WISCONSIN WATER WELL ASSOCIATION
EST. WWWA 1927
Providing & Protecting Wisconsin's Groundwater

WELL LOG

A PUBLICATION OF THE WISCONSIN WATER WELL ASSOCIATION

Spring 2023

IN THIS ISSUE

Find us on

LETTER FROM THE PRESIDENT

By Rick Peterson, WWWA President

Greetings everyone,

Following each Annual Conference, I am always extremely proud of the Board of Directors, Conference Committee, WWWA members and staff who volunteer their time to put this event together. We had over 200 attendees filter through 16 different sessions over 2 days. I'd like to thank each and every one of you who attended this year.

However, as much as I enjoy and appreciate the camaraderie, I know that there is always an opportunity to make it better. We truly value your feedback. As we near the start of our busy season, I'm trying to keep this in mind.

Throughout the years, continuing education sessions have always been a point of discussion. The concern we hear most often from attendees is relevancy. As a result, we have been working to provide more specialized educational sessions across the Annual Conference, Roadshows, and our Virtual Platform. I urge you to consider attending the Conference next year if you find the Roadshows to contain session irrelevant to you. We must take courses that are valid for all license types and that might not be for you – and that's okay!

With that being said, the WWWA is currently seeking speaker proposals for our 2024 continuing education sessions. Please email any class or speaker suggestions to info@wisconsinwaterwell.com or fill out the form on page 9.

I want to thank you all for your continued support of the Wisconsin Water Well Association. Your membership is incredibly important to be able to further our goal of being an outstanding group of professionals, whose goal is to provide safe drinking water to our customers and to "Provide and Protect the Groundwater of Wisconsin".

Rick Peterson

Rick Peterson, Clean Water Testing
920-841-3904, rick.peterson@cleanwatertesting.com

2023 WWWA BOARD OF DIRECTORS

EXECUTIVE DIRECTOR MESSAGE

By Jenni Kilpatrick, WWWA Executive Director

I would like to thank you for your participation in the 2023 Annual Conference and Continuing Education Sessions. The energy and positivity seen at WWWA events is incredibly inspiring and empowering.

We were able to see families join in the Trade Show and during the Bowling Tournament. The Bowling Tournament continues to grow - and the Conference attendees took over all the bowling lanes. The excitement couldn't be matched!

Our Tradeshow and Bowling Tournament would not be possible without the support of our amazing and generous sponsors and exhibitors:

- **Diamond Sponsors**
  - » Franklin Electric
  - » Headwater Wholesale
  - » Wisconsin Pump and Well Suppliers
- **Platinum Sponsors**
  - » Nolan Insurance Agency, LLC
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  - » Headwater Wholesale
  - » Hole Products
  - » Pentair
  - » Preferred Pump
  - » Rep Rite Burk & Associates
  - » TG Analytical Laboratories
  - » Xylem/Goulds Water Technology

Stay tuned for the 2024 Sponsor and Exhibitor Prospectus – designed to provide year-long benefits to our sponsors, and enhanced opportunities for our exhibitors.

We are incredibly grateful for the presenters that volunteered their knowledge and time to educating license holders both in-person and through our On-Demand Platform. Featured topics for 2023 education include:

- Chlorine: The Most Misunderstood Chemical in the Groundwater Industry
- Socket Fusion Process and Procedures

***Executive Director's Message** continued on next page*

- Well Development
- DNR Updates
- Grouting and Placement
- Seen and Unseen Flow in Wells
- Grouting Machine Safety
- Groundwater Industry Updates
- Sizing and Designing Electrical Circuit Components for Water Pump Systems
- Drill Bits and Pump Pieces
- WI DNR American Rescue Plan Act (ARPA) Well Compensation Grant Program
- Drilling at the Table Panel
- Sandstone Aquifers
- Collections from a Legal Standpoint
- Wisconsin's Karst Aquifers
- OSHA Procedures

You can access our on-demand continuing education courses 24 hours a day, 7 days a week. The on-demand platform will be closing on December 1st – please plan accordingly.

We are also offering one more in-person continuing education session at the Plumbers Union Local 75 in Madison on Tuesday, October 3rd.

If you have any suggestions for, or interest in presenting a continuing education session in 2024, please be sure to complete the Call for Presentations, found in this edition of the *Well Log*. We are full steam ahead, and already have anticipated content related to:

- Pump Control Quick Install Options for Improved Performance on Pumps with VFD
- Well Maintenance

Looking Ahead!

Legislative Day

Look in the mirror and you'll see the most important and most effective lobbyist for our industry. Survey after survey shows the same thing: **When it comes to influencing an elected official, nothing makes a bigger and more lasting impression than a visit from YOU** - the constituent.

We attempted to hold a Legislative Day in March; however, the timing proved difficult for our members. We are planning to reschedule and welcome the feedback from members to determine the best timing for the most participation. If advocacy is of interest to you, please be sure to reach out to the WWWA Office (info@wisconsinwaterwell.com).

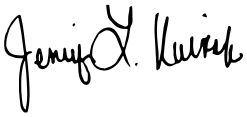
Promotion and Branding of the Organization/Apparel

We are continuing to build awareness of the Wisconsin Water Well Association – and promote the new branding to our membership and the public. The Annual Conference allowed us to debut some of the new apparel that will continue to be available to our members. We are exploring the idea of an online store for our members to purchase items. We would love to know what type of items you would like to see available. Please feel free to reach out to the WWWA Staff with your suggestions at info@wisconsinwaterwell.com.

Please feel free to reach out to me with any feedback, suggestions or ideas. Looking forward to the year ahead!

855-947-9837 / info@wisconsinwaterwell.com

Sincerely,



Jenni Kilpatrick, CAE
Executive Director

WWWA MEMBERSHIP UPDATE

As of April 12, 2023

164 FULL MEMBERS

38 ASSOCIATE MEMBERS

8 LIFE TIME MEMBERS

30 FULL MEMBERS 2nd Member from the same company

MORE DETAILS ON PAGE 11!

2023 ANNUAL CONFERENCE PHOTOS

THANK YOU TO OUR 2023 ANNUAL CONFERENCE SPONSORS!

The Wisconsin Water Well Association sincerely thanks each of our sponsors for making the Annual Conference possible! Your support helps us fight for what is clean and right – water the Wisconsin way!

DIAMOND SPONSORS

Franklin Electric

HEADWATER WHOLESALE

WISCONSIN PUMP & WELL SUPPLIERS

PLATINUM SPONSORS

FIRST SUPPLY

NOLAN Insurance Agency, LLC EST: 1968

Since 1947 Wilmar PUMP&SUPPLY

SILVER SPONSORS

GRUNDFOS

PREFERRED PUMP 100% EMPLOYEE-OWNED

ROSCOE MOSS COMPANY

LOBBYIST REPORT:
GOVERNMENT RELATIONS UPDATE

By Jeff Beiriger, WWWA Government Relations Advisor

State Budget

The legislative session is off and running. And while both the legislature and the Governor have talked more about their desire to work together, it's mostly still talk at this point. Priority one for both is the state budget.

All in all, this is something of a dream budget for everyone involved. There's a huge surplus, which is a much better "problem" to grapple with than a huge deficit. The surplus is made up of state funds and federal funds related to the pandemic. So, spending money that will likely not be there in a few years is something that makes Republican leaders nervous. That, and a number of policy-related issues that the Governor is pressing for. These items – legalizing marijuana being one example – do have a fiscal element, and can be part of the budget proposal, they are unlikely to pass using the budget vehicle (or any other, for the foreseeable future).

The Governor has not proposed spending all of the surplus. In fact, he has included a tax cut in his budget proposal, targeting those in the middle class. There's no opposition to a tax cut, but there is almost certainly going to be opposition to a tax cut that doesn't cut across all income levels.

And what spending the Governor has proposed – focusing on schools and local government aid – will come under the scrutiny of the Joint Finance Committee. Again, there is some agreement about funding schools and local government, but the magnitude of that spending and how those funds can be used will be on the table.

Republicans have, essentially, "scrapped" the Governor's budget proposal, but there's no surprise in that. And even if they have, the Governor has laid out his priorities. The legislature now has to create a document that will lay out its priorities and then the negotiations begin, with a target delivery date for a final budget being mid- to late-June.

What's In It for Me?

The budget includes a significant investment in funding of PFAS study, containment and remediation. The budget also includes a big investment in the well compensation grant fund, something that was increased last year using federal ARPA funds. Those funds will not be available for much longer, so the state will need to start to fund well compensation grants on its own, and well beyond the commitments made in recent state budgets.

As for the DNR, the budget does not include much in the way of additional funding, not for additional staff positions. By contrast, the Department of Safety & Professional Services (DSPS) has asked for 70+ new staff positions. Even with these positions, the agency would still be far below its staffing levels of the late 2000s and early 2010s. Under pressure for delays related to licensing and construction plan reviews, the Department is making a statement that it cannot continue to provide service without additional staff positions.

NR 812 Hearing (Cement Grout)

The public hearing on the proposed rule allowing for a change in the formulation of cement grouts will be held March 22, after which, the rule is expected to advance, as there is no known opposition at this time. The change is necessary as the current code only provides for a formula that is no longer available. An Emergency Rule is in place to allow the use of the new formulation, but Emergency Rules are temporary in nature and a permanent rule is necessary to fix the problem.

Licensing Study

On the issue of licensing, a study committee met late last year and hit upon a few ideas for licensure, most notably reciprocity and a license review committee. On reciprocity, the need for licensing will be reiterated, but expedited pathways for people moving to Wisconsin will be on the table. As this discussion progresses, it may be necessary to look at the provisions on NR 146 to find ways to expedite licensure without undermining the training/practical aspects that lead to testing and, ultimately, licensure.

Another aspect of the licensing study is a periodic review of all licenses to determine their necessity. While it is unlikely that licensure related to public health and safety would be eliminated, it does mean that every industry will have to testify periodically to characterize the continued necessity for the licensing requirements in their industry.

Bills Introduced

Legislation to evaluate sewer infiltration/inflow and road salts are being watched, as each has as a goal the protection of the groundwater.

***Lobbyist Report** continued on next page*

***Lobbyist Report** continued from previous page*

A bill to expand eligibility for well compensation grants was discussed. There are program features that are limiting the use of existing funds, so expanding eligibility may not me the answer without addressing these other features. The bill allows DNR to provide greater use of water treatment (versus constructing a new well) as a remedy and that should be closely reviewed, as it may be a good idea in some cases, but not be preferred in others.

NR Board

All of the Evers appointees have now been seated and the balance on the NR Board has shifted. Two additional seats – both Walker appointees – will be open for appointments on May 1.

The NR Board has signed off on additional work on NR 140, this time to include standards for PFAS contamination.

Supreme Court

As I write, we're a few weeks out from the election to decide the direction of the Wisconsin Supreme Court. While judicial elections are non-partisan, all that really means is that the candidates are running without party designation. Each clearly has partisan support and a distinctly conservative or progressive track record. Conservatives hold a 4-3 majority right now, and with the retirement of Justice Patience Roggensack, the balance on the court can switch to 4-3 in favor of progressive/liberal justices.

Already, this is the most expensive state supreme court election in U.S. history. The reasons are multiple, but many see control of the court as the last line of defense against a Republican legislative agenda that is blocked only by the Governor and just two seat in the Assembly that are preventing Republicans from holding enough seats to override any vetoes the Governor may issue.

Additionally, the court provides one path forward for redistricting in 2030, something Democrats would very much like to see happen, making more seats competitive and giving them a chance to claw back at least a few seats and reduce the potential for veto-proof Republican majorities.

A shift in the court may also being about a new set of environmental law suits, including another revisiting of high capacity wells and cumulative impact and assessing responsibility for PFAS contamination.

MUSTACHIOED MUSINGS

By Terry Farago

Looking back to the conference in January, we had a good attendance turnout, a ton of things to look at, and a record-breaking number of exhibitors. We even had a new pump hoist to check out. We're always trying to get more equipment in so if you're interested, send us a message at info@wisconsinwaterwell.com for information about the 2024 Annual Conference.

This year, nearly every breakout room was full and had some great conversations. Besides the continuing education aspect, we had several social events like our bowling tournament with a lot of opportunities to win great prizes donated by our generous sponsors and exhibitors.

We hear your complaints and understand that you guys don't want videos. For some, the online platform is great but it's not for everyone. It's getting harder and harder to get speakers to travel for the road show locations which results in videos. Companies just don't want their folks traveling as often anymore. We can't stress it enough to come to the conference for live speakers. I want to see some new faces at the 2024 Annual Conference. Try it out next year!

Well, there is my two cents – on now to work on the truck.

Your friend,
Terry

2024 CALL FOR PRESENTATIONS

The Wisconsin Water Well Association annual conference showcases problem-solving, technologies, and the latest in products for the water well industry.

We are seeking suggestions from members for presentations, and abstracts from those interested in providing your expertise in multiple areas.

Members, please submit your suggestions for topics directly to the WWWA Office via email to info@wisconsinwaterwell.com

Potential presenters, please submit your interest no later than September 30, 2023 to info@wisconsinwaterwell.com using the form below.

2024 WISCONSIN WATER WELL ASSOCIATION ANNUAL CONFERENCE:

January 17-18, 2024 • Kalahari Resort and Convention Center, Wisconsin Dells

~ and ~

CONTINUING EDUCATION SESSIONS: Various locations throughout the state.

If you would like to be considered to be a speaker for the **2024 WWWA Annual Conference**, please complete the following:

Company: _____

Name: _____

Address: _____

Phone: _____ **Email:** _____

Length of Presentation: _____

Track (choose all):

- ❒ Well Driller
- ❒ Pump Installer
- ❒ Rig Operator
- ❒ Geo-Thermal
- ❒ Business Management
- ❒ Legislative/Regulatory

Title of Presentation: _____

Brief Description of Presentation:

_____

_____

_____

WPWS UPDATES

WPWS HOLDS ELECTIONS, MAKES APPOINTMENTS

By Jeff Beiriger, WPWS Executive Director

WPWS elected its directors and officers for 2023 and made the following appointments:

PRESIDENT
Tim Nelesen ***(2024)***
Franklin Electric
tnelesen@fele.com

VICE PRESIDENT/SECRETARY
Tom Beran ***(2025)***
Headwater Wholesale
tberan@headwaterwholesale.com

DIRECTORS

Aaron Brown ***(2025)***
Headwater Wholesale
a.brown@headwaterwholesale.com

Jayson Cratsenberg ***(2024)***
Wilmar Pump
jcratsenberg.wps@gmail.com

Scott O'Brien ***(2025)***
Pentair
scott.O'Brien@pentair.com

Mike Olson ***(2024)***
Baker Manufacturing
molson@baker-mfg.com

Ezra Pett ***(2024)***
Headwater Wholesale
e.pett@headwaterwholesale.com

Perry Will ***(2025)***
Rep-Rite Burk
pwill@repriteburke.com

WISCONSIN PUMP & WELL SUPPLIERS

WWWA REPRESENTATIVE(S)
Terry Farago ***(2023)***
Farago & Son
copemanchew@gmail.com

Jason Hintzke ***(2023)***
Hintzke Well Drilling
jasonhintzkewell@live.com

(Current Board Term Ends)

EXECUTIVE DIRECTOR
Jeff Beiriger
P.O. Box 833
Germantown, WI 53022
888-782-6815 • Fax: 888-287-4116
jeff@assocmgmtservices.com

JOIN US FOR OUR FALL 2023 OUTING

WPWS GOLF OUTING
Thursday, September 21, 2023
Trappers Turn
Wisconsin Dells, WI

TRAPPERS TURN

And look for an announcement regarding our Spring 2023 event too! Coming soon....

Funds from all of our outings are used to help support well projects around the world. We are working with the Warren and Donna Pett Memorial Foundation on two projects in Uganda – one for a community farm and another for a church. Other projects are planned.

Photo credit: Jeff Beiriger

***WPWS Updates** continued on next page*

WARREN AND DONNA PETT MEMORIAL FOUNDATION

And speaking of the Pett Memorial Foundation, why not support the work of the Foundation with a round of golf? Registration and sponsorship information are available at http://pett.golfgenius.com for the July 8 event at Western Lakes Golf Course in Pewaukee. More information by calling Ezra Pett at 262/470-5703.

JOIN THE WISCONSIN WATER WELL ASSOCIATION

The WWWA, a trade association of well drillers, pump installers, manufacturers, and suppliers was established over 60 years ago. Our mission is simple: to provide and protect Wisconsin's most precious resource, groundwater. Our purpose is to increase the industry's knowledge and understanding of proper drilling, pump installation, and well filling and sealing techniques.

Members have the opportunity to:

- Appear in the member listing on the website and newsletter
- Apply for exclusive WWWA scholarships for their children and grandchildren
- Advise and assist in the enactment and enforcement of equitable laws and regulations
- Encourage and promote research pertaining to the water well industry
- Cooperate and network with other organizations in related industries

Visit us at www.wisconswaterwell.com to renew online or download an application.

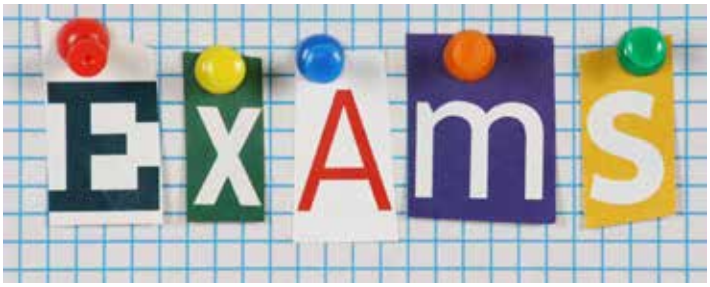
DNR UPDATES

IN-PERSON DNR PROCTORED LICENSE EXAMS AVAILABLE

By Bob Gundrum, Wisconsin Department of Natural Resources, Private Water Licensing Coordinator

The Wisconsin DNR will be proctoring in-person license exams in 2023. A 9:00 a.m. or 1:00 p.m. session can be selected from the following list of dates and locations:

- May 16 • Plover
  (application postmarked no later than April 25)
- May 17 • Plover
  (application postmarked no later than April 26)
- June 20 • Rhinelander
  (application postmarked no later than May 30)
- June 21 • Rice Lake
  (application postmarked no later than May 31)



To download the in-person exam application form, visit the ***Operator Certification Exams*** webpage at:

https://dnr.wisconsin.gov/topic/opcert/exams.html

Links to download application forms can be found below the ***DNR IN-PERSON PAPER EXAM APPLICATION FORMS*** section located under the ***DNR Applications*** tab. *Applications must be submitted by mail with fee payment and postmarked no later than three weeks prior to the date of the exam.* All sessions will be proctored in-person by Wisconsin DNR staff. More information is provided on the exam application. You may also contact the DNR at DNRDGLicensing@wisconsin.gov for further information.

WISCONSIN WELL DRILLER LICENSE HISTORY

By Bob Gundrum, Wisconsin Department of Natural Resources, Private Water Licensing Coordinator

According to ***"Wisconsin Groundwater Law and Regulation – A History: 1848-1895"*** by Harvey E. Wirth, Wisconsin was one of the first states to regulate well drillers and well construction. The Pure Drinking Water Law, (Chapter 162) was passed in 1935 allowing the Wisconsin State Board of Health to require the registration of well drillers and

"regulate the methods and procedures to be followed in the location, construction, and safeguarding of wells, the water from which is to be used for human consumption." The law went into effect January 1, 1936. It is believed that the first driller to be registered was M. F. Baley of Hillsboro, Vernon County. His registration was dated January 20, 1936. The Wisconsin State Board of Health, Wisconsin State Well Drilling Code, 1st issue, was adopted by the Board of Health on April 24, 1936. The code was public noticed on April 28 of 1936, officially becoming law. According to Wirth, the Pure Drinking Water Law was amended in 1953 to include registration of pump installers. The Pure Drinking Water Law is now numbered as Chapter 280. Chapter 280, Wis. Stats., establishes the statutory authority and framework for regulation of water well drilling, heat exchange drilling and pump installation.

Wisconsin DNR administers the water well drilling licensing program. Prior to 1968, there were interim agencies/departments responsible for administering the appropriate water well drilling statutes and codes (Dept. of Resource Development). According to Wirth, Chapter 75- Laws of 1967, "consolidated agencies and merged the

***DNR Updates** continued on next page*

***DNR Updates** continued from previous page*

Departments of Resource Development and Conservation into a newly created Department of Natural Resources. Integration of the activities was completed on July 1, 1968."

Traditionally, the term *"Registration"* was used in ch. 280 of the Statutes for the purposes of what was historically referred to as well driller and pump installer licensing. It is believed that the term *"Registration"* was changed to *"Licensing"* in 2005, but it may not have been until a change to the statute that occurred in 2008.

Ch. 280.01 (8) of the Statutes defines ***"Well drilling"*** as: *"the industry and procedure employed in obtaining groundwater from a well by digging, boring, drilling, driving or other methods but not including the driving of points. It shall also include all construction work and installation of well casings in said well involved therein for the protection of such well water against pollution."*

Chapter NR 146 administrative code defines ***"Well drilling"*** as: *"the meaning specified in s. 280.01 (8), Stats., and includes any activity which requires the use of a well drilling rig or similar equipment; or any activity which is conducted using a well drilling rig or similar equipment with the exception of the driving of points having pipe and casing smaller than three inches in diameter. Well drilling also includes constructing a well or performing any activity which changes the characteristics of a drilled well including constructing, reconstructing or deepening a well, sealing the annular space of a well, joining or welding together lengths of well casing pipe or liner pipe, installation of a liner, installing or replacing a screen, well rehabilitation, hydrofracturing, blasting and chemical conditioning."*

In Wisconsin, any parties engaging in the business of water well drilling without a license may be subject to fines of $100 per day for each day the violation continues or imprisonment. Any parties caught misrepresenting themselves on the license application are also subject to having their license revoked. For more information, contact the Wisconsin DNR at DNRDGLicensing@wisconsin.gov.

*Content taken from Wisconsin DNR archives

ARPA WELL GRANTS UPDATE

By Marty Nessman, Private Water Supply Section Manager

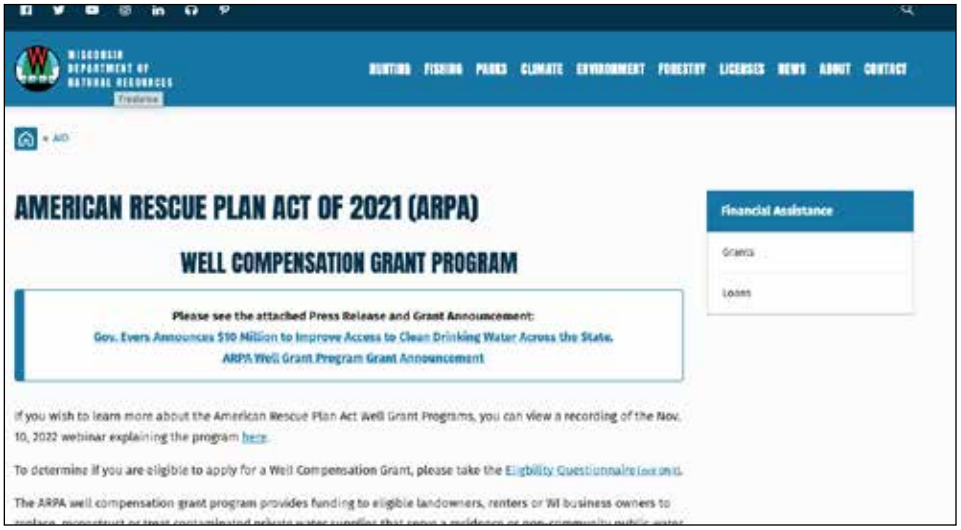
In October the DNR began accepting applications for grants to support the replacement, reconstruction, treatment, or abandonment of contaminated private and non-community public water supply wells. Approximately $10,000,000 for grants was allocated from the American Rescue Plan Act (ARPA). The grant expanded eligibility to well owners with nitrate contamination that were previously not eligible unless the well was used for watering livestock and wells with bacteria that were previously only eligible if the bacteria was from livestock.

The changes to grant eligibility has allowed over 150 individuals to receive grants totaling over $1.3 million in just the first four months of the program. The success of the program so far is due to the hard work of well drillers and pump installers who have provided cost estimates and assistance to well owners with high nitrates, bacteria, and other acute contaminants. The DNR appreciates the extra time that you have taken to work with us on when we have questions or need additional information to help process applications.

The DNR will accept applications and issue awards on a continuous basis until all funding is expended. Application materials are available on the Well Compensation Grants web page: https://dnr.wisconsin.gov/aid/WellCompensation.html, and the Well Abandonment Grants web page: https://dnr.wisconsin.gov/aid/WellAbandonment.html.

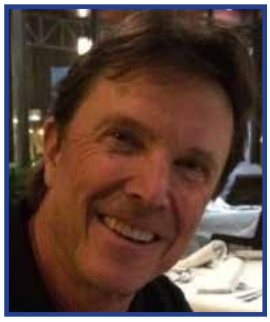
Questions about the program can be sent to DNRARPAWellGrants@wisconsin.gov.

The DNR has a GOV Delivery list to sign up to receive updates about the new program. Interested parties can sign up at https://public.govdelivery.com/accounts/WIDNR/subscriber/new. Under the "Grants and Loans" category, check the box next to 'ARPA Well Grant'.



AQUIFER TYPES OF NORTH AMERICA

PART ONE: UNCONSOLIDATED AQUIFERS



By Thom Hanna, RG, and Bob Sterrett, Ph.D.

As water well professionals, we work with groundwater and its interaction with the geology of an area where we install a well. This interaction between groundwater and the geologic framework is generally called hydrogeology.

The hydrogeology defines the aquifer type we are working in, which is a rock or sedimentary unit that produces useful water flows to a well. It is the hydrogeology of the aquifer that dictates what a well can ultimately produce. By understanding the hydrogeology of the aquifers we are working with, we can make better decisions about the construction and expectations of a well's production.

Aquifer categories can be used to identify, classify, and extrapolate hydrogeologic information from one location to another. This column provides a brief discussion of each aquifer type and supplements the description using figures and photographs on occasion.

As the discussion progresses from unconsolidated geologic materials (sand or gravel units for example) to consolidated/cemented geologic materials (rock for example), the porosity and hydraulic conductivity of a material are governed by secondary openings in the rock, such as joints or fractures. Wide ranges in hydraulic properties (porosity and hydraulic conductivity) exist for each type of aquifer, and the hydraulic characteristics typical of different regions of the United States that represent these aquifer types are provided in Table 1. It is important to remember these aquifer types also are found in other areas of the world.

This column is the first of a two-part series. The first part will explore unconsolidated aquifers and the second part will focus on consolidated aquifers that are generally called bedrock aquifers.

This column is based on an appendix that appeared in Groundwater & Wells, Third Edition. It is co-authored by my good friend and mentor, Bob Sterrett. Enjoy the trip through the aquifers of North America.

Overview of Aquifer Types

The U.S. Geological Survey (USGS) has categorized the principal water-yielding aquifers of North America into five groups. The information presented in this column is derived primarily from a section of the USGS's website titled "Principal Aquifers of the United States" (www.usgs.gov). The five groups of aquifers classified by the USGS are:

U.S. Region	Geologic Situation and Aquifer Group	Ranges in Hydraulic Characteristics of Dominant Aquifers			
		Hydraulic Conductivity		Well Yield	
		gpd/ft^2	m/day	gpm	m^3/day
Mountain valleys in arid western United States	Mountains with thin soils over fractured rocks, alternating with narrow alluvial and, in part, glaciated valleys (sand and gravel over igneous/metamorphic)	0.007–400	0.0003–15	10–100	50–500
Alluvial basins in arid western United States	Thick alluvial deposits in basins and valleys bordered by mountains (sand and gravel)	700–10,000	30–600	100–5,000	500–30,000
Basalt plateaus in arid northwest United States	Thick lava sequences interbedded with unconsolidated deposits and overlain by thin soils (igneous/metamorphic)	8,000–70,000	200–3,000	100–20,000	500–100,000
Plateau region of arid west-central United States	Thin soils over fractured sedimentary rocks (sandstone and carbonate)	700–7,000	30–300	10–1,000	50–5,000
High plains of semi-arid central United States	Thick alluvial deposits over fractured sedimentary rocks (sand and gravel; sandstone and carbonate)	700–7,000	30–300	100–3,000	500–20,000
Nonglaciated region of humid central United States	Thin regolith over fractured sedimentary rocks (sandstone and carbonate)	70–7,000	3–300	100–5,000	500–30,000
Glaciated region of humid central United States	Thick glacial deposits over fractured sedimentary rocks (sand and gravel; sandstone and carbonate)	40–7,000	2–300	50–1,000	300–3,000
Mountain ranges of humid eastern United States	Thick regolith over fractured crystalline and metamorphosed sedimentary rocks (igneous and metamorphic)	0.02–20	0.001–1	50–500	30–3,000
Atlantic and Gulf of Mexico humid coastal plains of United States	Thick layers of complex mixtures of clay, silt, sand, and gravel over bedrock (sand and gravel; sandstone and carbonate)	70–70,000	3–3,000	100–20,000	500–100,000
Alluvial valleys along major streams throughout United States	Thick sand and gravel deposits beneath floodplains and terraces of streams (sand and gravel)	700–40,000	30–2,000	100–5,000	500–30,000
Note that all values have been rounded to the next significant figure; and an average thickness of approximately 16.4 ft (5 m) is used as the break point between thick and thin.					

Table 1. Aquifer Groups

***Aquifer Types** continued on next page*

Aquifer Types continued from previous page

- Unconsolidated and semi-consolidated sand and gravel aquifers
- Sandstone aquifers
- Carbonate-rock aquifers
- Aquifers in interbedded sandstone and carbonate rocks
- Aquifers in igneous and metamorphic rocks.

As discussed in Table 1, these aquifer groups are not unique to North America, and the classification or grouping system can be extrapolated (with modifications) to other areas of the world.

Unconsolidated and Semi-Consolidated Sand and Gravel Aquifers

Unconsolidated sand and gravel aquifers are grouped by the USGS into four categories: basin-fill or valley-fill aquifers; blanket sand and gravel aquifers; glacial-deposit aquifers; and stream-valley aquifers. All four categories have intergranular porosity (open spaces between the sediment grains).

Most of the important unconsolidated and semi-consolidated aquifers were deposited by rivers and streams transporting and depositing sediments in relation to the energy of the stream. The amount of energy contained within a fluvial system during deposition is a function of the velocity and volume of flow.

The flow regimes within a stream are highly variable—ranging from laminar to turbulent—and these variations lead to the deposition of a wide variety of sediment types and sizes. Stream (alluvial) systems commonly have gravels deposited adjacent to silts and clays because the stream channel has migrated over time.

Unconsolidated aquifers can range from more than 3000 feet (1000 m) in thickness in some deep basins to a few feet in the case of glacial outwash aquifers or valley-fill alluvial aquifers located in mountain valleys. So, when we are working with unconsolidated aquifers the thickness can vary greatly.

Basin-Fill Aquifers

Basin-fill aquifers are located in areas that have significant topographic relief where materials from adjacent mountains were eroded, transported, and deposited in valleys adjacent to the mountains.

In the western United States, these basin-fill deposits are found in the Basin and Range Province (an area extending from Nevada to the western portion of Utah and into Arizona and southeastern California). The basin commonly is contained between two mountain ranges that are bounded by faults (Figure 1).

Quite often these basin-fill aquifers are bounded by less-permeable bedrock aquifers. As noted in Figure 1, the basins are formed by horst and graben structures where a horst is an upthrown block of rock and a graben is a downthrown block

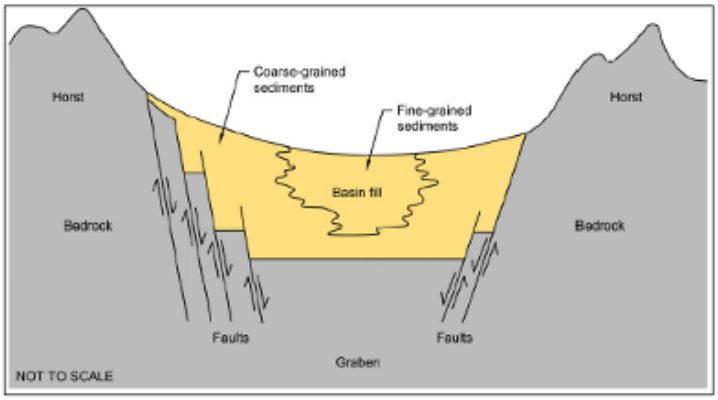


Figure 1. Cross section of a typical basin-fill aquifer (USGS).

and the sediments are primarily derived from the adjacent bedrock.

The dominant sediments that comprise basin-fill aquifers are derived from alluvial processes, primarily by streams that flow from the adjacent mountains into the basins. Basin-fill aquifers typically are deposited as alluvial fans at the base of the mountains. The coarser sediments (boulders, gravels, sands) are deposited near the basin margins, and finer sediment (fine sands, silts, clays) are deposited in the central parts of the basin.

Fine-grained deposits of silt and clay that act as confining layers can be interbedded with sand and gravel between the center and edges of the basin, depending on the rate of basin subsidence in relation to the rise of the adjacent mountains. In basins that contain thick sedimentary sequences, the sediments become increasingly more compacted and less permeable with depth. Figure 2 is a block diagram of closed and open basins.

In the centers of alluvial basins, lakes or playas may exist because the valley bottom is a groundwater discharge area, or they could be remnants of glacial lakes that occurred from the greater precipitation that occurred during the

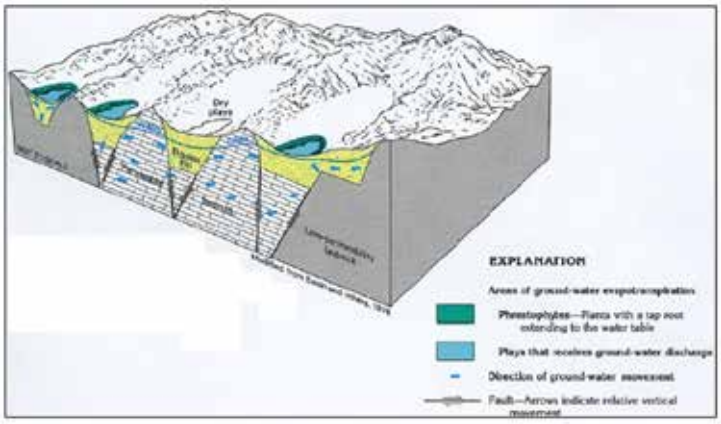


Figure 2. Diagram of closed and open basins in Basin and Range Province (USGS).

Aquifer Types continued on next page

Aquifer Types continued from previous page

Pleistocene age. Due to relatively high evaporation rates relative to precipitation, the basins may have deposits of salt, anhydrite, gypsum, or borate. These minerals are produced by evaporation of mineralized groundwater and surface water.

Two types of hydrologic settings are most common in alluvial basins. One type is a closed system where surface water does not exit the basin and all inflow to the basin evaporates. A second type is an open basin where the streams or groundwater exit the basin.

Valley-Fill Alluvial Aquifers

Valley-fill alluvial aquifers typically are shallow aquifers that are adjacent to and beneath streams and rivers. A diagram of the lower Mississippi River Valley is shown in Figure 3.

The degree of material sorting occurring in a particular stratum is dependent on the energy of the river. Coarser-grained sediments generally are interbedded with finer-grained materials, resulting in complex mixtures of sediment grain sizes. In many cases, continental glaciation has influenced the size of the alluvial valley; increased water flows during glaciation eroded the valley walls and thus enlarged the valley. When the meltwaters ceased, a valley much larger than could be formed by the current stream system occurred in the valley.

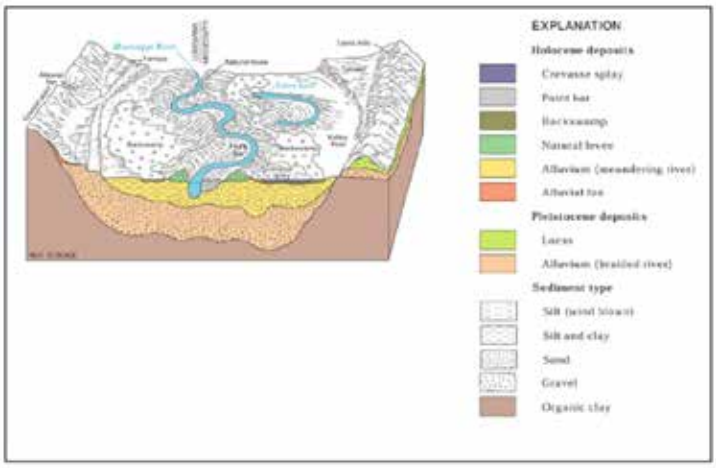


Figure 3. Typical cross-section of a valley-fill aquifer (USGS).

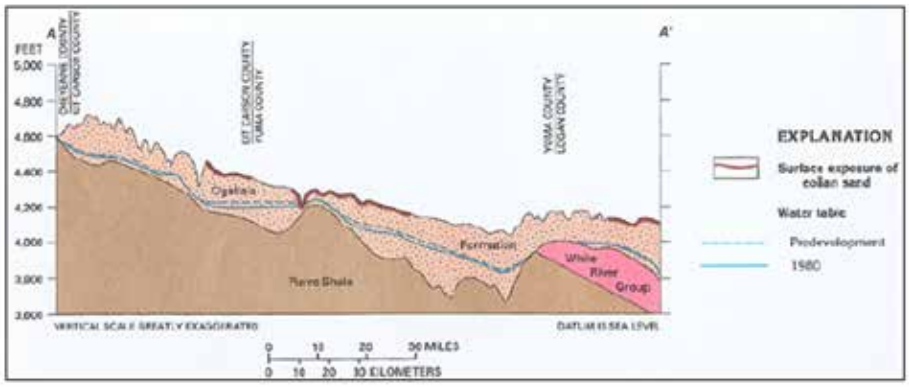


Figure 4. Cross section of blanket-type sand and gravel aquifer—Ogallala Formation of eastern Colorado (USGS).

Within these large valleys the streams meander, resulting in complex depositional patterns where coarse- and fine-grained sediments are interbedded. Valley-fill aquifers generally are unconfined to semi-confined and are hydraulically connected to the associated stream or river. Given their location in river valleys, these aquifers can be in local to regional groundwater, discharge areas from the greater valleys they occupy.

Blanket Sand and Gravel Aquifers

Blanket sand and gravel aquifers typically consist of alluvial deposits that result from the erosion of adjacent uplands and can extend great distances from their respective source areas. These aquifers can range from relatively thin deposits to thick deposits such as the High Plains Aquifer (Ogallala Formation) (Figure 4) that is located in the west-central portion of the United States.

Blanket sand and gravel aquifers generally are unconfined at shallow depth but can be locally confined where they contain silt and clay deposits. Because many of these aquifers are shallow, they respond seasonally to changes in precipitation and to pumping stresses. It should be noted that the Ogallala Formation is highly heterogenous and that the eastern portions of the formation are fine grained.

Coastal-Plain Aquifers

Coastal-plain aquifers are formed adjacent to the oceans where sediments from bordering highlands are deposited as alluvial deposits on land and in shallow marine environments. Sediments primarily consist of semi-consolidated sand, silt, and clay, interbedded with some carbonate rocks.

Coarser-grained materials, such as gravels and coarse sands, generally are deposited near sediment source areas and the amounts of silt and clay in a deposit increases near the coast. Coastal-plain aquifers generally form thick wedges of sediment that dip and thicken seaward. The coastal Florida aquifer system, where an unconfined surficial aquifer system of sediment and carbonate rocks overlie a thick confining unit, is shown in Figure 5.

Complex interbedding and variations in lithology are found in coastal-plain aquifers as a result of varying depositional environments induced by changing sea levels. Some aquifers are thick and continuous for hundreds of miles, others are local in extent.

As is the case in some regional aquifers. direct precipitation on outcrops and streams that cross the outcrops are the sources of recharge to coastal-plain aquifers. Recharge moves downgradient and down-dip in the aquifers toward the coasts. As shown in Figure 5, groundwater becomes confined

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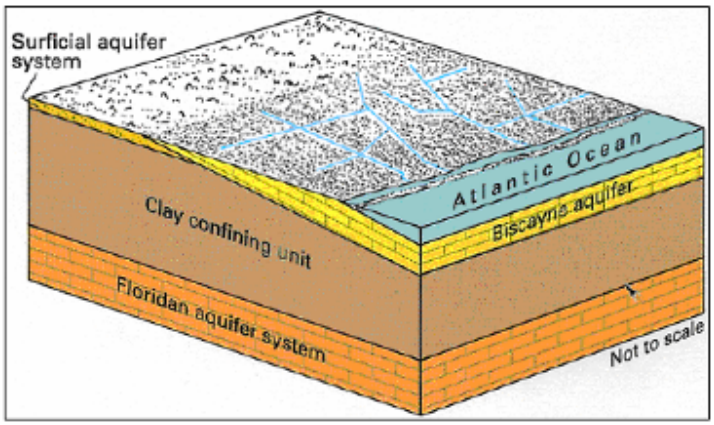


Figure 5 Block diagram of coastal-plain aquifer, Florida aquifer system (USGS).

beneath the clay, silt, and shale beds of younger formations that overlie the deeper aquifers.

Glacial-Deposit Aquifers

Glacial deposits cover approximately 8% of the earth's surface and significant portions of the Northern Hemisphere (more than 25%) and can vary in thickness from thin veneers a few feet thick to more than hundreds of feet thick in thickness.

These types of deposits can be complex from a depositional perspective and sediments types can vary significantly within short lateral and vertical distances. This high variability is due to fluvial-ice interactions and depositional processes occurring beneath, within, on top of, or adjacent to the ice sheet (Figure 6).

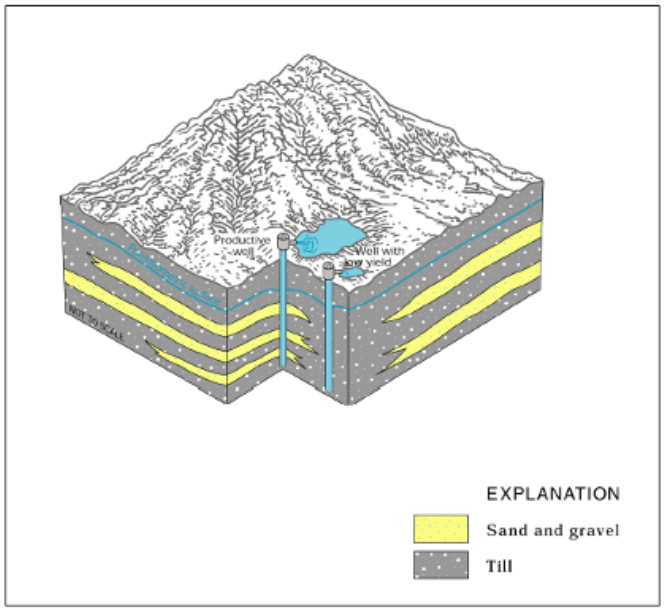


Figure 6. Diagram showing variability within glacial deposits (USGS).

As the ice melts at the front of the glacier, coarse-grained sand and gravel outwash sediments are deposited. Meltwaters form streams that create fluvial deposits similar to valley-fill aquifers. Often regional aquifers are formed in bedrock valleys or are in sheet-like deposits on outwash plains.

Thick deposits of clay, silt, and fine sand accumulate in lakes that are in front of the glacier, which can act as local confining units where they overlay sand and gravel beds. A buried stream valley covered by glacial till is shown in Figure 7.

Figure 7. Block diagram of glacial outwash aquifer (USGS).

Large glacial-deposit aquifers can be buried beneath till, glacial-lake deposits, or shallower sand and gravel aquifers. During ice advances, glacial till often is deposited on top of the glacial-deposit aquifers of the previous ice-age event. Glacial tills are geologic materials that are deposited directly by a glacier without re-working by meltwater. Tills consist of mixtures of clay, silt, sand, gravel, and boulders ranging widely in size and shape. Due to their fine-grained nature, the tills deposited by continental glaciers generally are not considered to be significant sources of groundwater.

Aquifers in the sand and gravel of glacial outwash plains typically are exposed at the land surface and receive direct recharge from precipitation. Water in the upper portions of these aquifers discharges to local streams, lakes, or wetlands. Water in the deeper parts of the aquifers generally discharges to intermediate or regional groundwater discharge area, depending on the relative topography of the area.

Flatter topography results in regional flow systems; more topographic relief relative to the thickness of the deposits produces local groundwater-flow systems.

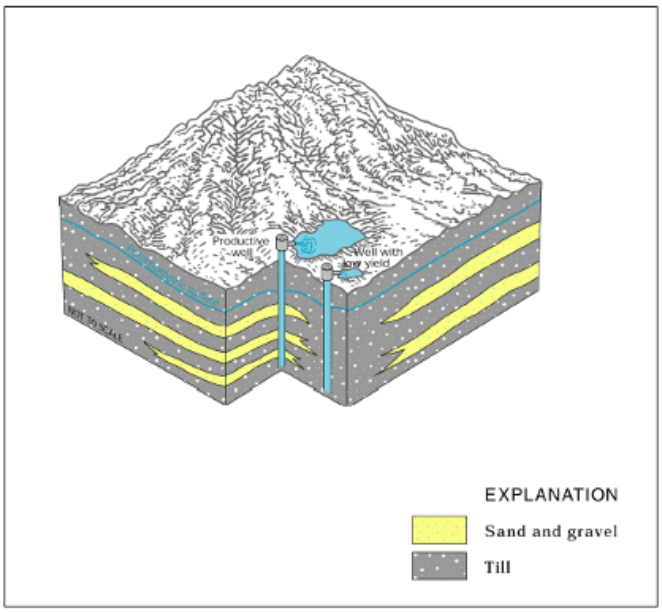


Figure 7. Block diagram of glacial outwash aquifer (USGS).

THREE FIELDS OF SCIENCE THAT CAN INFLUENCE THE LIFE CYCLE OF A WATER WELL: PART II: CHEMISTRY

By Roger Miller

Wet chemistry uses classical methods such as observation to analyze materials. It is called wet chemistry since most analyzing is done in the liquid phase. Photo courtesy Water Systems Engineering Inc.

The scientific field of chemistry contributes in many ways to the life cycle of a water well. From the capacity losses associated with mineral deposition, through degradation of the well structures by corrosion activities, to unacceptable changes in water quality from aquifer fluctuations and deposit buildup—chemistry is in action.

The nature of groundwater chemistry is in many ways directly associated with geology. The basic water-to-rock relationship contributes to the water chemistry through the activities of solubility, oxidation, reduction, and weathering.

When groundwater is recharged by its many sources, these activities are producing a multitude of changes from its atmospheric composition. This process of migration and the nature of its path is the creation of groundwater chemistry.

Universal Solvent

Water is commonly referred to as the universal solvent. With respect to groundwater, this is especially accurate as it flows through the subsurface—dissolving various minerals. The dissolution yields charged structures known as cations (positively charged) and anions (negatively charged).

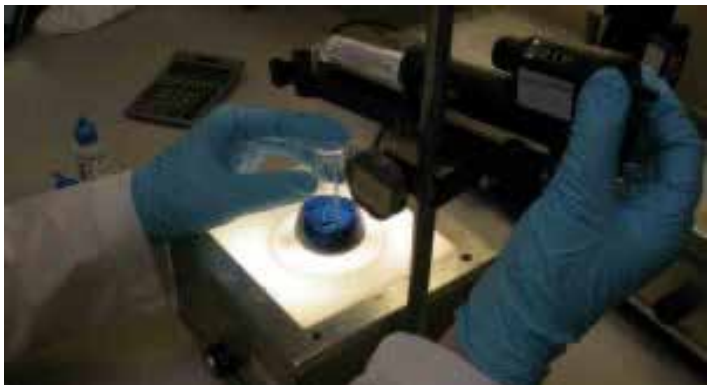
Common mineral cations present in groundwater are calcium, magnesium, manganese, and various forms of iron. Common water anions include carbonates, bicarbonates, sulfates, and hydroxyls.

A simplistic explanation of the importance of these ions in groundwater is that under certain conditions they will come together to form compounds such as the common calcium carbonate, calcium sulfate, or iron oxide/oxyhydroxide.

Many of these compounds are insoluble and will precipitate out in or around the well, blocking flow paths and causing the referenced loss of capacity. In addition to this concentrating effect in and around the well, it provides the potential for compounds to re-solubilize, increasing the concentrations of the ions in solution and effecting the produced water quality.

Albert Einstein's mentor Ernst Mach said, "The essence of science is measurement." Accordingly, a water chemist has the ability to evaluate groundwater chemistry and predict the potential of a well to foul over time from mineral deposition.

To that point, the field of water chemistry has defined the prominent water mineral cations of calcium and magnesium as "water hardness." These are the ions most available to pair with the carbonates and bicarbonate ions to form mineral precipitates such as calcium carbonate. Hardness levels of 0-60 mg/L are classified as soft; levels from 61-120 mg/L are moderately hard; levels of 120-



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180 mg/L are hard; and water with a hardness greater than 180 mg/L is classified as very hard.

Water alkalinity is a measure of a solution to neutralize acids. In well water, alkalinity is primarily a measure of the common anions of carbonate/bicarbonate. Bicarbonates represent the major form of alkalinity in natural waters; its source being the partitioning of carbon dioxide from the atmosphere and the weathering of carbonate minerals in rocks and soil. Other ions contribute to alkalinity such as hydroxides, phosphates, and silicates but carbonates make up approximately 90% of the reading.

It is important to note the alkalinity is strongly related to the measurement of pH (hydrogen ion concentration) as various forms of alkalinity are only present at certain pH levels. Therefore, from the measured values of these structures we can predict the formation of compounds such as calcium carbonate which requires alkalinity of >150 mg/L and hardness of >180 mg/L with a neutral pH value.

Digital titration allows for the distinguishing of subtle differences in the water chemistry. All photos courtesy Water Systems Engineering Inc. unless otherwise noted.

In conjunction with these mineral deposits is the formation of iron and manganese scales from the chemical reaction of oxidation. The presence of these metals is common to the subsurface as iron makes up about 5% of the earth's crust and manganese about 0.1%.

Common iron and manganese-related rock structures are hematite (iron oxide) and pyrolusite (manganese oxide) and soluble iron can be present in aquifer waters of these structures. The oxidation of these metals is the chemical reaction that presents them as insoluble and allows for their precipitation in and around the well.

This chemical reaction can occur with natural aquifer waters that are oxidative or can be caused by aeration of the flowing water from voids in the casing or drawdowns below the screens.

The mere presence of iron in a water sample is limited in its evaluation without knowing its oxidation state or even its origin. A single total iron test often fails to fully determine the variety of iron species present.

Knowing these different phases of iron can identify the potential for iron to fall out within the well as fouling deposits together with iron that is the result of active corrosion, iron that has been chemically oxidized, or even iron that is organically mobilized from potential bacterial influences.

A total iron test analyzes for both ferrous and ferric iron for a measure of the total iron in the sample. Ferrous iron can represent iron just released from a surface, indicating corrosion.

Upper casing exhibiting active corrosion as a result of the backflow of chlorinated water into the well. Photo courtesy Ned Marks, Terrane Resources Co.

Also, this dissolved phase of iron can reflect native background iron within the aquifer. The ferric state is iron that has been further oxidized, rendering it as insoluble and allowing for precipitation and deposition in and around the well. Total iron levels above 1 mg/L is an indication that iron precipitation may be occurring within the well.

Destructive Corrosion

The second water chemistry influence on the life cycle of a water well is the destruction of the well itself through the activity of corrosion. The term "corrosion" is defined as the deterioration of a material due to interaction with its environment. This chemical reaction is one of the most prominent factors that can influence the life cycle of a water well as it can affect the structural integrity of the well itself along with resulting capacity declines and even water quality issues.

The chemical-based corrosion process is an electrochemical action involving the movement of electrons from an anodic

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area to the cathodic area through the metallic pathway. Most metals used in water well construction are good conductors of electricity, allowing for easy movement of these electrons.

Careful attention to reactions helps in identifying the nature of water chemistry changes. These reactions mimic what's occurring downhole.

The anodic area where the electrons are initially released is the site of corrosion and metal damage. The water in the well is the electrolyte which provides the reactants for the flow of metal ions.

Most corrosion reactions in nature are electrochemical or common oxidation-reduction processes where oxidation occurs at the anode and reduction occurs at the cathode.

General corrosion is an attack of the metal that is distributed evenly over the complete surface. The electrochemical corrosion cell is usually represented by small anodic sites all over the metal surfaces and is generally referred to as uniform rust.

Galvanic/dissimilar metal corrosion is the electrical potential difference between different metals when they are in contact with an electrolyte, the water in the well. The Galvanic Series shows the less noble metals as the anodic and the more noble metals as the cathodic. Therefore, the anode gives up the metal ions to the cathode and by doing so degrades in the corrosion reaction.

Concentration cell corrosion, sometimes referred to as under deposit corrosion, is the activity of the electrochemical reaction occurring in a concentrated area of the metal surface. This reaction results in localized pitting of the metal and is noted as the most rapid and damaging type of corrosion of structures and equipment in the groundwater industry.

Testing multiple split samples allows for the evaluation of reactions from various types of treatment chemicals such as disinfectants or descalers.

Crevice corrosion is another form of localized attack that occurs in areas of well construction such as threaded pipe joints or gasketed flanges. In these areas, narrow gaps between two metal surfaces create contact with the water, or electrolyte, and provide the pathway for initiation of localized corrosion. Due to the pressures created in these areas by the buildup of corrosion byproducts, corrosion cracking lof the metal occurs, creating further degrading of the well components.

The process of well degradation by corrosion also includes microbial induced corrosion (MIC), which will be discussed next month as this series wraps up by discussing the science of microbiology.

As noted previously, the ability to measure the potential of corrosion reactions is the key to well construction, operation, monitoring, and maintenance. The common corrosion evaluations in the water industry is the Langelier Saturation Index and the Ryznar Stability Index. In both cases, calculated index values are first used to determine if the water is scale forming or not, with the latter used as an indication of the potential for corrosion.

Langelier based his index on water chemistry values of temperature, TDS (total dissolved solids), calcium concentration, total alkalinity, and pH value. Ryznar modified the Langelier calculation to what he considered a more reliable prediction by incorporating actual field results of scale formation and corrosion damage into his research.

A less involved measure of simple oxygen-induced corrosion which is historically fast and reliable is what our lab refers to as the "Nail Test." This test utilizes a low carbon steel nail and

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the actual aquifer water placed in a glass container for visual observation. If the water around the nail turns a pink color within a few hours, the water is corrosive when influenced by oxygen. Even the activity of iron bacteria can be identified with this test.

The loss of structural integrity to the well is the key influence corrosion has on the life cycle of a water well. However, with corrosion damage to the components of a well such as casings or screened intervals, water flow dynamics can change.

A hole in the casing caused by corrosion can provide a source of aeration to the water which in turn can produce a more corrosive water, increasing the potential damage to the lower portions of the well.

Additionally, a hole in the screened interval of a well can allow for higher velocities through these voids which can mobilize sand particles, not only creating an undesirable production of sand in the flowing water but also the erosion effect of the sand can further damage the screened area. These issues can result in capacity declines and alteration of water quality that are additional influences on well life.

Changing Quality

The last water chemistry area noted to influence the lifecycle of a well is change in water quality. The initial process of well design, site selection, operation, and subsequent water treatment processes handle the water quality issues up front. However, in some situations the water quality can change over time, presenting the well owner with the evaluation of correcting the changes or abandoning the well—both significant and often costly life cycle decisions.

The prominent quality changes over time are generally associated with aesthetics such as taste, odor, and color. In general, groundwater chemistry should be fairly stable with only slight variations. Fluctuations of greater than 10%, depending on the chemical parameter, can signal changes within the well that are affecting water quality such as deposition of minerals or the byproducts of system corrosion.

The control of the chemical parameters are not regulated by the Primary Drinking Water Regulations but recommended by the Secondary Drinking Water Standards and of course the demands of the customer base.

As noted in the Secondary Drinking Water Standards, water taste can be influenced by elevated levels of most metals and a low pH value resulting in a metallic taste. Similarly, elevated levels of chlorides and sulfates can also cause a salty taste to consumers.

Water color is generally influenced by copper as a blue-green stain, iron as a reddish orange stain, and manganese as a brown or black stain.

The prominent odor in groundwater in this series is the rotten egg smell generated by hydrogen sulfide. As will be explained in the future article in this series on microbiology, the primary process for the creation of hydrogen sulfide is bacterial in nature.

This process is generally the anaerobic decomposition of organic compounds containing sulfur by sulfate-reducing bacteria capable of converting sulfate to sulfide. The chemical process for the creation of hydrogen sulfide is relatively rare and is based on the reaction of either oxidation or reduction. The presence of this reaction is generally found in deep well settings where the ions of sulfur are stable, and the presence of bacteria is lower.

The decline in water quality from any of these issues can result in the inability to produce acceptable water to the customer base and must be addressed from the economic standpoint of repair or replace the well.

The three primary influences of water chemistry (material deposition and resulting loss of capacity, structural decline of the well itself through corrosion, and adverse changes in produced water quality) represent the uniqueness of the specific well setting and the potential effects of its operation.

Effective monitoring of the water chemistry produced from the well can assess these conditions and provide for changes in operation, proper maintenance, and treatment to maximize the life cycle of the well.

MARKETING MATTERS:
ARE YOU A COW OR A BUFFALO?

By Tara Schessler, In Time Creative

I recently heard this story on a podcast and had to Google it. Here is what I found:

"In his book, Take the Stairs: 7 Steps to Achieving True Success, Rory Vaden explains a phenomenon observed frequently on the Colorado plains, which are home to cow and buffalo alike. When storms approach, the two animals react in opposite ways. Cows will start moving away from the approaching storm–actually traveling in the same direction as the storm. Buffalo, however, will move toward the storm, rather than away from it.

Consequently, by running into the storm, the buffalo experience the pain of the storm sooner because they charge at it. The duration of the storm, however, is less because they keep moving through it. Contrast that to the cows, which hope to run away from the storm. The storm inevitably catches them and they experience its painful forces for a longer duration because they are traveling in the same direction."

LifeThought: Be like a Buffalo, not like a Cow

by Bruce on March 10, 2014 in LifeThoughts

LifeThought: Be like a Buffalo, not like a Cow - Bruce Van Horn

You can apply this phenomenon to obvious life situations: face your fears, take challenges head on, don't run away from tough situations. But let's apply this to sales and marketing, shall we?

The Danger of Unrealistic Expectations in Marketing!

There are numerous directions business owners and marketing managers can implement to elevate their new customer base and revenue. But often, the expectation from a business owner with any marketing approach is: It should begin working immediately! This is often unrealistic and is the marketing consultant's job to manage these expectations. Agreeing on the strategy is one thing, understanding when you will see a return on your investment, is another.

So how does this relate to cows and buffalo?

As a business owner, when thinking about your marketing, I'd encourage you to think and act like a buffalo. If you charge at the storm (the problem) and let your marketing approach reflect dedication, determination and consistency, you will break through the storm faster and build a stronger company in the long run.

When the storm comes (and they will), acting like a buffalo will help you capture new growth quicker by staying the course with a solid and proven method that is right for your product or service. Be the buffalo.

If you try a marketing program or strategy with immediate returns in mind, you likely will continue to weather the pains of lower R.O.I. longer, because you keep trying to avoid the storm. This approach will cause you more pain in the end and will teach you nothing about what works best for your business. Be the buffalo.

While you may be motivated to try new things to get immediate results, you will likely fall short of your revenue goals in the long run. To repeat, there's no way around the storm so trying to avoid or run away from it will inevitably prolong the discomfort. Constantly changing or switching approaches (to avoid the storm) will likely end up costing you more in the end. Be the buffalo.

Bonus Business Bites:

This cow vs. buffalo concept is an amazing training opportunity for your staff and team. How can you apply this tool to enhance customer experience, new business opportunities and sales? A team of consistent buffaloes will help you reach your business goals. Happy herding.

Sincerely,

Tara Schessler
TV Local Sales Manager,
Digital Sales Manager

Matthew J. Harter
TV Senior Account
Executive & Digital
Strategist

NOW AVAILABLE!
WWWA CLASSIFIED ADVERTISEMENTS

By Hope Vandenhouten, WWWA Coordinator

As a membership benefit, WWWA has a Classified Ad section of the website. For FREE, WWWA members may post used equipment or surplus product on this section of the website, and all visitors to the WWWA website.

Classified Ad Details:

- Non-members may post at $175 per posting, payment required prior to posting.
- Postings are limited be limited to 250 words + contact information/details.
- Posts may have up to four (4) images/photos included.
- Posts are published for up to 30-days or until they're sold, whichever comes first.
- WWWA office has full editing rights on posts.
- WWWA office has full discretion of whether or not a post is published.
- Posts are intended to offload used or over purchased equipment and product.
- Posts are not intended for sale of new items.

2023 VIRTUAL CONTINUING EDUCATION PLATFORM

VIRTUAL CONTINUING EDUCATION

Registration is open for the 2023 Virtual Continuing Education Platform! All courses MUST be completed by 11:59PM to be valid for renewing your 2024 license/s.

Courses are broken down into hour-long segments, giving you the freedom to complete one hour individually on a rainy afternoon or do three hours of education over a weekend.

You are also able to see your completed credits in real-time and print off completion certificates immediately after finishing your course.

Pump Installer, Well Driller, and Heat Exchange Well Driller are currently being offered.

CE SESSION COUNTS

as of 10/21/22

IN-PERSON		ONLINE
2023 Annual Conference	212	124 *as of 4/12/23*
Wisconsin Dells	132	
Green Bay	72	
Stevens Point	73	
Madison *(October 3, 2023)*	4 *as of 4/12/23*	

To get started sign up online and pick the courses that interest you! Check out the courses we have to offer this year below:

DNR Program Updates

Marty Nessman

1 = PI; 1 = WD; 1 = HE

This session will cover updates on the Private Water Supply Section and how they affect licensed drillers, pump installers and rig operators. Specific updates on staffing, code revisions and other relevant information will be discussed.

Grouting and Placement

Jim Hutmacher, CWD PI

1 = PI; 1 = WD; 1 = HE

This session will cover all types of grouting, sealing, and decommissioning wells using all products used currently in the water well industry.

Seen and Unseen Flow in Wells

Dave Hart, PhD

1 = PI; 1 = WD; 1 = HE

Even in wells that aren't being pumped or flowing artesian, water can be moving between aquifers. This can create problems, especially if water is flowing from an aquifer with poor quality water into an aquifer with high quality water. In this presentation, we'll look at some examples of flow, how it's measured, why it happens.

Groundwater Industry Update – A Look at the Rules and Regulations Affecting YOUR Industry

Jeff Beiriger, Government Relations Advisor, Wisconsin Water Well Association

1 = PI; 1 = WD; 1 = HE

The groundwater industry is a highly-regulated industry. And why wouldn't it be, given its importance. Simply stated, public health and safety is a priority for every citizen. This session will look at all of the various regulations and talk about what's new and how those changes affect your business and your customers.

Drill Bits and Pump Pieces

Dick Milaeger

1 = PI; 1 = WD; 1 = HE

The Drill Bits portion of the presentation will discuss present and past challenges in the drilling business, successes, and failures, drilling obstructions. The Pump Pieces portion of the presentation will cover issues and failures of pumping equipment, challenges with failures, fishing and production.

WI DNR American Rescue Plan Act (ARPA) Well Compensation Grant Program

Aaron Kent, Sandy Chancellor & Emily Mitchell

1 = PI; 1 = WD; 0 = HE

This on-demand session will provide an overview of the WI DNR American Rescue Plan Act (ARPA) Well Compensation and Well Abandonment grant Program. Information will be provided regarding eligibility criteria and the application and grant award process. This information will familiarize licensed well driller, pump installer and rig operators with the program which will be helpful for those who have clients who meet program eligibility.

***Continuing Education** continued on next page*

Sandstone Aquifers: Their Evolving Hydrogeology and Role in Regional Hydrology

Eric Hiatt, PhD

1 = PI; 1 = WD; 1 = HE

Wisconsin's sandstone aquifers have highly variable hydrologic properties. These sandstones provide opportunities to demonstrate fundamental processes that sand, and sandstones undergo in the evolution of aquifer properties. This course is designed for professionals who are not geologists or experts in sedimentary rocks, and it will highlight the factors that control the distribution and aquifer properties of sandstones.

POWTS & Wells 201 – The Impact of Septic System Density

Elizabeth "CeCe" Rudnicki

1 = PI; 1 = WD; 0 = HE

In 2022, CeCe's presentation covered the basic concepts of wastewater recycling and a discussion about how SPS 383 addresses methods for protecting drinking water supplies including setbacks and regulations. The 2023 presentation will use the SWIGG study and the UWSP Groundwater Quality Viewer to focus specifically on what types of groundwater issues we see in Wisconsin and how septic systems density can create a problem for well water.

Why are Wisconsin's Karst Aquifer so Vulnerable to Contamination?

Maureen Muldoon, PhD

1 = PI; 1 = WD; 1 = HE

Maureen started her career with the WGNHS in 1987. In 1998 she moved to UW-Oshkosh for 21 years where she was a professor of Geology. She has recently returned to the WGNHS where she conducts research that focuses on applied groundwater questions throughout Wisconsin. Her interests include investigation of groundwater quality and flow in carbonate rocks, relationship between geology and hydraulic properties, land-use impacts on groundwater quality, and delineation of wellhead protection zones. She is a licensed professional geologist and hydrologist in Wisconsin.

OSHA Procedures and Trenching Emphasis Program

Mary Bauer

1 = PI; 1 = WD; 1 = HE

This session with provide an explanation on how OSHA prioritizes job sites inspections and what happens when we conduct inspections. Trenching hazards will be discussed along with the standard to prevent trench collapses. Other hazards relating to digging or drilling will be discussed.

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IN MEMORIUM

JEFFREY KUHN

June 24, 1948 - January 3, 2023

The industry has lost a friend and a leader. Jeffrey Richard Kuhn, 74, of Oconomowoc, entered Eternal Life on Tuesday, January 3, 2023, after a long battle with cancer.

Jeff was a Master Plumber and was President of S & K Pump & Plumbing until his retirement in 2019. As a volunteer leader, he did just about everything a person could do, serving at the local, state and national levels. He is a past president of the Plumbing and Mechanical Contractors Association, Plumbing Contractors of Southeastern Wisconsin, and PHCC of Wisconsin. He also served as a National PHCC director, a QSC director, and a director on MCAA's Plumbing Contractors special interest group. Jeff also served as a member of the Wisconsin Plumbing Advisory Code Committee and the Wis-consin Plumbing Apprenticeship Advisory Committee. He also led several ef-forts to preserve and protect the state's plumbing license.

Most important to him, Jeff had strong family ties. He is survived by his wife of 40 years, Pamela Kuhn; children, Jennifer (Brant) Haenel, Kimberly (Paul) Wirth and Steven (Brienne) Kuhn; grandchildren, Kyle (Raven), Sydney, Lucas, Noah, Avery, Sam, Fynn, Claire, and Olivia; and great-grandson, Levi. He is preceded in death by daughter, Lori Moll; parents, Marilyn and Helmut Kuhn; and brother, Ronald Kuhn. Jeff was born June 24, 1948, and a graduate of Wauwatosa West High School Class of 1967. An avid water skier, hunter, fisherman and golfer, Jeff loved time at the lake and enjoyed his community in Fountain Hills, AZ after retirement.

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There are countless benefits to being a dues-paying member of the WWWA. While many are intangible, WWWA members receive discounted event registration, including registration for Continuing Education and the option to participate in special 'member-only' perks like the annual scholarships, contributions to the tri-annual *Well Log* and more.

Please visit www.wisconsinwaterwell.com to find a more detailed listing of membership benefits and details on the networking and educational opportunities coming in 2023.

The Board of Directors hopes that 2023 will continue to be a strong membership year with many returning and new members who will help the WWWA fight for what's good and right – ***Water the Wisconsin Way: Fresh. Clean. Safe.***

Dues to the Wisconsin Water Well Association are not deductible as charitable contributions for federal income tax purposes, but may be deductible as ordinary and necessary business expenses. The percentage of your 2023 dues that represents non-deductible lobbying costs is 30%

We hope to have your support!

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- ☐ Manufacturer Rep
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2102 E. Springs Drive, Madison, WI 53704

January 17-18, 2024

2024 Annual Conference
Kalahari Resort and Convention Center
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