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Technical Reference List for Minnesota Ground-Water Projects

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This document was designed to help users find *technical references such as guidance, technical methodologies and standards* on the Internet that may be useful for Minnesota ground-water projects. It is a selective and relatively concise reference list -- *not an exhaustive list*. To provide a desirable breadth of good quality technical references, it lists more than just Minnesota-specific documents. It was developed to complement the Minnesota Ground Water Information Resources component which was designed to help users find ground-water data or location-specific information.

IMPORTANT DISCLAIMER

This document emphasizes references available on the Internet and is only intended as a time-saving convenience. Nothing stated or referred to herein represents official guidance or procedures or is an indication that a particular reference is correct or appropriate for a particular application. Please refer to the appropriate organizations directly to ensure that you are using the most appropriate and up-to-date documents, web pages, guidance, etc.

Several hypertext links below point to documents in Adobe Portable Document Format (PDF). Please download the *most recent* (free) Adobe Reader software for viewing PDF documents.

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ENVIRONMENTAL INVESTIGATION AND SAMPLING METHODS

GROUND-WATER AND SURFACE-WATER INTERACTION INVESTIGATIONS

See examples of methods used for these types of investigations in the "Current Topics" component of this guide.

KARST AREAS - GROUND WATER INVESTIGATION METHODS

Procedures and techniques for Ground Water Investigations In Karst Areas are outlined by the MPCA Petroleum Remediation Program. Also see EPA Ground-Water Monitoring in Karst Terranes (below) and examples of methods used for these types of investigations in the "Current Topics" component of this guide.

REMEDIATION SITES

See the Remediation (Site Cleanup) Guidance section of this document.

USGS GROUND-WATER TECHNIQUES AND METHODS

This United States Geological Survey (USGS) web page includes links to information about a wide variety of ground-water investigation methods including the following:

- Index of Techniques of Water-Resources Investigations
- Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Selection, Installation, and Documentation of Wells, and Collection of Related Data
- Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Collection and Documentation of Water-Quality Samples and Related Data
- Handbook for collecting water-use data
- Geophysical tools

GROUND WATER SAMPLING AND MONITORING

MINNESOTA DEPARTMENT OF AGRICULTURE

Minnesota Department of Agriculture - Ground Water Sampling Guidance.

MINNESOTA POLLUTION CONTROL AGENCY

Minnesota Pollution Control Agency (MPCA), Ground-water Sampling Guidance. Note that "Part 2" of this web page includes links to program-specific sampling guidance.

MPCA Ground Water Monitoring and Assessment Program (GWMAP) Field Guidance Manual in PDF format. GWMAP has also published a Summary of Observations and Analysis of Field Techniques for Assessing Hydrology and Water Quality of Ground Water in PDF format.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers (U.S. EPA, 2002) in PDF format.

Ground-Water Monitoring in Karst Terranes (in PDF format). The hydrology of karst terranes is significantly different from that of non-karst terranes. Accordingly, the monitoring techniques necessary for reliable, accurate assessment of their ground-water quality are significantly different. In this light, Dr. James F. Quinlan wrote 'Ground-Water Monitoring in Karst Terranes, Recommended Protocols & Implicit Assumptions' in 1989. This document discusses these techniques, recommends ways to solve the special problems posed by monitoring in karst terranes, calls attention to possible regulatory problems, discusses the assumptions made when monitoring, and makes recommendations throughout the text.

UNITED STATES GEOLOGICAL SURVEY

Ground-Water Techniques, Methods, and Models (USGS).

This U.S. Geological Survey (USGS) web page includes links to many useful references including 'Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program -- Collection and Documentation of Water-Quality Samples and Related Data':

National Field Manual for the Collection of Water-Quality Data (USGS)

SOIL SAMPLING

PETROLEUM REMEDIATION PROGRAM (MPCA)

Soil Sample Collection and Analysis Procedures, Petroleum Remediation Program
Minnesota Pollution Control Agency:

MPCA POLICY FOR VOC SAMPLING AT MPCA CLEANUP SITES

VOC sampling policy in PDF format.

EPA METHOD SW-846 5035 - VOLATILE ORGANICS IN SOIL AND WASTE

Remember to do your own verification and to check with any applicable regulatory program staff to ensure that you are using the most current and most applicable version of any published procedure such as those mentioned in Method 5035.

EPA 'New Test Methods' page with link to Method 5035

WELLHEAD PROTECTION

MDH SOURCE WATER PROTECTION PROGRAM

Wellhead protection is part of the Source Water Protection program at the Minnesota Department of Health (MDH).

MDA DRINKING WATER PROTECTION

The Minnesota Department of Agriculture (MDA) has a web page featuring Drinking Water Protection in Agricultural Areas. This page includes wellhead protection case studies, drinking water protection fact sheets and numerous hypertext links to Resources for wellhead Teams and agricultural advisors.

EPA SOURCE WATER PROTECTION

This United States Environmental Protection Agency (EPA) Source Water Protection web site has basic information about the water used for drinking water and the federal, state, and local programs that assess and manage potential public health risks, including a Web Guide - an annotated guide to EPA source water resources.

The EPA also offers a Source Water Web Guide. This web-guide is a selected and very partial collection of available source water protection tools for community planners, public water supply operators, members of local source water protection teams, and anyone interested in protecting their sources of drinking water.

METHODS FOR DELINEATING WELLHEAD PROTECTION AREAS (EPA)

This United States Environmental Protection Agency web page features a literature review of methods for delineating wellhead protection areas.

THE GROUND WATER PROTECTION COUNCIL

The Ground Water Protection Council (GWPC) is a national association of state ground water and underground injection control agencies whose mission is to promote the protection and conservation of ground water resources for all beneficial use, recognizing ground water as a critical component of the ecosystem.

WELLS

Please make sure to check with local 'authorities' to ensure that you are aware of any applicable local, state, regulatory or programmatic requirements, rules, laws, etc., that are in effect or otherwise should take precedence for your drilling or well-related project.

MINNESOTA DEPARTMENT OF HEALTH

WELL MANAGEMENT PROGRAM

Since 1974, all water wells constructed in Minnesota must meet the location and construction requirements of the Minnesota Well Code. Wells can provide safe water for many years, but as wells age, they will deteriorate and eventually lose their ability to keep contaminants out of the water. If your well is old, or has not been inspected for many years, contact a licensed well contractor and have the well inspected. If your well has outlived its useful life, it should be properly sealed and replaced with a modern, safe well.

MDH Well Management Program.

Well Regulation by Local Government (Delegated Programs).

WELL-RELATED RULES AND LAWS

Rules and Laws.

SEALING UNUSED WELLS

This MDH Well Management program web page explains why sealing unused wells is so important and provides detailed information about how to seal wells properly. A well that is not in use - or sometimes referred to an "abandoned" well - can be a potential threat to health, safety, and the environment. Wells that are no longer used may be buried or forgotten. Often they have not been sealed properly. Sealing is the process of clearing an unused well of debris and filling the well with a special material called grout. The sealing must be done by a licensed contractor.

WELL DISCLOSURE

Well disclosure is the process by which the seller of property provides information to the buyer and the state about the location and status of all wells on the property. This process is required by state law, a portion of the Ground Water Protection Act (Minnesota Statutes, section 103I.235). The law applies to all types of wells, including wells used for drinking water, irrigation, livestock, commercial or industrial processing, heating or cooling, or monitoring. These wells include drive-point (sand-point) wells, drilled wells, and dug wells.

MINNESOTA WELL RECORDS ONLINE

The County Well Index web page allows visitors to search for wells by geographic location or other criteria and then view detailed information about individual wells.

Cross Reference Tip: Also see Laboratory Testing for Private Wells (MDH) in this document.

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

WELL SEALING PROGRAM

A program to seal unused wells on state-owned land is being implemented by the Minnesota Department of Natural Resources (DNR). The 1989 Minnesota Ground Water Act requires the DNR to inventory wells on state land and to prepare a plan to seal all unused wells on state land.

As of January 2001, the DNR has searched for old wells at 1,125 locations on state lands that were formerly in private ownership. A total of 750 unused wells on state property have been sealed.

Unused and improperly abandoned water wells are a potential vehicle for ground water degradation because they allow surface water and pollutants to flow down the well and directly enter an aquifer. In addition, a large percentage of abandoned dug wells also pose a physical hazard to wildlife and unsuspecting recreational users.

WELL INTERFERENCE - CONFLICTS AND INVESTIGATIONS

Increases in ground water use may affect other well owners nearby. In some cases, wells that were previously adequate can no longer produce enough water to meet domestic needs. Complaints about others' use of ground water are first reported to the DNR area hydrologist, who may ask the technical analysis program to conduct an investigation.

MINNESOTA WATER WELL ASSOCIATION (MWWA)

Minnesota Water Well Association.

UNITED STATES GEOLOGICAL SURVEY

Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Selection, Installation, and Documentation of Wells, and Collection of Related Data (PDF format).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SHALLOW INJECTION WELLS (CLASS V)

As of March 2005, the United States Environmental Protection Agency (EPA) administers the Underground Injection Control Program in Minnesota. An important part of the program for Minnesota involves Class V injection wells. The wells in this class are as diverse as they are similar. This category came about after all the easy definable wells were put into classes I through IV. This classification includes large septic tanks as well as very sophisticated experimental wells. See the EPA Underground Injection section below for more information.

DRINKING WATER FROM HOUSEHOLD WELLS

This web page features a pamphlet entitled Drinking Water from Household Wells. The pamphlet provides about 24 pages of general information about drinking water from home wells (also considered private drinking water sources). It describes types of activities that can create threats to a private drinking water supply. It also describes problems to look for and offers maintenance suggestions. Numerous hypertext links to related information are provided on this web page.

PROTECTING YOUR GROUND WATER SUPPLY

The web page is entitled Protecting Your Ground Water Supply. The potential for pollution entering a well is affected by its placement and construction — how close is the well to potential

sources of pollution? Local agricultural and industrial activities, the local area's geology and climate also matter. This document includes a checklist to help find potential problems with a water supply well.

THE NATIONAL GROUND WATER ASSOCIATION

The purpose of the National Ground Water Association is to provide guidance to members, government representatives, and the public for sound scientific, economic, and beneficial development, protection, and management of the world's ground water resources. Parts of this website are available only to paying members however, the following web pages contain valuable information about wells for the general public:

Wellowner.org offers a variety of information relating to ground water and private water well systems.

The Consumer Corner web page addresses topics such as having a well drilled and hiring a well contractor, well safety and maintenance, ground-water facts, ground-water quality, radon in ground water, septic systems and bacteria.

WATER QUALITY LIMITS, CRITERIA AND STANDARDS

MDH HEALTH RISK LIMITS FOR GROUNDWATER

This Minnesota Department of Health (MDH) web page includes a table with a list of the Health Risk Limits (HRLs) for groundwater and toxicological endpoints. As of March 2005, the HRLs on this page reflected limits promulgated in 1993/94. However, since the HRLs were undergoing substantial revisions in March 2005, look for updates to this web page in the near future. This page also includes links for more information about the chemicals and values, including information about the current rule and guidance.

MPCA CLEANUP PROGRAMS

Various Minnesota Pollution Control Agency (MPCA) programs have action levels or other types of limits that apply to contaminated soils and ground water. This web page has links to MPCA cleanup programs.

EPA NATIONAL RECOMMENDED WATER QUALITY CRITERIA

The United States Environmental Protection Agency's compilation of national recommended water quality criteria is presented as a summary table containing recommended water quality criteria for the protection of aquatic life and human health for approximately 150 pollutants. These criteria are published pursuant to Section 304(a) of the Clean Water Act (CWA) and provide guidance for states and tribes to use in adopting water quality standards.

EPA WATER QUALITY STANDARDS

Water quality standards are the foundation of the water quality-based pollution control program mandated by the Clean Water Act. Water quality standards define the goals for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect waterbodies from pollutants.

EPA DRINKING WATER STANDARDS

This United States Environmental Protection Agency (EPA) drinking water standards web site includes numerous links and details related to rulemaking, regulatory infrastructure, research, health, etc. Or, if you prefer, you can also go directly to an EPA web page focusing on contaminants and their maximum contaminant levels (MCLs).

SITE REMEDIATION: INVESTIGATION AND CLEANUP

Cross Reference Tip: If you don't find what you are looking for in this section, you might want to visit the Solvents and Other Organic Chemicals section in the Current Topics Web Review for Minnesota Ground Water Projects. It includes some references to migration, natural attenuation and remediation of organic chemicals.

MINNESOTA REFERENCES

MINNESOTA DEPARTMENT OF AGRICULTURE

Incident Response Unit (MDA)

The Minnesota Department of Agriculture (MDA) is the lead agency for response to, and cleanup of, agricultural chemical contamination (pesticides and fertilizers) in Minnesota. The MDA Agricultural Chemical Incident Response Unit has four major program areas: 24 hour Agricultural Chemical Emergency Response; Comprehensive Facility Investigations / MERLA; the Agricultural Voluntary Investigation and Cleanup (AgVIC) Program; and, the Agricultural Chemical Response and Reimbursement Account (ACRRA). Many of the Incident Response Unit guidance documents can be accessed on the Internet.

Remedial Investigation Work Plan (MDA)

Work plan.

MINNESOTA POLLUTION CONTROL AGENCY

Voluntary Investigation and Cleanup (VIC) program

VIC Program.

Underground Storage Tank (UST) and Aboveground Storage Tank (AST) Release Cleanup:

UST and AST guidance documents.

All Cleanup Programs (Main Page - Links List)

Select a program and follow hypertext links to look for guidance:

Risk-based Site Evaluation Process

The Minnesota Pollution Control Agency (MPCA) has developed guidance outlining a risk-based approach to decision making during site investigation and remedy selection under the state's Voluntary Investigation and Cleanup (VIC) and Superfund Programs. The Risk-Based Site Evaluation (RBSE) Manual provides a tiered process for making decisions based on an evaluation of risks to human health and the environment. MPCA staff members with expertise in risk assessment, soil physics, hydrogeology, and remediation technologies have developed this guidance and accompanying risk evaluation spreadsheets that comprise the RBSE Manual.

NATIONAL REFERENCES

GROUND-WATER REMEDIATION TECHNOLOGIES ANALYSIS CENTER

The Ground-Water Remediation Technologies Analysis Center (GWRTAC) compiles, analyzes, and disseminates information on innovative ground-water remediation technologies. GWRTAC has prepared a variety of reports by technical teams chosen from Concurrent Technologies Corporation (CTC), the University of Pittsburgh, and other supporting institutions, and has maintained an outreach program to provide innovative technology information to the public.

If your are interested in ground-water information, be sure to visit GWRTAC's Groundwater Central. Groundwater Central© is a portal for Internet-based groundwater information that consists of several integrated components that may be publicly accessed for no fee. The "smart" search engine provides a one-stop shop to browse for a wide variety of information from on-line publications and bibliographies, to presentations, case studies, research descriptions, data repositories, and vendors. As of May 2005, there were 3309 ground water related records in the system to search.

REMEDIATION TECHNOLOGIES DEVELOPMENT FORUM

The Remediation Technologies Development Forum (RTDF) is a public-private partnership to undertake research, development, demonstration, and evaluation efforts focused on finding innovative solutions to high priority cleanup problems. The RTDF includes partners from industry, several federal and state government agencies, and academia who voluntarily share knowledge, experience, equipment, facilities, and even proprietary technology to achieve common cleanup goals.

ITRC GUIDANCE DOCUMENTS

The Interstate Technology and Regulatory Cooperation Work Group (ITRC) is a state-led coalition working together with industry and stakeholders to achieve regulatory acceptance of environmental technologies and reduce compliance costs. This web site has a well-organized set of hypertext links to technology and site investigation and cleanup information for numerous scenarios and contaminant types including the following: Accelerated Site Characterization, Alternative Landfill Technologies, Brownfields, Dense Nonaqueous Phase Liquids, Enhanced In

Situ Biodenitrification, In Situ Bioremediation, In Situ Chemical Oxidation, Metals in Soils Mitigation, MTBE and Other Fuel Oxygenates, Permeable Reactive Barriers (Walls), Phytotechnologies Plasma Technologies, Radionuclides, Remediation Process Optimization, Sampling, Characterization and Monitoring, Thermal Desorption, Unexploded Ordnance and more.

REMEDIATION GUIDANCE LIBRARY

This site from the Lawrence Livermore Environmental Restoration Division includes databases, publications, site technology evaluations and decision-making guidance resources.

GROUND WATER AND ECOSYSTEMS RESTORATION RESEARCH (EPA)

This Division of the EPA conducts research and technical assistance to provide the scientific basis to support the development of strategies and technologies to protect and restore ground water, surface water, and ecosystems impacted by man-made and natural processes.

HAZARDOUS WASTE CLEAN-UP INFORMATION (CLU-IN) (EPA)

The Hazardous Waste Clean-Up Information (CLU-IN) Web Site provides information about innovative treatment and site characterization technologies to the hazardous waste remediation community. It describes programs, organizations, publications, and other tools for federal and state personnel, consulting engineers, technology developers and vendors, remediation contractors, researchers, community groups, and individual citizens. The site was developed by the U.S. Environmental Protection Agency (EPA) but is intended as a forum for all waste remediation stakeholders.

ONSITE ONLINE TOOLS FOR SITE ASSESSMENT (EPA)

The U.S. Environmental Protection Agency (EPA) has developed a suite of on-line calculators called "OnSite" for assessing transport of environmental contaminants in the subsurface. The purpose of these calculators is to provide methods and data for common calculations used in assessing impacts from subsurface contamination.

DNAPL CHARACTERIZATION METHODS AND APPROACHES (EPA)

Contamination from the use of chlorinated solvents, often classified as dense nonaqueous phase liquids (DNAPLs) when in an undissolved state, represents an environmental challenge with global implications. The identification of DNAPL source zones located beneath the water table is critical to ultimately achieve site remediation and aquifer restoration. This web page links to papers from the journal 'Ground Water Monitoring and Remediation' that provide a comparison of the advantages and disadvantages of many of the methods being used for detecting and delineating DNAPL contaminant source zones and compare the costs for implementing various characterization approaches using synthetic unit model scenarios. The objective is to determine which options are best to pursue based on site characteristics, method performance, and method costs. The findings can be used to assist with selection of appropriate site remediation management options.

ANALYTICAL TOOLS AND METHODS FOR DETECTION AND MONITORING (NIEHS/EPA)

These analytical tools and methods are applicable to the detection and monitoring of contaminants at Superfund sites. Specifically, these tools are used in site characterization, fate and transport studies, risk assessments and to improve the understanding of toxicity and disease etiology. Analytical tools also play a critical role in the validation of biomarkers, which are invaluable in the prevention, early detection and early treatment of disease. Use the links and search tools on this web page to find additional information about analytical tools and methods development projects.

CLEANING UP UNDERGROUND STORAGE TANK SYSTEM RELEASES (EPA)

EPA's federal underground storage tank (UST) regulations require that contaminated UST sites must be cleaned up to restore and protect groundwater resources and create a safe environment for those who live or work around these sites. Petroleum releases can contain contaminants of concern that can make water unsafe or unpleasant to drink. Releases can also result in fire and explosion hazards, as well as produce long-term health effects. This web page is well organized and contains links to numerous other sources of information.

NATURAL AND ACCELERATED BIOREMEDIATION RESEARCH (U.S. DEPT. OF ENERGY)

The goal of the Natural and Accelerated Bioremediation Research (NABIR) Program is to provide the fundamental science to serve as the basis for the development of cost-effective bioremediation of radionuclides and metals in the subsurface at DOE sites.

TOXIC SUBSTANCES HYDROLOGY PROGRAM (USGS)

The Toxic Substances Hydrology Program of the United States Geological Survey provides objective scientific information to improve characterization and management of contaminated sites, to protect human and environmental health, and to reduce potential future contamination problems.

ENVIROTOOLS

EnviroTools is created at Michigan State University and is sponsored by the National Institute of Environmental Health Sciences. EnviroTools contains presentation visuals, fact sheets, web links, a glossary and an annotated bibliography of other outreach resources, all designed to help cut through the confusion and jargon of site cleanup projects. The EnviroTools materials are aimed at community assistance leaders, outreach assistance providers and citizen leaders. However, many of the links also contain detailed technical information of interest to environmental professionals.

Highly recommended portions of the website include the following:

- Fact Sheets
- Glossary
- Links (extensive listing of high-quality resources)

ENVIRONMENTAL LABORATORIES, METHODS, DATA REVIEW

THE MDH ENVIRONMENTAL LABORATORY HANDBOOK

The MDH Environmental Laboratory Handbook is available online in PDF format on the above-mentioned web page or you can access it directly through this link (please be sure to verify with MDH staff that you are accessing the most current version).

ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM (MDH)

The Minnesota Department of Health's Environmental Health Division is responsible for monitoring the drinking water for citizens of the state. Municipal water supplies are required by law to test the drinking water supply. The Well Management section recommends that homeowners test their private well water for a number of contaminants. Laboratories that are certified to test drinking water may test either well water or municipal drinking water supplies. This web page also includes a link to a listing of approved analytical methods.

LABORATORY TESTING FOR PRIVATE WELLS (MDH)

Who can I contact to have private well water tested? County health agencies can provide testing for bacteria and nitrate, and some laboratories are certified to perform other tests. Prices vary, but usually fall in the range of $20-40 for both tests. Prices for other tests can vary widely. Regardless of which tests you want done, always make sure to use a laboratory that has been certified to perform each of those particular tests. Visit this web site for a list of all laboratories certified by Minnesota to test drinking water for a variety of chemical and biological parameters.

MDH ENVIRONMENTAL LABORATORY - MAIN PAGE

The MDH Environmental Laboratory supports the environmental protection functions of state government by performing physical, chemical, bacteriological and radiological analyses of environmental samples including air, drinking water, surface water, waste water, sediment, fish, soil and hazardous waste. The Laboratory also develops new analytical methods and provides technical training and consultation at the request of its clients. The Environmental Laboratory ensures that testing capacity is available to support the public health and environmental protection objectives of the state.

The Environmental Laboratory includes six technical areas:

- Inorganic Non Metals
- Inorganic Trace Metals
- Microparticulate

- Organic Chemistry
- Radiochemistry
- Water Microbiology

MPCA LABORATORY DATA CHECKLIST

This is the Minnesota Pollution Control Agency's(MPCA) informal checklist that may be used by a hydrogeologist or project manager to review laboratory data. It follows the general format of the National Functional Guidelines, the primary data review tool used in the U.S. Environmental Protection Agency's Contract Laboratory Program for Superfund analytical work.

ADDITONAL RESOURCES (MPCA)

For more resources from the MPCA related to this topic, see their Quality Assurance Program page.

For additional related information in this document, see the Quality Assurance section.

QUALITY ASSURANCE

MPCA QUALITY ASSURANCE PROGRAM

The Minnesota Pollution Control Agency's (MPCA) Quality Assurance/Quality Control Programs oversee environmental monitoring, including the agency's selection of laboratories, data collection; methods and parameters measured, helping to insure consistency of data and confidence in data quality.

For assistance with MPCA quality assurance policies or any of the following issues, contact Luke Charpentier at 651-296-8445 or luke.charpentier@pca.state.mn.us:

- Quality Assurance Project Plans (QAPPs) for remediation
- Superfund quality assurance
- Solid waste quality assurance
- RCRA quality assurance
- UST/LUST quality assurance
- Organic / metals methods

EPA QUALITY ASSURANCE

EPA'S QUALITY SYSTEM FOR ENVIRONMENTAL DATA AND TECHNOLOGY

EPA uses its Quality System to manage the quality of its environmental data collection, generation, and use. The primary goal of the Quality System is to ensure that environmental data are of sufficient quantity and quality to support the data's intended use. Under the EPA Quality

System, EPA organizations develop and implement supporting quality systems. Similar specifications may also apply to contractors, grantees, and other recipients of financial assistance from EPA.

QUALITY MANAGEMENT TOOLS - QA PROJECT PLANS (EPA)

A Quality Assurance Project Plan (QAPP) documents the planning, implementation, and assessment procedures for a particular project, as well as any specific quality assurance and quality control activities. It integrates all the technical and quality aspects of the project in order to provide a "blueprint" for obtaining the type and quality of environmental data and information needed for a specific decision or use. All work performed or funded by EPA that involves the acquisition of environmental data must have an approved Quality Assurance Project Plan.

NATIONAL CENTER FOR ENVIRONMENTAL RESEARCH - QUALITY ASSURANCE GUIDANCE & FAQS

EPA requires specific quality assurance activities be performed to ensure that the data collected are sufficient and adequate for their intended use, such as to test an hypothesis. EPA requirements are broadly defined in the Federal procurement and financial assistance regulations. The documents and links on this web page provide detailed guidance in meeting those quality requirements.

UNITED STATES GEOLOGICAL SURVEY

Quality-Assurance Plan for District Ground-Water Activities.

MISCELLANEOUS GROUND WATER REFERENCES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

UNDERGROUND INJECTION

U.S. EPA Underground Injection Control (UIC) Program

The UIC Program works with state and local governments to oversee underground injection of waste in order to prevent contamination of drinking water resources.

Example Guidelines for Preparation of UIC Class V Well Inventory Project Workplan in Minnesota (EPA Region 5)

Example guidelines.

TECHNICAL SUPPORT

U.S. EPA Technical Support Project: Technical Support Project Issue Papers

Technical Support Project Issue Papers.

U.S. EPA Technical Support Project: Ground Water Reference List

Ground Water Reference List.

CHEMICAL PROPERTIES AND EXPOSURE RESEARCH

Chemical Property Values (EPA)

Partitioning of chemicals between environmental media (water, air, soil) is partly determined by properties of the chemicals themselves. Values of these properties often can be obtained from the scientific literature that reports on measured values. Examples of 'tools' available from this web page include the following:

- Chemical and Physical Properties Database
- Environmental Fate Data Base
- Henry's law estimation
- Diffusivity in air and water
- Koc from Kow
- Retardation factor in ground water
- Effective solubilities of fuel components
- Multiphase partitioning
- Conversions between half lives and decay constants

EPA's National Exposure Research Laboratory (NERL) Drinking Water Research

NERL conducts research and development that leads to improved methods, measurements and models to assess and predict exposures of humans and ecosystems to harmful pollutants and other conditions in air, water, soil, and food. This web page includes a great list of hypertext links to current research related to drinking water.

GROUND WATER AND DRINKING WATER - GENERAL

U.S. EPA Ground Water

EPA Ground Water.

U.S. EPA - Ground Water & Drinking Water

The Office of Ground Water and Drinking Water (OGWDW), together with states, tribes, and its many partners, protects public health by ensuring safe drinking water and protecting ground water. OGWDW, along with EPA's ten regional drinking water programs, oversees implementation of the Safe Drinking Water Act, which is the national law safeguarding tap water in America

UNITED STATES GEOLOGICAL SURVEY (USGS)

GENERAL FACTS AND CONCEPTS ABOUT GROUND WATER - U.S. GEOLOGICAL SURVEY

General facts and concepts.

SELECTED GROUND-WATER ISSUES - U.S. GEOLOGICAL SURVEY

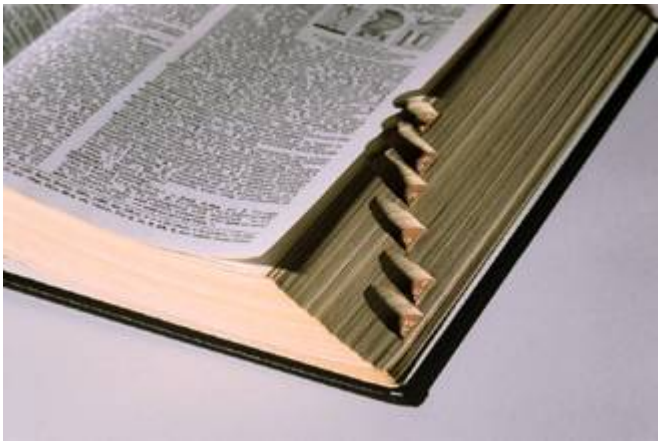
Selected ground-water issues.

UNIVERSITY OF MINNESOTA ONSITE SEWAGE TREATMENT PROGRAM

The Onsite Sewage Treatment Program at the University of Minnesota is dedicated to protecting public health and the environment through proper onsite wastewater treatment. This site includes information targeted at a variety of readers including environmental professionals, communities and individual homeowners. It also includes hypertext links to other organizations.

GLOSSARIES AND DICTIONARIES

The Groundwater Foundation: Groundwater Glossary



California Department of Water Resources: Groundwater Glossary

American Ground Water Trust: Ground Water - Definitions and Explanations

United States Geological Survey Glossary of Hydrologic Terms

United States Geological Survey Water Science Glossary of Terms

United States Environmental Protection Agency Drinking Water Glossary

United States Environmental Protection Agency: Dictionary of Technical and Legal Terms Related to Drinking Water

Nevada Department of Conservation and Natural Resources: Water Words Dictionary

United States Environmental Protection Agency Terms of Environment

International Union of Pure and Applied Chemistry: Glossary for chemists of terms used in toxicology

Links for Chemists: Chemical Dictionaries and Encyclopedia

Houghton Mifflin Geologylink® Geologic Glossary

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OneLook Dictionary Search

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