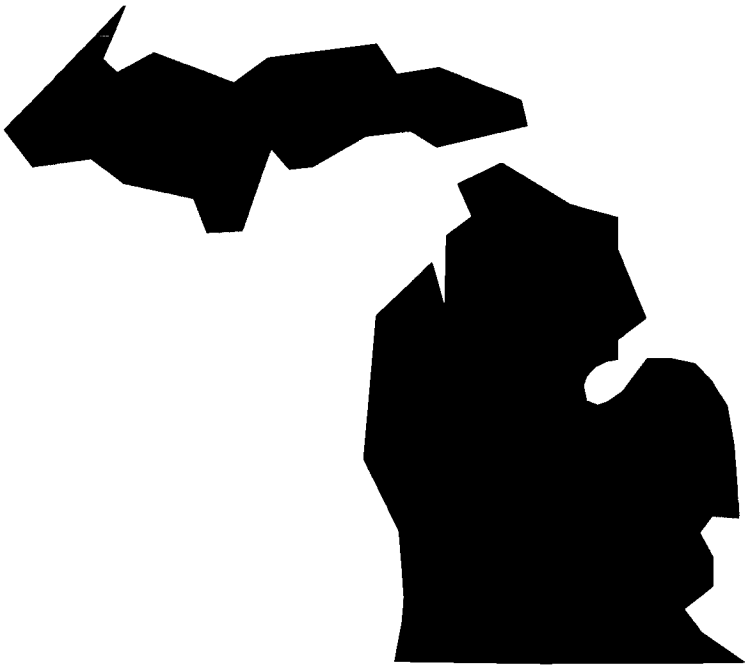
SOURCE WATER ASSESSMENT PROGRAM



Michigan Department of Environmental Quality

Drinking Water and Radiological Protection Division

DEQ

STATE OF MICHIGAN
SOURCE WATER ASSESSMENT PROGRAM

submitted to the

U.S. Environmental Protection Agency

by the

Michigan Department of Environmental Quality
Drinking Water and Radiological Protection Division

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MICHIGAN SOURCE WATER ASSESSMENT PROGRAM
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CHAPTER 1 - INTRODUCTION

The reauthorization of the federal Safe Drinking Water Act (SDWA) of 1996, P.L. 104-182, Section 1453. (a), requires federal guidance and defines state requirements for a source water assessment program (SWAP). The intent of this document is to provide a basis for the development of a SWAP to protect Michigan's sources of drinking water into the future. The 1996 federal amendments require states to:

- Identify the areas that supply public tap water.
- Inventory contaminants and assess water system susceptibility to contamination.
- Inform the public of the results.

The 1986 amendments of the same federal act required that states develop wellhead protection programs (WHPP). The Michigan Departments of Public Health and Natural Resources developed and received United States Environmental Protection Agency (USEPA) approval for the WHPP in 1994. In 1996 the program was transferred by executive order to the newly formed Michigan Department of Environmental Quality (MDEQ), Drinking Water and Radiological Protection Division (DWRPD). It is imperative that the assessment program be designed to enhance the WHPP to provide knowledge and guidance on directing limited resources toward protection of the public water supply resources. These two programs will provide information for long term protection of the public water supply resources and provide future monitoring guidance.

On August 6, 1997, the USEPA published the State Source Water Assessment and Protection Programs Guidance to assist states in developing an acceptable SWAP. This guidance document was required by the SDWA and describes the elements of a USEPA approvable SWAP and how this program integrates with other SDWA requirements.

Michigan has almost 12,000 public water supplies with over 18,000 sources. Of these, approximately 10,650 are noncommunity, public water supplies with ground water as the source. Michigan has only 70 surface water intakes, but these 70 sources provide drinking water to over 75 percent of the persons served by public water systems or about 50 percent of the state's population. These figures present Michigan with some unique challenges in developing a SWAP.

The efforts toward developing the SWAP in Michigan will be divided into three sections with a total of seven assessment categories:

- Noncommunity, Ground Water Supplies

- Community and Noncommunity, Surface Water Supplies
  - Great Lakes Sources
  - Great Lakes Connecting Channels
  - Inland Lakes and Rivers

- Community, Ground Water Supplies
  - Wellhead Protection Program
  - Karst Ground Water Assessments
  - Remaining Ground Water Assessments

Noncommunity Sources

The largest numbers of systems in Michigan are the noncommunity, public water supply systems. Almost all of these systems use ground water as their source of water supply. Those noncommunity water supplies not using ground water will be assessed utilizing surface water source criteria.

The present noncommunity public water supply program includes a sanitary survey of each system every five years. These surveys are done through contracts with local health departments (LHDs). It is proposed to expand these contractual efforts through a contract amendment to include an on-site assessment using an assessment survey form, scoring different criteria that affect the vulnerability of the source, and tabulating an assessment score for the site. These assessments will evaluate major potential sources of contamination within 800 feet of the source. The on-site assessment will also require locating the well in a statewide ground water data base through the use of geographical positioning system (GPS) units along with submittal of a well drilling record where available. All noncommunity systems, both transient and nontransient, will be assessed in the same manner.

It is proposed to develop, through contracts with the LHDs, countywide vulnerability maps using the information available at the county and data obtained through the assessments. These vulnerability maps will then be assembled to make a statewide vulnerability map. This work will be done through a contract with Michigan State University (MSU). Michigan State University will also oversee contractual efforts with the Groundwater Education in Michigan (GEM) centers. These centers will provide assistance to the LHDs as needed for using the GPS units and assisting in other areas of the program.

The master contract with MSU will include provisions to map the elevations of "first water" using the information from the well drilling records and other data that may be available. This information will assist in determining direction of ground water flow for first aquifers throughout the state. When contaminants enter the ground water system, they generally follow the direction of this "first water" flow. Knowledge of this flow direction will assist in evaluating the threat of contaminants to public drinking water supplies.

The initial assessments will provide a tool for determining sources that may need additional assessment and enhanced ground water protection measures. The statewide vulnerability map will provide additional information for assessing the potential impact of contaminant sources near wells. The map will reflect the data collected in the vicinity of the public water supply wells. There may be gaps on this map in areas where there are no public water supply wells. This tool will be useful, in the areas where it is complete, to the LHDs in their other programs such as on-site sewage approvals, private well permits, local contamination investigations, and future planning.

Evaluation of work done by the LHDs will be assessed as the work is submitted to the state. The GPS locations will be verified through an assessment system along with the well log entries. Payment will be for work completed.

Community, Surface Water Sources

Since there are only 70 sources in the state that use surface water, these systems will be assessed on a case by case basis. For the inland sources (10 systems), watershed assessments will be performed to inventory contaminants of concern, identify significant potential contamination sources, and determine the susceptibility of these systems to contamination. These sources include ground water previously determined to be under the direct influence of surface water.

For these assessments, United States Geological Survey (USGS) watershed delineations will be used with areas upstream of intakes subdivided into stream segments and/or subwatersheds and further segmented, if necessary, following preliminary data collection. Land use, hydrologic, soils association, and vulnerability analyses selected as appropriate will be undertaken through linkages with the Natural Resources Conservation Service (NRCS), the Michigan Resource Inventory System (MIRIS), and the

Center for Remote Sensing at MSU. Water quality data will be assessed from the USGS National Stream Quality Accounting Network (NASQAN) and National Water Quality Assessment (NAWQA) program, state discharge permits, Section 319 studies, and local sources. Location information for landfills, leaky underground storage tanks (LUST) and Superfund sites, and other areas of potential concern will be determined.

The remaining 60 public water supply sources in Michigan utilizing surface water have intakes located in the Great Lakes or its connecting waters. Some of these sources, such as the Detroit Water and Sewerage Department (DWSD) intake located five miles from the Lake Huron shoreline, will be subject to virtually no significant impacts other than thermal lake inversions. Other intakes, such as the ones on the St. Clair River, will have impacts, but significant data exists on potential contaminant impacts on these intakes. In these cases, assessments will be done using local data, information from the water plant personnel, and centralized state data sources. These sources will be assessed utilizing the "Assessment Protocol for Great Lakes Sources" developed by the Great Lakes states in USEPA Region 5. These assessments will be done using USGS staff and state personnel.

Community, Ground Water Sources

Michigan presently has a voluntary Wellhead Protection Program (WHPP). Approximately 160 Community Public Water Supplies (CPWS) have started some efforts in developing WHPPs. There are approximately 1250 community type systems that should develop these programs. Michigan will develop a 50-50 state/local matching grant program to provide additional incentive for systems to develop WHPPs. The state's goal is to get over 500 completed WHPPs by the end of the SWAP in 2003.

In Michigan, a WHPP is considered a complete source water assessment. State WHPP guidance requires delineation using approved models to assess the hydrogeological sensitivity of well recharge areas. Ground water supplies with nondetected tritium are not considered vulnerable and will not be required to delineate but must institute abandoned well surveys as part of their WHPP.

For ground water supplies whose delineated areas include surface waters, the state will confirm the hydraulic connection and determine the potential impact of surface water on the ground water source. Where necessary, the state will require a conjunctive delineation for ground water supplies influenced by surface water. This delineation will involve ground water modeling plus an analysis of the contributing watershed.

The community ground water systems without WHPPs will need to be assessed. This will be done using state staff or a third party contractor. The assessments on these remaining small systems will be similar to those conducted for the noncommunity systems. It is hoped that most systems will enter into development of WHPPs to minimize the number of necessary assessments for these community type ground water systems. These assessments will be initiated in the third or fourth year of the program depending upon the number of communities that complete WHPPs.

Karst Ground Water Sources

A small number of yet to be determined community and noncommunity water supplies derive their water from karst hydrologic systems (KHS). Ground water flow in KHS is typically controlled by a continuum of vertical and horizontal conduits formed in and enhanced by dissolution of limestone, dolomite, gypsum, and other soluble rocks and minerals. Ground water flow rates in KHS are typically an order (or orders) of magnitude faster than ground water flow in porous media (typically hundreds of feet per day in KHS). Karst hydrologic systems that are near or at the earth's surface provide a pathway for surface drainage and contaminants to directly enter drinking water supplies. Source water assessments in KHS will be completed using criteria developed jointly by the MDEQ and USGS, Michigan District.

Table 1. Michigan Public Water Supplies

Noncommunity Ground Water Supplies			
Transient =	8930		
Nontransient =	1720		
	Subtotal =	10650	*with approximately 13000 wells to assess*
Community Supplies			
Ground Water =	1250		*with an estimated 5000 wells to assess*
Surface Water Intakes			
Inland Rivers	10		
Great Lakes	60		
Subtotal	=	1320	
Total Number of Public Water Supplies =		11970	

Approximate Number of Assessments to Complete = 18000

Sensitivity/Susceptibility Determinations

The SWAP will include susceptibility determinations which take into account source sensitivity related to area geology or hydrology and contaminant sources within the assessment area. These factors are used to determine the potential to draw water contaminated by inventoried sources at concentrations that would pose concern. For ground water sources, the sensitivity could be determined by reviewing depth to "first water," recharge from precipitation and surface waters, thickness of confining layers, plus well construction, maintenance, and pumpage. The sensitivity analyses are then evaluated with the source chemical and/or isotope data and isolation from contaminant sources to determine susceptibility.

For ground water supplies with an approved WHPP, susceptibility determinations are part of the approved WHPP. First, the "natural" protection is evaluated through hydrogeological modeling and delineation of the recharge area. Sources of potential contamination located within this Wellhead Protection Area (WHPA) are listed as part of the contaminant source inventory. Management strategies are then developed to evaluate these sources on an on-going basis. This process must be dynamic in nature and evolve as necessary to meet the changing challenges that may threaten the WHPA in the future.

For surface water supplies, the susceptibility determination will be based on the watershed assessment area, or portions thereof, and the site specific intake critical assessment zone, volume of flow, land use, topography, contaminant sources, and historic raw water data.

Regulatory Benefits

Along with providing for the protection of our drinking water sources, SWAP also provides public water supplies with regulatory benefits. Enhancements in the program to complete wellhead protection benefits public water supplies through a reduction in monitoring requirements. Future monitoring relief will also be available to a lesser degree for sources which have completed assessments.

Surface water assessments will be of benefit in evaluating microbial water quality and disinfection byproduct precursors. These will be key factors in determining the level of treatment that will be required under the future Enhanced Surface Water Treatment Rule as well as Stage 1 and 2 Disinfection Byproduct Rules.

The USEPA Underground Injection Control (UIC) program could provide information on shallow, Class V injection wells in assessment areas. Proposed UIC rules would further provide USEPA with the regulatory authority to prohibit certain Class V wells.

The assessments will also be enhanced with the use of data previously collected from vulnerability assessments and from data collected during sanitary surveys. This information will also be beneficial for future sanitary surveys.

Data collected from ground water assessments could assist in defining the potential for microbial contaminants as proposed for regulation under the federal Ground Water Rule.

Capacity development and operator certification requirements may also be more readily achieved through the technical knowledge gained from the source water assessment.

Time Schedule

The following time schedule has been adhered to by the DWRPD to develop a draft SWAP:

June 30, 1998 to SWAP Committee
July 1998 to Division
July 28,1998 to SWAP Public Advisory Subcommittee
August 1998 to Region 5 States
August 20,1998 to SWAP Technical Advisory Committee
September 1998 conduct Public Meetings
October 27, 1998 SWAP Committee Approval of Final Draft
November 1998 to USEPA
January 14, 1999 SWAP Committee Approval of Program

This next time schedule stipulates the deadlines stated in the SDWA and proposed by DWRPD to maximize the allowable time for final SWAP development:

February 6, 1999 to USEPA
November 6, 1999 USEPA Approval
November 6, 2001 Proposed SWAP Completion Date
May 6, 2003 SWAP Completion with Allowable Extension

The basis for the DWRPD to request the allowable 18 month extension for SWAP completion is the large number of assessments required and the established 5 year noncommunity water supply sanitary survey cycle in which assessments are being completed. Additionally, at least 3 years will be necessary to implement WHPPs and then 18 months to complete assessments of community ground water supplies not participating in wellhead protection.

CHAPTER 2 – PUBLIC PARTICIPATION

One large general advisory committee or SWAP committee has been established with representation from industry, agriculture, government, water suppliers, citizens, environmental groups, contractors, and others. Many groups were invited to participate, although some did not elect to be represented. Letters inviting participation were sent out in September 1997 to public interest groups, public health groups, vulnerable population groups, business groups, conservation groups, drinking water suppliers plus local, state, and federal government agencies. Table 2 lists the governmental agencies and organizations that responded and are represented on the SWAP committee. Appendix C lists the individuals representing these agencies and organizations.

At the initial SWAP committee meeting on October 15, 1997, it was decided to establish two subcommittees; a Technical Advisory Subcommittee, and a Public Advisory Subcommittee. Members of the SWAP committee were invited to be members of one or both of these subcommittees. Other persons were solicited for membership of these committees depending on the need for their expertise. These subcommittees will meet, develop ideas and concepts, and then report back to the general advisory committee. The Technical Advisory Subcommittee has met and developed the basic framework for the Michigan assessment program. It was decided to develop a workgroup to work specifically with the surface water source assessments due to their limited number in Michigan. The Public Advisory Subcommittee has met and they are developing ideas for communicating with the public concerning the assessment program. All three committees have been instrumental in providing program direction for noncommunity assessments, surface water assessments including the Great Lakes Protocol, the WHP grant program, and public involvement.

Environmental health directors from four LHDs formed an advisory committee to assist the MDEQ in developing procedures for noncommunity water supply assessments. These health professionals provided important direction towards initiating these assessments in fiscal year 1997-1998.

In addition to committee meetings, the public was asked to participate in various stakeholder meetings, public hearings, workshops, and public meetings to assist in developing the components of SWAP. The wellhead protection grant program being developed as an intregal part of SWAP involved the public through an initial stakeholder meeting, public hearings for rulemaking, and application workshops. Public input for the draft SWAP was sought during four public meetings in September and October 1998. A chronological listing of public participation meeting dates and committee meeting minutes are included in Appendices D and E.

The first SWAP Committee meeting, October 15, 1997, provided program introductions, discussed resources, and set goals. The November 15, 1997, Technical Advisory Subcommittee meeting addressed the 10,500 noncommunity assessments which must be conducted during the existing 5 year sanitary survey cycle. On December 5, 1997, the Public Advisory Subcommittee met to identify "at risk groups," ensure proper public involvement, and discuss methods to disseminate SWAP information. The full SWAP Committee met once again on January 14, 1998 and discussed responsibilities, wellhead protection grants, noncommunity water supply SWAP status and data needs, and inconsistencies. On June 30, 1998, the committee met to discuss the status of the program and noncommunity assessments, review the first draft SWAP, and talk about committee tasks. The Public Advisory Subcommittee discussed at their July 28, 1998 meeting public outreach efforts, a draft SWAP brochure, and presentations at public meetings. The Technical Advisory Subcommittee met on August 20, 1998 to review the SWAP, third party contract, and assessments status. The full committee met again on October 27, 1998, to approve the final draft and will meet on January 14, 1999, for final SWAP approval.

Appendix T is the "Notice of Public Meeting" mailed to 800 municipal water suppliers, local health departments, SWAP committee members and stakeholder groups. While attendance at the four meeting sites was marginal, the SWAP was presented and comments were received. In addition, staff

participated in a Clean Water Fund Conference on October 3, 1998. Overall, general comments have been very supportive of the proposed Michigan program.

Responsiveness Summary

The two DWSD participants at the September 15, 1998 Detroit meeting discussed the city partnering with the MDEQ to model flow patterns of the St. Clair River, Lake St. Clair and Detroit River system (This project is being pursued with USGS).

Of the seven attendees at the September 17, 1998 Kalamazoo meeting, a water superintendent requested additional information for each village council member (SWAP documents provided) while a larger utility asked if their WHPP was a source water assessment (Yes).

In Grayling, on September 30, 1998, seven people attended and LHD representatives asked about prioritizing surface water assessments (Yes, with SWAP Committee direction) and notification procedures for abandoning wells when municipal water is extended (Policy already exists). A water plant superintendent requested Drinking Water Revolving Fund priority points be given for surface source water protection as with WHPPs (Referred to Drinking Water Revolving Fund (DWRF) Program).

The October 1, 1998 meeting in Escanaba, three attendees presented questions regarding the assessment of Canadian discharges (MDEQ will pursue) and the Marinette, Wisconsin intake located on the Michigan side of the Menominee River (Conferring with Wisconsin DNR).

Comments received at an October 3, 1998 Clean Water Fund Conference in Mt. Clemens encouraged public participation and requested documentation of the potential impact of the St. Clair and Clinton Rivers on Lake St. Clair and downstream public water supply intakes (Will be accomplished).

Additionally, informal public participation has occurred through SWAP staff participation and presentations at various watershed meetings, conferences, and seminars. The SWAP was presented in October at five Regional Operator Meetings attended by over 800 waterworks professionals. It is anticipated these activities will continue throughout SWAP development and implementation.

Opportunities for the general public to become involved in the source water assessment process will continue throughout the program. Comments will be welcomed regarding all program elements. Public input will be considered regarding specific assessment issues. Public participation will also be encouraged through WHPPs. Community water supplies will be encouraged to involve the public through the Consumer Confidence Rule (CCR).

Table 2. Agencies/Organizations Involved

- Michigan Department of Environmental Quality
  - Drinking Water and Radiological Protection Division
  - Geological Survey Division
  - Land and Water Management Division
  - Surface Water Quality Division
  - Storage Tank Division
  - Waste Management Division
- Michigan Department of Agriculture
- Michigan Department of Management and Budget
- Michigan Department of Natural Resources
- Michigan State University
  - Institute of Water Research
  - Agricultural Extension Service
- United States Department of Agriculture
  - Natural Resource Conservation Service
  - Rural Community Development
- United State Environmental Protection Agency
- United States Geological Survey - Michigan District
- Local Health Departments
- Local Planning Agencies
- Local Utilities
- Consulting Engineers Council
- American Indian Health
- American Water Works Association – Michigan Section
- Center for Environmental and Occupational Medicine
- Clean Water Action
- Groundwater Education in Michigan (GEM) Centers
- League of Woman Voters
- Michigan Agri Business Association
- Michigan Ecumenical Forum
- Michigan Environmental Council
- Michigan Ground Water Association
- Michigan Manufactured Home, Rec. Vehicle and Campground Assoc.
- Michigan Manufacturers Association
- Michigan Petroleum Assoc. & Assoc. of Convenience Stores
- Michigan Restaurant Association
- Michigan Rural Water Association
- Michigan School Business Officials
- Watershed Councils
- Citizens-at-Large

CHAPTER 3 – STATE APPROACH

Historically, since the early 1900's, Michigan conducted assessments of public water supply sources by completing water supply evaluations, vulnerability assessments and sanitary surveys. Passage of the Michigan Safe Drinking Water Act, Act 399 P.A. 1976, added requirements to these regulatory oversight processes. Furthermore, in 1994, the state's approved WHPP directed community, ground water supplies towards wellhead protection activities.

As defined in Michigan's SWAP, assessments of noncommunity ground water supplies will be conducted by LHD staff during sanitary surveys which occur every 5 years. Wellhead protection will be pursued for community, ground water supplies. Those ground water supplies electing not to pursue wellhead protection will be assessed through a scoring process similar to noncommunity water supply assessments.

All public water supply assessments will include an assessment area derived from standard and major contamination source isolation areas, wellhead protection delineations, or watershed boundaries. Standard and major contaminant isolation areas as defined by the Michigan SDWA are 75 feet and 800 feet for noncommunity, ground water supplies and 200 feet and 2000 feet for community, groundwater supplies. Karst hydrologic systems may necessitate increasing these isolation radii. These wellhead protection delineations are based on aquifer modeling for a ten year time of travel. Surface water assessments will include the watershed or subwatershed area plus a critical assessment zone in the immediate vicinity of the public water supply intake. The USGS will assist the MDEQ with source water assessments as described in Appendix F.

Contaminants of concern and contaminant sources will be evaluated in each assessment area. It is the intent of the program to identify known and potential sites of environmental contamination which will be included on a contaminant inventory list. Known sites of environmental contamination may include leaking underground storage tanks, Superfund sites, Part 201 sites of Act 451, sites of environmental contamination, and oil and gas contamination sites. Known sites which represent a potential for contamination include registered underground storage tanks, certified above ground storage tanks, hazardous waste generators, abandoned wells, plus surface and ground water discharges. Land use associated with agricultural operations, commercial facilities, manufacturing and industrial facilities, institutional facilities, and utility companies may also be considered potential sources of contamination particularly as they relate to nonpoint source discharges. Contaminants from these sources which threaten public health will be considered as contaminants of concern. In addition, the following contaminants will be considered when conducting the contaminant inventory: the USEPA Contaminant Candidate List, contaminants with USEPA health advisories, USGS NAWQA Program list of contaminants, and other contaminants the state has determined to be a threat to public health.

These contaminants and potential sources in combination with the source hydrogeology or hydrology sensitivity analysis will yield a susceptibility determination. Thus, the critical factors to consider in determining susceptibility are the relationships between the integrity or construction of the well or surface water intake, source sensitivity, and potential contaminant sources. This determination will also take into account any maximum contaminant level (MCL) violations related to source water quality or contaminants of concern detected in the source water.

The remainder of this chapter addresses the specific approach to noncommunity, ground water supplies, WHPPs, karst, and community, ground water assessments plus surface water assessments.

Noncommunity, Public Water Supply Assessments

Source water assessments are to be performed on approximately 10,650 noncommunity public water supplies (NCPWS) throughout the state. Five noncommunity water supplies derive their source from surface water and will be assessed similar to community surface water supplies.
The objectives of the ground water assessments are:

- Accurately establish through the use of a GPS and geographic information system (GIS) the location of NCPWS wells;
- Provide for the entry of water well and pump installation records into an electronic data management system;
- Identify the location and proximity of sources of contamination located within 800 feet of NCPWS wells; and
- Establish a Source Water Assessment Score (SWAS) which reflects the "inherent vulnerability" of the NCPWS well and source water.

Obtaining accurate location information and water well and pump installation (well record) information for NCPWS wells is an essential first step in the state SWAP. The location and well record information will be entered into the Statewide Groundwater Data Base (SGDB). The collection of location and well record information will be built upon the technical expertise and networking developed by the Kellogg Foundation, GEM grant program. Training of county staff and the compilation of data will be done by GEM regional centers located at major universities around the state. The effort will be coordinated by the Institute of Water Research, MSU, as they were the coordinators for the original GEM grant.

Location information will be collected for each NCPWS well using GPS. The ultimate goal is to obtain accurate GPS locations on all NCPWS wells for entry into the SGDB. Local health departments, at their option, will be contracted for site visits to obtain GPS locations on all NCPWS wells. The GPS locations must be "corrected" to provide accurate well locations before the locations are entered in the SGDB. Corrected locations may be obtained through the "real time" acquisition of accurate locations, or postprocessing collected location information to provide accurate locations.

The LHDs will be offered additional funds for corrected and accurate well locations. The supplemental funds may be used to purchase new GPS units or upgrade existing GPS capabilities, provided the LHD provides corrected and accurate GPS locations for entry into the SGDB. Local health departments collecting GPS locations but not providing "real time" corrected data will be loaned GPS units. The Institute of Water Research will be responsible for correcting location information obtained from counties not providing "real time" corrected data. The state has purchased 12 Trimble Geo Explorer II GPS units with a differential accuracy of 2 to 5 meters that will be rotated between counties that did not purchase GPS units. The LHDs accepting additional funds for providing accurate location will not be eligible for the use of loaner GPS units.

Information from well records is critical to the SWAP. As part of SWAP, available well records for NCPWS wells will be compiled. The SGDB contains location verified well information compiled from well records to which the well record information for NCPWS wells will be added. WELLKEY is the software program that allows well record information to be stored in a data base format and provides for the automated entry, storage, and retrieval of well information. The LHDs, at their option, will be contracted to enter the well record information for NCPWS wells in WELLKEY. The LHDs which do not enter well record information into WELLKEY will locate well records for NCPWS wells as part of the source water assessment procedure. Well records which are not entered into WELLKEY shall be forwarded to a GEM center for entry into WELLKEY and inclusion in the SGDB.

The use of GIS for analysis and display of location and well record information is necessary in the state SWAP. The ARC/INFO coverage is the MDEQ standard for GIS applications. ArcView and ARC/INFO are the standard software packages for departmental information analysis and applications.

To the extent staffing and contract activities allow, the SWAP will provide maps to LHDs that include the following information:

- Maps showing the locations of wells derived by address matching using the Type II data base and base maps developed from the Michigan Information System;
- County vulnerability maps based upon a statewide vulnerability map to be developed by Dr. Dave Lusch, MSU; and
- Potential sites for contaminant sources based upon state lists.

The GPS location and well record information obtained by the counties will be compiled and incorporated into the statewide GIS for use in the analysis of information and the presentation to the public. Through GIS the results can be used in protection efforts for public water supplies and can also be used to focus ground water protection efforts for private water supply wells.

In addition to the GPS/GIS phases of the source water assessment, the vulnerability of NCPWS wells will be evaluated by determining a Source Water Assessment Score (SWAS). The SWAS equates to a susceptibility determination. Ideally a source water assessment would entail a critique of the rate at which ground water moves both horizontally and vertically in the subsurface. Unfortunately, hydrogeologic studies which document the rate of ground water movement are scarce, difficult to conduct, and expensive. The SWAS has been created as a numeric system which assigns points for situations that represent a "perceived risk" based upon the evaluation of four criteria. The evaluation criteria provide a "qualitative assessment" of ground water movement and the potential for movement of contaminants into the subsurface.

The SWAS is based upon evaluation of the following:

1. the geologic sensitivity of the NCPWS well;
2. the construction, maintenance, and use of the NCPWS well;
3. chemistry and/or isotope data from the NCPWS well water; and
4. isolation of the NCPWS well from sources of contamination.

The criteria are evaluated in a manner such that a higher SWAS is equated to a greater perceived risk for the NCPWS source water.

Establishing a SWAS provides a rationale for identifying NCPWSs which should receive a priority in the NCPWS program. The SWAS system has been developed cooperatively with the Noncommunity Unit, Ground Water Supply Section, DWRPD. The Noncommunity Unit may utilize the SWAS to assign monitoring requirements and identify NCPWSs which should receive priority in the performance of sanitary surveys.

A more detailed description of Michigan's program for Noncommunity, Public Water Supplies is included as Appendix G.

Community Water Supply, Wellhead Protection Programs

A WHPP is a complete source water assessment and more. A WHPP defines the source water protection area including geological sensitivity and inventories contaminants. These factors will be utilized to complete the required SWAP susceptibility determination as outlined in the Source Water Assessment Flow Diagram in Appendix W. A WHPP goes further than determining susceptibility by prioritizing protection activities from documented contamination sources. Community, ground water supplies which contain low levels of tritium will be considered naturally protected with minimal sensitivity and lower susceptibility to contamination. Communities designated as low tritium will be requested to develop a WHPP which inventories contaminant sources and abandoned wells plus incorporates management efforts.

MDEQ defines an approved WHPP as a completed assessment and must work closely with the water supplier during the approval process to assure proper information for the susceptibility determination is obtained. The state does require this in the wellhead protection process. Since the state has defined requirements for a contaminant source inventory and high risk land uses in the WHPP, consistent criteria for susceptibility determinations is available.

When a WHPP is approved by the state, an approval letter from the MDEQ is sent to the water utility. The MDEQ will use this letter to summarize source water susceptibility as required by SWAP guidance. A portion of this letter will relate to the hydrogeological modeling of the ground water system and how this, combined with the contaminant source inventory, also gives the community the tools to evaluate the susceptibility of the public water supply source. In addition, this letter will state the importance of maintaining and updating the contaminant source inventory for future susceptibility evaluations.

Because wellhead protection efforts in Michigan remain voluntary, the state is encouraging WHPPs through a matching grant program. The state will, however, complete assessments for those supplies which fail to obtain an approved WHPP.

A community, ground water supply without a WHPP will be assessed in the same manner as the NCPWS except for a standard isolation radius of 200 feet and 2000 feet for major contamination sources as described in Appendix V of this document.

The purpose of Michigan's WHPP is to protect public water supply systems (PWSS), which use ground water, from potential sources of contamination. Protection is provided by identifying the area which contributes ground water to PWSS wells over a ten year time-of-travel (TOT), identifying sources of contamination within the area, and developing methods to cooperatively manage the area and minimize the threat to the PWSS.

Wellhead protection is a voluntary program which is implemented on a local level through the coordination of activities by local, county, regional, and state agencies. Guidelines for the program utilized by the MDEQ were developed jointly by the MDPH and MDNR. Although the program is voluntary, PWSSs who choose to participate in wellhead protection must develop a local WHPP consistent with the guidelines established by the state to receive state approval. Local WHPPs must specifically address seven elements which include the establishment of roles and duties, wellhead protection area (WHPA) delineation, identification of sources of contamination within the WHPA, the development of mechanisms to manage the WHPA and minimize threats to the PWSS, the development of contingency plans for water supply emergencies, identification of procedures for the development of new well sites and incorporate them into the local WHPP, and provide opportunities for public participation. Various state and local regulations are integrated into the local WHPP and provide legal authority for a broad range of activities which help to support local wellhead protection efforts.

Funding for the WHPP is available through a grant program designed to assist PWSSs in the development and implementation of WHPPs. The program is a 50 percent grant program which must be matched with 50 percent local funds. Grant money will be awarded to PWSSs based on a scoring system as outlined in the Administrative Rules in Appendix H and the Grant Application in Appendix I.

<u>The elements of Michigan's WHPP are:</u>

1. Roles and Responsibilities

This element is designed to identify individuals responsible for development and implementation of the local WHPP. While one individual is generally identified as the primary contact for the local WHPP, the establishment of roles and responsibilities frequently requires the building of partnerships within the community and the participation of many individuals. Since ground water knows no political boundaries, partnerships may be developed between local, township, county, regional, and state agencies and organizations to facilitate the effective management of the WHPA. In an effort to

develop effective partnerships, local teams may be developed which include managers at the local level (city manager, utilities superintendent, city engineer, fire chief, building inspectors, etc.), county and state agency representatives, local watershed councils, and representatives from the general public. The team can serve to provide consistency in the local WHPP as new parts of the program are addressed or team members leave. Building a team to oversee the wellhead protection process helps to ensure a continuance of the program in future years.

2. Wellhead Protection Area Delineation

The federal SDWA defines a WHPA as "... the surface and subsurface area surrounding a water well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field." In simpler terms, it is that area which contributes ground water to a PWSS well. Michigan WHPP requires a hydrogeologic study to identify the contributing area. The area contributing ground water to a well may extend for miles, therefore, Michigan's WHPP is based upon a ground water time-of-travel of 10 years. The 10 year TOT provides a reasonable length of time for responding to environmental problems within the WHPA while concurrently providing an area which can be reasonably managed.

3. Potential Sources of Contamination

Michigan's WHPP requires the identification of sources of contamination within the WHPA. As with all assessments, the contaminant source inventory will include regulated and unregulated drinking water contaminants. Known and potential sites of environmental contamination will be included on a contaminant inventory list. Known sites of environmental contamination may include leaking underground storage tanks, Superfund sites, Part 201 sites of Act 451, sites of environmental contamination, and oil and gas contamination sites. Known sites which represent a potential for contamination include registered underground storage tanks, certified above ground storage tanks, hazardous waste generators, and ground water discharges.

All land uses associated with agricultural operations, commercial facilities, manufacturing and industrial facilities, institutional facilities, utility companies, and others should be considered for potential sources of contamination. Abandoned wells left improperly sealed provide a direct conduit into the ground water system through which contaminants may migrate and should be considered as potential sources of contamination. In order to effectively manage a WHPA and accomplish wellhead protection, it is essential that threats to the PWSS are known.

4. Wellhead Protection Area Management

The goal of WHPA management is to provide mechanisms which will prevent existing and potential sources of contamination from reaching the public water supply well or well field. Communities are encouraged to develop management strategies which may be unique to their situation and specific to the contaminant source inventory developed for the WHPA. Management approaches may entail a broad range of activities including facility inspections, land-use regulations, operational policies, best management practices, public information, and education. Management strategies should serve to generate support and attention to the WHPA for local, county, state, and federal regulatory activities. The strategies should attempt to minimize (eliminate if possible) land use activities which pose a significant threat to the PWSS, motivate landowners within the WHPA to take appropriate steps to reduce threats to the PWSS, and provide education to residents, businesses, and industries located within the WHPA to emphasize their role in making wellhead protection work.

An important aspect of wellhead protection is the general acceptance of the concept by community leaders and the development of land use and land protection measures which support wellhead protection. One means of providing for intelligent land use development is the incorporation of the wellhead protection concept and the WHPA into a community's Master Plan. Incorporation in the Master Plan aids community leaders in recognizing the extent of the WHPA and the need to set goals and objectives for community development which serve to protect the PWSS. This approach provides a mechanism for the effective use of local regulations in support of wellhead protection. Such support may come through the development of communitywide zoning provisions, the development of a local site plan review process, or development of local standards for operation and maintenance of facilities located in the WHPA.

5. Contingency Plans

As part of the local WHPP it is important that the PWSS identify an effective contingency plan for water supply emergencies. The plan should identify personnel, testing equipment, and procedures and materials necessary for the fast and effective mitigation of water supply emergencies. A contingency plan should also include response protocol, notification procedures, and methods for handling emergencies based upon the nature of the threat to the PWSS. It is important that the contingency plan provide a course of action with an emphasis on providing a mechanism for chemical containment. The contingency plan should include the ability to provide an alternative water supply in the event that a PWSS well is impacted.

6. New Wells

Wellhead protection activities provide an excellent assessment of the PWSS by providing information on existing ground water availability, the ability of the PWSS to meet present demands, and the susceptibility of the existing wells to contamination. Where water supply expansion, increases in water use, or susceptibility of existing wells warrants future development of production facilities, a mechanism should be provided to incorporate the new facilities into the local WHPP. Public water supplies which undergo expansion with the construction of new wells are strongly encouraged to adopt the wellhead protection concept. This is done because the WHPA delineation is easier (and less expensive) at the time of construction, wellhead protection can be used to evaluate the availability of the ground water resource at a site, and wellhead protection helps ensure that ground water resource development is occurring in an area which is not subject to contamination.

7. Public Education and Participation

Community involvement in the development and implementation of the local WHPP helps to ensure its success and longevity. While it is best if all citizens are provided an opportunity to participate, it is essential that individuals who live, work, and own businesses in the WHPA take an active interest in the program. To generate interest in wellhead protection, communities have focused on public education and the dissemination of wellhead protection information. Public education may be provided by presentations at village/city/township meetings, before local boards and commissions, and at local schools. Information can be provided through wellhead protection newsletters and brochures, radio and cable television spots, and signs posted in WHPAs, etc. Appendix J is a copy of Michigan's Wellhead Protection Implementation Plan.

Karst Hydrologic System Assessments

Michigan has at least three geographical areas where KHSs are at or near the earth's surface. In these areas, there are direct pathways for entry and rapid transport of surface contaminants toward drinking water supplies. The Michigan SWAP will identify community and noncommunity water supplies that produce ground water from KHS, and conduct source water assessments following a protocol to be jointly developed by the MDEQ and the USGS. An outline defining the approach to be taken by the USGS is included in Appendix K.

Community Public Water Supplies, Ground Water Assessments

Community public water supplies which do not participate in wellhead protection will be assessed similar to noncommunity, ground water supplies. These supplies will mainly include mobile home parks, nursing homes, condominiums, apartments, subdivisions and correctional facilities. These assessments will consider regulated contaminants and isolation areas defined by the Michigan SDWA. The assessment area will be a 200 foot radius for standard contaminants (sewers, surface water, fuel storage, etc.) and 2000 feet for major contamination sources (large scale wastewater disposal, landfills, chemical disposal or storage etc.)

For these sources along with the noncommunity sources, a numerical scoring system will be used to compile raw data reflecting area geology, well construction, contaminant sources and water quality. This data will be analyzed, globally adjusted if necessary and then be used for guidance in developing source water protection efforts.

Community Public Water Supplies, Surface Water Assessments

An outline of the general methodology to be used for Great Lakes intakes will be a main part of the SWAP for states in the Great Lakes Region. Due to the unique nature of each intake, each assessment will be site-specific. Assessments of the Great Lakes water quality in general have been done by various agencies and these efforts should be referenced not duplicated. The opportunity should be given to individuals from the MDEQ, the USGS, water treatment plants, local surface water protection agencies, LHDs, area fire departments, business and industry, agriculture, education, planning, environmental groups, and the general public to be involved in the site-specific assessments. The team concept has proven to be valuable to communities which have begun developing a WHPP and could provide similar results for surface water supplies. The inclusion of diverse people and interest in the assessments will provide for a more comprehensive assessment and will help the assessments become valuable tools to future operations and source water protection.

Appendix L defines the protocol to be utilized by the Great Lakes states to conduct these assessments. Michigan will use the survey form in Appendix M to obtain preliminary assessment information of each intake from surface water treatment plant operators. A map depicting the location of Michigan surface water intakes is included as Appendix N. Appendix O consists of watershed maps for river sources.

The USGS, Michigan District, will be assisting the MDEQ as outlined in Appendix P with surface water assessments of near shore Great Lakes intakes plus, as noted in Appendix Q, for inland lakes and rivers sources. Delineations of subwatersheds may be deemed more acceptable for certain inland river sources. Information from the MDEQ, Surface Water Quality Division (SWQD), which includes a 5 year cyclic watershed review, watershed assessments, Total Maximum Daily Loads (TMDL's), etc., will be incorporated in the assessments. Appendix R defines data sources for assessments of public water supplies.

Appendix U is a draft project proposal by the USGS titled "Source Water Assessment of Public Water Supply Intakes and Spill - Response Modeling on the St. Clair - Detroit River System." The USGS has been working with the MDEQ, the Detroit Water and Sewerage Department (DWSD), the U.S. Army Corp of Engineers, and the National Oceanic and Atmospheric Administration to enhance a 1995 flow model of this system. This flow model project is proposed to include water quality modeling and particle tracking to assist in assessments of the 14 community water supply intakes along this river system which provide drinking water to almost 1/2 the states population.

Critical Assessment Zones

Critical assessment zones will be defined around each Great Lake intake as noted in the Great Lakes Protocol, Appendix L. Connecting river sources will have zones defined 2000 feet upstream of the intake. A susceptibility analysis will be completed in each critical assessment zone and incorporated in the overall susceptibility determination. This determination may include major contaminant sources which are outside the critical assessment zone. Critical assessment zones for inland rivers may not be defined since the entire watershed will be assessed.

CHAPTER 4 – PROGRAM IMPLEMENTATION

Governor John Engler signed into law Act 27 of the Public Acts of 1997 establishing a Drinking Water Revolving Fund (DWRF). Part of this law allows the MDEQ to apply to the USEPA for a partial capitalization grant to secure special set-aside funds. In September 1997, the MDEQ submitted to the USEPA an Intended Use Plan (IUP) for set-aside funds only for fiscal years (FY) 1997 and 1998. Michigan requested the full 10 percent, one time set-aside in FY 1997 for source water assessments. This funding provides the basic support for the source water assessment program. In addition, allowable set-asides were requested of $225,000 for source water protection and $1,000,000 for WHPP enhancement.

None of the requested source water assessment set-aside funds were spent in FY 1997. Beginning in FY 1998, the MDEQ hired staff and established contracts for implementing a statewide SWAP. The amount funded for FY 1998 was $1,100,000. The remaining SWAP funds will be used for FY 1999, 2000, and 2001 to complete the program.

Source water protection set-asides will be used to hire new staff and establish contracts to identify the initial elements of a Abandoned Well Management Program (Appendix S). Abandoned wells represent a major threat to the ground water resources of the state. The state will use existing definitions and authority in the Michigan SDWA and Public Health Code to implement this program. Close cooperation with LHDs will be essential to coordinate this program.

The MDEQ is initiating a WHPP enhancement involving matching grants to public water suppliers to provide additional incentives for local participation in the existing voluntary state WHPP. Wellhead protection training will be increased and educational materials developed for distribution to public water suppliers, LHDs, and the public. Administrative rules promulgated under the authority of the Michigan SDWA are required to implement this program and included in Appendix H.

Due to the complex nature and many variables in a statewide SWAP, it is not possible to provide a detailed implementation schedule or spending plan for the total program. Many decisions, especially concerning surface water assessments, remain to be made. Therefore, with the concurrence of Region 5 USEPA, it was decided to provide a general strategy for the 5 year program. A new IUP will be submitted each year of the program. This allows the state flexibility to alter spending as needed to complete the program and to make improvements in the program based upon evaluation of existing and new program activities.

Initially in the program, there was funding for the LHDs as allotments for enhancement of GPS equipment. The contracts with LHDs include payments for doing the noncommunity assessments, providing GPS locations of water supply sources, and for entering well log data into a statewide ground water data base.

The contract with MSU and the GEM centers will include various items. The GEM centers will provide training and on-site assistance to the LHDs. Michigan State University will assemble a data base for the assessments and develop methodologies for analyzing and mapping the data.

A Joint Funding Agreement has been entered into between the MDEQ and the USGS, Michigan District, for the period October 1, 1998 to September 30, 2003 to assist with source water assessments. This agreement allows for flexibility in directing resources and implementing SWAP responsibilities as outlined in Appendix F.

The WHP grants will be used to assist local communities in developing WHPPs. These will be 50 percent state grants with a 50 percent local match required. The requirements for the grants will include completion of a WHPP with a local team designated. The WHPP or specific steps within the

program must be completed as a grant requirement. Modeled delineations will be required for determination of the WHPA and a complete contaminant source inventory will be required in this area. The MDEQ and the local community will utilize this information to evaluate source susceptibility.

Throughout 1999, the MDEQ will be conducting pilot assessments on inland river and Great Lakes sources. Assessments on River Raisin communities have revealed local influences from wastewater treatment systems, storm sewer outfalls, highway and railroads plus extensive agricultural impacts on this source water. USGS is electronically compiling 5 years of water quality data from four water treatment plants on the river to document these impacts. USGS is also utilizing USEPA BASIN software to document additional contaminant sources and eventually model the river. These pilot assessments have already initiated interest in source water protection activities in the state's Conservation Reserve Enhancement Program (CREP) as proposed to USDA.

On the Great Lakes, MDEQ and the USGS have initiated two assessments and documented an existing storm sewer outfall and the potential for a railroad spill in critical assessment zones. Both community intakes appear to be influenced by inland river watersheds which will be evaluated by USGS with BASINS software. The preliminary finding of these assessments have been utilized to assist the Great Lakes states in finalizing the Great Lakes Protocol (Appendix L).

The on site data gathering and initial findings from these surface water pilot assessments are very preliminary. It is anticipated these assessments will not be finalized for several years as the process evolves and personnel become more knowledgeable on conducting assessments. It is the intent of MDEQ to release the final assessments when all information is gathered, the assessment conforms with state-wide efforts and the community is in agreement with its contents.

Staff Resources

The DWRPD staff resources available to implement SWAP include district staff of the Field Operations Section and staff from the Noncommunity Unit and Wellhead Protection Unit of the Ground Water Supply Section. In March 1998, DWRPD created an engineering specialist position in the Ground Water Supply Section to coordinate SWAP. Field Operations staff have direct contact with community water suppliers and provide an important link in the pursuit of wellhead protection. The district staff will also assist in surface water and ground water assessments. In addition, staff from the DWRPD Environmental Health Section will be requested to assist with assessments of community water supplies serving mobile home parks.

Staff from the Michigan Department of Consumer and Industry Services (MDCIS) will be asked to conduct assessments of community water supplies serving nursing homes and medical care facilities. Michigan Department of Agriculture (MDA) personnel will be asked to complete assessments of the noncommunity water supplies serving migrant labor camps.

Data Sources

Data sources available to assist SWAP include DWRPD files of the Field Operations Section, the Noncommunity Unit, the Wellhead Protection Unit and the public water supply inventory data base. Additionally, data collected through the USEPA Information Collection Rule (ICR) will be reviewed for surface water assessments. The Michigan Ground Water Data Base map, MSU ground water maps, and USGS data bases are also available as reference resources. Appendix R lists additional data sources available to assist with source water assessments.

CHAPTER 5 - COMPLETED ASSESSMENTS

The intent of the Michigan SWAP is to complete assessments of all community and noncommunity public water supplies by May 2003. The MDEQ and LHDs will provide narrative summaries of the initial assessments by direct mailings to the public water suppliers following a comparative analysis of the data and then completion of the assessment. The comparative analyses will be conducted to assure uniformity in the estimated 18,000 assessments to be completed. Maps of the source water protection areas will be included in the assessment. In addition, hydrogeological sensitivity and susceptibility determinations will be summarized. The complete file of each assessment conducted will be available upon request. If adjustments to the initial assessments are necessary, they will be completed as the information becomes available and provided to the water supplier as a revised assessment.

The availability of completed assessments for the public will be announced through the DWRPD web site at *http://www.deq.state.mi.us/dwr/.* This site will direct citizens to the water supplier, LHD, or MDEQ district offices for copies of the assessment. The final USEPA Consumer Confidence Rule (CCR) requires community water supplies to announce the availability of their source water assessment when completed in the annual report. The CCR also requires the summary of potential contaminant sources be included. The first CCR's will be required by October 1999. Water suppliers will be encouraged to notify the public through press releases or newsletters, and have the assessments readily available at municipal offices, local libraries and local government internet sites.

For those supplies that have an approved WHPP, the state will request the CCR reference the program for information concerning protection of the community's ground water resources. This will include the hydrogeological sensitivity of the recharge areas, a listing of potential threats to ground water quality and long term management plans for future protection efforts. The state will also transmit a letter to these public water suppliers which defines the sensitivity of their source(s), summarizes the contaminant source inventory and explains the source(s) susceptibility determination. Susceptibility determinations for community suppliers not implementing a WHPP will be determined from numerical score sheets and transmitted to the owner in a narrative summary using the categories in Appendix W.

Letters transmitting completed assessments for surface water supplies will include discussion of the source sensitivity, standard and/or major contamination sites inventoried, the defined critical assessment zone and source water assessment area, plus the susceptibility determination. The susceptibility determination will classify the source as slightly, moderately or highly susceptible based on site specific data and knowledge of the source.

Progress reports will periodically be provided to USEPA to assure assessments are being completed and the program is satisfactorily progressing. Comments from USEPA will be considered as the assessments are being completed. These comments may warrant adjustments in assessment protocol.

These assessments will provide LHDs and DWRPD Field Operations staff part of the information necessary to grant future monitoring waivers. Assessments will also provide information which will enhance local contingency planning and source water protection activities.

The completion of the SWAP should have many long term benefits for the residents of Michigan. The data collected in the vicinity of the public water supply wells will provide enhancement of existing data and add to the ground water knowledge in the state.

The SWAP for Michigan should assist persons that have private wells that are located near these public sources. The statewide vulnerability map will assist LHDs in determining potential risks to these private water sources. This vulnerability map will be included into the statewide GIS system that can then be combined with other data sources to provide information to other programs and the public.

CHAPTER 6 – SOURCE WATER PROTECTION PROGRAMS

The protection of Michigan's sources of drinking water has been accomplished through a variety of local, state, and federal programs. Information derived from the source water assessments will enhance these protection programs. Public and private well construction and isolation requirements in the Michigan SDWA and Public Health Code along with the technical expertise of local and state health department personnel have been the foundation of the state's water supply program. Properly constructed and isolated wells are considered the first line of defense in Michigan for source water protection of ground water sources. Routine field surveillance and sanitary surveys by health department staff have also been a strong focal point in source water protection.

The state's approved WHPP and recently adopted Abandoned Well Management Program both enhance source water protection activities for ground water supplies. Local health department sanitary codes and the MDEQ Waste Management Division ground water discharge permits are also directed at protecting drinking water aquifers. The MDA has a Groundwater Stewardship Program and Pesticide Management Plan to protect our ground waters. The Michigan Ground Water Data Base assists in protecting ground water sources by locating Part 201, storage tank, and Superfund contamination sites in relation to drinking water supplies.

Source water protection programs directed to Michigan surface water supplies include state regulations for proper placement and construction of water plant intakes and issuance of National Discharge Elimination System (NPDES) permits by SWQD for point source discharges. The SWQD is also active in controlling nonpoint source discharges to our surface waters through programs such as Clean Water Act, Section 319 projects. In addition, the MDEQ has given priority to watersheds which provide drinking water in the federal Clean Water Action Plan, Unified Watershed Assessment process.

Along with the above programs, the MDA Pesticide Management Plan and the United States Department of Agriculture, Natural Resource Conservation Service source water programs provide protection for our surface waters. Local watershed management groups also provide an important function in protecting surface and also ground water sources.

Michigan voters passed a Clean Michigan Initiative on November 3, 1998 to allocate bond funds for source water protection activities such as controlling nonpoint source discharges to surface waters and abandonment of wells.

REFERENCES

Federal Safe Drinking Water Act, Public Law 93-523, as amended
Michigan Safe Drinking Water Act, Act 399 PA 1976, as amended and Administrative Rules
Drinking Water Maximum Contaminant Levels – Regulated Contaminants
Michigan Wellhead Protection Program
Michigan Groundwater Protection Programs - MDEQ – October 1996
MDA State Pesticide Management
USEPA - State Methods for Delineating Source Water Protection Areas for Surface Water Supplied Sources of Drinking Water - August 1997 (EPA 816-R-97-008)
USEPA - State Source Water and Assessment Programs - August 1997(EPA 816-R-97-009)

APPENDIX A
DEFINITIONS

CLASS V WELLS - Underground Injection Control (UIC) definition for wells or subsurface systems which inject or dispose of nonhazardous fluids into or above an underground source of drinking water.

COMMUNITY PUBLIC WATER SUPPLY - A water supply that provides year round service to not fewer than 15 living units or not fewer than 25 residents.

CRITICAL ASSESSMENT ZONE - An area defined by a 2000 foot radius around a surface water intake. For connecting river sources, only the upstream 2000 foot component is defined.

DELINEATED AREA -The capture zone for a drinking water source. For ground water, the area is defined through modeling for wellhead protection or fixed radius approach for an assessment. Surface water sources are delineated by a watershed or subwatershed basis.

KARST HYDROLOGIC SYSTEM - A continuum of vertical and horizontal conduits formed by dissolution of geologic materials (limestone, dolomite, gypsum halite, sylvite, and other soluble rocks and minerals), in which ground water flow is typically much faster than ground water flow in porous media. Vertical conduits usually are closely spaced joint sets and open fractures (sometimes faults), and horizontal conduits are usually bedding plane partings or openings, all of which are hydrologically enhanced by dissolution of soluble rocks and minerals.

NONCOMMUNITY PUBLIC WATER SUPPLY - a water supply that has not less than 15 service connections or that serves not less than 25 individuals on an average daily basis for not less than 60 days per year.

SECTION 319 - Part of the federal Clean Water Act which funds nonpoint source pollution control program activities.

SENSITIVITY - Relative ease at which a contaminant can migrate to a water supply source. Measures inability of natural materials or hydrologic conditions to protect source. For ground water, a function of intrinsic characteristics of the geologic materials that compose the land surface, and the saturated and unsaturated zones. Independent of land use or contaminant characteristics.

SUSCEPTIBILITY - Likelihood of a contaminant impacting a source of drinking water considering source water protection area and sensitivity. Determines if contaminant could reach source at concentrations that could affect system's ability to meet all regulatory requirements. Also includes consideration of well construction and abandon wells for ground water sources and intake construction for surface water sources.

WATERSHED - A topographic feature that divides areas drained by different rivers, river systems, or lakes.

WELLKEY - Software Program that allows well record information to be stored in a data base format and provides for the automated entry, storage, and retrieval of well information.

APPENDIX B
ACRONYMS

CCR - Consumer Confidence Reports

CPWS - Community Public Water Supply

DWRPD - Drinking Water and Radiological Protection Division

GEM - Groundwater Education in Michigan

GPS - Global Positioning System

ICR - Information Collection Rule

LHD - Local Health Department

LUST - Leaky Underground Storage Tank

MCL - Maximum Contaminant Level

MDA - Michigan Department of Agriculture

MDCIS - Michigan Department of Consumer and Industrial Services

MDEQ - Michigan Department of Environmental Quality

MDMB - Michigan Department of Management and Budget

MDNR - Michigan Department of Natural Resources

MSU - Michigan State University

NASQAN - National Stream Quality Accounting Network

NAWQA - National Water Quality Assessment Program

NOAA - National Oceanic and Atmospheric Administration

NCPWS - Noncommunity Public Water Supply

NPDES - National Pollutant Discharge Elimination System

PWSS - Public Water Supply System

SDWA - Safe Drinking Water Act

SGDB - Statewide Groundwater Data Base

SWQD - Surface Water Quality Division

SWAP - Source Water Assessment Program

SWAS - Source Water Assessment Score

SWPA – Source Water Protection Area

TOT - Time-of-Travel

UIC - Underground Injection Control (Program)

USDA - United States Department of Agriculture

USEPA - United States Environmental Protection Agency

USGS - United States Geological Survey

WHPA - Wellhead Protection Area

WHPP - Wellhead Protection Program

APPENDIX C - SWAP COMMITTEE MEMBERS

SWAP Advisory Committee

First Name	*Last Name*	*Representing*
Marian	Bendixsen	League of Women Voters of Michigan
Nolan	Bennett	Clean Water Fund / Clean Water Action
Bob	Boruszewski	USDA - Rural Development
Lynne	Boyd	MDNR-MIRIS
Bryan D.	Brewer	Michigan Ground Water Association
Brad	Brogren	MDEQ-DWRPD
Elgar	Brown	MDEQ-DWRPD
Don	Brown	Citizen at Large
Lisa	Brush	Huron River Watershed Council
Shirley	Businski	MDNR - RMAP
Dennis	Carpenter	Michigan School Business Officials
Lisa	Chadwick	MDEQ - DWRPD
John	Chickering	MDEQ - DWRPD
Jim	Cleland	MDEQ - DWRPD
Jon	Coleman	Regional Planning
Hope	Croskey	MDEQ-LWMD
Dave	Dempsey	Michigan Environmental Council
Tim	DeWitt	Michigan Manufactured Housing
Steve	Eldredge	MDEQ-SWQD
Tom	Fedewa	MDA
John	Fiero	MDEQ - DWRPD
Brant	Fisher	MDEQ - DWRPD
Dave	Forstat	MDNR - Real Estate Division
Terry	Gill	League of Women Voters of Michigan
Bob	Godbold	Ingham County Health Department

Norm	Granneman	USGS
Mark	Griffin	MI Petroleum Assoc. & Assoc. of Convenience Stores
Michael	Harbut, M.D.	Center for Occ. & Env. Medicine
Jane	Hardisty	Natural Resources Conserv. Service
Matt	Hare	Michigan Manufacturers Association
Bryan	Harrison	MDEQ-ORR
Richard	Hinshon	Hinshon Environmental Consulting
Dave	Holtschlag	USGS
Joan	Hughs	Detroit Water & Sewerage Dept.
Jim	Janiczek	MDEQ - WMD
Steven	Johns-Boehme	Michigan Ecumenical Forum
Katie	Jones	MDEQ - DWRPD
Mike	Kadri	MDEQ - STD
William	Kelley	Consulting Engineering Council
Kevin	Kincare	MDEQ-GSD
Ruth	Kline-Robach	MSU Extension
Harry	Klingeman	Michigan Restaurant Association
Dave J.	Kraker	Kent County Health Department
Jaye	Lunsford	USGS
Lonnie	Lee	Waste Mgt. Div. - MDEQ
Jennifer	Leholm	MDEQ - DWRPD
David	Lusch	Michigan State University
Brian	McMaster	MDA
Paul	Miller	USDA Rural Community Dev.
Steve	Miller	MDEQ-DWRPD
Doug	Murphy	Michigan Agri Business

Jim	Nicholas	USGS
Richard	Overmyer	MDEQ-DWRPD
Gary	Peters	AWWA
Diane	Rekowski	Regional Planning
Mark	Richards	NE MI Council of Gov.
Cyndi	Roper	CW Fund /Clean Water Action
Tom	Segall	MRWA
Ruth	Shaffer	NRCS
Bill	Sheffer	MI MH, RV & CG Assoc.
Gang	Song	DWSD
Debbie	Spakoff Swartz	MDEQ to MSU
Amanda	Straky	MDEQ - DWRPD
Rob	Suber	MDMB - MIC
Mike	Sweat	USGS
Mark	Swartz	MDA
Pamela	Turner	DWSD
Chuck	Van Der Kolk	AWWA
Jane	Vass	American Indian Health
Ron	Van Til	MDEQ - DWRPD
Flint	Watt	MDEQ - DWRPD
Dave	Westjohn	USGS
Andrea	Zajac	MDEQ-STD
Ken	Zarzecki, P.E.	Water Utilities

APPENDIX D
SWAP PUBLIC PARTICIPATION RECORD

Presentations, Discussions and Meetings

August 18, 1997 - County Environmental Health Directors Advisory Committee Meeting

September 12, 1997 - AWWA Conference

September 19, 1997 - Michigan Section ASCE

September 25, 1997 - Michigan Municipal League

October 1, 1997 - County Environmental Health Directors Advisory Committee Meeting

October 2, 1997 - S.E. Michigan Environmental Health Directors Meeting

October 15, 1997 - SWAP Advisory Committee Meeting

November 5, 1997 - SWAP Technical Advisory Subcommittee

December 4, 1997 - SWAP Public Advisory Subcommittee

January 14, 1998 - SWAP Committee Meeting

May 15, 1998 - Wellhead Protection Grant Stakeholders Mtg.

June 12, 1998 - Wellhead Protection Grant Rules Hearing

June 18, 1998 - SWAP Presentation at U.P. WaterFest

June 29, 1998 - SWAP Meeting with Detroit Water and Sewerage Dept.

June 30, 1998 - SWAP Committee Meeting

July 9, 1998 - WHP Grant Workshop at Grayling

July 10, 1998 - WHP Grant Workshop at Escanaba

July 15, 1998 - WHP Grant Workshop at Kalamazoo

July 16, 1998 - WHP Grant Workshop in Oakland County

July 28, 1998 - SWAP Public Advisory Subcommittee Meeting

August 11-13, 1998 - Region V WHP Manager Meeting - Bloomington, IN

August 20, 1998 - SWAP Technical Advisory Subcommittee Meeting

September 8, 1998 - Municipal League Conference

September 15, 1998 - SWAP Meeting with Detroit Water and Sewerage Dept.

September 15, 1998 - Detroit Public SWAP Meeting

September 17, 1998 - Kalamazoo Public SWAP Meeting

September 22, 1998 - Michigan Section AWWA Conference

September 30, 1998 - Grayling Public SWAP Meeting

October 1, 1998 - Escanaba Public SWAP Meeting

October 3, 1998 - Clean Water Action Conference - Mt. Clemens

October 8, 1998 - AWWA Regional Operators Meeting - Port Huron

October 14, 1998 - AWWA Regional Operator Meeting - Grand Rapids

October 14, 1998 - Northern Lower Michigan Water Association - Evart

October 16, 1998 - AWWA Regional Operator Meeting - Jackson

October 20, 1998 - AWWA Regional Operator Meeting - Gaylord

October 21, 1998 - AWWA Regional Operator Meeting - Bay City

October 21, 1998 - 2nd Annual Groundwater Protection Conference - Gaylord

October 27, 1998 - SWAP Committee Meeting

November 6, 1998 - DWSD Swap Meeting

November 10, 1998 - Kalamazoo CCR Water Quality Workshop

January 7, 1999 - Meeting with Detroit Water and Sewerage Dept.

January 14, 1999 - SWAP Committee Meeting

January 26, 1999 - Meeting in Detroit with USEPA, USGS, USACE, Canadian, Detroit, and MDEQ

APPENDIX E - SWAP COMMITTEE MEETING MINUTES

SWAP Advisory Committee Meeting Minutes
October, 15, 1997
1:30 - 4:00
Manty Conference Room

Introductions around the room (see attendance list)

Introduction and program background by Flint Watt, Chief DWRPD.

Source Water Assessment Program (SWAP) will be difficult to implement in time period required.

Federal definition of SWA (read formal definition from guidance). Simplified definition: Define where the water comes from, identify contamination sources and protect groundwater.

It will take increased resources for program to meet federal requirement and be useful.

Timeline - There are 12,000 public water supply systems (PWSS) on groundwater and surface water. We have 18 months to deliver the program to EPA (February 1999), EPA has 9 months to review (November 1999), the state has 2 years to implement (2001), state can get an 18 month extension (May 2003).

Four year funding problem. We have 5.5 years to complete SWAs however funding for this work is only for four years (began September 1997), creating a 1.5 year gap.

With this committee we should get broad viewpoints and be able to reach consensus.

Elgar Brown (EB) - SDWA requires an advisory group that can be split into two subgroups: technical and public participation. Next meeting date for Technical Committee, November 5, 1997. Next meeting date for Public Participation Committee, December 4, 1997. Both groups will reconvene in January 1998.

The amendments to the SDWA passed over a year ago in August 1996. EPA provided final SWA guidance fall 1997. We hope to have the framework of the program complete by the November 5th meeting.

The 10% set aside funds can be spent over 4 years which began September 1997. We need tentative program approval from EPA before we can start to use the funds.

We have 1,500 Community water supplies 10,500 Noncommunity public water supplies (all ground water).

Noncommunity systems are restaurants, schools any well that serves over 25 people per day on a routine basis, 60 days per year.

We are looking at amending contracts with local health departments to do SWAs on the noncommunity wells. As they do their sanitary survey they can gather additional information to do an assessment. Once every five years a noncommunity system has a sanitary survey completed.

The Wellhead Protection Grant Program will be used as incentive to community water supply systems to complete WHPPs which also qualify as SWAS. We hope to get the bulk of the community water supply systems participating in the program through the grant program and will complete SWAs on the remaining systems.

About IO surface water systems on inland surface water (rivers) exist in Michigan. We will look at using existing programs in Surface Water Quality Division, etc. to build on to complete a SWA. The Raisin River will be a good demonstration study area due to atrazine impacts.

Great Lakes and connecting waters. We will look at doing site specific assessments by surveying the water plant operators.

We are looking for input for the total SWA program and especially for surface water systems.

The 10% set aside from the 1997 SRF or 5.9 million dollars must be spent over the next four years on SWAs through contracts, staff etc.

Mark Swartz (MS) - If EPA doesn't complete review of SWAP in 9 mo. what happens?

EB - The SWAP is automatically approved. If EPA denies the program we have 6 months to revise it and resubmit.

Steve Miller (SM) - This advisory group may expand to meet the technical needs or public information and dissemination needs.

EB - We want to do what's best for the state and meet federal requirements.

Three "idealistic"goals:

1. Plot location of all water supplies in state using GPS
2. Establish depth to first water and contour. Work with GEM Centers to help correlate data.
3. Develop a state vulnerability map

Bob Godbold (BG) - Gave an overview of county health department (CHD) sanitary surveys. CHDs have contracts with DEQ to conduct sanitary surveys and create "paper trail" documenting what was done and found in survey. This will provide a long-term water quality monitoring program. The network of contracts is working smoothly.

Dave Kraker (DK) - Dave distributed an example sanitary survey and explained what information they contained. After the survey is completed a monitoring schedule is established.

SM- Steve distributed a Vulnerability Assessment Worksheet and the document, "Source Water Assessments for Noncommunity Public Water Supply Systems" and reviewed their contents. We would like comments and feedback from the committee on the document before the November 5th meeting.

EB - This will be a method to flag vulnerable systems. Protection and management of these systems is voluntary. Only the SWAs are mandatory by law. This will serve as a long term prioritization effort.

Bill Kelly (BK) - Suspects problem with getting GPS locations for all wells due to large numbers.

EB - State has 12 GPS units. GPS units will be sent to GEM Centers that will train PWSSs to get GPS reading on their wells.

SM - We recognize the issue and will work with counties, GEM Centers to ensure quality control of GPS readings.

MS - Problem to tie in GPS readings with NERIS base map since GPS will be more accurate than base map.

SM - Recognize problem but don't want to sacrifice accuracy of well locations to "fit" on N4UUS map.

Lynne Boyd (LB) - In 2 years we may have more accurate maps 1: 12000 scale to use as base maps.

MS - Inspectors can help to get GPS readings of remote wells when they do their inspections.

SM - Reviewed the SWA score sheet. The higher the number indicates higher vulnerability.

Brant Fisher (BF) - Further explained the score sheet.

EB - SWAs will be redone every five years as a long term tool to monitor ground water conditions.

SM - Local Health Depts. will be responsible for filling out the score sheets. There are 43 LHDs in Michigan.

Tom Segall (TS) - There is a problem as the state will pay for SWAs for noncommunity water supplies but not wellhead protection for community supplies.

EB - WHPPs are SWAS, but SWAs are not WHPPs. WHP Grant Program will help to get communities involved with WHP, however the state will end up doing SWAs for those supplies that do not do WIHP.

Cindi Roper (CR) - Wants list of water supplies involved in WHP and population served.

EB - Written comments on SWA document are requested by November 3. First phase of sanitary surveys began in 1991. By 1998 we will have a sanitary survey on all systems in the state. We can encumber contracts beyond the four year time frame.

DK - About 5% to 10% of noncommunity systems change names every year.

BG - SWAs are "down the mission" of LHDs and they should not be a problem with "buy in" from them.

EB - The Public Advisory Committee will meet on December 4th, We will lay out the entire process and timeline for public participation at that meeting.

Steve Eldridge (SE) - There's a lot of information on the Raisin River, especially at the mouth of the river. The base monitoring program was cut therefore there is not a lot of information on other streams across the state. They are trying to increase volunteer monitoring.

EB - State may target the Raisin River as a demonstration area to conduct SWA and will take results to the committee for discussion.

CR - Please identify funding sources for information gathered during demonstration project. This will be valuable information.

Norm Granneman (NG) - USGS has three programs that have data that may assist. Tributary monitoring, NAQWA and NASQUAN.

Dave Lusch (DL) - Major challenge - What do you look at to determine vulnerability of surface water supplies short of water chemistry? Point discharges upstream?

Mark Richards (MR) - The problem won't be data, it will be finding the data.

EB - Turbidity is the best indicator of impact on surface water from runoff.
We have to have input from this advisory committee and will minimize the number of meetings. You can volunteer to be on one **or** the other committee or both if you choose.

SM - We are communicating with **other** states going through the same process with SWAP development.

Everyone was thanked for coming and their help with the SWAP process.
Meeting adjourned 3:45 pm.

Source Water Assessments

Technical Advisory Committee Meeting
Minutes: November 5,1997

Attendees

In attendance for the Source Water Assessment Technical Advisory Committee meeting were the following:

Name	Affiliation	Phone
Marion Bendixsen	League of Women Voters – Michigan	(517) 773-9719
Bryan Brewer	Michigan Ground Water Association	(616) 798-4292
Brad Brogren	Drinking Water & Radiological Prot. Div. – MDEQ	(517) 335-8311
Don Brown	Citizen at Large	(616) 344-3738
Elgar Brown	Drinking Water & Radiological Prot. Div. – MDEQ	(517) 355-8312
Hope Croskey	Land & Water Mgt. Division – MDEQ	(517) 332-7019
Brant Fisher	Drinking Water & Radiological Prot. Div. – MDEQ	(517) 335-9187
Dave Forstat	Real Estate Division – MDNR	(517) 241-I-)65
Bob Godbold	Ingham County Health Department	(517) 887-4515
Norman Granneman	U.S. Geological Survey	(517) 887-8919
Jim Janiczek	Waste Management Division – MDEQ	(517) 373-7262
Mike Kadri	Underground Storage Tank Division – MDEQ	(517) 335-7204
Kevin Kincare	Geological Survey – MDEQ	(517) 334-6970
Bill Kelley	Fishbeck, Thompson, Carr & Huber	(517) 627-1141
Dave Kraker	Kent County Health Department	(616) 336-3089
Dave Lusch	Institute Water Research – MSU	(517) 355-8497
Steve Miller	Drinking Water & Radiological Prot. Div. – MDEQ	(517) 335-8174
Rich Overmyer	Drinking Water & Radiological Prot. Div. – MDEQ	(517) 335-8310
Mark Richards	Northeast Michigan Council of Governments	(800) 925-5948
Tom Segall	Michigan Rural Water Association	(517) 327-0399
Rob Surber	Michigan Information Center – DMB	(517) 373-7910
Mark Swartz	Michigan Department of Agriculture	(517) 335-6545

Packet of Information

All committee members received a packet of information, a majority of which was specific to source water assessments on noncommunity public water supplies. The packet included the following:

1. A copy of the letter sent to local health departments offering an amendment to contracts for the completion of source water assessment activities,
2. A summary of the EPA publication "State Source Water Assessment and Protection Programs Guidance - August 6, 1997,"
3. MDEQ handout "Benefits of the Source Water Assessment Program to the Local Health Department Noncommunity Public Water Supply Program,"
4. Drafts of "Source Water Assessments for Noncommunity Public Water Supply Systems"and "Source Water Assessment Worksheet,"
5. A copy of"SWP Time Study" - a summary of results obtained by local health department representatives for the time needed to complete the source water assessment activities, _.
6. MDEQ handout "Supplemental Contract for Source Water Assessments, Breakdown of Funding,"
7. Examples of the amendment which would be made to the contracts with local health departments for funding the source water assessment activities,
8. A copy of "Supplemental Contract for Source Water Assessments, Expression of Interest Statement,"

9. Draft proposal "Facilitating Michigan's Source Water Assessment Program for Noncommunity Water Supplies" from David P. Lusch, Ph.D., Institute of Water Research, MSU.

Overview of Source Water Assessment Requirements

Elgar Brown began the meeting, with an overview of the source water assessment program. Michigan has 10,500 noncommunity public water supplies (Type 11) all served by ground water, 1200 community public water supplies (Type 1) on ground water, and 68 community public water supplies (Type 1) utilizing surface water. Source water assessments must be done on all of these systems. The biggest challenge is with the noncommunity public water supplies due to the large number of supplies. Community public water supplies on ground water are to be addressed through the wellhead protection program which is a complete "source water assessment." A discussion of the systems served by surface water was deferred until later in the meeting.

Elgar Brown then discussed the contents of the information packet and noted that the information packet could be viewed as a "sales pitch" to the counties for participation in the source water assessment program. Coordination with the noncommunity public water supply program 44 sanitary survey" activities is seen as the best way to complete the source water assessments. Particular emphasis was placed on the need to get started in addressing the noncommunity public water supplies. Given time constraints in the federal requirements for source water assessment we need immediate "buy in" from the 43 environmental health departments as soon as possible.

Source Water Assessments - Comments and Response

Comment: Bill Kelley expressed some concern over maintaining consistency among the local health departments in the completion of the source water assessments. Also, what if counties do not agree to the supplemental contracts for sources water assessments?

Response: Elgar Brown noted this was a concern. Staff believe the problem can be adequately addressed through the umbrella contract with the Institute of Water Research (IWR). The contract with the IWR will include requirements for providing training to the local health departments and the compiling of hydrogeologic data. This should help to minimize inconsistencies in the source water assessments. In the absence of local health department participation the assessments will be completed through the IWR contract and coordination with the GEM centers.

Response: Steve Miller also noted the counties are being offered a number of options so they may tailor there participation with staffing levels and experience. Meetings are planned with the counties on December 2 and ') to discuss the potential difficulties in implementation.

Response: Elgar Brown noted that preliminary conversations with the local health Departments suggest a high level of participation will be obtained.

Comment: Tom Segall expressed concern that the counties may look at the participation and funding options being offered and elect to do something different. What is the backup plan for this situation or no participation.

Response: Steve Miller noted that meetings with the counties are planned and that our intent is to provide flexibility in the level of county participation.

Response: Elgar Brown further clarified the role of the IWR and the plan to coordinate efforts through the Groundwater Education in Michigan (GEM) centers. The IWR umbrella contract will provide coordination of activities through the GEM centers. GEM centers will be obligated by contract to provide the necessary training to local health departments for the source water assessment activities. Training will be provided for WELLKEY entry of data, the use of GPS equipment, and completion of the source water assessments. In the absence of county participation the GEM centers will complete the source water assessment activities.

Overview of IWR Umbrella Contract

Dave Lusch was asked to further describe the IWR and GEM center coordination activities. He passed around a copy of the Draft, "Facilitating Michigan's Source Water Assessment Program for Non-Community Water Supplies." Under this proposal the IWR will be responsible for compiling of the source water assessment information including well log information, GPS locations of wells, and the source water assessment worksheets. This information is to be used to generate a comprehensive statewide map of ground water vulnerability. The vulnerability evaluation is to include assessing the direction of ground water flow for " first " water" and the availability of deeper aquifers.

Dave Lusch emphasized the importance of obtaining the WELLKEY and GPS information in FY 98. This would allow the IVIR to begin work in the vulnerability mapping immediately. It was emphasized the contract is general. Specifics of the contract will be established when the level of county participation is established.

IWR Contracts - Comments and Response

Comment: Elgar Brown noted that there will be a follow-up discussion on the IWR contract after the participation level of the local health departments have been evaluated.

Comment: Norm Granneman inquired about what might happen in the "worst case" scenario where no local health departments participate.

Response: Considerable local health department participation appears likely. However, Dave Lusch emphasized the draft IWR contract as currently proposed is a "worst case" scenario assuming no participation. If this were the case, the GEM centers would be appropriately compensated for completing the source water assessment activities.

Comment: Tom Segall expressed some concern over the value of mapping the depth to "first water." Why is this necessary when it presents a significant opportunity for misuse due to the generalization inherent to the information.

Response: Elgar Brown noted that as a source water assessment tool this information could prove very valuable. Contamination problems will generally migrate in the direction of first water. Such an evaluation provides many secondary benefits to programs that deal with waste disposal. While it is true there is a potential for misuse, the end product is not meant for general use by the public but for use by ground water professionals.

Response: Steve Miller noted that the source water assessment activities are being coordinated in a manner to act as an extension of earlier work that provided a ground water vulnerability map for Michigan.

Comment: Bill Kelley reiterated the fact that there is a potential for misuse when dealing with any information and noted that this should not preclude an attempt at obtaining additional information. This is what was done with the original assessments of the ground water resource which came out of the ponds, pits and lagoons program. The ponds, pits and lagoons information was expanded to include other ground water information which resulted in the ground water vulnerability map for Michigan. This new effort expands upon previous efforts and will provide a similar, although more comprehensive product.

Comment: Mark Swartz and Norm Granneman noted that the emphasis in the source water assessment activities is on the noncommunity public water supply evaluations. What happens if there is not agreement between the assessments and other information?

Response: Dave Lusch noted that the manner in which the source water assessments are completed should provide a good information base against which other information may be evaluated and verified.

Overview of Source Water Assessment Score System

Brant Fisher provided a brief overview of the source water assessment score system for noncommunity public water supplies. The scoring system is an adaptation of the assessment process successfully applied in Minnesota. The system consists of evaluating the supplies relative to geologic sensitivity; well construction, maintenance and use; sources of contamination and water chemistry. Geologic sensitivity is based upon the thickness of "continuous confining material" reported on the well log. Well construction, maintenance and use is an evaluation which reflects the compliance of the well with current "state-of-the-art" well construction requirements. The sources of contamination are rated based upon compliance with isolation requirements in the noncommunity public water supply program. Water chemistry information is evaluated relative to the occurrence of nitrates and/or organic chemicals in the source water. The scoring system provides for the assignment of points in each of the above mentioned areas to reflect the vulnerability of the noncommunity public water supply source water. A higher number of points reflects a greater vulnerability.

Source Water Assessment Score System - Comments and Response

Comment: Dave Lusch recommended a clarification in the application of "continuous confining material." Specifically, could layers thinner than 10 feet be added to provide a lower score in the geologic sensitivity.

Response: It was agreed the "continuous confining material" term needed clarification. Brant Fisher noted that in application, continuous confining material provides a lowering of the geologic sensitivity score only if there is at least 10 feet of continuous confining material reported on the well log. Citing an example, a log depicting 7 feet of clay, 6 feet of sand, than 3 feet of clay would provide no reduction in geologic sensitivity because there is not at least 10 feet of continuous confining material.

Comment: Dave Lusch suggested the geologic sensitivity be evaluated on the basis of 44 continuous partially confining material" (i.e. mixtures of clay and sand). This differentiation was seconded by Dave Kraker and Mark Swartz.

Response: The committee agreed that "continuous partially confining material" should be evaluated in a manner similar to "continuous confining material," although requiring a greater thickness of such material. The scoring process is to be amended in a manner that will require 15 feet of "continuous partially confining material" to obtain a lower geologic sensitivity score.

Comment: Mark Swartz mentioned the validity of differentiating between clay and mixtures of clay and sand. Ground water monitoring in MDA programs has resulted in the conclusion that a greater thickness of partially confining materials is required to provide a similar level of protection and different water quality between aquifers. He also noted that at least 40 feet of confining material was needed to provide a significant difference in water quality.

Response: Dave Lusch expressed the opinion that the scoring system would adequately reflect such a situation by significantly reducing the geologic sensitivity score.

Comment: Mark Swartz questioned the validity of creating a separate source water assessment database. As an example, it was suggested that the development of the source water assessment score for geologic sensitivity might best be done by populating a database - VVELLKEY, noncommunity public water supply database - with the exact information needed in the assessment. This would allow for the direct transfer of information to other databases. Bob Godbold suggested a similar possibility with CHEMKEY.

Response: Elgar Brown noted that in many instances the noncommunity public water supply database possesses the information that is needed.

Response: Dave Kraker indicated that with the present inconsistencies among counties in the use (or nonuse) of the noncommunity public water supply database it would be best to develop a separate database for the source water assessments and later setup a relationship between the databases.

Response: Steve Miller indicated that in the case of CHEMKEY it is only available in "beta" form and therefore, not really available. Exploration of options with CHEMKEY may be useful as a pilot project with one of the local health departments.

Comment: Mark Swartz expressed concern that "contaminant source inventory" presents a negative image and suggested that sources be identified through a "land use inventory."

Response: Rich Overmyer responded to this comment by indicating the intent in the language was to maintain consistency with the noncommunity public water supply program. Dave Kraker agreed, noting his staff understands the contaminant source language as proposed. He sees no reason to develop a new nomenclature which would require further "educating" of the local health department staff.

Response: Elgar Brown noted this may be an issue for the public information committee to address in the release of information to the public. It was emphasized we need to maintain continuity with the noncommunity public water supply program.

Comment: Jim Janiczek questioned the assignment of points to "known" versus "potential" sources of contamination. It was recommended the point assignment be altered to allow for the ready recognition of the presence of known sources of contamination in the vicinity of a well.

Response: It was agreed by the committee that known sources of contamination would be assigned 15 points and potential sources of contamination assigned 10 points.

Comment: Dave Kraker suggested the WELLKEY number be included on the Source Water Assessment Worksheet.

Response: Committee was in agreement with this recommendation.

Source Water Assessments on Surface Water Systems

Elgar Brown provided a very brief overview of source water assessments on the surface water systems. There had been one subcommittee meeting regarding this issue. Michigan has 68 surface water systems. Nine of these systems are on inland rivers (4 on the River Raisin) and the remainder on the Great Lakes and connecting waters. Surface water systems will become an important issue since ¼ of the population served by public water supplies are on surface water systems. The development of an approach is at a slower pace due to fewer time constraints for implementation.

Tentative plans are being made for a "pilot project" on an inland source - possibly one on the River Raisin or Ann Arbor which is on the Huron River. Third party contracts and integration with MDA programs are being considered. Ron Van Til is handling the preliminary development of an approach to addressing the surface water systems.

Source Water Assessment Public Advisory Committee
Meeting Summary

December 4, 1997
Drinking Water and Radiological Protection Division
1:30 p.m.- 4:00 p.m.

Meeting summary by Debbie Spakoff Swartz

Overview of Safe Drinking Water Act Amendments for Source Water Protection Program

Michigan has 3.5 years (until 2003) to assess all Type I and Type II water supplies.

There are 1,500 Type I and 10,500 Type 11 water supplies in Michigan. Type I supplies will be assessed when a local wellhead protection program is completed. Most Type I supplies will complete a local wellhead protection program using grant money that will be available beginning in 1998. The DEQ Drinking Water and Radiological Protection Division will be responsible for completing assessments on Type I supplies that choose not to participate in the wellhead protection program.

The DEQ Drinking Water and Radiological Protection Division (DWRPD) is looking to county health departments to complete assessments on Type II supplies. DWRPD is asking county health departments to build on current sanitary surveys to complete 20% of the assessments in their county per year over a five-year period. A four-page draft Source Water Assessment form has been developed.

Committee Responsibilities

The goal of the SWAP Public Advisory Committee is to ensure that the majority of concerns expressed by the public are addressed in the early stages of program development.

A request was made for all concerns to be "put on the table" now so that they can be fully evaluated and addressed early in the program development process.

We anticipate two phases of Public Advisory Committee involvement.

Phase 1:

Identify key groups that must be involved including those "at risk".

Ensure that appropriate groups are involved or at least informed of SWAP development.

Suggested Key Groups to Involve:
Michigan Restaurant Association - (-23 % Type 11 supplies are restaurants)
School Business Officials
Industry
Gas stations
Michigan Association of Convenience Stores
MRWA
AWWA
Michigan Association for Local Public Health (and appropriate forums such as MALEHA and others)
Campground Association

"At risk" groups:
Dialysis, cancer, and AIDS patients
Children
Elderly - RTAP, MI Association of Retired School Personnel
Pregnant women
Neighborhood Associations from low income areas

Committee suggestion: Contact Physicians for Social Responsibility

Action Items:

1. **Elgar Brown, Steve Miller and Debbie Spakoff Swartz, prioritize key groups.**

2. **Steve Miller, contact Physicians for Social Responsibility. Elgar Brown, Steve Miller and Debbie Spakoff Swartz, meet with Department of Community Health to discuss involvement of "at risk" groups.**

3. **Elgar Brown and Steve Miller, call each of the key group contacts to explain the SWAP program and how they can be affected by it, and ask for their participation.**

4. **Debbie Spakoff Swartz, develop a one-page information sheet to describe the proposed SWAP assessment process for groundwater supplies, surface water supplies and the Great Lakes and connecting waters.**

5. **Send information sheet to key group contacts after called by Elgar or Steve and invite to upcoming SWAP Committee Meeting scheduled for January 14, 1998.**

Committee Suggestion: Use existing meetings and conferences to hold focus groups.

The one page information sheet and additional SWAP materials can be given to SWAP committee members and used for discussion at upcoming meetings. Committee member should request to be put on the agenda of upcoming conferences that they are familiar with to discuss program specifics in a small group setting.

There is a Groundwater Advisory Committee meeting December 17, 1997. Mark Swartz will distribute SWAP information and discuss at meeting if provided the materials. There is a Michigan Technical Committee meeting scheduled for January 26, 1998. This is the advisory board for USDA farm bill programs. Brian McMaster can distribute SWAP information and discuss the program if given materials. Brian can also put Elgar on the meeting agenda to provide a program overview.

Action Items:

1. Elgar Brown, Steve Miller and Debbie Spakoff Swartz need to identify upcoming meetings and conferences at which SWAP materials will be discussed.

2. Send SWAP materials to meeting contact person.

Committee Suggestion: Beta test SWA process.

Select three different communities with Type II wells (urban, suburban, rural, school, restaurant etc.) to conduct a SWA beta test. Work with the County Health Department and the well owner to complete a SWA on the well. Create a local SWA steering team with representatives from the community. Explain

the technical aspects of the program to the steering team including how the assessment on their water supply was conducted. Discuss whether the information generated in a SWA is useful to the steering committee and identify concerns and/or suggestions they have to improve the program.

Discuss contaminant source inventory and best way to avoid an adversarial relationship with business owner.

Discuss how to get the information out to those in their community.

Test SWA process in all three communities and improve the process to reflect knowledge gained through local experiences.

Item of concern: We must be aware that local interest groups, such as those involved with the decommissioning of the Big Rock nuclear plant, may be interested in drinking water issues but can direct the discussion away from the purpose of the meeting and towards their topic of concern.

Action Item: Present Beta-test suggestion at full SWAP Committee Meeting on January 14, 1998 for comment. Discuss which systems would be selected for the beta test and how to determine if they are representative of the different types of systems found throughout Michigan.

Phase II:
Determine who should get SWA results and how they should be made available to the public. This involves determining where copies of the assessments should be stored, how people could access the assessments and how people should be informed that the assessments exist.

Committee Suggestions

Develop a SWAP information packet tailored for individual groups to explain why they may be interested in SWA results and where to get information.

Committee can personally communicate with their organizations to discuss the SWAP.

Develop a SWAP video to explain the assessments and begin raising public awareness of the program. Distribute to key groups and committee members to share with their constituents. (MDA worked with MSU Extension to produce a simple 15 minute video for around $2000 to explain the RFP process.)

Utilize the Internet so that anyone who is interested in the SWAs can read the results. Most public libraries have access to the Internet.

Make SWAs available at county health departments and the local water supply. The Consumer Confidence Reports should state where to obtain a copy of the report.

Use a public service announcement to get the word out about the assessments.

Publicize the assessments by giving the water supplies that have completed an assessment

a sticker or something to post stating that the supply has been evaluated and where to find more information.

Put all SWA information onto CD ROM.

The League of Women Voters can do more video down link sessions.

Use a kiosk (touch screen computer system) to make information available in public areas such as libraries.

Action Items:

1. Prioritize suggested methods to distribute information

3. Discuss current ideas at next SWAP meeting scheduled for January 14, 1998.

Post meeting comments and suggestions for further discussion:

To ensure consistency in SWAP data for all water supplies throughout the state, it was proposed that the DEQ require all Type I water supplies to submit a SWA with their VIHP grant proposal.

If the SWAP committee supports beta-testing the program in a few communities, then discuss this with the County Health Department subcommittee to get their input and to select communities for the beta-test.

Source Water Protection Program Meeting Summary
January 14, 1998
DEQ Drinking Water and Radiological Protection Division
Manty Conference Room
1:30 p.m. - 4:00 p.m.

Present:

Steve Miller, DEQ, DVIRPD
Elgar Brown, DEQ, DWRPD
Ron Van Til, DEQ, DWRPD
Debbie Spakoff Swartz*, DEQ, DWRPD
Lisa Chadwick*, DEQ, DWRPD
Terry Gill, League of Women Voters
Norin Granneman, U.S. Geological Survey
Ruth Shaffer, USDA Natural Resources Conservation Service.
Ruth Kline-Robach*, MSU Extension
Lisa Brush, Huron* River Watershed Council
Marian Bendixsen, League of Women Voters
Don Brown, Citizen at Large
Cyndi Roper*, Clean Water Action
Dennis Carpenter, Michigan School Business Officials
Bryan Brewer, Michigan Ground Water Association
Mark Swartz*, MDA, Environmental Stewardship Div.
Bill Sheffer*, Michigan Manufactured Housing, Recreation Vehicle and Campground Association
Dave Forstat, DNR, Real Estate Division
Bill Kelly, Fishbeck, Thompson, Carr and Huber
Brad Brogren*, DEQ, DWRPD
John Chickering, DEQ, DWRPD
Rich Overmeyer*, DWRPD, GWS, NCU
David Kraker, Kent County Health Department
Bob Godbold*, Ingham County Health Department
Tom Segall*, Michigan Rural Water Association
Andrea Zajac, DEQ, USTD
Steve Eldredge, DEQ, SWQD

*Volunteered to be on the SWAP demonstration project subcommittee.

1:30 p.m. Meeting began with introductions.

Cyndi Roper (CR) - Asked whom to contact for Source Water Assessments (SWA) on surface water supplies.

Steve Eldredge (SE) - Steve will be involved with a review of SWAs on surface water and can be contacted for information. Steve asked the SWAP committee if a demonstration will be done on Raisin River as previously discussed.

Elgar Brown (EB) - After meeting with other Region 5 states in Chicago, he wants to wait to see how Ohio's demonstration project is going on the Maumee River and model Michigan's surface water assessment accordingly.

CR - Requested a copy of EPA's comments on Michigan's SWA work plan.

Tom Segall (TS) - Asked to have EPA's work plan comments sent to everyone with a copy of these meeting minutes.

Bill Kelly (BK) - Is confused on how the wellhead protection grants can be linked with source water assessments.

EB - The idea is to have a consistent assessment on all groundwater supplies (Type I and Type II). If a Type I system completes the same assessment form when filling out a wellhead protection grant application, we'll have the same information, in the same format, for all systems in the state. We are asking for the committee's opinion on this. We will discuss it further in the Wellhead Protection Grant Program Stakeholders meeting and the specifics will be addressed in the wellhead protection grant guidance.

EB - Contracts to do SWAs are being sent to the County Health Departments next week. MSU and the Groundwater Education in Michigan (GEM) centers will assist local health departments with SWAs and geological data entry into the state groundwater database (SGDB). MSU and GEM assistance will be funded through a contract with the DEQ.

Don Brown (DB) - Consistency in a contaminant source inventory throughout the state will be difficult to obtain.

EB - The GEM centers will help to oversee activities and maintain consistency. Within the 800 foot radius, aerial photos can be used to locate major sources. We can not be prescriptive. Local health departments know most about major sources.

Mark Swartz (MS) - The "contaminant source inventory" terminology may not be well received at the local level. Using different terminology such as "land use inventory" would most likely be better received and could accomplish the same thing.

Steve Miller (SM) - We will not be listing the names of facilities and their addresses on the assessments. The federal mandate says to identify sources by contaminant, but does not require listing by name and address.

EB - The gradient of "first water" will be very helpful to see if contaminant sources within the 800 feet are upgradient or not.

Norm Granneman (NG) - Will the SWAP Technical Committee discuss the "first water" issue? This is a big issue that needs to be further discussed.

Tom Segall (TS) - Has concerns about the "depth to water" concept and what it will accomplish. A statewide map is too ambitious and will not be useful. Resources should be directed at the public water supply and information that might impact them. Looking at the area around the well would be useful.

MS - I support Norm and Tom's suggestion to further discuss this issue. Less than I % of the state would be covered by source water assessment areas using an 800 foot radius. Therefore, a statewide map of depth to first water seems inappropriate. It makes sense to look at the depth to water and surface water features within the 800 foot radius of a well.

EB - We are not going to expand field data into areas outside the radius of the 11,000 wells. All wells will be put into the State Groundwater Data Base and enhancement will be done. This will be a highly technical map, not for the lay person.

SM - This is the least defined aspect of the SWAP and will be focused on in year two of the contract. This will be taken back to the Technical Committee for Dave Lusch, Dick Passero and county health departments to discuss.

MS - Can well data from all wells within the 800 foot radius be put into the State Groundwater Data Base? The GEM centers may be able to help with this. That information would provide long term benefit to the water supplies.

EB - No, we do not have enough resources.

Dennis Carpenter (DC) - Schools need consistency in assessments.

TS - The relationship between wellhead protection grants and SWAs needs to be explained.

EB - We are asking the committee if there would be value in getting a consistent set of data from all water supplies throughout the state. When a community applies for a wellhead protection grant, we could ask them to complete the same four pace SWA form that is being used for the Type II supplies. This would give us the same information, in the same format, for both Type I and Type II supplies throughout the state and help us meet EPA assessment requirements.

SM - There is a concern about the level of effort this may cause for large supplies such as Lansing and Kalamazoo that have over 100 wells.

EB - For large supplies we could ask for a discussion on the system rather than filling out the four page assessment for each well.
(The committee seemed to agree with this idea and had no objections at this time.)

Ruth Kline-Robach (RKR) - When will the wellhead protection (WHP) rules for the grant program be passed?

EB - We need authorization to develop a WHP grant program to allow us to go through the rule process. The legislation must be passed by October 1, 1998, for the state to maintain primacy for enforcement of the Safe Drinking Water Act. The grant authorization is part of this legislation.

CR - Will there be time for public input on the WHP grant program?

EB - There will be a meeting to discuss the grant program March 2. This group and others will be notified of the meeting.

SM - We will mail out the latest version of the four page assessments ASAP. (Enclosed is a copy of the latest version of the assessment.)

Andrea Zajac (AZ) - The American Public Works Association conference agenda would be a good opportunity to discuss the SWAP. The conference is scheduled for three days, May 19 - 21.

TS - MRWA, MTA, Michigan Manufactured Housing etc. have newsletters that can be used to inform others about the SWAP.

EB - We will develop a SWAP article to use in various organization's newsletters.

Ruth Shaffer (RS) - There needs to be a positive spin on SWAS. Information on how to protect the water supply must be provided to the well owner.

Rich Overmyer (RO) - Well owners need to become aware of their responsibilities. There have been 8000 violations for failure to monitor. County health departments need to explain their role in SWAs and give owners information on their responsibilities. A multi media approach using public service announcements news releases and handout materials are all good ideas.

Bob Godbold (BG) - County health departments can identify the supplies that need to be worked with.

CR - Can a special mailing be done for all Type II supplies?

TS - MRWA can bring its members together to work through these matters.

RO - If we don't talk to the regulated community we are missing the boat. We need to work with the owners first and then educate the "customers".

AZ - Mailings only reach 10% to 20% of the public. One on one works the best to inform.

RS - Work with associations, schools, churches on the demonstration project to understand the SWAP process. This can be "flushed out" at the next Public Advisory Committee meeting.

EB -We must submit the final program to EPA by February 1999.

TS - Consumer confidence reports will report SWAs on Type I supplies. There is currently no mechanism for distribution of information for Type II supplies. The Internet will be a good tool.

DC - Wants to see the draft program and be given the opportunity to comment.

EB - We'll distribute the draft program and meet to discuss it in late spring or early summer. We plan to begin drafting the program after we have developed a strategy on how we will address the surface water sources. The Technical Assistance Committee will be brought back together after information from Ohio is gathered on their surface water demonstration project.

EB - We'll get the next SWAP meeting notice out one month ahead of time. It will be on a Wednesday from 1:30 p.m. until 4:00 p.m. Those who want to participate in a subcommittee to address the SWAP public advisory pilot projects, put an asterisk by your name on the attendance sheet and we will contact you to set up a meeting time.

4:00 p.m. Meeting adjourned.

Source Water Assessment Program
Advisory Committee Meeting
June 30, 1998
Manty Conference Room
9:30 AM – 11:40 AM

Present:

Katie Jones DEQ, DWRP	517-335-9049
Ruth Kline-Robach, MSU Extension	517-355-0224
Tom Fedewa, NRCS	517-335-0113
Bill Kelley, FTC&H	517-627-1141
Gary Peters, Saginaw Midland Water	517-684-2220
Steve Eldredge, DEQ, SWQD	517-335-4177
Shirley Businski, MDNR-RMAP	517-241-1366
Jon Coleman, Tri County Regional Planning	517-393-0342
Pamela Turner, DWSD	313-267-3627
Joan Hughes, DWSD	313-965-9770
Dick Hinshon, Hinshon Environmental Consulting	517-372-1470
Andrea Zajac, DEQ, STD	517-335-7294
Jim Cleland, DEQ	517-335-8326
Rich Overmyer, DEQ	517-335-8310
Steve Miller, DEQ	517-335-8174
Elgar Brown, DEQ	517-335-8312
Brad Brogren, DEQ	517-335-8311
Amanda Straky, DEQ	517-335-8923
Bob Boruszewski, USDA, Rural Development	517-337-6736, ext. 1252
Jim Nicholas, USGS	517-887-8906
Dave Lusch, MSU, IWR	517-355-8497
Don Brown, citizen	616-344-3738
Cyndi Roper, Clean Water Fund, Clean Water Action	517-337-4447
Terry Gill, League of Women Voters	810-387-3379

REVIEW MINUTES FROM JANUARY 14, 1998 MEETING

PROGRAM STATUS

MSU Contract- 5 year contract has been implemented that will be renewed annually.
Ground Water Education of Michigan (G.E.M.) Centers – Michigan Technological University, Land Information Access Association, Michigan State University, University of Michigan – Flint, Grand Valley State University, Western Michigan University, Eastern Michigan University.
The G.E.M. Centers will offer training and technical support for Global Positioning Systems (GPS), Wellkey, and T2, to local health departments.

Local Health Department Contracts – Some counties have already begun assessing water supply systems and many are involved in training employees on Wellkey, T2, and GPS. Fieldwork will begin this summer.

Wellhead Protection Grants – Formal public hearing was held on June 12, 1998. Those attending supported the grant program.
Technical changes where made and reviewed at the public meeting and the rules have been resubmitted, a second hearing was scheduled for September 10, 1998. Since the committee

meeting, it has been decided that there will be not be a rules hearing in September. The March 25, 1998 version of the rules will be submitted for approval. Training sessions on the grant program and applications will be held in four locations around the state in July.

ASSESSMENT STATUS

Noncommunity Water Supplies – Source water assessments are being tied into sanitary surveys that are done by local health departments.
Many counties are purchasing GPS units through a cost share program.

Surface Water Assessments – The City of Detroit Water Supply has been added to the Advisory Committee to represent surface water supplies. The S.W.A.P. program will evolve and include surface water systems in the first year. A subcommittee will be formed to determine an assessment process for surface water systems. There will be a meeting in August in Indiana with Region 5 states to discuss working draft of Great Lakes Assessment Protocol.

Community, Groundwater Assessments –There are approximately 140 systems that are involved in Wellhead Protection. The Technical Advisory Committee will discuss a program for source water assessment for the remaining 360 systems that are not active in the Wellhead Protection Program at the next meeting in August.

Karst, Groundwater Assessments – Jim Nicolas, from the USGS Michigan District is developing an assessment procedure for the few karst groundwater supplies.

DRAFT SWAP

Introduction – The 1996 Safe Drinking Water Act amendments require states to

- Identify areas that supply public tap water
- Inventory tap waters and assess water system susceptibility to contamination.
- Inform the public of the results

There will be three sections for source water assessment

1. Noncommunity, Groundwater Supplies
2. Community and Noncommunity Surface Water Supplies
3. Community, Ground Water Supplies

Time Schedule

Development of draft SWAP

- June 30, 1998 present draft to SWAP Committee
- July 15, 1998 present draft SWAP to Division
- August 11, 1998 present draft SWAP to Region 5 States
- September 1998 conduct Public Meetings- attendance is not mandatory but would be appreciated.
- November 11, 1998 present draft SWAP to USEPA
- January 15, 1999 present final draft to SWAP Committee

An extension from November 6, 2001 to May 6, 2003 will be requested to finish source water assessments.

Public Participation – Public meetings will be held in September to discuss the draft SWAP. Notification of the meetings will involve a mailing to restaurants, campgrounds, mobile home parks, etc. Draft articles will be published in newsletters and the Department of Environmental Quality home page will also provide information on SWAP.

Agencies or Organizations Involved – Brad Brogren asked for any changes to list of involved agencies and organizations on page 8 of the draft SWAP. No changes or additions were received.

State Approach –Delineation, time of travel, contaminant sources, sensitivity, susceptibility etc will be discussed at the Technical Advisory Committee meeting in August.

Implementation – An implementation schedule or spending plan has not yet been provided for the total program. A general strategy for the five year program will be provided.

- Local health departments will receive funds for GPS equipment, doing assessments, providing GPS locations of water supply sources, and entering well log data into a statewide database.
- GEM centers will provide training and on site assistance to the local health departments, Michigan State University will assemble a database for the assessments and provide a procedure for analyzing and mapping GPS data.
- Wellhead Protection grants will be used to help fund communities that are involved in wellhead protection.

Source Water Protection Program – Programs are listed on page 32 of the draft SWAP. Comments should be faxed to 517-335-8298.

COMMITTEE TASKS- Meetings.

The Public Advisory subcommittee will be meeting July 28,1998
The Technical Advisory Committee will be meeting August 20, 1998
There will be a full committee meeting in October 1998.
The final draft will be reviewed in January 1999.

Source Water Assessment Program
Public Advisory Committee Meeting
July 28, 1998
Manty Conference Room
9:30 AM – 11:40 AM

Present:

Amanda Straky, DEQ-DWRP	517-335-8923
Lisa Chadwick, DEQ-DWRP	517-335-9505
Jon Coleman, Tri-County Regional Planning	517-393-0342
Andrea Zajac, DEQ-STD	517-335-7294
Katie Jones, DEQ-DWRP	517-335-9049
Doug Murphy, MABA	517-333-8788
Jane Vaas, American Indian Health	313-846-3718
Terry Gill, League of Women Voters	810-387-3379
Cyndi Roper, Clean Water Action and Clean Water Fund	517-337-4447
	Primary # Aug. & Sept.810-792-8375
Rich Overmyer, DEQ	517-335-8310
Elgar Brown, DWRP-DEQ	517-335-8312
Brad Brogren, DWRP-DEQ	517-335-8311

PUBLIC OUTREACH

Presentation of the Source Water Assessment Program (SWAP)

The SWAP will be discussed at the AWWA ground water conference in October.
SWAP is on the agenda for the Technical Water and Waste Water Conference in February.
The draft SWAP will be presented at the Region 5 meeting in August.
Present SWAP to local government councils, present to the Michigan Association of Planners in the fall.

Public promotion of the SWAP will include articles in newsletters, Publications, and a SWAP pamphlet. Anyone who has a newsletter or circulation and would like to include the SWAP article, or a similar article please contact Brad Brogren.

Phase 2 of the public outreach will be discussed at the December meeting. Some options are; SWAP video, Web page, Consumer Confidence Reports, and information available at Public Health Centers.

We need to decrease the "threat" of SWA to the utility companies. The utility companies should be the first target audience.

SWAP Pamphlet

One pamphlet for an education audience and one for the lay-person. Include illustrations or pictures in the pamphlet.
The SWAP Pamphlet needs to be at a sixth grade reading level. How will SWAP impact the community and why is it important to the public needs to be included in the pamphlet. Pamphlets will be made available at local branches of the government, and distributed in mailings.

Efforts towards getting pamphlets to; townships, planning officials, municipal leagues, MSPO, utility companies, and schools.

Send SWAP pamphlet to restaurant associations, gas stations, etc., for noncommunity supplies.

Incorporate SWAP education into youth education activities.

PUBLIC PRESENTATIONS

SWA presentation materials are available. If you would like to use them please contact Brad Brogren.

Stage for a Website.

Location of Public Meetings – We want to have public comments in by fall.

Escanaba, Grayling, Gaylord, Marquette, Grand Rapids and Detroit were mentioned as potential meeting sites. Jane Vaas will look into facilities for Detroit and Grand Rapids.

How will we inform the public of these presentations?

AAA Magazine- Michigan Living

Newsletters

Radio spots

Contact people within individual groups through networking.

PWS announcements

MEETINGS

Technical Advisory Committee meeting on Aug. 20, 1998

Public Meeting - tentatively scheduled on September 16, 1998 at a Detroit facility

Full Committee meeting in October

Source Water Assessment Program
Technical Advisory subcommittee Meeting
1:00 p.m. to 3:20 p.m.
8-20-98

Amanda Straky, MDEQ	517-335-8923
Steve Miller, MDEQ	517-335-8174
Ron Van Til, MDEQ	517-335-9045
Steve Eldredge, MDEQ	517-335-4177
Dave Kraker, Kent Co. Health Dept.	616-336-3089
Tom Fedewa, Mich. Groundwater Stew. Program	517-335-0113
Brant Fisher, MDEQ	517-335-9187
Brad Brogren, MDEQ	517-335-8311
Elgar Brown, MDEQ	517-335-8312
Bill Kelley, FTC&H	517-627-1141
Jon Coleman, Tri-County Regional Planning	517-393-0342
Jim Nicholas, U.S. Geological Survey	517-887-8906
Pamela Turner, DWSD	313-267-3627
Gang Song, DWSD	313-267-3628
Katie Jones, MDEQ	517-335-9049
Dave Lusch, MSU, IWR	517-355-8497
Andrea Zajac, MDEQ	517-335-7294
Cyndi Roper, Clean Water Fund, Clean Water Action	517-337-4447
	810-792-8375
Nolan Bennett, Clean Water Fund, Clean Water Action	517-337-4447

MEETING MINUTES

1 USEPA Region V States SWAP Meeting
Bloomington IN Managers Meeting
- All states had draft proposals for SWAP
- Michigan was ahead on noncommunity water supplies
- Reviewed Great Lakes Protocol
- Region V Proposal passed

2. Michigan SWAP Status
Draft SWAP- August version the June/July comments have been added as items in bold letters. Comments will be incorporated into September drafts.
Grant Rules- The original March 20th version has had an informal review done and are waiting on the formal review. After the formal review the rules will go to J. Carr for 45 days after which they will become approved. Technical adjustments will be promulgated as amendments, grant money will be available for disbursement after the rules have been finalized.
SWAP on the Web – Will be located on the Division home page in early September. The web page will contain information on presentations to Water Suppliers and Public Meeting dates.

3. Noncommunity Assessments
Status – Contracts with all counties except Wayne because they don't have any noncommunity supplies. District health department - SWA linked into the sanitary survey.
- Data is being entered into WELLKEY
- Looking at contracts for next year, 20% SWA each year
- All data will be entered next year, WELLKEY, and GPS locations
- Develop first water and vulnerability maps in FY 99. Contracts with GEM centers and MSU

4. MSU/GEM SWAP
   Status/Contracts – 6 subcontracts with the GEM centers through MSU, some data has been submitted on a draft work order that is being reviewed. Pushing for GPS locations to be completed this FY. Need to separate T2 from GPS locations in order to pay counties.

   Many counties have received GPS equipment, technical problems have been solved. Ready to write CD for digital raster graphics. The problem has been with Quality and elevation locations and will need to be re-projected into a usable form.
   Needs to be in a form that people are used to and provide training
   Used as a statewide resource
   Available in Geo Ref.
   The first year – draft map
   Second year – Review comments
   Third year – Develop and map in response to comments
   Complete 80% of phase 2 DEMS

5. Surface Water Assessments
   Great Lakes Protocol – on site studies to learn about intake, initial survey done. Gather information from the water plant on effects of water quality. Have to determine what the assessment will be for surface water systems.

   Detroit is working on a system model for baseline assessments on the St. Clair River to the Detroit River. 3 system site assessment to gather information to make each assessment site specific the first year.

   Work groups will be formed and Detroit's assessment system will be compared with other state surface water assessment programs. Funds will be reserved for the project.

   There are nine inland river sources, watersheds will be addressed individually. Five of the nine have already been delineated. Ohio and Indiana have an assessment of 10 miles up stream and 1000ft up tributaries.
   USGS Assistance – Overview on pages "14 –15". Provide a conceptual approach on near shore, inland rivers, and karst assessments. Near shore is being done concurrently with the Great Lakes Protocol. Inland River intakes – know the contributing area.

   Surface Water Assessment Survey for Wisconsin – Use a similar survey to Wisconsin's and expand on raw water quality, past records, storm, river, and tributary information, confirm locations. Digitize locations. Would like to involve water supply operators and anyone who would like to work on the survey form.

6. Karst, Ground Water Assessments
   USGS Assistance – Karst systems need to be defined. The number of karst systems will need to be determined. If there are only a few karst supply systems than DEQ and USGS with take care of the SWA. If there are more systems then guidelines will be developed, using other state guidelines as a reference. A workgroup will be formed to define and determine the number of karst supplies. Vulnerability of karst systems will need to be ranked.

   The problems encountered with karst systems is, they are very expensive to model. There are probably less than 30 systems in Michigan.

7. Remaining Ground Water Assessments
   Community supplies & no WHP – Mobil home parks, condominiums, and apartments.
   Follow similar procedure as Noncommunity. Well data, on site geology, contamination within 800 ft raise to 2000ft, water quality data, increase the isolation distance from 75 feet to 200 feet.

   Need to expand and define the management zone.

8. Draft SWAP
   Compare our program to other state programs that are listed on the web. Provide EPA with susceptibility determinations to determine the sensitivity of the supply's aquifer to contaminant sources in the assessment area (pg. 4, draft SWAP).

   Please fax or e-mail any comments to be included in the next draft, to Brad Brogren.

9. Future Meeting Dates
   Public Meetings present draft SWAP to water supplies and public
   - September 16th Detroit
   - September 17th Kalamazoo
   - September 30th Grayling
   - October 1st Escanaba

   AWWA Regional Meetings
   - October 8th- Port Huron
   - October 14th – Grand Rapids
   - October 16th – Jackson
   - October 20th – Gaylord
   - October 21st – Bay City

   Final Draft presented to SWAP Committee,
   - October 27th – Lansing, Manty Conference room 1C 9:30 am

   January 1999 – Final SWAP presented to Committee

Source Water Assessment Program
Advisory Committee Meeting
9:35 a.m. to 11:35 a.m.
10-27-98

Rich Overmyer, MDEQ, DWRPD	517-335-8310
Dave Holtschlag, USGS	517-887-8910
Chuck VanDerKolk, MI Section, AWWA	616-772-6212
Katie Jones, MDEQ, DWRPD	517-335-9049
Marian Bendixsen, League of Women Voters	517-773-9719
Christine Spitzley, Tri-County Regional Planning Comm.	517-393-0342
Tom Segall, MI Rural Water Association	517-327-0399
Paul Miller, USDA Rural Development	517-337-6635
Cyndi Roper, Clean Water Fund, Clean Water Action	517-337-4447
Nolan Bennett, Clean Water Fund, Clean Water Action	517-337-4447
Don Brown, Citizen-at-Large	616-344-3738
Mike Sweat, USGS, WRD	517-887-8915
Gary Peters, MI Section, AWWA	517-684-2220
Brad Brogren, MDEQ	517-335-8311
Elgar Brown, MDEQ	517-335-8312
Pamela Turner, DWSD	313-267-3627

MEETING MINUTES

1. Introductions
   Handouts-October 16, 1998 Narrative Revision of SWAP; SWAP Draft Brochure
   10/16/98 Revision – revised since last mailing
   Brochure (green) is a draft, was passed out at public meetings

2. Michigan SWAP Subcommittee Minutes
   Subcommittees have met; minutes are in SWAP Appendices
   Public Advisory (July 28, 1998) – Minor revisions, no other comments.
   Technical Advisory (August 20, 1998) – No comments.

3. Michigan SWAP Update
   August, September, October Drafts – September Draft on Internet. October Draft was mailed to committee members. Now working on November Draft to submit to EPA. Comments will be incorporated into October Draft.

   Meetings/Presentations (USEPA, DWSD, USGS, AWWA, CWA, NLMWA, General Public) – Number of meetings this summer and fall. In meeting with Detroit Water and Sewer (DWSD), discussed modeling on Lake St. Clair. Public meetings generally not well attended.

   Comments (USEPA, USGS, Public Meetings) – EPA response to August submittal favorable. Joint funding with USGS to perform such things as karst modeling.

   Appendices (Watershed Maps, WTP Survey Form) – Appendices make up the bulk of the document. Manistique River Watershed map a new addition since last draft.

WHP Grant Rules – Now go from Director to JCAR, hopefully today. Once submitted, starts a 45-day clock. If JCAR doesn't act within 45 days, the Governor signs and becomes law. Grant applications may be out to the public by mid-December, will then have 30-45 days to complete and return, so the first wave of applications may be coming back to our office by mid-February.

Noncommunity Assessments – GEM centers and local health departments (LHD's) working on assessments, appear to be working all right. Michigan is probably further ahead on this than most states.

4. Michigan SWAP Review

October 16, 1998 Revision – Dave Westjohn (USGS) working on changes in karst verbiage, fine-tuning things. We are encouraging cooperation with USGS in general, but especially in understanding karst as it relates to source water. They have a lot of experience and resources that can be of benefit to our department. Discussed a document from EPA on susceptibility determinations, this will need to be incorporated into the November document. Need to take a broader look at things, because Michigan has thousands of water supplies, other states have only hundreds. (Following is a discussion of changes in the October Draft, on a page by page basis). Intake critical assessment zones (pg 4), vulnerability zones (pg 4), large number of assessments (pg 5), named groups invited to participate; subcommittees; synopsis of public meetings (pg 6), notice of public meetings; summary of public comments; Canadian discharges and discharges to the Menominee River; impact of Clinton River on Lake St. Clair (there are 13-14 water intakes from Lake St. Clair to Lake Erie). Some modeling done to figure out how vulnerable these intakes are. USGS, Army Corps of Engineers and City of Detroit are working with us to pull data together. This is in the preliminary stages, don't know yet how all this may be financed. Try to get the best models and modeling (pg 7). How do WHP and SWA relate to each other? A complete WHP program is a complete SWA, but a complete SWA is not a complete WHP program (not reciprocal). Wellhead protection grants - $2 million for FY 1999, $1 million each year thereafter. MCL violations and their relation to water quality (we do have some nitrate MCL's). MCL needs the average of four consecutive tests, atrazine in River Raisin only shows up in one quarter (due to spring runoff), is non-detect for the other three quarters (pg 9). Further explanation of the relationship between sensitivity and wellhead protection. What is hydrological sensitivity? Discussion of sensitivity vs. susceptibility. Mention of tritium and its relation to sensitivity/susceptibility (pg 12). Subwatershed delineations, related to NPDES permits. Five-year cyclic watershed review-check with SWQD (pg 15). Completed assessments-maps of SWAP areas will be included. Noncommunity, nontransient-question of how to communicate the SWA to the transient community. Assessment provided to owner, what happens then? Public Advisory Committee may have to work on how to get information out to the public. Assessments will be put online, but how much do we have to personally deliver? Source water assessments will be included with consumer confidence reports (CCR's). Source water information will enhance protection programs (pg 19).

Appendices – Additions were made to definitions and acronyms pages. SWAP Advisory Committee list needs some updating. Appendix relating to USGS Assistance to MDEQ, need to define PAC and TAC, DWSD. Change "develop" protocol to "draft" protocol. Need ballpark funding figures. Information on karst will probably change with Westjohn input. Protocol for Great Lakes Sources. Surface water Assessment Survey-pass along to WTP operators or personnel. Gathering information form to gain preliminary data before going into a full-blown assessment. Needs a little work. Public Water Supply Intake map, needs a little work. MI has 70 intakes of surface waters. Need to define nearshore and offshore.

5. Michigan SWAP Direction

Committee Approval of Final Draft with Revisions – Next document may be called the Final Draft. It was proposed, moved and seconded that the October Draft be accepted. There was unanimous concurrence by the committee.

November Final Draft Submittal to USEPA – With committee approval, now submit November edition to EPA.

Final SWAP Draft on the Internet - The update will be on the Internet, but can also request a hard copy.

SWAP Committee Meeting @ 9:30 a.m., January 14, 1999 for Final SWAP – announcement of next meeting; subcommittee meeting times will probably be decided then.

6. Michigan SWAP 1999 Tasks
   February 1999 Program Submittal to USEPA – After January 1999 meeting.
   Continue Noncommunity Assessments – Good idea.
   Pursue Wellhead Protection Programs - $1 million will be available in matching grants around first of the year, another $1 million will be available in Aug/Sep 1999.
   Initiate St. Clair River, Lake St. Clair and Detroit River Flow Modeling – Previously discussed.
   Develop Assessment Procedures
   Conduct Pilot Surface Water Assessments for Inland Rivers and Great Lakes Sources
   Develop Templates and Public Information Procedures (Brochure, etc.) – finalize brochure.

7. Committee Comments
   Technical Advisory Committee will probably be pretty active in 1999.
   Accolades to the committee and B^3 for bringing SWAP to its present state.

8. Adjourn 11:35 a.m.

Source Water Assessment Program
Advisory Committee Meeting
9:42 a.m. to 12:12 p.m.
01-14-99

Rich Overmyer, MDEQ, DWRPD	517-335-8310
Brant Fisher, MDEQ, DWRPD	517-335-9187
Brad Brogren, MDEQ, DWRPD	517-335-8311
Elgar Brown, MDEQ, DWRPD	517-335-8312
Dave Holtschlag, USGS	517-887-8910
Bob Boruszwski, USDA Rural Development	517-337-6635
John Fiero, MDEQ, DWRPD Environmental Health	517-335-8280
Wayne Kukuk, MDEQ, DWRPD	517-335-8964
Jennifer Leholm, MDEQ, DWRPD	517-335-8719
Cyndi Roper, Clean Water Fund, Clean Water Action	517-337-4447
Nolan Bennett, Clean Water Fund, Clean Water Action	517-337-4447
Marian Bendixsen, League of Women Voters	517-773-9719
Don Brown, Citizen-at-Large	616-344-3738
Tom Fedewa, Mich. Groundwater Stewardship Program	517-335-0113
Ruth Kline-Robach, MSU, CES	517-355-0224
Lonnie C. Lee, MDEQ, WMD Groundwater Program	517-373-4735
Mark Swartz, MDA Groundwater Stewardship Program	517-335-6545
Jon Coleman, Tri-County Regional Planning	517-393-0342
D.B. Westjohn, U.S. Geological Survey	517-887-8921

MEETING MINUTES

1. Introductions

2. Handouts-October 27, 1998 Advisory Committee Minutes
   Corrections: (Section 4, Michigan SWAP Review)
   - There are 14 water intakes from the St. Clair River to Lake Erie
   - Source Water Assessments will be available (not included) with consumer confidence reports (CCRs)
   - Protocol for Great Lakes Sources needs to be detailed (discussed later in meeting)

3. Michigan SWAP Update
   a. MSU Contract / Noncommunity Water Supplies (Ruth Kline-Robach) MSU got a late start on the project, only worked on it for 4 months in 1998. Had 65% participation with local health departments and GEM (Groundwater Education in Michigan) centers. Still have a lot of work to accomplish in 1999. General discussion on some project results ensued.
   b. Wellhead Protection Grants (Brant Fisher) On January 8, 1999 the Wellhead Protection (WHP) Grant rules were filed with the Office of the Great Seal (Secretary of State) rules go into effect 15 days from filing on January 23, 1999. Have $1 million for first grant period, thru March 1999, then another $1 million in the next grant period, though October 1999. Not much response yet, expect many applications to come in near deadline, January 29, 1999.
   c. USGS Projects-Karst, Inland Rivers, St. Clair-Detroit Rivers. USGS and Michigan Department of Environmental Quality (MDEQ) entered into a joint funding agreement through 2003 for these projects. (Dave Westjohn) All references in SWAP documents to karst changed to karst hydrologic systems. Has completed literature search and has working GIS model based on karst hydrologic systems in Kentucky. Will select three community water supply sites with karst hydrologic systems for detailed source water assessments. Learn from targeted sites, then branch out to others. Developing maps of

areas where bedrock is susceptible to karst, and where bedrock is less than 25 feet below ground surface (creates rapid groundwater movement). Karst and public health concerns; hepatitis, polio, raw sewage. Karst areas have higher incidents of detection of bacteria, nitrates, phosphorus. (Mike Sweat, in absentia) Inland Rivers- Has reviewed SWAP implementation documents; locating pertinent literature; investigating data on inland water supply sources; reviewing EPA watershed software; developing database of surface waters in SE Michigan. (Dave Holtschlag) Propose to identify sources of water to intakes in the St. Clair and Detroit Rivers, using a 2-D model. Met with City of Detroit, found trial version of hydrodynamic model, newly developed by the U.S. Army Corps of Engineers. Looks like model may work well, using particle tracking analysis to determine sources of water.

d. MDEQ-DWRPD (Drinking Water & Radiological Protection Division) Web Site-Trying to put the text of SWAP out there, have not yet been successful.
e. Other- Clean Michigan Initiative (CMI)- Passed in November, now trying to include non-point source, well abandonment. Final decisions on CMI monies have not yet been made.

4. Michigan SWAP Correspondence

   Final Draft of SWAP was sent to EPA on November 18, 1998; EPA sent back comments in December 1998. Document shared with Michigan Department of Agriculture (MDA), Michigan Department of Consumer and Industrial Services (MDCIS) which regulates nursing homes and medical care facilities and MDEQ-DWRPD Environmental Health section, which regulates mobile home parks.

5. Michigan SWAP Final Revisions

   Final Draft (dated 1/12/99) distributed without appendices to reduce paper – (Brad Brogren) Many changes minor; all changes in bold. (pg. 4) 70 intakes, not 70 separate sources. (pg. 6) Wellhead Protection Activities to include all Type I systems. Changes in karst definitions. (pg. 7) Changes in estimated well numbers. Revisions to susceptibility determinations. Clean Water Action (CWA) suggested, for surface waters, an intake critical assessment zone of at least 1000 feet on each bank of a principle stream, at least 500 feet on tributaries, and a minimum of 10 miles upstream of intake. The Final Draft incorporates a 2000 foot critical assessment zone and watershed assessment for inland river sources. (pg. 19) Change references from Clean Water Action to Clean Water Fund. CWA suggested changing public input may be sought to public input will be considered, which was incorporated into Final Draft. League of Women Voters representative supported public participation in activities. (pg. 12) CWA suggested additional lists of contaminants when completing contaminant inventories; incorporated into Final Draft. CWA suggested adding names and addresses of known and potential sources of contamination to Source Water Assessments; Suggestion not incorporated into Final Draft. (pg. 15) Additional wording on Wellhead Protection Plans. (pg. 16) Change of wording to consider all land uses for their potential as a source of contamination. (pg. 18) CWA suggests adding language to include many groups and organizations in the site-specific assessment process; incorporated into Final Draft. (pg. 19) Wording referring to new Appendix U pertaining to St. Clair-Detroit Rivers document. Critical Assessment Zones set at 2000 feet, an arbitrary distance. (pg. 20) Reference to joint agreement between MDEQ and USGS. (pg. 21) Reference to MDCIS and MDA and their roll is source water assessments. (pg. 22) Verbiage on availability of completed Source Water Assessments. CWA will work on clarification of the Protocol for Great Lakes Sources. (Committee would like to finalize SWAP Document by early February 1999.

6. Committee Discussion

   Brief discussion of what would be considered a major source of contamination; Act 399 referenced.

7. SWAP Committee Approval

   Unanimous approval of document with amendments by show of hands in room

   Distribution of Document – Should now only be distributed to EPA and committee members, not to the general public yet, not until finally approved by EPA. After final copy, any changes will be marked on the page with a revision date.

8. Technical Advisory Committee 1999 Tasks
   a. Pilot surface water assessments – several supplies interested
   b. Community, Groundwater assessments – 415 mobile home park supplies, have an average of 125-150 homes per park. Probably not much response to the WHP Grant program from them right now. May be able to fund them, or get a pilot project going, further down the road.
   c. St. Clair-Detroit River assessments – Will let the full committee know when public meetings occur.
   d. Any other Technical Advisory issues?

9. Public Advisory Committee 1999 Tasks

   a. Community brochure-need to finalize and approve, now in draft form. Rich Overmyer working on Non-community sanitary survey/surface water assessment brochure. Local Health Departments will be doing sanitary surveys and source water assessments at the same time. Would be good to have the non-comm. brochures finalized by the meeting in February in Grayling. Any comments should be forwarded to R. Overmyer within the next few weeks.
   b. Web Site-Hope to have final document on our homepage by early February. Would also like to include a tracking sheet to summarize status of assessments.
   c. Templates-suggestions to summarize data from assessments

   Technical Advisory Committee will probably meet in March 1999, the first or fourth week. The Public Advisory Committee will probably meet in April 1999, possibly the third week. Full committee will probably meet again after the EPA has had time to review and comment on the document.

10. Adjourn - 12:12 p.m.

APPENDIX F
USGS Assistance to MDEQ for SWAP

USGS Roles

1) Develop protocols and perform source water assessment for all inland river supplies.
2) Determine qualifying supplies, develop protocols, and perform representative source water assessments for karst ground water supplies.
3) Categorize intakes, develop protocols, and perform representative source water assessments for Great Lakes intakes.
4) On behalf of MDEQ, provide technical oversight on connecting channel intakes, including reviewing approach and models, codevelopment of protocols, and source water assessments assistance to DWSD.
5) Based on experience in (4), develop protocols for other connecting channel supplies and provide technical assistance and oversight for those source water assessments.
6) Technical assistance and oversight in areas where MDEQ needs additional expertise and/or is understaffed for meeting SWAP timelines. Includes, but not limited to, noncommunity ground water, ground water from karst, inland rivers, connecting channels, and Great Lakes.
7) Participation on Public Advisory Committee (PAC) and Technical Advisory Committee (TAC).

Draft Timeline for Discussion

FY 1999

1) Define karst, determine qualifying karst supplies, and develop a detailed approach and workplan for SWA in karst areas.
2) Begin SWA as pilot assessments on selected inland river and Great Lakes supplies.
3) Provide technical assistance to DWSD and MDEQ for developing a detailed approach to SWA for DWSD supplies and 12 other community intakes on the St. Clair - Detroit River system.
4) Assist MDEQ in completion of final SWAP document
5) Provide technical assistance to MDEQ in areas where they want to move forward in FY99, but are limited by internal staffing issues.
6) Provide technical assistance to MDEQ and MSU for some aspects of the vulnerability mapping.
7) Participate on PAC and TAC.

FY2000

1) Develop draft protocol for Great Lakes supplies and complete on-site visits to all Great Lakes sources.
2) Categorize Great Lakes sources.
3) Choose 3 (?) Great Lakes sources, develop a detailed approach for SWA for each, and complete SWA for each.
4) Develop final protocol for SWAs at Great Lakes supplies.
5) Choose 3 (?) karst supplies and complete SWA for each.
6) Develop final protocol for SWAs at karst supplies.
7) Provide continued technical assistance to DWSD and MDEQ.
8) Develop protocol for and categorize connecting channel supplies.
9) Provide technical assistance to MDEQ in areas where they want to move forward in FY00, but are limited by internal staffing issues.
10) Participate on PAC and TAC.

FY2001

1) Provide technical assistance and oversight for remaining karst supplies.
2) Provide technical assistance and oversight for remaining Great Lakes supplies.
3) Provide technical assistance and oversight for remaining connecting channel supplies.
4) Begin susceptibility determinations.
5) Review monitoring data strategies.
6) Assist MDEQ in developing a long-term monitoring program for source waters.

Staffing, Funding, and Budget

Staffing

1) The SWAP program runs through May 2003. The need for significant USGS assistance appears to be greatest in FY99-01.
2) The level of USGS involvement that is needed is somewhat unclear at this time, since none of us at MDEQ and USGS have experience estimating the amount of time necessary to undertake the activities described in 1-7 above.
3) The USGS has the capability to put any number of people to work on SWAP, since we are not under any significant Full-time Equivalent (FTE) constraints and there are technical resources and people available in the USGS outside of the Michigan District.
4) Our recommendation is to begin FY99 with two half-time FTEs dedicated to SWAP, one for karst issues and one for surface water issues. After these people detail out a workplan, we can revise staffing and timelines in accordance with MDEQ needs. There are a number of activities associated with SWAP that will not require a senior-level hydrologist.

Funding

1) Our best guess at overall funding for USGS assistance, assuming USGS roles 1-7 above and the draft timeline above, is that we will need 2 FTEs on SWAP in FY99-01 and our role in FY02-03 would be significantly reduced.
2) Our recommendation to get the project underway is to prepare a Joint Funding Agreement (JFA) that covers FY99-03 and which shows an initial allotment of $30,000 from MDEQ and $30,000 from USGS. Implicit in signing this agreement, and understood by all, is that the dates and amounts of the agreement would be modified based on MDEQ's assessment of their needs for USGS assistance. This is accomplished by a standard amendment that we use annually with State agencies, since at the beginning of the year we seldom know exactly what we'll be doing with the state during the year.
3) A first cut at a budget that incorporates the above USGS roles and timeline is provided on pages 3-4.

Estimates for Draft Budget

Fiscal Year	Item	Net Cost	Gross Cost
1999			
	MJS 1/2 time	33,384	
	DBW 1/2 time	35,412	
	Student 1/2 time	13,000	
	Student 1/2 time	13,000	
	Travel	4,000	
	Miscellaneous	2,000	
	TOTAL	100,796	**188,403**
2000			
	FY99 X 1.05	105,836	**197,824**
2001			
	MJS 1/2 time	36,806	
	DBW 1/4 time	19,521	
	Student 1/2 time	14,331	
	Student 1/2 time	14,331	
	Travel	4,400	
	Miscellaneous	2,205	
	TOTAL	91,594	**171,204**
2002			
	MJS 1/4 time	19,323	
	Student 1/4 time	7,524	
	Travel	1,000	
	Miscellaneous	1,000	
	TOTAL	28,847	**53,920**
2003			
	FY02 X 1.05	30,289	**56,616**

Draft Budget for USGS Role in SWAP

Fiscal Year	MDEQ	USGS	Total
1999	158,400	30,000	188,400
2000	122,800	75,000	197,800
2001	96,200	75,000	171,200
2002	26,950	26,950	53,900
2003	28,300	28,300	56,600
Total	432,650	235,250	667,900

APPENDIX G
Source Water Assessment Worksheet

Data collection to complete the source water assessment worksheet is an extension of the Sanitary Survey conducted as part of the Noncommunity Public Water Supply Program. Please complete the following as appropriate.

Name of Supply: _____ **WSSN:** _____

Address: _____ **County:** _____

Well Log and Location

Well Log Available ☐ Yes ☐ No
Well Log Entered in WELLKEY ☐ Yes ☐ No (If No, attach copy)
If Well Log Entered in WELLKEY WELLKEY # _____,
GPS Location Obtained for Well(s) ☐ Yes ☐ No

Geologic Sensitivity - $SWAS_G$

Geologic sensitivity is determined based upon the total thickness of Continuous Confining Material (CCM) or Continuous Partially Confining Material (CPCM). Beginning with a $SWAS_G$ of 30 points, 3 points are deducted for each 10 feet of CCM or 15 feet of CPCM. The CCM must be reported on the well record as 10 feet of continuous material and the CPCM 15 feet of continuous material to provide for a deduction. The summing of CCM layers thinner than 10 feet or CPCM layers thinner than 15 feet is not allowed. Where the point deduction exceeds 30 points, the $SWAS_G$ shall be assigned zero (0) points.

CCM Table: Utilize where well log reports just "clay" or "shale"

CCM (feet)	0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 or greater	**CCM Pts. Deducted**
Pts. Deducted	0	3	6	9	12	15	18	21	24	27	30	

CPCM Table: Utilize where well log reports mixture of "sand/clay" or "sandstone/shale"

CPCM (feet)	0 to 14	15 to 29	30 to 44	45 to 59	60 to 74	75 to 89	90 to 104	105 to 119	120 to 134	135 to 149	150 or greater	**CPCM Pts. Deducted**
Pts. Deducted	0	3	6	9	12	15	18	21	24	27	30	

30 Points minus the CCM pts. deducted and the CPCM pts. Deducted - **$SWAS_G$**	

Well Construction, Maintenance and Use - $SWAS_W$

This portion of the source water assessment score provides an evaluation of the NCPWS relative to the grouting, age, casing depth, and pumping rate for the well.

Well Grouting

Casing sealed entire length in accordance w/ 1994 Revisions	Casing sealed by driven casing method - 1994 Revisions	Casing sealed in accordance with 1967 code	Casing not sealed or status unknown	Enter Points Below
0 pts.	5 pts.	10 pts.	15 pts.	

Well Age

Constructed after 1994	Constructed 1976 - 1994	Constructed 1967 - 1976	Constructed Pre-1967	Enter Points Below
0 pts.	5 pts.	10 pts.	15 pts.	

Casing Depth

Well cased 200 feet or greater	Well cased from 100 - 199 feet	Well cased from 25 - 99 feet	Well cased <25 feet or not known	Enter Points Below
0 pts.	5 pts.	10 pts.	15 pts.	

Pumping Rate

20 gpm or less	21 - 50 gpm	51 - 100 gpm	Greater than 100 gpm	Enter Points Below
0 pts.	5 pts.	10 pts.	15 pts.	

Sum of pts. from grouting, age, casing depth, and pumping rate - **$SWAS_W$**	

Water Chemistry and Isotope Data - $SWAS_C$

This portion of the source water assessment score provides an evaluation of the NCPWS relative to the present of nitrates and nitrites, organic chemicals, and tritium.

Nitrate and Nitrites

Not Detected	Detected Less than ½ MCL	Detected ½ MCL to <MCL	Detected Exceeds the MCL	Enter Points Below
0 pts.	10 pts.	20 pts	50 pts.	

VOCs and SOCs

Not Detected	Not Sampled	Detected @ Less than MCL	Detected Exceeds the MCL	Enter Points Below
0 pts.	5 pts.	20 pts	50 pts.	

Water Chemistry and Isotope Data continued

Tritium Results

No Test	Tritium @ < 1 TU	Tritium @ > 10 TU	Enter Points Below
0 pts.	-30 pts.	30 pts.	

Sum of pts. from nitrate/nitrite, organic chemicals and tritium result- **$SWAS_C$**	

Isolation from Sources of Contamination - $SWAS_S$

This portion of the source water assessment score provides an evaluation of the NCPWS relative to the wells isolation from "major" and "standard" sources of contamination. Sources of contamination are also evaluated dependent upon whether they are "potential" or "known" sources of contamination.

"Potential" Major Sources of Contamination from 75 to 800 feet

Source of Contamination	Number Of Sources	Distance From Well (feet)	
Large Scale Waste Disposal			
Land Application of Sanitary Wastewater or Sludge			
Landfill			
Bulk Chemical or Chemical Waste Storage			
Under Ground Storage Tank			
Other			Enter Points Below
Number of Major Sources from 75 to 800 feet		**x 10**	

"Potential" Major Sources of Contamination within 75 feet

Number of Major Sources within 75 feet		**x 20**	

"Potential" Standard Sources of Contamination within 75 feet

Source of Contamination	Number Of Sources	Distance From Well (feet)	
Storm or Sanitary Sewers			
Pipe Lines			
Septic Tank or Septic Drain Field			
Cesspools, Seepage Pits or Dry Wells			
Leeching Beds			
Barnyards			
Surface Water			
Other			Enter Points Below
Number of Standard Sources within 75 feet		**x 10**	

Isolation from Sources of Contamination continued

"Known" Sources of Contamination within 800 feet

Source of Contamination	Number Of Sources	Distance From Well (feet)	
Part 201of Act 451 Sites (formerly Act 307 sites)			
Superfund Sites			
Leaking Underground Storage Tanks			**Enter Points Below**
Number of Known Sources within 800 feet		**x 25**	

Sum of pts. from sources of contamination - **$SWAS_S$**	

Source Water Assessment Score - SWAS

Sum of $SWAS_G$, $SWAS_W$, $SWAS_C$ and $SWAS_S$ = **SWAS**	

APPENDIX H

DEPARTMENT OF ENVIRONMENTAL QUALITY

DRINKING WATER AND RADIOLOGICAL PROTECTION DIVISION

SUPPLYING WATER TO THE PUBLIC

Filed with the Secretary of State on January 8, 1999.
These rules take effect 15 days after filing with the Secretary of State

(By authority conferred on the director of the department of environmental quality by sections 5 and 16 of Act No. 399 of the Public Acts 1976, as amended, and Executive Reorganization Order No. 1996-1, being §§325.1005, 325.1016 and 330.3101 of the Michigan Compiled Laws)

R 325.10101 to R 325.12706 of the Michigan Administrative Code are amended by adding R 325.12801, R 325.12802, R 325.12803, R 325.12804, R 325.12805, R 325.12806, R 325.12807, R 325.12808, R 325.12809, R 325.12810, R 325.12811, R 325.12812, R 325.12813, R 325.12814, R 325.12815, R 325.12816, R 325.12817, R 325.12818, R 325.12819, and R 325.12820 to read as follows:

PART 28. WELLHEAD PROTECTION GRANT ASSISTANCE

R 325.12801 Definitions.

Rule 2801. As used in these rules:

(a) "Abandoned well" means any of the following which presents a threat to the groundwater resource and which no longer serves the purpose for which it was intended or has been taken out of service:

(i) A water well.
(ii) A monitoring well.
(iii) An oil well.
(iv) A gas well.
(v) A mineral well.
(vi) A drainage well.
(vii) A recharge well.
(viii) A test well.
(ix) An injection well.
(x) Other unplugged borings.

(b) " Aquifer test" means a groundwater resource assessment completed under Act No. 399 of the Public Acts of 1976, as amended, being §325.1001 et seq. of the Michigan Compiled Laws, R 325.10813 governing the study of hydrogeological conditions by suppliers of water of type I and type IIa public water supplies, and R 325.10814 governing the studies of suppliers of water of type IIb and type III public water supplies.

(c) " Contaminant source inventory" means the identification of sources of contamination or land uses within a wellhead protection area that have a potential to adversely impact the groundwater resource.

(d) " Delineation" means a hydrogeologic investigation conducted for the purpose of determining a wellhead protection area that meets the requirements of the state of Michigan wellhead protection program.

(e)" Elements" means the 7 areas that shall be addressed to obtain approval of a wellhead protection program and includes all of the following:

(i) Roles and duties.
(ii) Delineation of the wellhead protection area.

(iii) Identification of potential and known contaminant sources.
(iv) Management strategies.
(v) Contingency plans for the wellhead protection area.
(vi) New wells.
(vii) Public participation.

(f) " Grant applicant" means a community public water supply, or a not-for-profit, nontransient, noncommunity public water supply that applies for grant assistance under the wellhead protection grant program on behalf of the persons or municipality served by the public water supply.

(g) " Grant assistance" means the dedication of grant funds to a public water supply to support the development and implementation of a wellhead protection program.

(h) " Grant-eligible activity" means a task undertaken by a community or nontransient, noncommunity public water supply for the purpose of determining a wellhead protection area or developing and implementing a wellhead protection program that is eligible for grant assistance in accordance with these rules.

(i) " Grant program priority list" means an annual list of grant applicants developed by the department that ranks the applicants for prioritization of grant assistance.

(j) " Local team" means a group of not less than 3 persons that includes the public water supply superintendent, a representative of the municipality, and a representative from at least 1 of the following entities whose purpose is to facilitate the development, implementation and long-term maintenance of a wellhead protection program:

(i) Local health department.
(ii) Local fire department.
(iii) Business and industry.
(iv) Agriculture.
(v) Education.
(vi) Planning.
(vii) Environmental groups.
(viii) The general public.

A local team for a nontransient, noncommunity public water supply shall include representation from not less than 3 of the groups listed in this subdivision.

(k) " Low tritium public water supply" means a community supply or nontransient, noncommunity water supply that has had its well water sampled for tritium and had sample results of not more than 1.0 tritium unit (TU).

(l) " Total grant assistance" means the maximum amount of grant assistance each fiscal year that a public water supply may receive based upon the population served by the public water supply and the number of wells owned and operated by the public water supply.

(m) " Wellhead protection area" means the area which has been approved by the department in accordance with the state of Michigan wellhead protection program, which represents the surface and subsurface area surrounding a water well or well field, which supplies a public water supply, and through which contaminants are reasonably likely to move toward and reach the water well or well field within a 10-year time of travel.

(n) " Wellhead protection program" means a program that has been approved by the department upon meeting the criteria for approval under the state of Michigan wellhead protection program.

R 325.12802 Applicant qualifications.

Rule 2802. (1) Community and not-for-profit, nontransient, noncommunity public water supplies that utilize groundwater as a source of water, exclusive of federally owned public water supplies, may qualify for grant assistance.

(2) A public water supply that applies for grant assistance shall provide a local match equal to the grant assistance requested in the grant application.

(3) A public water supply that receives grant assistance shall be able to complete the grant-eligible activities specified in the grant application within 2 years from the time the grant assistance is awarded to the public water supply.

(4) Public water supplies that have outstanding prior year fees as prescribed in the Act are not eligible for grant assistance.

R 325.12803 Submission of applications.

Rule 2803. (1) An applicant for grant assistance shall apply to the department on a form prescribed and provided by the department.

(2) The department shall establish a deadline for submission of applications in the grant application process and shall notify applicants of the application deadline on the form prescribed and provided by the department.

(3) An applicant shall provide a description of the grant-eligible activities for which the grant assistance is to be applied.

(4) An application shall include proof, through 1 of the following, of a local match to the grant assistance and proof that the grant assistance and local match will be expended on grant-eligible activities, as applicable:

(a) Providing documentation of a line item budget dedicated to the grant-eligible activities identified in the grant application. The line item budget shall include the dedication of funds to grant-eligible activities in an amount equal to the grant assistance plus the local match.

(b) Providing documentation of a contractually binding agreement committing the applicant to an expenditure of funds in an amount equal to the grant assistance plus the local match for the grant-eligible activities identified in the grant application.

(c) Providing documentation of previous expenditures on grant-eligible activities equivalent to or greater than the grant assistance requested in the grant application.

(d) Providing documentation of the match through a combination of any of the items specified in this subrule.

(5) Previous expenditures by the applicant to seal abandoned wells as defined in Part 127 of Act No. 368 of the Public Acts of 1978, as amended, being §333.12701 et seq. of the Michigan Compiled Laws, within a wellhead protection area or within a 1-mile radius of a low tritium public water supply may be utilized as the local match.

R 325.12804 Long-term commitment to wellhead protection.

Rule 2804. (1) A grant applicant shall demonstrate a long-term commitment to the development, implementation, and maintenance of a wellhead protection program by providing both of the following:

(a) A time line for completion of the grant-eligible activities.

(b) A time line for the completion of each of the elements required of a state-approved wellhead protection program.

(2) The applicant shall demonstrate the establishment of a local team whose goal is to facilitate the development, implementation, and maintenance of a wellhead protection program.

R 325.12805 Priority list.

Rule 2805. (1) Annually, the department shall develop a grant program priority list of applicants deemed eligible for grant assistance.

(2) For the purpose of providing grant assistance, the grant program priority list shall take effect on the first day of each fiscal year, except for fiscal year 1998.

(3) The grant program priority list shall be based upon all of the following criteria:

(a) The establishment of a local team.

(b) Coordination of the local team with an adjacent municipality.

(c) The adoption of a local ordinance or resolution related to wellhead protection.

(d) The manner in which the local match is provided.

(e) The proposed time line for completion of a wellhead protection program.

(f) Incorporation of the wellhead protection program into other land use planning strategies.

R 325.12806 Availability of grant funds.

Rule 2806. (1) Grant assistance shall be provided to an eligible grant applicant to the extent that grant funds are available as determined by the department.

(2) An eligible applicant denied grant assistance during the year a grant program priority list is developed shall be prioritized on the next annual grant program priority list using the same criteria, unless the applicant submits an amendment to the grant application that alters the applicant's status on the grant program priority list or unless conditions change for the original grant submittal.

(3) An applicant that has not received grant assistance upon application in any previous fiscal year shall be placed on the grant program priority list ahead of an applicant who was funded in a previous year and funded in the current fiscal year of application if all of the following provisions apply:

(a) The applicant meets the minimum points requirement for funding in the priority list score as specified in R 325.12807(2).

(b) The awarding of grant assistance to the applicant is in compliance with R 325.12810.

(c) Grant funds are available.

R 325.12807 Priority list score.

Rule 2807. (1) A maximum of 25 points may be awarded a grant applicant for prioritization on the annual grant program priority list.

(2) A minimum of 10 points is required in the priority list score to be eligible for grant assistance.

(3) A maximum of 5 points shall be assigned a grant applicant for the development of a local team. The points shall be assigned in accordance with the following schedule:

(a) Five points for a team that includes representation by the public water supply superintendent, the municipality, and any 6 of the following entities:

(i) The local health department.

(ii) The local fire department.

(iii) Business and industry.

(iv) Agriculture.

(v) Education.

(vi) Planning.

(vii) An environmental group.

(viii) The general public.

(b) Four points for a team that includes representation by the public water supply superintendent, the municipality, and any 5 of the following entities:

(i) The local health department.

(ii) The local fire department.

(iii) Business and industry.

(iv) Agriculture.

(v) Education.

(vi) Planning.

(vii) An environmental group.

(viii) The general public.

(c) Three points for a team that includes representation by the public water supply superintendent, the municipality, and any 4 of the following entities:

(i) The local health department.

(ii) The local fire department.

(iii) Business and industry.
(iv) Agriculture.
(v) Education.
(vi) Planning.
(vii) An environmental group.
(viii) The general public.

(d) Two points for a team that includes representation by the public water supply superintendent, the municipality, and any 3 of the following entities:
(i) The local health department.
(ii) The local fire department.
(iii) Business and industry.
(iv) Agriculture.
(v) Education.
(vi) Planning.
(vii) An environmental group.
(viii) The general public.

(e) One point for a team that includes representation by the public water supply superintendent, the municipality, and any 2 of the following entities:
(i) The local health department.
(ii) The local fire department.
(iii) Business and industry.
(iv) Agriculture.
(v) Education.
(vi) Planning.
(vii) An environmental group.
(viii) The general public.

(4) Two points shall be assigned for a local team that includes representation from an adjacent municipality which has land in the projected or approved wellhead protection area or which receives service from the applicant or if the approved wellhead protection area lies entirely within the jurisdiction of a municipality and the public water supply does not provide service to an area outside of the jurisdiction of the municipality.

(5) A maximum of 3 points shall be assigned a grant applicant for the adoption of an ordinance or resolution as follows:

(a) Three points for the passage of a local ordinance related to the development and implementation of a local wellhead protection program.

(b) One point for the adoption of a local resolution that demonstrates a commitment to the development and implementation of a local wellhead protection program.

(6) A maximum of 6 points shall be assigned a grant applicant based upon the manner in which the local match is demonstrated as follows:

(a) Six points for demonstrating that the local match has been provided through the previous expenditure of funds on grant-eligible activities.

(b) Three points for demonstrating that the local match and the grant assistance have been committed through a contractually binding agreement with a consultant.

(c) One point for demonstrating that the local match has been provided as an identifiable item within a local budget dedicating the local match and the grant assistance to grant-eligible activities.

(7) A maximum of 3 points shall be assigned a grant applicant based upon the time line for completion of a wellhead protection program as follows:

(a) Three points for a program completed before the date of the grant application.

(b) Two points for a time line for program completion within 1 year of the date of application.

(c) One point for a time line for program completion within 3 years of the date of application.

(8) A maximum of 6 points shall be assigned the grant applicant as follows:

(a) Three points for a plan to incorporate the wellhead protection program into a municipality's master plan or other regional land use planning program.

(b) Three points for a plan to implement a public outreach, education, or planning program of not less than 3 years duration.

(9) If the priority list score results in a tie between 2 applicants, then the award of grant funds shall be provided to the applicants as follows:

(a) The applicant that has received the lesser amount in total grant funds through application in previous fiscal years shall be awarded the grant funds in the current year of application.

(b) If the applicants have received the same amount in total grant funds through application in previous fiscal years, then the applicant whose public water supply exhibits the greatest population-to-grant dollars ratio shall be awarded the grant assistance.

R 325.12808 Total grant assistance based upon population served.

Rule 2808. (1) The total grant assistance received by a public water supply in the wellhead protection grant program shall be based upon the total population served by the public water supply.

(2) The total grant assistance available to a public water supply shall be as follows:

(a) A public water supply that serves a population of 500 persons or less shall be eligible for a total grant assistance of not more than $7,500.00.

(b) A public water supply that serves a population of 501 to 3,300 persons shall be eligible for a total grant assistance of not more than $15,000.00.

(c) A public water supply that serves a population of 3,301 to 10,000 persons shall be eligible for a total grant assistance of not more than $30,000.00.

(d) A public water supply that serves a population of more than 10,000 persons shall be eligible for total grant assistance of not more than $50,000.00

(3) A grant applicant that requests grant assistance in excess of the population-based limit for the total grant assistance shall be granted the maximum allowable grant assistance in accordance with subrule(2) of this rule if other requirements for grant assistance are fulfilled.

R 325.12809 Total grant assistance based upon number of wells.

Rule 2809. (1) The total grant assistance available to a public water supply based upon the population served shall be increased based upon supplemental grant assistance that reflects the number of wells which the public water supply owns and operates as follows:

(a) A public water supply that owns and operates 3 to 5 wells shall be eligible for supplemental grant assistance of not more than $5,000.00.

(b) A public water supply that owns and operates 6 to 10 wells shall be eligible for supplemental grant assistance of not more than $10,000.00.

(c) A public water supply that owns and operates 11 to 15 wells shall be eligible for supplemental grant assistance of not more than $15,000.00

(d) A public water supply that owns and operates more than 15 wells shall be eligible for supplemental grant assistance of not more than $20,000.00.

(2) A grant applicant that requests supplemental grant assistance in excess of the maximum based upon the number of wells owned and operated by the public water supply shall be provided the maximum grant assistance in accordance with subrule(1) of this rule.

R 325.12810 Distribution of available grant funds based upon population served by public water supplies.

Rule 2810. (1) If the requests for grant assistance exceeds the grant funds available in a fiscal year, then the maximum and minimum grant assistance provided

to public water supplies according to the population served shall be based upon a percentage of the total grant funds available for the fiscal year as follows:

(a) Public water supplies serving a population of 500 persons or less shall receive not more than 30%, and not less than 15%, of the total grant funds available in any given fiscal year.

(b) Public water supplies serving a population of 501 to 3,300 persons shall receive not more than 50%, and not less than 25%, of the total grant funds available in any given fiscal year.

(c) Public water supplies serving a population of 3,301 to 10,000 persons shall receive not more than 30%, and not less than 15%, of the total grant funds available in any given fiscal year.

(d) Public water supplies serving a population of more than 10,000 persons shall receive not more than 30%, and not less than 15% of the total grant funds available in any given fiscal year.

(2) The department may provide a greater percentage of the available grant funds to public water supplies of a given population served if requests for grant assistance do not exceed the established minimum percentage of total grant funds available to public water supplies of other population-served categories.

R 325.12811 Disbursement of grant assistance.

Rule 2811. (1) The department shall disburse the grant assistance upon submittal of a project report demonstrating that the applicant has completed the grant-eligible activities identified in the grant application.

(2) The department may provide a partial disbursement of the grant assistance upon submittal of a project report demonstrating that the applicant has completed a corresponding and appropriate portion of the grant-eligible activities identified in the grant application. A partial disbursement of the grant assistance shall not exceed 50% of the total cost of the corresponding and appropriate portion of the grant-eligible activities for which the partial disbursement is requested.

R 325.12812 Grant-eligible activities to support local wellhead protection programs; contact person; formation of local team; team responsibilities

Rule 2812. (1) Grant-eligible activities shall support the development or implementation of a local wellhead protection program and be consistent with the state of Michigan wellhead protection program.

(2) A public water supply shall provide the department with the name, title, and address of a contact person who shall take the lead in the development and implementation of the local wellhead protection program, including local administration of the wellhead protection grant.

(3) A public water supply shall provide the department with evidence of the formation of a local team. The team shall consist of the public water supply superintendent, the municipality, and at least 1 of the following entities:

(a) The local health department.

(b) The local fire department.

(c) Business and industry.

(d) Agriculture.

(e) Education.

(f) Planning.

(g) An environmental group.

(h) The general public.

(4) The local team shall be responsible for providing a time line for the completion of grant-eligible activities identified in the grant application.

(5) The local team shall be responsible for providing a time line for the completion of a wellhead protection program.

R 325.12813 Wellhead protection program elements.

Rule 2813. (1) The following wellhead protection program elements include grant-eligible activities for which grant funds may be applied:

(a) The establishment of roles and duties.
(b) The delineation of a wellhead protection area.
(c) The completion of a contaminant source and land use inventory.
(d) The development or implementation of management strategies and programs to control contaminant sources or land use.
(e) The development and implementation of a contingency plan.
(f) The phasing of new wells into a wellhead protection program.
(g) The development or implementation of public participation strategies in a wellhead protection program.
(2) Program development and implementation activities, such as a contaminant source and land use inventory, development and implementation of management strategies, contingency planning and public participation, are eligible for grant assistance in more than 1 fiscal year.

R 325.12814 Grant-eligible activities; development and implementation of certain partnership agreements.
Rule 2814. The development and implementation of partnership agreements between municipalities for the purpose of wellhead protection is grant-eligible.

R 325.12815 Grant-eligible delineation activities.
Rule 2815. (1) Grant-eligible delineation activities shall be proposed, described, and completed in accordance with the wellhead protection area delineation guidance established by the department in the state of Michigan wellhead protection program.
(2) Grant-eligible activities include the following:
(a) The compilation of existing hydrogeologic information.
(b) The Installation of observation wells for an aquifer test on an existing public water supply well.
(c) Aquifer tests and aquifer test analysis on an existing public water supply well.
(d) Surveying.
(e) Collection of static water levels.
(f) Groundwater modeling, including particle tracking.
(3) If deemed necessary by the department due to the lack of accessibility to existing wells, the area geology indicates a public water supply may be a low tritium public water supply, or a known groundwater contamination is present within the wellhead protection area, the following activities may be deemed grant-eligible:
(a) The installation of monitoring wells for the collection of static water level information.
(b) The collection and analysis of tritium samples.
(c) The installation of sentinel wells to monitor water quality within the wellhead protection area.

R 325.12816 Grant-eligible contaminant source and land use inventory activities.
Rule 2816. (1) Contaminant source and land use inventories to identify existing and potential threats to a public water supply are grant-eligible within the wellhead protection area or within a 1-mile radius of the well field for a low tritium public water supply.
(2) the following contaminant source and land use inventory activities are grant-eligible activities:
(a) Record searches to identify potential sources of contamination and land uses that have a potential to impact the groundwater.
(b) General surveys to identify potential sources of contamination and land uses that have a potential to impact the groundwater.
(c) On-site inspection of facilities that have a potential to impact the groundwater.

(d) Record searches to identify historical land uses that have a potential to impact the groundwater.

(e) The mapping of existing and potential sources of contamination within the wellhead protection area.

(f) Updating a contaminant source inventory.

(g) The development and implementation of a program to locate and identify abandoned wells.

R 325.12817 Grant-eligible management activities.

Rule 2817. (1) Grant-eligible management activities shall provide an elevated level of protection to the wellhead protection area or within a 1-mile radius of the well field for a low tritium public water supply.

(2) Grant-eligible management activities include the following:

(a) The development and implementation of best management practices that reduce the risk of groundwater contamination.

(b) The development and implementation of wellhead protection resolutions or ordinances.

(c) On-site inspections for the purpose of improving facility management of potential sources of contamination.

(d) The development and implementation of a program to control abandoned wells, excluding the actual sealing of abandoned wells.

(e) Incorporation of a wellhead protection program into a municipality's master plan or other regional land use planning program.

R 325.12818 Grant-eligible contingency plan and emergency response protocol activities.

Rule 2818. The development and implementation of a contingency plan and emergency response protocol for a wellhead protection area or within a 1-mile radius of the well field for a low tritium public water supply are grant eligible activities.

R 325.12819 Grant-eligible new well activities.

Rule 2819. Grant-eligible activities for new wells include the following:

(a) Completion of a delineation for a new well or well field, exclusive of the cost incurred to conduct an aquifer test that is a requirement of the public water supply program for the construction of new wells.

(b) The development and implementation of a wellhead protection program for a new well or well field.

(c) Incorporation of a new well or well field into an existing wellhead protection program.

R325.12820 Grant-eligible public participation activities.

Rule 2820. (1) Grant-eligible activities for public participation shall provide a positive benefit to the wellhead protection program by raising public awareness in matters pertaining to wellhead protection and utilization of the groundwater resource by a public water supply.

(2) Grant-eligible activities for public participation include, but may not be limited to, the following:

(a) The development and implementation of a school curriculum related to wellhead protection.

(b) The development and implementation of a strategy to educate the general public on issues related to wellhead protection.

(c) The development, production, and circulation of educational materials.

(d) The development, preparation, and production of media announcements, such as news releases, newspaper articles, and radio announcements.

(e) Signing activities which identify an approved wellhead protection area or which promote the concept of wellhead protection, such as storm drain stenciling and the construction and placement of road signs.

APPENDIX I

Michigan Department of Environmental Quality
Drinking Water and Radiological Protection Division

Wellhead Protection Grant Application

Water Supply Name:_____ WSSN: _____

Address: _____

Contact: _____ Title: _____ Phone: _____

Contact's Address:_____

Population served by public water supply: _____ Number of wells: _____
Source of population data_____

I. Grant assistance based on population served a. _____
Supplemental assistance based on number of wells b. _____
Total grant assistance you are eligible for this funding cycle
(add lines a and b) c. _____
Total of previous expenditures to date d. _____
Amount of grant assistance requested this application e. _____

II. Demonstrate that funds have been committed to wellhead protection and attach documentation of the dedication of funds to the grant eligible activities for which grant assistance is being requested. Provide proof of the dedication of funds to grant eligible activities in the form of receipts for previous expenditures, proof of a written agreement, or proof of the funds as a local budget item. Please complete attached Table 1: Previous Expenditures Tabulation, to document all previous expenditures. Include all documentation for this section as Appendix A. (Maximum 6 Points)

III. For completion of this section, please refer to the attached Table 2: Grant Assistance Tabulation. The tabulation is completed to identify previous expenditures that can be utilized as a local match, identify projected project costs, and define the distribution of grant assistance to the grant eligible activities for which assistance is being requested.

1. First, identify in column (A), Grant Eligible Activities, all grant eligible activities you have previously completed. It is important that all previous grant eligible activities be identified in your first application.
2. Next, identify in column (A) the grant eligible activities to be completed for which you are requesting grant assistance. A breakdown of the grant eligible activities is important if you will be requesting a partial distribution of grant funds.
3. In column (B), Deliverable (report, contaminant inventory, etc.), identify the "deliverable" related to the grant eligible activities.
4. In column (C), Activity Cost, enter the previous expenditures or the projected cost for completion of the grant eligible activities identified in column (A).
5. In column (D), Amount Requested for the Activity, enter the amount of grant assistance you are requesting for the grant eligible activity identified in column (A). Reimbursement for previous expenditures is not available. Accordingly, for grant eligible activities you have previously completed, column (D) will be zero. However, previous expenditures can be carried forward as a local match for the Grant Eligible Activities to be completed in this and future grant applications.

When the table is properly completed, the Total for column (C), Activity Cost, will be two times or greater than the Total for column (D), Amount Requested for the Activity. Include Table 2: Grant Assistance Tabulation at the end of Appendix A.

EQP 2054 (Rev. 12/98)

IV. Establishment of a local team consisting of at least 3 individuals is required for a public water supply to receive grant assistance. The local team must include the PWS superintendent and representation from the municipality or owner served by the PWS. Identify members of the local team by filling in appropriate sections of the following table. Team members must complete the Participation Agreement forms and the forms included with the application to be eligible for the maximum of 5 Points. Adjacent municipality representation is worth 2 additional points. Include all documentation for this section as Appendix B.

Local Team Representative	Name	Representing
PWS Superintendent	_____	_____
Municipality	_____	_____
Local Health Department	_____	_____
Local Fire Department	_____	_____
Business and Industry	_____	_____
Agriculture	_____	_____
Education	_____	_____
Planning	_____	_____
Environmental Organization	_____	_____
General Public	_____	_____
Adjacent Municipality	_____	_____
Other	_____	_____

V. Demonstrate a long-term commitment to the development, implementation, and maintenance of a Wellhead Protection Program. Attach documents, as applicable, to demonstrate your long-term commitment to wellhead protection. Include all documentation for this section as Appendix C.

Attachment 1: Local Ordinance or Resolution related to wellhead protection (Maximum 3 Points)
Attachment 2: Schedule of Completion for local Wellhead Protection Program (Maximum 3 Points)
Attachment 3: Evidence of incorporating wellhead protection into Master Plan or other land use planning programs (Maximum 3 Points)
Attachment 4: Public Outreach and Education (Maximum 3 Points)

VI. I certify that all information in this application is true and complete. I understand any misstatement of facts may result in forfeiture of grant assistance eligibility.

SIGNATURE: _____ DATE_____

TITLE:_____

APPENDIX J
WHP IMPLEMENTATION PLAN

Activity	*Method*	*Schedule*	*Milestone*
ROLES & DUTIES			
Review roles and duties of state WHPP staff and organize to optimize staff strengths and program efficiency.	WHP staff and program evaluations. Meetings, discussions and agreements.	On an annual basis.	Development of a strategic plan which outlines specific roles and duties for state WHPP staff which supports program goals.
Complete source water assessments to identify PWSS in greatest need of WHP for Noncommunity Systems.	County health depts. will conduct source water assessments and evaluate well construction, land use, hydrogeology & water sampling results for Noncommunity Systems.	Reviews will be completed on PWSS by 2003.	Identification of "target" communities that would benefit the most from participation in WHP.
Complete vulnerability assessments for Community Water Systems that do not have WHPPs	Vulnerability assessments and sanitary surveys are performed by District Engineer	All PWSS evaluated for SWAs by 2003.	All highly vulnerable PWSSs targeted to participate in WHP by 2003.
Establish the target number of new communities the state will provide WHP assistance to.	Evaluate state resources. Set feasible target numbers for assistance. Design plan to increase assistance once staff increases.	On an annual basis.	Provide assistance to "target number" of new communities.
Establish the target number of local WHPPs to be approved annually.	Evaluate state resources and ability to partner with "service providers" to help communities complete a WHPP.	On an annual basis.	Approve "target number" of local WHPPs per year.
Integration of WHPP with state agencies MDEQ, MDA, MDOT, State Police.	Meetings, formal and informal agreements	Ongoing	Formal and informal agreements from departments/divisions which support WHP
Coordination of WHPP with "Service Providers": GEM centers, watershed councils, TCRPC, MRWA.	Meetings, conferences, Internet	Ongoing	Increased WHP support to communities Service Providers
Coordination of WHPP with supporting agencies: MSPO, MTA, MML, MAC, MAR, MSU Extension, NRCS.	Meetings, conferences, Internet	Ongoing	Increased involvement of these organizations with the WHPP. Formal or informal agreements/MOUs

Coordinate WHPP with U.S. EPA programs.	Through meetings, correspondence and conferences.	Meet annually at a minimum with semiannual meetings preferred.	Increased federal support of the MWHPP and coordination of more federal programs with the WHPP.
Communicate with other states to exchange information on WHP and problem solve.	Meetings, community visits, correspondence, conferences and workshops.	Meet annually at a minimum with semiannual meetings preferred.	Communication links which will facilitate the exchange of information. Improved state WHPP.
Develop Rules to administer WHP grants.	Coordination with Adm. Section and WHP Rules advisory team.	Draft rules complete in 1998.	Approved Rule package
Establish WHPP Grant program for communities	Creation of a grant advisory team	Review by grant advisory team. Make appropriate revisions.	Establishment of WHP Grant program.
Evaluate establishment of WHPP contracts with service providers.	Creation of contract advisory team.	Meet as necessary until contract strategy established	Establishment of contracts to assist communities with WHPPs.
DELINEATION OF WHPA			
Assist communities in the process of WHPA delineation.	Through meetings and review of work plans and groundwater modeling efforts.	On an as needed basis.	Review WHPA delineations submitted to the state within thirty days.
Develop state policy for use of Tritium results in WHPA delineation scheme.	Review current research and existing guidance. Discuss among WHP staff and Service Providers.	Development of draft policy in FY 98 and revisions as new technology improves analysis techniques and/or the MWHPP is modified.	Draft policy on the use of Tritium and WHPA delineation in FY 98.
Provide additional incentives and support to seal abandoned wells for communities with no tritium detected.	Through the District Engineer.	Development of additional material related to proper sealing of abandoned wells on an as needed basis.	Development of incentives, mechanisms, code violation letters and list of cost share opportunities for proper well closure. Additional well closure education & guidance for PWSSs.

Incorporation of WHPA delineations in the MIRIS data base and on the division's Internet home page.	Meetings with MIRIS data base supervisor to obtain approval and identify responsibilities for data entry. Scanning WHPAs to place on home page.	Meeting to discuss feasibility of MIRIS overlay data layer in FY 98. All WHPAs on home page in FY98.	MIRIS WHPA data layer and all WHPAs on home page.
CONTAMINANT SOURCE IDENTIFICATION			
Assess local contaminant source inventory efforts.	Through monitoring waiver program.	Once every three years.	Evaluate the contaminant source identification status for all communities participating in the program.
Assist local communities with identification of major sources of contamination which are on the MIRIS system.	By providing ARC View maps to communities with approved WHPA delineations.	Upon request by community.	Establishment of a process by which maps can be generated for all requests within one month.
Sharing local WHPP contaminant source identification techniques	Through outreach activities such as workshops and informational documents such as the "Lessons Learned" document.	As opportunities arise.	Completion of a new "Lessons Learned" document and a conference/workshop to exchange ideas.
Updating list of "Land Use Categories with a Potential for Groundwater Contamination"	Research and/or new survey.	Once every three years.	Updated list of land use categories with a potential to contaminate groundwater and those that are most common in WHPAs.
WELLHEAD PROTECTION AREA MANAGEMENT			
Provide assistance to communities developing their management plan for WHP.	By providing informational materials and opportunities for communities to meet and exchange ideas.	On an as needed basis.	Creation of a new guidance document. Offer a "Networking Conference" to exchange ideas.
Incorporation of WHP into other regulatory program's protocols or regulations to better manage WHPAs.	Meetings, presentations, educational materials and workshops	Meetings will be held as opportunities arise. New materials will be developed and conferences will be held on an annual basis.	Increased education,integration of WHP with DEQ's LWMD,WMD, ERD, GSD, USTD, SWQD, & EAD, DWRPD and MDA's PPPMD & Environmental Division. Initial integration of WHP with MDOT's Geoenvironmental Group is targeted for FY98.
Strengthening small community PWSSs management component.	Educational opportunities, creation of new informational materials.	As opportunities arise.	Creation of additional informational brochures, news articles and/or a workshop to exchange information for small community supplies.
Provide assistance to noncommunity PWSSs for management of the WHPA.	Through the sanitary survey.	Once every five years.	All noncommunity PWSS sanitary surveys completed and appropriate sampling established by 1999.

CONTINGENCY PLAN			
Review local WHPPs to ensure appropriate contingency plan.	Through initial and recurring review of local WHPPs.	Upon initial program approval and every three years when programs are reviewed.	Submittal and maintenance of local contingency plans for delineated WHPAs.
Increase coordination with State Police Emergency Management Division to support WHPP.	Through meetings and agreements.	Establish agreement by end of FY 97. Review progress on an annual basis.	Agreement to coordinate and support community WHPPs.
NEW WELLS			
Collection of data for WHPA delineation for new wells.	Through incorporation of requirements for data collection in the MSDWA rules.	As permits by MDEQ for new wells are granted.	Establishment of aquifer data for all new wells.
Incorporation of all new wells into an existing local WHPP.	Through requirements stipulated in the MWHPP.	As new PWSSs come on-line.	Delineation of WHPA and incorporation of all new wells into an existing WHPP.
PUBLIC PARTICIPATION			
Public involvement.	Workshops and conferences.	On an annual basis.	New communities participating in the program. Greater public involvement from those communities presently participating in the program.
Public awareness of WHPP.	Documents, fliers, pamphlets.	On an as needed basis.	Development of additional information and outreach methods and materials for home and business owners.
Development of a public service announcement for WHP	Through PSA process	By 1999	Increased public awareness and involvement in WHPP
Development of WHP newsletter or activities report on home page.	Coordination with Division internet person.	First "newsletter" in FY98 with revisions every 6 months.	Increased public awareness and involvement in WHPP.

APPENDIX K

Source Water Assessment

Ground Water in Karst Hydrologic Systems (KHS)

Issues specific to PWS withdrawing ground water in KHS

- The typical conceptual model of ground water flow in karst areas is (1) solutionally enlarged horizontal bedding plane openings act as aquifers, (2) the intervening matrix acts as confining units, and (3) vertical fractures and sinkholes interconnect some aquifers with each other and/or with the land surface
- Ground water flow in karst areas can be extremely fast due to high hydraulic conductivity and low porosity
- The area contributing flow to a well can be quite large due to the very low storage in bedding plane openings
- In some areas, ground water will be under the direct influence of surface water
- Typical wellhead protection approaches should be used with caution, though in some cases they will be applicable or will serve as a good first cut for evaluating potential contaminant sources and vertical hydraulic heterogeneities
- Nonpoint sources and sinkhole sources are substantive issues of concern
- Pathogens are a substantive issue of concern

Applicable data and approaches

- A substantial number of studies have focused on issues relevant to SWAP in karst areas and considerable expertise is available.
- Historical water quality and GIS land use data may be available
- Findings from similar settings in Michigan or nearby states may substantially decrease long-term monitoring needs
- Microbial molecular methods are preferable and applicable to potential pathogens

Approach

Delineate source water protection area (SWPA)

- Previous studies in similar hydrologic settings should be systematically evaluated and used to help guide the final design for SWAP in karst areas
- Delineation should be done in a step-wise fashion individually tailored to what is already known about the aquifer for each PWS—this should help avoid unnecessary costs. We should consider the idea of a first-cut delineation which is very conservative, that is large enough to include any potential source area. Then evaluate available information on potential contaminant sources and hydraulic heterogeneities within the first-cut delineation. A procedure for a final delineation would be based on this evaluation.
- Enter delineation into GIS

Source inventory within SWPA

- Use available water quality database and GIS databases for land use and demography
- Where needed, acquire digital air imagery, interpret, and enter into GIS

Significant potential point sources

- Use available paper, computer, and GIS databases
- Confirm locations of any major potential point sources with GPS

Significant potential nonpoint sources

- Use available GIS databases for land use and demography
- Interpret potential nonpoint sources according to relevant studies linking land use to potential contaminants (for example, NAWQA)

Contaminants of concern

- Identify potential contaminants based on findings from previous 2 steps
- Determine if available water quality data confirm or deny presence of potential contaminants
- Collect samples to confirm presence or absence of potential contaminants
- Design appropriate long-term sampling program to minimize analytical costs for public water supply (PWS) based on available and new water quality data

Determination of PWS susceptibility

- Initial level of susceptibility based on findings from above
- Long-term level of susceptibility based on projected land use and demographic changes in SWPA and findings in other SWPAs in Michigan or similar watersheds in Great Lakes states—appropriate sampling to reduce future risks
- Time-of-travel should be estimated using conservative approaches. Measurement of time-of-travel would be too expensive
- Where applicable use available interpretations of sinkhole locations and fracture lineations and compare to locations of potential sources of contamination. Where unavailable, develop new interpretations based on aerial imagery.

APPENDIX L

FINAL DRAFT

Assessment Protocol for Great Lakes Sources

Revised 8/30/99

Introduction

Recently there has been concern over the protection of the nation's drinking water sources. This issue has been debated nationally and eventually was addressed in federal legislation. In 1996 when the federal Safe Drinking Water Act was reauthorized, legislation was added that requires source water assessments be performed on all sources of public drinking water supplies. The assessments must consider the vulnerability of these public drinking water sources. Assessments of intakes that extend into the Great Lakes present a unique challenge in determining the scope and magnitude of these assessments with limited resources. The intakes for some of these sources extend far enough into a lake to receive no effects from specific shoreline contaminant sources (except possibly air borne contaminants) while others closer to shore do. To provide guidance on how source water assessments should be performed, it will be necessary to address this very basic premise. USEPA may be able to give some assistance by providing access to data bases, developing screening methods and area wide monitoring for general contaminants, general lake responses to airborne contaminants, and other area wide general assistance.

A workgroup from the Great Lakes States is being organized to develop these parameters. This workgroup includes representatives of the Great Lakes States, water utilities with intakes on the Great Lakes, USEPA Region V and other interested parties. There should be consensus among the states and USEPA on the make up of the group. USEPA and the Region V states met on June 16, 1999 to develop a mission state and a final draft of this protocol. The following mission statement defines the intent of the workgroup.

> *The mission of the Great Lakes Protocol Workgroup is to develop a consensus amongst the states for a consistent procedure allowing the flexibility necessary to properly conduct source water assessments of our Great Lakes drinking water sources. This flexibility will take into account the variability of these sources and site specific concerns for determination of source sensitivity and susceptibility.*

Initial Survey

An initial survey will be performed at each Great Lakes source to assess local source water impacts. Any criteria or studies that were performed to locate the intake should be reviewed. Senior operators and the plant superintendent at the treatment plant should be interviewed to gain knowledge of the raw water quality fluctuations. Past water quality records would need to be reviewed and also any data collected through the Information Collection Rule (ICR). Bacteriological quality, alkalinity and turbidity levels are good indicators of localized impacts. If this review indicates that only minor fluctuations occur in raw water quality compared to the lake's background quality, the source is probably not impacted from localized contaminants and the assessment would parallel a general water quality assessment of the total lake with some consideration for potential emergency spills.

The "Great Lakes Surface Water Assessment Survey" form developed with this protocol can be utilized as a screening tool to assist in determining localized impacts. The initial survey should be used to assist with determining procedures to follow in conducting the survey. The assessment procedures will depend upon the type of local impacts, the availability and quality of local data, weather conditions, runoff, etc.

Critical Assessment Zone

To provide some continuity for assessing the Great Lakes intakes, the concept of a "Critical Assessment Zone" around each intake was developed. The two factors used for this zone which effect the sensitivity of Great Lake intakes **are** the distance from shore or length of the intake pipeline (L) in feet and the water depth (D) in feet. The shallower, near shore intakes are more sensitive to shoreline influences than the off shore, deep intakes. The **factor for** sensitivity (S) can be calculated by the formula:

$$L \times D = S$$

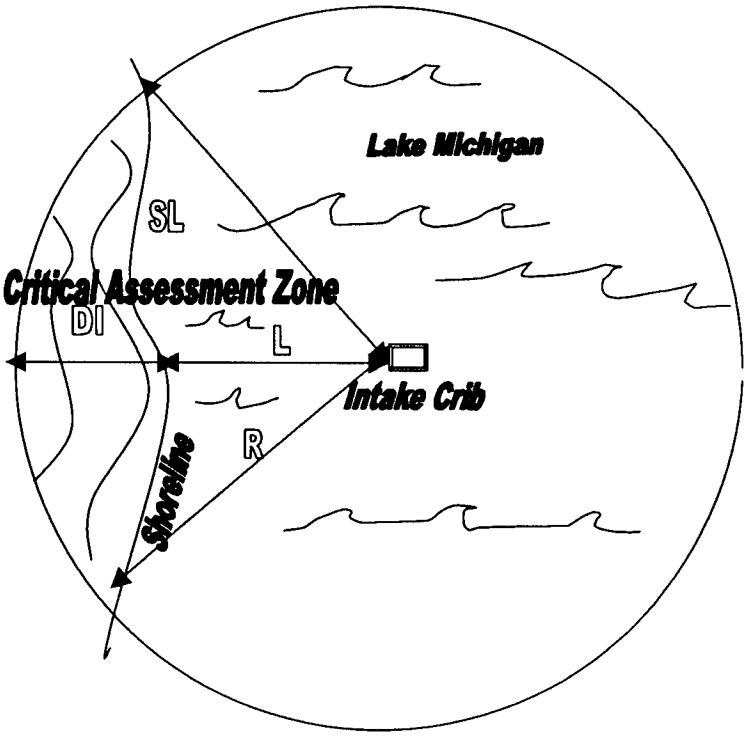
Generally, S values less than 25,000 represent highly sensitive intakes while S values greater than 125,000 indicate lower sensitivities. This degree of sensitivity can be used by the states as a tool to prioritize assessment activities and assist with the susceptibility determination after taking contaminant sources into account.

The intake's degree of sensitivity combined with information obtained from the survey form and local data such as intake construction, lake bottom characteristics, localized flow patterns, and thermal effects can be used to complete a sensitivity analysis.

The following columns represent Great Lakes intakes with high, medium and low sensitivities. A "Critical Assessment Zone" is defined as the area from the intake structure to the shoreline and inland. This area includes a triangular water surface and a land area encompassed by an arc from the endpoint of the shoreline distance on either side of the on shore intake pipe location. The shoreline distance (SL) is measured in feet in both directions from the intake pipe location on shore while the distance inland (DI) in feet is determined by subtracting the submerged intake pipe length (L) from the critical assessment zone radius (R). The drawing, which follows, illustrates an example of the critical assessment zone.

Note: √ indicates square root of parenthesized calculations.

Sensitivity Value	Critical Assessment Zone	Shoreline Distance	Distance Inland
<25,000	3,000 foot radius	$SL=\sqrt{(3000^2-L^2)}$	$DI=3000-L$
25,000-125,000	2,000 foot radius	$SL=\sqrt{(2000^2-L^2)}$ $L>2000;SL=0$	$DI=2000-L$ $L>2000;DI=0$
>125,000	1,000 foot radius	$SL=\sqrt{(1000^2-L^2)}$ $L>1000;SL=0$	$DI=1000-L$ $L>1000;DI=0$



Following the sensitivity analysis, an initial inventory should be completed by a combination of a simple survey form followed by an on site interview.

Attached to this document is a survey form the states could use to conduct this interview.

Completing the Assessment

If the assessment indicates the intake is not impacted by potential shoreline contaminants, the assessment should reference general Great Lakes water quality and trends within the source water assessment area. This information has been compiled by several sources such as the U.S. EPA's Great Lakes National Program Office and the Great Lakes Mass Balance Studies done by the USEPA, the States, and USGS. Another source could be the Remedial Action Plans for Great Lake Areas of Concern and the Lakewide Management Plans.

For systems where the initial survey indicates a potential for shoreline impacts, the assessment becomes more difficult and site specific. The next step would be to provide a delineation of the area that contributes potential impacts through the use of local data and/or the "Critical Assessment Zone" concept. It would then be necessary to assess the impacts in the area and their relative impact on the quality and treatability of the raw water. If a river or stream that discharges into the lake near the intake causes a significant impact, a partial watershed assessment of that river or stream would be necessary. These impacts may not be continual, but may arise only as a result of certain events such as a specific wind direction and intensity, or a river or stream discharge into the lake at a certain flow level. The USEPA BASINS software and USGS SPARROW software may provide data for this determination. There may also be impacts from certain thermal or seasonal conditions. The workgroup should develop criteria to determine "significant impact and level of impact". These issues will require extensive review of the water quality records and in depth interviews with plant personnel.

If the water quality impact is due more to a general lake condition, such as proximity to a shallow bay or wind direction, the degree of these impacts must be assessed. Interviews with the plant personnel with extensive experience at the plant would be essential. Once the impacts are categorized, assessments must be made for each impact. For example, if a shallow bay causes water quality impacts, these impacts should be noted along with the change in water quality anticipated and the degree and frequency of change. If the quality change results from an algae bloom, the conditions that promote the

bloom should be listed, along with the resulting water quality changes and the degree and frequency of the changes. Each impact should be listed in the narrative portion of the assessment.

If the impact results from a discharge on the shoreline, runoff from the shoreline, or location of a facility near the intake, these potential impacts should be listed and assessed. It will be necessary to delineate an "area of concern", determine the impacts in this area and then assess these impacts. This could become complex depending upon the shoreline assessment. If the impact were from runoff, it would first have to be assessed to determine the degree of impact due to the volume and concentration of contaminants in the runoff. Is the runoff significant? If it were, the potential makeup of the runoff would need to be assessed. For example, is the runoff from farmland? If so, the time of the year would be critical. If it were urban runoff, the types of commercial and industrial establishments in the area would be important. These assessments will be complex and must be designed so they can be altered and expanded, as more information becomes available. The assessment must be dynamic in nature and be designed to be expanded in the future.

Many bays and tributary mouths in urban or industrialized areas hold deposits of sediment contaminated by metals and organic toxicants. Records of EPA and State environmental management agencies, as well as the U.S. Army Corps of Engineers Harbor Dredging Programs should be evaluated to determine whether an increase in turbidity due to material suspended in such sites might pose a risk.

Wind direction, thermal effects and local current patterns affect many intakes. The affects may be due to a shallow bay, or proximity to a shallow bay, where the bottom sediments are stirred into the intake water column or it may direct shoreline runoff over the intake. These impacts can be surveyed by delineating the area that contributes water to the general area and checking the potential contaminants in the area. Extensive interviews with plant personnel and review of historical records will be necessary. Once the impact has been determined, the assessment of the impact must be made. The list of contaminants associated with each impact must be listed.

Remote sensing, including aerial photograph and satellite imagery, can be extremely revealing both in analyzing a history of events and near real time tracking of tributary and nearshore phenomena.

To complete the assessment, the susceptibility determination should include a general map of the area; delineation of the contributing areas, and listing of the locations of the various impacts along with a narrative that explains these impacts. Three-dimensional hydraulic models can be valuable tools for use in areas where they have been developed.

Before public release of the completed assessment, it should be reviewed with the water supplier for agreement of it contents.

Spill Assessments

Large volumes of materials are transported on the Great Lakes by shipping. Some of these materials are toxic in nature and are subject to accidental spillage during transit and loading. Ships also pose potential risks to intakes through accidental spills of fuel and lubricants. When doing vulnerability assessments of the intakes, this traffic should be considered. If ships pass in close proximity to an intake, or if there is a nearby commercial loading facility or harbor, procedures should be established to respond to spills from these ships. It would not be possible to predict many specific contaminants from general shipping, but proximity of a particular industry serviced at a local harbor would indicate heightened risk potentials for specific products or supplies. Procedures could be developed for reaction to families of contaminants, such as volatile organic chemicals, pesticides, etc. Previous spills in the vicinity, if any, should be reviewed and assessed. The source should have a contingency plan for guidance in an emergency.

Spills along lakeshores or connecting river shorelines should also be assessed along with potential spills from pipelines, docking facilities, railroad lines, etc. For example, there are numerous chemical plants along the St. Clair River, which connects Lake Huron to Lake St. Clair. These potential sites should first be identified and located on a map if the initial survey indicates there may be impacts from these areas. Procedures then should be developed for assessing and reacting to these types of emergencies. Where possible on the connecting rivers, modeling of the river flows could be used to assess potential impacts on intakes. In these cases, the specific contaminant would normally be known and this information could be used in the assessment.

For intakes located close to the lake shore lines, again the areas that could significantly impact the intake should be delineated. Potential spill sources in these areas such as industries; disposal facilities, highways, railroads; pipelines, etc. should be located, mapped and assessed. Depending upon the type of potential risk, the specific contaminant may be identifiable, but this may not always be the case. These spills should be considered differently from the routine discharges that may exist. A spill is a unique event, and emergency reaction would be necessary to deal with the potential impact.

Surveys of fixed facilities, pipelines, highway and rail corridors and shipping routes have generally been completed and can be obtained by contacting the local emergency planning committee or the area planning committee. These two groups should have inventories of oil and hazardous materials at fixed facilities and along transportation routes.

Potential Treatment Impacts

The impacts from treatments at the intake should also be included in the assessments. Continual treatment for zebra mussels may cause development of other impacts on the finished water quality. Short-term treatments or impacts such as intake cleaning, dredging, construction, etc should also be included in the assessment.

Summary

An outline of the general methodology to be used for Great Lakes intakes should be a main part of the source water assessment program for states in the Great Lakes Region. Due to the unique nature of each intake, each assessment will be site specific. Assessments of the Great Lakes water quality in general have been done by various agencies and these efforts should be referenced not duplicated. The site-specific assessments, if done in close cooperation with the treatment plants and local surface water protection agencies, become valuable tools to future operations and planning.

APPENDIX M

Michigan Source Water Assessment Program

Surface Water Assessment Survey

Water Supply Name _____ WSSN _____

Source Water/Intake Description _____

Please indicate your level of concern (Very, Somewhat, Low, Don't Know) for each of the following Contaminant Groups and Contaminant Sources with comments where appropriate.

Contaminants of Concern

Microbial(Coliform,Cryptosporidium) _____

Inorganics (Metals, Nitates, etc.) _____

Volatile Organics (Benzene, TCE, etc.) _____

Synthetic Organics (PCB's, Dioxin, etc.) _____

Pesticides (Atrazine, etc.) _____

Radioactivity (Radium, etc.) _____

Other _____

Contaminant Sources of Concern

Crop Related Agriculture _____

Grazing Related Agriculture _____

Animal Feeding Operations _____

Municipal Wastewater Discharges _____

Industrial Wastewater Discharges _____

Wastewater Treatment Bypasses _____

Combined Sewer Overflows _____

Urban Runoff/Storm Sewers _____

Construction Runoff _____

Contaminated Sediments _____

Bank or Shoreline Modifications _____

Drainage/Filling of Wetlands _____

Highway Runoff _____

Stream Channelization _____

Dredging _____

Dam Construction _____

Contaminants of Concern (continued)

Upstream Impoundments _____

Land Disposal of Sludge/Wastewater _____

Landfills _____

Leaky Underground Storage Tanks _____

Marinas _____

Wildlife _____

Mining Activities _____

Salt Storage _____

Logging Activities _____

Spills _____

Shipping _____

River/Creek Influences _____

County Drain Influences _____

Others _____

_____

Past Raw Water Qualities (10 Years)

	Average	Minimum	Maximum	Comments
Turbidity				
Total Coliform				
Fecal Coliform				
HPC				
Chlorides				
pH				
Color				

Raw Water Quality Operational Experiences

_____

_____

_____

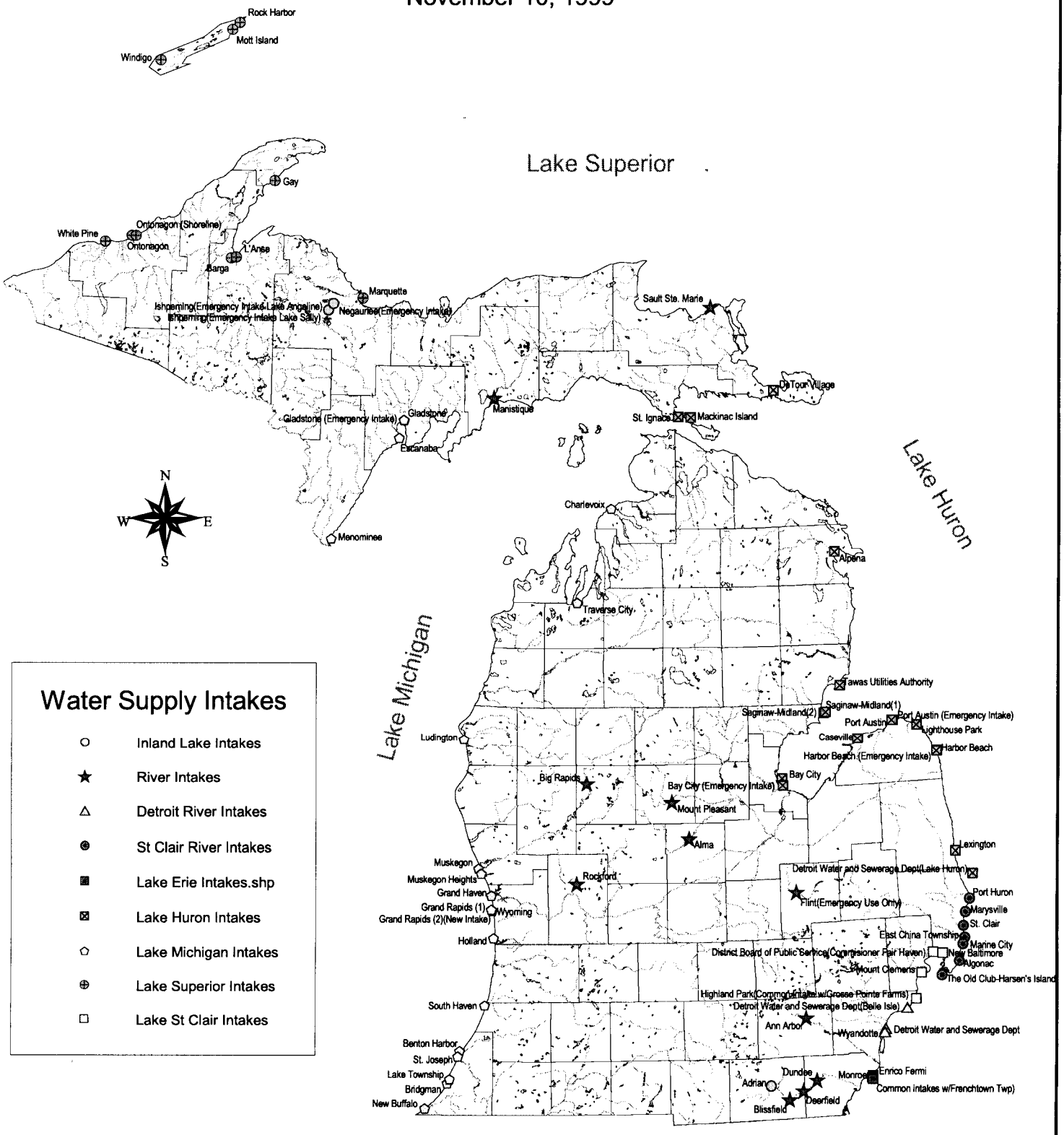
Survey Completed by_____**Title**_____**Date**_____**Telephone**_____

Address_____**City**_____**MI**____**Zip Code**_____

PUBLIC WATER SUPPLY INTAKES IN MICHIGAN

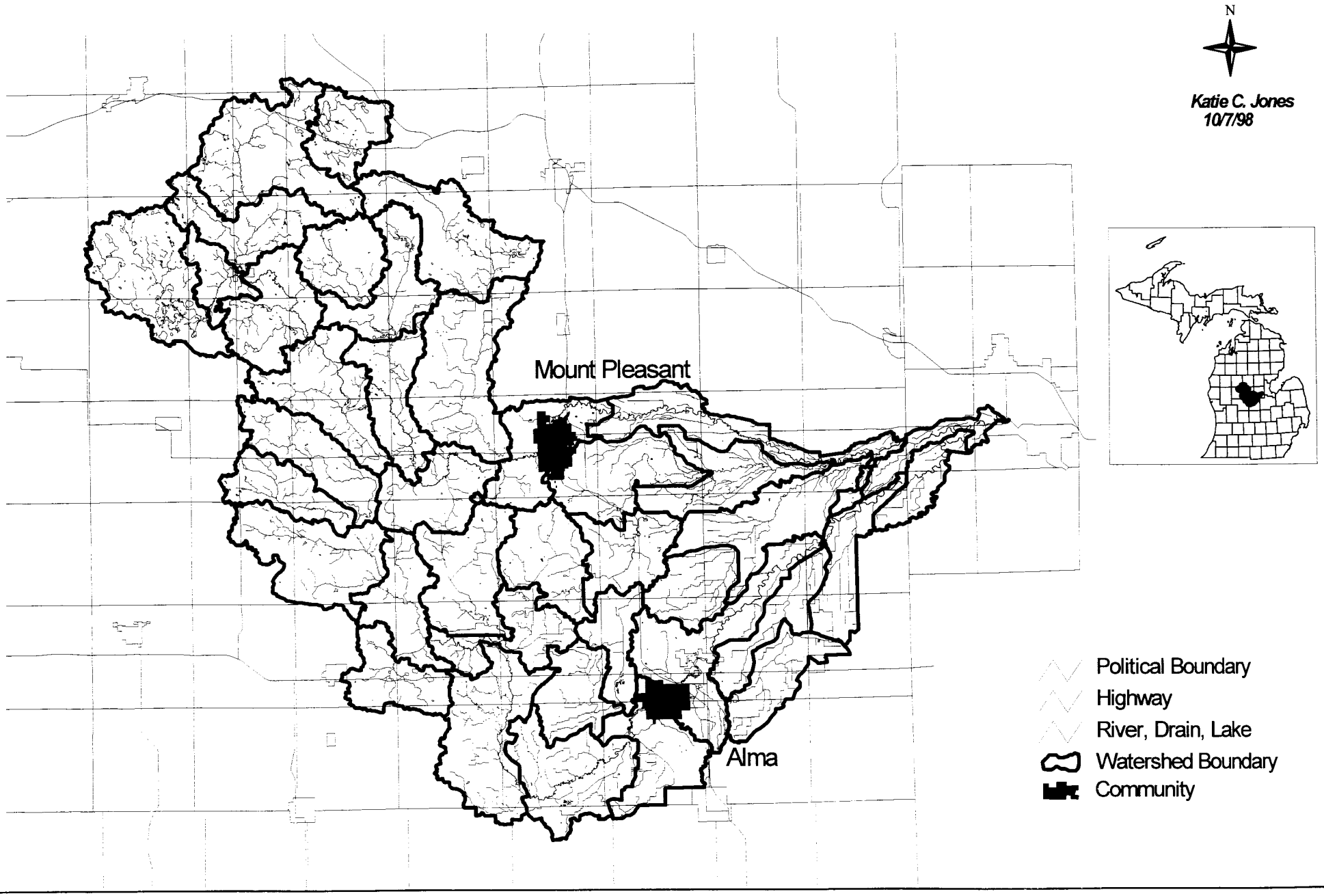
GREAT LAKES AND CONNECTING WATERS

November 10, 1999



Chippewa River Watershed with Pine River Tributary

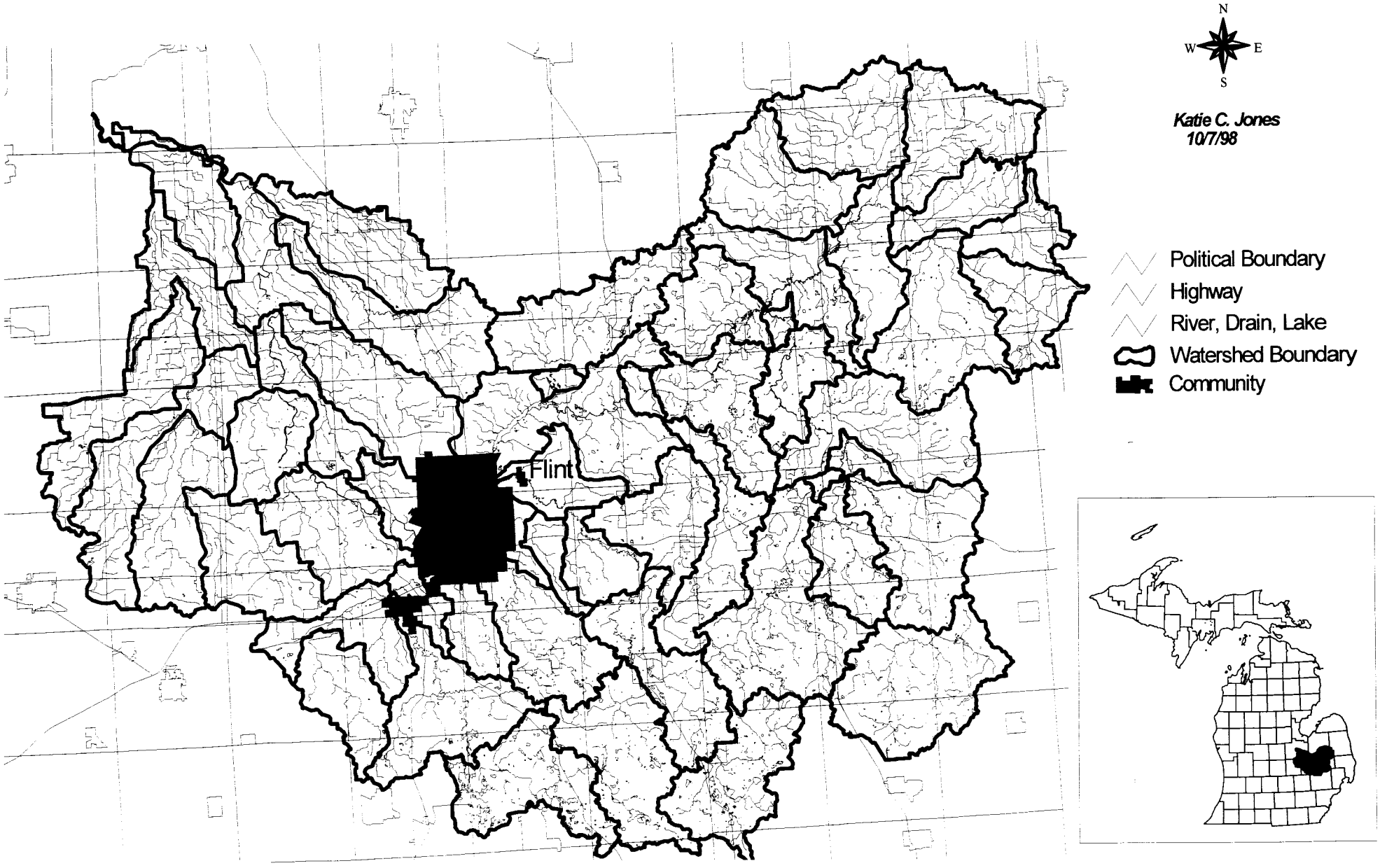
Michigan Public Water Supply Systems: Surface Water Sources



APPENDIX O

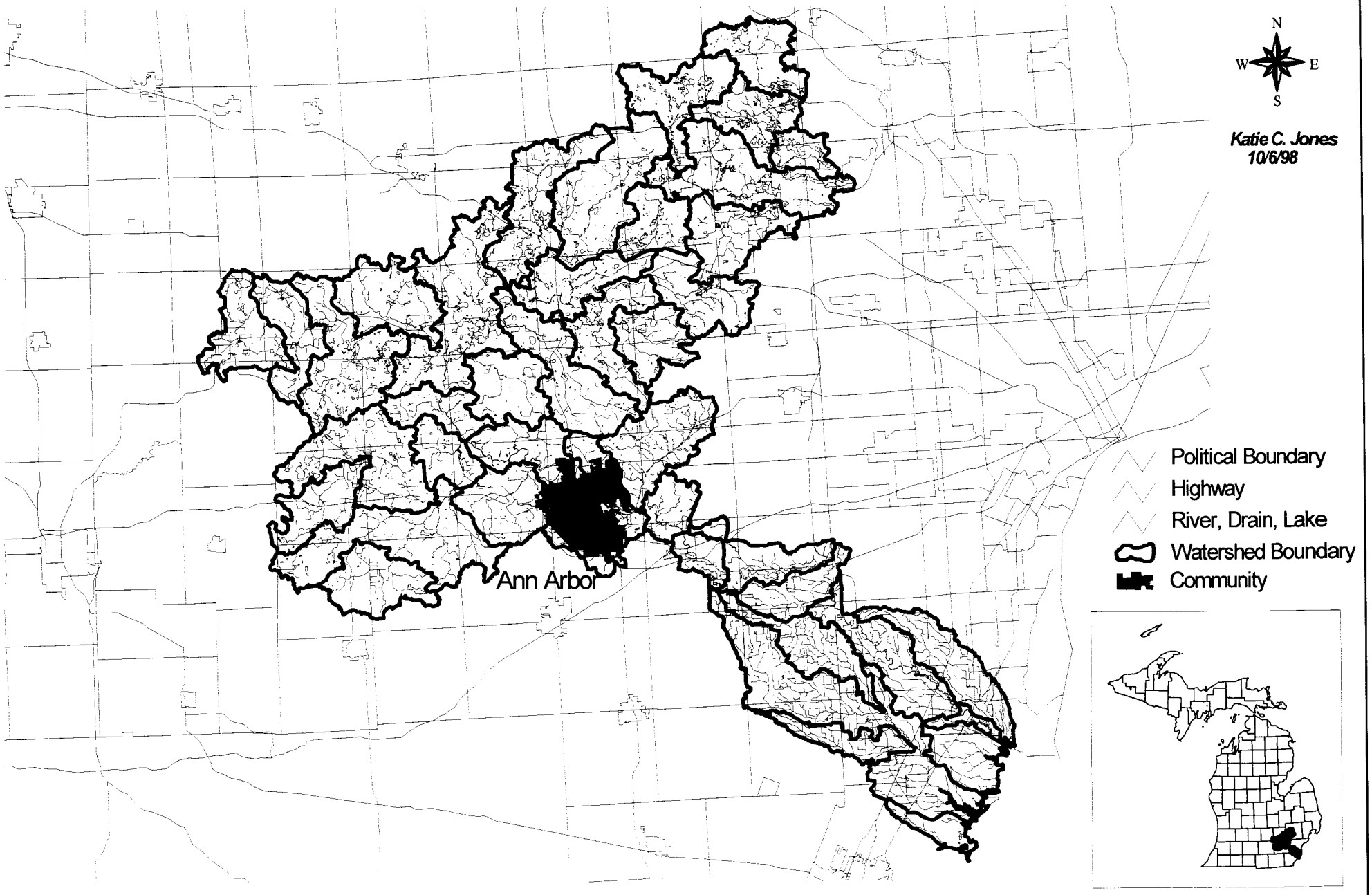
Flint River Watershed

Michigan Public Water Supply Systems: Surface Water Sources

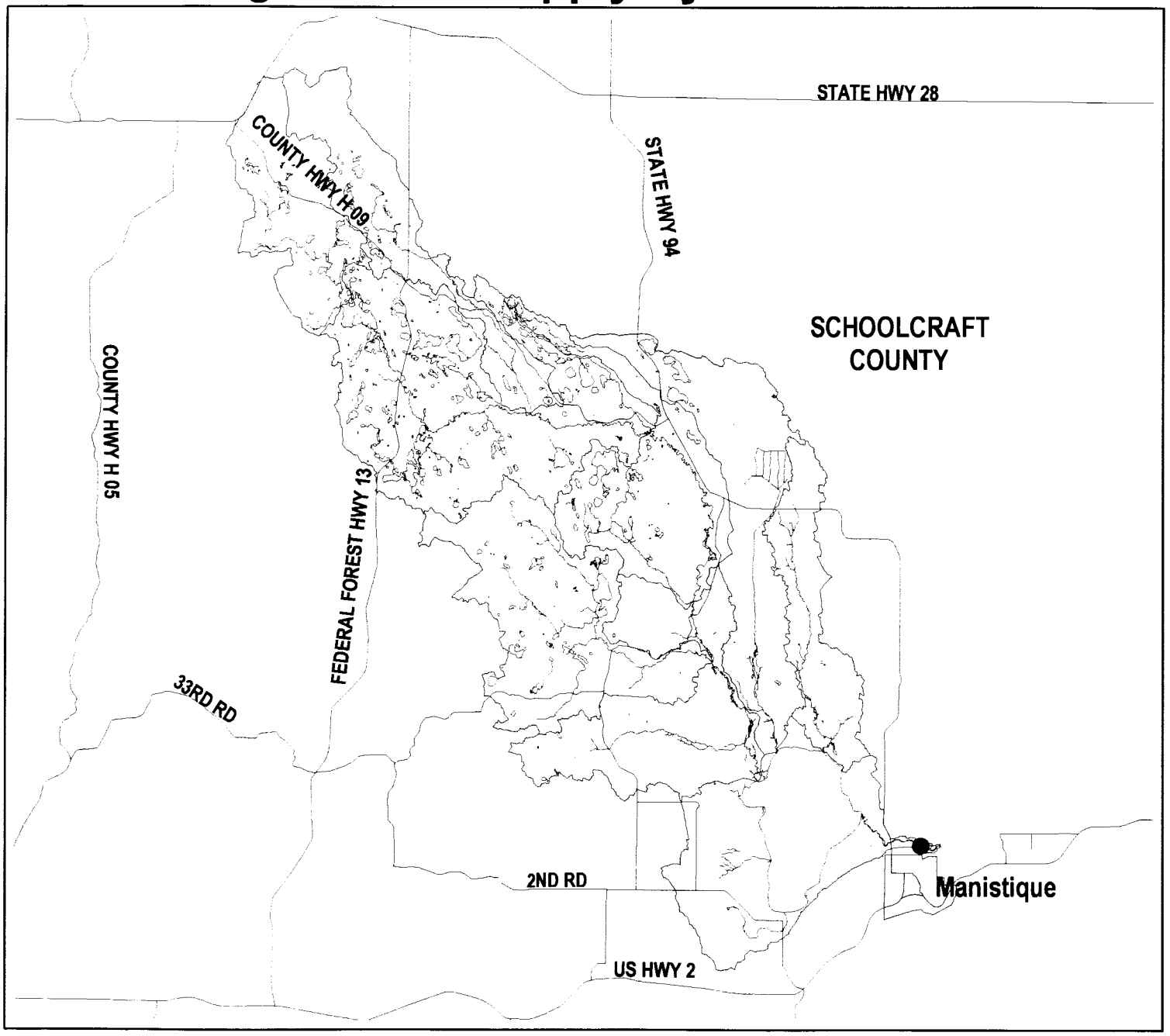


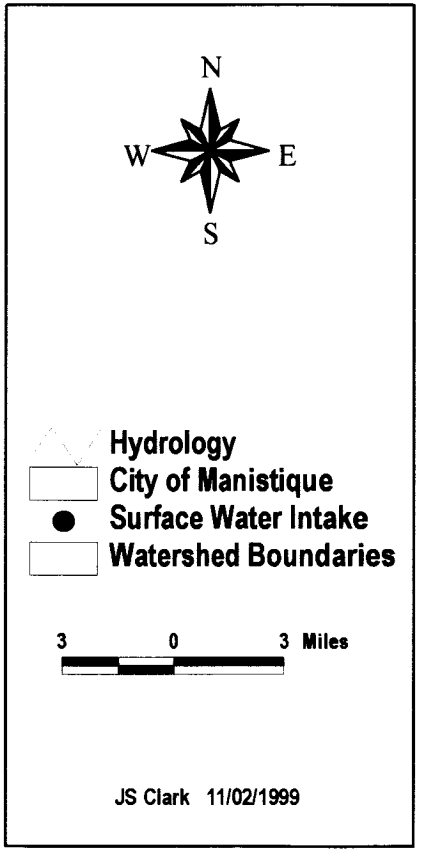
Huron River Watershed

Michigan Public Water Supply Systems: Surface Water Sources



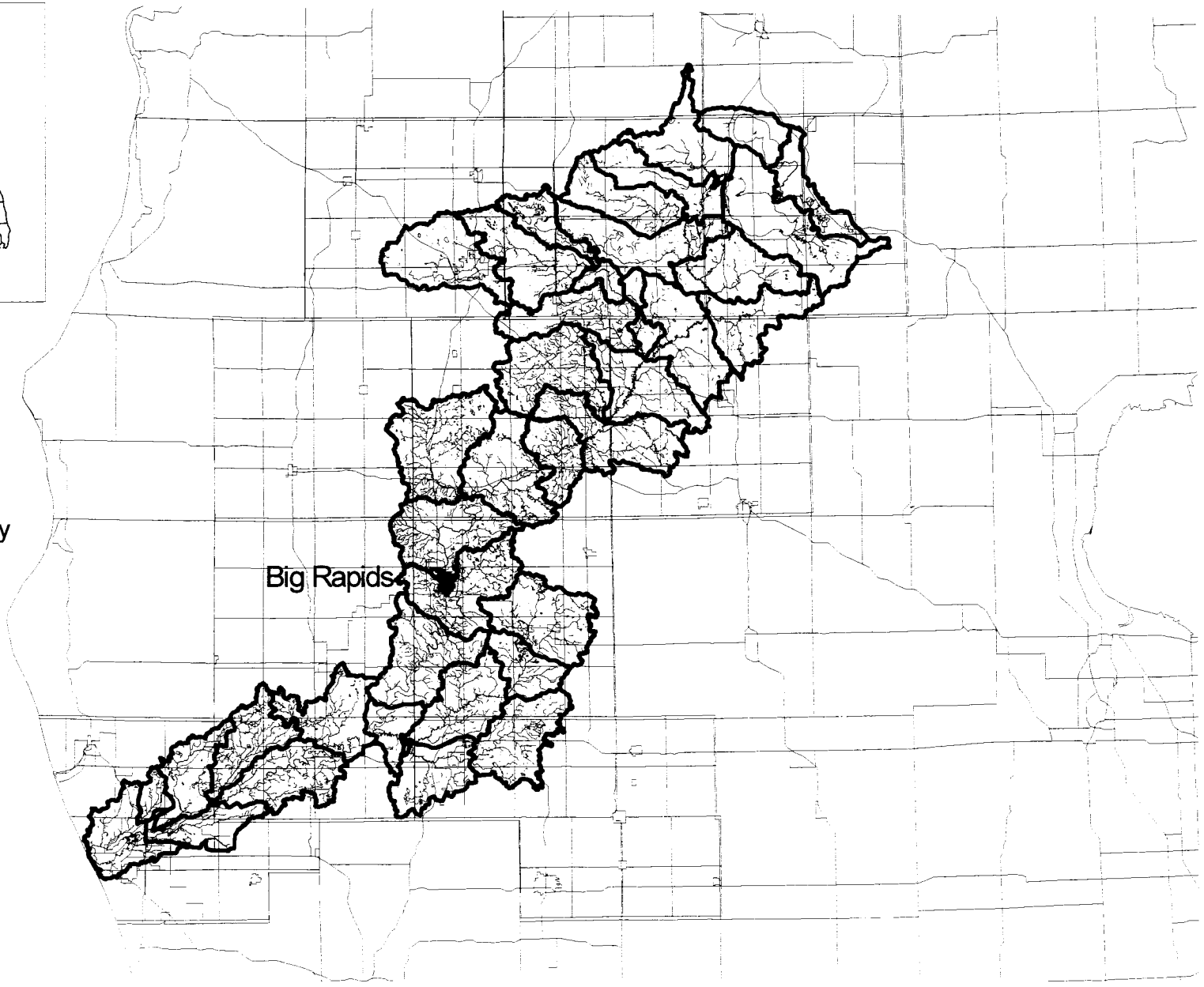
Indian River Watershed
Michigan Water Supply Systems: Surface Water Sources





Muskegon River Watershed

Michigan Public Water Supply Systems: Surface Water Sources

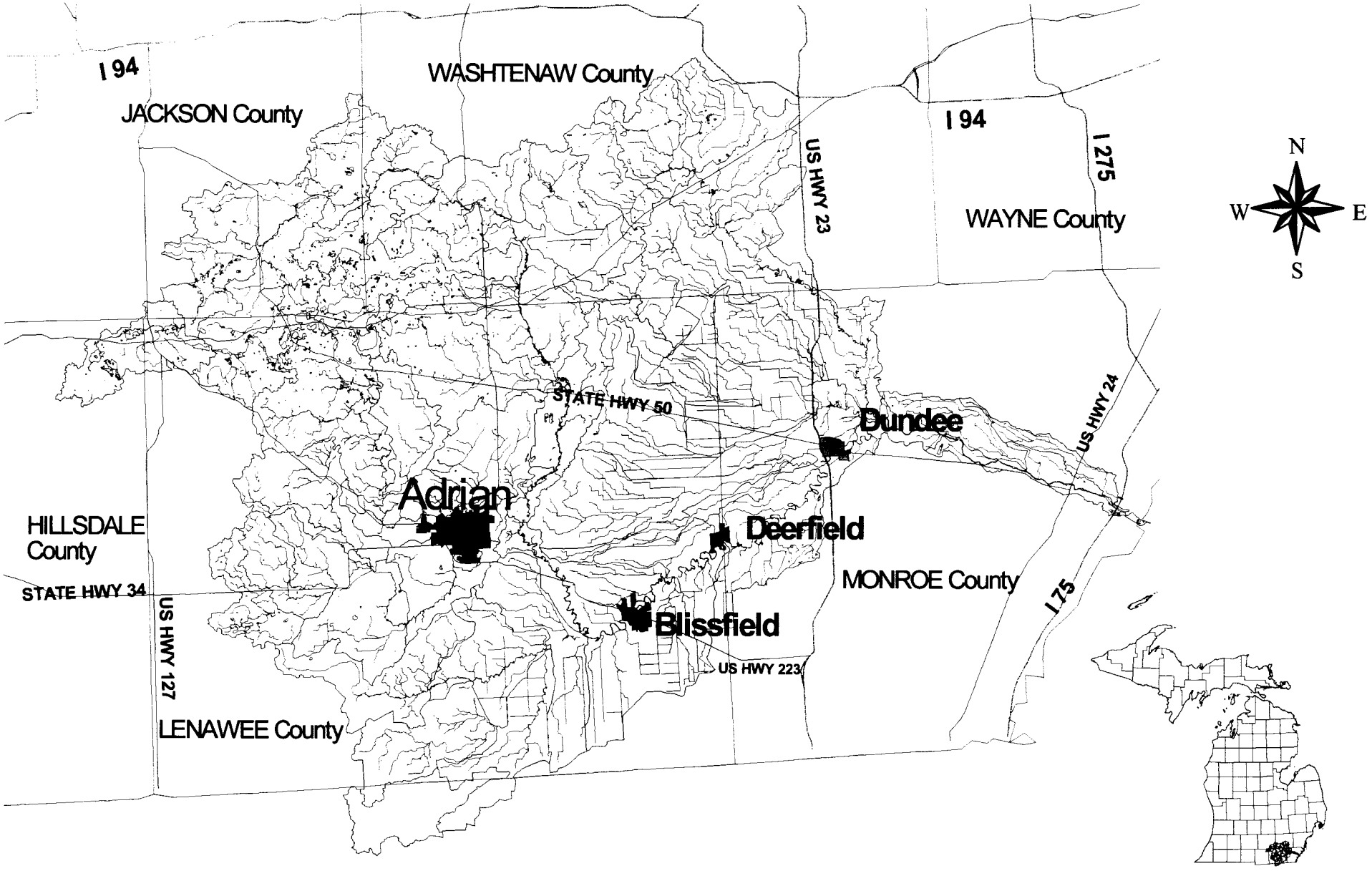


Political Boundary
Highway
River, Drain, Lake
Watershed Boundary
Community

N

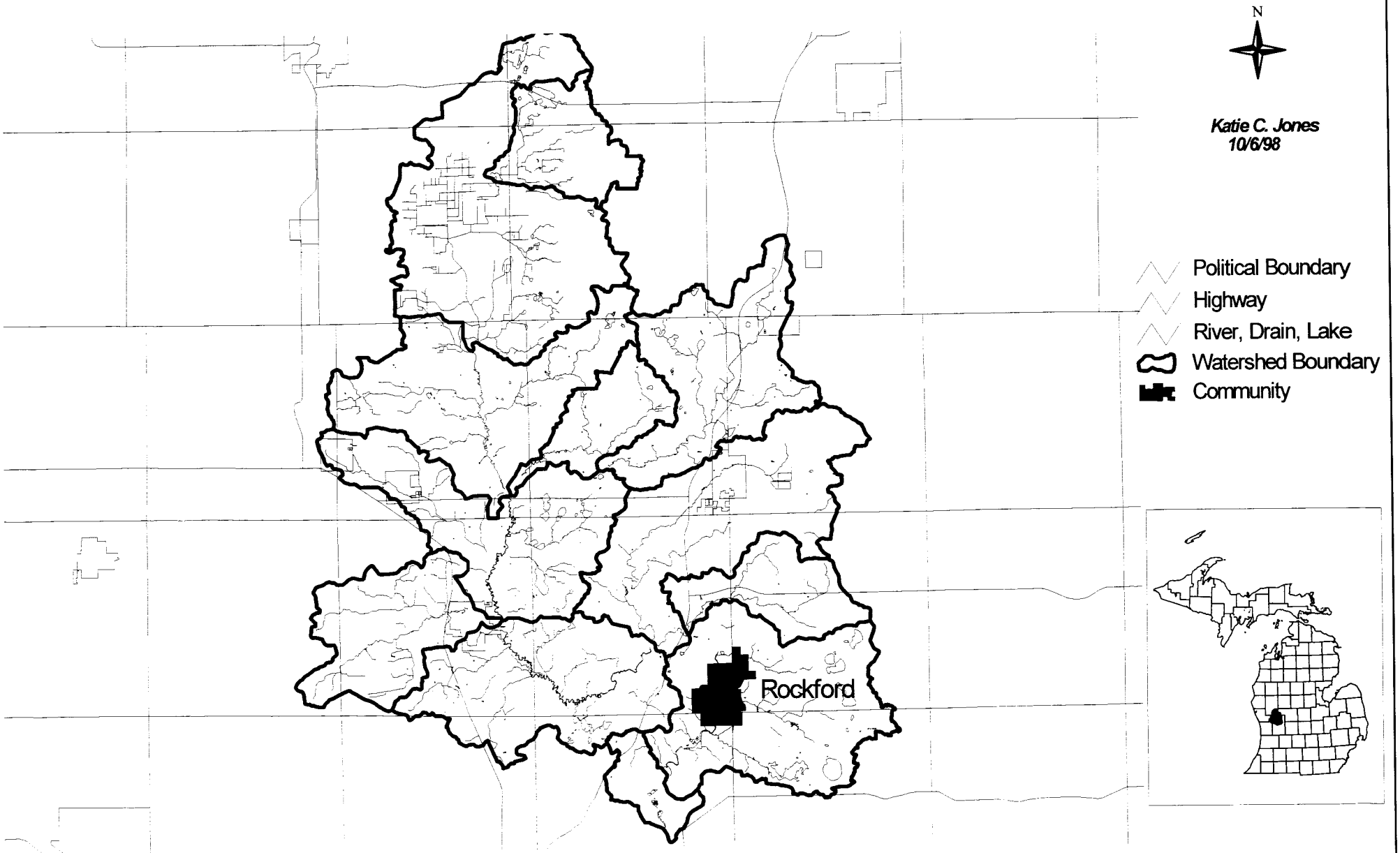
Katie C. Jones
10/7/98

Raisin River Watershed
Michigan Water Supply Systems: Surface Water Sources



Rogue River Watershed

Michigan Public Water Supply Systems: Surface Water Sources



APPENDIX P

Source Water Assessment—Nearshore Great Lakes Intakes

Issues specific to nearshore Great Lakes PWS

- All of those relevant to inland river PWS apply, if an inland river discharges to the Great Lakes sufficiently close to the PWS intake
- Issues relevant to offshore Great Lakes intakes are also applicable
- Pathogens are a substantive issue of concern

Applicable data and approaches

- Those relevant to inland river and offshore Great Lakes intakes are applicable
- Linkages to the State's TMDL and trend-monitoring program may substantially decrease long-term monitoring needs
- Microbial molecular methods are preferable and applicable to potential pathogens

Approach

Identify Great Lakes tributaries within 2 miles of intake

Delineate watershed for identified tributaries

- Use available delineations or digitize new ones—confirm with state and PWS
- Enter delineation into GIS

Use NOAA or Corp data to determine littoral currents near intake and potential temporal variability in currents—those upcurrent constitute potential tributary sources

- Follow SWAP procedure for inland rivers for potential tributary sources or
- Consider the water quality only at the tributary mouth—use available water quality data or collect new data
- Contaminant loads from tributaries are relevant; concentrations are not

Identify locations of direct discharges of potential point or nonpoint sources to the Great Lakes upcurrent from intakes

- If water quality data from the Great Lake near the intake are available, use these to confirm or deny presence of potential contaminants
- If data are not available, collect new water quality data from the Great Lake near the intake to confirm or deny presence of potential contaminants
- Incorporate findings from multi-state/USEPA SWAP for offshore Great Lake intakes

Determination of PWS susceptibility

- Initial level of susceptibility based on findings from above
- Long-term level of susceptibility based on findings from similar PWS in Great Lakes
- Issues related to spills from Great Lakes vessels need to be incorporated
- Time-of-travel estimates from potential sources to PWS intakes need to be estimated

APPENDIX Q

Source Water Assessment—Inland Rivers and Lakes

Issues specific to inland river and lakes PWS

- In Michigan, as much as 75 percent of annual discharge in a river is ground water and significant discharges to lakes can also be ground water
- Nonpoint sources are the major contributor of potential sources to ground water discharging to inland rivers and lakes
- The impact of ground water on inland river and lakes PWS system is best measured in the surface water near the PWS intake
- In rivers, there is significant temporal variability in concentrations for many potential contaminants
- Pathogens are a substantive issue of concern

Applicable data and approaches

- Substantial historical water quality and GIS land-use data may be available
- Collection of new water quality data for contaminants of concern is relatively inexpensive
- Findings from similar settings in Michigan or nearby states may substantially decrease long-term monitoring needs
- Linkages to the state's TMDL and trend-monitoring program may substantially decrease long-term monitoring needs
- Microbial molecular methods are preferable and applicable to potential pathogens

Approach

Delineate watershed upstream of intake—Source water protection area

- Use available delineations or digitize new ones—confirm with state and PWS
- Enter delineation into GIS

Source inventory within SWPA

- Use available water quality database and GIS databases for land use and demography
- Where needed, acquire digital air imagery, interpret, and enter into GIS

Significant potential point sources

- Use available paper, computer, and GIS databases
- Confirm locations of any major potential point sources with GPS

Significant potential nonpoint sources

- Use available GIS databases for land use and demography
- Interpret potential nonpoint sources according to relevant studies linking land use to potential contaminants (for example, NAWQA)

Contaminants of concern

- Identify potential contaminants based on findings from previous 2 steps
- Determine if available water quality data confirm or deny presence of potential contaminants
- Collect samples to confirm presence or absence of potential contaminants
- Design appropriate long-term sampling program to minimize analytical costs for PWS based on available and new water quality data

Determination of PWS susceptibility

- Initial level of susceptibility based on findings from above
- Long-term level of susceptibility based on projected land-use and demographic changes in SWPA and findings in other SWPAs in Michigan or similar watersheds in Great Lakes states—appropriate sampling to reduce future risks
- Susceptibility is also related to TOT from potential sources to the PWS intakes. The USGS is addressing this issue at a national scale on behalf of USEPA and similar approaches can be adapted for site-specific use in Michigan.
- Consider evaluating susceptibility for the time of year when contaminant concentrations should be highest.

APPENDIX R

Data Sources for Assessment of Surface Water Supplied PWSSs

Data/Information Source	General Summary	Michigan Coverage	Agency
1. National Water Data Storage and Retrieval System (WATSTORE)	Aggregate data management system for dissemination of descriptive information and analytical data for over 440,000 sites throughout the country. The water quality file includes approximately two million analyses of surface water and ground water samples (chemical, physical, and biological characteristics). The peak flow file includes over 500,000 peak streamflow and gage height values.	Selected sites / 1972 to present	USGS
2. National Stream Quality Accounting Network (NASQAN)	National network of over 500 stations that monitored water quality data for a wide range of dissolved and suspended constituents, including nutrients, major ions, dissolved and sediment-bound heavy metals, pesticides, etc. By 1995, there were only 142 monitoring sites, generally located at the downstream end of watersheds. In 1996, NASQAN II was established, focusing on 39 stations in the 4 largest river basins in the country (Mississippi, Columbia, Colorado, Rio Grande).	Selected sites / late 1970's to mid -1990's	USGS
3. National Water Quality Assessment (NAWQA)	National network for surface water and ground water quality data for 53 major watersheds and aquifer systems throughout the country. A wide array of chemical constituents are measured in surface water and ground water, streambed sediments, and fish tissues.	Selected sites / early 1990's to present	USGS
4. Aggregate Water Use Data System (AWUDS)	Water use data base for major thermoelectric, industrial, irrigation, public water supply, and other water users. Data collected or estimated by the states and/or the USGS and reported every five years in national water use summaries.	Statewide / 1950 to present	USGS/DEQ
5. Cooperative Stream Gaging Program	Current network of 144 stream flow gaging stations, 19 lake gaging stations, 29 crest-stage partial-record stations, and 2 low-flow partial-record stations. There are also 15 active surface water quality stations for selected locations (includes one record in River Raisin Watershed and four records in the Muskegon Watershed).	Statewide / early 1900's to present	USGS/DEQ
6. National Atmospheric Deposition Program/National Trends Network (NADP/NTN)	Network of 191 monitoring sites throughout the country that provides continuous data on precipitation chemistry for the assessment of atmospheric deposition.	Selected sites / 1995 to present	USGS
7. State General Soils Geographic Data Base (STATSGO)	General soils data base and maps for state in Geographic Information System (GIS). Soils are classified within 210 soil associations and up to 21 soil series. Maps are available at the 1:250,000 scale.	Statewide / late 1980's	NRCS
8. Soil Survey Geographic Data Base (SSURGO)	Detailed county soil survey data base and maps in Geographic Information System (GIS). Three counties completed (Antrim, Muskegon, and Midland); others at various stages (mapping for state scheduled for completion by 2004). Maps are available at the 1:24,000 and 1:12,000 scales.	Statewide / early 1990's to present	NRCS
9. Michigan Resource Information System (MIRIS)	A statewide database with information on land utilization, management, and resource protection. Information includes 1978 land cover; soils; water, oil and gas wells; solid waste landfills; hazardous waste sites; oil and gas contamination sites; sites of environmental contamination; natural landscape and features, etc.	Statewide / 1979 to present	DNR/DEQ
10. Storage and Retrieval (STORET) Data Management System	Computerized database utility for the storage and retrieval of physical, chemical, and biological data pertaining to the quality of United States waterways. It is EPA's oldest and largest computerized database, with information from over 800,000 stations for water quality, fish tissue and sediment samples, biological surveys, stream flow data (from U.S. Geological Survey), etc.	Statewide / early 1960's to present	EPA/DEQ

11. Coastal/ Inland Water Permit Information System (CIWPIS)	Tracking and coordination system for land/water interface permits to regulate flood plains, wetlands, lakes and streams, etc. (Does not include aquatic nuisance permits, sand dune permits, or subdivision plats.) Information maintained for about 6,500 of 8,000 permit applications received annually by the Land and Water Management Division. The system is being converted to a windows format.	Statewide /	DEQ/LWMD
12. Permit Compliance System (PCS)	Federal database used to track information related to National Pollutant Discharge Elimination System (NPDES) permits and compliance with those permits. Information available for approximately 2,000 wastewater dischargers in Michigan. Limited data are available for storm water dischargers.	Statewide /	DEQ/SWQD
13. National Pollutant Discharge Elimination System (NPDES) Permits	Federal program authorized by the Clean Water Act and delegated to the state. NPDES permits for 1,151municipal, industrial, and commercial facilities are issued for the discharge of treated wastewaters to the state's surface waters. (There are also 4,595 facilities covered under General Permits). Permit requirements are specific to the discharger, including limitations on concentrations of pollutants allowed to be discharged. Limitations are based on protecting water quality so that defined water designated uses, including drinking water protection, are protected.	Statewide /	DEQ/SWQD
14. Total Maximum Daily Loads (TMDL's)	TMDL's are developed for waterbodies in which nationally mandated pollutant limitations for point source dischargers are not sufficient to protect water quality. The development of a TMDL involves 1) determination of the capacity of a surface water to assimilate discharges of a given pollutant and 2) distribution of that capacity among the sources of that pollutant, including point and nonpoint sources. The distribution is used to determine limitations for NPDES permits and goals for nonpoint source controls.	Statewide /	DEQ/SWQD
15. Sites of Environmental Contamination: Section 201, 1994, PA 451	A database is maintained with information for 2,789 sites of environmental contamination (the annual list of environmental contamination sites is no longer published). Data are available in a windows format using Access 2.0 software. As of 1996, LUST sites are no longer reported as part of this database.	Statewide / 1989 to present	DEQ/USTD
16. Leaking Underground Storage Tank (LUST) Sites	An Underground Storage Tank Data Management System (UST-DMS) database is maintained that contains 25,316 facility sites, of which 7,239 are LUST sites with confirmed releases. The system is currently in a DOS format but should be converted to a windows-based system by mid-1999.	Statewide / 1986 to present	
17. Intensive Water Quality Studies	Studies conducted to define water quality in a given stream segment over a short period of time. Information is generally obtained by placing automatic samplers at various locations along a stream segment. Additional data related to the stream channel, flow velocities, and flow rates are also collected. The information is used to develop models which simulate the interaction of the stream and the pollutant.	Statewide /	DEQ/SWQD
18. Clean Water Act 319 Nonpoint Source Management Studies	NPDES delegated states are required to develop and implement approved Nonpoint Source Control Programs. A portion of the federal funding to Michigan is awarded as grants to local units of government to conduct demonstration watershed planning and implementation projects. Planning projects generally last one year and determine water quality problems associated with nonpoint sources, identify specific problem sources, and develop a strategy to control those sources. Implementation grants fund projects up to three years to implement planning recommendations.	Statewide /	DEQ/SWQD

19. Clean Water Act 305(B) Water Quality Management Report	Report prepared by the states and submitted to EPA every even numbered year summarizing water quality and pollution control programs at the state level. The report addresses surface water quality (rivers and streams, inland lakes, Great Lakes, wetlands) and groundwater quality in the state. EPA uses the state reports to prepare a summary to Congress regarding the status of water quality nationally.	Statewide /	DEQ/SWQD
20. Remedial Action Plans for Michigan Areas of Concern	Under the Great Lakes Water Quality Agreement, EPA and Environment Canada, in consultation with Michigan and Ontario, developed a list of 42 Areas of Concern where Great Lakes and connecting channels water quality has been severely impacted by human activities. Fourteen of these areas are in Michigan. Remedial Action Plans are required for each of these areas to identify impaired uses, the causes of impaired uses, and recommendations for remediating problems. Stage One RAPs have been completed for each of Michigan's areas of concern, with additional activities undertaken at various levels.	Selected Watersheds /	DEQ/SWQD
21. Lakewide Management Plans	Lakewide management plans being developed for each of the Great Lakes to identify strategies for reducing the loadings of critical pollutants in order to restore beneficial uses. The plans are called for by the Great Lakes Water Quality Agreement and are being jointly prepared by the EPA and Environment Canada, with state participation. The exception is Lake Michigan, which is solely a United States responsibility. The draft plan for Lake Michigan is expected in 1998; the plans for Lake Superior and Lake Erie are under development.	Great Lakes /	EPA/DEQ
22. NRCS Common Resource Areas	Over 700 subwatershed areas (e.g. portions of 8-digit USGS watersheds) have been delineated and are being assessed based on common physical characteristics and/or resource concerns. These Common Resource Areas will be subject to targeted conservation practices implemented by the Natural Resources and Conservation Service.	Selected Subwatersheds / 1995 to present	NRCS
23. Fisheries Watershed Assessments	Selected watershed assessments that summarize fisheries and related land use and water resources data. As of 1998, assessments have been completed for the Huron and Muskegon watersheds. The Rouge watershed is near completion, and work is underway for the Au Sable, Manistee, Raisin, St. Joseph, Menominee, and Ontonagon watersheds.	Selected Watersheds / 1995 to present	DEQ/FD
24. Local Watershed Management Plans	Watershed management plans prepared by local watershed councils, counties, or other watershed-focused organizations to coordinate the protection and utilization of watershed resources (River Raisin Watershed Management Plan, etc.).	Selected Watersheds	Watershed/ County/Other Organizations
25. Envirofacts	Federal information system consisting of seven USEPA Databases.	Nationwide	USEPA

DEQ/DWRPD - April 7, 1998,August 26, 1999

APPENDIX S

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER AND RADIOLOGICAL PROTECTION DIVISION
GROUND WATER SUPPLY SECTION

Abandoned Well Management Program

I. INTRODUCTION

Abandoned wells threaten the quality of drinking water from both private wells and those serving public water supply systems. A large number of unplugged abandoned wells exist in Michigan. Studies to determine the magnitude of the problem, and assess the impact of these wells on Michigan's ground water quality, have not been conducted.

The Drinking Water and Radiological Protection Division (DWRPD) of the Michigan Department of Environmental Quality (MDEQ) is implementing a comprehensive program to coordinate statewide abandoned water well plugging activities. Plugging abandoned wells protects aquifers that supply drinking water to nearly one-half of Michigan's citizens. Proper well closure also eliminates risk of injury. The goal of the MDEQ program is to maximize abandoned water well plugging. The Abandoned Well Management Program (AWMP) strategy incorporates the following elements:

1. Existing regulatory authority in Part 127, 1978 PA 368, as amended (Michigan Public Health Code).
2. The state/local cost sharing program implemented under the Michigan Public Health Code in conjunction with the Departments of Community Health and Agriculture.
3. Community outreach initiatives, coordinated through regional Groundwater Education in Michigan (GEM) centers within state universities.
4. Networking of municipal water utilities and local public health agencies.
5. Partnership with the water well drilling/plugging industry.
6. Coordination with the agricultural well closure cost sharing assistance program operated by the Michigan Department of Agriculture's (MDA) Farm*A*Syst Program.

II. BACKGROUND

The construction of water wells in Michigan using drilling machines probably dates back to the early to mid-1800's. By the turn of the century, drilled wells of 1½ inch to 4 inch diameter steel casing were common throughout the state. Many early water wells were hand dug and lined with stone, brick, wood, or concrete. Historically, when household wells were taken out of service, they were abandoned without plugging. When a replacement well was needed, the water service line from the old well was often just severed. Sometimes the end of the water pipe was capped. On early wells, with windmills or hand pumps, the pump was often disconnected leaving the pump rods and plunger in the well. Some abandoned wells were filled with fieldstones and some drilled wells were merely capped by jamming something into the top. Occasionally, a municipal well was abandoned by shearing off the pump column, allowing it to drop to the well bottom. The pump motor was salvaged and a cover was placed over the well.

Well owners traditionally did not wish to spend money plugging a well, nor did they recognize the potential threat to their new water well. Some older wells were buried 4 to 5 feet to protect against freezing. Once they are abandoned, wells can be easily forgotten. Above grade casings become overgrown, and buried wells are not visible. After property with an abandoned well is sold, existence of the well is unknown to the new landowner.

Reports of well casings being bulldozed during demolition or paved over during road building projects have been received by state and county officials. The MDEQ officials recently received complaint of an open well on state owned land in Ogemaw County. The uncovered 4 feet deep pit, in which the

unplugged well was located, is a safety hazard and a liability for the state. Many more abandoned wells are thought to exist on state property.

III. Environmental and Safety Threats

Industrial chemicals, petroleum products, fertilizers, pesticides, and disease-causing sewage organisms can travel down an abandoned well. Poor quality water from deeper aquifers can move upward in an abandoned well to adversely impact water quality in shallower aquifers. Natural filtration and degradation processes are bypassed. Abandoned artesian wells can lower natural pressures of confined aquifers. The principal threat to ground water from abandoned wells is that they can transfer surface or near surface contaminants into potable aquifers in the following manner:

1. Through the cased portion of a well borehole after casing has deteriorated or corroded.
2. By entering the well through a faulty cap or cover.
3. Via an unsealed annular space between the well casing and borehole.
4. Through the uncased portion of a bedrock borehole.
5. Between strings of casing or liner pipe.

People have intentionally used old wells for illegal disposal of waste or rubbish. The use of old wells for waste oil disposal has been documented in Michigan, Minnesota, and Wisconsin. Abandoned wells have also been converted to drain agricultural lands.

In addition to environmental hazards, unplugged large diameter abandoned wells are a safety hazard. Serious injury and death has occurred when people have fallen into open or poorly covered wells. One of these accidents occurred in Michigan in 1997. Thousands of large diameter dug wells exist in Southeast Lower Michigan and throughout the Thumb region. The 1990 U.S. census shows 57,052 household dug wells in Michigan.

IV. Michigan Regulations

Michigan regulations define when a well is considered "abandoned" or "temporarily abandoned." Abandoned wells are required to be plugged with impermeable sealing materials. Cement or swelling bentonite clay grouts are commonly used. A well that is taken out of service, but intended to be used in the future, can be retained as a temporarily abandoned well if it is properly constructed. Landowners are responsible for plugging abandoned wells on their property, but public knowledge of this requirement is not widespread.

Abandoned well regulations are promulgated pursuant to §333.12714 of the Michigan Public Health Code. This statute was initially passed as 1965 PA 294. No water well plugging regulations existed in Michigan until the rules for PA 294 became effective in 1967. Administrative rules pertaining to well abandonment are R 325.1601(1), R 325.1605(6), and R 325.1662 to R 325.1670.

Safety concerns are addressed, to a limited extent, in Chapter LXXII of the Michigan Penal Code, §750.493b. This law requires covering or fencing of wells or cisterns 12 inches or more in diameter. However, the widely publicized Texas incident, where an infant girl fell 22 feet into a well and was miraculously rescued, involved an 8 inch diameter well casing.

Michigan's Seller Disclosure Act, 1993 PA 92, requires that a real estate seller disclose information about the well and water testing results to the purchaser. However, this process focuses on the well serving the facility, not abandoned wells on the premises.

There is currently a cost share program implemented by the MDA to assist agricultural producers with plugging abandoned wells on farmsteads. Landowners pay 25 percent of the cost and the remaining 75 percent, up to $1,000, is paid for by the state. This program does not furnish cost share assistance for nonagricultural property owners. About 1,000 wells have been plugged annually since the program began in 1995. The well closure program is implemented pursuant to the Groundwater and Freshwater Protection Act, 1993 PA 247.

V. Size of the Problem

No one knows exactly how many unplugged abandoned wells exist in Michigan. The National Ground Water Association reports that Michigan leads the nation in number of water wells drilled annually. The U.S. census figures show that Michigan has the highest number of household wells in service. It is quite likely that Michigan has more abandoned wells than any other state.

Other states' estimates range from one abandoned well for every five wells in service to four abandoned wells for each well in service. Another projection is that one abandoned well exists for each generation a homesite has been occupied. The highest concentration of abandoned wells is expected to be in urban and suburban settings where municipal water has been extended into areas of dense housing concentration. Recently, Meridian Township, Ingham County, prepared a listing of over 2,800 addresses where abandoned wells are suspected because of past connection to municipal water. Surveys in other communities are expected to reveal similar densities of abandoned wells.

In the late 1980's the Minnesota Department of Health prepared an extensive report for the U.S. Environmental Protection Agency to assess the impact of abandoned wells on municipal water wells. They concluded that between 300,000 and 370,000 abandoned wells have the potential to degrade ground water in the vicinity of Minnesota's municipal water supplies. Minnesota estimates their statewide abandoned well numbers to be from 700,000 to 1.2 million. Comparing Michigan's well numbers to Minnesota's may provide the closest estimate. The U.S. census figures for 1990 showed 1.12 million household wells in Michigan, compared to Minnesota's 484,016. Assuming a similar abandoned well occurrence rate between the states, Michigan may have from 1.6 million to 2.7 million abandoned wells. This estimate appears to coincide with an estimate of the total number of water wells drilled as determined by the number of water well records submitted. Submittal of water well records upon completion of a well has been required by state law since 1965. State well record forms became available in late 1966. Since then, over 800,000 records have been submitted to the MDEQ, Geological Survey Division. This averages 26,000 wells drilled annually for the past three decades. If this annual drilling rate were projected backward for the past century, 2.6 million water wells are thought to exist. By subtracting the number of wells in service (from the 1990 U.S. census), an approximate number of 1.5 million abandoned wells is derived.

VI. Current Activities

Within the past few decades, there has been increased focus on the need to plug abandoned wells and an overall increase in well plugging. However, plugging is limited predominantly to wells taken out of service when replacement wells are drilled, unused municipal wells (where the water superintendent and/or consulting engineer are aware of the importance of well plugging), and where the MDA cost sharing program has enticed voluntary well closure.

Many local health departments (LHDs) are requiring plugging of the old well as a condition of the permit issued for the new well. County and district health departments receive state funding and program standards require that well abandonment is monitored. However, implementation of most of these programs took place within the past three years. Some local programs remain poorly developed. There is little effort, at present time, to address plugging of wells abandoned after municipal water has been extended. Only a handful of Michigan counties have programs that adequately address well abandonment in areas served by municipal water.

An existing program within the MDEQ, DWRPD, pays for plugging drinking water wells contaminated with industrial chemicals. Plugging occurs simultaneously with state funded well replacement or connection to municipal water. Owners do not receive the replacement water supply unless they agree to have the abandoned well plugged. Well drilling contractors complete the plugging through competitively bid contracts. This program is implemented pursuant to Part 201 of Act 451, PA 1994, Natural Resources and Environmental Protection Act. Since 1984, when the program began, about 8,000 wells have been plugged, or about 615 wells per year.

The best estimate of the total number of wells being plugged annually in Michigan is 6,500. This is based on numbers reported by LHDs in their annual budget proposals. Assuming one million abandoned wells exist in Michigan, at the present plugging rate it will take 150 years to correct the problem, if no new wells are improperly abandoned in that period.

VII. Barriers to Well Plugging

Several barriers exist that complicate the remedial strategy for the abandoned well problem. They are summarized as follows:

- Most landowners are unaware of their legal obligation to plug abandoned wells or their potential liability for environmental contamination or injury. This will require an intensive statewide outreach initiative.
- Paying from several hundred to over a thousand dollars to plug a well is viewed as an unnecessary investment by landowners.
- The incentive for a landowner to invest in well plugging relies on the owner's:

    1. concern for the environment and protection of drinking water sources,
    2. desire to reduce potential liability for pollution or personal injury,
    3. interest in minimizing delay during sale of property,
    4. intent to avoid prosecution for violating well plugging regulations, and
    5. confidence that a standby water supply is unnecessary.

- Many wells will never be found because structures have been built over them.
- Cost share incentives, such as those used in the MDA program, may not be effective for identifying the most environmentally hazardous abandoned wells. Owners using such wells for illegal waste disposal will not be enticed by financial assistance.
- Locating buried abandoned wells often requires extensive investigative work, such as:

    1. conducting a search of records (water well records, aerial photographs, property deeds, municipal water connection records, and historic documents and photographs),
    2. contacting previous property owners and neighbors who may recall the location of abandoned wells, or
    3. contacting local water well drillers who may recall the location of wells they drilled. Older well drilling firms often have drilling records predating state mandated well record submittal (1967) that are useful for finding wells.

- Buried steel cased wells can be located using magnetic locators and electromagnetic induction instrumentation, but LHDs and well drilling contractors do not have this equipment. Use of these devices is time-consuming and training on their use is necessary.
- Many well drillers rely on excavation with a backhoe to find a buried well. This can result in enormous property disruption, making owners reluctant to try finding an old well.
- Removal of pipe strings, stuck pumps, or debris to prepare a well for plugging can increase plugging costs significantly.
- State well code provisions that allow retention of a "temporarily abandoned well" for future use, is frequently used by any owner to avoid the cost of plugging. Wells retained for future use are often forgotten.
- Owners have found some well drilling contractors unwilling to plug wells. Contractors point out there is more profit in drilling wells than plugging them.
- A statewide tracking system does not exist for matching well plugging records with water well completion records.

VIII. Proposed Strategy

Michigan's abandoned well problem developed over many decades and it will not be solved overnight. Addressing the problem will require a broad, comprehensive strategy. The following components comprise the MDEQ AWMP strategy:

1. Demonstration projects will be completed (funded by Safe Drinking Water Act, Drinking Water Revolving Fund or source water protection activities) to accurately determine the magnitude of the problem. (Find out how many abandoned wells exist within a specified area.) Delineated wellhead protection areas surrounding municipal water wells will be used for this purpose. The MDEQ intends to initiate demonstration projects this fiscal year. The projects will provide insight into the most cost effective method for locating abandoned wells and enable a more accurate projection of the resources needed to solve the statewide problem.

2. A survey of state and local regulatory agencies, water well industry, and hydrogeological consultants, will be conducted to identify contamination cases associated with unplugged abandoned wells. This data will assist in assessing the statewide environmental impact of abandoned wells on ground water resources. Over 20 percent of all water samples from private wells, as analyzed by the MDEQ laboratory, are positive for coliform bacteria. A portion of this contamination may be the result of unplugged abandoned wells in the vicinity of the well in service. A study to investigate this relationship is appropriate.

3. A priority ranking needs to be developed to assess which wells are of most environmental concern and constitute the greatest safety hazard. A method for concentrating abandoned well identification and plugging efforts in areas of known ground water contamination and most geologically vulnerable areas should be formulated.

4. County well permitting programs must be coordinated to ensure that abandoned wells are properly plugged when replacement wells are drilled. This includes development of a tracking mechanism for wells taken out of service, which are retained by the owner as an alternate water source.

5. Partnerships between municipal water utilities and LHDs should be encouraged to ensure that LHDs are notified when municipal water service is connected to a building previously served by a water well.

6. Municipal water supply cross connection programs should be examined to determine if they can be effectively used to achieve well abandonment. An assessment should be made to determine if the water service connection process can be changed to include plugging of an abandoned well as part of a hook up contract. Combining the two activities will result in the issuance of one bill to the customer rather than two. The expense may tend to be accepted more readily than if separate billing occurred.

7. Elevate public awareness of abandoned well hazards through development and dissemination of pamphlets, instructional materials, and news releases.

8. Explore use of local and state building permit programs and occupancy approvals to optimize well plugging. This could ensure that plugging of abandoned wells would occur before or during demolition of structures.

9. Study use of evaluations for real estate transactions as a means to identify unplugged abandoned wells and make purchasers aware of potential hazards.

10. Develop a better means of positively locating new wells (using global position system (GPS) technology) to ensure that wells being drilled today can be located in the future if casings become buried. Encourage LHDs to incorporate GPS location of wells as part of well inspection process.

    Investigate methods for positively labeling a well casing with a code (permanent bar coding) that can be linked to the water well record for that particular well. This would enable "cradle to grave" tracking of the water well. Development of a statewide well tracking protocol and acquiring GPS units for all counties would require supplemental funding.

11. Efforts should be coordinated with the Department of Management and Budget to develop a process to inventory state properties to identify and plug abandoned wells.

12. Survey other states to identify effective regulatory and nonregulatory strategies for dealing with abandoned wells.

13. Initiatives to expand MDA's Farm*A*Syst well closure program so that cost share assistance can be offered to nonagricultural property owners should be supported.

14. Acquisition of magnetic locators for LHD sanitarians and MDA Farm*A*Syst technicians' use when conducting property assessments is needed. Use of these devices will improve success of finding buried steel well casings. Magnetic locator use significantly reduces the amount of excavation required to find wells.

15. MDA's Groundwater Stewardship Advisory Committee should be utilized as a technical resource to provide input into the Abandoned Well Management Program strategy.

16. Innovative nonregulatory incentives to encourage voluntary plugging will be explored. Among the items for consideration are:

    (a) Amnesty period for owners to disclose abandoned wells used for waste disposal without fear of prosecution.
    (b) Bounty or finders fee to reward persons who reveal the location of hazardous abandoned wells.
    (c) Toll-free hotline to report abandoned wells and obtain information on well plugging and private water supply issues.
    (d) Tax rebate to assist owners with plugging costs if they hire a registered water well drilling contractor to complete the plugging. This will encourage proper plugging by technically competent individuals.

17. Regulatory-based strategies that could be effective include:

    (a) Amending the Seller Disclosure Act to require disclosure of abandoned wells as an environmental problem, along with a mechanism to report findings to a local or state regulatory agency. Make seller responsible for plugging costs within a specified time after transfer of property. Minnesota officials report success with this approach.
    (b) Creation of monetary incentives to reward owners who plug wells.
    (c) Civil fines for illegal discharge of hazardous materials into abandoned wells.
    (d) Annual maintenance permit for wells taken out of service that are left unplugged because of owner's intent to use. This will discourage long-term inactive wells. This is a key feature of Minnesota's successful program.
    (e) Require abandoned well plugging record to be submitted to building official before demolition permit can be issued.

(f) Funding to expand the AWMP and for cost sharing well closure costs. Possible funding source is a registration fee for each new well drilled. A $25 registration fee submitted with each well record would generate $650,000 each year (based on average 26,000 wells per year). This level of funding would support 3 FTEs for the Abandoned Well Management Program and enable 50 percent level cost share funding for the plugging of over 2,000 wells per year.

IX. Program Budget

The AWMP is a new initiative funded for FY 97/98 from the federal Drinking Water Revolving Fund established under the Safe Drinking Water Act. The MDEQ is in the process of hiring a program coordinator. The budget for FY 97/98 is $225,000.

APPENDIX T

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

"Better Service for a Better Environment"

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: www.deq.state.mi.us

RUSSELL J. HARDING, Director

August 31, 1998

TO: Public Water Suppliers, Local Health Departments, Interested Public

FROM: Drinking Water and Radiological Protection Division

SUBJECT: Michigan Source Water Assessment Program

NOTICE OF PUBLIC MEETING

The Michigan Department of Environmental Quality (MDEQ) is developing a Source Water Assessment Program as required by the 1996 reauthorization of the federal Safe Drinking Water Act (SDWA). The 1996 amendments to the SDWA require states to:

- Identify the areas that supply public drinking water.
- Inventory contaminants and assess water susceptibility to contamination.
- Inform the public of the results.

The MDEQ with the assistance of an advisory committee is completing a draft of the Source Water Assessment Program (SWAP) and is soliciting public input for its finalization. The department has scheduled four public meetings to present the draft SWAP, explain the intent of the program and receive public comments. The draft SWAP document is available on the department internet site at http://www.deq.state.mi.us/dwr/. Copies will also be available at the public meeting sites. The meeting locations, dates and times are as follows:

DETROIT - Clark Elementary School, 15755 Bremen
I-94 to Cadieux, south to Breman, then west
5 PM, Tuesday, September 15, 1998

KALAMAZOO- Nazareth Complex, 3299 Gull Road
4 PM, Thursday, September 17, 1998

GRAYLING - Holiday Inn, 2650 S. Business Route I-75
1 PM, Wednesday, September 30, 1998

ESCANABA - State Office Building, 305 Ludington St.
9 AM, Thursday, October 1, 1998

The department appreciates receiving comments on the draft SWAP by October 15, 1998. All comments, however, received prior to the mandated February 6, 1999 final SWAP submittal date to USEPA will be considered. Comments or questions concerning the Michigan SWAP can be directed to Bradley B. Brogren, P.E., Source Water Specialist, 517-335-8311 or FAX at 517-335-9434.

PLEASE ADVERTISE, DISTRIBUTE AND/OR POST THIS NOTICE FOR PUBLIC REVIEW

APPENDIX U

Draft USGS Proposal

Source Water Assessment of Public Water Supply Intakes and Spill-Response Modeling on the St. Clair-Detroit River System

Problem Statement: The St. Clair-Detroit River system is an international navigational pathway through the Great Lakes that also provides a public water supply for about one half of the residents in Michigan. Although a model has been developed to describe the flow in this system, its adequacy for identifying the source of water to public supply intakes and for providing real-time information needed for planning and coordinating spill-response operations is unknown.

Objectives: This study will utilize and enhance an existing, preliminary flow model of the St. Clair-Detroit River system to identify likely sources of water to public supply intakes and to provide a basis for coordinating real-time responses to contaminant spills. The model will be used to provide two-dimensional flow information within the system over a range of likely flow scenarios. The flow information will be linked with a water quality model to describe conservative and nonconservative transport near public water supply intakes. The direct use of the model by the cooperating agencies will be supported.

Benefit: This study will help protect the health of nearly half the population of Michigan by identifying likely sources of water to public supply intakes in St. Clair River and Detroit River. In addition, the model will provide water managers with a mechanism to prepare and respond to emergencies related to movement of constituents in the St. Clair-Detroit River system.

Approach: The U.S. Army Corps of Engineers (USACE) has developed a preliminary model of flow in the St. Clair-Detroit River system (John Koschik and Ron Heath, USACE, oral commun., 1998). The preliminary model uses a general purpose two-dimensional depth-averaged finite-element hydrodynamic numerical model (Norton, King, and Orlob, 1973) referred to as RMA2. The USACE Detroit District, in cooperation with the Waterways Experiment Station and Environment Canada, initiated model development to predict the effects of proposed structures and dredging projects on water levels and currents in the system.

This study will evaluate the preliminary model of the St. Clair-Detroit River system by comparing simulated stage and flow values to measured conditions. The model will be enhanced by (1) refining the model grid to incorporate recently improved information on channel bathymetry, (2) accounting for local inflows and withdrawals, (3) including time-varying wind data as boundary conditions, and (4) formally optimizing parameter estimates. The preliminary and enhanced models will simulate the transport of conservative and nonconservative constituents near public water supply intakes by use of the RMA4 water quality model (Norton, King, and Orlob, 1973). Results of model simulations will be compared and the benefits of the enhancements will be evaluated. Specific steps in the approach are described in the following paragraphs.

Historical data on stage and flow will be obtained and compiled for analysis. Stage data will be obtained at 15 or more sites on the connecting channels and Lake St. Clair from recording stations operated by Corps of Engineers (COE), National Oceanic and Atmospheric Administration (NOAA), and Canadian Hydrographic Survey (CHS). Mean monthly flow data will be obtained for St. Clair River and Detroit River from Great Lakes Environmental Research Laboratory (GLERL).

The multidimensional flow characteristics of St. Clair River and Detroit River will be assessed to determine the sufficiency of a two-dimensional flow model. Acoustic Doppler Current Profiler (ADCP) measurements of streamflow at 20 or more cross sections on St. Clair River and Detroit River obtained monthly by the COE between 1996 and 1998 will be analyzed. Vector plots will be prepared to aid in the visualization of the three dimensional flow field at selected cross sections. Continuous ADCP measurements of point velocities and flow obtained by the GLERL meter in the Detroit River near NOAA's Ft. Wayne gage will also be analyzed.

As part of an initial evaluation, flow will be simulated within St. Clair River by use of the preliminary flow model driven by stage data from gaging stations near the upstream and downstream limits of the river. The accuracy of the preliminary model will be assessed for reproducing (1) the mass balance of computed monthly flows, (2) the total discharge and distribution of flows within measured cross sections, (3) the continuous point velocity measurements, and (4) the intervening stage measurements. A similar analysis will be completed independently for the Detroit River component of the flow model.

Using the SMS system, the connecting channel models will be enhanced to better represent the channel bathymetry. Additional nodes will be added near selected areas where stream discharge is continually monitored by the U.S. Geological Survey (USGS) or Canadian agencies, and near areas of withdrawal for public water supply, as needed. Flow information will be obtained to specify boundary conditions corresponding to local inflows and withdrawals.

A formal optimization model will be used to iteratively estimate seasonal variations in channel roughness and eddy viscosity and to describe parameter sensitivities for the enhanced models of the connecting channels. Channel roughness coefficients will be subdivided longitudinally (within reaches) and transversely (along left, main, and right channel areas) to provide flexibility in reproducing the multidimensional flow characteristics of the system. Results of the analysis will be used to modify parameter estimates or to identify errors and refine the description of channel bathymetry, as appropriate. Confidence intervals and sensitivities will be computed for all model parameters.

The effectiveness of including wind data for improving model performance will be investigated. Time-varying wind velocity data will be included with stage data to specify boundary conditions for simulations on the individual connecting channels. The formal optimization process will be repeated to estimate channel roughness, eddy viscosities, and wind shear coefficients simultaneously. The simulation results will be compared with simulations without wind information to identify the potential improvements in model performance.

Flow will be simulated throughout the full St. Clair-Detroit River system by specifying stage near the upstream limit of the St. Clair River and near the downstream limit of the Detroit River using the optimized models of the connecting channels, the preliminary Lake St. Clair component, and wind velocity data. Simulation results obtained using the *full* model will be compared with direct measurement data and simulation results obtained using the models of the individual connecting channels. Degradation in the results of the *full* simulation model will be attributed to model errors associated with the preliminary Lake St. Clair component.

In response to any degradation of simulation results obtained using the full model, the preliminary Lake St. Clair model will be enhanced to improve the simulation accuracy. Additional nodes will be added to improve the definition of lake bathymetry and to ensure the numerical integrity of the results as needed. The formal optimization process will be repeated with the full model to refine parameter estimates and detect possible limitations in the description of bathymetry. The accuracy of simulations for reproducing stage and multidimensional flow characteristics at individual cross sections documented.

Results of selected St. Clair-Detroit River flow simulations from RMA2 will be used as input to the general purpose water quality model RMA4, developed by Norton, King, and Orlob (1973). The RMA4 will be used to simulate the concentrations of selected constituents that are affected by advection and dispersion. Concentrations of nonconservative constituents will be simulated by use of a first-order decay approximation. Results of simulations will be used to track the source of water to public water supply intakes in the connecting channels.

A statistical model will be developed to simultaneously forecast expected stages at the two flow model boundaries of the full model for up to 24-hours. The forecast model will facilitate the creation of boundary conditions needed to drive flow model simulations for conditions associated with a spill event. The information on the expected hydrodynamics during an event and the water quality model will provide a basis for developing effective real-time responses to constituent migrations in the connecting channels.

Report: A U.S. Geological Survey Water-Resources Investigations Report will be prepared to document the results of the analysis.

Budget:

Element	Hours	FY1999	Hours	FY2000	Total
Principal investigator, USGS	1500	$51,000	1500	$52,530	$103,530
Water quality specialist, USGS	100	3,500	100	3,500	7,000
Student assistant	200	2,000	200	2,100	4,100
SMS modeling package		4,300		900	5,200
Parameter optimization package		650		100	750
Dual Pentium processor computer		5,300		0	5,300
Travel, presentation, and training		3,500		3,500	7,000
Books and reference materials		1,500		1,000	2,500
Report preparation	100	2,000	200	4,000	6,000
Report production		0		5,000	5,000
Subtotal		66,750		59,130	125,880
Technical Service Charge		58,016		51,393	109,410
Total-USGS		124,766		110,523	235,290
Information services, COE	300	19,626	300	20,215	39,841
Project Total	2200	$144,393	2300	$130,738	$275,131

Personnel: The principal investigator will be David J. Holtschlag, GS- 12, of the U.S. Geological Survey. Information services from the COE will be provided by John Koschik of the Detroit Office, who will provide discharge, stage, and velocity data, and Ronnie Heath of the Waterways Experiment Station in Vicksburg, Mississippi, who will provide the preliminary flow model in electronic (SMS) format and assist in the enhancement of the flow model.

APPENDIX V

INTRODUCTION

Source water assessments are to be performed on community public water supplies (CPWS) throughout the state which do not participate in wellhead protection. The source water assessments will be completed in accordance with the provisions described herein and have, as objectives, the following:

- Accurately establish through the use of a global positioning system (GPS) and geographic information system (GIS) the location of CPWS wells;
- Provide for the entry of water well and pump installation records into an electronic data management system;
- Identify the location and proximity of sources of contamination located within 2000 feet of CPWS wells; and
- Establish a Source Water Assessment Score (SWAS) which reflects the "inherent vulnerability" of the CPWS well and source water.

GPS LOCATIONS and WATER WELL RECORDS

Obtaining accurate location information and water well and pump installation (well record) information for CPWS wells is an essential first step in the state Source Water Assessment Program (SWAP). The location and well record information will be entered into the Statewide Groundwater Data Base (SGDB).

Global Positioning System

Location information will be collected for each CPWS well using a Global Positioning System (GPS). The ultimate goal is to obtain accurate GPS locations on all CPWS wells for entry into the SGDB. The GPS locations must be "corrected" to provide accurate well locations before the locations are entered in the SGDB. Corrected locations may be obtained through the "real time" acquisition of accurate locations, or postprocessing of the collected location information to provide accurate locations.

Well Records and WELLKEY

Information from well records is critical to the SWAP. As part of SWAP, available well records for CPWS wells will be compiled. The SGDB contains location verified well information compiled from well records to which the well record information for CPWS wells will be added. WELLKEY is the software program that allows well record information to be stored in a data base format and provides for the automated entry, storage, and retrieval of well information.

Geographic Information System

The use of geographic information systems (GIS) for analysis and display of location and well record information is necessary in the state SWAP. ArcInfo coverage is the Michigan Department of Environmental Quality standard for GIS applications. ArcView and ArcInfo are the standard software packages for departmental information analysis and applications.

To the extent staffing and contract activities allow, the Source Water Assessment Program will provide maps to district offices that include the following information:

- Maps showing the locations of wells derived by address matching using the Type I database and base maps developed from the Michigan Information System;
- County vulnerability maps based upon a statewide vulnerability map to be developed by Dr. Dave Lusch, Michigan State University; and
- Potential sites for contaminant sources based upon state lists.

The GPS location and well record information will be compiled and incorporated into the statewide GIS for use in the analysis of information and the presentation to the public. Through GIS the results can be used in protection efforts for public water supplies and also be used to focus ground water protection efforts for private water supply wells.

OVERVIEW of SOURCE WATER ASSESSMENT SCORES

In addition to the GPS/GIS phases of the source water assessment, the vulnerability of CPWS wells will be evaluated by determining a Source Water Assessment Score (SWAS). Ideally a source water assessment would entail a critique of the rate at which ground water moves both horizontally and vertically in the subsurface. Unfortunately, hydrogeologic studies which document the rate of ground water movement are scarce, difficult to conduct, and expensive. The SWAS has been created as a numeric system which assigns points for situations that represent a "perceived risk" based upon the evaluation of four criteria. The evaluation criteria provide a "qualitative assessment" of ground water movement and the potential for movement of contaminants into the subsurface. The SWAS is based upon evaluation of the following:

1. the geologic sensitivity of the CPWS well;
2. the construction, maintenance and use of the CPWS well;
3. chemistry and/or isotope data from the CPWS well water; and
4. isolation and control of the CPWS well from sources of contamination.

The criteria are evaluated in a manner such that a higher SWAS is equated to a greater perceived risk for the CPWS source water.

The SWAS system has been developed cooperatively with the Environmental Health and Field Operations Sections in the Drinking Water and Radiological Protection Division. Staff from these sections may utilize the SWAS to assign monitoring requirements and identify CPWSs which should receive follow-up activities.

SOURCE WATER ASSESSMENT SCORE (SWAS) SYSTEM

The Source Water Assessment Score (SWAS) system is based upon the accumulation of points for situations that represent a perceived risk to the CPWS source water. The SWAS is derived from a sum of a geologic sensitivity score ($SWAS_G$); a well construction score ($SWAS_W$); a score for chemistry and isotope data ($SWAS_C$); and isolation and control from sources of contamination score ($SWAS_S$).

Geologic Sensitivity - $SWAS_G$

The $SWAS_G$ is factored into the SWAS based on the total thickness of Continuous Confining Material (CCM) such as clay, clay-rich till or shale, penetrated in construction of the CPWS well; or the total thickness of Continuous Partially Confining Material (CPCM) such as a mixture of sand and clay or sandstone and shale. The total thickness of CCM and CPCM should be determined from the well record for the CPWS well. Where a well log is not available, well records from adjacent wells or test hole borings may be used. Geologic maps (i.e., lithologic cross-sections) may also be used if they provide adequate coverage of the area in which the CPWS well is located.

Thirty points (30) are initially assigned to the $SWAS_G$ to represent a well lithology with an associated "high geologic sensitivity." From the thirty points, three points are than deducted from the $SWAS_G$ for each 10 feet of CCM or 15 feet of CPCM indicated on the well record. The greater the amount of CCM or CPCM, the greater the intrinsic geologic protection provided the NCPWS well, the greater the number of points deducted, and the lower the resulting $SWAS_G$. The following table provides a breakdown of geologic sensitivity, feet of CCM, feet of CPCM, and the points deducted from the 30 points to provide the resultant $SWAS_G$:

Geologic Sensitivity, CCM, CPCM, and Points Deducted

Geologic Sensitivity	High Sensitivity		Moderate Sensitivity						Low Sensitivity		
Amount of CCM (feet)	0	10	20	30	40	50	60	70	80	90	100 or greater
Amount of CPCM	0	15	30	45	60	75	90	105	120	135	150 or greater
Points Deducted	0	3	6	9	12	15	18	21	24	27	30

It is important to note the CCM and/or CPCM must be equal to or greater than 10 feet and 15 feet, respectively, to provide a deduction in the $SWAS_G$. The CCM and/or CPCM less than 10 feet and 15 feet, respectively, shall not be summed to provide a deduction to the $SWAS_G$. Further, where the amount of CCM and/or CPCM indicated on the well record results in a deduction of more than 30 points, the $SWAS_G$ shall be assigned a score of zero (0).

Well Construction - $SWAS_W$

The design, physical condition, and operation of a CPWS well may allow the entrance of contaminants into the well despite a high level of intrinsic geologic protection. To account for this possibility, the SWAS is assigned points through the $SWAS_W$ based upon four criteria related to the construction and use of the NCPWS wells. The $SWAS_W$ is assessed points based upon well grouting, the age of the well, the casing depth, and the pumping rate of the well.

Well Grouting - The well grouting criteria provides an evaluation of the condition of the well relative to current requirements set forth in the Groundwater Quality Control Act, Part 127, 1978 PA 368, as amended and rules, 1994 Revision, for sealing the annular space of a water well. Points are added to the $SWAS_W$ in accordance with the following:

0 pts. - the well record indicates the casing has been sealed from bottom to top in accordance with R 325.1634a, Construction of wells; grouting rotary-bored and augered wells, Rule 134a of the Groundwater Quality Control Act, Part 127, 1978 PA 368, as amended and rules;

5 pts. - the well record indicates the casing has been sealed to an unknown depth or to a depth of 25 feet, in accordance with R 325.1635, Construction of wells; grouting driven casing wells, Rule 135, of the Groundwater Quality Control Act, Part 127, 1978 PA 368,as amended and rules;

10 pts. - the well record indicates the well was grouted, but the date of construction precedes the 1994 revisions to the Groundwater Quality Control Act, Part 127, 1978 PA 368, as amended and rules, and available evidence suggests the well is not in compliance with current grouting requirements;

15 pts. - the well record indicates the well was not grouted, no well record is available, or other information suggests the well was ineffectively grouted.

Well Age - The age of a well provides an overall indication of probable conformity to current code requirements for the construction of a well, and an indication of the probable integrity of the well due to deterioration of materials used in the construction of the well. The $SWAS_W$ is assessed a greater number of points as the age of the well increases in accordance with the following criteria:

0 pts. - a well record is available which indicates the well was constructed after the 1994 revisions to the Groundwater Quality Control Act, Part 127, 1978 PA 368, as amended and rules, or a well record is available which indicates the well was constructed in accordance with the 1994 requirements;

5 pts. - a well record is available which indicates the well was constructed prior to 1994 and after 1976, the year the State of Michigan, Safe Drinking Water Act, 1976 PA 399, and administrative rule, was adopted as the standard for the regulation of public water supply systems;

10 pts. - a well record is available which indicates the well was constructed prior to 1976 but after 1967, the year the Groundwater Quality Control Act, Part 127, 1978 PA 368, as amended and rules, was originally adopted as the standard for the construction of wells;

15 pts. - a well record is not available, the age of the well is unknown, or it is determined that the construction of the well precedes the 1967 inception of the Groundwater Quality Control Act, Part 127 of Act 368, P.A. of 1978, as amended and rules.

Casing Depth - The depth to which a well is cased is a factor in determining the amount of earth material available to provide for natural attenuation of potential contaminants. The $SWAS_W$ is assessed a greater number of points as the casing depth is decreased in accordance with the following criteria:

0 pts. - the well record, or a physical determination of the casing depth, indicates the well is cased to a depth of 200 feet or greater;

5 pts. - the well record, or a physical determination of the casing depth, indicates the well is cased to a depth between 100 and 199 feet;

10 pts. - the well record , or a physical determination of the casing depth, indicates the well is cased to a depth between 25 and 99 feet;

15 pts. - the well record, or a physical determination of the casing depth, indicates the well is cased less than 25 feet, the casing terminates below grade, or the casing depth is not known.

Pumping Rate - The pumping rate has considerable impact on the "cone of depression" and "area of influence" of a well. In generalized terms, the area of influence is greater at higher pumping rates, thereby, increasing the potential for contamination of a CPWS well. Accordingly, the $SWAS_W$ is assessed additional points based upon the following criteria for the pumping rate of the permanent pump:

0 pts. - the well record, or a physical determination of the pumping rate of the permanent pump, indicates the well is pumped at a rate of less than 200 gallons per minute (gpm);

5 pts. - the well record, or a physical determination of the pumping rate of the permanent pump, indicates the well is pumped at a rate of 200 to less than 500 gpm;

10 pts. - the well record, or a physical determination of the pumping rate of the permanent pump, indicates the well is pumped at a rate of 500 to less than 1000 gpm;

15 pts. - the well record, or a physical determination of the pumping rate of the permanent pump, indicates the well is pumped at a rate greater than 1000 gpm.

Water Chemistry and Isotope Data - $SWAS_C$

Water chemistry data provides a refinement to the SWAS through the $SWAS_C$ which may increase or decrease the SWAS. As examples, the presence of nitrates, nitrites, volatile organic compounds or synthetic organic compounds, even at low levels, regulated inorganic chemicals and regulated radionuclides are indicators of source water vulnerability and increase the SWAS; the absence of tritium in the source water indicates the source water is old and not vulnerable, thereby decreasing the SWAS.

Nitrates and Nitrites - Water chemistry data which indicates nitrate-nitrogen (NO_3-N) or nitrite-nitrogen (NO_2-N) concentrations are present in the well water are an indication of vulnerability and result in points being added to the $SWAS_C$. The NO_3-N and NO_2-N data should be evaluated and points assigned the $SWAS_C$ based upon the most recent sample results. Water chemistry data for NO_3-N or NO_2-N concentrations in the well water shall result in the assignment of points to the $SWAS_C$ in accordance with the following:

0 pts. - NO_3-N and NO_2-N not detected in the well water;

10 pts. - NO_3-N or NO_2-N detected in the well water at a concentration that is less than one-half the drinking water standard;

20 pts. - NO_3-N or NO_2-N detected in the well water at a concentration that is less than the drinking water standard, but the concentration is one-half or more than one-half the drinking water standard;

50 pts. - NO_3-N or NO_2-N detected in the well water at a concentration that exceeds the drinking water standard.

Presence of Organic Chemicals - The presence of a volatile organic compound (VOC) or synthetic organic compound (SOC) is a clear sign of source water vulnerability. Points will be added to the $SWAS_C$ if water chemistry data indicates the presence, with confirmation, of a VOC or SOC in accordance with the following:

0 pts. - No VOC or SOC has been detected in the well water;

10 pts. - VOC or SOC detected in the well water at a concentration that is less than one-half the drinking water standard;

20 pts. - VOC or SOC detected in the well water at a concentration that is less than the drinking water standard, but the concentration is one-half or more than one-half the drinking water standard;

50 pts. - VOC or SOC detected in the well water at a concentration that exceeds the drinking water standard.

Inorganic Chemicals - Water chemistry data which indicates the presence of regulated inorganic chemical contaminants in the well water from man made or natural sources indicates either a vulnerable source and/or the sources possible inability to meet drinking water standards. Fluoride is exempt from this scoring unless natural concentrations exceed 1/2 the MCL or 2 mg/l. Points will be added to the $SWAS_C$ if water chemistry data indicates the presence, with confirmation, of a inorganic contaminants in accordance with the following:

0 pts. - Regulated inorganic contaminants not detected in the well water;

10 pts. - Regulated inorganic contaminants detected in the well water at a concentration that is less than one-half the drinking water standard;

20 pts. - Regulated inorganic contaminants detected in the well water at a concentration that is less than the drinking water standard, but the concentration is one-half or more than one-half the drinking water standard;

50 pts. - Regulated inorganic contaminants detected in the well water at a concentration that exceeds the drinking water standard.

Radionuclides - The presence of regulated radionuclides indicates the well is susceptible to natural or manmade contaminants which may effect the supply's ability to meet drinking water standards. Points will be added to the $SWAS_C$ if water chemistry data indicates the presence, with confirmation, of a regulated radionuclide in accordance with the following:

0 pts. - Regulated radionuclides not detected in the well water;

10 pts. - Regulated radionuclides detected in the well water at a concentration that is less than one-half the drinking water standard;

20 pts. - Regulated radionuclides detected in the well water at a concentration that is less than the drinking water standard, but the concentration is one-half or more than one-half the drinking water standard;

50 pts. - Regulated radionuclides detected in the well water at a concentration that exceeds the drinking water standard.

Tritium - The analysis of CPWS well water which indicates no tritium is present indicates the source water is not vulnerable and results in a negative assignment of points to the $SWAS_C$: Sources with tritium levels between 1.0 and 10 tritium units are of questionable vulnerability and receive no points.

-30 pts. - added to the $SWAS_C$ where isotope data indicates the tritium concentration in the source water is less than 1.0 tritium units;

+30 pts. - added to the $SWAS_C$ where isotope data indicates the tritium concentration in the source water exceeds 10 tritium units.

Isolation from Sources of Contamination - $SWAS_S$

Isolation from Standard and Major Sources - The isolation of a CPWS well from sources of contamination is an important criteria in the source water assessment. The maintenance of isolation distances can significantly reduce the perceived risk associated with the use of a well. The $SWAS_S$ is assessed points for failure to maintain adequate isolation between "potential" sources of contamination and "known" sources of contamination. Known sources of contamination include those sources where the ground water has been impacted as a leaking underground storage tank or other sites of environmental contamination. The $SWAS_S$ is assessed points based upon isolation as follows:

10 pts. - each "standard source" of potential contamination within 200 feet of the CPWS well;

10 pts. - each "major source" of potential contamination located from 200 to 2000 feet of the CPWS well;

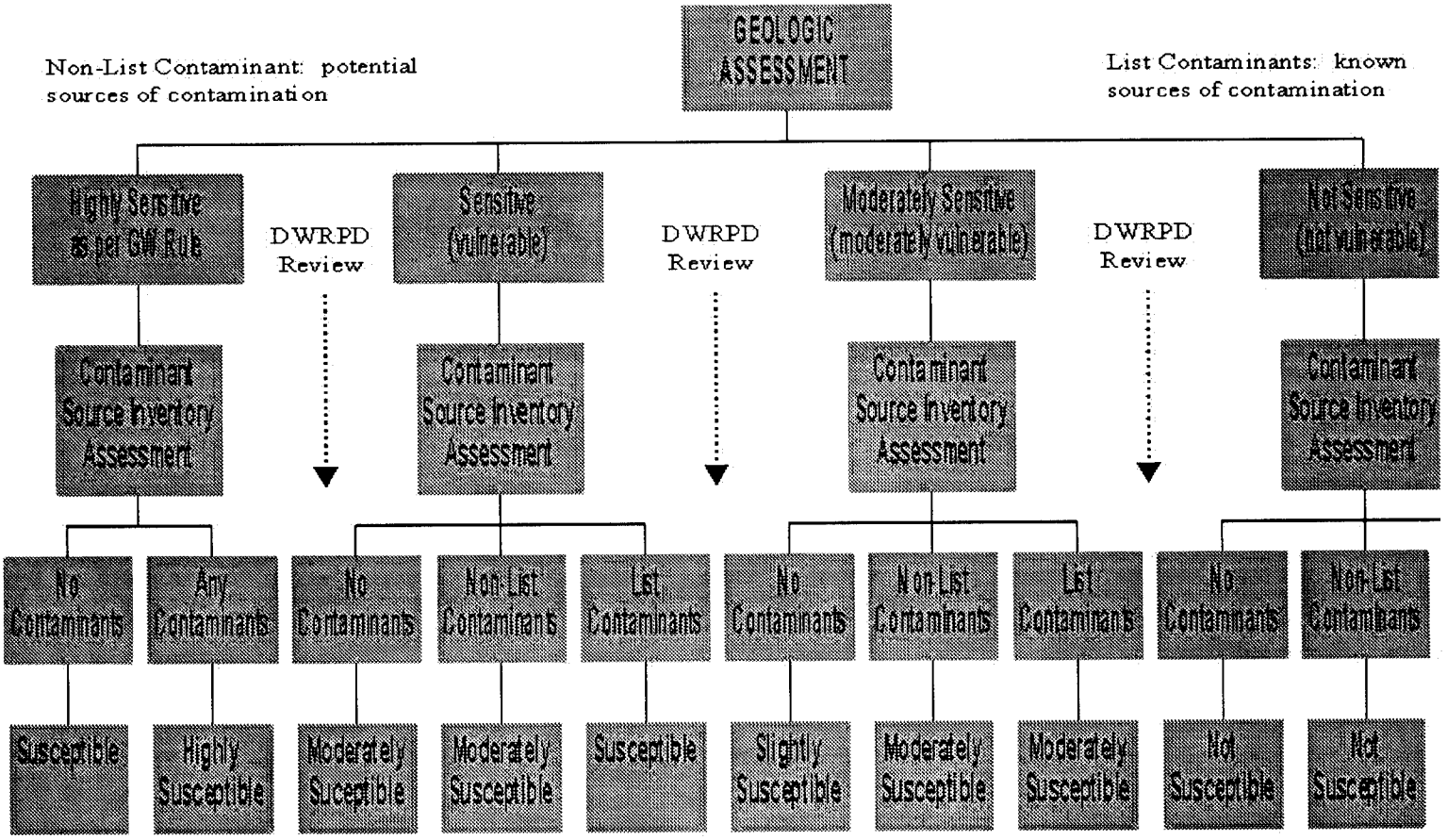
20 pts. - each "major source" of potential contamination located within 200 feet of the CPWS well;

25 pts. - each "known" source of contamination located within 2000 feet of the CPWS well.

Control of Standard Isolation Area - The Michigan Safe Drinking Water Act requires a CPWS to own or control through a lease or easement the defined isolation area around each well. Failure to own or properly control this area effects the future vulnerability of the well. Additional points will be added to the $SWAS_S$ based on the following schedule:

0 pts. - CPWS owns or leases entire isolation area.

10 pts. - CPWS owns or leases 1/2 or more of the isolation area.

20 pts. - CPWS owns or leases less than 1/2 the isolation area.

Source Water Assessment Flow Diagram