



March 13, 2018

City of Denmark  
Attn: Dr. Gerald Wright  
4768 Carolina Hwy  
Denmark, SC 29042

RE: Sanitary Survey  
System # 0510002

Dear Dr. Wright:

On February 23, 2018, a sanitary survey was conducted on the public water system serving the City of Denmark. The intent of the sanitary survey is to evaluate the public water system's ability to provide a continuous supply of safe drinking water to its customers.

The City of Denmark received an overall rating of **Needs Improvement**. Enclosed is a copy of the survey and a report, which includes a description of the public water system, specific findings made during the sanitary survey, and recommendations for correcting any deficiencies. This survey and the report should be kept on file for no less than ten (10) years and be made available to the public or DHEC upon request. It is requested that all parties responsible for the operation and maintenance of the water system review this report promptly.

If you have any questions or if I can be of any assistance, please call me at (803) 642-1637.

Sincerely,

Crystal L Robertson  
Aiken Environmental Affairs Office  
206 Beaufort Street NE  
Aiken, SC 29801

cc: Marty Chaney, Bureau of Water



SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL  
AIKEN ENVIRONMENTAL AFFAIRS OFFICE

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**SANITARY SURVEY REPORT**

*City of Denmark  
Water System # 0510002  
Bamberg County*

**Introduction**

The South Carolina Department of Health and Environmental Control recently conducted a sanitary survey of the City of Denmark's public water system. This survey consisted of a review of the Department files and an on-site inspection by Department personnel on February 23, 2018. The following persons participated in the on-site inspection:

Cedric Hudson	City of Denmark - Public Works Director
Travis Clark	City of Denmark
Kelly Chaplin	SCDHEC - Orangeburg Environmental Affairs Office
Crystal Robertson	SCDHEC - Aiken Environmental Affairs Office

**System Description**

The City of Denmark owns and operates a groundwater facility and associated potable water distribution system that serves a population of approximately 3,500 residents and approximately 2,116 students and staff at Voorhees College and Denmark Technical College by 1,501 service connections. The system has a current rated capacity of 1,351,700 gallons per day. Information on the system's wells is given in the table below.

Well	Type	Horsepower (HP)	Yield (GPM)	Regulated Capacity	Treatment
Well 2 - Voorhees	Turbine	60	330	316.80 TGD	Gaseous Chlorine
Well 4 - Cox Mill	Turbine	50	350	336.00 TGD	Gaseous Chlorine & HaloSan
Well 5 - Acacia Street	Submersible	40	403	386.88 TGD	Gaseous Chlorine
Well 6 - W. Voorhees	Submersible	40	325	312.00 TGD	Gaseous Chlorine

Well 1 - Brooker Center and Well 3 - Legare Street are no longer in service and have been physically disconnected from the system. Treatment at the four active wells consists of the addition of gaseous chlorine for disinfection. In addition, Well 4 - Cox Mill has an iron bacteria treatment system which consists of an automatic injection of HaloSan tablets. The system has two 50-Kilowatt generators stationed at Well 5 - Acacia Street and Well 6 - W. Voorhees that are

capable of running these two wells during an emergency. In addition, the system maintains an emergency connection with Bamberg Public Works (System #0510001).

Three elevated storage tanks with a total volume of approximately 575,000 gallons serve the City of Denmark. The City Hall Tank was taken offline and physically disconnected from the system in 2011. Information on the system's tanks is given in the table below.

Location	Capacity (Gallons)
Nibco Tank	250,000
Voorhees Tank	125,000
Bamberg County - Industrial Park Tank	200,000

Currently, the City of Denmark's public water system operators are:

Name	License	Certification #	Class
Cedric Hudson	Treatment	5044	A
	Distribution	785	A
Tim Freeman	Treatment	6651	D
	Distribution	1830	G
Travis Clark	Distribution	T3889	T

### Findings and Recommendations

1. The system received a **Satisfactory** rating for Protection from Contamination. The purpose of this item is to ensure that all ground water sources are properly protected from contamination due to surface water runoff, local ground contamination, and/or contamination due to animals or insects. The design standards for well construction require a 100-foot pollution free radius around the well.

On February 2, 2018, DHEC staff investigated a report of a broken sewer main in close proximity to Well 2 - Voorhees Well. Upon investigation, staff determined that the sewer line in question had been abandoned. A newer gravity sewer line was located nearby and parallel to the broken and inactive sewer line.

While reviewing the presence of sewer lines in the area of the Voorhees well, it was determined that an active gravity sewer line is located within the 100 foot pollution-free radius for the well. Research revealed that the sewer line was installed circa 1998. After consultation with Bureau of Water engineering and hydrogeology staff, the determination was made that the active gravity sewer poses very little threat to the well's water quality. The well is over 300 feet deep with alternating layers of sand, clay and occasional limestone. Due to this finding, at this time the relocation of the sewer line is not advised. However, the Department requests that the system provide routine observations (at minimum of once

per week) of the manholes immediately upstream and downstream of the well. The inspections, along with any difference in flow, should be documented and any observed problems reported immediately to the Department. In addition, the Department requests that the system provide routine bacteriological sampling of the raw water (prior to disinfection) at a frequency of once per quarter. The results should be maintained in the system's files and any positive result should be reported to the Department immediately.

Well 2 - Voorhees Well was constructed prior to many of the current regulations. The Department recommends the City of Denmark begin budgeting to bring the well up to current standards. Specifically, the well casing does not extend 12 inches above the pad and the pad does not cover a three-foot radius around the wellhead. The system should raise the wellhead and the pad should be extended to protect the source from surface water. The Department looks forward to monitoring the progress of this project during the next sanitary survey. In addition, the concrete pads at Well 5 - Acacia Street and Well 6 - W. Voorhees have separated from the wellhead block. This gap should be sealed.

2. The system received a **Needs Improvement** rating for Wellhead Piping. The purpose of this item is to ensure that the wellhead piping is configured in such a way as to minimize the potential for contamination of the source while also providing for proper testing and control of the well. The proper sequence of wellhead appurtenances is as follows: pump, air release valve, check valve, flow meter, raw water sample tap, blow-off, isolation valve, chemical injection points, and finished water sample tap. It was noted during the survey that there are two sample taps at Well 4 - Cox Mill prior to the check valve. As discussed, these sample taps should be removed immediately. In addition, the air release valve at Well 2 - Voorhees is currently downstream of the check valve. The air release valve should be moved to a location upstream of the check valve in conjunction with the improvements noted under Protection from Contamination.
3. The system received a **Needs Improvement** rating for Chemical Injection Points. The injection points for the chemical feed lines are contained in vaults at Well 4 - Cox Mill and Well 2 - Voorhees. At the time of the inspection, the injection points were covered by mud and debris and could not be inspected. Following the survey the system cleaned the mud and debris from the vaults; however, the system must routinely inspect and maintain these vaults. The injection points must be readily accessible for inspection and maintenance at all times. This rating will be reevaluated during the next survey.
4. The system maintained a **Satisfactory** rating for Water Quality. The purpose of this item is to ensure that a water system consistently produces water which complies with established water quality standards. Routine sampling continues to show that the City of Denmark's water meets the National Primary Drinking Water Standards. Considering the history of discolored water complaints in Denmark, this item will be closely evaluated during each subsequent Sanitary Survey.
5. The system received a **Needs Improvement** rating for Cross Connection Control. The purpose of this item is to ensure that the water system has a program in place to identify and eliminate cross-connections between the water system and possible sources of

contamination. The system has 65 cross connections protected by testable backflow prevention devices. All devices are tested annually by Oneal Plumbing. In January 2017, one of these devices failed the backflow prevention test. At the time of the inspection, the device had not been replaced or repaired. Immediately following the inspection the device was replaced and it passed testing. The Department appreciates the quick action taken to resolve this issue; however, the system should ensure failed devices in the future are addressed in a more timely manner. In addition, as discussed the system should create a similar program and master list of all low hazard connections, such as residential in-ground sprinkler systems. The system should create a replacement schedule for these non-testable backflow prevention devices.

6. The system maintained a **Satisfactory** rating for Fire Flow. The purpose of this item is to ensure that the water system can provide adequate flow to protect the integrity of their water system when fire protection is provided. As discussed during the survey, hydrants must be flow tested at a minimum of once every three years and the City of Denmark's hydrants will be due for testing again in December of this year.
7. The system maintained a **Satisfactory** rating for Valve and Hydrant Maintenance. The purpose of this item is to ensure that a system's valves and hydrants are being maintained such that they can be located and operated as needed. The City of Denmark has approximately 180 hydrants that are maintained in conjunction with Fire Flow testing. Documentation of this maintenance was available at the time of the inspection. The City of Denmark has approximately 225 valves that are exercised once every three years. This maintenance is also due this year. As discussed, the Department recommends that the system increase the frequency of valve maintenance for the most critical valves. The system's Standard Operating Procedure states that critical valves are exercised annually. Immediately following the sanitary survey, the system created a master list of the most critical valves and committed to an annual exercise cycle for these valves.
8. The system maintained a **Satisfactory** rating for Flushing Program. The purpose of this item is to ensure that the system's routine flushing program is adequate to help maintain a disinfectant residual throughout the system, as well as, to help prevent water quality issues associated with stagnant, discolored, and sediment laden water. Weekly flushing events are documented and the Department appreciates the system's efforts to improve water quality and reduce complaints through a rigorous flushing program.
9. The system received an **Unsatisfactory** rating for Storage Maintenance. The purpose of this item is to ensure that the water system's storage tanks are properly maintained to guarantee their good working condition. At the time of the survey, the system lacked documentation of required routine inspections. Specifically, Regulation 61-58 7.E states "*All elevated, hydropneumatic and ground storage tanks shall be inspected at a minimum of once a week for the purpose of checking on the security of the tank(s) and insuring that proper air/water ratios are being maintained in hydropneumatic storage tanks. Vent screens, hatches and other openings on atmospheric tanks must be inspected annually to ensure sanitary protection.*" The Department also recommends a comprehensive exterior and interior inspection of elevated storage tanks every three years at a minimum.

The Voorhees Tank and Nibco Tank had their last comprehensive inspection in 2012 by Southeastern Underwater Services, Inc. The Department recommends that these two tanks have a comprehensive inspection conducted this year. The system should begin routine weekly and annual inspections of all three tanks and maintain documentation of these inspections. In addition, the Voorhees Tank is showing a lack of routine maintenance and significant signs of rust. At the time of the inspection, the sample tap and base of the tank were covered in ants, there was evidence indicating vultures have been roosting on the tank, and the grass beneath the tank appeared to be dying, possibly due to vulture waste. The system must take action immediately to address the nuisance problems at this tank.

At the time of the inspection, the Department was unable to determine if the Bamberg County - Industrial Park Tank had been inspected since its installation in 1984. This tank is owned by Bamberg County; however, it serves the City of Denmark's public water system. The City of Denmark has never taken ownership of this tank and it is not incorporated into the City's Standard Operating Procedures, Emergency Procedures, or any other documentation. The tank is in poor condition. It has substantial amounts of rust on the exterior (the interior condition is unknown), lacks an overflow pipe and sample tap, and is overgrown with weeds and vines. The tank does not serve the industrial park that it was originally intended to serve, and the City of Denmark must determine if the tank is needed. The City should consult an engineer to determine if the tank can be disconnected and if so submit the plans to the Department for approval. If the tank is needed to maintain system pressure or for any other reason, the City of Denmark must work with the tank owner, Bamberg County, to determine the roles and responsibilities for the tank and must incorporate the tank into all operating procedures and plans. This item must be addressed immediately and progress must be reported to the Department by April 13, 2018.

10. The system received a **Satisfactory** rating for Sample Siting Plan. The purpose of this item is to ensure that there is no place in the distribution system where microbiological contamination could persist indefinitely with little chance of detection. The system currently collects five samples per month on a rotation that includes 15 sample locations. At the time of the survey the sample location map included in the Sample Siting Plan did not correspond with the locations listed in the plan and the locations being sampled. Immediately following the survey, the system updated the map to reflect the accurate locations and, as requested, moved one location on Highway 78 toward Bamberg to better represent the water quality in that area. The Department appreciated the quick response to this item. The system should ensure all changes are communicated to the contract laboratory and that sampling is conducted according to the plan.
11. The system received a **Satisfactory** rating for Emergency Plan. The purpose of this item is to ensure that the system has a current and readily accessible plan addressing who to contact and arrangements that would be necessary in the event that there is an emergency involving the facility or distribution system. The City of Denmark should update their current plan as some of the contact information is outdated. Please submit an updated contact list to the Department by April 13, 2018.

## **Conclusions**

The City of Denmark public water system received an overall Needs Improvement rating. The Department would like to thank Cedric Hudson and Travis Clark for their assistance in conducting the sanitary survey. The Department looks forward to working with the water system in the future to ensure that the residents continue to receive the highest quality of drinking water.