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WEBSITE: www.a-npdc.org

Eastern Shore of Virginia Ground Water Committee
February 20, 2024 10:00a.m.
ESVA Chamber of Commerce
19056 Parkway, Melfa VA

The committee's mandate is to "assist local governments and residents of the Eastern Shore in understanding, protecting and managing ground water resources, to maintain a ground water resources protection and management plan, to serve as an educational and informational resource to local governments and residents of the Eastern Shore, and to initiate special studies concerning the protection and management of the Eastern Shore ground water resource."

Virtual Attendance:
For Joining **via Computer:**
1. Click this link: https://zoom.us/j/7577872936?pwd=QTNJdmhCc3pWdVNUZ0ZWYnVJdWpWUT09
2. If prompted, enter the Meeting ID: 757 787 2936
3. If prompted, enter the Passcode: 7577872936

For joining **via Phone (calling in):**
1. Dial 1-646-558-8656
2. When prompted for meeting code enter 7577872936#
3. When prompted to identify as host or participant, enter #
4. When prompted for password, enter 7577872936#

Translation services available: Call 1-718-838-9317... #6980900. Press 1 for Spanish. Press 2 for Haitian Creole.

Servicios de traducción disponibles: Llame al 1-718-838-9317 ... # 6980900. Presione 1 para español.

Sèvis Tradiksyon Disponib: Rele 1-718-838-9317 ... # 6980900. Peze 2 pou kreyòl ayisyen.

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Eastern Shore of Virginia Ground Water Committee
February 20, 2024 Meeting Agenda

1. Call to Order
2. Public Participation
3. Minutes of the January 16, 2024 Meeting
4. January Financial Status Report
5. February 20, 2024 Staff Report
6. Residential Well Testing Program
7. Groundwater Outreach and Education
8. Ground Water Sustainability: Regulatory Policies and Updates
9. February 20, 2024 Ground Water Consultant Report
10. Committee Attendance Record FY2024
11. Attachments
12. Schedule Next Meeting
13. Adjournment

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee

FROM: Kellen J. Singleton
Interdisciplinary Planner
Accomack-Northampton Planning District Commission

DATE: February 20, 2024

SUBJECT: **January 16, 2024 Meeting Minutes**

Please see the attached January 16, 2024 Meeting Minutes for approval.

Approval from the Ground Water Committee is requested to accept the Meeting Minutes.

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Minutes of the January 16th, 2024 Meeting

Eastern Shore of Virginia Ground Water Committee

The meeting of the Eastern Shore of Virginia Ground Water Committee was held at 10:00 AM on Tuesday, January 16th, 2024 in the hybrid format – virtually on the Zoom Platform and in person – in the conference room of the Eastern Shore Chamber of Commerce in Melfa, VA.

Members Present	Members Absent	Others Present
John Coker, Chairman	Mike Mason	Kellen Singleton, A-NPDC
Paul Muhly, Vice Chairman	Charles Kolakowski	Britt McMillan, ARCADIS
Elaine Meil, Secretary*	Ann Hayward Walker	Curtis Consolvo, GeoResources
Sue Mastyl		Joseph Betit, Earth Systems Management
Paul Grossman		Eric Seavey, DEQ
Steve Sturgis		Weedon Cloe, DEQ
Daniel Hershey		William Leslie, Captains Cove Resident*
Grayson Chesser		Bill Savage, ESSWCD
Calvin Washington		Palmer Smith, ESSWCD
		Ken Dufty, Northampton Resident
		Sheila Traina, Cheriton Resident
		Joseph Betit, Earth Systems Management*
		David Boyd*
		Preston Lane*
		Mike Noseworthy*
		Weedon Cloe*
		Caitlin Kelly*
		Hunter Cooper*

Signifies Zoom participant

1. Call to Order

Chairman Coker called the meeting to order at 10:02 AM.

2. Public Participation

Mr. Dufty informed the group on Potomac Aquifer issues and history of unsustainable use. Mr. Duffy advised the committee to petition the Virginia Water Control Board to investigate water supply and develop alternative use/source guidelines for groundwater supply on Virginia's Eastern Shore citing DEQ undersupplied management.

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Mr. McMillan corroborated Potomac Aquifer water supply overallocation and DEQ role adding that the current system of continuous permitting and over-allocation is unsustainable.

The committee discussed the importance of surficial pond recharge. Chmn. Coker advised the importance of surficial pond utilization to groundwater use sustainability. Delegate Rob Bloxom has reported that legislation is pending concerning agriculture irrigation pond construction.

Mem. Sturgis and Chesser stated need to address 404 USACE Permitting concerning water pumping authority and pond recharge as well as DEQ regulation concerning fill that limit irrigation pond construction and maintenance.

The committee discussed total regional groundwater use. Mr. McMillan addressed 9 and 15m gal ESVA water use estimate disparity illustrating that old USGS model did not include paleochannel data and that 15m gal estimate included residential use.

Committee members clarified GWC role in relation to State Water Control Board. It was noted that current environment was not conducive to responsiveness.

3. Minutes of October 17, 2023 Meeting

The draft minutes of the October 17th 2023 Meeting was presented.

Mem. Mastyl advised clarification to note: "Mr. Seavey informed the committee that the Eastern Shore has decreased its historical agricultural water use noting that the most significant regulatory burden is at the county level with the Chesapeake Bay Preservation Area wetland Resource Protection Area (RPA)."

Mem. Grossman moved to approve the minutes with clarification. Seconded by Mem. Hershey, the motion carried.

4. December 2023 Financial Report

The FY 2024 Financial Status Report as of December 31, 2023 was presented.

Total Bills Payable equaled $3129.50; Balance equaled $85,533.25

Mem. Grossman moved to approve the December FY 2024 Financial Status Report. Seconded by Mem. Mastyl, the motion carried.

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5. January 16, 2024 Staff Report

Staff updated the committee on:

- Virginia Pollutant Discharge Elimination System Permit Numbers VAG-40, -52, -83, -84, -01, -11, -75, -25, -87, -64, VAR-05, -10, -40, and VAN-00
- VA Pollution Abatement Program Permit Numbers VPA-01079, -01035, -01080, -01047, -01076.
- Groundwater Withdrawal Permit GW0044201 - Town of Chincoteague, Inc; 6150 Community Drive, Chincoteague Island, VA 23336
- Groundwater Withdrawal Permit GW0079000 - Robin Rinaca; P.O. Box 400, Melfa, VA 23410
- Groundwater Withdrawal Permit GW0070501 - Fern Point Limited Partnership; 6158 Fern Point Road, Franktown, VA 23354
- Groundwater Withdrawal Permit GW0070301 - Jeffery L. Shelley; 34372 Shelley Farm, Painter, VA 23420
- Groundwater Withdrawal Permit GW0037302 - Shore Real Estate Group, LLC.; 23700 Commerce Park, Beachwood, OH 44122

On December 7, PDC planning and administrative staff met to develop a plan of action to address esvaplan.org and specifically the GWC web content and presence. Staff updated the committee on plan to address website issues. Committee members discussed content updating and regular site maintenance.

Staff present Mr. Eric Seavey-Manager, Office of Water Withdrawal Permitting 10/18/23 Response to GWC Public Comment to DEQ Office of Water Withdrawal Permitting Concerning Permit GW0080100.

Staff updated committee on GWC Member Status. Staff thanked Mr. Paul E. J. Muhly for his dedicated service over two terms on the committee and welcomed Accomack County District 5 Board of Supervisor representative Calvin Washington, Sr. to the Eastern Shore of Virginia Ground Water Committee.

Chmn. Coker opened nominations from the floor for Vice Chairman of the Eastern Shore of Virginia Ground Water Committee (GWC). Mem. Chesser nominated Mem. Washington as GWC Vice Chairman. The nomination was seconded by Mem. Mastyl.

By unanimous vote, Mem. Washington was elected GWC Vice Chairman.

6. ARCADIS Work Authorization

Staff presented the ARCADIS EXHIBIT B WORK AUTHORIZATION: 2024 Project Year. Staff requested Committee approval of the ARCADIS Project Year 2024 Work Authorization.

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Mem. Grossman moved to approve the ARCADIS Project Year 2024 Work Authorization. Seconded by Mem. Hershey, the motion carried.

7. GWC Public Comment to DEQ Office of Water Withdrawal Permitting Concerning Permit GW0053901

GWC Public Comment to DEQ Office of Water Withdrawal Permitting Concerning Permit GW0053901 was presented with Mr. Seavey - Manager, Office of Water Withdrawal Permitting response.

It was noted that there was no answer from DEQ on alternative sources.

8. Residential Well Testing Program

The GWC will revisit during February meeting.

9. Information for New Members

Mems. Walker and Grossman have drafted an information guide for new membership. Mem. Grossman presented the draft information guide as of 11/13/23 for review.

The committee discussed publication of the material. Chmn. Coker and Mem. Mastyl advised further work to package and digitize information as a resource for new members and decision makers.

Mr. McMillan stated intent to draft an annual State of the Resource Report.

The group discussed USACE and DEQ regulatory restrictions. A subgroup was suggested to address issues. Mr. McMillan will reach out to Arcadis staff for further guidance.

10. January 16, 2024 Ground Water Consultant Report

Mr. McMillan updated the group on the specifics of new draft permits and renewals, Groundwater Withdrawal Permits for Shore Health and Rehab (GW0037302), Shelley Farm (GW0070301), and Jones 3 Farm (GW0070501). A total of 7 draft permits to date have been issued this Fiscal year (October 1, 2023 to September 30, 2024). Committee members expressed concern with rate of issuance.

Chmn. Coker moved to give GWC Advisor, Mr. McMillan authority to comment for the GWC on interim permitting. Seconded by Mem. Mastyl, the motion carried. Committee members stated the need for clarification on DEQ policy on required site specific investigations of surficial aquifer and groundwater monitoring.

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Mr. McMillan advises monitoring of well network where modeling results do establish a potential for adverse changes to water quality due to simulated chloride concentration increases.

Schedule Next Meeting & Adjournment

The next Committee meeting was scheduled for February 20, 2024 from 10AM-12PM at the ESVA Chamber of Commerce, Melfa, VA.

Mem. Hershey moved to adjourn. Seconded by Mem. Grossman, the motion carried.

The Meeting was adjourned at 12:01 PM.

_____
John Coker, Chairman

Copy test:

_____
Elaine K. N. Meil, Secretary

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee

FROM: Sandy Taylor
Administrative Director
Accomack-Northampton Planning District Commission

DATE: February 20, 2024

SUBJECT: **January 2024 Financial Statement**

Committee approval of the Financial Statement is requested.

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EASTERN SHORE OF VIRGINIA GROUND WATER COMMITTEE

Financial Statement-January 2024 — Fiscal Year 2024

	Annual Budget	Current Activity	YTD Activity	Balance
Ground Water Consultant Appropriations:				
Accomack County	$ 14,251.00	$ 0.00	$ 7,125.50	$ 7,125.50
Northampton County	7,415.00	$ 0.00	$ 3,707.50	3,707.50
Subtotal	$ 21,666.00	$ 0.00	$ 10,833.00	$ 10,833.00
Ground Water Modeling Run Appropriations:				
Accomack County	$ 1,500.00	$ 0.00	$ 0.00	1,500.00
Northampton County	1,500.00	0.00	$ 0.00	1,500.00
Subtotal	$ 3,000.00	$ 0.00	$ 0.00	$ 3,000.00
Ground Water Committee Staff Support:				
Accomack County	$ 12,276.00	$ 1,357.91	$ 8,064.91	4,211.09
Northampton County	7,724.00	$ 699.53	$ 4,384.53	3,339.47
Subtotal	$ 20,000.00	$ 2,057.44	$ 12,449.44	$ 7,550.56
Ground Water Member Fees:				
Accomack County	$ 2,640.00	$ 294.00	$ 781.50	1,858.50
Northampton County	2,640.00	$ 209.78	$ 591.03	2,048.97
Subtotal	$ 5,280.00	$ 503.78	$ 1,372.53	$ 3,907.47
USGS Ground Water Model:				
Accomack County	$ 7,500.00	$ 0.00	$ 0.00	7,500.00
Northampton County	7,500.00	$ 0.00	$ 0.00	7,500.00
Subtotal	$ 15,000.00	$ 0.00	$ 0.00	$ 15,000.00
Ground Water Plan Project Implementation				
Accomack County	$ 26,854.00	$ 0.00	$ 0.00	26,854.00
Northampton County	15,827.00	0.00	$ 0.00	15,827.00
Subtotal	$ 42,681.00	$ 0.00	$ 0.00	$ 42,681.00
Total Revenues	$ 107,627.00	$ 2,561.22	$ 24,654.97	$ 82,972.03

Bills Payable as of January 31, 2024

DUE TO	DESCRIPTION	DATE	AMOUNT
A-NPDC	Staff Support	01/01/2024-01/31/2024	$ 2,057.44
Board Members	Meeting Fees	16-Jan-24	$ 503.78
Arcadis	Consultant		$ 0.00
		Total Bills Payable	**$ 2,561.22**

Allocated Funds

	Prior Year Funds	Expenditures	Balance
Ground Water Modeling Run	$14,000.00	$14,000.00	$ 0.00
Ground Water Plan Project Implementation	44,847.00	0.00	$ 44,847.00
Total Allocated Funds	$ 58,847.00	$ 14,000.00	$ 44,847.00

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee

FROM: Kellen J. Singleton
Interdisciplinary Planner
Accomack-Northampton Planning District Commission

DATE: February 20, 2024

SUBJECT: **February 2024 Staff Report**

Environmental Reviews and Permits:

N/A

VA Pollutant Discharge Elimination System Program :

- Domestic Sewage Discharges of Less than or Equal to 1,000 Gallons per Day (VAG40)
- Seafood Processing Facilities (VAG52)
- Remediation of Contaminated Sites and Hydrostatic Tests (VAG83)
- Discharges of Stormwater Associated with Industrial Activity (VAR05)
- Non-Metallic Mineral Mining (VAG84)
- Concentrated Animal Feeding Operations (VAG01)
- Concrete Products Facilities (VAG11)
- Vehicle Wash and Laundry Facilities (VAG75)
- Non-Contact Cooling Water Discharges (VAG25)
- Pesticides Discharges (VAG87)
- Watershed Permit for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed (VAN00)
- Potable Water Treatment Plants (VAG64)
- Discharges of Stormwater from Construction Activities (VAR10)
- Discharges of Stormwater from Small MS4s (VAR40)
- Fundraising Car Wash Guidelines

For details please see:

https://www.deq.virginia.gov/permits/water/surface-waters-vpdes

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VA Pollution Abatement Program:

Facility	Permit Number	City / County	Permit Action	DEQ Admin Office	Application Received	Application Complete	Draft Permit Sent to Owner
Accomack County Leachate Treatment Facility	VPA01079	Accomack County	Reissuance	Tidewater	12/11/2020	1/20/2021	
Tyson Farms Inc - Temperanceville	VPA01035	Accomack County	Reissuance	Tidewater	10/6/2020	5/12/2021	
Atlantic Town Center Clean Water Plant	VPA01080	Accomack County	Issuance	Tidewater	4/11/2011		
Kuzzens Incorporated	VPA01047	Northampton County	Reissuance	Tidewater	2/28/2022	5/27/2022	
Perdue Foods LLC - Accomack	VPA01076	Accomack County	Reissuance	Tidewater	9/9/2022		

Consent/Enforcement Orders:

N/A

Groundwater Withdrawal Permits:

Groundwater Withdrawal in Accomack County, Virginia - GW0070001
Public comment period: February 2, 2024 – March 4, 2024
Applicant name, address and permit number: Kuzzens, Inc.; 3769 Grapeland Circle, Exmore, VA 23350; GW0070001
Name and location of water withdrawal: Walker Farm; Tax Parcel IDs: 110-9-A, 110-9-B, 110-9-C, Pungoteague Island, VA 23420

For details please see: https://www.deq.virginia.gov/permits/public-notices/water/water-withdrawal

Upcoming Events/Meetings:

Date and Time		Meeting Title	Board	Scope
Feb-23 2024 (Fri)	10:00 am	State Water Control Board Meeting Agenda	State Water Control Board	R
Feb-27 2024 (Tue)	10:00 am	Sewage Collection and Treatment Regulation (9VAC25-790) Amendments - Regulatory Advisory Panel Agenda	State Water Control Board	R
Mar-05 2024 (Tue)	6:00 pm	Public Hearing - Virginia Pollution Abatement (VPA) Regulation and General Permit for Animal Feeding Operations and Animal Waste Management (9 VAC 25-192)	State Water Control Board	H

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Old Business:

- Website Updates and Optimization
- Public Comments to DEQ Office of Water Withdrawal Permitting Concerning Permit and DEQ Responses

New Business:

- Groundwater Committee Plan Updating
- The Gene Hampton Ground Water Committee Award
- Outreach Opportunity: Earth Day event in Exmore on 4/20

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee

FROM: Kellen J. Singleton
Interdisciplinary Planner
Accomack-Northampton Planning District Commission

DATE: February 20, 2024

SUBJECT: **Residential Well Testing Program**

Subcommittee Program Scope and Standards Update

- Subcommittee meetings and membership.
- An update to the ground water resources protection and management plan.
- Residential water testing services procurement and contacts.
- Addition of interior residential water testing to program e.g., lead.
- Development of a "GW 101 Fact Sheet" for domestic use.
- Residential test results distribution methods.

The draft budgets $84,528 for Residential Well Testing Program implementation.

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee

FROM: Kellen J. Singleton
Interdisciplinary Planner
Accomack-Northampton Planning District Commission

DATE: February 20, 2024

SUBJECT: **Groundwater Outreach and Education**

Groundwater Outreach and Education

- Public mischaracterizations of ground water supply
- Information guide for decision makers and new membership.
- Informational handouts and material.
- Public outreach and educational opportunities.

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DRAFT – November 13, 2023

Eastern Shore Groundwater Committee

Information for New Members

The Eastern Shore of Virginia Ground Water Committee (GWC) is a bi-county committee formed in 1990 by Accomack and Northampton Counties to study and plan for ground water protection. The 11-member committee meets monthly and includes elected officials, citizens, and local government staff. The Accomack-Northampton Planning District Commission (A-NPDC) staffs the committee and a consulting hydrogeologist advises the committee prepares monthly technical reports, and coordinates with the Virginia Department of Environmental Quality and the US Geological Survey (USGS).

Current Members

Chairman: John Coker

Vice Chairman: Paul Muhly

Committee Members:

- Accomack County - Paul Muhly, Grayson Chesser, Daniel Hershey, Susan Mastyl
- Northampton County - John Coker, Paul Grossman, Steve Sturgis, Ann Hayward Walker,
- Non-voting Ex-officio - Elaine Meil, Charles Kolakowski, and Mike Mason

A-NPDC Staff - Kellen Singelton

Consulting Hydrologist - Britt McMillan, Arcadis

Groundwater Management Area

The Eastern Shore of Virginia is one of six areas designated by the US Environmental Protection Agency (USEPA) as a Sole Source Aquifer within the Mid-Atlantic area (Federal Region 3). EPA designated the Columbia – Yorktown-Eastover Multi-aquifer System a sole source aquifer, effective May 9, 1997.

The Sole Source Aquifer (SSA) Program, which is authorized by Section 1424(e) of the Safe Drinking Water Act, allows communities to petition the USEPA for protection when a community is dependent on a single source of drinking water and there is no possibility of a replacement water supply to be found.

On June 17, 2013, the State Water Control Board adopted amendments (9VAC25-600-20) that declared the Eastern Shore of Virginia as a groundwater management area, known as the Eastern Shore Groundwater Management Area. It encompasses the counties of Accomack and Northampton.

Website

https://www.esvaplan.org/planesva/ground-water-management/eastern-shore-of-virginia-ground-water-committee/

Important Documents

- *Hydrogeologic Framework of the Virginia Eastern Shore*. 2019. USGS. https://pubs.usgs.gov/sir/2019/5093/sir20195093.pdf

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- *Eastern Shore of Virginia Groundwater Resource Protection and Preservation Plan.* 2013. A-NPDC and the Eastern Shore of Virginia Groundwater Committee https://www.a-npdc.org/wp-content/uploads/2016/05/ESVAGroundwaterResourceProtectionAndPreservationPlan2013compress.pdf
    - This is an update of the first plan which was developed in 1992. This plan provides an overview of Eastern Shore groundwater management (80+ pages).
    - This plan reflects a sustainable, systematic approach (p. 1.2-1) to using and managing the groundwater resource
    - To sustain the aquifer capacity, this plan describes threats to groundwater capacity and quality and provides this guidance: the Virginia Department of Environmental Quality (VDEQ) regulates all withdrawals greater than or equal to 300,000 gallons/month. Under these regulations, the VDEQ:
        1. Requires that all pump intakes are above the top of the aquifer and
        2. Groundwater levels are not lowered below the 80% criterion
- Add: Paul's jurisdiction diagram
- Add: Paul's 80% diagram
- The Virginia Eastern Shore Groundwater Model https://www.usgs.gov/centers/virginia-and-west-virginia-water-science-center/groundwater-flow-modeling
- Others?

Mandate

> The committee's mandate is to "assist local governments and residents of the Eastern Shore in understanding, protecting and managing ground water resources, to maintain a ground water resources protection and management plan (see above), to serve as an educational and informational resource to local governments and residents of the Eastern Shore, and to initiate special studies concerning the protection and management of the Eastern Shore ground water resource."

What does the Mandate mean regarding our role and activities?

The Committee meets monthly to discuss eastern shore ground water issues and review proposed ground water withdrawals over 300,000 gals per month, which are permitted by DEQ. Proposed permits are reviewed by the GWC's Consulting Hydrologist; his monthly report to the GWC is included in each meeting packet. Under our mandate, the GWC can provide comment to DEQ on proposed permits. Occasionally, EPA sends federal projects to the GWC for review as part of a Memorandum of Understanding related to our Sole Source Aquifer.

The mandate implies that members should be open to learn about various relevant technical aspects of groundwater and groundwater management. This technical knowledge is important for the members to engage with groundwater and drinking water agencies in protecting and managing ground water resources on the Eastern Shore. This knowledge also is useful in providing educational and informational resource to local governments and residents of the Eastern Shore.

The documents listed above are excellent sources of directly relevant information. Various fact sheets and presentations on the website provide additional information and details on specific topics, e.g.,

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Paleochannels and Saltwater intrusion https://www.esvaplan.org/planesva/ground-water-management/publications-resources/

GWC Programs

- Residential Well Testing, others added as needed
- Groundwater Committee Projects and Programs on the website, under which is also Permits and Tracking.
- Past projects are also listed on the website

Meetings

- The Board Room at the ESVA Chamber of Commerce, Melfa VA
- Monthly (except July and December), 3rd Tuesday from 10 am – noon
- Attendance in person or virtual
- Typical agenda structure: Call to Order, Public Participation, Previous Meeting Minutes, Financial Status Report, A-NPDC Staff Report, Ground Water Consultant Report, additional topics, e.g., NASA PFAS Status Update, Residential Well Testing Program

Meeting Materials

- The meeting materials to be covered in the agenda are compiled into a packet and distributed via email by A-NPDC staff before each monthly meeting
- Posted at: https://www.esvaplan.org/planesva/ground-water-management/eastern-shore-of-virginia-ground-water-committee/

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee

FROM: Kellen J. Singleton
Interdisciplinary Planner
Accomack-Northampton Planning District Commission

DATE: February 20, 2024

SUBJECT: **Ground Water Sustainability: Regulatory Policies and Updates**

Regulatory Policy and Challenges

- USACE Section 404 of the Clean Water Act
- DEQ VWP Permitting
- Other

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee

FROM: Britt McMillan
Principal Hydrogeologist
Arcadis

DATE: February 20, 2024

SUBJECT: February 20, 2024 Ground Water Consultant Report

Technical/Regulatory/Educational Items

1. Three draft permits were submitted for public comment on or after January 12, 2024. Two draft permit comment periods have expired: Eastern Shore Nursery (GW0079000) and Town of Chincoteague (GW0044201) and one draft permit is still under public comment for February 2024: Walker Farm (GW0070001) for a total of 10 draft permits to date this Fiscal year (October 1, 2023 to September 30, 2024). Two draft permits are renewals of current valid permits and one is a new permit (Eastern Shore Nursery). Shore Health and Rehab is requesting an increase over their current withdrawal and Shelley Farm and Jones 3 Farm are not requesting any changes to their withdrawal amounts. DEQ is accepting public comment on the draft Shore Health and Rehab permit through Jan 22, 2024 and public comment on the draft Shelley Farm and Jones 3 Farm permits through January 29, 2024. Copies of 1) the draft Permit, 2) associated Fact Sheets that provide information on the basis for the permit conditions, and 3) instruction on providing public comment are available on the DEQ website under the heading "***Contact for public comments, document requests and additional information***": https://www.deq.virginia.gov/permits/public-notices/water/water-withdrawal

Facility		Type	Aquifers				New	Draft Permit (Gal)			Percen-tile	Public Comment Deadline
				YTEO								
Permit No	Name		S	U	M	L		Monthly	Annual	Increase		
GW0080100	Cherrystone Campground	P			✓	✓	N	3,340,000	11,800,000	6%	52%	Oct 2
GW0053901	Perdue Farms	I		✓	✓	✓	N	78,000,000	700,000,000 to 650,000,000	-7%	100%	Oct 30
GW0080000	Afshan Farm	A			UNK		Y	1,216,860	4,725,900	NA	13%	Nov 6
GW0060601	Midwood Farm	A	✓	✓			N	3,000,000	10,000,000	-56%	50%	Nov 13
GW0037302	Shore Health and Rehab	P		✓			N	810,000	6,600,000	28%	26%	Jan 22
GW0070301	Shelley Farm	A		✓			N	6,550,000	16,600,000	0%	69%	Jan 29
GW0070501	Jones 3 Farm	A		✓			N	9,629,000	11,974,000	0%	55%	Jan 29
GW0079000	Eastern Shore Nursery	A	UNK					6,300,000	36,890,000	NA	81%	Feb 12
GW0044201	Town of Chincoteague	P	✓	✓	✓		N	34,100,000	219,400,000	0%	98%	Feb 12
GW0070001	Walker Farm	A	✓				N	7,500,000	13,100,000	0%	61%	Mar 4

Notes:

Type: A = Agriculture
CA = CAFO (Confined Animal Feeding Operation)
I = Industrial
P = Public Water Supply

Aquifers:
S = Surficial aquifer (the % indicates the percent of the total withdrawal from the surficial aquifer)
YTEO = Yorktown-Eastover aquifer system
U, M, L = Upper, Middle, Lower YTEO

New:

Y = New Permit
N = Re-Issued Permit
Percentile: Compares annual amount to other permitted withdrawals on the Eastern Shore. For a percentile of 75%, 75% of the permits are less than the draft permit and 25% are greater. Large withdrawals (> 75-percentile) are presented in orange.

Facility		Special Conditions		
Permit No	Name	WQ	Alt	Other
GW0080100	Cherrystone Campground	✓		Chloride monitoring. Well video logging, survey, and pump reset.
GW0053901	Perdue Farms	✓	✓	Tiered (decreasing) withdrawals, Alt Source Development Plan, Well Abandonment
GW0080000	Afshan Farm		✓	Pump intake, geophy logs, video logging
GW0060601	Midwood Farm			Pump intake, geophysical logs, well abandon, pond controls
GW0037302	Shore Health and Rehab			Well abandon
GW0070301	Shelly Farm			None
GW0070501	Jones 3 Farm			None
GW0079000	Eastern Shore Nursery			Flow meters, geophysical logs, pump intake, pond level control
GW0044201	Town of Chincoteague	✓		Well abandon, alternative source evaluation
GW0070001	Walker Farm			Pond level control

Draft Eastern Shore Nursery (GW0079000) is for a new permit for an existing groundwater withdrawal. The Fact Sheet states *"There is no historical withdrawal information available as the facility was unpermitted and the wells were unmetered."* There are surface water use records dating back at least to 2002 recording use from irrigation ponds. While there are no recorded use records from the wells, the wells were constructed between 2000 and 2015. It is reasonable to assume supplemental groundwater from wells have been used over at least a portion of this time without a permit.

Groundwater use is for irrigation supporting a wholesale nursery and related support activities including drinking and sanitary water supply for nursery staff. The principal source of irrigation water is from eight dug ponds

Withdrawal Amounts: The requested withdrawal amount is 36,890,000 gallons per year, which is a relatively large withdrawal on the Shore (81% of the permitted groundwater withdrawals on the Shore are less). Basis for the requested amount were calculated amounts using the "EPA Lean & Water Toolkit".

The Fact sheets state: *"groundwater well withdrawals were not reported, and calculating the amount of groundwater used for pond recharge is not possible. Demand estimates were calculated with no expected expansion or increase in withdrawal over the permit term, with no projected demands during drought conditions."* And *"With limited information and no metering data currently available, staff reviewed the calculations provided, which used the EPA Lean & Water Took Kit, estimates per water area by inches per water head/drip/micro irrigation zone, and found them to be reasonable."*

DEQ review concludes that: *"The applicant's operational use of ponds as the primary source for facility needs, with groundwater wells used primarily for sanitary needs and supplementation of the same ponds, provides for minimizing groundwater use, as much as possible."*

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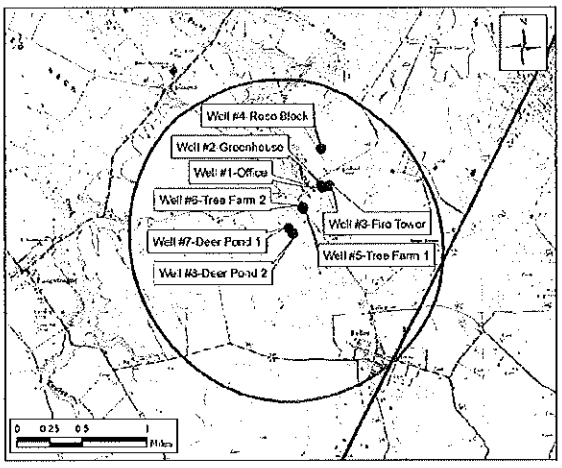
DEQ No.	Well No.	Location	Screen Interval (ft bgs)	Estimated Aquifer	Apportioned Withdrawal (%)
100-01721	#1	Office	100-115	S/UYT	2
100-01722	#2	Greenhouse	100-120	S/UYT	2
100-01723	#3	Fire Tower	50-70	S	17
100-01724	#4	Rose Block	60-70	S	22
100-01725	#5	Tree Farm 1	100-120	S/UYT	2
100-01726	#6	Tree Farm 2	95-115	S/UYT	2
100-01727	#7	Deer Pond 1	70-90	S	23
100-01728	#8	Deer Pond 2	70-90	S	30

A majority of the requested withdrawal are from wells screened at depths less than 90-feet below ground surface. While site specific information has not verified the aquifer, it is likely these wells withdraw from the Columbia (Surficial) aquifer.

Special Conditions:

a. Within 3-months install flow meters on all wells.
b. Within 2-years, complete geophysical logs from at least two locations: one between Well #2 and Well #3 and one between Well #5 and Well #6. Complete induction logs from Well #4, and either Well #7 or Well #8.
c. Within 90-days of notification by DEQ, reset pump depths if necessary.
d. Within 3-months, install and maintain a device to measure impoundment water levels on each impoundment that received pumped groundwater. Provide to DEQ procedures implemented to monitor impoundment water levels during pumping to prevent pond overflow.

Eastern Shore Nursery
Area of Impact - Upper Yorktown-Eastover Aquifer



● Eastern Shore Nursery Wells
—— Upper Yorktown-Eastover Area of Impact

Simulated drawdown at or exceeding one foot in the Upper Yorktown-Eastover (UYE) aquifer resulting from a 34,010,200 gpy, 50-year withdrawal from the Columbia and Upper Yorktown-Eastover (UYE) aquifers using the VAHydroGW-ES.

Maximum radius of one foot drawdown (Area of Impact) extends approximately 1.6 miles from the pumping center.

Technical evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply November 27, 2023

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Additional Remarks:

a. Based on the withdrawal apportionment, it is likely 92% of the groundwater withdrawal is from the Columbia (Surficial) aquifer. If this is verified by the geophysical logs, a majority of the groundwater withdrawal will be from the more sustainable Surficial aquifer, significantly reducing impacts to the Yorktown-Eastover aquifers. It would be beneficial for the Groundwater Committee to request results of the geophysical logging after it is completed.
b. While there are no groundwater withdrawal records, given the long-term operations at Eastern Shore Nursery, it is likely most of any drawdown effects from this withdrawal on the groundwater resource have already occurred. The withdrawal amount isn't likely an increase above what has been historically used, it is most accounting for previously undocumented use.

Draft Town of Chincoteague (GW0044201) is for a renewed permit for an existing withdrawal. The original groundwater withdrawal permit was issued 1986. The current permit was issued April 1,

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2011 with an expiration date of March 31, 2021. The permit has been administratively continued until a new permit is issued. Groundwater use is for public water supply for domestic and commercial use.

Withdrawal Amounts: The requested withdrawal amount of 219,400,000 gallons per year is the same as the previous (current) groundwater withdrawal permit. There is no requested increase in irrigation use for the draft permit. The amount requested is for a relatively large amount, 98% of the permitted withdrawals on the Shore are less.

The groundwater withdrawal is used to recharge and supplement water from an approximate 1-acre irrigation pond. Total volume of the irrigation pond is 6,500,000 gallons. There is no automated overflow prevention installed in the pond. As stated in the VDEQ Fact Sheets, "during production the facility is monitored daily by a farm manager who ensures the pond is not overfilled by groundwater pumped from the facility's production wells.

DEQ No.	Well No.	Screen Interval (ft bgs)	Estimated Aquifer	Apportioned Withdrawal (%)
100-00850	#3A	100-115	S	7.85
100-00851	#3B	100-120	S	7.59
100-00852	#3C	50-70	S	7.69
100-00028	#4	60-70	MYT	24
100-00032	#5	100-120	MYT	2.2
100-00320	#6	95-115	UYT/MYT	26.24
100-00945	#7	70-90	MYT	24.43

Twenty-three percent of the withdrawal is from the Surficial aquifer. This is a very high percentage for a public water supply.

Special Conditions:

a. Well Abandonment: Verify, and if necessary, abandon 11 wells and abandon and replace one well (Well #4).
b. Secure out-of-service observation wells to prevent vandalism or accidental misuse.
c. Water quality monitoring: monitor two wells: Well 8 (100-00945) and SOW-115F (100-1282) quarterly for chlorides. Well 8 is screened in the Middle Yorktown-Eastover aquifer and SOW-115F is screened in the lower Yorktown-Eastover aquifer.
d. Alternative Source Evaluation: "*...include evaluation of the ability of the Surficial aquifer to provide additional water supply needs for the facility along with other potential alternate source options or water treatment options...*". Report will be submitted to DEQ within 9-years of permit issuance.

Additional Remarks:

a. The Town of Chincoteague withdrawal is one of the longest active withdrawals on the Shore, and while there is significant seasonal variability in use (mostly due to seasonal tourism), the overall annual withdrawal has remained stable over the past permit term. A majority of the water level impacts have already been observed. There have been some evidence of saltwater intrusion over the years, typically associated with localized upconing when operations of individual wells change. Impacts of other withdrawals in addition to the Town's withdrawal may affect saltwater intrusion. The required chloride monitoring will aid in this evaluation.
b. Selection of the Middle Yorktown-Eastover (Well 8) and Lower Yorktown-Eastover aquifer (SOW-115F) wells, which are located within the well field and are not used as a withdrawal well, are particularly well suited for monitoring potential saltwater intrusion.

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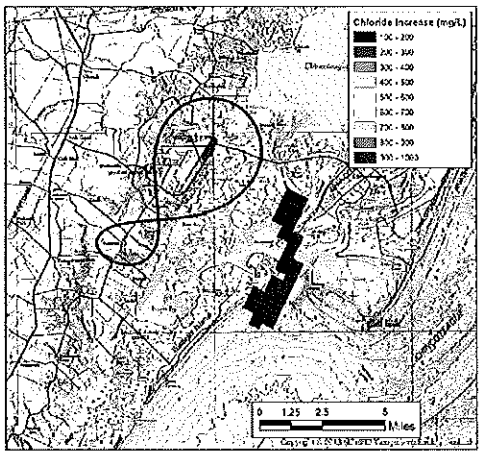
Town of Chincoteague - Upper Yorktown-Eastover Aquifer - Simulated VESM Chloride Concentration Increase



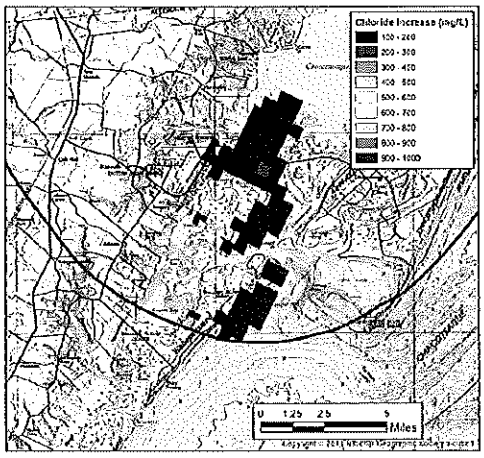
● Town of Chincoteague Wells
—— Upper Yorktown-Eastover Aquifer AOI

Simulated chloride concentration increase in the Upper Yorktown-Eastover aquifer resulting from a 50 year simulation of a 219,400,000 gpy, 50 year withdrawal from the Columbia, Upper Yorktown-Eastover, and Middle Yorktown-Eastover aquifers using the VAHydroGW-ES.

Technical Evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply January 10, 2022

DEQ VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Town of Chincoteague - Middle Yorktown-Eastover Aquifer - Simulated VESM Chloride Concentration Increase



● Town of Chincoteague Wells
—— Middle Yorktown-Eastover Aquifer AOI

Simulated chloride concentration increase in the Middle Yorktown-Eastover aquifer resulting from a 50 year simulation of a 219,400,000 gpy, 50 year withdrawal from the Columbia, Upper Yorktown-Eastover, and Middle Yorktown-Eastover aquifers using the VAHydroGW-ES.

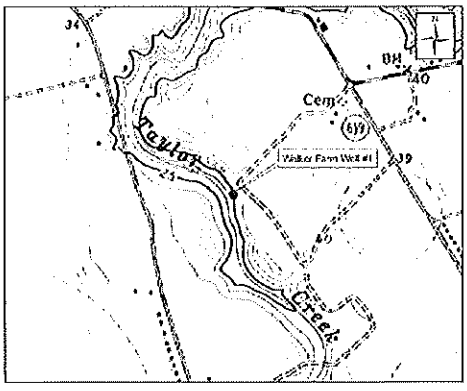
Technical Evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply January 10, 2022

DEQ VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Draft Walker Farm (GW0070001) is for a renewed permit for an existing withdrawal. The current permit was issued October 1, 2013 with an expiration date of September 30, 2023. The permit has been administratively continued until a new permit is issued. Groundwater use is for agricultural irrigation. Principal crop is tomatoes irrigated through plasitculture drip irrigation method. Water is supplied from one well screened in the Surficial (Columbia) aquifer and is used to replenish an irrigation pond.

The requested withdrawal amount of 13,100,000 gallons per year is the same as the previous (current) groundwater withdrawal permit. There is no requested increase in irrigation use for the draft permit. The amount requested is for a moderate amount, 61% of the permitted withdrawals on the Shore are less and 39% are greater. Maximum historical use over the past 10-years (2013-2022) was 13,175,000 gallons in 2022, or 101% of the permit limit.

Walker Farm
Area of Impact - Columbia Aquifer



● Walker Farm Well

Simulated drawdown at or exceeding one foot in the Columbia aquifer resulting from a 10,214,853 gpy withdrawal from the Columbia aquifer for 50 years using a two-dimensional Neuman simulation.

Simulated drawdown is less than one foot.

Technical evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply December 1, 2023

DEQ VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Alternative Sources (Surficial aquifer): The irrigation well is screened in the Surficial aquifer with a screen interval of 30 to 86 feet below ground surface.

Special Conditions:

a. Pond water level control: within 3-months, install and maintain a device to measure pond water levels and provide to DEQ the procedures implemented to monitor pond water levels during pumping to ensure that groundwater pumping does not result in overfilling the pond.

Additional Remarks:

1. The withdrawal is from the Surficial aquifer, which is the most sustainable source of water on the Eastern Shore. This use is consistent with the intent of the *Ground Water Supply Protection and Management Plan for the Eastern Shore of Virginia* and the *Virginia Ground Water Management Act.*

2. The additional requirement for installing a device to measure pond water levels was recommended by the Groundwater Committee for two previous draft Permits in January 2024. The measuring device can be electronic or manual (such as a staff gauge).

2. **Public Comments:** Previously, the Groundwater Committee responded to all draft Permits as part of the public comment phase. These comments were provided at a time DEQ gave the Groundwater Committee a "courtesy copy" of the draft Permit prior to the 30-day comment period. After DEQ ceased providing the courtesy copy and given the shorted time frame to address comments, this practice ceased. With the large number of recent draft permits it would be beneficial to comment on draft permits as necessary. Given the shortened response period (compared to the past), it is helpful to have structured response options along with individualized comments. Four structured response options are provided below:

   a. "The Committee believes that the proposed withdrawal is consistent with the intent of the *Ground Water Supply Protection and Management Plan for the Eastern Shore of Virginia* and the *Virginia Ground Water Management Act,* and that the draft permit provides adequate protection for the ground water resource. Therefore, the Eastern Shore of Virginia Groundwater Committee supports the proposed Ground Water Withdrawal Permit." *{add qualifying text, such as citing beneficial uses or concerns regarding implementation}*
   b. "The Committee believes that the proposed withdrawal is substantially consistent with the intent of the *Ground Water Supply Protection and Management Plan for the Eastern Shore of Virginia* and the *Virginia Ground Water Management Act*, and that the draft permit provides protection for the ground water resource. Therefore, the Eastern Shore of Virginia Groundwater Committee does not object to the proposed Ground Water Withdrawal Permit." *{add qualifying text, such as citing beneficial uses or concerns regarding implementation}*
   c. "Based on the information provided, the Committee believes that the proposed withdrawal may conflict with the intent of the *Ground Water Supply Protection and Management Plan for the Eastern Shore of Virginia* and the *Virginia Ground Water Management Act*, and may have a detrimental effect on the ground water resource. Therefore, the Eastern Shore of Virginia Groundwater Committee would like several issues clarified before the Ground Water Withdrawal Permit is issued." *{add qualifying text that specifies the issues, such as definition of the impact area, water conservation requirements, or monitoring}*
   d. "Based on the information provided, the Ground Water Committee believes that the proposed withdrawal may conflict with the intent of the *Ground Water Supply Protection and Management Plan for the Eastern Shore of Virginia* and the *Virginia Ground Water Management Act*, and may have a detrimental effect on the ground

water resource. Therefore, the Eastern Shore of Virginia Groundwater Committee has concerns about the Draft Ground Water Withdrawal Permit and believes that a Public Hearing is appropriate to resolve these concerns." *{add qualifying text that specifies the issues, such as definition of the impact area, water conservation requirements, or monitoring}*

3. **DEQ Virginia Eastern Shore Model 2022-2023 Simulation of Report and Total Use:**
DEQ released the annual report that provides summary information on permitted groundwater use and model simulated impacts from the groundwater use on the Eastern Shore aquifers. The report and be accessed from the DEQ website at:
https://www.deq.virginia.gov/our-programs/water/water-quantity/advisory-committees/eastern-virginia-groundwater-management-advisory-committee

The report documents actual groundwater use for permitted wells and the total permitted amounts. 2023 actual use and permitted use is summarized on the tables below.

County	Reported (MGD) 2023	Permit (MGD) 2023	Percent Used 2023
Accomack	5.04	7.62	66%
Northampton	1.29	2.59	50%
Total	6.33	10.21	62%

County	Permitted Use 2023	Domestic (Estimated) 2008	Total 2023
Accomack	5.0	1.4	6.5
Northampton	1.3	0.6	1.9
Total	6.3	2.1	8.4

Aquifer	Reported (MGD) 2023	Permitted (MGD) 2023	Percent Used 2023
Surficial	0.34	0.89	38%
Upper Yorktown	2.84	4.44	64%
Middle Yorktown	2.80	3.82	73%
Lower Yorktown	0.28	0.54	52%
Paleochannels	0.19	0.53	36%
Total	6.46	10.21	63%

Note: the "Reported" and "Permit" amounts are for groundwater withdrawals from permitted wells. The "Domestic" is for individual domestic use and is an estimate from the USGS 2008 study. The USGS is in the process of updating this estimate.

This amount does not include surface water withdrawals from irrigation ponds. The irrigation ponds are all contained in the Surficial aquifer and are replenished by 1) direct precipitation, 2) stormwater runoff, and 3) groundwater recharge. The percent of the pond recharged by groundwater recharge will be very location and seasonal specific. Since the pond both recharges the Surficial aquifer (in the winter) and is recharged by the Surficial aquifer (in the summer) there is likely negligible net effect on the groundwater resource.

Based on the reported permitted use and in 2023 and estimated domestic use, the total actual groundwater withdrawal in 2023 is estimated at 8.4 MGD average.

A more detailed discussion will be provided at the Groundwater Committee meeting.

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee

FROM: Kellen J. Singleton
Interdisciplinary Planner
Accomack-Northampton Planning District Commission

DATE: February 20, 2024

SUBJECT: **Committee Attendance Record**

Committee Attendance Record
The FY2024 Committee Attendance Records are attach

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Eastern Shore of Virginia Ground Water Committee

EASTERN SHORE OF VIRGINIA GROUND WATER COMMITTEE FY 2024 ATTENDANCE RECORD

Member	Term Exp.	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
ACCOMACK COUNTY													
Calvin Washington, Sr.	*Vice Chair; Next vote: July 2025*	-	-	-	-	*	*	X					
Paul Muhly		*	X	X	X	*	*	–					
Dan Hershey	*June 2025*	*	X	X		*	*	X					
Grayson Chesser	*June 2023*	*	X	X		*	*	X					
Sue Mastyl	*April 2025*	*	X	X	X	*	*	X					
NORTHAMPTON COUNTY													
John Coker	*Chair; Next Vote: July 2025*	*		X	X	*	*	X					
Paul Grossman	*March 2024*	*	X	X	X	*	*	X					
Steve Sturgis	*July 2024*	*	X		X	*	*	X					
Ann Hayward Walker	*December 2024*	*	X	X	X	*	*						
NON-VOTING EX-OFFICIO MEMBERS													
Charles Kolakowski	*NA*	*				*	*						
Mike Mason	*NA*	*				*	*						
Elaine Meil	*NA*	*				*	*	X					

-	Not a member	X	Member Present	()	Alternate Present
*	No Meeting Held	NA	Not Applicable		

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EASTERN SHORE OF VIRGINIA GROUND WATER COMMITTEE FY 2024 ATTENDANCE RECORD

Virginia Eastern Shore Model (VAHydroGW-ES) 2022-2023 Simulation of Potentiometric Groundwater Surface Elevations of Reported and Total Permitted Use

December 31, 2023
Office of Water Supply
Water Withdrawal Permitting and Compliance
Water Planning Division

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Table of Contents

1. VAHydroGW-ES Model Background

The Virginia Eastern Shore Model[1] (VESM) is a SEAWAT[2] groundwater model which encompasses all of the Delmarva Peninsula within Virginia and part of the peninsula in southern Maryland. The original groundwater model was created by the USGS and simulates water levels within the aquifers and confining units of the Eastern Shore from 1900 through 2003 based upon historic pumping records. Water levels are simulated for the Upper, Middle, and Lower Yorktown-Eastover aquifers and confining units as well as the Eastville and Exmore Paleochannel aquifers.

For aquifers near coastal areas the increase in density across a transition zone from fresh groundwater to seawater significantly affects the direction of groundwater flow. The capacity of SEAWAT to simulate the variable-density form of the groundwater flow equation increases the accuracy of simulated water levels in the Eastern Shore aquifers.

The original VESM was updated and adapted for use in the VA-DEQ groundwater withdrawal permitting process in 2010 and is now referred to as VAHydroGW-ES. Water levels within the aquifers were simulated to respond quickly to changes in simulated pumping. Consequently, when repeating the 2003 stresses for 50 years the simulated water levels reached "equilibrium" very quickly and at the end of the simulation were very similar to those simulated with a steady-state version of the model. Because of the very short simulation time, and the similarity in simulated water levels, the steady-state version of the VAHydroGW-ES was used from 2010 through 2015 for modeling the water level impact of proposed withdrawals in the groundwater withdrawal permitting process. The steady-state version of the model does not simulate changes in salinity. For larger withdrawals and some smaller withdrawals located near the coastal areas it was necessary to simulate the potential for saltwater intrusion as part of the groundwater withdrawal permitting process. In order to do so the VAHydroGW-ES was modified by repeating all of the 2003 stresses for each year through 2010. The 2010 total permitted pumping rates were then added to the model and repeated for 50 years. Changes in chloride concentrations due to a proposed withdrawal were observed at the end of the 50 years and used to assess the potential for water quality degradation.

Between the time that the VESM was updated and adapted for use in the VA-DEQ groundwater withdrawal permitting process in 2010 and the updates to the VAHydroGW-ES were completed as outlined in this report, the Virginia Coastal Plain Model[3] (VCPM) was adapted for use in the VA-DEQ groundwater withdrawal permitting process in 2013. The VCPM is a SEAWAT groundwater model which encompasses all of the Coastal Plain within Virginia and parts of the Coastal Plain in northern North Carolina and southern Maryland. The original groundwater model was created by the USGS

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[1] Sanford, W.E., Pope, J.P., and Nelms, D.L., 2009, Simulation of groundwater-level and salinity changes in the Eastern Shore, Virginia: U.S. Geological Survey Scientific Investigations Report 2009–5066, 125 p.
[2] Langevin, C.D., Thorne, D.T., Jr., Dausman, A.M., Sukop, M.C., and Guo, Weixing, 2008, SEAWAT Version 4: A Computer Program for Simulation of Multi-Species Solute and Heat Transport: U.S. Geological Survey.
[3] Heywood and Pope, Simulation of Groundwater Flow in the Coastal Plain Aquifer System of Virginia, Scientific Investigation Report 2009-5039.

and simulates water levels within the aquifers and confining units of the Coastal Plain from 1890 through 2003 based upon historic pumping records. The updated and adapted VCPM is referred to as the VAHydroGW-VCPM model. The VCPM updating process included modifying the VCPM to simulate water levels for 50 years beyond the end of the historic portion of the model (1890 - 2012) – this 50 year portion of the model is referred to as the predictive portion of the model. The predictive portion of the model was based upon two scenarios: the *Total Permitted Scenario* and the *Reported Use Scenario.*

Similarly, the VAHydroGW-ES updates outlined in this report document the creation of a 50 year predictive portion of the model. The VAHydroGW-ES 50 year predictive model is also based upon two scenarios: the *Total Permitted Scenario* and the *Reported Use Scenario.* The 50 year *Total Permitted Scenario* is now used for evaluation of VA-DEQ groundwater withdrawal permit technical evaluations on the Eastern Shore as opposed to the steady-state version of the model used previously.

2. VESM Historic Model Updates

Water use data from 2004 through 2015 were obtained in electronic format from the Virginia DEQ. DEQ Office of Water Supply receives water use data from Groundwater Withdrawal Permit holders as a condition of their permits.

The VAHydroGW-ES encompasses all of the Delmarva Peninsula within Virginia and a portion of the Delmarva Peninsula in southern Maryland. Row and column assignments for withdrawals reported within Virginia were made using well locations (latitude and longitude) to plot the position on a GIS coverage of the VAHydroGW-ES finite-difference grid. Model layers for withdrawals were assigned based upon the top and bottom elevation of the withdrawal screens - using a land surface Digital Elevation Model (DEM) and the depths of the withdrawal screens. If necessary, adjustments to model layer assignments were made to align the assigned model layers with model layers containing the DEQ staff's assigned aquifer for each screen interval.

The historic portion of the VAHydroGW-ES was then updated by adding reported use pumping records from 2004 through 2015. For each year, the reported withdrawals were simulated at a constant rate (cfd) equivalent to the annual average for that year. Withdrawals from Maryland were simulated at the 2003 rates (the most recent year available at the time of the model execution). Boundary conditions, domestic withdrawals, and precipitation were simulated at the 2003 rates specified by the USGS in the original VAHydroGW-ES for the years 2004 through 2015.

Once the inputs to the historic VAHydroGW-ES were updated through 2015, the VAHydroGW-ES water level observations were updated with observed water levels from wells throughout the Virginia Eastern Shore. The VAHydroGW-ES aquifer hydraulic conductivity was recalibrated to reflect the updated inputs and observations. The results of the recalibration process are outlined in the report *Eastern Shore 2016 Model Updates and Recalibration* on file with the VADEQ. The updated and recalibrated VAHydroGW-ES model was then used to create the *VAHydroGW-ES 2015 Reported Use*

Simulation and *VAHydroGW-ES 2016 Total Permitted Simulation* in November 2016. In September of 2017 the annual updates of the VAHydroGW-ES were performed to create the *VAHydroGW-ES 2016 Reported Use Simulation* and *VAHydroGW-ES 2017 Total Permitted Simulation*. In November of 2018 the annual updates of the VAHydroGW-ES were performed to create the *VAHydroGW-ES 2017 Reported Use Simulation* and *VAHydroGW-ES 2018 Total Permitted Simulation*. In November of 2019 the annual updates of the VAHydroGW-ES were performed to create the *VAHydroGW-ES 2018 Reported Use Simulation* and *VAHydroGW-ES 2019 Total Permitted Simulation*. In November of 2020 the annual updates of the VAHydroGW-ES were performed to create the *VAHydroGW-ES 2019 Reported Use Simulation* and *VAHydroGW-ES 2020 Total Permitted Simulation*. In October of 2021 the annual updates of the VAHydroGW-ES were performed to create the *VAHydroGW-ES 2020 Reported Use Simulation* and *VAHydroGW-ES 2021 Total Permitted Simulation*. In October of 2022 the annual updates of the VAHydroGW-ES were performed to create the *VAHydroGW-ES 2021 Reported Use Simulation* and *VAHydroGW-ES 2022 Total Permitted Simulation*.

The remainder of this report outlines the creation of the *VAHydroGW-ES 2022 Reported Use Simulation* and *VAHydroGW-ES 2023 Total Permitted Simulation*.

3. VAHydroGW-ES 2022 Reported Use Simulation

3.1 Model Preparation

The VAHydroGW-ES model (1900-2022) was updated with reported withdrawals for the 2022 calendar year. The *VAHydroGW-ES 2022 Reported Use Simulation* was created by taking the water levels and chloride concentrations at the end of the updated historic model (1900-2022) and using them as starting conditions for a 50 year predictive model. For this *VAHydroGW-ES 2022 Reported Use Simulation*, withdrawals from the Virginia Eastern Shore were simulated for the duration of the 50 year simulation using the average reported pumping for the 5 years from 2018 through 2022. Withdrawals from Maryland were simulated at the 2003 rates (the most recent year available at the time of the model execution). Boundary conditions, domestic withdrawals, and precipitation were simulated at the 2003 rates specified by the USGS in the original VESM for the duration of the 50 year simulation.

A total use of 7.93 million gallons per day (MGD) represents the 2018-2022 reported average withdrawal and was applied to the 50 years of prediction (2023-2072) in the *VAHydroGW-ES 2022 Reported Use Simulation*. The 2018-2022 average reported use of 6.33 MGD was assigned to withdrawals within the Virginia Eastern Shore. The total use assigned to Maryland withdrawals was 1.60 MGD. A breakdown of the Virginia reported water use data by county is shown in Table 1.

Table 1. 2018-2022 Average Water Use Report -Withdrawals Modeled by County

County	Use Allocated to Model (MGD)	Use Allocated to Model (%)
Accomack	5.04	79.7%
Northampton	1.29	20.3%
TOTAL	**6.33**	**100.0%**

The reported use amount allocated to each aquifer is shown in Table 2.

Table 2. 2018-2022 Average Reported Use - Total Simulated Amount by Aquifer

Aquifer	Use Allocated to Model (MGD)	Use Allocated to Model (%)
Surficial	0.34	5.3%
Upper Yorktown-Eastover	2.84	44.0%
Middle Yorktown-Eastover	2.80	43.4%
Lower Yorktown-Eastover	0.28	4.4%
Exmore Paleochannel	0.14	2.2%
Eastville Paleochannel	0.05	0.8%
TOTAL	6.46	**100.0%**

The *VAHydroGW-ES 2022 Reported Use Simulation* model outputs potentiometric water levels for each model layer. Water levels do not vary significantly between layers corresponding to a given aquifer. Consequently, the water levels from the end of the simulation for the uppermost model layer for each aquifer were analyzed. For each confined, regulated aquifer the water levels were assigned to corresponding Geographic Information System (GIS) grid cells then converted to an ArcView shapefile. The head values were then contoured using ESRI's Spatial Analyst Spline tool. Smoothest contours were generated using the spline method (20 neighbors). The water levels from the end of the 50 year *VAHydroGW-ES 2022 Reported Use Simulation* are shown in Attachment A. The simulated chloride concentrations from the end of the 50 year *VAHydroGW-ES 2022 Reported Use Simulation* are shown in Attachment C.

3.2 VAHydroGW-ES Cells Violating the 80% Drawdown Criterion

The Upper, Middle, and Lower Yorktown-Eastover aquifer potentiometric water levels from the end of the *VAHydroGW-ES 2022 Reported Use Simulation* are all simulated above the critical surface for those aquifers. Based on current use, the water levels in these aquifers comply with state regulatory standards.

4. VAHydroGW-ES 2023 Total Permitted Simulation

4.1 Withdrawals Simulated

9VAC25-610 ("Evaluation Criteria for permit applications") of the GWMA Regulations requires the evaluation of proposed withdrawals in combination with all existing lawful withdrawals. This simulation was created by replacing the reported use amounts of the predictive portion of the *VAHydroGW-ES 2022 Reported Use Simulation* for all GWMA permit holders with the maximum annual withdrawal limit allowed under the terms of active permits.

All other withdrawals and model inputs from the *VAHydroGW-ES 2022 Reported Use Simulation* were not changed. For the GWMA permits that have been created or renewed after 2009 the permit amount was divided between the active wells of the permit based upon the apportionment table found in the permit's technical evaluation. For all other GWMA permit holders the permitted amount was divided evenly between the active wells of the permit. For permits with a 10 or 15 year lump sum value, the lump sum value was divided evenly among the 10 or 15 year permit to obtain a yearly withdrawal rate. Once the total permitted yearly withdrawal rate was established for each permitted well, the permitted amount was then repeated for each year of 50 year the simulation. Beginning in the 2021 *Total Permitted Simulation* and continuing in subsequent Total Permitted simulations, the withdrawals for the Marshall Johnson Grapeland Complex facility varied in yearly amounts.

Row and column assignments for permitted withdrawals within the Virginia Eastern Shore were made using well locations (latitude and longitude) to plot the position on a GIS coverage of the VAHydroGW-ES finite-difference grid. Model layers for withdrawals within the Virginia Eastern Shore were assigned based upon the top and bottom elevation of the withdrawal screens - using a land surface DEM and the depths of the withdrawal screens. If necessary, adjustments to model layer assignments were made to align the assigned model layers with model layers containing the DEQ staff's assigned aquifer for each screen interval. The VAHydroGW-ES utilizes the MODFLOW Multi-Node Well (MNW) package. The MNW package allows withdrawals to be assigned to multiple, consecutive (single aquifer withdrawals) or non-consecutive (multi-aquifer withdrawals) model layers. Modeled water extraction is allocated by the MNW package among assigned model layers based upon each layer's hydrogeologic properties.

All of the permitted withdrawals simulated in the *VAHydroGW-ES 2023 Total Permitted Simulation* are listed in Attachment E. Table 3 outlines the withdrawal amounts in the *VAHydroGW-ES 2023 Total Permitted Simulation*. The Total Permitted simulated withdrawal of 11.81 MGD is 5.35 MGD greater than the total amount reported as actual use.

Table 3. Simulated Total Permitted Withdrawals

Withdrawal Source	Use Allocated to Model (MGD)	Use Allocated to Model (%)
GWMA Maximum Permitted	10.21	86.5%
Maryland Reported Use	1.60	13.5%
TOTAL	**11.81**	**100.0%**

A breakdown of the *VAHydroGW-ES 2023 Total Permitted Simulation* pumping data by county is shown in Table 4.

Table 4. Simulated Total Permitted Withdrawals -Withdrawals Modeled by County

County	Use Allocated to Model (MGD)	Use Allocated to Model (%)
Accomack	7.62	74.7%
Northampton	2.59	25.3%
TOTAL	**10.21**	**100.0%**

The *VAHydroGW-ES 2023 Total Permitted Simulation* amount allocated to each aquifer is shown in Table 5.

Table 5. *VAHydroGW-ES 2023 Total Permitted Simulation* – Pumping Amount by Aquifer

Aquifer	Use Allocated to Model (MGD)	Use Allocated to Model (%)
Surficial	0.89	8.7%
Upper Yorktown-Eastover	4.44	43.5%
Middle Yorktown-Eastover	3.82	37.4%
Lower Yorktown-Eastover	0.54	5.3%
Exmore Paleochannel	0.46	4.5%
Eastville Paleochannel	0.07	0.7%
TOTAL	10.21	**100.0%**

The water levels from the end of the 50 year *VAHydroGW-ES 2023 Total Permitted Simulation* are shown in Attachment B. The simulated chloride concentrations from the end of the 50 year *VAHydroGW-ES 2023 Total Permitted Simulation* are shown in Attachment D.

4.2 VESM Cells Violating the 80% Drawdown Criterion

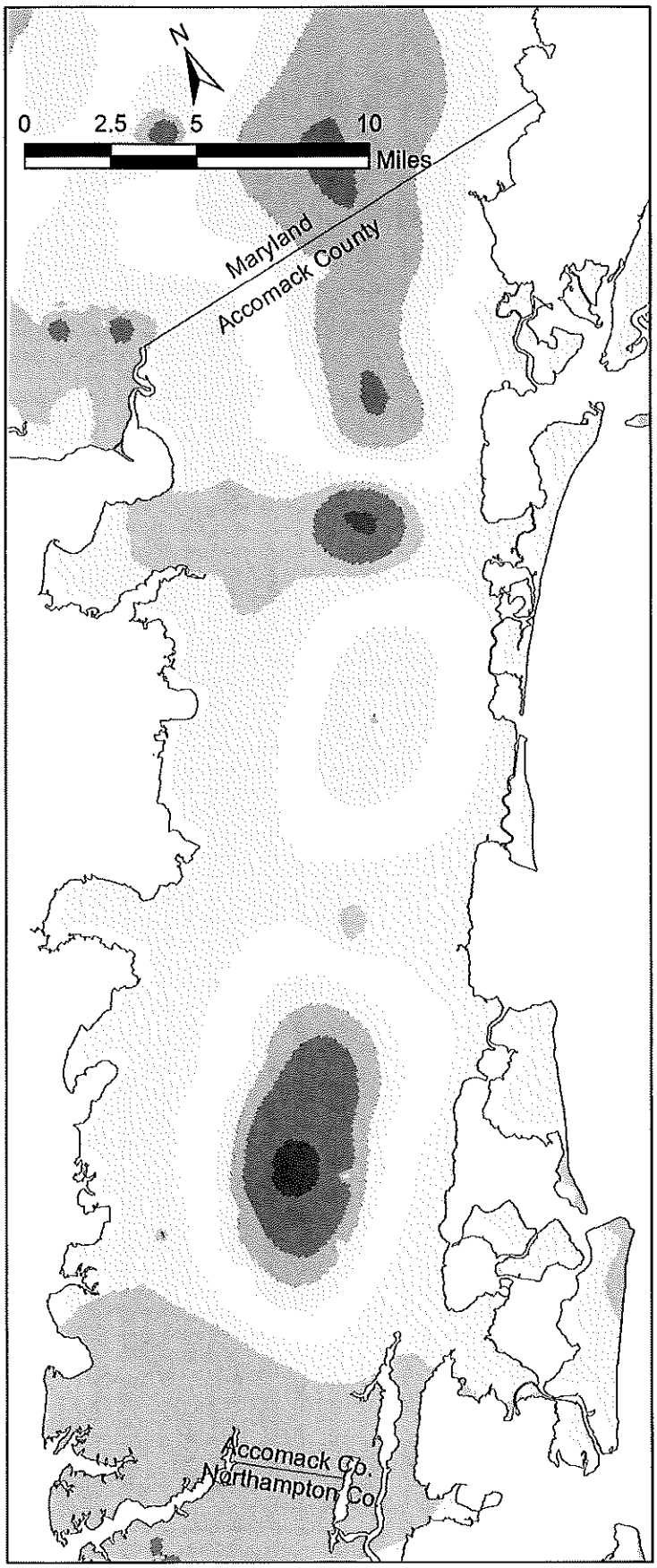
The *VAHydroGW-ES 2023 Total Permitted Simulation* shows areas of the Eastern Shore for the Upper and Middle Yorktown-Eastover aquifers where predicted water levels (at the end of the 50-year simulation) are below the critical surface for those aquifers. In several of the cells in the Upper Yorktown-Eastover aquifer with water levels predicted to be below the critical surface, the predicted water levels are also below the aquifer top represented in the model framework. Maps of all areas not in compliance with the 80% drawdown criterion are presented in Attachment C.

The Lower Yorktown-Eastover aquifer potentiometric water levels from the end of the *VAHydroGW-ES 2023 Total Permitted Simulation* are all simulated above the critical surface for that aquifer. Based on current use, the water levels in the Lower Yorktown-Eastover aquifer comply with state regulatory standards.

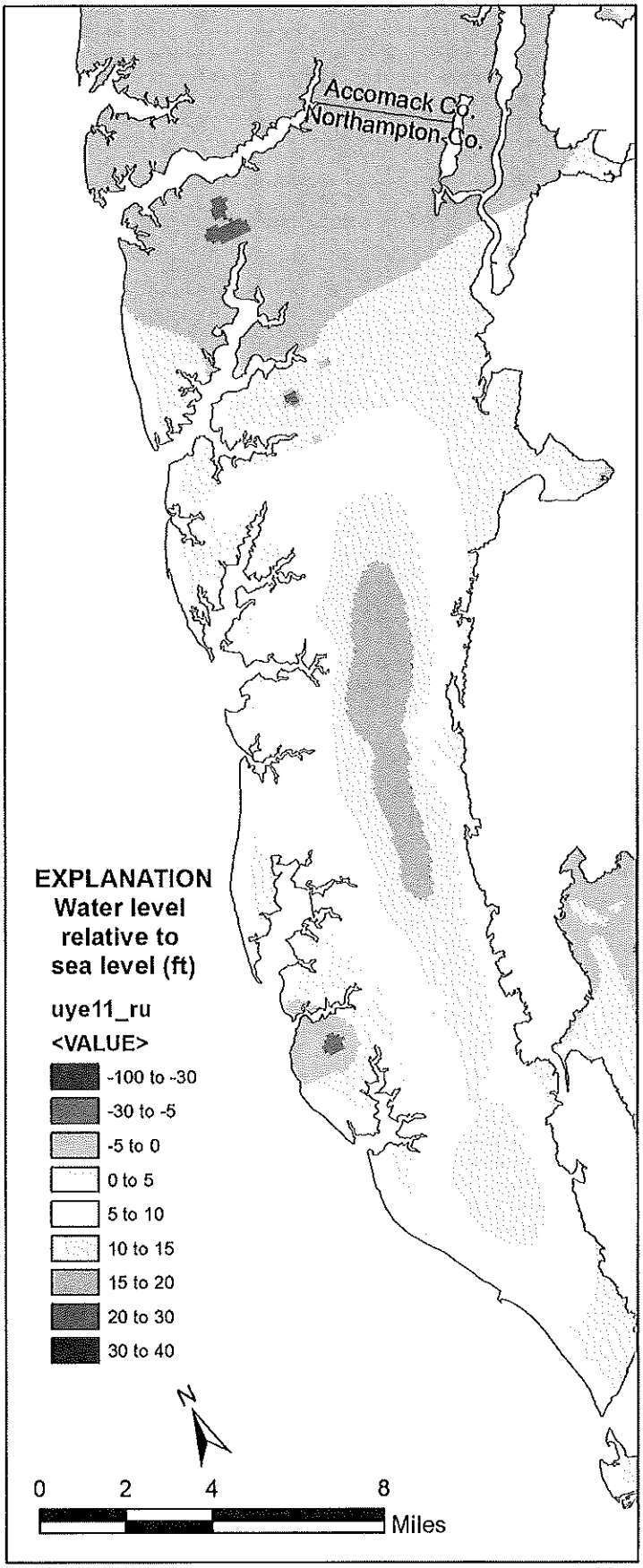
Attachment A

Simulated Potentiometric Contours
VAHydroGW-ES 2022 Reported Use Simulation

VAHydroGW-ES 2022 Reported Use Simulation
Upper Yorktown-Eastover Water Levels

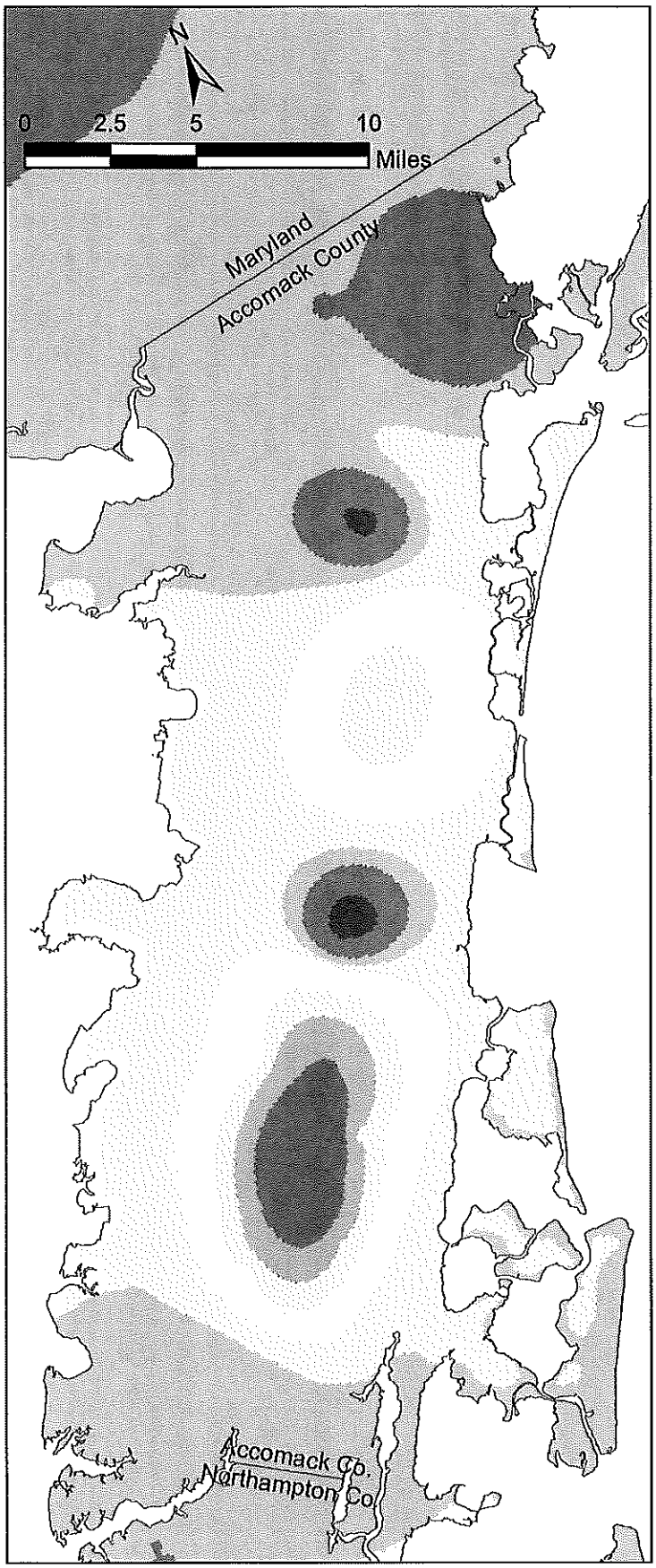


Accomack County

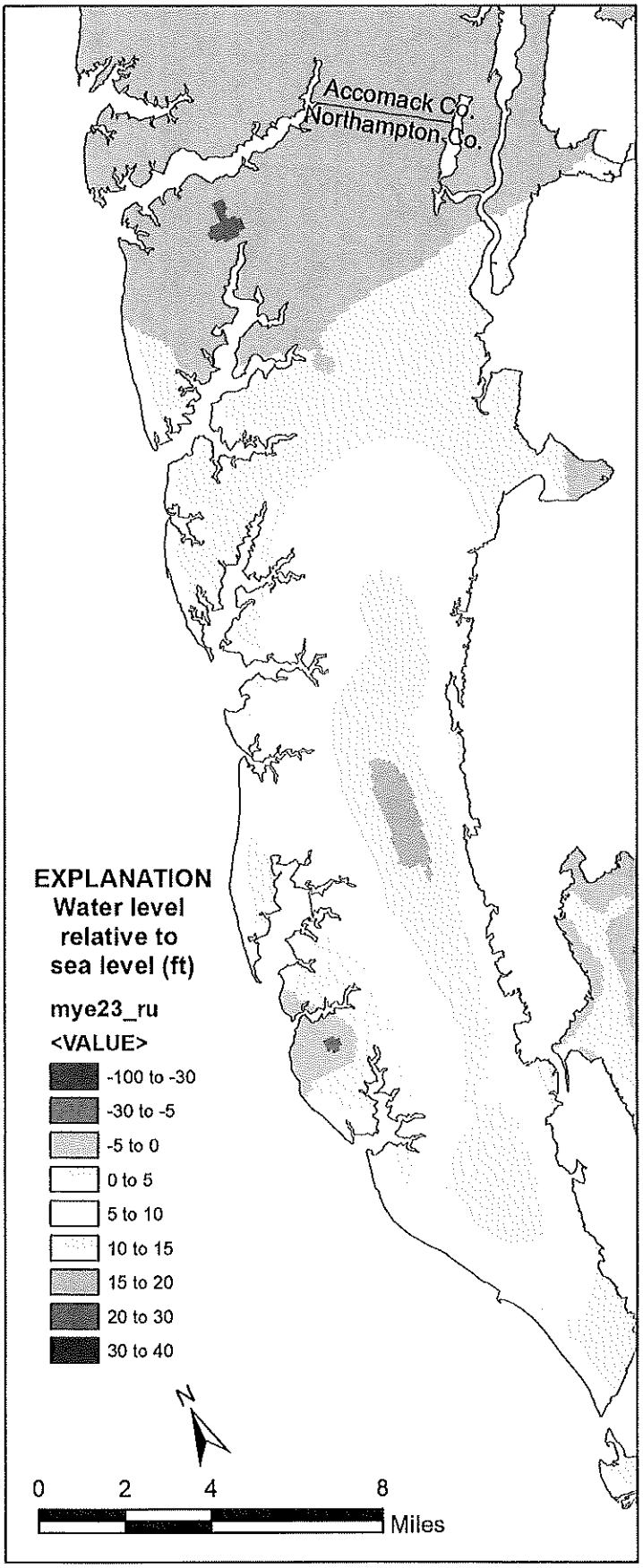


Northampton County

VAHydroGW-ES 2022 Reported Use Simulation
Middle Yorktown-Eastover Water Levels

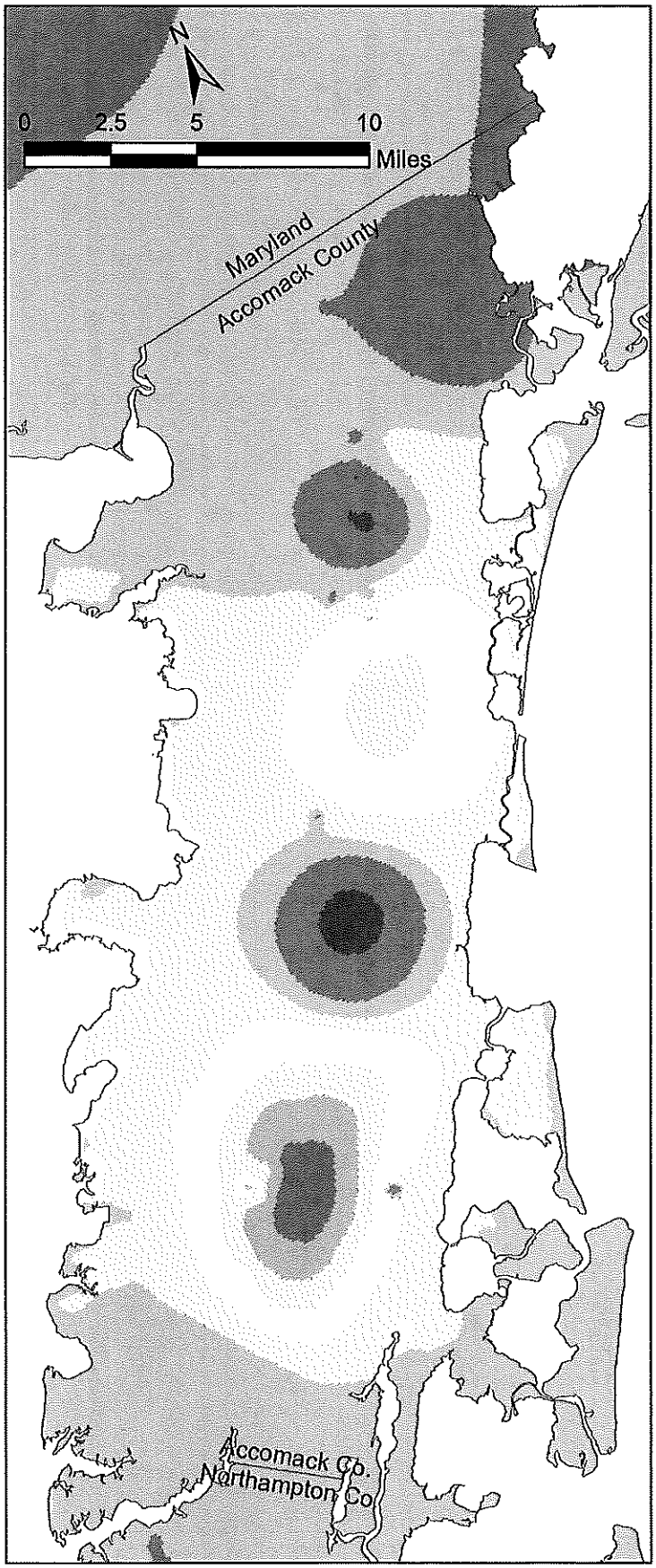


Accomack County

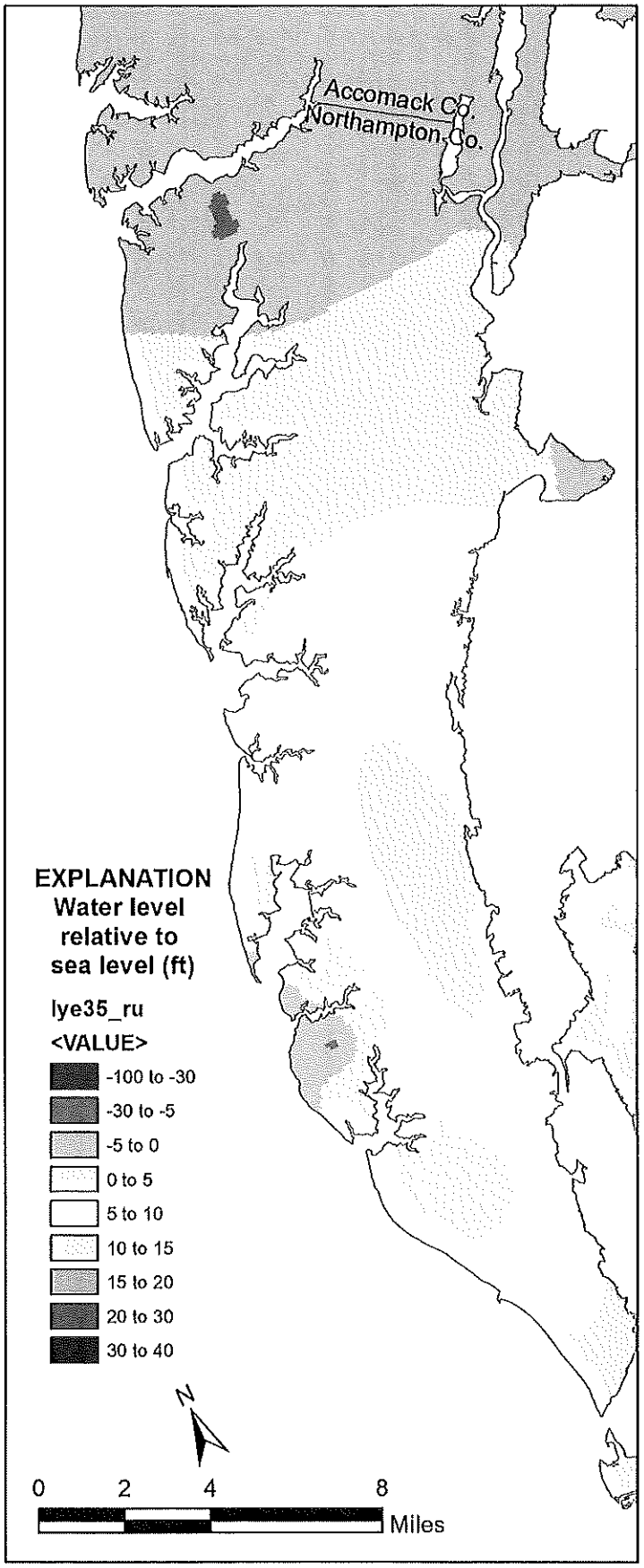


Northampton County

VAHydroGW-ES 2022 Reported Use Simulation
Lower Yorktown-Eastover Water Levels



Accomack County

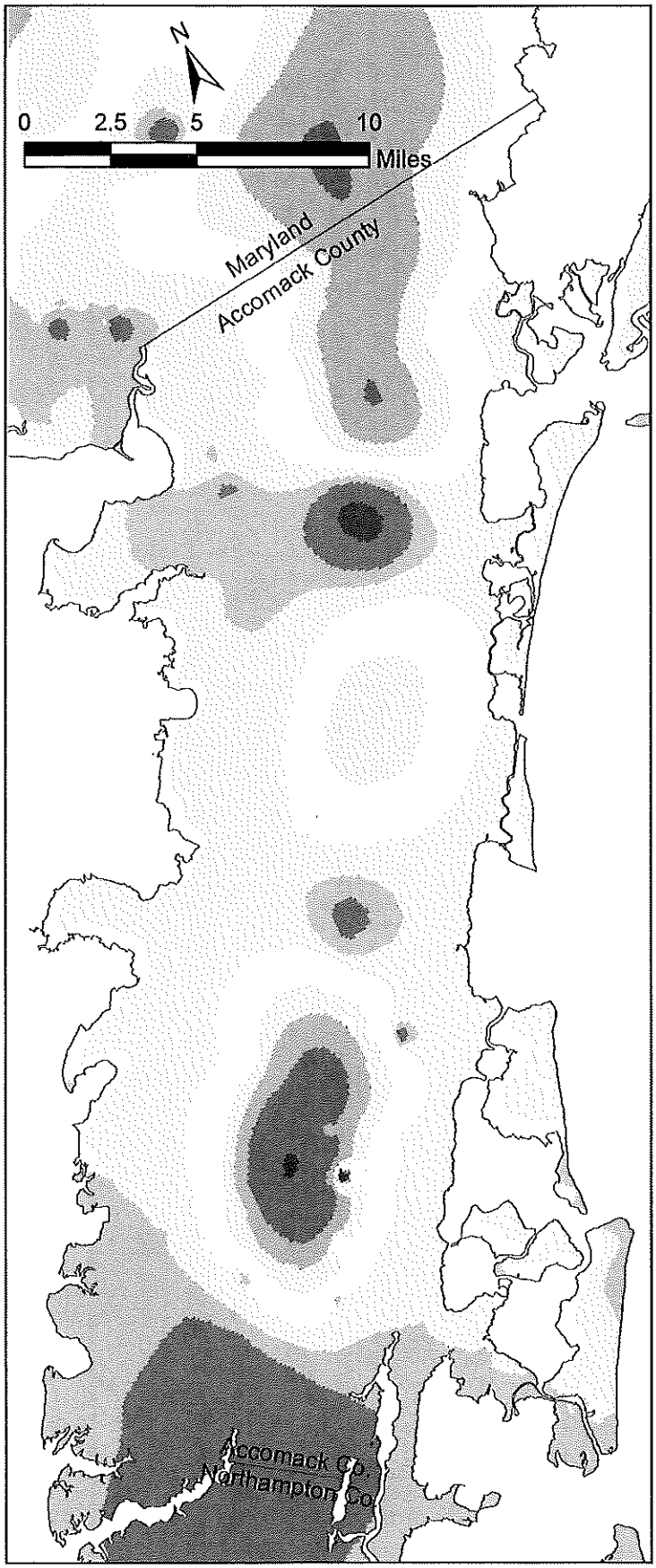


Northampton County

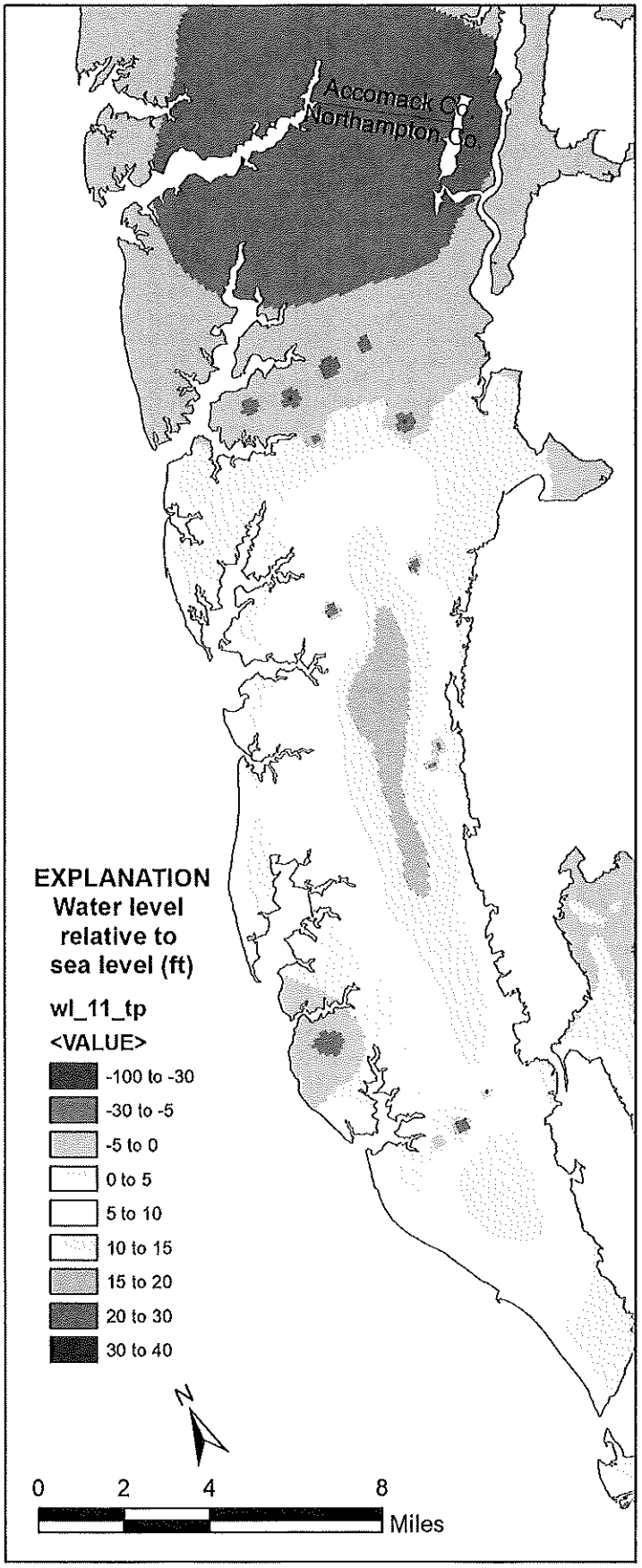
Attachment B

Simulated Potentiometric Contours
VAHydroGW-ES 2023 Total Permitted Simulation

VAHydroGW-ES 2023 Total Permitted Simulation
Upper Yorktown-Eastover Water Levels

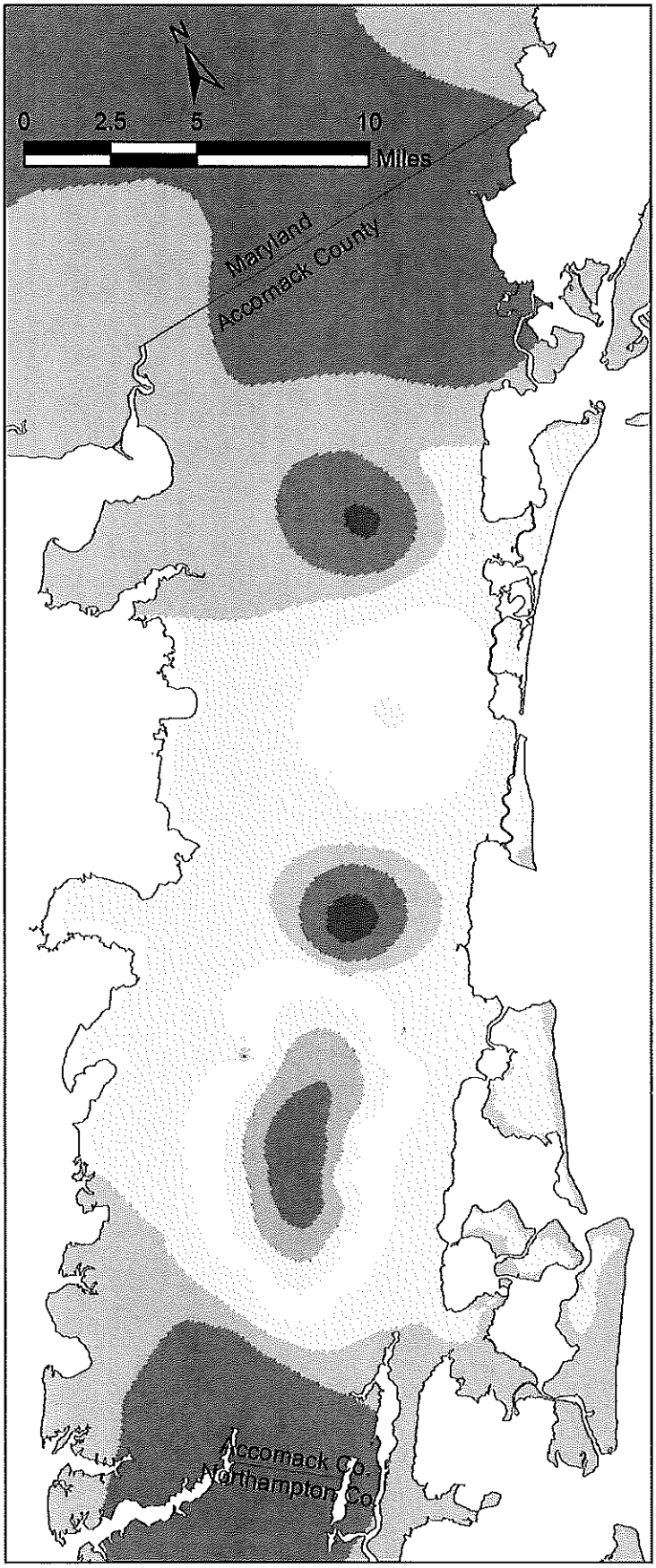


Accomack County

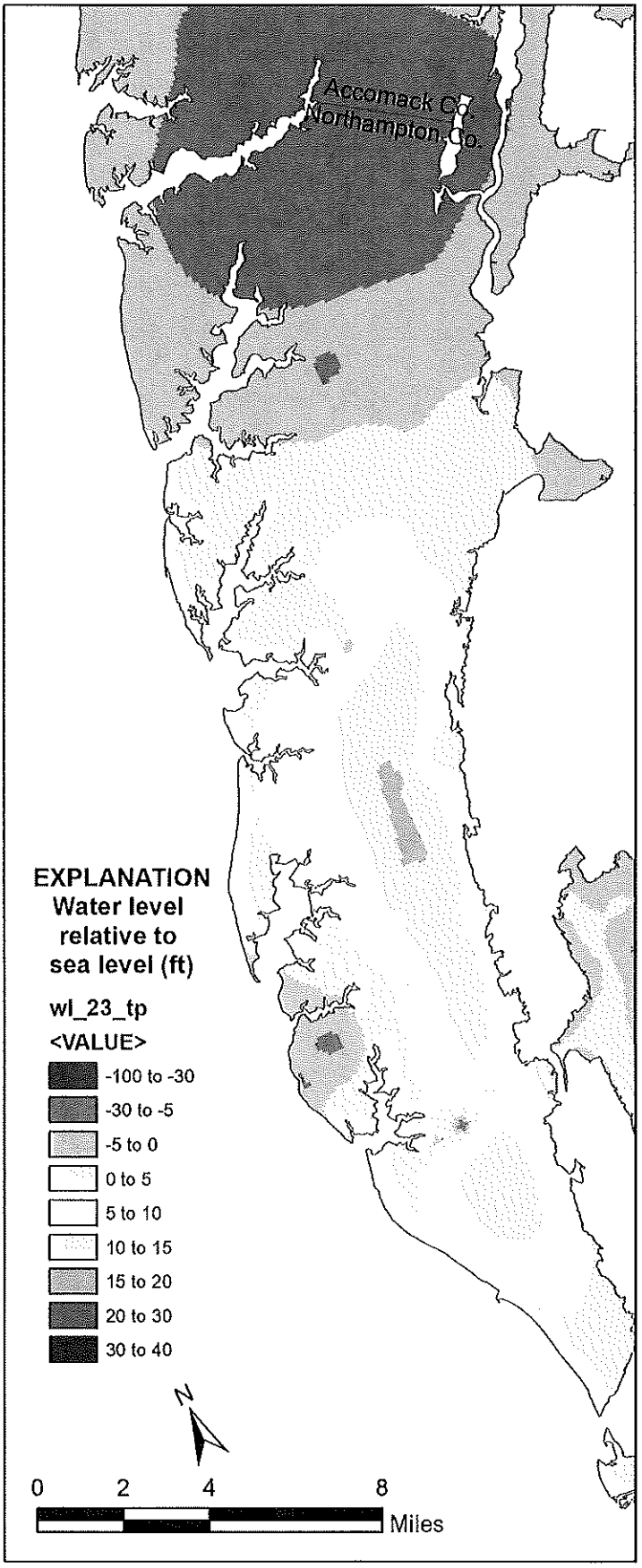


Northampton County

VAHydroGW-ES 2023 Total Permitted Simulation
Middle Yorktown-Eastover Water Levels

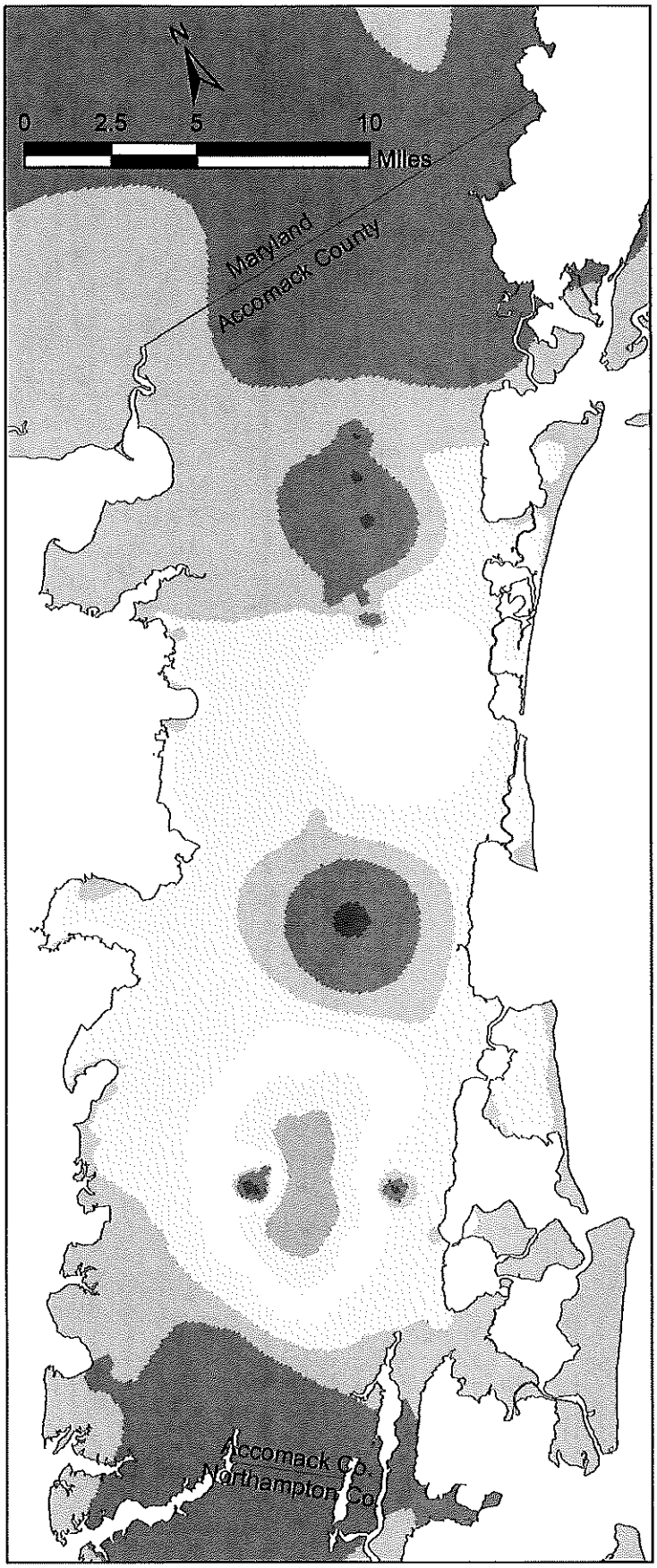


Accomack County

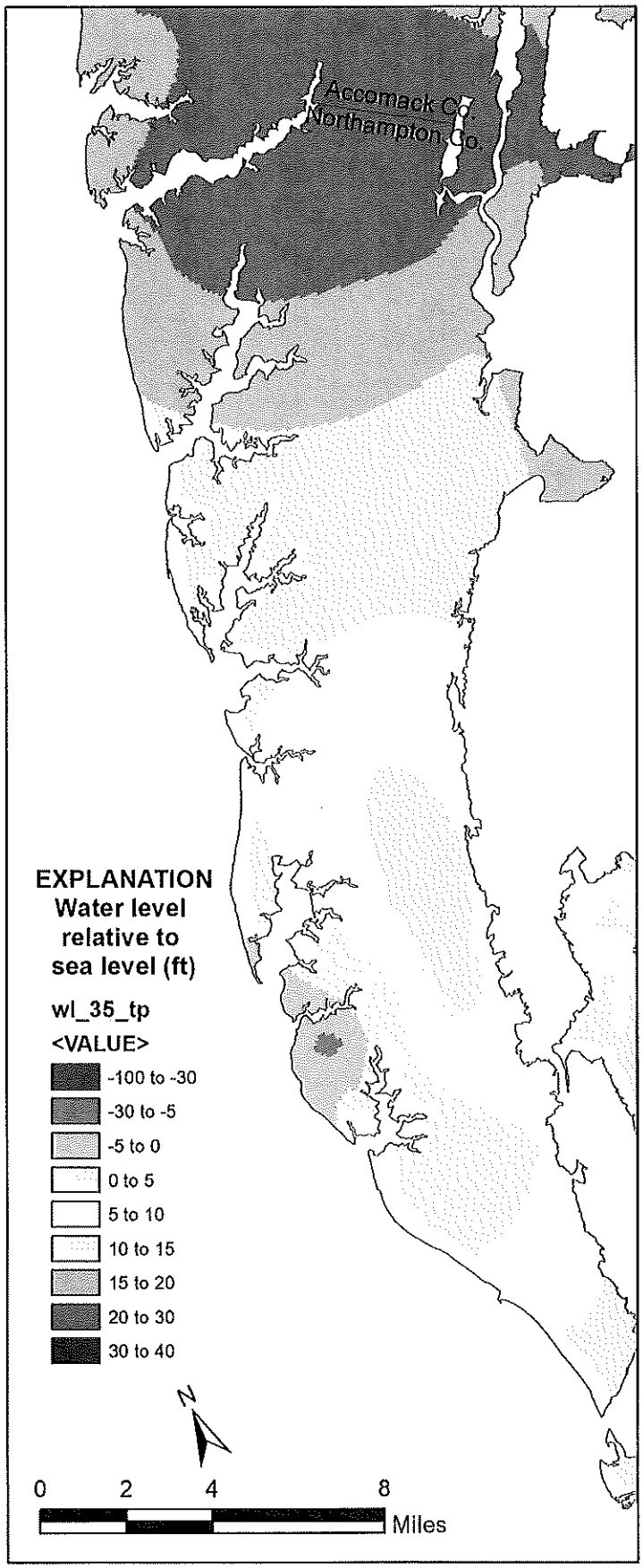


Northampton County

VAHydroGW-ES 2023 Total Permitted Simulation
Lower Yorktown-Eastover Water Levels



Accomack County

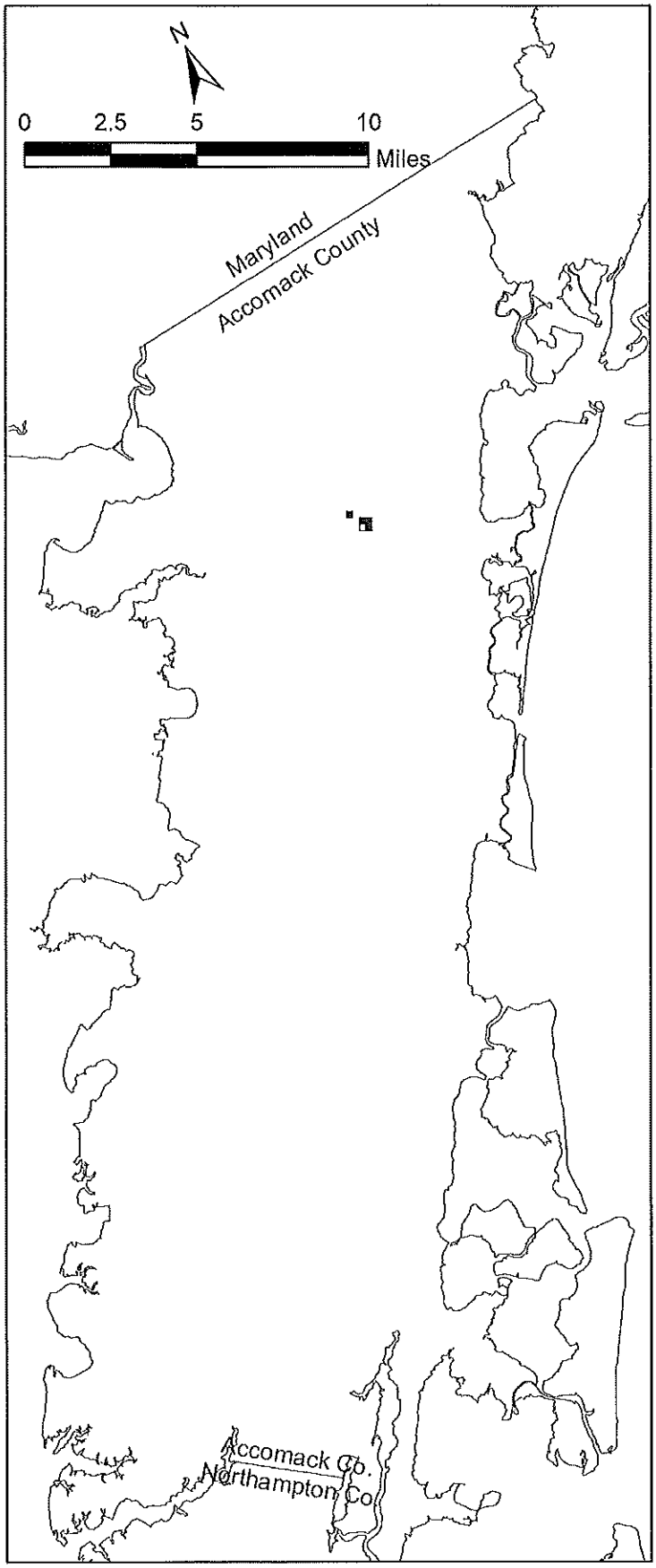


Northampton County

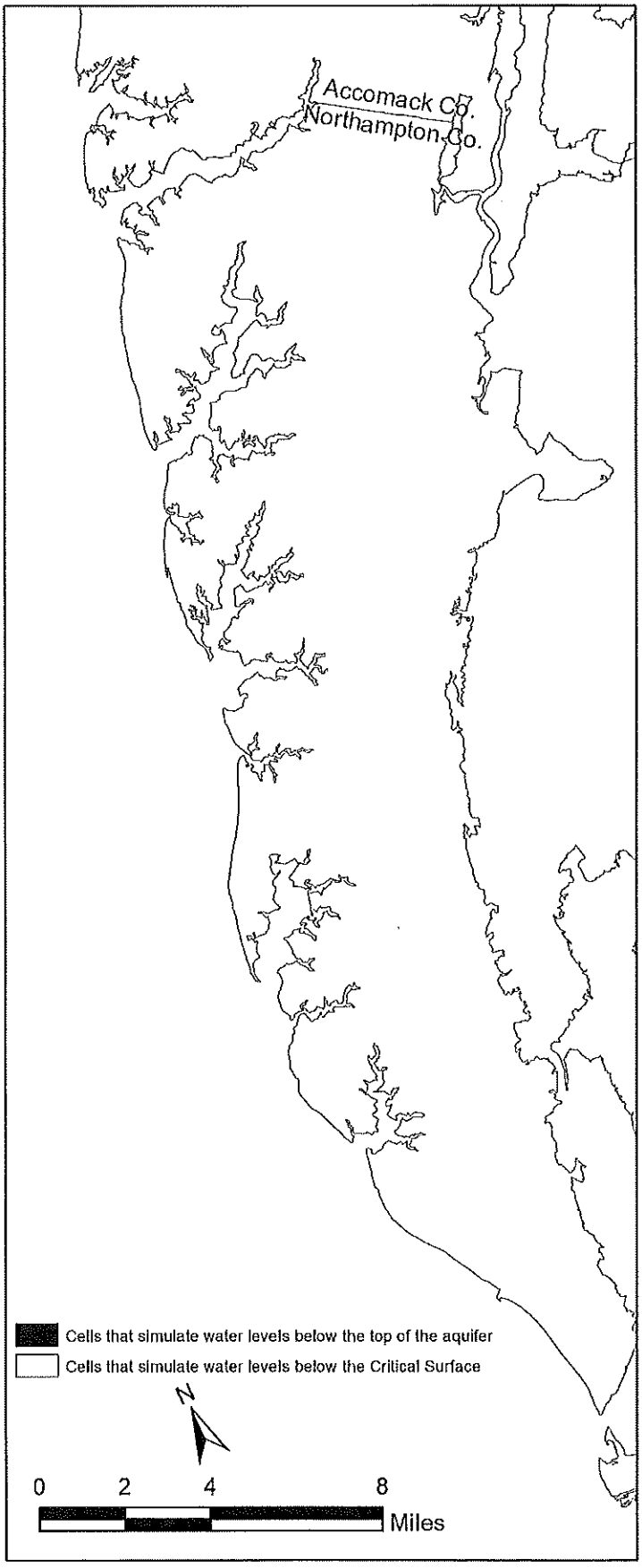
Attachment C

Simulated Water Levels
Below the Critical Surface and Below the Aquifer Top
2023 Total Permitted Simulation

VAHydroGW-ES 2023 Total Permitted Simulation
Upper Yorktown-Eastover Water Levels Below Critical Surface

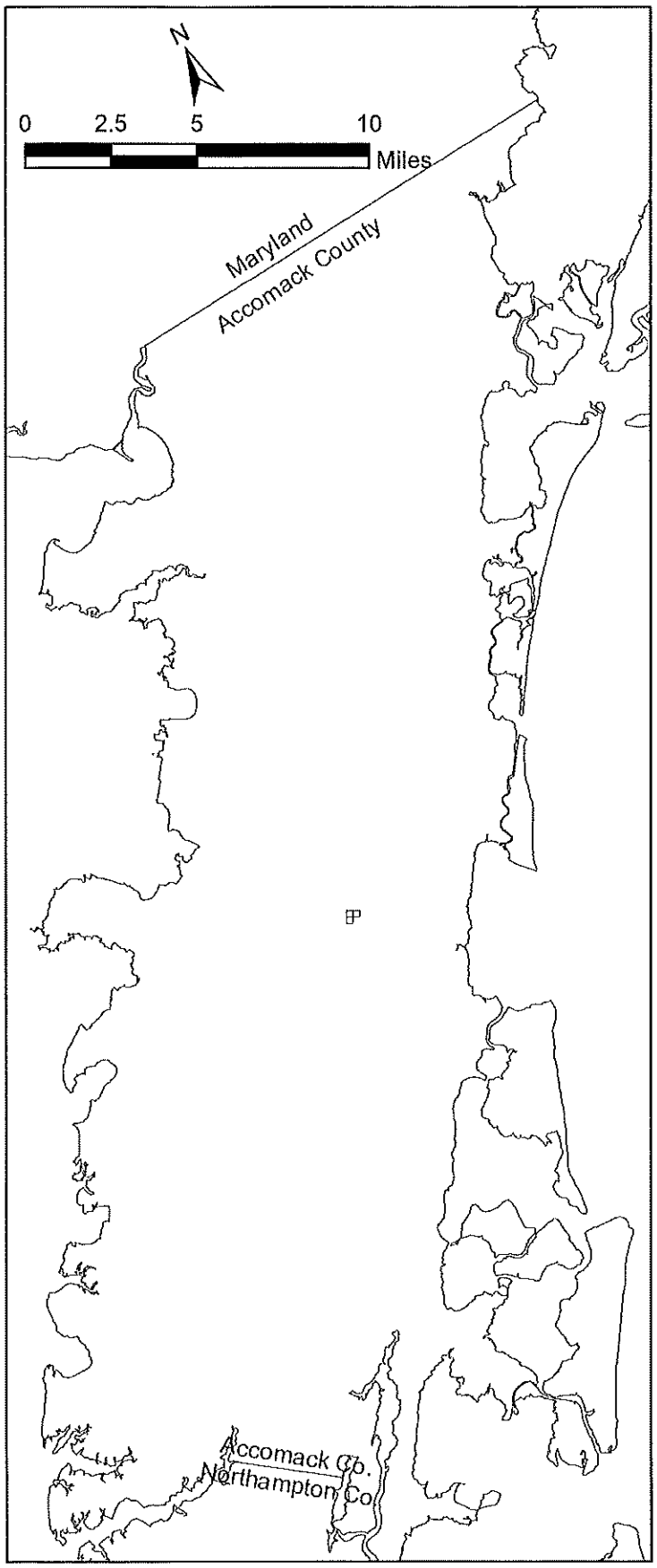


Accomack County

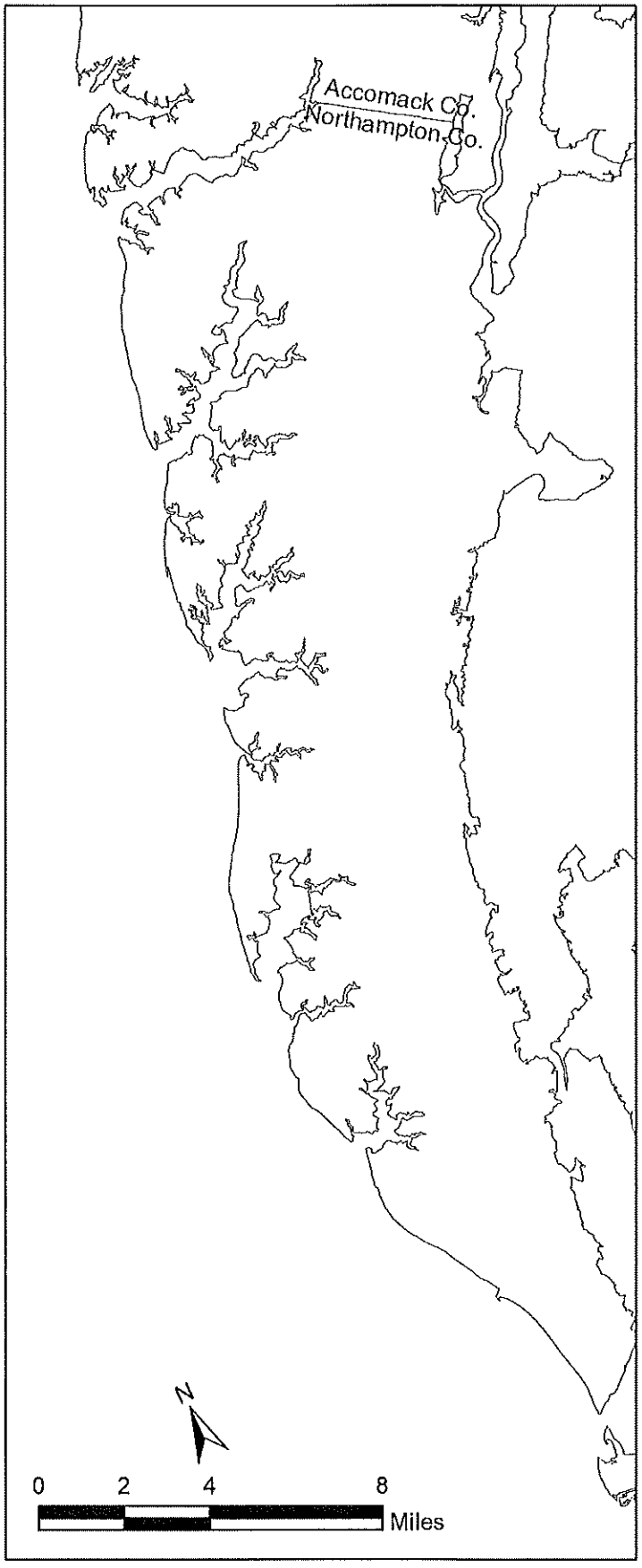


Northampton County

VAHydroGW-ES 2023 Total Permitted Simulation
Middle Yorktown-Eastover Water Levels Below Critical Surface



Accomack County



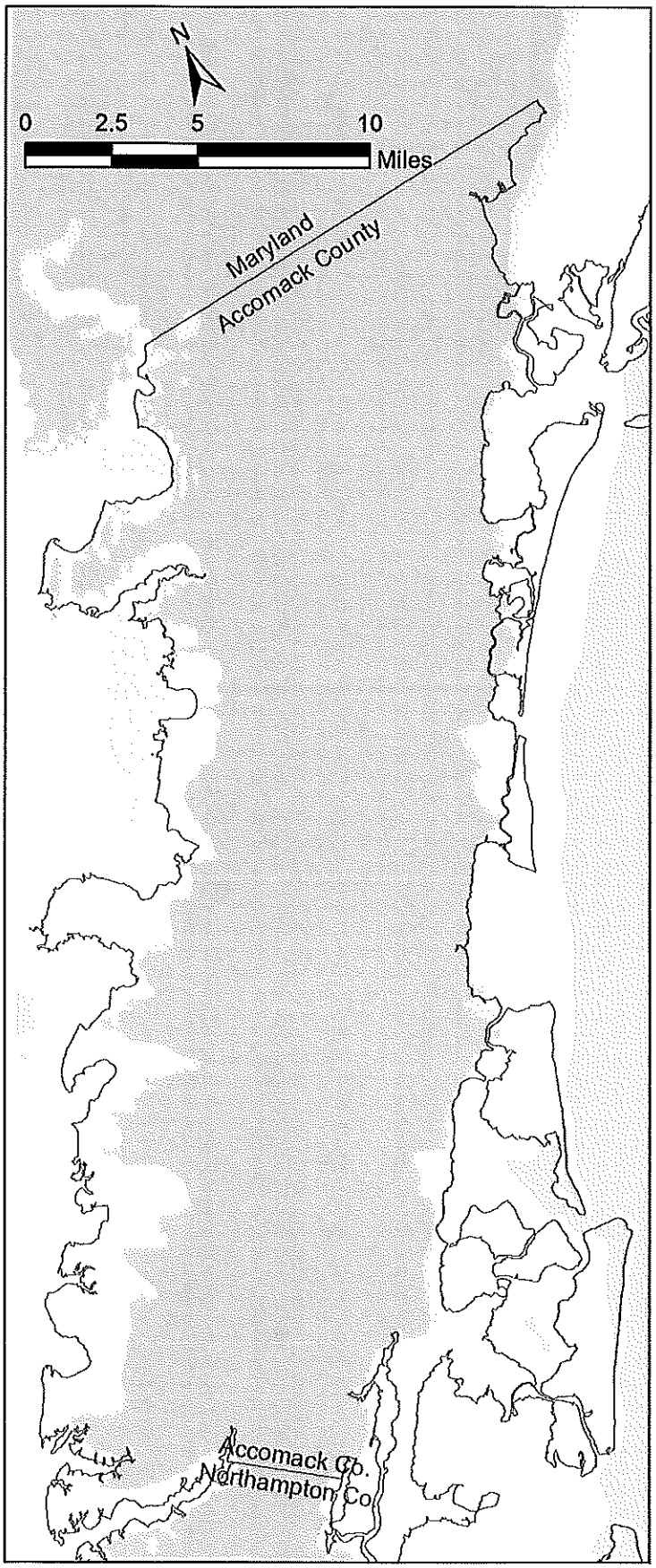
Northampton County

Cells that simulate water levels below the Critical Surface

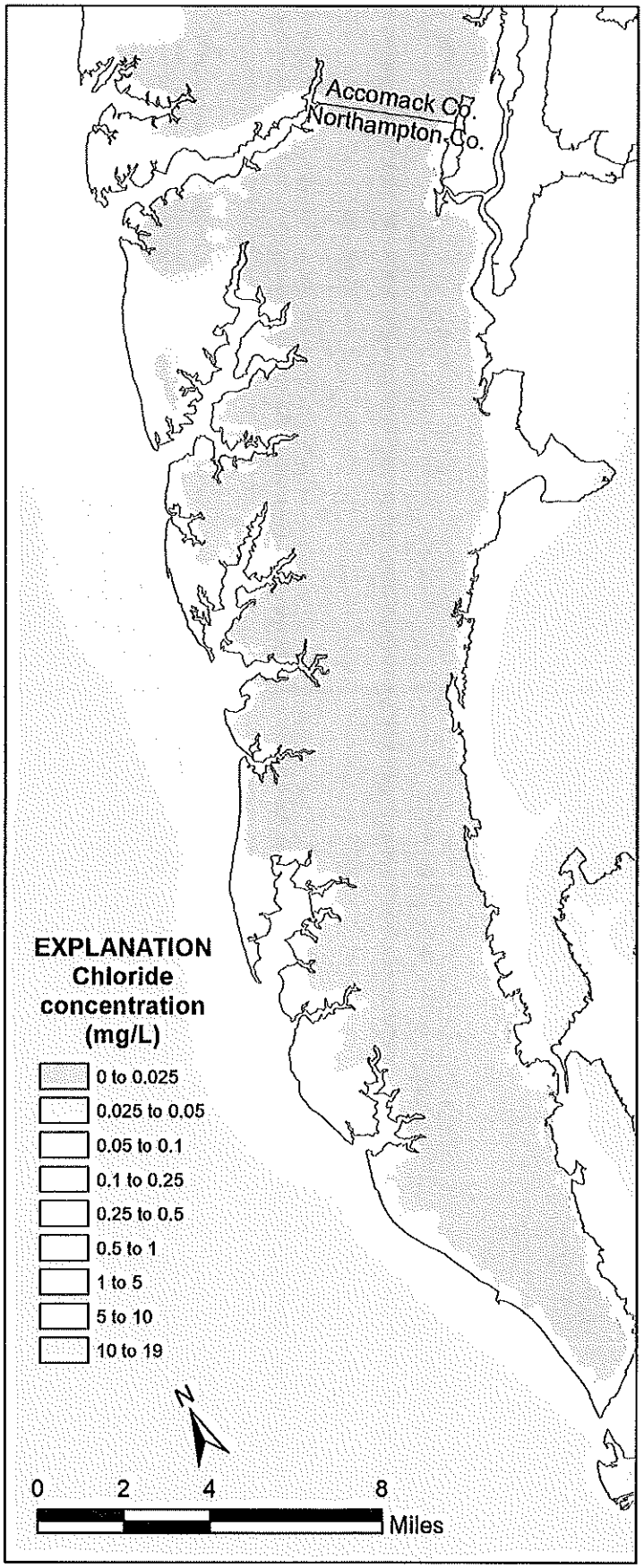
Attachment D

Simulated Chloride Concentrations
VAHydroGW-ES 2022 Reported Use Simulation

VAHydroGW-ES 2022 Reported Use Simulation
Upper Yorktown-Eastover Chloride Concentrations

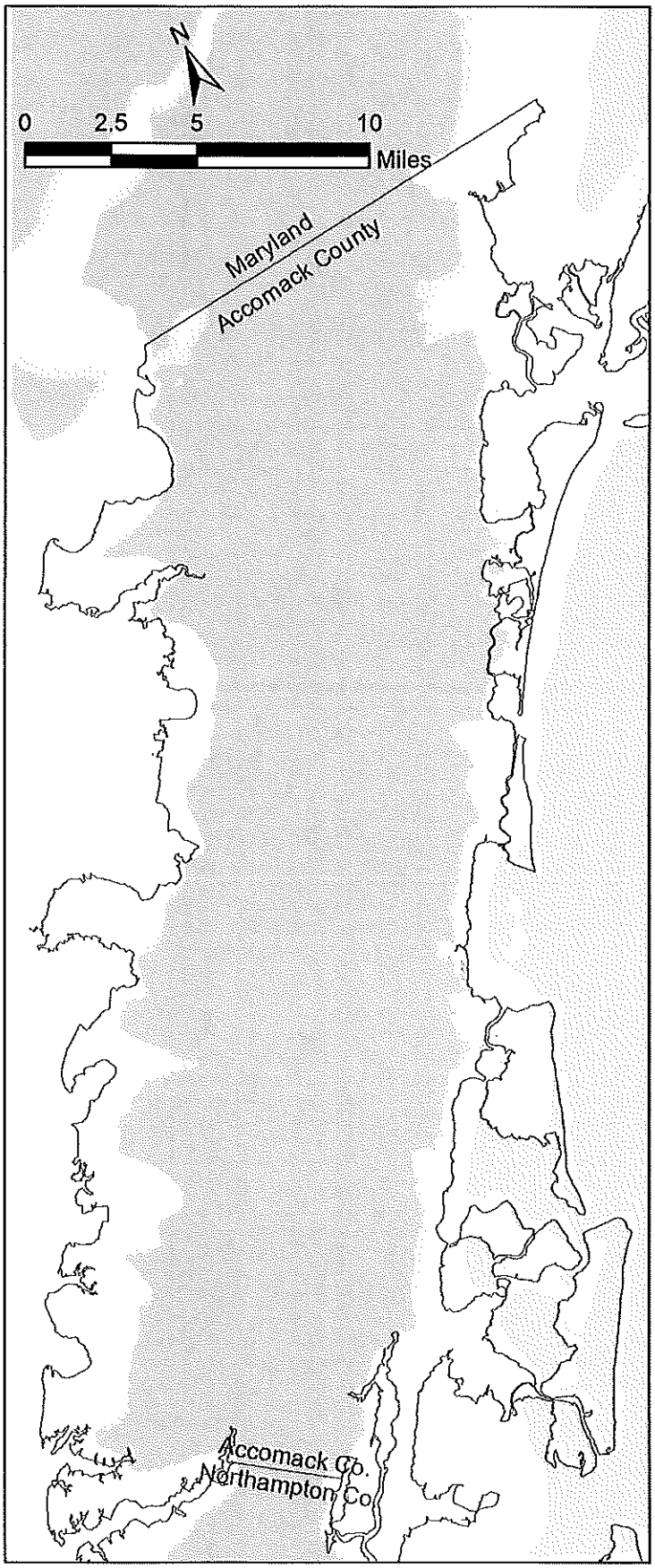


Accomack County

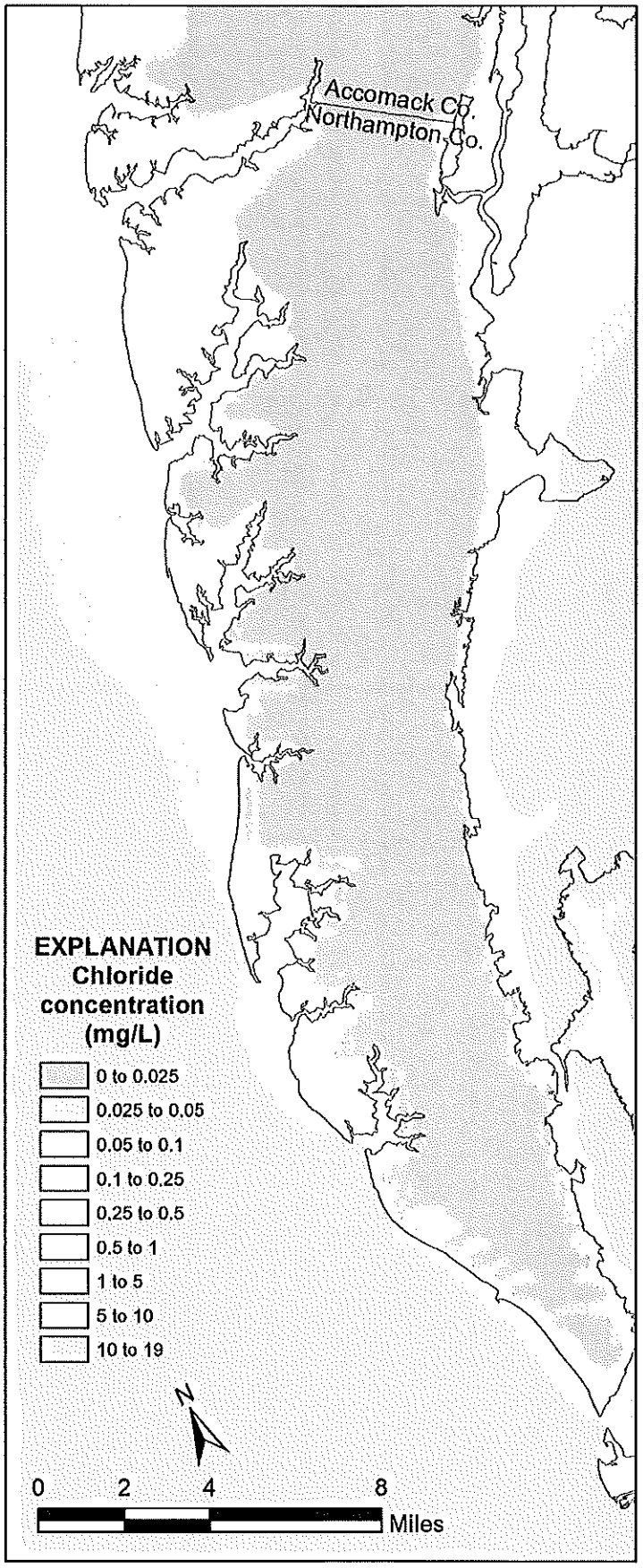


Northampton County

VAHydroGW-ES 2022 Reported Use Simulation
Middle Yorktown-Eastover Chloride Concentrations

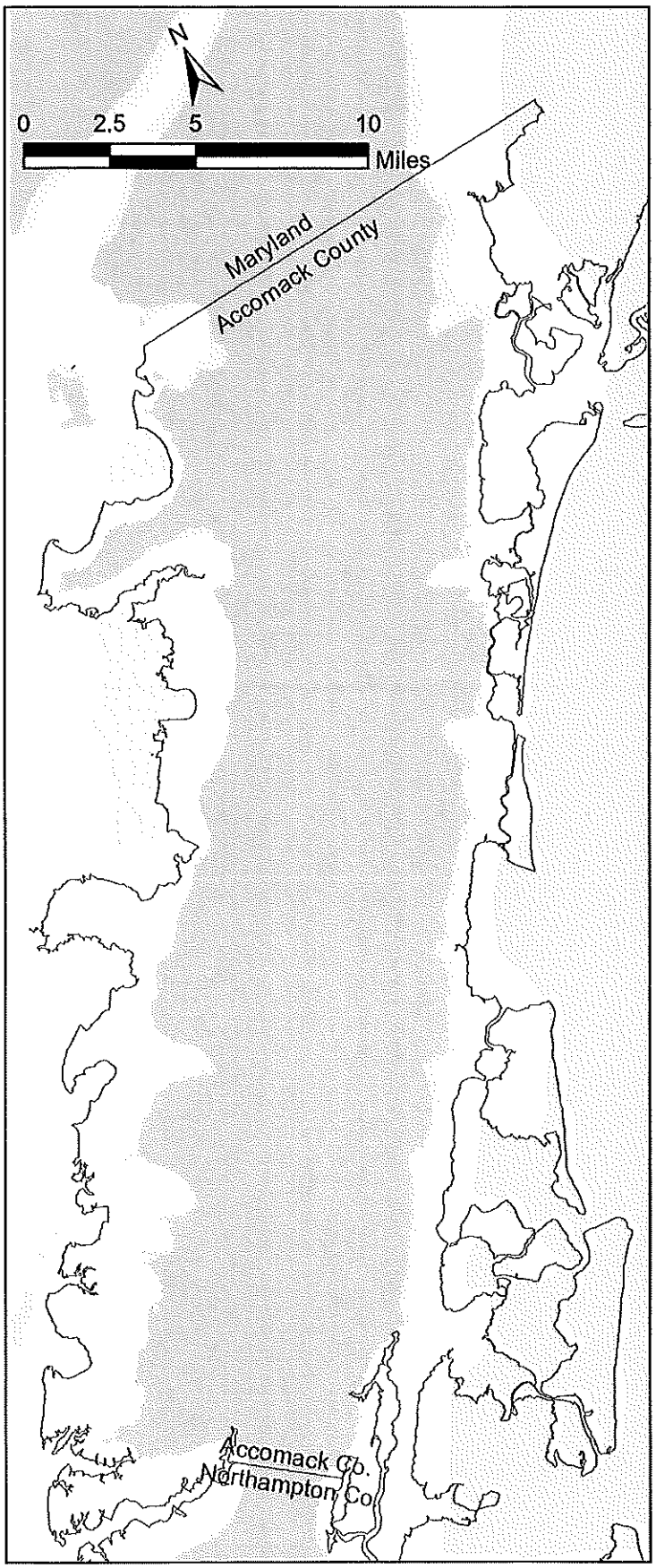


Accomack County

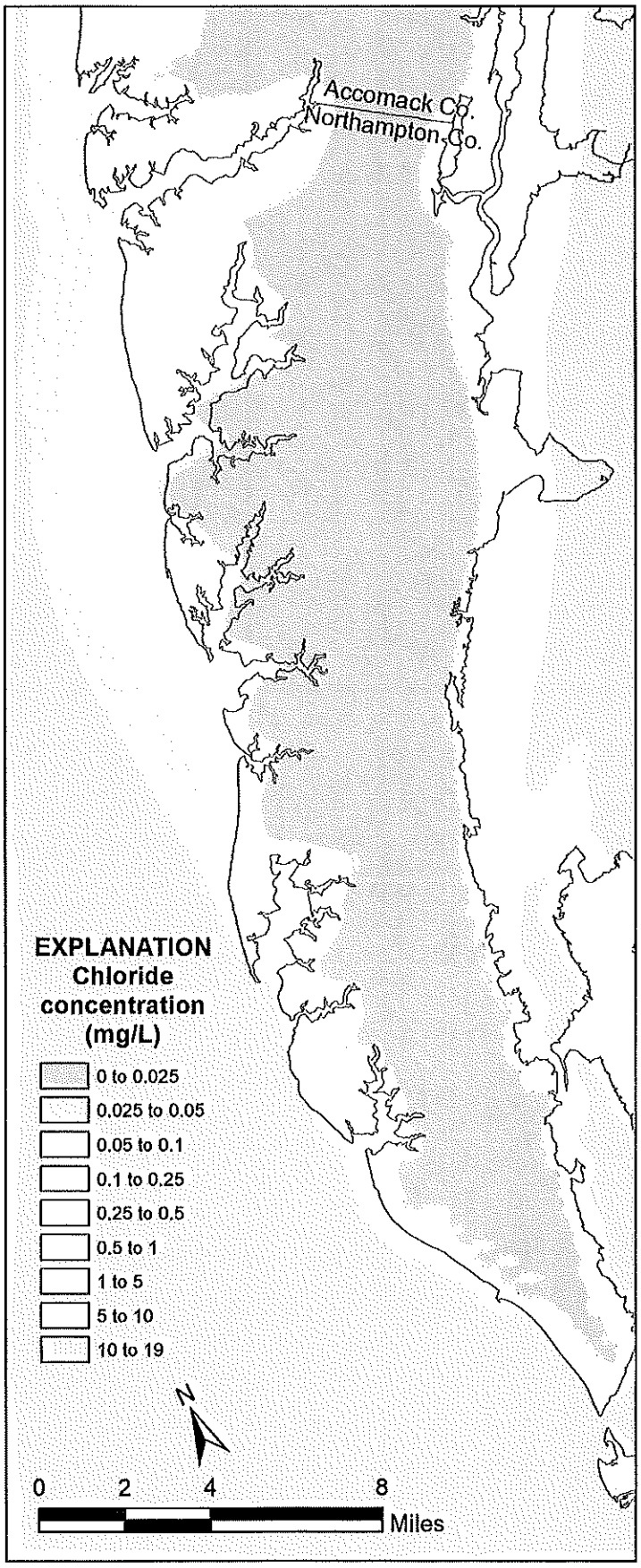


Northampton County

VAHydroGW-ES 2022 Reported Use Simulation
Lower Yorktown-Eastover Chloride Concentrations



Accomack County

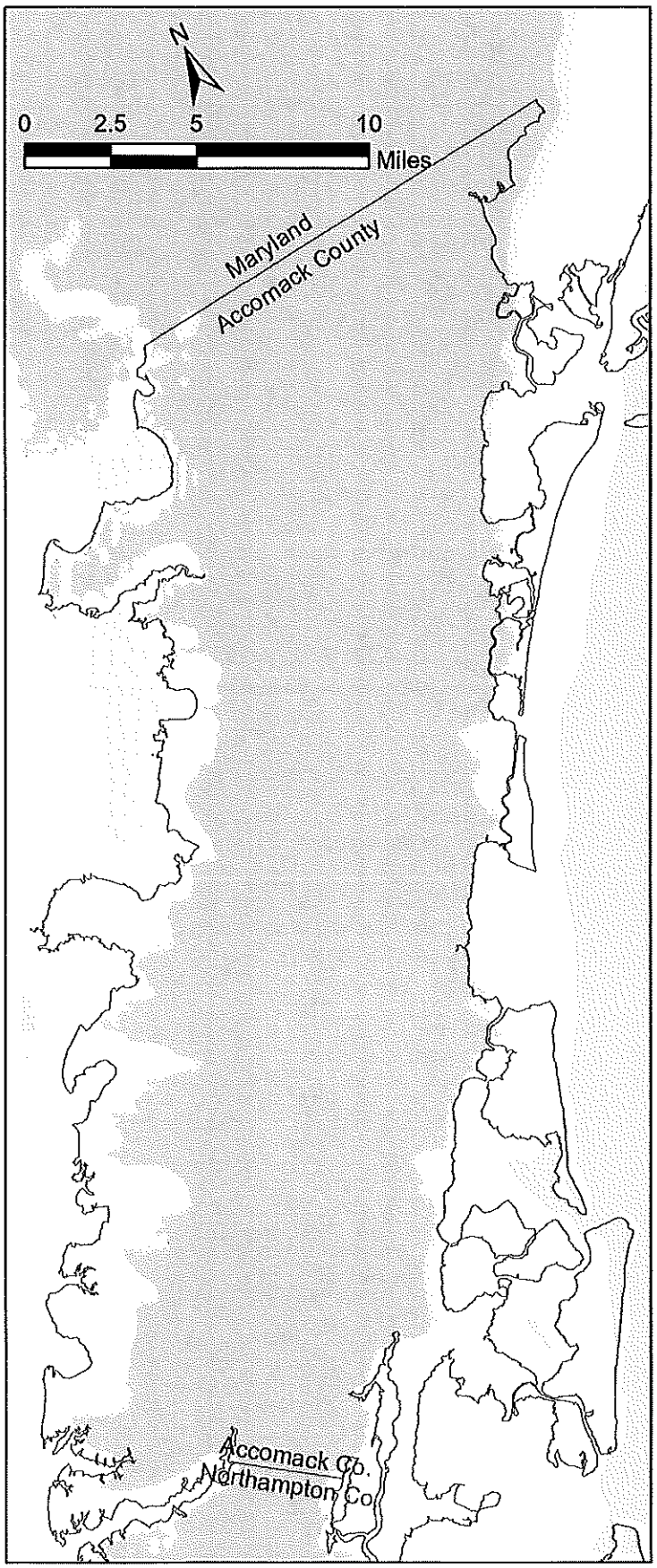


Northampton County

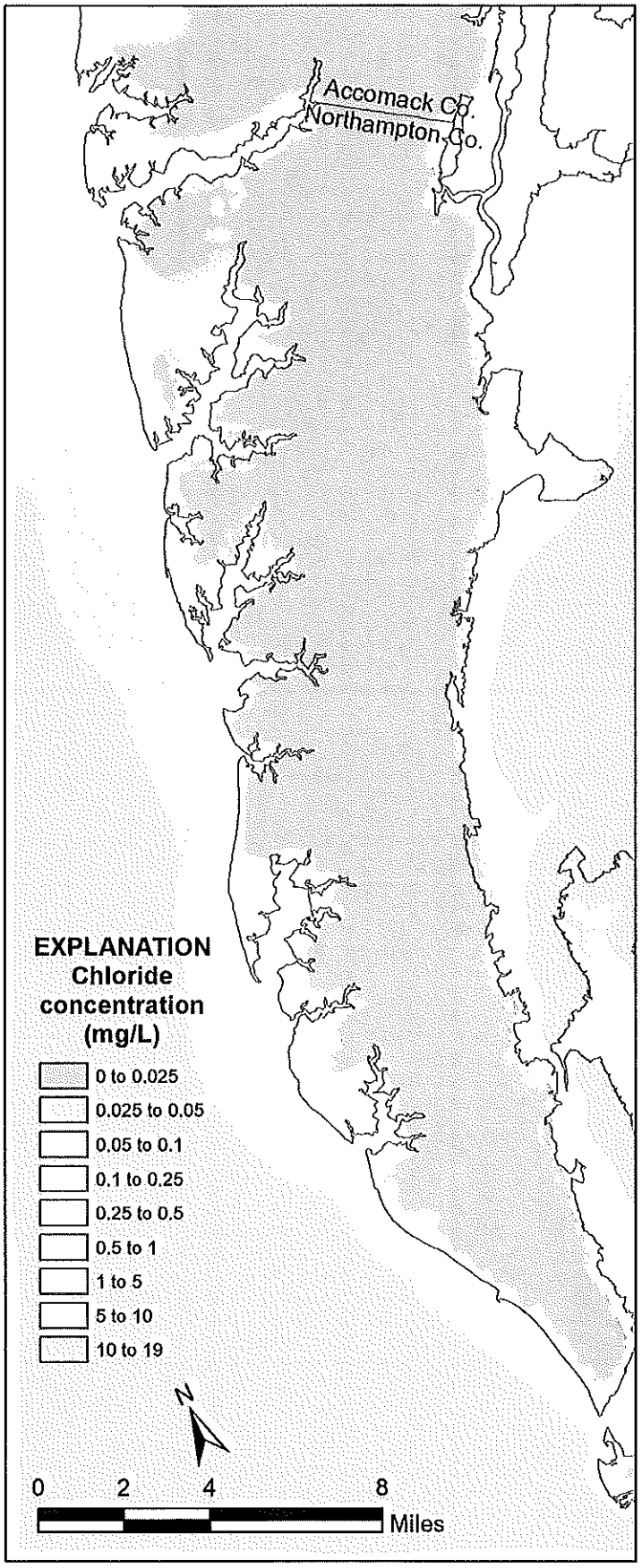
Attachment E

Simulated Chloride Concentrations
VAHydroGW-ES 2023 Total Permitted Simulation

VAHydroGW-ES 2023 Total Permitted Simulation
Upper Yorktown-Eastover Chloride Concentrations

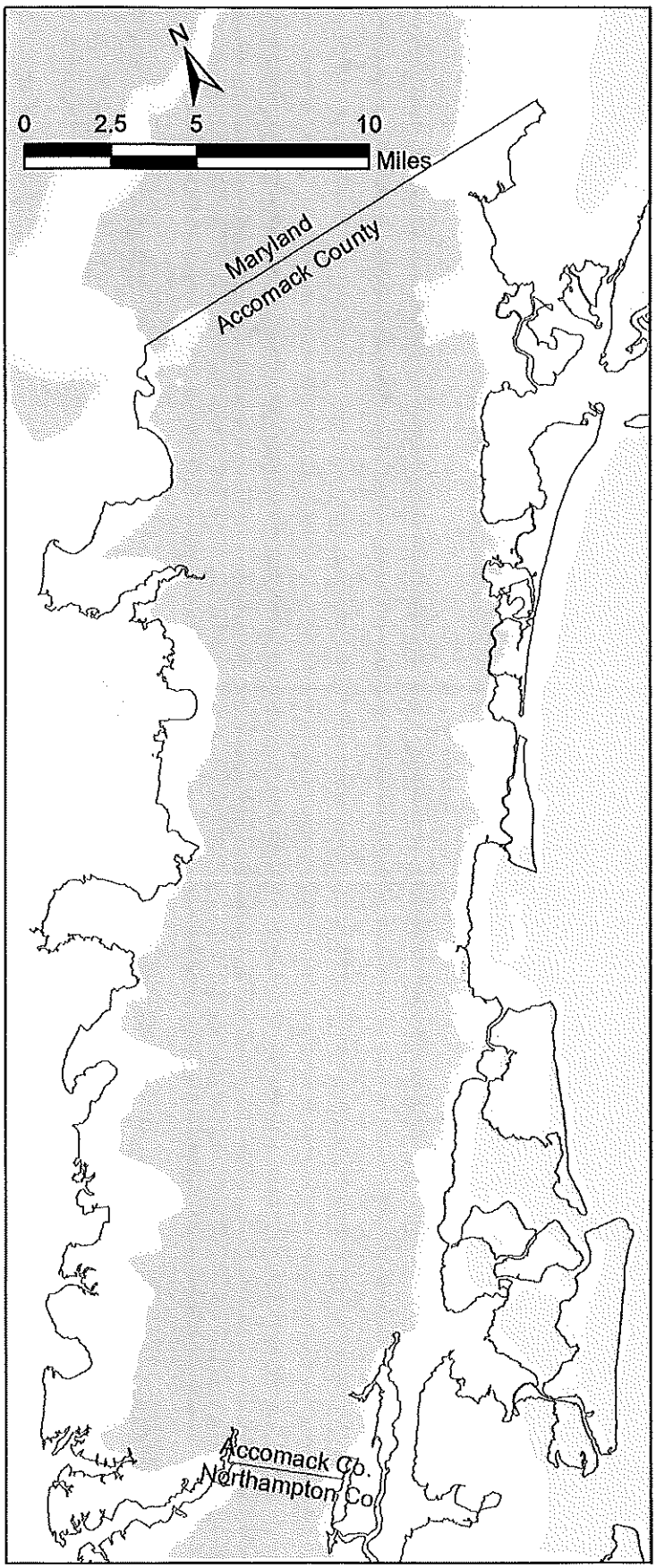


Accomack County

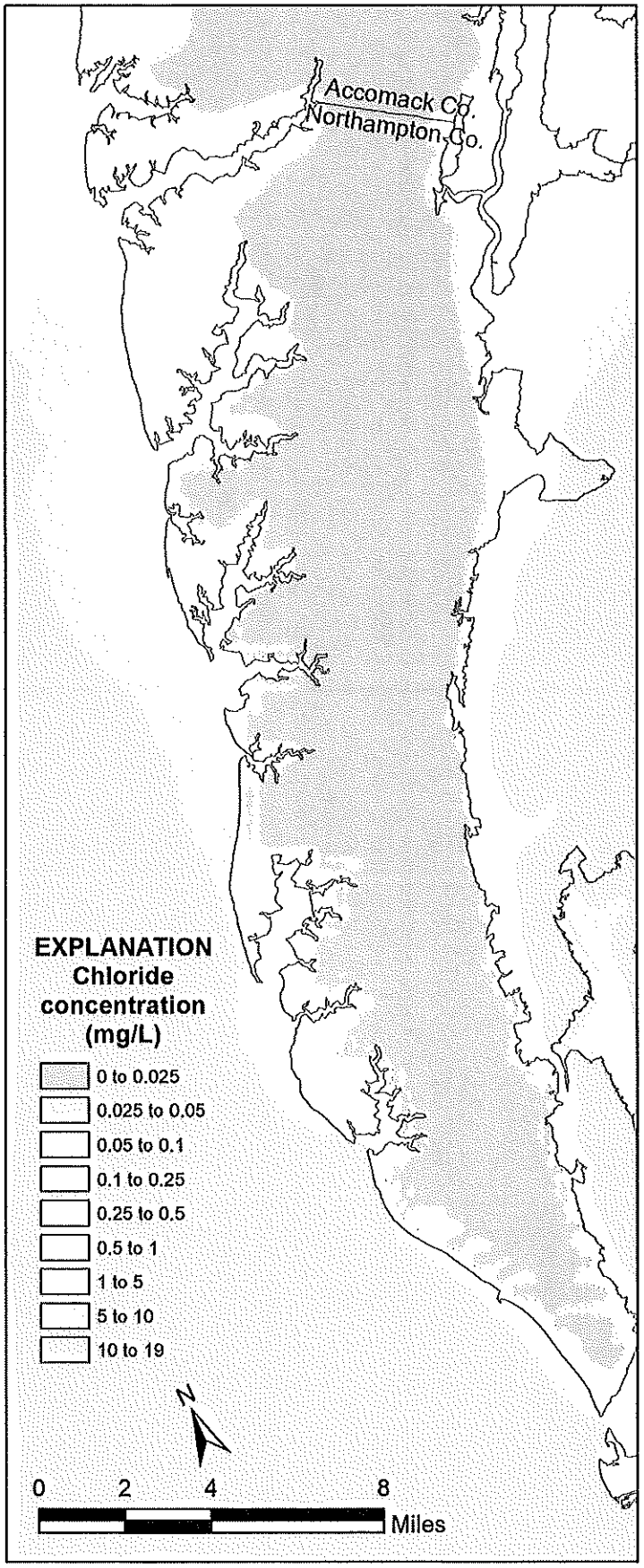


Northampton County

VAHydroGW-ES 2023 Total Permitted Simulation
Middle Yorktown-Eastover Chloride Concentrations

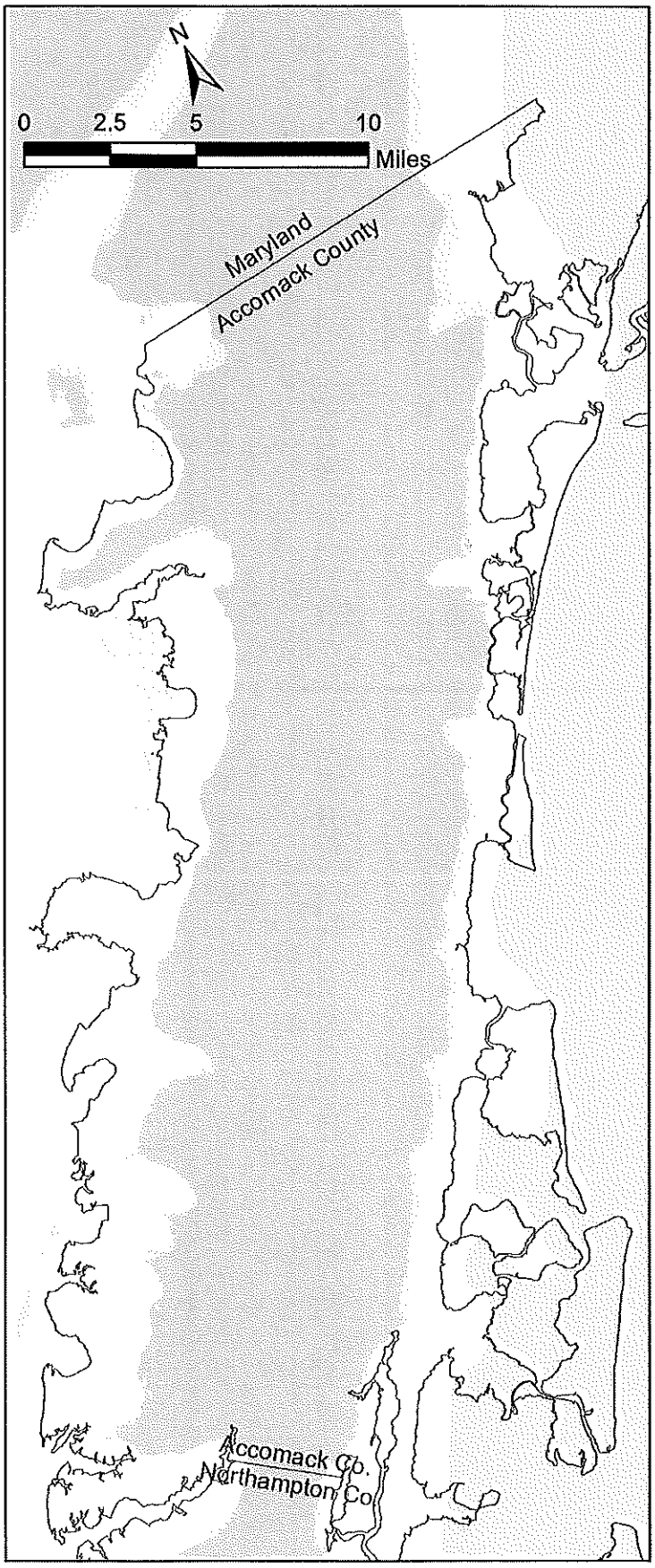


Accomack County

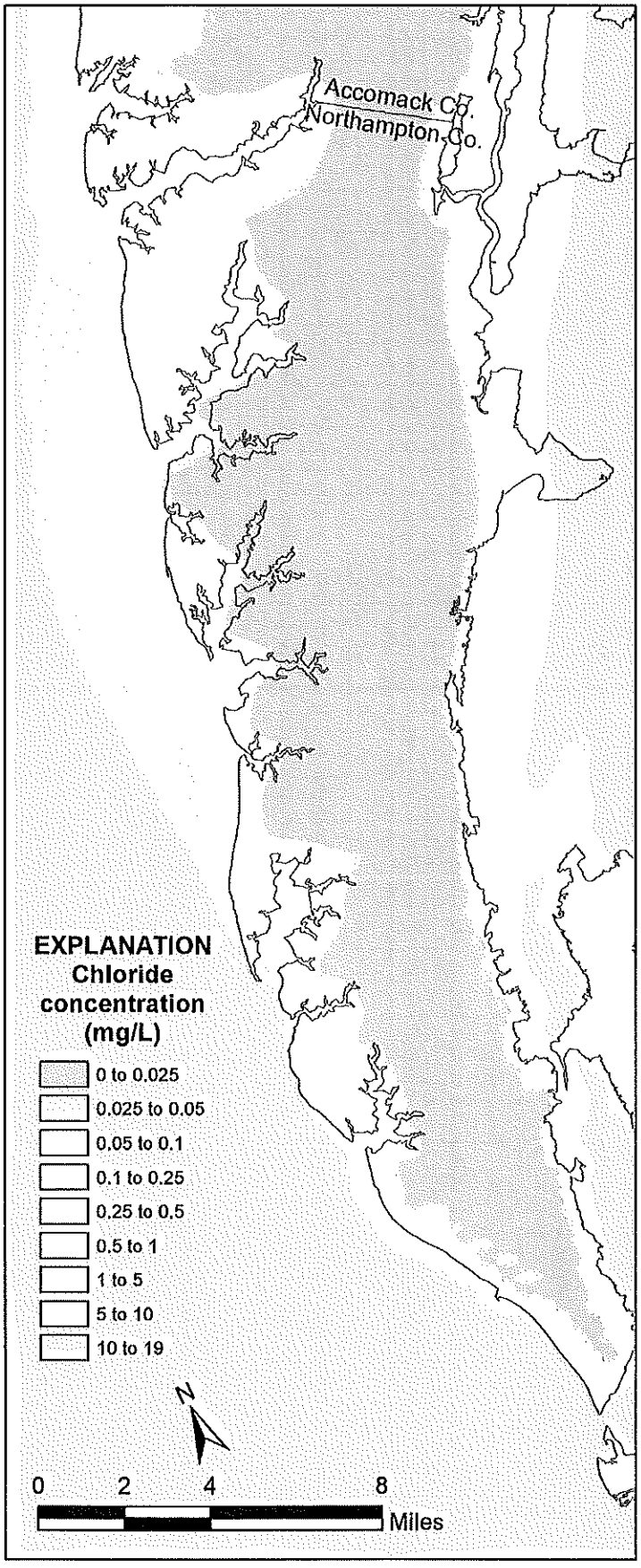


Northampton County

VAHydroGW-ES 2023 Total Permitted Simulation
Lower Yorktown-Eastover Chloride Concentrations



Accomack County



Northampton County

Attachment F

Permits Simulated
VAHydroGW-ES 2023 Total Permitted Simulation

PERMIT	OWNER	FACILITY	PERMITTED PUMPING (MGD)	PERMITTE PUMPING (%)
GW0033100	Accomack County	Accomack County Office Buildings Waterworks	0.016	0.16%
GW0069601	Ace 1971 and Gigi 1971 Trust	Hogneck Farm	0.044	0.42%
GW0079300	Aldon Justice	Robin's Nest Farm	0.010	0.10%
GW0075000	Ali Razwan	Shore Livestock	0.025	0.24%
GW0072700	Andrew Morey	Morey Farm	0.024	0.23%
GW0074300	Anthony Czarniak	Levi's Farm	0.021	0.20%
GW0079800	Antonio Rogers Antonio Rogers	Rogers Poultry Farm	0.008	0.08%
GW0044601	Aqua Virginia, Inc. Captain's Cove Utility Company Incorporated	Captain's Cove Utility Company, Inc.	0.293	2.83%
GW0046001	Ballard Brothers Fish Company Incorporated	Ballard Brothers Fish Co., Inc	0.035	0.34%
GW0046000	Ballard Brothers Fish Company Incorporated Ballard Brothers Fish Company Incorporated	Cherrystone Family Camping Resort	0.032	0.31%
GW0037901	Bayshore Concrete Products -Cape Charles	Bayshore Concrete Products Corp Cape Charles*	0.040	0.39%
GW0074200	Bill Davis	Last Hurrah Farm	0.031	0.30%
GW0078100	Burke Palmer Booth	Pixies Poultry Farm	0.009	0.09%
GW0041201	Cape Charles Town of	Cape Charles Municipal Corporation	0.173	1.67%
GW0070700	Charles D Tankard	Tankard Farm*	0.037	0.36%
GW0062101	Charles D Tankard	Wyatt Farm*	0.021	0.21%
GW0049601	Chincoteague Bay Trails End Association, Incorporated Chincoteague Bay Trails End Association, Incorporated	Trails End Utility Company Incorporated	0.069	0.67%

GW0044200	Chincoteague Town of	Chincoteague Town of	0.601	5.80%
GW0043301	Commonwealth Chesapeake Company LLC	Commonwealth Chesapeake Power Station*	0.068	0.66%
GW0071400	Curtis H. Jones & Son Inc.	Jones 2 Farm*	0.018	0.17%
GW0070500	Curtis H. Jones & Son Inc.	Jones 3 Farm*	0.056	0.54%
GW0074400	Dan V Luu	Luu Farm	0.029	0.28%
GW0076000	Danny Huynh	Tai Dat Farm	0.026	0.25%
GW0069700	David B. Tankard Jr.	David's Nursery*	0.267	2.58%
GW0069300	Del Monte Fresh Production Inc	Outten Farm*	0.085	0.82%
GW0067101	Del Monte Fresh Production Inc Del Monte Fresh Production Inc	Bull Farm	0.259	2.50%
GW0047600	Del Monte Fresh Production Inc Del Monte Fresh Production Inc	Duer Home Farm	0.020	0.20%
GW0047301	Del Monte Fresh Production Inc Del Monte Fresh Production Inc	Mappsville Facility & Labor Housing	0.019	0.19%
GW0055700	Delmarva Enterprise	Dreamland Homes	0.033	0.32%
GW0070400	Donald L. Fitchett and David F. Mason	Home Farm & Fitchett Farm*	0.061	0.59%
GW0069500	Dublin Farms, Inc.	Seybolt Farm*	0.053	0.51%
GW0043701	Eastern Shore Yacht and Country Club	Eastern Shore Yacht and Country Club*	0.026	0.25%
GW0045401	Eastville Town of	Eastville Town of	0.049	0.48%
GW0072800	Edward Thornton	Thornton Farm (Ed, Pat, and Brandy Sue Farm)	0.022	0.21%
GW0060501	Eleanor Bull Lambertson	C and H Farms Incorporated*	0.020	0.19%
GW0072900	ET and Jan Trader	Trader Farms-E.T. Trader, T&H, and Jan Trader	0.026	0.25%
GW0038801	Exmore Town of	Exmore Town of	0.167	1.61%
GW0061401	George T Sharp	Edgewater Farms*	0.024	0.23%
GW0075800	Giuse Farm, LLC	Giuse Farm	0.031	0.30%
GW0073700	Goodman Poultry Farms, LLC	Tanner Farm	0.022	0.21%

GW0073800	Hai Tran	Mason Farm	0.021	0.20%
GW0068900	Hermitage Farms Nursery	Hermitage Farms Nursery	0.157	1.51%
GW0077300	Hien Tran	Fulushou Farm	0.025	0.24%
GW0076400	Hop Van Nguyen	Nguyen and Emily Poultry Farm	0.009	0.08%
GW0076300	Hop Van Nguyen	Peter and Mary Poultry Farm	0.009	0.09%
GW0073500	Horace Edward Kelley III	Eddie Kelley Farm	0.033	0.31%
GW0072400	IF Acquisition LLC, dba The Ivy Farm IF Acquisition LLC, dba The Ivy Farm	The Ivy Farm, Inc.	0.019	0.19%
GW0073600	Igbal Mohammad	Elahi LLC	0.018	0.18%
GW0075700	Iqbal Mohammad	Dennis Farm	0.046	0.44%
GW0072500	Ish Farm, LLC	Ish Farm	0.032	0.30%
GW0070300	Jeffery L. Shelley	Shelley Farm*	0.034	0.32%
GW0077600	Kenneth Blair	Davis Wharf Farm	0.012	0.12%
GW0077800	Kevin Vu	Brittany Farm	0.016	0.15%
GW0053800	Kuzzens Inc	Kuzzens KMC Camp	0.006	0.06%
GW0071600	Kuzzens Inc	Mappsville North Complex	0.013	0.13%
GW0070100	Kuzzens Inc	Marshall-Johnson-Grapeland Complex*	0.187	1.80%
GW0070100	Kuzzens Inc	Marshall-Johnson-Grapeland Complex*	0.187	1.80%
GW0069100	Kuzzens Inc	Melfa Farm*	0.151	1.45%
GW0069200	Kuzzens Inc	Painter Complex*	0.158	1.53%
GW0069900	Kuzzens Inc	Tipton Farm*	0.142	1.37%
GW0070000	Kuzzens Inc	Walker Farm*	0.024	0.23%
GW0065601	Kuzzens Inc. (formerly Six L's Packing Company, Inc.)	Bowen Farm	0.100	0.96%
GW0065901	Kuzzens Inc. (formerly Six L's Packing Company, Inc.) Kuzzens Inc. (formerly Six L's Packing Company, Inc.)	Christian/Ames Farm	0.163	1.57%
GW0070600	Kuzzens Inc. (formerly Six L's Packing Company, Inc.) Kuzzens Inc. (formerly Six L's	Doughty-Drewer Complex	0.219	2.11%

	Packing Company, Inc.)			
GW0065700	Kuzzens Inc. (formerly Six L's Packing Company, Inc.) Kuzzens Inc. (formerly Six L's Packing Company, Inc.)	Machipongo Farm	0.134	1.29%
GW0070900	Kuzzens Inc. (formerly Six L's Packing Company, Inc.) West Point Mill	Jones 1 Complex	0.099	0.95%
GW0074900	Le Ung	Seaside Farm	0.027	0.26%
GW0060601	Long Grain & Livestock Co / David Long	Midwood Farm	0.000	0.00%
GW0074500	McChicken Farms, LLC	McChicken Farms	0.027	0.26%
GW0074600	Miller Time, LLC	Miller Time Farm	0.021	0.20%
GW0076100	Minh Thanh Luu	Steven Farm	0.033	0.32%
GW0073100	Mohammad Afzal Chattha	Chattha Livestock Poultry Farm	0.026	0.25%
GW0068701	Mount Warren Farms LLC Mount Warren Farms LLC	Mount Warren (Custis) Farms	0.033	0.32%
GW0078900	Mr. & Mrs. Grasyon C. Chesser, Jr.	Holden Creek Gun Club	0.047	0.45%
GW0074800	Ngu Ba Do	Johnathan Farm	0.033	0.32%
GW0038700	Northampton County	Bayview Community	0.014	0.13%
GW0049200	Onancock Town of	Onancock Town of	0.221	2.13%
GW0072300	Pacific Tomato Growers, Ltd.	Sunripe Camp	0.005	0.05%
GW0054700	Parksley Town of	Town of Parksley Water Works	0.080	0.77%
GW0053900	Perdue Farms Incorporated	Perdue Farms Incorporated	1.918	18.50%
GW0069800	Phillip Custis	Custis Farm*	0.144	1.39%
GW0076600	Phillip Greene	Greene's Poultry Farm	0.021	0.20%
GW0075100	Ray Newman	Highway Farm*	0.108	1.04%
GW0071200	Ray Newman	Newman Farms*	0.241	2.32%
GW0037301	Riverside Healthcare Association	Riverside Shore Rehabilitation Center	0.014	0.14%
GW0072600	Ryan Brady	Brady Farms	0.027	0.26%
GW0074700	Sanns Farm, LLC	Sanns of the Shore	0.040	0.38%
GW0047901	Shore Health Services, Inc.	Shore Memorial Hospital	0.023	0.22%
GW0077900	Son Nguyen	Turkey Run Farm	0.027	0.26%

GW0079200	Steve Hoang	H&H Poultry Farm	0.032	0.31%
GW0039202	Sunset Beach RV LLC & Sun Communities Operating Limited	Sunset Beach Resort & Campground	0.021	0.20%
GW0079900	Tai Van Nguyen	Tram Thoa	0.010	0.10%
GW0070800	Tankard Nurseries LLC	Lumber Hall Farm*	0.127	1.22%
GW0078500	Teresa Farms LLC	Teresa Farm	0.035	0.34%
GW0073300	Thomas A Davis	Davis Farm	0.016	0.15%
GW0079100	Tri Nguyen	Anna Farm	0.040	0.39%
GW0073400	Tri Tran	Eagle, Birdie, Superior Farm	0.015	0.15%
GW0076800	Tri Tran	Elite Farm	0.012	0.12%
GW0076700	Tri Tran	Excel Farm	0.010	0.10%
GW0053501	Triangle Enterprises, Inc.	Triangle Mobile Home Park	0.017	0.17%
GW0073900	Tull LLC	Holland Homestead, Backwoods, & Horsey Poultry	0.015	0.15%
GW0078400	Tyler Ames	Summer's Rest Farm	0.027	0.26%
GW0049900	Tyson Farms, Inc.	Tyson Farms, Inc.	1.584	15.28%
GW0039301	US NASA -Wallops Flight Facility	Goddard Space Flight Center - Island System	0.033	0.31%
GW0034600	US NASA -Wallops Flight Facility	Goddard Space Flight Center - Main Base	0.088	0.85%
GW0054001	Va. Dept. of Conservation and Recreation Va. Dept. of Conservation and Recreation	Kiptopeke State Park	0.011	0.11%
GW0075400	Van T. Tran	Van Tran Farm	0.053	0.51%
GW0046301	Virginia Landings - National American Corp	Virginia Landing Campground	0.016	0.16%
GW0075500	Vision Quest Enterprises, LLC	Vision Quest Farm	0.021	0.20%
GW0075900	Vy Nguyen	Kylie Farm	0.041	0.40%
GW0073000	William Davis Lovell and Therese B. Lovell	Old Mill Farms	0.033	0.32%
GW0061101	William M Daley	Broadleaf Farms*	0.010	0.10%
GW0071000	Willis Family Limited Partnership	Seaford Farm*	0.069	0.67%
GW0042501	YMCA of South Hampton Roads	YMCA Family Campground	0.013	0.13%

*Lump sum permit – simulated value was calculated as the permit term total allowed pumping divided by the number of years in the permit term.