Maumee River Area of Concern

2004 Stream & Septic Monitoring Study

FINAL REPORT

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US Army Corps of Engineers®
Buffalo District

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TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

EXECUTIVE SUMMARY

This 2004 Stream & Septic Monitoring Study Final Report (S&SS Report) serves as the final submittal as outlined in Contract DACW49-04-R-0010: Maumee River Area of Concern (AOC) Remedial Action Plan (RAP). The S&SS Report is organized to incorporate major work plan and monitoring plan elements and both stream and septic system monitoring results and findings.

This study tested creeks, ditches and sediments in Lucas and Wood Counties for conventional parameters used in sanitary surveys including total phosphorus; dissolved oxygen; total suspended solids; temperature; ammonia-nitrogen (NH_3-N), and fecal coliform. Streams were sampled for all of the above and sediments were sampled for fecal coliform.

While and after the stream sampling results were available, the Lucas County Health Department and Wood County Health District conducted a total of approximately 200 dye tests on residential septic systems in priority areas identified in the Septic System Monitoring Plan, and septic outfalls identified by the stream sampling. Residents whose systems were tested were provided with educational materials and advised to maintain or upgrade their sewage system as necessary.

Summarized stream sampling results are shown on Table 4.1 (Appendix E) for the 53 stream and sediment samples conducted. Table 4.2 (page 11) shows the breakout for low, middle, and high focus areas based on actual single sample test results for surface water and sediment fecal coliform values. Higher values indicate the priority areas for additional sampling and dye testing in future studies.

Approximately one out of every 4 dye tests (out of ~200 conducted) was found to be positive over the course of the septic system dye testing. Septic monitoring results are summarized in Tables 4.3 and Table 4.4 (both in Appendix E) of this report in Microsoft Excel format. Additional information from the Lucas County Health Department and Wood County Health District for individual dye testing locations is found in Appendix B of this report.

Geographic representations of the stream and septic sampling data are found on Maps 1 through 4 in Appendix E of this report showing sampling locations, magnitude of results and background information about sewered areas, locations of treatment plants, previous study sample locations and other details.

Additional stream and septic sampling in the future will focus on multiple samples at specific priority locations as well as follow-up dye testing. Public education about homeowner septic systems operation and maintenance is critical to improve the water quality of local streams that feed into larger water bodies to form the Maumee River Area of Concern and impact the entire region.

1.0 INTRODUCTION

1.1 PURPOSE OF DOCUMENT

This 2004 Stream & Septic Monitoring Study Final Report (S&SS Report) serves as the final submittal as outlined in Contract DACW49-04-R-0010: Maumee River Area of Concern (AOC) Remedial Action Plan (RAP). The S&SS Report is organized to incorporate major work plan and monitoring plan elements and both stream and septic system monitoring results and findings.

1.2 BACKGROUND AND OBJECTIVES OF STUDY

The Great Lakes Water Quality Agreement between the U.S. and Canada of 1978 and its 1987 amendments defined persistently polluted trouble spots in the Great Lakes as "Areas of Concern," or AOCs. The agreement, through the International Joint Commission (IJC) identified 43 AOCs and recommended the development of AOC-specific Remedial Action Plans, or RAPs (comprehensive ecosystem approach to restoring and protecting an AOC) to define corrective measures to restore all beneficial uses to each AOC. The Maumee River RAP is a committee of the Toledo Metropolitan Area Council of Governments (TMACOG) in partnership with Ohio EPA.

Areas of Concern were identified based on impairments of beneficial uses of water resources. Each RAP was charged with identifying how to restore beneficial uses. The impairments identified by IJC that define AOCs were:

i) Restrictions on fish and wildlife consumption;
ii) Tainting of fish and wildlife flavor;
iii) Degradation of fish and wildlife populations;
iv) Fish tumors or other deformities;
v) Bird or animal deformities or reproduction problems;
vi) Degradation of benthos;
vii) Restrictions on dredging activities;
viii) Eutrophication or undesirable algae;
ix) Restrictions on drinking water consumption, or taste and odor problems;
x) Beach closings;
xi) Degradation of aesthetics;
xii) Added costs to agriculture or industry;
xiii) Degradation of phytoplankton and zooplankton populations; and
xiv) Loss of fish and wildlife habitat.

The Maumee RAP began its process of identifying water quality problems with preparation of its *Stage I Report* in 1990[i]. The 1991 "Recommendations Report" [ii] presented an agenda for addressing issues raised in the *Stage I* report that would lead to restoration of impaired beneficial uses. Since 1991 it has been used to guide the RAP

priorities. In that time the RAP and its many local partners have conducted numerous studies and implementation projects.[iii]

The problems associated with land use within the Maumee River vary widely from heavily urban, industrialized areas to developing areas to rural agricultural spaces. Although industrial and municipal wastewater discharges, which have improved from the past, continue to impact water quality, non-point source pollution and specific land uses exhibit increasingly pronounced impacts to the Maumee River water quality.

High levels of fecal bacteria in waterways are a good example of an issue that requires action with both point and non-point sources. Past studies document high levels of fecal coliform bacteria in many AOC streams, in parts of Maumee Bay, and at the beaches of Maumee Bay State Park.

Local governments that operate Publicly Owned Treatment Works (POTWs) have invested millions of dollars to reduce bacterial contamination by upgrading their combined sewer overflow (CSO) systems. The City of Toledo is implementing its Toledo Waterways Initiative to this purpose, at an estimated cost to ratepayers of $450 million over a fifteen year period. A similar initiative is needed in unsewered areas. In these areas sewage treatment is provided by onsite or Home Sewage Treatment Systems, HSTSs. Most residences use individual household septic systems or sewage aerator systems. Businesses, trailer parks, and subdivisions where public sanitary sewers are not available are served by “package” sewage treatment plants. Most package plants are activated sludge treatment plants using the same principles as their municipal counterparts.

What package plants and septic systems have in common is that they are subject to much less regulation and monitoring than municipal POTWs. Package plants and septic systems are difficult to monitor because they are widespread and numerous. They are a problem because their owners frequently do not understand how to operate and maintain them. While there are only five POTWs in the AOC, there are about 83 package plants and over 20,000 septic systems. As a result, systems can fail and bypass untreated sewage to storm tiles, streams, and ditches.

The 2004 Stream and Septic Monitoring Study (S&SS) addresses fecal bacterial issues in unsewered portions of the Lower Maumee AOC. Specific problems the RAP has identified as impairing beneficial uses of aquatic resources include:

- High fecal coliform bacteria levels signal many water quality violations in tributaries to the Maumee River above CSO areas and beach postings in Maumee Bay. Failed and failing home sewage disposal systems are believed to be a significant source of fecal coliform affecting AOC streams.
- Failure of many streams to meet OEPA stream use attainment designations due to non-point source pollution and loss of or lack of riparian habitat

- Most Lower Maumee AOC streams in Lucas and Wood Counties ultimately drain into Maumee Bay. The Bay and the Maumee Bay State Park beaches have a history of fecal bacteria levels that pose a threat to safe recreation.

This study's key objective was to identify fecal bacteria sources (most likely failed septic systems) so that they may be corrected in order to better protect safe water recreation.

1.3 DESCRIPTION OF WATERSHED

Toledo Harbor is a federal commercial harbor located at the natural outlet of the Maumee River system. Located in northwest Ohio, the Maumee River watershed, which covers 6,609 square miles, is the largest river draining into the Great Lakes. The Maumee and its tributaries drain all of Williams, Defiance, Paulding, Van Wert, Allen, Putnam, and Henry Counties in Ohio; and parts of Fulton, Lucas, Wood, Hancock, Hardin, Auglaize, and Mercer counties. In addition, the Maumee drains parts of Steuben, Dekalb, Allen, and Adams counties in Indiana, and parts of Hillsdale and Lenawee counties in Michigan.

The Lower Maumee AOC includes the Maumee River and its tributaries from the mouth to River Mile 23 (Bowling Green water intake); North Maumee Bay and its tributaries (e.g., Halfway Creek, Silver Creek, Shantee Creek, and the Ottawa River a.k.a. Tenmile Creek); Maumee Bay and its tributaries; and Lake Erie Direct tributaries between Maumee Bay and the Portage River (e.g., Cedar Creek, Crane Creek, Turtle Creek, and the Toussaint River). Major cities in the AOC include Toledo, Oregon, Bowling Green, Rossford, Perrysburg, Northwood, Sylvania, and Maumee Ohio. The Maumee River reaches Lake Erie via Maumee Bay, located in the shallow western basin of Lake Erie.

1.4 REGULATIONS AND IMPACTS

The Ohio Administrative Code (OAC) defines bathing, primary and secondary contact bacterial standards. Appendix E includes a file of Section §3745-1-07 documenting the relevant code defining primary and secondary contact standards. The streams and ditches that were sampled would not meet bathing beach criteria, but are likely to be at least occasionally affected by secondary contact standards. These water quality values (200, 400, 1000, and 2000) are the standards by which the sample results in Table 4.2 were divided.

Bathing water standards are 200 counts of fecal coliform per 100 mL, based on a minimum of five samples within a thirty day period or shall not exceed 400 counts or less per 100 mL in more than ten percent of the samples within a thirty day period.

Fecal coliform standards for primary contact use a geometric mean content (most probable number or most found), based on a minimum of five samples within a thirty day period. These numbers are not to exceed 1,000 counts per 100 mL and are also not to exceed 2,000 counts per 100 mL in more than ten percent of the samples within a thirty day period.

Secondary contact fecal coliform counts shall not exceed 5,000 per 100 mL in more than ten percent of the samples taken in any thirty day period. See Table 7.13 (page 23 of attached file in Appendix E) for additional information.

1.5 RECENT DEVELOPMENTS

South Bass Island and Put-in-Bay had a series of incidents where visitors had a history of gastrointestinal illness after visiting South Bass Island. As of mid-September, the Ottawa County Health Department has interviewed more than 1,400 people regarding this outbreak. Well test results are beginning to confirm the suspicion that groundwater has been contaminated by sewage. The Ohio Department of Health has posted information about this situation as well as tips for residents to protect their health. A series of news articles related to the situation as well as copies of certain web pages with information is included in Appendix D of this report.

The City of Toledo and the Maumee Bay State Park (both within the Maumee Area of Concern) are less than fifty miles west of South Bass Island. Ottawa County borders Lucas and Wood Counties. Problems with groundwater in the South Bass Island recreational area have lead to drinking water advisories and reduction in tourism in the area.

2.0 REVIEW OF EXISTING WATER QUALITY INFORMATION

The 2004 Stream & Septic Monitoring Study Work Plan documents various sources of existing water quality information from the Ohio Environmental Protection Agency (OEPA), the United States Geological Survey (USGS), City of Toledo, Jerusalem-Ottawa County Health Department Stream Sampling Data, TMACOG Student Watershed Watch Data, Swan Creek StreamKeeper Program sample data, Critical Area Designations, Package Sewage Treatment Plants, and presently served sanitary sewerage areas. More information for each of these data sources can be found in the Work Plan and its appendices.

Stream sample sites were selected mainly based on OEPA surveys for Lucas and Wood Counties in the Area of Concern, data from unsewered communities that have sewage problems, and critical priority area designations as coordinated and tracked by the Lucas and Wood County Health Departments along with OEPA and TMACOG. These priority areas have been developed from stream and dye-testing results, field observations and complaints.

3.0 STREAM AND SEPTIC MONITORING PLAN SUMMARY

3.1 SAMPLING RATIONALE

This study tested creeks, ditches and sediments in Lucas and Wood Counties for conventional parameters used in sanitary surveys. The surface water parameters are: total phosphorus; dissolved oxygen; total suspended solids; temperature; ammonia-nitrogen (NH_3-N), and fecal coliform. These parameters have long been used to document proof of stream contamination due to untreated sewage, each covering different aspects of water pollution. Suspended solids testing is a physical measurement, affected by fecal matter, toilet paper, and other sewage solids. Phosphorus and ammonia-nitrogen are nutrients present in sewage. Phosphorus is the critical nutrient responsible for cyanobacteria ("toxic blue-green algae") blooms in Lake Erie. Nitrogen contributes to the blooms, but is a greater concern for drinking water supplies. Temperature was measured because the water quality standard for ammonia depends on waster temperature.[iv] Also, warm water can be an indicator of sewage. The dissolved oxygen measures the amount of oxygen available to support aquatic life. Low levels of dissolved oxygen indicate organic enrichment, such as from sewage. Fecal coliform is an indictor test for the presence of pathogens found in sewage; see discussion below.

Stream sediments were also tested for fecal coliform. A recent study[v] concluded that stream sediments can act as a reservoir for fecal bacteria. The bacteria can accumulate and survive in sediments for extended periods. A flushing rain event can stir up the sediments and release enormous numbers of bacteria into the stream. During a long period of quiescent flow, it is possible for surface water to flow with low concentrations of bacteria over highly contaminated sediments. Therefore, it was determined important to test both surface water and sediment.

Either fecal coliform or *E. coli* could have been used to test for bacterial contamination. Fecal coliform is a well-established standard that has been used for many years. It is a test for indicator bacteria that signify the presence of fecal matter from warm-blooded animals, and the possible presence of pathogens. *E. coli* is a test for a specific organism present in fecal matter of warm blooded animals. *E. coli* has received increased acceptance as a water testing standard in recent years. In order to sample as many locations as possible under this program, it was necessary to select either fecal coliform or *E. coli* as our standard, but not both. Fecal coliform was selected because that is the current standard Ohio EPA continues to use in enforcement of surface water quality standards.

As described previously, the objective of this Study was to identify failed septic systems. The stream sampling and analysis performed as part of this study provided a snap-shot of stream water quality to identify or confirm chronically impacted areas. It is recognized that weather conditions can significantly influence stream water quality; however, it was beyond the scope of this study to evaluate the watershed conditions during various weather conditions or over any length of time. Weather conditions were tracked prior to and during sampling and have been taken into account during data evaluation.

Some dye sampling was conducted while stream sampling was underway based on existing priority area information. After stream sampling results were made available, additional septic system dye tests were conducted in stream sampling areas with high fecal coliform bacteria results to pinpoint sources of untreated sewage in the AOCs streams and ditches.

3.2 TASK DESCRIPTIONS

3.2.1 Task 1 - Prepare S&SS Study Plan

Black & Veatch and TMACOG prepared a project work plan for water and sediment sampling in AOC streams and ditches. Appropriate existing bacterial and chemical data was collected and organized for the Plan including past stream sampling data, areas where sanitary sewers are available, locations of package plants, and known or suspected septic system failures. Sampling locations were selected based on the review of past data that suggested the possible presence of untreated sewage or streams with development but no past data. Potential residences and businesses were identified for sewage system dye testing. The evolving plan also determined who would conduct dye tests on any commercial septic systems based on funding and availability. This Plan also incorporated materials prepared by the Toledo Metropolitan Area Council of Governments (TMACOG) in cooperation with both the Wood and Lucas County Health Departments and recommendations for number, qualifications, and training of personnel required for stream and sediment sampling, and dye testing.

3.2.2 Task 2 - Perform Stream Sampling and Analysis

Black & Veatch sampled and coordinated with an analytical laboratory for non-field related sample analysis as required. Stream samples were made and analyzed for approximately 50 sites for the following parameters: total phosphorus; dissolved oxygen; total suspended solids; temperature; ammonia-nitrogen (NH_3-N), and fecal coliform. Stream sediment samples were also taken and analyzed for fecal coliform contamination. All sample documentation included the time, date, and GPS location of the sample collection. Photographs were also taken of one day in the field showing the method of sample collection and various conditions observed at specific project sites.

Stream sampling consisted of one grab sample of both water and sediment per site, with a limited number of additional QA/QC sampling also performed. Candidate stream sampling sites were identified based on the review of existing data described below. Priority was given for streams, areas, and sites with historical problems and potentially significant water quality impacts. In areas with multiple potential pollutant source contributors, multiple sample sites were identified to more accurately pinpoint the sources.

Secondary parameters of concern were elevated levels of ammonia (over 1 mg/L) , total phosphorus (over 1 mg/L) and/or total suspended solids (over ~ 50-100 mg/L) or dissolved oxygen levels below 5 mg/L. Other important factors such as weather conditions and site observations were also considered.

3.2.3 Task 3 - Perform Septic System Dye Testing

While and after the stream sampling results were available, the Lucas County Health Department and Wood County Health District conducted a total of approximately 200 dye tests on residential septic systems in priority areas identified in the Septic System Monitoring Plan, and septic outfalls identified by the stream sampling. Residents whose systems were tested were provided with educational materials (see below) and advised to maintain or upgrade their sewage system as necessary.

Septic dye test sites were identified prior to stream sampling based on prior experiences and existing data. In some cases, septic testing occurred in the same areas as stream sampling. In general, sites for follow-up septic dye testing were prioritized based primarily upon surface and sediment fecal coliform. Priority was given to sites with the highest concentrations of both surface water and sediment fecal coliform values as indicated in Table 4-1. More focused testing occurred as time allowed as stream sampling results became available.

3.2.4 Task 4 - Distribute Educational Materials and Public Information

Educational materials were reproduced by TMACOG and provided to residents whose septic systems were tested by the Health Departments as part of this study. The materials were used by Health Department personnel to explain proper septic system operation and maintenance to residents. The materials have been developed for the average resident, and have been found effective on other projects. About 250 copies of the materials were distributed. The materials are as follows:

- "Give Water a Hand" brochures. The TMACOG Stormwater Coalition developed a series of six educational brochures of water quality issues that affect stormwater. The third, released in July 2004, addressed septic systems. The brochure is specific to the Lower Maumee AOC, explaining the basics of septic system maintenance in the tight soils and flat, slow drainage conditions of the Great Black Swamp. A copy of this brochure is included in Appendix C.

- "Dollars Down the Drain" videos. Friends of the Crooked River associated with Kent State University and the Cuyahoga River RAP produced this entertaining program on septic system operation and maintenance. These videos were produced both in VHS and DVD formats for greater resident convenience. A copy of this video has been included in DVD format as part of Appendix C.

3.2.5 Task 5 – Prepare Stream and Septic Monitoring Study (S&SS) Report

The S&SS Study Report is contained in this document and reflects efforts by Black & Veatch, TMACOG and the Health Departments. The report includes stream and septic system data collected by Black & Veatch and the Health Departments and maps of data points created by TMACOG in geographical information system (GIS) format. It summarizes the actions taken and future actions by the Toledo/Lucas County Health

Department and Wood County Health District to address sources of fecal contamination identified.

4.0 STREAM AND SEPTIC MONITORING RESULTS

4.1 STREAM MONITORING

Based on the rationale described above a list of more than 50 potential stream sampling locations was developed. Over the course of the sampling, some sites were found to be duplicates of other sites and some did not have water or reasonable access for sampling at the time that the samples were to be taken, leading to the selection of additional sites. A summary of sites initially selected and actually sampled is provided as Table 4-1. Additional information is contained on the individual field data sheets, found in Appendix A of this report.

Sites were identified by area name; city or township name; river or ditch name, cross roads, and basis for selection. Field data collected included GPS latitude and longitude data, sediment and area descriptions, weather conditions, the sample date and time, last rainfall, dissolved oxygen and temperature readings as well as general site comments. Water samples taken for laboratory analysis included total suspended solids (TSS), ammonia-nitrogen, total phosphorus, and fecal coliform. Sediment samples were taken for fecal coliform as well. Stream sampling data field notes can be found for each site in Appendix A.

Summarized results are shown on Table 4-1 and also include a designation of “low”, “middle” or “high” fecal coliform values as broken down in Table 4-2 below. These designations correspond to the top, middle and bottom 1/3 of actual test results for surface water and sediment fecal coliform values. Any value over 1,000 counts should be of highest consideration for meeting possible primary contact standards, as mentioned in Section 1.4 of this report.

Using the 200 count per 100 mL standard, 60% of the samples did not meet the strictest bathing water standards. If 400 counts per mL were used, 35% of the sites sampled would not meet bathing standards.

Of the remaining 35% (19 sites out of 53), almost half do not meet primary contact standards. The 16% of sites with values over 1,000 counts per 100 mL will be the first set of sites for greater sampling and homeowner education and enforcement efforts in the future. These areas are near Berkey, Providence and Holland in Lucas County and near Middleton and Washington in Wood County.

Besides the areas mentioned above, Lemoyne in Wood County was an area of concern with relatively high sediment fecal coliform values. Berkey was the largest area of concern for Lucas County and efforts are underway to work with residents in this area.

Table 4-2: Site Priorities Based on Results of
Surface Water and Sediment Fecal Coliform Concentrations

Fecal Coliform: Sediment (#/100 ml/g dry weight) (across) Surface Water (#/100 ml) (down)	**0-30**	**31-199**	**> 200**
0-200 (Meets bathing water criteria)	Low (8, 15%)	Low (10, 19%)	Low (3, 6%)
201-400 (May meet bathing water criteria some of the time)	Low (2, 4%)	Low (7, 13%)	Middle (4, 8%)
401-1000 (Exceeds bathing water criteria, meets primary contact criteria)	Middle (3, 6%)	Middle (5, 9%)	Middle (3, 6%)
1001-2000 (Meets primary contact criteria some of the time)	Middle (1, 2%)	High (2, 4%)	High (1, 2%)
> 2000 - ~5000 (Exceeds primary contact criteria, may exceed secondary contact criteria)	High (2, 4%)	High (1, 2%)	High (1, 2%)

Additional parameters of concern were ammonia-nitrogen values and total phosphorus. There were two sites in Lucas County with high ammonia values over 2 mg/L, #8 – Providence and #10 – Whitehouse. Wood County also had two sites with high values for both ammonia and phosphorus. These sites were located in #41 – Middleton (Sugar Ridge) and #46 – Troy (Stoney Ridge). Dissolved oxygen and temperature values were recorded, but not considered critical parameters for this study.

4.2 SEPTIC MONITORING RESULTS

Septic monitoring results are summarized in Tables 4.3 and 4.4 of this report in Microsoft Excel format. Additional information from the Lucas County Health Department and Wood County Health District for individual dye testing locations is found in Appendix B of this report. Lucas County did not collect detailed field observations prior to this study. During the course of the dye testing, a test record was developed and utilized to document some field conditions at the time of sampling. Wood County information includes detailed GPS data as well as observations related to the type of sewage treatment, location of sewage treatment system on the property, source of water supply, visual inspection of the system and additional comments.

Approximately one out of every four dye tests was found to be positive. Various types of septic systems found include aeration, tanks with leach fields, aeration with evapo-transpiration fields, tanks with no treatment beds, tanks with filter beds, sand filters, stone filter beds, septic tanks with outlets, jet aerators, leaching tile, field tile and a subsurface

sand filter. Many aerators observed in Wood County had motors that were not functional or functioning at the time of the dye test.

4.3 PUBLIC EDUCATION

Copies of the video "Dollars Down the Drain" were given to Wood County residents that participated in the dye testing in VHS or DVD format. A brochure "Give Water a Hand" was mailed to about 38,000 residents through TMACOG, mainly in Lucas County and was also given to some residents that asked about the stream sampling that was being done in their area.

4.4 GEOGRAPHICAL SUMMARY OF DATA

Please find attached maps (Appendix E) that summarize the data generated in this report. The first map, Surface Water and Sediment Fecal Coliform Concentrations" shows the stream sampling locations and magnitude of fecal coliform found in the streams and sediment samples at each location, the lower Maumee AOC boundary, and the 11 and 14 digit Hydrological Unit Code watersheds. The second and third maps show the results and locations of the septic system dye tests for Lucas and Wood Counties and references the stream sample sites. The fourth map, "Maumee AOC with Package Plants and Sewered Areas" contains the locations of the municipal wastewater treatment plants, package plants, sewered areas, county boundaries, and the Maumee Area of Concern (AOC). The four maps referenced above also include information about road, major streams and ditches, municipalities and townships, and county lines where applicable. Some ditch and stream layers may not be represented on the map but can be found in their entirety in the GIS directory (Appendix F).

See Appendix E for maps of the "208" *Areawide Water Quality Management Plan* "Critical Home Sewage Disposal Areas", Student Watershed Watch sampling locations and Swan Creek StreamKeeper testing sites.

5.0 CONCLUSIONS AND RECOMMENDED FUTURE INVESTIGATIONS

5.1 STREAM SAMPLING

Concentrations for fecal coliform values were lower than anticipated for this study. This may have been impacted by the varying time between rainfall events, the distance from sampling locations to the actual septic system outfall locations, lack of flow at certain locations, and even natural sample variability.

Additional and repeat testing in areas of higher concentration is recommended, as well as performing both fecal coliform and *E. coli* testing in areas of concern where septic systems appear to be working to determine if wildlife and/or agriculture are adversely impacting water quality values. An EPA Wastewater Technology Fact Sheet for Bacterial Source Tracking documents that the major categories of fecal bacteria may be human, livestock, wildlife, or even domestic pets in more urban watersheds. Each source produces unique, identifiable strains of fecal bacteria due to variations in intestinal environments and pressures that differ from source to source. A copy of this Fact Sheet is included in Appendix E.

Suggested additional/repeat testing locations would include sites in Berkey, Whitehouse, Providence, Northwood, Toledo, and Holland in Lucas County as well as Five Point, Dunbridge, Sugar Ridge, Dowling, Sugar Creek, Liberty Hi, Stoney Ridge, and Lemoyne in Wood County.

5.2 SEPTIC SAMPLING

The stream and sampling project was an eye opener for the Wood County Health District in terms of greater awareness of the number of sewage system in Wood County that consisted of aeration motors, many of which (~nine out of ten) are not functioning properly. The original intent of the project was to focus on areas that had received sewage complaints in the past, sites that were known as critical sewage areas as listed in the Wood County Home Sewage Treatment Plan, and areas that have a high density of homes, all within the Maumee River RAP area.

The original intent was to sample dye tests for all residents within a certain area with stream sampling results of fecal coliform greater than 5,000 per 100/mL. The idea was that if any sample came back with counts higher than 5,000 counts for fecal coliform, the Wood County Health District would then conduct dye test on the all the residents within a certain area to find the source and order them to repair or upgrade their sewage treatment system to current code. As the early site results became available, no results were found over the 5,000 threshold, so thoughts shifted from enforcement to education.

Approximately 100 dye tests were conducted in Wood County on sewage treatment systems throughout the several areas listed in the project with the emphasis on educating the homeowners about their own system. A questionnaire was developed and utilized as

door-to-door septic tests were conducted. The video "Dollars Down the Drain" was also distributed to each household that participated in the survey.

After conducting 100 dye tests, it was concluded that there are several systems (20% or more) within Wood County that are failing. In many incidents, dye showed up in the streams or ditches within hours or a few days. Other incidents involved checking the tank only to see that aeration motors are either not plugged in, not running at all, or not even present. The number of individuals that did take care of their system was also surprising to one dye tester, either by having the tanks pumped frequently, and/or by adding additives or enzymes to their septic tank. The other Wood County dye tester found that most residents did not know anything about the location or operation of their septic systems.

Some sampling areas created a lot of confusion due to the way common tile systems are set up. Wood County tested several systems that consisted mostly of aerators (even where motors were running) where dye was not observed where expected. No dye was ever observed in Dunbridge, which may require additional investigation in a future study.

Both Wood and Lucas Counties recognize the need for additional dye testing to obtain information to be presented to residents and elected officials on the types of septic systems that are in the county and how or why they are failing. Both Health Departments also began using GPS to document their dye testing efforts. This information will be entered into each County and TMACOG's GIS layer for future reference.

5.3 PUBLIC EDUCATION

Wood County Health District distributed videos to each household that participated in the dye test and survey. Residents seemed skeptical about the survey and afraid that the Health Department would force them to install new systems if something was wrong. As the sample results were under 5,000 counts for fecal coliform, approaching the dye testing for educational purposes rather than enforcement helped to increase awareness regarding septic system maintenance and household water use. If problems were identified, residents were strongly encouraged to call a registered contractor to have the problems resolved. Some residents did not choose to participate in the dye testing and survey.

The most important lesson learned from this study and sampling has been that education of the general public is imperative in septic system operation, maintenance, remediation and the general overview of use of the system itself. After receiving a copy of the video, some residents called to follow up with the Health Department and indicated that they were implementing water conservation into their daily routine and were very grateful to learn more about their septic systems.

5.4 GENERAL OBSERVATIONS AND FUTURE RECOMMENDATIONS

Higher stream fecal counts were expected than what was actually measured, especially in areas where sewage effluent was obviously discharging from pipes and reconfirmed with dye. Additional and repeated stream sampling should be conducted in some of these areas to better define the existing conditions and to show improvements as septic systems are repaired or replaced.

Both Health Departments will be following up with homeowners for appropriate upgrades, repairs or suggested replacement of failed or inadequate septic systems. Where appropriate, the data will be used to further support the need for public sanitary sewers in specific areas. This information will also be incorporated into the "208" *_Areawide Water Quality Management Plan_* as "Critical Home Sewage Disposal Areas," TMACOG's principal environmental policy document, that is used in recommending priorities for actions by local governments.

Results will also be incorporated into Wood County *_Home Sewage Treatment System_* (HSTS) Plan and the Northwestern Water and Sewer District (Wood County) Sewerage Master Plan. This HSTS document is used by Ohio EPA and Ohio DNR as part of the "Appendix 8" Watershed Action Plan, and used in prioritizing §319 Nonpoint Source grant funds.

Lucas County plans to use some of this information to better educate the elected officials and the general public regarding the overall water quality impact of sewage systems within Lucas County. Long term plans include establishing an operation and maintenance program to enable the community to test, evaluate and remediate large sections within the county and eventually the entire county of failing septic systems and/or inadequately treating septic systems. The program would further insure that environmental impact would be reduced due to the fact of continual monitoring of the myriad of systems within Lucas County. Lucas County may also eventually develop an HSTS plan as more information becomes available.

This work has demonstrated the need for Lucas County to increase their documentation of dye test records. During the course of the dye testing, Lucas County adopted the use of the form that is shown in Appendix B of this report. Not all of Lucas County's dye test results have an accompanying form. Both Counties will be working to upgrade their log systems to better document available data in case legal action may be required to ensure homeowner compliance with septic system regulations.

6.0 REFERENCES

[i] Ohio Environmental Protection Agency, TMACOG, Maumee RAP, August 1990. *Lower Maumee River Remedial Action Plan Stage 1 Investigation Report*

[ii] Maumee RAP and TMACOG, 1991. *Maumee River Area of Concern Remedial Action Plan Volume 4 Recommendations for Implementation*

[iii] Activities and Accomplishments in the Maumee Area of Concern 1991-2001 http://www.epa.state.oh.us/dsw/rap/MaumeeAOC1991-2001.pdf

[iv] Ohio Administrative Code 3745-1-07 Water use designations and statewide criteria. http://www.epa.state.oh.us/dsw/rules/01-07.pdf

[v] University of Toledo and TMACOG *Wolf Creek Bacterial Impact on Maumee Bay State Park Beach*, June 2003