Ohio EPA Test Results April 2004

April 2004 High Scores

Gary Evans Water Supply III
Gerald Robison Water Supply II
Scott Brown Water Supply I
David Ashworth Water Supply I
Lyndon Johnson Water Supply I
Bradford Ady Water Supply I

Karen Kovolo Wastewater III
Gary Agler Wastewater II
Charles Dahlgren Wastewater I
John Miller Water Distribution II
Scott Damman Water Distribution I
Thomas Madej Collection System II
Jon Brenneman Collection System I

Water 1

Aaron, Kevin S
Ady, Bradford H OIT
Allen, Eric C
Angel, Justin R OIT
Ashworth, David M
Barron, Tina OIT
Bayus, David E OIT
Benedict, Brian D OIT
Blair, Lisa A OIT
Bodnar, Kenneth C OIT
Brown, Scott A OIT
Carper, William I
Chaney, Michael V OIT
Cotterill, Jeffrey B
Cousins, Devin W OIT
Cramer, Paul E
Darr, Tyler J
DeMarge, Donald P
Donat, Gary D
Eckman, Tim T
Etzkorn, Mark A
Frederick, Josh L
Fulcher, Noble A OIT
Green, Christopher A OIT
Hartung, Christopher T OIT
Hemmelgarn, Lawrence H
Hershberger, Randi R
Hintz, Marcia A OIT
Johnson, Donald J OIT
Johnson, Myron V
Johnson, Lyndon OIT
Jones , Allen L
Joyce, Richard A
Keith, Arthur E OIT
Kimball, Jesse N OIT
Krsul, Joseph M OIT
Leeder, Clifford J
Lenzo, Kevin M
Manger, Brian S
Martinson, Donald J
McNeely, Andrea J OIT
Meek, Brent M
Meyer, Rex A
Michael , Larry E
Moore, Roy V OIT
Mount, Daniel W OIT
Oaks, Carole L
Peoples, Matthew C OIT
Popp, Charles W OIT
Roberts, Gary
Rominger, Marion F
Roth, Daniel G
Santone, Michael R OIT
Scales, Carol S OIT
Schriner, Michael J
Schweitzer, Kenneth D
Shilander, John R OIT
Shumaker, John T OIT
Sibert, Philip E
Smith, Dana J OIT
Stroud, Paul D
Sutter, Stan M
Tackett, Billy A OIT
Taylor, Adam A
Toy, Eugene M OIT
Vance, Jeffrey A
Vlasak, Ronald K
Waldbillig, William M
Warner, Jeremiah R
Woods, David L
Workman, Daniel B
Woss, Adolph G OIT

Water 2

Baglama, Jason A
Becker, Bill L
Boeing, Thomas C
Cipolla, Michael J
Cron, Charles J
Davis, Gary L OIT
Downie, Merle J
Fox, Nathan L
Harden, Larry E
McCain, Berry M OIT
Pry , Neil A
Roberts, Michael L OIT
Robison, Gerald D
Seaman, Jeffrey S
Smith, Ted J
Smith, Michael J
Stobaugh, Alan T
Watts, Ryan E
Wehrkamp, Tim J OIT

Water 3

Abbuhl II, Nile E
Baldwin, David A
Britt-Lesiak, Christie L
Cameron, Jonathan R
Cirelli, Daniel D
Collins, Bradley K. OIT
Eddy, Andreas W
Evans, Gary J
Gundy, Simon J OIT
Hampshire, Keith L OIT
Hellman, Paul A
Johnston , Scot G OIT
Kline, Ken E OIT
Luli, Robert P
Mowell, John A OIT
Musser, Rodney A OIT
Petkova, Rayka H OIT
Rohrbach, James N
Rucker, Marcus
Schumacher, Ted M
Slagle, Chad M
Tracy , Merle V
Turnbull, Patrick A OIT
Vollmar, William M
Wiler, Jeffrey D
Witt, Christopher J
Young, Brett D

Water Distribution 1

Ater, Aaron M
Boggs, William W
Brumfield, Chad A
Burkhart, Bradley S OIT
Byers, Gary P
Creamer, Robert J
Damman, Scott R
Doremus, Steven W OIT
Eubanks, William A
Ferris, David K
Green, Donald K OIT
Hulbert, Brett A
Krebs, Todd A
Lucas, Marvin G
Ludwig, James L
Mays, William M
Neitz, Kevin S
Pape, Bruce E OIT
Piro, Vincent N
Pruett, Thomas O
Roberts, Joel D OIT
Rothgeb, James M
Selogy, Joseph W
Sharp, Timothy J
Stockwell, Jeff C
Vaughn, Chris H
Vollrath, Neil D OIT
Windsor, Raymond L
Winter, Mark A

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Zeedyk, Denver J

Water Distribution 2

Ames, Mikah B
Augustus, Keith J
Bakies, Michael P
Bell, Scott A
Beyerlein, Wayne L
Brafford, Delmas Scott
Burba, Brian M
Cantor, Eric D
Chesser, Jeffrey D
Doebert, Ronald E OIT
Eickhoff, Joel L
Heath, Lance E
Honaker, Eric V
Hunter, James R
King, Robert W
Lytle, Keith A
McDaniel, Christopher L OIT
Miller, John R
Mullen, John A
Orosz, Thomas J
Parsons, Travis W
Rathge, Jeffrey H
Sheridan, Thomas J
Spencer, Brian D
Wagner, Mark G OIT
Wenclewicz, Michael J

Operator Certification Examination Results April 2004

April 27, 2004	Total Number Taking Exam	Total Number Passing Exam	Total Number Failing Exam	Total Number Passing Math	Total Number Passing Theory	% Passing Math	% Passing Theory	% Passing Exam
Collection I	35	19	16	22	24	62.86%	68.57%	54.29%
Collection II	27	17	10	18	23	66.67%	85.19%	62.96%
Wastewater I	214	74	140	109	94	50.93%	43.93%	34.58%
Wastewater II	65	20	45	44	22	67.69%	33.85%	30.77%
Wastewater III	73	20	53	37	23	50.68%	31.51%	27.40%
Wastewater Totals	414	150	264	230	186	55.56%	44.93%	36.23%

April 28, 2004	Total Number Taking Exam	Total Number Passing Exam	Total Number Failing Exam	Total Number Passing Math	Total Number Passing Theory	% Passing Math	% Passing Theory	% Passing Exam
Distribution I	55	30	25	37	34	67.27%	61.82%	54.55%
Distribution II	45	26	19	38	26	84.44%	57.78%	57.78%
Water I	159	72	87	87	93	54.72%	58.49%	45.28%
Water II	53	19	34	21	27	39.62%	50.94%	35.85%
Water III	77	27	50	44	29	57.14%	37.66%	35.06%
Water Totals	389	174	215	227	209	58.35%	53.73%	44.73%

Exam Totals	803	324	479	457	395	56.91%	49.19%	40.35%

Ohio EPA Division of Drinking & Ground Waters List Serve

The Ohio EPA Division of Drinking and Ground Waters is pleased to announce its newest list serve "CMCUinfo". The Chemical Monitoring and Compliance Unit (CMCU) will use this electronic mail service to provide you with quick and timely updates on drinking water monitoring and compliance issues. If you are interested in signing up, please subscribe at **http://www.epa.state.oh.us/ddagw/listserveCMCU.htm** This is a free service and there is no charge for subscribing. The list of subscribers to this list server is private and will not be shared. Please contact Brian Tarver at (614)644-2752 or **brian.tarver@epa.state.oh.us** if you have any questions regarding the mailing list.

Long Term 1 Enhanced Surface Water Treatment Rule

The new Long Term 1 Enhanced Surface Water Treatment Rule (LT1 Rule) will become effective on January 1, 2005 for surface water systems serving a population of less than 10,000. The major requirements of the new rule will be new turbidity standards for filtered water quality and new turbidity monitoring requirements for individual filters. Will your water system be able to achieve compliance with the LT1 Rule when it becomes effective on January 1, 2005? To gain awareness of your water system's ability to achieve compliance with the new LT1 Rule, we recommend taking the following proactive steps:

Steps to take now to be ready for the LT1 Rule

1. **Rules:**
   Become familiar with the LT1 rule. The draft LT1 rule is available on the Ohio EPA website: **http://www.epa.state.oh.us/ddagw/oac.html#draftrules**

The federal version of the rule is available at the following website: **http://www.epa.gov/fedrgstr/EPA-WATER/2002/January/Day-14/w409.htm**

Guidance Documents:
The following guidance document was written for the Interim Enhanced Surface Water Treatment Rule which applies to surface water systems serving a population greater than 10,000 but may also be helpful for the LT1 rule: **http://www.epa.gov/safewater/mdbp/mdbptg.html#turbidity**

Fact Sheets:
The following fact sheets are related to the new LT1 rule and are available on the following website: **http://www.epa.state.oh.us/ddagw/pubs.html**

- General Requirements of the Long Term 1 Enhanced Surface Water Treatment Rule
- Requirements for Conducting An Individual Filter Self-Assessment as Required by the Interim Enhanced and Long Term 1 Enhanced Surface Water Treatment Rules
- Requirements for Conducting A Comprehensive Performance Evaluation as Required by the Interim Enhanced and Long Term 1 Enhanced Surface Water Treatment Rules
- Continuous Turbidimeter Calibration Requirements

New reporting form and instructions:

There will be a new form entitled EPA Form 5109-B which will need to be completed each month. The new EPA 5109-B form and instructions for completing the form are available at: **http://www.epa.state.oh.us/ddagw/pubs.html.**

2. Review combined filter effluent turbidity records for at least the previous 12 months to account for seasonal variations.

   Would the new 0.3 NTU standard in 95 % of the samples have been met each month?

   Would the new 1 NTU standard have been met each month?

3. Install continuous inline turbidimeters on each filter effluent and begin collecting some turbidity samples from each filter. If the inline turbidimeters aren't available yet, take some grab samples from each filter effluent.

   What is the potential for any of the filters to exceed a trigger? Implement process control at the treatment plant.

   Is every treatment process being optimized? Select critical parameters to be evaluated at each step in the treatment process and begin sampling at least daily to ensure adequate treatment at each step. Look at chemical feed rates. Are the dosages appropriate?

5. Evaluate condition of each filter.

   What is the media depth in the filters? Is the media depth uniform throughout the filter? Observe the backwash cycle and calculate the actual backwash rate that is being used. How does the actual backwash rate compare to the backwash meter? Evaluate the duration of a backwash cycle. Is the backwash duration too short? How long does it take for the filter to produce water less than 0.3 NTU after being backwashed?

6. Begin discussing the treatment plant's performance in meeting the LT1 Rule with the mayor and council or the board of public affairs.

   What capital expenses will be

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needed to achieve compliance with the LT1?

7. Consider the need for retaining an engineering firm to assess the plant's capabilities.

The new LT1 Rule will be followed by a proposed Long Term 2 Enhanced Surface Water Treatment Rule (LT2 Rule) which will apply to all surface water systems. The purpose of the LT2 Rule is to further improve control of microbial pathogens and to further address risk-risk trade-offs with the control of disinfection byproducts. The proposed LT2 Rule is expected to be promulgated in the Spring of 2005 with early implementation requirements to collect source water microbial quality data to begin within six months of promulgation (for systems serving a population of at least 10,000) and within 30 months of promulgation (for systems serving a population of less than 10,000). The level of additional microbial treatment which will be required, if any, will be determined based on the source water microbial quality. Ohio EPA has provided comments to USEPA on the proposed LT2 Rule and these comments can be found at the following website: **http://www.epa.state.oh.us/ddagw/FederalRules.htm**

In addition, the American Water Works Association has provided comments on the LT2 Rule which can be found at the following website:

http://www.awwa.org/Advocacy/govtaff/AWWACommentsonLT2ESWTRJan92004.pdf

Ohio's EPA's Ambient Ground Water Quality Data Available on the Web

Ohio EPA's Division of Drinking and Ground Waters (DDAGW) staff are proud to announce that Ambient Ground Water Network data for Ohio is now available on the U.S. Environmental Protection Agency's (U.S. EPA) Web site in Modernized STORET (STORage and RETrieval). U.S. EPA administers STORET and is committed to maintaining and updating the database as a national repository for environmental data at no cost to the user. Consequently, many organizations use STORET as their primary tool for storing environmental information including biological, chemical and physical data for ground water, surface water, air and soils.

Loading Ohio's Ambient Ground Water Network water quality data to STORET has been a long-term goal of Ohio EPA since the early 1990s. To achieve this goal, DDAGW staff worked with information technology staff at Ohio EPA and U.S. EPA. The leadership of Mike Slattery, a geologist with DDAGW, and his project team's efforts were integral to achieving this goal.

The Ambient Ground Water Network data set includes 7,000 raw ground water samples collected over the past 30 years from 200 active and 160 inactive wells across Ohio. Active Ambient Ground Water Network wells are sampled every six or 18 months. New data will be loaded into STORET semi-annually. The primary objective of collecting statewide, raw ground water data from major aquifers is to help characterize Ohio's ground water quality, which in turn can be used to enhance water resource planning and prioritize ground water protection activities.

The Ambient Ground Water Monitoring Program places a priority on collecting water quality data representative of aquifers used by public water systems. The majority of the Ambient Ground Water Network wells are high production public water system wells. Water quality analyses indicate that some of the Ambient Ground Water Network wells are influenced by land use activities.

Data available from the STORET Web site **(http://www.epa.gov/storet/dbtop.html)** can be selected by geographic areas (state/county, latitude/longitude or watershed), by stations (facilities) or by projects. All of the Ambient Ground Water Network data is housed under the Ohio EPA, Division of Drinking and Ground Waters Organization ID, 21OHDGW. All Ambient Ground Water Network data are located in the Ambient Ground Water Monitoring Program project. Selected data can be downloaded in a tilde (~) delimited text file.

Access to Ambient Ground Water Network data in STORET compliments existing water quality data analysis available on Ohio EPA's Web site at **http://www.epa.state.oh.us/ddagw/wqcharpr.html.** The site contains links to Clean Water Act 305(b) reports as well as several slide presentations that discuss Ohio's ground water quality. Ground water quality of Ohio's major aquifers is characterized in the 2002 305(b) Report, Ohio's Ground Water Quality, using Ambient Ground Water Network data. In addition, the report discusses specific ground water issues in Ohio such as identifying sensitive aquifers, nitrate trends and arsenic distribution in Ohio public water systems. If you need help retrieving Ambient Ground Water Network data from the STORET Web site or have other questions about Ambient Ground Water Network data, please e-mail **gwq@epa.state.oh.us** or call Mike Slattery or Chris Kenah at (614) 644-2752.

Water Rule Development

Ohio EPA Division of drinking and Ground Waters has developed the following table to provide an update on current drinking water rule development. Contact Mark Sheahan or Kelly Butler at (614) 644-2752 if you have questions.

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Rule Package	General Description	Issues of Note?	Status / Comment Deadlines
3745-89 Laboratory Certification	• Updates to 10 lab certification rules in Chapter 3745-89 • Result of five-year rule review	• many clarifications & process improvements • authority to require a cert. lab to issue notification to its customers explaining any deviations or unacceptable results • new provisions for denial and suspension of certifications	• filed with Joint Comm. on Agency Rule Review (JCARR) on 3/22/04 • public hearing held 4/27/04; no comments received • JCARR hearing on 5/17/04 • Anticipate being effective in late June 2004
3745-91 & 3745-96 Plan Approval and Consumer Confidence Reports	• Update rule 3745-91-08 to refer to latest edition (2003) of Recommended Standards for Water Works • Update and correct references to other OAC rules in rule 3745-96-01 (CCRs)		• filed with JCARR on 3/30/04 • public hearing 5/4/04 • comment deadline 5/4/04 • JCARR hearing 6/7/04
Long-term 1 Enhanced Surface Water Treatment	adopt requirements of federal rule (final 1/14/02)	• addresses subpart H systems serving fewer than 10,000 persons • will require certain water systems to meet strengthened filtration requirements to improve control of microbial pathogens, esp. Cryptosporidium	• interested party comment period ended 02/13/04; no comments received • filed with JCARR on 5/5/04 • comment after filing with JCARR -deadline 6/8/04
Filter Backwash Rule	• adopt requirements of federal rule (final 6/8/2001) • regulates return of filter backwash water to the treatment process to prevent microbial control from being compromised	• the rule does not prohibit recycling > 10% • Ten States' Standards recommends limiting the rate of recycle flow to 10 percent of the plant flow rate	• interested party comment period ended 02/13/04; no comments received • filed with LT1ESWT rule pkg on 5/5/04 • comment after filing with JCARR -deadline 6/8/04
3745-81-15 3745-81-16 3745-81-23 Radionuclides	• Adopt new and revised MCLs (final 12/7/00) • one of two sets of rules affecting MCLs	• new MCL for uranium • initial monitoring requirements	• interested party comment period ended 1/05/04; no comments received • anticipate filing w/ JCARR in May 2004
3745-87 Capability Assurance	• required five-year rule review • strengthen rules as a tool for water systems to evaluate and improve overall system performance	• integrating the use of Capability Assurance Plans with deficiencies noted during sanitary surveys	• internal comment ended 4/2/04 • anticipate interested party review beginning mid-May • comment welcome during interested party comment period and after filing with JCARR
3745-81-11 - Arsenic MCL 3745-81-19 - Point-of-use treatment	Adopt revised MCL for arsenic (Federal rule final 02/22/02 - new MCL effective 1/1/2006) New rule to allow and provide specifications for use of point-of-use treatment	• costs to small community systems • non-centralized treatment (point-of-use & point of entry)	• anticipate interested party review begin late May to early June 2004 • comment welcome during interested party comment period and after filing with JCARR
3745-81 Variances & Exemptions	Rescission of the variance & exemptions rules in Chapter 3745-81	• alternative mechanisms for water systems to address difficulty complying with MCLs	• anticipate interested party review beginning late May - early June • comment welcome during interested party comment period and after filing with JCARR
3745-88 Disadvantaged community loan rules	New rules to administer subsidies to disadvantaged communities		• rules drafted by SRF staff and OWDA staff
Chapter 3745-7 Operator Certification	• review and update all of operator certification rules	• prerequisites for each operator classification • minimum staffing levels for each plant	• workgroup currently drafting amendments • internal review spring 2004

Past President - Marlay Price

I would like to take a little time to express appreciation to my friends in Ohio for having the opportunity to serve as your 2003-2004 association president.

Marlay Price

I have always been very proud to represent Ohio in my travels for AWWA. It was especially fun when we seemed to gang up on them, when Ron Schwarzwalder, Mike Caprella, Bob Stevenson, Curtis Truss and myself served at some of the same times together. Curtis, of course, is now running for president, after having served as vice-president. Good luck Curtis! May the *Schwarz* be with you (sorry, couldn't resist….literary license, you know).

Your tremendous support with things, such as the Membership Summit, when the Ohio Section sent 9 people to Denver, has been overwhelming…and, now Melinda Raimann has received her diamond pin for outstanding recruiting! It was my pleasure to award this to her at the section leadership forum in Orlando. What a great example of Ohio participation.

We have now overtaken the Pacific Northwest Section in membership, placing us as the third largest section and the second largest single state section. Watch out Texas!

I would also like to thank you for your generous support for the Ohio reception, last year in Anaheim. It will go down as one of AWWA's best. I understand that Larry Valentine is being commissioned to take his show on the road.

The July issue of Mainstream will contain some of the following:

When I started my term, my intention was to limit the amount of agenda items for the year to just a few. The thinking was that a manageable number would give me a chance to do a thorough job, rather than spread myself too thin. Wrong. As the year progressed the list got longer and longer.

I am gratified to report, however, that with a whole bunch of help, we were able to accomplished much more than I dreamed possible. Let me recap a few things:

Open Association

We have used the Mainstream this year to lay open the association, as much as possible.

Our first addition, summer 2003, had a graphic illustration of the website so navigation would be as simple as possible. Did you know that we have over 8,000 pages on this incredible award winning site and we receive over 10,000,000 hits per month?!

The second, fall 2003, talked about our products and services and opportunities for getting involved with your professional organization.

The winter addition gave a graphic illustration of the volunteer governance and who the contacts are for volunteer groups.

And finally, the spring 2004 issue laid out the staff structure, again with contact information.

All of this was done in the spirit of making your association more transparent and user friendly so that you can get the last little benefit for you membership experience. This will be an ongoing endeavor.

Membership

In February we were able to conduct a membership summit in Denver. 80 people from 37 sections attended. This event allowed us to show off the great work that the Membership Committee, once chaired by Larry Valentine, and the Membership Department have done in supplying materials and programs to allow us to grow. Our attendees were both inspired and energized.

It is with great pride that we can say that membership in AWWA is at its highest level in history at 57,647 members. Few other associations can claim growth, much less record numbers.

Infrastructure

As we all know, infrastructure replacement, as it pertains to water, is a huge looming problem for our utilities and communities. Drought, the economy, security, population growth, and regulatory compliance have all required the use of our precious resources. It is no wonder that replacement has been left on the back burner.

Good news….there is now a publication available that will help us educate our local decision makers about the importance of this issue. It is called Avoiding Rate Shock and it is the product of an effort undertaken by the Water Utility Council. You will hear more about this in the coming months.

Our efforts in Washington have also paid off. When we come to Washington for the Water Matters Fly-In, the representatives and staffs know who we are and what our issues are. Thanks to you who support this important AWWA activity.

Let's not overlook how important this can be for our local efforts in Ohio. The legislative luncheon in Columbus is a good start.

Strategic Plan

A huge amount of effort has been invested in the most sophisticated and visionary strategic plan that I have been associated with. A draft is being presented to the membership this year.

This plan looks out, not at just three years, or five years, but fifteen years. It is intended to identify potential barriers between where we are now and where we want to be in the future, and position ourselves so that we can overcome them.

The board is continuing to review this plan and plans to formally adopt it during the winter board meeting in January of 2005. Keep your eyes open for it and give us your ideas. It is meant to reflect what you want your association to be concerning itself with, so that you can get the most for your membership dollar.

What a great organization! This is good solid stuff.

It is a pleasure to be associated with all of the volunteers that work so hard for us and the water community. This is a first class outfit and it has been an honor to be part of it.

Thanks again, to all of you in Ohio, for this chance to serve. Go Curtis!

Lime/Soda Softening Sludge Not Just a Waste Residual

By: Rick Shamblen and Mike Burris • Malcolm Pirnie, Inc.

Many farmers in Ohio and throughout the Midwest have benefited from the application of the sludge generated from municipal water treatment plants utilizing the lime softening process. Although these reuse benefits have been generally recognized, this paper attempts to quantify the value of this water treatment waste stream in relation to commercially available agricultural lime application products.

Most all of our groundwater supplies and many of our surface water supplies in this part of the country contain elevated levels of hardness. A water's hardness originates from the corrosive characteristics of our natural water supplies. Pure water has often been referred to as the "universal solvent" because of its tendency and ability to readily dissolve, to some extent, almost anything. As our natural water supplies travel through rock and soil, both above and below ground, they dissolve a multitude of substances. With the predominance of naturally occurring materials such as calcite ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$) throughout the Midwest, elevated levels of calcium and magnesium develop in our groundwater and surface water supplies. It is the presence of these two elements that primarily constitute the hardness of a water.

For the use of water by our residential, commercial and industrial customers, hardness is not a health issue. Hard water does however create many aesthetic and maintenance problems for all customers. In response to this, treatment to reduce the natural hardness of our water supplies has been practiced for over 100 years. The treatment process which has historically and traditionally been used is the lime/soda ash treatment process. It is interesting to note that Ohio utilities were leaders in the development and use of this water treatment technology. It is reported that prior to 1900 there were a number of lime/soda softening plants in operation for the treatment of commercial and industrial water supplies for boiler feed applications and laundry purposes. In 1903, the first municipal lime softening water treatment plant in the United States was built in Oberlin, Ohio. Following that, in 1908, the Dublin Road Water Treatment Plant, a 30 mgd lime/soda softening facility, was constructed in Columbus, Ohio. In 1923, this plant was increased in capacity to 54 mgd, and, for a number of years had the distinction of being the largest lime/soda softening plant in the world.

Calcium and magnesium exist in our natural water supplies as both carbonate hardness (alkalinity) and noncarbonate hardness. Depending upon the pH of the lime/soda softening reaction and the ratio of the carbonate hardness to the noncarbonate hardness of the water being treated, the following reactions with lime ($Ca(OH)_2$) can take place:

Carbonate Hardness Reactions:

$$Ca(HCO_3)_2 + Ca(OH)_2 = \underline{2CaCO_3} + 2H_2O$$
$$Mg(HCO_3)_2 + Ca(OH)_2 = MgCO_3 + \underline{CaCO_3} + 2H_2O$$
$$MgCO_3 + Ca(OH)_2 = \underline{Mg(OH)_2} + \underline{CaCO_3}$$

Noncarbonate Hardness Reactions:

$$MgSO_4 + Ca(OH)_2 = \underline{Mg(OH)_2} + CaSO_4$$
$$MgCl_2 + Ca(OH)_2 = \underline{Mg(OH)_2} + CaCl_2$$

Similarly, for these utilities that use soda ash (Na_2CO_3) in conjunction with lime for noncarbonate hardness removal, the following reactions can occur:

$$CaSO_4 + Na_2CO_3 = \underline{CaCO_3} + Na_2SO_4$$
$$CaCl_2 + Na_2CO_3 = \underline{CaCO_3} + 2NaCl$$

As shown by the reactions, the hardness in a water supply is lowered by causing the precipitation (removal from solution) of calcium carbonate ($CaCO_3$) and magnesium hydroxide ($Mg(OH)_2$). These two solids comprise the major portion of lime softening sludge, with calcium carbonate being the predominant compound.

Table 1 presents a listing of liming materials commonly used by the farming community. The materials are characterized by their "Total Neutralizing Power" (TNP) and physical size (fineness). The TNP values are determined by agronomic laboratories from a titration analysis of the liming material, somewhat similar to an alkalinity analysis for water. The TNP value represents the calcium carbonate equivalency of the liming material. It is interesting to note that most of all the "liming" materials listed in Table 1 are not lime, but rather calcium carbonate. The benefits of these materials as a soil conditioner arise from the ability of calcium carbonate to increase a soil's alkalinity and buffering capacity, thereby restoring and maintaining desired pH conditions.

The agricultural industry uses Ag-Ground Limestone (TNP 90+) as the basis for rating the effectiveness

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of the other commercially available materials shown. The last column of the table shows the "Effective Neutralizing Power" (ENP), i.e., the pounds of the specific liming material needed to equal the neutralizing capability of one-ton of Ag-Ground Limestone (TNP 90+). This equivalence rating is based upon both the TNP and the particle size range of the specific material. For example, the Ag-Superfine with a TNP of 80 - 89 has an ENP value of 1800 lbs. per ton. Even though this material has a lower TNP then the Ag-Ground 90+, the smaller particle size results in the fact that 1800 lbs. of this grade liming material has the neutralizing capability of 2000 lbs. of Ag-Ground (90+). On the other hand, Ag-Fine Meal 90+ has a comparable TNP to Ag-Ground (90+); however, because of the larger particle size of the Ag-Fine Meal 90+, 2500 lbs. of this material must be applied to achieve the neutralizing capability of 2000 lbs. of Ag-Ground 90+.

TABLE 1

CHARACTERIZATION OF AGRICULTURAL LIMING MATERIALS

Grade	TNP	Fineness Percent passing mesh size				ENP, lbs/ton
		100	60	20	8	
Agricultural limestone and/or slag (air cooled)						
Hydrated	160+	90	95	98	100	1000
	130-140	90	95	98	100	1200
Ag-Superfine	90+	80	95	100	100	1600
	80-89	80	95	100	100	1800
Ag-pulverized	90+	60	70	95	100	1700
Ag-Ground(base)	**90+**	**40**	**50**	**70**	**95**	**2000**
	80-89	40	50	70	95	2300
Ag-fine meal	90+	30	40	60	85	2500
	80-89	30	40	60	85	2800
Ag-course meal	90+	20	30	50	80	2900
	80-89	20	30	50	80	3200
Ag-fine screening	90+	10	20	45	80	3400
	80-89	10	20	45	80	3800
Ag-course screenings	90+	5	15	40	80	4000
	80-89	5	15	40	80	4300
Agricultural granulated slag (water cooled)						
Ag-granulated slag	90+	10	15	60	95	2000
	80-89	10	15	60	95	2300

Table 2 presents an analysis of a central Ohio municipal water plant's lime softening sludge. The sludge sample was taken from the plant's dewatering lagoon, and the analyses were performed by an agronomic laboratory. All analyses are reported on a dry weight basis, and the mesh size values indicate the sludge particles' size distribution (percent passage) corresponding to Table 1.

The analyses show, as expected, that the solids' composition is predominantly calcium, with the balance being mostly magnesium (i.e., calcium carbonate and magnesium hydroxide). The TNP of the softening sludge solids is shown to be 105, indicating that the neutralizing capability of the lime softening sludge solids is greater than Ag-Ground Limestone 90+, the agricultural industry's standard. Additionally, the small particle size distribution of the softening sludge solids greatly enhances the effectiveness of this by-product material as a soil conditioner.

Consider the following example:

A farmer collects a soil sample and submits it to an agronomic laboratory for soil fertility analyses. Based on the farmer's crop production plans for a specific field, the agricultural services laboratory provides recommendations for fertilizer and lime application rates. For example, the findings of the soils analysis result in a recommended lime (Ag-Ground Limestone 90+) application rate of 5,710 lbs / acre for

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the farmer's soybean field to achieve the desired soil conditions.

To use the water plant lime softening sludge above as his soil conditioner instead of Ag-Ground Limestone 90+, the agricultural services laboratory reports that because of the high TNP and the small particle size distribution of the water plant sludge, only 4890 lbs. of the municipal water treatment plant's lime softening sludge solids must be applied per acre to achieve comparable results.

Proper soil pH is probably the most important single factor with regard to soil fertility. Specifically, liming benefits agricultural soils and crops in the following ways:

Increases soil pH and the availability of phosphorus, molybdenum and magnesium for crop uptake;

Reduces harmful crop uptake of aluminum, manganese and iron;

Improves microbial activity which results in a increased release of nitrogen, phosphorus, boron, sulfur and other elements from a soil's organic matter;

Results in better soil structure and tilth.

Lime softening sludge from municipal water treatment operations is in abundant supply throughout the Midwest and can provide valuable and needed soil amendment qualities to the farming community. The high calcium carbonate content and small particle size of the softening sludge solids result in a more rapid increase and stabilization of a soil's pH than that obtained with commercial agricultural liming materials. Application rates of approximately two dry tons per acre every 2-3 years are typical. Land application of this material represents the return to our environment of natural elements and minerals in a safe, beneficial and cost effective way.

For most of our municipal lime softening water treatment plants, sufficient agricultural cropland is available within close proximity for the implementation of this sludge disposal practice. Table 2 below presents data compiled by the Ohio Department of Agricultural for the year 2002 showing the number of cropland acres planted for Ohio's three major crops.

Table 3 shows that for the year 2002, approximately 8.8 million acres were planted with either corn, beans or wheat within the State of Ohio. This equates to an average of about 100,000 cropland acres within each of Ohio's eighty-eight counties in need of regular conditioning for pH control.

Consider, for example, a typical 5.0 mgd municipal lime softening water treatment plant that produces approximately 5200 tons of softening sludge dry solids per year. The total number of cropland acres this utility would need for its land application program, based upon an application rate of two-tons of dry sludge solids per acre every three-years, would be 7800 - acres. This example illustrates, as most utilities will find, that an abundance of agricultural cropland in Ohio is available within each county and/or nearby adjacent counties to successfully implement a land application program.

Utilities that are practicing lime/soda softening should work with their Soil and Water Conservation Agency, their State University Extension Agent, their agronomic laboratory and local agricultural chemical dealers, and their state regulatory agencies to plan and/or enhance their softening sludge land application practices.

TABLE 2

LIME SOFTENING SLUDGE ANALYSIS

Parameter	Results
Calcium (Ca)	**37.6%**
Magnesium (Mg)	**3.4%**
TNP	**105**
Nitrogen, Ammonium (NH_4-N)	<0.02%
Phosphorus (P_2O_5)	0.06%
Potassium (K_2O)	0.06%
Cadmium	6.3 mg/Kg
Copper	92.9 mg/Kg
Lead	<6.3 mg/Kg
Nickel	9.5 mg/Kg
Zinc	44 mg/Kg
100 Mesh	**98**
60 Mesh	**100**
20 Mesh	**100**
8 Mesh	**100**
Percent solids	47.4%

TABLE 3

OHIO CROPLAND UTILIZATION

Crop	Cropland Acres Planted
Corn	3,200,000
Beans	4,750,000
Wheat	860,000