Wellhead Protection Management Plan October 2001

Presented to

Village of Yellow Springs

Presented by
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Volume 1 of 3

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SECTION I
BACKGROUND

Introduction

The Wellhead Protection Management Plan represents the third phase of the wellhead protection process for the Village of Yellow Springs well field. Phase I, delineation of the protection area, and Phase II, identification of possible pollution sources are presented in the June 1998 report entitled *Village of Yellow Springs, Ohio Wellhead Protection Program*, prepared by the Wellhead Protection Advisory Commission and Panterra Corporation. These first two phases, the delineation and pollution source inventory components, were endorsed by the Ohio Environmental Protection Agency (OEPA). Because portions of the management phase rely on information developed and gathered during the first two phases, some of this information is necessarily incorporated into this document. Where general information is quoted from and/or restated from the June 1998 report, the information is included in this report in italics.

Management of the delineated wellhead protection area is not as easy or as straightforward as in some other Ohio Communities. While the Village is owner and operator of the community water system, it does not have jurisdiction over the land area identified as the wellhead protection zone. In the fall of 2000, the Yellow Springs Village Council asked the Yellow Springs Environmental Commission (EC) to form the core of a committee to work with Bennett & Williams in developing the wellhead protection management plan. This solicitation followed a September 14, 2000 kickoff presentation to Village Council where the process of developing and implementing the management plan was discussed. Because the Council's goal was to solicit varied interests to participate, letters were sent to over seventy members of the community representing a wide variety of interests in the wellhead protection area. A special solicitation was made to those members of the previous Wellhead Commission, inviting them as individuals to participate in the Committee. The result was the formation of the Yellow Springs Wellhead Protection Committee (YSWPC).

Public meetings were held on October 10, and November 30, 2000 to discuss the general nature of the Wellhead Protection Plan and to describe the process of developing and implementing the management plan. The participation and responsibilities of the YSWPC were also discussed. All public meetings as well as the Village Council kickoff meeting were videotaped and broadcast.

One key element in designing a wellhead protection management plan where multi-jurisdictional cooperation will be involved is an immediate public awareness program. Therefore, the development of the management plan included two main input processes: 1) the development and circulation of a questionnaire and 2) stakeholder interviews. The original concept was for Bennett & Williams to design the questionnaire and questions for the stakeholders. However, the YSWPC expressed interest in providing comments so an additional questionnaire review phase was incorporated into the timeline and the questionnaire was revised based on comments received. Stakeholder questions were altered and revised by YSWPC interviewers both before and during the interview process.

Once formed, the YSWPC conducted interviews to solicit involvement from all stakeholders within and/or adjacent to the delineated wellhead protection area. Where possible, interviews were conducted by teams to incorporate a broader interest base in the process. Approximately 41 stakeholder interviews were conducted. The interview summaries are provided in Appendix A.

In addition, slightly less than 2,000 questionnaires were sent to users of the Village of Yellow Springs domestic water to obtain feedback on community perceptions and opinions regarding wellhead protection issues. The questionnaire was designed to assess public perception about four different areas relating to wellhead protection and water conveyance. The respondents were asked questions relating to:

1) the potential pollution sources identified in the previous delineation;
2) ideas and perceptions about future land use options;

3) ways to prevent potential pollution in the wellhead protection area; and
4) information about the current potable water delivered by the Village. Information on household demographics also was gathered for informational purposes only. Over 400 questionnaires were returned. A copy of the questionnaire form is included in Appendix B.

The Wellhead Protection Committee played a vital role in this process by conducting interviews and preparing detailed summaries of both the questionnaires and interviews. The questionnaire responses as summarized by the YSWPC are included in Appendix C.

In January 2001, the former Wellhead Protection Commission submitted the report entitled Village of *Yellow Springs Wellhead Protection Management Plan* for the Village Council's consideration. Because of the importance of incorporating all thoughts and opinions of the community in the WHP management planning process, the report was reviewed as part of the preparation of this plan. As a result, some of the concepts and approaches of the proposed plan were incorporated in this document. The ultimate goal of this process is to provide the community with the best possible management plan, that is both implementable and protective of the water supply for the Village and the ground-water resources of the area.

It is important to note that the management plan developed as part of this process was based only on those potential pollution sources identified within the one and five year time-of-travel zones as delineated in the 1998 plan and endorsed by the Ohio EPA. However, in consideration of flow regimes, some potential pollution sources, and recharge areas to the well field, the Village has decided to expand the existing protection area to include the well field capture zone, and also wants to better understand surface-water/ground-water recharge resulting from induced infiltration from the Little Miami River. To this end, the Village has prepared a capture zone map and has begun to contemplate additional potential pollution sources within this area. Appendix Y contains a selected bibliography of information provided by the Village that has been made

publicly available to the Village. These elements are included in the current plan primarily as planned future improvements to the management and delineation strategies. Although the focus of the management plan will be on potential pollution sources within the one and five year time-of-travel zones, educational strategies in this plan will be expanded to include the capture zone and community-at-large, when cost-effective and reasonable.

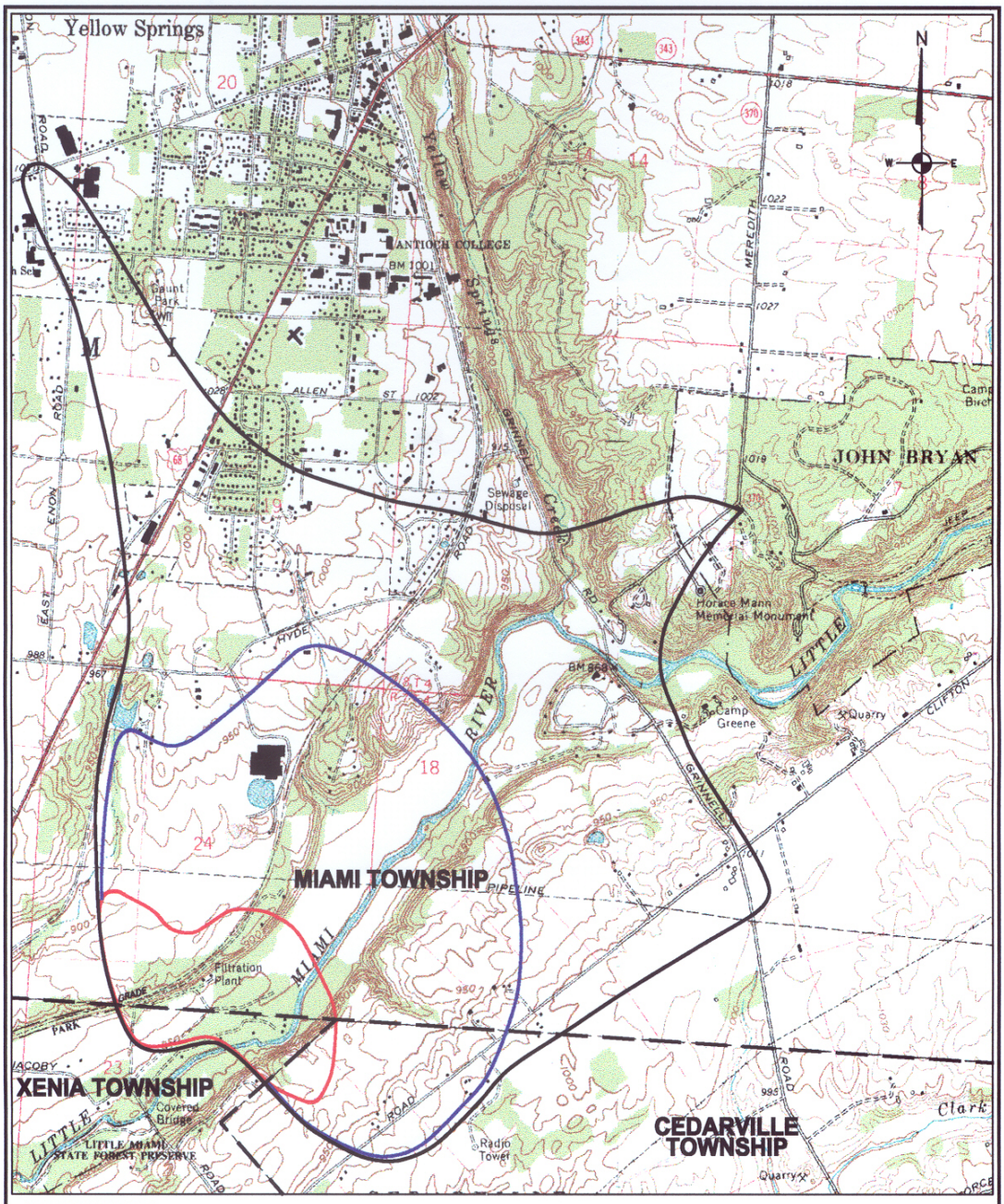
Wellhead Protection Area

One and Five Year Time-of-Travel

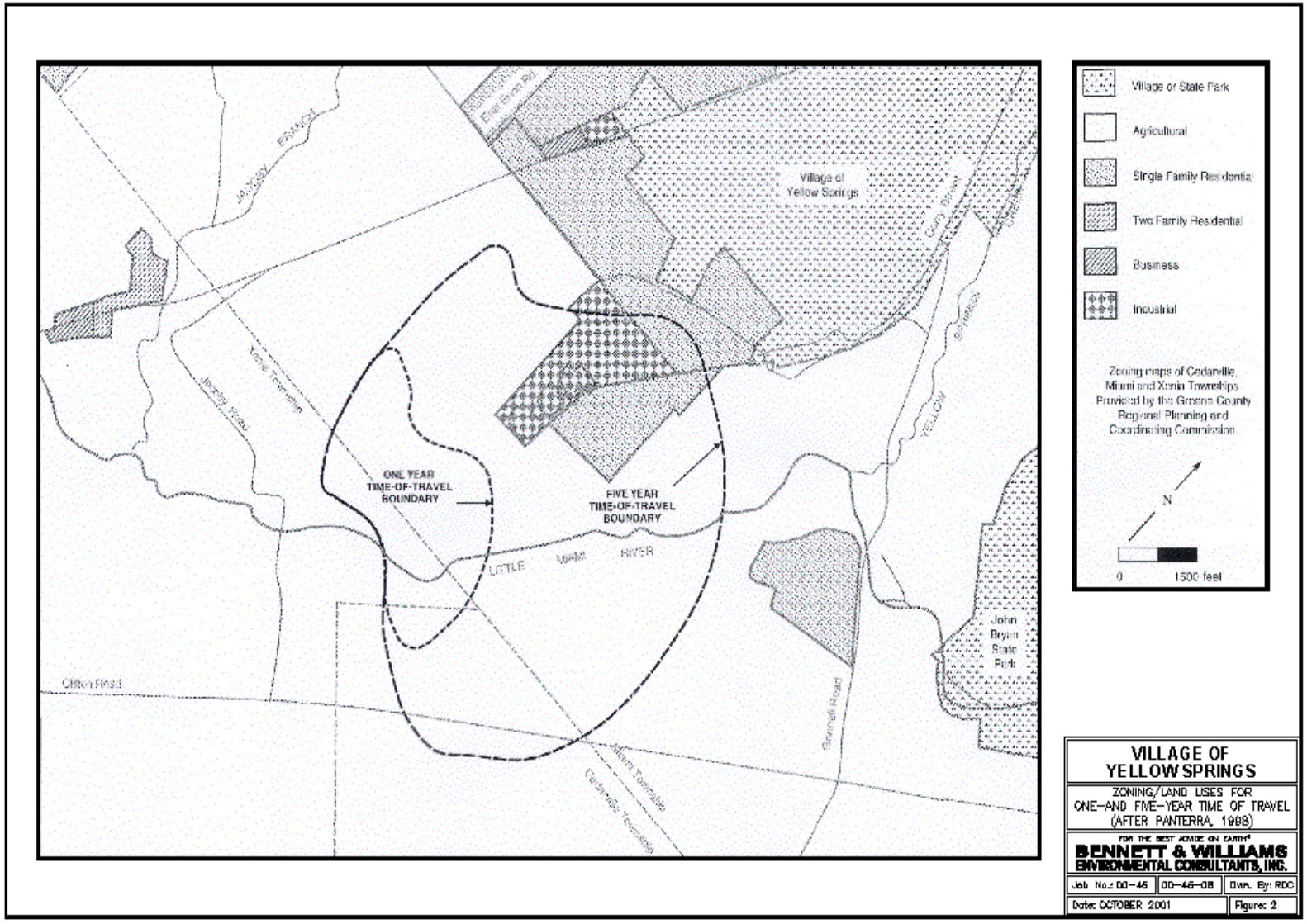
The one- and five-year time-of-travel (TOT) boundaries delineated for the Village of Yellow Springs Wellfield are shown in Figure 1. *The area within the five-year TOT zone is designated as the "Wellhead Protection Area (WHPA); the area within the one-year TOT zone is referred to as the Inner Management Zone (IMZ). The delineation of multiple protection areas allows for the development of management strategies which account for shorter travel and response times based on proximity to the well field. The potential pollution source inventory presented below is based on these delineations.*

As shown in Figure 1, *the 380-acre IMZ surrounds the Village Well Field and the immediate upgradient and downgradient portions of the capture area. Approximately one third of the IMZ, extending in a 2,000-foot wide band from southwest to northeast, consists of the relative flat valley bottom/flood plain of the Little Miami River. Adjacent to this band, the remaining thirds of the IMZ to the east and west consist of rolling uplands. The IMZ is in Miami, Xenia and Cedarville Townships.*

Currently the entire area within the IMZ is zoned as agricultural (A-1). This zoning generally reflects the main types of land uses present, i.e., active farmland, woodland, scrub land, and single family dwellings. A map showing the current zoning and land uses is found in Appendix F of the WHP report (Figure 2). *Approximately two-thirds of the IMZ consists of woods, thickets, prairie and some wetlands, mostly within and just beyond the boundaries of the river valley. Most of this land is Village-owned land associated with the well field or part of the Glen Helen Nature Preserve owned by*



VILLAGE OF YELLOW SPRINGS			TIME-OF-TRAVEL AND WELL FIELD CAPTURE ZONES (AFTER PANTERRA, 1998 AND 1999)	FOR THE BEST ADVICE ON EARTH® BENNETT & WILLIAMS ENVIRONMENTAL CONSULTANTS, INC.	
Job No. : 00-46	00-46-06	Dwn. By : RDC		Date : OCTOBER 2001	Figure : 1


Village or State Park
Agricultural
Single Family Residential
Two Family Residential
Business
Industrial
Zoning maps of Cedarville, Miami and Xenia Townships Provided by the Greene County Regional Planning and Coordinating Commission
N
0
1500 feet
Village of Yellow Springs
ONE YEAR TIME-OF-TRAVEL BOUNDARY
FIVE YEAR TIME-OF-TRAVEL BOUNDARY
LITTLE
MIAMI
RIVER
John Bryan State Park
Clifton Road
Jacoby Road
Yellow Springs
Grinnell Road
Miami Township
Cedarville Township
VILLAGE OF YELLOW SPRINGS
ZONING/LAND USES FOR ONE-AND FIVE-YEAR TIME OF TRAVEL (AFTER PANTERRA, 1998)
FOR THE BEST ADVICE ON EARTH
BENNETT & WILLIAMS ENVIRONMENTAL CONSULTANTS, INC.
Job No.: 00-45
00-45-08
Dwn. By: RDC
Date: OCTOBER 2001
Figure: 2

Antioch College. This ownership insures a relatively high degree of protection against the development of new potential pollution sources. The remaining third of the IMZ consists of privately-owned agricultural land found in the uplands east and west of the river valley. Most of this land is devoted to grain production. No farmsteads or agricultural structures exist in these areas.

The WHP area is shown in Figure 1 *and includes the area between the one- and five-year TOT boundaries. With the exception of having larger amounts of upland area, the WHPA is similar to the IMZ in terms of its topography, hydrology, and geology. General land-use patterns in the WHPA are similar to the IMZ with much of the river valley area consisting of woodlands, prairies, and wetlands flanked by upland agricultural areas.*

Approximately 80 percent of the WHPA is zoned agricultural (A-1). Most of the active agricultural land is in the uplands, with the exception of one crop field along the west side of the river. Most of the land in the valley on the east side of the river is part of the Glen Helen Nature Preserve. (Review of parcel maps indicates that only approximately one third to one half of the land on the east side of the river is part of the Glen Helen Nature Preserve.) *The remaining area in the northwestern portion of the WHPA is zoned industrial (I-1) and residential (R-1B). The property-zoned industrial is owned by the Morris Bean & Company (MBC). The land zoned residential consists of the properties within the "Vale" Community.*

Capture Zone

The capture zone boundaries are shown on Figure 1. The capture zone is primarily to the north, northeast and northwest of the one and five year TOT. The capture zone was delineated after the submission of the original wellhead protection plan to the OEPA. According to correspondence, the capture zone delineation has been revised twice since the creation of the first draft map in March 1999. The original capture zone map was developed using water levels measured in November 1994 and with sparse data in the northern section. Because the data used to delineate the one and five year TOT contained a preponderance of potentiometric data in the area nearer the wellfield, south of the Village, additional data from existing and new wells in the upper

portion of the capture zone area was collected during August 1999. These wells were "cased through the unconsolidated overburden and into the bedrock", according to the September 14, 1999 letter transmitting the second capture zone map. A third capture zone map was prepared to correct discrepancies in elevation data found after the second map was issued. Correspondence provided by the Village relating to the generation of the capture zone map and water level measurements is included in Appendix X.

SECTION II
POTENTIAL POLLUTION SOURCES

As part of the Village of Yellow Springs Wellhead Protection Program, a Potential Pollution Source Inventory (PPSI) was completed for the delineated protection areas surrounding the well field. The list of identified and other potential pollution sources within the one- and five-year TOT boundaries is provided in Table 1. This table also includes a relative risk for the identified sources.

The approved plan recommended that the potential pollution source inventory be refined during the management phase of the plan. As site specific information was gathered during the interview process conducted by the YSWPC, the majority of this information was updated from the original summaries in the June 1998 Wellhead Protection Report (Panterra, 1998). As this additional information was gathered, it became clear that the relative risk rankings in Table 1 were not necessarily accurate. For example, residential heating fuels were ranked "high", but there is only one known residence heated by fuel oil; the remaining houses are heated by natural gas. Rather than re-rank all sources, the information was incorporated into the individual source control strategies and emphasis on importance is described in those sections.

A general description of potential source areas is provided below. Pertinent text from the 1998 report is included in italics; the updated information is included in normal font.

Morris Bean & Company

The Morris Bean & Company (MBC) *has operated an aluminum casting foundry at their property on Hyde Road since 1949. The property is approximately 60 acres in size and contains buildings that house the aluminum casting and foundry operations.* The property also includes two settling ponds, a large holding pond and a waste foundry sand pile. The company used 1,1,1-trichloroethane (1,1,1-TCA) in the aluminum casing operation from 1949 until 1991, when isopropyl alcohol was substituted.

Table 1. List of Potential Pollution Sources (After Panterra, 1998)					
	TIME-OF-TRAVEL ZONE		**RELATIVE RISK**		
IDENTIFIED POTENTIAL POLLUTION SOURCE	**1-YEAR**	**5-YEAR**	**HIGH**	**MEDIUM**	**LOW**
Village of Yellow Springs Water Treatment Plant	X				X
Morris Bean & Company		X	X		
Vectren Natural Gas Pipeline		X			X
OTHER POTENTIAL POLLUTION SOURCES					
Residential heating fuels	X		X		
		X			X
Septic Systems	X			X	
		X		X	
Agricultural fuels		X			X
Stored agricultural chemicals		X		X	X
Agricultural chemical runoff	X				X
		X			X
Little Miami River	X				X
		X			X
Roads	X				X
		X			X
Little Miami Bike Trail (former railroad grade)	X				X
		X			X
Regulated hazardous materials	X		X		
		X		X	
Potentially hazardous, unregulated materials	X		X		
		X		X	
Sewage systems	X				X
		X			X
General lawn and garden chemicals	X				X
		X			X
Non-specific residential and agricultural pollution	X				X
		X			X
Electric transmission lines (transformers)	X		X		
		X	X		
Existing wells	X				X
		X			X
Residential businesses		X			X

In 1988, concentrations of several volatile organic compounds (VOCs) were detected in the ground water of the bedrock and buried valley aquifers in the study area. Concentrations of total VOCs (1,1-dichloroethane, 1,1-dichloroethene, 1,1,1-trichloroethane, and trans-1-2-dichloroethene) in monitoring wells installed in the bedrock uplands near the Morris Bean plant have been measured at over 1000 parts per billion (ppb).

Total VOC concentrations of 0.9 to 160 ppb have been measured in springs located hydraulically downgradient of the Morris Bean plant and issuing from the base of the sugar rock. These springs are designated GS-1, GS-2, and GS-3….. in the main body of text. 1,1-dichloroethane, 1,1,1-trichloroethane, and dichloroethane have been measured in Village monitoring wells MW-1 and MW-2 at concentrations between 0.5 to 1.7 ppb and concentrations of 1,1-dichloroethane have been measured in production wells YS-1 and YS-2 in concentrations ranging from 0.5 to 6.05 ppb. The concentrations of total VOCs have decreased through time at the Village's well field and none have been detected in finished water from the Village's water treatment plant since 1990. There have been no VOCs detected in YS-3R, YS-4, or YS-5.

As a result of the ground-water contamination, MBC is currently under an Interim Action Order by the OEPA. In response, MBC has installed five ground-water recovery wells within the underlying bedrock formation. The ground-water recovery system began operating in March 2000. The water is treated on site using the activated carbon adsorption method and discharged to the settling ponds. Monthly progress reports regarding the performance of the interim actions and quarterly ground-water analytical reports are submitted to the OEPA. Based on the April 2001 quarterly ground-water sampling results, 1,1,1-trichloroethane, trichloroethene, 1,1-dichloroethane, cis-1,2-dichloroethene, and 1,1-dichloroethene were reported in ground water from the site. The averaged combined flow rate from the recovery wells for the April and May 2001 periods were 0.85 and 1.1 gallons per minute (gpm), respectively.

MBC is currently a conditionally exempt small quantity generator of hazardous waste and has procedures for storage, handling, use, and disposal of their hazardous materials and filing of EPA reports as required. By definition, a conditionally exempt small quantity generator never accumulates more than 2200 pounds of hazardous waste onsite and generates less than 220 pounds (or roughly 25-30 gallons) in a calendar month. Generator status changes though time if these threshold limits change at the facility. Process waste streams from MBC include:

- White sand with binder residue from molding process that is disposed onto the onsite sand pile;

- Tire molding sand that is disposed off site by Waste Management, Inc.

- Process water from the plant that is discharged into settling ponds with two primary ponds leading to a third holding pond that has a permitted outfall. The process water is used to cool air compressors and wash off molds containing plaster. The outfall water is tested monthly in accordance with the NPDES permit. The facility's estimated water use is approximately 75,000 to 100,000 gallons per day.

- Waste penetrant oil and hydraulic oil that is occasionally generated are taken off site for disposal.

Morris Bean & Company has its own sanitary sewer system and treatment plant that discharges to an onsite infiltration pond. Because of the amount of sewage generated and the fact that it is a commercial operation, the waste disposal system at Morris Bean is under the jurisdiction of the OEPA and not the Greene County Combined Health District. The Health Department inspects this site annually and reports their findings to the OEPA. The OEPA Southwest District Office, Division of Surface Water no longer approves infiltration pond systems and has recommended that MBC either upgrade their system to meet current standards or tie into the Village's sanitary sewer system.

Agricultural Areas

Agricultural activities can pose a number of potential risks to ground water. Above and underground fuel storage tanks, the storage and mixing of herbicides, pesticides and fertilizer, and, to a lesser extent, the application of herbicide/pesticide and fertilizer products can present potential ground water pollution risks.

The land over the buried valley within the IMZ has not been in cultivation for many years. The upland areas in the east and west sections of the IMZ are currently in soybean-corn-hay rotations with integrated pest management and soil conservation techniques in place. No storage and/or mixing of pesticides/herbicides occurs place within the IMZ. Potential sources of water quality degradation include plant nutrients, herbicides, pesticides, and sediment.

Village of Yellow Springs Water Treatment Plant

The Village of Yellow Springs Water Treatment Plant is within the central portion of the IMZ, approximately 500 to 600 feet north of the nearest production well (YS-3R). Chlorine and fluoride are the only bulk chemicals used in the treatment process. The chemicals used for treatment are stored in a secure room at the plant. The maximum quantity stored is twenty two (22) 15-gallon drums of 25 percent strength hydrofluorosilic acid, and eleven (11) 150-pound cylinders of chlorine. The facility currently has an emergency spill response plan. There is no secondary containment in the chemical storage room. In addition to the bulk chemicals, small quantities of a variety of substances (e.g. reagents and solutions) are stored and used within the WTP laboratory.

The plant uses approximately 140,000 gallons of water weekly to backwash the filters. The backwash water is treated (red water filter) and discharged to an onsite lagoon. There is no surface water discharge from the lagoon, thus the backwash water dissipates through infiltration, evaporation and transpiration. The plant is serviced by a septic tank installed in 1962.

Natural Gas Pipeline

Vectren owns a 20-inch steel pipeline that traverses the wellhead protection area in an east-west line approximately 2,000 feet north of the well field. The pipeline transports natural gas, containing the additive Mercaptan as odorant, under normal operating pressure of 270 to 350 pounds per square inch (psi). Vectren monitors for leaks by several methods including: annual walking survey, quarterly vehicle and/or aerial patrol, and electronic SCADA monitoring of pipeline pressures and flows at various stations along the pipeline. The SCADA is utilized for pressure monitoring and adjustment along the pipeline and is capable of detecting pressure changes of less than one psi.

In the case of a leak or suspected leak, Vectren's notification protocol varies depending on the severity of the leak and the potential impact on the community. In the case of a major leak that has significant impact on the community, Vectren would notify the Village of Yellow Springs' police or fire department. The Villages' wellhead protection person can be added to this list by contacting Vectren and providing their name and telephone number.

Vectren does not have a specific "leak response plan", however, they do have a series of internal procedures that address operations and emergency response. Although Vectren as a policy does not distribute internal procedures to the public, they have expressed a willingness to work on a joint plan with the Village.

Electric Transmission Lines (Transformers)

Based on information provided by the Dayton Power and Light Company (DP&L), there are 12 DP&L transformers within the five-year time of travel capture zone for the well field. Of the 12 transformers, six are within the one-year time-of-travel capture zone and are labeled as non-PCB. The remaining transformers are outside the one-year time-of-travel zone but within the five-year time of travel zone. Two of these are labeled as non-PCB and the four other transformers are not labeled. The fluid used in

the newer transformers is a non-toxic petroleum oil [(Shell Dila (R) Oil AX)] that, according to DP&L, is generally considered environmentally safe.

Residential Areas

Residential dwellings pose potential pollution risks due to the storage, use and disposal of potentially-polluting substances. Possible sources of ground-water pollution from households include leaking heating oil storage tanks, improper use or disposal of hazardous household products such as automotive fluids, and lawn and garden products. In addition, improperly maintained or poorly constructed septic systems are a potential source of ground-water contaminants including but not limited to coliform bacterial, nitrates, and household hazardous waste. *Septic systems located in flood plains are prone to malfunction because of high water tables and periodic flooding.*

Only a few homes are within the IMZ. Most of these are in the floodplain near the well field. One home (old Antioch College President's House), however, is south of the well field above the valley wall in the uplands.

Approximately 20 residences are within the 5-year WHPA. These include several farmsteads along Clifton Road and approximately 12 residences in The Vale. The Vale is a community south of Hyde Road between the bike path and the Little Miami River. Although each house is privately owned, the land is held by Community Service, Inc. All of the houses have septic systems and one house has a septic tank-dry well combination. Yellow Springs Water serves all the houses but one. One house has a well that is reportedly 100 feet deep.

All but one of the houses is heated by natural gas. One house has been heated by fuel oil since being built in 1957. The tank is buried in the back yard and its current integrity (i.e. leaking, not leaking) is unknown. Based on homeowner interviews, fertilizer and pesticide use is minimal to nonexistent in the Vale community.

The old Hugh Taylor Birch estate is to the north of Jacoby Road, just on the east side of the Little Miami River. It consists of a gatehouse of one household, the mansion which has three apartments and the multi-unit garage that is used for storage. These structures were built in 1931, and are owned by Antioch University and administered by the Glen Helen Ecology Institute. The Glen may not be sold and its use is legally restricted to nature preserve/education.

The facility has been heated by propane gas since the 1950s. There are two very large storage tanks behind the mansion. This is the third heating system used by these buildings: coal, oil, and now propane. Remnants of all three heating systems are found in the two houses. A fuel oil tank, now not used, is in the basement of the mansion.

Both houses have septic systems (not aerated). The leaching tile field from the mansion is behind the mansion, near a natural swale which drains farmland uphill from the Birch Property, and which empties into the Little Miami River. Both houses obtain domestic water from an onsite spring. The spring water is stored in a cistern, pumped to pressure tanks, and distributed to the residences. The cistern lacks a cover, and in the past has been non-potable because of bacterial contamination.

There are no lawn, garden, tree, or farming chemicals used on this property. In addition, no business is conducted that requires the storage or disposal of products not suitable for landfill disposal. There is no trash pickup on the property and the residents haul their disposable materials to trash and recycling sites in the area.

On-Site Wastewater Treatment Systems

There were no regulations on sewage disposal systems prior to the 1950s and for such systems the Health Department has little or no information unless an inspection has taken place after a complaint or during the sale of the house. Between the 1950s and early 1970s all septic systems were required to have 800 gallon, minimum, septic tanks and 250 to 600 feet of leaching tile lines. Percolation tests were run to design some of these systems. In the early 1970s, new regulations determined the size of the leaching

tile field from the number of bedrooms in the house and the type of soil in the area of the system.

With regard to new developments, if the planned new development is for lot sizes greater than five acres, there is no overall review of the plan by the Health Department. Rather the Department does its normal review on the well and disposal system of each house as it is built. If the lot size is less than five acres, the Health Department is involved from the beginning in approving the plan. If, for example, the Department determines that a particular lot cannot within regulations sustain a sewage system, approval of the development is withheld until the lots are redrawn so that all of the lots may accommodate compliant sewage systems. A development of more than five or six lots, less than five acres each, must also be approved by the Regional Planning Board. A building permit is not issued unless well water supply, sewage, and zoning permits are issued first. No sewage systems, and therefore no development, are permitted in the 100-year flood plain of the Little Miami River.

Transportation Routes

Two unpaved, unnamed roads extend from the southwest into the central portion of the IMZ and pass near the Village's production wells. One is the Village's access road to the well field and water treatment plant and the other a private drive to the residential dwellings adjacent to the well field along the river. Neither of these roads is more than lightly traveled or used for the transport of significant quantities of potentially polluting substances; therefore, the threat posed by transportation-related spills in the IMZ is negligible.

The little Miami Scenic Trail/Bikeway passes through the northwestern third of the IMZ along the top edge of the river valley wall. The Trail is built upon the bed of the former Little Miami of Penn Central Railroad right-of-way. The railroad was active along the corridor from 1846 to the early 1970's. With the exception of occasional trial maintenance vehicles, traffic along the trail is currently limited to pedestrian, bicycle, and equestrian uses.

Clifton Road is the only major transportation route that passes through the WHPA. Approximately 4,600 feet of Clifton Road traverses through the southeastern edge of the WHPA. In 1994, traffic volume counts along this route indicated an average usage of approximately 600 to 700 vehicles per day. No information is available to determine how much of the Clifton Road usage is by commercial vehicles that may transport substances potentially hazardous to ground water quality. Based on its distance from major commercial centers and other more heavily-used routes, it can be assumed that the percentage of commercial usage is relatively small.

Surface Water Sources

The primary surface water source within the WHPA is the Little Miami River. In addition, Yellow Springs Creek discharges to the Little Miami River approximately 7,000 feet upstream of the well field. Surface water quality degradation can occur through both non-point and point source discharges. Ground-water 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, the chemical/physical properties of the contaminant, and the river water velocity. 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. The quantity of water that can be induced to recharge an aquifer through the streambed may vary considerably with location and time and is dependent on numerous interrelated factors. Because the influence of surface-water quality in the Little Miami River on ground-water quality at the well field is not fully understood, the potential risk associated with this potential pollution source is unclear.

SECTION III
PUBLIC EDUCATION AND INVOLVEMENT

Educational activities and voluntary approaches are the core of the selected control strategies for the Wellhead Protection Management Plan. Consequently, the overall success of the protective strategies will depend on the cooperation of those entities within the WHPA. Gaining this cooperation will require a concerted effort to increase public awareness and understanding that certain actions can affect the quality of their drinking water. Once people understand this concept, they are more willing to change their practices. Education, in this case, will be the key to establishing this awareness as well as providing information and resources to facilitate the control strategy implementation.

The education strategies will involve an overall component for the general public and a more directed component incorporated into the source control strategies. Strategies for the general public will focus on increasing awareness of the concepts and importance of source water protection, whereas educational programs developed as part of the source control strategies will be less general, focusing on specific topics.

Public Activities to Date

The Village of Yellow Springs has solicited public involvement in the WHP planning process through a variety of mediums including the formation of a wellhead protection committee, public meetings, stakeholder interviews and questionnaires. The information obtained from the stakeholder interviews was used to formulate source control strategies and establish dialog for addressing WHP issues. The completed questionnaires provided valuable public perceptions regarding potential pollution sources, future pollution sources and the various mechanisms used to prevent potential pollution. More importantly, these public involvement activities have heightened community awareness of the complex issues of wellhead protection.

Public Meetings

The Village of Yellow Springs held three public meetings: September 4, October 10 and November 30, 2000 relating to wellhead protection and management. The first meeting was a kickoff meeting with Village Council to highlight the wellhead management process. During the second and third meetings, the general concepts of wellhead protection as they pertain to the Villages' water supply were presented and discussed. These meetings were publicized through correspondence to possible participants and with articles, notices, and letters in the Yellow Springs News. The meetings were also videotaped and broadcast.

Subsequent to these meetings, as well as the questionnaire and interview processes, the public information process has already been expanded by other citizens in the Village. For example, the Yellow Springs News published several articles on wellhead protection. Independent of the official Village meetings, the Yellow Springs Men's Group sponsored an educational forum on wellhead protection. This program was a direct outgrowth of heightened public awareness and questions spawned by the questionnaires. The program featured state, county and local speakers and was well attended. A copy of the program is provided in Appendix D.

Publication/Brochure

In a proactive effort to initiate public education efforts prior to plan approval, the Environmental Commission in cooperation with the Village of Yellow Springs recently developed a multi-page brochure describing the concepts of wellhead protection as they relate to the Village ground-water supply. The brochure was modeled on one produced for New Carlisle, Ohio by the OEPA using Section 319 money, with permission from both New Carlisle and OEPA. A copy of the brochure is provided in Appendix E. Included in the brochure is a generalized map showing the one-year time-of-travel (TOT), five-year TOT and capture zone boundaries for the well field. The brochure was distributed locally in the wellhead protection area and to Yellow Springs residents and water customers via mail this past spring (2001). In addition to educational material, the brochure includes contacts and phone numbers for additional information.

Questionnaires

Because the successful implementation of the Management Plan will require the involvement and cooperation of many, the first step in finding common ground was to solicit the general thoughts and opinions of the community. In December 2000, approximately 70 "yellow" questionnaires were sent to stakeholders who have particular interest in and/or knowledge regarding the designated wellhead protection area (e.g. landowners within the WHPA). These were the stakeholders who the Committee hoped to later interview. In January 2001, slightly less than 2000 "white" questionnaires were sent to all households using Village Water. The two colors provided a means to distinguish responses from the two groups who might in some cases have different interests. Over 400 questionnaires were collected through the beginning of February. The numerical results of the questionnaires were tallied and written comments were carefully recorded by the YSWPC. The tallied results for the white and yellow questionnaires are provided in Appendices F and G, respectively. A summary of the questionnaire results, including comments, is provided in Appendix C.

Stakeholder Interviews

Beginning in January 2001, approximately 41 individual interviews were conducted with individuals with particular interests in and/or knowledge regarding the wellhead protection area. A list of those interviewed is provided in Table 2. Interview questions were prepared in advance and were tailored to each target audience. Where possible, the interviews were conducted by a YSWPC member(s) with interests or background relating to the target audience. The interview process was successful both in obtaining information for developing source control strategies and establishing dialog with key stakeholders in the community. Interview summaries as reported by the YSWPC are provided in Appendix A.

Table 2. Interviewed Stakeholders

Morris Bean & Company
Farmers
Yellow Springs Water Treatment Plant
Vectren (Natural Gas Pipeline)
Dayton Power & Light Company
Township Trustees
Miami
Xenia
Cedarville
Homeowners
The Vale
The Birch Estate
Others
Township Zoning Commissions
Miami
Xenia
Cedarville
Fire/Emergency Personnel
Glen Helen Ecology Institute

Future Activities

Introduction

Future educational strategies will build off of previous efforts and will target a broader spectrum of the community. Strategies for the general public will focus on increasing awareness of the concepts and importance of source water protection and will be directed at local units of government, civic organizations, businesses, industries, schools, and the community at large. Specific target groups will include: Village of Yellow Springs elected officials; Miami, Xenia and Cedarville Township Trustees and Zoning Officials; Greene County Commissioners; Greene County Health District; Local Emergency Planning Committee for Greene/Montgomery County; Solid Waste Management District; Soil Conservation Service and County Extension Service; and Morris Bean & Company. Additional target groups, such as schools and local community service groups also will be incorporated in the program. In many cases, the cooperation of these various organizations is key to leveraging additional resources and public involvement needed to ensure the successful implementation of the management plan.

Specific Target Groups

Subcommittees will be formed to prepare and present initial presentations to the various groups regarding the needs and benefits of wellhead protection, the specific goals and strategies of the WHP Management Plan, and opportunities for additional groups or individuals to become involved. Initial presentations will be focused on particular activities or involvement that the specific group can contribute to wellhead protection efforts. Some examples of requested input to the groups are as follows:

Village of Yellow Springs Elected Officials

Although the current elected officials are well-informed on wellhead protection issues and the importance to the community, these officials will necessarily need fully to understand and discuss potential future actions ranging from increasing the general public awareness to funding potential alternative emergency water connections and/or

preserving land from future undesirable development. (These and other options are discussed in more detail in other sections of this plan.) The elected officials will need to focus on cooperative efforts with private citizens, industry, and governmental bodies in order to achieve the desired wellhead protection. As elected officials change, the education and action items will need to be revisited in order to have an effective plan.

Miami, Xenia and Cedarville Township Trustees and Zoning Officials

Because the current wellhead protection area is within these three townships, these townships play an important role in current protection as well as future development. The Trustees as well as the Zoning officials may need to better understand their potential role in protecting the water resources, particularly as development pressures seek to change current land usage. By adopting appropriate zoning measures for future activities within the wellhead protection areas and by making protective and informed decisions on future land use, these officials can assure a reliable and safe supply of water from the wellfield. Also, as elected officials change, the new officials need to become better informed of their role and the importance of protecting the area resources.

Greene County Commissioners

Greene County Commissioners need to be aware of the existence and importance of wellhead protection, not only to Yellow Springs, but also to other communities that provide water to their citizens. These officials may be convinced to contribute resources to protect land within wellhead protection zone or to provide impetus for other governmental bodies to work together cooperatively to achieve emergency supplies as well as planned protection. As officials change, it is important to re-introduce the ideas of wellhead protection.

Greene County Health District

The Health Department approves wells and private sewage disposal systems in the County. The Health Department also conducts inspections of wells and sewage systems when conditions warrant inspection. The Health Department can help assure that

existing systems are maintained and function properly, but they can also play a role in future density and system design/performance.

Local Emergency Planning Committee for Greene/Montgomery County

The emergency planning committee needs to understand how the committee and Village can work together to prevent a "water crisis" as well as respond to one. The planning committee can provide assistance in securing options for water supply in times of crisis as well as coordinating notification and protection efforts. As personnel change, education and cooperation efforts need to be re-established.

Solid Waste Management District

The Solid Waste Management District needs to be appraised of the existence of the wellhead protection areas so that protection of the area can be factored into planning efforts or recommendations for waste-related issues.

Soil Conservation Service and County Extension Service

These two governmental agencies work closely with farmers and individuals in more rural areas on issues as diverse as: farm ponds, agricultural practices for soil loss, and nutrient/pesticide/herbicide application. Personnel need to be aware of the existence of the wellhead protection area as well as assist in protection measures by working with farmers to use best management practices in critical areas.

Morris Bean and Company

Educational strategies for Morris Bean and Company are incorporated in the next chapter on source control strategies.

Schools

Developing an appropriate study unit for use in the primary or secondary school system on water supply, conservation, and protection is one way to assure that individuals will understand the importance of "safe" water. By soliciting input from the school board or curriculum advisors, an appropriate grade level(s) can be chosen for

target curriculum development. A field trip to the water plant is another way to gain support and understanding of "where water comes from". Science projects on water quality can be similarly used.

In addition to targeting public schools, Antioch College and/or Wright State University officials and/or professors need to be contacted for support and potential curriculum inclusion. Perhaps the primary or secondary school curriculum could be developed at the college. Special science presentations on wellhead protection could be developed by college students and made available to public schools. College projects could be designed to focus on water quality issues or management issues such as successful implementation of this plan. The ideas can be endless if educators join forces to promote wellhead protection.

Following the initial presentations, feedback will be sought from each group regarding the quality and content of the program. The feedback will be used to revise, if necessary, the presentation approach and/or materials for future presentations and/as action items. Follow up presentations will be offered annually to provide status updates and reports on implementation efforts.

Community-At-Large

In addition to the above target groups, public education and involvement efforts will be developed for the community at large. This strategy will target residents within the Village, the entire WHPA (including the capture zone), and the surrounding townships. An initial fact sheet describing the concepts and importance of source water protection will be mailed to all Village water customers and residents within the WHPA. At least semiannually, a newsletter will be distributed to water customers and residents within the WHPA describing the current status of the management plan implementation. Along with the general update, the newsletter will provide tips and reminders for being good WHP stewards as well as pertinent information (i.e. dates, places and times) of upcoming community events related to WHP (e.g. hazardous household material collection dates). In addition to the newsletters, the YSWPC will explore the regular use

of public service announcements through local radio and newspapers (editorials and articles) to distribute general information on the program.

Yellow Springs will consider sponsoring an annual or bi-annual "Wellhead Protection Day" as part of an Earth Day or other appropriate community gathering. Tours of the water treatment plant and wellfield will be included as public education and outreach.

A subcommittee will be formed to develop/assemble the above public education materials. The OEPA Division of Drinking Water can assist in the development of the public education programs by giving presentations and providing fact sheets and other educational materials. The schedule of implementation for future activities is provided in Table 3.

Table 3. Future Education and Public Participation Strategies

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Educate target groups regarding the wellhead protection program and management plan and solicit their input and involvement. Educate the community-at-large regarding the wellhead protection program and management plan and solicit input and involvement.	Establish subcommittees and prepare presentation materials. Give presentations to target groups.	May 2002 and annually thereafter		OEPA Division of Drinking and Ground Waters
	Develop educational brochures and fact sheets and newsletters for distribution in the mail and at public functions. Hold "Wellhead Protection Day" celebration.	Initiated spring 2001 with the development and distribution of brochure. Hold annual or bi-annual "Wellhead Protection Day".		
	Develop and distribute a semiannual newsletter describing current WHP status and including pertinent tips, reminders, dates and locations of upcoming community events related to WHP.	June 2002 then semiannual thereafter		
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Annually after initial development		

SECTION IV
SOURCE CONTROL STRATEGIES

Educational activities and voluntary approaches are the core of the selected control strategies for the Wellhead Protection Management Plan because these can be implemented now. Furthermore, even though the Village is owner and operator of the community water system, it does not have jurisdiction over the land identified as the wellhead protection zone. Consequently, educational activities and voluntary approaches offer the greatest potential for more immediate successful plan implementation. It is understood, however, that voluntary approaches may be less successful in accomplishing the Committee's goal to protect resources both now and from future potential pollution sources caused by land use changes. In the instance of future sources, regulatory approaches should be considered. However, because the delineated time of travel capture zone extends across multiple different jurisdictions, including Miami Township, Xenia Township and Cedarville Township, the successful implementation of regulatory controls will require inter-jurisdictional cooperation.

Control strategies are divided into general source control strategies, specific source control strategies and source control strategies for future potential pollution sources. General source control strategies include general land use controls that are currently in place that limit specific land uses in the WHPA. Specific source control strategies address identified potential and known pollution sources within the WHPA. Source control strategies for potential pollution sources address regulatory and non-regulatory techniques that will be used to prevent and/or minimize future pollution sources from future activities within the WHPA.

Control strategies are provided for each potential pollution source category along with the associated implementation schedule. The overall implementation strategies are designed to include shared responsibilities of the Yellow Springs Wellhead Protection Committee. The strategy is to identify a lead person, targeting members who are a peer to the industry or represent a community interest, to work with others to implement the

strategy. Work efforts will be phased, allowing for the accomplishment of set objectives before proceeding. This will focus volunteer efforts and permit the opportunity for strategy evaluation and refinement before implementing the next phase.

The YSWPC volunteer(s) assigned to each strategy is responsible for working with a Village representative, if designated, and for successfully seeing the strategy implementation through to completion. In most cases, the volunteer will utilize additional people and resources through the public involvement strategies to attain the specified goal.

Because educational and voluntary strategies will form the core of many of the specific source strategies, the Village should consider including some or all of the capture zone area when planning educational activities. For example, information that is developed regarding septic system maintenance and proper abandonment of wells can be sent to areas of the capture zone outside the one and five year TOT that are not served by public water or sewer. Similarly, educational outreach can be extended to the capture zone area on topics such as household waste management and lawn care. Educating all residents about the importance of source control strategies benefits everyone long-term.

The recommended general and specific source control strategies, as well as source control strategies for future potential pollution sources, are discussed in the following sections and are summarized in table format showing strategy, initial completion schedules and initial individuals responsible for implementation. Some tasks are ongoing and future dates and individuals will need to be revised accordingly as the process evolves. Completion dates for the various tasks assume that plan implementation will begin in January 2002.

Present General Land-Use Controls

General land use controls refer to existing zoning and/or designations within the WHPA that limit specific land-uses. Although developed independently of the Village's wellhead protection process, the permitted land-uses, in most cases, are either compatible

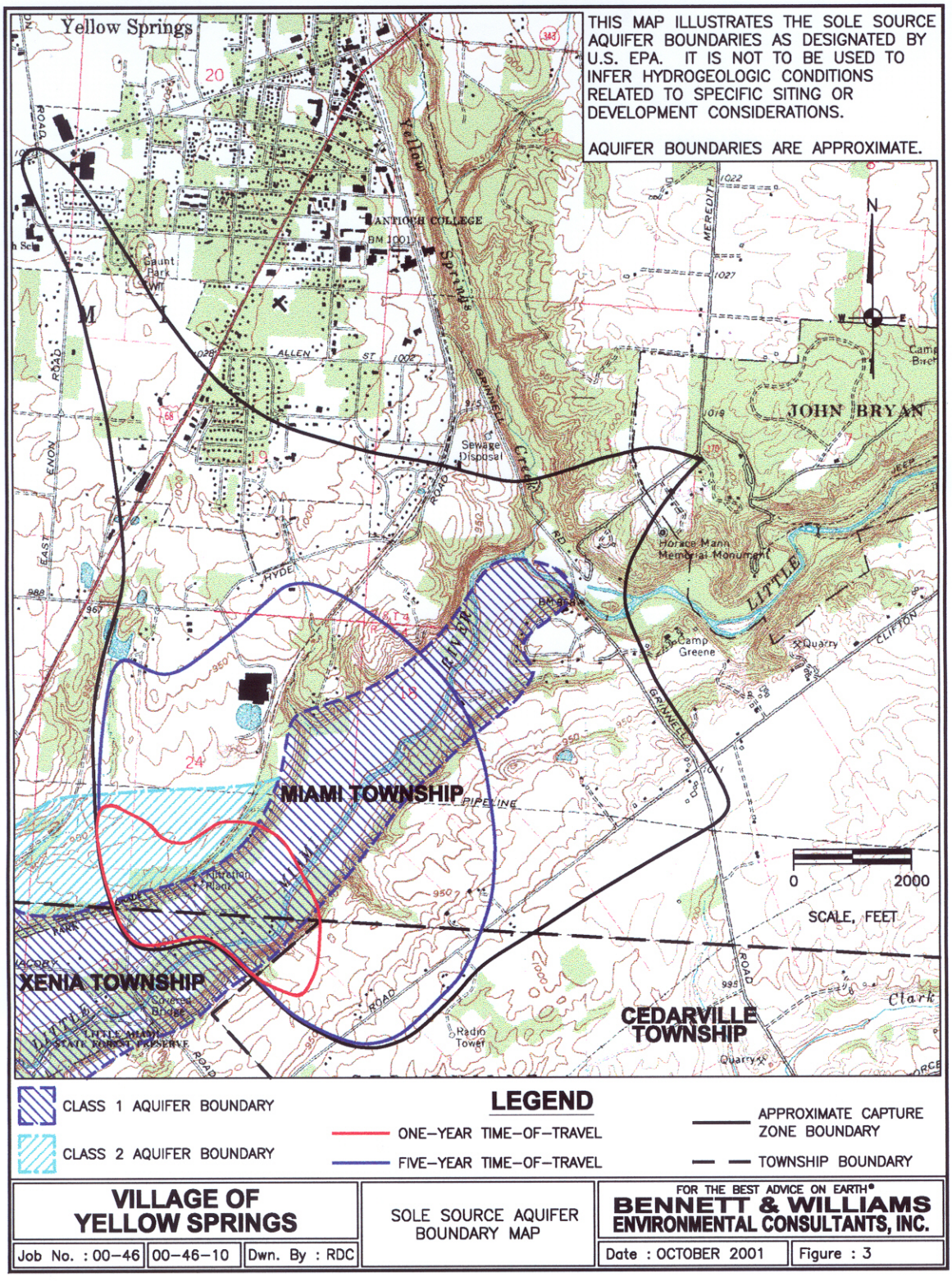
with the WHP goals and/or provide for more stringent design standards than otherwise would be applied. Consequently, in areas where these land-use controls overlap the WHPA, the Village inherits the associated benefit of regulated future development.

Sole Source Aquifer

In 1986, the Miami Valley Regional Planning Commission (MVRPC) petitioned the U.S. EPA to designate the buried valley aquifer system associated with the Great Miami and Little Miami Rivers as a Sole Source Aquifer. The Sole Source Aquifer (SSA) Protection Program is authorized by Section 1424(e) of the Safe Drinking Water Act of 1974 (Public Law 93-523, 42 U.S.C. 300 et. seq). In general, protection afforded within designated Sole Source Aquifer areas includes a review of potentially federally-funded projects such that contamination of the aquifer as a result of these projects will be prevented. Privately-funded projects are not affected by these regulations, and there are no federal requirements to protect ground-water where private funds are utilized.

In addition, State of Ohio regulatory agencies utilize Sole Source Aquifer status as siting criteria for various permit requirements. For example, chapter 3745-27-07 (H) of the Ohio Administrative Code (OAC) prohibits siting a sanitary landfill above an aquifer declared by the federal government to be a sole source aquifer. These same regulations prohibit siting a sanitary landfill or a construction demolition landfill facility within the five-year TOT capture zone of the well field. Figure 3 shows the sole source aquifer boundaries in the vicinity of the Yellow Springs well field.

In addition, Division of State Fire Marshal, Bureau of Underground Storage Tank Regulations (BUSTR) rules define areas associated with sole-source aquifers as sensitive areas (OAC 1301:7-9-09). As such, the State Fire Marshal adopted rules to prescribe more stringent levels of release containment and release detection methods, as defined in OAC 1301:7-9-10, for UST systems in designated sensitive areas.


THIS MAP ILLUSTRATES THE SOLE SOURCE AQUIFER BOUNDARIES AS DESIGNATED BY U.S. EPA. IT IS NOT TO BE USED TO INFER HYDROGEOLOGIC CONDITIONS RELATED TO SPECIFIC SITING OR DEVELOPMENT CONSIDERATIONS.
AQUIFER BOUNDARIES ARE APPROXIMATE.
Yellow Springs
ANTIOCH COLLEGE
JOHN BRYAN
MIAMI TOWNSHIP
XENIA TOWNSHIP
CEDARVILLE TOWNSHIP
Sewage Disposal
Horace Mann Memorial Monument
Camp Greene
Quarry
Radio Tower
Filtration Plant
Covered Bridge
0
2000
SCALE, FEET
LEGEND
CLASS 1 AQUIFER BOUNDARY
CLASS 2 AQUIFER BOUNDARY
ONE-YEAR TIME-OF-TRAVEL
FIVE-YEAR TIME-OF-TRAVEL
APPROXIMATE CAPTURE ZONE BOUNDARY
TOWNSHIP BOUNDARY
VILLAGE OF YELLOW SPRINGS
SOLE SOURCE AQUIFER BOUNDARY MAP
FOR THE BEST ADVICE ON EARTH
BENNETT & WILLIAMS ENVIRONMENTAL CONSULTANTS, INC.
Job No. : 00-46
00-46-10
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Date : OCTOBER 2001
Figure : 3

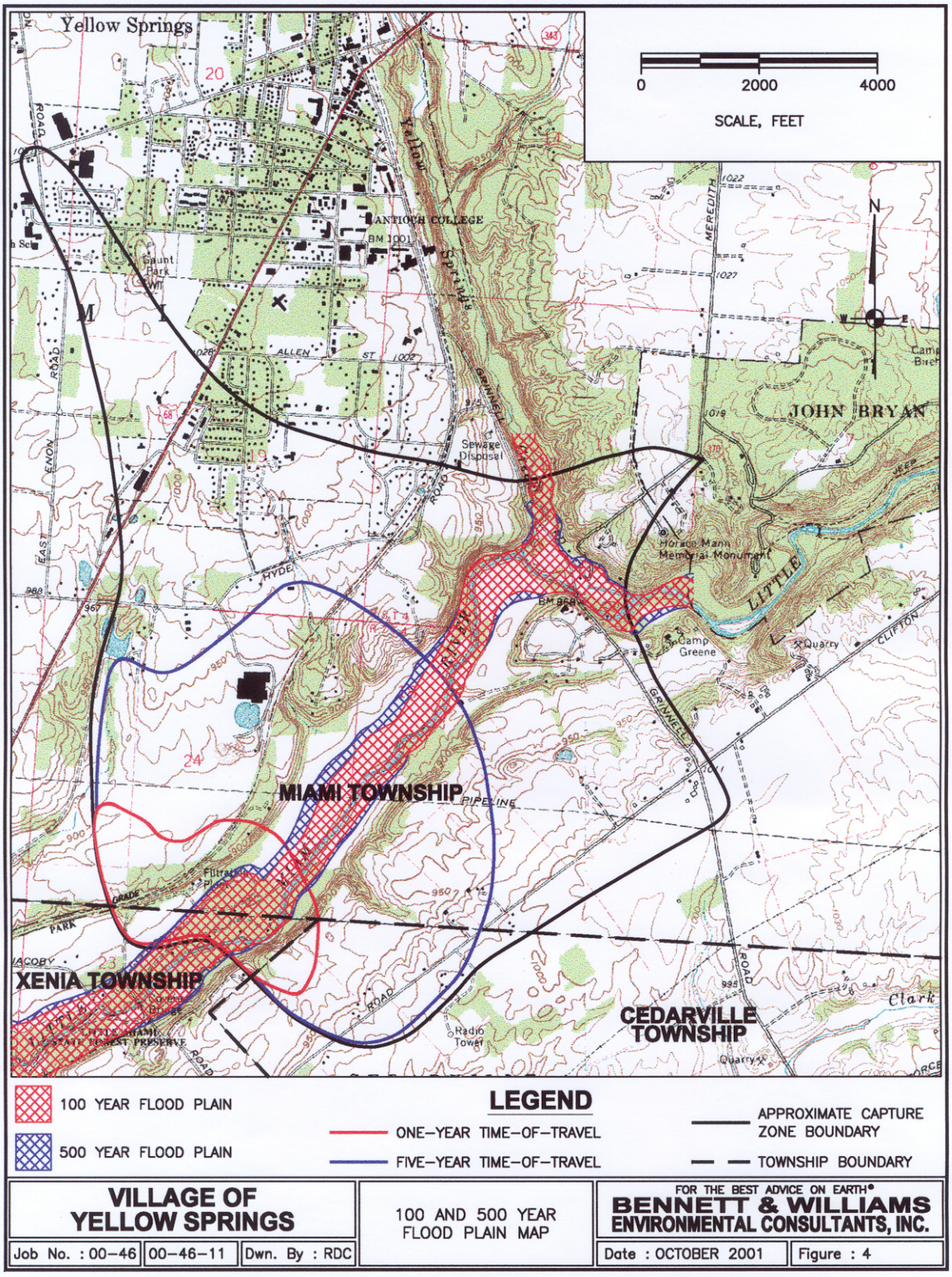
State Scenic River

The Little Miami River is designated as a State Scenic River and, as a result, certain safeguards and development restrictions apply to it and its riparian corridor. This designation assumes that the river possesses water conservation, scenic, fish, wildlife, historic, or outdoor recreation values which should be preserved. The area associated with a State Scenic River includes lands adjacent to the watercourse in sufficient width to preserve, protect, and develop the natural character of the watercourse, but not more than 1000 feet from the normal waterlines of the watercourse (OAC 1517.14). Certain land uses, for example, sanitary, industrial and/or residual solid waste landfills and solid waste transfer facilities, as identified by State and Federal regulatory agencies, are prohibited in areas adjacent to State Scenic Rivers (OAC 3745-27-22, OAC 3745-27-07 and OAC 3745-30-06).

100-Year Flood Plain

Land within the Federal Emergency Management Agency's (FEMA) 100-year flood level elevation of the river is protected against certain types of development by overlay flood plain zoning regulations by Miami and Xenia Townships. Figure 4 shows the 100 and 500 year flood plain boundaries in the one and five year TOT as well as the capture zone. Copies of the zoning resolutions for Miami and Xenia Townships are included in Appendices O and P, respectively.

Miami Township Flood Plain River Protection Overlay regulations prohibit encroachment in the floodway. Examples of encroachment in the floodway are filling, new construction, substantial improvement and other development. Permitted uses in association with the underlying zoning district (in this case A-1, agriculture) as stated in the regulations, include agriculture, accessory parking not including a building, parks, recreation, yards and open space. Although the regulatory language was adopted, Miami Township never adopted the overlay district. The overlay district needs to be adopted for the protection to be complete.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JOHN BRYAN
MIAMI TOWNSHIP
XENIA TOWNSHIP
CEDARVILLE TOWNSHIP
Sewage Disposal
Horace Mann Memorial Monument
Camp Greene
Quarry
Radio Tower
PIPELINE
LEGEND
100 YEAR FLOOD PLAIN
500 YEAR FLOOD PLAIN
ONE-YEAR TIME-OF-TRAVEL
FIVE-YEAR TIME-OF-TRAVEL
APPROXIMATE CAPTURE ZONE BOUNDARY
TOWNSHIP BOUNDARY
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100 AND 500 YEAR FLOOD PLAIN MAP
FOR THE BEST ADVICE ON EARTH
BENNETT & WILLIAMS ENVIRONMENTAL CONSULTANTS, INC.
Job No. : 00-46
00-46-11
Dwn. By : RDC
Date : OCTOBER 2001
Figure : 4

Xenia Township F-1 – Flood Plain Overlay regulations prohibit filling in an area that is below the Federal Emergency Management Agency's (FEMA) 100-year flood level elevation. Permitted uses in the regulations are agriculture: including agriculture buildings and structures, nurseries, greenhouses, but not being used for habitation. Buildings used for habitation will comply with the Federal Flood Plain Act. Conditional uses of the flood plain are public recreation, commercial recreation and open auto parking lots.

With the exception of the adoption of the overlay district in Miami Township, the land-use controls summarized above are currently in place and thus already implemented. For the current land use controls, the primary task with regard to this strategy will be to monitor and review any proposed developments in these areas to ensure they comply with the current requirements. This will involve working with the townships to notify the Village of any proposed developments or land-use changes within the WHPA. In addition, because it is theoretically possible that one or more of these current controls could be subject to change in the future, the strategy will need to include monitoring for any proposed changes or revisions that may alter the existing protective coverages.

In addition to monitoring the existing protection mechanisms, this control strategy will focus on working with Miami Township Trustees to complete the protection already in existing zoning language by adopting the overlay zone for the 100-year floodplain. The implementation schedule for this strategy is presented in Table 4.

Specific Source Control Strategies for Identified Pollution Sources

Morris Bean & Company

The primary control strategy for MBC will be to monitor the current interim actions used to mitigate the volatile organic compound (VOC) ground-water contamination at the facility. The facility is currently required to submit monthly progress reports on the interim action to the OEPA Division of Emergency and Remedial

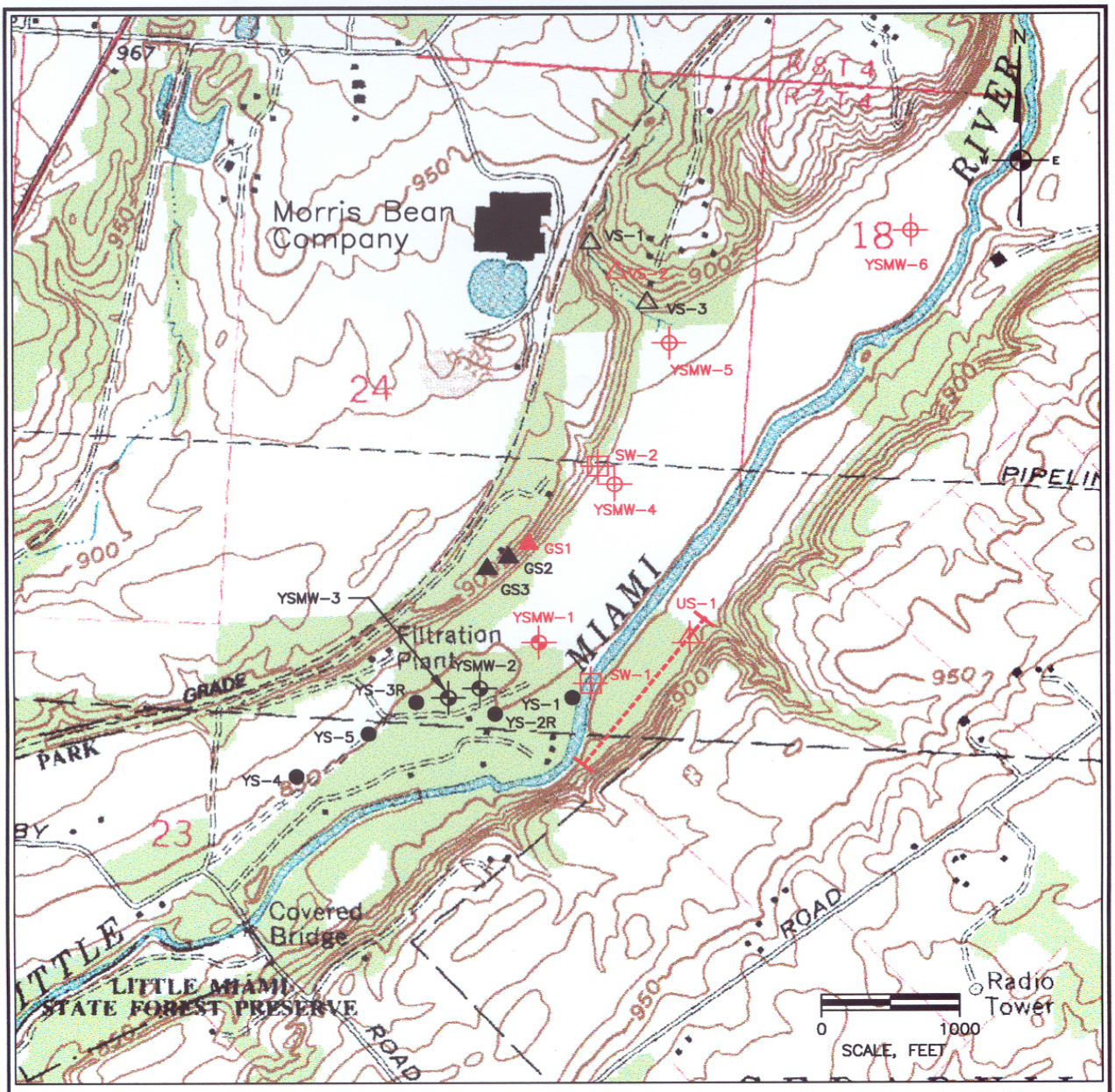
Table 4. Strategies for Present General Land-Use Controls

Controls	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Sole Source Aquifer		Completed		
State Scenic River		Completed		
100-Year Flood Plain in Xenia Township		Completed		
100 Year Flood Plain in Miami Township	Hold initial meetings with Township Zoning Commission to discuss adoption of overlay to support current zoning language; Similar meeting with Township Trustees.	March 2002		
	Work with Zoning Commission and Township Trustees to effect adoption	December 2002		
Monitor and review any proposed developments in these areas to ensure they comply with current requirements.	Establish point of contact with Miami, Xenia and Cedarville Townships to notify the Village representative of any proposed land use changes within the WHPA.	March 2002		
	Monitor for any proposed changes or revisions that may alter the existing protective coverages.	Annually		

Response (DERR). The monthly progress reports contain ground-water elevation data and water quality sampling results of the treatment system effluent before discharging to the settling ponds. In addition, water samples are collected on a quarterly basis from nine monitoring wells (including MW-1, MW-2, MW-3, MW-5, MW-7, MW-10, MW-12, MW-13, and MW-14), five recovery wells (RW-1 through RW-5), and the inflow to the granular activated carbon treatment system. MBC also voluntarily samples six springs that discharge to the valley for VOCs on a semi-annual basis. A map showing the approximate monitoring well and recovery well locations is provided in Appendix H. The sampled spring locations (GS-1 through GS-3 and VS-1 through VS-3) as shown on Figure 5 in the main text. Appendix H also includes the report of laboratory results from MW-1 for April 6, 2001. It is understood that other monitoring wells, the treatment system effluent, treatment system influent, recovery wells and springs are also analyzed for the same parameter list.

The Village will establish a subcommittee that includes representation from MBC. The subcommittee's primary goal will be to monitor the ongoing interim actions to ensure that the Village's interests with regard to wellhead protection are preserved. Because of the technical nature of this assignment, the subcommittee should incorporate and/or local Universities). The subcommittee will meet initially with OEPA DERR to review the progress and success of the ongoing interim action measures to mitigate the VOC ground-water contamination. Based on this initial meeting, the subcommittee will determine the schedule (i.e. semiannually, annually, etc.) and procedures (i.e. meetings, conference calls, letters, etc.) for reviewing the interim action status with the Agency and MBC. The subcommittee will be included on the correspondence list to review and inventory submittals between MBC and the Agency. The subcommittee will present status updates to the YSWPC as needed. In the event a change in conditions warrants revision of the management plan or approach, the subcommittee will be responsible for recommending the revisions and establishing new implementation target dates.

Strategies targeted for preventing future contamination will include compliance monitoring, education and development of an early response notification plan. Given its


Morris Bean Company
VS-1
VS-2
VS-3
YSMW-5
YSMW-6
18
24
23
SW-2
YSMW-4
GS1
GS2
GS3
YSMW-3
YSMW-1
YSMW-2
Filtration Plant
US-1
SW-1
YS-3R
YS-1
YS-2R
YS-5
YS-4
MIAMI
RIVER
PIPELIN
GRADE
PARK
Covered Bridge
LITTLE MIAMI STATE FOREST PRESERVE
ROAD
Radio Tower
0
1000
SCALE, FEET
LEGEND
RED INDICATES MONITORING LOCATION
PRODUCTION WELL
EXISTING MONITORING WELL
GLEN SPRING
PROPOSED SPRING SAMPLING POINT
PROPOSED MONITORING WELL
VALE SPRING
PROPOSED SURFACE WATER STATION
ACTUAL SPRING SAMPLING LOCATION TO BE DETERMINED
VILLAGE OF YELLOW SPRINGS
WATER QUALITY MONITORING LOCATIONS
FOR THE BEST ADVICE ON EARTH
BENNETT & WILLIAMS ENVIRONMENTAL CONSULTANTS, INC.
Job No. : 00-46
00-46-07
Dwn. By : RDC
Date : OCTOBER 2001
Figure : 5

status as a conditionally exempt small quantity generator, MBC is regulated for the use, storage and disposal of chemicals and other substances used in their industrial processes. The OEPA Division of Hazardous Waste Management, Southwest District Office is responsible for compliance monitoring and oversight of hazardous waste management activities, where they occur, at MBC. The subcommittee should meet with OEPA DHWM to review MBC compliance history and inspection results and to further identify contaminant types and potential release points and quantities. Based on this initial meeting, the subcommittee will determine the schedule and procedures for receiving future updates from the Agency. MBC should also be approached about voluntarily reporting types and quantities of hazardous materials used and generated at the site on an annual basis.

Education will focus on the incorporation of additional wellhead protection information materials into the current in-service training on waste handling, spill prevention, containment and clean-up procedures. In addition, as part of an early notification system, the Village will establish a point of contact and solicit MBC, OEPA DERR and the Local Emergency Planning Committee to be included in the notification chain in the event of a spill or release.

Morris Bean & Company has its own sanitary sewer system and wastewater treatment plant that discharges to an onsite infiltration pond. The OEPA SWDO Division of Surface Water is responsible for regulating this system and has recommended the MBC either upgrade to meet current standards or tie into the Village's sanitary sewer system. In addition to the annual inspection program currently performed by the Health District, the primary protective strategies for this source will emphasize education. Educational efforts will focus on the possible negative influence on ground water of using septic systems for the disposal of harmful household and industrial products. The subcommittee will work to incorporate this information into current in-service training programs. As a long term strategy, the Village and MBC will establish dialog to review the options, costs and possible time frame for extending the Village's sewer service to

MBC. The schedule of implementation for the MBC source control strategies is provided in Table 5.

Agricultural Areas

Strategies for controlling herbicide, pesticide and fertilizer use and associated runoff within the WHPA will focus on education and voluntary adherence to agricultural "Best Management Practices". Best Management Practices (BMPs) are agricultural and production guidelines developed from work at universities and agencies to minimize off-site damage while maintaining profitability and stability in farming operations. Most BMPs involve common-sense farming and focus on management of inputs to provide for economic, environmental and agronomic efficiency in production agriculture. Appendix I contains fact sheets and Bulletins from the Ohio State University Extension pertaining to agricultural BMP's.

The first step in implementing this strategy will hinge upon an assessment of the agricultural operations identified within the WHPA to determine what, if any, aspects of the farming operation may threaten ground-water quality. The initial assessments may be conducted under the Ohio Farm Assessment System or Farm*A*Syst. Farm*A*Syst is a voluntary, confidential self-guided farmstead assessment program designed to evaluate multiple aspects of the farming operation to determine the potential for surface and/or ground-water contamination. Educational materials describing Farm*A*Syst program are provided in Appendix J.

The Ohio Farm*A*Syst program is administered through local county extension offices and consists of a series of worksheets intended to help identify farmstead conditions that could negatively affect water quality. The program highlights practices that may need to be modified to reduce the risk of ground-water contamination.

Table 5. Strategies for Morris Bean & Company

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Verify Compliance with Current Regulations Regarding materials use, handling, storage, reporting and other regulations.	Meet with Ohio EPA Southwest District Office (SWDO) Division of Hazardous Waste Management (DHWM) to discuss compliance standing.	March 2002		OEPA SWDO DHWM Harold O'Connell (937) 285-6078
	Meet with MBC to pursue voluntary reporting of types and quantity of hazardous wastes used and generated.	April 2002	___and MBC Representative	
Establish communication lines for assessing the current interim actions currently being conducted to mitigate the existing ground-water contamination at the facility.	Meet with MBC and Ohio EPA Southwest District Office (SWDO) Division of Emergency and Remedial Response (DERR) to review and discuss the interim action measures.	March 2002		OEPA SWDO DERR Randy Watterworth Site Coordinator (937) 285-6357
	Have Village point-of-contact included on document copy chain. Establish filing system for managing documentation.	March 2002		
	Review interim action status.	To be determined		
Educate workers regarding waste handling, spill prevention, containment and clean-up procedures.	Determine current schedule of in-service training. Incorporate additional wellhead protection training materials in the current curriculum and promote cautionary measures.	July 2002	___ and MBC Representative	
Establish an early notification plan to alert the Village in the event of a spill or release from the facility.	Provide emergency phone numbers for the Village point-of-contact to appropriate representatives at MBC, OEPA and the local emergency planning commission.	July 2002		
Review inspection reports and compliance history for the MBC wastewater treatment plant.	Establish a filing system for managing documentation.	April 2002		OEPA SWDO DSIWM Mike Zimmerman (937) 285-6102 Greene County Combined Health Dist.
Review options, costs and possible timeframe for connecting MBC to Village wastewater treatment plant.	Establish dialog with Village and MBC; progress reports semi-annually.	July 2002 and semi-annual progress updates thereafter.	___ and MBC Representative	
Evaluate success of strategy implementation	Review and update strategies as needed.	Annually after initial development		

Because Farm*A*Syst is a voluntary program, the farmer decides whether to assess their property on their own, or if they want additional technical advice and/or assistance from the Greene County Extension Office in completing the assessment. In practice, completing the worksheets is a time consuming process that some farmers may not be inclined to spend. Consequently, it is important that the initial introduction to the program emphasize that the goal of the process is to organize a support system that builds partnership with agricultural organizations and the farmer that supports both water quality protection and operational profitability. It is understood that some farmers within the WHPA lease the land from the property owner for their operation. These farmers must be included in the assessment process.

Following the completion of the assessment, the Village should facilitate dialog between the property owner (farmer) and the appropriate agencies (Ohio Cooperative Extension Service (OSU Extension Office), the U.S. Department of Agricultural Soil Conservation Services (SCS) and the Soil and Water Conservation District (SWCD) to review possible alternatives and make decisions about which BMPs to implement. Alternately, the farmers may be approached directly about voluntarily reporting the types, quantities, and application rates of agrochemicals utilized on their fields. The schedule of implementation for this strategy is provided in Table 6.

Village of Yellow Springs Water Treatment Plant

Strategies for the Village of Yellow Springs Water Treatment Plant include the review and revision of current practices and polices and include an inspection of the onsite septic system. The current bulk product handling procedures for hydroflurosilic acid and chlorine gas will be reviewed to determine if any additional safety protocols are warranted. Similarly, the existing emergency response procedures for bulk chemical spills or releases will be reviewed and revised as needed. Finally, the current procedures for the handling, storage and disposal of laboratory chemicals and treatment sludges will be reviewed to assess if additional protocols are warranted.

Table 6. Strategies for Agriculture

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Educate farmers and landowners regarding the importance of employing best management practices that support both water quality protection and operational profitability.	Meet personally with farmers and land owners within the WHPA to open dialog regarding the importance of assessing current agricultural operations within the WHPA.	April 2002		Greene County Extension Office Jerry Mahan (937) 372-9971 U.S. Department of Agricultural Soil Conservation Services Soil and Water Conservation District Farm Service Agency
Farmers and landowners conduct voluntary assessments of agricultural operations in the WHPA.	Work with the Greene County Extension Office to introduce and implement the Ohio Farm Assessment System. Follow up as needed to facilitate the assessment completion. Follow up as needed until forms are completed.	June 2002		
Implement appropriate best management practices (BMPs).	If needed, help secure assistance for the farmer/property owner from the appropriate agencies. Follow up as needed to insure best management practices have been implemented.	August 2002 Depends on implementation schedule.		
Evaluate success of BMPs in meeting assessment goals.	Review and update strategies as needed.	Annually after initial implementation.		

The Village of Yellow Springs will coordinate with the Greene County Combined Health District to develop and implement an inspection program for the onsite septic system. Inspections will be conducted every three years. Regular inspections will help identify problems before they become significant, thus minimizing and/or preventing adverse leakage to the ground-water system. In addition, a regular inspection program will assist in the early identification of needed maintenance and repairs. Potential problems, when identified early, may be corrected at little or no expense compared to major repairs. The inspections will be conducted in the spring when water levels tend to be highest and thus the load on the system is greatest. The Village will attend to any needed maintenance and/or repairs identified in the inspection.

In addition to maintenance, the Village will evaluate the current waste streams to the system and identify and eliminate those that pose a threat to ground-water quality. Following this study, the use of alternative products will be evaluated and educational materials developed to encourage the separation and appropriate disposal of common products with potentially hazardous ingredients from the septic system waste stream. The schedule of implementation for this strategy is provided in Table 7.

Natural Gas Pipeline

The control strategy for this potential source will focus on establishing communication lines between the Village and Vectren. In the case of a leak or suspected leak, Vectren's notification protocol varies depending on the severity of the leak and the potential impact on the community. The goal of this strategy will be to establish a reporting plan to advise the Village of any significant pressure drops, leaks, repairs or emergencies associated with the transmission line segment passing through the WHPA.

The Village will provide Vectren with a map showing the WHPA boundaries relative to the transmission line and materials describing the sensitive nature of this area. In addition, the name and emergency phone number of a Village representative (i.e. water

Table 7. Strategies for the Yellow Springs Water Treatment Plant

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Review current bulk chemical handling and storage procedures and determine if additional protocols are warranted. Assess current procedures for the handling, storage and disposal of laboratory chemical and treatment sludges.	Review current handling, storage and disposal procedures and determine if additional protocols are warranted.	February 2002		Greene County Combined Health District, Deborah Leopold, RS (937) 374-5600
Educate workers regarding waste handling, spill prevention, containment and clean-up procedures.	Evaluate the current in-service training programs and incorporate additional wellhead protection training materials in the current curriculum and promote cautionary measures.	May 2002		
Educate staff on the proper use and maintenance of septic systems.	Develop materials from existing information resources and incorporate it with current in-service training.	May 2002		
Inspect the onsite septic system and perform any needed maintenance or repairs.	Develop and implement a three year inspection program for the onsite septic system. Coordinate with the Greene County Combined Health District to conduct the inspections.	April 2002		
Evaluate current waste stream to system and identify items that pose a threat to ground water.	Provide education to encourage separation and appropriate disposal of potentially hazardous constituents.	May 2002		
Evaluate the success of strategy implementation.	Review and update strategy as needed.	Annually after initial development		

plant supervisor, water superintendent) will be provided for Vectren's existing emergency notification plan. The schedule of implementation for this strategy is provided in Table 8.

Electric Transmission Lines (Transformers)

The primary strategy for this potential source is to address the four non-labeled transformers in the WHPA. As a result of dialog initiated with the Dayton Power and Light Company (DP&L) with regard to this strategy, DP&L has already prioritized the replacement of the unlabeled transformers. It is anticipated that the four non-labeled transformers will be replaced with non-PCB transformers as early as August 2001.

Although the fluid used in the non-PCB transformers pose less risk to the environment, there remains potential for an accidental spill or release from the estimated 12 DP&L transformers within the WHPA. The Village, therefore, will contact DP&L and develop an emergency notification plan in the event of a transformer release within the WHPA. A Village representative (i.e. water plant supervisor, water superintendent) will be assigned as a point of contact to be notified by DP&L in the event of a release. The emergency phone number will be provided for incorporation into the existing DP&L emergency notification plan. The schedule of implementation for this strategy is provided in Table 9.

Residential Areas

Residential dwellings pose potential pollution risks due to the storage, use and disposal of potentially-polluting substances. Possible sources of ground-water pollution from households include leaking heating oil storage tanks, leaking automotive fluids, and improper use or disposal of hazardous household products such as automotive fluids and lawn and garden products. Improperly maintained or poorly constructed septic systems are a potential source of ground-water contaminants including but not limited to coliform bacteria, nitrates, and household hazardous waste. In addition, septic systems located in flood plains are prone to malfunction because of high water tables and periodic flooding.

Table 8. Strategies for Natural Gas Pipeline

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Develop notification system in case of any significant pressure drops, leaks, repairs or emergencies associated with the transmission line segment within the WHPA.	Call the Vectren Customer Service number and provide them with a contact name and telephone number.	February 2002		Vectren Customer Service (800) 909-7668 Vectren 24-Hour Emergency (800) 920-9427
	Schedule meeting with Vectren to transfer maps and information pertaining to the WHPA	March 2002		
	Review & update system as needed	Annually after initial development		

Table 9. Strategies for Electrical Transmission Lines

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Replace the four non-labeled DP&L transformers within the WHPA.	DP&L currently has the non-labeled transformers on a replacement schedule. Contact DP&L to verify the date of replacement.	January 2002		DP&L Representative Mr. Scott Arentsen (937) 331-3106
Develop early response notification system in case of a spill.	Develop a notification system including who to contact, telephone numbers, and back up plans.	February 2002		
	Schedule meeting to transfer information to DP&L.	March 2002		
	Review & update system as needed.	Annually after initial development		

Strategies for On-Site Wastewater Treatment Systems

The protective strategies for On-Site Wastewater Treatment Systems will emphasize education and include a three-year inspection program for on-lot systems (septic tank/leaching tile field systems) and an annual inspection program for off-lot (aeration system with discharge to surface water). Note that no off-lot systems are known to be in the WHPA at this time. The purpose of the inspections will be to identify potential problems. Educational efforts will focus on the importance of proper septic system operation and maintenance and the possible negative influence on ground water of using septic systems for the disposal of harmful household and industrial products. There currently is a considerable list of education materials regarding these topics available through the Ohio State University Extension, the Greene County Combined Health District, and the National Home Assessment System Program. Examples of these educational materials are provided in Appendix K. The available educational information should be tailored, as needed, to address the key concerns with regard to ground-water protection. A packet of educational materials will be prepared and delivered via direct mail to residents within the WHPA.

In addition to homeowner education, the Village of Yellow Springs will coordinate with the Greene County Combined Health District to develop and implement an inspection program for those residential sewage systems within the WHPA. Inspections will be conducted every three years for on-lot systems and every year for off-lot systems (if any are identified in the WHPA). Currently the Greene County Combined Health District does not perform routine inspections, however, they will perform inspections free of charge for new and repair certifications and to diagnose suspected problems. Regular inspections will help identify problems before they become significant, thus minimizing and/or preventing adverse leakage to the ground-water system. In addition, a regular inspection program will assist in the early identification of needed maintenance and repairs. Potential problems, when identified early, may be corrected at little or no expense compared to major repairs.

The inspections will be conducted by a Registered Sanitarian from the Greene County Combined Health District, who would provide this service for a fee (approximately $40 per residence) to the Village. Ideally, the inspections should be conducted in the spring when water levels are high and thus the load on the system is greatest. Following the inspection, a letter will be sent to each property owner presenting the inspection results and findings, along with recommendations, if necessary, for any needed maintenance or repair. The Village will maintain a database of the inventoried septic systems and related inspection reports and correspondence.

Because participation in the inspection program will be voluntary, it will be important to communicate the benefit to the property owners of identifying problems that eventually require major repairs (i.e. regular maintenance is cheaper than major repairs). Because of their experience in these matters, the Greene County Combined Health District can provide assistance in facilitating this goal.

With regard to new systems, the wellhead protection committee will coordinate with the Greene County Health Department and local Township officials to ensure that all siting and design requirements are met for the installation of new septic systems within the WHPA. The schedule of implementation for this strategy is provided in Table 10.

Wells (Existing, New and Abandoned)

The protective strategies for existing and abandoned wells within the WHPA will focus on owner education and well inspection. The initial challenge will be to identify properties within the WHPA that are served by private wells. Some of this work has already been conducted as part of the recent property owner interviews and surveys. Once identified, the private well owners will be contacted by a Village representative and encouraged have their well inspected. The purpose of the well inspections will be to evaluate the apparent integrity of the well and its surroundings with regard to its potential as a pollutant pathway to the aquifer.

Table 10. Strategies for Residential Sewage Systems

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Identify all residential sewage systems within the WHPA.	Complete the inventory initiated during the survey and interview process.	March 2002		
Educate owners on the proper use and maintenance of septic systems.	Develop materials from existing information resources and distribute information to identified property owners and tenants.	June 2002		Ohio State University Extension, (614) 292-6181
Develop and implement an inspection program for those residential sewage systems within or adjacent to the WHPA.	Coordinate with the Greene County Combined Health District to establish an inspection schedule.	August 2002		Greene County Combined Health District, Deborah Leopold, RS (937) 374-5600
Send each property owner a letter presenting the results and findings, along with recommendations, if necessary, for any needed maintenance or repair.	Establish a notification letter format and related property owner database. Mail or deliver letters. Follow up to determine if recommendations were implemented.	October 2002		
Develop a database of all inventoried sewage systems and related correspondence.	Establish a paper and/or electronic database file containing names, addresses and inspection results.	August 2002		
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Every 3 years after initial development		

The inspections will be conducted by a Registered Sanitarian from the Greene County Combined Health District, who would provide this service for a fee to the Village. Ideally, well inspections could be conducted at the same time as the septic system inspections. Following the inspection, a letter will be sent to each property owner presenting the inspection results and findings, along with recommendations, if necessary, for any needed maintenance or repair. The Village will maintain a database of the inventoried private well systems and related inspection reports and correspondence.

Because participation in the inspection program will be voluntary, it will be important to communicate the benefits of insuring their source of water is not subject to potential contamination. An example of educational material available from the National Home Assessment Program is provided in Appendix L. Because the Greene County Health District has experience in approaching property owners to conduct voluntary assessments (inspections), the Village will coordinate with them to encourage participation in the program.

Out of service wells will be inventoried and, if appropriate, recommended for abandonment in accordance with either OAC 3701-28-7 (for private water wells) or OAC 3745-9-10 (for all other wells). With regard to new well installations, the Village will coordinate with the Greene County Health Department and the appropriate township to insure that all siting and design requirements in OAC 3701-28-12 are met for the installation of new wells within the WHPA. The schedule of implementation for this strategy is provided in Table 11.

Table 11. Strategies for Private Wells

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Identify all private wells within the WHPA.	Complete the well inventory initiated during the survey and interview process.	March 2002		Greene County Combined Health District, Deborah Leopold, RS (937) 374-5600 Ohio State University Extension, (614) 292-6181
Educate property owners on the importance of preserving well integrity to protect their water quality.	Develop materials from existing information resources and distribute information to property owners.	May 2002		
Inspect private wells within the WHPA. Identify and catalog any out-of-service wells.	Develop and implement an inspection program for all private wells within the WHPA. Coordinate with the Greene County Combined Health District to conduct the inspections.	August 2002		
Send each property owner a letter presenting the results and findings, along with recommendations, if necessary, for any needed maintenance or repair.	Establish a notification letter format and related property owner database. Mail or deliver letters. Follow up to determine if recommendations were implemented.	October 2002		
Properly seal and abandon all out-of-service wells in accordance with Ohio Approved Standards.	Establish a written protocol conforming with OAC 3701-28-7 for distribution to property owners. Develop a contact list of qualified local well abandonment contractors.	January 2002		
Develop a database of all inventoried private well systems and related correspondence.	Establish a paper and/or electronic database file containing names, addresses and inspection results.	August 2002		
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Annually after initial development		

Domestic Chemical Waste

The Village will develop and maintain public information/education programs that identify the primary hazardous household chemicals of concern, their proper use, storage and handling methods, and less hazardous alternatives. The emphasis will be on education to encourage: 1) pollution prevention by reducing or eliminating the use of hazardous household materials, and 2) separation and appropriate disposal of common household products with potentially hazardous ingredients from other household wastes. Resources for reducing or eliminating the use of hazardous materials in the home are presented in a Consumer Guide to Safer Alternatives (Appendix M). The Ohio State University Extension and the National Home Assessment Program have produced several educational Fact Sheets regarding the identification, disposal and reduction of hazardous materials in the household (Appendix M). In addition, the U.S. EPA has developed the Disposal Guide to Household Hazardous Wastes that contains useful and practical recommendations for the appropriate disposal of many common household products with potentially hazardous ingredients (Appendix M).

To facilitate the proper disposal of household hazardous materials, the Village will notify residents within the WHPA of the date, time and location of the annual Greene County Solid Waste Management community household hazardous materials collection program. The Greene County Solid Waste Management District funds an annual household hazardous materials collection day program that typically occurs in August. In addition to the annual collection day, the Village will continue to maintain its current oil recycling center and review options for expanding the facility to include the collection of materials such as batteries, antifreeze, paint, etc. The Village will also identify local commercial garages that voluntarily accept used motor oil and/or batteries for recycling on a regular basis. The County household hazardous materials collection day and the availability of these alternative recycling services will be advertised in water bill inserts and through direct mailings to residents within the WHPA. In addition, notifications will be published in the local paper. The schedule of implementation for this strategy is provided in Table 12.

Table 12. Strategies for Domestic Waste

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Establish a public education program regarding the proper use, storage, handling and disposal of hazardous household chemicals, and alternatives to the use of hazardous materials.	Develop educational pamplets and brochures for distribution to homeowners within the WHPA.	September 2002		The Ohio State University Extension
Notify residents in advance of community sponsored collection events and locations (collection days, recycling centers, etc.)	Coordinate with the Greene County Solid Waste Management District to distribute information on annual hazardous material collection day prior to collection day.	Annually one month prior to collection date and as needed for Village programs		Greene County Solid Waste Management District Kimberly Mason (937) 427-1199
	Prepare notification on water bill to be received one month prior to collection date. Include information on Village programs.			
	Prepare direct mailing to WHPA residents one month prior to collection date. Include information on Village programs.			
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Annually after initial development		

General Lawn and Garden Chemicals

Although interviews with stakeholders within the WHPA indicate lawn and garden chemical use is minimal, practices may change with time and owners/occupants. In addition, residential lawn and garden chemical use within the well field capture zone or adjacent to Yellow Springs Creek and/or Little Miami River watersheds may potentially influence water quality. Consequently, the Village will develop informational materials for public distribution to both Village residents and property owners within the WHPA discussing ways to reduce the potential impact that lawn chemical applications may have on drinking water. This will include information on organic lawn and yard maintenance, alternatives to lawns, integrated pest management, and the importance of following appropriate lawn chemical application rates and frequencies when lawn chemicals are used. Such literature can be incorporated with other wellhead protection related materials for distribution in late winter to early spring prior to spring and summer lawn maintenance activities. The Ohio State University Extension and the National Home Assessment Program provide education resources regarding general lawn and garden chemical application (Appendix N). The Village of Yellow Springs Environmental Commission distributed a flyer on "Pesticide Free Lawns" in 1997 and 1998. This flyer and other materials and resources are also included in Appendix N. The schedule of implementation for this strategy is provided in Table 13.

Residential and Agricultural Fuel Storage Tanks

The protective strategy for residential storage tanks within the WHPA will focus on inspection and abandonment. The first step will be to finalize the inventory of residential buried or above ground heating fuel tanks within the WHPA. Once identified, the Village will arrange for a qualified contractor to inspect and test all existing tanks. The purpose of the inspection will be to evaluate the structural integrity of the tank and associated distribution system. If it can be arranged, a Village representative should accompany the inspector to obtain information regarding the age, capacity and use status of each tank. Following the inspection, a letter will be sent to each property owner presenting the inspection results and findings, along with recommendations, if necessary,

Table 13. Strategies for General Lawn and Garden Chemicals

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Establish a public education program regarding lawn and garden maintenance, including natural lawn care alternatives, integrated pest management, and appropriate lawn chemical application rates and frequencies. Include information on garden chemicals as well. Include information on proper storage and disposal of unused chemicals.	Develop educational pamphlets and brochures for distribution to Village residents and homeowners within the WHPA.	March 2003		The Ohio State University Extension
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Annually after initial development		

for any needed maintenance or repair. In addition, the property owner will be provided with a name of a Village representative to notify in the case of a tank overfilling and/or suspected leak. The Village will maintain a database of the inventoried tanks and related inspection reports and correspondence. Because participation in the inspection program will be voluntary, it is important to communicate in advance the mutually shared benefits of conducting the inspections.

Out of service tanks will be inventoried and, if appropriate, recommended for removal or abandonment. The Village will provide a list of qualified local contractors who are certified to perform these services. In the event the property owner is incapable of financing the needed maintenance or abandonment, the Village will consider providing financial assistance. The schedule of implementation for this strategy is provided in Table 14.

Transportation Routes

Strategies for transportation routes will focus on education and the preparation of an early response notification plan. The Village will work with the Local Emergency Planning Committee for Greene/Montgomery County to educate local emergency crews regarding the location of the WHPA and to establish an early response notification plan to coordinate the appropriate response in the event of a spill. The Village will provide local emergency crews with maps showing the location of roads and buildings relative to the WHPA. The Village will educate local emergency response personnel regarding general WHP issues by providing educational materials and training regarding wellhead protection concepts and general susceptibility of ground-water resources to surface borne contaminants. This information can be incorporated in current emergency personnel training schedules. Signage will be posted along roadways to indicate when entering the WHPA and provide an emergency number to call in the event of an accidental release or spill.

Table 14. Strategies for Above and Underground Storage Tanks

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Identify all residential and agricultural storage tanks within the WHPA.	Complete the inventory initiated during the survey and interview process.	April 2002		
Develop and implement an inspection program for storage tanks within or adjacent to the WHPA. Send each property owner a letter presenting the results and findings, along with recommendations, if necessary, for any needed maintenance, repair or abandonment.	Coordinate with a Certified Contractor to establish an inspection schedule. Establish a notification letter format and related property owner database. Mail or deliver letters. Follow up to determine if recommendations were implemented. Provide name of person to notify in the event of a spill or leak.	August 2002 October 2002		
Develop a database of all inventoried tank systems and related correspondence. Evaluate the success of strategy implementation.	Establish a paper and/or electronic database file containing names, addresses and inspection results. Review and update strategies as needed.	October 2002 Annually after initial development		

An early response notification plan will be developed with the local emergency crews in the event of a spill. This plan will include the name of a Village contact person(s) and emergency telephone numbers. A Village representative (i.e. water plant supervisor, water superintendent) will be assigned as a point of contact to be notified by local emergency personnel in the event of a spill. Depending on the severity of the spill, the Village contact will be responsible for notifying OEPA Division of Emergency and Remedial Response, the OEPA Office of Public Water Supply, the Greene County Department of Health, and the Village Safety Services Director.

The Village will work with the appropriate Townships, Greene County Engineer's Office (Highway Section) and Ohio Department of Transportation to establish best management practices that are protective of surface water and ground water. Reductions in salt usage and herbicides along roadways within the WHPA will be emphasized. In addition, the Village will establish appropriate communication protocol with personnel responsible for maintenance activities along the bike trail for notifying the Village in the event of an accidental spill. The schedule of implementation for this strategy is provided in Table 15.

Surface Water Sources

Strategies for surface water should include participation in local watershed protection efforts that could affect surface water quality in the wellhead protection area. The Village currently has staff and Council representatives attending the Upper Little Miami Watershed Improvement Group (ULMWIG). The ULMWIG is an issue-oriented group informally affiliated with the Little Miami River Partnership and organized around the issue of total maximum daily load (TMDL) implementation. The Village should assess more active participation in the Little Miami River Partnership, and similar organizations such as Little Miami, Inc. Village participation in watershed protection activities should be ongoing and coordinated with the wellhead protection strategies for addressing surface water sources.

Table 15. Strategies for Transportation Routes

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Educate local emergency response crews regarding the location and sensitive nature of the WHPA.	Prepare educational materials and meet with local township emergency response personnel.	May 2002		Local Emergency Planning Committee for Greene/Montgomery County
Establish an emergency action plan to coordinate appropriate agencies in the event of a spill along roadways or along the bike path.	Establish a point of contact for the Village (i.e. plant supervisor, water superintendent) to notify in the event of a spill. Develop a list of Agency contacts to notify in the event of a spill.	September 2002		OEPA Division of Emergency and Remedial Response OEPA Office of Public Water Supply Greene County Combined Health District
Post signage along roadways within the WHPA and provide an emergency number to call in the event of an accident or spill.	Coordinate sign design and locations with the Ohio Department of Transportation and local Townships.	September 2002		Ohio Department of Transportation
Establish best management practices for roadway salt and herbicide usage.	Coordinate with Townships, Greene County Engineer's Office (Highway Section) and ODOT to develop and implement practices.	November 2002		
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Annually after initial development		

Protective strategies for surface water sources will include spill notification and water quality monitoring. The Village will establish an emergency notification plan with both local emergency crews and the OEPA. This plan will include the name of a Village representative and emergency telephone numbers to contact in the event of an accidental spill or release into the Little Miami River, Yellow Springs Creek and the unnamed drainage from the MBC settling ponds. In addition, a water sampling program will be initiated to monitor surface water quality trends in both the Little Miami River and the drainage receiving discharges from the MBC settling ponds. The sampling locations, parameters and frequency are provided in the Water Quality Monitoring Program section of this report.

In addition, based on the available information, it appears that further quantification of surface-water and ground-water interactions in the vicinity of the well field is warranted to more accurately assess ground-water vulnerability. It is recommended that the Village initiate an investigation to evaluate surface-water/ground-water interactions. The Village should seek the expertise of a ground-water specialist (either as a paid consultant or volunteer from the community and/or local Universities) capable of conducting surface-water/ground-water evaluations. After determining the degree of interconnection, the Village should re-evaluate the delineation of the one and five year time-of-travel zones and the capture zone. In addition, the proposed management approach for the surface to ground water potential source area should be re-evaluated. Sources of potential surface water pollution may need to be expanded if surface water contributions to the wellfield are significant. This would include an assessment of the Village of Yellow Springs Wastewater Treatment Plant that discharges upstream of the well field. The schedule of implementation for this strategy is provided in Table 16.

Source Control Strategies for Future Potential Pollution Sources

Source strategies for future potential pollution sources will focus on a combination of both regulatory and non-regulatory techniques to protect and manage the

Table 16. Strategies for Surface Waters

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Educate local emergency response crews regarding the location and sensitive nature of the WHPA.	Prepare educational materials and meet with local township emergency response personnel.	March 2002		Local Emergency Planning Committee for Greene/Montgomery County Miami Valley Emergency Management Authority, Ernie Kovar, 937-854-4822
Participate in local watershed protection activities.	Actively participate in Upper Little Miami Watershed Improvement Group (ULMWIG) meetings. Explore more active attendance in Little Miami River Partnership and Little Miami, Inc.	March 2002		ULMWIG, Facilitator, Sarah Hippensteel (513) 695-1187 Little Miami River Partnership, Watershed Coordinator, Sarah Hippensteel (513) 695-1187
Monitor surface water quality in the Little Miami River and the drainage receiving discharge from the MBC settling ponds.	Implement water-quality monitoring program developed for the WHP Management Plant.	April 2002		OEPA Div. of Emergency and Remedial Response OEPA Office of Public Water Supply Greene Cnty. Combined Health Dist.
Further quantify the surface-water/ground-water interactions at the well field.	Obtain the services of a specialist (either as a paid consultant or volunteer from the community and/or local Universities) capable of evaluating surface-water/ground-water interactions.	September 2002		
Re-evaluate the 1 and 5 year Time-of-Travel and the Capture Zone to reflect surface water/ground-water interactions.	Obtain the services of a specialist (either as a paid consultant or volunteer from the community and/or local Universities) capable of evaluating surface-water/ground-water interactions.	April 2003		
Re-evaluate management strategies for surface water/ground-water interactions.	Review and update strategies as needed.	July 2003		
Re-evaluate the 1 and 5 year Time of Travel and the Capture Zone to reflect changes in water use/pumping and land use.	Obtain the services of a specialist to update the delineation of defined areas.	Minimum every Five Years		
	Review and update potential pollution source inventory; update management strategies as needed.	Minimum Every Five Years		
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Annually after initial development		

ground-water resources. Regulatory techniques will emphasize performance zoning/ standards and non-regulatory techniques will include conservation easements and land purchases.

Zoning

All three townships, Xenia, Miami, and Cedarville, have adopted zoning regulations to protect the quality of life within the townships. While the purpose of the regulations may be different, the intent of the zoning regulations is nonetheless to protect valuable resources such as land or aesthetics through standards designed to promote these objectives. As such, it seems obvious that protection of water resources for both the existing landowners (mostly served by private wells) and the Village of Yellow Springs is a desirable goal and a natural outgrowth for zoning regulation.

Currently 80 percent of the land within the WHPA is zoned as agricultural. However, the land uses and conditional land uses in the agricultural designation vary from township to township. Agricultural districts also include conditional uses not intuitively obvious from the word "agricultural". For example, Miami Township includes the following conditional uses under agricultural districts: commercial mines and gravel pits; landfills for disposal of garbage by the county, municipality or township; commercial feedlots; and disposal of sewage solids or liquids. Cedarville Township allows: mineral extraction and private sanitary landfills. Similarly, Xenia Township also allows disposal of garbage or refuse by a county, township, or a municipal corporation. Density of housing also varies within the agricultural districts. For example, agricultural districts in Xenia Township allow single family dwellings with on-lot sewage systems when gross densities do not exceed one dwelling unit per three acres with a minimum lot area of one acre; Cedarville requires minimum two acre parcels; Miami Township requires minimum three acre lot sizes. The zoning codes for Miami, Xenia and Cedarville Townships area provided in Appendices O through Q, respectively.

From the above discussion, it is clear that even within the current zoning, there are some future land uses that are not desirable within a wellhead protection area. Moreover, changes in practices in existing land uses, for example, by future owners or operators of existing facilities, may also pose potential pollution risks. The same potential problems can be anticipated as zoning changes are contemplated and densities of land usage increase. The following approaches will be pursued with each Township in order to protect the valuable water resources long-term.

Overlay Zoning

The primary objective of overlay zoning is to impose reasonable restrictions and reporting requirements on land uses within the wellhead protection area. The purpose of overlay zoning is not to be onerous, but rather to recognize that protection of the water resources benefits all citizens, including the landowners. Overlay zoning is a frequently-used mechanism in wellhead protection areas to encourage land uses that are compatible with water resource protection. In Ohio, there are several communities that have adopted overlay zoning as part of a wellhead protection management strategy.

While the specifics of the zoning ordinances differ from jurisdiction to jurisdiction, several common themes are typical among the zoning ordinances. Typical provisions found in zoning ordinances for wellhead protection include:

1) Prohibited activities. These provisions typically include one or all of the following types of activities: hazardous waste landfills; sanitary landfills; construction and demolition debris landfills; salvage yards; junkyards; storage of road salt; animal feed lots; outside storage of herbicides, pesticides, fertilizers, or fungicides; dry cleaning and commercial laundry establishments; industrial uses which discharge processed waters onsite; chemical and bacteriological laboratories; metal polishing, finishing, and plating establishments; commercial wood finishing, preserving, painting, and furniture stripping establishments; commercial printing, photocopying and photographic processing establishments; trucking and bus terminals; leather

tanning and finishing; electrical component manufacturing or assembly; new installation of underground storage tanks of liquid petroleum and/or chemical products of any kind; storage of petroleum and/or any other regulated substances in underground storage tanks; any use that involves, as a principle activity, the manufacture, storage, use, transportation, or disposal of toxic or hazardous material; dry wells; septage and sludge spraying without prior approval; battery reclamation or manufacturing; manufacturing of paints, varnishes, lacquers, and enamels; commercial establishments for motor vehicle repair/service shops and/or body repair; lawn, garden, pesticide, and agricultural services with on-site bulk mixing or blending of fertilizers, pesticides, and other industry-related chemicals for commercial application; use of liquid petroleum products for dust suppression; permanent storage of regulated substances in trucks, trailers, or rail cars; and temporary storage of regulated substances in trucks, trailers, or rail cars not meeting current U.S. Department of Transportation standards for the transportation of regulated substances.

2) Provisions for Conditional Use. Where prohibitions are adopted, existing non-conforming uses are allowed under certain circumstances. For example, the ordinance may require reporting of types and volumes of regulated substances for non-conforming uses. The ordinance may decree that if a non-conforming use ceases for a specified period of time (for example six months or a year) that the non-conforming use loses its non-conforming zoning exception.

3) Limits on the Amount of Regulated Substances. The ordinances define regulated substances in different terms, but typically limit the amount of regulated substances that can be handled or generated at a site. An example of such limits are:
    a) the aggregate of regulated substances in use may not exceed twenty (20) gallons or one hundred and sixty (160) pounds at any one time,

b) the total use of regulated substances may not exceed fifty (50) gallons or four hundred (400) pounds during any period of twelve (12) consecutive months.

If these thresholds are exceeded by conforming usages, then reporting requirements and/or inspection requirements on a regular frequency are generally used.

4) List of Allowable Land Uses. In addition to prohibitions, zoning ordinances may also list allowable land uses. The ideal land uses are low density, low intensity and non-handling/generation of toxic and/or hazardous wastes. Examples of allowable uses contained within adopted ordinances include: all ordinary and customary uses associated with maintenance and upkeep of buildings and grounds; necessary public utilities and/or facilities designed so as to prevent contamination of ground water; agricultural uses: pasture, light grazing, hay making, gardening, nursery, and any activities designed for conservation of soil, water, plants and wild life; uses which do not handle hazardous or toxic wastes or substances; and residential uses.

5) Requirements for Use of Best Management Practices. Where routine agricultural operations are performed, ordinances typically require that best management practices as indicated by the Ohio State University Cooperative Extension Service, the Soil and Water Conservation District, and label directions approved by the United States Environmental Protection Agency or Department of Agriculture be used. These best management practices generally apply to: the application of agricultural chemicals; fertilizers; mineral acids; organic sulphur compounds, etc.; and include plant nutrients and crop protection materials as well.

6) Protection Requirements for Storage Tanks. If storage tanks are allowed or existing, both above and underground storage tanks may be addressed in ordinances. Requirements for secondary containment and spill response plans

are common for above ground storage tanks. Requirements for leak testing, structural integrity testing and leak detection can be applied to underground storage tanks. The ordinance can combine both design and performance standards to minimize the possibility of a release.

7) Enforcement Section. Enforcement sections identify the individual or entity responsible for enforcement. Penalties and enforcement mechanisms are included as well as a severability clause.

The Village will work with the Township Zoning Commissions and the Township Trustees to incorporate and enact a Wellhead Protection Overlay District into each zoning code. As a minimum, the Wellhead Protection Overlay District should include:

1) Limits on the volume of regulated substances used and stored;
2) Reporting requirements for usage of regulated substances;
3) Restrictions and/or prohibitions on undesirable land uses;
4) Provisions for conditional use where existing land uses are present;
5) Requirements for the use of best management practices in agricultural practices;
6) Protection requirements for above and below ground storage tanks; and
7) Establishment of an enforcement section.

Recognizing that each ordinance needs to be tailored to existing land uses as well as desirable future uses, there are many models that can be referenced for specific ideas. Appendix R contains several ordinances for wellhead protection purposes that were provided by the Ohio EPA as examples of existing ordinances. As another starting point for overlay zoning, the Village and Townships may wish to use the draft wellfield protection overlay that was prepared August 10, 1994 by Xenia Township and is here included as Appendix R. This resolution was never adopted, but contains many elements of the wellhead protection zoning overlay contemplated by this plan. As envisioned, the zoning resolutions may be different for each township, but the goal should be resource

protection. If overlay zoning is not desirable at this time, the option for overly zoning will be re-visited every two years or as development pressures arise. The schedule for implementation of this strategy is provided in Table 17.

Performance Zoning

The primary objective of performance zoning is to provide protection for ground-water quality that is not explicitly safeguarded under existing land-use regulations. In this approach, a performance standard is established that prohibits the degradation of surface-water and ground-water quality within the WHPA. Under this approach, land uses are not restricted, but the land user must demonstrate that the proposed land use will not adversely degrade surface-water and ground-water quality within the WHPA. In Ohio, this approach is best used by municipalities. Similar restrictions can be imposed by Townships using performance standards as part of conditional use permits (see next section on performance standards).

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Performance zoning evaluates prospective developments based on their projected impact on the area. In contrast to the blanket siting restrictions established under traditional zoning regulations, performance zoning evaluates new developments based on their potential adverse influence on surface-water and ground-water quality within the WHPA. In this approach, developers are not told how to develop the land, only that their final design must meet the established performance standards. The developer is responsible for minimizing harmful impacts in the design, as opposed to the local government. If the design fails to meet the established performance standards, the project can be either conditionally approved, postponed pending revision, or rejected outright.

One example of how performance standards can be used is the case where new underground storage tanks are proposed to be installed. If a general performance standard for non-degradation of ground water is adopted, the developer will need to demonstrate that the underground tanks will not degrade ground water. The developer can propose whatever methods will accomplish this objective. In this situation, the developer might propose double lined tanks with leak detection to meet the performance

Table 17. Strategies for Zoning Options for Future Land Uses to Minimize Potential Pollution Sources

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Pursue development and adoption of Overlay Zoning for WHPA with each Township.	Hold initial meetings with Township Zoning Commission(s) to discuss ideas; similar meeting with Township Trustees.	March 2002		
	Develop subcommittee to develop draft Overlay Zoning (either joint with all Townships or separately).	May 2002 or as appropriate		
	Work for adoption of Overly Zoning.	May 2003 or as appropriate		
Pursue development and adoption of Performance Zoning.	Hold initial Council meetings to discuss ideas after potential pollution sources within remaining area of capture zone delineated.	January 2003		
	Develop subcommittee to develop draft Performance Zoning Standards.	March 2003 or as appropriate		
	Work for adoption of Performance Zoning.	March 2003 or as appropriate		

Table 17 (continued). Strategies for Zoning Options for Future Land Uses to Minimize Potential Pollution Sources

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Pursue incorporation and/or enforcement of performance standards into existing conditional use standards of the zoning resolution in each Township.	Hold initial meetings with Township Zoning Commission(s)and Board(s) of Zoning Appeals to discuss ideas.	March 2002		
	Develop subcommittee to review existing zoning resolution standards.	May 2002 or as appropriate		
	Formulate recommendations, if appropriate, for zoning resolution amendments.	September 2002 or as appropriate		
	Work for enforcement/adoption of supportive zoning resolutions.	May 2003 or as appropriate		
Review options of Overly Zoning and/or Performance Zoning/Standards in Township(s) and/or Village where no such zoning/standard are enacted.	Approach Zoning Commissions, Board of Zoning Appeals, and/or Trustees in Township(s) where additional measures are needed for WHP.	Every 2 years after initial meetings or non-actions or as development pressures arise		
	Hold council meeting to discuss additional measures needed in remaining capture zone area.			
Evaluate the success of strategy implementation	Review and update strategies as needed	Bi-annually		

standard. The decision as to whether or not this "preventive measure" meets the performance standard is made under the zoning regulations.

The primary advantage of performance zoning is that it provides for greater flexibility than traditional zoning measures because the land can be put to a wider range of uses as long as the specific performance standards are met. In addition, this approach distributes the cost of protecting the ground-water resources among the parties that may directly impact them. The disadvantage to this approach is that the effective enforcement of performance standards requires informed and educated individuals. When this standard is implemented, education and/or outside assistance may be necessary in order to reach informed approvals and/or denials.

This zoning may be enacted separately or concurrently with Overlay Zoning, although the two approaches may be used concurrently for the most flexible protection. This option can best be used by the Village to protect areas within municipal boundaries once potential pollution sources have been identified through the inventory process. If performance zoning is not desirable at that time, the option for performance zoning will be revisited, if appropriate, every two years. The schedule for implementation of this strategy is provided in Table 17.

Performance Standards

The primary objective of performance standards is to provide surface and ground-water quality protection in the WHPA. Performance standards are similar to performance zoning, but differ in the application. Performance standards are established as part of conditional use permits within the existing zoning resolutions. This may require that the zoning resolution be amended to incorporate provisions to achieve this objective, if they are not already in place. In situations, where broad powers are already included in the zoning resolution, a reference to the WHPA and strict enforcement may be all that is necessary. For example, Miami Township Zoning Resolution in Section 18.4442(*i*) states that the Board of Zoning appeals in determining the appropriateness of the conditional

use can grant the permit only if the use "will not result in water pollution. In making this determination, they shall consider: the amount of rainfall received by the area, the relation of the land to flood plains, the nature of soils and subsoils and their ability to adequately sue (sic) disposal; the slope of the land and its effect on effluents; the presence of streams as related to effluent disposal; the applicable health and water resources department regulations." The Board has several options to ensure water resource protection. First, the applicant may demonstrate to the Board that the proposed use either will not result in pollution or demonstrate that proposed methods to prevent pollution will be adequate to achieve the objective. Alternately, the Board may require a study to demonstrate that the standard will be attained. Further, the Board may impose additional measures deemed appropriate to minimize/prevent impacts of the proposed use. Finally, the Board may refuse to issue a conditional permit if the applicant cannot satisfactorily demonstrate compliance with the intent of the standard.

Each jurisdiction needs to evaluate their existing zoning resolution regarding the ability of the current resolution to adequately address these concerns. If performance standards are implemented, similar to performance zoning, education and/or outside assistance may be necessary to reach informed approvals, impose appropriate conditions or issue informed denials.

The Village will work with the Zoning Commissions, Boards of Zoning Appeals and the Township Trustees to amend, incorporate, and/or enact performance standards, if applicable. These may be enacted either separately or concurrently with Overlay Zoning, although use of the two approaches together will offer the best and most flexible protection. The goal will be to adopt a broad-based performance standard of prohibition of degradation of surface and/or ground water within the WHPA. If performance standards are not desirable at this time in one or more of the Townships, the option for performance will be revisited, if appropriate, every two years or as development pressures arise. The schedule for implementation of this strategy is provided in Table 17.

Ordinance

One alternative to working with Townships to effect overlay zoning, performance zoning, and/or performance standards may be the adoption of an ordinance by the Village of Yellow Springs directly that affects activities within the wellhead protection area. Subsection 3750.11 (G) of the Ohio Revised Code states:

> " A political subdivision that owns, operates, or is served by a public water system as defined in section 6109.01 of the Revised Code may establish and enforce requirements that provide for the protection of ground water resources that serve as a source of drinking water for its public water system and that are located within scientifically derived wellhead protection areas".

This statute appears to provide broad jurisdiction to a public water system and may be applicable to areas outside the municipal boundaries of the Village. The City of Springfield has quoted this statue as the authority for the ordinance included in Appendix W. A complete copy of Subsection 3750.11 is also included for reference in Appendix W. The Village should consider legally researching this option for wellhead protection, particularly if Townships are not agreeable to adopting zoning measures for wellhead protection. The schedule for implementation of this strategy is included in Table 18.

Cooperative Economic Development Agreements (CEDA)

The Ohio General Assembly passed legislation (ORC Section 701.07) to allow for the creation of cooperative economic development agreements (CEDAs) for "facilitating economic development to create or preserve jobs and employment opportunities and to improve the economic welfare of the people in the area of the contracting parties." CEDA districts are ways for municipalities and townships to come to an agreement on how areas can grow in a mutually beneficial way. By working jointly on issues and sharing revenues, communities can concentrate on important issues such as protecting and enhancing school districts, providing adequate water and sewer services, improving emergency services and working toward regional planning.

Table 18. Strategies for Alternative Protection of Land from Undesirable Future Land Uses

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Pursue viability of Village adoption of direct ordinance for wellhead protection area.	Hold initial discussions regarding desirability of adopting ordinance directly.	March 2002		
	If determined to be desirable, seek legal opinion for determination of option viability.	June 2002		
	If viable option, form subcommittee to prepare draft ordinance.	To Be Determined		
	Adopt and implement ordinance.	To Be Determined		
Pursue option of establishment of CEDA District.	Hold initial meetings with Township Trustees in each Township to determine necessity, viability and timing.	June 2002		
	If appropriate, form subcommittee to prepare draft District.	To Be Determined		
	Adopt and implement CEDA District.	To Be Determined		
	Review option for CEDA District, where appropriate.	Every two years or as development pressures arise		

Table 18 (continued). Strategies for Alternative Protection of Land from Undesirable Future Land Uses

Strategies	Tasks	Date to be Completed	Yellow Springs Wellhead Protection Committee Member(s)	Additional Resources
Pursue option of establishing conservation easements on one or more parcels of land.	Establish network with organizations, universities and/or foundations to ascertain options.	April 2002		
	If appropriate, identify potential landowners.	To Be Determined		
	Identify potential funding options and secure option.	To Be Determined		
	Review option for conservations easements.	Every two years or as development pressures arise		
Pursue land purchase option for selected parcels.	Establish fund for wellhead protection that can also be used to purchase land.	December 2002		
	Explore available land options.	June 2002		
	Secure land for Village use compatible with Wellhead Protection goals.	To Be Determined		
	Review option for land purchase as availability arises.	Every two years or as development pressures arise		
Evaluation the success of strategy implementation.	Review and update strategies as needed.	Bi-annually		

With regard to wellhead protection, CEDAs represent a mutually beneficial, positive approach to growth that preserves the economic welfare of the community while protecting the ground-water resources. One example of a recently-adopted CEDA agreement between a Village and Township is included as Appendix S. Although many of these provisions are not applicable for direct incorporation for purposes of this plan, the agreement is one example of how this vehicle can be used.

The Village will work with the Townships to explore whether or not establishment of a CEDA District is a viable way to minimize undesirable land usage within the WHPA. If such a district is not desirable or necessary at this time, the option for establishing such a district in the future will be re-visited every two years or as development pressures arise. The schedule for implementation of this strategy is provided in Table 18.

Conservation Easements

Conservation easements can effectively protect land from development by restricting all or a portion of the property to open space or limited development uses. In granting a conservation easement, the property owner gives up certain development rights of the property. Conservation easements may restrict that parcel to only specified types of developments or densities, or specify that parcels within the WHPA remain undeveloped into perpetuity.

The Village will network with organizations, universities and/or foundations to ascertain the interest, viability, and potential funding sources for conservation easements. Although priority will be given to land not already protected within the one-year TOT capture zone, land within the five-year TOT capture zone will also be considered. The Village will encourage conservation easements that further wellhead protection efforts. The Village will consider the option of establishing an easement on the well field

property currently owned by the Village. If enacted, this easement could serve as a model for other surrounding owners.

If appropriate and affordable, the Village may purchase and/or hold conservation easements. The Village maintains a Green Belt Fund and an Open Space Program that can be used, among other things, to acquire conservation easements on lands necessary for the protection of water quality. Funding is presently provided through partial dedication of estate tax revenues and lease payments on Village-owned farmland and a cell tower site. The Village actively cooperates with Tecumseh Land Trust to identify and acquire easements, held by Tecumseh Land Trust, on land in the Village green belt. The Village should continue to build the fund and consider establishing a policy temporarily prioritizing the acquisition of easements and/or lands in the wellhead protection area. Other sources of revenue should also be explored. If no potential land or sufficient funding sources can be identified at this time, the issue will be explored again in two years or as the opportunity arises. It is desirable to implement this strategy while the land is still relatively rural and undeveloped. The schedule for implementation of this strategy is provided in Table 18.

Land Purchases

The Village may consider purchasing land within or adjacent to the WHPA to secure it from potential future adverse development. Although this is the most protective strategy, purchasing all land within the WHPA is neither cost effective nor practical. However, it may be desirable to purchase select parcels of land. In order to be able to pursue this strategy as an option, the Village will consider the establishment of a fund for land acquisition. The Village will consider the use of the Green Belt Fund and Open Space Program as a source of funding for the purpose of placing conservation easements on the property. After an easement has been secured, the Village may then re-sell the land, recapturing some of the purchase price, which can then be returned to the Breen Belt Fund to support future acquisitions. The Village will also review options for external grants and loans for wellhead protection.

If land purchase appears a viable option, the Village will work with appropriate landowners to develop a purchase strategy that meets the needs of the landowner as well as the Village. Land purchase options include:

1. Property purchases at fair market value;
2. Property purchases below fair market value with the reduced price potentially qualifying as a charitable deduction from income taxes;
3. Purchases made through installments to allow the seller to spread the income from the sale over a several year period, thus deferring and/or reducing income taxes; and
4. Property purchase with a reserved life estate, where the land is sold now but is not transferred until the death of the individual landowner.

The Village will revisit the potential for land acquisition on a two-year cycle or as parcels potentially become available. The schedule for implementation of this strategy is provided in Table 18.

SECTION V
WATER QUALITY MONITORING PROGRAM

Introduction

A water quality monitoring plan is a key element of an effective wellhead protection program. A water-quality monitoring program relies on a series of monitoring points designed as an early warning system for the detection of impending contamination to the well field. A system is designed considering local ground-water flow patterns, hydrogeologic conditions, time-of-travel zones, and identified potential pollution sources. The monitoring network should then be sampled at a frequency that will allow for an adequate response time to implement contingency plans for alternate water supplies or development of remedial action plans in the event contamination is detected.

The water quality monitoring network will provide water quality data that can be used to identify future trends in ground-water quality as a result of current land uses and land coverages. A key component of the water quality monitoring program includes the proper selection and placement of sampling points, the designation of an acceptable sampling frequency, and the sampling for an appropriate list of indicator analytical parameters. Additionally, the ground-water portion of the network will provide accurate and consistent ground-water level data (hydraulic head measurements) that can be used in future well field hydrogeologic investigations and refinements to protection area delineation.

Current Village Ground-Water Monitoring Program

The Village of Yellow Springs maintains three monitoring wells within the well field (YSMW-1 through YSMW-3). Monitoring well locations are shown in Figure 5. Historically, these wells have been sampled since January 1991 for the volatile organic compounds, 1,1-dichloroethane, 1,1,1-trichloroethane and dichloroethane. Monitoring well boring logs and construction diagrams are provided in Appendix T. In addition, the Village samples the raw water from each production well for volatile organic compounds (VOCs) in conjunction with the monitoring well sampling events. Finally, the OEPA

Division of Drinking and Ground Waters samples production well YS-2R as part of the Ambient Ground-Water Monitoring Network. As part of this program, YS-2R is sampled semiannually for VOCs and the parameters listed in Table 19.

Proposed Monitoring Network

Traditionally, only ground-water monitoring wells are used to establish an early warning network for detection of migrating contaminants. However, the hydrogeologic setting of the Yellow Springs well field is a buried valley aquifer system wherein the water for the well field is derived from three sources: 1) direct infiltration of precipitation into the sand and gravels of the buried valley aquifer and movement to the wellfield; 2) induced flow from the Little Miami River into the buried valley aquifer (either as a result of wellfield pumping or due to natural gradients); and 3) infiltration into the bedrock and discharge to the Valley either through springs at the surface (where the water infiltrates or flows to the river) or directly to the buried valley aquifer underground. It is one of these springs (on State Route 343 in the Glen) from which Yellow Springs takes its name. In this hydrogeologic setting, a water quality monitoring program needs to consist not only of ground-water monitoring wells, but also springs and surface water because water, and hence contaminants, can reach the well field from all sources.

The proposed monitoring network for the Village of Yellow Springs well field consists of four monitoring wells, three springs, and two surface water locations. Although the proposed network recommends four monitoring wells, the plan utilizes only one of the existing monitoring wells and replaces the two other existing wells with alternate locations. These replacement ground-water monitoring points will provide information on existing water-quality and provide data to monitor future trends resulting from land use/land cover changes. The purpose of utilizing each existing or proposed monitoring location is discussed below. The water quality monitoring program and subsequent need to either add or remove monitoring points from the network will be evaluated as water-quality changes dictate.

Table 19. Yellow Springs Production Well YS-2R – OEPA Ambient Monitoring Parameters.

Total Dissolved Solids
Total Organic Carbon
Aluminum
Barium
Calcium
Chromium
Copper
Hardness, Total
Iron
Magnesium
Manganese
Nickel
Potassium
Sodium
Strontium
Zinc
Arsenic
Cadmium
Lead
Selenium
Alkalinity
Chemical Oxygen Demand
Chloride
Fluoride
Ammonia
Nitrate-Nitrite
Sulfate
Total Kjeldahl Nitrogen
Total Phosphorus

Monitoring Wells

The proposed monitoring well network will consist of existing monitoring well YSMW-1 and three additional monitoring wells, YSMW-4, YSMW-5, and YSMW-6. Existing monitoring wells YSMW-2 and YSMW-3 are too close to the existing production wells to provide advanced warning of contamination and therefore will be dropped from the ground-water sampling program. Although YSMW-1 is also too close to the production wells to provide advanced warning, it is the furthest upgradient of the existing monitoring wells and has a history of VOC detections. Consequently it is recommended the Village continue to sample YSMW-1 to monitor VOC concentration trends in this well. Although YSMW-2 and YSMW-3 will be dropped from the ground-water quality monitoring network, it is recommended that the Village maintain these observation points for ground-water level monitoring purposes.

It is recommended that the Village of Yellow Springs install three additional monitoring wells (YSMW-4, YSMW-5 and YSMW-6) in the buried valley aquifer upgradient from the well field. The proposed monitoring well locations are shown on Figure 5. The specific location of each well may need to be modified based on site access. Monitoring well YSMW-4 will be installed within the buried valley aquifer just beyond the one-year time-of-travel capture zone for the purposes of monitoring potential influence of MBC and agricultural non-point sources from the adjacent uplands. Monitoring well YSMW-5 will be installed in the vicinity of the discharge of the intermittent stream for the purpose of monitoring the Vale residential area, the potential influence of MBC and other upland sources. Because the stream does not discharge to the Little Miami River directly, all stream discharge is expected in infiltrate into the buried valley aquifer. Monitoring well YSMW-6 will be installed within the buried valley aquifer just inside the five-year time-of-travel capture zone to monitor ground-water migrating laterally down the valley. All three wells will be screened within the shallow sand and gravel outwash formation. Although actual site conditions will dictate final design, it is anticipated, based on the available information, that the wells will be between 30 and 50 feet deep and completed with 10 to 20 feet of screen. As potential

pollution source areas in the well field capture zone are further understood, additional sentinel monitoring wells may need to be installed.

In addition to the proposed ground-water monitoring network, the quarterly ground-water quality data reported for the MBC monitoring and recovery wells will be evaluated in conjunction with the Village's monitoring program to monitor the status of the current VOC contaminant plume.

Springs

Surface springs along the valley margins in the vicinity of the well field will be sampled to evaluate ground-water quality in the carbonate aquifer from beneath the adjacent uplands. Two notable sets of springs along the northwestern valley margin include the Glen Springs (GS-1, GS-2 and GS-3) and the Vale Springs (VS-1, VS-2 and VS-3) (Figure 5). These springs are currently sampled semiannually (spring and fall) by MBC for VOCs on a voluntary basis. Glen Spring GS-1 and Vale Spring VS-2 will be incorporated into the ground-water quality monitoring program for the Village of Yellow Springs Well Field. GS-1 was selected because it seldom dries up and it historically has the largest reported VOC concentrations of the Glen Springs. In addition to MBC, GS-1 will monitor the potential influence from agricultural non-point sources in the adjacent uplands. Vale Spring VS-2 was selected because of its proximity to MBC and the Vale residential source area. If either of these springs are dry, then an alternate spring in the vicinity should be sampled.

In addition to GS-1 and VS-2, it is anticipated that springs are along the valley wall across the Little Miami River from the well field. Springs in the interval marked on Figure 5 should be inventoried and the one with the highest flow included in the sampling network. If no springs are found, another ground-water monitoring well should be installed into the shallow sand and gravel aquifer at the proposed spring location on Figure 5. The spring (or well) along the southeastern valley margin will monitor ground-water quality from potential source areas (mainly agricultural) on the adjacent uplands.

Surface Water

Surface water quality in the well field vicinity will be monitored in the Little Miami River (SW-1) and the unnamed drainage that receives the permitted discharge from MBC (SW-2). Sampling locations are shown on Figure 5. Water quality data from the Little Miami River will be used to assess the general quality of surface waters as influenced by agricultural runoff, urban runoff and wastewater treatment plant discharges that potentially may influence ground-water quality at the well field through induced infiltration. For this purpose, the sampling station is proximal to the well field (downstream of Yellow Springs Creek) where the potential for induced infiltration is greatest. Station SW-2 will be monitored to assess the quality of surface water from the adjacent uplands and MBC.

Sampling Parameters and Frequency

Although there are no specific standards for raw water quality, established drinking water standards may be used to measure relative ground-water quality for well field protection monitoring programs. In general, drinking water quality is measured against the Primary and Secondary standards established by the U.S. EPA under the Safe Drinking Water Act (SDWA) of 1974. The Ohio EPA further revised these standards, or Maximum Contaminant Levels (MCLs), to serve as the basis for water-supply regulations and compliance within the State. A list of the Ohio primary and secondary drinking water standards is presented in Table 20. For wellhead protection monitoring purposes, the categories of inorganics/metals, volatile organic chemicals, and semi-volatile organic chemicals are of prime interest. These, in addition to other useful monitoring parameters, will be discussed in greater detail in the following sections.

Monitoring Frequency and Analytical Parameters

It is recommended that initial sampling of the monitoring network include a comprehensive analysis for Groups 1 through 5 of the major analyte groups outlined in Table 21, including general ions, inorganics/metals, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs). This first round of sampling will help establish general ambient ground-water quality as well as to identify any specific

TABLE 20
OHIO'S PRIMARY AND SECONDARY DRINKING WATER STANDARDS (2000)*

(MCLs in mg/L unless otherwise noted)

PRIMARY STANDARDS

REGULATED VOLATILE ORGANIC CHEMICALS (VOCS)

Chemical Name	MCL
Benzene	0.005
Carbon tetrachloride	0.005
o-Dichlorobenzene	0.6
p-Dichlorobenzene	0.075
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007
cis-1,2-Dichloroethylene	0.07
trans-1,2-Dichloroethylene	0.1
Dichloromethane	0.005
1,2-Dichloropropane	0.005
Ethylbenzene	0.7
Monochlorobenzene	0.1
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1
1,1,1-Trichloroethane	0.2
1,1,2-Trichloroethane	0.005
Trichloroethylene	0.005
1,2,4-Trichlorobenzene	0.07
Trihalomethanes (total)	0.1-a
Vinyl chloride	0.002
Xylenes (total)	10

OTHER UNREGULATED VOCS FOR WHICH MONITORING IS REQUIRED

Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Chlorodibromomethane
Chloroethane
Echloroform
Chloromethane
o-Chlorotoluene
p-Chlorotoluene
Dibromomethane
m-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,3-Dichloropropane
2,2-Dichloropropane
1,1-Dichloropropene
1,3-Dichloropropene
Fluorotrichloromethane
Hexachlorobutadiene
Isopropylbenzene
p-Isopropyltoluene
Napthalene
n-Propylbenzene
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachnoroethane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene

REGULATED SEMI-VOLATILE ORGANIC CHEMICALS (SOCS)

Chemical Name	MCL
Alachlor	0.002
Atrazine	0.003
Benzoa-pyrene	0.0002
Carbofuran	0.04
Chlordane	0.002
2,4-D	0.07
Dalapon	0.2
Dibromochloropropane (DBCP)	0.0002
Di(2-ethylhexyl)adipate	0.4
Di(2-ethylhexyl)phthalate	0.006
Dinoseb	0.007
Diquat	0.02
Endothall	0.1
Endrin	0.002
Ethylene dibromide (EDB)	0.00005
Glyphosate	0.07
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Hexachlorobenzene	0.001
Hexachlorocyclopentadiene	0.05
Lindane	0.0002
Methoxychlor	0.04
Oxamyl (Vydate)	0.2
Pentochlorophenol	0.001
Picloram	0.5
Polychlorinated Biphenyls (PCBs)	0.0005
Simazine	0.004
2,3,7,8-TCDD (Dioxin)	0.00000003
Toxaphene	0.003
2,4,5-TP (Silvex)	0.05

OTHER UNREGULATED SOCS FOR WHICH MONITORING IS REQUIRED

Aldicarb
Aldicarb sulfone
Aldicarb sulfoxide
Aldrin
Butachlor
Carbaryl
Dicamba
Dieldrin
3-Hydroxycarbofuran
Methomyl
Metolachlor
Metribuzin
Propachlor

INORGANICS/METALS

Chemical Name	MCL
Antimony	0.006
Arsenic	0.05
Asbestos	7 mil fibers/L
Barium	2
Berylium	0.004
Cadmium	0.005
Chromium	0.1
Copper	-b
Cyanide	0.2
Lead	-b
Mercury	0.002
Nickel	0.1
Nitrate (as N)	10
Nitrite (as N)	1
Selenium	0.05
Thallium	0.002

MICROBIOLOGICAL

Bacteria	4 per 100 mL
Coliform	1 per 100 mL

PHYSICAL

Turbidity	1 TU (monthly ave.) 5 TU av. of 2 consec. days

RADIONUCLIDES

Gross Alpha	15 pCi/L
Man-made beta	5 pCi/L
Radium 226 and 228	5 pCi/L

SECONDARY STANDARDS

Aluminum	0.05-0.2
Chloride	250
Color	15 color units
Corrosivity	non-corrosive
Fluoride	2
Foaming Agents	0.5
Iron	0.3
Manganese	0.05
Odor	3 threshold odor number
pH	7-10.5
Silver	0.1
Sulfate	250
Total Dissolved Solids (TDS)	500
Zinc	5

NOTES
* = From Ohio Administrative Code, 3745-81 and 3745-82.
mg/L = Milligram per liter (equivalent to parts per million-ppm).
MCL = Maximum Contaminant Level
a = Includes bromodichloromethane, dibromochloromethane, bromoform and chloroform.
b = Treatment based standard.

Table 21. Proposed Ground-Water Monitoring Analytical Groups

Group 1 Routine Field Parameters	Group 2 Metals	Group 3 General Ions	Group 4 VOCs	Group 5 SVOCs
Water Levels	Antimony	Alkalinity	volatile organic compounds	semi-volatile organic compounds
Temperature (field)	Arsenic	Ammonia		
pH (field)	Asbestos	Calcium		
Specific Conductance (field)	Barium	Chloride	(see Table 22)	(see Table 23)
Turbidity (field)	Berylium	Fluoride		
	Cadmium	Iron		
	Chromium	Magnesium		
	Copper	Manganese		
	Cyanide (total)	Nitrate		
	Lead	Nitrite		
	Mercury	Ammonia		
	Nickel	Total Phosporus		
	Selenium	Potassium		
	Silver	Sodium		
	Thallium	Sulfate		
	Zinc			
		Total Organic Carbon (TOC)		
		Total Dissolved Solids (TDS)		

anomalies resulting from natural or manmade factors. Following the first round of monitoring well sampling, and assuming that no problematic contaminants have been detected, it should be possible to develop a monitoring strategy to evaluate local ground-water quality utilizing a much-reduced list of analytes. If contaminants are detected, the Village will consider further investigations to identify the sources of contamination.

A) Group 1 – Routine Field Parameters

Various physical and chemical parameters can be used as general indicators of ground-water quality. General ground-water quality indicators such as temperature, pH, specific conductance, and turbidity should be routinely collected at each monitoring well during each sampling event.

B) Group 2 - Metals

Metal contamination of ground water is commonly linked with improper material handling and waste disposal practices associated with industrial and commercial land uses. Ground-water analysis should include sampling for metals for which Maximum Contaminant Levels (MCLs) have been established. After initial screenings, the list of metals can be shortened to only those anticipated at particular monitoring sites.

C) Group 3 - General Ions

Data regarding the concentrations of major and minor ions are valuable in characterizing ambient ground-water quality. Such chemical data can be useful in the determination of ground-water flow sources (e.g., bedrock or alluvium), in detecting possible existing contamination problems, and in identifying anomalous ground-water quality trends. Chloride and nitrate analyses are useful in revealing agricultural non-point sources and sewage-related sources. In some cases, total organic carbon (TOC) is useful in screening for the presence of organics and ground-water degradation from various industrial, residential, and

chlorinated/brominated compounds in pesticides, herbicides, solvents and fuels.

D) Group 4 - Volatile Organic Compounds (VOCs)

This category includes thousands of man-made and naturally occurring compounds that are most often associated with industrial and commercial activities, as well as home uses. These include a variety of fuels, solvents, degreasers, thinners, paints, etc. Many of these substances contain volatile organic compounds that have associated human health risks and are extremely mobile and persistent in ground water. Currently, Ohio's public drinking water regulations require analysis for 54 of the most common of these chemical compounds (Table 22).

E) Group 5 – Semi Volatile Organic Compounds (SVOCs)

Most of the semi-volatile organic chemicals (SVOCs) of concern in the well field protection area are pesticides and herbicides (Table 23). In the vicinity of the well fields, pesticide and herbicide use is primarily associated with agricultural (local and upstream croplands). Runoff and infiltration from these areas have potential to transport these chemicals into both surface water and ground-water supplies. Currently, Ohio's drinking water regulations require that public water purveyors monitor finished water for five SVOCs generally consisting of pesticides and herbicides.

Based on current information, only a few of the listed SVOCs may be in use in the well field TOT zones. For early-warning monitoring purposes, it is most practical to monitor for pesticides and herbicides that are known to be used, or have the highest probability of being used, in the areas up-gradient of the well field. Sampling for pesticides and herbicides should be timed to follow periods of increased chemical handling and usage as well as greater rainfall, such as late spring or early summer.

Table 22. Volatile Organic Compounds
(Included from Analytical Group 4 - Table 21)

Chemical Name	CAS Number
Benzene	71-43-2
Bromobenzene	108-86-1
Bromoclоromethane	74-97-5
Bromodiclоromethane	75-27-4
Bromoform	75-25-2
Bromomethane	74-83-9
n-Butlybenzene	104-51-8
sec-Butlybenzene	135-88-8
tert-Butlybenzene	98-06-6
Carbon tetrachloride	56-23-5
Chloroethane	75-00-3
Chloroform	67-66-3
Chloromethane	74-87-3
o-Chlorotoluene	95-49-8
p-Chlorotoluene	106-43-4
Dibromochloromethane	124-48-1
Dibromomethane	74-95-3
m-Dichlorobenzene	541-73-1
o-Dichlorobenzene	95-50-1
p-Dichlorobenzene	106-46-7
Dichlorodifluoromethane	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethylene	75-35-4
cis-1,2-Dichloroethylene	156-59-2
Trans-1,2-Dichloroethylene	156-60-5
Dichloromethane	75-09-2
1,2-Dichloropropane	78-87-5
1,3-Dichloropropane	142-28-9
2,2-Dichloropropane	594-20-7
1,1-Dichloropropene	563-58-6
1,3-Dichloropropene	542-75-6
Ethylbenzene	100-41-4
Fluorotrichloromethane	75-69-4
Hexachlorobutadiene	87-68-3
Isopropylbenzene	98-82-8
p-Isopropyltoluene	99-87-6
Monochlorobenzene	108-90-7
Napthalene	91-20-3
n-Propylbenzene	103-65-1
Styrene	100-42-5
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethylene	127-18-4
Toluene	108-88-3
1,2,3 -Trichlorobenzene	87-61-6
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethylene	79-01-6
1,2,3-Trichloropropane	96-18-4
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Vinyl chloride	75-01-4
Xylenes (total)	1330-20-7

Table 23. Semi-Volatile Organic Compounds.
(Included from Analytical Group 5 - Table 21)

Acenaphthene	Hexachlorobenzene	Aldrin
Acenaphthylene	Hexachlorobutadiene	Alpha-BHC
Acetophenone	Hexachlorocyclopentadiene	Beta-BHC
2-Acetylaminofluorene	Hexachloroethane	Delta-BHC
4-Aminobiphenyl	Hexachloropropene	Gamma-BHC; Lindane
Anthracene	Indeno (1, 2, 3-cd) pyrene	Chlordane
Benzo (a) anthracene	Isodrin	2,4-Dichlorophenoxyacetic acid
Benzo (b) fluoranthene	Isophrorne	4,4'-DDD
Benzo (k) fluoranthene	Isosafrole	4,4'-DDE
Benzo (ghi) perylene	Kepone	Dieldrin
Benzo (a) pyrene	Methapyrilene	Endosulfan I
Benzyl alcohol	3-Methylcholanthrene	Endosulfan II
Bis (2-chloroethoxy) methane	Methyl methanesulfonate	Endosulfan sulfate
Bis (2-chloroethyl) ether	2-Methylnaphthalene	Endrin
2,2'-oxybis (1-Chloropropane)	Methyl parathion	Endrin aldehyde
Bis (2-methylhexyl) phthalate	Naphthalene	Heptachlor
4-Bromophenyl phenyl ether	1, 4-Napthoquinone	Heptachlor epoxide
Butyl benzyl phthalate	1-Naphthylamine	Methoxychlor
p-Chloroaniline	2-Naphthylamine	Polychlorinated biphenyls; PCB's
Chlorobenzilate	o-Nitroaniline	Silvex; 2,4,5-Trichlorophenoxyacetic acid
2-Chloronaphthalene	m-Nitroaniline	Toxaphene
4-Chlorophenyl phenyl ether	p-Nitroaniline	
Chrysene	Nitrobenzene	
Diallate	N-Nitrosodi-n-butylamine	
Dibenzo (a, h) anthracene	N-Nitrosodiethylamine	
Dibenzofuran	N-Nitrosodimethylamine	
Di-n-butyl phthalate	N-Nitrosodiphenylamine	
o-Dichlorobenzene	N-Nitrosodipropylamine	
m-Dichlorobenzene	N-Nitrosomethylethylamine	
p-Dichlorobenzene	N-Nitorsopiperidine	
3, 3'-Dichlorobenzidine	N-Nitorsopyrrolidine	
Diethyl phthalate	5-Nitro-o-toluidine	
Thionazin	parathion	
Dimethoate	Pentachlorobenzene	
p- (Dimethylamino) azobenzene	Pentachloronitrobenzene	
7, 12-Dimethylbenz (a) anthracene	Phenacetin	
3, 3'-Dimethylbenzidine	Phenanthrene	
Dimethyl phthalate	p-Phenylenediamine	
m-Dinitrobenzene	Phorate	
2, 4-Dinitrotoluene	Pronamide	
2, 6-Dinitrotoluene	Pyrene	
Di-n-octyl phthalate	Safrole	
Diphenylamine	1, 2, 4, 5-tetrachlorobenzene	
Disulfoton	0-Toluidine	
Ethyl methanesulfonate	1, 2, 4-Trichlorobenzene	
Famphur	Triethyl phosphorothioate	
Fluoranthene	1, 3, 5-Trinitrobenzene	
Fluorene		

Sampling Schedule

The monitoring network will be sampled for the parameters in Table 21, Groups 1 through 5, on a semiannual basis for the first year to establish a base set of data. The initial sampling round will be conducted in the spring of 2002. After the first year, the sampling frequency and parameter lists can be revised based on the water quality data. However, the monitoring network should be sampled for all the parameters listed in Groups 1 through 5 every two years to evaluate potential water quality changes. The schedule for implementation of this strategy is provided in Table 24.

Table 24. Water Quality Monitoring Network - Analytes and Sampling Frequency

Water Quality Monitoring Points	Approximate Location	Sampled by Village[2] (Y/N)	Sampling Parameters[3]	Sampling Frequency
One existing monitoring well (YSMW-1) [1.]	In well field.	Y	Routine Field Parameters	Spring/Fall 2002 - Complete list of parameters (Long List) ⇩ Shorten Metals, SVOC, VOC lists based on results (Short List) ⇩ Spring/Fall 2003 Spring/Fall 2004 Short List ⇩ Spring 2005 Long List ⇩ Fall 2005 Short List
Three new monitoring wells (YSMW-4, YSMW-5, YSMW-6).	Near one year time of travel. Where intermittent stream discharges and infiltrates. Near five year time of travel.	Y	Metals (for which primary or secondary drinking water standards are established)	
Two existing springs (GS-1, VS-2).	Downgradient of Morris Bean and agricultural areas. Downgradient of Vale residential area.	Y	General Ions	
One spring to be located (US-1) (or alternate additional monitoring well if spring not found).	Across River from wellfield downgradient of agricultural areas.	Y	VOCs[4]	
Two surface water stations (SW-1, SW-2).	Unnamed drainage from Morris Bean. At Little Miami river adjacent to wellfield.	Y	SVOCs[5]	
Morris Bean recovery treatment system effluent.	Discharge from on-site sewage system.	N	Regulated selected VOCs[6]	Monthly
Morris Bean current sampling. Nine monitoring wells. Five recovery wells. Six springs (GS-1, GS-2, GS-3, VS-1, VS-2, VS-3). Inflow to recovery treatment system.	On-site around plant, pond and sandpile. On river side of pond. Downgradient from plant.	N	Regulated and voluntary selected VOCs[6]	Quarterly

1-Two other existing monitoring wells to be retained for water level measurements collected concurrent with other water quality sampling efforts.

2-All sampling not conducted by the Village is conducted by Morris Bean Company (either voluntary or regulatory) and may be changed or discontinued without notice. This data will be reviewed as part of the plan as long as data is available.

3 -More detail in Table 21
4-More detail in Table 22
5-More detail in Table 23
6-More detail in Appendix H

SECTION VI
CONTINGENCY PLAN

The Village has developed an emergency contingency plan ("Water Contingency Plan") in accordance with OAC 3745-85. The purpose of the plan is to ensure that provisions for safe drinking water are in place during emergency conditions. These emergencies may include: short term power failure (less than 2 hours), long-term power failure, pump or motor failure, loss of water from a well, major water main break and unplanned absence of operator. The Water Contingency Plan is incorporated into this Wellhead Protection Plan. A copy of the Water Contingency Plan is included as Appendix U. Contingency planning with respect to the WHP area includes water supply planning to provide short and long term alternatives for water sources (including funding) and emergency spill response.

Short Term Source of Water

Yellow Springs has an elevated water storage capacity of approximately 1.75 million gallons. This is adequate storage for approximately four days at average daily demand. For well field emergencies, this storage will be the first used short-term source of water.

The following steps shall be taken in the event of short-term interruption in service of the Village's public water supply:

- Notify consumers of the emergency through the news media, cable access channel and local organizations. A list of print and electronic news media that service the Yellow Springs area is included in the water treatment plant contingency plan. The Village shall establish a hot line number for consumers to call if the period of interruptions is expected to be more than ten (10) days.
- Critical need users identified in the existing Water Contingency Plan shall be notified in person.

- The nature of the interruption will determine the recommended consumer actions. For example, a major water line break may require a boiling notice be posted for affected consumers. In all emergencies, consumers will be asked to conserve water.
- Should Village-treated water be unavailable for a prolonged period of time, water will be brought in to the Village from outside sources. Agreements have been created with the following sources:

    - Xenia
    - North Beaver Creek Water Treatment Plant (Greene County)
    - Warren County
    - Cedarville
    - St. Marys
    - Lebanon

- Temporary storage facilities will be set up in Gaunt Park and the Bryan Center. Temporary storage tanks may be available from the above listed facilities. Additional assistance may be available from the Ohio National Guard (614-889-7155) in the form of water "buffalos". Agreements with local water haulers have also been formed. Copies of these and other agreements are part of the Water Contingency Plan.

- For longer expected periods of interruption, a temporary above ground line will be established with Xenia, Ohio, or other neighboring water supplier. The Village will begin talks with Xenia on the matter.

- The Ohio National Guard and/or the Greene/Montgomery County Local Emergency Planning Committee (LEPC) will be contacted (24-hour telephone number is 937-225-4357) to provide the supply line from Xenia to the Village. The Village will contact both entities to establish

procedural requirements. The procedures developed will be added to this plan as an amendment.

The schedule for implementation of this contingency is provided in Table 25.

Long Term Source of Water

Well Field Expansion

The aquifer system that currently provides water to the Village will be evaluated through hydrogeological studies to determine its potential to provide additional water to the Village as an expansion project. Consideration will be given to the location of potential pollution sources as part of the investigation. Further consideration will be given to the land areas involved, specifically with respect to the ability of the Village to secure land or rights to the land. The Village will evaluate funding avenues to begin well field expansion studies. When funding becomes available, the Village will contract with an established hydrogeological firm to perform the work.

Public Water Connection

The Village will begin preliminary discussions with the City of Xenia, the City of Springfield and Greene County (North Beaver Creek) to determine the feasibility of establishing a permanent interconnection with one of their distribution systems as part of a cooperative agreement. The interconnection can work both ways, if feasible. The goal would be to establish a memorandum of understanding with one of the systems to obtain or supply water during emergencies. If one or more of the suppliers is willing to provide water, then Yellow Springs will commission an engineering feasibility study to develop basic design criteria and provide budgetary cost estimates as a basis for decision making.

Based on the results of the engineering study, the Village will then determine if a connection is economically feasible and evaluate potential sources of funding as necessary.

Table 25. Strategies for Contingency Planning -- Short Term Source of Water

Strategies	Tasks	Date to be Completed	Yellow Springs Representative	Additional Resources
Minimize water consumption by consumer notification.	Issue notification through news media, cable, local organizations.	As Needed		
	Notify critical need users immediately and in person.	As Needed		
	Establish hot line if 10 day or more interruption anticipated.	As Needed		
Provide alternate short-term water source.	Create agreements with other local purveyors including: Xenia, Greene County, Springfield, Warren County, Cedarville, St. Marys and Lebanon.	Done		
	Set up temporary facilities in Gaunt Park and Bryan Center with tanks or water buffalos.	As Necessary		
If long-term interruption anticipated, establish temporary above-ground connection with other supplier.	Begin talks with Xenia to provide such temporary service.	April 2002		
	Establish memorandum for water service with Xenia or other purveyor.	December 2002		
	Secure commitment from Ohio National Guard/LEPC for supply line to connect.	June 2002		
Evaluate the success of strategy implementation.	Review and update contingencies as needed	Bi-annually		

Water Supply Planning

In addition to investigating short and long term sources of additional supply, the Village will also implement measures/studies to conserve water. The OEPA-endorsed "Ohio Suggested Drought Response Actions" is adopted by the Village through the Water Contingency Plan and this Wellhead Protection Plan. A copy of the latest (July 2001) version of the document is included in Appendix V.

Funding

The Village does not currently have a special emergency contingency fund for the public water system. However, the Village Manager has full authority to make whatever purchases or expenditures are required during emergencies. The Village Manager can use the ongoing Village cash balance (typically in the range of $500,000 and $700,000) for purchases. Village Council is notified for purchases in excess of $10,000. For longer-term projects, funding sources will be investigated by the Village. These sources include, but are not limited to:

- Drinking Water Protection Fund. This loan fund is available from the OEPA and is intended to be used to help public water systems in the event of a system contamination threat.
- State of Ohio Drinking Water Assistance Fund. Although this fund can be accessed for a number of different programs, a portion of the fund is specifically set aside each year for implementation of well head protection plans.
- Community Assistance Fund. Offered through the Ohio Water Development Authority and is limited to public drinking water projects necessary to meet an enforceable requirement of the Safe Drinking Water Act.
- Village Capital Improvement Fund (jointly administered by the OEPA and the Ohio Water Development Authority). This fund is intended to aid Ohio villages with financing preliminary engineering plans, detailed engineering plans, feasibility studies and legal costs for planning phases of

public drinking water facilities. The fund has a limit of $25,000 for planning and $50,000 for design.

The schedule for implementation of this contingency is provided in Table 26.

Spill Response

Emergency Response. With emergency financial assistance from the Village (through Village Manager or Council), the Township Fire Departments will coordinate existing operating procedures for spills and fires that might impact the Wellhead Protection Area. Procedures will include:

- Location of well field protection areas and potential pollution sites;
- Identification of chain-of-command responsibilities for various types of incidents and sites;
- Training of dispatchers to record relevant information about spills with the Wellhead Protection Area.
- Provision to dike any flow channel between the source and entry to a ground water source.
- Provisions to spread protective barriers beneath any leaks or spills, safety permitting.

Hazardous Material Inventory. Facilities that store quantities of hazardous substances reportable under the Superfund Amendments and Reauthorization Act that may impact the Village water supply will be periodically inventoried by the Village. This information will be shared with the Township Fire Departments, the Dayton Area Regional HazMat Team and the Miami Valley Emergency Management Authority (EMA) to be used in the event of an emergency.

Table 26. Strategies for Contingency Planning - Long Term Source of Water

Strategies	Tasks	Date to be completed	Yellow Springs Representative	Additional Comments
Examine current wellfield to assess water supply potential.	Conduct hydrogeological study of current wellfield for expansion capacity.	December 2002 pending funding		
	Secure land options, if needed and incorporate additional area into wellhead protection strategy.	To Be Determined		
Establish permanent water interconnection with distribution system of another public purveyor.	Establish dialog with area water purveyors – (Xenia, Springfield, Greene County) to assess options.	April 2002		
	Establish memorandum/cooperative agreement.	December 2002		
	Commission engineering study to provide design and budgetary cost estimates.	To Be Determined		
	Secure funding and construct permanent interconnection.	To Be Determined		
Implement water conservation measures/studies.	Adopt and follow the OEPA-endorsed Ohio Suggested Drought Response Actions.	Adopted		
Evaluate funding alternatives for Wellhead Protection and water supply improvements and secure funding, if appropriate.	Become familiar with requirements and utilization of funding sources including but not limited to: Drinking Water Protection Fund, State of Ohio Drinking Water Assistance Fund, Community Assistance Fund and Village Capital Improvement Fund. Apply for funding and implement approved action.	December 2002		
Evaluate the success of strategy implementation.	Review and update contingencies as needed.	Bi-annually		

Spill Reporting. The Village will coordinate and communicate with the Ohio EPA, the local fire departments, the Greene/Montgomery County Local Emergency Planning Committee (Ken LeBlanc, 937-223-6323), and the Miami Valley Emergency Management Authority (Ernie Kovar, 937-854-4822) regarding the identification of and response to spills that occur in the area that may affect ground and surface water.

The schedule for implementation of this contingency is provided in Table 27.

Table 27. Strategies for Contingency Planning -- Spill Response

Strategies	Tasks	Date to be Completed	Yellow Springs Representative	Additional Resources
Coordinate and establish emergency response procedures for spills.	Coordinate existing operating procedures for spills/fires in WHPA with Township Fire Departments, Montgomery/Greene County LEPC and Miami Valley EMA.	March 2002		
	Establish chain-of-command responsibilities for incidents.	May 2002		
	Train dispatchers to record relevant information for WHP.	October 2002		
	Institute readiness for diking and protective barriers to reduce spread of potential contaminants to water supply.	June 2002		
	Review and update information.	Annually		
Collect and distribute information about hazardous materials stored in WHPA.	Inventory facilities that store reportable quantities of hazardous substances.	June 2002 and annually thereafter		
	Distribute letter with collected information to Township Fire Departments and Dayton Area Regional HazMat Team.	August 2002 and annually thereafter		
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Bi-annually		

SECTION VII
SUMMARY

The Yellow Springs Wellhead Management Plan: addresses education and public participation involvement; includes source control strategies for identified potential pollution sources; identifies potential strategies for controlling future potential pollution sources; establishes a water quality monitoring program; and includes contingency planning options. These elements are summarized in a series of tables for ease of user references. The tables include timelines and individuals responsible for implementing the action items. The tables are organized as follows:

Education/Public Participation Strategies	Table 3
Source Control Strategies for Identified Sources	Tables 4 – 16
Control Strategies for Potential Future Sources	Tables 17 – 18
Water Quality Monitoring Program	Tables 24 (21-23)
Contingency Plan Strategies	Tables 25 – 27
Improving/Enhancing Current WHP Strategies	Table 28

In addition, there are several activities designed to improve or enhance wellhead protection or contingency planning that are mentioned in several sections of the text and that are summarized once again for clarity. These include: 1) delineating potential pollution sources within the capture zone and modifying source control strategies to reflect additional identified sources; 2) conducting surface/ground water studies to establish the degree of interconnection in the vicinity of the well field and revising the one year, five year and capture zones, if necessary; 3) evaluating the ground-water resources in the vicinity of the current well field to determine long term needs and potential supplies and evaluating/revising wellhead protection strategies, if necessary; and 4) identifying and securing a second well field, if necessary, to meet long term water supplies demands and establish an early proactive wellhead protection strategy for that area. These additional strategies are summarized in Table 28 so that the short-hand guide to the wellhead protection plan can be referenced through the tables only.

Table 28. Strategies to Improve/Enhance Current Wellhead Protection Plan

Strategies	Tasks	Date to be Completed	Yellow Springs Representative	Additional Resources
Complete wellhead protection inventory and management strategies in capture zone beyond five year time-of-travel.	Conduct potential pollution source inventory (PPSI) for capture zone (outside currently-designated one and five year time-of-travel).	June 2002		
	Where inventory shows known plumes of contamination, establish dialog with appropriate agencies to insure plumes identified and monitored.	As Soon As Confirmed		Ohio EPA, Southwest District Office
	Continue dialog with agencies to insure that remediation efforts for known plumes address potential impacts to the water supply.	As Soon As Confirmed		
	Evaluate data to determine if ground-water monitoring network needs to be expanded (either through new or using existing wells).	As Soon As is Practicable		Ohio Department of Health, Rebecca Petty (614) 466-4801
	Submit revised PPSI to OEPA.	December 2002		
	Develop new or expand current management strategies to address identified sources.	June 2003		
	Develop new or expand current management strategies to address potential future sources.	June 2003		
	Submit revised Management Plan to OEPA.	December 2003		
	Revise capture zone delineation as additional information is available.	As Available or Review Every Five Years		

Table 28 (continued). Strategies to Improve/Enhance Current Wellhead Protection Plan

Strategies	Tasks	Date to be Completed	Yellow Springs Representative	Additional Resources
Further quantify the surface water/ground water interactions at the well field.	See Table 16			
Examine current well field to assess water supply potential.	See Table 26			
Identify and secure a second well field, if necessary to meet long-term water supply demands.	Commission a study to evaluate potential alternative areas.	To be Determined		
	Confirm selected area by test drilling.	To be Determined		
	Establish wellhead protection area.	To be Determined		
Evaluate the success of strategy implementation.	Review and update strategies as needed.	Bi-annually		

The Village of Yellow Springs has the opportunity to implement strategies that will protect the valuable ground-water resources, not only for the Village, but also for the local landowners utilizing ground water. A combination of voluntary and regulatory strategies will accomplish this protection both now and into the future. However, cooperation and participation of the public as well as other governmental agencies is needed to make this plan a success.