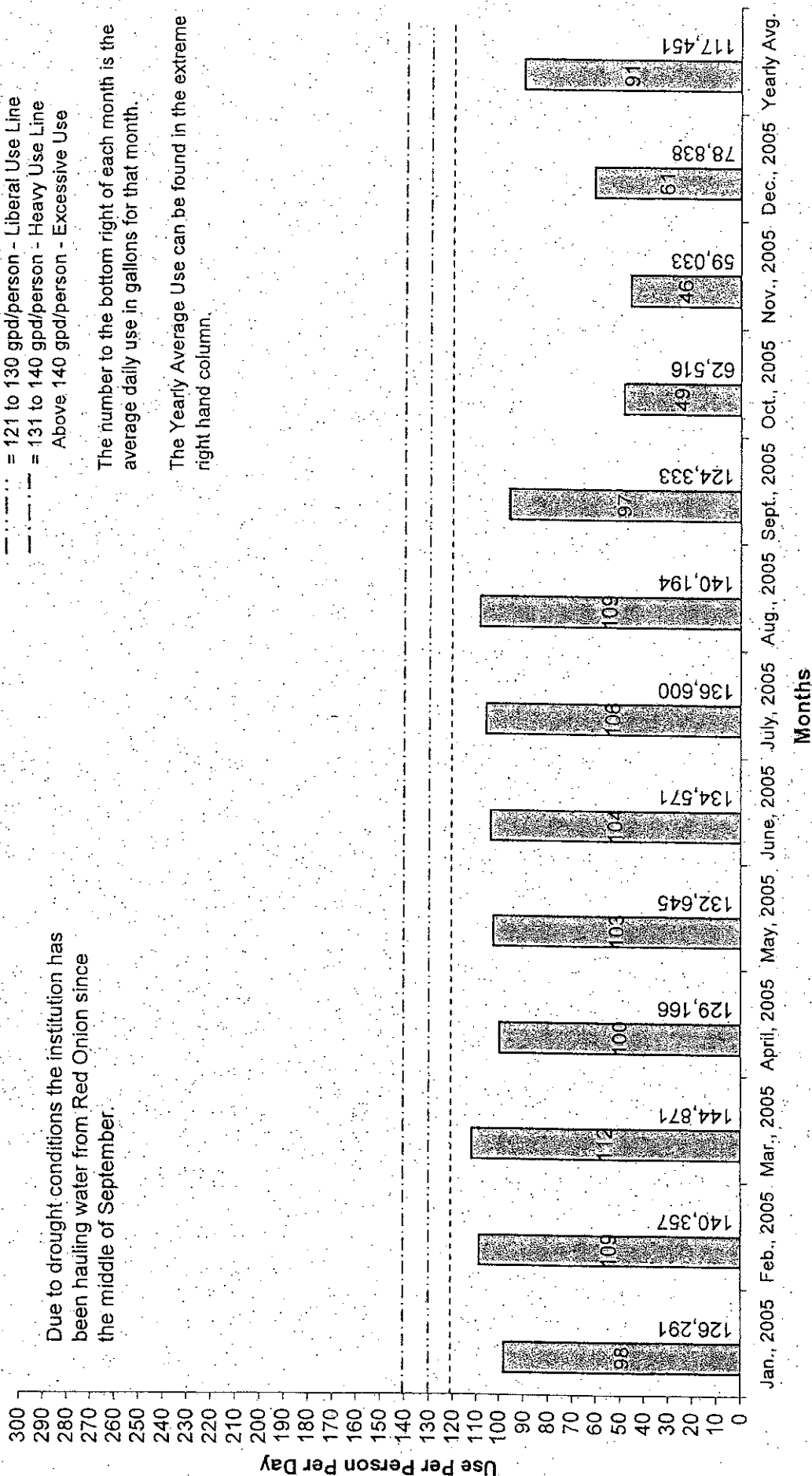
# Water Use Per Person Trend Chart - West Service Area Wallens Ridge State Prison

Below 120 gpd/person - Conservative Use  
 = Normal Use Line - 120 gpd/ person  
 = 121 to 130 gpd/person - Liberal Use Line  
 = 131 to 140 gpd/person - Heavy Use Line  
 Above 140 gpd/person - Excessive Use

The number to the bottom right of each month is the average daily use in gallons for that month.

The Yearly Average Use can be found in the extreme right hand column.

Due to drought conditions the institution has been hauling water from Red Onion since the middle of September.



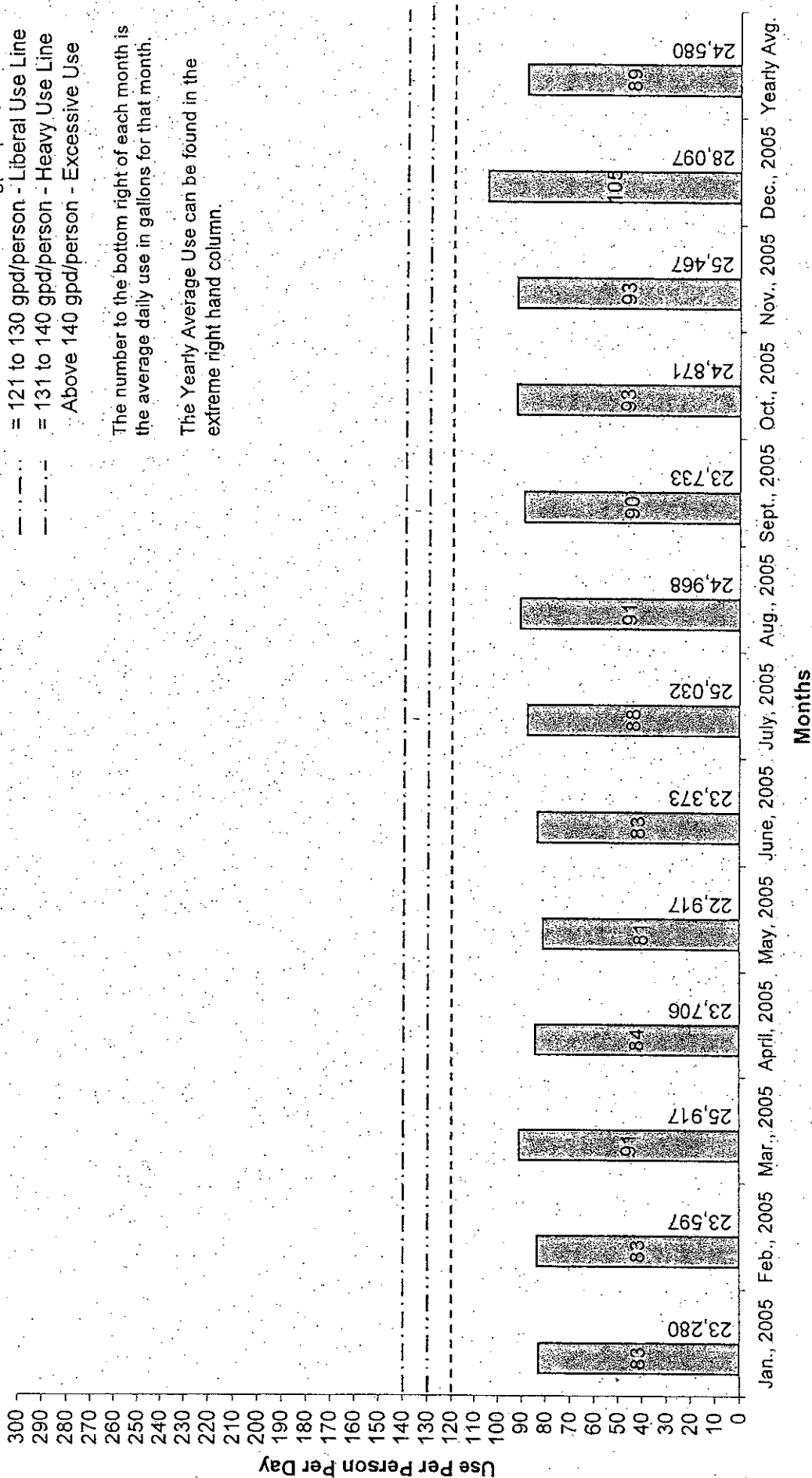


# Water Use Per Person Trend Chart - North Service Area Cold Springs Correctional Unit 10

- Below 120 gpd/person - Conservative Use
- Normal Use Line -- 120 gpd/ person
- 121 to 130 gpd/person - Liberal Use Line
- 131 to 140 gpd/person - Heavy Use Line
- Above 140 gpd/person - Excessive Use

The number to the bottom right of each month is the average daily use in gallons for that month.

The Yearly Average Use can be found in the extreme right hand column.



# Water Use Per Person Trend Chart - North Service Area

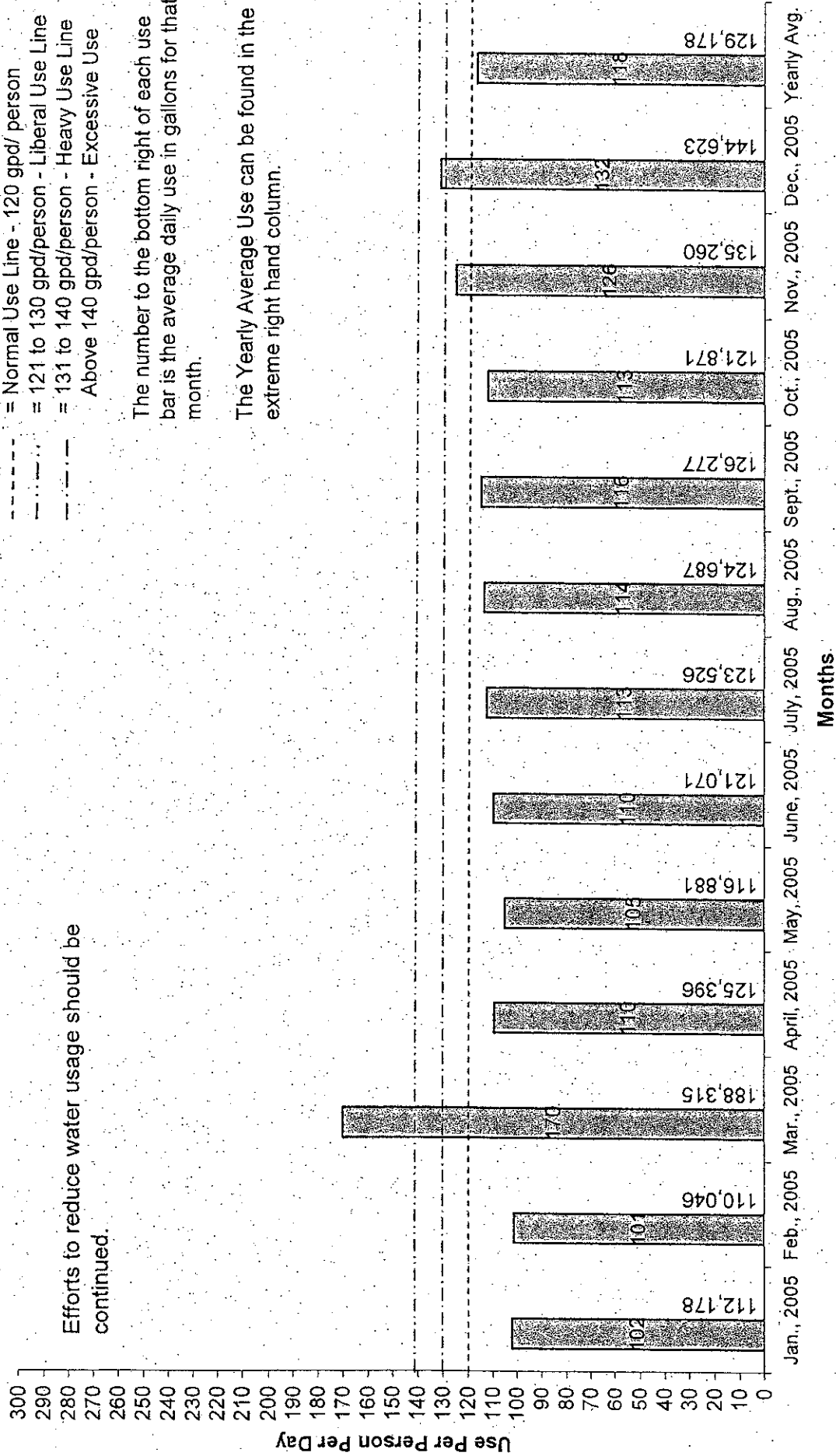
Fluvanna Cor. Center for Women

- Below 120 gpd/person - Conservative Use
- Normal Use Line - 120 gpd/ person
- 121 to 130 gpd/person - Liberal Use Line
- 131 to 140 gpd/person - Heavy Use Line
- Above 140 gpd/person - Excessive Use

Efforts to reduce water usage should be continued.

The number to the bottom right of each use bar is the average daily use in gallons for that month.

The Yearly Average Use can be found in the extreme right hand column.



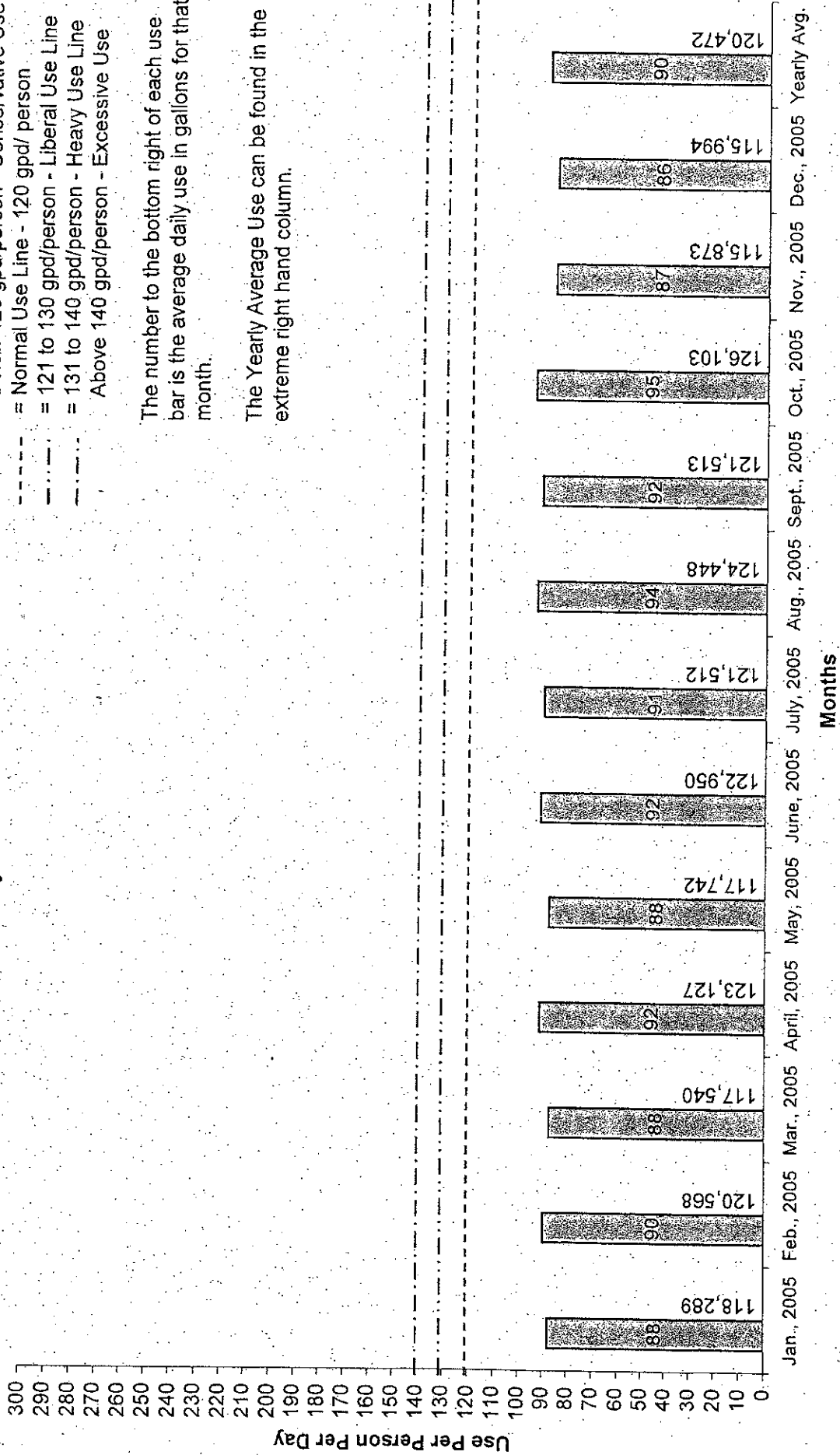
# Water Use Per Person Trend Chart - Eastern Service Area

## Haynesville Correctional Center

- Below 120 gpd/person - Conservative Use
- = Normal Use Line - 120 gpd/ person
- - - - - = 121 to 130 gpd/person - Liberal Use Line
- - - - - = 131 to 140 gpd/person - Heavy Use Line
- - - - - Above 140 gpd/person - Excessive Use

The number to the bottom right of each use bar is the average daily use in gallons for that month.

The Yearly Average Use can be found in the extreme right hand column.



# Water Use Per Person Trend Chart - Eastern Service Area

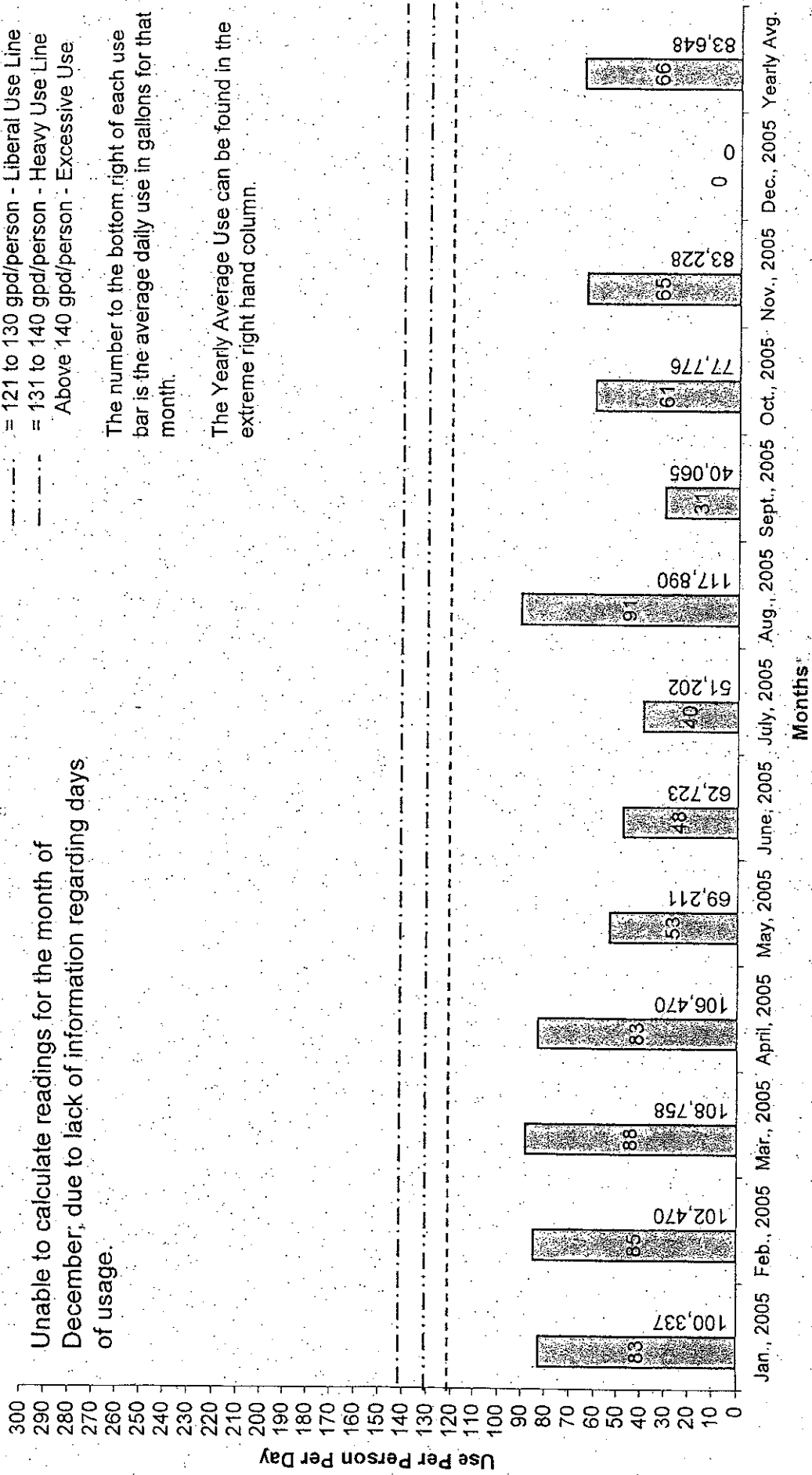
## Sussex I State Prison

- Below 120 gpd/person - Conservative Use
- Normal Use Line - 120 gpd/ person
- 121 to 130 gpd/person - Liberal Use Line
- 131 to 140 gpd/person - Heavy Use Line
- Above 140 gpd/person - Excessive Use

Unable to calculate readings for the month of December; due to lack of information regarding days of usage.

The number to the bottom right of each use bar is the average daily use in gallons for that month.

The Yearly Average Use can be found in the extreme right hand column.



# Water Use Per Person Trend Chart - Eastern Service Area

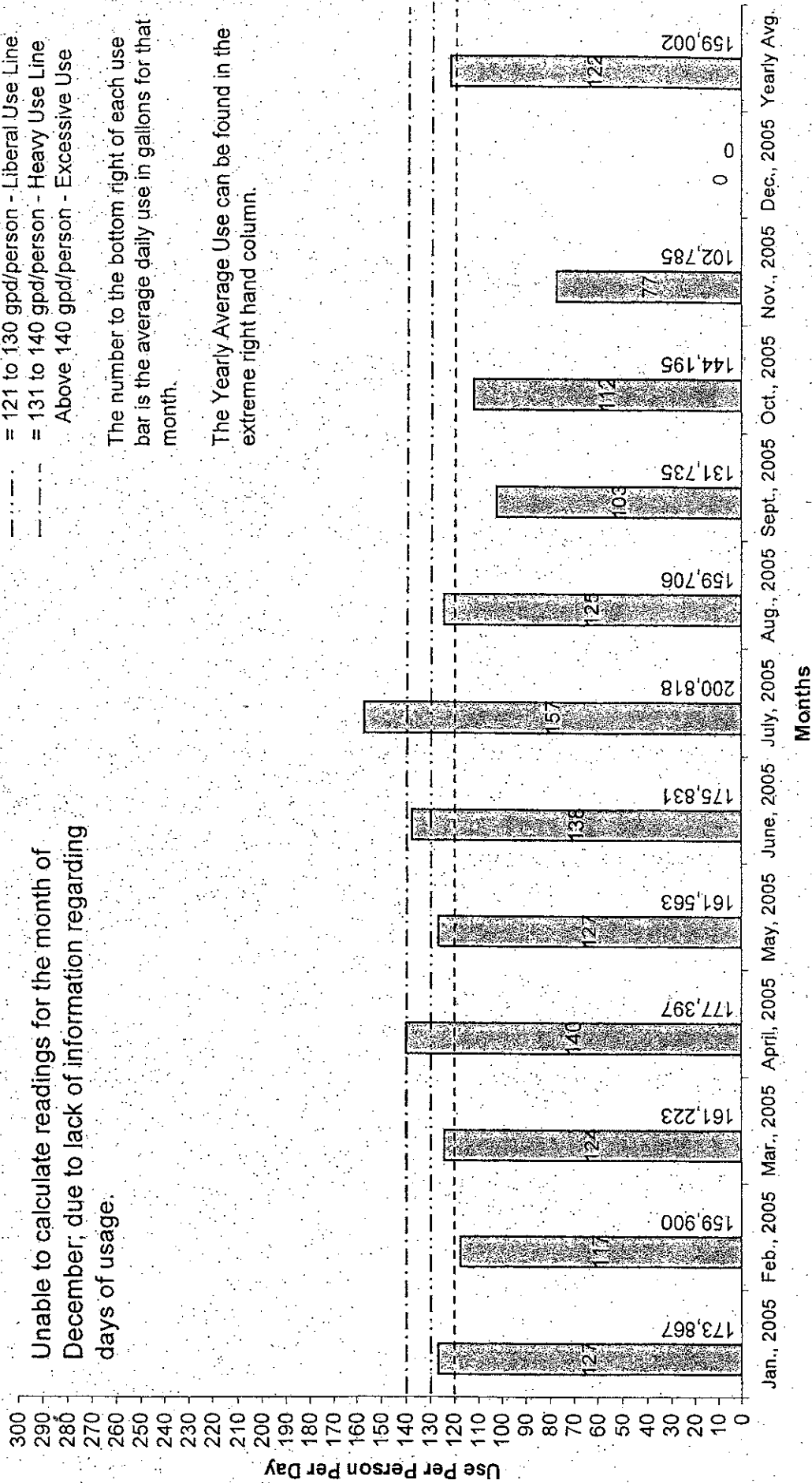
## Sussex II State Prison

- Below 120 gpd/person - Conservative Use
- Normal Use Line - 120 gpd/person
- 121 to 130 gpd/person - Liberal Use Line
- 131 to 140 gpd/person - Heavy Use Line
- Above 140 gpd/person - Excessive Use

Unable to calculate readings for the month of December; due to lack of information regarding days of usage.

The number to the bottom right of each use bar is the average daily use in gallons for that month.

The Yearly Average Use can be found in the extreme right hand column.





# Water Conservation and Management Plan

## Northampton County Government Complex

County of Northampton  
The Horns  
Eastville, VA 23418

April 2006  
Rev. October 2006

GMB FILE NO. 2002124.C

# GMB

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SALISBURY/BALTIMORE/SEAFORD/LEWES/YORK/DOVER



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# **Water Conservation and Management Plan**

## **DEQ Ground Water Withdrawal Permit**

### **No. GW0049700**

#### **CHAPTER 1: INTRODUCTION**

The water withdrawn under this permit will be used to serve the Northampton County Government Complex. This Complex will include a courthouse, a three-hundred twenty-five inmate regional jail facility, a sheriff's office and a social services building.

The administrative portion of the Northampton County Government Complex will be the direct responsibility of the Northampton County Administrator and her designee, the Director of Public Works.

Use of water in the sheriff's office and the regional jail will be administered by the Northampton County Sheriff and as dictated by this permit and in coordination with the County Director of Public Works.

Any recommended changes of procedures pertinent to the jail facility must meet the permit requirements of the Virginia Department of Corrections, the Virginia Department of Health/Office of Drinking Water and the Virginia Department of Environmental Quality.

#### **CHAPTER 2: USE OF WATER SAVING PLUMBING PROCESSES**

Since security and public safety are the highest priority at jails and prison facilities, water restricting plumbing devices are not generally used in such facilities. Water conservation fixtures which are used are those that specifically do not contain easily removable parts, such as hose bibs, shower heads and aerated faucet nozzles. Toilets will be designed with sufficient volume and pressure so as to prevent intentional stoppages.

A central control panel will allow the staff of this jail facility to have the capacity to control the frequency and duration of use of each inmate utilized fixture within the area of confinement, thereby enabling strict water conservation measures to be enacted and adhered to should there be the need.

## **2.1 INMATE HOUSING**

### **A. Showers**

Prolonged shower use will be prevented by installation of a dedicated water use control panel which will limit the duration, and, when needed, the frequency of use. In addition, restrictor devices will be installed where possible. The restrictor devices shall be installed such that special security tools are required for their removal.

### **B. Toilets**

Restrictor devices will not be allowed on inmate toilets. Sufficient pressure and water volume is required to prevent stoppages. Water saving toilets will be utilized where security is not jeopardized. Devices will be installed on the toilets which will be designed to limit the gallonage utilized per flush without affecting the proper amount of water necessary for a full flush. Flush valves with no less than a 1.6 gpf requirement will be used. The frequency of use can be further limited and controlled via a central control panel.

### **C. Lavatory Sinks**

The lavatory sink mixing valves shall be equipped with devices that limit prolonged water use. Aerators will not be used in areas where inmates can easily remove them. The duration and frequency of use can also be controlled via the central control panel.

### **D. Climate Control Facilities**

Air-to-Air exchange climate control equipment will be utilized in lieu of Water-to-Air units and therefore will not be a consideration with regard to water use.

### **E. Water Coolers**

Push-button or handicap push bar type single nozzle water coolers will be used in the courthouse facility.

### **F. Water-cooled ice makers**

These devices generally use high amounts of water and shall not be installed. Air or refrigerant type ice machines will be used.

### **G. Hose Bibs or Single Faucet Sinks**

Water saver fixtures, water restrictors and aerators will be used on these items.

## **2.2 FOOD PREPARATION AREAS AND MESS HALL**

### **A. Hose bibs or single faucet sinks**

Water saver fixtures, water restrictors and aerators will be manufactured into the hose bibs. Easily removable devices will not be used.

### **B. Toilets**

Restrictor devices will not be allowed on inmate toilets. Sufficient pressure and water volume is required to prevent stoppages. Water saving toilets will be utilized where security is not jeopardized. Flushometers will be installed on the toilets which will be designed to lessen the amount of gallons per flush without affecting the proper amount of water necessary for full flush. Flush valves with no less than a 1.6 gpf requirement will be used.

Employee access toilets will be installed in areas with limited or no inmate access. These units will be self-contained tank type toilets. Flush valves with no less than a 1.6 gpf requirement will be used.

### **C. Lavatory Sinks**

Mixing valves will be equipped with devices that limit prolonged use. Flow controllers, timers, motion detectors, or automatic shut on/off devices will be used. Aerators will not be installed in areas where they can be easily removed by inmates.

### **D. Water Coolers**

Push-button or handicap push bar type single nozzle water coolers will be used in the jail facility.

### **E. Water-cooled ice makers**

These devices generally use high amounts of water and shall not be installed. Air or refrigerant type ice machines will be used.

### **F. Miscellaneous Equipment**

Water may be used to heat or cool food during preparation. The food preparation equipment will be evaluated by the Food Service Supervisor to determine water use. The equipment will be repaired or replaced if it is found to use more than the standard amount of water required for use.

All plumbing appliances will be equipped with water saver devices and back flow prevention devices. Toilet flush valves, hose bibs, and facets shall be maintained in good working order.

## **2.3 INDUSTRIES, MEDICAL, EDUCATIONAL AREAS**

### **A. Toilets**

Restrictor devices will not be allowed on inmate toilets. Sufficient pressure and water volume is required to prevent stoppages. Water saving toilets will be utilized where security is not jeopardized. Flushometers will be installed on the toilets which will be designed to lessen the amount of gallons per flush without affecting the proper amount of water necessary for full flush. Flush valves with no less than a 1.6 gpf requirement will be used.

Employee access toilets will be installed in areas with limited or no inmate access. These units will be self-contained tank type toilets. Flush valves with no less than a 1.6 gpf requirement will be used.

### **B. Showers**

No water restriction devices will be used on showers that are specifically used as safety or chemical emergency use. These showers are specifically used for safety and will not be tampered with. If water safety devices will be used with the safety showers, these devices will be installed only in accordance with the safety aspect of the equipment.

### **C. Lavatory Sinks**

Mixing valves will be equipped with devices that limit prolonged use. Flow controllers, timers, motion detectors, or automatic shut on/off devices will be used. Aerators will not be installed in areas where they can be easily removed by inmates.

### **D. Water Coolers**

Push-button or handicap push bar type single nozzle water coolers will be used in the courthouse facility.

### **E. Water-cooled ice makers**

These devices generally use high amounts of water and shall not be installed. Air or refrigerant type ice machines might be used.

### **F. Medical, Dental, X-Ray Equipment**

All dental and medical equipment will be installed with water saving devices.

For X-Ray Equipment, reclaimable or recyclable equipment will be used where practical. Equipment that is replaced shall be designed for reclaimable or recyclable water use.

## **2.4 LAUNDRIES**

Industrial and commercial equipment will be designed with low water use requirements. Full loads of laundry will be used rather than partial half loads so as to maximize the laundry load use. Personal washing machines will not be used.

## **2.5 ADMINISTRATIVE AND OUTSIDE THE SECURE PERIMETER BUILDINGS**

### **A. Toilets**

Tank type or self-contained toilet units with water saver devices will be used. Toilets with flush valves will have the control valve turned to minimum control.

### **B. Showers**

Restrictor type showerheads will be used to limit shower times. Devices will be installed on the mixing valves to prevent prolonged water use.

### **C. Lavatories (sinks)**

All sinks will be installed with water saving devices. Aerators may be used.

### **D. Water Coolers**

Push-button or other handicapped accessible (push bar type) single nozzle water coolers will be used in the courthouse facility.

### **E. Hose Bibs**

Water saver fixtures and water restrictor aerators will be used.

### **F. Washing Machines**

Wash loads will be limited to once a week, full loads. Water saving devices will be installed on the machines.

### **G. Vehicle Maintenance Areas**

Clean water will not be used to clean motors or parts. Water limiting steam jennys and / or high pressure washers will be used for cleaning. Functional spray nozzles will be used when water is used for cleaning.



## **2.6 OFFICE BUILDINGS**

### **A. Toilets**

Tank type or self-contained toilet units with water saver devices will be used. Toilets with flush valves will have the control valve turned to minimum control.

### **B. Showers**

Restrictor type showerheads will be used to limit shower times. Devices will be installed on the mixing valves to prevent prolonged water use.

### **C. Lavatories (sinks)**

All sinks will be installed with water saving devices. Aerators may be used.

### **D. Water Coolers**

Push-button or handicapped accessible (push bar type) single nozzle water coolers will be used in the courthouse facility.

### **E. Hose Bibs**

Water saver fixtures and water restrictor aerators will be used.

### **F. Cafeterias**

All plumbing appliances will be equipped with water saver devices. Toilet flush valves, hose bibs, and facets shall be maintained in good working order. Thawing of frozen food by running or still water shall not be permitted. Advance thawing of foods under refrigeration or by microwave oven is required.

### **G. Irrigation**

Timed automatic on/off devices shall only be used. Irrigation timers shall be set to operate during non-peak demand periods, the early morning, and late afternoon hours.

## **CHAPTER 3: WATER LOSS REDUCTION PROGRAM**

### **3.1 Water Distribution and System Leaks**

The Northampton County Public Works Department will read and record the main water meters on a monthly basis. The main water meters will alert the Department to excessive water use. Excessive use will be use of water above the daily design rate. High use of water will be investigated immediately. Water system leaks will be repaired immediately. Frost proof yard hydrants will be installed to reduce burst pipe susceptibility.

### **3.2 Observation of Inmate Bath Areas**

The corrections staff will observe the bath areas to prevent excessive water use by shower length, and when sinks and lavatories are left running.

### **3.3 Food Preparation**

The kitchen staff will utilize water saving methods during food preparation and cleanup activities. In lieu of a full sink of water, use a half-full sink of water and wash smaller volumes of equipment at any one time. Schedule wash times. Kitchen staff will notify the jailer if high water use or water leaks are observed.

Presoak utensils in basins of water, rather than in running water.

Replace automatic shut-off spray nozzles, which can use as much as 4.5 gallons of water each minute, with low-volume nozzles using 2.0 gallons per minute.

Wash everything that can be washed in the dishwashers. Wash only full loads. Once the unit is filled for operation, the only water wasted is the rinse water or about one gallon per cycle.

Turn off food preparation faucets that are not in use. Consider installing foot triggers.

Adjust ice machines to dispense less ice if ice is being wasted.

### **3.4 Miscellaneous Water Use**

The Maintenance Director will assign a member of his staff to be responsible for the water system day to day operations, follow up on high water use issues, and water conservation methods.

### **3.5 Water reuse**

Water reuse will be implemented where it does not adversely affect the health and safety of the employees and inmates. The reuse of domestic water is limited in its capabilities.

## **CHAPTER 4: DROUGHT CONDITION WATER USE**

Chapter 3 provided general information and guidance to conserve water, which should be followed during normal water use. This Chapter (4) concerns conditions when a drought has been declared. Drought conditions bring about concerns over water supplies and it is in the best interest of all users to curtail water use over what normal or day-to-day conservation requires.

Drought conditions in the Commonwealth are monitored by the Drought Monitoring Task Force, which is headed up by the Department of Environmental Quality in conjunction with the State Climatologist. Recommendations for curtailment of water use are a result of drought conditions as reported by this task force. The task force does not demand the curtailment of water use but advises the waterworks owner of conditions which may warrant concern. The representative for the owner in the Department of Corrections is the Director. The Director has directed the Environmental Services Unit to advise him on drought conditions base on information they receive from the Drought Monitoring Task Force and will be recommending what level of drought severity to employ.

The County will comply as directed by the Director of the Virginia Department of Environmental Quality to any requirements for mandatory water use reductions during water shortage emergencies including ordinances prohibiting the waste of water generally and requirements for mandatory water use restrictions, with penalties during water use emergencies.

The Task Force has developed a Drought Monitor. The drought monitor ranges from a level of dry conditions to exceptionally dry conditions. For the purposes of this Water Conservation and Management Plan, the severity codes will be based on the Drought Monitor.

Drought conditions vary in severity. Depending on the drought severity level, the action taken could range from no action to drastic water curtailment steps. Also, because drought severity can differ from county to county and in different sections of the state, an announced code condition could differ for each institution.

The following severity codes are to be followed when initiated by the Director after having been advised by the Environmental Services Unit.

### **4.1. Code Blue Drought Condition (an abnormally dry situation)**

Code Blue drought conditions persist when the Drought Monitor stipulates a “DO” or abnormally dry situation. This is a situation where the Drought Task Force would recommend voluntary curtailment of water use but be more concerned with outdoor fires. The following steps shall be taken when a “Code Blue” severity level is announced.

A. Water will be conserved by voluntary curtailment of water use, see section 2.0 of this water conservation plan.

B. Voluntary water curtailment should be limited to reduced floor, sidewalk washing, irrigation, vehicle washing, etc.

#### **4.2. Code Yellow Drought Condition (moderate and severe drought)**

Code Yellow drought conditions persist when the Drought Monitor stipulates a “D1” and “D2” which means a moderate and severe drought, respectively. The Drought Monitoring Task Force would elevate the level of voluntary curtailment to stricter limits on the water use as follows:

A. Water will be conserved by voluntary curtailment of water use, see section 2.0 of this water conservation plan.

B. Vehicle washing is limited to once a week. Automatic water cutoff devices will be installed on all hoses.

C. Irrigation of lawns, flowers, shrubbery will be limited to once a week. Irrigation will be conducted only during periods of low flow. Spray nozzles will be used for hand watering. Sprinklers will not be used to irrigate flowers lawns, and shrubbery.

D. Water will be restricted for required wash downs of floors, walls, loading docks, etc. Limited daily use and automatic cut off devices will be used.

E. Washing machines used in the institution will be used only once a week with full loads only.

F. Special attention will be paid to system leaks. Repairs will be conducted as soon as possible.

G. Office personnel will be reminded to be cognizant of faucets left on, constantly flushing toilets, and wet areas on floors and lawns. These observations will be reported to maintenance.

#### **4.3. Code Red Drought Condition (extreme and exceptional drought)**

Code Red drought conditions persist when the drought monitor stipulates a “D3” and “D4” which means an extreme and exceptional drought, respectively. It is the most serious level of drought conditions that persists. The Drought Monitoring Task Force would elevate the level of recommended mandatory curtailment of the use of water as follows:

- A. The respective Regional Office, Central Office and ESU will be notified.
- B. Emergency services will be informed if the facility is in short supply or out of water for fire suppression. Emergency services will then be put on stand by.
- C. Irrigation and washing of vehicles will cease.
- D. Washing of floors, walls, loading docks, etc. will be stopped unless in violation of sanitation concerns. The respective Environmental Health Specialist will be consulted for guidance pertaining to food sanitation concerns.
- E. In the event of a water shortage, commercial restaurant operations will be required to cease operations until such water shortage has ended or by other acquisition of some additional and permanent water supply.
- F. All laundry operations will cease. Clothes will be sent out for cleaning if necessary.
- G. Inmate showering will be further restricted. Inmates will be placed on a scheduled shower time of every third day. Showering will be held to a 10 minute maximum.
- H. Food services shall provide “cold plate” meals.
- I. Vendors will be contacted for delivery of tank, bottled water and portable toilets. A list of vendors is provided in Appendix A.

## **CHAPTER 5: WATER USE EMERGENCIES**

This water outage plan will be used during emergency water outages brought about by fires, mechanical failure or Code Red drought conditions. An emergency condition is declared when the day-to-day operation of the facility is seriously affected by the loss of water use.

### **5.1 Water Outage Emergency Plan**

- A. Immediate notification of the Maintenance Director/Water Conservation Manager, County Administrator, County Sheriff, Clerk of the Works, Assistant County Administrator, Environmental Health Supervisor, or Regional Health Director is required.
- B. Notify emergency services that the facility is in short supply or out of water for fire suppression. Have these services standby for emergency situations.
- C. Shut off master valves to specific buildings so as to prevent low pressure flush valve malfunction.
- D. Shut off the master valve to the water storage tank. This will leave the tank full for an emergency situation, and prevent the loss of stored water. If the water source is shut off, facility personnel will maintain a constant lookout for fire and turn the water back on in the event of a fire.
- E. Vendors will be contacted for delivery of tank, bottled water and portable toilets. A list of vendors is provided in the Appendix.
- F. Water use that is non-essential for the operation of the facility will be ceased. Such water uses include, general cleaning, vehicle washing, irrigation, washing machines, etc.
- G. Food services shall provide “cold plate” meals.

## **Chapter 6: Water Use Education Program**

### **6.1 Assignment of Duties**

The Public Works Director will assign the duties of Water Conservation Manager to existing staff. This staff member should have some experience with plumbing and plumbing fixtures, experience with making repairs to water distribution systems, and a general knowledge and dedication to water conservation.

### **6.2 Duties and Responsibilities**

The staff member whom is assigned the duty of managing and overseeing water conservation will develop and maintain an education program to assure continual water conservation based on, but not limited to, the following criteria.

- A. Enforce this Water Conservation and Management Plan and report any non-conformance and misuse of water resources to the Public Works Director.
- B. Keep informed of water conservation means and methods by attending National, State, Local and Private seminars, meetings and events. This includes membership to magazines, papers, newsletters, etc., that pertain to water saving system equipment and conservation.
- C. Routinely (at the discretion of the Public Works Director) hold meetings with the Institutional staff or office staff (office buildings) to keep them informed of the latest in water conservation technology and inform them of any amendments to this Water Conservation and Management Plan.
- D. Maintain a posting system of newsletters, reports, drought reports, etc. where all staff can see and have access to. Maintain sufficient copies of reports for staff to study and read at their leisure.
- E. Conduct meetings and in-house seminars with all Institutional staff to keep them informed of water conservation efforts, latest equipment technology and discuss issues of existing water conservation efforts in and around the Institution or office.
- F. Quarterly, audit the water system and report findings concerning compliance with this Water Conservation and Management Plan to the Public Works Director. The report should not only report on non-compliance but provide recommendations to prevent future non-compliance.

### 6.3 Public Works Director Responsibilities

The Public Works Director will be tasked with Administering the Water Conservation and Management Plan. This includes the initial drafting of this plan, implementation and amendments. The Water Conservation Manager will copy the Public Works Director on all reports to keep the Public Works Director informed of accomplishments, non-conformances and other issues.

The Public Works Director will routinely meet with the Water Conservation Manager during institution visits to discuss progress. The Public Works Director will assist the Water Conservation Manager with implementation of this plan including the water use education program, assistance and advice for equipment and any support for mandated actions



VIRGINIA DEPARTMENT OF HEALTH  
ENGINEERING DESCRIPTION SHEET

DATE: August 20, 2004

WATERWORKS NAME: Northampton County Government Complex CERTIFIED CLASS: V

COUNTY/CITY: Northampton County TYPE: Community

LOCATION: This waterworks is located on off state route T1604 (Debedeavon Lane) approximately 1/4 mile west of Business Route 13 at Eastville.

OWNER: Northampton County  
P.O. Box 66  
Eastville, VA 23347  
(757) 678-0440

OPERATOR: Mr. John Parker (Class IV)  
c/o Northampton County Schools  
P. O. Box 360  
Machipongo, VA 23405  
(757) 331-1840

PERMIT NO.: 304904

DATE ISSUED: August 20, 2004

TYPE OF TREATMENT: None

SOURCE: Groundwater (one well)

DESIGN CAPACITY: 12,000 GPD

DESCRIPTION OF PROPOSED PROJECT

The proposed waterworks project consists of one well, a 1,600-gallon hydropneumatic tank, and water lines connecting the well to the tank and then to the temporary housing unit.

The well was drilled starting on December 17, 2003, and was completed on December 18, 2003. The well bore is 220 feet deep, with cement grout extending from the surface to 60 feet. The PVC well casing is 8-inches in diameter and extends to 180 feet, extending to 200 feet of 6-inch PVC screen (10 slot). Gravel pack is installed from 180 feet to 200 feet. The well is equipped with a submersible pump (rated at 55 gpm at 210 feet TDH) driven by a 5 HP motor. The pump intake is set at 140 feet. The well has a tested yield of 60 gpm, over a 48-hour period from May 7, 2004 to May 9, 2004, with the water level dropping from 8-3/4 feet (static condition) to 119-1/3 feet (dynamic condition).

Storage is provided by a 1,600 gallon (effective capacity 523 gallons) hydropneumatic tank.

EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERCs). One ERC for will utilize 400 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity

A. Source Yield

1. Number of Sources

- a. Required = 1 up to 49 ERCs, more than 1 for 50 or more ERCs
- b. Provided = 1 well

2. Well Yield:

$$\begin{array}{ll} 60 \text{ gpm} & 60 \text{ gpm} / 0.5 \text{ gpm} / \text{ERC} = 120 \text{ ERC} \\ & 120 \text{ ERC} * 400 \text{ gpd} / \text{ERC} = 48,000 \text{ gpd} \end{array}$$

B. Well Pump Capacity:

$$55 \text{ gpm} \qquad 55 \text{ gpm} * 1440 \text{ minutes} / \text{day} = 79,000 \text{ gpd}$$

II. Storage Capacity

A. Total Storage = 1,570 gallons ÷ 3 = 523 gallons effective storage

B. Storage Capacity =  $\frac{523 \text{ gallons}}{200 \text{ gal./ERC}} = 2.615 \text{ ERCs}$

III. Peak Hour Capacity:

Estimated delivery capacity during one hour –

$$\begin{array}{ll} \text{Pump } 55 \text{ gpm} * 60 \text{ minutes per hour} = & 3,300 \text{ gallons} \\ \text{Tank supply} = 1,570 \text{ gallons} / 3 = & \underline{523 \text{ gallons}} \\ \text{Total} & 3,600 \text{ gallons} \end{array}$$

Peak hour demand of 1,098 gallons is less than the 3,600 gallons available, therefore peak hour demand can be met.

IV. Limiting Case

A. Storage Capacity = 2.61 ERCs

B. Exchanging 3 ERC production capacity for 1 ERC storage capacity can bring the capacity up to 30 ERCS – per approved design exception.

C. Capacity Equivalent = 30 ERCs x 400 gpd/ERC = 12,000 gpd

Therefore, based on the critical values discussed above, the proposed waterworks has a design capacity of 12,000 gpd.

DWT/mw



# Shore Memorial Hospital



**MALCOLM  
PIRNIE**

**VIRGINIA DEPARTMENT OF HEALTH  
ENGINEERING DESCRIPTION SHEET**

DATE: July 20, 2006

WATERWORKS NAME: Northampton Co. Government Complex CERTIFIED CLASS: V

COUNTY/CITY: Northampton County TYPE: Community

LOCATION: This waterworks is located on off state route T1604 (Debedeavon Lane) approximately 1/4 mile west of Business Route 13 at Eastville.

OWNER: Northampton County  
P.O. Box 66  
Eastville, VA 23347  
(757) 678-0440

OPERATOR: Mr. Michael Thornes  
9181 Thoreau Drive  
Birdsnest, Virginia 23307

PERMIT NO.: 302506

DATE ISSUED: July 20, 2006

TYPE OF TREATMENT: None

SOURCE: Groundwater (one well existing, two proposed)

DESIGN CAPACITY: 19,600 GPD

**DESCRIPTION OF PROPOSED PROJECT**

The proposed waterworks project consists of one elevated tank and distribution piping.

Storage is currently provided by a 1,600 gallon (effective capacity 523 gallons) hydropneumatic tank. This project will replace the hydropneumatic tank with an elevated tank. The effective capacity of the elevated tank is 74,798 gallons (75,000 nominal volume). This project also includes about 1,300 feet of 4-inch diameter, 1,050 feet of 6-inch diameter and 470 feet of 8-inch diameter waterlines.

## EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERCs). One ERC will utilize 400 gallons per day. This system's capacity is evaluated as follows:

### I. Source Capacity

#### A. Source Yield

##### 1. Number of Sources

- a. Required = 1 up to 49 ERCs, more than 1 for 50 or more ERCs
- b. Provided = 1 well
- c. Proposed = 2 wells (total of three wells)

##### 2. Well Yield:

$$\begin{array}{ll} 60 \text{ gpm} & 60 \text{ gpm} / 0.5 \text{ gpm} / \text{ERC} = 120 \text{ ERC} \\ & 120 \text{ ERC} * 400 \text{ gpd} / \text{ERC} = 48,000 \text{ gpd} \end{array}$$

#### B. Well Pump Capacity:

$$55 \text{ gpm} \qquad 55 \text{ gpm} * 1440 \text{ minutes} / \text{day} = 79,000 \text{ gpd}$$

### II. Storage Capacity

A. Total Storage = 74,798 gallons (elevated)

B. Storage Capacity =  $\frac{74,798 \text{ gallons}}{200 \text{ gal./ERC}} = 374 \text{ ERCs}$

### III. Peak Hour Capacity:

Estimated delivery capacity during one hour –

$$\begin{array}{ll} \text{Pump } 55 \text{ gpm} * 60 \text{ minutes per hour} = & 3,300 \text{ gallons} \\ \text{Tank supply} = 74,798 & = \quad \underline{74,798 \text{ gallons}} \\ \text{Total} & 78,098 \text{ gallons} \end{array}$$

Peak hour demand of 3,900 gallons is less than the 78,098 gallons available, therefore peak hour demand can be met.

### IV. Limiting Case

A. Number of wells = 49 ERCs

B. Capacity Equivalent = 49 ERCs x 400 gpd/ERC = 19,600 gpd

Therefore, based on the critical values discussed above, the modified waterworks will have a design capacity of 19,600 gpd.

DWT/mw



COMMONWEALTH of VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL QUALITY

APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT  
(FOR USE IN GROUND WATER MANAGEMENT AREAS)

PREAPPLICATION CONFERENCE DATE: 10/20/04

1. APPLICANT INFORMATION:

Applicant: Northampton County FIN/SSN: \_\_\_\_\_  
Applicant Address: 5265 The Hornes Eastville, VA 23347 Phone: (757) 678-1282 ext: 282  
(Street, City, State, Zip Code)

2. FACILITY INFORMATION:

Facility/System Name: Northampton County Government Complex  
Facility Address: 5265 The Hornes Eastville, VA 23347  
(If Applicable, Street, City, State, Zip Code)  
Contact Name: Jim Chapman Title: Clerk of the Works Phone: 757-678-1282 ext:282  
Fax: 757-678-1284  
Location of Withdrawal Well or Well System: Northampton County  
(County/City)

3. TYPE OF APPLICATION:

This application is for:

- ☐ Existing withdrawal, not previously permitted  
☒ New withdrawal  
☐ Expand or enlarge existing permit No. \_\_\_\_\_  
☐ Modification of permit No. \_\_\_\_\_  
☐ Minor amendment of permit No. \_\_\_\_\_  
☐ Renewal of existing permit No. \_\_\_\_\_ with modification  
☐ Renewal of existing permit No. \_\_\_\_\_ without modification

Existing withdrawal permit amount N/A gallons per N/A (Day,Month,Year)

Date of expiration of existing Ground Water Withdrawal Permit N/A

Requested withdrawal amount 16,206,000 gallons per year, 1,350,500 gallons per month (average)  
17,565,000 2,025,750 (peak)

4. TYPE OF USE: (Check all that apply)

USE	%USE		%USE
<input checked="" type="checkbox"/> Public Water Supply	100	<input type="checkbox"/> Aquaculture	_____
<input type="checkbox"/> Industrial	_____	<input type="checkbox"/> Golf Course Irrigation	_____
<input type="checkbox"/> Commercial	_____	<input type="checkbox"/> Landscape Irrigation	_____
<input checked="" type="checkbox"/> Fire Protection	_____	<input type="checkbox"/> Nursery	_____
<input type="checkbox"/> Drought Relief	Emergency Only	<input type="checkbox"/> Crop Irrigation	_____
<input type="checkbox"/> Livestock Watering	_____	<input type="checkbox"/> Other	_____

If type of use is public water supply;

Estimate the percentage of the withdrawal for human consumptive use 95 %;

Attach a complete copy of the Virginia Department of Health Water Works Operation Permit and Engineering Description Sheets or equivalent.

OFFICE USE ONLY

Date Application Received \_\_\_\_\_ Date Fee Received \_\_\_\_\_ Application # \_\_\_\_\_  
Notice Date \_\_\_\_\_ LGOF Date \_\_\_\_\_ Returned \_\_\_\_\_ Amount \_\_\_\_\_  
Date Complete \_\_\_\_\_

**5. JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED:**

Briefly describe the nature of the activity and the proposed beneficial use of ground water.

Water supply (potable) for new Northampton County Government Complex in Eastville. Complex will include a new Sheriff's office, Courthouse, Social Services Center and Regional Jail.

**Documentation of beneficial use:** Attach documentation demonstrating that the annual and monthly amount of ground water withdrawal requested is the smallest amount of withdrawal necessary to support the proposed beneficial use and that the amount is representative to support similar uses when adequate conservation measures are employed.

Include a description of the product produced or the service provided, the unit of measure (acres, lbs., bushels, etc.) of the product or service, the unit of time that the product or service is produced (day, month, year), the amount of water (gallons) required to produce a unit of product or service, and the quantity of the product or service. Include calculations showing the total amount of water required to produce a product or provide a service.

Attach a line drawing showing the water flow through the facility/system. Indicate wells, meter locations, sources of surface intake, and treatment, or other operations generating wastewater. Construct a water balance on the line drawing by showing average flows between intakes, treatment units and discharge points.

**Water demand projections:** Include documentation to support the intended beneficial use over a ten year permit cycle such as population and water demand projections and expansion plans. Describe special treatment (i.e. RO, EDR) when proposed.

**Apportionment of withdrawal to individual wells:** Attach an operational pumping schedule for applications with multiple wells. Indicate whether the withdrawal from each well is daily, seasonal or intermittent. Describe the frequency of use and pumping volume for each well for each month in a calendar year.

**6. WASTEWATER TREATMENT AND DISPOSAL:**

Will wastewater be generated as a result of the withdrawal of ground water?

Yes (Yes/No) If yes, check the appropriate box below.

☒ Septic Tank and Drainfield

☐ Public Sewer \_\_\_\_\_  
(Name of system)

☐ State Waters \_\_\_\_\_  
(Name of water body)

Discharge Permit # \_\_\_\_\_

☐ Have applied for a discharge permit from the Department of Environmental Quality.

**7. WELL LOCATION(S):**

Locate all wells (existing, proposed, abandoned, out of service), facility property boundaries and/or water supply service area associated with the application on a (1) United States Geological Survey 7 1/2 minute topographic map, or copies of such maps, and (2) detailed location map of each existing and proposed well. The detailed location map must be of sufficient detail such that all wells may be easily located for site inspection.

# Documentation of Beneficial Use

## Water Demand Summary

Building/Office	STAFF		VISITOR		STAFF + VISITOR	
	# people	Unit demand (gpd)	Demand (gpd)	# people	Unit demand (gpd)	Demand (gpd)
County Administration	48	35	1,680	30	5	1,830
Dept. of Social Services	55	15	825	70	3	1,035
Clerk of Court	7	15	105	3	3	114
Circuit Court	4	15	60	100	3	360
General District Court	8	15	120	100	3	420
J&DR Court	4	15	60	80	3	300
Juvenile Probation	10	15	150	5	3	165
Commonwealth's Attorney	4	15	60	0	3	60
Registrar	4	15	60	5	3	75
Sheriff's Office	24	15	360	5	3	375
Jail	40	15	600	20	3	660
Jail (inmates)	325	120	39,000			39,000
<b>TOTAL</b>			<b>43,080</b>		<b>1,314</b>	<b>44,394</b>

Average daily demand = 44,400 gal/day  
 Average monthly demand = 1,350,500 gal/month  
 Average yearly demand = 16,206,000 gal/year  
 Peak monthly demand = 2,025,750 gal/month  
 Yearly demand w/ 2 months peak = 17,556,500 gal/year  
 Domestic Storage = 22,200 gallons  
 Fire reserve storage = 48,000 gallons  
 Total Storage Required = 70,200 gallons  
 Elevated Storage Provided = 75,000 gallons

Fire reserve storage is for onsite fire hydrants and sprinkler systems and routine use is not anticipated.

## Water Demand Projections

Construction of the Northampton County Government Complex will be phased over the next few years. The demand calculations are for the complex at full buildout and no further expansion is planned.



# Proposed Well Pumping Schedule

Rotating lead/lag/standby configuration for equal wear and runtime

Month	Well 165-459 (#1)			Well 165-460 (#2)			Well 165-461 (#3)		
	use	lead or lag	gal/month	use	lead or lag	gal/month	use	lead or lag	gal/month
January	daily	lag	335,000	daily	lead	1,014,500	intermittent	n/a	< 1,000
February	intermittent	n/a	< 1,000	daily	lag	335,000	daily	lead	1,014,500
March	daily	lead	1,014,500	intermittent	n/a	< 1,000	daily	lag	335,000
April	daily	lag	335,000	daily	lead	1,014,500	intermittent	n/a	< 1,000
May	intermittent	n/a	< 1,000	daily	lag	335,000	daily	lead	1,014,500
June	daily	lead	1,014,500*	intermittent	n/a	< 1,000	daily	lag	335,000
July	daily	lag	335,000	daily	lead	1,014,500	intermittent	n/a	< 1,000
August	intermittent	n/a	< 1,000	daily	lag	335,000	daily	lead	1,014,500
September	daily	lead	1,014,500	intermittent	n/a	< 1,000	daily	lag	335,000
October	daily	lag	335,000	daily	lead	1,014,500	intermittent	n/a	< 1,000
November	intermittent	n/a	< 1,000	daily	lag	335,000	daily	lead	1,014,500
December	daily	lead	1,014,500*	intermittent	n/a	< 1,000	daily	lag	335,000
January	daily	lag	335,000	daily	lead	1,014,500	intermittent	n/a	< 1,000
February	intermittent	n/a	< 1,000	daily	lag	335,000	daily	lead	1,014,500
March	daily	lead	1,014,500	intermittent	n/a	< 1,000	daily	lag	335,000
April	daily	lag	335,000	daily	lead	1,014,500	intermittent	n/a	< 1,000
May	intermittent	n/a	< 1,000	daily	lag	335,000	daily	lead	1,014,500
June	daily	lead	1,014,500*	intermittent	n/a	< 1,000	daily	lag	335,000
July	daily	lag	335,000	daily	lead	1,014,500	intermittent	n/a	< 1,000
August	intermittent	n/a	< 1,000	daily	lag	335,000	daily	lead	1,014,500
September	daily	lead	1,014,500	intermittent	n/a	< 1,000	daily	lag	335,000
October	daily	lag	335,000	daily	lead	1,014,500	intermittent	n/a	< 1,000
November	intermittent	n/a	< 1,000	daily	lag	335,000	daily	lead	1,014,500
December	daily	lead	1,014,500*	intermittent	n/a	< 1,000	daily	lag	335,000

Intermittent use is designated for maintenance of lead or lag well and or associated equipment.

\* Estimated 2,025,750 monthly demand for peak months.

DEPARTMENT OF ENVIRONMENTAL QUALITY  
WATER DIVISION  
PERMIT APPLICATION FEE  
EFFECTIVE JULY 1, 2002

INSTRUCTIONS

Applicants for individual Virginia Pollutant Discharge Elimination System (VPDES), Virginia Pollution Abatement (VPA), Virginia Water Protection (VWP), Surface Water Withdrawal (SWW), and Ground Water Withdrawal (GWW) Permits are required to pay permit application fees except farming operations engaged in production for market. Fees are also required for registration for coverage under General Permits except for the general permits for sewage treatment systems with discharges of 1,000 gallons per day (GPD) or less and for Corrective Action Plans for leaking underground storage tanks. Except for VWP permits, fees must be paid when applications for permit issuance, reissuance or modification are submitted. Applicants for VWP permits will be notified by the DEQ of the fee due. Applications will be considered incomplete if the proper fee is not paid and will not be processed until the fee is received.

The permit fee schedule is included with this form. Fees for permit issuance or reissuance and for permit modification are included. Once you have determined the fee for the type of application you are submitting, complete this form. The original copy of the form and your check or money order payable to "Treasurer of Virginia" should be mailed to the Department of Environmental Quality, Receipts Control, P.O. Box 10150, Richmond, VA 23240. A copy of the form and a copy of your check or money order should accompany the permit application. You should retain a copy for your records. Please direct any questions regarding this form or fee payment to the DEQ Office to which you are submitting your application.

APPLICANT NAME: NORTHAMPTON COUNTY SSN/FIN: 54-6001468  
ADDRESS: CLERK OF THE WORKS DAYTIME PHONE: 1757-678-1282  
P.O. BOX 1227 Area Code  
EASTVILLE, VA 23347  
FACILITY/ACTIVITY NAME: NORTHAMPTON COUNTY GOVERNMENT CENTER  
LOCATION: THE HORNES, EASTVILLE, VA  
TYPE OF PERMIT APPLIED FOR  
(from Fee Schedule): GWW PERMIT FOR NEW/EXPANDED WITHDRAWAL  
TYPE OF ACTION: ☒ New Issuance ☐ Reissuance ☐ Modification  
AMOUNT OF FEE SUBMITTED  
(from Fee Schedule): \$6000.00  
EXISTING PERMIT NUMBER (if applicable): \_\_\_\_\_

DEQ OFFICE TO WHICH APPLICATION SUBMITTED (check one)

- |  |  |  |  |   |
|--|--|--|--|---|
| <input type="checkbox"/> Abingdon/SWRO | <input type="checkbox"/> Harrisonburg/VRO      | <input type="checkbox"/> Kilmarnock/KO | <input type="checkbox"/> Woodbridge/NVRO               | <input type="checkbox"/> Lynchburg/SCRO |
| <input type="checkbox"/> Richmond/PRO  | <input type="checkbox"/> Richmond/Headquarters | <input type="checkbox"/> Roanoke/WCRO  | <input checked="" type="checkbox"/> Virginia Beach/TRO |   |

FOR DEQ USE ONLY

Date: \_\_\_\_\_  
DC #: \_\_\_\_\_

Original Form and Check - DEQ Accounting Office  
Copy of Form and Copy of Check - DEQ Regional or Permit Program Office

■ ■ ■ ■  
ARCHITECTS  
ENGINEERS

206 WEST MAIN STREET  
SALISBURY, MD 21801  
PH: 410.742.3115  
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AMANDA H. POLLACK, PE  
MARTIN D. DUSBIER

JERRY KOTRA  
RONALD L. NOBLE  
C. RICHARD ROHM

October 11, 2005

Virginia Department of Environmental Quality  
Tidewater Regional Office  
5636 Southern Blvd.  
Virginia Beach, VA 23462

Attn: Henry L. Ghittino  
Groundwater Permits Group Leader

Re: Northampton County Government Complex  
GMB Project No. 2002124C  
Ground Water Withdrawal Permit Application GW 0049700

Dear Hank:

Kindly reference your comment letter dated September 12, 2005 for the referenced project. I apologize for the delay in getting back to you, but Steve Kvech, who wrote the permit application, has moved from the area and I needed to get his input on a few of the items.

Concerning your comments on Section 5 – Justification for the Amount of Withdrawal Requested, I offer the following responses:

1. The unit demands for staff were based on the absolute minimum allowed in the Virginia Department of Health. Visitor flows were estimated based on one trip to the restroom facilities for each visitor. Projected flows for inmates were based on historical data from prison complexes in Princess Anne and Hagerstown, Maryland. Although most of the services provided in the complex were previously supplied by the Town of Eastville, we believe that historical data would not accurately reflect the projected use. The existing buildings are old, do not have any low flow fixtures, and are inefficient. The proposed buildings in the new Government Complex have low flow fixtures.
2. We have modified the permit application and monthly demand computations by adding additional information about "peak" monthly demands. We have computed the peak monthly demand by adding 50% to the average monthly demand. This should allow for some more flexibility in operating the system. For the yearly total, then, we have assumed that there will be two months of the year that require the additional demand.
3. We have modified the proposed well pumping schedule to match the projected annual average demand. We have added notes concerning potential peak monthly flows.

File  
w/ water  
File

RECEIVED  
10/20/05

Concerning your comments regarding Section 13 – Water Conservation and Management Plan, please see the following document that can then be attached to the Permit Application.

Please insert the enclosed revisions in the appropriate sections of the application.

As we discussed, I look forward to your comments on the aquifer test plan.

Please contact me at 410 742 3115 with any questions or concerns.

Sincerely,



Steve Marsh, P.E.

CC: ✓Northampton County  
Attn: Jim Chapman, Clerk of the Works (w/ encl.)

### **WATER CONSERVATION AND MANAGEMENT PLAN.**

Proposed buildings are being designed and constructed in accordance with the Uniform Statewide Building Code. Water saving fixtures in the restroom facilities are specified throughout the complex. All urinals in the proposed Courthouse, Social Services Building and Eastern Shore Regional Jail are low consumption type with 1.0 gallons per flush. All water closets are low consumption type with 1.6 gallons per flush.

A significant percentage of total water use for the site is in the proposed Jail, where water usage can be electronically controlled in case of mandatory water use restrictions. Duration and frequency of showers, restroom flushes, and sink use can be electronically controlled.

There are no irrigation sprinklers on the site. Wastewater on site undergoes tertiary treatment for nitrogen removal and is directed to a subsurface disposal system, thereby recharging the water table (unconfined) aquifer. Currently, other than the subsurface disposal wastewater system, there is no potential for water reuse on site.

Prison staff will be trained on the use of the electronic controls of the water system. The inmates' use of water will likely be minimized by the staff rather than through their own efforts. As such, water use training and education programs will focus on the staff.

Concerning water loss reduction, there are no irrigation sprinklers on site. County staff can check water meter records to see if a leak has gone undetected. The plumbing fixtures for the prison are rated as vandal proof, but because of their potential for damage, the facilities will be checked continuously by prison staff for leak detection.

Any mandatory water use reductions during water shortage emergencies declared by the local governing body or the Director of DEQ will be followed, with the understanding fines will be issued for non-compliance. Because there are no irrigation sprinklers on-site, and because the prison staff has the direct ability to control water usage electronically, the government complex should have an easier time meeting mandatory water use reductions than many other locations.

Mike Thornes  
Director Public Works  
Northampton Co,  
P.O. Box 66  
Eastville, VA 23347



# COMMONWEALTH of VIRGINIA

ROBERT B. STROUBE, M.D., M.P.H.  
STATE HEALTH COMMISSIONER

Department of Health  
OFFICE OF DRINKING WATER  
SOUTHEAST VIRGINIA ENGINEERING FIELD OFFICE

830 SOUTHAMPTON AVENUE, ROOM 2058  
NORFOLK, VIRGINIA 23510-1001  
PHONE (757) 683-2000  
FAX (757) 683-2007

SUBJECT: NORTHAMPTON COUNTY  
Water - Northampton County Government Complex  
PWSID: 3131554

## Source Water Assessment

Ms. Katherine H. Nunez, County Administrator  
Northampton County  
P. O. Box 66  
Eastville, VA 23347

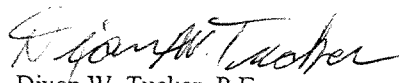
Dear Ms. Nunez:

The Southeast Virginia Field Office of the Virginia Department of Health, Office of Drinking Water has completed a Source Water Assessment for your waterworks. Attached you will find a copy of the assessment. Please take a few minutes to look over your copy. The availability of the Source Water Assessment Report is the first step in assisting in the preparation of a Source Water Protection Program (SWPP). The Virginia Department of Health is available to provide technical assistance to waterworks in developing a SWPP for your waterworks. Please contact me if you have any questions concerning this assessment. Please note that the susceptibility class assigned is relative and not intended to be a definitive determination.

This waterworks is classified as a community waterworks, the following information from the Source Water Assessment must be included in the next and subsequent Consumer Confidence Report issued by the waterworks with a brief summary of the susceptibility to contamination of each drinking water source.

"The Virginia Department of Health conducted a Source Water Assessment of the Northampton County Government Complex Waterworks in 2006. The first well (Well 1) was determined to be of low susceptibility to contamination using the criteria developed by the state in its approved Source Water Assessment Program. The assessment report consists of maps showing the Source Water Assessment area, an inventory of known Land Use Activities utilized at Land Use Activity Sites in Zone 1, Susceptibility Explanation Chart, and Definitions of Key Terms. The report is available by contacting your waterworks system owner/operator at the phone number and/or address listed in this document."

Sincerely,

  
Dixon W. Tucker, P.E.  
District Engineer

 KMH/DWT/mw  
Enclosure

pc: VDH - Office of Drinking Water

R:\DIST22\Northampton\Northampton Gov Cmplx\SWAP\SWA owner letter.doc

**VIRGINIA DEPARTMENT OF HEALTH  
SOURCE WATER ASSESSMENT REPORT**

DATE: February 13, 2006  
PWSID: 3131554  
WATER: Northampton County Government Complex  
OWNER: Northampton County  
SUBJECT: Northampton County  
TYPE: Community

For the source serving the subject waterworks this report includes, map(s) showing the source water assessment area (divided into Zones 1 and 2 with Zone 1 having greater influence on the source), an inventory of known Land Use Activities of Concern and Potential Conduits to Ground Water within the assessment area, a rudimentary determination of its relative susceptibility to contamination, and documentation of any known contamination within the last 5 years. Information in this report is provided to aid in efforts toward Source Water Protection.

The Source Water Assessment of the subject waterworks has yielded the following results:

Source Name	Relative Susceptibility to Contamination	Explanation
Well 1	Low	Properly constructed ground water source located in an area that tends to inhibit contaminant migration, is protected with an appropriate aquitard, and has had no known detection of contamination within the last 5 years with potential conduits to ground water in the Zone 1 assessment area

The criteria utilized for placement into a particular susceptibility class is included on the attached Source Water Susceptibility Determination Form (Form A or Form A2). Explanations for selection of a susceptibility class are included on Chart A. The susceptibility class is not intended to be a definitive determination. A list of definitions of key terms used in this report is included on Chart B.

There are Potential Conduits to Ground Water] located in Zone 1 for Well 1. The Potential Conduits to Ground Water are shown in Zone 1 and inventoried on the "Potential Conduits to Ground Water Inventory Form (Form F)" for this source.

No Land Use Activities of concern or Potential Sources of Contamination are known to exist in Zone 1 and Zone 2 for the source.

There has been no known contamination of the source within the last 5 years.

The source waters for this waterworks have been categorized in accordance with the following table:

Source Name	Source Water Type
Well 1	Ground Water

Based on the source type, the following assessment area delineation has been assigned in accordance with the guidance of the Virginia Source Water Assessment Program and are shown on the attached maps prepared for each source:

Ground Water Assessment Area

- Zone 1 = 1000-foot fixed radius surrounding source
- Zone 2 = 1-mile fixed radius surrounding source and outside of Zone 1

**VIRGINIA DEPARTMENT OF HEALTH  
SOURCE WATER ASSESSMENT REPORT**

The following attachments are part of this report (one for each source):

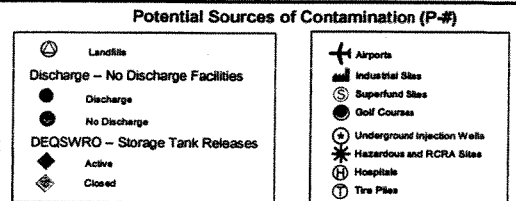
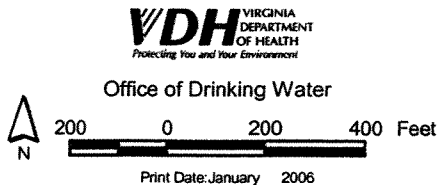
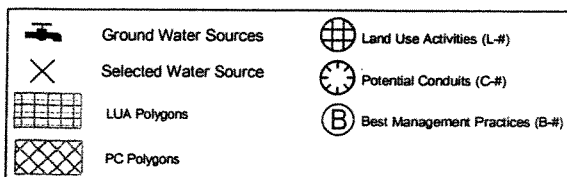
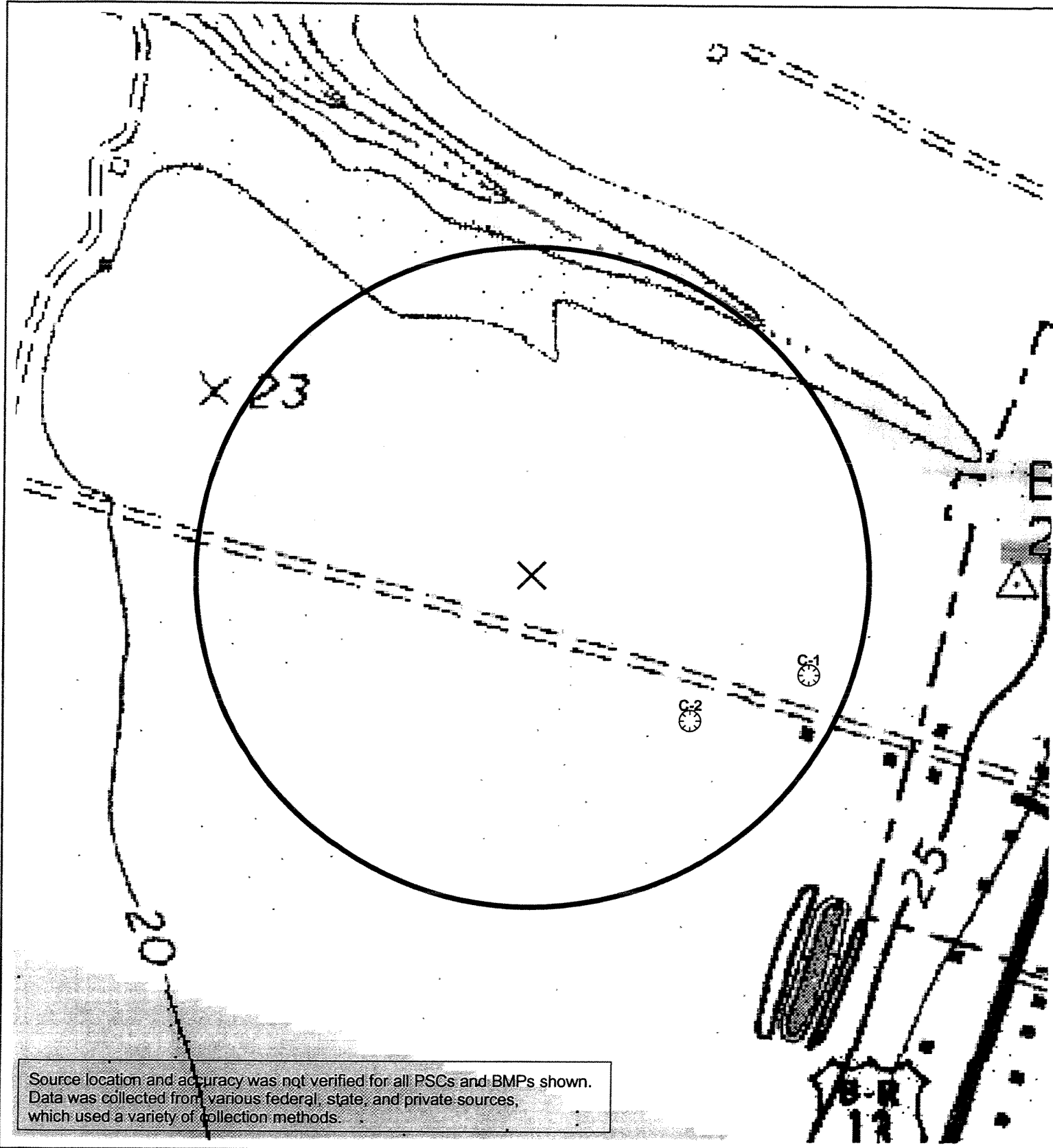
- ☒ Assessment Area Map(s)
- ☐ Source Water Susceptibility Determination Form (Form A)
- ☒ Ground Water Coastal Plain Source Water Susceptibility Determination Form (Form A2)
- ☒ Known Contamination Documentation Form (Form B)
- ☐ Potential Sources of Contamination in Zones 1 and 2 Form (Form D)
- ☐ Ranking of Land Use Activity and Potential Sources of Contamination Form (Form E)
- ☐ Area Features Documentation Form (Form E2)
- ☒ Potential Conduits to Ground Water Inventory Form (Form F)
- ☐ Best Management Practice Documentation Form (Form G)
- ☒ Chart A (Susceptibility Explanations)
- ☒ Chart B (Key Definitions)



PWSID: 3131554  
FACILITY: WELL 1  
WATERWORKS: NORTHAMPTON COUNTY GOVERNMENT COMPLEX

# SWAP Zone 1 Map

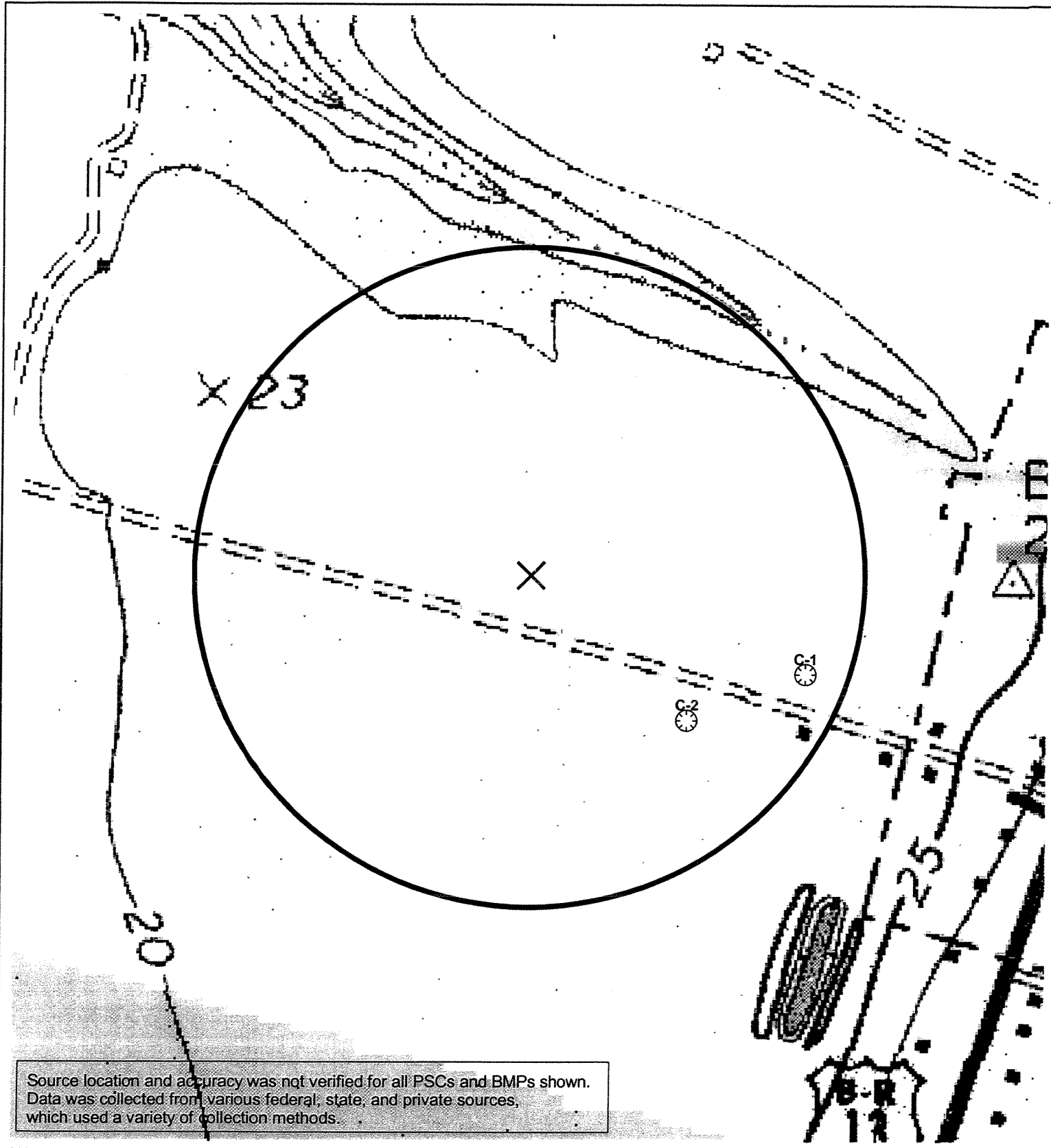
ISTRICT 22  
COUNTY/CITY: NORTHAMPTON



PWSID: 3131554  
 FACILITY: WELL 1  
 WATERWORKS: NORTHAMPTON COUNTY GOVERNMENT COMPLEX

# SWAP Zone 1 Map

DISTRICT 22  
 COUNTY/CITY: NORTHAMPTON



	Ground Water Sources		Land Use Activities (L-#)
	Selected Water Source		Potential Conduits (C-#)
	LUA Polygons		Best Management Practices (B-#)
	PC Polygons		

VIRGINIA DEPARTMENT OF HEALTH  
 Protecting You and Your Environment  
 Office of Drinking Water

200 0 200 400 Feet  
 Print Date: January 2006

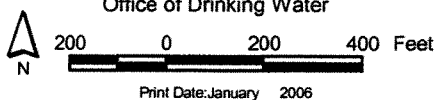
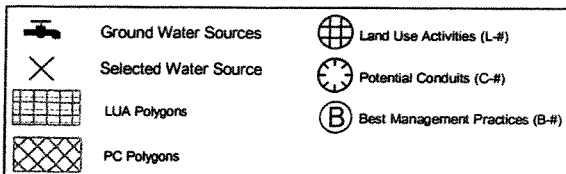
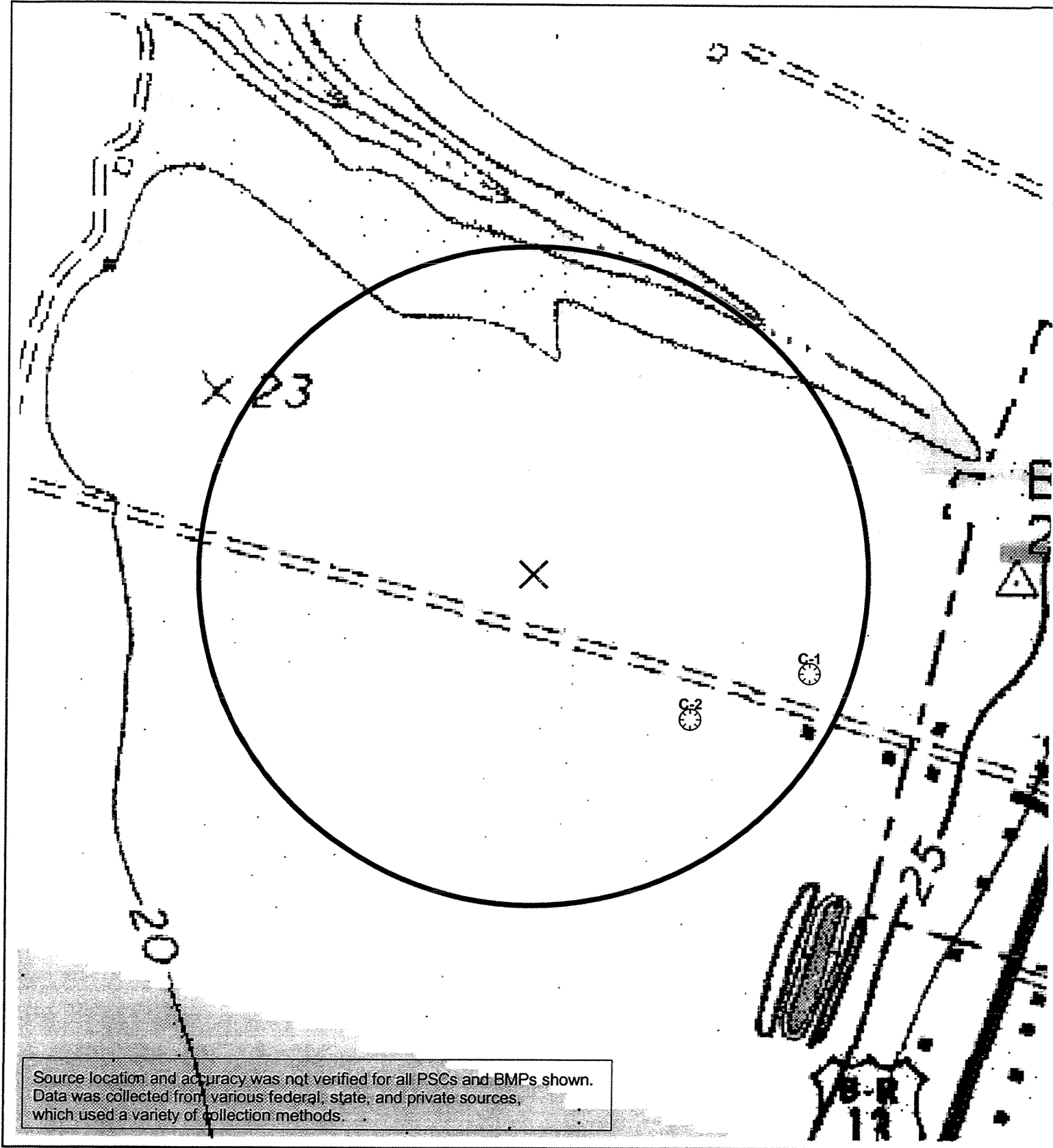
**Potential Sources of Contamination (P-#)**

 Landfills Discharge - No Discharge Facilities  Discharge  No Discharge DEQSWRO - Storage Tank Releases  Active  Closed	 Airports  Industrial Sites  Superfund Sites  Golf Courses  Underground Injection Wells  Hazardous and RCRA Sites  Hospitals  Tire Piles
--	---

PWSID: 3131554  
FACILITY: WELL 1  
WATERWORKS: NORTHAMPTON COUNTY GOVERNMENT COMPLEX

# SWAP Zone 1 Map

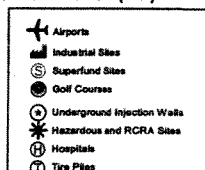
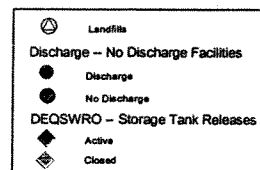
DISTRICT 22  
COUNTY/CITY: NORTHAMPTON



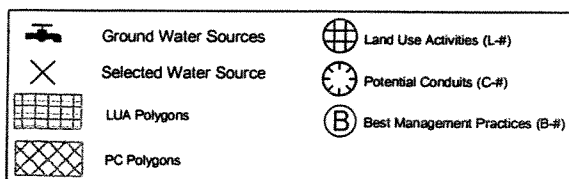
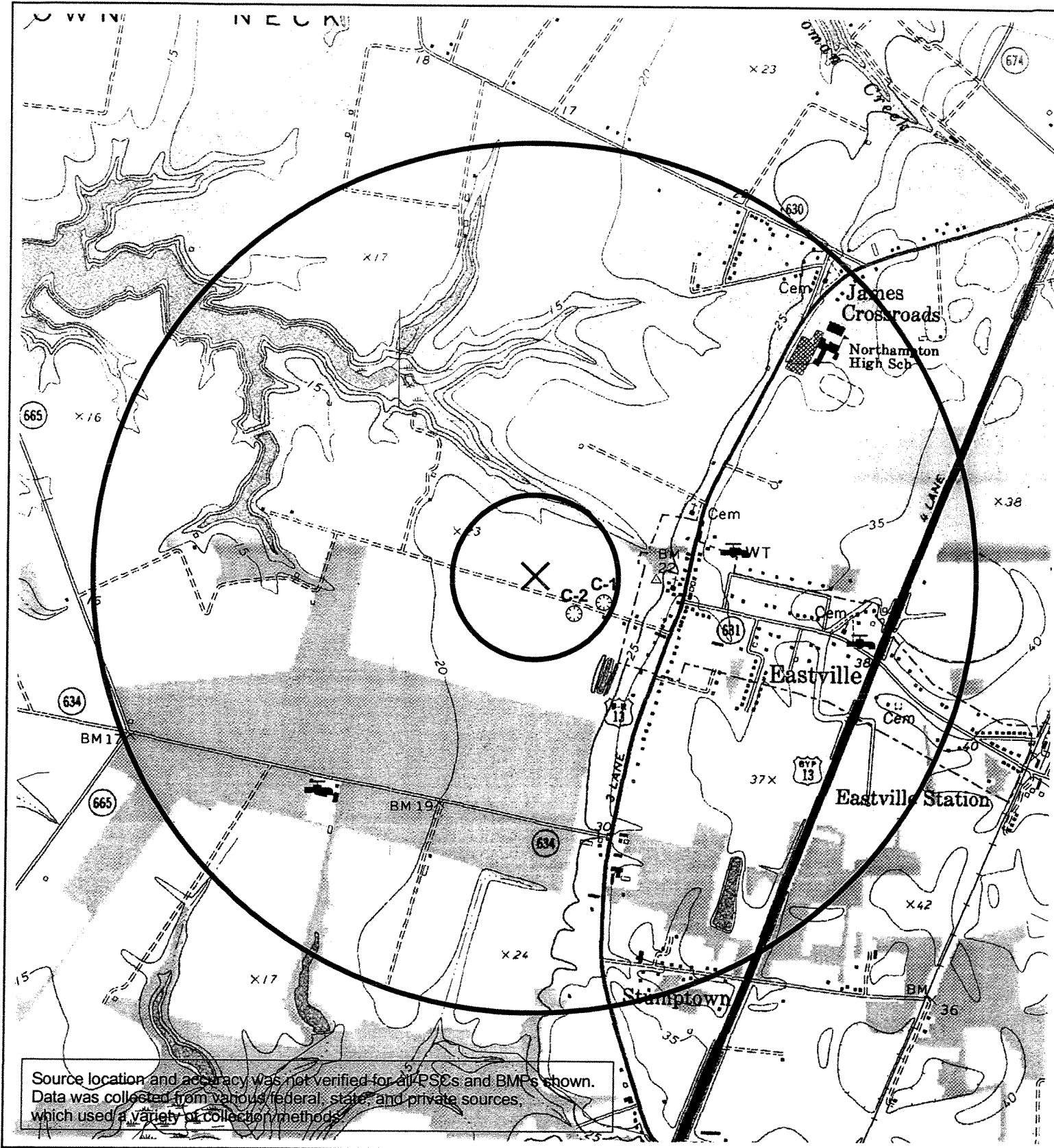
**VDH** VIRGINIA  
DEPARTMENT  
OF HEALTH  
Protecting You and Your Environment

Office of Drinking Water

## Potential Sources of Contamination (P-#)



# SWAP Zone 2 Map



800 0 800 1600 Feet

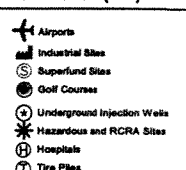
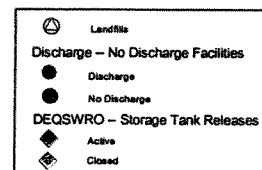


Print Date: January 2006

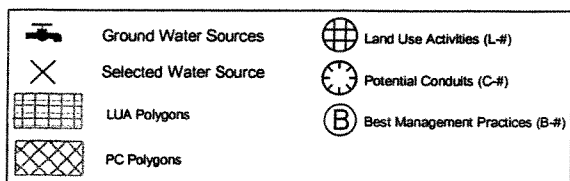
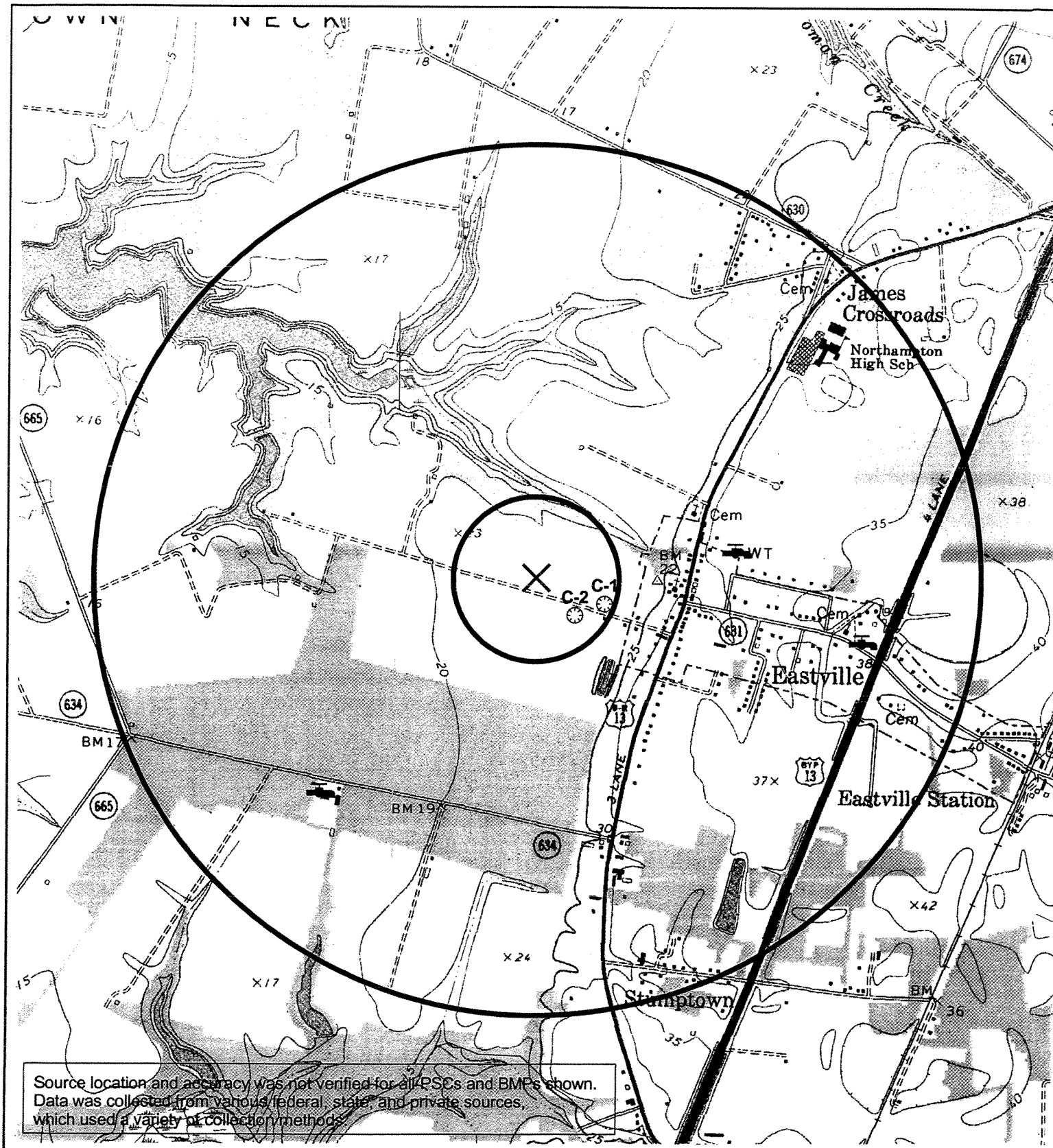
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 OF HEALTH  
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Office of Drinking Water

## Potential Sources of Contamination (P-#)



# SWAP Zone 2 Map



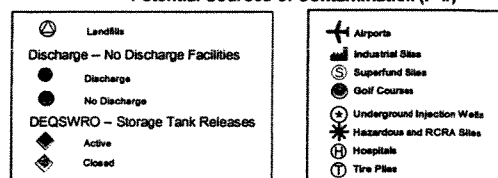
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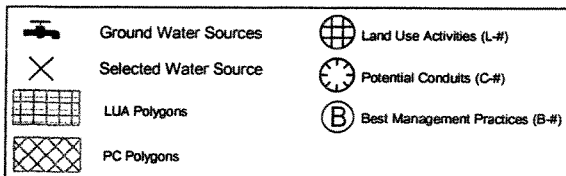
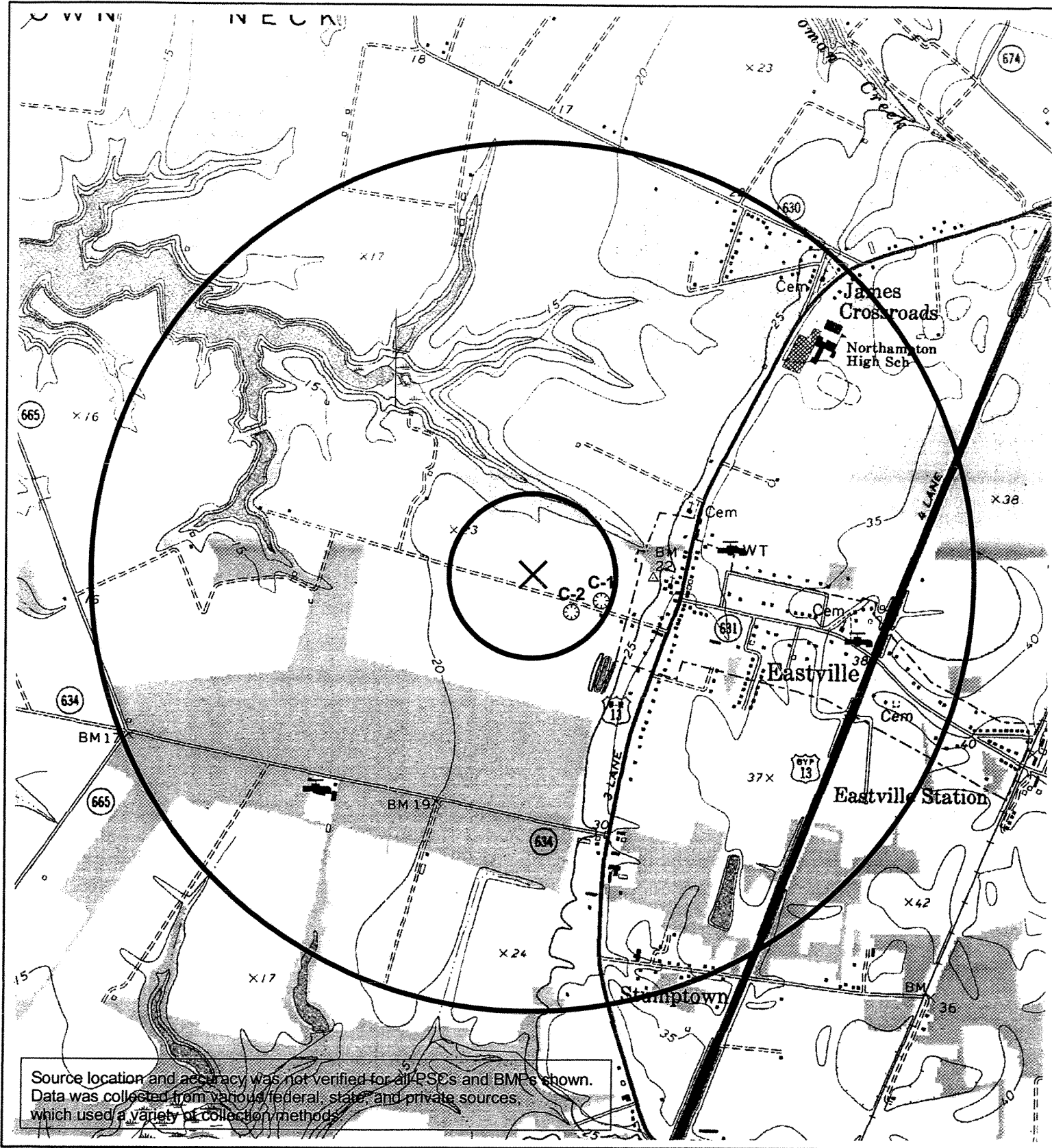
Office of Drinking Water

Print Date: January 2006

## Potential Sources of Contamination (P-#)



# SWAP Zone 2 Map



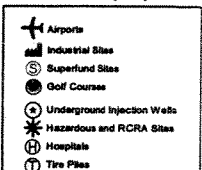
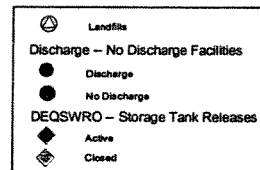
800 0 800 1600 Feet

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 OF HEALTH  
*Protecting You and Your Environment*

Office of Drinking Water

Print Date: January 2006

## Potential Sources of Contamination (P-#)





## Ground Water Coastal Plain Source Water Susceptibility Determination ( Form A2 ) Appendix A-2

## Waterworks:

**Waterworks:**  
NORTHAMPTON COUNTY GOV'T COMPLEX

**PWSD#:**

**Facility:**

Evaluated by: MARY MARONE Date: 12/19/2005

**Date:**

te: 12/19/2005

Reviewed by:

1: C. W. Tucker

**Date:**

2-15-6

	CIRCI E ANSWER
Step	Complete Entire Worksheet

1	Is the source a Class IIB (or better) well constructed in accordance with the Waterworks Regulations?	YES	NO
		<input checked="" type="radio"/>	<input type="radio"/>

2	Does a well driller's log, the U.S. Geological Survey Aquifer Susceptibility Study, or an independent geologic study clearly indicate that an aquitard is present within the first 100 ft. below surface elevation and depth of well screen is greater than 100 ft. deep? If unknown, answer 'NO'.	YES	NO
---	--	-----	----

	YES (If any are)	NO (If both are)
<p><b>Answers to Step 3 should be based on knowledge that presence is due to a non naturally occurring situation.</b></p> <p>Is the geometric mean &gt; 3 TC/100 ml in 20 or more source (raw) water samples collected in the last 5 years?</p> <p>Have fecal coliform been detected in 2 or more source samples collected in the past 5 years?</p>		

4	Does the most recent sanitary survey confirm that the source construction conforms to the construction standards of the Waterworks Regulations?	YES	NO
---	---	-----	----

**Answers to Step 5 should be based on knowledge that presence is due to a non naturally occurring situation.**  
Has a nitrate concentration  $> 5$  mg/L been detected in the past 5 years?

	(If any are) YES	(If none are) NO
5 Has a nitrite concentration > 0.5 mg/L been detected in the past 5 years?		
Has a combined Radium 226 and Radium 228 concentration > 5 pCi/L in 2 or more samples been detected in past 5 years?		
Has detection of Uranium > 30 µg/L in 2 or more samples been detected in past 5 years?		
Has detection of any VOC		

6	Has detection of any VOC contaminant exceeded the PMCL in 2 or more samples in the past 5 years?	YES
7	Have any SOC/VOC contaminants (excluding TTHM's) been detected in the past 5 years?	NO

	YES	NO
List detected contaminant(s) and sample dates on Form B List of Known Contamination Documentation Form.		
[Source <u>IS</u> Sensitive if answered 'NO' to one or more of the following steps: 1, 2, and 4 Source <u>IS</u> Sensitive if answered		Go to step 8

8	'YES', to one or more of the following steps: 3, 5, or 6.]	Sensitive
	[Source <u>IS NOT</u> Sensitive if answered 'YES' to all of the following steps: 1 2 and 4 and 'NO' to steps 3 5 and 6.]	Not Sensitive

9	Determine the susceptibility of the source by completing the chart below. Work from left to right across the rows.
For Completion	3-337

<u>Sensitive Source</u>	Do any identified PCs (Other Wells in Use or Abandoned Wells) to Ground Water penetrate the aquitard referred to in Step 2? If unknown, answer 'Yes'.	<u>Susceptibility</u>
for Sensitive Ground Water sources, does a LUA exist in Zone 1 or does a PSC exist in Zone 1 or 2?		

		Very Low

	YES →	Low
NO →		
YES →		

YES →			
YES →	YES →		
	NO →		
	YES →		
		YES →	

Moderate

[illegible]

<b>VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER</b>			
<b>Known Contamination Documentation Form (Form B) APPENDIX 15B</b>			
<b>County/City:</b> <u>NORTHAMPTON</u>	<b>Waterworks:</b> <u>NH COUNTY GOV'T COMPLEX</u>	<b>PWSID#:</b> <u>3131554</u>	<b>Facility:</b> <u>WELLS</u>
<b>Compiled by:</b> <u>MARTY MALONE</u>	<b>Date:</b> <u>12/20/2005</u>	<b>Reviewed by:</b> <u>[Signature]</u> <b>Date:</b> <u>2-15-06</u>	
<b>Where applicable, circle 'yes' or 'no'. Note: listing is based on last 5 years of data</b>			
<b><u>MICROBIAL CONTAMINATION</u></b>			
a. Has a geometric mean determination for 20 or more total coliform samples been conducted in the past 5 years? <u>YES</u> <input checked="" type="radio"/> NO <input type="radio"/>			
b. Does the geometric mean exceed 3 col./100 ml? If 'yes', what was the geometric mean? <u>col./100 ml: NO</u>			
c. Have fecal coliform bacteria been detected in 2 or more samples collected in the past 5 years? YES <input checked="" type="radio"/> NO <input type="radio"/>			
d. If 'yes', list the laboratory sample identification number(s) and sample collection date(s): <u>N/A</u>			
<b><u>NITRATE CONTAMINATION*</u></b>			
a. Has the nitrate concentration in any sample collected in the past 5 years exceeded 5 mg/L? YES <input checked="" type="radio"/> NO <input type="radio"/>			
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and nitrate concentration(s):			
c. Was the 10 mg/L MCL exceeded? YES <input checked="" type="radio"/> NO <input type="radio"/>			
<b><u>NITRITE CONTAMINATION*</u></b>			
a. Has the nitrite concentration in any sample collected in the past 5 years exceeded 0.5 mg/L? YES <input checked="" type="radio"/> NO <input type="radio"/>			
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and nitrate concentration(s):			
c. Was the 1 mg/L MCL exceeded? YES <input checked="" type="radio"/> NO <input type="radio"/>			
<b><u>SOC/VOC CONTAMINATION*</u></b>			
a. Have any SOC/VOC contaminants been detected in the past 5 years? YES <input checked="" type="radio"/> NO <input type="radio"/>			
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s), SOC/VOC contaminant(s) and SOC/VOC concentration(s) under line 'c'.			
c. Was any SOC/VOC MCL exceeded? YES <input checked="" type="radio"/> NO <input type="radio"/> If yes, circle samples which exceeded the MCL.			
<b><u>RADIUM 226 AND RADIUM 228 CONTAMINATION*</u></b>			
a. Has a combined Radium 226 and Radium 228 concentration exceeded 5 pCi/L in 2 or more samples collected in the past 5 years? YES <input checked="" type="radio"/> NO <input type="radio"/>			
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and Radium 226 and Radium 228 concentration(s) under line 'c'.			
c. Was the Radium 226 and Radium 228 MCL exceeded? YES <input checked="" type="radio"/> NO <input type="radio"/> If yes, circle samples which exceeded the MCL.			
<b><u>URANIUM CONTAMINATION*</u></b>			
a. Has detection of Uranium > 30 µg/L in 2 or more samples been detected in the past 5 years? YES <input checked="" type="radio"/> NO <input type="radio"/>			
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and calculated uranium concentration(s):			
c. Was the Uranium MCL exceeded? YES <input checked="" type="radio"/> NO <input type="radio"/> If yes, circle samples which exceeded the MCL.			
<b><u>INORGANIC CHEMICAL CONTAMINATION*</u></b>			
a. Has any inorganic chemical contaminant in any sample collected in the past 5 years equaled or exceeded its' respective PMCL? YES <input checked="" type="radio"/> NO <input type="radio"/>			
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and contaminant concentration(s):			

\*Contamination refers to situation whereby source quality was degraded by human activity.



## Potential Conduits to Groundwater Inventory Form (Form F)

County/City: NORTHAMPTON      Waterworks: NORTHAMPTON COUNTY GOVERNMENT      PWSID#: 3131554      Facility: WELL 1  
COMPLEX

Compiled by: Marty Malone      Date: 12/19/05      Reviewed by: Dixon W. Tucker      Date: 2-15-06

Map ID #	Type of Conduit	Estimated Distance from Well (feet)	Comments
C-2	Caves/Sinkholes	640	small sinkhole
C-1	Ponds, streams	873	Pond (Stormwater Retention)

# Chart A

## Susceptibility Classes

Susceptibility	Explanation
Very low	Properly constructed ground water source located in an area that tends to inhibit contaminant migration, is protected with an appropriate aquitard, and has had no known detection of contamination within the last 5 years with no land use activities of concern or potential conduits to ground water in the Zone 1 assessment area nor potential sources of contamination in the Zone 1 or Zone 2 assessment areas
Low	Properly constructed ground water source located in an area that tends to inhibit contaminant migration, is protected with an appropriate aquitard, and has had no known detection of contamination within the last 5 years with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area[and][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]
Moderate	[choose] [Ground water source constructed in an area that tends to promote migration of contaminants] [or] [Ground water source located in an area that tends to inhibit contaminant migration but unprotected [choose] [because of unknown or inadequate well construction][and][by an appropriate aquitard] [or] [Properly constructed ground water source located in an area that tends to inhibit contaminant migration in which contaminants have been detected within the last five years] [or] [Ground water source located in an area that tends to inhibit contaminant migration but an identified potential conduit to ground water penetrates the aquitard in the assessment area]
High	[choose] [Ground water source constructed in an area that tends to promote migration of contaminants with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]] [or] [Ground water source construction is unknown or inadequate with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area][and][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]] [or] [Ground water source located in an area that tends to inhibit contaminant migration but is unprotected [choose] [because of unknown or inadequate well construction][and]by an appropriate aquitard with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area][and][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]] [or] [Ground water source located in an area that tends to inhibit contaminant migration in which contaminants have been detected within the last five years] with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area[and][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]
Moderate	[choose] [Surface water] [or] [Ground water under the direct influence of surface water source] exposed to an inconsistent array of contaminants at varying concentrations due to changing hydrologic, hydraulic and atmospheric conditions with no land use activities or potential sources of contamination of concern in the Zone 1 assessment area
High	[choose] [Surface water] [or] [Ground water under the direct influence of surface water source] exposed to an inconsistent array of contaminants at varying concentrations due to changing hydrologic, hydraulic and atmospheric conditions with land use activities or potential sources of contamination of concern in the Zone 1 assessment area .

## Chart B: Definitions of Key Terms

Aquifer:	A water bearing geological unit that will yield water to wells or springs.
Aquitard:	An underground confining bed of earthen material that retards, but does not prevent, the flow of water between adjacent aquifers.
Best Management Practices:	Practices utilized by the owner and/or operator of land use activities in attempts to reduce or eliminate contamination of the environment.
Community Waterworks:	A waterworks which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
Confined or Nonsensitive Aquifer:	An aquifer that is bounded by impervious confining layers both at the top and the bottom. Also referred to as an artesian aquifer.
Contaminant:	Any chemical element or compound or cause of change in physical properties that renders water unfit for a given use. In the subsurface, this may be thought of as the presence of any chemical element or compound at a level and in a form that may cause damage to human or environmental receptors.
Delineation:	The process of defining or mapping a boundary that approximates the areas that contribute water to a particular water source used as a public water supply. For surface waters, the land area usually consists of the watershed for a reservoir or stream. For ground water sources, the boundary typically approximates the surface area that contributes water to the aquifer.
Ground Water:	Water that is found below the surface, which has accumulated in pore spaces of geologic material.
Ground Water Under the Direct Influence of Surface Water:	A ground water with (i) significant occurrence of insects, microorganisms, algae, or pathogens, or (ii) significant and relatively rapid shifts in water characteristics which closely correlate to climatological or surface water conditions. The Virginia Department of Health designates a ground water source meeting certain conditions as a Ground Water Under the Direct Influence of Surface Water in accordance with 12 VAC 5-590-430 of the <i>Waterworks Regulations</i> .
Identified Flowing Surface Leaking Source: verified	<p>A surface water stream that enters the ground water by flowing into a sinkhole, through the bottom of a stream bed, or by other means and which has been</p> <p>through tracer or other studies to reemerge from the ground as a spring of through a well; or which flows beneath broken rubble (which is strewn down the side of a mountain) with openings to the atmosphere and which is collected at a 'springbox'</p>
Impoundment Source Intake:	A raw water intake that feeds from a surface water consisting of a reservoir or other type of impoundment.
Land Use Activity:	An activity that stores, uses, or produces chemicals or biological pathogens and that have the potential to release such contaminants within the source water assessment area.

## Chart B: Definitions of Key Terms

Non-Community Waterworks:	A waterworks that is not a community waterworks but serves any 25 or more persons for 60 or more days per year.
Non-Tidal Source Intake:	A raw water intake that feeds from surface water that is not influenced by tidal action and possesses a stream flow, which travels downgradient.
Non-Transient Non-Community Waterworks:	A waterworks that is not a community waterworks but that regularly serves at least 25 of the same persons for 6 months or more per year.
Potential Conduits to Ground Water:	A fracture, sinkhole, drilled hole, well or any type of conduit through the ground that has the potential to carry surface water or surface runoff directly into a ground water.
Potential Sources of Contamination:	A land use activity whose presence and location have been identified in selected state, federal, or private databases during the assessment.
Raw Water Intake:	The suction intake that draws water from a surface water source for use as a public water supply.
Sensitivity:	The relative ease, with which a contaminant applied near the land surface, or to the subsurface, can migrate to the delineated source water area.
Source Water Assessment:	An assessment to provide information on the potential contaminant threats to the water source(s) of a waterworks and the susceptibility of those sources to contamination.
Surface Water:	Water open to atmosphere and subject to receiving surface runoff.
Susceptibility to Contamination:	The determined classification (or rating) of the susceptibility of a source to contamination based on its sensitivity and the presence of land use activities of concern, potential sources of contamination, or potential conduits to ground water (for ground water sources only) within the assessment area. This classification is not intended to be definitive.
Tidal Source Intake:	A raw water intake that feeds from a surface water that is influenced by tidal action resulting in a stream flow that travels in either direction based on the rise or fall of moon or wind driven tides.
Upgradient:	The directions from a source in which ground elevation rises with distance. Opposite is downgradient. Water will flow downgradient.
Watershed:	A topographical area that is within a line drawn connecting the highest points uphill of a drinking water intake or otherwise known area of recharge from which overland flow drains to a water supply intake.

VIRGINIA DEPARTMENT OF HEALTH  
ENGINEERING DESCRIPTION SHEET

DATE: September 15, 2005

WATERWORKS NAME:	Shore Memorial Hospital	CERTIFIED CLASS: IV
COUNTY/CITY:	Northampton County	TYPE: Community
LOCATION:	This waterworks is located on Hospital Avenue (State Route T-681) approximately 1/4 mile west of Lankford Highway (U.S. Route 13) in Nassawadox, Virginia.	
OWNER:	Shore Memorial Hospital P.O. Box 17 Nassawadox, Virginia 23413-0017 C/O Mr. Richard Brvenik, President (757) 414-8765 Fax 757-414-8614	
OPERATOR:	Mr. Maurice Chandler Water/Wastewater Plant Operator P.O. Box 17 9507 Hospital Avenue Nassawadox, Virginia 23413-0017 Phone: (757) 414-8796 Fax at wastewater lab 757-442-5720	
PERMIT NO.:	3131550	
DATE ISSUED:	September 15, 2005	
TYPE OF TREATMENT:	Chlorination and corrosion control	
SOURCE:	2 Wells	
DESIGN CAPACITY:	173,200 GPD	

DESCRIPTION OF WATERWORKS

The waterworks consists of two wells, a ground storage tank, an elevated tank, a hydropneumatic tank, booster pumps, two liquid chlorination systems, two corrosion control metering systems, appurtenances, and the distribution system.

Well No. 1 (Nursing Home Well, Old Hospital Well, DEQ number 165-025 or the Tower Well) has no construction information available on file. It was drilled starting on an unknown date. Information from DEQ indicates that the depth is 304 feet, with an unknown depth of grout. The material of the well casing is unknown. We don't have information on the location of the screens. DEQ indicates that the well is screened in the Upper, Middle and Lower Yorktown-Eastover aquifers. The size of the screen openings is unknown. The existence of a gravel pack is unknown. The well is equipped with a turbine pump (driven by a 15 H.P. motor) rated at 150 gpm. The well yield and drawdown are unknown. This well is located near the 75,000-gallon elevated tank and routinely supplies water to the Nursing Home, School of Nursing, Daycare, Renal Dialysis, and the new addition to the hospital building. However, this well can supply water to some of the hospital during an emergency.

Well No. 2 (Hospital Well, DEQ number 165-001 or Pressure Tank Well) was drilled starting on December 6, 1968, and the well was completed on February 13, 1969. The well bore is 305 feet deep, with cement grout extending from the surface to 75 feet. The 18-inch diameter outer casing is grouted with cement. An 8-inch well casing extends from 1.5 feet above ground to 159 feet. A 6-inch well casing extends from 170 to 305 feet with 6-inch (30 slot) screens set at

depths 160-170, 218-238, 271-286 and 296-301 feet. The well is equipped with a turbine pump (rated at 175 gpm at an unknown TDH) driven by a 30 H.P. motor. The well has a tested yield of 175 gpm, over a 12-hour period (from February 10, 1969 to February 11, 1969) with the water level dropping from 21 feet (static condition) to 139.4 feet (dynamic condition). This part of the system operates at a higher pressure than the Tower system.

Storage is provided by a 75,000-gallon elevated tank, a 10,000-gallon (effective capacity 8,272 gallons) ground storage tank and a 10,000-gallon (effective capacity 3,333 gallons) hydropneumatic tank. Duplicate booster pumps, each rated at 220 gpm at 155 feet TDH transfer water from the 10,000-gallon ground tank to the 10,000-gallon hydropneumatic tank. The booster pumps are provided with alternating and lead/lag controls.

Raw water MPN sampling indicates that the source water does not require disinfection. Chlorination is practiced for distribution system protection.

The Department of Environmental Quality has issued a Groundwater Withdrawal Permit (No. 0047900 covering this waterworks. Shore Memorial Hospital is entrusted with resource use responsibilities via that permit, and is advised to be aware of any compliance requirements of that permit

## EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERCs). One ERC will utilize 400 gallons per day. This system's capacity is evaluated as follows:

### I. Source Capacity

#### A. Source Yield

##### 1. Number of Sources

- a. Required = 1 up to 49 ERCs, more than 1 for 50 or more ERCs
- b. Provided = 2 wells

2.	Yield:	<u>Well Number</u>	<u>Well Yield (gpm)</u>	<u>Pump</u>	<u>Observed</u>
		1	Unknown (use 150)*	150	130
		2	<u>175</u>	<u>175</u>	190
		Total = 325		Total = 325 gpm	

\* Grandfathered in, we do not have the original yield data.

325 gpm \* 1,440 minutes / day = 468,000 gallons per day (gpd)

B. Production Capacity:  $\frac{325 \text{ gpm}}{0.5 \text{ gpm/ERC}} = 650 \text{ ERCs}$

650 ERCs \* 400 gpd/ERC = 260,000 gpd

II. Booster Pump Capacity

A. Total Pumping Capacity =  $220 + 220 = 400$  gpm (assume)

B. Capacity =  $Q = 11.4 N^{0.544}$   
 $400 \text{ gpm} = 11.4 N^{0.544}$   
 $N = 692 \text{ ERC}$

$$692 \text{ ERC} * 400 \text{ gpd/ERC} = 276,800 \text{ gpd}$$

III. Storage Capacity

A. Total Storage =  $75,000 \text{ gal.} + 8,272 \text{ gal.} + 3,333 \text{ gal.} = 86,605 \text{ gallons}$   
Elevated      Ground      Pressure      Total

B. Storage Capacity =  $\frac{86,605 \text{ gallons}}{200 \text{ gal./ERC}} = 433 \text{ ERCs}$

$$433 \text{ ERCs} * 400 \text{ gpd/ERC} = 173,200$$

IV. Limiting Case

A. Storage Capacity = 433 ERCs

B. Capacity Equivalent =  $433 \text{ ERCs} * 400 \text{ gpd/ERC} = 173,200 \text{ gpd}$

Therefore, based on the critical values discussed above, this waterworks is issued an operation permit for a design capacity of 173,200 gpd.

DWT/mw



# LARGE NON-AGRICULTURAL SELF-SUPPLIED WATER USERS



**MALCOLM  
PIRNIE**





# Bayshore Concrete Products



**MALCOLM  
PIRNIE**

**APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT**  
**BAYSHORE CONCRETE PRODCUTS CORPORATION, CAPE CHARLES, VIRGINIA**

**ATTACHMENT (Section 5).**

JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED

*Nature of Activity Utilizing Water and Documentation of Beneficial Use*

The Bayshore Concrete Products Corporation is primarily engaged in the manufacturing of structural concrete components. Items such as elevated bridging girders, cylindrical piles, and slabs. The facility manufactures its concrete products using a wet batching method. The standard industrial classification (SIC) code for this operation is 3272 (also NAICS 327390). Nearly all of the withdrawn water is used for production at the facility; water is used as an ingredient within concrete as well as a curing agent (steam accelerated curing). The remainder is used for other facility uses such as equipment wash out, aggregate cooling and area cleaning. The plant produces concrete at variable rates from year to year, so estimates of average annual quantities produced will also vary. A line diagram depicting the flow of water through the facility is attached for reference. The nature of these activities and the beneficial use are described below.

Concrete Ingredient This facility utilizes multiple aggregate and cements, which are varied by need. In general; aggregate materials (sand, stone, and gravel) are hauled to the facility by local suppliers and dumped into each of their respective holding bins until used. The aggregate components are to some extent, stored in bins atop of the mixer as well as assembled in the mixing cylinder directly. Cement and fly ash are brought to the facility by truck or rail and stored in their respective silos. This facility utilizes two, four cubic yard Eirich counter-current intensive mixers as a portion of the fully automated batching system manufactured by Erie-Strayer. Water added to the mixer is furnished by the facilities groundwater wells. The added water is temperature controlled using either geothermal unit or water heater.

Plant Wash Water Different washing processes utilize water at the plant. Compared to other concrete facilities, the washing practices at BCP are kept to a minimum. The main washing functions are mix-hopper washing and hauling-truck cleanout. In general: water is used to wash the mixers and are than emptied into a front loader, which transports the water to the settling basins/treatment area. Also, the trucks used to transport aggregate are rinsed at this same wash out basins. Water is withdrawn from well #3 to replenish the facilities aggreate wash-out basin.

Landscape Irrigation The facility does not practice any landscape irrigation.

There is no municipal water supply that may be used in lieu of groundwater. There is no adequate onsite source of surface water that can be used. Groundwater has been historically withdrawn at this facility for the documented beneficial industrial use.



### *Water Demand Projections and Justification of Withdrawal Request*

The Bayshore plant produces a variable amount of concrete per year. BCP, Inc. management has reviewed the current operation, water demand, and economy as it pertains to current operation and plans for future expansion of the facility. This review led to a projection of water needs over the next 10-years and the realization that the current permitted withdrawal is adequate to meet those demands. The following paragraphs outline the projected needs relative to the beneficial use described above.

Production at this facility is first and foremost limited by its Air Permit, which limits production to 270,000 tons per year. This is equivalent to approximately 133,333 Cubic yards per year. Year-to-year production volumes are a function of contractual obligations rather than by active marketing. Bayshore Concrete Products typically operates as a contracted entity. As such, their year-to-year production volume may fluctuate greatly. For example: in 2000, BCP, Inc. employed about 450 employees and produced 107,000 cubic yards of concrete products in support of the JFK elevated roadway project, resulting in a total withdrawal of 18.5 MG. In 2002, the facility only produced 50,000 cubic yards, resulting in a withdrawal of 11.5 MG.

In general, BCP, Inc. makes finished concrete products that are created onsite and assembled elsewhere (Piles, Bridge beams, and deck slabs). Bayshore Concrete Products differs from other ready-mix plants in that they actively cure their products to accelerate the engineered finished strengths in order to meet and/or exceed off-site construction deadlines. To achieve this acceleration, steam booths are used as temporary storage and curing stations. More water is used for steam than as an ingredient in concrete.

Calculation of unit-based water demand is complex. There are numerous variables that can contribute to the equation. Each finished product that BCP makes differs in initial water consumption. There are multiple shapes and sizes that the facility generates; as such, the water required for each product is different. The size of each product created requires different curing times; however, the design specifications of each piece created may have specific requirements dictated by the project engineer.

Considering the average groundwater withdrawn and the volume of produced concrete, the average unit-based rate of groundwater consumption (including water as a concrete ingredient, curing, cleaning, washing, and dust suppression and staff support) is approximately 200-gallons/cy. This rate is based on consumed groundwater and does not include the volume of recycled and reused water.

Due to anticipated demand for concrete from the facility, expansion of facility capacity is variable, however should not exceed the facilities permitted limit. The facility is expected to experience variable monthly production. Rates of concrete production could double from the current rate depending upon the contracted need. Current permitted withdrawals are sufficient to supply the water necessary for this demand and forecasted demand. Based upon current unit-based groundwater usage, the facility could produce as much as 135,000 cubic yards. Therefore the current permitted

volume of 27,000,000 gallons is sufficient withdrawal to anticipate the maximum extent of future operations.

Annual and monthly maximums are not likely to be sustained year over year do to the nature of this facility. A lump-sum permit would be able to provide the necessary volume of water. The apportionment table below is modeled on the facilities peak production. As such the table provides an annual maximum total of 27.00 Million gallons per year and 3.00 Million gallons per month.

The proposed lump sum volumes previously determined by the DEQ shall be used in conjunction with the Maximums discussed in this section. The volumes are as follows:

TERM	Annual Maximum	Monthly Maximum
1 Maximum Year	20.00 MG / 20.00 MG	3.00 MG
3 High Use Years	16.00 MG / 48.00 MG	3.00 MG
6 Nominal Years	13.00 MG / 78.00 MG	3.00 MG
Total 10-year Volume	<b>146.00 MG</b>	

These amounts reflect the actual usage over the previous permit period in conjunction with maximums that could be experienced if maximum demand/production is experienced.



The permitted yield will be produced from eleven of 13 existing production wells. Wells #2, 5b are out of service. Wells #8, #9, #10 do not exist. Review the following table for more information on apportionment.

<sup>1</sup> APPORTIONMENT OF WITHDRAWALS	Well #1	Well #3	Well #4	Well #5	Well #5c	Well #6	Well #7	Well #10a	Well #10b	Well #11	Well #12	<sup>3</sup> Totals
Schedule	<sup>2</sup> M – PRN											
January	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	2.25 MG
February	202,500 gal	315,000 gal	103,500 gal	270,750 gal	270,750 gal	450,000 gal	562,500 gal	288,750 gal	288,750 gal	22,500 gal	225,000 gal	3.00 MG
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Annual <i>Estimated Usage</i>												27.00 MG/YR
<sup>1</sup> Estimates of projected maximum water use in gallons. Actual use will vary. <sup>2</sup> M-PRN = monthly withdrawal pumped as needed. <sup>3</sup> Numbers rounded for simplicity.												

**APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT**  
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Total 10-year Volume	<b>153.00 MG</b>	

These amounts reflect the actual usage over the previous permit period in conjunction with maximums that could be experienced if maximum demand/production is experienced.



*Apportionment of Withdrawal to Individual Wells (at maximum withdrawal)*

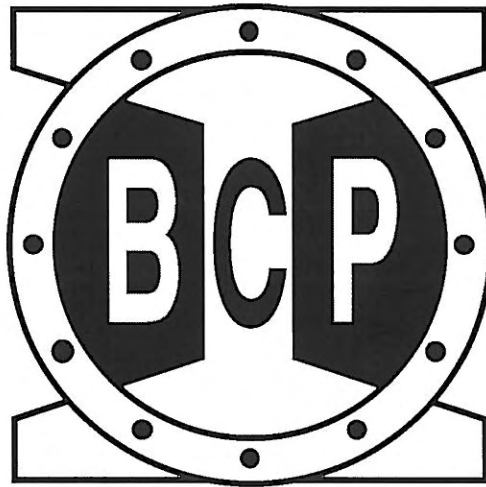
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Annual Estimated Usage												27.00 MG/YR
<sup>1</sup> Estimates of projected maximum water use in gallons. Actual use will vary.												
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# **GROUNDWATER CONSERVATION AND MANAGEMENT PLAN**

**APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT:  
SECTION 13 ATTACHMENT**

BAYSHORE CONCRETE PRODUCTS INCORPORATED  
1134 BAYSHORE ROAD  
CAPE CHARLES, VIRGINIA 23350



CAPE CHARLES, VIRGINIA  
MARCH, 2007

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2.0	WATER DEMAND .....	2
3.0	WATER SUPPLY .....	3
4.0	WATER CONSERVATION MEASURES .....	4
5.0	WATER MANAGEMENT MEASURES.....	5

## ***1.0 GENERAL INFORMATION***

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Bayshore Concrete Products, Inc., herein referred to as the “facility”, is an industrial concrete fabrication manufacturer located in Cape Charles, Virginia. The standard industrial classification (SIC) code for this operation is 3272. 100% of the water withdrawals are used to support production and the staff.

Normal operation of the facility typically requires annual withdraws of variable amounts of groundwater that is withdrawn from its twelve production well and one geothermal well. Because this property is located within the Eastern Shore Groundwater Management Area – as defined by the Virginia Department of Environmental Quality [VDEQ] – a Water Conservation and Management Plan has been prepared in accordance with the Ground Water Management Act of 1992, Chapter 25 (§62.1-254 et seq.) of Title 62.1 of the Code of Virginia. The purpose of this document is to analyze water supply and demand issues facing the facility and develop a reasoned and justifiable response for water conservation and management. This document is intended to help guide the facilities management with respect to its responsibility for the operation and policy management decisions. Lastly, this document will meet the permit requirement by VDEQ for a water conservation and management plan. Water conservation measures are those physical facilities, equipment, or devices utilized with certain methods, techniques, policies, practices, and procedures, which reduce water consumption, improve water use efficiency, reduce water loss or waste, increase water recycling or reuse and ultimately result in a reduction of water demand. Water management consists of a plan to implement water conservation measures.

This Water Conservation and Management Plan, referred to herein as the “Plan” includes identification of water demand and water source and then provide guidance to implement water management and conservation measures.

## ***2.0 WATER DEMAND***

---

Water demand for the facility is driven by a concrete production. There are limited opportunities to conserve water wherever it is used and can be managed. The following paragraphs describe the water demand by reviewing the facilities use of it.

The water that is used in production is withdrawn directly from twelve on-site production wells (two of which are emergency stand-by wells). The water is directed through a series of filters, heaters, tanks, boilers, conditioners or any combination of the aforementioned. A significant percentage of the water withdrawn is heated to create steam. As such, less water is directed to waste management than is actually withdrawn.

The total maximum monthly consumption of groundwater from the target aquifers over the permitting period is 3.0 million gallons (MG), while the annual total over that duration will not exceed 27.0 MG as these values are maximums that could be expected over the lifetime of the facilities 146 Million Gallon lump Sum permit period. The month-to-month water use is nearly flat in terms of distribution. The facility does not appear to have increased consumption during any particular months of the year.

### ***3.0 WATER SUPPLY***

---

The following section presents a general overview of water resources available to the facility. There is no municipal supply pipeline from the Town of Cape Charles. All production water is withdrawn from the facilities wells.

Water need is a function of production demand. The facility operates at a variable rate, as their production demand is variable. The water withdrawn from the natural aquifer has been found to be of sufficient quality for continued use. Water withdrawals are on an as-needed basis and do not stagnate or remain in temporary storage for extended periods of time.

#### **4.0 WATER CONSERVATION MEASURES**

---

The following conservatory measures will be implemented with regard to the water supply including groundwater from the facilities' wells.

- No unnecessary groundwater withdrawal will be permitted.
- Facility management annually reviews water use and will implement changes where possible and practical to better manage water use and increase water conservation.
- Ground water withdraws are only implemented as needed.
- *Water Reuse Evaluation:* Due to the nature of use, significant reuse opportunities are limited. Due to the nature of production and the subsequent curing process, much of the withdrawn water cannot be reclaimed and reused. The sole reuse operation that is routinely practiced on-site is at the facilities washout basins. Water that is in the washout system is not discharged and new-water additions are derived from Well #3 as needed. The facility utilizes steam for accelerated concrete curing, most of the usable steam vapor is lost to the atmosphere during the curing process. Storm water is collected and used as Dust Suppression water as needed and if available. Bayshore Concrete will adopt other conservation (reuse/recycle) opportunities as technology develops.
- *Water Saving Plumbing and Processes:* Facility management has committed to the use of water saving plumbing, processes and fixtures where appropriate. All new or renovation construction involving the use of groundwater resources will include fixtures and equipment designed to conserve water use. Currently within the facility we are utilizing low-water usage toilets and bathroom fixtures in newer construction and where renovations have been completed.

## **5.0 WATER MANAGEMENT MEASURES**

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The following management measures will be implemented with regard to the water supply including groundwater from the facilities' wells:

- Water Loss Reduction:
  - (a) The facility conducts accurate monthly records review to discover excessive usage that may indicate a leak in the system or significant change in operations.
  - (b) The facility will conduct routine inspection of any above ground water piping systems and storage tanks for any indication of leaks. The Facility is obligated to repair any leaks that are discovered.
- Mandatory water use restrictions will be implemented during water shortage emergencies declared the local governing body, the Director of DEQ, or the Governor. The facility will comply with penalties for demonstrated failure to comply with mandatory water use restrictions.
- Water saving plumbing and processes will be implemented in accordance with the Uniform Statewide Building Code when upgrades to these systems are made. These items include, but are not limited to:
  - Water saving plumbing such as 0.5 GPM faucets and 1.6 GPF toilets
  - Steam reclamation technologies as they become available
  - Increased stormwater retention/collection for enhanced dust suppression



- The Facility functions with water use education program for all field staffers and is to be reviewed and adhered to. As the majority of the water use is actually automated through the batching computer and curing requirements, it shall be generally accepted that the management directs the water use. Water use education shall be accomplished utilizing the existing weekly training sessions with the workforce, with dedicated sessions occurring annually. Components of the water use education include:
  - Withdrawn water is not used for general equipment cleaning and maintenance.
  - Withdrawn water is not to be used for irrigation.
  - Withdrawn water is only to be consumed from the source that has been approved by the Virginia Department of Health.

**CONSERVATION AND MANAGEMENT PLAN  
EMPLOYEE EDUCATION PROGRAM**

BAYSHORE CONCRETE PRODUCTS INCORPORATED  
1134 BAYSHORE ROAD  
CAPE CHARLES, VIRGINIA 23350



CAPE CHARLES, VIRGINIA  
OCTOBER, 2007

## TRAINING OBJECTIVES:

- Identify the requirement for water conservation.
- Recognize Water Efficiency Improvement Best Management Practices.
- Identify restricted uses
- Practice in water conservation
- Report leaks

### Identify the requirement for water conservation.

Bayshore Concrete Plant is located within the Eastern Shore Groundwater Management Area (GWMA). A region is designated as a GWMA when there is the concern that potential demands on ground water resources may not be sustainable. In compliance with the Ground Water Management Act of 1992 when an individual user of ground water, whether an agricultural, industrial or municipal user, withdraws over 300,000 gallons per month must have a permit to withdrawal water from the Virginia Department of Environmental Quality. BCP must maintain and preserve this right to use this resource and is obligated to actively analyze water supply issues and develop a plan for proactive water conservation and management.

The water that is used in production is withdrawn directly from the facilities network of production wells. The water is directed through a series of filters, heaters, tanks, boilers, conditioners or any combination of these processes to a user endpoint. **NOTE:** Water for human consumption may only be withdrawn from wells that have been approved by the Virginia Department of Health.

The maximum monthly consumption of groundwater permitted at BCP is 3.0 million gallons. Additionally, the total annual consumption must not exceed 27.0 million gallons.

### Recognize Water Efficiency Improvement Best Management Practices

The EPA has identified Water Efficiency Improvement Best Management Practices (BMPs) in ten possible areas. Of these ten areas identified for improvement, four are related to BCP operations. All related BMPs are implemented. These water efficiency BMPs are:

**Public Information and Education Programs** – BCP has a continuing education program to maintain awareness of water conservation. *Employees are required to attend training sessions and are encouraged to make suggestions that might lead to additional conservation of water resources.*

**Distribution System Audits, Leak Detection and Repair** – BCP conducts monthly

records reviews to discover excessive usage that may indicate a leak in the system or significant change in operations. Managers also conduct routine physical inspections of any above ground water piping systems and storage tanks for any indication of leaks. The Facility is obligated to repair any leaks that are discovered immediately. *Employees should report any and all water leaks to the appropriate manager when discovered.*

**Toilets, Urinals, and Faucets** - Facility management has committed to the use of water saving plumbing, processes and fixtures where appropriate. All new or renovation construction where appropriate will include fixtures and equipment designed to conserve water use.

**Miscellaneous High Water-Using Processes** - As the majority of the water use is actually automated through the batching computer it is generally accepted that the management already maintains efficient use of water for high-use-processes.

## **Water Reuse**

Due to the nature of BCP operations, opportunities to reuse water is limited as most process water used as a mix ingredient, lost to the atmosphere, or lost as steam vapor during the curing process. The sole reuse operation that is routinely practiced on-site is at the facilities washout basins. Water utilized in the washout system is recirculated within the basins for reuse. BCP will adopt other conservation (reuse/recycle) opportunities for water reuse, such as steam reclamation technologies, may be used as they become available.

## **Additional Water Conservations Measures**

Additional water use savings can be realized through the utilization of storm water and administrative policy to restrict non-beneficial and unnecessary utilization of water.

Storm water is collected and used for dust suppression as needed and if available. When upgrades to this system are made, attention to increasing onsite detention volume of storm water will be made in order to enhance dust suppression.

By administrative policy the following water uses are not authorized by BCP:

- Ground water is generally not used for daily equipment cleaning and wash down in work and curing areas unless safety is compromised.
- Ground water is not to be used for irrigation.
- Mandatory water use restrictions will be implemented during water shortage emergencies as declared by the Director of DEQ or by the Governor.



## Best Western Sunset Beach Resorts



**MALCOLM  
PIRNIE**

## Projected Water Use Evaluation

Attached are two evaluations prepared in support of the withdrawal request. The first evaluation was prepared in an effort to determine a factor "X" associated with use based on the demand centers at the facility described as the RV Park (X use per site) the Motel and Restaurant ( $1.3 * X$ ) and Pub use evaluated as \$10/food patron and \$7.50/beverage patron and a patron use of 5 gpd assumed.

For the evaluation the occupancy rates of the Motel and RV Park and the cash revenue for the pub were used to predict Room days and RV site days. Using the record water usage and subtracting anticipated pub use (based on receipts) a use figure for the motel and RV Park was then used to determine the X factor in gpd. The determination was made for 2003, 2004 and 2005. Based on the average "X" determined during the period a projected full occupancy determination was made. This full occupancy prediction used highest revenue for the pub of record and the average "X" to predict Motel + RV usage. The average "X" determined was 223.4 gpd. This represents the predicted gpd for an RV site and  $1.3 * 223.4 = 290.42$  is the predicted value for a room (REMEMBER THE RESTAURANT AND ALL OTHER ACCESSORY USES ARE LUMPED IN THIS VALUE). The full occupancy figure predicted a peak month of 1,077,560 gallons.

In an effort to predict an annual use figure, anticipated growth for the next 10 year period was assumed to be an occupancy of 65% for the motel and 55% for the RV Park on an annual basis. Pub use was projected based on an annual revenue of \$325,000.00.

Based on this analysis, an annual use which may be anticipated during the next 10 years was determined to be 7,646,624 gallons.

Since the above analysis was a bit confusing, a second evaluation was initiated. In the second evaluation an overall "occupancy rate" was evaluated. In this evaluation the reported occupancy rates were converted to daily rates – the number of rooms occupied per day by month and the number of RV Sites occupied by day per month. Since there are a total of 127 available (73 Rooms + 54 Sites) the overall % occupied was determined. Pub use was again evaluated based on revenue. A monthly use was assigned based on predicted patrons (determined from revenue breakdown) and a patron evaluated at 5 gpd.

The pub use was subtracted from the reported monthly usage (2003 – 2005 to date period) and a monthly use per % occupancy was determined.

Based on the historic occupancy record a "GOAL" occupancy by month was determined for the coming 10 year period. The prediction is an overall occupancy of 60%. To use the same "occupancy" or use figures for the pub, it was necessary to determine what might be a 100% Pub day – a revenue of \$2500/Day (or a water use figure of 1500 gpd) was used.

This overall occupancy "GOAL" determination resulted in a prediction of 6,859,070 gallons. To allow for potential expansion (possible expansion of RV Park) during the 10

year period a contingency of 10% was assumed. The contingency should also address any occupancy >60% overall or the addition of other special events similar to Harvest Fest. The predicted value is an annual use of 7,544,977 gallons with a predicted peak month of 1,093,399 gallons.

Both of the evaluations result in a potential annual value very close to the existing permitted value of 7,650,000 gallons. The request is thus for a continuation of the existing allowed withdrawal values (7.65 MG/Yr and a peak month value of 1.42 MG).

The predictions for the annual use requested are both below what may be the 100% potential of the facility. It is assumed that a reasonable occupancy goal should be adequate for the coming 10 years. The peak month is requested to be maintained at the current level so that "special" events which may be planned or scheduled would not result in a permit violation. The peak monthly usage value is not an expected "normal" occurrence however it is a figure that should allow the facility some leeway in its potential marketing efforts (reach 100% consistently for a period of time) or add additional festival or other special events at the site.

## **WATER CONSERVATION PLAN BEST WESTERN SUNSET BEACH RESORT**

Best Western Sunset Beach Resort includes a full service motel with 73 rooms and a 100 seat restaurant. In addition there is an RV park with 54 full service hookups on the property. The resort also has the Pelican Pub located on the beach which also serves food and beverages. There are outdoor recreation areas provided for the use of facility guests. The facility is served by a water system supplied by multiple wells. It is also noted that the facility is served by a wastewater treatment plant located on the property. The final step of the wastewater treatment plant is a terminal wetland which provides infiltration of the treated effluent into the ground.

In an effort to conserve water, the following measures have been taken at Best Western Sunset Beach Resort:

1. All plumbing modifications, additions or renovations will incorporate the use of water saving fixtures
2. Water usage is routinely monitored (daily meter readings) to allow an assessment of water usage, loss or leakage. In addition, since the facility is a commercial establishment, occupancy and facility usage is known. Water usage can be gauged based upon facility occupancy/patronage. Water loss or excessive usage can be determined based upon a noted high use not associated with high occupancy/patronage or a known water demand. All leaks are repaired when detected. The housekeeping staff monitors the motel rooms for faulty or problem plumbing (running toilets or dripping faucets). Problems are reported to the main desk and repairs are made to fixtures when a problem is noted. It would be difficult to rent a room with faulty plumbing.

If there is a system distribution problem exterior to the motel which requires repair that cannot be addressed by onsite staff, a local contractor is contacted and the repair scheduled for immediate attention.

3. Employees of Best Western Sunset Beach Resort have been instructed regarding water saving techniques. In particular, the grounds crew is encouraged to always use mechanical procedures when cleaning outside (sweeping, scraping, etc.) rather than water assisted methods. Similarly, maintenance at the STP should be performed using mechanical methods (skimming and scraping) as opposed to relying on a hose to ease operations. The Best Western Sunset Beach Resort water supply system is not routinely used for landscape watering. Minimal, landscape maintenance use of the onsite system is performed (spot reseedling of bare areas or infill planting). There is no routine irrigation of landscape features at the facility.



In the restaurant, conservation practices include washing full loads of dishes, providing water upon request and minimizing the use of "extra" dishes which have no beneficial purpose.

At the Pelican Pub, plastic/paper utensils and dishes are utilized for food/beverage service to customers.

The motel encourages guests staying more than one night to recycle towels. Guests are provided a card which indicates that towels may remain for reuse if desired. Guests may choose to elect this option if they desire.

A notice is posted behind the main desk indicating the facility is located in the Eastern Shore Ground Water Management Area and that water conservation practices are necessary.

During "festivals" which take place at the facility, portable toilets are utilized to reduce water consumption. The site has been provided with several areas for outdoor recreation for the enjoyment of guests which minimize reliance on the site water system (picnic/barbecue areas, beach, natural areas).

4. The primary use of water at Best Western Sunset Beach Resort is for domestic purposes associated with the operation of the motel, restaurant, RV park and Pub. As noted above, all of the wastewater from the facility is treated onsite in the facility STP which relies on the terminal wetland for final management. This is the only water reuse option currently available at the site. Water supplied to guests of the facility must conform to established Health Department criteria.
5. During water shortage emergencies declared by the local governing body or by the director of the Department of Environmental Quality, Best Western Sunset Beach Resort patrons will be notified that there is a water shortage emergency and that water use must be minimized. Customers will be asked to please shorten showers and to use water conservation practices.



# Cherrystone Family Camping Resort



**MALCOLM  
PIRNIE**

### **ATTACHMENT 3**

#### **METHODOLOGY FOR FLOW PROJECTIONS**

Total Year 2002 usage was 8.057 million gallons which will be used as historic usage. With 732 campsites this results in a usage of 11,000 gallons per year per campsite. The maximum month was July with a usage of 2.347 million gallons or 3206 gallons per campsite. These numbers are not accurate for any particular campsite as not all are occupied on any given day. Occupancy rates have been increasing in recent years and it is anticipated that over the next 10 years the occupancy rate will increase at least another 5%. Therefore, we will use  $11,000 \times 1.05 = 11,550$  gallons/campsite/year for future projection and  $3206 \times 1.05 = 3366$  gallons/campsite/month for the maximum month.

## ATTACHMENT 4

### ANTICIPATED WATER USAGE THROUGH 2012

There are presently 732 campsites. It is anticipated that some 200 additional sites of the "Pull Through" type will be added in the next few years. These types of sites are increasingly in demand but not currently available. Also, a new 70,000 gallon pool is anticipated which will require approximately 100,000 gallons per year accounting for evaporation and spillage.

#### Annual Usage

1.	Historic Usage	8,057,000 gal./yr.
2.	Unmetered Usage	169,000 gal./yr.
3.	Five (5) percent occupancy increase	402,850 gal./yr.
4.	200 new campsites @ 11,550 gal/yr. =	2,310,000 gal./yr.
5.	New Pool	<u>100,000 gal./yr.</u>
		11,038,850 gal./yr.
	Say	11,100,000 gal./yr.

#### Monthly Usage

1.	Historic Maximum Usage	2,347,000 gal./mo.
2.	Unmetered Usage	68,000 gal./mo.
3.	Five (5) percent occupancy increase	117,350 gal./mo.
4.	200 new campsites @ 3366 gal./mo.	673,200 gal./mo.
5.	New Pool	<u>100,000 gal./mo.</u>
		3,305,550 gal./mo.
	Say	3,310,000 gal./mo.



AUGUST 29, 2003

Erin Tisdale  
DEQ-TRO  
5636 Southern Blvd.  
Va. Beach, VA 23462

Dear Ms. Tisdale


Provided is a list of well apportionments we are submitting for your approval. We are requesting that wells 1 and 4 share the percentage shown. These two wells are to be rotated on a monthly schedule. Usually, one of the wells is held in reserve as a precautionary measure. If we were to have a well that needed repair or suddenly broke down, the other well could be placed into service while repairs were being made.

<u>Well number</u>	<u>Percentage</u>	<u>Million Gallons*</u>
1 & 4	32.9%	3 6519
2	63.0%	6 9930
3	.9%	.0999
5	.5%	.0555
6	.3%	.0333
7	.3%	.0333
8	1.4%	.1554
10	.3%	.0333 - clams
11	.4%	.0444
Totals:	100%	11 1000

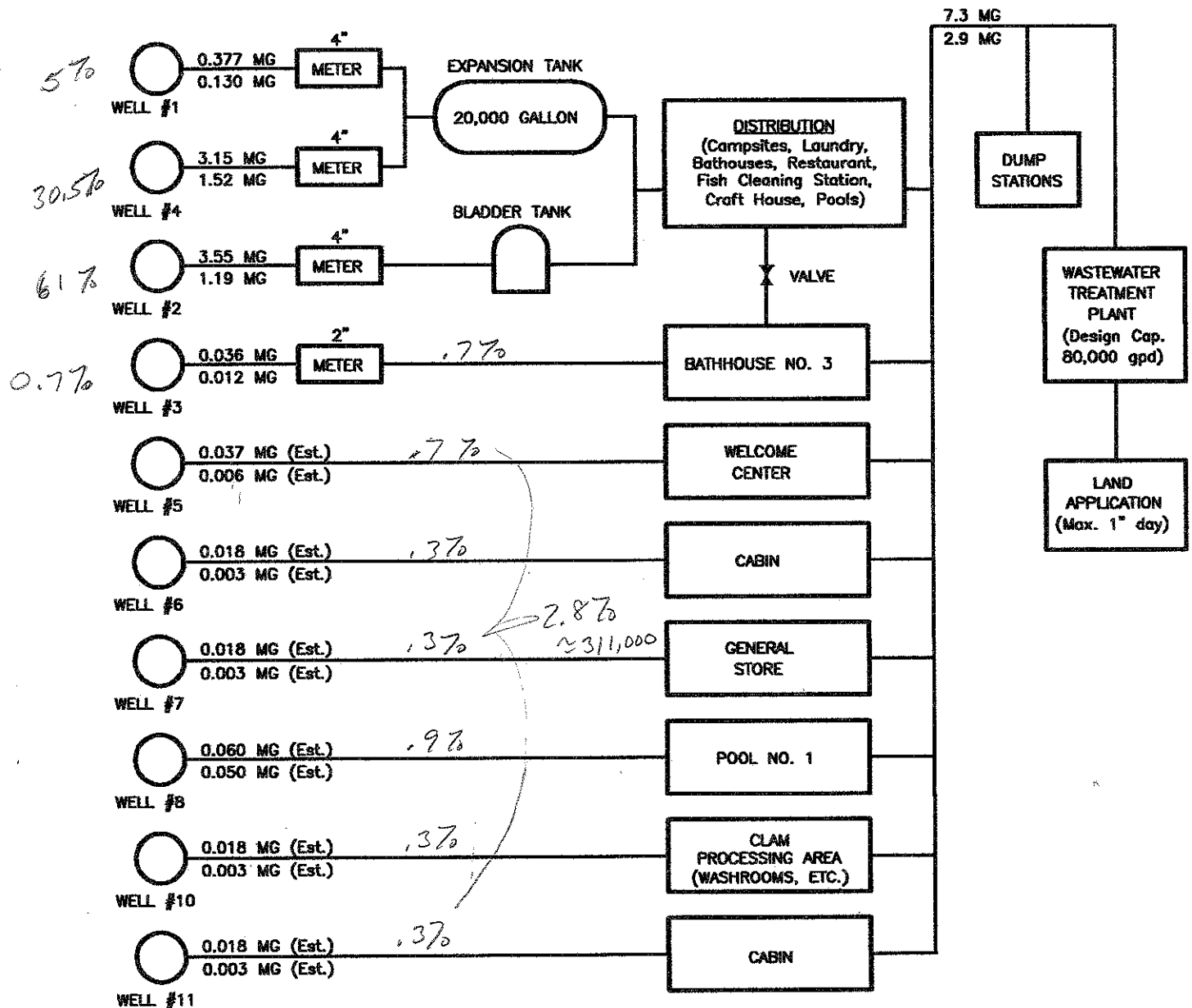
\*All figures shown are for yearly withdrawals. Monthly withdrawals will vary according to use and weather conditions.

I hope this report meets with your satisfaction and if you have any questions please feel free to call.

Sincerely,

  
James Hopkins  
General Manager  
Cherrystone Family Camping Resort

C:\Land Proj\40137 - CherryStone Expanded Use Permit\dwg\WATER FLOW LINE DIAGRAM.DWG, 5/28/03 1:39:53 PM, 1:1:2



### LEGEND

3.15 MG = MILLION GALLONS / YEAR  
1.52 MG = MILLION GALLONS / MAX. MONTH  
NOTE: FLOWS ARE FOR YEAR 2001

## CHERRYSTONE CAMPGROUND WATER FLOW LINE DIAGRAM



R. KENNETH WEEKS ENGINEERS  
2733 TIDEWATER DRIVE  
NORFOLK, VIRGINIA 23509

- Use of wells 1-4 has been corrected here.

**WATER CONSERVATION AND MANAGEMENT PLAN**

1. Use of Water Saving Plumbing and Processes

The use of water saving plumbing and processes including, where appropriate, the use of water saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code will be followed.

2. Water Loss Reduction Program

The water system will be visually inspected for leaks by full-time maintenance staff on a weekly basis. Monthly water meter readings will also be reviewed in terms of excessive withdrawal which may be indicative of a leak. If a leak is detected, that part of the water system will be shut down immediately and repaired. The staff will be instructed to note areas where changes will help to conserve water, or reduce losses. In addition, groundwater use will be audited during the first two years of the permit cycle and a leak detection and repair program will be implemented within one year of completion of the audit.

3. Line Replacement

Water line replacement in Area 1 has been completed. Area 2 water lines will be replaced over the next (5) years, or sooner if significant leaks are found. Remaining areas will be monitored and lines replaced if warranted.

4. Water Use Education Program

Employees will receive instruction as to the important of efficient water use and conservation methods during their orientation. Campers will also receive instruction concerning efficient water use and conservation upon arrival at the campground. Placards promoting water conservation methods will be posted in appropriate areas, and campers will be requested to promptly notify staff of any problems with the water system such as plumbing leaks or dripping fixtures.

5. Evaluation of Potential Water Reuse Options

There are no practical options for water reuse.

6. Requirements for Mandatory Water Use Reductions

The campground will comply with any mandatory water use reduction during water shortage emergencies declared by the local governing body or the Director of DEQ and with any penalties for failure to comply. This will include provisions of requirements for mandatory water use restrictions to seasonable and year-round employees, prohibiting all non-essential uses such as lawn and ornamental irrigation or vehicle washing at the campground.



## Kuzzens KMC Camp



**MALCOLM  
PIRNIE**



**APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT  
KUZZENS KMC CAMP, CHERITON – NORTHAMPTON COUNTY, VA**



**ATTACHMENT (Section 5)**

**JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED**

***Nature of Activity Utilizing Water and Documentation of Beneficial Use***

The Kuzzens KMC camp is located approximately three quarters of one mile east-northeast of the town Cheriton, Virginia and has been a camp since 1947. The property was originally owned by Webster and KMC canning. The camp has 11 dormitories, 1 crew leaders home, two combined laundry/bath houses, and 2 water supply/pump houses. The maximum capacity of the camp is 336. Expansion of the camp is not planned at this time.

***Data Acquisition and Reliability***

No sufficient data has been generated or is available at this facility. Actual consumption rates can not be calculated as there is no such data available. Flow totalizers have been installed but one occupancy season has yet to elapse. At the end of the 2007 season sufficient data will have been generated to establish a consumption rate.

Despite the lack of data, there are other facilities within the ESGMA area that have been evaluated and deemed acceptable for permitting. A value of 55 gallons per person per day was generated during that evaluation which had a need basis of 336 seasonal occupants. Although it would be ideal to have tangible data to address the specific demands generated at this facility, the aforementioned value of 55 gallons per person per day will be used. Permit #GW0004300 operates a 14 unit Migrant Labor Camp (MLC) which houses a maximum 336 migrants. Those 14 units at peak occupancy have been approved to withdrawal a total of 560,000 gallons per month. This equates to a per-occupant value of 55 gallons per occupant per day.

***Demand and Beneficial Use***

This camp houses migrant laborers six months per year. The facility is reported to begin occupancy in mid June and can be fully occupied through mid October. Occasionally, occupancy may extend into November or at the end of the agricultural season. During this time period, the maximum occupancy is approximately 336 individuals per week as the facility can only has 336 beds.

Water withdrawn at the camp is used for sanitary and domestic purposes. Water is used for food preparation, cleaning, bathing, drinking, and laundry. Water for personal irrigation is not permitted at this. There is no other water demand at this site.

Due to the previously mentioned lack of data a few assumptions must be made to calculate a reasonable demand volume. An evaluation of payroll records was made. There are 7 Labor Crews that routinely share the opportunity to utilize the KMC camp. The KMC camp is located in Cheriton it is centrally located to Kuzzen's operations. Because of this central location, the facility is chosen to be filled to occupancy before crew members are directed to other camps. Because of this, the KMC camp is the first to be used and the last to be vacated.

An evaluation of payroll records from the beginning of 2003 through 2007 was performed. Considering the abovementioned housing practice, a statistical method has been applied to the needs assessment. The attached calculation pages (Table 1.a and 1.b) have been included to demonstrate the occupancy need. The evaluation revealed the following information:

**Percentage Occupied by month:**

Month	Percentage Occupied	Crew Count
January	0 %	0
February	0 %	0
March	0 %	0
April	0 %	0
May	0 %	0
June	23.5 %	79
July	100 %	336
August	100 %	336
September	100 %	336
October	100 %	336
November	21.1 %	71
December	0 %	0

The specific day of occupancy can not be determined at the growing and picking seasons may be suppressed or accelerated due to climate variations. It will be assumed that the statistical percentages of occupancy begins on June 1 and ends on November 30.

The total days used for estimation is as follows:

	Days
June	15
July	31
August	31
September	30
October	26
November	15
Total	148

Each month's consumption rate can be calculated with the following formula:

$$55 \frac{\text{gallons}}{\text{per\_occupant\_per\_day}} * X \frac{\text{days}}{\text{month}} * Y_{\text{occupants}} = X \frac{\text{gallons}}{\text{month}}$$

	Days	Crew Count	Total consumption
June	15	79	65,175
July	31	336	572,880
August	31	336	572,880
September	30	336	554,400
October	26	336	480,480
November	15	71	58,575
Total	148		2,304,390

Based on these calculations the facility requires 2.30 million gallons per year with a maximum monthly withdrawal of 0.572 million gallons per month. The facility now operates two wells for this system. The newest well was installed to supplement the waning production of the original well and as a preventative measure in the event the aged well becomes irreparable. These two wells will be used in concert. Apportionment of these wells will be discussed on the following page.

#### Apportionment of Withdrawal to Individual Wells

As there is no withdrawal data available for this facility yet, the apportionment will be assumed to be 50% / 50%. This may be revised in the future as data is generated. \*

The apportionment table below depicts the contribution of withdrawal from each well.

\* Will be single well w/d - Well #1 to be ABN as

1 APPORTIONMENT OF WITHDRAWALS	Well #1 (DEQ #165-23)	Well #2 (DEQ #165-491)	Total
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	32,587	32,588	65,175
July	286,440	286,440	572,880
August	286,440	286,440	572,880
September	277,200	277,200	554,400
October	240,240	240,240	480,480
November	29,287	29,288	58,575
December	0	0	0
Annual Estimated Usage	1,152,195	1,152,195	2,304,390

\*\* Included herein is the 2003-2007 payroll inventory and Calculation tables

Year	Month	Crew 637	Crew 640	Crew 641	Crew 682	Crew 683	Crew 684	Crew 694
2003	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	0	0	0	0	0	0	0
	July	188	0	0	222	92	170	0
	August	172	0	0	124	122	130	0
	September	163	0	0	166	113	130	0
	October	134	0	0	128	106	160	0
	November	0	0	0	0	0	0	0
2004	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	98	108	0	0	76	82	0
	July	89	142	0	156	110	146	0
	August	103	135	0	110	181	185	0
	September	64	128	0	110	160	114	0
	October	0	65	0	104	153	64	0
	November	0	0	0	96	89	0	0
2005	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	0	0	0	0	0	0	0
	July	99	161	255	168	0	0	55
	August	143	89	206	139	0	0	0
	September	84	138	209	87	0	0	0
	October	0	103	163	93	0	0	0
	November	0	0	115	58	0	0	0
2006	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	0	0	33	0	0	0	0
	July	88	0	243	125	0	0	0
	August	90	0	190	126	0	0	0
	September	92	0	160	116	0	0	0
	October	85	0	156	65	0	0	0
	November	0	0	0	0	0	0	0
2007	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	0	0	0	0	0	0	0
	July	0	0	205	114	0	0	118
	August	0	0	183	112	0	0	110
	September	0	0	167	144	0	0	86
	October	0	0	120	206	0	0	45
	November	0	0	57	0	0	0	0

\*\* Transcribed from accounting records

## TABLE 1a. SITE OCCUPANCY

**VADEQ GROUNDWATER WITHDRAWAL**  
**Kuzzens KMC Migrant Labor Camp**  
 Cheriton, Virginia

## MSA, P.C.

ENVIRONMENTAL SCIENCES, PLANNING, SURVEYING  
 ENGINEERING & LANDSCAPE ARCHITECTURE



5033 ROUSE DRIVE  
 VIRGINIA BEACH, VIRGINIA 23462  
 (757) 490 - 9264 FAX (757) 490 - 0634  
[www.msaonline.com](http://www.msaonline.com)



DATE:  
 5/11/2007

SCALE:  
 Relative

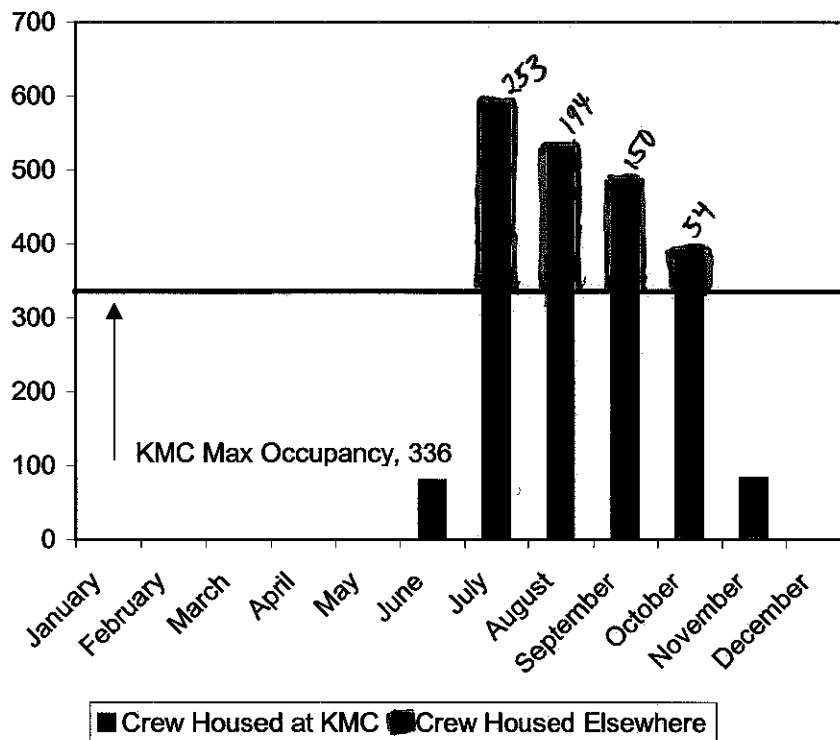
MSA JOB #:  
 02833C

### 5- Year Average

Year	Month	Total
2003	April	0
	May	0
	June	0
	July	672
	August	548
	September	572
	October	528
	November	0
2004	April	0
	May	0
	June	364
	July	643
	August	714
	September	576
	October	386
	November	185
2005	April	0
	May	0
	June	0
	July	738
	August	577
	September	518
	October	359
	November	173
2006	April	0
	May	0
	June	33
	July	456
	August	406
	September	368
	October	306
	November	0
2007	April	0
	May	0
	June	0
	July	437
	August	405
	September	397
	October	371
	November	57

	Total	KMC Occupancy	Overage	% Occupied
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	0	0	0	0
June	79	79	0	24%
July	589	336	253	100%
August	530	336	194	100%
September	486	336	150	100%
October	390	336	54	100%
November	83	71	12	21%
December	0	0	0	0

**Kuzzens Crew Totals 2003-2007 (Averaged)**



**TABLE 1b. SITE OCCUPANCY**

**VADEQ GROUNDWATER WITHDRAWAL  
Kuzzens KMC Migrant Labor Camp**  
Cheriton, Virginia

**MSA, P.C.**

ENVIRONMENTAL SCIENCES, PLANNING, SURVEYING  
ENGINEERING & LANDSCAPE ARCHITECTURE



5033 ROUSE DRIVE  
VIRGINIA BEACH, VIRGINIA 23462  
(757) 490 - 9264 FAX (757) 490 - 0634  
[www.msaonline.com](http://www.msaonline.com)



DATE:  
**5/11/2007**

SCALE:  
**Relative**

MSA JOB #:  
**02833C**

**GROUNDWATER CONSERVATION AND MANAGEMENT PLAN**

KUZZENS KMC CAMP  
20508 PAT TOWN ROAD  
CHERITON, NORTHAMPTON COUNTY VIRGINIA

NORTHAMPTON, VIRGINIA

JUNE, 2007

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## **1.0 GENERAL INFORMATION**

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The Kuzzen's KMC Migrant Labor Camp (MLC), herein referred to as the "facility", is a seasonal labor camp that provides a temporary residence during the agricultural season. This camp is located within the town of Cheriton, Northampton County, Virginia. The facility provides a potable water supply (transient, non-community) to its transients.

Typical consumption at the facility requires consumption of a virtually fixed amount of groundwater from its two-well system located centrally on the MLC property. Because this property is located within the Eastern Virginia Groundwater Management Area – as defined by the Virginia Department of Environmental Quality [VDEQ] – a Water Conservation and Management Plan has been prepared in accordance with the Ground Water Management Act of 1992, Chapter 25 (§62.1-254 et seq.) of Title 62.1 of the Code of Virginia. The purpose of this document is to analyze water supply and demand issues facing the facility and develop a reasoned and justifiable response for water conservation and management. This document is intended to help guide the management of the KMC MLC (Kuzzen's Inc.), who are responsible for the operation and policy management decisions of the facility. Lastly, this document will meet the permit requirement by VDEQ for a water conservation and management plan.

Water conservation measures are those physical facilities, equipment, or devices utilized with certain methods, techniques, policies, practices, and procedures, which reduce water consumption, improve water use efficiency, reduce water loss or waste, increase water recycling or reuse and ultimately result in a reduction of water demand. Water management consists of a



plan to implement water conservation measures. This Water Conservation and Management Plan, referred to herein as the “Plan” includes identification of water demand and water source and then provide guidance to implement water management and conservation measures.

## **2.0 WATER DEMAND**

---

Water at this facility is utilized for a variety of purposes. This use includes, but is not limited to, water used for cooking, bathing, laundry, cleaning, and other assorted domestic purposes. Nearly all water that is withdrawn at the facility is for potable use. The facility maintains a full-time water distribution system to supply each individual camper with water for all domestic needs. Sanitary waste and domestic usage waste generated on-site is handled by a single mass drain field located on the property.

The facility does not engage in any routine irrigation practices. Water withdrawal data, as of this writing, was unavailable. This is an existing withdrawal. It is a fact that the facility operates seasonally and is closed most of the year. Site occupancy occurs between mid June through mid October.

### **3.0 WATER SUPPLY**

---

The following section presents a general overview of water resources available to the facility. As there are no municipal supply pipelines located within the town of Cheriton or Northampton County, drinking water, as well as general-use water, is directly withdrawn and distributed at the camp. Due to the nature of water usage, almost all water is used for potable purposes. There are two wells located within the complex that supply adequate quality and quantity of groundwater.

Water occurs in several forms or media (i.e., liquid and solid meteoric precipitation, surface water, and groundwater) in the relative geographic proximity of the facility. Although this region receives approximately 42 inches of precipitation per year, the facility is not large enough to be able to support a precipitation collection system and cistern storage system that could supply the required volume and rate of fresh water during normal operations. During periods of peak demand, surface water resources are not reliable as a result of high rates of evapotranspiration and low inputs from precipitation.

Groundwater has been used for at this location since the late 1940's without issues regarding quality or quantity. Due to the dynamic nature of the confined aquifer system, groundwater is naturally buffered during recharge to the aquifer. Thus, the regional, confined aquifer's groundwater is the most reliable source of quality water as opposed to any other options (surface water, sea water, etc.).

#### **4.0 WATER CONSERVATION MEASURES**

---

The following conservatory measures will be implemented with regard to the water supply including groundwater from the facilities' wells.

- No unnecessary groundwater withdrawal will be permitted. A bi-lingual notice will be dispatched to each tenant notifying them that the facility is located within the Eastern Shore Ground Water Management Area. This notice will explain the obligation that Kuzzen's Inc has to obtain and preserve a ground water withdrawal permit with the Virginia Department of Environmental Quality. This notice will also include highlights on how each individual can assist in water conservation efforts.
- Facility management will regularly review water use and will implement changes when identified:
  - During camp occupancy, well readings will be collected once per week to allow for the immediate identification of unusual use and/or leaks.
  - The Management will adopt and maintain an electronic database to record and monitor the well readings collected above.
- Water saving plumbing fixtures are used at this site. In the event of a need for replacement, new water saving fixtures will be used as direct replacements as provided in the Uniform Statewide Building Code. Laundry washing machines located on-site may have the opportunity to be updated. When these machines require replacement, newer efficient models should be evaluated.
- Water for irrigation is not used at this facility.
- Encourage transients to conserve water through the use of regularly posted bulletins and other conversational reminders, posters and/or notices posted in public areas. These bulletins will be issued each year or as new conservation efforts are identified and

implemented. These bi-lingual bulletins will be posted in public areas such as the entrance to the facility, at the bath houses, and laundry facilities.

- *Water Reuse Evaluation:* All water used at this facility can not be reused or recycled.

## **5.0 WATER MANAGEMENT MEASURES**

---

The following management measures will be implemented with regard to the water supply including groundwater from the facilities' wells.

- Water Loss Reduction:
  - (a) The facility will conduct weekly readings during camp occupancy in order to identify excessive flow that may indicate a leak in the system or significant change in consumption.
  - (b) The facility will conduct routine inspection of all above ground water piping systems and storage tanks for any indication of leaks on a weekly basis.
  - (c) The facility will conduct routine observations along underground potable water piping systems for indications of leaks. In conjunction with regular collection of monthly meter readings, routine observations along pipelines will also be conducted.
  - (d) Any leak discovered in the potable water storage/supply system will be repaired as soon as is practical or will be bypassed so as to minimize loss of water.
- Mandatory water use restrictions will be implemented during water shortage emergencies declared the local governing body, the Director of DEQ, or the Governor. Non-essential uses of water, such as irrigation will be restricted. In addition, facility personnel will be prohibited from general washing of buildings, paved surfaces, or equipment. The facility will comply with penalties for demonstrated failure to comply with mandatory water use restrictions.
- Water Conservation: Water conservation efforts as described in section 4.0 of this document shall be followed in order to preserve the resource and right to withdrawal water from the resource.



# VDCR Kiptopeke State Park



**MALCOLM  
PIRNIE**

## Section 5

### Kiptopeke State Park

GW # ~~0031600~~ 0054000

#### **Description of Services/Product:**

Kiptopeke State Park provides year-round recreational opportunities including hiking/biking, camping, fishing, boating, wildlife watching and swimming. This includes 47 tent sites, 86 electric/water/sewer sites, 8 rental RVs, 1 camping lodge (bunkhouse sleeps 14), 5 group tent sites, 1 yurt (sleeps 6), 5-six bedroom cabin (sleep 16), linen facility, 4 bathhouses/bathroom facilities (3 of 4 have showers), fishing pier (with fish cleaning station), boat ramp, RV dump station, camp store, contact station, office, shop/maintenance area, picnic area with 2 shelters, 4.2 miles of biking/hiking trails and 5 residences (4 active and one seasonal-interpretive trailer).

The Family Campground magazine rated Kiptopeke State Park as a Top 100 family campground, Top 10 fishing location and Top 5 birding location in 2005.



## Section 5

### Kiptopeke State Park

GW # ~~0031600~~ 0054000

#### Future Population:

Kiptopeke State Park continually serves 300,000-500,000 people per year. These numbers have fluctuated since 2001 due to World Trade Center destruction, rising and falling gas prices, terrorism threats and rising costs of living/travel. We hit a record attendance year in 2003 of 500,000, but have seen attendance drop to 300,000 over the last two years because of gasoline costs. We feel the park will continue to serve the 300,000-500,000 population range over the next ten years.

#### Expansion Plans:

Kiptopeke State Park recently added 5-six bedroom cabins to its overnight facilities through the 2002 GOB (Government Obligation Bonds). We don't have any additional 2002 GOB projects funded or scheduled for Kiptopeke.

The park's master plan presently calls for visitor and environmental education centers with the EEC having dormitories built to sleep 48. We plan in 2007 to change our master plan, adding these additional facilities: 4-2 bedroom cabins, 2-3 bedroom cabins and 6 yurts (replacing the 5 group tent sites with yurts). These six new cabins and the visitor center would be top building priorities.

Kiptopeke State Park  
Section 5  
GW#0054000 (new permit #)

Section 5-Question 1: Per my conversations with Brenda Brown, I've recalculated the figures used for 2004-2007 and projections for 2008-2017, bringing the projected numbers in alignment with annual use figures. Please review this completed request for new figures and explanations to previously submitted permit.

We used 1997's water permit paperwork and the standard for new campgrounds in VA State Park's that each site averages 4 people/day and 25 gallons each person a day. Therefore, I used the 25 gallons per day in my figures here per person. See attached paperwork on DCR sites Visitor Centers. I used planned scope of work for the Environmental Education Center to calculate its usage numbers and placed it under the projected 2008-2017 annual usage numbers.

Smith Mountain Lake State Park  
Visitor Center Water Usage 2005-49,370 gal  
2004-36,860 gal  
*(2-year avg. 43,115 gal/yr.)*

Grayson Highlands State Park  
Visitor Center Water Usage 2007-60,850 gal

Hungry Mother State Park  
Visitor Center Water Usage 2006-82,600 gal  
2007-47,500 gal  
*(2-year avg. 65,050 gal/yr)*

Therefore Kiptopeke averaged these for a sum 56,436 gal/yr.

Environmental Education Centers (EEC)-Natural Tunnel is the only park with similar facilities to the one proposed at Kiptopeke. Their EEC's water supply is on a share water system and therefore they don't have numbers for the EEC's use only. I've based the figures listed below on the occupancy rates of our present overnight facilities Yurt-48% and RV trailers 46% yearly.

EEC-48 rooms X 193 nights/year X 50 gpd/room=463,200 gpy

(193 nights is 50% occupancy rate over the year and used standard park numbers per campsite of 100 gpd for 4 people and used the 25 gallons per day average per person and multiplied by 2 people per room for total water consumption).

**From:** Amanda Brown  
**To:** Sweeney, Sam  
**Date:** 2/28/2008 8:26:59 AM  
**Subject:** Re: Water Usage SMLSP

Here you are

2006- 36,860

2005- 49,370

~Amanda

Amanda Brown  
Smith Mountain Lake State Park

>>> Sam Sweeney 02/28/08 5:01 AM >>>

Amanda, can you tell me how much of that total was strictly VC operations? Thanks Sam

**From:** Ann Pickle  
**To:** Sweeney, Sam  
**Date:** 3/10/2008 2:11:25 PM  
**Subject:** Re: Visitor Center Water Usage

Here you go. 47,500 gallons per year = \$328.46 per year. I hope this helps. If you need anything else, please let me know.

Ann Pickle  
Office Manager  
Hungry Mother State Park  
2854 Park Boulevard  
Marion, VA 24354  
(276) 781-7400  
Fax: (276) 781-7402  
ann.pickle@dcr.virginia.gov

>>> Sam Sweeney 03/07/08 4:30 PM >>>

Ann, can you send me the water usage for your visitor center? I need several state park's water usage totals for their VCs for a water application with DEQ. Thanks Sam

**From:** Ann Pickle  
**To:** Sweeney, Sam  
**Date:** 3/14/2008 8:47:51 AM  
**Subject:** Re: Visitor Center Water Usage

Here you go. 82,600 gallons or \$593.34 for 2006. If you need anything else, please let me know and I will get it to you as soon as I can. Thanks

Ann Pickle  
Office Manager  
Hungry Mother State Park  
2854 Park Boulevard  
Marion, VA 24354  
(276) 781-7400  
Fax: (276) 781-7402  
ann.pickle@dcr.virginia.gov

>>> Sam Sweeney 03/13/08 8:39 AM >>>

Ann, the last two years would be helpful, but if you can only do one year I understand. I have to create a baseline total averaging several state parks with similar attendance figures and use them to complete a usage sheet for future facilities. Hope all is going well. Sam

# FAX TRANSMISSION

Grayson Highlands State Park

829 Grayson Highland Lane

Mouth of Wilson, VA 24363

Phone: (276) 579-7092

FAX: (276) 579-2374

TO: Sam Sweeney

DATE: 2/21/2007

FAX #: 1-757-331-4649

Pages: 8 ; including this one

FROM: Harvey Thompson

SUBJECT:

COMMENTS: Visitor Center Well Usage

April → October 2007

60,850 gallons

You can determine amts. for each well water systems for GH from the monthly well monitoring reports that follow

Virginia Department of Health  
Monthly Operating Report  
Groundwater-Well or Spring  
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: April

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	<u>10,090</u>	<u>          </u>
# 3 Campground	<u>1,610</u>	<u>          </u>
# 8 Visitor Center	<u>6,120</u>	<u>          </u>
# 11 Campground	<u>25,800</u>	<u>          </u>
# 12 Office	<u>500</u>	<u>          </u>
# 13 Stable Area	<u>6,920</u>	<u>4,248</u>
# 14 Campground	<u>2,800</u>	<u>505</u>
Total Usage	<u>53,440</u>	<u>Total 4,754</u>

Number of Connections: 7

Number of People Served: 4,754

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson, Park Manager

Title: Park Manager Sanler

Comments: All water systems were online by May 1, 2007.  
Visitor Center not opened to public until May 19, 2007.  
Campgrounds opened full service May 1, 2007.

Submit to: Virginia Department of Health  
Office of Water Programs  
424 East Main Street  
Abingdon, VA 24210



Virginia Department of Health  
Monthly Operating Report  
Groundwater-Well or Spring  
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077286, 1077280, 1077281, 1077282, 1077283

County: Grayson

Year: 2007 Month: May

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	<u>5,580</u>	<u>3,865</u>
# 3 Campground	<u>14,430</u>	<u>1,450</u>
# 8 Visitor Center	<u>8,880</u>	<u>3,000</u>
# 11 Campground	<u>27,350</u>	<u>1,070</u>
# 12 Office	<u>800</u>	<u>865</u>
# 13 Stable Area	<u>12,460</u>	<u>543</u>
# 14 Campground	<u>36,510</u>	<u>1,850</u>
<b>Total Usage</b>	<u>106,020</u>	<b>Total</b> <u>12,243</u>

Number of Connections: 7

Number of People Served: 12,243

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson, Park Manager

Title: Park Manager Senior

Comments: All water systems were online by May 1, 2007.

Visitor Center not opened to public until May 19, 2007.

Campgrounds opened full service May 1, 2007.

Submit to: Virginia Department of Health  
Office of Water Programs  
464 East Main Street  
Abingdon, VA 24210

Virginia Department of Health  
Monthly Operating Report  
Groundwater-Well or Spring  
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077269, 1077280, 1077281, 1077282, 1077283

County: Grayson

Year: 2007 Month: June

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	<u>10,710</u>	<u>7,540</u>
# 3 Campground	<u>21,430</u>	<u>2,000</u>
# 8 Visitor Center	<u>9,820</u>	<u>8,001</u>
# 11 Campground	<u>38,350</u>	<u>2,000</u>
# 12 Office	<u>700</u>	<u>888</u>
# 13 Stable Area	<u>35,220</u>	<u>987</u>
# 14 Campground	<u>49,870</u>	<u>2,000</u>
<b>Total Usage</b>	<u>166,200</u>	<b>Total</b> <u>20,424</u>

Number of Connections: 7

Number of People Served: 20,424

Certified Operator: Harvey N. Thompson

Certificate Number: 1804 000400

Signed: *Harvey N. Thompson*

Title: Park Manager Senior

Comments: \_\_\_\_\_

Submit to: Virginia Department of Health  
Office of Water Programs  
454 East Main Street  
Abingdon, VA 24210

Virginia Department of Health  
Monthly Operating Report  
Groundwater-Well or Spring  
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: July

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	<u>10,570</u>	<u>2,550</u>
# 3 Campground	<u>23,740</u>	<u>2,500</u>
# 8 Visitor Center	<u>12,390</u>	<u>3,500</u>
# 11 Campground	<u>25,380</u>	<u>3,000</u>
# 12 Office	<u>2,800</u>	<u>888</u>
# 13 Stable Area	<u>30,350</u>	<u>1,500</u>
# 14 Campground	<u>69,080</u>	<u>4,979</u>
Total Usage	<u>174,310</u>	Total <u>18,915</u>

Number of Connections: 7

Number of People Served: 18,915

Certified Operator: Harvey N. Thompson

Certificate Number: 1804 000400

Signed: Harvey N. Thompson, Park Manager

Title: Park Manager Senior

Comments: Installed new water meter at the office well.  
Due to the drought and lack of winter snow fall, we are averaging 4,000 gallons  
of water per day from 3 wells that supply the campground.

Submit to: Virginia Department of Health  
Office of Water Programs  
454 East Main Street  
Arlington, VA 22210

Virginia Department of Health  
Monthly Operating Report  
Groundwater-Well or Spring  
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077250, 1077250, 1077251, 1077252, 1077253

County: Grayson

Year: 2007 Month: August

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	<u>14,500</u>	<u>2,500</u>
# 3 Campground	<u>29,550</u>	<u>3,203</u>
# 6 Visitor Center	<u>12,340</u>	<u>3,600</u>
# 11 Campground	<u>24,100</u>	<u>2,500</u>
# 12 Office	<u>217,320</u>	<u>900</u>
# 13 Stable Area	<u>38,010</u>	<u>2,000</u>
# 14 Campground	<u>51,350</u>	<u>4,500</u>
<b>Total Usage</b>	<b><u>387,170</u></b>	<b>Total <u>19,203</u></b>

Number of Connections: 7

Number of People Served: 19,203

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson

Title: Park Manager Senior

Comments: Installed new water meter at the office well.

Recovered serious leak in supply line to Office, digging to find problem after replacing water meter. No evidence of leakage at ground level.

Submit to: Virginia Department of Health  
Office of Water Programs  
454 East Main Street  
Abingdon, VA 24210

Virginia Department of Health  
Monthly Operating Report  
Groundwater-Well or Spring  
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077289, 1077290, 1077291, 1077292, 1077293

County: Grayson

Year: 2007 Month: September

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	<u>18,580</u>	<u>3,000</u>
# 3 Campground	<u>22,128</u>	<u>4,500</u>
# 8 Visitor Center	<u>6,170</u>	<u>2,500</u>
# 11 Campground	<u>13,040</u>	<u>4,500</u>
# 12 Office	<u>156,256</u>	<u>1,500</u>
# 13 Stable Area	<u>28,150</u>	<u>3,600</u>
# 14 Campground	<u>38,340</u>	<u>4,415</u>
<b>Total Usage</b>	<u>277,662</u>	<b>Total</b> <u>23,915</u>

Number of Connections: 7

Number of People Served: 23,915

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson

Title: Park Manager Senior

Comments: Leak at office well system has been repaired.  
Will begin winterization process at the end of October.

Submit to: Virginia Department of Health  
Office of Water Programs  
454 East Main Street  
Abingdon, VA 24210

Virginia Department of Health  
Monthly Operating Report  
Groundwater-Well or Spring  
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077258, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007

Month: October

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	<u>12,620</u>	<u>1,500</u>
# 3 Campground	<u>17,650</u>	<u>3,500</u>
# 8 Visitor Center	<u>6,120</u>	<u>1,500</u>
# 11 Campground	<u>14,470</u>	<u>3,500</u>
# 12 Office	<u>9,580</u>	<u>1,701</u>
# 13 Stable Area	<u>14,860</u>	<u>1,600</u>
# 14 Campground	<u>24,850</u>	<u>3,500</u>
Total Usage	<u>100,150</u>	<u>16,801</u>

Number of Connections: 7

Number of People Served: 16,801

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson

Title: Park Manager Senior

Comments: Will be winterizing all well water systems with the exception of the office during the month of November.

Submit to: Virginia Department of Health  
Office of Water Programs  
454 East Main Street  
Abingdon, VA 24210

## Section 5-Question 2:

Seasonal water usage was based on projections for 2008-2017 and not from 2004-2006 figures. Figures for overnight stays dropped after 911 and with new cabins and camping lodge/bunkhouse added since 2005 increased usage numbers should be assumed. Usually takes 3-4 years to see what the actual occupancy rates per unit for annual basis will be.

### Annual Projected Water Usage 2008-2017

#### Seasonal Water Usage-May 1-Labor Day Weekend

May:

Weekends/Holiday 15 days X 31,000 gpd= 465,000 gal

Week Days 16 days X 16,900 gpd= 270,400 gal

Total 735,400 gal

June:

Weekends 12 days X 31,000 gpd= 372,000 gal

Weekdays 18 days X 16,900 gpd= 304,200 gal

Total 676,200 gal

July:

Weekends/holiday 9 days X 31,000 gpd= 279,000 gal

Weekdays 22 days X 16,900 gpd= 371,800 gal

Total 650,800 gal

August:

Weekends 10 days X 31,000 gpd= 310,000 gal

Weekdays 21 days X 16,900 gpd= 354,900 gal

Section 5-2 continued:

Total 664,900 gal

September:

Weekends 9 days X 31,000 gpd= 279,000 gal

Weekdays 21 days x 5,500 gpd= 115,500 gal

Total 394,500 gal

October/November/December 1, 2008

62 days X 5,500 gpd= 341,000 gal

December/January/February

90 days X 4,300 gpd= 387,000 gal

March-April

61 days X 5,500 gpd= 335,500 gal

Projected Annual 2008-2017 Grand Total Year Water Usage

**4,185,300 gpy**



### Section 5-Question 3:

We used 100-gpd/per site standard per DCR estimates for all sites. This assumes 25 gpd per person with occupancy rate per site of 4 people.

Linens: 14 beds/per lodge cabin X 23 gal/wash= 320 gallons.  
(Rounded down from 322 to 320 to have even/round numbers to work with).

Section 5-Question 4:

**Park Manager's Residence**-single family home, 3 BD, 2 BA, 4 residents, summer garden irrigation

**Assistant Park Manager's Residence**-single family home, 3 BD, 2 BA, 2 residents, no irrigation

**Chief Ranger's Residence**-single family home, 3 BD, 2 BA, 1 resident, summer garden irrigation

**Interpretive Trailer-office/home**, 1 BD, 1 1/2 BA, 1 resident  
Spring/Summer/Fall, no lawn irrigation (**Seasonally used facility**)

**Dutton Residence**-single family home, 3 BD, 2 BA, 1 resident, summer lawn irrigation system

## Section 5-Question 5:

Summer interpretive programmers and occasional volunteers use the interpretive trailer. It isn't always used yearly, but since 2004, its been used throughout the winters in 2004 and 2005, fall in 2006 and 2007 with volunteers staying from 4-16 weeks. However, the Dutton residence is located in the campground and is home to Mrs. Dutton year-round. Since, the interpretive trailer is not allowed in our totals, we would like to substitute Mrs. Dutton's residence for the interpretive trailer. Both are serviced off the new park well DEQ #165-378.

Section 5-Question 6: The water in question is used at the waterfront bathroom and fishing pier.

Line 3: 200 people X 5 gpd=1000 gpd (Swim beach bathroom and fishing pier)

Section 5-6  
Kiptopeke State Park  
Calculations

Weekend Summer Water Demand-Weekend Season Use (May 1-Labor Day)

Campground (135 sites X 100 gpd/site)=	13,500
Beach (800 people @ 5 gpd/person)=	4,000
4 Staff Residences @ 400 gpd=	1,600
Maintenance Shop (6 people @ 5 gpd/person)	30
Picnic Area (200 people X 2 turnovers X 5 gpd/person)=	2,000
Six bedroom cabins (5 cabins X 400 gpd)=	2,000
Linen Services-Cabins (320 gal/rental X 5)=	1,600

Summer Season Use Ave. 30 % higher

Peak Daily (Weekend Season)=24,730

Peak Daily (Weekend Season) 24,730 X 1.25=30,912 GPD

Therefore say **31,000 GPD**

see next  
revised  
sheet

(BAA)

## Section 5-2

The extra 25% was utilized in the 1997 permit process, I repeated this allowance for variances; however, based on discussions with DEQ's Brenda Brown, this is not allowed. Therefore the Water Demand should read 24,730 GPD.

## Section 5-2

### Kiptopeke State Park

### Calculations

#### Weekend Summer Water Demand-Weekend Season Use (May 1-Labor Day)

Campground (135 sites X 100 gpd/site)=	13,500
Beach (800 people @ 5 gpd/person)=	4,000
4 Staff Residences @ 400 gpd=	1,600
Maintenance Shop (6 people @ 5 gpd/person)	30
Picnic Area (200 people X 2 turnovers X 5 gpd/person)=	2,000
Six bedroom cabins (5 cabins X 400 gpd)=	2,000
Linen Services-Cabins (320 gal/rental X 5)=	1,600

Summer Season Use Ave. 30 % higher

Peak Daily (Weekend Season)=24,730

***Peak Daily (Weekend Season) 24,730 GPD***

### Section 5-3

The extra 25% was utilized in the 1997 permit process, I repeated this allowance for variances; however, based on discussions with DEQ's Brenda Brown, this is not allowed. Therefore the Water Demand should read 13,530 GPD.  
Corrected information posted below.

### Section 5-3

#### Weekday Summer Seasonal Water Withdrawal (May 1-Labor Day)

80 campsites X 100 gpd=	8,000
50 people X 5 gpd X 2 turnovers (picnic)=	500
200 people X 5 gpd=	1,000
5 Residences X 400 gpd=	2,000
5 Cabins X 400 gpd=	2,000
Maint. Shop (6 X 5 gpd)=	30

***Daily Summer Demand      13,530 GPD***

Section 5  
Kiptopeke State Park  
Calculations  
Section 5

Off Season Water Demand-Weekdays (Labor Day-1<sup>st</sup> Monday  
Dec. & March 1-April 30)

10 campsites X 100 gpd/site=	1,000
Picnic Area 50 people X 5 gpd=	250
4 Residences @ 400 gpd=	1,600
Office/Shop Areas 9 people X 10 gpd=	90
Cabins 2 nights rental X 400 gpd=	800
Linen Services (2 X 320 gal/rental)=	640
Daily Off Season Water Demands 4,380 GPD	

Kiptopeke State Park

Off Season Water Demand Weekends (Labor Day-Dec. 1<sup>st</sup>  
Monday & March 1-April 30)

20 Campsites X 100 gpd/site=	2,000
Picnic Area 50 people @ 5 gpd=	250
4 residences @ 400 gpd=	1,600
Office/Shop 9 people @ 10 gpd=	90
Cabins 5 rentals @ 400 gpd=	2,000
Cabin Linens 5X 320=	1,560
Weekend Daily Demands	8,500 GPD



Kiptopeke State Park

Winter Water Demands (1<sup>st</sup> Monday Dec.-March 1)

4 residences @ 400 gpd= 1,600

Shop/Office (9 people @ 10 gpd)= 90

Cabins 2 rental @ 400 gpd= 800

Day Use general 250

Linen Services Cabins (2 X 320)= 640

Total Winter Daily/Weekend Use 3,380 GPD

Per my conversation with Brenda Brown, DEQ Water Permit Writer, I've adjusted each year's totals to accurately show the water used and estimated amount come within 10% of projected totals.

## Section 5: DEQ Question 5-7 Revised Totals

### Kiptopeke State Park

#### Water Calculations

#### 2004 Usage Numbers

Yearly Attendance: 509,599

#### Overnight Usage

RV Rental	761 nights X 100 gpd= 76,100 gpy
EWS campsites	2370 nights X 100 gpd= 237,000 gpy
EW campsites	2733 nights X 100 gpd= 273,300 gpy
Tent campsites	2259 nights X 100 gpd= 225,900 gpy
Park-sold campsites	3318 nights X 100 gpd= 331,800 gpy
Group Campsites	240 nights X 100 gpd= 24,000 gpy
Picnic Shelter	33 days X 500 gpd= 16,500 gpy
Yurt Rentals	94 nights X 100 gpd= 9,400 gpy
Residences (5)	(365X400 gpdX5) gpd=730,000 gpy
Camping Lodge	new-24 nights X 300 gpd= 7,200 gpy

Overnight Usage Total 1,931,200 gpy

#### Day Use

Parking Paid (4 per car-beach)	20,458 passes X 4 people X 5 gpd=414,160 gpy
Fish Cleaning Station	estimate 4,000 gpy
Linen-Vending Usages	1,085 rentals X 40 per use= 43,400 gpy
Park Shop Usages	estimate 10,000 gpy
Custodial Needs (Cleaning Facilities/Laundry)	100,800 gpy
Office	estimate 4,000 gpy
Dump Station	11,000 gpy

Day-Use Totals 587,360 gpy

Total Estimated Use 2,518,560 gpy (Corrected)

Estimated Total-rounding removed from figure) 2/25/08

Actual 2004 Water Use 2,361,053 gpy

## Section 5-Question 8: page 1 of 3

Based on my conversation with Brenda Brown regarding the overages estimated for water usage in these years, I revised them to better reflect what truly happened.

See attached revised sheets for 2004-2006's water usage totals.

### Kiptopeke State Park

#### Water Calculations

#### 2004 Usage Numbers

Yearly Attendance: 509,599

#### Overnight Usage

RV Rental	761 nights X 100 gpd= 76,100 gpy
EWS campsites	2370 nights X 100 gpd= 237,000 gpy
EW campsites	2733 nights X 100 gpd= 273,300 gpy
Tent campsites	2259 nights X 100 gpd= 225,900 gpy
Park-sold campsites	3318 nights X 100 gpd= 331,800 gpy
Group Campsites	240 nights X 100 gpd= 24,000 gpy
Picnic Shelter	33 days X 500 gpd= 16,500 gpy
Yurt Rentals	94 nights X 100 gpd= 9,400 gpy
Residences (5)	(365X200 gpdX5) gpd=365,000 gpy
Camping Lodge	new-24 nights X 300 gpd= 7,200 gpy

Overnight Usage Total 1,566,200 gpy

#### Day Use

Parking Paid (4 per car-beach) 20,458 passes X 4 people X 5 gpd=414,160 gpy

Fish Cleaning Station	estimate	4,000 gpy
Linen-Vending Usages	1,085 rentals X 40 per use=	43,400 gpy
Park Shop Usages	estimate	10,000 gpy
Custodial Needs (Cleaning Facilities/Laundry)		100,800 gpy
Office	estimate	4,000 gpy
Dump Station		11,000 gpy
Day-Use Totals		587,360 gpy

Total Estimated Use 2,518,560 gpy

Actual 2004 Water Use 2,361,053 gpy

## Water Calculations

### 2005 Usage Numbers

Yearly Attendance: 399,838

### Overnight Usage

RV Rental	846 nights X 100 gpd=	84,600 gpy
EWS campsites	2663 nights X 100 gpd=	266,300 gpy
EW campsites	2895 nights X 100 gpd=	289,500 gpy
Tent campsites	2340 nights X 100 gpd=	234,000 gpy
Park-sold campsites	3827 nights X 100 gpd=	382,700 gpy
Group Campsites	122 nights X 100 gpd=	12,200 gpy
Picnic Shelter	46 days X 500 gpd=	23,000 gpy
Yurt Rentals	119 nights X 100 gpd=	11,900 gpy
Camping Lodge	40 nights X 300 gpd=	12,000 gpy
Residences (5)	(365 daysX5X200 gpd)=	365,000 gpy

Total Overnight Usage 1,681,200 gpy

### Day Use

Parking Paid (4 per car-beach)	19,833 passes X 4 X 10 gpd=	793,320 gpy
Fish Cleaning Station	estimate	4,000 gpy
Linen-Vending Usages	1,686 rentals X 40 gpd=	67,440 gpy
Park Shop Usages	estimate	10,000 gpy
Custodial needs (Cleaning Facilities/Laundry)	estimate	90,800 gpy
Office	estimate	4,000 gpy
Dump Station		11,000 gpy

Total Day-Use Usage 980,560 gpy

Water Usage Estimate 2005	2,661,760 gal/yr.
Actual Usage 2005	2,614,898 gal/yr.

## Water Calculations

### 2006 Usage Numbers

Yearly Attendance: 275,079

#### Overnight Usage

RV Rental	781 nights X 100 gpd= 78,100 gpy
EWS campsites	3049 nights X 100 gpd=304,900 gpy
EW campsites	2617 nights X 100 gpd=261,700 gpy
Tent campsites	4102 nights X 100 gpd=410,200 gpy
Park-sold campsites	3827 nights X 100 gpd=382,700 gpy
Group Campsites	143 nights X 100 gpd= 14,300 gpy
Picnic Shelter	67 days X 500 gpd= 33,500 gpy
Yurt Rentals	110 nights X 100 gpd= 11,000 gpy
Camping Lodge	54 nights X 300 gpd= 16,200 gpy
Residences (5)	(365 daysX5X200 gpd)=365,000 gpy

Total Overnight Usage 1,877,600 gpy

#### Day Use

Parking Paid (4 per car-beach)	12,352 passes X 4 X 5 gpd=396,660 gpy
Fish Cleaning Station	estimate 4,000 gpy
Linen-Vending Usages	1,513 rentals X 40 gpd= 60,520 gpy
Park Shop Usages	estimate 10,000 gpy
Custodial needs (Cleaning Facilities/Laundry)	estimate 90,800 gpy
Office	estimate 4,000 gpy
Dump Station	11,000 gpy

Total Day-Use Usage 576,980 gpy

Water Usage Estimate 2006	2,454,580 gal/yr.
Actual Usage 2006	2,234,022 gal/yr.

## Section 5-Question 10:

### Kiptopeke State Park

#### Water Calculations

#### 2007 Actual Usage Numbers

Yearly Attendance: 376,456

*\*Reserve America database  
nights = # of sites reserved  
in the year*

#### Overnight Usage

RV Rental	855 nights X 100 gpd= 85,500 gpy
EWS campsites	3,986 nights X 100 gpd= 398,600gpy
(Divided standard electric site totals in half since new reservation system doesn't distinguish between EWS/ES sites in totals)	
EW campsites	3986 nights X 100 gpd= 398,600 gpy
Tent campsites	3525 nights X 100 gpd= 352,500 gpy
Park-sold campsites	545 nights X 100 gpd= 54,500 gpy
Group Campsites	239 nights X 100 gpd= 23,900 gpy
Picnic Shelter	78 days X 500 gpd= 39,000 gpy
Yurt Rentals	121 nights X 100 gpd= 12,100 gpy
Residences (5)	365 X 200 gpd X 5 gpd= 365,000 gpy
Camping Lodge	71 nights X 300 gpd= 21,300 gpy
Lodges	52 nights X 400gpd= 20,800gpy

Overnight Usage Total 1,771,800 gpy

#### Day Use

Parking Paid (4 per car-beach)	15,766 passes X 4 people X 5 gpd= 315,320 gpy
Fish Cleaning Station	estimate 4,000 gpy
Linen-Vending Usages	999 rentals X 30 per use= 29,970 gpy
Park Shop Usages	estimate 10,000 gpy
Custodial Needs (Cleaning Facilities/Laundry)	100,800 gpy
Office	estimate 4,000 gpy
Dump Station	11,000 gpy
Day-Use Totals	475,090 gpy

Total Estimated Use 2,246,890 gpy

Actual 2007 Water Use 2,361,053 gpy

Kiptopeke State Park  
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Section 5-1

Its complex includes an environmental education center and 2 dormitories sleeping 60 people overnight. Kiptopeke plans the same style EEC with a 48 person capacity dormitory. See figures below for EEC's water consumption revisions.

Natural Tunnel State Park's well supplied all operations within the park with water until last month. Last month they started using county water. Their park operations include an Olympic and children's size pools, 5 picnic shelters, 3 bathroom facilities, amphitheater, campground, chairlift, visitor center and the EEC. It is difficult to speculate the total amount of water needed for the dormitory and EEC with all these units on a combine water system.

Kiptopeke State Park  
Water Calculations

**2008-2017 Projected Usage Numbers**

Yearly Attendance: 309,838 2005 attendance

**Projected Yearly Attendance: 340,822 (2005's Plus 10%)**

**Overnight Usage**

RV Rental	811 nights X 100 gpd= 81,100 gpy
EWS campsites	3,017 nights X 100 gpd= 301,700gpy
<b>(Divided standard electric site totals in half since new reservation system doesn't distinguish between EWS/ES sites in totals)</b>	
EW campsites	3058 nights X 100 gpd= 305,800 gpy
Tent campsites	3056 nights X 100 gpd= 305,600 gpy
Park-sold campsites	2,879 nights X 100 gpd= 287,900 gpy
Group Campsites	186 nights X 100 gpd= 18,600 gpy
Picnic Shelter	56 days X 500 gpd=28,000 gpy
Yurt Rentals	111 nights X 100 gpd= 11,100 gpy
Residences (5)	365 X 200 gpd X 5) gpd=365,000 gpy
**Camping Lodge	138 nights X 300 gpd= 41,400 gpy
**Lodges	913 nights X 400gpd=365,200 gpy
(5 lodges X 50% occupancy over 365 days)	

**\*\*Note lodge opened 2007 and 2008 will be first full year of rentals-takes 2-3 (i.e. 2009-2010) years to reach average yearly rentals. Presently, RV rentals 46% occupancy rate, camping lodge 39% (after 1 ½ seasons open to public use), yurt 48% rate, therefore we are using a 50% occupancy rate.**

**\*\*Note-Camping lodge opened to public use in fall of 2005 and HVAC added in 2007. Except the same occupancy rate 50% as lodges based on RV trailers and Yurt occupancy rates.**

**Special Notes:**

Overnight usage is prefaced on 275 nights/year March 1 through November 30 when campground is open. (All campsites (tent, group, E/W and EWS), RVs, yurt, camping lodge and picnic shelters fit under this time).

Cabins/Lodges are open year round-365 days; therefore the numbers are for 365 days. Park is open for day use activities year round but only day use and cabin facilities from December 1-February 28/29 each year.

Overnight Usage Total 2,111,400 gpy

**Day Use Water Consumption**

Parking Paid (4 per car-beach)	17,102 passesX4peopleX5gpd=342,040 gpy
Fish Cleaning Station	estimate 4,400 gpy
Linen-Vending Usages	1,321 rentals X 30 per use= 39,630 gpy
Park Shop Usages	estimate 11,000 gpy
Custodial Needs (Cleaning Facilities/Laundry)	
[913/2 night stay min.=456 rentals/year X 26 gal/wash X 14 per cabin]	
	165,984 gpy
Office	estimate 4,400 gpy
Dump Station	12,100 gpy

Day-Use Totals 579,554 gpy

Figures for parking and linen-vending usages based on 2004-2007 figures for each line item averaged over the four year period.

Total Estimated Use 2,690,954 gpy

**Future Proposed Facilities to be added between 2008-2017:**

Note: Kiptopeke State Park's master plan is being revised in spring 2008, with the additional proposed facilities being added to park infrastructure. 2002 state parks received Government Obligated Bonds for new facilities. These projects are due for completion in 2010. State parks are looking for another bond proposal in 2012 funding new facilities.



**Kiptopeke's New Facilities Water Usage**

Visitor Center-located at waterfront area of park-  
Well source is park campground well 165-378.

Kiptopeke State Park

Section 5-Question 11 continued

Environmental Education Center with 48 person capacity 24-room dormitory-south of cabin area-new EEC well DEQ#165-560 proposed for these site-0.3 miles south of lodges now well 165-463.

Cabins: 4-2 bedroom cabins-well 165-463-located in cabin loop

2-3-bedroom cabins-well 165-463-located in cabin loop

Park housing-4 additional houses-single family dwellings (3 bedrooms/2 baths/no irrigation systems for lawns) well 165-463/165-378 or new well for their water source, depends on final location of homes. Present plans have them on new park well DEQ # 165-378.

**Proposed facility Usage Figures:**

Visitor Center estimates based on other DCR facilities-56,436 gal/yr.

Environmental Education Center with 48-room dormitory-

24 room (2 people per room) X 193 (yr-round operation with 50% occupancy rate) X 50 gpd/room (25 gal/day X 2 people per room)=231,600 gal/yr.

Cabins: 4-2 bedroom cabins-183 nights/yr X 4 cabins X 200 gal/day=146,400 gal/yr

2-3-bedroom cabins-183 nights/yr X 2 cabins X 250 gal/day=91,500 gal/yr

Park Housing 4 homes-365 X 4 homes X 200 gpd= 292,000 gpy

Facility/Laundry Facilities

2 bedrooms cabins laundry washing:

5 beds/linens X 26 gal/wash X 92 rentals/yr X 4 cabins= 47,840 gal/yr.

7 beds/linens X 26 gal/wash X 92 rentals/yr X 2 cabins= 33,488 gal/yr.

Note: Cabin rates based on 50% occupancy rate on 365 days/year and a 2-night min. stay requirement by state parks.

Projected New Facilities Water Usage 2008-2017      899,264 gal/yr.

Grand Total Projected Water Use 2008-2017    3,590,218 gal/yr.

Section 5-Question 12:

The difference between these figures is Kiptopeke is washing all cabin laundry/linens for cabin stays at the park and that is the 288,000 gpy.

The other line item is the Linen-vending rental laundry washers located in the campground. Those usage numbers are based on recorded uses each year from cash registers sells.

Section 5  
Kiptopeke State Park  
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Well Schedules

Well ID	FREQUENCY Days per week Average	Months per Year Average
Park Well-Winter	2	3
Park Well-Off Season-weekday	3	5
Park Well-Off Season-weekends	2	5
Park Well-Summer Weekdays	4	4
Park Well-Summer weekends	2	4
Cabin Well-Winter	1	3
Cabin Well-Off season weekday	1	5
Cabin Well-Off season weekends	1	5
Cabin Well-Summer Days	2	4
Cabin Well-Summer Weekends	1	4

## Kiptopeke State Park

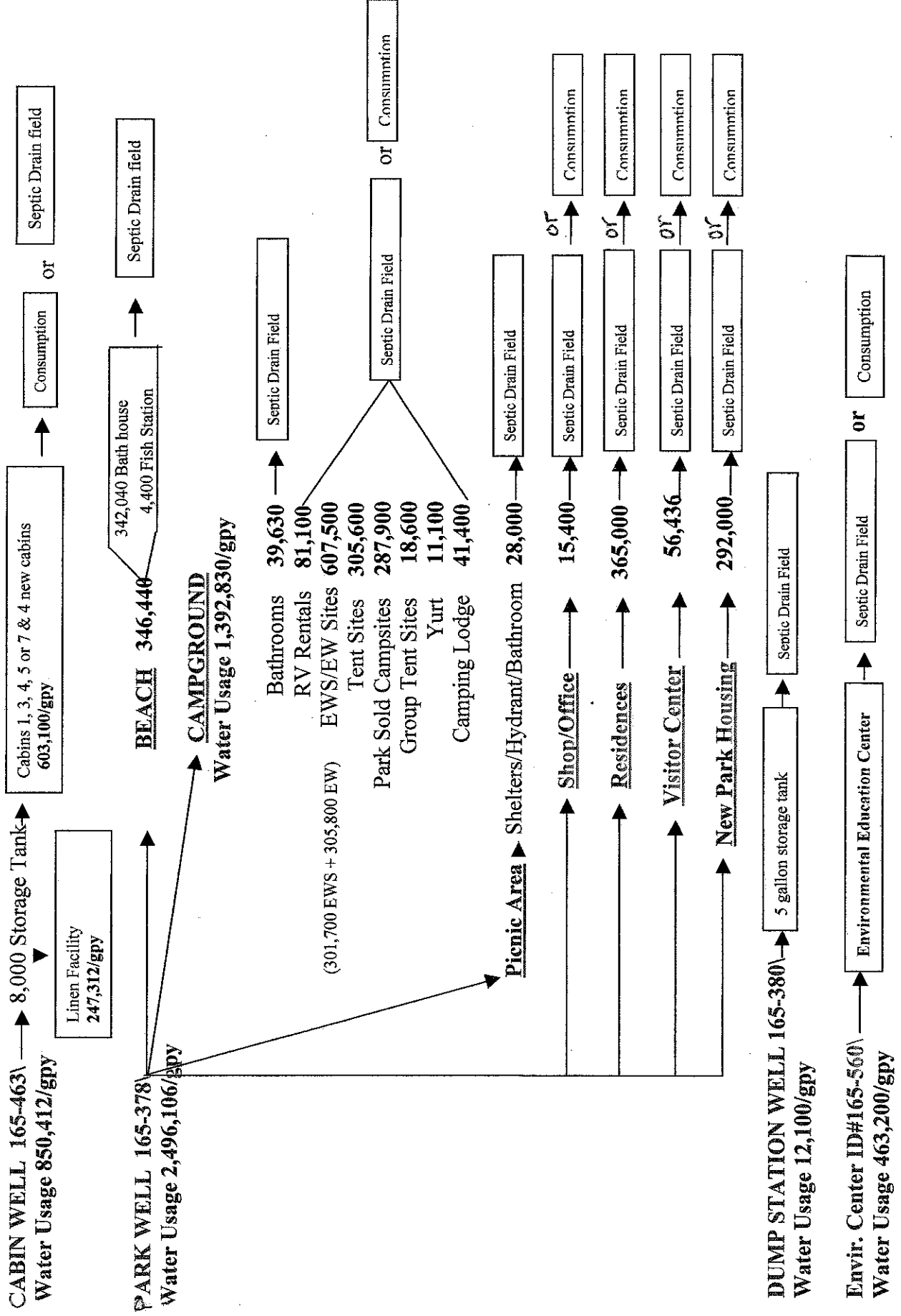
### Well Water Flows

Well ID	Max. Daily Flow Rate (in MGD)	Max. Total Volume	Duration (in Days)
Park Well-Winter	.0027	.235	87
Park Well-Off Season-Daily	.00406	.4304	106
Park Well-Off Season-Weekend	.00714	.314	44
Park Well-Summer Daily	.0149	1.326	89
Park Well-Summer Weekend	.0274	.9864	36
Cabin Well-Winter	.00144	.1253	87
Cabin Well-Off Season Daily	.00144	.153	106
Cabin Well-Off Season Weekend	.0036	.158	44
Cabin Well-Summer Daily	.002	.178	89
Cabin Well Summer Weekend	.002	.072	36

# SECTION 5

## KIPTOPEKE STATE PARK

TITLE: WATER FLOW DISTRIBUTION  
BASED ON 2008 - 2017 PROJECTIONS



\ = Metered Well Symbol

## Section 13

Kiptopeke State Park

GW # ~~0031600~~ 0054000

Page 1 of 2

### 1. Use of Water Saving Devices/Plumbing:

The Division of State Parks at Kiptopeke and all other State Parks is specifying the use of water saving fixtures in all new and renovated structures as provided in the Uniform Statewide Building Code.

### 2. Water Loss Reduction Program:

The water system will be visually inspected for leaks by full-time staff on a weekly basis. Monthly water readings will be reviewed to ensure all excessive withdrawals, which may be indicative of a leak are accounted for. If a leak is detected, that part of the water system will be shut down immediately and repaired. The staff will be instructed to notice areas where changes would help conserve water or reduce losses.

### 3. Water Use Education Program

Employees will receive instruction as to the important of efficient water use and conservation methods during orientation. Campers will also receive instruction concerning efficient water use and conservation at the campground. Placards

Kiptopeke State Park  
Section 13 page 2 of 2

promoting water conservation methods will be posted in bathrooms, kiosks and through Interpretive/environmental educational programming.

4. Evaluation of Potential Water Reuse Options:

There are no practical options for water reuse. Kiptopeke State Park is served by a number of drain fields and does not have any treated wastewater for use as a water reuse option, for non-potable purposes such as agricultural/park irrigation or toilet flushing. The Division of State Parks has no plans at this time for any wastewater treatment facility at this park.

5. Requirements for Mandatory Water Use  
Reductions

The park will comply with any mandatory water use reduction during water shortage emergencies declared by the local governing body or the Director of DEQ and with any penalties for failure to comply. This will include provisions of requirements for mandatory water use restrictions to seasonable and year-round employees, prohibiting all non-essential uses such as lawn and ornamental irrigation or vehicle washing at the park.



# YMCA Family Campground



**MALCOLM  
PIRNIE**



## **ATTACHMENT 5 WATER NEED JUSTIFICATION**

### **General Description**

The YMCA of South Hampton Roads is in the process of developing approximately 150 acres in the Silver Beach area for use as a family campground. The campground will contain an office, rental cabins, a dining hall, various activity centers, and staff housing. The YMCA plans to develop the campground in phases, with Phase I having facilities to accommodate 300 campers and staff, and Phase II accommodating an additional 150 campers for a total of up to 450 persons.

The campground will be supplied with potable water using two (2) onsite wells which are completed to a depth of 220 feet. A 4-inch diameter residential well constructed to a depth similar to the other wells on the site is proposed to serve the Camp Director's house. A schematic diagram outlining the campground water supply system is included as Figure 1 of this attachment, followed by a figure prepared by Kimley-Horn and Associates, Inc. presenting water plant details.

Sanitary wastewater from the campground will be disposed of using a mass drainfield, with a smaller septic system drainfield receiving wastewater from staff facilities. An independent onsite septic system with drainfield is proposed to receive wastewater from the Camp Director's house. A discussion of the proposed wastewater treatment and disposal system is included in Attachment 6.

### **Estimated Water Use**

The campground is expected to operate at full capacity during the summer months of June, July and August. Due to the seasonal nature of camping, it is anticipated that during the months of April, May, September, and October the campground will be operating at one-half (1/2) capacity. During the months of March and November it is estimated that 100 people will be using the campground on weekends, with 50 people expected at the campground on weekends during the months of December, January and February. A total of 10 people, comprised of YMCA staff and their families, are anticipated to be resident year round and are included in the estimates noted above.

The Virginia Department of Health has required that 75 gallons per person per day be used as a water supply/system design criteria for the campground. According to representatives from Kimley-Horn and Associates, Inc., this criteria is sufficient in a campground setting to accomodate incidental uses of water such as the operation of a swimming pool, general cleaning tasks, and landscape maintenance.

Table 1 summarizes the anticipated monthly and annual water use. At full capacity, the campground will require approximately 34,000 gallons of water per day.

Annual water use for public supply is estimated to be approximately 5,463,000 gallons. Therefore, the YMCA of South Hampton Roads requests a permit to withdraw 5,500,000 gallons annually, with a monthly maximum of 1,100,000 gallons.  $231 = 35.48 \text{ mgd}$

TABLE 1  
ESTIMATED WATER USE SUMMARY

<u>Month</u>	<u>No. of Persons</u>	<u>Max. Daily Flow Rate (gallons)</u>	<u>Tot. Est. Water Use (gallons per month)</u>
January	50	3,750 <sup>Days</sup> 23 <sub>8</sub>	47,250 ✓ <sup>People</sup> 10 <sub>50</sub>
February	50	3,750	45,000 ✓
March	100	7,500	77,250 ✓
April	225	~16,875	506,250 ✓
May	225	~16,875	523,125 ✓
June	450	~33,750	1,012,500 ✓
July	450	~33,750	1,046,250 ✓
August	450	~33,750	1,046,250 ✓
September	225	~16,875	506,250 ✓
October	225	~16,875	523,125 ✓
November	100	7,500	76,500 ✓
December	50	3,750	53,250 X
Total Estimated Annual Water Use		=	5,463,000

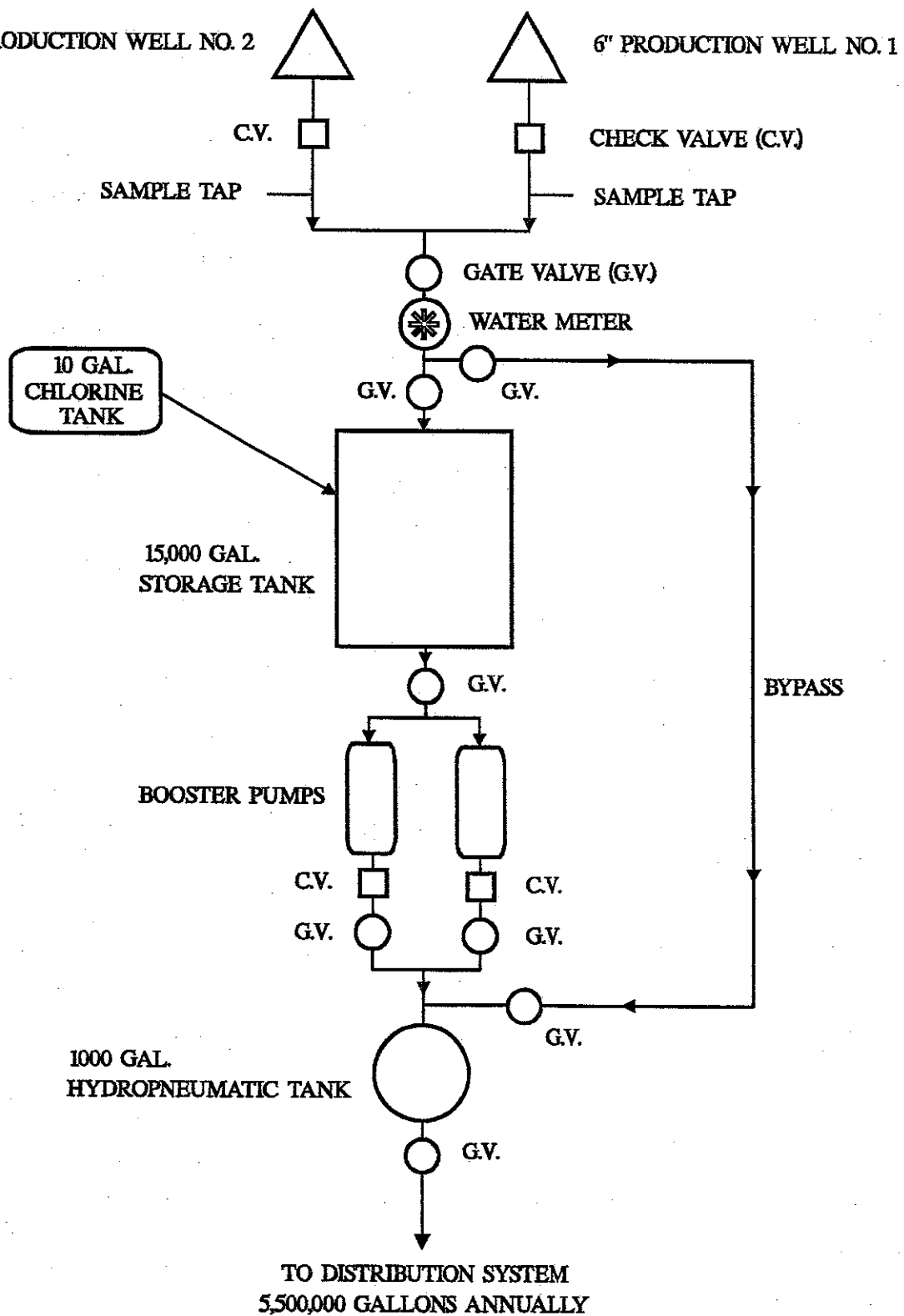
Basis: 75 GPD per person

Campground open only weekends November through March

A maximum of ten (10) persons onsite year round

4" PRODUCTION WELL NO. 2

6" PRODUCTION WELL NO. 1



RKA

WATER SYSTEM SCHEMATIC  
YMCA FAMILY CAMPGROUND  
SILVER BEACH, VIRGINIA

FIGURE NO. 1

**ATTACHMENT 13**  
**WATER CONSERVATION AND MANAGEMENT PLAN**

**1. Water Saving Plumbing and Processes**

All domestic plumbing fixtures at the YMCA Family Campground will meet the 1993 BOCA plumbing code for ultra low water consumption.

**2. Water Loss Reduction Program**

The plumbing systems will be inspected and maintained on a regular basis. YMCA staff will be instructed to note areas where changes will help to conserve water, or reduce losses. Campers will be requested to notify staff of any problems with the water system such as plumbing leaks or dripping fixtures.

**3. Water Use Education Program**

Employees will receive instruction as to the importance of efficient water use and conservation methods during their orientation. Placards promoting water conservation methods will be posted in appropriate areas.

**4. Evaluation of Potential Water Reuse Options**

Wastewater from the campground will be returned to the ground using a mass drainfield and smaller onsite drainfield.

**5. Requirements for Mandatory Water Use Reductions**

The campground will comply with any mandatory water use reductions during water shortage emergencies declared by the local governing body or the Director of DEQ. This will include provision of requirements for mandatory water use restrictions to seasonal and year-round employees, prohibiting all non-essential uses such as lawn and ornamental irrigation or car washing at the campground.



# LARGE AGRICULTURAL SELF-SUPPLIED WATER USERS



**MALCOLM  
PIRNIE**



## David's Nursery



**MALCOLM  
PIRNIE**

#5 (David's Nursery):

JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED

Projecting what plants to grow and in what quantities for future sales has always been and will continue to be the most difficult aspect of horticulture. David's Nursery is spread out on over 500 acres and grows a wide variety of plants, mostly woody ornamentals but also including some perennials. This year we will sell approximately 250,000 plants, some of which took eight years to mature. My two sons are active partners in this business; they are young and aggressive, and I can easily foresee them doubling the size of our nursery in the next ten years. Of course, doubling our size will necessitate doubling our water demand. At the present time we have approximately 40 employees whose annual income range is from \$14,000 to \$50,000. Considering our estimated future sales growth, our number of employees and their incomes will also increase and impact the economy of the Eastern Shore. We are in the top ten of wholesale nurseries in the state of Virginia. A graph is attached which details our sales from recent years and projects our future doubling in size.

Nursery crops are rotated with winter wheat to add humus to the soil. Woodsland covers several areas which along

with grass filter strips and the winter wheat prevent wind and water erosion. Ponds serve a dual purpose, not only for irrigation, but to detain sediment from entering the creek.

Irrigation is provided by the following methods:

traveling gun, trickle, overhead, and individual spray nozzles. The traveling gun waters approximately 125 acres of field grown plants. The water for this gun comes from a pond. The trickle system, which is supplied by another pond, furnishes water to 30 acres of field grown hollies. Another 37 acres of plants grown in containers are watered by overhead irrigation provided by three wells (container well, well #1, & well #2). Our P & P (Pot in Pot) consists of 44 acres which are watered by 3 additional wells. Each plant in this area has an individual watering nozzle secured in the container so that none of the water is wasted. We are currently expanding our P & P type of growing and we intend to use this type of plant production at our new well. We would like to have everything on trickle or individual nozzles as in P&P, but not all plants grow satisfactorily using these methods and we have to use our best business judgment as to what plants we can sell in the future. We ~~alternate pumping~~ from our different wells which are spread throughout our many fields, however these wells are cross connected so if one breaks down we are still able to supply water to our



plants.

Included is a mathematical estimate of our present water usage. This is a seasonal estimate for eight months not taking into account rainy days during those months. The days which we pump in November, December, January and February should be offset by the rainy days in the other eight months. We will install water meters on most wells so that next year we will know how much water to apply for.

## David's Nursery year 2000

P + P 1 15 A. 18 Zone Trickle 2 zones Overhead

150 GPM Pump 10 min/zone Trickle 45 min Overhead

Trickle 10 min  $\times$  150 GPM  $\times$  18 Zones  $\times$  30 days = 810,000 gal/mo45  $\times$  150  $\times$  2  $\times$  30 days = 357,000 gal/mo1,167,000 gal  $\times$  8 mo. = 9,288,000 gal/year

P + P 2 16 A. 150 GPM - 24 Zones Trickle @ 10 min

150 GPM  $\times$  10 min  $\times$  24 Zones  $\times$  30 days = 1,080,000 gal1,080,000 gal  $\times$  8 mo. = 8,640,000 gal/year

P + P 3 16 A. 150 GPM - 25 zones Trickle @ 10 min

150 GPM  $\times$  10 min  $\times$  25 zones  $\times$  30 days = 1,125,000 gal/mo1,125,000 gal  $\times$  8 mo = 9,000,000 gal/year

Container Well 8 A (Overhead) 220 GPM 7 zones @ 10 min

220 GPM  $\times$  60 min  $\times$  7 Zone  $\times$  30 days = 2,772,000 gal/mo2,772,000  $\times$  8 mo. = 22,176,000 gal/yr.

# 1 25 A 311 GPM (Overhead) 14 zones @ 60 min.

311 GPM  $\times$  60 min  $\times$  14 zones  $\times$  30 days = 7,837,200 gal/mo.7,837,200  $\times$  8 = 62,697,600 gal/yr.7,837,200  $\div$  25  $\div$  27,000 = 11.6 inches/mo

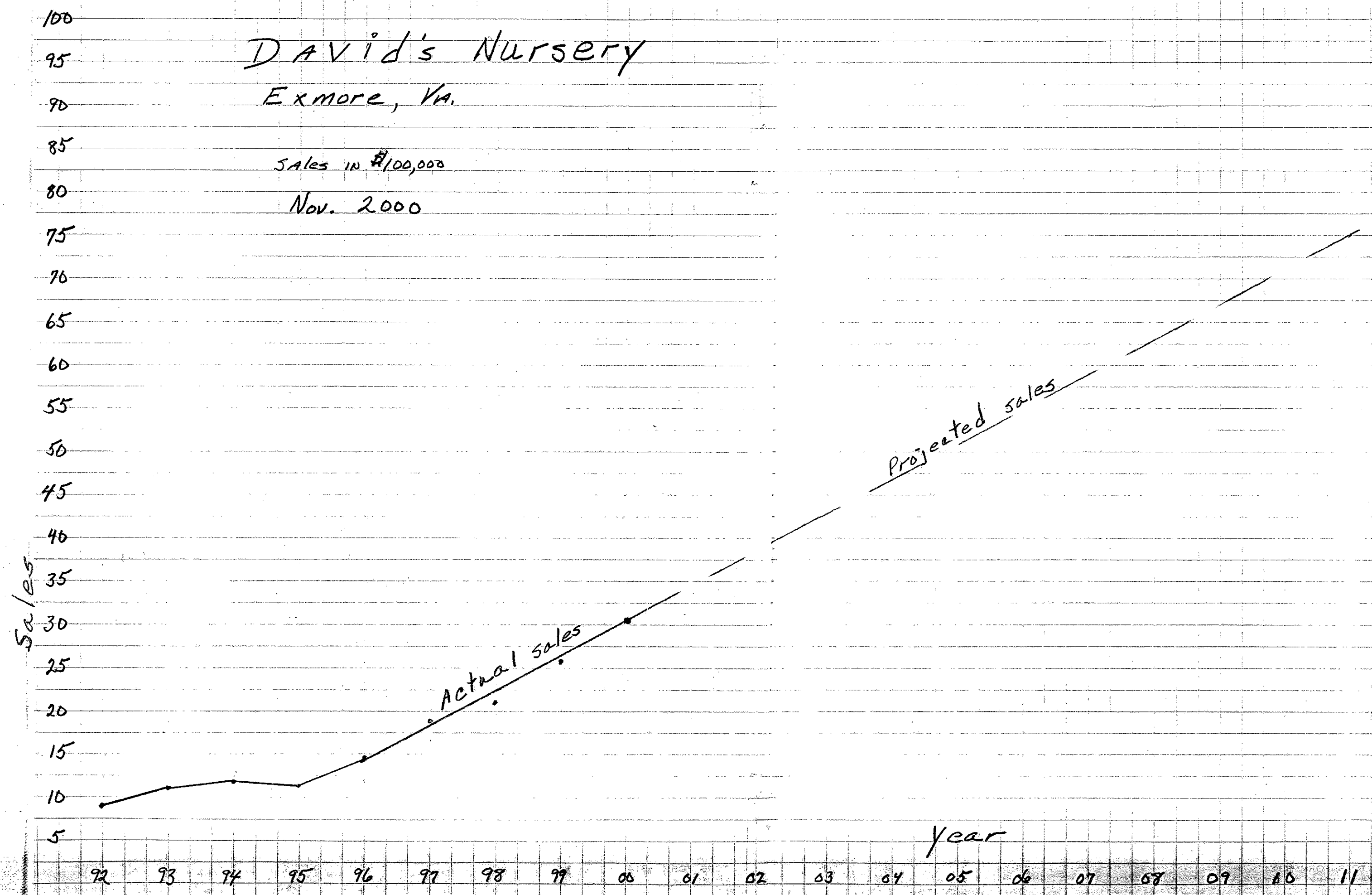
# 2 4 A 220 GPM 4 zones @ 180 min

180 min  $\times$  220 GPM  $\times$  10 days 396,000 gal/mo396,000  $\times$  8 mo = 3,168,000 gal/yr

# DAVID'S NURSERY

Exmore, Va.

Sales in \$100,000  
Nov. 2000



#13 (David's Nursery):

#### WATER CONSERVATION AND MANAGEMENT PLAN

At David's Nursery we are constantly asking ourselves how we can save water. To increase our efficiency we often water at night when there is no wind or evaporation. We use time clocks to change zones so we do not run the water excessively. P&P and trickle irrigation are ways we save water by putting water where it is most needed.

We check continually for leaks in all of our irrigation. If we discover a break in our overhead irrigation, we have at least five people who are immediately available to repair the system. In our P&P field (approximately 37 acres but expanding) a team of five men regularly walk each row checking for leaks.

We have four people trained in the use of our time clocks. We turn them off in wet weather and curtail their use during cool weather when the plants' growth slows and the days are shorter. Our employees report leaks immediately and we continue to train new employees on how to fix them.

We reuse water in ponds from which we supplement our irrigation as described in #12.



# Herbert Nottingham Farm



**MALCOLM  
PIRNIE**

## **Attachment A**

This well is necessary for the production of a vegetable crop , tomatoes , utilizing drip irrigation under a plastic mulch . I chose drip irrigation because of its high-water use efficiency and the limited source of available water (no location for a productive dug pond) on this farm .

Drip irrigation allows me to implement one of the primary objectives of good water management - simply the ability to apply the right amount of water at the right time while maintaining higher yields attributable to irrigation .This irrigation practice also allows me to control nutrient application which in turn can control nutrient leaching . These are two major considerations with groundwater pollution and my proximity to the Chesapeake Bay . Through the use of technology both old and new many things related to drip irrigation can be monitored water usage being one of these . In the last four years to better utilize my available water I have used a combination of several things , a crop consultant and tensiometers . I found I needed more water to meet the yield goal set for a profitable return for the tomato crop .

To predict what water needs will be needed at a given time or what yields can be assumed with x amount of water is very difficult for several reasons .

1. Vegetable crops moisture needs vary according to growth stages . The easiest example to explain would be corn which cannot stand moisture stress during the tasseling and silking , with tomatoes blossom aborting can be associated with moisture stress . Transpoevaporation is another factor very important in later growth stages especially in tomatoes , which relates to the next factor .

2. Weather Conditions . Without adequate rainfall subsoil moisture can require substantial amounts above that of normal irrigation just to maintain optimum moisture levels for plant growth . Getting back to transpoevaporation , hot sunny days in the final growth stages of a tomato plant require additional amounts of water to keep the plant healthy and productive .

3. Market Conditions . Market conditions basically determine the length of my growing season , a good market could extend the season as much as 3-4 weeks , with a mature crop during the month of August my water usage could increase by 25% . The opposite holds true for a bad market .

Understanding these things makes it easier to see where agricultural needs differ from commercial processing or industrial needs . It's difficult say it takes x gallons to produce y products . I use a conservative estimate of 300,000 gallons per acre to produce a 1500 box crop of tomatoes . This figure was an average of the figures used by the Maryland Department of Agricultural and Pacific Tomato Growers . Once again I used the conservative side of their figures . With this figure my projected water needs would be 10.65 million gallons .

My normal growing season begins in March when the land is tilled and dry fertilizer applied , fumigation , then the installation of drip irrigation ,followed by plastic mulch row covering and the farm is ready for planting . The tomato crop is planted generally in early April , at this time our irrigation begins . Below are monthly water projections .

April - 1 million

May - 2.25 million

June - 2.75 million

July - 3.15 million

## **Attachment A**

August - 1.5 million

Considering these things plus my historical data I feel that 10.65 million gallons annually would satisfy my needs as projected for the next 10 years .

I have enclosed several reports compiled by Virginias' Marketing Service that should help substantiate the factors I used above in their relation to my irrigation needs as they relate to vegetable production .

## **Attachment A**

For the last 8 years this well has supplied water for the production of vegetables on this 35 acres . It is reasonably to assume my water needs will not exceed the 10.65 million gallons applied for in this application .

Population should remain basically the same considering current zoning ordinances require 5 acre minimums in agricultural areas . Currently there are 4 residences within 200 yards of this well location with no known complaints concerning residential water .

Considering current zoning ordinances population expansion should remain basically at the same level for the next 10 years .





COMMONWEALTH of VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL QUALITY

Application # U5221 PAGTR025

AGRICULTURAL GROUND WATER WITHDRAWAL APPLICATION  
FOR EXISTING USERS TO OBTAIN A GROUND WATER WITHDRAWAL PERMIT  
PURSUANT TO THE GROUND WATER MANAGEMENT ACT OF 1992

Section 62.1-259 and Section 62.1-260.E of the Ground Water Management Act of 1992 require that all persons withdrawing ground water on or before July 1, 1992 for agricultural or livestock watering purposes in excess of 300,000 gallons per month from a well, well system or a pond recharged by ground water with mechanical assistance in the Eastern Shore or Eastern Virginia Ground Water Management Areas, apply for a ground water withdrawal permit by December 31, 1993. Section 62.1-260 E requires the Virginia Department of Environmental Quality to issue ground water withdrawal permits for the total amount of ground water withdrawn in any consecutive twelve month period between July 1, 1983 and June 30, 1993 together with such savings as can be demonstrated to have been achieved through water conservation. A separate application must be filed for each well or system of wells. An agricultural well system is defined as follows: (1) two or more unconnected withdrawal points located on the same or contiguous properties under common ownership for which the withdrawal is put to the same beneficial use, (2) two or more interconnected withdrawal points under common ownership which may or may not be located on a contiguous property. Completed applications must be received at the Virginia Department of Environmental Quality, Office of Spill Response and Remediation, P.O. Box 11143, Richmond, VA. 23230, by December 31, 1993.

1. Landowner: W. T. NOTTINGHAM JR. Phone: 804-331-3119  
Landowner Address: 2497 PICKETTS HARBOR DRIVE  
HB. RD. CAPE CHARLES, VA 23310  
(Street, RR and Box #, City, State, Zip Code)  
Agent/Renter Name: NOTTINGHAM ENTERPRISES INC Phone: 804-331-3119  
Location of Withdrawal Well or Well System: NORTHAMPTON, CHEAPSIDE  
(County/City)  
Farm Name: CHEAPSIDE FARM

2. Total amount of ground water withdrawal during any consecutive twelve month period between July 1, 1983 and June 30, 1993 5723,400 Gallons.  
Consecutive twelve month begins JULY 1, 1992 and ends JUNE 30, 1993.  
(Period must begin on the first day of the beginning month and end on the last day of the ending month.)

3. Documentation of ground water withdrawal claim must be provided. The preferred documentation of withdrawal amounts are voluntary ground water withdrawal reports submitted pursuant to the Water Withdrawal Reporting regulations (VR 680-15-01) or flow meter readings. Attach a copy of the Annual Report of Water Withdrawals or flow meter readings if available for the period chosen in 2. above. If ground water withdrawal reports or meter readings are not available, provide estimates of withdrawals based on one of the following methods:

For Irrigation:

Method #1: Total acres irrigated, depth of irrigation, number of irrigations per year. (Example; 100 acres of potatoes, 1 inch of irrigation, irrigated 3 times per year. Solution: There are 27,152 gallons in 1 acre inch of water. 100 acres x 3 times x 27,152 gallons/acre = 8,145,600 gallons of ground water withdrawn in one year).

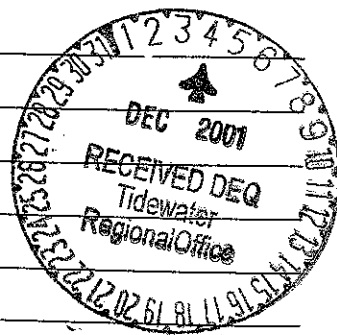
Type of crops/fruits/vegetables irrigated during 12 month period: \_\_\_\_\_

Number of acres irrigated for each crop during 12 month period: \_\_\_\_\_

Number of inches of irrigation during 12 month period: \_\_\_\_\_

Number of irrigations: \_\_\_\_\_

Calculate your annual usage: \_\_\_\_\_



**Method #2:** Pumping capacity of well pump(s) and total pumping time.

(Example: Well #1 pumps 150 gallons per minute and well #2 pumps 100 gallons per minute. Both wells are pumped for 200 hours during a 12 month period. Solution: 150 gallons/minute x 60 min/hr x 200 hours = 1,800,000 gallons pumped from well #1. 100 gallons/minute x 60 min/hr x 200 hours = 1,200,000 gallons pumped from well #2. Total = 1,800,000 + 1,200,000 = 3,000,000 gallons of ground water used in one year).

Type of crops/fruits/vegetables irrigated during 12 month period:

Number of acres irrigated for each crop during 12 month period: \_\_\_\_\_

Pump capacity: \_\_\_\_\_ Hours pumped: \_\_\_\_\_

Pump capacity: \_\_\_\_\_ Hours pumped: \_\_\_\_\_

Pump capacity: \_\_\_\_\_ Hours pumped: \_\_\_\_\_

Pump capacity: \_\_\_\_\_ Hours pumped: \_\_\_\_\_

Pump capacity: \_\_\_\_\_ Hours pumped: \_\_\_\_\_

Pump capacity: \_\_\_\_\_ Hours pumped: \_\_\_\_\_

Pump capacity: \_\_\_\_\_ Hours pumped: \_\_\_\_\_

Pump capacity: \_\_\_\_\_ Hours pumped: \_\_\_\_\_

Attach additional sheets if necessary

Calculate your annual usage: \_\_\_\_\_

**Method #3:** Gallons of fuel, electricity, etc. for pump, pumping rate.

(Example: Pump uses .6 gallons of fuel/hr., pumping rate is 400 gallons per minute, 150 gallons of fuel used. Solution: 400 gal/min x 60 min/hr = 24,000 gal/hr divided by .6 gal of fuel/hr = 40,000 gal of water/gallon of fuel x 150 gal of fuel = 6,000,000 gal of water used in one year).

Type of crops/fruits/vegetables irrigated during 12 month period:

Number of acres irrigated during 12 month period: \_\_\_\_\_

Fuel usage rate: \_\_\_\_\_

Total fuel used during 12 month period: \_\_\_\_\_

Calculate your annual usage: \_\_\_\_\_

**Method #4: Other methods for recording irrigation usage**

Type of crops/fruits/vegetables irrigated during 12 month period: \_\_\_\_\_

Number of acres irrigated during 12 month period: \_\_\_\_\_

Explain your irrigation system and approach to develop your estimated withdrawal: \_\_\_\_\_

**For Livestock Watering:**

Type of livestock/poultry watered during 12 month period: \_\_\_\_\_

Animal subtype	Number of animals	Amount of water per animal per day
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Provide the name of the reference document used to determine water consumption rates. \_\_\_\_\_

Do You use water for livestock cooling? Yes No (circle one)

Number of livestock/poultry cooled: \_\_\_\_\_

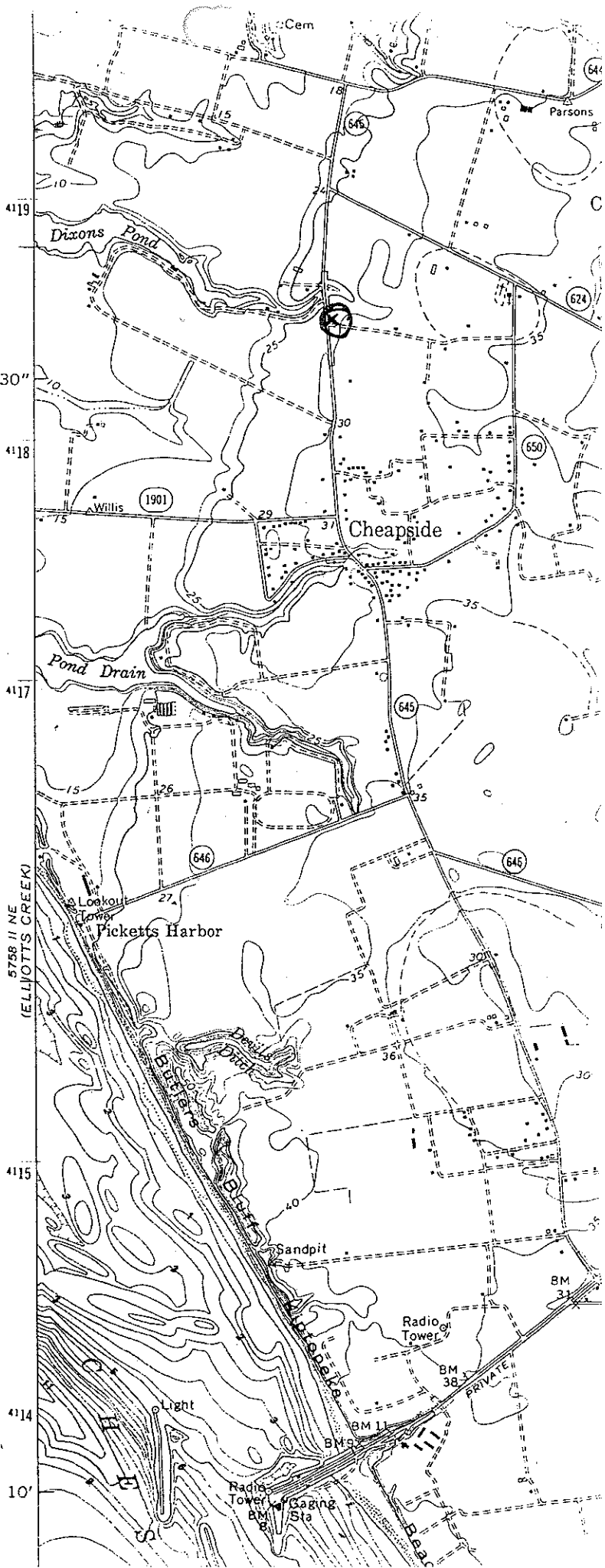
Annual amount of water used for cooling: \_\_\_\_\_

Do you use water for dairy operation washing? Yes No (circle one)

Annual amount of water used for dairy operation washing: \_\_\_\_\_

Figure your annual usage: \_\_\_\_\_

4. Well Location(s): Locate all wells associated with the application on a United States Geological Survey 7 1/2 minute topographic map or copies of such maps. Assistance may be obtained from Department of Environmental Quality staff at 804-527-5187.



INTERIOR-GEOLOGICAL SURVEY, RESTON, VIRGINIA-1991  
 421  
 422000m E 37° 07' 30"  
 75° 52' 30"

ROAD CLASSIFICATION

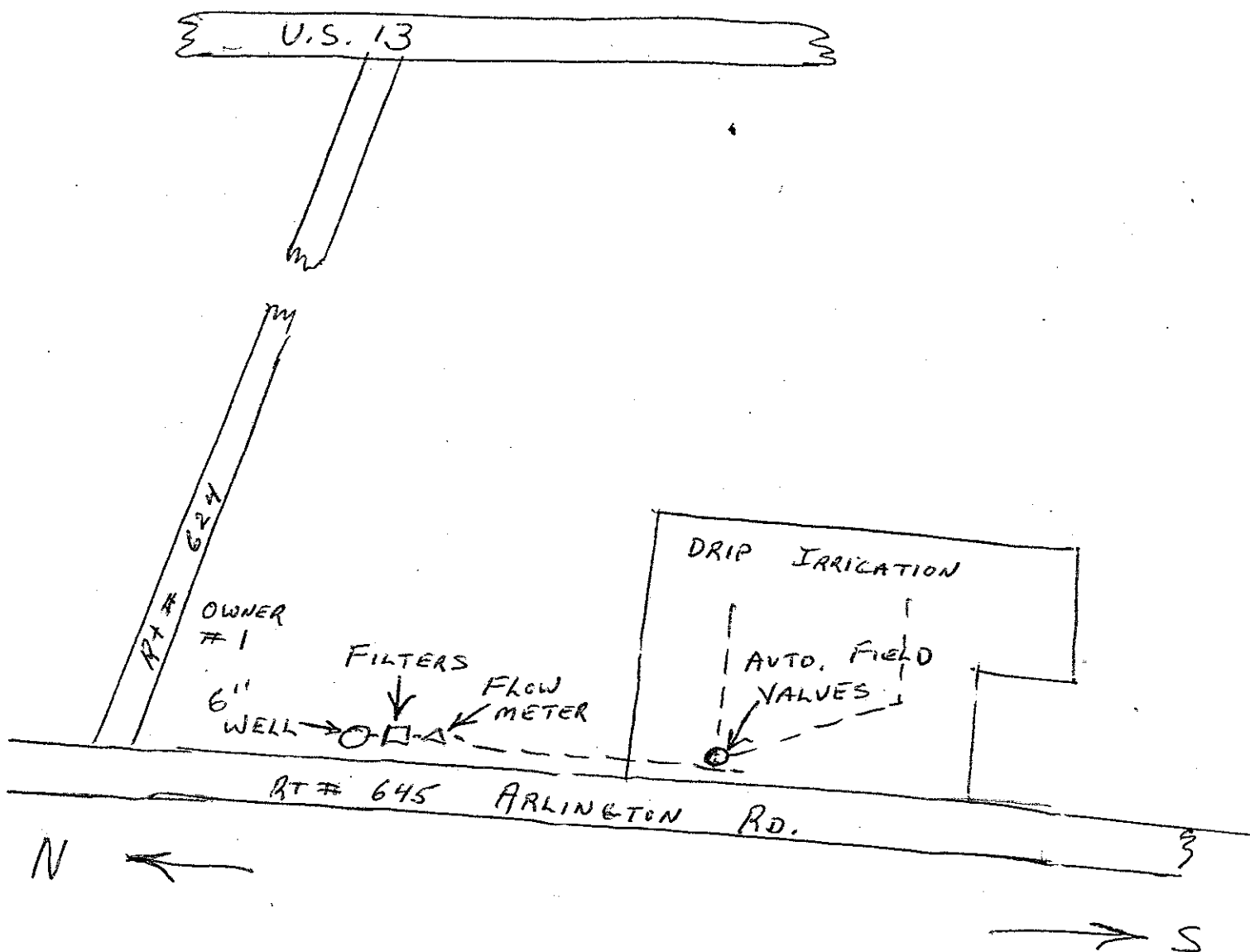
- Primary highway, all weather, hard surface
- Secondary highway, all weather, hard surface
- Light-duty road, all weather, improved surface
- Unimproved road, fair or dry weather
- U. S. Route
- State Route

Map photoinspected 1989  
 No major culture or drainage changes observed

TOWNSEND, VA.  
 37075-B8-1B-024  
 PHOTOINSPECTED 1989  
 1968  
 PHOTOREVISED 1980  
 BATHYMETRY ADDED 1986  
 DMA 5858 III NW-SERIES V834

MAGNETIC NORTH  
 CENTER OF SHEET  
 0.34'  
 3 MILLS  
 compiled from latest  
 controlling

5. Irrigation system sketch: Provide a sketch of the irrigation system in the space provided below. Show the location of all wells, ponds, meter locations and buried water lines in the irrigation system. See attached example.



Complete the well information worksheet for all existing wells associated with this application. ATTACH copies of original water well completion reports for each well listed below. DEQ well identification plates must be attached to each existing well. Well identification plates can be obtained at the appropriate DEQ Regional Office.

Provide the four digit user ID# listed on your Annual Report of Water Withdrawals if you are currently reporting under the Water Withdrawal Reporting Regulations.    --    --    --    --

5221-16/94 100

[illegible]

**\*\* Well Status: (Act) Active, (Abnd) Abandoned, (Alt) Altered from the Original Construction, (OS) Out of Service**

7. Section 62.1-260.E. of the Ground Water Management Act of 1992 allows the applicant to apply for ground water withdrawal rights, in addition to those based on withdrawals between July 1, 1983 and June 30, 1993, for savings achieved through water conservation. In order to qualify for savings achieved through water conservation, water conservation measures must have been implemented which resulted in a lower withdrawal amount during the 10 year period. For example, a farmer irrigated 100 acres of crops with a sprinkler irrigation system which used 8.1 million gallons in 1981. In 1982, the farmer installed a drip system to irrigate the 100 acres which used 6.1 million gallons of water for the year. Therefore, when the 10 year period started on July 1, 1983, the farmer would only be able to document 6.1 million gallons if he continued to irrigate the same crop and acreage through June 30, 1993. In this case, the farmer would be entitled to apply for 6.1 million gallons plus the 2 million gallons he saved prior to July 1, 1983.

Does the applicant intend to apply for ground water withdrawal rights based on savings achieved through water conservation? \_\_\_\_\_ Yes ☒ No

8. Section 62.1-260.G. of the Ground Water Management Act of 1992 allows the applicant to apply for more water in addition to those based on withdrawals between July 1, 1983 and June 30, 1993 and savings achieved through water conservation.

Does the applicant intend to apply for ground water withdrawal rights in excess of those established by historical use and savings achieved through water conservation at this time? \_\_\_\_\_ Yes ☒ No

9. Signatory Requirements: *The application must be signed by the landowner, responsible corporate official, general partner or proprietor.*

I certify under penalty of law that this document and all information submitted were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is to the best of my knowledge, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. I further certify that I am an authorized signatory as specified in the Ground Water Withdrawal Permit Regulation (VR 680-13-07).

Signature: W. T. Nottingham Jr. Date 12-5-93  
 Printed Name: W. T. NOTTINGHAM JR.  
 Title: President, Nottingham Enterprises Inc.  
 Phone: (804) 331-3119

Owner Name: W.T. Nottingham Jr.			Data from Annual Water Use Reports on file.						
System Name: Nottingham Enterprises Inc.									
User ID#: 5221									
1999 Tomato Crop									
Withdrawal Location			MG Used	Acres Irr.	Inches/Acre	Withdrawal Location	MG Used	Acres Irr.	Inches/Acre
Pond Drain (North Side)			8.06	46.60	6.37	Pond Drain (North Side)	10.60	46.60	8.38
Pond Drain (South Side)			24.43	115.00	7.82	Pond Drain (South Side)	24.40	115.00	7.81
Well #1			9.78	35.50	10.15	Well #1	8.08	35.50	8.38
			42.27				43.08		
1997 Tomato Crop									
Withdrawal Location			MG Used	Acres Irr.	Inches/Acre	Withdrawal Location	MG Used	Acres Irr.	Inches/Acre
Pond Drain (North Side)			5.80	46.60	4.58	Pond Drain (North Side)	5.20	46.60	4.11
Pond Drain (South Side)			9.80	115.00	3.14	Pond Drain (South Side)	8.64	115.00	2.77
Well #1			5.00	35.50	5.19	Well #1	4.40	35.50	4.56
			20.60				18.24		
1995 Tomato Crop									
Withdrawal Location			MG Used	Acres Irr.	Inches/Acre	Withdrawal Location	MG Used	Acres Irr.	Inches/Acre
Pond Drain (North Side)			4.92	46.60	3.89	Pond Drain (North Side)	6.21	46.60	4.91
Pond Drain (South Side)			10.58	115.00	3.39	Pond Drain (South Side)	15.22	115.00	4.87
Well #1			3.58	35.50	3.71	Well #1	5.87	35.50	6.09
			19.08				27.30		
1993 Tomato Crop									
Withdrawal Location			MG Used	Acres Irr.	Inches/Acre	1992 No Report On File			
P1			13.80	110.00	4.62				
P2			6.48	50.80	4.70				
P3			0.73						
			21.01						
1991 Potato Crop									
Withdrawal Location			MG Used	Acres Irr.	Inches/Acre	Withdrawal Location	MG Used	Acres Irr.	Inches/Acre
Lake Allure			16.335	110	5.47	Pond	5.32	98	2.00
			16.335				5.32		



Phone 757-621-9039  
Fax 757-331-4552

January 18, 2002

## Water Conservation and Management Plan

### 1. Requirements for the use of water saving plumbing and processes.

The Water Conservation and Management Plan for this farm utilizes all the technology available that I could afford, from the use of a computer controlled irrigation system, to buried PVC pipe, to the trickle tape that applies the irrigation water. My emphasis has been the most efficient use of the water available.

We begin all farm irrigation systems by making both a visual and physical survey of the farm. Through these surveys we try to determine two things, usable acreage and topographic characteristics. The usable acreage is then divided into zones to accommodate the available water. This is very important with trickle irrigation systems, available water must be divided so the capacity (gallons/min) of your water source is not exceeded and your water pressure to the trickle tape allows the trickle tape to operate at peak efficiency. The topographic survey helps to determine row direction, row length, drainage problems and to a small degree the PVC pipe size for my buried water supply line. The topo survey on this farm indicated a need to perform some land contouring, to improve the drainage and increase the efficiency of our trickle tape.

Next a blueprint is formed to indicate how I intend to supply the water to the zones that have been divided in the field. PVC pipe buried to a depth of 48 inches will be used to supply water from the well pump to the valves in each field zone. The entire system is controlled by a small computer. The computer allows me to program the amount of water applied to each zone; the time irrigation starts and stops, the # of irrigation cycles in a day, the amount of fertilizer applied, the time of the fertilizer application and more. The information from the physical survey helps determine the gallons per minute each zone requires, it is important figure used in the programming of each irrigation zone. I program each zone with the flow rate that will normally be required using the information already obtained.

The computer system offers many other features, one of the most important when dealing with water conservation and management is the Evapotranspiration Watering Factor (ET Watering Factor). This allows me to add a percentage increase in the amount of water needed to sustain a plant on a hot day. A weather monitor can also be interfaced to automatically do this, in my case this proved cost prohibitive, I simply watch the weather and adjust the amount of water accordingly. I determine irrigation needs mainly by two means, through the use of tensiometers and experience. Tensiometers measure soil saturation, I generally placed 2 in each zone at different soil depths from their readings I determine the daily irrigation requirements.

### 2. Water loss reduction program.

The PVC pipe in this system has compression fittings at one end of each pipe that are pressed together (identical to pipe used in municipal water systems) making them virtually leak free, at any directional change or line end concrete is poured to assure no separation or leaks. The plumbing from the well casing to the point at which it attaches to the buried PVC pipe is located on a 8'x10' concrete pad making it compact, simplistic in design, visually and physically accessible, making any leaks easily discernible and readily serviceable.

A water flow meter interfaced with my computer controller monitors flow rates for each zone, if the flow rate I programmed for a certain zone is exceeded the computer shuts down the irrigation cycle in that zone and starts the next zones' cycle. I can set the amount of excess water the computer will tolerate before it switches zones. Trickle irrigation systems have irrigation tape fittings that are disconnected from sudden pressure changes, field labors inadvertently walking on them, and several other reasons. I program the computer to change zones when the flow rate is exceeded by more than 15%, indicating a greater than normal leak. I monitor each irrigation system periodically during the day if a leak has occurred I only need to look at the controller to tell the size of the leak and its location.

### 3. Water education program.

Presently I am the only operator of this irrigation system but should I employ someone to operate the system that person will be trained in the system operation to insure that all water conservation measures are adhered to. I will also continue my education in conservation and water management practices as the information becomes available.

### 4. Evaluation of potential water reuse options.

I have no waste water or water that is discharged that is not utilized.

**5. Water use reductions during water shortage emergencies .**

I will comply with all water use reductions during water shortage emergencies declared by the local governing body or the Director of DEQ .

It is very evident through the system incorporated on this farm as well as all my farms good water management is a priority . I strive to achieve maximum use and efficiency from every gallon .



# Hermitage Farms Nursery



**MALCOLM  
PIRNIE**

# **APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT HERMITAGE FARMS NURSERY. FRANKTOWN – NORTHAMPTON COUNTY, VA**

## **ATTACHMENT (Section 5).**

### JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED

#### *Nature of Activity Utilizing Water and Documentation of Beneficial Use*

The Hermitage Farms Nursery is located approximately one-half mile south-southwest of Franktown, Virginia. The operation is located on two parcels that total approximately 200 acres. Currently, 29.5 acres are in production on the facilities western parcel. The western parcel has approximately 20.7 acres of land yet to be developed. The eastern parcel has approximately 50. There are three modes of irrigation utilized at this facility: overhead/broadcast irrigation, drip irrigation, and hand watering.

The current operation consists of four water use regimes distributed amongst 8 production wells. The facility operates 3 green/propagation houses (2 wells), 10.2 acres of drip irrigation land (2 wells), 19.3 acres of overhead irrigation land (2 wells) and six homes (2 wells). Each of the irrigation demand operations has increased in size year-over-year. Currently the facility operates only its western parcel with plans to expand into its eastern parcel (50 additional acres) after the remaining 20.7 acres on the western parcel are fully developed. The facility can meet the current and future demand of the western parcel operation with its current well configuration. The eastern parcel, when developed, will require two additional supply wells to meet the demand.

When the facility has finishes its planned expansions there will be a total of: 70.4 acres of drip irrigation land and 29.4 acres of overhead irrigation resulting in approximately 100 acres of irrigated land. The facility has no plans to increase its potable demand which is currently less than 5% of the total withdrawal.

#### *Current Consumption and Demand*

Groundwater withdrawal data was collected and analyzed between January 2007 through December 2008. With two years of complete data, the system was assessed in terms of its documented consumption and its projected expansion. As the facility has four separate usage demands it was imperative to separate each use type so they may be analyzed in reference to their individual withdrawal well.

Residential and potable withdrawals are attributed to two wells specifically (#1 DEQ# 165-551 and #2 DEQ# 165-554). A partial potable use (at the facilities main office) is sourced from the combined propagation wells. However, potable use from those wells is negligible (less than 500 gallons a day). The current monthly mean for well #1 is 9,795 gallons per month. The current monthly mean for well #2 is 22,083 gallons per

month. As expansion of potable use is not planned, the 99% percentile will be used to approximate the maximum likely demand. No expansion algorithm will be applied.

The first usage regime (Hand watering) is derived from the facilities' propagation wells. Well #4 (DEQ 165-555) and Well #8 (165-556). These wells supply water to the greenhouses and to a minor extent to the office (less than 500 gallons per day). These wells alternate their production, which accounts for their very similar withdrawals. Propagation Well #4 (165-555) does produce a slightly higher volume of water. The facility currently has the materials to construct a fourth greenhouse with plans to add a fifth within ten years.

The second usage regime (Overhead watering) is derived from two wells which are essentially pond recharge wells. Well #5 (DEQ 165-550) and well #6 (165-557) recharge the "Branch pond" and the "Back pond" respectively. The water withdrawal supplements the overhead irrigation required for the plants that can not be irrigated by drip irrigation. The total of the facilities 19.32 acres of Overhead watering area is currently divided into 5 subsections. Sections "A", "B", and "C" are serviced by the Branch pond and total approximately 12 acres of land. Sections "D" and "E" are serviced by the Back pond and total approximately 7.4 acres. The area serviced by the Branch Pond system will not be extended. However, the Back pond area plans to expand into two additional subsections "F" and "G". This expansion is approximately 10.1 additional acres.

The third usage regime (Drip Irrigation) is based on withdrawals taken from the facilities "P&P" wells. Old P&P (Well #3, DEQ #165-552) and New P&P (Well #7, DEQ #165-553) supply water to an above ground storage tank which forwards water to the drip system. Currently 10.2 acres of drip irrigation land are in production. The water withdrawals associated with these wells are essentially equal. However, well #3 does produce approximately 2% more water.

The table below details the facilities basic monthly withdrawal statistics based on the last two years of data:

Well#,DEQ#	Well Name	Average	Max	Deviation	Weighted Average
#1, 165-551	Old Office	9,887	17,300	3,261	11,654
#2, 165-554	Trailers	21,855	34,780	4,586	24,148
#3, 165-552	Old P&P	182,066	423,700	127,376	224,525
#4, 165-555	Prop 1	6,985	10,790	2,544	8,257
#5, 165-550	Branch pond	18,554	250,100	56,627	27,219
#6, 165-557	Back Pond	387,366	1,772,200	597,738	736,047
#7, 165-553	New P&P	167,779	521,800	144,774	252,230
#8, 165-556	Prop 2	6,692	10,100	2,374	7,978
Total					1,292,058

The weighted average statistics were compiled in order to account for the actual distribution of withdrawal based on the actual demand. The weighted average statistics are provided as an addendum to this section.

#### *Future Consumption and Demand*

Hermitage Farms has increased the scale of its operation each year. The future demand is based on the volume of expansion that is likely to occur within the next ten years. The weighted averages above are based on a unit basis relative to the type of consumption experienced at each well. The current demand has been reduced to an average that correlates to a "per unit" use. To expand the demand, the weighted average is applied to the total demand that is anticipated during the next permit term (Ten-Years).

The demand unit-types are:

- Prop1 and Prop2 = Greenhouses = 3 currently
- Old P&P = Drip irrigation acreage = 5.1 currently
- New P&P = Drip irrigation acreage = 5.1 currently
- Old Office = Homes = 2 currently
- Trailers = Home = 4 currently
- Back Pond = Overhead Irrigation acreage = 7.38 currently
- Branch Pond = Overhead Irrigation acreage = 11.94 currently

Incorporating the weighted average data, a per-unit table can be made:

Well Name	Weighted Average, gallons	Current unit demand	Per unit demand
Old Office	11,654	2 homes	5,827 gal/home
Trailers	24,148	4 homes	6,037 gal/home
Old P&P	224,525	5.1 acres	44,024 gal/acre
Prop 1	8,257	1.5 greenhouses	5,505 per/Ghouse
Branch pond	27,219	11.94 acres	2,279 gal/acre
Back Pond	736,047	7.38 acres	9,9735 gal/acre
New P&P	252,230	5.1 acres	49,457 gal/acre
Prop 2	7,978	1.5 greenhouses	5,318 gal/Ghouse

The total future demand (monthly average) is added to the current demand:

Well Name	Per unit demand	Total Projected demand	Total Future Per Unit Demand
Old Office	5,827 gal/home	2 homes	11,654 gal
Trailers	6,037 gal/home	5 homes	30,186 gal
Old P&P	44,024 gal/acre	10.4 acres	457,855 gal
Prop 1	5,505 per/Ghouse	2.5 greenhouses	13,763 gal
Branch pond	2,279 gal/acre	11.94 acres	27,219 gal
Back Pond	9,9735 gal/acre	17.48 acres	1,743,374 gal
New P&P	49,457 gal/acre	10.4 acres	514,352 gal
Prop 2	5,318 gal/Ghouse	2.5 greenhouses	13,296 gal
Total			2,811,699 gal

The tables above reflect the changes expected to occur on the facilities Western Parcel. In addition to these changes, the facility will expand its drip irrigation operation into the Eastern Parcel. The eastern parcel contains approximately 50 acres of arable land. The documented drip irrigation rate stated above can be averaged to determine the order of demand anticipated for the expanded drip irrigation system. The formula below illustrates the drip irrigation demand for the Eastern Parcel:

$$\begin{aligned}
 \text{Old } P \& \ P_{\text{Gallons/acre}}^{\text{monthly rate}} &= 44,024 \text{ gallons/acre} \\
 \text{New } P \& \ P_{\text{Gallons/acre}}^{\text{monthly rate}} &= 49,457 \text{ gallons/acre} \\
 \text{Average} &= \left( \frac{44,024 \text{ gallons/acre} + 49,457 \text{ gallons/acre}}{2} \right) = 46,741 \text{ gallons/acre} \\
 46,741 \text{ gallons/acre} &\times 50 \text{ acres} = 2,337,025 \text{ monthly gallons}
 \end{aligned}$$

The total weighted, normalized monthly and annual demand is:

$$\begin{aligned}
 2,337,025 \text{ East Parcel gallons} &+ 2,811,699 \text{ West Parcel gallons} = 5,148,724 \text{ gallons/month} \\
 5,148,724 \text{ normalized gallons/month} &\times 12 \text{ months/year} = 61,784,688 \text{ gallons/year}
 \end{aligned}$$

This facility has a seasonal component with respect to its production. As such, the withdrawals of each month will not be consistent. To account for the highest monthly demand, the data was analyzed to account for the average monthly demand. In general the percentage of annual consumption is:

January	1.1%
February	0.9%
March	1.7%
April	3.1%
May	5.1%
June	7.4%
July	9.7%
August	19.0%
September	26.8%*
October	18.9%
November	4.7%
December	1.1%

The total sum of percentages equals 98.2%. The additional 1.8% is to be distributed equally for all months. As September is the month with the greatest demand and additional 0.15% is added to the 26.8% in order to assess this month's likely maximum demand.

The following equation derives the likely maximum monthly withdrawal:

$$26.95\% \frac{\text{September}}{\text{Annual total withdrawal}} * 61,784,688 \frac{\text{gallons}}{\text{year}} = 16,650,973 \frac{\text{September gallons}}{\text{year}}$$

The maximum annual and monthly withdrawals with this permit application are”

- **61,784,688 gallons per year (maximum)**
- **16,650,973 gallons per month (maximum)**

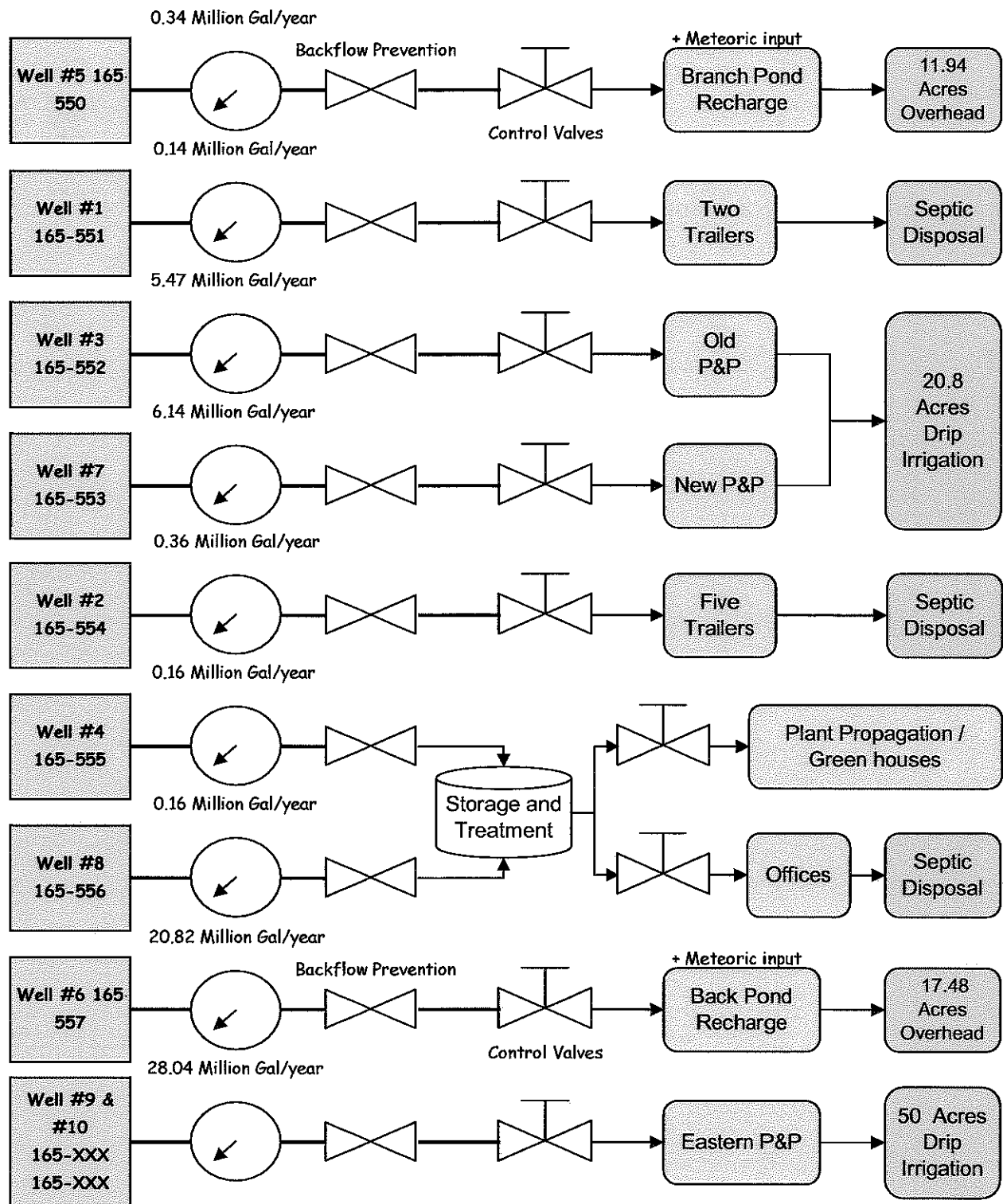
*Apportionment of Withdrawal to Individual Wells (existing wells)*

The permitted yield will be produced from eight existing wells. Each well is monitored and yields differing amounts of water in order meet demand.

APPORTIONMENT OF WITHDRAWALS	Well-#1 (DEQ #165-551)	Well-#2 (DEQ #165-554)	Well-#3 (DEQ #165-552)	Well-#4 (DEQ #165-555)	Well-#5 (DEQ #165-550)	Well-#6 (DEQ #165-557)	Well-#7 (DEQ #165-553)	Well-#8 (DEQ #165-556)
January	1,538	3,985	60,437	1,817	3,593	230,125	67,895	1,755
February	1,259	3,260	49,448	1,486	2,940	188,284	55,550	1,436
March	2,378	6,158	93,403	2,808	5,553	355,648	104,928	2,713
April	4,336	11,229	170,322	5,120	10,125	648,535	191,339	4,946
May	7,133	18,474	280,208	8,423	16,658	1,066,945	314,784	8,138
June	10,349	26,805	406,576	12,222	24,170	1,548,117	456,745	11,807
July	13,566	35,137	532,944	16,020	31,683	2,029,288	598,707	15,477
August	26,573	68,825	1,043,911	31,380	62,059	3,974,894	1,172,724	30,317
September	37,482	97,079	1,472,464	44,263	87,536	5,606,693	1,654,159	42,762
October	26,433	68,462	1,038,416	31,215	61,733	3,953,974	1,166,552	30,157
November	6,573	17,025	258,231	7,762	15,352	983,263	290,095	7,499
December	1,538	3,985	60,437	1,817	3,593	230,125	67,895	1,755
Annual Estimated Usage	139,158	360,424	5,466,796	164,334	324,995	20,815,894	6,141,373	158,763

The wells planed for the facilities eastern parcel have not been constructed yet. The apportionment attributed to these wells will be approximately 50/50. The approximate withdrawal of 28,044,474 gallons would be shared equally by both production wells.





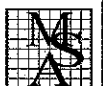
**FIGURE 2. Site Schematic**

**GROUND WATER WITHDRAW PERMIT  
HERMITAGE FARM NURSERY**  
Franktown, Virginia

**MSA, P.C.**

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DATE:  
1/21/2009

SCALE:  
NTS

MSA JOB #:  
06778

# **WATER CONSERVATION AND MANAGEMENT PLAN**

**HERMITAGE FARMS NURSERY  
7483 MASON FARM ROAD  
FRANKTOWN, VIRGINIA**

**NORTHAMPTON COUNTY, VIRGINIA**

**MARCH 2009**

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## 1.0 GENERAL INFORMATION

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The Hermitage Farms Nursery, herein referred to as the “facility”, is a nursery located in Franktown, Virginia. The facilities’ operational area consist of approximately 100 acres. Nearly 95% of groundwater withdrawals at this facility is utilized for plant irrigation; the remainder of the water withdrawn is utilized as a potable source for the employees and staff residing onsite.

Normal operation at this facility requires water withdrawals in order to provide a sustainable resource for the onsite irrigation demand. Because this property is located within the Eastern Virginia Groundwater Management Area – as defined by the Virginia Department of Environmental Quality [VDEQ] – a Water Conservation and Management Plan has been prepared in accordance with the Ground Water Management Act of 1992, Chapter 25 (§62.1-254 et seq.) of Title 62.1 of the Code of Virginia. The purpose of this document is to analyze water supply and demand issues facing the facility and develop a reasoned and justifiable response for water conservation and management. This document is intended to help guide the Hermitage Farms Nursery employees and management in responsible operation and policy management decisions related to the utilization of groundwater. Lastly, this document meets the permit requirement by VDEQ for a water conservation and management plan. Water conservation measures are those physical facilities, equipment, and/or devices utilized with certain methods, techniques, policies, practices, and procedures, which reduce water consumption, improve water use efficiency, reduce water loss or waste, increase water recycling or reuse and ultimately result in a reduction of water demand. Water management consists of a plan to implement water conservation measures.

This Water Conservation and Management Plan, referred to herein as the "Plan", includes identification of water demand and water source and then shall provide guidance to implement water management and conservation measures.

## 2.0 WATER DEMAND

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Water demand at this facility is primarily associated with irrigation practice. Irrigation at this facility is administered in three ways: overhead/broadcast irrigation, drip irrigation, and targeted hand watering. The remainder of the water used on-site is for potable consumption. There are limited opportunities to conserve water beyond what is currently conserved; The facility was awarded with the "2007 Ground Water Award" by the Eastern Shore of Virginia Ground Water Committee. This award recognized the efforts the facility has made in the protection of groundwater through both water reuse and reclamation efforts.

In order to discuss the conservation and management potential, each water use regime shall be evaluated separately. The facility currently operates on 29.5 acres with plans of expanding an additional 70 acres within the next ten years. Targeted hand watering occurs within the facilities greenhouses. Water used in the greenhouses is dedicated to plant propagation. Targeted watering is applied as needed with little waste as the young seedlings are not capable of surviving inundation. Any water that is not absorbed by the seeding beds may fall to the ground where it may either infiltrate or sublimate in to water vapor. As greenhouses are designed to retain heat and moisture (as humidity), any water not utilized by seedlings is therefore functional as an environmental control.

The facility currently operates 10.2 acres of drip irrigation area. Drip irrigation water is withdrawn directly from the wells and applied to the plants through a series of low flow drip emitters. Due to the controlled application of water possible through drip irrigation practices,

there are limited opportunities to conserve additional water beyond the current practice. There are only as many emitters used as there are plants requiring irrigation. Water is applied as needed and only when the demand for non-meteoric water is present.

The facility also operates 19.3 acres of overhead irrigation area. Overhead irrigation is utilized for the plants that have either been removed from drip irrigation, are being prepared for shipment, or have short maturation cycles. The facilities' overhead irrigation practice is rate based and is limited when meteoric inputs are both anticipated and active. Water utilized for overhead irrigation is mostly sourced from reclaimed waters. The facility, as previously mentioned, was recognized for its efforts in incorporating the usage of reclaimed water. The primary source of reclaimed water is generated by Shore Memorial Hospital in the form of treated waste water effluent. The facility also has a large engineered reclamation basin which collects as much storm and overhead irrigation water as possible.

### **3.0 WATER SUPPLY**

---

The following section presents a general overview of water resources available to the facility. The facility is not tied to any municipal water supply. There are eight deep wells at the facility that currently supply adequate quality and quantity of groundwater.

Although this region receives approximately 42 inches of precipitation per year, the facility is not able to capture and store all of the water that falls as rain. However, the facility does have an active reclamation system in place that captures as much meteoric water as possible. During periods of peak demand, surface water resources are not reliable as a result of high rates of evaporation, evapotranspiration and low inputs from precipitation. Groundwater has been used as a supplement to its reclamation system for many years without issues in terms of quality or quantity. Groundwater is a reliable source of water during the peak demand period (summer months).



#### **4.0 WATER CONSERVATION MEASURES**

---

The following conservation measures are currently implemented:

- No unnecessary groundwater withdrawals will be used. Water withdrawn under the facilities Ground Water Withdrawal Permit is withdrawn for the purposes listed below:
  - Supplementing surface withdrawals
  - Providing water directly to drip irrigation areas
  - Providing water for potable consumption
  - Overhead irrigation when required
  - Mixing of chemicals or fertilizers
- The facility does not distribute water outside of the its boundaries.
- Drip and overhead broadcast systems are routinely inspected (weekly) to ensure that proper flows are applied. No water beyond the current established demand will be applied. Pooling of water in overhead irrigation areas will not be permitted.
- The facility will continue to utilize Shore Memorial's treated wastewater as a source of surface water.
- The facility will continue to utilize lined overhead irrigation areas. These areas are designed to collect all and any water that is not utilized by plants. Each collection area is engineered to direct water to one of the facilities many lined stormwater ditches. These ditches are graded and connected to the facilities rear collection pond. The water in this pond is treated with aeration in order to improve the quality.
- Encourage employees to conserve water through the use of regular conversational reminders, posters and/or bulletins posted in message areas or bulletin boards.

- *Water Reuse Evaluation:* Water is reused at this facility. Water is collected from both stormwater run-off and from treated wastewater streams. This recovered water is used to recharge two of the facilities storage ponds. The water collected supplies the overhead irrigation areas. Additional areas of water reuse are not feasible as drip irrigation does not produce waste and potable use water can not be processed on site for reuse (septic treatment).

This conservation and management plan examined all water uses and presents management measures in Section 5.0.

## **5.0 WATER MANAGEMENT MEASURES**

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The following management measures will be implemented with regard to the water supply including groundwater from the facilities' wells and surface sources.

- **Water Loss Reduction:**
  - (a) The facility conducts monthly records review to find excessive usage that may indicate a leak in the system or significant change in operations.
  - (b) The facility will conduct routine inspections of all above ground water piping systems and storage tanks for any indication of leaks daily.
  - (c) The facility will conduct routine observations along surface pathways of underground potable water piping systems for indications of leaks monthly.
  - (d) Any leak discovered in the potable water storage/supply system will be repaired as soon as is practical or will be bypassed so as to minimize loss of water.
- The facility utilizes a water collection and treatment system to recover, treat, recycle, and reuse wastewater and stormwater.
- Mandatory water use restrictions will be implemented during water shortage emergencies declared by the local governing body or the Director of DEQ. Non-essential uses of water will be restricted. In addition, facility personnel will be prohibited from general washing of buildings, paved surfaces, or equipment. The facility will comply with penalties for demonstrated failure to comply with mandatory water use restrictions.



# Tankard Farm



**MALCOLM  
PIRNIE**

**APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT**

**Justification for the amount of withdrawal requested:**

In 1999, Charles Tankard started raising fescue sod for sale commercially. Vegetable crops may need irrigation 3 to 4 times a growing season on average. Sod, however, requires irrigation approximately 9 months per year. This will necessitate a considerable increase in water usage to maintain our present crops. Consequently, it is imperative that an application be made for a larger ground water withdrawal.

At the present time, the Tankard farm has approximately two hundred forty-five (245) acres irrigated from both the pond and the wells. Around sixty-three (63) acres are in sod and one hundred eighty-two (182) acres are in vegetable crops.

Estimated water usage is 80,641,440 gallons per year. The pond is expected to yield approximately 35% of the water and the well will supplement the remaining 65%. This is the worst case scenario. In years with normal rainfall, the pond will do better than the above estimate. As a consequence, well #165-435 will not be used as much. On extreme drought years, the crops on the Tankard farm will need about 51,840,000 gallons for survival from well #165-435.

**APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT** .

**Water conservation and Management Plan:**

1. Land Preparation: Certain farming practices can help aid in the conservation of water. Cultivation of the land before irrigation is one of these practices. This practice of loosening and stirring up the soil so that water absorption happens more quickly prevents the water from turning into runoff. After irrigation, cultivation is not performed for several days so that the crop has time to absorb as much of this moisture as possible.

The need for irrigation is determined by the use of tensioneters, which determine the moisture content of the soil.

The irrigation schedule is determined by crop management guides which give the information on how frequently and how much to irrigate. Small young plants do not need as much water as a fully mature plant. The water requirements of a mature plant that is supporting the development of fruit, especially as it approaches harvest, requires considerably more water.

Different soil types hold water longer than others. Bojac sandy loam does not hold moisture as long as nimmo sandy loam. Since these are two of the primary

soils on the land we farm, our irrigation schedules are adjusted to take these soil types into consideration. (The soil types determination cited comes from maps supplied by the U.S. Department of Agriculture Soil and Conservation Service in cooperation with Virginia Polytechnique Institute.

Environmental factors constantly alter the irrigation schedules.

Early morning and night irrigation is an important step in water conservation.

Watering at these times slows down the evaporation rate, thus requiring less water to be applied at one time. Timing is essential during irrigation so that these water saving effects can be preformed while at the same time providing the plant with ample nutrition to continue prospering during their growing period.

Irrigation during high wind conditions is not highly regarded upon when considering water conservation. It is generally understood that if irrigation is preformed under high winds that a very uneven application of water will be applied to the intended crop. Also, under high wind conditions the evaporation rate of water is greatly increased, therefore less water is able to reach the intended plant. With these considerations in mind, it would be the best judgment for all involved to wait for lower wind conditions to begin the application process.

Since our operation uses a pond as the primary water source, the pond's water supply is monitored carefully. Surface water from our pond, which was dug with

an excavator, is used as long as it is able to supply the needed water. This pond measures five hundred (500) feet long by sixty (60) feet wide and fourteen (14) feet deep. During periods of excess moisture, the ground around the pond holds moisture. As the pond is pumped down, springs close to the surface help recharge this pond. We have had the sediment cleaned out to keep the natural springs working at their best potential.

This pond is located at a low elevation point on this farm with many surrounding fields sloped in the direction of the pond. This provides a natural way to collect surface water from the runoff from the rainwater. Also, a drainage ditch that drains excess water from the fields empties into this pond.

After long periods of dry conditions and pumping from this pond, this water supply is depleted and fails to provide for the needs of my crops. At this time, the well (DEQ #165-435) pump will be used to supplement the pond. The well's water will be discharged into the pond to assist the natural spring action.

The water saving practice employed when recharging the pond is the system of buried eight (8) inch 160 psi PCV pipe used to transport the water from the well to the pond. This system is extremely efficient and there is no water loss.



## 2. Water loss reduction program:

### A. Types of irrigation systems used:

The main system called a center pivot is a machine that moves very slowly in a circular motion around the field applying water. For conservation needs, the center pivot contains drop pipes in order to get the water application closer to the ground. This in turn prevents an uneven application to the crops and also prevents the excess irrigation of unintended areas. Another conservation advantage to the center pivotal operation is the ability to lower the water pressure output and adjust the speed of the machine to move slower. This function creates less water use per cycle and ensures a more thorough, healthier distribution of water.

The second type of irrigation system used here on the Tankard Farm is the hard hose irrigation or traveling gun. This system also is used with water conservation in mind, however it is less conservation friendly. Even though these systems are not as efficient as the pivotal systems, they still work to ensure some type of water conservation. These gun systems contain nine nozzle selections that are used based on wind conditions. Six are ring nozzles and three are taper borer nozzles, all of different sizes. Like stated before a certain nozzle is chosen at the time application based on wind speed, direction and many other factors.

## **2. B. Pump Station Inspections:**

Transporting the water from its source to these irrigation systems is one main conservation issue. Here on the Tankard Farm water is drawn from the pond and pumped to each of these systems through underground pvc pipes. When chosen, these pipes were selected because of their conservative and sturdy nature. Since they are buried underground there is hardly no risk of puncturing and it can be assumed that these pipes are almost completely leak proof, and provide the utmost conservation of water.

The equipment used to transport the water for irrigation are diesel engines driving centrifugal pumps. These engines and pumps do not start and stop automatically. An operator, who is always Charles Tankard, starts these pumps after checking all systems that lead to and from the pump. The operator also sets the engine speed, checks the water pressure and checks visually for leaks every time the engine is started. This is done one (1) to four (4) times daily, depending on the system used.

Ultimately, if leaks do exist, the pressure will not be sufficient to run the pump and irrigation will not be possible. Consequently, any leaks or irregularities are repaired immediately.

## **2. C. Water conveyance:**

The water is supplied by an eight (8) inch 160psi PVC pipe buried thirty-six (36) inches deep.

These pipes either seal 100% or are blown apart, like a city water main, causing a visible eruption. When this happens, the pump has been designed with safety switches which will cut the pump off and the water flow is ceased.

The mainline piping was installed by burring the pipe to a depth of thirty-six (36) inches. Also, at the end of each pipe a thrust block was installed through the use of poured cement.

Leaks are detected through visual inspection, as noted above. (The operator also sets the engine speed, checks the water pressure and checks visually for leaks every time the engine is started. This is done one (1) to four (4) times daily, depending on the system used.

Ultimately, if leaks do exist, the pressure will not be sufficient to run the pump and irrigation will not be possible. Consequently, any leaks or irregularities are repaired immediately by the operator.) The process for repairs would involve digging up the damaged section of pipe and replacing it.

## **2. D. Irrigation system inspections:**

Inspections of the connections between the sprinkler assemblies an supply line are made visually by the operator each time the system is used . The inspections are

checked for leaking water. When no leaks are observed, the irrigation system is operating as designed.

Hard hose gun systems contain nine nozzle selections that are used based on wind conditions. Six are ring nozzles and three are taper borer nozzles, all of different sizes. Like stated before a certain nozzle is chosen at the time application based on wind speed, direction and many other factors.

The operator determines that the system is set properly by consulting the manuals that come with the irrigation system that is being used. Nozzle output is determined by size and pressure needed. Field lengths are known to the operator, so the cart travel speed can be adjusted to apply the correct amount of water to the particular crop in the field.

Inspections are performed each time the system is used and at least hourly during its use.

Since inspections are performed so frequently and repairs are made immediately, written records of each incident are not maintained.

**2. E. Irrigation system control equipment:**

These irrigation systems are designed to be started manually. They are operated by diesel power units with centrifugal pumps. These units are designed with safety shut off switches that sense water pressure decline. Such built-in safety switches would shut down water flow in the case of a pipe line or coupling break. The simplicity of this system is what makes it so desirable. When everything shuts down, water loss and flooded fields are no longer an issue.

This equipment is inspected visually. Again, the pressure gauges tell all that the operator needs to know.

These inspections are made up to four (4) or more times a day when the system is in use.

Since inspections are performed so frequently and repairs are made immediately, written records of each incident are not maintained.

2. F. Water control structures for runoff:

Each of the fields have buffer strips of grass to contain water.

This strip allows the water to soak in to the soil instead of becoming runoff.

3. Water use education program:

Education is a major factor in utilizing the water management plan. Tankard Farm's employs mostly seasonal help, however one to two employees are maintained year round. The seasonal help are not qualified to operate the irrigation systems, on the other hand the full time employees are extensively trained in water pump usage and operation. Their training includes the basic operational features of an irrigation pump such as turning on and off the system and resetting certain speeds based on weather conditions. However if any problems are observed they are instructed to immediately turn the system off and contact their supervisor. The majority of the time the main operator of the system is mostly the farmer himself, unless the instructed employee is sent to do the operation.

**4. Evaluation of potential water reuse options:**

The pond on the Tankard Farm is located at a low elevation point on this farm with many surrounding fields sloped in the direction of the pond. This provides a natural way to collect surface water from the runoff from the rainwater. Also, a drainage ditch that drains excess water from the fields empties into this pond.

**5. Water use reductions during water shortage emergencies:**

If the local governing body or the Director of DEQ declare mandatory water use reductions during water shortage emergencies, the operator, Charles Tankard will comply with the water usage restrictions that are imposed.



# Webster Processing Plant



**MALCOLM  
PIRNIE**



## JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED

### 5.1 NATURE OF ACTIVITY UTILIZING WATER AND DOCUMENTATION OF BENEFICIAL USE

Webster Investors, LLC (Webster) is developing a currently unused property located in Cheriton, Northampton County, Virginia. The project site is the former KMC Foods, Inc. Property, located off Sunnyside road, just east of Cheriton. The location of the site is shown in Figure 5-1. Based on information provided in previous site studies, the site was in operation from the 1920s to 1988 and was used as a farming and canning operation. The site included several buildings that were previously used by KMC Foods, Inc. for the processing and canning of vegetables. A total of five production wells were located on the project site. The production wells are currently out of service and are in the process of being abandoned. These wells are discussed further in Section 8.

The proposed development includes an industrial park and a tomato repackaging facility to be operated by East Coast Brokers and Packers (ECBP). The installation of new groundwater production wells and wastewater treatment facilities will be required to serve the industrial park and the repackaging facility. The total water usage will consist of the water usage for the industrial park plus the water usage for the repackaging facility. The installation of two groundwater production wells is planned for the development. One well (Production Well #1) will provide the water supply for potable, domestic, and sanitary use to the employees of the tenants of the industrial park. The second well (Production Well #2) will supply water solely to the repackaging facility. A line drawing showing the flow of water through the facility is shown in Figure 5-2.

### 5.2 WATER DEMAND ESTIMATES

The industrial park is currently under development and there are no tenants or water users, with the exception of a small office building located on-site. Because the facility is currently under development, there are no historical water usage records for tenants and employees. Therefore, this section provides a water demand estimate for the development. A water demand estimate for the industrial park section of the development is provided in Section 5.2.1. A water demand estimate for the tomato repackaging facility is provided in Section 5.2.2.

#### 5.2.1 Industrial Park

As noted previously, there are no historical water usage records for this facility. Therefore, water usage has been estimated for the industrial park using water consumption rates provided by the Virginia Department of Health (VDH) guidance for determining the design capacity of waterworks. The VDH guidance provides daily water consumption rates for a variety of uses such as dwellings, schools, shopping centers, hospitals, etc. The VDH guidance does not provide water consumption rates for industrial parks. Therefore, water consumption rates for shopping centers was used as the basis for estimating water consumption rates for the industrial park because this use appeared to be the closest to industrial park use.

Water consumption provided in the VDH guidance is based on gallons per day (gpd) per 1,000 square feet (sq. ft.) of floor space. The VDH water consumption rate for shopping centers is 200-300 gpd per 1,000 sq. ft. of floor space. Therefore, the water demand estimate for the industrial park was based on the total floor space of the buildings (excluding the tomato repackaging facility) and a more conservative estimate of 100 gpd per 1,000 sq. ft. of floor space.

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Site development plans show the site divided into seven parcels, identified as Parcels A through G. Parcel F is the parcel that the repackaging facility will be developed on and is excluded from this estimate. Water demand estimates for the repackaging facility are provided in Section 5.2.2. The total projected area of building space is 140,600 square feet. The building area per parcel is summarized in Table 1.

<b>Table 1. Building Area Summary by Parcel</b>	
<b>Parcel ID</b>	<b>Building Area (feet<sup>2</sup>)</b>
A	15,000
B	15,000
C	22,500
D	24,000
E	41,600
G	22,500
Total area:	140,600

The daily water demand was estimated based on a usage rate of 100 gallons per day per thousand square feet. Therefore, the estimated daily water demand for the industrial park is

$$140,600 \text{ feet}^2 / 1,000 * 100 \text{ gpd} = 14,060 \text{ gallons per day.}$$

This water demand is equal to 309,320 gallons per month (0.309 million gallons (MG) per month) based on 22 days of operation per month (average 30 days per month minus eight weekend days per month). Because the industrial park is expected to operate full time year-round, there should be minimal seasonal variation. Therefore, the estimated annual water demand for the industrial park is 3.71 MG per year. Because this estimate is based on the projected total area when the industrial park is fully developed, the projected water demand is not expected to increase significantly over the 10-year permit period.

### **5.2.2 East Coast Brokers and Packers Tomato Repackaging Facility**

The ECBP tomato repackaging facility will be the largest water user at the site. A description of the tomato repackaging process and a water demand estimate are provided below.

#### **Description of the Tomato Repackaging Process**

Currently, ECBP tomato processing plants on the Eastern Shore manage the harvesting and packing of tomatoes for shipping and retail sales. Harvested tomatoes are brought to the plants in large plastic bins. Tomatoes are dumped from the bins into wash flumes on the production lines where they are washed in a sodium hypochlorite solution. After the washing process, tomatoes are packed in 25# boxes for shipping.

In the tomato repackaging process, tomatoes that have already been harvested and boxed are sorted by certain criteria such as size, color, ripeness, etc. and are repackaged to meet the special requirements of commercial customers, such as grocery stores and restaurant chains. Tomatoes can also be repackaged into packages of specific quantities or specialty packages, depending on customer requirements.

Even though the tomatoes have gone through a washing process prior to boxing and shipping, repackaged tomatoes are washed again during the repackaging process because of additional handling. The tomato repackaging production line consists of a wash tank or flume and an overhead spray rinse. The wash tank is filled with a heated sodium hypochlorite solution on a daily basis. The tomatoes are then placed in the wash tank for initial cleaning. The tomatoes then leave the wash tank on a roller or conveyor belt where they are rinsed with clean water by an overhead spray. The wash water is recirculated and reused during production. However, the wash tank is emptied and the equipment is pressure washed and cleaned on a daily basis. The wash tank is then refilled prior to the next production run. Although the wash water is recirculated and reused, some water loss results from wet tomatoes

leaving the wash tank and from evaporation from the tank. Some of this water is made up by rinse water from the overhead spray rinse flowing back into the wash tank.

### Estimated Daily Water Demand

Water will be used in the repackaging facility in the repackaging process (process water) and as potable water for the facility employees. The principal water use will be process water associated with the repackaging production line. Process water is used in the repackaging process in three principal areas; the tomato wash tank, the overhead spray rinse, and pressure washing and cleaning the repackaging machinery. Additional water will be required to supply potable and sanitary water for use by facility employees and management.

The repackaging machinery that will be used at the ECBP facility will be constructed by Tri-Pak Machinery, Inc., located in Harlingen, Texas. According to information provided by Tri-Pak, repackaging machines are custom built to the requirements of the particular facility. Based on the requirements for the ECBP facility, Tri-Pak provided the following water use specifications for the production machinery. The wash tank volume will be 6,700 gallons and will be filled on a daily basis; the overhead spray rinse will use between 20 to 30 gallons per minute (approximately 9,600 to 14,400 gallons per day); and pressure washing and cleaning the machinery will use approximately 1,000 gallons per day. These estimates are based on an eight-hour workday.

According to ECBP, the repackaging production line will require between 50 and 80 workers to operate the production line. Because the facility is currently under development, there are no historical water usage records for facility workers. Therefore, the VDH Guidance for Conducting a Comprehensive Public Drinking Water Supply Needs Assessment was used to estimate the potable water demand for employees. The Guidance Document provides daily consumptive use estimates for a variety of uses, including dwellings, restaurants, hospitals, etc. The consumptive use category most closely related to the repackaging facility is "Factories, per person, per eight-hour shift." The guidance document lists a consumptive use range of 15 to 35 gallons per worker per day. Based on a projected maximum 80 workers and using a consumptive use of 15 gallons per day, the estimated potable water demand is 1,200 gallons per day.

A daily water demand estimate based on one production line, a 25 gpm (average) flow rate for the overhead spray and 15 gallons per worker per day is provided in Table 2. This estimate is based on an eight-hour workday. Because this work is seasonal, longer workdays are required at times during the summer months when harvesting and packing is busiest on the Eastern Shore. Therefore, this table also contains a water demand estimate base on a 12-hour workday. The 12-hour workday estimate assumes that the water volumes required for the wash tank and washing and cleaning remain the same, and water usage for the overhead spray and potable water increases by four hours (eight hours x 1.5).

**Table 2. Total Estimated Daily Water Demand (one production Line).**

Usage	Wash Tank	Overhead Spray (20 gal/min)	Washing & Cleaning	Potable Water	Total Demand (8-hr day)	Total Demand (12-hr day)
1 Prod. Line	6,700	12,000	1,000	1,200	20,900	27,500

East Coast Brokers and Packers plans to begin production with a single repackaging line to repackage large, round tomatoes. According to ECBP, their expansion plans include adding a second repackaging line within two years to repackage Roma tomatoes, and a third line to repackage grape tomatoes within four years. Based on the water usage assumption above, the daily water demand for three repackaging lines is provided in Table 3. The daily water demand for three repackaging lines is used to estimate the monthly and annual water demand, which is discussed in Section 5.3.

**Table 3. Total Estimated Daily Water Demand (three production Lines).**

Usage	Wash Tank	Overhead Spray	Washing & Cleaning	Potable Water	Total Demand (8-hr day)	Total Demand (12-hr day)
3 Prod. Lines	20,100	36,000	3,000	3,600	62,700	82,500

### 5.3 MONTHLY AND ANNUAL DEMAND

The total monthly demand is the sum of the total estimated demand from the tomato repackaging facility plus the total estimated demand from the industrial park. The total annual demand is the sum of the total monthly demand for 12 months.

The monthly demand for the industrial park is projected to be relatively uniform over a 12-month period. The industrial park is projected to operate full time (eight hours per day) year-round. Based on an estimate of 22 workdays per month, the monthly demand for the industrial park is 309,320 gallons per month.

In addition to farms on the Eastern Shore, ECBP also owns land and raises tomatoes in Florida and Georgia. For this reason, ECBP plans to operate the repackaging plant year-round. During the summer months, they will repackage tomatoes harvested on the Eastern Shore. In the off-season, they will harvest tomatoes in Florida and Georgia and ship them to the Webster facility for repackaging and shipping to markets in the northeast.

In the off-season, plant operation is expected to be eight hours per day, five days per week according to ECBP. Therefore, the monthly water demand for off-season operation is based on 22 workdays per month (average 30 days per month minus eight weekend days). However, due to a seasonal increases in production on the Eastern Shore during the summer months, ECBP expects that the plant will be in operation for longer periods. In addition, there are generally two crops of tomatoes produced on the Eastern Shore and two harvests during the summer months. Therefore, the monthly demand for two months during the summer (July and September) was based on 15 days of eight-hour workdays plus 15 days of 12-hour work days.

Based on the above estimates, the total average and maximum monthly water demand for one year for the Webster site is summarized in Table 4.

**Table 4. Total Estimated Monthly and Annual Water Demand.**

Month	Repackaging Plant			Industrial Park	Total Demand (gallons/month)
	Process Water	Potable Water	Plant Total	Potable Water	
January	1,300,200	79,200	1,379,400	309,320	1,688,720
February	1,300,200	79,200	1,379,400	309,320	1,688,720
March	1,300,200	79,200	1,379,400	309,320	1,688,720
April	1,300,200	79,200	1,379,400	309,320	1,688,720
May	1,300,200	79,200	1,379,400	309,320	1,688,720
June	1,300,200	79,200	1,379,400	309,320	1,688,720
<b>July</b>	<b>2,043,000</b>	<b>135,000</b>	<b>2,178,000</b>	309,320	<b>2,487,320</b>
August	1,300,200	79,200	1,379,400	309,320	1,688,720
<b>September</b>	<b>2,043,000</b>	<b>135,000</b>	<b>2,178,000</b>	309,320	<b>2,487,320</b>
October	1,300,200	79,200	1,379,400	309,320	1,688,720
November	1,300,200	79,200	1,379,400	309,320	1,688,720
December	1,300,200	79,200	1,379,400	309,320	1,688,720
Annual Total:	17,088,000	1,062,000	18,150,000	3,711,840	21,861,840

**Bold** - Represents maximum estimated monthly demand.

Based on these estimates, the maximum total monthly water demand is approximately 2,487,000 gallons and the maximum annual demand is approximately 21,862,000 gallons.

#### **5.4 10-YEAR WATER DEMAND PROJECTION**

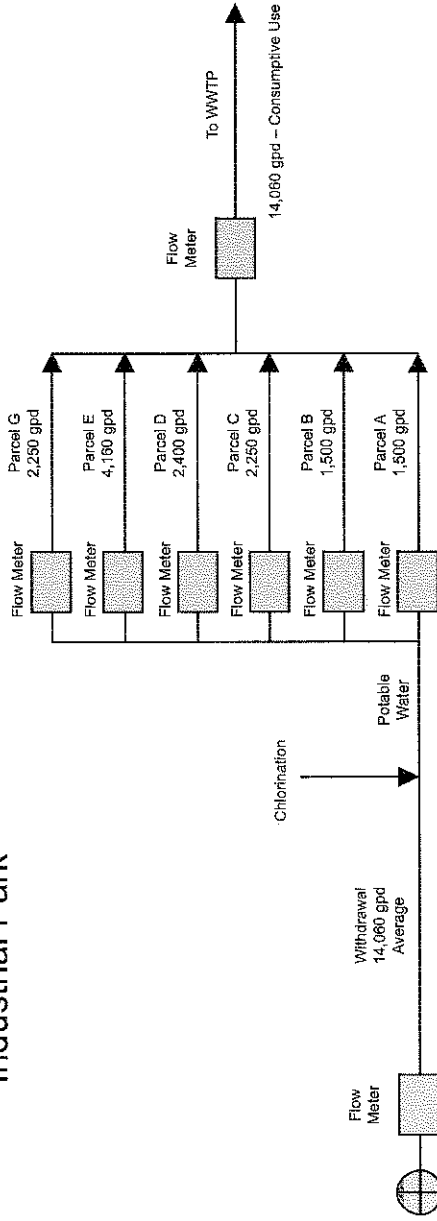
The monthly and annual water demand estimates are based on full development of the industrial park and full production at the repackaging facility. Therefore, the monthly and annual water demands provided in Table 4 are considered to be maximum projected demands and little increase in demand is expected over the 10-year permit period. Therefore, demand projection is 218.62 MG for the 10-year permit period.

#### **5.5 APPORTIONMENT OF WITHDRAWAL FROM INDIVIDUAL WELLS**

As discussed in Section 5.1, Well #1 will provide the water supply for potable, domestic, and sanitary use to the employees of the tenants of the industrial park, and Production Well #2 will supply water solely to the repackaging facility. Therefore, Production Well #1 will produce approximately 3.71 MG per year, or approximately 17% of the total withdrawal, and Production Well #2 will produce approximately 18.15 MG per year, or approximately 83 % of the total withdrawal.

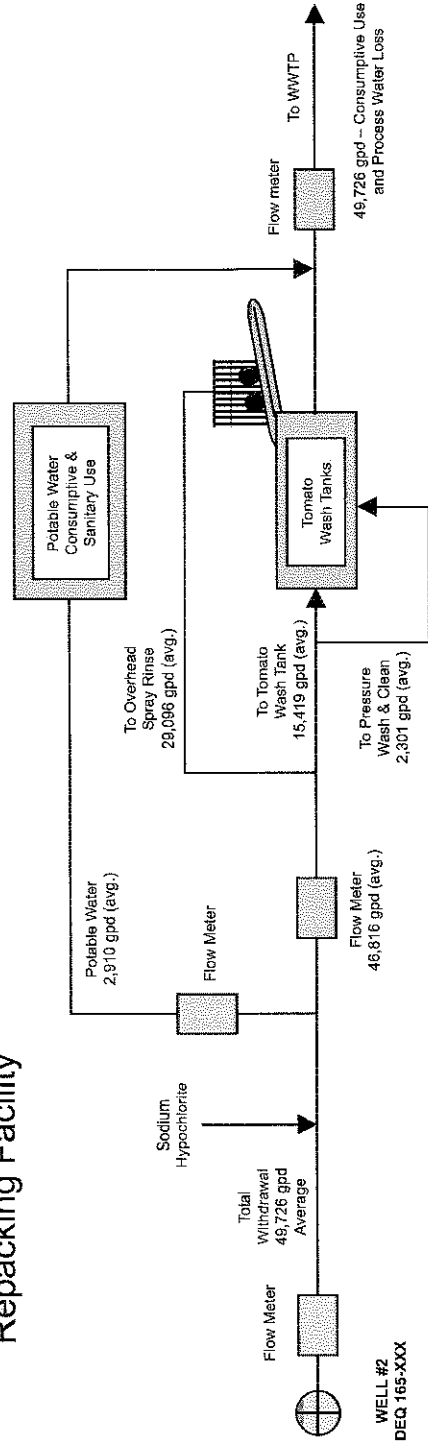
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# Webster Investors, LLC Industrial Park



WELL #1  
DEQ 165-XXX

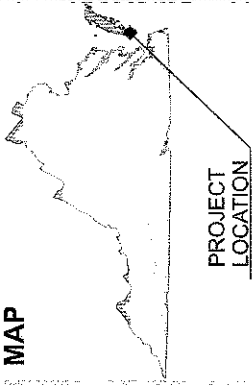
# East Coast Brokers & Packers Repacking Facility



WELL #2  
DEQ 165-XXX

# Water Flow Line Drawing NOT TO SCALE

## VICINITY MAP



SOURCE:  
Cheriton, Virginia



Environmental  
Groundwater  
Hazardous Materials  
Geotechnical  
Industrial Hygiene

**GER**  
Consulting Engineers

GeoEnvironmental Resources, Inc.

GeoEnvironmental Resources, Inc.  
2712 Southern Boulevard, Suite 101  
Virginia Beach, VA 23452

## WATER USE LINE DRAWING

Webster Property  
Cheriton, Virginia

PROJECT NUMBER	DRAWING NUMBER
120-5135	5-2

# REPORT OF ENGINEERING SERVICES

## WATER CONSERVATION AND MANAGEMENT PLAN

### WEBSTER PROCESSING PLANT

21131 WEBSTER ROAD  
CHERITON, VIRGINIA 23310

Prepared for

Webster Investors, LLC  
16464 Courthouse Road  
Eastville, Virginia 23347

Attention: Mr. Joseph J. Corrado

Prepared by

Brian C. Parker, R.E.M. and Philip T. Rogan, P. G.

Friday, August 28, 2009



GeoEnvironmental Resources, Inc.

Environmental • Groundwater • Hazardous Materials • Geotechnical • Industrial Hygiene

SOUTHERN PROFESSIONAL CENTER I

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# WATER CONSERVATION AND MANAGEMENT PLAN

Webster Investors, LLC  
21131 Webster Road  
Cheriton, Virginia 23310

## 1.0 Introduction

Webster Investors, LLC (Webster) is developing a currently unused property located in Cheriton, Northampton County, Virginia. The project site is the former KMC Foods, Inc. Property, located off Sunnyside Road, just east of Cheriton. The site was in operation from the 1920s to 1988 and was used as a farming and canning operation. The site included several buildings that were previously used by KMC Foods, Inc. for the processing and canning of vegetables.

The proposed development includes an industrial park and a tomato repackaging facility. The installation of new groundwater production wells and wastewater treatment facilities will be required to serve the industrial park and the repackaging facility. The total water usage will consist of the water usage for the industrial park plus the water usage for the repackaging facility. The installation of two groundwater production wells is planned for the development. One well (Production Well #1) will provide the water supply for potable, domestic, and sanitary use to tenants and employees of the industrial park. The second well (Production Well #2) will supply water solely to the repackaging facility.

Normal operation at the industrial park and repackaging facility will require the production of variable amounts of groundwater from the planned groundwater production wells.

### 1.1 WATER CONSERVATION

Conservation of water has reached a new level of awareness. In some cases, conservation may represent a practical alternative to supply augmentation, or at least complement supply augmentation. Fresh groundwater supplies, like other natural resources, are a limited commodity which must be managed wisely to preserve the well-being of future generations. Efforts to conserve existing supplies and the efficient allocation of water resources should be made at each stage of the water supply planning process.

Water conservation measures are those physical facilities, equipment, or devices utilized in conjunction with certain methods, techniques, policies, practices, and procedures which result in reduced water consumption, improved water use efficiency, reduced water loss and waste, increased water recycling or reuse, and ultimately result in a reduction or minimization of water demand. Water management consists of a plan to implement water conservation measures.

This Water Conservation and Management Plan (the Plan) includes identification of water demand and water resources and then provides guidance to implement water management and conservation measures.

### 1.2 REGULATORY REQUIREMENTS

The Groundwater Management Act of 1992 was approved in April 1992. It requires a Groundwater Withdrawal Permit (GWP) for groundwater withdrawals of 300,000 gallons per month or more within declared Groundwater Management Areas (GMAs). Currently, there are two Ground Water Management Areas in the state, the Eastern Virginia Ground Water Management Area (EVGMA) and the Eastern Shore

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Ground Water Management Area (ESGMA). Groundwater Withdrawal Regulations (9VAC25-610-100) require that applications for new GWPs within GMAs include a water conservation and management plan approved by the Virginia Department of Environmental Quality (VDEQ). An approved water conservation and management plan must include:

- ♦ Requirements for the use of water saving plumbing and processes, including, where appropriate, the use of water saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code.
- ♦ A water loss reduction program.
- ♦ A water use education program.
- ♦ An evaluation of potential water reuse options.
- ♦ Requirements for mandatory water use reductions during water shortage emergencies declared by the local governing body or the Director of DEQ, including, where appropriate, ordinances prohibiting the waste of water generally and requirements for mandatory water use restrictions, with penalties during water shortage emergencies.

The Webster property is located within the ESGMA. Therefore, a water conservation and management plan is required for this facility.

### **1.3 PLAN OBJECTIVES**

The primary objective of this Water Conservation and Management Plan is to provide a documented, effective conservation and management strategy designed to minimize the demand for groundwater at the Webster property, and to demonstrate compliance with the Groundwater Management Act of 1992. The specific measures and management strategies to be used at the Webster site are presented in detail first, then are briefly summarized in the concluding section.

## **2.0 Water Demand**

Water demand at the Webster property is for a variety of purposes, including process water for the cleaning and repackaging of tomatoes, and general potable water requirements (sanitary water, drinking water, and process water, as required) for employees of the repackaging facility and the tenants of the industrial park. The largest water demand at the Webster site will be for process water for tomato cleaning and repackaging.

### **2.1 TOMATO PROCESSING**

Repackaged tomatoes are washed and rinsed prior to repackaging. The production line consists of a wash tank or flume and an overhead spray rinse. The wash tank is filled with a heated sodium hypochlorite solution on a daily basis. The tomatoes are then placed in the wash tank for initial cleaning. The tomatoes then leave the wash tank on a roller or conveyor belt where they are rinsed with clean water by an overhead spray. The wash water is recirculated and reused during production. However, the wash tank is emptied and the equipment is pressure washed and cleaned on a daily basis. The wash tank is then refilled prior to the next production run.

Although the wash water is recirculated and reused, some water loss results from wet tomatoes leaving the wash tank and from evaporation from the tank. Some of this water is made up by rinse water from the overhead spray rinse flowing back into the wash tank. Lost wash water is also slowly replaced with fresh solution throughout the day. Process wastewater will be managed by land application in rapid infiltration basins (RIBs) which are proposed to be constructed at the facility.

## 2.2 POTABLE WATER (GENERAL USE)

The rest of the water demand will be for general potable water usage for processing plant employees and for tenants and employees at the industrial park. This water will primarily be used for sanitary and domestic needs, such as drinking water and food preparation (breakfast, lunch, etc.). Employees will commute to and from work and there will be no permanent residents on-site. Therefore, other domestic uses such as baths/showers, watering lawns and gardens, etc. are not considered to be significant uses.

## 3.0 Water Supply

The EPA designated the Columbia and Yorktown-Eastover aquifer system as a sole source aquifer (SSA). A SSA is defined as one which supplies at least 50% of the drinking water consumed in the area overlying the aquifer. In addition, these areas have no alternative drinking water source(s) which would physically, legally, and economically supply all those who depend upon the aquifer for drinking water.

Because there are no other water resources such as lakes, rivers or reservoirs in the area that could potentially provide a reliable water supply at the Webster site and there is no municipal water supply pipeline from Cape Charles to the Cheriton area, all water used at the Webster facility will be supplied by groundwater.

## 4.0 General Conservation Measures and Management Strategies

The following conservation measures will be implemented as part of the strategy to manage groundwater supplies.

- ♦ No unnecessary groundwater withdrawal will be permitted by the industrial park management.
- ♦ Facility management, both industrial park management and East Coast Brokers and Packers (ECBP) management, will periodically review water use and will implement changes where possible and practical to better manage water used and increase water conservation. The periodic review will include but not be limited to the following:
  - Monthly visual inspections for water loss and leak detection
  - Weekly observation of all pumps and storage tanks
  - Daily evaluation of water reuse and recycling for production purposes
- ♦ All permanent plumbing fixtures throughout the facility (both the tomato processing facility and the rest of the industrial park) shall contain low-flow fixtures and 1.6-gpf toilets. Any older plumbing that may be in place from the preexisting structures shall be replaced with newer, more efficient models as needed within the scope of the Unified Statewide Building Code recommendations.
- ♦ The facility does not and will not use groundwater for landscape irrigation purposes.
- ♦ The facility management shall encourage employees to conserve water through the use of regular reminders. These reminders may include but are not limited to verbal reminders, and posters or bulletins posted in message areas or on bulletin boards.
- ♦ *Water Reuse Evaluation:* A significant portion of the water used at this facility (tomato processing) cannot be reclaimed or reused.

Specific water conservation measures and management strategies are presented here. The ultimate goal of these measures is to minimize the need for, and use of, pumped groundwater.

## 5.0 Water Saving Plumbing and Processes

In addition to the water required for tomato preparation and packing, potable water will also be required for sanitary and drinking water purposes for packing plant employees and future tenants of the industrial park. Plant employees and industrial park tenants will commute to and from the site. Therefore, potable water use will be primarily for sanitary purposes (e.g., flushing toilets and washing hands), for drinking water, and most likely some minimal food preparation (e.g., for breakfast or lunch).

There will be no permanent residences or tenants, therefore, there will be no additional demand for dinner preparation, showers/baths, washing clothes, etc. For this reason, plumbing fixtures will mostly be limited to faucets and toilets. All plumbing fixtures utilized at the facility shall be efficient, low-flow or water saving fixtures as provided in the Unified Statewide Building Code recommendations. As listed below, these requirements are consistent with the Federal Energy Policy Act of 1992 and regulations established in the Code of Federal Regulations (CFR) at 10 CFR 430.32. Plumbing fixtures used in all new construction at the facility and in any remodeling and/or replacement in existing structures shall not exceed the following flow rates:

♦ Lavatory faucets	2.2 gallons per minute at 60 psi
♦ Lavatory replacement aerators	2.2 per minute at 60 psi
♦ Kitchen faucets	2.2 per minute at 60 psi
♦ Kitchen replacement aerators	2.2 per minute at 60 psi
♦ Metering faucets	0.25 gallon per cycle
♦ Shower heads	2.5 per minute at 80 psi
♦ Toilet	1.6 gallons per flush
♦ Urinal	1.0 gallons per flush

Flow meters will be installed on the production wells to accurately account for both monthly water usage and total water usage. Flow meters will also be installed on supply lines for the tomato preparation processes to accurately account for the monthly and total water demand for tomato processing.

In addition to tracking groundwater withdrawal rates and process water usage, flow meters will also be installed on individual supply lines for each of the tenants/buildings, which will allow groundwater use to be monitored and tracked separately at each tenant/building.

## 6.0 Water Loss Reduction

At least once per year, a water loss audit will be conducted to determine the volume and nature of water lost and unaccounted for water within the industrial park and the repackaging plant. The primary purpose of the audit is to identify potential sources of water loss that might escape detection by normal meter readings. Because the water supply systems will be relatively simple and serve a limited number of people or connections, there are a limited number of areas where water losses might go undetected. Examples include:

- ♦ Water meter errors or malfunctions
- ♦ Leaks or breaks in the water distribution lines
- ♦ Drainage or leaks from water storage tanks

All leaks or breaks will be repaired immediately when identified. Any nonfunctioning water meter will be replaced immediately when found. At the time the leak or break is identified or a broken meter is found, an estimated volume of the amount of water lost will be reported. All records of lost or unaccounted for water will be maintained by the industrial park management.

## 7.0 Water Use Education

A key factor in reducing water use by facility tenants and employees is the development of a water use education program. It is extremely important to educate users on the various aspects of the water industry and information on how water is produced and why we need to conserve, especially in a sensitive area such as the Eastern Shore where groundwater is in a limited supply. The goal of the water use education program will be to make the facility tenants and employees understand their water sources, the problems associated with supplying water, and how changes in consumer behavior can lower the cost of supplying water and conserve limited groundwater resources.

The industrial park is limited in size and will have a limited number of tenants and employees. Therefore, the Water Use Education program need not be as comprehensive or complex as might be required for a larger public water supply system serving a general population, including private residences, commercial and industrial users, and public uses such as schools and fire protection. Therefore, the facility will use bill inserts and educational brochures or posters in its water use education program:

Bill Inserts - The industrial park will bill tenants for water usage. Therefore, the principal item that will be included in the water use education program will be bill inserts. Inserts will be included on a regular basis (but not less than once every six months) in water bills sent to the tenants that will include water conservation techniques and leak detection strategies, as appropriate. This method can be useful for showing the tenant how water conservation benefits both the tenant and the industrial park. Tenants benefit by reducing their water bills and the industrial park benefits by preserving its groundwater resources.

Brochures or Posters - Brochures and posters that provide information on water use and conservation will be placed in the buildings in the industrial park where employees will have access to the information.

## 8.0 Evaluation of Water Reuse Options

The purpose of the Virginia Water Reclamation and Reuse Regulation (9VAC25-740) is to promote and encourage the reclamation of wastewater and water reuse in a manner that is protective of the environment and public health, and as an alternative to discharging treated effluent to state waters. Water reuse options include:

- ♦ Irrigation, including agricultural, municipal, and residential
- ♦ Urban reuse:
  - Ornamental landscape features (e.g., ponds and fountains)
  - Fire protection
  - Dust control and concrete mixing on construction sites
  - Vehicle and window washing
  - Sanitary use in public, commercial, and industrial buildings
- ♦ Industrial Reuse:
  - Cooling water
  - Boiler make-up water
  - Industrial process water
- ♦ Indirect potable reuse (reclaimed water that is discharged to a water body that is used as a raw water supply for another treatment plant).

Due to the rural location and low population density in the local area around the facility, there are no large users or industrial processes that could use reclaimed water at the present time. In addition, there are no surface water bodies in Northampton County that can be used as a raw water supply. Therefore the urban, industrial, and indirect potable water reuse options are not considered to be viable water reuse options at the present time.

The only viable potential water reuse option at the industrial park would be for landscape irrigation. However, any potential landscape irrigation usage would probably require a relatively low water volume and it would be cost prohibitive to treat the water for landscape irrigation.

For these reasons, water reuse at the industrial park or in the surrounding community is not considered to be viable at this time because of the relatively small amount of water used, the seasonal nature of the irrigation demand, and the potential difficulty and expense of treating, storing, and distributing reclaimed water.

## 9.0 Mandatory Water Use Reductions

Requirements for mandatory water use reductions during local or regional water shortage emergencies typically involve local ordinances that provide for restrictions and penalties that may be applied during a declared water shortage emergency. Mandatory water use restrictions will be implemented during water shortage emergencies declared by the local governing body (Northampton County), the director of DEQ, or the Governor.

Potential water use reduction strategies for the industrial park and tomato processing plant are relatively limited compared to potential strategies for municipal systems that serve larger populations consisting of private, public and commercial users. However, water use reduction at the facility will include, but is not necessarily limited to, the following:

- ♦ General washing of buildings, paved surfaces, or equipment will be prohibited.
- ♦ Production at the processing plant and industrial park may be reduced or limited in the event that groundwater withdrawals exceed any temporarily mandated emergency withdrawal limits.
- ♦ Facility tenants/businesses will not be permitted to water lawns or landscaping.
- ♦ It is not anticipated that there will be permanent (seasonal or year-round) residents. However, potential tenants may have clothes-washing requirements (e.g., for work clothes or uniforms). In this case, use of washing machines will be limited to full capacity loads only.
- ♦ The facility will inspect the supply/distribution lines from the production wells to the users for evidence of leaks on a regular basis. Any leaks detected will be fixed as quickly as possible, or the production well will be shut off until the leak can be repaired.
- ♦ The facility will comply with any applicable penalties for failing to comply with the mandatory water use restrictions.

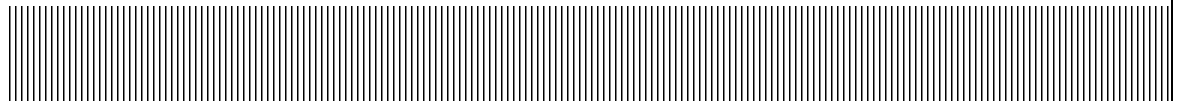


**Northampton County**  
Water Supply Plan

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# Appendix D

## Enacted Ordinances



## CHAPTER 53: WATER PROTECTION

### Section

- [53.01](#) Authority and purpose
- [53.02](#) Definitions
- [53.03](#) General requirements
- [53.04](#) Variance
- [53.05](#) Oil-water separation requirements

### ***Cross-reference:***

*For provisions regarding the minimum separation distances: subsurface absorption systems and wells, see § 154.069*

### **§ 53.01 AUTHORITY AND PURPOSE.**

(A) *Authority.* This chapter, to be cited as the Ground Water Protection Ordinance of Northampton County, Virginia, is hereby ordained, enacted, and published by the Board of Supervisors of Northampton County, Virginia pursuant to the provisions of Title 15.2, Chapter 22, Article VIII Code of Virginia, 1950, as amended.

(B) *Intent and purposes.*

(1) *Intent.* This chapter is intended to be in accord with and to implement the goals, objectives, and policies set forth in the Comprehensive Plan of Northampton County adopted by the Board of Supervisors of Northampton County.

(2) *Purposes.*

(a) The regulations that follow are part of a comprehensive and longrange program to implement reasonable provisions, not inconsistent with applicable state water quality standards, to protect surface and ground water as defined in VA Code § 62.1-255. More specifically, the purpose of these regulations is to require variations in the sizes of lots based on whether a public or community water supply or sewer system is available and used, as in accord with VA Code § 15.2-2283.

(b) The Eastern Shore of the state depends entirely on a limited supply of ground water for potable water demand, as well as for most non-potable demands. For this reason, the Eastern Shore of Virginia has been designated a Virginia Ground Water Management Area under the Ground Water



Management Act of 1992, VA Code Title 62.1, Chapter 25. In 1997 the U.S. Environmental Protection Agency designated the aquifers beneath the Eastern Shore of Virginia, with the exception of Chincoteague Island and Tangier Island, as an EPA Sole Source Aquifer.

(c) Under the Ground Water Management Act of 1992, the state has adopted regulations that are implemented by the Department of Environmental Quality. These regulations apply only to individual ground water withdrawals in excess of 300,000 gallons in a single month. The Eastern Shore of Virginia Ground Water Supply Protection and Management Plan (1992) and the Technical Analysis for Ground Water Ordinances on the Eastern Shore of Virginia (2001) document the potential for multiple individual ground water withdrawals in close proximity to each other to exceed the 300,000 gallons per month threshold that would require a ground water withdrawal permit for a single well.

(d) Threats to ground water on the Eastern Shore may be placed into three general categories: (1) saltwater intrusion; (2) hydraulic head depression; and (3) contamination from surface sources. Certain residential developments, commercial businesses and industries that are served by individual private wells can have adverse effects on ground water levels and quality. Certain ground water withdrawals that individually do not exceed the state limit may, in aggregate with other nearby users, greatly exceed that amount. These aggregated withdrawals have the potential to have as much impact on the ground water resource as an individual permitted withdrawal. This ground water protection ordinance is intended to ensure protection and wise management of the ground water resource for both existing uses and future growth in the county.

(Ord. passed 6-23-03)

## **§ 53.02 DEFINITIONS.**

For the purpose of this chapter, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

**ADVERSE EFFECT.** Reductions in ground water levels or changes in ground water quality that limit the ground water use associated with any ground water user lawfully withdrawing or authorized to withdraw ground water at the time of application approval.

**APPLICANT.** An individual, partnership, association, or corporation proposing to use ground water as a source of potable water supply.

**AQUIFER.** A stratum or zone below the ground surface that will yield water in a usable quantity to a well.

**AREA OF IMPACT.** The areal extent of each aquifer where more than one foot of drawdown is predicted to occur due to a proposed ground water withdrawal.

**CENTRAL SYSTEM.** A water or wastewater system that serves 33 or more properties.

**CLOSED-LOOP GROUND-SOURCE HEAT PUMP WELL.** A well consisting of a sealed loop of plastic pipe buried beneath the earth's surface to allow heat transfer between the fluid and the pipe in the earth.

**CLUSTER SYSTEM.** A water or wastewater system that serves fewer than 33 properties.

**DEEP AQUIFER.** A confined or semi-confined aquifer, typically referred to as the Yorktown-Eastover aquifer and typically occurs greater than 50 feet below the surface.

**DEVELOPMENT, NEW.** The new construction, or substantial alteration, of residential, commercial, industrial, institutional, recreation, transportation, or utility facilities or structures which involves an increase in impervious surface.

**EQUIVALENT RESIDENTIAL CON-NECTION.** A volume of water used equal to a residential connection which is 400 gallons per day unless supportive data indicates otherwise.

**GROUND WATER.** Any water, except capillary moisture, found under the ground surface in the zone of saturation or beneath the bed of any stream, lake, reservoir or other body of surface wholly or partially within the boundaries of this Commonwealth, whatever the subsurface geologic structure in which such water stands, flows, percolates or otherwise occurs (As defined in VA Code § 62.1-255).

**HYDROGEOLOGIC INVESTIGATION.** An evaluation to define the hydrogeologic characteristics of an aquifer or confining unit including, but not limited to, pumping tests.

**IMPERVIOUS SURFACES.** Areas that do not allow significant quantities of water to penetrate.

**MASS OR COMMUNITY SUBSURFACE DRAINFIELD.** A sewage disposal system or systems which will discharge effluent to a single absorption area or multiple absorption areas with or without combined flows, such that the loading rate applied to any acre, in accordance with Virginia Sewage Handling and Disposal Regulations, exceeds 1,200 gallons per day.

**MITIGATION.** Actions necessary to assure that all ground water users within the proposed development and other existing ground water users, who experience adverse impacts as a result of the new withdrawals, continue to have access to the quantity and quality of water needed for their uses.

**OBSERVATION WELL.** A well for obtaining information on hydraulic characteristics and water quality of an aquifer.

**PRODUCTION WELL.** A well designed to supply adequate yield and water quality for its intended use and meeting County and Health Department requirements.

**SALT WATER INTRUSION.** Encroachment of saline or brackish water into an aquifer that results in adverse effects.

**STABILIZED YIELD.** Measured drawdown in the well at the end of a minimum eight-hour constant rate pumping test.

**TWO-WELL SYSTEM.** An individual or centralized well system that consists of separate wells for potable and non-potable uses. In such a system, the well(s) for non-potable uses are screened in the water table aquifer.

**WATER TABLE AQUIFER.** The uppermost, unconfined water-bearing unit, typically occurring within 40-90 feet of the land surface.

**WELLHEAD PROTECTION.** The assessment of potential threats to ground water, and planning and managing land uses to prevent contamination and overuse of groundwater supplies.

(Ord. passed 6-23-03)

### **§ 53.03 GENERAL REQUIREMENTS.**

(A) Any new developments that have an average density more than I Equivalent Residential Connection (ERC) per 1/2 acre for any contiguous area of the development with 33 or more ERCs, or 50 or more ERC for cluster developments, will be required to have one of the following ground water protection measures:

- (1) A centralized wastewater collection and treatment system (WCTS).
- (2) Septic drainfields that are designed for 1.5 times normal capacity.

(3) An exception to the requirements of division (A), including the installation of alternative on-site wastewater disposal systems, may be granted upon approval of a variance by the Northampton County Board of Zoning Appeals, as described in § [53.04](#).

(B) All new developments of 33 or more ERC, cluster developments with 50 or more ERC, or new developments with 4 ERC or more located within 1/4 mile of an aggregated groundwater withdrawal of 33 or more ERC, must submit to the Zoning Administrator the measures that will be taken to prevent over pumpage of ground water, in addition to the requirements of division (A) of this section. Ground-source heat pumps used for heating or cooling are restricted to using closed-loop ground-source heat pump wells as specified in the Virginia Department of Health Regulations 12 VAC 5-630-10 *et seq.* Ultra-low-flow plumbing fixtures are required, as specified in the Virginia State Wide Building Code, as well as one of the following measures:

- (1) Two-well systems.
- (2) A centralized water supply system.

(3) An exception to the requirements of division (B) may be granted upon approval of a variance by the Northampton County Board of Zoning Appeals, as described in § [53.04](#).

(Ord. passed 6-23-03)

### **§ 53.04 VARIANCE.**

(A) *Granting variances.* The Northampton County Board of Zoning Appeals has the authority to grant a variance to the requirements of § [53.03](#) in cases where it can be demonstrated that a development will have no adverse impact on ground water resources, or that alternative measures will protect ground water. In order to be considered for a variance, an application must be submitted to the Northampton County Department of Planning and Zoning.

(B) *Initial application.*

- (1) At a minimum, the application shall contain the following information:
  - (a) Site plan or subdivision plan showing the number and sizes of lots. A location plan

showing the relative location of the area within Northampton County shall also be included.

(b) An analysis of average and maximum daily water demands to be supplied by the proposed production wells.

(c) 1. Identification of proposed well screen depths and results of a hydrogeologic investigation. The hydrogeologic investigation shall, at a minimum, report the information required by the Commonwealth of Virginia Water Well Completion Report Form (Form GW-2) and Virginia Department of Health Uniform Water Well Completion Report Form. The stabilized yield and water levels required under Item 2 of Form GW-2 shall be determined from constant pumping rate of the well.

2. The number of observation wells to be constructed as part of the hydrogeologic investigation shall, at a minimum, comply with the number specified in the table below. Construction and location of the observation wells can be such that they may be converted to production wells, pending approval by the Virginia Department of Health.

<b><i>Number of ERCs</i></b>	<b>Number of Observation Wells</b>
< 33	2
33-75	5
76-100	6
101 - 200	7
> 200	Add One Additional Well Per 100 Lots (e.g.: 201-300 lots = 8 wells; 301-400 lots = 9 wells)

(d) Water quality analyses of ground water at the proposed development. At a minimum the following will be analyzed for: Calcium, magnesium, iron, manganese, potassium, sodium, chloride, sulfate, nitrate, alkalinity, total dissolved solids, and fecal coliforms. Sample depth shall coincide with proposed well screen depth.

(e) Physical characteristics that identify soil type and slopes, quantity of green space, impervious surfaces, and storm water management plan.

(f) Proposed ground water development plans, including number of wells, location of wells, capacity per well and well screen interval.

(g) Mitigation measures that, at a minimum, comply with the requirements listed in division (E) of this below.

(2) The Zoning Administrator will review the variance application and present a staff report to the Northampton County Board of Zoning Appeals. After reviewing the application, and after conducting a public hearing, the Board of Zoning Appeals may act on the variance application. Approval of the application will be determined based on the applicant's ability to demonstrate that the proposed potable water well(s) will have no adverse effect on the quality or quantity of ground water within the proposed development and adjacent areas. If, during the application review process, the Zoning Administrator or Board of Zoning Appeals determines that supplemental information is required to evaluate the applicant's proposed ground water use, the Zoning Administrator will notify the applicant in writing what supplemental information the applicant must submit prior to the Board of Zoning Appeals rendering a decision on the application. Supplemental information that may be required of the applicant is described in division (C) below.

(C) *Supplemental Information.* The following supplemental information may be required by the Zoning Administrator or Board of Zoning Appeals to provide additional data necessary to adequately evaluate the application for potable water wells. The specific information required will be determined on a case-by-case basis.

(1) Water quality analysis for samples collected from overlying and/or underlying aquifers.

(2) A ground water flow model to predict the ground water levels and amount of drawdown resulting from the proposed withdrawals. At a minimum, the model will predict the area of impact from the proposed withdrawals. The ground water flow model can vary from simple analytical calculations to more complex computer based one-dimension, two-dimensional, and three-dimensional flow models.

(3) Salt water intrusion model to predict the potential for movement of brackish ground water resulting from the pumping. The salt water intrusion model may be either a two-dimensional or three-dimensional model and may account for both lateral and vertical movement (upcoming) of ground water. Specific requirements for evaluating salt water intrusion will be determined on a case-by-case basis.

(4) A wellhead protection model accepted by the US EPA, such as the US EPA WHPA model to evaluate the susceptibility of the wells to contamination.

(D) *Application review.* The application will be reviewed by the Zoning Administrator and may also be reviewed by other agencies/parties, such as the Eastern Shore of Virginia Ground Water Committee, as determined by the Zoning Administrator. The applicant is responsible for the cost of any third-party engineering review of the application, if agreed to by the applicant. If the applicant does not agree to pay for the cost of third-party engineering review, the application shall be considered withdrawn.

(E) *Mitigation plan.*

(1) In cases where it is determined that an adverse effect is likely, the applicant has the option of providing a plan to mitigate these effects. If the Northampton County Board of Zoning Appeals determines that the mitigation plan adequately addresses the adverse effects, the Zoning Administrator will approve the application. If the Northampton County Board of Zoning Appeals determines that the proposed potable water wells will have an adverse effect on the quality or quantity of ground water within the proposed development and adjacent areas that are not mitigated, the Zoning Administrator will issue a letter denying the application.

(2) Types of mitigation considered are:

(a) Implementation of Best Management Practices (BMP's).

(b) Compensation to adversely impacted ground water users.

(3) Best Management Practices may include, but are not limited to, recharge basins, buffer areas, or other site-specific methods that will eliminate the adverse impact to the ground water resource and other existing ground water users. The applicant must provide information on the intended BMP such as site plans, adequately document how the BMP will prevent adverse impacts to the ground water resource or other existing ground water users, and provide a monitoring plan where applicable to demonstrate that the BMP is performing as designed.

(4) Alternatively, where the variance request applies to a variance from the water supply requirements, the applicant shall provide and implement a plan that will compensate existing ground water users for adverse effects on their ability to use the ground water resource. The mitigation plan is non-exclusive and may not be applied or construed to bar a claimant's recourse to conventional legal or equitable remedies in the event of loss or impairment of water supply. At a minimum, the Mitigation Plan will conform to the Virginia Department of Environmental Quality requirements for permitted users in a Ground Water Management Area. Specifically, the plan must include.

(a) The rebuttable presumption that water level or water quality declines that cause adverse impacts to existing wells within the area of impact are due to the proposed withdrawal.

(b) A commitment by the applicant to mitigate undisputed adverse impacts due to the proposed withdrawal in a timely fashion.

(c) A speedy, nonexclusive, low-cost process to fairly resolve disputed claims for mitigation between the applicant and any other claimant.

(d) The requirement that the claimant provide documentation that they are the owner of the well; documentation that the well was constructed and operated prior to initiation of the applicant's withdrawal; the depth of the well, the pump, the screens, and any other construction information that the claimant possesses; the location of the well with enough specificity that it can be located in the field; the historic yield of the well, if available; historic water levels for the well, if available; and the reasons the claimant believes that the applicant's withdrawals have caused an adverse impact on the well. The mitigation plan extends to comparable replacement wells installed by existing groundwater users after the effective date of the permit. Existing groundwater users shall not be prejudiced by exclusion from the mitigation plan by virtue of their repair or replacement of existing wells with comparable wells.

(5) An example Mitigation Plan may be obtained from the Virginia Department of Environmental Quality.

(Ord. passed 6-23-03)

### **§ 53.05 OIL-WATER SEPARATION REQUIREMENTS.**

(A) *General.* All new commercial or industrial facilities with the potential to discharge oil-contaminated stormwater, wash water, or other process wastewater shall be required to treat the discharge by oil-water separation technology. These facilities include, but are not limited to, automotive service shops, automotive maintenance facilities, machinery maintenance facilities, and vehicle washing facilities. Parking areas used by the customers and employees of commercial and industrial facilities shall be exempted from this requirement.

(B) *Design.* Oil-water separators must be designed to collect and treat all water that has a reasonable potential to contact oil, grease, or other petroleum products. For washing facilities, the device(s) must be sized (at a minimum) to treat the maximum flow of wash water. If the device(s) are intended to treat stormwater, they must be sized (at a minimum) to collect and treat the peak flow that would result from a two-year, one-hour storm event.

(C) *Maintenance.* The facility operators must visually inspect the oil-water separator(s) at least monthly, and oil/solids must be removed as needed to ensure proper operation. All oil-water separators

must be inspected for system integrity at least annually by qualified individuals, and records of the inspections must be maintained at the facility for a minimum of three years and provided to the Zoning Administrator if requested. All oil removed from the devices must be recycled or otherwise disposed of according to the requirements of the Resource Conservation and Recovery Act (RCRA).

(D) *Exception.* The requirements of this section may be waived for car washing facilities that operate under a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Car Wash Facilities. In order to be granted an exception, the owner or operator must provide a written request for exception to the Northampton County Zoning Department, as well as a copy of their general VPDES permit. Other exception requests may be made by applying for a variance in accordance with § [53.04](#). Such variance application shall be accompanied by a technical justification prepared by a civil engineer.

(Ord. passed 6-23-03)

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