A-NPDC
ACCOMACK-NORTHAMPTON PLANNING DISTRICT COMMISSION
P.O. BOX 417 • 23372 FRONT STREET • ACCOMAC, VIRGINIA 23301
(757) 787-2936 • TOLL FREE (866) 787-3001 • FAX: (757) 787-4221
WEBSITE: www.a-npdc.org

Eastern Shore of Virginia Ground Water Committee
October 19, 2021 10:00a.m.
The Enterprise Building
Accomack-Northampton Planning District Commission
23372 Front Street
Accomac, VA 23301

For Public Participation Only:
Join Zoom Meeting
https://zoom.us/j/7577872936?pwd=QTNJdmhCc3pWdVNUZ0ZWYnVJdWpWUT09
Meeting ID: 757 787 2936 **Passcode:** 7577872936
One tap mobile +16465588656,,7577872936#,,,,*7577872936# US (New York)

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.

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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MEETING AGENDA

1. Call to Order
2. Public Participation

3. Minutes of the September 21st, 2021 Meeting 5
4. September 2021 Financial Status Reports 12
5. October 19, 2021 Staff Report 14
   - Environmental Reviews and Permits 14
   - Other Items 14
   - Research & News 14
   - Upcoming Events/Meetings 14
6. Ground Water Consultant Updates 17
7. Ground Water Consultant Quarterly Report, Q4 (July 2021 – September 2021) 18
8. FY 2022 ATTENDANCE RECORD 20

9. Other Matters
10. Schedule Next Meeting: November 16, 2021 at 10:00AM at the Enterprise Building, A-NPDC 23372 Front Street, Accomac, VA **NOTE: NO DECEMBER 2021 MEETING**
11. Adjourn

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Minutes of the September 21st, 2021 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, September 21st, 2021 at the Accomack County Board Room, Accomac, VA.

Members Present	**Members Absent**	**Others Present**
Paul Muhly, Chairman	Charles Kolakowski	Jessica Steelman, A-NPDC
Jackie Phillips	Taylor Dukes	Anne Doyle, A-NPDC
Daniel Hershey	Michael Mason	Joe Grist, VDEQ*
Roberta Kellam*	John Coker, Vice Chairman	Britt McMillan, ARCADIS
Grayson Chesser*	Elaine Meil, Secretary	Bill Savage, ESSWCD
Paul Grossman*		Janet Sturgis, NoCo Planning Commission*
		Matt Kearns, USGS*
		Jason Pope, USGS*
		Bob Bilicki, Wachapreague Town Council
		Ben Young, NRCS
		Michelle White, AcCo Citizen, Onancock
		Rob Shendock, Chincoteague Planning Commission*

signifies virtual participant

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NOTE: NO QUORUM

Call to Order

Chairman Muhly called the meeting to order at 10:04 AM.

Public Participation

Janet Sturgis, Northampton County Planning Commission –
Expressed to the Committee concern over the Wagner Borrow Pit, any regulations that could be enforced, and requested additional insight from DEQ.
Committee members asked that Britt McMillan, GWC Consultant compile brief summary to send to Joe Grist, DEQ for review and feedback.

Bob Bilicki, Wachapreague Town Council –
Presented to the Committee on the current feasibility study being conducted in Wachapreague regarding a pump station at the commercial waterfront that would eventually connect to the HRSD pump station. Requested information on identifying groundwater table to show areas of concern to Wachapreague residents.
Committee members recommended that Mr. Bilicki speak with Tom Brockenbrough of Accomack County; A-NPDC Staff, Jessica Steelman, to follow up.

Review of the July 20, 2021 Minutes

The draft minutes of the July 20th, 2021 meeting were presented.

FY 2021 Financial Status Report

The FY 2021 Financial Status Report as of August 2021 was presented. Total Bills Payable equaled $7,100; total revenues received equaled $13,156.75.

Staff Update

Committee Attendance Record

The FY2022 Committee Attendance Record is attached.

Environmental Reviews and Permits

VA Pollutant Discharge Elimination System Program –

Wastewater Treatment, Town of Chincoteague
Permit Number: VA0054003
Notice Purpose: To seek public comment on a draft permit that will allow the release of treated municipal wastewater into a water body in Chincoteague, Virginia.
Public Comment Period: September 1, 2021 to October 1, 2021
Applicant: Sunset Bay Utilities, LLC, 9919 Stephen Decatur Highway, Ocean City, MD 21842
Facility: Sunset Bay Utilities South Wastewater Treatment Plant, 3855 South Main Street, Chincoteague, VA 23336
DEQ Contact:
Robert E. Smithson, Tidewater Regional Office
Phone: (757) 518-2106; Fax: (804) 698-4178
Email: Robert.SmithsonJr@DEQ.Virginia.gov

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VA Pollution Abatement Program –
None.

Consent Orders –
None.

Groundwater Withdrawal Permits –
Public Notice: *General Permit for Use of Surficial Aquifer on the Eastern Shore [9 VAC 25 – 910]*
Public Comment opened on 8/30/2021 and will remain open through 10/29/2021. Contact: Joe Grist, DEQ j

Environmental Impact Reviews –
None.

Other Items
Major SUP 2021-05 Eastern Shore Materials, LLC Borrow Pit – documents from Northampton Planning Commission August 3, 2021 meeting can be viewed here; fall under the Bureau of Mines. GWC original 2018 letter attached.

ESVA Groundwater Litigation – documents attached.

Research & News
Sea Level Rise and Failing Septic Systems, by Molly Mitchell, PhD, and Julie Herman, PhD, Virginia Institute of Marine Science (attached); full research article can be viewed at https://www.frontiersin.org/articles/10.3389/fmars.2021.631757/full

Upcoming Events/Meetings
REGULAR MEETINGS OF STATEWIDE AUTHORITIES, BOARDS, COMMISSIONS, AND COMMITTEES –
Public Hearing – Proposed Amendments to the Water Quality Management Planning Regulation – Nutrient Allocations
A public hearing to receive comments on proposed amendments to the Water Quality Management Planning Regulation. The proposal appears in the Virginia Register on August 30, 2021. The public comment period begins on August 30, 2021, and ends on October 29, 2021.
Date/Time: 10/7/2021 at 1:00PM
Location: Department of Environmental Quality, Piedmont Regional Office, 4949-A Cox Road, Glen Allen, VA 23060
Contact: Gary Graham, gary.graham@deq.virginia.gov, 804-689-4103

MEETINGS ABOUT TOTAL MAXIMUM DAILY LOADS (or TMDLs) for IMPAIRED WATERS –
For more information about TMDLs in Virginia, click here for the *Virginia Department of Environmental Quality TMDL Web site*. TMDL reports are available at *http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspx*.

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VIRGINIA GENERAL ASSEMBLY WATER-RELATED MEETINGS –
For meetings of legislative committees and commissions, see *http://lis.virginia.gov/cgi-bin/legp604.exe?191+oth+MTG*. Links to information about General Assembly commissions, councils, and special interim committees coordinated by the Division of Legislative Services are available online at *http://dls.virginia.gov/commissions.html*. The Virginia General Assembly Web site is *https://virginiageneralassembly.gov/*.

USGS EM-Logging 2020 Presentation
Sam Caldwell with USGS presented findings from EM-Logging 2020. Presentation can be found here.

Ground Water Consultant Report
Technical/Regulatory/Educational Items:

1. Public Comment (**ends October 29, 2021**): General Permit for Use of Surficial Aquifer on the Eastern Shore [9 VAC 25 - 910].
    a. See draft Regulations (**attached**)
    b. See Background Documents (**attached**)
    c. The purpose of the general permit is "*to authorize the development of a general permit and create a new general permit regulation to promote use of the surficial aquifer on the Eastern Shore for non-potable purposes"*
    d. Regulatory Advisory Panel (RAP) formed 1Q2020 and completed draft regulations by October 2020.
    e. SWCB authorized Public Comment at their December 2020 meeting.
    f. Public Comment period ends October 29, 2021.
    g. Summary of 9VAC25-910:
        i. Permit duration: Fixed 15-year (i.e. 2020 to 2035) regardless of application date
        ii. Applicable withdrawals:
            1. Groundwater withdrawals > 300,000 gal/month from the surficial aquifer
            2. For the purpose of the general permit, wells with a maximum depth less than 80-feet is considered to be screened in the surficial aquifer
            3. Wells screened deeper but are believed to be surficial aquifer must demonstrate with geophysical logs. Additionally, drilling must be coordinated at least four months in advance with DEQ.
        iii. Application Requirements:
            1. Permit fee (**$600**). Agricultural withdrawals no fee.
            2. Groundwater Withdrawal Permit Application Form (**see attached**), provided by DEQ). The intent is a simplified form similar to other general permit applications.
            3. GW-2 (**see attached**): well construction reports (Water Well Completion Report)
            4. Well name; depth; screen intervals; pumping rate; and location (longitude and latitude)
            5. Map showing locations of wells
            6. Surface water and groundwater conjunctive use systems, if applicable. (Irrigation ponds and similar)
            7. Amount (monthly) of groundwater requested.
            8. If a well is > 80 ft depth, geophysical logs and optional DEQ inspection

(at the discretion of DEQ).

9. Area of impact (for use in the Mitigation Plan).

iv. Reporting Requirements:
   1. Routine monthly total use reported to DEQ annually (**see attached reporting form**).
   2. Withdrawals in excess of the permit amount must be reported by the 5th day of the month following the excess withdrawal. Failure to report may result in compliance or enforcement activities.
   3. Annual Water Audit Form (**see attached**) documenting:
   4. Water use compared to expected need
   5. New water saving equipment, procedures, or improvements
   6. Leak detection and repair including quarterly visual monitoring.

v. Mitigation Requirements:
   1. Requires an Area of Impact analysis:
      a. https://swet.apps.aquaveo.com
   2. Instructional video:
      a. https://www.youtube.com/watch?v=NzZWjTmL-oA&feature=youtu.be
   3. Follows the existing mitigation requirements:
   4. Response to a claim will be within 5-business days
   5. If accepted, mitigation within 30-business days
   6. If denied:
   7. Provide justification for denial
   8. Require additional documentation
   9. May request arbitration

2. Wagner Pit proposed expansion.
   a. Proposed approx. 51 acre expansion to a new parcel east (and across railroad tracks) from the existing borrow pit.
   b. Proposed operations are reportedly the same as the existing pit. In April 2018 (**attached**), the Groundwater Committee reviewed a Special Use Permit that would expand the existing pit by 8-acres.
   c. Based on review of the documents related to the proposed 51 acre expansion, the principal findings from the April 2018 review apply:
      i. Any impacts to the confined Yorktown-Eastover aquifer is expected to be negligible.
      ii. Potential impacts to the surficial (Columbia) aquifer are:
         1. Lowered groundwater levels during operation which may reduce yield for the adjacent nursery well or other shallow wells nearby;
         2. Local change in the groundwater flow conditions:
            a. Groundwater converging toward the pit at higher rates during operation, which has the potential to result in movement of groundwater impacted by nearby septic or agricultural systems (after operations cease, groundwater flow would most likely return to approximate pre-pit conditions); and
            b. After excavation is complete, the pit would be expected to behave similarly to other irrigation ponds: a net source for groundwater recharge in the winter months and a net sink

(removal) for groundwater in the summer months.

iii. A condition in the April 2018 review was "*no disposal of any material into the pit and the use of the pit as an irrigation pond following excavation conclusion*."
iv. The exception is that the proposed expansion appears to leave open the possibility that fill may be placed in the pit. From an August 31, 2021 response:
    1. "*As projects that come up, where overburden is brought to the pit, it will be utilized in berms or to slope pit walls.*"
    2. There is also reference to monitoring (including "water monitoring") in accordance with DMME requirements. There does not appear to be any monitoring requirements in the existing DMME permit.
    3. Certain fill material, either placed adjacent to the pit or in the pit, can have the potential to adversely impact groundwater quality.

3. Thomas Farms Poultry Groundwater Withdrawal Permit lawsuit:
    a. Between Jessica L. Thomas, LLC, et al (Petitioners) v. Virginia State Water Control Board, et al. (Defendants)
    b. Involves three farms: Chicken Bacon Ranch; Wishart's Point Farm; and Thomas Farm.
    c. Relevant text from the introduction:
        i. "*appeal contesting the last minute addition of a Special condition to three groundwater withdrawal permits*"
        ii. "*The Special condition requiring a costly alternative source investigation ("ASI") was added despite the fact that (1) DEQ's own rigorous Technical Evaluation demonstrated no need for the condition to be imposed; (2) no comments received by the Board offered any contrary evidence or support for imposition of the condition; and (3) DEQ, the agency with technical expertise in groundwater permitting, confirmed to the Board that there was no technical support for inclusion of the condition*."
        iii. "*Moreover the condition was added at the eleventh hour, without any notice or opportunity to object provided to Thomas Farms, without any written explanation or justification for the Boards deviation from the DEQ recommendation.*"
4. Draft Groundwater Committee Prioritization Matrix
    a. A detailed draft matrix was previously submitted. Based on an initial review of the Matrix, an annotated version has been developed to facilitate priority ranking for groundwater resource issues on the Shore.
    b. The annotated matrix is intended to supplement the detailed matrix and not replace it. The annotated matrix is structed similar to the detailed matrix with four major categories:
        i. Institutional Mechanisms
        ii. Research Needs
        iii. Monitoring
        iv. Alternate Source Development
    c. The four major categories are further subdivided as needed.
    d. Descriptive columns have been added, some that include a subjective ranking (Implementability, Short Term Effectiveness, Long Term Effectiveness, Implementation Cost)
        i. An initial rank has been populated for each category.
        ii. Because these rankings are subjective, there should be additional consideration on the final ranking.

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e. The intent is to use the annotated matrix to identify short term and long term focus for Groundwater Committee efforts with the detailed matrix providing necessary information to provide backup for the recommendations.

Other Items:

Additional FY2021 Groundwater Committee activities. Continue update of the Eastern Shore Groundwater Protection Plan.

Ground Water Project Priorities

The GWC reviewed project priorities and action items.

Other Matters

The matter of reimbursement for travel to meetings for GWC members; requiring a bylaw amendment. **Staff requested members send starting location in order to calculate costs**.

GWC members requested information update on possibility of conducting business meetings virtually. **Staff to supply information as updates are given from the state.**

Schedule Next Meeting & Adjournment

The next Committee meeting was scheduled to be in Accomack County at the Enterprise Building: 23372 Front Street, Accomac for October 19th at 10:00 AM. **NOTE**: NO DECEMBER 2021 MEETING.

Chairman Muhly adjourned the meeting at 12:07 PM.

_____

Paul Muhly, Chairman

Copy test:

_____

Elaine K. N. Meil, Secretary

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee
FROM: Elaine Meil
Executive Director
Accomack-Northampton Planning District Commission
DATE: October 19, 2021
SUBJECT:

September 2021 Financial Status Reports

The FY 2021 Financial Status Report is attached.

TOTAL BILLS PAYABLE		**$465.00**
Revenues Received:	Accomack County	$0.00
	Northampton County	$0.00
TOTAL REVENUES RECEIVED		**$ 0.00**

Staff requests the Committee review and consider approving the September 2021 Financial Status Report.

EASTERN SHORE OF VIRGINIA GROUND WATER COMMITTEE

Financial Statement--September 2021

Fiscal Year 2021

REVENUES:	Annual Budget	Current Period Activity	YTD Activity	Balance	% of Budget
Ground Water Consultant Appropriations:					
Accomack County	$ 14,251.00	$ 0.00	$ 3,562.75	$ 10,688.25	25.00%
Northampton County	7,415.00	$ 0.00	$ 1,853.75	5,561.25	25.00%
Subtotal	$ 21,666.00	$ 0.00	$ 5,416.50	$ 16,249.50	
Ground Water Modeling Run Appropriations:					
Accomack County	$ 1,500.00	$ 0.00	$ 375.00	1,125.00	25.00%
Northampton County	1,500.00	$ 0.00	$ 375.00	1,125.00	25.00%
Subtotal	$ 3,000.00	$ 0.00	$ 750.00	$ 2,250.00	
Ground Water Committee Staff Support:					
Accomack County	$ 6,770.00	$ 0.00	$ 1,692.50	5,077.50	25.00%
Northampton County	6,191.00	$ 0.00	$ 1,547.75	4,643.25	25.00%
Subtotal	$ 12,961.00	$ 0.00	$ 3,240.25	$ 9,720.75	
USGS Ground Water Model:					
Accomack County	$ 7,500.00	$ 0.00	$ 1,875.00	5,625.00	25.00%
Northampton County	7,500.00	$ 0.00	$ 1,875.00	5,625.00	25.00%
Subtotal	$ 15,000.00	$ 0.00	$ 3,750.00	$ 11,250.00	
Total Revenues	$ 52,627.00	$ 0.00	$ 13,156.75	$ 39,470.25	25.00%
Ground Water Modeling Run Appropriations:					
Remaining Balance FY2021	$ 9,000.00				
Total Revenues/Remaining Balance	$ 61,627.00				

EXPENDITURES:

Ground Water Consultant	$ 21,000.00	$ 0.00	$ 5,250.00	$ 15,750.00	25.00%
Ground Water Modeling Run	6,000.00	$ 0.00	$ 0.00	6,000.00	0.00%
Ground Water Committee Staff Support	14,627.00	$ 465.00	$ 2,315.00	12,312.00	15.83%
USGS Ground Water Model	14,000.00	$ 0.00	0.00	14,000.00	0.00%
Total Expenditures	$ 55,627.00	$ 465.00	$ 7,565.00	$ 48,062.00	13.60%
NET SURPLUS OR (DEFICIT) OF REVENUES LESS EXPENDITURES	$ 6,000.00	-$ 465.00	$ 5,591.75		

* Deposits for the period include:		** Expenditures for the period include:	
As Summarized	$ 0.00	Payables (previous month)	$ 465.00
	$ 0.00	Total Expenditures	$ 465.00

Bills Payable as of August 30, 2021

DUE TO	DESCRIPTION	DATE	AMOUNT
ANPDC	Staff Support	30-Sep-21	$ 465.00
Total Bills Payable			**$ 465.00**

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FROM: Elaine Meil
Executive Director
Accomack-Northampton Planning District Commission
DATE: October 19, 2021
SUBJECT:

October 19, 2021 Staff Report

Committee Attendance Record

The FY2022 Committee Attendance Record is attached.

Environmental Reviews and Permits

VA Pollutant Discharge Elimination System Program –
None.

VA Pollution Abatement Program –
None.

Consent Orders –
None.

Groundwater Withdrawal Permits –
None.

Environmental Impact Reviews –
None.

Other Items

Research & News

Water Well Design and Construction, Thomas Harter, University of California, Davis, and Kearny Agricultural Center (attached)

Upcoming Events/Meetings

REGULAR MEETINGS OF STATEWIDE AUTHORITIES, BOARDS, COMMISSIONS, AND COMMITTEES –

Public Hearing – Proposed Amendments to the Water Quality Management Planning Regulation – Nutrient Allocations

A public hearing to receive comments on proposed amendments to the Water Quality Management Planning Regulation. The proposal appears in the Virginia Register on August 30, 2021. The public comment period begins on August 30, 2021, and ends on October 29, 2021.

Date/Time: 10/7/2021 at 1:00PM

Location: Department of Environmental Quality, Piedmont Regional Office, 4949-A Cox Road, Glen Allen, VA 23060

Contact: Gary Graham, gary.graham@deq.virginia.gov, 804-689-4103

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Trees as Best Management Practices (BMPs) Stakeholder Advisory Group Meeting #2
Second meeting of the "Trees as BMP" Stakeholder Advisory Group formed in response to Chapter 405 of the Virginia Acts of Assembly 2020 (HB520). Please note that if you have been fully vaccinated for COVID-19, that wearing a mask is not required but is optional. If you have not been fully vaccinated for COVID-19, we ask that you wear a mask or maintain appropriate social distance.
Date/Time: 10/20/2021 at 10:00AM
Location: Training Room, DEQ Piedmont Regional Office, 4949-A Cox Road, Glen Allen, Virginia 23060
Contact: William K. Norris, william.norris@deq.virginia.gov, (434) 962-2161

Public Meeting – Virginia Clean Water Revolving Loan Fund, FY 2022 Intended Use Plan, Projects Targeted for FY 2022 Funding Assistance
A public meeting for the presentation of the draft list of targeted FY 2022 loan recipients and Intended Use Plan for public review and comment. A notice and additional information is available on the posted general notice at: https://townhall.virginia.gov/L/ViewNotice.cfm?GNid=1324 . Questions should be directed to the DEQ staff person listed below.
Date/Time: 10/29/2021 at 10:00AM
Location: 3rd Floor Conference Room, 1111 East Main Street, Richmond, Virginia 23219
Contact: Karen Doran, cwfap@deq.virginia.gov, (804) 698-4133

Trees as Best Management Practices (BMPs) Stakeholder Advisory Group Meeting #3
Third meeting of the "Trees as BMP" Stakeholder Advisory Group formed in response to Chapter 405 of the Virginia Acts of Assembly 2020 (HB520). Please note that if you have been fully vaccinated for COVID-19, that wearing a mask is not required but is optional. If you have not been fully vaccinated for COVID-19, we ask that you wear a mask or maintain appropriate social distance.
Date/Time: 11/4/2021 at 10:00AM
Location: Training Room, DEQ Piedmont Regional Office, 4949-A Cox Road, Glen Allen, Virginia 23060
Contact: William K. Norris, william.norris@deq.virginia.gov, (434) 962-2161

MEETINGS ABOUT TOTAL MAXIMUM DAILY LOADS (or TMDLs) for IMPAIRED WATERS –
For more information about TMDLs in Virginia, click here for the *Virginia Department of Environmental Quality TMDL Web site*. TMDL reports are available at *http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspx*.

VIRGINIA GENERAL ASSEMBLY WATER-RELATED MEETINGS –
For meetings of legislative committees and commissions, see *http://lis.virginia.gov/cgi-bin/legp604.exe?191+oth+MTG*. Links to information about General Assembly commissions,

councils, and special interim committees coordinated by the Division of Legislative Services are available online at *http://dls.virginia.gov/commissions.html*. The Virginia General Assembly Web site is *https://virginiageneralassembly.gov/*.

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee
FROM: Britt McMillan, Principal Hydrogeologist, Arcadis
DATE: October 19, 2021
SUBJECT:

Ground Water Consultant Updates

This will be shared with the Committee as an addendum to the October 19, 2021 GWC Packet.

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee
FROM: Britt McMillan, Principal Hydrogeologist, Arcadis
DATE: October 19, 2021
SUBJECT:

Ground Water Consultant Quarterly Report, Q4 (July 2021 – September 2021)

This will be shared with the Committee as an addendum to the October 19, 2021 GWC Packet.

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MEMORANDUM

TO: Eastern Shore of Virginia Ground Water Committee
FROM: Britt McMillan, Principal Hydrogeologist, Arcadis
DATE: October 19, 2021
SUBJECT:

Well & Septic Forum

Presentations from Cathy Plant, VDH and Britt McMillan, ARCADIS and GWC Consultant.

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EASTERN SHORE OF VIRGINIA GROUND WATER COMMITTEE
FY 2022 ATTENDANCE RECORD

Members	Term Exp.	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Accomack County													
Daniel Hershey	June 2022	X	*	X									
Grayson Chesser	June 2023	X	*	V									
Jackie Phillips	NA		*	X									
Paul Muhly	Chairman Next vote: July 2023	X	*	X									
Northampton County													
John Coker	Vice Chairman Next vote: July 2023	X	*										
Paul Grossman	March 2024	X	*	V									
Roberta Kellam	March 2024	X	*	V									
Taylor Dukes	January 2022		*										
Non-Voting Ex-Officio Members													
Charles Kolakowski	NA		*										
Elaine Meil	NA		*										
Mike Mason	NA		*										

- Indicates not a member. X Indicates member present. V Indicates virtual presence
* Indicates no monthly meeting held. NA Not Applicable ( ) Indicates an alternate present

Ground Water Committee Actionable Items to Address Priority Concerns

Water Quality Studies

	Study	Goal	Cost
1 - HIGH PRIORITY	A) Water Quality Testing of Wells in the Surficial Aquifer	**To determine the water quality of wells in the surficial aquifer and paleochannels.** While past research has documented areas in the surficial aquifer where nitrate exceeds the drinking water MCL, there is limited current data. Based on the best current available informoation, nitrogen in groundwater is improving with the implementation of BMPs. Testing should address greatest concerns: land use pollutants (nitrogen), emerging contaminants, and "nuisance" constituents like iron and sulfate. Wells that should be included are: DEQ SOWs, existing wells, abandoned wells, and new wells (prior to or at time of construction). Testing should be done routinely.	Moderate
	B) Testing of On-Site Systems	**To determine the impact poorly designed/constructed or poorly maintained and operated on-site systems (including pit-privies) have on groundwater.** Historically, nitrates and bacteria have been of greatest concern. Emerging contaminants, such as pharmaceuticals in particular, are of increasing concern. While domestic systems have a typically small impact, large land application systems can yield wide-spread impacts.	Moderate
	C) Identification of Emerging Contaminants	**To identify emerging contaminants that were not previously regulated and have limited information on risk to human and ecological health.** While many contaminants may have been used extensively for years, information on their impact to water quality is limited. Many of these contaminants are mobile and do not readily degrade in the environment, including pharmaceuticals (such as steroids and other recalcitrant compounds) and MTBE (past gasoline additive). These emerging contaminants are most often managed by tracking developing national/federal research and well sampling in target areas. PFOS/PFOA at NASA Wallops is well documented.	Moderate
2 - LOW PRIORITY	Locating of Out of Service Wells	**To identify and map abandoned wells across the Eastern Shore, particularly those in the surficial aquifer.** Ownership, lat/long, depth, and age of well should be researched; reduce cost of drilling wells for purpose of sampling if existing out of service well is used.	Low
3 - MEDIUM PRIORITY	Saltwater Intrusion in Confined Aquifers	**To determine the level of saltwater intrusion in the Yorktown-Eastover Aquifers**. Research should include identifying the rate of saltwater intrusion, taking into consideration sea level rise and climate change, along with the impacts of salt water on the edge zones, and consequences of the sea level rising above the fresh water lens.	High

	A	B	C	D	E
9					
10	**Community Education Program to Enhance Public Knowledge for ESVAs Only Water Supply**				
11	**priority**	**Topic**	**Material**	**Cost**	**Distribute To/At**
12	**1**	Groundwater 101		Low	ES Post, CBES, Schools, Environmental Education Council (EEC), County Mailings Insert,
13		Paleochannels		Low	ES Post, CBES, Schools, Environmental Education Council (EEC), County Mailings Insert,
14		Saltwater Intrusion		Low	ES Post, CBES, Schools, Environmental Education Council (EEC), County Mailings Insert,
15	**2**	Wells & Septic		Low	ES Post, CBES, Schools, Environmental Education Council (EEC), County Mailings Insert,
16		BMPs		Low	ES Post, CBES, Schools, Environmental Education Council (EEC), County Mailings Insert,
17		The GWC	What it does and how it can help	Low	ES Post, CBES, Schools, Environmental Education Council (EEC), County Mailings Insert,
18		Program Mascot	Wally the Waterdrop	Low	
19	**County Technical Assistance for Ordinance Development**				
20	**priority**	**Subject**	**Material** *(table, map, data, language, etc.)*	**Cost**	
21	**1**	Development	Suggestions for future development that should be included/considered; sample language to include in a comprehensive plan; as requested by county/locality	Low	
22	**2**	Reuse	Develop sample language for ordinances to include reuse. Identify how reuse has been used on the Shore for irrigation; the benefits of addressing waste water disposal and reducing use of fresh groundwater. Research solutions to the issue of cost of transporting the reuse water to the end user; as requested by county/locality	Low	

	A	B	C	D	E
23	**3**	Enhanced Recharge & Aquifer Storage and Recovery	Develop sample language for ordinances to include enforcement of BMPs for the purpose of accomplishing enhanced recharge. Stormwater BMPs are designed to increase recharge to groundwater in preference to surface water (such as bioretention ponds). The approach of enforcing BMPs is much more cost effective than ASRs, such as the Chesapeake ASR or HRSD SWIFT systems that require substantial infrastructure and can be operationally complex. Stormwater BMPs often require more care in design, construction, and maintenance than conventional stormwater ponds, but are beneficial to both surface water and groundwater resouces. *Sample Language can include reccomendations, i.e. 50/100 year flood retention ponds are required for commercial/industrial properties along the recharge spine; as requested by county/locality*	Low	
24					
25	**Priorities Outside Ground Water Committee Scope of Service** *Items that the GWC can support, advocate, & disseminate information about through the efforts of the GWC Community Education Program*				
26		**Item**	**Description**	**Responsible Party**	**Status**
27		County Comprehensive Plans	Comprehensive Plans provide a basis for and a roadmap that can be used to direct future development in the County. Groundwater Committee previously provided support for the plans. Principal limitation is the Plans are not by themselves enforceable.	Counties	Periodic
28		Ordinance Updates	Ordinances provide an enforcable mechanism to implement groundwater protection/preservation measures. Most often applied to new construction or redevelopment. Groundwater Committee previously developed draft ordnances, some aspects adopted by the Counties. Principal limitations: 1) Dillon Rule and 2) Long term enforcement often difficult.	Counties/Localities	Past/No Current
29		Paleochannels	Investigate the hydraulic interconnection of the paleochannels with the surficial aquifer and Yorktown-Eastover aquifers. Methods include drilling and well testing; geophysical methods. Important to understanding recharge to and sustainability of the Yorktown-Eastover aquifers. Investigation methods vary substantially in cost and accuracy.	USGS	New
30		Freshwater-Saltwater Transition	Groundwater transition from fresh to saltwater is not well documented. Better understanding will improve ability to model saltwater intrusion. A more cost effective approach would be to expand other investigations to provide this information, including adding an additional investigation component to the USGS EM program.	USGS	Ongoing (limited)

	A	B	C	D	E
31		Aquifer & Confining Unit Hydraulic Characteristics	Hydraulic properties of the aquifers and confining units are important in understanding recharge, water balance, and ultimately sustainablity for the aquifers. Principal properties are: transmissivity, hydraulic conductivity, and storage. Information most lacking for 1) confining units; 2) paleochannels; and 3) surficial aquifers. Information can be collected from existing wells and/or incorporated in new wells (similar to some DEQ permit requirements).	USGS or DEQ	Limited (DEQ permit requirements)
32		Deep Aquifers	Several aquifers below the Yorktown-Eastover aquifer occur in Accomack County and are largely absent in Northampton County (as a result of the bolide impact). Very little information is available on yield and quality for these aquifers in Accomack County. These aquifers may be a viable future source of water in Accomack County. Based on limited information, water quality in these deeper aquifers is likely brackish (not potable without desalting). Additionally, based on limited information the aquifers likely have lower yield than their counterparts to the west and north.	USGS or DEQ	New
33		Climate Change	Climate change has the potential to significantly imact groundwater resources on the Shore. The most likely impacts are from:1) Highly variable precipitation patterns resulting in either or both:a) Extended and extreme droughtsb) Extended and excessive precipitation2) More frequent and stronger storms (in particular hurricanes). Droughts result in increasted groundwater use and less recharge to the aquifers. Past droughts on the shore have resulted in "dry wells" and saltwater intrusion. Increased frequency and duration will compound these issues.More frequent and stronger storms result in storm surges that can contaminate the surficial aquifer from both salt water and man made sources (such as petroleum hydrocarbons).	Regional Study; USGS; CRMP	New
34		Water Use	Water use in excess of 300,000 gal/month is tracked by DEQ. This information is important in tracking both surface water and groundwater use trends on the Shore. Groundwater use reporting through the DEQ permit program is effective in tracking this use. Surface water reporting through the Virginia Water Withdrawal Reporting Regulation is less consistent. Routine (annual) FOIA request for this data is a relatively low level of effort compared to the value of the information.	DEQ	Ongoing
35		Groundwater Levels	Groundwater levels are measured through manual gaging or automated systems in DEQ State Observation Wells (SOW). Groundwater level measurements are a critical means to track response of the groundwater resource to changes in use. Groundwater level information is available through the USGS Water Use web site. Routine (annual) extraction of this data is a relatively low level of effort compared to the value of the information.Expansion of the water level monitoring network should be evaluated to include areas identified as succeptable to either water level declines or saltwater intrusion.	DEQ	Ongoing

	A	B	C	D	E
36		Enforcement of Use of the Surficial	Surficial aquifer is a far more sustainable source of groundwater than the Yorktown-Eastover aquifer. Surficial aquifer use through both constructed ponds and wells help preserve the much more limited Yorktown-Eastover resrouce. Based on available information, the surficial aquifer is capable of yielding sufficient water for most uses on the Shore, and while water quality can be variable, water quality is generally acceptable for most non-potable uses and many potable uses. Efforts to increase use of this aquifer are on-going and any additional incentives would be beneficial.	DEQ	Ongoing
37		Brackish Water/Saltwater Treatment (membrane & ultrafiltration)	Groundwater desalting has been used to treat groundwater in Virginia for over 30-years. To date use on the Shore has been very limited. If groundwater from a deeper aquifer is used, or if brackish portions of the Yorktown-Eastover aquifer is used, a wild variety of desalinization systems are available. Cost of constructing and operating desalinization systems continue to decrease. Most are designed to treat groundwater, several in the United States have been constructed to treat surface water. Moderate construction and operational cost (that continues to decrease) of groundwater desalinizaiton systems are a potential option.	State/County	New
38		Identifying Well Clusters	GWC to support and ask BOS to support through letter; action would be responsibility of another agency (USGS?)		

PUBLICATION 8086 FWQP REFERENCE SHEET 11.3

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In partnership with
NRCS Natural Resources Conservation Service
http://www.nrcs.usda.gov

Farm Water Quality Planning

A Water Quality and Technical Assistance Program for California Agriculture

http://waterquality.ucanr.org

This REFERENCE SHEET is part of the **Farm Water Quality Planning (FWQP)** series, developed for a short course that provides training for growers of irrigated crops who are interested in implementing water quality protection practices. The short course teaches the basic concepts of watersheds, nonpoint source pollution (NPS), self-assessment techniques, and evaluation techniques. Management goals and practices are presented for a variety of cropping systems.

UC PEER REVIEWED

Reference:

Water Well Design and Construction

THOMAS HARTER is UC Cooperative Extension Hydrogeology Specialist at the University of California, Davis, and Kearney Agricultural Center.

WATER WELL BASICS

A water well is a hole, shaft, or excavation used for the purpose of extracting ground water from the subsurface. Water may flow to the surface naturally after excavation of the hole or shaft. Such a well is known as a *flowing artesian well.* More commonly, water must be pumped out of the well.

Most wells are vertical shafts, but they may also be horizontal or at an inclined angle. Horizontal wells are commonly used in *bank filtration,* where surface water is extracted via recharge through river bed sediments into horizontal wells located underneath or next to a stream. The oldest known wells, *Qanats,* are hand-dug horizontal shafts extending into the mountains of the old Persian empire in present-day Iran.

Some wells are used for purposes other than obtaining ground water. Oil and gas wells are examples of this. Monitoring wells for groundwater levels and groundwater quality are other examples. Still other purposes include the investigation of subsurface conditions, shallow drainage, artificial recharge, and waste disposal.

In this publication we focus on vertical water-production wells commonly used to supply water for domestic, municipal, and agricultural uses in California. Our purpose is to provide readers with some basic information about water wells to help them understand principles of effective well construction when they work with a professional driller, consultant, or well servicing agency for well drilling and maintenance.

DETERMINING A WELL LOCATION

The location of a well is mainly determined by the well's purpose. For drinking and irrigation water-production wells, groundwater quality and long-term groundwater supply are the most important considerations. The hydrogeological assessment to determine whether and where to locate a well should always be done by a knowledgeable driller or professional consultant. The water quality criteria to use for drinking water wells are the applicable local or state drinking water quality standards. For irrigation wells, the primary chemical parameters of concern are salinity and boron and the sodium-adsorption ratio.

Enough ground water must be available to meet the pumping requirements of the wells. For large municipal and agricultural production wells, pumping rate requirements range from about 500 to 4,000 gallons per minute (gpm). Small- and medium-sized community water systems may depend on water wells that produce from 100 to 500 gpm. Individual homes' domestic wells may meet their needs with as few as 1 to 5 gpm, depending on local regulations. To determine whether the desired amount of ground water is available at a particular location and whether it is of appropriate quality, drillers and groundwater consultants rely on their prior knowl-

Well Design Objectives

- Highest yield with minimum draw-down
- Good quality water with proper protection from contamination
- Sand-free water
- Long lifetime (>50 years)
- Reasonable short-term and long-term costs

edge of the local groundwater system, experience in similar areas, and a diverse array of information such as land surface topography, local vegetation, rock fracturing (where applicable), local geology, groundwater chemistry, information on thickness, depth, and permeability of local aquifers from existing wells, groundwater levels, satellite or aerial photographs, and geophysical measurements.

In most cases, the well location is further limited by property ownership, the need to keep surface transportation of the pumped ground water to a minimum, and access restrictions for the drilling equipment. When locating a well, one should also consider the proximity of potential sources of contamination such as fuel or chemical storage areas, nearby streams, sewer lines, and leach fields or septic tanks. The presence of a significant barrier between such potential sources and the well itself is very important for the protection of the well.

WATER WELL DESIGN AND INSTALLATION

Once the well location has been determined, a preliminary well design is completed. For many large production wells, a test hole will be drilled before well drilling to obtain more detailed information about the depth of water-producing zones, confining beds, well production capabilities, water levels, and groundwater quality. The final design is subject to site-specific observations made in the test hole or during the well drilling.

The overall objective of the design is to create a structurally stable, long-lasting, efficient well that has enough space to house pumps or other extraction devices, allows ground water to move effortlessly and sediment-free from the aquifer into the well at the desired volume and quality, and prevents bacterial growth and material decay in the well (see sidebar, Well Design Objectives).

A well consists of a bottom sump, well screen, and well casing (pipe) surrounded by a gravel pack and appropriate surface and borehole seals (Figure 1). Water enters the well through perforations or openings in the well screen. Wells can be screened continuously along the bore or at specific depth intervals. The latter is necessary when a well taps multiple aquifer zones, to ensure that screened zones match the aquifer zones from which water will be drawn. In alluvial aquifers, which commonly contain alternating sequences of coarse material (sand and gravel) and fine material, the latter construction method is much more likely to provide clean, sediment-free water and is more energy efficient than the installation of a continuous screen. Hardrock wells, on the other hand, are constructed very differently. Often, the borehole of a hardrock well will stand open and will not need to be screened or cased unless the hard rock crumbles easily.

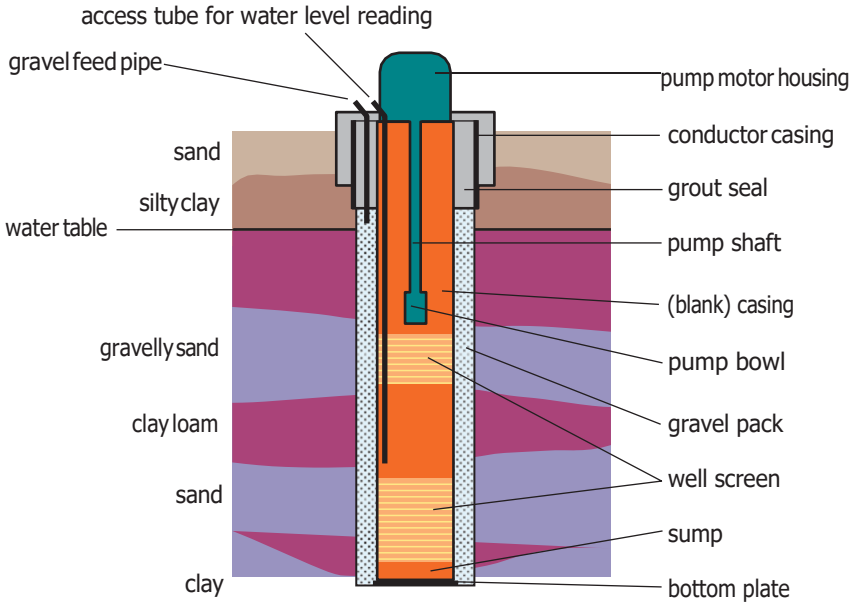

Figure 1. Components of a well.

Drilling a Well: Overview

The process of designing and constructing a water well begins when you make arrangements with a licensed driller or with a professional consultant who designs the well and oversees the work of the licensed driller. We strongly recommended against any reliance on dowsers or well witchers to locate a well site. Research shows no scientific or other reliable basis to substantiate the use of water dowsing as a means to locate a well site.

The driller or consultant finds a suitable location to meet the specified purpose of the well and a preliminary design is established. Once the drilling rig is set up, the drilling process itself may last from a few hours (for a shallow, small-diameter well) to several weeks (for a deep, large-diameter well). Sometimes, particularly for large production wells and where water quality is particularly important, the driller will drill a small-diameter pilot hole before drilling the well bore. From information obtained from the pilot hole, a driller or consultant can determine aquifer formations and groundwater quality at various depths and then optimize the final well design for the specific hydrogeological conditions at the site. Appropriate materials (screen, casing, gravel) can then be ordered in a timely fashion prior to the final drilling.

Once the well bore is drilled, the driller installs well casing and well screens and fills the annulus around the casing with a gravel (filter) pack and the appropriate cement and bentonite seal to prevent water from leaking between uncontaminated and contaminated aquifers or from the land surface into the well (*bentonite* is a special type of clay used to seal against water leaks). Then the driller develops the well (see Well Development), implements an aquifer test, completes the sanitary seal of the well head, and installs a pump and power source. Proper design, construction, development, and completion of the well will result in a long life for the well (as long as half a century or more) and efficient well operation.

The purpose of the screen is to keep sand and gravel from the gravel pack (described below) out of the well while providing ample water flow to enter the casing. The screen should also be designed to allow the well to be properly developed (see Well Development). Slotted, louvered, and bridge-slotted screens and continuous wire wrap screens are the most common types. Slotted screens provide poor open area. They are not well suited for proper well development and maintenance, and are therefore not recommended. Wire wrap screens or pipe-based wire wrap screens give the best performance. The additional cost of wire wrap screens can be offset if you only install screen sections in the most productive formations along the borehole.

The purposes of the blank well casing between and above the well screens are to prevent fine and very fine formation particles from entering the well, to provide an open pathway from the aquifer to the surface, to provide a proper housing for the pump, and to protect the pumped ground water from interaction with shallower ground water that may be of lower quality.

The annular space between the well screen, well casing, and borehole wall is filled with gravel or coarse sand (called the *gravel pack* or *filter pack*). The gravel pack prevents sand and fine sand particles from moving from the aquifer formation into the well. The gravel pack does not exclude fine silt and clay particles; where those occur in a formation it is best to use blank casing sections. The uppermost section of the annulus is normally sealed with a bentonite clay and cement grout to ensure that no water or contamination can enter the annulus from the surface. The depth to which grout must be placed varies by county. Minimum requirements are defined in the *California Well Standards* (Bulletin 74–90, California Department of Water Resources [http://www.water.ca.gov]): 50 feet for community water supply wells and industrial wells and 20 feet for all other wells. Local county ordinances may have more stringent requirements depending on local groundwater conditions.

At the surface of the well, a surface casing is commonly installed to facilitate the installation of the well seal. The surface casing and well seal protect the well against contamination of the gravel pack and keep shallow materials from caving into the well. Surface casing and well seals are particularly important in hardrock wells to protect the otherwise open, uncased borehole serving as a well.

WELL DRILLING

Wells can be constructed in a number of ways. The most common drilling techniques in California are rotary, reverse rotary, air rotary, and cable tool. Auger drilling is often employed for shallow wells that are not used as supply

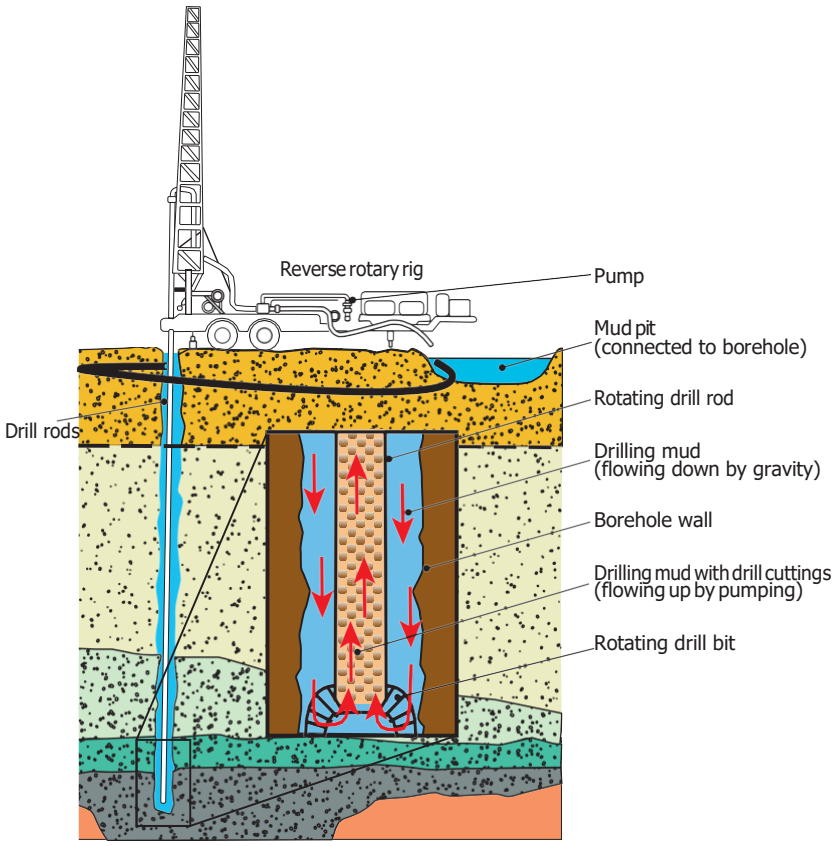

Figure 2. Principles of reverse rotary drilling. (adapted from Driscoll, 1996. Johnson Screens/A Wetherford Company is publisher and copyright holder.)

wells. In unconsolidated and semi-consolidated materials, (reverse) rotary (Figure 2) and cable tool methods are most commonly employed. Hardrock wells generally are drilled with air rotary drilling equipment.

Properly implemented, all of these drilling methods will produce equally efficient and productive wells where ground water is available. Cable tool drilling generally is less labor-intensive but takes more time than (reverse) rotary drilling. Reverse rotary and rotary drilling require large amounts of circulation water and the construction of a mud pit, something to be considered if the well is to be drilled in a remote location with no access to water.

During drilling, drillers must keep a detailed log of the drill cuttings obtained from the advancing borehole. In addition, after the drilling has been completed but before the well is installed, it is often desirable to obtain more detailed data on the subsurface geology by taking geophysical measurements in the borehole. Specialized equipment is used to measure the *electrical resistance* and the *self-potential* or *spontaneous potential* of the geological material along the open borehole wall. The two most important factors that influence these specialized logs are the texture of the formation and the salinity of the ground water. Sand has a higher resistance than clay, while high salinity reduces the electrical resistance of the geological formation. Careful, professional interpretation of the resistance and spontaneous potential log and the drill cuttings' description provides important information about water salinity and the location and thickness of the aquifer layers. The information obtained is extremely useful when finalizing the well design, which includes a determination of the depth of the well screens, the size of the screen openings, and the size of the gravel pack material.

Because of timing issues, it is better—especially in remote areas—to drill a pilot hole a good deal ahead of the well construction date and obtain all pertinent log information early on from the pilot hole. The well design can then be completed and the proper screen, casing, and gravel materials can be ordered for timely delivery prior to the drilling of the well.

Note that a copy of all well log information should be given to the person who pays for the drilling job. The Department of Water Resources keeps copies of all well logs and has a large collection of past well logs. These can be requested by a well owner if the original records are unavailable. The well log contains important information about construction details and aquifer characteristics that can be used later for troubleshooting well problems.

WELL DEVELOPMENT

After the well screen, well casing, and gravel pack have been installed, the well is *developed* to clean the borehole and casing of drilling fluid and to properly settle the gravel pack around the well screen. A typical method for well development is to surge or jet water or air in and out of the well screen openings. This procedure may take several days or perhaps longer, depending on the size and depth of the well. A properly developed gravel pack keeps fine sediments out of the well and provides a clean and unrestricted flow path for ground water.

Proper well design and good well development will result in lower pumping costs, a longer pump life, and fewer biological problems such as iron-bacteria and slime build-up. Poorly designed and underdeveloped wells are subject to more frequent pump failures because sand and fines enter the well and cause significantly more wear and tear on pump turbines.

Poorly designed and underdeveloped wells also exhibit greater water level drawdown than do properly constructed wells, an effect referred to as *poor well efficiency.* Poor well efficiency occurs when ground water cannot easily enter the well screen because of a lack of open area in the screen, a clogged gravel pack, bacterial slime build-up, or a borehole wall that is clogged from incomplete removal of drilling mud deposits. The result is a significant increase in pumping costs. Note that well efficiency should not be confused with pump efficiency. The latter is related to selection of a properly sized pump, given the site-specific pump lift requirements and the desired pumping rate.

Once the well is completed and developed, it is a good practice to conduct an *aquifer test* (or *pump test*). For an aquifer test, the well is pumped at a constant rate or with stepwise increased rates, typically for 12 hours to 7 days, while the water levels in the well are checked and recorded frequently as they decline from their standing water level to their pumping water level. Aquifer tests are used to determine the efficiency and capacity of the well and to provide information about the permeability of the aquifer. The information about the pumping rate and resulting pumping water levels is also critical if you are to order a properly sized pump.

Once the well development and aquifer test pumping equipment is removed, it may be useful to use a specialized video camera to check the inside of the well for damage, to verify construction details, and to make sure that all the screen perforations are open.

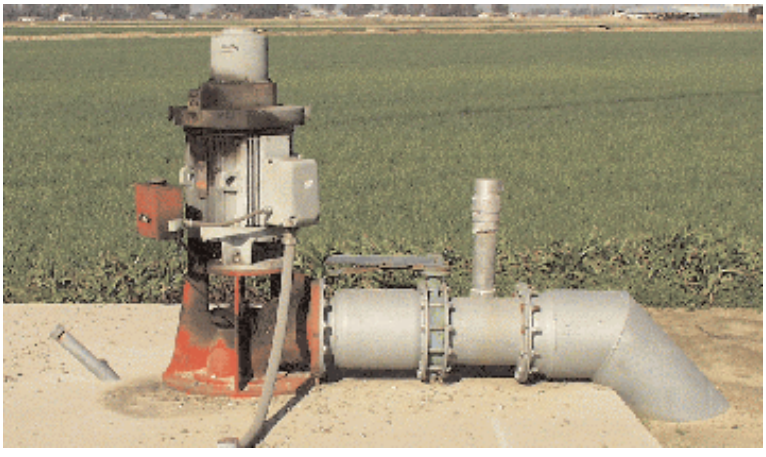

Figure 3. Properly completed well with elevated concrete seal (but with leaking lubricant).

WELLHEAD PROTECTION

The construction of the final well seal is intended to provide protection from leakage and to keep runoff from entering the wellhead (Figure 3). Minimum standards for surface seals have been set by the California Department of Water Resources (DWR Bulletin 74–90). It is also important to install backflow prevention devices, especially if the well water is mixed with chemicals such as fertilizer and pesticides near the well. A backflow prevention device is intended to keep contaminated water from flowing back from the distribution system into the well when the pump is shut off.

FOR MORE INFORMATION

For more online information on groundwater-related topics, visit http://waterquality.ucanr.org and http://groundwater.ucdavis.edu.

You'll find detailed information on many aspects of field crop production and resource conservation in these titles and in other publications, slide sets, CD-ROMs, and videos from UC ANR:

Nutrients and Water Quality, slide set 90/104

Protecting Groundwater Quality in Citrus Production, publication 21521

Sediments and Water Quality, slide set 91/102

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pr-3/03-WJC/CR

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This publication has been anonymously peer reviewed for technical accuracy by University of California scientists and other qualified professionals. This review process was managed by the ANR Associate Editor for Natural Resources.