

UWS

*Removal of As(III) and As(V) in Contaminated Groundwater with Thin-film Microporous Oxide Adsorbents	M. A. Anderson	UW-Madison	\$4,500#
*Importance of Groundwater in Production and Transport of Methyl Mercury in Lake Superior Tributaries	D. Armstrong, D. Krabbenhoft, and K. Rolffhus	UW-Madison & USGS	\$3,260#
*A Basin-scale Denitrification Budget for a Nitrate-contaminated Wisconsin Aquifer: A Study at the Groundwater/Surface Water Interface	B. Browne, G. Kraft D. Saad	UW- Stevens Point & USGS	\$18,532#
Co-occurrence and Removal of Arsenic and Iron in Groundwater	P. McGinley	UW-Stevens Point	\$11,120
Field Evaluation of Raingardens as a Method for Enhancing Groundwater Recharge	K. Potter	UW-Madison	\$19,039
Impacts of Land Use and Groundwater Flow on the Temperature of Wisconsin Trout Streams	S. Gaffield and L. Wang	WGNHS	\$33,696
Impacts of Privately-Sewered Subdivisions on Groundwater Quality in Dane County, WI	K. Bradbury	WGNHS	\$39,415
Monitoring and Scaling of Water Quality in the Tomorrow-Waupaca Watershed	H. Lin and B. Browne	UW-Stevens Point	\$35,445
Removal of Heavy Metals and Radionuclides from Soils Using Cationic Surfactant Flushing	C. Evans and Z. Li	UW-Parkside	\$20,849
Investigation of Changing Hydrologic Conditions of the Coon Creek Watershed in the Driftless Area of	R. Hunt	UW-Madison	\$21,619
Effect of Clean and Polluted Groundwater on Reproduction and Development	S. Dodson	UW-Madison	\$22,148
Removal of Arsenic in Groundwater Using Novel Mesoporous Sorbent	J. Park	UW-Madison	\$28,299
Groundwater-Lake Interaction: Response to Climate Change, Vilas County, Wisconsin	M. P. Anderson	UW-Madison	\$20,989

UWS/DATCP

*Remediation of soil and groundwater using effectively and ineffectively nodulated alfalfa.	N. Turyk, B. Shaw M. Russelle	UW-Stevens Point	UWS \$10,785 DATCP \$8,030
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The total cost for all projects funded by the UWS in FY 02 including the co-funded project above is \$306,311 (including fringe benefits and 6% administration costs).

X partially funded in FY 01

co-funded by U.S.G.S. base funding of WRI

* denotes continuing project from FY 01

Table 2: Groundwater Projects to be Funded through the Joint Solicitation for FY 03

<i>Agency Title</i>	<i>Author(s)</i>	<i>Affiliation</i>	<i>FY 03 Budget</i>
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DATCP

*Chloroacetanilide and Atrazine Residue Penetration and Accumulation in Two Wisconsin Groundwater Basins	W. DeVita, P. McGinley, and G. Kraft	UW-Stevens Point	\$31,067
*Agrochemical Leaching from Sub-optimal, Optimal, and Excessive Manure-N Fertilization of Corn	J. Norman and K. Brye	UW-Madison	\$35,409

No new projects were funded by DATCP through the FY 03 joint solicitation process.

The total cost for all projects funded by DATCP in FY 03, including the co-funded project below is \$80,000

DNR

*Nitrate Loading History, Fate, and Origin for Two Wisconsin Groundwater Basins	G. Kraft	UW-Stevens Point	\$31,722
*Monitoring Contaminant Flux from a Stormwater Infiltration Facility to Groundwater	C. Dunning and R. Bannerman	USGS & DNR	\$35,000
*Importance of Disinfection on Arsenic Release from Wells	W. Sonzogni, G. Bowman, J. Standridge, and A. Clary	WSLH	\$15,000
Evaluation of Enzyme Linked Immunosorbent Assay for Analysis of Di Amino Atrazine in Wisconsin Groundwater in Comparison to Chromatography	J. Strauss and W. Sonzogni	WSLH	\$11,932

DNR/DATCP

*Occurrence of Antibiotics in Wastewater Effluents and their Mobility in Soils: A Case Study from Wisconsin	K. G. Karthikeyan and W. Bleam	UW-Madison	DNR \$28,476 DATCP \$13,524
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The total cost for all new projects funded by DNR through the FY 03 joint solicitation process, including the co-funded project below is \$17,864.

The total cost for all projects funded by DNR in FY 03, including the co-funded projects is \$128,062.

UWS

*Co-occurrence and Removal of Arsenic and Iron in Groundwater	P. McGinley	UW-Stevens Point	\$17,054
*Field Evaluation of Raingardens as a Method for Enhancing Groundwater Recharge	K. Potter	UW-Madison	\$19,039#
*Impacts of Land Use and Groundwater Flow on the Temperature of Wisconsin Trout Streams	S. Gaffield and L. Wang	WGNHS	\$31,816
*Impacts of Privately-Sewered Subdivisions on Groundwater Quality in Dane County, WI	K. Bradbury	WGNHS	\$17,733
*Monitoring and Scaling of Water Quality in the Tomorrow-Waupaca Watershed	B. Browne	UW-Stevens Point	\$33,387
*Removal of Heavy Metals and Radionuclides from Soils Using Cationic Surfactant Flushing	C. Evans and Z. Li	UW-Parkside	\$21,049
*Removal of Arsenic in Groundwater Using Novel Mesoporous Sorbent	J. Park	UW-Madison	\$28,299#
Role of the Hyporheic Zone in Methylmercury Production and Transport to Lake Superior	D. Armstrong and C. Babiarz	UW-Madison	\$31,620

Determination of Aquitard and Crystalline Bedrock Depth Using Time Domain Electromagnetics	D. Hart and D. Alumbaugh	UW Extension	\$30,330
Monitoring the Effectiveness of Phytoremediation and Hydrogeologic Response at an Agricultural Chemical Facility	W. DeVita and M. Dawson	UW- Stevens Point	\$14,910
F Test for Natural Attenuation in Groundwater: Application on Benzene	F. Evangelista and A. Pelayo	UW-Whitewater	\$12,950
Photocatalytic Adsorption Media and Processes for Enhanced Removal of Arsenic from Groundwaters	M. Anderson	UW-Madison	\$31,116

UWS/DNR

Arsenic Contamination in Southeast Wisconsin: Sources of Arsenic and Mechanisms of Arsenic Release	J. Bahr and M. Gotkowitz	UW-Madison	UWS \$41,831 DNR \$5,932
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The total cost for all new projects funded by the UWS through the FY 03 joint solicitation process, including the co-funded project above is \$162,757.

The total cost for all projects funded by the UWS in FY 03 including the co-funded project above is \$303,525 (including fringe benefits and 6% administration costs and excluding USGS co-funding).

funded by U.S.G.S. base funding of WRI

* denotes continuing project from FY 02

BENEFITS FROM MONITORING AND RESEARCH PROJECTS

Table 3 (see Appendix) lists groundwater-related monitoring and research projects funded by state agencies since enactment of Wisconsin's comprehensive groundwater protection legislation (1983 Wisconsin Act 410) in 1984. Those agencies that have funded projects are the DNR, DATCP, DILHR/Commerce, and the UW System. There are 291 projects listed. One hundred eighty-nine of these projects have been funded through the joint solicitation process that began in FY 92. The remaining projects were funded by the above agencies through separate solicitation processes prior to 1992. The table includes the project title, principal investigator or investigators, the years the project was funded, the funding agency or agencies, and the project number if assigned.

Many projects have provided valuable information regarding the state's groundwater resources. Some have helped to evaluate existing regulatory programs and determine if there is a need for additional regulations. Numerous studies have increased the knowledge of the movement of contaminants in the subsurface. Others have developed new methods for groundwater evaluation and protection. The following discussion highlights some of the areas that have been the focus of research and monitoring projects and illustrates how agencies have used the project results to improve the management of the state's groundwater resources. Citations refer to the projects listed in Table 3.

The Atrazine Rule

The development of the Atrazine Rule (ATCP 30, Wis. Adm. Code) illustrates how the benefits of state-funded research and monitoring can build on one another. In the mid-1980s the corn herbicide atrazine was first detected in monitoring wells and private drinking water wells in Wisconsin. The first systematic well sampling program to characterize atrazine contamination on a statewide basis was the 1988 DATCP Grade A Dairy Farm Well Water Quality Survey (LeMasters, 1989). This state-funded well survey estimated that atrazine was present in 12% of the Grade A Dairy Farm Wells in the State.

This study left unanswered many questions regarding the sources, groundwater susceptibility, and the presence of pesticides other than atrazine. Without better information on these and other questions, it was challenging for DATCP, the agency charged with groundwater protection related to agricultural chemicals, to develop a plan of action. It was obvious that a concerted information gathering program was needed. Over the next several years, before and during the development of the DATCP atrazine rule, the Wisconsin Groundwater and Pesticide Research Program played an essential role in providing the needed information. Research and monitoring were conducted on several topics that played a direct role in the evolution of the atrazine rule.

The state research and monitoring program funded several key projects to better understand the sources of atrazine contamination. When atrazine was first found in groundwater, an argument had been made that this was the result of point sources such as spills and mishandling. One of the most important findings that allowed DATCP to begin developing the atrazine rule was that normal agricultural applications of atrazine could lead to groundwater contamination. The DATCP groundwater monitoring project for pesticides (Postle, 1986-96) used monitoring wells located next to agricultural fields to study groundwater contamination by atrazine and other pesticides. This study showed that atrazine from field use on sandy soils could cause contamination, often above the 3 µg/L ES. The UW Water Resources Center conducted a detailed hydrogeologic study (Chesters, 1990-91) at a farm in Dane County and showed conclusively that atrazine contamination could result from both field applications and mixing/loading practices. With the knowledge that nonpoint contamination of groundwater by atrazine was indeed occurring, DATCP could develop ways to reduce this contamination.

State-funded research was essential in showing that atrazine contamination did not follow simplistic notions of groundwater contamination susceptibility. One of the most important findings was that the Central Sands and the Lower Wisconsin River Valley (LWRV), two areas that appear similar in soils and agricultural practices, had significantly different susceptibility to contamination. These differences were pointed out in several research projects conducted by the UW Soil Science Department (Daniel, 1991; Lowery, 1991; McSweeney, 1991;

Lowery, 1992-3). This information had a direct influence on the atrazine rule in that there is now a use prohibition in the LWRV and managed use in the Central Sands.

Another key finding related to the susceptibility of groundwater to atrazine contamination was that many of the areas with high frequency of detections had medium textured (loamy) soils. It had previously been thought that these areas were less susceptible to leaching and groundwater contamination than areas with sandy soils. State-funded research and monitoring efforts, however, showed that the intensity of atrazine use, in addition to soil and geologic conditions, played an important role in the contamination. This finding helped to explain why many areas in south central Wisconsin, with medium textured soil and high corn production, had many wells contaminated with atrazine. This knowledge allowed DATCP to adopt management strategies for reducing atrazine contamination in these areas.

When atrazine was first discovered in Wisconsin's groundwater in the mid-1980s, DATCP was interested in managing its use based on predictive modeling of contamination processes. Modeling activities funded by the state research program, however, indicated that the behavior of atrazine and other contaminants in the environment was complex and could not be reliably predicted by modeling. In response to this finding, DATCP adopted a more empirical approach to identifying management areas. Actual well results were plotted on maps and, together with an analysis of soils and geology, management areas were delineated.

When monitoring and rule making efforts for atrazine first started, parent atrazine was the only compound that was considered. As more research was conducted, however, it was discovered that three metabolites (breakdown products) of atrazine were present in groundwater and were of health concern (Chesters, 1990-91; LeMasters, 1990; Cowell, 1990; Cates, 1991). State-funded sampling programs showed that due to the presence of atrazine metabolites, the groundwater problems were more serious than previously considered. This knowledge allowed DNR to strengthen the groundwater standard for atrazine in 1992 and allowed DATCP to strengthen the atrazine rule in 1993 and extend required use reductions to the entire state.

It is interesting to try to envision how DATCP's atrazine rule would look if it did not have the benefit of the intensive research and monitoring efforts. It is safe to say that it would not have been developed on as good an understanding of the behavior of atrazine in the environment or the geographic patterns of contamination. It is possible that without the intensive monitoring efforts, the full extent of the problem would not have been discovered and atrazine use would not have been reduced. On the other hand, it is possible that with inadequate knowledge a "broad brush" approach would have been taken. This could have resulted in unfair regulations that were not tailored to the different geographic areas of the state.

Two important aspects of environmental regulation that promote its acceptance are that it is based on science and that it is fair. Good research is necessary to achieve these two characteristics. The Atrazine Rule has experienced a relatively high degree of acceptance due to the effort that was put into its development.

Groundwater Monitoring at Solid Waste Disposal Sites

The DNR's Solid Waste Management (SWM) program received project funding eight times from 1985 to 1995 through the joint solicitation process. These projects have benefited the program in many ways, primarily impacting regulations and monitoring practices.

The first two studies (Friedman, 1985-87; Battista, 1988-89) revealed for the first time that groundwater around many Wisconsin landfills was contaminated by VOCs. The studies also showed that VOC contamination of groundwater was more common at unlined municipal solid waste landfills than at other types of landfills. A follow-up VOC study (Connelly 1993-94) showed that VOC levels have decreased at most of the unlined landfills, though at many of the sites VOC levels do not show continued decline. There was no VOC contamination definitely attributable to leachate migration at any of the older, engineered landfills that confirmed that these sites are performing as SWM program staff had hoped. The results of the three VOC studies have been used to establish requirements for VOC sampling at new and existing landfills. These studies have also indicated

that inorganic compounds could be useful in predicting VOC contamination at landfills. Therefore, until recent EPA rules required VOC monitoring, the SWM program allowed sites to sample for inorganic parameters as part of routine monitoring and not sample VOCs until inorganics were elevated. The VOC studies provided valuable data that was used to convince EPA to reduce the number of VOCs required for monitoring at municipal solid waste landfills in Wisconsin. This reduction in monitoring (the use of inorganics and the reduced number of VOCs when they are required) allowed landfill owners considerable cost savings while maintaining equivalent environmental protection. Additionally, the VOC data was used to require responsible parties to define the degree and extent of contamination and remediate groundwater contamination at their landfills.

Research on methods of assessing groundwater quality data and data quality control completed in the third VOC study has been helpful to SWM program staff and consultants in interpreting groundwater quality data from landfills and other facilities. This study also showed the need to require laboratories to report data between the limit of detection and the limit of quantitation.

An assessment of Wisconsin's Groundwater Monitoring Plan program (Pugh, 1992) for active non-approved landfills provided the documentation of a set procedure for selecting monitoring sites. This information has been useful in recent meetings with municipalities held to convince municipalities that they have not been singled out for further evaluation of groundwater contamination and to demonstrate that the process used for selecting landfills for monitoring is objective.

Three studies from 1991 to 1994 on the potential groundwater impacts at deer pits, yard waste sites, and construction and demolition landfills (Pugh, 1992-3; Pugh, 1994) were conducted because little or no data existed on the potential impact to groundwater from these sites. Research has provided the information necessary to revise rules and establish policy regarding monitoring and siting of construction and demolition (C/D) landfills, deer pits, and yard waste sites in Wisconsin. The groundwater study of deer pits showed that impacts were minimal and helped the SWM program to decide not to require liners and to loosen some construction and reporting requirements. Similarly, the yard waste site study showed only minor groundwater impacts, which led the SWM program to encourage active management of these sites rather than stiffen regulations. The study of construction and demolition landfills showed some groundwater impacts at large sites but little or no impacts at smaller sites. These findings led to new regulations (effective June 1996) allowing lined intermediate size C/D landfills, which can provide the economic benefits of a large site without the potential negative impacts of very large sites. Based on the research, the regulations were written to require groundwater monitoring of inorganic parameters at small size C/D landfills but only require VOC sampling when establishing background. Since these studies have been conducted, many states and the EPA have contacted the SWM program about the information collected.

A more recent DNR-funded study undertaken by the SWM program (Connelly, 1994) was a comparison of groundwater sampling methods for collecting metals samples at monitoring wells. The study was in response to EPA's October 1991 ban on field filtering of groundwater samples that became effective in October 1994. The SWM program opposed this ban because many Wisconsin monitoring wells produce very turbid water which can lead to false positive results for metals if samples are not filtered. Additionally, the new EPA-recommended procedure, low-flow pumping, requires a significant amount of additional equipment. The study showed that the low-flow pumping method was appropriate in many circumstances but could not be used to sample slowly recovering wells. The results showed that turbidity was the best indicator that a well has been sufficiently purged. The results of the investigation are being used to revise groundwater sampling procedures required by the SWM program. Additionally, the study helped establish Wisconsin as one of two leading states playing a major role in advising EPA on revisions to their groundwater sampling requirements at municipal solid waste landfills.

A follow up study by the SWM program (Svavarsson, 1995) compared low flow pumping and bailing for VOC groundwater sampling at landfills. The study indicated that, in contrast to what some were claiming, there was very little difference in the results when using the two different methods. These findings were incorporated into the new groundwater sampling code and allowed the use of either method for sampling VOCs. This reduced the cost that landfill owners would otherwise have had to bear to purchase and operate low flow pumping equipment.

Monitoring for Naturally Occurring Compounds (e.g. Arsenic)

Wisconsin is also a leader in groundwater monitoring for naturally occurring compounds. Two projects in the DNR Lake Michigan District (Stoll, 1992; 1994) identified the existence of lead and arsenic contamination in groundwater. Homeowners were alerted through direct mailings, public meetings and mass media news releases. Over 72,000 people were unaware of their exposure to the substances in their drinking water. In one case, the sources of metals in these drinking water supplies were given priority for removal (Door County Lead Arsenate Mixing Sites). In an Arsenic Advisory Area (AAA), well construction criteria were defined to avoid arsenic associated with a mineralized zone located at the contact between the St. Peter Sandstone and the Galena-Platteville Dolomite. The DNR coordinated with the DHFS to conduct health surveys on individuals consuming locally contaminated water supplies and made appropriate health recommendations. Local County Health Departments in affected areas are also actively monitoring groundwater quality and are providing assistance to homeowners. In FY 01 and FY 02, DHFS staff (Knobeloch 2001) received additional funding to conduct a follow-up investigation on the relationship between exposure to inorganic arsenic in water and health outcomes. As part of this research effort, local health departments, DNR staff, town clerks and others have conducted well sampling campaigns in townships in the affected counties.

Ongoing research indicates that casing off the upper parts of the St. Peter Sandstone is usually effective in eliminating or reducing the presence of arsenic in drinking water. DNR guidance recommends the installation of 80 feet of casing through the sandstone contact for drinking water wells in the AAA. However, in an effort to save costs, the majority of wells constructed are not following the recommendations. Over the last several years, some wells that were not constructed according to guidance have exhibited increasing arsenic concentrations over time and have required replacement or reconstruction. In addition, follow-up testing on 50 replacement wells found that arsenic levels are exceeding standards in at least 5 cases where initially they had been below. Additional sampling of replacement wells occurred in FY 01 and 02 to test whether current guidelines are adequate at lowering arsenic concentrations (O'Connor 2001).

In FY 02 the WGNHS completed field experiments in the Fox River Valley that evaluated mechanisms of arsenic release to groundwater from domestic wells completed in the St. Peter sandstone aquifer, including studies of arsenic exposure to residents in the area and the effects of well chlorination on arsenic levels (Gotkowitz 2001). Results of this study were presented to DNR Drinking Water and Groundwater Program staff and used by the DNR to develop well construction guidelines for the Towns of Algoma and Omro.

Several other ongoing projects addressing arsenic issues include a study refining analytical methods for detection of arsenic compounds (Aldstadt 2001), a study of the role of chlorination in releasing arsenic (Sonzogni 2002), three projects investigating treatment methodologies for both private and public water supplies (Anderson 2001, Park 2002, McGinley 2002), and a new project investigating the occurrence of arsenic in southeastern Wisconsin aquifers (Gotkowitz 2003). These studies will help provide needed information about the occurrence, health risks, and remediation of arsenic in drinking water supplies. Results will be made available as final reports are completed.

Groundwater Movement in Fractured Dolomite

Door County has been the site of four research projects by the WGNHS to develop a framework for studying the complex groundwater flow regime in fractured rock found in many parts of the state. The first project (Bradbury, 1986-90) started as a nonpoint source watershed project investigating the hydrogeology and groundwater geochemistry in the shallow fractured dolomite aquifer in Door County. Groundwater quality was found to vary widely over time with bacteriological contamination common. The second study (Bradbury, 1992) showed that modeling results obtained from a discrete fracture model varied considerably from results produced by a continuum model for groundwater movement. The discrete fracture model estimated capture zones, groundwater flow paths, and groundwater travel times by using mathematical representations of fractures digitized from aerial photos. The third study (Bradbury, 1993-94) used a tracer for characterization of groundwater movement and contaminant transport. It revealed that hydraulic conductivity can vary widely in the same well depending on what

depth interval is tested.

A fourth study applied the discrete fracture flow model above to wellhead protection at the City of Sturgeon Bay (Bradbury 1996). Municipal wells at Sturgeon Bay draw groundwater from a series of horizontal fracture planes in Door County's dolomite aquifer, and delineating wellhead protection areas in such environments is extremely challenging. This complex project has required hydrogeologic information and analytical tools developed through the three Door County groundwater research projects above which targeted processes and models for groundwater movement in fractured rocks. Without the knowledge and experience gained through these previous projects the Sturgeon Bay Wellhead Protection Project could not have been accomplished.

During 1999, Bradbury and others began a follow-up project to attempt to verify the results of the Sturgeon Bay wellhead protection project using natural groundwater tracers (Bradbury 2000). This research is measuring the natural seasonal variations in temperature, electrical conductivity, and oxygen and hydrogen isotopes of groundwater and precipitation in order to verify the sources and velocities of groundwater moving toward Sturgeon Bay's wells. The use of such tracers is attractive because they are naturally present in the environment.

Developing New Tools for Groundwater Protection

Applications of a wide variety of tools for gathering and working with hydrogeologic and groundwater quality data have been funded. Projects involving one of the most promising tools in environmental management, Geographic Information Systems (GIS), have been funded in the DNR's Northeast Region (NER) and in Dane County. The funding agencies hope to continue to develop improved methodologies to make groundwater quality and contaminant source data more readily available.

Geographic information management in DNR's Northeast Region. An environmental inventory utilizing GIS was created in the DNR's former Lake Michigan District (Carlson, 1992-93; Stoll, 1994). Computerized maps were created which link all potential groundwater impact site locations with their respective data. This project has resulted in numerous map products showing potential groundwater contamination source/receptor relationships in a rapidly retrievable, highly summarized fashion. Many consultants, county agencies, state agencies and realtors have utilized this information for environmental management and land transactions. The chief benefits to the public have been the rapidly accessible information and greater purchasing confidence when buying property. Landowners also experience increased responsibility for the land they reside on, as they become aware of how readily available this information is. In this way, use of GIS has heightened awareness of the importance of wise land use.

A subsequent project gathered relevant geologic and hydrogeologic data from case files and entered them into one single relational database (Stoll, 1996-97). This database is joined in a GIS with the previously located site information. This combination provides an easily accessible wealth of information that can be used for queries and analysis. In addition, a program was developed utilizing Environmental Systems Research Institute (ESRI) Avenue for ArcView language to query data the DNR Region has gathered. For instance well driller construction logs which are in a File Maker Pro software database are linked in an ArcView Project to be readily viewed by selecting an area on screen. Also, summary reports can be prepared of local conditions prior to investigating contamination sites in the field by selecting an area on screen.

GIS work conducted in NER has provided the seed for the growth of GIS and GPS source and receptor locational work statewide. In 1998, NER mapped the location of over 2000 public water supply wells utilizing GPS methods with differential correction. From that work, wellhead vulnerability radii are assigned to each well to provide the basis for Wellhead Vulnerability determinations relative to that well and its local potential contaminant sources.

Regional groundwater models. Previous support of county-wide groundwater inventory studies and of modeling methodologies (Potter, 1992-93; Anderson, 1997) has given WGNHS and USGS personnel the hydrogeologic databases and analytical tools needed for the construction of regional groundwater models such as the recently

completed Dane County groundwater model. This computer model, which covers all of Dane County, simulates current and future groundwater conditions and is being used to evaluate how current and future groundwater pumping affects regional water levels and also how groundwater use affects shallow lakes, streams, and wetlands. In addition, this model has been used to delineate groundwater capture zones for all municipal wells in Dane County (Bradbury 1996).

The Dane County model, which provides a modern hydrogeologic framework for groundwater movement in Dane County, has stimulated a number of significant research projects by other investigators (Mickelson 1994-95; Bradbury et al., 2000). These investigators are using the model as a starting point for more detailed flow models of specific problems or areas of the county. One of the most significant of these is the award of a multi-year USEPA STAR grant to a team of DNR, UW-Madison, USGS, and WGNHS investigators who are investigating the water-resources impact of different land-use strategies on Madison's urban fringe. This research will support several graduate students and is will provide an integrated assessment of the hydrological, ecological, and institutional impacts of urbanization and land-use change. This research is focused on the Pheasant Branch watershed just west of Madison. Other research projects are investigating the sources of groundwater supplying important springs in the Nine Springs and Token Creek watersheds, with the goal of determining how nearby development and groundwater use could affect the springs.

The Dane County model has now become a prototype for regional groundwater models in other parts of Wisconsin. In FY 00 the WGNHS, USGS, and SEWRPC began a cooperative project to develop a similar model for the entire seven-county SEWRPC area of southeast Wisconsin. Other modeling projects are taking place in Sauk, Rock, and La Crosse Counties. Such models are critical tools in the planning process, and allow water managers to evaluate the impacts of various future water management and land use alternatives in order to make well-informed land-use decisions.

Prevention and Remediation of Groundwater Contamination

The State of Wisconsin (through the UWS Water Resources Institute) has supported twenty-four research projects emphasizing new technologies for prevention or remediation of groundwater contamination. Many of these projects have been completed. Final technical reports are published or in press. The reports and studies in progress provide information or products that will be important for future efforts aimed at controlling or attenuating groundwater contamination in Wisconsin. The findings cover a wide range of technologies including:

- New and enhanced physicochemical or biological methods to renovate waters contaminated by pesticides and volatile organic carbon compounds (Li, 2000), (Benson and Eykholt, 2000), (Benson, 1997-2000), (Hoopes, 1997-99), (Park, 1997-98), (Collins, 1997-98), (Bahr, 1996-98), (Hickey, 1994-96), (Anderson, 1994-95), (Chesters and Harkin, 1991), (Harris and Hickey, 1991-92);
- Enhancements in the ability to control, monitor, and predict the movement of landfill and mine waste contaminants to groundwater (Edil and Benson, 2000), (Edil 1997), (Benson, 1995-96), (Edil and Park, 1992-93);
- Improvements in the predictability of pump-and-treat remediation applications to contaminated aquifers (Bahr, 1994-95);
- Innovative agricultural practices designed to reduce groundwater contamination by pesticides and nitrate (Bundy, 1993-94, 1997-98), (Shinners, 1995-96), (Newenhouse, 1995), (Harrison, 1992-93), (Bahr, 1991-92); and
- Development of new technologies for evaluating the integrity of water supply well and exploration borehole seals (Edil, 1996, 1998-99), (Edil and Benson, 1997-98).

Biological Effects of Groundwater Contaminants

The GCC has solicited research projects during the last several years that deal with biological aspects of groundwater contamination.

Several projects have focused on developing new techniques for detecting, quantifying, and monitoring

microorganisms in groundwater and soils. Researchers at the UW-Madison Soil Science Department, developed a rapid molecular method using the polymerase chain reaction (PCR) to assay soils for the presence of specific sewage-borne pathogens (Hickey 1997). PCR-based methods eliminate the need to culture organisms for detection, and remedy shortcomings of traditional techniques by allowing rapid, sensitive, and specific identification of the pathogens of concern rather than indicator organisms. The PCR protocol Hickey developed was designed to detect DNA originating from *Escherichia coli*, which is one of the major species of bacteria associated with human waste. With this method he could distinguish *E. coli* DNA from that of its closest relative, *Shigella*. The method allowed the detection of DNA equivalent to about 20 cells. Currently, he is testing the PCR method for tracking of *E. coli* in the environment.

Because they have the capacity to co-metabolize a wide variety of organic chemicals, including halogenated compounds, methanotrophic bacteria have significant potential for bioremediation. The UW-Milwaukee Department of Biological Sciences has developed methods for quantification of methanotrophs in groundwater (Collins 1997, 1999). These methods, that include competitive PCR and direct PCR, will provide approaches to monitoring bioremediation and natural attenuation. In addition, this work has provided the basis of another study that applied direct PCR to the detection of pathogens in groundwater (Collins 2001). This project will be completed in FY 03.

The Marshfield Medical Research Foundation has investigated the association of pathogenic viruses and bacteria in private wells with incidences of infectious diarrhea and indicators of well water contamination (Borchardt 1997, 1999). In general, infectious diarrhea was not associated with drinking from private wells, nor was it associated with drinking from wells positive for total coliform. However, wells positive for enterococci were associated with children having diarrhea of unknown etiology, which was likely caused by Norwalk-like viruses. Final results indicate that the incidence of virus contamination in private wells is lower than that of community wells, but still may affect 4-12% of private wells.

The UW-Madison Department of Wildlife Ecology recently completed a study of the possible relationship between common agricultural chemicals and Wisconsin's declining and endangered amphibian population (Karasov, 1998). The researchers tested the effects of atrazine and nitrate on northern leopard frog (*Rana pipiens*) larvae in the laboratory. Neither atrazine, nor nitrate, nor their interaction had a significant effect on development rate, percent metamorphosis, time to metamorphosis, percent survival, mass at metamorphosis, or hematocrit. Nitrate slowed growth of larvae; however, this growth inhibition was not thought to be biologically important when compared to natural variation in the environment. Thus, the authors concluded that concentrations of atrazine and nitrate commonly found in the environment do not appear to pose a significant threat to *R. pipiens* larvae through direct toxicity.

Researchers at UW-Stevens Point College of Natural Resources studied the acute and chronic toxicity of nitrate to brook trout embryos and larvae (Crunkilton, 1999). Exposure to nitrate at environmentally realistic concentrations increased mortality in brook trout embryos and reduced growth or biomass in long-term exposures. The lowest observable effect concentration was 6.25 mg/L NO₃-N for both mortality and growth of feral brook trout. Mortality was greater in soft water compared to hard water and the effect was independent of nitrate concentration. These findings suggest that high nitrate concentrations may increase mortality of brook trout embryos in coldwater streams with significant groundwater baseflow in agricultural areas.

GROUNDWATER DATA MANAGEMENT

Department of Natural Resources

Collection and coordination of groundwater data exchange within the DNR and with outside agencies continues to be a high priority. The Department continues its focus on the collection and retrieval of groundwater data to meet inter-agency responsibilities and cooperative agreements.

The Department's groundwater data system, the Groundwater Retrieval Network (GRN), continues to provide access to well and sample data through its web interface, available at <http://www.dnr.state.wi.us/org/water/dwg/>. GRN currently accesses information from over 276,600 wells. These wells represent public and private water supply wells, piezometers, monitoring wells, non-potable wells, and groundwater extraction wells from three program systems in the bureaus of Waste Management and Drinking Water and Groundwater. Enhancements to the GRN system, suggested by regional and central office staff as well as external partners, are implemented through a yearly process allocating available groundwater related programming hours. These programming hours are used to improve system functionality and ease of use.

A new program is being finalized that maintains an updated GRN locational coordinate and updates a statewide Geographic Information System (GIS) coverage of well locations, maintained through a link with GRN. GRN allows users to extract well and sample information in Microsoft Excel format, comma or tab delimited text format. Using ArcView (a desktop GIS software package) GRN data can then be imported to create a well GIS "layer" on a personal computer for viewing and querying purposes.

Several enhancements of data systems related to the DNR Well Forms software program were completed to allow uploading electronic information from the Monitoring Well Construction and Monitoring Well Development forms. Consultants and drillers have the ability to submit their information in an electronic format to the Department and that information can now be uploaded to our existing system.

The Bureau for Remediation and Redevelopment (RR) Program continues to work on the development of its GIS Registry System. The existing application is intended to be converted to ESRI's software product, ARCIMS, so that the programming and other maintenance tasks can be accomplished more quickly and at a lower cost. RR also intends to develop a registry web site for soil contaminated sites. In addition to the ongoing efforts, work continues on quality assurance and quality control (QAQC) of existing data.

As of July 1, 2002, the Bureau of Waste Management only accepts electronic submittal (via diskette) of environmental monitoring data from landfill owners, labs and consultants (landfill owners with less than 10 wells were granted an exemption from electronic submittal until this year). Establishment of electronic signature standards from DOA continues to delay progress in implementing a pilot program to allow facilities to submit environmental monitoring data via e-mail. The Bureau is continuing to look at options to provide a web interface to allow facilities to upload environmental monitoring data into the Groundwater and Environmental Monitoring System (GEMS) database and review the data currently in GEMS.

The Bureau of Watershed Management has implemented a database, designated the System for Wastewater Applications, Monitoring, and Permits (SWAMP). This database system stores facility specific information such as address, contacts, location, permit requirements, monitoring results, and violations of permit requirements for private and municipal wastewater treatment facilities. Data for holders of specific Wisconsin Pollutant Discharge Elimination System (WPDES) and general permits are stored. The system contains current information on groundwater, wastewater, and biosolids treatment/management. Historical sampling data from groundwater monitoring wells is available through the system and current sample results are added on a monthly basis. Sampling results and site loading information are also available for land application of municipal sludge, septage and industrial sludge, by-product solids and wastewater.

The State's Source Water Assessment Program continued to make progress on several groundwater-related data initiatives in FY 02. The DNR's Drinking Water and Groundwater program coordinated efforts to improve the Department's data on public water supply wells and significant potential sources of contamination that may threaten these wells. Cooperative projects with the Remediation and Redevelopment, Waste Management, and Watershed Management programs are improving existing locational information and collecting new information for known groundwater contamination sites, large landfills, large confined animal feedlot operations and other potential threats. Additionally the WGNHS and DNR continue to improve their searchable index of scanned images of more than 350,000 well construction reports. DNR staff use these reports to help determine the susceptibility of public water systems to contamination and for many other purposes.

Department of Agriculture, Trade and Consumer Protection

DATCP needs up-to-date, reliable data about pesticide and nitrate-N contamination of groundwater. DATCP uses these data to develop substance specific rules about pesticide use, such as DATCP's "Pesticide Product Restrictions" (Chapter ATCP 30, Wis. Adm. Code), to respond to citizen requests on groundwater quality data for specific locations, and to initiate timely investigations of pesticide contamination of groundwater. DATCP ensures the quality of its database by carefully checking and cross-referencing paper lab slips and computerized data received from DNR, DATCP's laboratory, and other sources. This scrutiny is important, because DATCP uses these data for regulatory purposes. DATCP also works closely with other local and state agencies to coordinate groundwater data collection and to improve the integrity of groundwater data in Wisconsin.

DATCP maintains two groundwater sample databases: the *Drinking Water Well System* and the *Monitoring Well System*. The *Drinking Water Well System* contains contact and location information, well characteristics, and pesticide and nitrate sample results for private and public drinking water wells. The *Monitoring Well System* contains similar information for monitoring wells, and also tracks specific pesticide use history, soils, crop history, well construction, and precipitation and irrigation at monitored sites.

DATCP's *Drinking Water Well System* currently contains information for over 37,000 wells and over 217,000 pesticide and nitrate-N results. These data represent samples analyzed by DATCP, SLOH, and other public and private laboratories. The *Drinking Water Well System* was converted from a Paradox to Access97/SQL Server application in FY 99 to: (1) meet state database and operating system (Windows NT) standards, (2) improve compatibility of data with other established database systems, and (3) begin improving links between these databases and our geographic information system (GIS) tools. The *Monitoring Well System* will be converted to Access97/SQL Server in FY 02. Members of DATCP's Groundwater Protection Unit and its Containment and Remediation Unit access the database.

DATCP uses geographic information system (GIS) tools to analyze groundwater data and prepare maps for public hearings, DATCP board meetings, presentations, and other uses. DATCP prepares and maintains ArcInfo and ArcView data layers of well locations, atrazine concentrations, atrazine prohibition areas, and other pesticide and nitrate-N data. These GIS layers and associated database information are used to generate maps of statewide pesticide and nitrate-N detections in wells, as well as maps for chapter ATCP 30, Wis. Adm. Code (the "Atrazine Rule"). Other GIS analyses involve identifying groundwater wells that may be impacted by point sources of pesticide and nitrate-N contamination. DATCP also uses global positioning system (GPS) receivers to locate and map wells and other features, such as agricultural facilities and spill sites, that may affect groundwater quality.

Wisconsin Geological and Natural History Survey

The Wisconsin Geological and Natural History Survey, a part of the University of Wisconsin-Extension, has the responsibility for geologic mapping, collection, and analysis of basic data, and survey and research on Wisconsin's groundwater resources. Products from the Survey geologic mapping program support land-use planning and groundwater-quality management and protection. County-wide inventories of groundwater resources are supported through cooperative agreements with county governments. Through analysis and integration of data from subsurface records and water-quality sampling programs, these studies result in water-table elevation maps and other products, providing planners and educators with a good foundation of information for groundwater-quality management and protection. Detailed research and monitoring of groundwater movement and quality are undertaken on a project basis. Maps, publications, and presentations are developed for groundwater education and outreach.

Computerized groundwater databases, including geographic information systems (GIS) data, continue to be developed at the Survey, usually on a project basis to assist with on-going research. The effort to integrate, standardize, and document our data holdings continues to be a priority at the WGNHS. Another high priority is to make high quality, accurate digital datasets available to state agencies and the public.

Department of Commerce

Commerce is continuing its data integration information technology initiative. With regard to groundwater protection, Commerce maintains databases of underground petroleum storage tank systems and properties with petroleum contamination either in the past or currently. The database also stores information on activities associated with onsite sewage system design, installation and maintenance. The department is studying whether Sanitary Permit information collected by the governmental units (counties) may be integrated with information on onsite system servicing, maintenance and inspection activities that are required to be reported and tracked. The goal is to reduce or eliminate duplicative records kept by the governmental units and the department.

University of Wisconsin System

The Central Wisconsin Groundwater Center maintains a database of private well testing data from the Environmental Task Force Regional Laboratory at UW-Stevens Point, and Drinking Water Education Programs conducted through the Center. There are currently over 344,000 individual test results for approximately 49,100 samples covering the state. Chemistry data includes pH, conductivity, alkalinity, total hardness, nitrate-nitrite, chloride, saturation index, and coliform bacteria. In 1998, a new sampling program for iron, sodium, potassium, copper, lead, calcium, magnesium, manganese, zinc, and triazine was also initiated. Arsenic and sulfate were added late in 1999. The database primarily covers the period 1985 to the present. The database is PC-based and can be easily queried to be a significant source of information for local communities and groundwater managers. Forty-three counties are represented by 100 or more samples in the databases, and 23 counties are represented by 500 or more samples.

Department of Transportation

The DOT has entered salt storage facility records into a new database. There are currently 1,193 salt storage "sites" listed in the database and 2,212 "sub-sites" or storage facilities including salt storage sheds, liquid storage containers, and salt storage piles at docks. Detailed inventories of salt use are kept by each county and updated monthly. A record of facility inventories, inspections, repairs and improvements is included in the database.

The DOT maintains records of hazardous material investigation and remediation for highway projects. These records include information regarding groundwater contamination and groundwater use restrictions.

Groundwater monitoring is also performed for several DOT wetland mitigation projects. These records contain information on groundwater elevation and gradients as it relates to a wetland restoration or creation project (surface water and groundwater interaction).

The Wetland Mitigation Bank Accounting System is maintained by DOT on Wetland Bank activity. This system provides information on wetland loss and compensation by acres and wetland type and by project and location.

Department of Health and Family Services

DHFS does not maintain a centralized database on groundwater data. The Department relies on other state agencies for computerized groundwater information.

DIRECTIONS FOR FUTURE GROUNDWATER PROTECTION

PRIORITY RESEARCH & MONITORING ISSUES

- **Investigate adverse impacts from groundwater withdrawals:** In FY 97, DNR staff with help from a Groundwater Quantity Technical Advisory Committee completed a report on the status of groundwater quantity in Wisconsin (see "Condition of the Resource - Groundwater Quantity"). The report identifies localized areas with groundwater quantity problems and discussed the effects of groundwater withdrawals on surface waters and long-term groundwater availability. There is a need to further quantify hydrographic relationships of surface and groundwater. The GCC should continue to encourage research efforts that will provide information useful in addressing this issue.
- **Investigate adverse impacts of naturally occurring substances in groundwater:** Continued problems of elevated arsenic, low pH, and other water quality problems in domestic wells exist over large areas of northeast Wisconsin. Additionally elevated sulfate and total dissolved solids have been found in some new deep municipal wells in the Lower Fox River Valley making the wells unusable. In some other existing deep wells as far south as Milwaukee the total dissolved solids have been steadily increasing over the years. These sulfate and TDS levels pose a problem for local water managers, and the origin of the dissolved solids is not completely understood. The State needs more information about the extent and causes of these problems in order to give advice to homeowners, municipalities, and well drilling contractors. The GCC should continue to encourage research efforts that will provide information useful in addressing these issues.
- **Evaluate occurrence of recently discovered groundwater contaminants:** Recent research conducted in Europe and the U.S. indicates that traces of pharmaceuticals (including antibiotics and hormones) and pesticide breakdown products are common contaminants found in groundwater and surface water. Current testing methods do not allow adequate detection of these possible contaminants. Research is needed to determine whether these substances pose a threat to Wisconsin's groundwater resource.
- **Research land use management and its impact on the groundwater resource:** Additional research is needed on the effect of various land uses (e.g. urbanization) on groundwater quality and quantity. Several projects that study the impacts of land use on groundwater have been and continue to be funded through the joint solicitation. These projects must be managed in such a way as to maximize their relevance to state land use problems. This issue crosses agency lines and promises to be an important issue for years to come.

PRIORITY POLICY & PLANNING ISSUES

- **Address groundwater quantity issues at both statewide and regional levels:** Groundwater quantity was an important topic at the Groundwater Summit held October 30, 2001. Common themes in the afternoon breakout sessions included the need for a statewide management plan for water quantity, water conservation, high capacity well reform, reevaluation of water pricing structures and regional approaches to water quantity issues. At the conclusion of the Summit, 87.5% of those who filled out an evaluation form agreed that there is a need for a statewide groundwater quantity strategy in Wisconsin. 100 per cent of evaluation form respondents agreed that we are not doing enough to protect groundwater quantity in the state. The GCC will continue to be active on this issue and facilitate further dialogue among all parties on potential approaches and solutions.
- **Provide resources to local governments for Smart Growth/Comprehensive Planning activities.** Recent legislation has required local units of government to develop a comprehensive plan by 2010 in order to undertake land use activities. This plan must address 9 elements, including natural and agricultural resources,

housing, utilities, and land use. This planning process presents a unique opportunity to address and implement groundwater protection at the local level. The GCC will seek ways to assist local communities in their planning efforts to encourage groundwater protection. The Local Government Subcommittee will play an active role in this effort.

- **Find solutions to groundwater nonpoint pollution problems:** A 2002 DATCP report indicates that 37.7% of wells contain a detectable level of at least one herbicide or herbicide metabolite and 11.1% of Wisconsin's wells still contain detectable atrazine residues. In addition, 14% exceed the nitrate standard. These rates are substantially higher in agricultural areas. More work is needed to determine how far Wisconsin groundwater will deteriorate without a substantial change in farming practices, and what practices will sustain both agriculture and groundwater quality. The GCC will support the agencies and the UWS in obtaining information pertinent to the human health implications of consuming nitrate contaminated groundwater and the effect of discharge of this groundwater on surface waters and their ecosystems. In addition, it will continue to facilitate consistent education to provide a clear message on the many causes and effects of nitrate in groundwater for urban and rural citizens.
- **Identify tools that can be used to better predict Wisconsin's groundwater susceptibility to contamination:** Studies have demonstrated the need for developing statewide data layers that would facilitate better groundwater vulnerability assessments. These data layers include land use, soils, regional groundwater flow, hydrogeologic characteristics such as aquifer materials, and potential point sources of contamination such as underground storage tanks and pesticide spills. The studies also illustrate the importance of locational data for contaminant sources. The GCC's Planning & Mapping and Monitoring & Data Management Subcommittees have prioritized, promoted, and helped facilitate the development of data layers as part of a larger data integration initiative. Through the DNR's Source Water Assessment Program, which will be implemented in 2003, this work will continue and will result in improved predictive capabilities.

PRIORITY COORDINATION ISSUES

- **Promote consistency between the agencies on data management issues:** Through the DNR's groundwater data system and the Directory of Groundwater Databases, state and local government agencies now have more convenient access to groundwater data. This effort must be maintained by continuing to identify what data needs exist and ways to make data easily accessible. Data consistency must be promoted by use of translatable geolocational coordinate systems and consistent data elements for use in a GIS environment. The GCC will continue to provide leadership and communication on data management through its subcommittees. This continued effort displays the GCC's commitment to management of the resource through sound scientific methods.
- **Coordinate and facilitate the publication and distribution of information and educational materials on groundwater related issues:** The public has benefited from the consistent educational messages that have been endorsed by the Education Subcommittee. The Education Subcommittee will continue to provide its leadership and assistance to state agencies providing educational materials to the public. Priorities for the future include promoting water stewardship, awareness of water quantity issues, and providing materials for local communities to assist in their comprehensive planning activities.
- **Distribute findings from groundwater research or monitoring projects:** More than 100 summaries of groundwater-related monitoring and research projects funded through the joint solicitation process are now available online. The rate of response to the web site posting of research findings has been very encouraging so far. To maintain and enhance this response it will be important to add new summaries annually as they become available, create a more visually appealing set of front-end pages for the site, and publicize the web site location and content more widely. More work needs to be done to target interested audiences and distribute summaries and final reports more widely.

- Increase citizen involvement in groundwater protection:** Citizens are concerned about the protection of Wisconsin's groundwater, as evidenced by their participation in discussions of the Perrier bottling plant proposals, the routing of a possible Highway 10 bypass of Stevens Point near the municipal well field, and other local groundwater issues. However, citizen groups need a source of accurate unbiased technical information as well as assistance in organizing and communicating about their groundwater activities. Programs such as the National Groundwater Guardian program help citizen groups network and receive recognition for their efforts. Wisconsin's hiring of a statewide Groundwater Guardian coordinator (the first in the nation) is a positive step toward an active and informed citizen network and should be continued.

GROUNDWATER COORDINATION ISSUES

The Groundwater Guardian program is a national effort to help citizens become more active in groundwater protection. The program provides technical information, training, and support to citizen groups. The program also provides a national network of groundwater guardians who can share information and resources. The program is a voluntary effort and is open to all citizens. The program is a national effort to help citizens become more active in groundwater protection. The program provides technical information, training, and support to citizen groups. The program also provides a national network of groundwater guardians who can share information and resources. The program is a voluntary effort and is open to all citizens.

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Washington, D.C. 20540
U.S. Department of Justice
Federal Bureau of Investigation

TO: DIRECTOR, FBI (100-442610) FROM: SAC, NEW YORK (100-100000) (P)

RE: JAMES EARL RAY, AKA; ALIEN; (100-100000) (P)

NY 100-100000

On 10/10/68, NY 100-100000 advised that James Earl Ray, AKA, was seen at the New York Public Library on 10/10/68. The individual was seen by a NY 100-100000 employee and was seen to enter the building at approximately 10:30 AM. The individual was seen to enter the building at approximately 10:30 AM. The individual was seen to enter the building at approximately 10:30 AM.

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APPENDIX

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Wisconsin Groundwater Coordinating Council
MEETING MINUTES – AUGUST 17, 2001
DNR Central Office, Madison

Members Present: Susan Sylvester (DNR), Jamie Robertson (WGNHS), Bruce Rheineck for Nick Neher (DATCP), Henry Anderson (DHFS), and Eric Scott (Commerce)

Others Present: Tim Asplund, Jeff Helmuth, and Becky Pottratz (DNR), Ron Hennings (WGNHS), John Norman (UW-Madison), and Joe Janczy (EPA)

The meeting began at 10:00 AM.

1. **General Business** – Introductions were made. The minutes from the May 17th meeting were approved without modification. Susan Sylvester polled the GCC members present about continuing the 12 noon meeting times. Members indicated that this time period continued to work for them, but that it may be appropriate to begin the summer (August) meeting earlier in the day.
2. **Budget Update** – Susan Sylvester provided an update on the FY 02-03 budget process, and touched on several items with potential effects on the DNR and water programs. Overall, waters programs fared well in the budget passed by the legislature, with increased funding for rivers, dam safety, wetlands, and exotic species. Susan will be serving on the governor's exotic species task force, with a report due in January. [The provision to create a separate Department of Forestry was vetoed by the Governor. A requirement for an Environmental Impact Statement to be prepared for water bottlers seeking a high capacity well permit and a requirement for airborne particulate filters to be installed on new wells were also vetoed.] Commerce, DHFS, WGNHS, and DATCP did not report any major budget items pertaining to groundwater programs.
3. **Education Subcommittee Report** – Ron Hennings reported on the following activities of the Education Subcommittee, which met on July 16th:
 - Drinking Water Awareness Week (May 6-12, 2001) - Subcommittee members reviewed activities surrounding this observance. Chris Mechenich and Don Swailes (DNR) participated in a call-in show on public radio on July 3rd as a follow-up to their appearance in May. Several press releases went out from DNR and UW Extension, but it was not known how widely they were printed in newspapers. Subcommittee members plan to follow up to see if clipping services are available to track these press releases in the future.
 - Farm Progress Days – There will be a strong groundwater presence at this year's Farm Progress Days, to be held in Rock County, Sept. 18-20. All of the state agencies with groundwater and drinking water exhibits will be housed in the same pavilion, and are working together on a display involving milk jugs filled with water to represent daily water consumption. Several subcommittee members are actively involved in this endeavor.
 - Groundwater Study Guide – Subcommittee members reviewed a revised cover letter to accompany this 1991 DNR-produced guide. Efforts are being made to distribute the remaining study guides before they become too outdated.
 - Groundwater Guardian Coordinator – The Central Wisconsin Groundwater Center recently hired a half-time coordinator to work with Groundwater Guardian communities in Wisconsin and to further build a citizen constituency around groundwater and drinking water issues. This position is funded by a DNR grant using Wellhead Protection Program funds.
4. **Monitoring and Data Management Subcommittee (MDMS) Report** – Jeff Helmuth reported on the following activities of the MDMS, which met on July 17th:
 - Minimum data elements -The Subcommittee has been working on a list of minimum data elements to

assist local groundwater data managers in creating and maintaining groundwater databases. The final list was to have been reviewed and endorsed by the GCC then made available to other agencies and local governments. However, the Federal government (EPA and USGS) recently released their own set of data elements for all water quality data, which includes over 70 elements. The MDMS is reviewing this Federal list to check for similarities and differences, and will wait for a final version expected in October before proceeding further.

- Act 88 - The DNR has determined that the Privacy Act does NOT apply to groundwater databases and information.
- Well Construction Report Scanning Project - The WGNHS recently completed a substantial effort to scan in the 350,000 well construction reports dated prior to 1988 and to key in 7 data elements to allow queries of the reports electronically. This phase of the project was funded with SWAP dollars. The reports are now available on the DNR's Intranet and from WGNHS on CD. Jeff noted that this was a big effort, but that it will be very useful for a variety of purposes. Jeff thanked the WGNHS and staff members (Bill Bristoll and Irene Lippelt) for their efforts.
- DNR Well Forms Program - Over 300 drinking water well construction reports from well drillers have been uploaded since its inception earlier this year, easing workload for DNR staff. Monitoring well construction reports have been coming in slowly, partly due to limited initial promotion of the software, program staff not requesting electronic data submittals and the form's less frequent use.

5. Planning and Mapping Subcommittee Report - Tim Asplund reported on the following activities of the P&M Subcommittee, which last met on June 11th:

- Karst Inventory Project - Further progress on this effort has been postponed until after the Groundwater Summit. The Subcommittee will work with the Karst Data Workgroup to develop a plan for further distributing the form, developing a database, and guiding future mapping efforts.
- Smart Growth and Groundwater Issues - Subcommittee members are reviewing a draft document by UW-Extension providing guidance to local communities preparing comprehensive plans as part of the recent Smart Growth legislation. The guidance document details items to consider in developing the Natural Resources Element of the plan. Comments are due by the end of August. Chuck Warzecha (of P&M), Chris Mechenich (Education) and Dave Lindorff (Local Government) met recently to discuss developing facts sheets on incorporating groundwater issues into Smart Growth planning. They will bring their ideas to their respective subcommittees in October and report back to the GCC in November.
- NRCS - Jon Hempel, State Soil Scientist, met with the Subcommittee on June 11th and provided an update on NRCS soil mapping and digitizing initiatives. The Subcommittee also discussed having NRCS officially represented on the Subcommittee. Tim will be following up with NRCS staff and inviting them to participate in future meetings.

6. 2001 Report to the Legislature - Tim Asplund asked for comments on the 2nd draft of the report, including specific comments on the cover letter and the section on Future Directions. Several GCC members expressed approval of the letter, which focused on the upcoming Groundwater Summit rather than listing highlights from the last year. Henry Anderson suggested referring to the Executive Summary for a listing of highlights. No additional suggestions were made for the Future Directions section, but it was generally felt that items should not be deleted from the list at this time. Henry suggested that the Future Directions section be moved to the front of the document, immediately after the Executive Summary. Others suggested making these pages a different color and handing them out at the Groundwater Summit. Tim noted that the Report would include the program for the Groundwater Summit, and would be available in mid-September.

7. FY 03 Joint Solicitation - Tim Asplund reported that he had recently met with Jim Hurley of the Water Resources Institute (WRI) to plan for the FY 03 Joint Solicitation. He handed out a draft timeline and

noted that dates were roughly the same as last year. The Solicitation is scheduled to go out at the end of September with a proposal deadline of November 19th. A Proposal Writer's Workshop will be held on October 24th in conjunction with the Midwest Groundwater Conference at the Inn on the Park in Madison. A major change this year will be online submission of proposals through the WRI web site. Investigators will be asked to register online at WRI and submit their proposals in Adobe Acrobat format directly to a database. This process will further streamline the review process and enable more uniform tracking and comparison of project proposals. Henry Anderson noted that many other granting agencies are using electronic submission programs and that investigators should be getting used to this process.

8. **Meet the GCC brochure** - Tim Asplund reported that the revised brochure was at the printer and should be available by the end of August. The GCC web site was also updated with photographs and biographical information for each of the GCC members.
9. **Wisconsin Groundwater Summit** - Tim Asplund provided an update on the Groundwater Summit, which will be held at the Country Inn Hotel in Waukesha on October 30-31, 2001. Tim reviewed an updated agenda for the Summit and shared lists of confirmed participating groups and groups that had not responded. Susan Sylvester asked everyone to scan through the list to identify groups that should be contacted with follow-up calls from Tim or herself. Bruce Rheineck will take the list back to Nick Neher and ask him to follow up with some of the agricultural and farming groups. Tim reported that the next step was to finalize the program and get it distributed to the Summit participants, the legislature, and key media representatives. Tim is working with Becky Pottratz, Communication and Education Specialist for the DNR's Bureau of Drinking Water and Groundwater, on a media strategy for the Summit, which will include a couple of press releases in advance of the Summit. Susan asked that the GCC members make themselves available for a conference call if needed prior to the Summit.
10. **Source Water Assessment Program (SWAP) Update** - Jeff Helmuth, DNR's SWAP team leader, commented on the following three components of SWAP activities:
 - **Source Water Area Delineations** - Regional modeling projects to determine source water areas for municipal systems continue in several counties, including Rock, Eau Claire, Sauk, Pierce and St. Croix, Fond du Lac, and La Crosse as well as in SEWRPC counties and the Central Sands Area. These projects should be completed in 2001 or 2002. Hydrogeologic mapping is being evaluated for use in karst areas, and may be useful for smaller public systems. Very few municipal systems seem to have impacts from the surface. In addition to being used for the SWAP and vulnerability assessments, the delineations will prove to be a useful educational tool, as the influence of hydrogeological settings on the shape of source water areas is being shown.
 - **Potential Contaminant Source Data Collection** - Staff have been working with several DNR programs to digitally locate high priority LUST and ERP sites, most RCRA, Superfund, and large quantity hazardous waste generators, landfills, CAFO's, and WPDES outfalls and treatment lagoons. This has been a large effort, requiring onsite visits and on-screen digitizing, but will provide useful information for many purposes beyond source water assessment.
 - **Susceptibility Determinations** - The completed well construction report scanning project was primarily funded to provide information for susceptibility determinations of public water systems. Groundwater age-dating is another tool that is being pursued, especially in cases where a well construction report cannot be located or other indicators of contamination are detected. Finally, a computer application to assist DNR staff in making source water and vulnerability assessments is being built into the Drinking Water System.The deadline for completion of SWAP is May 2003. Wisconsin has the 2nd highest number of public water systems relying on groundwater in the U.S.
11. **Monitoring and Modeling of Nonpoint Pollution in Agricultural Fields** - Dr. John Norman, of UW-Madison's Soil Science Department, provided an overview of research that he has been carrying on for

the last several years with support from the UW System and DATCP through the GCC's Joint Solicitation. His research involves developing water budgets and quantifying leached chemicals from a series of experimental plots outfitted with Equilibrium Tension Lysimeters (ETL) near Arlington, WI. Plots include unfertilized and fertilized cornfields receiving no till or conventional tillage, and a restored prairie as a control. The ETL are located 4 feet below the root zone and are designed to accurately measure the amount of drainage (infiltration) from the overlying plot. Major findings from the past 5 years of continuous monitoring include:

- Drainage is the largest component of the water budget in the first 6 months of the year, while evapotranspiration is greatest in the summer and fall.
- About 10-50% of the applied N fertilizer in fall leaches to groundwater during the January – June time period.
- Drainage decreases by tillage type (Chisel plow > No till > prairie).
- N leaching is similar for chisel plow and no till.

Using this data, Dr. Norman and students have been building models to apply these results to other systems. Their approach is to link horizontal landscape models (runoff) with discrete vertical models (drainage) to be able to model where and how water flows on a whole-field scale. Inputs to the model include soil properties, topography, and weather variables, while outputs include soil moisture, drainage, yield, and grain moisture. These models have shown that even very small changes in elevation (as little as 1% slope) can have significant effects on drainage patterns and potential for leaching of chemicals. Infiltration sites can be very small, yet contribute a large proportion of the leaching from an entire field. The key to managing these fields is to keep water in place through contour plowing and strip cropping, resulting in greater overall yields, less runoff and less leaching of N and other chemicals to groundwater. Future work includes adding manure at optimal, less than optimal, and overapplied rates on a set of previously unfertilized fields to measure leaching of N from these systems and compare to fields receiving inorganic fertilizer.

The meeting adjourned at 12:30 PM. The next meeting is scheduled for 12 noon on November 9th at DATCP, 2811 Agriculture Drive, in Madison.

Respectfully submitted,

Tim Asplund, Water Resources Specialist
Department of Natural Resources

Wisconsin Groundwater Coordinating Council
MEETING MINUTES – NOVEMBER 9, 2001
DATCP Boardroom

Members Present: Susan Sylvester (DNR), Nick Neher (DATCP), Carol Cutshall (DOT), Fran Garb (UW-System), Henry Anderson (DHFS), and Cathy Cliff (Commerce)

Others Present: Jill Jonas and Mike Lemcke (DNR), Barb Lensch (NRCS), James Vanden Brook and Jane Larson (DATCP), Eric Scott (Commerce), Anders Andren and Jim Hurley (UW Water Resources Institute).

The meeting began at 12:00 PM.

1. **General Business** – Introductions were made. The minutes from the August 17th meeting were approved without modification. Agenda repair was made to move the update on Water System Security Issues to the beginning of the meeting.
2. **Water System Security Issues** – Jill Jonas, Director of DNR's Bureau of Drinking Water and Groundwater, provided an update on activities for protection of our water supplies that have been implemented due to the bombing of September 11th. Lines of communication have been improved between the federal government and the state. They have also been improved between the state and local water purveyors. Many contacts are being received from the local water purveyors that are trying to ascertain cost beneficial improvements to their security systems. Weekly conference calls on security are occurring to improve consistency across the state. Many training programs have been scheduled by entities involved with protection of the resource.
3. **Education Subcommittee Report** – Jane Larson reported on the following activities of the Education Subcommittee, as reported at their October meeting:
 - Farm Progress Days (Sept. 18-20 in Rock County) - Testing of water samples was offered to farmers who attended the event. Over 100 samples came in from participants from 9 different counties. 22% of those samples had nitrate with 28 mg/L being the highest value. The average concentration of the samples that had nitrate was 6 mg/L. A visualization of how much water a person uses per day was made with milk jugs and it appeared that it had some impact on attendees. Jim Gibson from the Wisconsin Technical College System offered himself as a person that farmers could follow up with for questions after Farm Progress Days were over.
 - Smart Growth – Four fact sheets are being worked on which will help communities to incorporate groundwater into their smart growth planning process. Chuck Warzecha, David Lindorff, and Christine Mechenich are taking the lead on putting them together. These initial Fact Sheets will cover a basic overview, the required 9 elements, resources on groundwater and land use, and residential development.
 - Karst Brochure – Subcommittee members are reviewing a karst tri-fold brochure that was developed by Suzanne Wade, the Rock River Coalition & UW-Extension to determine if it should be evolved to apply to other specific areas or for statewide use.
 - Brochure Review – Becky Pottratz has taken the lead on updating both the "Pesticides in Groundwater" and "Radium in Groundwater" brochures. These brochures are overdue for revision.
 - Next Meeting – The Subcommittee's next meeting is scheduled for January 24th, 2002.
4. **FY 03 Joint Solicitation** – Jim Hurley gave a demonstration of the Water Resources Institute's (WRI) Online Proposal Submission process, unveiled for the first time for this year's Solicitation. The site is designed to be very user friendly and as of the meeting already had principal investigators beginning to submit their projects. The system offers the ability for a principal investigator to submit information a piece at a time rather than only when the entire project is complete. Several former investigators used

the site in a beta test mode and had a positive reaction.

Jim also reported that the WRI is actively working on being able to leverage their monitoring and research dollars. They have received pre-approval for 104(b) base funding for the WRI and it appears that they may receive a 75 to 80 thousand dollar increase. However, the tuition remission issue will likely use up all of the increase. The WRI will try to use second year projects to effectively access the funding. Fran Garb made a motion to accept the 3 to 4 proposals that would allow WRI to access the funding. Nick Neher seconded the motion. The motion passed.

5. **Groundwater Summit Report and Steps Ahead** - Mike Lemcke reported that the Groundwater Summit was definitely a success, handed out a summary, and highlighted the work/follow-up that is yet to be done.

- **Meeting Highlights** – 135 delegates representing more than 50 agencies, organization, and local governments attended the Summit. The morning focused on the bringing the group up to date on the resource, its political history, and diverse viewpoints on what should be done or not done with it. The afternoon's focus was targeted at information that could be gathered through break out sessions. Quantity issues dominated the discussion in both the morning and afternoon sessions. When asked, "Is there a need for a statewide groundwater quantity strategy in Wisconsin?" 84 of 96 participants (87.5%) responded "Yes". On the evaluation forms 54 out of 54 respondents said, "we are not doing enough" to protect groundwater quantity in the state. Overall feedback on the Summit was positive. On the evaluation forms that were returned, 47 out of 53 thought the Summit was an effective means of gathering input on groundwater issues and 48 of 53 felt they had adequate input into the process.
- **Key themes to emerge from the Summit** – A group of GCC Subcommittee members met October 31st, 2001, to "debrief" and discuss general impressions from the Summit. Themes that were winnowed out were developing a groundwater strategy; exploring options for regionalization of water management; land use and groundwater protection; second generation of groundwater law implementation; building a groundwater constituency; whose water is it?; long term monitoring needs; surface water connections; and recognizing ecosystem services as well as economic benefits of groundwater. Further synthesis of these themes is necessary before finalizing a Summit action plan.
- **What are our Next Steps?** There are four items that are on the near horizon. A matrix of information that was gathered during the break out sessions will be put together and then sent out to the participants for their comments. Secondly a preliminary "Action Plan" or set of strategic actions will be established. In addition, a full conference proceedings will be developed. Lastly the Summit will feed into the Wisconsin Academy of Sciences, Arts and Letters' "Waters of Wisconsin" project.

The GCC asked that the above information be developed and that an update be brought back to them on a regular basis. The Council will then be able to determine additional subcommittee activities.

6. **2000 Survey of Agricultural Chemicals in Wisconsin Groundwater** – Jim Vanden Brook reported that the purpose of the survey was to obtain a current picture of agricultural chemicals in groundwater and to compare those levels to those surveyed in 1994 and 1996.

336 private wells in the various agricultural districts were randomly selected for this survey. 19 compounds were detected including 18 pesticides or their breakdown products. Primarily corn herbicides were found. Very few pesticides were detected in the northern third of the state. 37.7% of the wells had detectable levels of pesticides. The percentage of pesticide detected has greatly increased

since 1994. However, Jim noted that the analytical ability to detect pesticides has greatly increased in the last 7 years. Alachlor and its metabolites were detected in over 25% of the wells. Acetochlor and its metabolites were also detected in the well water. Finally, atrazine is being evaluated to determine if it could be reintroduced into an area where it had once been banned. In areas where it is being reintroduced it is being detected in well water. Survey results will be published soon.

7. Set meeting dates for 2002 – The next four meeting dates were established. They are:

- February 22nd - Water Resources Institute
- May 10th - DNR Service Center, Dodgeville
- August 16th - DNR, Central Office
- November 15th - DHFS

8. The meeting was adjourned.

Respectfully submitted,

Michael Lemcke, Natural Resources Manager
Department of Natural Resources

Wisconsin Groundwater Coordinating Council

MEETING MINUTES – FEBRUARY 22, 2002

Water Resources Institute Conference Room

Members Present: Susan Sylvester (DNR), Nick Neher (DATCP), Jamie Robertson (WGNHS), Carol Cutshall (DOT), Fran Garb (UW-System), Cathy Cliff (Commerce), and Jack Metcalf (Governor's representative)

Others Present: Anders Andren and Jim Hurley (UW Water Resources Institute); Ed Morse (WRWA); Shaili Pfeiffer (Wisconsin Academy); Jon Standridge (WSLH); Chris Mechenich (CWGC, via phone)

The meeting began at 12:10 PM.

1. **General Business** – Introductions were made. The minutes from the November 9th meeting were approved without modification. Susan Sylvester made note of a call she had received from a professor at UW-Superior who is interested in getting involved in regional or statewide groundwater monitoring and research activities, especially involving GIS. Susan noted that he is very interested in working with the GCC on groundwater issues in the northern part of the state. **Contact information:** Dr. William Bajjali, 715-394-8056; wbajjali@staff.uwsuper.edu; <http://frontpage.uwsuper.edu/bajjali>.
2. **Education Subcommittee Report** – Chris Mechenich made note of her pride in the work of the Subcommittee, especially in these times of budget cutbacks. She noted that the collective efforts of the Subcommittee far exceeded what could be accomplished individually. She then reported on the following activities of the Education Subcommittee, which met most recently on January 24th:
 - **Groundwater Summit** - The Subcommittee has been given the "Education and Communication Needs" that were identified at the Groundwater Summit, and will be ranking and prioritizing them at the next meeting. Many of the needs matched well with recent and ongoing activities of the Subcommittee, especially those related to groundwater quantity.
 - **Smart Growth** – As reported at the last GCC meeting, Chris, Chuck Warzecha, and David Lindorff are working on four fact sheets to help local communities incorporate groundwater into their "Smart Growth" planning process. Chris noted that these should be ready by April 1st, primarily in electronic format, and could be linked to the GCC web page, the DNR's Land Use site, and sites at UW Extension. Chris also noted that the Smart Growth process was just getting underway on the local level, and that the GCC was ahead of the curve in terms of putting this information together. Jamie Robertson asked who would be the audience for these fact sheets and expressed his view that it should be directed toward resource professionals, rather than the general public. Cathy Cliff noted that it might be worth taking a more comprehensive approach rather than focusing only on groundwater. Chris reiterated that these fact sheets were designed specifically to deal with groundwater, as it is a resource that is often overlooked when dealing with land use planning. She also noted that it was meant to be part of the technical resource kit that will be made available to the committees at the local level that will be charged with developing the specific plans. Jim Hurley noted that he was on one of those local committees and that he would find something like this to be a welcome resource. He noted that communities receiving some of the first rounds of grant assistance would be good places to distribute information, as these communities will set the stage for later efforts. *Nick Neher offered to bring up the fact sheets at the next Wisconsin Land Council meeting, and to determine how the Council plans to address educational aspects of Smart Growth.*
 - **GRN/WCR access on DNR internet site** – The issue of access to locational information included in the Groundwater Retrieval Network and the Well Construction database has been raised in several Subcommittees. Chris emphasized the educational value of this information to the general public and teachers, and noted that it is not very useful without the locational information that was removed as a security precaution. Cathy Cliff and Nick Neher both commented that it has presented difficulty

for their staff, though they understood that the information was available in other formats. Chris pointed out that it was primarily the private well information that was at issue, while the security concerns largely involved public water systems. *Susan Sylvester directed Tim Asplund to investigate with DNR staff the possibility of separating out the private well data from public water system data in these databases.*

- Next Meeting – The Subcommittee's next meeting is scheduled for April 2nd, 2002. Nick Neher asked about an item in the January 24th minutes regarding the letters that well owners receive from DATCP when a substance is detected in well water samples collected in their surveys. He wondered whether the lack of response is due to people feeling adequately informed or not caring. Nick said that he would welcome any suggestions to improve the effectiveness of these letters if needed.

3. **Planning and Mapping Subcommittee Report** - Tim Asplund reported on the following activities of the Subcommittee, which last met on December 5th, 2001 (as provided by Bob Pearson):

- The Subcommittee selected a new chairperson (Bob Pearson, DOT), to replace Lisa Morrison who is stepping down after 7 years as chair;
- Bob and Ron Hennings helped UW-Extension with a new karst brochure (e.g., map, photos, review text, etc.);
- Bob submitted an abstract on behalf of the Subcommittee regarding voluntary karst mapping for the AWRA/WGWA Conference (March 7-8);
- Bob will be meeting with Mindy James of WGNHS to update and add material to the karst web site and with Lisa Morrison and Bill Bristol to determine use, applications, or modifications to the karst inventory electronic form;
- DOT (Pearson) is working with DNR (Helmuth) Source Water Assessment Program to provide GPS coordinates for statewide salt storage sheds. This information will be a new data layer for DOT and DNR Mapping.
- During spring 2002, the Subcommittee will send out "canned" reminders to all state agency staff (field folks in particular) to consider filling out the karst form if features are observed or noted during routine activities.

Tim mentioned that the Subcommittee would be involved in evaluating output from the Groundwater Summit and that it was looking to undertake new initiatives. One example of a possible project is to produce a Wisconsin GIS Environmental Mapping Index pamphlet (e.g., like Indiana's or Florida's). It could be a simple index highlighting the various themes, layers, dates, scales, and contacts for all state agencies, and would be a useful reference tool for all to use (state, local, private, planning commissions, etc.). Bob Pearson noted that currently all the "environmental data layers" are scattered throughout the various state agencies, and determining who has what layer is problematic for general workers and the public. *Nick Neher agreed with this need, and said he would bring up this issue to the Land Council.*

4. **Monitoring & Data Management Subcommittee Report** - Tim Asplund summarized highlights from the November 27th, 2001, meeting, as provided by Jeff Helmuth:

- FY 03 Joint Solicitation - The Subcommittee was actively involved in reviewing proposals and met with the Research Subcommittee on January 9th.
- Groundwater Summit - The Subcommittee reviewed a draft list of Research and Monitoring/Data Management needs that were identified in some of the various breakout sessions. *A "final" list will be reviewed at the next meeting.*
- Minimum Data Elements - This effort has been delayed due to a Federal data standards document recently produced by an EPA/USGS group. The group approved a second draft of the document in November, but it will likely be updated and revised periodically. The Subcommittee decided to go back to the original Minimum Data Elements document and rework it to provide references to the full EPA/USGS report rather than try to incorporate the Federal standards. The intention of the guidance is to give Wisconsin groundwater data managers a starting point and to help with data sharing between agencies and with local partners. Database managers would be encouraged to use

these other sources as references. A "final" draft was sent out for comments (comments due 2/22/02). *Tim asked if the GCC wanted to provide comments and/or approval via email or if this should be an agenda item for the May meeting? Members indicated that email would be fine, and Tim said that he would provide a hard copy of the document at the next meeting.*

- **Karst Reporting Form computer application** - Randell Clark developed an application to allow users to create their own karst database on their computer and share files with other users and ultimately with the WGNHS. This is one piece of a larger effort to create a statewide database of karst features and would be beneficial to people with existing databases. The Karst Data Workgroup needs to do some more work in terms of defining karst and put some limits on what should be in the database. For now, the WGNHS will accept email submissions of databases created with this program and keep them on file, but would not be able to create and maintain a master database at this time.

5. **FY 03 Joint Solicitation and UWS Groundwater Research Plan** – Jim Hurley provided an overview of this year's solicitation process, which was enhanced by the electronic submission and review process developed by WRI. Jim noted that this system allowed for a fairly rapid turnaround time between the proposal deadline (Nov. 15th) and the Groundwater Research Advisory Council (GRAC) meeting (Feb 15th). A few statistics on the process:

- 38 proposals were submitted, of which 33 were eligible for UWS funding;
- over \$1 million was requested for FY 03; proposals averaged \$33,000 in the first year;
- 11 new researchers submitted proposals;
- 10 institutions were represented, including UW Whitewater for the first time;
- 250 email requests for reviews were sent out: 155 (62%) accepted, 145 (94%) completed;
- All except 1 proposal had at least 3 separate reviews.

Jim noted that the GRAC meeting was particularly intense this year, as DNR, DATCP, and Commerce were unable to commit significant funds to new projects for FY 03. Jim then handed out a summary of the UWS plan for FY 03, as recommended by GRAC. He noted that 2 of the 7 continuing projects would be covered by USGS matching funds, as approved by the GCC in November. He also noted that there had been some slight modifications to project budgets since the GRAC meeting, which resulted in being able to fully fund 5 projects, and put some money back into one project that had been cut back. One project will also receive some funds from the DNR to cover part of the drilling costs. Finally, Jim noted that only 2 of the projects would carry over into FY 04, meaning that the full \$270,000 might be available for new projects next year if USGS match is still available. *Nick Neher expressed his appreciation at the level of organization and effort that the WRI provided this year and made a motion to approve the UWS Groundwater Research Plan as presented. Jack Metcalf seconded the motion and the motion carried unanimously.*

6. **Future Funding for Monitoring and Research**- Jamie Robertson made note that it has been very helpful and appropriate in the past for DNR to be a player in the Joint Solicitation process, and that he recognized that this year was unusual. However, he expressed his concern that this not turn into a long term reality and that he felt the GCC should go on record to support DNR's involvement in the past and the future. Nick Neher echoed this sentiment and broadened it to DATCP and all of the other agencies represented on the GCC. *Susan Sylvester reiterated her support for agency participation in the process and directed Tim Asplund to draft a letter to go to all of the agency secretaries in support of future monitoring and research funding, while acknowledging the current budget situation.*

7. **Wisconsin Fertilizer Research Council (WFRC)** - Tim Asplund reported that he had met recently with Jim Jacobus, Manager of the WFRC research program, and Jeff Postle and Kevin Beckard of DATCP to discuss ways to better share information and proposals of mutual interest. Tim noted that occasionally proposals are submitted to the Joint Solicitation that might better fit the WFRC process and vice versa, and that the decision-making time frame was very similar. However, there are significant differences in

the scope, funding level, and review process for the two solicitations. No formal plan was developed at this time, but Tim and Jim agreed to share relevant proposals in the future and ensure communication throughout the review and decision-making process.

8. **National Water Quality Monitoring Council (NWQMC) Conference** - Tim Asplund noted that he had submitted an abstract and would be presenting a paper at the upcoming NWQMC conference at the Monona Terrace Convention Center on May 20-23, 2002. The title of the paper is "The Joint Solicitation – Wisconsin's Groundwater Research and Monitoring Partnership." The paper will be part of a workshop on capacity building for State Monitoring Councils, and will focus on the successes of the GCC and the Joint Solicitation. (See <http://nwqmc.site.net>).
9. **Groundwater Summit Update and Directions** - Tim Asplund handed out a list of accomplishments to date and tasks ahead as a follow-up to the Groundwater Summit held October 30, 2001. Some of the key accomplishments included:
 - A press release that went out on November 26th summarizing the Summit highlights;
 - Transcriptions of all the morning presentations, 75% of which have been edited by the speaker;
 - A compilation of the small group Breakout Session comments into a matrix of needs and potential solutions;
 - Updates to the GCC Summit web page, including highlights, a list of proposed outcomes, speaker biographies, a participant list, PowerPoint presentations and the Breakout Session Matrix (<http://www.dnr.state.wi.us/org/water/dwg/gcc/GCC-GWSUMMIT.HTM>);
 - Notification to Summit participants about the updated web page and an invitation to comment on the Breakout Session Matrix (by March 15th);
 - Lists of the Breakout Session comments provided to the Monitoring and Data Management and Education Subcommittees.

Tim noted that he would be gathering some of the GCC Subcommittee members that attended the Summit to help formulate the "Strategic Agenda" this spring, and hoped to report back to the GCC at the May meeting. All of the Subcommittee Chairs and most of the agencies are represented in this "Core Group." *Cathy Cliff agreed to find someone from Commerce who would be willing to participate.* The GCC again reiterated their concern about the policy implications of some of the recommendations from the Summit. Tim noted that he would direct the "Core Group" to be careful about the language used in the Strategic Agenda, and that it would be clearly stated that any policy recommendations were garnered from the Summit participants, and do not necessarily represent the views of the GCC. Additional tasks ahead include further refining the Breakout Session Matrix and putting together the Summit Proceedings to serve as a complete record of the Summit and its outcomes. Finally, Tim will continue to work with "Waters of Wisconsin" (WOW) to incorporate groundwater issues and Summit follow-up discussion into their Fall Forum and other activities (see below).

10. **Waters of Wisconsin Initiative** - Shaili Pfeiffer, Project Coordinator with the Wisconsin Academy of Sciences, Arts, and Letters, provided an overview of the Waters of Wisconsin Initiative, which has been underway for about a year and will culminate in a Fall Forum on October 21-22, 2002 at the Monona Terrace. The initiative is a "first-of-its-kind" attempt by the Academy to provide a neutral framework for addressing long-term policy issues that are facing the State. A 20-person committee and a larger Advisory Network of water resource professionals from a variety of disciplines guide the effort. Some of the key components of the initiative include regional public forums focusing on different water issues, assessing the current Status and trends of water and aquatic resources, drafting a set of Sustainability principles, and developing alternative Scenarios for the future. These efforts will culminate in a report on the future of Wisconsin's water resources and the Fall Forum, where the report will be presented and further developed. The organizers hope that the initiative will set into motion policy discussions on a variety of levels and set into place a comprehensive water policy for the State. More information can be

found on the Wisconsin Academy's web site (<http://www.wisconsinacademy.org>) or by contacting Shaili (smpfeiffer@facstaff.wisc.edu).

11. **Technical Presentation** - Jon Standridge, of the Wisconsin State Laboratory of Hygiene, gave a presentation on a recently completed study titled "Passage of Microorganisms In Septic System Effluents Through Mound Sand In a Controlled Laboratory Environment." This study was funded by the WDNR, and driven by recent rules (Comm 83) regulating private onsite wastewater treatment systems (POWTS), as well as public health and resource protection concerns related to microbial pathogens. The specific focus of the study was to evaluate the removal of microbes from POWTS wastewater by sand that is typically used in mound systems. Jon noted that there are many factors that affect removal (filtration, adsorption and die-off), but that the main factors assessed in this study were loading rate (1-8 gal/ft²/day), effluent quality (10³ - 10⁷ fecal coliforms), column length (12 - 60 inches), and dosing frequency (1 or 5 times per day). In addition, the study employed a range of microbial indicators, including total coliform, fecal coliform, *E. coli*, enterococci, and coliphage. The basic procedure was to introduce wastewater effluent at regular intervals to a set of columns packed with sand for a period of several months. Every 3 weeks, the effluent was collected from the bottom of the columns and tested for the presence of the microbial indicators. Each column had a unique combination of effluent quality and length. The loading rate was applied evenly for all columns, but doubled twice during the course of the experiment.

The results of the study were fairly complex, but significant findings included:

- **Low total coliform, fecal coliform or *E. coli*** loads present in **high** quality effluents do not pass through 12 inches of mound sand when dosed evenly throughout the day at 2 gallons per square foot per day.
 - As dose volume is doubled (4 and 8 gallons per square foot per day), **total coliform** breakthrough occurs, but not **fecal coliform or *E. coli***.
 - If dose volume is not spaced throughout the day, **total coliform, fecal coliform and *E. coli*** breakthrough occurs.
- **High total coliform, fecal coliform, and *E. coli*** loads present in **low** quality effluents do not pass through 24 inches of mound sand when dosed evenly throughout the day at 2 gallons per square foot per day.
 - Doubling dosage rate to 4 gallons per day results in passage of **total coliform, fecal coliform, and *E. coli*** organisms, even through 60-inch columns.
- *E. coli* is a slightly more sensitive indicator of microbial passage through mound sand than is **fecal coliform**, while **total coliform** is a substantially better indicator of microbial passage than *E. coli*.
- **Enterococci and coliphage** are not better indicators than the traditional coliform indicators.

Some discussion of the implications of the study ensued, along with some suggestions for presenting and interpreting the results for future publications. Jon noted that he hoped to team up with engineers and soil scientists, possibly from WDNR, to put together a paper for peer-reviewed publication. Copies of the report can be obtained from Jon directly (jhs@mail.slh.wisc.edu) or from Tim Asplund.

12. **Commerce Report Due to GCC** - Susan Sylvester noted that there is a provision in Comm 83.71(7), Wis. Adm. Code, for an annual report on POWTS performance monitoring activities of the Department of Commerce that is to be provided to the GCC on an annual basis. The first report was due December 31, 2001, but the GCC has not received any report to date. *Cathy Cliff agreed to follow up on this item with the appropriate administrator in Commerce.*
13. **The meeting was adjourned.** The next meeting is scheduled for Friday, May 10th, 2002, at the DNR Service Center in Dodgeville.

Respectfully submitted,

Tim Asplund, Water Resources Specialist
Department of Natural Resources

Wisconsin Groundwater Coordinating Council
DRAFT MEETING MINUTES – MAY 17, 2002
Department of Natural Resources Board Room

Members Present: Nick Neher (DATCP), Carol Cutshall (DOT), Fran Garb (UW-System), Cathy Cliff (Commerce), Mike Lemcke for Susan Sylvester (DNR), and Ron Hennings for Jamie Robertson (WGNHS)

Others Present: Jim Hurley (UW Water Resources Institute), Bob Pearson (DOT), Dave Lindorff and Tim Asplund (DNR), Madeline Gotkowitz (WGNHS), and Brian Barrett (SEWRPC)

The meeting began at 12:10 PM.

1. **General Business** – Introductions were made. The minutes from the February 22nd meeting were approved without modification. The agenda was modified to include a discussion item related to the Report to the Legislature.
2. **Education Subcommittee Report** – Tim Asplund reported that Jane Larson was stepping down from the Subcommittee, due to her changing responsibilities at DATCP. Jane Larson had been a member of the Education Subcommittee since October 1993. Tim read the following comments from Chris Mechenich:

Jane has been a highly valued and productive member, faithfully keeping us informed about groundwater-related activities at DATCP, and bringing in other DATCP staff to help with projects or answer questions where needed. She helped organize the GCC's first groundwater education session for legislators held in the Capitol Rotunda. She was a frequent volunteer for ad-hoc subgroups to brainstorm ideas or review materials, and was an important member of the interagency group that developed the 'Tests for Drinking Water from Private Wells' brochure published by DNR. She also cheerfully accepted the role of hosting the bimonthly subcommittee meetings at DATCP for the last several years.

Nick Neher noted that budget cuts resulted in reduced staff in the public information office, requiring Jane to take on additional responsibilities for the Department. Randy Zogbaum, a hydrogeologist in the Water Quality Section, will replace Jane on the Subcommittee.

Tim noted that the Subcommittee had further discussed Nick Neher's inquiry about the adequacy of DATCP's letters to private well owners when a detectable level of a pesticide was found in their well. Jeff Postle had clarified that the letter itself referred people to Jeff or to the local DNR drinking water specialist, but that it was his standard practice to refer people to DHFS with any health related questions related to the letter or the sampling results. Nick noted that one follow-up study done by DATCP had found that 50% of people still used their well after being notified of a detectable level.

Tim passed around a copy of a press release that went out the week before Drinking Water Awareness Week that highlighted the Groundwater Summit and quoted Susan Sylvester and Jamie Robertson. Other press releases went out around the same time. Tim also noted that Becky Pottratz of the DNR was working with Wisconsin Public Radio to produce a series of radio call-in programs related to drinking water and groundwater issues.

Finally, Tim noted that several members of the Subcommittee would be staffing booths and displays at the upcoming Farm Progress Days in Richland County (July 9-11). The highlight of this effort is UW Extension's well testing program. Ron Hennings noted that this effort was a good example of the collaboration that goes on as a result of the GCC.

3. **Planning and Mapping Subcommittee Report** - Bob Pearson gave a quick summary of the Subcommittee meeting minutes from April 3rd, noting that the "Agency Updates" occurred at the beginning of the meeting to ensure that adequate time was given to this important activity. He pointed

out that Jeff Helmuth gave an update on SWAP (Source Water Assessment Program) and the DNR's Land Legacy project. He also noted that the Subcommittee continues to press ahead on the karst mapping initiative, though it did not appear on the agenda for the last meeting.

Bob then highlighted two areas that the Subcommittee will be focusing on. One possible project is to produce a GIS Index or Catalog for groundwater information. As a start, Subcommittee members will be extracting the groundwater-specific information from the agency Land Integration Plans that were submitted to DOA in April. The index or catalog could be a simple brochure or web site, highlighting the various themes, layers, dates, scales, and contacts for groundwater information available from state agencies. A second area of focus will be evaluating the role and responsibility of the Subcommittee, especially as its focus has shifted from planning to mapping related activities. There is some overlap with the Monitoring and Data Management Subcommittee, and Bob noted that the 2 Subcommittees would be meeting jointly in July to discuss these issues.

Finally, Bob reiterated his view that one of the primary benefits of the Subcommittee and the GCC as a whole was the loose confederation or "underground network" of groundwater professionals that interact as a result of their participation in GCC activities. These interactions produce many intangible benefits, and are as important as the specific products that are generated. Bob suggested to the GCC that it may wish to direct Subcommittee members to document these sorts of activities for future reports or audits that may occur. *Nick Neher suggested that this be an agenda item for the next meeting.*

4. **2002 Report to the Legislature** - Following up on Bob Pearson's comments, Nick Neher suggested that each Subcommittee be asked to contribute one or two examples of activities that illustrate the "synergistic" or intangible benefits of the Subcommittees or the GCC for the 2002 Report to the Legislature. Examples could include "personal interest stories" or activities that happen without a direct charge from the GCC. These examples will be included in the Subcommittee Activities section and highlighted in the Executive Summary. Nick noted that these examples would be useful to show the legislature and citizens how the GCC pays dividends by fostering communication and reducing redundancies and inefficiencies.

Tim Asplund then handed out a proposed outline and timeline for the 2002 Report, which is due in August. He noted that the Education Subcommittee would be discussing ways to streamline the report and better highlight significant accomplishments and activities at its next meeting. He asked if there were any comments or suggestions from the GCC. Discussion ensued on the purpose of the report and whether any changes were needed. It was agreed that the report serves a useful purpose as a general reference and compendium of groundwater-related activities, but that it probably could be made more user-friendly. *Nick noted that the GCC would be open to recommendations from Tim or the Subcommittee on streamlining the report in the future.*

5. **Monitoring & Data Management Subcommittee Report** - Mike Lemcke noted that the Subcommittee had finalized the "Recommended Minimum Elements for Groundwater Databases" and that a draft copy had been provided in the meeting packet. Distribution of the document would be occurring in the next few months. Mike also reported on the status of access to the DNR's GRN and WCR databases on the internet. Mike noted that Wisconsin has always been proactive at providing access to well information, but that recent events have precluded this open policy. Arrangements are being made with other agencies and partners (DATCP, CWGC, and WGNHS) to allow full access via a password system, though this has been a fairly rigorous process. Commerce and DOT are welcome to obtain access in this way if they are interested. Mike noted that this solution did not address the issue of public access and the educational uses that the information has been used for in the past. He noted that staff are continuing to explore the possibility of restoring locational information for private wells only. He expressed his hope that the security concerns would be eased in the next 6-12 months, and that the DNR could continue its tradition of open access.

6. **Local Government Subcommittee Report** - Dave Lindorff summarized the May 1st conference call of the Subcommittee, noting that it had last met in October 2000. Mayor Carol Lombardi of Waukesha and Mayor John David of Watertown agreed to join the Subcommittee as representatives of the Wisconsin Alliance of Cities (WAC). Lawrie Kobsa, representing the Municipal Environmental Group and Brian Barrett, former General Manager for the Waukesha Water Utility and current chair of the Groundwater Technical Advisory Committee for SEWRPC, also participated.

Dave noted that much of the discussion focused on feedback from the Groundwater Summit and the items from the breakout session matrix that were related to Local Government (regional water management, groundwater quantity, and Smart Growth). The Subcommittee also gave positive feedback on the Smart Growth Fact Sheets that Dave and others have been working on (see next item) and gave suggestions for distributing them to local partners. The group also discussed future directions for the Subcommittee, and agreed to meet more frequently, with a focus on groundwater quantity issues and regional approaches. The next meeting will be in late August or early September.

7. **Smart Growth Fact Sheets** - Dave Lindorff provided an update on the development of the Smart Growth Fact Sheets that Chris Mechenich reported on at the February GCC meeting. Dave reiterated that the Fact Sheets were the result of discussion in various Subcommittees about how best to share information on groundwater with local governments as they go through their comprehensive planning process, spurred on by the "Smart Growth" law. This process presents a golden opportunity to encourage groundwater protection activities at the local level. Dave noted that the Fact Sheets should be completed in the next couple of months, and would be made available on the GCC web site, the DNR's Land Use information page, and through UW Extension. Dave mentioned that he, Chris, and Chuck Warzecha were also discussing other ways to distribute the fact sheets, perhaps through targeted mailings to local government groups, planning organizations, or the recipients of DOA grants. *The GCC cautioned against "reinventing the wheel" and encouraged Dave to look into any existing distribution system through DOA's Office of Land Information Services (OLIS), or the Land Council before doing any widespread mailings.*

8. **Report from Commerce re: Performance Monitoring of POWTS (Onsite Systems)** - Cathy Cliff noted that she had passed along the GCC's inquiry about the report required in Comm 83 on the Department of Commerce's Performance Monitoring activities, and that a copy of the report was included in the meeting packet. She requested that any specific questions on the report be directed to Mike Corry or Roman Kaminski in the Buildings and Safety Division. Ron Hennings noted that the report indicated that very little monitoring had been done due to limited budgets, and expressed his hope that more extensive monitoring be done in the future.

9. **Letter to Agency Secretaries** - Tim Asplund noted that he had followed up on the GCC's request from the last meeting to send out a letter to all of the agency secretaries acknowledging the limited budgets for the current fiscal year and expressing the hope of the GCC for restored funding in the future for groundwater monitoring and research. A copy of the letter was included in the meeting packet. Ron Hennings noted that Jamie Robertson was very pleased with the letter. Cathy Cliff noted that Commerce Secretary Philip Albert did respond to the letter and expressed his agency's support for groundwater research and monitoring in the future as budgets allow.

10. **Groundwater Summit Update and Draft "Strategy" Document** - Tim Asplund provided an overview of progress made on putting together a summary of the Groundwater Summit held October 30, 2001. He noted that a "core group" of GCC Subcommittee members, including chairs of each Subcommittee and representatives from each agency had met in April and fleshed out a format and structure for the strategy document. The group spent considerable time discussing the purpose of the document and how it would be used in the future. The group decided that it would be best to steer away from the term "strategy" in

the title, and that it was more appropriately a summary or synthesis of ideas and directions. However, the group felt that it would be worth asking groups (agencies, local governments, nonprofit or advocacy organizations) to endorse the document and make use of it in developing their own specific strategies or planning activities. Tim then explained the timeline for completing the document, noting that it still needed one final round of review by the core group. The goal is to provide the document to Summit participants for their review in early June, and then include a final version in the 2002 Report to the Legislature.

Tim then walked the GCC through the document and asked for any feedback or specific comments. Brian Barrett noted that the issue of aquifer depletion and water table declines could be made more explicit in the introduction. Cathy Cliff asked for further clarification on the concept of "endorsement", saying that it should be clear that endorsing the document means that an entity agrees that the concepts should be explored, not that every specific strategy be agreed to. Fran Garb noted that the document could use some tighter editing and sprucing up with more appealing formatting, but that she felt the document accomplished its purpose and was the necessary length for capturing all of the concepts. *The GCC gave its approval to go ahead with the final editing and distribute to the Summit participants for their review.*

11. **Review of Joint Solicitation process** – Jim Hurley noted that this year's joint solicitation raised some issues with the process, related in a large part to the tighter budgets and increased competition for the limited funds. In particular, there were questions about the intended use of funds, the review process, and confidentiality of the decision-making. He noted that he, Tim Asplund, and Mike Lemcke had met earlier this spring to discuss these issues and had reviewed the existing MOU between the UW System, the Groundwater Research Advisory Council (GRAC), and the GCC. Jim noted that there were some differences between the MOU and current practice, in particular the way that scores from external reviewers and the GCC Subcommittees are presented to the GRAC. Jim suggested that updating the MOU to reflect current practice might be the best way to address some of the concerns about the review process. Mike Lemcke then gave some background on the MOU, and noted that the WRI's system had evolved well beyond the process outlined in the 1991 MOU. Fran Garb agreed saying that the MOU did not reflect the rigor of the process now and strongly urged that a new MOU be drafted. Nick Neher also agreed, and said to be sure to leave some flexibility in the MOU to allow further improvement to the process. *Fran volunteered to work with Jim to draft a new MOU that would come from the UW System and be provided to the GCC in August for their approval.*

Jim then discussed some concerns that he had regarding confidentiality of the GRAC process, in particular the discussion of specific proposals and decisions made in the GRAC meeting outside of the GRAC. Jim asked for the GCC's input on how best to handle this concern in the future. *The GCC felt that it would be best for the chairs of the GRAC and the GCC Subcommittees to reiterate the need for confidentiality at the front end of the process, both in any written communication and at the beginning of the review meetings.*

12. **Technical Presentation on Sauk County Hydrogeologic Modeling** - Ron Hennings introduced Madeline Gotkowitz, a hydrogeologist with the Wisconsin Geological and Natural History Survey (WGNHS), who presented an overview of a recently completed modeling project for Sauk County. Madeline noted that funding for the project had come from the Source Water Assessment Program administered by the DNR, and was one of several regional modeling projects being coordinated through that program for the purpose of delineating source water areas for municipal wells. Madeline also noted that there was considerable local interest in the project, and that the modeling would be a useful tool to help the County manage and preserve its water resources. A number of products were generated by the project, including a database of all wells in the county, 1:100,000 scale Depth to Bedrock and Water Table maps, a conceptual 3D hydrogeologic model, and information on zones of contribution for the county's 14 municipal well systems. Madeline then went into detail about the interesting features of the

county, the elements of the conceptual model, and some of the questions that could be answered by the model. She noted that Sauk County appeared to be in good shape in terms of its water resources and that there did not appear to be any long term declines in water tables as seen in other regions of the state.

Nick Neher asked how this area was chosen for study and whether this level of effort could be applied in other areas. Mike Lemcke noted that study locations were chosen to match available expertise and population centers, and that all municipalities larger than 9000 were currently part of a completed or ongoing SWAP project. Nick also asked whether this information could be used to assess the impact of a proposed high capacity well within the county. Madeline noted that the model was meant to provide information on a larger scale for educational purposes and decision-making about land use and well siting, but that detailed testing and modeling would still be necessary to determine localized impacts of a particular well. Cathy Cliff noted that there is a large amount of information from remediation sites buried in files and wondered if compiling this information in a centralized place would eliminate the need for new tests and wells for every new site. Madeline answered that even if all this data were compiled, the scale would be larger than the local information needed for a particular remediation site. The GCC thanked Madeline for her presentation.

13. Miscellaneous agency updates:

- Mike Lemcke noted that the DNR would be going to the Natural Resources Board in June to ask for authorization for public hearings on the next round of groundwater standards, which will include a standard for alachlor ESA.
- Mike also noted that atrazine may again be a "hot" issue in the future, with the recent publication of reports linking atrazine with frog abnormalities. He noted that the current groundwater standard and prohibition areas are based on human health standards for drinking water, not to protect frogs. He also noted that there are currently no surface water standards for atrazine. Nick Neher noted that their recent survey showed that atrazine levels are declining in private wells.
- Nick mentioned that DATCP is currently performing an agricultural impact statement for an herbicide known as Balance, and may consider a special local needs regulation. Nick also noted that DATCP would not be proposing any additional atrazine prohibition areas this year, as they are not finding any evidence for a need.

14. The meeting was adjourned. The next meeting is scheduled for Friday, August 16th, 2002, at the Department of Commerce office at 201 West Washington Avenue in Madison.

Respectfully submitted,

Tim Asplund, Water Resources Specialist
Department of Natural Resources

FY03 Joint Solicitation of Groundwater and Related Research/Monitoring Proposals

September 2001

The University of Wisconsin System (UWS) and the Wisconsin Departments of Natural Resources (DNR), Agriculture, Trade, and Consumer Protection (DATCP), and Commerce annually participate in a joint solicitation for research or monitoring proposals dealing with groundwater and/or pesticides. The four state agencies will have approximately \$700,000 available for groundwater-related monitoring or research in fiscal year 2003 (July 1, 2002 – June 30, 2003). Approximately \$330,000 of that total will be available for new projects. The four monitoring/research programs are summarized as follows:

1. UWS Groundwater Research - The UWS, through its UW-Madison Water Resources Institute (WRI), has received funding since FY 90 for groundwater research. They will have \$300,000 to fund research in FY 03. Through FY 01, the UWS has spent \$3.5 million on 97 groundwater research projects. Several projects have been co-funded with DNR, Commerce and/or DATCP and five were co-funded with WRI through the US Geological Survey.
2. DNR Management Practice Monitoring - The DNR has been funding groundwater management practice monitoring projects since FY 86. The DNR has approximately \$275,000 available for FY 03 to support groundwater monitoring studies evaluating existing design and/or management practices associated with potential sources of groundwater contamination. The intent of these studies is to reduce the impacts of potential sources of contamination by changing the way land activities that may impact groundwater are conducted. The money comes from the Groundwater Account of the Environmental Fund (which is funded by various fees). Through FY 01, the DNR has spent approximately \$5.0 million on 151 monitoring projects. Several of these projects have been co-funded with DATCP, Commerce and/or UWS.
3. DATCP Pesticide Research - Since 1989, the DATCP has had approximately \$135,000 available annually to fund research on pesticide issues of regulatory importance. This money comes from fees paid by pesticide manufacturers to sell products in Wisconsin. Through FY 01, the DATCP has spent about \$1.5 million on 39 pesticide projects. Some of these projects have been co-funded with DNR and/or UWS.
4. Department of Commerce Private Sewage System Research - The Division of Safety & Buildings (formerly in the Department of Industry, Labor, and Human Relations) received an annual appropriation of \$50,000 from 1990 to 1993 to fund research on alternatives to current private sewage-system technology. In 1994, when the appropriation expired, \$75,000 generated through plan review and licensing fees became available each year for research on private sewage systems. Commerce will not have any funds available for new research projects in FY 03. Through FY 01, the DILHR/Commerce has spent approximately \$600,000 on eight projects. Two projects were co-funded with DNR and UWS.

The Wisconsin Groundwater Coordinating Council (GCC) provides consistency and coordination among the four state agencies in funding groundwater monitoring and research to meet state agency needs. The reasons for this solicitation to be made jointly are to:

- Facilitate proposal writing
- Streamline the review process
- Curtail duplication
- Improve coordination among agencies and researchers
- Enhance communication among the agencies and among principal investigators (P.I.)

Joint funding of some projects may be appropriate, but joint funding is not the purpose of this solicitation because each agency has its own designated mission and priorities. Although all proposals received will be distributed to each agency, each investigator is asked to identify the agency whose mission and priorities best match their project.

Please read the solicitation carefully; it contains a description of the priorities for each agency program and other pertinent information, including a new online proposal submission process. Capital items may not be purchased with these funds, and faculty salaries plus fringe benefits will be limited to a maximum of 10% of an individual grant (e.g., for a \$20,000 grant, a maximum of \$2,000 can be allotted to faculty salaries and fringe benefits).

Investigators who are new to this program are encouraged to solicit an example proposal from the agency contacts listed below and attend the Proposal Writer's Workshop on October 24, 2001.

If you have questions please call the following appropriate agency contacts.

James P. Hurley, UW Water Resources Institute: (608) 262-1136; hurley@wri.wisc.edu

Tim Asplund, Department of Natural Resources: (608) 267-7449; asplut@dnr.state.wi.us

Jeff Postle, Department of Agriculture, Trade and Consumer Protection (608) 224-4503;

jeff.postle@datcp.state.wi.us

Harold Stanlick, Department of Commerce: (262) 521-5065; hstanlick@commerce.state.wi.us

Eligibility

Please note that each agency has separate requirements for eligibility. Review the agency-specific sections carefully. In general:

UWS: Funds are restricted for use by faculty within the UW System or by academic staff who have achieved nomination to P.I. status.

DNR: Funds are restricted to use by UWS and state agency contractors.

DATCP: Any college or university, research foundation or individual having a demonstrated capacity in pesticide or other applicable research may submit proposals.

Investigators who are not affiliated with the state and therefore not eligible for funding by UWS or DNR may wish to collaborate on a proposal with a UWS investigator or state agency staff member.

A principal investigator with unfinished Joint Solicitation-funded final reports that are significantly overdue (in the case of UWS by more than six months) with respect to initially specified or understood completion dates will not be eligible for new funding. The Groundwater Coordinating Council may consider extenuating circumstances on a case-by-case basis.

Submission of Proposals

New this year – Online proposal submission

Proposals for this year's Joint Solicitation will be submitted entirely online, through the University of Wisconsin Water Resources Institute's Web site at <http://wri.wisc.edu>. The Web site will be ready for principal investigator registration and proposal uploads after October 15, 2001. **The deadline for submittal of proposals is 6:00 PM Monday, November 19, 2001.**

Please note that investigators will be required to register on the Web site prior to submitting a proposal. This step can be accomplished at any time after October 15. Investigators should be prepared to provide the following information when submitting a proposal online:

- Title
- Investigators
- Abstract (condensed version of project summary separate from the Project Narrative that is uploaded as a .pdf file)
- Location of Research
- Names and addresses of three qualified reviewers of proposal (two must be from outside of Wisconsin; include areas of reviewer expertise)
- Target agency ranking
- Adobe Acrobat file (.pdf) of proposal narrative
- Budget information

Investigators will be required to upload a .pdf version of their proposal to the WRI Web site. In order to create a .pdf file, investigators will need to either use Adobe Acrobat software or go online to Adobe's site to create a .pdf file. Adobe offers a monthly subscription for pdf file creation or a free trial period that enables creation of 5 pdf files at: <http://www.adobe.com/store/products/createpdf.html>. Complete instructions for online submission can be found at the WRI Web site.

Proposals should be no longer than 18 pages. All pages should be 8.5" x 11". The project summary, narrative, curriculum vitae, and support pages should start on a new page, be double-spaced (except for Figure and Table legends), and use no smaller than 11-point font. All margins should be no less than 0.75 inches. The proposal narrative must be consecutively paginated on the bottom of the page. Include literature citations in the proposal where appropriate (single-spaced within, double-spaced between). Any section of a proposal that exceeds the specified maximum page limits will be grounds for returning the proposal to the author. A proposal guideline checklist is provided on page 7 to assist proposal authors.

All proposals must be submitted online. No facsimiles of proposals and no hand-written proposals will be accepted. Special attachments (maps, brochures, etc.) will be accepted, noted, and kept on file, but will not be included in the package of materials submitted to reviewers.

Review of Proposals

All proposals received through the joint solicitation process receive reviews from the following four groups:

1. External peer review: The UW Water Resources Institute solicits a minimum of four external peer reviews of all proposals. (As part of this peer review process, investigators should provide the names, addresses and email of three suggested reviewers with expertise in the field of the proposal.)
2. The Research and Monitoring & Data Management Subcommittees of the GCC
3. The Groundwater Research Advisory Council
4. Staff from the funding agencies

The most important consideration of the reviewers is whether the proposal meets agency priorities as outlined in this solicitation. Other criteria include project cost, proposed timeline, whether the proposed project methodology meets the stated objectives, whether the resources requested are adequate to carry out the project, and whether the project investigators have the abilities to complete the proposed project. Funding decisions will be made in March 2002. Proposals that are funded become the property of the granting Wisconsin state agency.

Proposals that are not chosen for funding through this solicitation may be referred to other funding sources for their consideration with permission of the investigators. Likewise, other funding organizations may refer proposals to the funding agencies involved in this solicitation.

Guidelines for Proposal Submission

(See WRI web site <http://wri.wisc.edu>) for complete submission details)

I. Investigator and Proposal Information (entered online)

- A. Title
- B. Investigators (from drop-down menu of investigators previously-registered on the site)
- C. Abstract (condensed version of project summary separate from the Project Narrative that is uploaded as a .pdf file)
- D. Location of Research
- E. Names and addresses of three qualified reviewers of proposal (two must be from outside of Wisconsin; include areas of reviewer expertise)
- F. Target agency ranking

II. Proposal text (uploaded as Adobe Acrobat .pdf file to the WRI web site).

- A. Title, Investigators, Affiliations of Investigators (top of first page)
- B. Project Summary (begin on same page, **not to exceed 2 double-spaced pages**)
 - 1. Specific groundwater or related problem addressed by research/monitoring proposal.
 - 2. What will findings contribute to problem solution or understanding?
 - 3. Project objectives.
 - 4. Project approach to achieve objectives including methods and procedures.
 - 5. Users of project findings.
- C. Proposal Narrative (begin on new page, **not to exceed 10 double-spaced pages**)
 - 1. Objectives
 - 2. Background information describing prior research/monitoring relevant to objectives; references to ongoing projects and how they relate to proposed investigation; information gaps which will be filled by the proposed project.
 - 3. Project plan outlining experimental design and schedule
 - 4. Methods detailed enough to convince the reviewer that the investigators are up-to-date on modern techniques; a general statement alluding to techniques is not acceptable.
 - 5. Relevance to groundwater and related problems
 - 6. Citations

7. Training support (if any) provided by the project and information dissemination plan.

D. Curriculum vitae of Principal Investigators (begin on new page, **not to exceed 4 pages**)

Include curriculum vitae (including recent publications) of each investigator and state the time each will spend on the project.

E. Current or pending support. (begin on new page, **not to exceed 2 pages**)

III. Budget information (entered online at WRI web site)

A. Salaries and wages

B. Fringe benefits (include percentage of grant to be used for faculty salaries, wages, and benefits)

C. Tuition remission charges (if applicable).

D. Supplies and publication costs: list office, laboratory, computer and field supplies separately.

E. Travel to support field operations only. Travel to meetings is excluded because of the limited funding.

F. Other costs: e.g., equipment maintenance and fabrication, subcontracts, rentals, etc.

G. Total direct costs.

PROPOSAL GUIDELINE CHECKLIST

ITEM	GUIDELINE	THIS PROPOSAL
GENERAL PRESENTATION		
Font	Minimum of 11 point	
Margins	Minimum of 0.75"	
PAGE LIMITATIONS		
Project Summary	Maximum of 2 pages	
Narrative and supplements	Maximum of 10 pages	
Curriculum Vitae	Maximum of 4 pages total and 2 for 1 P.I.	
Current and Pending Support	Maximum of 2 pages	
Entire Proposal	Maximum of 18 pages	
PAGINATION		
Project Summary	Page 1 and 2	
Narrative and supplements	Begin on new page, paginate starting at 3	
Curriculum Vitae	Begin on new page, paginate consecutively	
Current and Pending Support	Begin on new page, paginate consecutively	
LINE SPACING		
Project Summary	Double spaced	
Narrative Body	Double spaced	
Figure Legends	Single spaced	
Tables / Titles	Single spaced	
Citations	Single within, double between	
Training and Info Transfer	Single spaced	
Curriculum Vitae	No specific guidelines	
Current and Pending Support	No specific guidelines	

**UNIVERSITY OF WISCONSIN SYSTEM (UWS)
PROJECTS FUNDED
THROUGH THE GROUNDWATER RESEARCH ADVISORY COUNCIL**

As part of the joint solicitation for groundwater research proposals, the UWS, through its Water Resources Institute (WRI) and its Groundwater Research Advisory Council, seeks projects of a fundamental or applied nature on any aspect of groundwater research in the natural sciences, engineering, social sciences or law. Projects funded in the current cycle are listed on the WRI web site at <http://wri.wisc.edu>. The UWS has approximately \$105,000 available in FY 03 to fund new projects. The remainder of the UWS groundwater research funds has been committed to ongoing projects for FY 02.

Applicant Requirements: Most often the principal investigator will be a faculty member on any campus in the UWS. However, academic staff who has achieved nomination to P.I. status by endorsement of the relevant academic dean may serve in this capacity. Projects that appear to be continuations of a previously funded project with two years of UWS support and projects that have been twice rejected will not be considered. The UWS also strives to avoid funding situations where a P.I or co-P.I.'s name appears on more than two UWS projects during any given fiscal year.

Budget Considerations: Projects will not be approved in any one budget cycle for a period of more than two years and then contingent on satisfactory progress. No capital equipment (more than \$5,000 per item) may be purchased. Travel for attendance at scientific meetings will not be accepted. Faculty salaries and fringe benefits to be paid from any project may not exceed 10% of the total individual grant (including fringe benefits). Overhead costs are not allowed. Supplies should not exceed 20% of individual grant.

Review of Proposals: Most recent literature citations are absolutely required for all proposals seeking support from the UWS. Funding decisions are based on ratings by GCC subcommittees and reviews solicited from an international list of experts in the field of the proposed work. The GRAC, which consists of university, state agency, and public representatives, meets as a body to discuss the results of the review process and thereupon to recommend a priority list of projects that the UWS should strive to fund in accordance with budgetary resources. A suitable UWS Groundwater Research Program is then assembled by the WRI and submitted to the GCC for approval before the Department of Administration can release UWS research funds upon passage of a State budget.

UWS Groundwater Research Priorities:
(Presented in no particular order of importance.)

- Chemical and biological degradation of pollutants in surface soils, subsoils, and groundwater, including identification, toxicity, and persistence of degradation products.
- Transport of pollutants in soil and groundwater, including elucidation of soil and hydrologic factors controlling movement and development or validation of predictive models.
- Impact of waste, and agricultural (including agricultural feeding operations), industrial, or municipal management practices on groundwater quality.
- Characterization of geologic factors affecting groundwater movement, contamination, and aquifer recharge.
- Interactions of groundwater and surface water including chemical transformations in the hyporheic zone; impacts of groundwater withdrawal on surface waters; influence of groundwater discharge on water

quality and stream biota; and groundwater export of nutrients to surface waters.

- Land-use impacts on wetland quality and the interaction of groundwater with wetlands.
- Examination of the social and economic impacts of groundwater contamination and groundwater protection policies.
- Investigations on the development, understanding, improvement, cost-effectiveness, or utility of innovative biological, chemical or physico-chemical technologies for remediation of contaminated soils and/or groundwater.
- Biological, ecosystem, and human health effects of common groundwater pollutants and development or evaluation of surrogate, cost-effective bioassay systems for risk assessment.
- Field validation of effects of new technologies for on-site waste treatment (septic systems) on groundwater quality.

**DEPARTMENT OF AGRICULTURE, TRADE AND CONSUMER PROTECTION (DATCP)
PESTICIDE RESEARCH PROGRAM**

**RESEARCH GRANT PROGRAM FOR FY 03
SOLICITATION OF APPLICATIONS**

The DATCP Pesticide Research Program is administered by the Agricultural Resource Management Division. Applications are invited for grant awards focusing on regulatory issues associated with pesticide use and control. The DATCP has approximately \$55,000 available for FY 03 to fund new projects. Investigators should note that the focus of the DATCP program is on pesticide research, which includes but is not limited to groundwater issues.

Applicant Requirements: Any college or university, research foundation or individual having a demonstrated capacity in pesticide or other applicable research may submit proposals.

Budget Considerations: The Department may award grants not to exceed three years for research projects on the program priorities outlined below.

Review of Proposals: Proposals are reviewed using the process outlined on p. 3. Funding decisions are made by the DATCP Secretary based on recommendations by the Bureau of Agrichemical Management staff who receive input from GCC subcommittee members and experts in the field.

DATCP RESEARCH PRIORITIES FOR FY 03

- 1) **Evaluation of the Environmental Fate Investigation Strategies and Remediation Alternatives for Contaminated Soil and Water at Pesticide Spill Sites.**
Research should investigate the degradation and movement of pesticides at spill sites, develop criteria on the need for and appropriate extent of remedial actions, and evaluate various methods for investigation and remediation of contaminated soil and water.
- 2) **Development of Methods for Cleaning Pesticide Mixing/Loading Pads and Disposing of Pesticide Rinsates.**
Projects should evaluate methods of decontaminating pesticide mixing/loading pads and disposing of or treating pesticide-contaminated rinsate water.
- 3) **Refinement of Application Methods for Pesticides with High Drift Potential to Reduce Environmental and Public Health Problems.**
The research should focus on how different application methods and environmental conditions affect the potential for drift of pesticides such as metham sodium or clomazone.
- 4) **Evaluation of Factors Influencing the Patterns of Groundwater Contamination by Pesticides and Pesticide Metabolites in Wisconsin.**
This topic involves examining factors which influence pesticide leaching to determine areas of the state that are susceptible to groundwater contamination by specific pesticides.
- 5) **Use Related Monitoring of Pesticides and Pesticide Metabolites in Groundwater.**

This project should study groundwater contamination by field application of pesticides in key environmental settings such as fractured bedrock areas.

6) **Identification of the Sources of Pesticide Contamination in Rural Areas.**

Methods should be developed and investigations conducted at contaminated well sites to determine if the contamination is due to field use (nonpoint source) or spills or mishandling (point source) of pesticides.

7) **Evaluation of the Economic Feasibility of Various Chemical and Non-Chemical Weed Control Practices.**

This project should develop a methodology for evaluating the economic feasibility of modifying weed control practices and apply it to examples where practices are changed to reduce impacts on groundwater.

8) **Pesticide Use Surveys.**

These projects should conduct detailed pesticide use surveys that complement other data gathering efforts, such as ground and surface water monitoring, to improve the understanding of pesticide related issues.

9) **Use Related Monitoring of Pesticides in Surface Water and the Effect of Management Practices on Contaminant Levels.**

Projects on this topic should determine the impacts of pesticide use practices on surface water quality and evaluate the ability of various management practices, such as stream setbacks, to reduce contamination.

10) **Evaluation of the Effect of Pesticide Use on Endangered Species and their Habitat.**

This topic should explore how the use of specific pesticides affects the habitat and survival of endangered species in Wisconsin and how alternative pest control methods could reduce problems.

11) **Evaluation of Health and Environmental Risks from Commonly Used Lawn Care Pesticides**

This project should evaluate the health risks following applications of lawn care pesticides such as pendimethalin, 2,4-D, dicamba, and MCPP.

12) **Development of Pest Management Techniques that Lead to Efficient Use of Pesticides and Reduce Impacts on the Environment.**

This project should look at ways of reducing pesticide use through integrated pest management, use of alternative pest control strategies, best management practices, or other techniques that promote efficient pesticide use and minimize environmental problems.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
GROUNDWATER MANAGEMENT PRACTICE MONITORING PROGRAM

Management practice monitoring is defined as groundwater monitoring or support activities associated with groundwater monitoring, such as laboratory technique development or geologic resource description, for establishing or improving management practices necessary to meet the state groundwater quality standards of NR 140, Wis. Adm. Code. Approximately \$170,000 will be available to fund new monitoring projects in FY 03 (July 1, 2002 through June 30, 2003). The remainder has been allocated for ongoing monitoring or related projects.

Applicant Requirements. Funds are restricted to use by UWS and state agency contractors. Others may submit proposals if they include a state-affiliated co-principal investigator.

Budget Considerations. Monitoring proposals will be considered for a maximum of two years. Contracts will be approved on an annual basis. Projects costing less than \$35,000 annually will be given greater consideration than more expensive projects. Budget items to be identified should include such things as personnel costs, supplies, equipment, necessary travel, and other appropriate items. The management practice monitoring funds cannot support indirect costs or the purchase of capital equipment.

In preparing the budget be aware of the following contractual requirements:

Contractual Requirements:

- All monitoring wells installed shall meet DNR regulations and approved procedures for installation, construction and documentation (Chap. NR 141, Wis. Adm. Code.)
- For each new monitoring well, a soil boring form (Form 4400-122), a well construction report (Form 4400-113A), and a monitoring well development form (Form 4400-113B) shall be submitted on paper or in a computer format supplied by the DNR.
- For all existing groundwater sample points (monitoring wells, piezometers, and private water supplies) not previously identified in DNR databases, a Groundwater Monitoring Inventory form (Form 3300-67) supplied by the DNR shall be completed and submitted on paper or in computer format.
- All groundwater quality monitoring data shall be submitted in a computer format compatible with the state Groundwater Retrieval Network and shall be reported to the DNR quarterly after the contractor has received the data. The contractor shall verify computerized data.
- All groundwater samples shall be analyzed by a laboratory certified in Wisconsin for that purpose under Chapter NR 149, Wis. Adm. Code.
- The contractor shall request and use labels with Wisconsin Unique Well Numbers from the DNR for wells constructed and/or sampled to allow identification of wells.
- Abandonment of monitoring wells shall be the responsibility of the contractor. Wells shall be abandoned in accordance with DNR regulations (Chap. NR 141, Wis. Adm. Code) and approved procedures upon completion of the project, unless alternative prior arrangements have been made with the DNR. A well abandonment report shall be submitted on Form 3300-5 or in a computer format supplied by the DNR.

- Quarterly project status reports shall be submitted to the project manager within 30 days of the end of each quarter. A final report and a project summary shall be submitted to the project manager within 60 days of the end of the contract period. The final report must contain a thorough discussion of how the results of the project can and should be used by decision-makers. For example, results that could assist local decision-makers with integrating groundwater in Comprehensive Planning activities should be highlighted.

Review of Proposals: All proposals will be reviewed and rated by DNR staff, and the Monitoring & Data Management and Research Subcommittees of the Groundwater Coordinating Council.

Two important criteria in evaluating each proposal are: 1) whether the proposal addresses an emerging issue or a ongoing monitoring need as listed below; and 2) whether the project involves either groundwater monitoring or activities conducted to support groundwater monitoring. Support functions can include, among other things, laboratory analysis technique development, well drilling and construction methodology development, data management and definition of geologic and hydrogeologic conditions for groundwater management purposes. Proposals should contain a clear discussion of the expected practical application of the project results. This will help the reviewer understand the importance of the proposed research, and will ensure that the researcher designs the project with practical application of results in mind.

In making final funding decisions, the DNR's Groundwater Section will formulate its recommendations based on input from all project reviewers and available funds. The Director of the DNR's Bureau of Drinking Water and Groundwater will make the final funding decisions.

Management Practice Monitoring Priorities for FY03

Proposals will be considered for funding that address one or more of the following emerging issues or ongoing monitoring needs.

Emerging Issues

The Research and Monitoring & Data Management Subcommittees of the Wisconsin Groundwater Coordinating Council and Department staff have identified the following emerging issues as being of the highest importance for groundwater monitoring and research for FY 03. Unlike the ongoing priority monitoring topics that follow the emerging issues, these are specific ideas for projects for which state groundwater experts see an immediate need.

Groundwater Withdrawals and Connections to Surface Waters – Recent events (high capacity well permits, aquifer storage and recovery pilot programs, arsenic, and urban growth near recharge areas) have highlighted the need for continued understanding of the implications of groundwater use on groundwater quality, groundwater quantity, and surface water resources. Research is needed in the following areas:

- identification of areas of the state sensitive to groundwater withdrawals;
- quantification of environmental, social and economic impacts of groundwater withdrawals, including projections of groundwater use in NE and SE Wisconsin;
- assessment of and improvements to existing mechanism for determining impacts of withdrawals on public water supplies;
- monitoring of surface and groundwater flow to determine hydrologic connections and pathways between them;
- investigation of the occurrence and causes of aquifer drawdowns that affect surface water features such as springs, streams and wetlands; and
- characterizing groundwater impacts on and contributions to surface water quality, including TMDL development.

Further information on this issue may be obtained by contacting Tim Asplund (608-267-7449).

Natural Attenuation – In September 1996, chapter NR 726 was revised to allow case closure of sites above NR 140 groundwater enforcement standards. A case can be closed above enforcement standards if it is demonstrated that natural attenuation is effectively cleaning up groundwater. Once the site is closed there is a presumption that natural attenuation will continue cleaning up groundwater until enforcement standards are met. There is a need to go back and audit a sub-set of closed sites to determine whether the assumptions made at closure were appropriate. Questions that need to be addressed include 1) Has the plume margin changed since closure and how much? 2) Have contaminant concentrations in groundwater changed since closure and how long will it take to meet enforcement standards? 3) Has land use surrounding the site changed since closure, e.g., have potable wells been installed near the site? 4) Was site closure appropriate? 5) How do contaminant type and aquifer characteristics influence the time frame for natural attenuation? Further information on this issue may be obtained by contacting Mike Lemcke (608-266-2104).

Incorporating Groundwater in Comprehensive Planning - Legislation adopted in 2000 requires all communities that make land use decisions to base those decisions on a comprehensive plan by January 1, 2010. The legislation outlines nine elements that must be included in each comprehensive plan. Groundwater information or issues may be addressed in several of the nine elements. Work is needed to develop an example comprehensive plan that would show how groundwater could be adequately addressed in a comprehensive plan. This will be valuable information for local governments who typically don't have the resources to fully address groundwater issues. For more information, contact Dave Lindorff (608-266-9265).

Pharmaceuticals - Research is needed to determine whether pharmaceuticals are entering Wisconsin's groundwater. Antibiotics and hormones are widely used in medicine. Certain drugs are also used to enhance the health of livestock, swine and poultry. Pharmaceuticals can enter the environment via municipal sewage effluent, private septic tanks, and animal feedlots. Research proposals should address at least one of the following questions: 1) Can commonly used drugs be detected in groundwater? 2) How do antibiotics, hormones, and other pharmaceuticals behave in the environment, e.g. do they leach, how quickly do they breakdown? and 3) What are the most cost-effective analytical methods for pharmaceuticals in water? Further information on this issue may be obtained by contacting Bill Phelps (608-267-7619).

Microbial Pathogens – Research is needed to develop and test cost-effective screening tools that indicate the presence of, and/or quantify microbial pathogens in groundwater. Investigate the incidence and analytical and monitoring techniques for microbial contaminants, including parasites, bacteria, viruses, and microbial indicators in groundwater. Characterize viruses in groundwater sources serving public water systems. Investigate the potential for airborne microbial contamination of wells through construction practices and evaluate possible prevention strategies. Further information on this issue may be obtained by contacting Don Swailes (608-266-7093).

Infiltration of Urban Runoff - As part of the Runoff Management Program Redesign, Wis. Adm. Code Chapter NR 151 has been proposed to encourage infiltration of stormwater and preserve groundwater recharge. There is a need to monitor the impact of stormwater infiltration on groundwater quality including organic compounds, metals, bacteria and viruses to evaluate DNR performance standards for pretreatment and infiltration devices at residential, commercial and industrial sites. In addition, research is needed on the effects of land use on groundwater recharge and potential strategies for increasing infiltration. Further information on this issue can be obtained by contacting Laura Chern (608 266-0126).

Ongoing Needs

The following priority topics for groundwater management practice monitoring represent ongoing needs as determined by the Research and Monitoring & Data Management Subcommittees of the Wisconsin Groundwater Coordinating Council, a number of state agency staff, and university researchers. The list of priorities is not in any specific order. Further information on any of these topics may be obtained by contacting Tim Asplund (608-267-7449).

Arsenic in Groundwater – Serious arsenic problems exist in Wisconsin, especially in the Lower Fox River Valley. Research to further characterize the source, extent, health effects, and treatment is a continuing need. Examples: define the lateral and vertical extent of the arsenic contamination as well as other associated metals and water quality problems; improve understanding of the system geochemistry, including reaction triggers and the mobility of the contaminants released; find solutions to drinking water problems such as well construction/reconstruction options and treatment; and conduct toxicological and risk assessment studies that may be needed to determine impacts on human health and the environment.

Nitrogen Contamination - Conduct site-specific studies to compare the NRCS 590 standard as proposed in ATCP 50 to current management practices. Evaluate the extent of impacts of nitrate contamination on groundwater quality. Examples: monitoring and evaluation of the impacts of animal operations on groundwater; evaluating the effectiveness of Best Management Practices (BMPs) in reducing nitrogen levels in groundwater. Compare methods that can be used to evaluate the groundwater impacts of current farming systems as well as the economic and water quality impacts of alternative farming systems.

Water Quality in the Deep Sandstone Aquifer - Elevated sulfate and total dissolved solids (TDS) have been found in some new deep municipal wells in the Lower Fox River Valley making the wells unusable. In some other existing deep wells as far south as Milwaukee the TDS have been increasing over the years. Naturally occurring radium is also a problem in many of these wells. Research is needed to define the extent of these water-quality problems, to determine the sources of the dissolved constituents, to determine the hydrogeologic processes responsible for mobilizing the constituents, and for developing advice for the design and placement of new wells and the remediation of older wells.

Data Management/Data Integration – Improve existing state methods for managing and integrating groundwater monitoring data. Examples: working with state agencies to identify existing archives of data related to groundwater quality and management practice monitoring (e.g. karst features); developing a framework for a statewide karst feature database.

Health Effects of Groundwater Contaminants - Research is needed to better characterize the impact of contaminated groundwater on public health. Proposals should focus on contaminants that are commonly encountered in public and private drinking water supplies at levels of health concern. Pathogenic microorganisms, toxic chemicals (both naturally-occurring and synthetic), and their metabolites are of interest.

Groundwater Remediation - Evaluate current or developing remediation technologies, with an emphasis on natural attenuation. Examples: comparing the effectiveness of pump & treat versus natural attenuation through modeling by running sensitivity analysis on permeability, electron acceptor availability, contaminant mass in smear zone, and extraction well location; identifying biogeochemical parameters for cost effective evaluation of natural attenuation at petroleum contaminated sites; and determining the utility of natural attenuation for chlorinated compounds.

Pesticide Management – Evaluate pesticide use impacts on groundwater quality. Examples: monitoring to determine if changes in pesticide application procedures and/or tillage practices have significant potential for reducing pesticide impacts on groundwater; evaluation of the extent of groundwater contamination from agricultural and nonagricultural pesticide use and handling in various geologic settings; monitoring at