

# GUN PLAIN CHARTER TOWNSHIP ALLEGAN COUNTY, MICHIGAN



## *Wellhead Protection Program Plan*

*2014 Renewal*

(Original WHPP: September 2004)

#14169

**GUN PLAIN CHARTER TOWNSHIP  
WELLHEAD PROTECTION PROGRAM PLAN  
2014 RENEWAL**

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**GUN PLAIN CHARTER TOWNSHIP  
WELLHEAD PROTECTION PROGRAM PLAN  
2014 RENEWAL**

**EXECUTIVE SUMMARY**

Throughout the State of Michigan, areas of polluted groundwater are present in almost every urbanized area. When contamination in groundwater becomes significant, human health and economic activities may be affected. As a result, communities have recognized the need for a systematic program of groundwater quality management. A Wellhead Protection Program (WHPP) develops long-term strategies to protect a community's drinking water supply. The long-term management of groundwater quality is endorsed at both the federal and the state level. Specifically, the Federal Safe Drinking Water Act was amended in 1986 to include wellhead protection. Additionally, the State of Michigan provides financial and technical resources for communities to develop a wellhead protection program. Gun Plain Charter Township's Wellhead Protection Plan (Plan) is a "living" document that details action being taken to ensure the long-term integrity of the Township's water supply system.

Gun Plain Township is located in Allegan County, southwestern lower Michigan. The water system for the Township includes two production wells. The Township contracts for the operation and maintenance of the wells and the water distribution system. The Township relies on the two wells: well numbers 2 and 3. These are presently the only production wells in service.

In the past, the Township recognized the importance of protecting the wellfield that supplies drinking water to the community. In 2002, the Township selected Fleis & VandenBrink Engineering, Inc. (F&V) to assist in developing a formal Wellhead Protection Program based on guidelines provided by the Michigan Department of Environmental Quality (MDEQ). Recently, MDEQ has requested that Plans be updated in five year intervals. In 2014, the Township reviewed and revised their WHPP based on the MDEQ document "Checklist for Wellhead Protection Program Renewal".

Development of the Township's Wellhead Protection Program and subsequent MDEQ Program Renewals included public meetings which were held quarterly in 2002 through 2014 and again in 2013 through 2014. These meetings provided an opportunity for Township residents and elected officials to discuss the general nature of the Township's WHPP.

The overall goals of the Township's program are included in this WHPP. Previous reports detail the collection of available information on the hydrogeology of the Gun Plain Township area, including the interpretation of numerous depth-to-water measurements and results from aquifer performance testing. The collected information was used to develop a groundwater model that delineated the 10-year groundwater contribution zone for the Township's wellfield. This area is known as the Wellhead Protection Area (WHPA). Detailed explanations of the WHPA delineation and specific options in developing and implementing management strategies were discussed at public meetings during the development and the renewal of the Township's WHPP.

This plan also identifies sites of environmental contamination listed on state and federal databases and located within the WHPA. Documenting these sites is important for several reasons, including identifying immediate risk to drinking water. This documentation is referred to as a Contaminant Source Inventory.

Collected information was used to analyze the "sensitivity" and determine the "susceptibility" of the Township's drinking water wells to potential sources of contamination. MDEQ has defined the aquifer supplying the Township's wells as having "moderate" sensitivity to potential contamination. After review of the Contaminant Source Inventory information included in this Plan, the susceptibility of the wells to impact from identified sources of surface contamination will be determined by MDEQ.

Based on the Township's goals, and on the delineated WHPA, the Township reviewed numerous options to manage the WHPA and surrounding areas. Options reviewed included both regulatory (e.g., ordinances, site review criteria, existing programs) and non-regulatory options (e.g., public education). Options that were considered effective and practical have been implemented or will be considered for future implementation.

## **GUN PLAIN CHARTER TOWNSHIP WELLHEAD PROTECTION PROGRAM PLAN 2014 RENEWAL**

### **I. PURPOSE AND SCOPE**

The purpose of Gun Plain Charter Township's Wellhead Protection Program (WHPP) is to protect the Township's public water supply system from contamination. This protection is provided by determining the groundwater areas that contribute to the existing municipal wells. This area is called the wellhead protection area (WHPA). Once the WHPA is defined, existing and potential sources of groundwater contamination within the area are identified. Finally, methods to manage the WHPA and minimize the threat to existing and future private and municipal water supply wells are considered and implemented, if appropriate.

The MDEQ's WHPP was developed in response to the 1986 Amendments to the Federal Safe Drinking Water Act. Portions of this WHPP are voluntary and are implemented on a local level through coordination of a Wellhead Protection Team (Team) consisting of local, county and state representatives.

Guidelines have been established for the WHPP by the Water Resources Division of the MDEQ. The 2004 WHPP developed for Gun Plain Charter Township was based on MDEQ guidelines in effect at that time.

MDEQ WHPP Renewal guidelines include the following major elements, which are further detailed in this written WHPP Plan (Plan):

- Introduction
- Roles and Responsibilities
- Wellhead Protection Area Delineation
- Contaminant Source Inventory
- WHPA Management Approaches
- Water Supply Emergency Contingency Plan
- Plan for New Wells
- Public Participation and Outreach/Education

The lead agency for the WHPP is Gun Plain Charter Township. The Township has been actively pursuing wellhead protection activities since 2002, when a formal wellhead protection program was initiated by completing an investigation of its existing municipal wellfield, compiling data which described hydrogeologic conditions and groundwater flow directions, and identifying existing and potential sources of contamination upgradient of its existing wellfield location. In 2003, the Township completed the delineation of the two wells located at a single wellfield.

The location of the two Gun Plain Charter Township municipal wells and the Wellhead Protection Area are illustrated in Figure 1. As illustrated in Figure 1, the WHPA for wells #2 and #3 originates in Section 26 and extends northeast into Sections 23, 24 and 25 of Gun Plain Charter Township and Sections 19 and 30 of Prairieville Township in neighboring Barry County. A map of the WHPA is also located at the MDEQ Water Division, Wellhead Protection Unit website ([www.michigan.gov/deq](http://www.michigan.gov/deq) and search for "Wellhead Protection Maps").

This written Plan also identifies several known and potential sources of contamination within and near the WHPA. Since a portion of the 10-year delineated wellhead protection area is located in Barry County's Prairieville Township, the implementation and long-term success of the program will depend on the inter-governmental cooperation of Gun Plain Charter and Prairieville Township, and on the voluntary assistance of land owners within the WHPA.

## II. INTRODUCTION

The purpose of this section includes updating basic information about the public water supply system (PWSS) and the community. The Township is located approximately 25 miles north of Kalamazoo along US 131, Allegan County. According to Township records, the 2010 census population is 5,895 and the population served by the wellfield is 385. The Township operates two Type I wells, an elevated storage tank and approximately 50,000 feet of water main. The wells have a total capacity of 750 gallons per minute (gpm) and a firm capacity (capacity with largest production well off-line) of 350 gpm.

This section also identifies the goals for the Township's WHPP. These goals and objectives are intended to develop a successful long-term program to protect Gun Plain Charter Township's drinking water wellfield and to prevent groundwater pollution in the wellhead protection areas through public education and cooperative management by local government agencies.

**Goal #1 To protect the public drinking water supply by preventing the pollution of surface and groundwater within the WHPA.**

*Objective is to maintain a safe drinking water supply and protect the Township's water infrastructure investment by preventing pollution from entering groundwater.*

- Methods:
- Define the Wellhead Protection Area (WHPA)
  - Inventory actual and potential contamination within the WHPA
  - Ensure historical wells have been properly abandoned
  - Coordinate WHP activities with county and state agencies

**Goal #2 To instill a sense of ownership of the wellfields and encourage the local community to recognize that wellhead protection is both worthwhile and necessary.**

*Objective is to develop local awareness and support for wellhead protection.*

- Methods:
- Develop educational strategies
  - Notify property owners located near the wellfields

**Goal #3 To clarify the roles and duties of agencies and individuals involved in wellhead protection.**

*Objective is to develop an effective WHP program.*

- Methods:
- Assign municipal staff
  - Identify volunteers to assist with various aspects of the program

**Goal #4 To promote inter-governmental and intra-governmental cooperation to assure protection of the water resources within the WHPA.**

*Objective is to address groundwater protection on a regional basis.*

**Goal #5 To promote the speedy and thorough cleanup of existing contamination within the WHPA.**

*Objective is to reduce the likelihood of contaminants migrating into the municipal water supply.*

- Methods:
- Document known sites of contamination
  - Develop cleanup priority and monitoring system

**Goal #6 To plan and prepare for water supply emergencies.**

*Objective is to plan to respond to potential natural and man-made events including hazardous material spills, vandalism, power loss, etc.*

- Methods:
- Develop program with local municipal leaders
  - Define program in a written plan

### III. ROLES AND RESPONSIBILITIES

The purpose of this section includes updating information about the Team. The long-term success of the Township's WHPP depends largely on the effectiveness of the Team and the continuing education and awareness of groundwater issues within the local community. Most communities, including Gun Plain Charter Township, have interested citizens and uniquely qualified individuals who have lived in the area for years and can contribute greatly to the long-term success of the WHPP.

Gun Plain Charter Township's Team represents the "stakeholders" of the community. Members of the Team have provided input and guidance throughout the WHPP Renewal process. The Team also reflects the reality that the groundwater reaching the existing municipal wells does not recognize municipal boundaries, and a cooperative effort with other communities in the area is necessary to effectively manage land use and development within the wellhead delineation areas.

Team members and their representation are listed in Attachment A. The WHPP was last updated in 2014. No new organizations or agencies have become involved. Additional intergovernmental agreements or memoranda have not been implemented or updated.

As planned in the initial WHPP, members of the Team have been and will continue to be instrumental in future revisions or changes in the Township's WHPP. The Team will meet once a year to review the WHPP relative to changes or plans in the community. More frequent meetings will be scheduled if needed. The agenda of the annual Team meetings will minimally include a review/update of the contaminant source inventory and a review of the Township's water production. Additional items that may be addressed include:

- Current wellhead protection education/awareness efforts
- New wellhead protection education/awareness ideas and recommendations
- Other communities' WHP programs
- Review of any changes in MDEQ WHP guidance
- Abandoned well closures
- Review effectiveness of the WHP management options

The Gun Plain Charter Township Plan is a written compilation of numerous concepts which, when implemented, are designed to protect the integrity of the Township's wellfield and distribution system. While several strategies have already been implemented, the development of this Plan has provided additional strategies that are discussed throughout this written Plan. The following Action Plan Summary (Table 1) is a quick-reference guide for some of the additional strategies listed in the Plan. The Action Plan Summary identifies roles and responsibilities for specific Team members, including responsibility for the periodic update of the Plan. Given the dynamic nature of wellhead protection, it is important to acknowledge that roles and responsibilities will change over time and that planning for this change is essential.

The Township will have a key role in a successful and sustainable Wellhead Protection Program. Specifically, the Water System Operator will be asked (in addition to other items referenced in the Action Plan Summary) to:

- ✓ Perform contingency procedures in the event of a water system or water supply emergency.
- ✓ Perform maintenance and operation of the water system.
- ✓ Monitor the quality of the Township's drinking water supplies.
- ✓ Work with MDEQ to support state Wellhead Protection Program requirements.

- ✓ Work with MDEQ to promote the incorporation of WHPP principles into the periodic evaluations and surveillance of public water supplies that are carried out by MDEQ personnel.
- ✓ Work with MDEQ to promote state enforcement of the regulatory programs listed above within the Wellhead Protection Areas.

Additionally, the Township Supervisor will be asked (in addition to other items referenced in the Action Plan Summary) to:

- ✓ Observe best alternatives for future planning and zoning within the WHPA.
- ✓ Promote “best” wellhead management practices within both the WHPA and within the Township.
- ✓ Assist inspectors, builders, and earth moving contractors, generating awareness of environmentally incompatible land activities or materials handling practices.
- ✓ Search for funding sources for Wellhead Protection Program activities at the federal, state and local level.
- ✓ Work with MDEQ to ensure the Township’s WHPP meets or exceeds any state or federal WHPP requirements.
- ✓ Review maintenance and operation of the water system with Board.
- ✓ Review the quality of the Township’s drinking water supplies with the Board.
- ✓ Serve as custodian of the Wellhead Protection Program.
- ✓ Maintain the local Wellhead Protection Program and review of the program with the Wellhead Team.
- ✓ Work with County Road Commission and MDOT to encourage their consideration of road salt and sand application within the Township, and especially within the WHPA.
- ✓ Support MDEQ preparation of technical assistance materials for local units of government.

**TABLE 1  
GUN PLAIN CHARTER TOWNSHIP WELLHEAD PROTECTION PROGRAM  
ACTION PLAN SUMMARY**

<b>Item #</b>	<b>Action (page where referenced in Plan)</b>	<b>Due Date</b>	<b>Frequency</b>	<b>Lead Team Member</b>
1	Discuss Fire Fighter Right to Know (FFRTK) survey options with the volunteer Gun Plain Charter Township Fire Department. (See page 16)	Ongoing	Ongoing	Fire Chief
2	Review Water Supply Emergency Contingency Plan. (20)	Ongoing	Annually	Township Supervisor
3	Provide copy of MDEQ approved WHPP Renewal to County. (16)	2014	Once	Township Supervisor
4	Contaminant Source Inventory Maintenance. (10)	2017	Every 3 years	Township Supervisor
5	Performance of contingency procedures in the event of a water system or water supply emergency. (3, 18, )	Ongoing	Review Annually	Township Supervisor
6	Review maintenance and operation of the water system with Board. (4)	Ongoing	Review Annually	Township Supervisor
7	Review the quality of the Township's drinking water supplies with Board. (4)	Ongoing	Review Annually	Township Supervisor
8	Link WHPP Plan to other Township Plans. (27)	Ongoing	Review Annually	Township Supervisor
9	Observing best alternatives for future planning and zoning within the WHPA. (27)	Ongoing	Review Annually	Township Supervisor
10	Promotion of best wellhead management practices within both the Wellhead Protection Area and the Township. (4)	Ongoing	Review Annually	Township Supervisor
11	Proper siting and consideration of new production wells for water supply in a manner consistent with the conclusions of the WHPA delineation. (30)	Ongoing	Review Annually	Township Supervisor
12	Continued support and promotion of the County's Used Oil Collection and Household Hazardous Waste Programs. (25)	Ongoing	Review Annually	Township Supervisor
13	Search for funding sources for Wellhead Protection Program activities. (4)	Ongoing	Review Annually	Township Supervisor
14	Work with MDEQ to insure the Township's WHPP meets or exceeds any state or federal WHPP requirements. (4)	Ongoing	Review Annually	Water Operator

15	Funding for Abandoned Well Program. (19)	Ongoing	Review Annually	Township Supervisor
16	Gun Plain Charter / Prairieville Township coordination of leaking underground storage tank cleanups. (15)	Ongoing	Review Annually	Township Supervisor
17	Custodian of the Wellhead Protection Program. (4)	Ongoing	Review Annually	Township Supervisor
18	Maintenance of the local Wellhead Protection Program and review of the program with the Team. (4)	Ongoing	Review Annually	Township Supervisor
19	Continued public education and awareness of the WHPP, including water and sewer issues. (4)	Ongoing	Review Annually	Township Supervisor
20	Assist inspectors, builders, and earth moving contractors, generating awareness of environmentally incompatible land activities or materials handling practices. (4)	Ongoing	Review Annually	Township Supervisor
21	Work with County Road Commission and MDOT to encourage their consideration of road salt application with priority placed on the WHPA. (4)	Ongoing	Review Annually	Township Supervisor
22	Support MDEQ preparation of technical assistance materials for local units of government. (4)	Ongoing	Review Annually	Township Supervisor
23	Work with MDEQ to support state Wellhead Protection Program requirements. (4)	Ongoing	Review Annually	Township Supervisor
24	Work with MDEQ to promote incorporation of WHPP principals into the periodic evaluations and surveillance of public water supplies that are carried out by MDEQ personnel. (4)	Ongoing	Review Annually	Township Supervisor
25	Work with MDEQ to promote state enforcement of the regulatory programs listed above within the Wellhead Protection Areas. (4)	Ongoing	Review Annually	Township Supervisor
26	Periodic contact with County Sanitarians (wells Sanitarian and septic Sanitarian) in regards to water well and septic permits within the Township. (4)	Ongoing	Review Annually	Township Supervisor
27	Installation of "Wellhead Protection Area" road signs at entrances to the Township. (purchased 2004, installed 2014) (17)	2014	Review Annually	Township Supervisor
28	Distribution of an informational wellhead protection brochure. (ongoing, started in 2004) (17)	Ongoing as authorized by Board	Review Annually	Township Supervisor
29	Provide Township Offices with a copy of the Wellhead Protection Plan for public review. (2004 and 2014) (17)	2014	Review Annually	Township Supervisor

30	Township's newsletter to provide information on WHP. (ongoing, started in 2003) (17)	Ongoing as authorized by Board	Review Annually	Township Supervisor
31	Discuss the Township's groundwater protection programs at meetings with the Plainwell Chamber of Commerce and Downtown Development Authority. (17)	Ongoing	Review Annually	Township Supervisor
32	Work with the City of Plainwell Wellhead Protection Program to address common goals. (17)	Ongoing	Review Annually	Township Supervisor
33	Annual Wellhead Protection Program town hall meeting. (starting in 2015) (17)	Ongoing	Review Annually	Township Supervisor
34	Identify and publicize used oil and household hazardous waste recycling centers. (ongoing, started in 2003) (17)	Ongoing	Review Annually	Township Supervisor
35	Use of annual Consumer Confidence Reports to re-introduce the concept of wellhead protection. (17)	Ongoing	Review Annually	Township Supervisor

#### IV. WELLHEAD PROTECTION AREA DELINEATION

The purpose of this section is to update information about the WHPA. The Federal Safe Drinking Water Act defines a WHPA as “...*the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move towards and reach such water well or wellfield*”. The entire WHPP is based on the results of this key element.

Between 2002 and 2003, Gun Plain Charter Township completed a hydrogeological study to identify groundwater areas that move towards and reach the Township’s water supply wells. The study included reviewing existing background information on the regional geologic formations, surveying groundwater elevations to determine groundwater gradients and directions of flow and conducting an aquifer pump test and analysis. Computerized groundwater flow modeling and particle tracking was used to delineate the groundwater area surrounding the municipal wellfield through which contaminants could reasonably move towards and reach the municipal wellfields.

Since 2003, new geological data that will have a material impact on the current delineation has not been identified. Changes in well usage or flow rates in the current WHPA that would have a material impact on the WHPA have not been identified (e.g., well abandonment, new wells, etc.)

The MDEQ Guidelines for establishing a wellhead protection area are based on a groundwater time of travel of 10 years. This means that the area delineated for the WHPP needs to encompass groundwater areas which contribute to the Township’s wellfields at a distance of 10 years’ groundwater travel time. A 10-year time of travel is used to provide a reasonable length of time for addressing environmental problems within the wellhead protection area, while limiting the size to an area which can be reasonably managed by the Township’s existing water operations, land planning and zoning ordinances.

The 10-year WHPA delineation for Gun Plain Charter Township is illustrated in Figure 1. This is unchanged from 2003. The previously completed Delineation Report includes the methodology used to develop the WHPA including maps, figures, and geological cross-sections used for the modeling. Since the original delineation, additional production wells have not been added to the Township’s water system.

## V. CONTAMINANT SOURCE INVENTORY

The goal of this element is to identify existing and potential sources of contamination within the previously determined WHPA. Contamination has several possible pathways to reach groundwater including direct spills, interior floor drains which discharge into the ground, septic systems, leaking underground storage tanks, storm water runoff, or dry and abandoned wells. In certain hydrogeologic settings, even very small amounts of a hazardous substance can contaminate large areas of groundwater.

The Federal Safe Drinking Water Act also requires that a WHPP “...will identify within each wellhead protection area all potential anthropogenic sources of contaminants which may have any adverse effect on the health of persons”. An anthropogenic source is any activity performed by or caused by human actions that is, or potentially could be, a source of contamination to groundwater, including human actions affecting natural contaminants. The releases can be either from *point* sources, such as leaking tanks or impoundments, or from *non-point* sources, such as the application of agricultural chemicals or releases from areas containing septic tank/leach field systems.

A contaminant is defined in this WHPP as an organic, inorganic or microbiological substance that is regulated under federal, state or local environmental programs.

Applicable federal and state-related environmental laws and hazardous material regulations to control the use of potential contaminants generally include the Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA or "Superfund"), Safe Drinking Water Act (SDWA), Clean Water Act (CWA), Toxic Substances Control Act (TSCA) and the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Although these regulations have imposed controls on a wide range of industries and hazardous material treatment, storage and disposal practices, they tend to focus primarily on the larger manufacturing industries which manage the majority of hazardous wastes and hazardous materials in this country. Other smaller industries and businesses are not as stringently controlled (if controlled at all) due to the focus on industries that manage wastes or materials above a threshold amount or because the materials managed by the smaller industries are not considered "hazardous". As a result, materials and wastes that are not generally regarded or regulated as "hazardous" still have the potential to contaminate groundwater supplies.

Identifying the location and types of potential sources of contamination is essential in the development and implementation of effective management and public education strategies within the local WHPP.

### A. CATEGORIES OF POTENTIAL CONTAMINATION SOURCES

As part of this WHPP, categories of sources or activities having the potential to contaminate groundwater are provided in Attachment C. The table is intended to provide a general overview of environmental risks associated with various activities. The categories have been grouped according to the type of activity (e.g., agricultural, residential, governmental, commercial and industrial) with which the source is commonly associated. The type(s) of contaminant(s) commonly associated with the various types of sources and the relative risk to groundwater quality are also provided.

### B. CONTAMINANT SOURCE INVENTORY PROCESS

An initial inventory was completed in 2003. The purpose of this inventory was to develop and confirm a list of existing and potential sources of contamination within the WHPA.

The inventory was further developed in the Spring of 2014. The identification of existing sources of contamination has been compiled using information from various agencies including those listed below:

- Sites of Environmental Contamination (201 sites), Remediation and Redevelopment Division (RRD), MDEQ (Part 201 of Act 451) (<http://www.deq.state.mi.us/part201ss/>)
- Underground Storage Tank List, Waste and Hazardous Materials Division, MDEQ (Part 213 of Act 451) (<http://www.deq.state.mi.us/sid-web/>)
- Leaking Underground Storage Tank Sites, Remediation and Redevelopment Division, MDEQ (Part 213 of Act 451) (<http://www.deq.state.mi.us/sid-web/>)
- Oil & Gas Contamination Sites, Geological and Land Management Division, MDEQ (Act 61) ([http://www.michigan.gov/deq/0,4561,7-135-6132\\_6828-98518--,00.html](http://www.michigan.gov/deq/0,4561,7-135-6132_6828-98518--,00.html)) <<F&V must conduct>>
- Hazardous Waste Generators, Waste and Hazardous Materials Division, MDEQ (Part 111 of Act 451) (<http://www.deq.state.mi.us/tsd/> & <http://www.deq.state.mi.us/wdsp/>)
- Groundwater Discharge Permits, Water Bureau, MDEQ (Part 31 of Act 451)
- Landfill/Solid Waste Disposal Site List, Waste and Hazardous Materials Division, MDEQ (Part 115 of Act 451) (<http://www.deq.state.mi.us/wdsp/>)
- Federal National Priorities List EPA, Region 5 (CERCLA and Superfund) (<http://www.epa.gov/superfund/sites/npl/npl.htm> & <http://www.deq.state.mi.us/spad/>)
- Other sites of concern

For this WHPP, '*existing*' sources are those which are known to have caused, or threaten to cause, groundwater contamination; regulatory agencies may have information pertaining to existing sources. '*Potential*' sources are those which may or may not have caused groundwater contamination but have the potential to do so; regulatory agencies may or may not have knowledge and/or information available relating to potential sources. F&V used the services of Environmental Data Resources (EDR) to search various databases for environmental information for the WHPA. F&V reviewed the information with the Team to check for discrepancies and obtain local information about the sites identified by EDR. A copy of information used for the inventory and identified sites are included in Attachment C.

### C. TRANSPORTATION ROUTES

No major transportation routes are located in the WHPA.

### D. SURFACE WATER SOURCES

The Township is in the Kalamazoo River watershed. Lake Doster lies in the eastern portion of the Township and occupies a portion of the wellhead protection area. Silver Creek and other drains also run through the southern and eastern portions of the WHPA. All of these surface water bodies are connected to the Kalamazoo River.

Surface water quality degradation within the River can occur through both non-point and point source discharges. Groundwater quality degradation may occur when surface water of lesser quality recharges the aquifer by means of infiltration through the streambed.

With point source discharges, the contaminant threat is dependent on the volume of the release, chemical/physical properties of the contaminant and surface water velocity. Significant point source discharges to Lake Doster have not been identified.

Non-point source contaminants are usually seasonally derived, resulting from the release of fertilizer and pesticide applications in agricultural portions of the watershed and/or storm water runoff from urban areas.

It is important to note that groundwater/surface water interactions in lake and river/creek systems are often complex and are transient in nature. Because these two resources are connected, groundwater can be impacted by contaminants released to surface water and vice versa.

#### **E. ABANDONED WELLS**

Abandoned wells can pose a threat to groundwater. Wells which are not properly closed can provide a direct conduit for surface run-off and contaminants to easily reach the groundwater. Abandoned wells may be from oil and gas drilling, water wells, irrigation wells, or dry wells.

As part of the Contaminant Source Inventory completed for the Township's Wellhead Protection Program, MDEQ Geological Survey Division was contacted for records of oil and gas wells or listed contamination sites within the Gun Plain Charter Township area. MDEQ records indicated no active or abandoned wells, 'dry holes' (a well used for oil and gas exploration and not associated with production) or listed oil and gas contamination sites have been identified within the Township's WHPA.

The Township will also consider practical and legal options of having any future water system expansions include a requirement that connecting properties abandon their existing well.

The Township is also considering abandoning wells located in the municipal wellfield and used for various water tests.

#### **F. HAZARDOUS PIPELINES**

Based on records publicly available through the U.S. Department of Transportation's Pipeline and Hazardous Material Safety Administration natural gas, petroleum, and other hazardous material pipelines in the Township's WHPA were not identified. Natural gas transmission pipelines are located in Plainwell outside of the WHPA.

#### **G. SENSITIVITY ANALYSIS**

The 1996 amendments to the Federal Safe Drinking Water Act requires that states analyze the "sensitivity" and determine "susceptibility" of a community's source of drinking water to potential sources of contamination.

Sensitivity is determined from the natural setting of the source water (raw water to the Township's wells), and indicates natural protection afforded the source water. As documented by MDEQ on November 12, 2003, information from the WHPA delineation indicates that the aquifer from which the Township's wells obtain groundwater is "leaky-confined." Leaky-confined aquifers are geologically categorized as "moderate", meaning that polluting materials spilled on the surface are not significantly prevented from vertical migration by one or more geologic confining layers located above the aquifer.

#### **H. SUSCEPTIBILITY DETERMINATION**

Susceptibility identifies factors within the community's wellhead protection area that may pose a risk to the water supply. The susceptibility determination provides information with respect to listed facilities and land areas within the wellhead protection area that should be given greater priority and oversight in implementing a wellhead protection program. After review of the Contaminant Source Inventory information included in this Plan, a susceptibility determination will be made by MDEQ.

When considering sensitivity and susceptibility, it is important to understand that a system can have low sensitivity relative to some conditions (e.g., wells located a significant distance from potential

contamination sources) and high susceptibility because of other conditions (e.g., the type of contaminant).

#### **I. CONTAMINANT SOURCE INVENTORY MAINTENANCE**

All data management systems require periodic maintenance. Data maintenance for the Township's Contaminant Source Inventory was initiated when the preliminary list of sites was compiled. Specifically, the preliminary site names and mapped locations were confirmed by members of the Team.

## **VI. WELLHEAD PROTECTION AREA MANAGEMENT APPROACHES**

The goal of this element is to provide mechanisms which will prevent existing and potential sources of contamination from reaching the area's municipal water supply wells. Existing regulatory controls that can easily be adapted as WHPA management methods have been reviewed, and additional management methods were developed by the Team.

In developing the initial management strategy, it was acknowledged that it is highly improbable that all risks within the WHPA can be eliminated but, by applying one or more management tools, the likelihood of groundwater contamination impacting the municipal water supply in the future can be reduced. The WHPP Plan Renewal included review of the initial management strategies and also review of certain management activities identified by MDEQ in their WHPP Renewal guidance.

While some of the proposed management options refer to existing regulatory programs, it was recognized that protection of the WHPA can best be accomplished by developing partnerships with local businesses, industry, schools and the agricultural community and focusing on education/training and pollution prevention concepts. Additionally, it was recognized that the Township's WHPP will require regular review and updates to determine the effectiveness and appropriateness of the selected management options.

### **A. REVIEW OF MANAGEMENT STRATEGY OPTIONS**

Review of the management options as part of the initial WHPP was completed by the Team in 2002. Table 2 outlines the options that were reviewed by the initial Team as well as the Team in place during the 2014 Renewal. The Table lists the advantages and limitations of each option. The management options MDEQ identified as needing to be addressed for Renewal approval are also included in Table 2 and denoted with bold text. The Team was assigned the lead responsibility to recommend what specific WHPA management options should be presented to Gun Plain Charter Township Board and the neighboring Prairieville Township Board, if any, for further consideration. Selected options, updates and changes since the original WHPP was approved, and a timetable for implementation, are discussed in the following sections of this Plan Renewal.

**TABLE 2  
WELLHEAD PROTECTION AREA MANAGEMENT OPTIONS**

Option	Advantages	Limitations
<b>Overlay GW Protection Districts and General Zoning Ordinance Provisions for Wellhead Protection</b>	<ul style="list-style-type: none"> <li>• <i>Similar</i> to other overlay zoning methods familiar to planning commissions.</li> <li>• Targeted to specific wellhead protection areas.</li> <li>• Restricts certain high risk land uses in wellhead protection areas.</li> <li>• WHPA is identified on practical base/zoning map.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires staff to develop overlay map.</li> <li>• Requires modifying existing zoning ordinance.</li> <li>• Inherent nature of zoning provides "grandfather" protection to pre-existing uses and structures.</li> </ul>
<b>Site Plan Review</b>	<ul style="list-style-type: none"> <li>• Requires developers to design facilities for groundwater protection.</li> <li>• Assurance/consistency with county and state permits.</li> <li>• Proactive – places community in process of protecting groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires qualified staff or consultants.</li> <li>• Administrative cost higher.</li> </ul>
<b>Permits Checklist</b>	<ul style="list-style-type: none"> <li>• Alerts land owners to environmental permit requirements.</li> <li>• Helps community monitor environmental risks.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires staff to develop system.</li> </ul>
Prohibition of Various Land Uses	<ul style="list-style-type: none"> <li>• Used within mapped WHPAs to prohibit known groundwater contaminants and processes that generate contaminants.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires amendment to zoning ordinance.</li> <li>• Requires enforcement by both visual inspection and on-site investigations.</li> </ul>
Special Permitting	<ul style="list-style-type: none"> <li>• Used to restrict contaminant uses within WHPAs that may cause groundwater contamination.</li> <li>• Community adopts special permit "thresholds" for various uses and structures within WHPAs.</li> <li>• Community grants special permits for "threshold" uses only if groundwater quality will not be compromised.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires detailed understanding of WHPA's sensitivity by local permit granting authority.</li> <li>• Requires enforcement of special permit requirements and on-site investigations.</li> <li>• Requires case-by-case analysis to ensure equal treatment of applicants.</li> </ul>
Transfer of Development Rights	<ul style="list-style-type: none"> <li>• Used to transfer development from WHPAs to locations outside WHPAs.</li> </ul>	<ul style="list-style-type: none"> <li>• Cumbersome administrative requirements.</li> <li>• Not well-suited for small communities without significant administrative resources.</li> </ul>
Cluster/PUD Design	<ul style="list-style-type: none"> <li>• Allows for "point source" discharges that are more easily monitored by guiding residential development outside of WHPAs.</li> </ul>	<ul style="list-style-type: none"> <li>• Slightly more complicated to administer than traditional "grid" subdivision.</li> <li>• Enforcement/inspection requirements are similar to "grid" subdivision.</li> </ul>
Growth Controls/Timing	<ul style="list-style-type: none"> <li>• Community imposes growth controls in the form of building caps, subdivision phasing or other limitation tied to planning concerns which allows the community an opportunity to plan WHPA protection.</li> </ul>	<ul style="list-style-type: none"> <li>• Generally complicated administrative process.</li> <li>• Requires administrative staff to issue permits and enforce growth control ordinances.</li> </ul>
<b>Compliance With Existing Zoning Regulations and Plans</b>	<ul style="list-style-type: none"> <li>• Disseminates information to businesses.</li> <li>• Inexpensive/easy to enact and administer.</li> <li>• Places burden on applicants to obtain permits/approvals.</li> </ul>	<ul style="list-style-type: none"> <li>• Local groundwater may be vulnerable if other permit agencies fail to enforce compliance.</li> </ul>
Regulating or prohibiting Underground Fuel Storage Systems	<ul style="list-style-type: none"> <li>• Monitors or eliminates underground fuel storage systems (UST) within WHPAs.</li> </ul>	<ul style="list-style-type: none"> <li>• Prohibition of USTs requires little administrative support.</li> <li>• Regulating USTs requires moderate amounts of administrative support for inspection follow-up and enforcement.</li> </ul>

**TABLE 2 (cont.)  
WELLHEAD PROTECTION AREA MANAGEMENT OPTIONS**

<b>Option (continued)</b>	<b>Advantages</b>	<b>Limitations</b>
Privately Owned Wastewater Treatment Plants (Small Sewage Treatment Plants)	<ul style="list-style-type: none"> <li>Prohibits Small Sewage Treatment Plants (SSTP) within WHPAs.</li> </ul>	<ul style="list-style-type: none"> <li>Prohibition of SSTPs requires little administrative support.</li> <li>Regulating SSTPs requires moderate amount of administrative support for inspection follow up and enforcement.</li> </ul>
Prohibit Septic Cleaners Containing Solvent Compounds	<ul style="list-style-type: none"> <li>Prohibits the application of certain solvent septic cleaners within WHPAs.</li> </ul>	<ul style="list-style-type: none"> <li>Difficult regulation to enforce even with sufficient administrative support.</li> </ul>
Septic System Upgrades	<ul style="list-style-type: none"> <li>Requires periodic inspection and upgrading of septic systems.</li> </ul>	<ul style="list-style-type: none"> <li>Significant administrative resources required for this option to be successful.</li> </ul>
Toxic and Hazardous Material Handling Regulations	<ul style="list-style-type: none"> <li>Promotes proper handling and disposal of toxic materials/waste.</li> <li>Community knows what is being used and where.</li> <li>Hazardous substance users may have incentive to reduce or eliminate use.</li> </ul>	<ul style="list-style-type: none"> <li>Requires administrative support and on-site inspections.</li> </ul>
Drainage Requirements	<ul style="list-style-type: none"> <li>Uses advanced engineering designs of subdivision roads within WHPAs to ensure that road drainage is directed outside of WHPAs.</li> </ul>	<ul style="list-style-type: none"> <li>Requires moderate level of inspection and enforcement by administrative staff.</li> </ul>
Sale/Donation	Provides broad protection to the groundwater supply.	<p>There are few administrative requirements involved in accepting donations or sales of land from the private sector. Administrative requirements for maintenance of land accepted or purchased may be substantial, particularly if the community does not have a program for open space maintenance. Legal consequences of accepting land for donation or sale from the private sector, mostly involving liability.</p>
<b>Strategic Monitoring Within the WHPA</b>	Monitors groundwater quality within WHPAs.	Requires moderate administrative staffing to ensure routine sampling and response if sampling indicates contamination.
Contingency Plans	Provides appropriate response in cases of contaminant release or other emergencies within WHPAs.	Requires significant up-front planning to anticipate and be prepared for emergencies.
Hazardous Waste Collection	Reduces the accumulation of hazardous materials within WHPAs and the community at large.	Hazardous waste collection programs are generally sponsored by government agencies, but administered by a private contractor.
Public Education	Informs community residents of the connection between land use within WHPAs and drinking water quality.	Requires some degree of administrative support for programs, such as brochure mailing, to more intensive support for seminars and hazardous waste collection days.
<b>Abandoned Well Search and Closure Program</b>	Reduces conduits to transport surface contaminants to the lower drinking water aquifer.	Requires staff to manage program. Requires up-front planning to develop survey process. Funding to plug abandoned wells.

**TABLE 2 (cont.)  
WELLHEAD PROTECTION AREA MANAGEMENT OPTIONS**

<b>Option (continued)</b>	<b>Advantages</b>	<b>Limitations</b>
<b>Facility Inspections or a Hazardous Material Survey</b>	<p>Informs property owners of the connection between hazardous material usage within WHPAs and drinking water quality.</p> <p>Reduces the unsecured storage of hazardous materials within WHPAs and the community at large.</p> <p>Provides a benefit to business owners by making them aware of potential violations before a federal or state inspection.</p>	<p>May be perceived as over-bearing government policy.</p>
<b>Partnerships or Agreements With County or State Agencies Helping to Develop Program</b>	<p>Increases coordination between agencies.</p> <p>Increases the commitment to long-term success of the WHPP.</p>	<p>May be perceived as reducing local control on land use/zoning issues.</p>
Regional WHPA Districts	<p>Protects regional aquifer systems by establishing new legislative districts that often transcend existing corporate boundaries.</p> <p>Provides for protection of areas outside an individual community.</p> <p>Involves many stakeholders.</p> <p>Efficient use of technical and administrative resources by reducing duplication of tasks.</p>	<p>Difficult to develop due to several planning/governmental bodies.</p> <p>May be perceived as reducing local control on land use/zoning issues.</p>
<b>Inter-Agency Coordination and Communication</b>	<p>Increases coordination between communities.</p>	<p>Staffing.</p> <p>Ongoing communication agendas.</p>
Land Banking	<p>Acquires and protects land within WHPAs.</p>	<p>Land banks require significant administrative support if they are to function effectively.</p>

## **B. SELECTED MANAGEMENT STRATEGIES**

In 2013/14, the Team reviewed and reconsidered management strategies to reflect current concepts, thoughts and experiences from other communities. Going forward, the Team recognizes that ideas may change as new information becomes available. The Township plans to review these management strategies and continue to revise as appropriate. Overall, the Township has attempted to develop management strategies that can be measured. The development of measurable steps will continue into the future.

The following options were either previously implemented by the Township or are currently being pursued by the Team.

### **i. Inter-Agency Coordination and Communication**

The Township will continue to rely on inter-agency coordination and communication with a variety of initiatives and existing regulatory programs:

#### Part 22 of PA 451, Michigan Natural Resources and Environmental Protection Act

Part 22 requires certain notifications be made for groundwater discharges located within a MDEQ approved wellhead protection area. Part 22 also specifies certain isolation distances from water supply wells. This program provides the Local Unit of Government notification of permitted groundwater discharges.

In the future, when a Part 22 related transmittal is received, the Township will contact MDEQ or the Township's Engineer to determine what action, if any, should be taken.

#### Part 213 of PA 451, Michigan Natural Resources and Environmental Protection Act

Cleanup at leaking underground storage tank properties in Michigan is regulated under Part 213 of Michigan's Natural Resource and Environmental Protection Act. Part 213 allows environmental cleanups that leave certain concentrations of contaminants in soil and groundwater. Future land use at the contaminated site is restricted when this approach is taken. Additionally, this approach includes filing the form "Notice to Local Unit of Government of Land Use Restrictions" with the municipality where the restricted land use is being proposed.

If this form is filed for a property located within the Township's portion of the WHPA, the Township (or their representative) will contact MDEQ to review the proposed cleanup approach. However, since the WHPA extends into Prairieville Township, Gun Plain will need to work with Prairieville to develop a mechanism to inform Gun Plain Township if a notification is received for property located within or near Prairieville's portion of the WHPA. Accordingly, the Gun Plain Township will work with Prairieville Township to develop a system to notify the Township if a Part 213 of PA 451, Michigan Natural Resources and Environmental Protection Act "Local Unit of Government" notification of land use restrictions is being implemented as part of a leaking petroleum underground storage tank cleanup.

If the above notification is received, the Township will contact the MDEQ Storage Tank Division, Kalamazoo District office, and inform them that the contaminated property is located within a Delineated Wellhead Protection Area. The Township will request that the MDEQ strongly consider the Wellhead Protection Area when reviewing proposed corrective action activities at the leaking underground storage tank location.

A copy of form "Notice to Local Unit of Government of Land Use Restrictions" is included in Attachment D.

### Michigan Right to Farm Act (Act 93 of 1981)

This Act requires Generally Accepted Agricultural and Management Practices (GAAMPs) for a variety of farm related land use. Several GAAMPs consider Wellhead Protection Areas, including:

- Site Selection and Odor Control for New and Expanding Livestock Production Facilities (2009). Specifically, certain potential new livestock production facilities (i.e., “Category 3 Facilities”) shall not be constructed within a WHPA. An expanding livestock production facility may be constructed with review and approval by the local unit of government administering the Wellhead Protection Program.
- Pesticide Utilization and Pest Control (2014). Specifically, certain on-farm bulk storage and containment facilities for pesticides must be located at least 2,000 feet from a Type I community public water supply and/or outside of a wellhead protection area. This does not apply to an application site.
- Nutrient Utilization (2014). Specifically, certain potential new bulk liquid fertilizer storage areas must be located at least 2,000 feet from a Type I community public water supply. Additionally, if a wellhead protection program exists, potential storage areas must be located outside of a wellhead protection area.
- Nutrient Utilization (2014). Site-specific nitrate management practices and tools should be used in wellhead protection areas.

### Fire Fighter Right to Know

The Michigan Fire Fighter Right to Know (FFRTK) laws require every community fire department survey and inspect all facilities handling hazardous substances.

The Township will discuss options for using the FFRTK survey with the volunteer Gun Plain Charter Township Fire Department to assist with tracking compliance with various existing state and federal hazardous substance regulations.

### County Partnerships

The Township had previously delivered a copy of the MDEQ approved delineated Wellhead Protection Area to the Allegan County Health Department. The Township will also provide a copy of the Wellhead Protection Program Plan Renewal document.

The County is responsible for issuing on-site septic and water well permits. The Township will request that the County consider the WHPA in future permitting decisions, as appropriate. The Township will periodically contact the County to confirm that the appropriate staff are aware of the location of the Township’s WHPA. The intent of staying in contact is to minimize potential disruptions in WHPA inspections as the result of County personnel changes.

The Township will also partner with the County on future public education efforts (e.g., abandoned wells, household hazardous waste collection, small business pollution prevention or waste reduction). The combined Township/County efforts to inform small business owners could have a long-term positive impact on groundwater quality.

The County coordinates the collection of household hazardous waste for member communities who maintain an annual contract with the County. The Township will encourage participation in this program.

Other

Additionally, several State regulations affect certain land uses both within and outside of the Wellhead Protection Area. The intent of the regulations is to protect all Michigan groundwater. The specific land use categories (from “The Power to Protect: Planning and Managing Land Uses in the Wellhead Protection Area”, Draft Bulletin, February 2002 Lillian F. Dean, FAICP) are as follows:

- ✓ Farming and other agricultural operations (\*)
- ✓ Agricultural bulk chemical storage facilities (\*)
- ✓ Oil and gas drilling and operation (\*)
- ✓ Abandoned Wells
- ✓ Underground storage tanks (\*)
- ✓ Aboveground storage tanks (\*)
- ✓ Commercial and industrial use with hazardous substances on-site
- ✓ Junkyards and auto salvage yards
- ✓ Septic system installation and maintenance
- ✓ Storm water retention and detention basins
- ✓ Road salt application and storage
- ✓ Waste treatment and disposal facilities (\*)

The (\*) means that the State laws involved either preclude or severely restrict local regulatory activities.

**ii. Public Education**

It is recognized that public education, awareness and regular maintenance of the WHPP Plan will be a key element of the long-term success of the WHPP. The Township’s strategy is consistent with the County-wide strategy of public education being a long-term, continuous and repetitive process. Specific historical, current and future actions include:

- ✓ Installation of “Wellhead Protection Area” road signs at entrances to the Township. (purchased 2004, installed 2014)
- ✓ Distribution of an informational wellhead protection brochure. (ongoing, started in 2004)
- ✓ Provide Township Offices with a copy of the Wellhead Protection Plan for public review. (2004 and 2014)
- ✓ Use the Township’s newsletter to initially introduce the concept of wellhead protection. This will continue in the future and will provide detailed information on various aspects of WHP (e.g., household hazardous waste disposal, water conservation, abandoned wells, etc.) (ongoing, started in 2003)
- ✓ The Township Supervisor will discuss the Township’s groundwater protection programs at meetings with the Plainwell Chamber of Commerce and Downtown Development Authority.
- ✓ The Township Supervisor will work with the City of Plainwell Wellhead Protection Program to address common goals.
- ✓ The Township will hold annual Wellhead Protection Program town hall meetings that will be opened to the general public. The intent of the meetings is to review the overall Township WHPP. Public education/awareness ideas will be reviewed and a formal recommendation will be made to the Board. The Team review process will include reviewing what education/awareness activities other communities are completing. Other topics may include review of water well operations, contaminant source inventory updates, and/or effectiveness of the Environmental Permit Checklist. (starting in 2015)

- ✓ Identify and publicize used oil and household hazardous waste recycling centers. (ongoing, started in 2003)
- ✓ Use the annual Consumer Confidence Reports to re-introduce the concept of wellhead protection. Future efforts will provide detailed information on various aspects of WHPP (e.g., household hazardous waste disposal, water conservation, abandoned wells, etc.)

Some of the above activities may be completed by local community groups (e.g., Boy Scouts, Girl Scouts, schools, civic groups, church youth groups). This would both complete a measurable goal and also provide an opportunity for “hands-on” public education.

### **iii. Abandoned Well Search and Closure Program**

In the past, the Township has worked with MDEQ to locate and properly plug and abandon unused water wells located in the Township. The Township will continue to actively encourage property owners to identify abandoned wells. If reported, the Township will record the well location and owner. The Township will annually attempt to identify funding sources to have the wells properly abandoned.

The Township will address on-site wells when demolition permits are issued. The intent is to ensure abandoned wells are properly plugged prior to demolition activities, since it is difficult, if not impossible, to locate old wells after demolition activities have taken place.

The Township Offices will make available informational brochures on the management of abandoned wells that have been provided by the County.

### **iv. Encourage Local Compliance with Existing Pollution Prevention Programs**

Existing federal and state programs require certain industries and businesses to prepare pollution prevention plans. Examples are Storm Water Pollution Prevention and Pollution Incidence Prevention plans.

These types of plans review operations and ensure that consideration is provided to the location and management of activities that could impact groundwater resources. Small businesses are often unaware they are required to compile these plans.

Additionally, while these types of plans are required, it is not always necessary to submit them to regulating authorities. However, these plans typically must be provided to the regulating authority upon request.

The Township will rely on the Environmental Permit Checklist to identify land use that may require compliance with existing pollution prevention programs. For those land uses, the Township will inquire if compliance is being addressed as part of the Township’s site review process.

### **v. Linking the WHPP to Other Township Plans**

The Township recognizes that the long-term success of the Wellhead Program will depend, in part, on a large cross-section of individuals and groups understanding and recognizing the value in the programs goals. One way to accomplish this is to link the Wellhead Protection Program Plan to other Township plans (e.g., Master Plans, Policy Plans, Strategic Plans, Single-Issue Plans).

The 2010 update to the Township Master Plan included Wellhead Protection as an objective for Goal #4, Protect the Environment and Conserve Natural Resources.

Future updates to the Township’s Water Reliability Study will include consideration of the Wellhead Protection Program Plan. Specifically, the Water Reliability Study may be used to budget for long-term Wellhead Protection activities (e.g., public awareness, contaminant source inventory maintenance, contingency plan updates).

Future zoning regulation updates will formally consider the Wellhead Protection Area.

**vi. Contaminated Property Cleanup**

The Township has requested MDEQ updates on cleanup activities at certain contaminated properties located within or near the Wellhead Protection area. Additional updates will be considered for upcoming annual WHP meetings.

**vii. Environmental Permit Checklist and Site Plan Review Criteria**

The Township intends to use the Environmental Permit Checklist as part of site plan review in the Township. The intent of the Permit Checklist is to assist developers in complying with various state and county environmental permit requirements. A copy of the permit checklist is included in Attachment E.

The Township will also review options for enhancing existing site plan review criteria as it relates to groundwater protection.

In 2004, Gun Plain Charter Township prepared an Environmental Permit Checklist for use. A copy of the permit checklist is included in Attachment E.

**viii. Groundwater Protection Ordinance**

The Township has not adopted a groundwater protection ordinance. However, the Township's existing zoning ordinance addresses:

- Groundwater protection via Pollution Incident Prevention Plans at service stations and auto garages
- Golf courses and resulting impacts from water use
- Chemical storage
- Site plan review
- Blight

The Township WHP Team may consider recommending the development of an ordinance at future annual meetings.

## VII. WATER SUPPLY EMERGENCY CONTINGENCY PLAN

The goal of this element of the Plan is to provide both short-term and long-term protection of the Township's water supply system by identification of personnel, testing equipment, procedures, and materials which can be used for rapid correction or elimination of environmental accidents which might constitute a water supply emergency. The contingency plan also addresses response protocols, notification procedures and methods of containment.

The existing contingency plan outlines the program for the rapid correction or mitigation of water supply emergencies. It contains an inventory of necessary stand-by personnel, equipment, chemicals, and other materials readily available for the correction of water supply problems, including emergency measures in the event of contamination of the municipal wells from an emergency spill within the wellhead protection area. The means of notification of customers affected by an emergency is also provided, along with a description of the precautions and measures to be taken to protect the health of the affected system's water customers.

Township leaders understand that response to contaminated wells is not limited to technical measures. Indeed, when a municipal well becomes contaminated, it becomes a technical problem requiring professional knowledge of hydrogeology, engineering and other disciplines. Additionally, financial, legal, public relations and risk assessment problems often occur. Often, the initial public questions include:

- What is the current water quality?
- What is the source of the contaminants?
- What are the effects of past water usage?
- What action is being taken?

When municipal wells become contaminated, it is usually a surprise. This is especially true for wells located in a Wellhead Protection community. While it is unlikely that any plan will prevent an adverse response from the Township's water customers, this Wellhead Protection Plan suggests:

- Inform residents the truth as soon as it is known.
- Inform residents immediately upon confirmation of contaminants in the water supply.
- Continue to inform residents of activities being undertaken.

If the wells become contaminated, the MDEQ would likely require that the Township immediately initiate activities to provide either a treated water system or a new water supply. Once contamination is discovered, action may need to be taken before bonds or loans become available to address infrastructure needs.

If the wells become contaminated, an invaluable resource would include a previously established, consistent and strong public education program. Such a program would likely provide Township officials with the "benefit of the doubt" when explaining cleanup concentrations goals, how clean is clean, projected schedules, costs and funding.

Two parts of the long-term contingency planning for the Township will be based on the results of the Contaminant Source Inventory. First of all, the Township may initiate a system of self-monitoring for certain contaminants that have been identified near the wells. Specifically, the Township may sample for certain contaminants at a greater frequency than required by state law. The frequency and tests will be determined upon review of available files from a contaminated site. Secondly, future updates to the Contaminant Source Inventory may identify other chemicals that should be tested for more frequently than required by law. The Township will work closely with environmental professionals (state, county and private) to evaluate cost/benefit relationships of any testing beyond what is already completed by the Township.

Since the Plan was last updated, the Township has encountered water supply emergencies. Those emergencies have been discussed at the Team meetings and include:

- Response to Boil Water advisory in 2014.

## VIII. PLAN FOR NEW WELLS

The goal of this element is to provide a mechanism for incorporating new wells or wellfields into the WHP program. In the future, the Township may find it necessary, as a result of either existing or projected increased water demand, aging wells/infrastructure, or as the result of a contamination threat, to explore the development of additional groundwater sources for drinking water. Wellhead protection provides a mechanism that can be used to help select the best site and to identify areas that should be protected now so they will be able to provide quality drinking water in the future when they are needed. Additionally, it should be realized that the development of a new groundwater source in the vicinity of existing sources may modify the movement of groundwater in the subsurface, perhaps changing the shape and orientation of the existing WHPA. Evaluation of the significance of those changes is necessary in order to ensure that the management strategy in place will continue to protect the community's drinking water supply.

A new groundwater source is defined as either an additional groundwater source or an existing groundwater source that has been modified in a manner to increase its capacity or discharge to the system. When the Township begins planning the development of a new groundwater source, several steps should be followed. First of all, the Township should conduct a "draft" delineation and preliminary potential contaminant source inventory for each site being considered. "Draft" delineation is defined as applying the existing WHPA delineation to the considered additional well sites.

If the "draft" delineation and potential contaminant source inventory indicate that the considered well site is favorable, the Township would determine the WHPA for the new well using current MDEQ delineation guidance. This may include obtaining sufficient information from existing data sources or from field measurements to complete the delineation using an MDEQ accepted analytical or numerical groundwater modeling method.

If more than one potential site is available for a new source, the Township should proceed in its evaluation of those sites according to the discussions above. If the Township develops a new well or increases the capacity of an existing well that is within an already delineated WHPA, it is likely that the new or modified source will have a significant impact on the existing WHPA. In all cases, the effect of the new well on the existing WHPA geometry and orientation should be evaluated.

The groundwater models that were used to delineate the WHPA for the existing municipal production wells may also be used to develop a WHPA for a new well.

Any new or adjusted WHPA boundaries should be compared to the existing WHPA boundaries. If significant differences are observed, the Township should consider modifying the existing Wellhead Protection Plan to encompass the new delineation.

In summary, the following WHPP tasks would be completed when considering a new well location:

- A "draft" WHPA delineation and contaminant source inventory would be completed using existing information.
- If the location is favorable, based on review of the "draft" information, a complete MDEQ WHPA delineation would be completed based on current MDEQ guidance.
- A contaminant source inventory of existing and potential sources of contamination within the WHPA would be completed.
- The processes, procedures and requirements set forth in existing MDEQ guidance and regulations must be applied in the location, selection, well design and system implementation of any new wells.

The Township will consider updating their "Water System Emergency Response Plan" to address new wells as a result of contamination.

Currently, the Township does not anticipate an expansion of the public water supply system.

## **IX. PUBLIC PARTICIPATION AND OUTREACH/EDUCATION**

In order for the WHPP to be successful, everyone within the community, and especially those who live and conduct their businesses within the Wellhead Protection Area, needs to be included in the planning process and continuing development and implementation of the Plan. The program developed for implementation by the Township has involved, and will continue to involve, public participation. Public education and awareness is a key element of the Township's WHPP.

The Team members represent a broad cross-section of the community. As a result, the Team will be relied upon to inform and educate area residents regarding the WHPP and groundwater awareness.

Specific public education items are referenced in Section IV.C.ii of this report.

The Township's WHPP will continue to encourage a program to maximize "community effort" and two-way communication with the public to foster community understanding of wellhead protection, and to identify and support the community leaders and volunteers in the implementation of the program.

## X. SELECT REFERENCES

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## **Glossary of Terms**

### **Aquifer**

Permeable geologic material, such as rock, sand, or gravel, which contains water in sufficient quantities to supply a well.

### **Confined Aquifer**

1) An aquifer overlain and underlain by impermeable layers, such as clay; or 2) an aquifer in which the groundwater is under pressure greater than atmospheric pressure and which will rise in a well above the point at which it is first encountered.

### **Critical Materials**

Substances that are listed in Michigan's "Critical Materials Register". The Register is a list of chemicals of high environmental concern. Facilities that store critical materials on site must submit a pollution incident prevention plan to the State, and they must provide secondary containment for the materials.

### **Groundwater Impact/Contamination**

The result of the spillage or discharge of hazardous substances or polluting materials into an aquifer.

### **Delineation**

The mapping out of the area through which groundwater moves to reach a drinking water supply well(s).

### **Environmental Regulations**

State environmental laws have been codified into one Act, the Natural Resources and Environmental Protection Act (Act 451 of 1994) (NREPA). The following "parts" deal directly with groundwater protection:

#### **Part 201 of NREPA, Environmental Remediation Section**

The State's own "Superfund" law; this section oversees the cleanup of contaminated sites in Michigan. The section also provides for the listing and prioritization of contaminated sites.

#### **Part 111 of NREPA, Hazardous Waste Management**

Regulates the storage, treatment, and disposal of hazardous waste. Requires permits for facilities which store, treat, or dispose of hazardous waste. Those that generate more than 1000 kilograms/month of hazardous waste are termed "large quantity generators" (LQG). These generators must report their waste generation to the State and to the EPA, provide secondary containment for liquid wastes, and prepare emergency plans. Those generating between 100 and 1000 kilograms/month are termed "small quantity generators" (SQG). These generators must report their waste generation to the State and the EPA. Those generating under 100 kilograms/month are "conditionally-exempt small quantity generators." They must keep records of their operations.

Part 111 also regulates the siting and operation of hazardous waste landfills.

#### **Part 115 of NREPA, Solid Waste Management**

Regulates the siting and operation of solid waste landfills.

#### **Part 31 of NREPA, Water Resources Protection**

Mandates the protection and conservation of the water resources of the State, including groundwater. Regulates discharges of pollution to ground and surface water. Requires facilities handling "critical materials" to prepare spill response plans and to provide secondary containment. Requires facilities discharging polluting materials to the

groundwater (through floor drains or otherwise) to obtain a groundwater discharge permit. Regulates sanitary wastewater discharges of over 10,000 gallons per day.

**Part 615 of NREPA, Supervisor of Wells**

Regulates the drilling and operation of oil and gas wells, and the disposal of wastes created from such operations. Well drilling, operation, closure, and waste disposal must be carried out so that damage of fresh water supplies is prevented.

**Part 211 of NREPA, Underground Storage Tank Regulations**

Requires annual registration of underground storage tanks and compliance with leak detection requirements. Regulates response to discovered leaking tanks.

**Part 83 of NREPA, Pesticide Control**

Regulates the use of pesticides for agricultural uses.

**State laws not codified into NREPA:**

**Public Health Code (Act 368 of 1978)**

Regulates construction of private water wells. Part 127 requires that wells that are abandoned be properly plugged to prevent contamination.

**Michigan Safe Drinking Water Act (Act 399)**

Provides for the supervision and control of public water supplies and public health protection.

**Relevant Federal laws:**

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**

Often called the "Superfund Act," it oversees and funds cleanup of contaminated sites.

**Underground Injection Control Program**

Regulates the underground injection of toxic waste. Hazardous waste operators injecting waste into wells must obtain a permit from the EPA.

**Safe Drinking Water Act (SDWA)**

A federal Act designed to protect drinking water. 1986 amendments require states to develop wellhead protection plans "to protect wellhead areas within their jurisdiction from contaminants which may have any adverse effects on the health of persons."

**Superfund Amendments and Reauthorization Act (SARA), Title III, Community Right-to-Know**

Requires facilities using certain amounts of hazardous substances to report their usage to the EPA and to the State. Facilities meeting certain criteria must also prepare emergency response plans.

**Fire Fighter Right to Know Program**

Requires Fire Fighters to survey and inspect all facilities in their community that handle hazardous substances.

**Freedom of Information Act**

States that all information gathered by public agencies must be made available to the public upon request.

**Groundwater**

Freshwater that fills the spaces between sand, gravel, and clay underground.

**Hazardous Substance**

A chemical or other material which is or may become injurious to the public health, safety, or welfare, or to the environment. You can find hazardous substances in small and large businesses, farms, and households.

**Household Hazardous Waste**

Products used in the household or home garage that, when used, stored, or disposed of improperly, may pose a threat of contamination to the environment.

**Hydrogeology**

The study of water and geology, and how the two interact.

**Hydrogeologist**

A person who studies hydrogeology.

**Leaky Confined Aquifer**

An aquifer that has a confining layer of clay over it that is noncontiguous, allowing for some recharge ("leakage") from the surface.

**Secondary Containment**

Providing a kind of structure around a storage tank or container so that, if there is a spill, the substance will be contained.

**Site of Environmental Contamination**

Sites where leakage, spillage, or other discharge of hazardous substances has contaminated the groundwater or soil; and that the State has placed on its list of contaminated sites, under the Environmental Remediation Section (Part 201) of the Natural Resources Environmental Protection Act, PA 451.

**Superfund Site**

A site listed as contaminated under the Federal Superfund law.

**Topographic Maps**

Maps produced by the U.S. Geological Survey that show roads, lakes, streams, wetlands, developed areas, municipal boundaries, elevation contours, and other features at a scale of 1:24,000.

**Tritium**

An isotope of water (a water molecule that has three hydrogen atoms instead of two). Atmospheric testing of nuclear weapons in the 1950's caused tritium levels in water supplies to increase. (Don't worry! Tritium is a harmless substance). Hydrogeologists test the level of tritium in water to measure the age of the water.

**Unconfined Aquifer**

An aquifer with the water table as its upper boundary. Because the aquifer is not under pressure, the water level in a well is the same as the water table outside the well.

**Underground Injection Wells**

Wells into which treated water and/or other wastes are injected for disposal.

**Underground Storage Tanks**

Tanks under the surface of the ground in which gasoline, fuel oil, and other substances are stored.

**Water Table**

The top of an unconfined aquifer where water pressure is equal to atmospheric pressure. The water table depth fluctuates with climate conditions on the land surface above and is usually gently curved, following a subdued version of the land surface topography.

**Well Logs**

Records that well drillers complete when they drill a residential or public drinking water well. Well logs contain information such as depth to water table, lithology, the type of well constructed, and the depth of the well.

**Wellhead**

The physical structure at the land surface through which groundwater is withdrawn from an aquifer.

**Wellhead Protection Area (WHPA)**

The surface and subsurface area surrounding a water well or wellfield through which contaminants are reasonably likely to move toward and reach such well or wellfield. The WHPA is the "catchment area" of concern for public water supplies dependent on groundwater.

**Wellhead Protection Plan (WHPP)**

A plan developed by a community operating a public well water supply system that details how the community will work to protect their wells from contamination.

Adopted from: "*Wellhead Protection Community Guide*" Huron River Watershed Board, February, 1997 pg. 171 - 176.

# FIGURES

**ATTACHMENT A**

**WELLHEAD PROTECTION TEAM**

## **ATTACHMENT B**

# **CATEGORIES OF POTENTIAL SOURCES OF CONTAMINATION AND PUBLIC PARTICIPATION/EDUCATION**

**ATTACHEMENT B**  
**CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

**AGRICULTURAL SOURCES (K)<sup>5</sup>**

<b>TYPE OF SOURCE</b>	<b>HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT<sup>1,2,3</sup></b>
Animal feedlots (0006) <sup>4</sup> and burial areas (0007)	Livestock sewage wastes; nitrates; phosphates; chloride; chemical sprays and dips for controlling insect, bacterial, viral, and fungal pests on livestock; coliform <sup>6</sup> and noncoliform bacteria; viruses
Manure spreading areas (0008) and storage pits (0009)	Livestock sewage wastes; nitrates
Livestock waste disposal areas (0010)	Livestock sewage wastes; nitrates
Crop areas and irrigation sites (0011)	Pesticides; <sup>7</sup> fertilizers; <sup>8</sup> gasoline and motor oils from chemical applicators
Chemical storage areas and containers (0012)	Pesticide <sup>7</sup> and fertilizer <sup>8</sup> residues
Farm machinery areas (0013)	Automotive wastes; <sup>9</sup> welding wastes
Agricultural drainage wells (0014) and canals (0015)	Pesticides; <sup>7</sup> fertilizers; <sup>8</sup> bacteria; salt water (in areas where the fresh-saltwater interface lies at shallow depths and where the water table is lowered by channelization, pumping, or other causes)

**RESIDENTIAL SOURCES (D)**

<b>TYPE OF SOURCE</b>	<b>HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT<sup>1,2,3</sup></b>
Common household maintenance and hobbies (0016)	<u>Common Household Products:</u> <sup>10</sup> Household cleaners; oven cleaners; drain cleaners; toilet cleaners; disinfectants; metal polishes; jewelry cleaners; shoe polishes; synthetic detergents; bleach; laundry soil and stain removers; spot removers and dry cleaning fluid; solvents; lye or caustic soda; household pesticides; <sup>11</sup> ; photochemicals; printing ink; other common products; <u>Wall and Furniture Treatments:</u> Paints; varnishes; stains; dyes; wood preservatives (creosote); paint and lacquer thinners; paint and varnish removers and deglossers; paint brush cleaners; floor and furniture strippers; <u>Mechanical Repair and Other Maintenance Products:</u> Automotive wastes; <sup>9</sup> waste oil; diesel fuel; kerosene; #2 heating oil; grease; degreasers for driveways and garages; metal degreasers; asphalt and roofing tar; tar removers; lubricants; rustproofers; car wash detergents; car waxes and polishes; rock salt; refrigerants
Lawns and gardens (0017)	Fertilizers; <sup>7</sup> herbicides and other pesticides used for lawn and garden maintenance <sup>12</sup>
Swimming pools (0018)	Swimming pool maintenance chemicals <sup>13</sup>
Septic systems (0019), cesspools (0020), and sewer lines (0021)	Septage; coliform and noncoliform bacteria; <sup>6</sup> viruses; nitrates; heavy metals; synthetic detergents; cooking and motor oils; bleach; pesticides; <sup>11, 12</sup> paints; paint thinner; photographic chemicals; swimming pool chemicals; <sup>11</sup> septic tank/cesspool cleaner chemicals; <sup>14</sup> elevated levels of chloride, sulfate, calcium, pharmaceutical wastes, magnesium, potassium and phosphate
Underground storage tanks (0022)	Home heating oil
Apartments and condominiums (0023)	Swimming pool maintenance chemicals; <sup>13</sup> pesticides for lawn and garden maintenance and cockroach, termite, ant, rodent, and other pest control; <sup>11,12</sup> wastes from on-site sewage treatment plants; household hazardous wastes <sup>10</sup>

**ATTACHMENT B (cont.)**  
**CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

**GOVERNMENT SOURCES (E)**

TYPE OF SOURCE	HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT <sup>1,2,3</sup>
Schools (0024) and government offices and grounds (0025)	Solvents; pesticides; <sup>11,12</sup> acids; alkalis; waste oils; machinery/vehicle servicing wastes; gasoline and heating oil from storage tanks; general building wastes <sup>15</sup>
Park lands (0026)	Fertilizers; <sup>8</sup> herbicides; <sup>12</sup> insecticides <sup>11</sup>
Public and residential areas infested with mosquitoes, gypsy moths, ticks, ants, or other pests (0027)	Pesticides <sup>7,11</sup>
Highways, road maintenance depots, and deicing operations (0028)	Herbicides in highway rights-of-way; <sup>7,12</sup> road salt (sodium and calcium chloride); road salt anticaking additives (ferric ferrocyanide, sodium ferrocyanide); road salt anticorrosives (phosphate and chromate); automotive wastes <sup>9</sup> ; diesel fuel, gasoline from storage tanks.
Municipal sewage treatment plants and sewer lines (0029)	Municipal wastewater; sludge; <sup>16</sup> treatment chemicals <sup>17</sup>
Storage, treatment, and disposal ponds, lagoons, and other surface impoundments (0030)	Sewage wastewater; nitrates; other liquid wastes; microbiological contaminants
Land areas applied with wastewater or wastewater byproducts (0031)	Organic matter; nitrate; inorganic salts; heavy metals; coliform and noncoliform bacteria; <sup>6</sup> viruses; nitrates; sludge; <sup>16</sup> nonhazardous wastes <sup>18</sup>
Storm water drains and basins (0032)	Urban runoff; gasoline; oil; other petroleum products; road salt; microbiological contaminants
Combined sewer overflows (municipal sewers and storm water drains) (0033)	Municipal wastewater; sludge; <sup>16</sup> treatment chemicals; <sup>17</sup> urban runoff; gasoline; oil; other petroleum products; road salt; microbial contaminants
Recycling/reduction facilities (0034)	Residential and commercial solid waste residues
Municipal waste landfills (0035)	Leachate; organic and inorganic chemical contaminants; wastes from households <sup>10</sup> and businesses; <sup>15</sup> nitrates; oils; metals
Open dumping and burning sites (0036), closed dumps (0037)	Organic and inorganic chemicals; metals; oils; wastes from households <sup>10</sup> and businesses <sup>15</sup>
Municipal incinerators (0038)	Heavy metals; hydrocarbons; formaldehyde; methane; ethane; ethylene; acetylene; sulfur and nitrogen compounds
Water supply wells, monitoring wells, older wells, domestic and livestock wells (0039), unsealed and abandoned wells (0040), and test hole/wells (0041)	Surface runoff; effluents from barnyards, feedlots, septic tanks, or cesspools; gasoline; used motor oil; road salt
Sumps and dry wells (0042)	Storm water runoff; spilled liquids; used oil; antifreeze; gasoline; other petroleum products; road salt; pesticides; <sup>7</sup> and a wide variety of other substances
Drainage wells (0043)	Pesticides; <sup>11,12</sup> bacteria
Well pumping that causes interaquifer leakage, induced filtration, landward migration of sea water in coastal areas; etc. (0044)	Saltwater; excessively mineralized water
Artificial groundwater recharge (0045)	Storm water runoff; excess irrigation water; stream flow; cooling water; treated sewage effluent; other substances that may contain contaminants, such as nitrates, metals, detergents, synthetic organic compounds, bacteria, and viruses

**ATTACHMENT B (cont.)**  
**CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

**COMMERCIAL SOURCES (C)**

<b>TYPE OF SOURCE</b>	<b>HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT<sup>1,2,3</sup></b>
Airports (0046), abandoned airfields (0047)	Jet fuels; deicers; diesel fuel, aircraft fuel from aircraft and storage tanks; chlorinated solvents; automotive wastes; <sup>9</sup> heating oil; building wastes <sup>15</sup>
Auto repair shops (0048)	Waste oils; solvents; acids; paints; automotive wastes; <sup>9</sup> misc. cutting oils
Barber and beauty shops (0049)	Perm solutions; dyes; miscellaneous chemicals contained in hair rinses
Boat yards and marinas (0050)	Diesel fuels; oil; septage from boat waste disposal areas gasoline and diesel fuels from storage tanks ; wood preservative and treatment chemicals; paints; waxes; varnishes; automotive wastes <sup>9</sup>
Bowling alleys (0051)	Epoxy; urethane-based floor finish
Car dealerships (especially those with service depts.) (0052)	Automotive wastes; <sup>9</sup> waste oils; solvents; miscellaneous wastes
Car washes (0053)	Soaps; detergents; waxes; miscellaneous chemicals; waste grease, motor oil and fuel
Camp grounds (0054)	Septage; gasoline; diesel fuel from boats; pesticides for controlling mosquitoes, ants, ticks, gypsy moths, and other pests; <sup>7,11</sup> household hazardous wastes from recreational vehicles (RVs) <sup>10</sup>
Carpet stores (0055)	Glues and other adhesives; fuel from storage tanks if forklifts are used
Cemeteries (0056)	Leachate; lawn and garden maintenance chemicals <sup>12</sup>
Construction trade areas and materials (plumbing, heating and air conditioning, painting, paper hanging, decorating, drywall and plastering, acoustical insulation, carpentry, flooring, roofing and sheet metal, wrecking and demolition, etc.) (0057)	Solvents; asbestos; paints; glues and other adhesives; waste insulation; lacquers; tars; sealants; epoxy waste; miscellaneous chemical wastes
Country clubs (0058)	Fertilizers; <sup>8</sup> herbicides; <sup>7,12</sup> pesticides for controlling mosquitoes, ticks, ants, gypsy moths, and other pests; <sup>11</sup> swimming pools chemicals; <sup>13</sup> automotive wastes
Dry cleaners (0059)	Solvents (perchloroethylene, petroleum solvents, Freon); spotting chemicals (trichloroethane, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)
Funeral services and crematories (0060)	Formaldehyde; wetting agents; fumigants; solvents
Furniture repair and finishing shops (0061)	Paints; solvents; degreasing and solvent recovery sludges
Gasoline services stations (0062)	Oils; solvents; miscellaneous wastes
Hardware/lumber/parts stores (0063)	Hazardous chemical products in inventories; heating oil and fork lift fuel from storage tanks; wood-staining and treating products such as creosote
Heating oil companies, underground/above ground storage tanks (0064)	Heating oil; wastes from truck maintenance areas <sup>9</sup>
Horticultural practices, garden nurseries, florists (0065)	Herbicides, insecticides, fungicides, and other pesticides <sup>12</sup>
Jewelry/metal plating shops (0066)	Sodium and hydrogen cyanide; metallic salts; hydrochloric acid; sulfuric acid; chromic acid
Laundromats (0067)	Detergents; bleaches; fabric dyes
Medical institutions (0068)	X-ray developers and fixers; <sup>19</sup> infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; dental acids; miscellaneous chemicals
Office buildings (0069)	Building wastes; <sup>15</sup> lawn/garden maintenance chemicals; <sup>12</sup> gasoline; oil

**ATTACHMENT B (cont.)  
CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

**COMMERCIAL SOURCES (C) - continued**

<b>TYPE OF SOURCE</b>	<b>HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT<sup>1,2,3</sup></b>
Paint stores (0070)	Paints; paint thinners; lacquers; varnishes; other wood treatments
Photography shops, photo processing laboratories (0072)	Biosludges; silver sludges; cyanides; miscellaneous sludge
Print shops (0073)	Solvents; inks; dyes; oils; photographic chemicals
Railroad tracks and yards (0074)	Diesel fuel; herbicides for rights-of-way; creosote for preserving wood ties
Research laboratories (0075)	X-ray developers and fixers; <sup>19</sup> infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; solvents; infectious materials; drugs; disinfectants (quaternary ammonia, hexachlorophene, peroxides, chlornexade; bleach); miscellaneous chemicals
Scrap and junk yards (0076)	Any wastes from businesses <sup>15</sup> and households; <sup>10</sup> oils
Sports and hobby shops (0077)	Gunpowder and ammunition; rocket engine fuel; model airplane glue
Aboveground and underground storage tanks (0078)	Heating oil; diesel fuel; gasoline; other petroleum products; other commercially used chemicals
Pharmacies (0071)	Spilled and returned products
Transportation services for passenger transit (local and interurban) (0079)	Waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes <sup>9</sup>
Veterinary services (0080)	Solvents; infectious materials; vaccines; drugs; disinfectants (quaternary ammonia, hexachlorophene, peroxides, chlornexade, bleach); x-ray developers and fixers <sup>19</sup>

**INDUSTRIAL SOURCES (B)**

<b>TYPE OF SOURCE</b>	<b>HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT<sup>1,2,3</sup></b>
Material stockpiles (coal, metallic ores, phosphates, gypsum) (0081)	Acid drainage; other hazardous and nonhazardous wastes <sup>18</sup>
Waste tailing ponds (commonly for the disposal of mining wastes) (0082)	Acids; metals; dissolved solids; radioactive ores; other hazardous and nonhazardous wastes <sup>17</sup>
Transport and transfer stations (trucking terminals and rail yards) (0083)	Fuel tanks; repair shop wastes; <sup>9</sup> other hazardous and nonhazardous wastes <sup>17</sup>
Aboveground and underground storage tanks and containers (0084)	Heating oil; diesel and gasoline fuel; other petroleum products; hazardous and nonhazardous materials and wastes <sup>18</sup>
Storage, treatment, and disposal ponds, lagoons, and other surface impoundments (0085)	Hazardous and nonhazardous liquid wastes; <sup>18</sup> septage; sludge <sup>16</sup>
Chemical landfills (0086)	Leachate; hazardous and nonhazardous wastes; <sup>18</sup> nitrates
Radioactive waste disposal sites (0087)	Radioactive wastes from medical facilities, power plants, and defense operations; radionuclides (uranium, plutonium)
Unattended wet and dry excavation sites (unregulated dumps) (0088)	A wide range of substances; solid and liquid wastes; oil-field brines; spent acids from steel mill operations; snow removal piles containing large amounts of salt
Operating and abandoned production and exploratory wells (for gas, oil, coal, geothermal, and heat recovery); test hole wells; monitoring and excavation wells (0089)	Metals; acids; minerals; <sup>18</sup> sulfides; other sulfides; other hazardous and nonhazardous chemicals <sup>18</sup>
Dry wells (0090)	Saline water from wells pumped to keep them dry
Injection wells (0091)	Highly toxic wastes; hazardous/ nonhazardous wastes; <sup>18</sup> oil-field brines
Well drilling operations (0092)	Brines associated with oil and gas operations

**ATTACHMENT B (cont.)  
CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

**INDUSTRIAL PROCESSES (B) (PRESENTLY OPERATED OR TORN-DOWN FACILITIES)<sup>20</sup>**

<b>TYPE OF SOURCE</b>	<b>HEALTH, ENVIRONMENTAL, OR AESTHETIC CONTAMINANT<sup>1,2,3</sup></b>
Asphalt plants (0093)	Petroleum derivatives
Communications equipment manufacturers (0094)	Nitric, hydrochloric, and sulfuric acid wastes; heavy metal sludges; copper-contaminated etchant (e.g., ammonium persulfate); cutting oil and degreasing solvent (trichloroethane, Freon, or trichloroethylene); waste oils; corrosive soldering flux; paint sludge; waste plating solution
Electric and electronic equipment manufacturers and storage facilities (0095)	Cyanides; metal sludges; caustics (chromic acid); solvents; oils; alkalis; acids; paints and paint sludges; calcium fluoride sludges; methylene chloride; perchloroethylene; trichloroethane; acetone; methanol; toluene; PCBs
Electroplaters (0096)	Boric, hydrochloric, hydrofluoric, and sulfuric acids; sodium and potassium hydroxide; chromic acid; sodium and hydrogen cyanide; metallic salts
Foundries and metal fabricators (0097)	Paint wastes; acids; heavy metals; metal sludges; plating wastes; oils; solvents; explosive wastes
Furniture and fixtures manufacturers (0098)	Paints; solvents; degreasing sludges; solvent recovery sludges
Machine and metalworking shops (0100)	Solvents; metals; miscellaneous organics; sludges; oily metal shavings; lubricant and cutting oils; degreasers (TCE); metal marking fluids; mold-release agents
Mining operations (surface and underground) (0101)	Mine spoils or tailings that often contain metals; acids; highly corrosive mineralized waters; metal sulfides
Unsealed abandoned mines used as waste pits (0102)	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals <sup>18</sup>
Paper mills (0103)	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals; <sup>18</sup> organic sludges; sodium hydroxide; chlorine; hypochlorite; chlorine dioxide; hydrogen peroxide
Petroleum production and storage companies, secondary recovery of petroleum (0104)	Hydrocarbons; oil-field brines (highly mineralized salt solutions)
Industrial pipeline (0105)	Corrosive fluids; hydrocarbons; other hazardous and nonhazardous materials and wastes <sup>18</sup>
Photo processing laboratories (0106)	Cyanides; biosludges; silver sludges; miscellaneous sludges
Plastics materials and synthetics producers (0107)	Solvents; oils; miscellaneous organics and inorganics (phenols, resins); paint wastes; cyanides; acids; alkalis; wastewater treatment sludges; cellulose esters; surfactant; glycols; phenols; formaldehyde; peroxides; etc.
Primary metal industries (blast furnaces, steel works, and rolling mills) (0108)	Heavy metal wastewater treatment sludge; pickling liquor; waste oil; ammonia scrubber liquor; acid tar sludge; alkaline cleaners; degreasing solvents; salt; metal dust
Publishers, printers, and allied industries (0109)	Solvents; inks; dyes; oils; miscellaneous organics; photographic chemicals
Public utilities (phone, electric power, gas) (0110)	PCBs from transformers and capacitors; oils; solvents; sludges; acid solution; metal plating solutions (chromium, nickel, cadmium); herbicides from utility rights-of-way
Sawmills and planers (0111) and gluing wastes	Treated wood residue (copper quinolate, mercury, sodium biazide); tanner gas; paint sludges; solvents; creosote; coating
Stone, clay, and glass manufacturers (0112)	Solvents; oils and grease; alkalis; acetic wastes; asbestos; heavy metal sludges; phenolic solids or sludges; metal-finishing sludge
Welders (0113)	Oxygen, acetylene
Wood preserving facilities (0114)	Wood preservatives; creosote

**ATTACHMENT B (cont.)**  
**CATEGORIES OF POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

**Key to footnotes**

- <sup>1</sup>In general, groundwater contamination stems from the misuse and improper disposal of liquid and solid wastes; the illegal dumping or abandonment of household, commercial, or industrial chemicals; the accidental spilling of chemicals from trucks, railways, aircraft, handling facilities, and storage tanks; or the improper siting, design, construction, operation, or maintenance of agricultural, residential, municipal, commercial, and industrial drinking water wells and liquid and solid waste disposal facilities. Contaminants also can stem from atmospheric pollutants, such as airborne sulfur and nitrogen compounds, which are created by smoke, flue dust, aerosols, and automobile emissions, fall as acid rain, and percolate through the soil. When the sources listed on this table are used and managed properly, groundwater contamination is not likely to occur.
- <sup>2</sup>Contaminants can reach groundwater from activities occurring on the land surface, such as industrial waste storage; from sources below the land surface but above the water table, such as septic systems; from structures beneath the water table, such as wells; or from contaminated recharge water.
- <sup>3</sup>This table lists most common wastes, but not all potential wastes. For example, it is not possible to list all potential contaminants contained in storm water runoff or research laboratory wastes.
- <sup>4</sup>Contaminant WHPP Number.
- <sup>5</sup>Facility WHPP Code.
- <sup>6</sup>Coliform bacteria can indicate the presence of pathogenic (disease-causing) microorganisms that may be transmitted in human feces. Diseases such as typhoid fever, hepatitis, diarrhea, and dysentery can result from sewage contamination of water supplies.
- <sup>7</sup>Pesticides include herbicides, insecticides, rodenticides, fungicides, and avicides; many are highly toxic and quite mobile in the subsurface. An EPA survey found that the most common pesticides found in drinking water wells were DCPA (dacthal) and atrazine (EPA, 1990b), which EPA classifies as moderately toxic (class 3) and slightly toxic (class 4) materials, respectively (Meister Publishing Company, 1991).
- <sup>8</sup>The EPA National Pesticides Survey (EPA, 1991) found that the use of fertilizers correlates to nitrate contamination of groundwater supplies.
- <sup>9</sup>Automotive wastes can include gasoline; antifreeze; automatic transmission fluid; battery acid; engine and radiator flushes; engine and metal degreasers; hydraulic (brake) fluid; and motor oils.
- <sup>10</sup>Toxic or hazardous components of common household products are noted on the attached table (EPA 1990c).
- <sup>11</sup>Common household pesticides for controlling pests such as ants, termites, bees, wasps, flies, cockroaches, silverfish, mites, ticks, fleas, worms, rats, and mice can contain active ingredients including naphthalene, phosphorus, xylene, chloroform, heavy metals, chlorinated hydrocarbons, arsenic, strychnine, kerosene, nitrosamines, and dioxin.
- <sup>12</sup>Common pesticides used for lawn and garden maintenance (e.g., weed killers, and mite, grub, and aphid controls) include such chemicals as 2,4-D; chlorpyrifos; diazinon; benomyl; captan; dicofol; and methoxychlor.
- <sup>13</sup>Swimming pool chemicals can contain free and combined chlorine; bromine; iodine; mercury-based, copper-based, and quaternary algaecides; cyanuric acid; calcium or sodium hypochlorite; muriatic acid; sodium carbonate.
- <sup>14</sup>Septic tank/cesspool cleaners include synthetic organic chemicals such as 1,1,1 trichloroethane, tetrachloroethylene, carbon tetrachloride, and methylene chloride.
- <sup>15</sup>Common wastes from public and commercial buildings include automotive wastes (see above definition); rock salt; and residues from cleaning products that may contain chemicals such as xlenols, glycol esters, isopropanol, 1,1,1-trichloroethane, sulfonates, chlorinated phenols, and cresols.

**ATTACHMENT B (cont.)**  
**POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION**

**Key to footnotes (cont.)**

<sup>16</sup>Municipal wastewater treatment sludge can contain organic matter; nitrates; inorganic salts; heavy metals; coliform and noncoliform bacteria (see above definition); and viruses.

<sup>17</sup>Municipal wastewater treatment chemicals include calcium oxide; alum; activated alum, carbon, and silica; polymers; ion exchange resins; sodium hydroxide; chlorine; ozone; and corrosion inhibitors.

<sup>18</sup>The Resource Conservation and Recovery Act (RCRA) defines a hazardous waste as a solid waste that may cause an increase in mortality or serious illness or pose a substantial threat to human health and the environment when improperly treated, stored, transported, disposed of, or otherwise managed. A waste is hazardous if it exhibits characteristics of ignitability, corrosivity, reactivity, and/or toxicity. Not covered by RCRA regulations are domestic sewage; irrigation waters or industrial discharges allowed by the Clean Water Act; certain nuclear and mining wastes; household wastes; agricultural wastes (excluding some pesticides); and small quantity hazardous wastes (i.e., less than 220 pounds per month) discharged from businesses.

<sup>19</sup>X-ray developers and fixers may contain reclaimable silver, glutaldehyde, hydroquinone, phenedone, potassium bromide, sodium sulfite, sodium carbonate, thiosulfates, and potassium alum.

<sup>20</sup>This table lists potential groundwater contaminants from many common industries, but it does not address all industries.

*Source: Wyoming Department of Environmental Quality*

## **ATTACHMENT C**

# **CONTAMINATION SOURCE INVENTORY INFORMATION**

**ATTACHMENT D**

**ENVIRONMENTAL PERMIT CHECKLIST**

**ATTACHMENT E**  
**ENVIROMENTAL PERMIT CHECKLIST**

# **ATTACHMENT F**

## **WATER SUPPLY EMERGENCY RESPONSE PLAN**