Failing Septic Systems in Mid-Michigan:

An Unseen Threat to Public Health

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PSC

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This report was developed with the thoughtful guidance, input, and discussion of the members of the Mid-Michigan Water Quality Management Committee, which represents a variety of diverse interests from Clinton, Gratiot, and Montcalm Counties. The committee met on five occasions between February and April 2018 at the First Baptist Church building located in Carson City, Michigan.

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EXECUTIVE SUMMARY

Mid-Michigan is facing a threat to public health. The lakes, rivers, and streams of Clinton, Gratiot, and Montcalm Counties are consistently showing bacteria levels that are too high to safely enjoy common recreational activities such as fishing, boating, and swimming. The conservation districts of these counties have led efforts to assess conditions of the waterways. Sampling has been conducted to answer questions about the severity and source of contamination. In every watershed where sampling has occurred, E. *coli* levels, which are used as an indicator of human pathogens in water, have exceeded safe levels, sometimes at alarming rates. The sampling has also confirmed that human sewage from failing septic systems is a significant source of the contamination. For example,

- In the Looking Glass River watershed, 46 sites in Clinton and Shiawassee Counties were sampled in 2015 for the presence of human sewage. Of the sites in Clinton County, more than half tested positive. Further analysis occurred in 2016, 17 sites were sampled over the course of the summer. All of these sites exceeded state standards for boating/fishing and swimming; in other words, it was unsafe to touch the water.
- In the Flat River watershed, 32 sites were sampled in 2014. The results showed that 75 percent of the sites exceeded state standards for swimming on at least one occasion. The presence of human sewage was confirmed at locations throughout the watershed.
- In the Pine-Chippewa River watershed, the state conducted sampling at 20 locations throughout summer 2017. The results showed that 85 percent of sites exceeded daily and monthly standards for boating/fishing and swimming. Only 10 percent of sites met all applicable standards. In 2015, Alma College conducted sampling on the Pine River that showed that four out of five locations exceeded monthly standards throughout the summer.
- In the Upper Maple River watershed, 49 sites were sampled in 2015 for the presence of human sewage. Approximately 80 percent of the sites tested positive. Further analysis occurred at ten locations throughout the summers of 2015 and 2016. Each of these sites exceeded safe levels for swimming and 80 percent exceeded safe levels for boating and fishing. This sampling also confirmed the presence of human sewage at every site.

Clinton, Gratiot, and Montcalm Counties are predominantly rural communities, the majority of which do not have sewer service. Most homes and businesses in the region rely on septic systems to manage their wastewater.[1] When properly installed and maintained, septic systems effectively treat wastewater. These systems generally function well for between 20 and 30 years. However, when they are improperly maintained or used beyond their expected service life, they can discharge polluted water into the community, and, cumulatively, pose significant risks to public health.

[1] For the purposes of the committee's report, a septic system includes a septic tank, absorption field, trench, or bed system, as well as an alternative onsite sewage treatment system. Definitions of these terms are provided in the glossary.

A growing body of evidence suggests that septic systems in the region are aging, and many residents are unaware of septic management practices and the effects that failing septic systems can have on public health and the environment. To better understand homeowner awareness of septic management practices and the condition of systems in the region, the Clinton Conservation District conducted a survey of residents that were likely to have septic systems. The randomized survey was completed by 283 people, providing statistically significant results for the region. The results of the survey show:

- Approximately 30 percent of residents did not know they have a septic system.
- The average age of septic systems is 28 years old.
- Half of the septic systems in the region are likely older than 26 years.
- Forty-three percent of respondents indicated they have not had their system pumped within the last five years, and 25 percent indicated that they do not pump or maintain their system on a regular basis.
- Only 15 percent of residents are aware of the normal lifespan of a septic system.

The state of septic systems is further evidenced by a pilot study that was conducted by the Gratiot Conservation District in partnership with the Mid-Michigan District Health Department (MMDHD). Through the study, paper records were digitized for a small portion of the county that includes approximately 1,100 households. The results show that 38 percent of households had either no septic permit on record with the health department or were dated prior to 1970, an age at which a septic system is highly unlikely to continue to function as designed.

DEVELOPING LOCAL SOLUTIONS

The Clinton, Gratiot, and Montcalm Conservation Districts have led efforts to assess public health concerns in the region's waterways and convene community partners to develop sensible solutions to address these concerns. In 2014, the Clinton Conservation District, in collaboration with the health department, convened the first group of regional stakeholders to assess the impact of failing septic systems in Mid-Michigan. The committee developed a series of recommendations regarding steps the health department, conservation districts, and other community partners could take to decrease public and environmental health risks of failing septic systems. Recommendations fell into three categories: 1) improving information management, 2) enhancing educational activities, and 3) developing an innovative Healthy Waters, Healthy Families program to enhance management of septic systems.

Since the committee issued its report in 2014, the conservation districts and the MMDHD have worked to implement these recommendations. The health department launched a new Web-based information technology (IT) system to manage septic system permitting and inspections. Plans are also in place to digitize paper records and integrate them in the new IT system. A survey of residents with septic systems was conducted to better understand residents' views regarding their systems. The results were used to develop an education and outreach strategy for the Upper Maple River watershed; however, the strategy could be applied throughout Mid-Michigan.

To build off this work and to continue to implement the recommendations, the conservation districts and the health department formed a committee. This committee comprises community leaders that represent diverse interests from the three counties, and their goal was to discuss public health concerns associated with septic systems. The committee was charged with developing recommendations that would reduce

public and environmental health risks associated with failing systems for consideration by the MMDHD Board of Health and the member counties' boards of commissioners.

The committee discussed a wide range of topics related to septic management practices, the public health risks posed by failing systems, financial realities for residents in the region, and alternative approaches that could be employed to address these issues. Over the course of five meetings with robust and thoughtful discussion, the committee developed a series of recommendations to address the region's public health concerns.

RECOMMENDATIONS

The key elements of the committee's recommendations—detailed on page 23—include enhancing education and outreach activities, promoting and developing financial support mechanisms, and updating the health department's sanitary code to more proactively manage septic systems.

Enhance Education and Outreach

Education and outreach activities can positively affect septic management in Mid-Michigan. The committee recommends that the health department should continue to collaborate with organizations such as the conservation districts to enhance homeowner awareness of septic management practices. These partnerships should expand to include Realtors, septic inspectors, septic installers, and lenders.

The Clinton Conservation District has requested state funding to support these activities in the Upper Maple River watershed. Similarly, the Montcalm Conservation District is positioned to secure state funding to focus on education and outreach within the Flat River watershed. Once the Pine River watershed management plan is completed, the Gratiot Conservation District will also be eligible for funding.

Financial Support Mechanisms

The costs of replacing or fixing a septic system can be substantial, especially for residents of limited means. To this end, the committee recommends that the health department collaborate with other partners to enhance awareness of existing financial support programs, such as the Michigan State Housing Development Authority (MSHDA) Property Improvement Loan Program. Additionally, the health department and its member counties should evaluate establishing additional local financial assistance programs. The health department should also help residents apply for and receive funding through these programs, as needed.

This recommendation could be financially supported by the state through watershed management implementation grants. For state grant funds to be used for septic management purposes, the counties must pass a septic management ordinance. The Clinton Conservation District has requested these funds as part of a pending grant proposal that focuses on the Upper Maple River watershed. The Gratiot and Montcalm Conservation Districts could also pursue similar funding from the state, if a septic management ordinance is passed.

Update the Sanitary Code

The health department's current regulations appear to be adequate regarding septic system siting, installation, and sizing. However, after systems are constructed, the health department has very limited

means to ensure they continue to function as they were designed. Information available from all three counties shows that many septic systems are no longer functioning, contributing waste to the environment and, cumulatively, threatening public health.

To address these concerns, the committee recommends updating the sanitary code to require a discharge permit for all developed properties—including residential, commercial, agricultural, and industrial structures—with wastewater plumbing that is not connected to a municipal or community sewer system regulated by the state. This recommendation would provide the health department a mechanism to ensure septic systems continue to operate as designed. The permit model would require properties to be inspected at least every ten years. The frequency of inspections could be adjusted using a risk-based approach that prioritizes systems with a higher probability of failing. For example, as systems age, and near the end of their useful life, the inspection frequency could be accelerated to identify failing septic systems that contribute sewage into the environment. Residents would not be required to pump or maintain their system at any predetermined frequency; they would be able to use a management approach that fits their needs. However, when a system is pumped or serviced, an informational maintenance report would be submitted to the health department. Under this approach, a septic system could be inspected approximately three to six times over its anticipated 30-year lifespan.

The committee recognizes that implementing a discharge permit model would require additional resources for the health department, which would be funded through reasonable administrative fees set by the MMDHD Board of Health. The health department would rely on licensed third parties to complete the inspections. Implementing this approach would be a significant but manageable task for the health department that could be phased in over time, with priority given to higher-risk properties, such as those in areas with documented contaminants and those for which no septic permit is on file with the health department.

If adopted by the board of health and its member counties, this approach is expected to identify and fix failing septic systems in the region and help residents proactively maintain their septic systems. Taking these steps will help prevent untreated sewage from entering our lakes, rivers, and streams, reducing pathogen levels that threaten public health in Mid-Michigan's communities.

NEXT STEPS

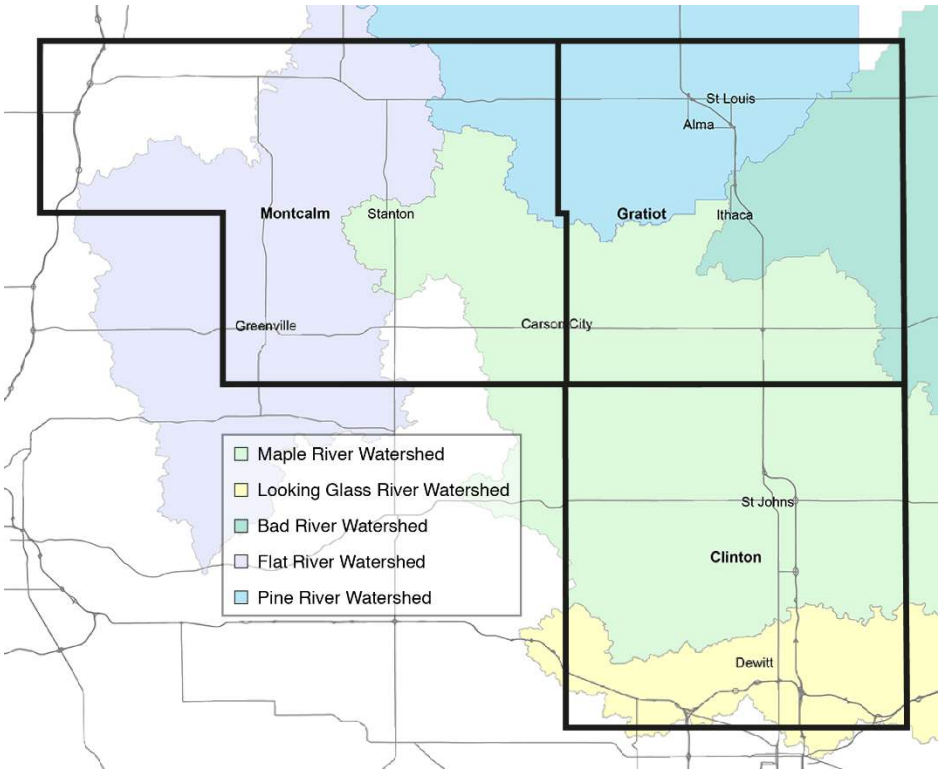
The committee's recommendations will be presented to the MMDHD Board of Health for its consideration. If the board decides that it would like to pursue updates to its sanitary code, health department staff may be tasked with developing updated ordinance language. The language would be developed in coordination with stakeholders and presented in a draft form for approval by the board of health before going through a public review process. If the board decides to adopt updates, it must then also be approved by the boards of commissioners for Clinton, Gratiot, and Montcalm Counties to go into effect.

BACKGROUND

The MMDHD is responsible for protecting public and environmental health in Clinton, Gratiot, and Montcalm Counties. Over the last decade, the health department, conservation districts, watershed groups, and other stakeholders have become aware of the growing threat to public health posed by failing septic systems.

In each of the three counties, conservation districts have led efforts to develop and implement watershed management plans that document land use and environmental conditions, identify sources and causes of pollution, and develop strategies to support a healthier environment and stronger communities and promote the economic viability of the region. The region is home to five primary watersheds that extend across county boundaries and include all communities within the region. The primary watersheds in the region are the Looking Glass River, Flat River, Pine (Chippewa) River, Bad River, and the Upper Maple River. This region includes all the creeks and streams that flow into these rivers. Exhibit 1 shows the boundaries for each of watersheds within the region.

EXHIBIT 1. Watersheds of Mid-Michigan



Source: Map provided at the courtesy of the Clinton Conservation District.

While each of the counties and watersheds are at different points of developing and implementing watershed plans, a growing body of evidence shows lakes, rivers, and streams within the region are

experiencing excessive pollution that threatens public health and at times, makes it unsafe to use the water for activities such as swimming, boating, or fishing because of high levels of bacteria and human pathogens.

MICHIGAN'S WATER QUALITY STANDARDS

Water quality standards are developed to protect human health. E. *coli* is used as an indicator of the presence of bacteria and human pathogens in waterbodies. In other words, when E. *coli* is present, other pathogens are usually also present in the water that can cause diseases such as diarrhea, giardia, hepatitis, or cholera.

Different water quality standards exist for various interactions with water, including partial body contact and full body contact. Partial body contact covers a range of activities where people may touch water such as boating and fishing. Full body contact covers activities such as swimming where people are fully submerged underwater. Acceptable levels for partial body contact are higher than full body contact. Full body contact also has different standards for a single day and aggregated levels over a 30-day period (monthly standard). Maximum levels are provided in Exhibit 2.

EXHIBIT 2. Water Quality Standards in Michigan

Water Quality Standard	Daily Maximum	Monthly Maximum
Partial body contact (boating, fishing, etc.)	1,000 E. *coli* per 100 milliliters	Not applicable
Full body contact (swimming, falling out of your boat, etc.)	300 E. *coli* per 100 milliliters	130 E. *coli* per 100 milliliters

Source: MDEQ 2018.

Water Quality Sampling Methods

Local partners—including the Clinton, Gratiot, and Montcalm Conservation Districts—have coordinated water quality sampling in watersheds throughout the three counties using a variety of sampling methods. These methods can strategically identify areas with high bacteria levels that threaten public health and identify whether human sewage is a contributing factor. The primary methods used to sample water quality in the region are:

- **E. *coli* counts:** The most commonly used method to monitor bacteria levels is to conduct water quality samples and use laboratory analysis to determine how much bacteria are present. This approach indicates whether water quality meets or exceeds standards but does not provide information on the source of bacteria.

- **Canine source tracking:** Working dogs have been used throughout much of human history. In modern times, dogs have been trained for many purposes such as search and rescue operations, as well as the identification of drugs and bombs. Relatively recently, dogs have been trained to smell the presence of human sewage in waterbodies. The approach has shown a high degree of accuracy to identify the presence or absence of human sewage, but cannot identify the amount of sewage present. Canine source tracking is often used by watershed groups as a cost-effective screening tool to focus efforts and identify areas for further study using DNA analysis.

- **DNA analysis:** Water samples where E. *coli* is present can be further analyzed using expensive laboratory analysis to identify the sources of bacteria using DNA markers. This analysis has been used to identify the prevalence of human sewage relative to other sources of bacteria that may be present in the water such as bovine, swine, and waterfowl.

WATER QUALITY IN MID-MICHIGAN

The conservation districts have used a combination of these sampling methods to assess water quality and public health concerns throughout the region. In every watershed where sampling has occurred, E. *coli* levels have consistently exceeded safe levels. Where source tracking has occurred through DNA or canine analysis, human sewage has been consistently identified as a source. A summary of the status of watershed planning efforts and the available sampling results for each watershed follow.

Upper Looking Glass River

The Upper Looking Glass River watershed covers 204 square miles; it is located primarily in Clinton and Shiawassee Counties, but also reaches slightly into Ingham and Livingston Counties. It is a subsection of the Looking Glass River, which is a tributary to the Grand River.

The watershed management plan for the Upper Looking Glass River was completed in 2008, and an update was submitted for approval in 2017. The plan synthesized data that was previously collected to identify threats to water quality and goals for addressing them; among the most common of these threats were bacteria from animal and human waste. The Clinton and Shiawassee Conservation Districts have partnered to conduct sampling throughout the watershed. Highlights of the sampling efforts include:

- In 2015, 46 sites were analyzed using canine scent tracking. Of these sites, 54 percent located in Clinton County, and 39 percent located in Shiawassee County tested positive for human waste—indicating that failing septic systems are prevalent in the area. Notably, Shiawassee County has enacted a septic inspection ordinance that may contribute to differences in water sampling results, because it identifies and corrects failing systems.
- In 2016, 17 sites were sampled six different times. The results showed 100 percent of the sites exceeded partial body contact (boating/fishing) standards and the monthly standard for full body contact standards (swimming).

Flat River

The Flat River watershed is approximately 564 square miles and is located in Kent, Montcalm, Ionia, and Mecosta Counties. It flows into the Grand River in Lowell. A watershed management plan was completed in 2016. Human sources of E. *coli*, mainly from failing or improperly installed or maintained septic systems, were identified as the priority pollutant that should be addressed. Highlights of the sampling efforts include:

- In 2014, 32 sites were sampled one to five times. The results showed eight sites (25 percent) met daily maximum E. *coli* standards on all dates sampled, 24 sites (75 percent) exceeded the full body contact standards (swimming) at least once, and 14 sites exceeded the partial body contact standards (boating/fishing), on at least one date.
- In 2014, 44 sites were analyzed using canine scent tracking. Canine test results indicated that 50 percent of sites tested positive for human waste by at least one dog, indicating that failing septic systems are prevalent in the area.
- In 2015, 24 sites were analyzed using canine scent tracking. Canine test results indicated that 79 percent of sites tested positive for human waste by one or two canines, indicating that failing septic systems are prevalent in the area.
- Between 2014 and 2015, five of nine surface water samples (56 percent) tested positive for human DNA markers. One groundwater sample was collected and did not test positive for human DNA.
- Between 2015 and 2016, ten locations were sampled six different times using DNA analysis. All of these sites tested positive for human DNA markers; six of these sites also tested positive for bovine DNA markers. All ten of the sites exceed safe levels of bacteria for swimming (total body contact) and eight sites exceeded boating/fishing standards (partial body contact).

Upper Pine River

The Upper Pine River watershed is approximately 308 square miles located in Gratiot Isabella, Montcalm, and Mecosta Counties. The Pine flows into the Chippewa River in Midland County before it joins the Tittabawassee and, eventually, the Saginaw River. In 2018, the Gratiot Conservation District received state funding to develop a watershed management plan. That plan is forthcoming; however, some preliminary sampling results are available. In 2017, the Michigan Department of Environmental Quality (MDEQ) sampled 20 sites throughout the larger Pine-Chippewa watershed once a week over a three-month period. The samples show:

- 85 percent of sites exceeded daily and monthly standards for full body contact
- 35 percent of sites exceeded daily standard for partial body contact
- 10 percent of sites met all applicable E. *coli* standards

In 2015, Alma College conducted water quality sampling throughout the summer at five locations on the Upper Pine River. These samples showed that four sites exceeded the monthly standards throughout the summer. The fifth sampling location exceeded the monthly standard between mid-July and mid-August.

Bad River

The Bad River watershed is approximately 339 square miles that is located in Gratiot and Saginaw Counties. The Bad River flows into the Shiawassee River. A watershed plan has not yet been completed for the Bad River and sampling results are not available.

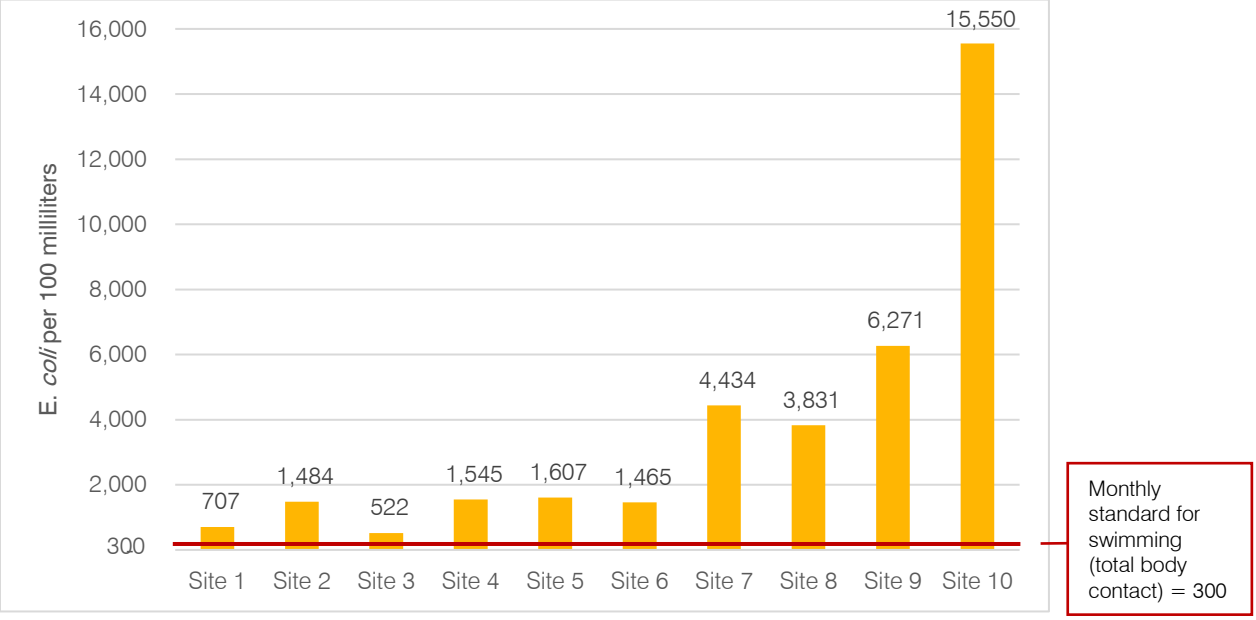
Upper Maple River

The Upper Maple River watershed is approximately 513 square miles and is located primarily within Clinton and Gratiot Counties, with portions extending into Ionia, Montcalm, and Shiawassee Counties. The Upper Maple is a subsection of the Maple River watershed, a tributary to the Grand River.

In 2010, a watershed management plan was completed for the Upper Maple River. One component of the plan indicated that all subwatersheds were likely threatened because of high bacteria levels associated with failing septic systems. Since the plan was developed, the Clinton Conservation District—in partnership with many other public and private organizations—has led efforts to further assess the health of the river and better understand the extent of public health risks. Highlights of the sampling efforts include:

- In 2015, 49 sites were analyzed using canine scent tracking. Of these sites, approximately 80 percent (39 sites) tested positive for human waste indicating that failing septic systems are prevalent in the area.
- Between 2015 and 2016, ten locations were sampled six different times using DNA analysis. All of these sites tested positive for human DNA markers; six of these sites also tested positive for bovine DNA markers. All ten of the sites exceeded safe levels of bacteria for swimming (total body contact) and eight exceeded boating/fishing standards (partial body contact), sometimes at alarming levels. Exhibit 3 shows the sampling results at these ten sites.

EXHIBIT 3. 2016 Upper Maple River Watershed Sampling Results



Source: Graph provided at the courtesy of the Clinton Conservation District.

SEPTIC SYSTEMS IN MID-MICHIGAN

As part of a study completed in 2014, the Clinton Conservation District asked Public Sector Consultants (PSC) to estimate the number of households serviced by community wastewater treatment systems and septic systems within Clinton, Gratiot, and Montcalm Counties. To develop the estimate, PSC used 2010 census data to identify the number of households within the counties, MDEQ data to identify community wastewater treatment systems, and information provided by individual jurisdictions to identify the number of households connected to a given wastewater treatment system. Within the three counties, an estimated 43,277, or 58 percent, of households are served by septic systems, while 31,978, or 42 percent, of households are served by a community wastewater treatment system (PSC 2014).

The U.S. Environmental Protection Agency (U.S. EPA) estimates the national failure rate of onsite systems at about 10 percent (U.S. EPA 2013). The Barry-Eaton Health Department (BEDHD) found, through its inspection program, a failure rate of about 25 percent (BEDHD 2014). Using these figures as low and high ends of a range, PSC estimated that between 4,328 and 10,820 septic systems are failing within Clinton, Gratiot, and Montcalm Counties. The estimated range by county is provided in Exhibit 4.

EXHIBIT 4. Estimated Septic System Failure-Rates

		Failure rates	
County	**Estimated septic systems**	**10%**	**25%**
Clinton	14,979	1,498	3,745
Gratiot	8,808	881	2,202
Montcalm	19,490	1,949	4,873
Total	**43,277**	**4,328**	**10,820**

Source: PSC 2014.

The potential impact of these failing systems is larger than it may initially seem. On average, Americans use 88 gallons of water per day (U.S. EPA n.d.). In Mid-Michigan, the average household size is just over 2.5 people per house (U.S. Census 2010)—meaning that, on average, houses with a failing system are discharging approximately 225 gallons of untreated wastewater into the environment every day. On an annual basis, this is more than 82,000 gallons per house. In Clinton, Gratiot, and Montcalm Counties, failing septic systems could be contributing between 355,879,322 and 889,616,077 gallons of untreated sewage into the environment every year, assuming a 10 percent and 25 percent failure rate.

PREVIOUS STAKEHOLDER ENGAGEMENT EFFORTS

In 2014, as part of its ongoing efforts to implement watershed management plans, the Clinton Conservation District approached the MMDHD to discuss septic systems within the watershed. As a result, the district and the MMDHD convened a stakeholder committee to further evaluate the potential environmental and public health effects of well and septic systems. The committee also was charged with developing recommendations that would reduce public and environmental health risks associated with failing systems for consideration by the MMDHD Board of Health.

The 14-member committee, representing diverse interests from the three counties, met five times between April and June 2014. The first three committee meetings focused on sharing information and developing a

common understanding of issues relating to water quality in the three counties, the potential health and environmental impacts of septic systems, current well and septic regulations, basic well and septic system function and maintenance approaches, educational strategies to enhance homeowner awareness, current inspection methods during property transactions, and varying points of view regarding well and septic system management. Drawing on this discussion, committee members developed guiding principles and recommendations to the board of health.

2014 STAKEHOLDER RECOMMENDATIONS AND IMPLEMENTATION

The committee developed a series of recommendations regarding steps the health department, conservation districts, and other community partners could take to decrease public and environmental health risks of failing septic systems. Recommendations fell into three categories: 1) improving information management; 2) enhancing educational activities; and 3) developing an innovative Healthy Waters, Healthy Families program to enhance management of septic systems. These recommendations and progress toward their implementation are summarized below.

Improving Information Management

The 2014 committee recommended a series of steps that the health department could take to improve information management to make more informed and strategic decisions regarding septic system management. This included developing a new online database of well and septic records to provide information to homeowners, home buyers, Realtors, and service providers in a streamlined manner. The committee also recommended digitizing all paper copies of well and septic records and integrating them with the new system.

Implementation

The health department has developed and implemented a new information technology platform (Hedgerow software) to utilize an electronic permitting system for well and septic permits. The online program integrates billing, permitting, and licensing within the same platform. The system is integrated with the FetchGIS mapping tool that provides location data and site-specific assets on a viewer used to make an electronic drawing that shows the location of existing wells, buildings, driveways, and waterbodies. The tool also enables environmental health specialists to add proposed features to a parcel and to scale and measure on the parcel. The measure tool is critical to ensure all isolation distances are met for well locations and isolation between septic disposal and waterbodies. The FetchGIS mapper is used to produce custom maps for special projects or site investigations.

To improve access to historical records, the digitalization and indexing of water well and septic system permits will begin in 2018. Hard copies will be accessible to the public via an online portal that will be accessible at the health department's website. Indexing will be simple and will allow clients to search for well or septic records by address.

Enhancing Educational Activities

The 2014 committee recommended a series of steps to enhance educational activities to support homeowner awareness of appropriate septic management practices and seek funding for those activities.

Implementation

The Clinton Conservation District conducted a survey of residents within the Upper Maple River watershed in areas served by septic systems. While the survey was focused on a subset of the three counties, the results are likely descriptive of all three counties because of the similarities of the communities in the region. Key insights from the survey include:

- Most residents in the target areas are homeowners (98 percent), and they tend to stay in the same house for a long period of time (the average length in residence is 25.9 years).
- The average age of respondents is just under 60.
- Homeowners feel a personal responsibility to help protect water quality (85 percent) and believe there is a personal connection between individual land use practices and water quality.
- Residents are largely unaware of what the water quality concerns are in the region. Most respondents indicated they did not know what pollutants are present in the watershed or what the sources of pollution are.
- The survey was designed to target areas in which residents were likely to have a septic system. One of the final survey questions confirms that the approach was successful where only 1.4 percent of respondents indicated that they pay a sewer bill. Yet, approximately 30 percent of respondents indicated that they did not know whether they had a septic system.
- A large portion of residents are unaware of best management practices for septic systems.
- One quarter of respondents indicated that they do not pump or maintain their septic system on a regular basis.
- Fifty-seven percent of respondents indicated that they have had their system pumped within the last five years.
- Respondents are unaware of the lifespan of septic systems. Approximately 68 percent indicated they did not know; 10 percent indicated systems last forever; 7 percent indicated 40 years; and 14 percent indicated that they lasted 20 or 30 years.
- The average year of installation was 1990. In other words, as of 2018, the average age of a septic system in the region is 28 years old.
- The median year of installation was 1992. In other words, half the systems in the region are older than 26 years.

The results of the survey were used to develop an information and education strategy that will help increase homeowner awareness of septic management practices and water quality within the region. The Clinton Conservation District has requested grant funding from the state to support implementation of the strategy. Furthermore, once historical well and septic records are digitized and integrated into the health department's new database, outreach strategies can be further tailored based on the status of homeowner's septic records.

Develop Healthy Waters, Healthy Families Program

The 2014 committee recommended that the health department should consider adopting an innovative ordinance that would require inspections of septic systems using a risk-based approach without delaying or preventing property transactions from proceeding. Under the recommended approach, the Health Department would use a narrow definition of "system failure" that would address failed systems with high risk to public health, such as those with illicit connections/direct discharges to surface waters or ponding

on the surface. The details of program mechanics and requirements would need to be developed and discussed further with stakeholders.

Implementation

The development of an outreach and education strategy, analysis of additional water quality samples, and launching the new IT system were necessary precursors to implementing this recommendation. Once those efforts were underway, the Clinton, Gratiot, and Montcalm Conservation Districts, in collaboration with the MMDHD, convened a new stakeholder committee in 2018 to discuss the development of Healthy Waters, Healthy Families program to develop sensible strategies to address failing septic systems within the region.

2018 MID-MICHIGAN WATER QUALITY COMMITTEE

The Clinton, Gratiot, and Montcalm Conservation Districts collaborated with the MMDHD to form the 2018 Mid-Michigan Water Quality Committee. This committee represents the interests from the three counties to identify sensible strategies to include in a septic management ordinance that would enhance public and environmental health and garner support within the region for consideration by the MMDHD Board of Health. PSC was hired to help guide the committee through the consensus building process. The committee met five times between February and April 2018 in Carson City, Michigan.

The committee discussed a wide range of topics, including current water quality conditions experienced throughout the region (see pages 11 to 13), financial mechanisms to support septic management, and alternative ordinance structures that could be used to address water quality concerns. Through these discussions, the committee developed a vision statement to help guide the region's septic management practices, while embracing the guiding principles that were previously set in 2014.

The rigorous and thoughtful discussion that occurred in these meetings led to the development of recommendations for consideration by the board of health and the boards of commissioners from its member counties. A summary of these discussions follows.

COMMITTEE VISION

The MMDHD collaborates with community partners to protect public health. Septic regulations are not necessarily burdensome and are administered in a trusted and transparent manner to ensure that water quality is safe. Residents are knowledgeable about maintaining their septic systems, and financial assistance is available to those who need support.

GUIDING PRINCIPLES

The Mid-Michigan Water Quality Committee reaffirmed the guiding principles previously established by the 2014 committee. These guiding principles, along with the committee's vision statement, articulate shared values of the group and should be used to evaluate recommendations.

- The health department has a responsibility to protect public health and the environment and minimize risks associated with unacceptable exposures.
- Failed wells and septic systems fall under the purview of the health department, which has a legal mandate and responsibility to assist residents and ensure compliance with existing regulations.

- Failing well and septic systems, especially those with an illicit or direct connection, constitute an environmental and public health risk that should be addressed.
- While educational efforts to increase homeowner awareness of effective well and septic system maintenance would likely have a positive effect on system failure rates, these efforts alone are not likely to address the range of existing problems (e.g., illicit or direct connections).
- Solutions to identified problems should be tempered by common sense and strike a balance between decreasing risks and economic costs borne by government, local communities, and individuals.
- The health department should maintain and enhance its collaborative relationships with service providers and residents as it regulates well and septic systems.
- The health department should establish criteria and measure the effectiveness of risk reduction activities over time.

FINANCIAL SUPPORT MECHANISMS

The costs of replacing or fixing a septic system can be substantial, especially for residents of limited means. Recognizing that new septic management requirements may necessitate some residents to invest in repairs or replacement of their septic system, the committee stressed the importance of developing financial support mechanisms to assist residents. PSC researched three approaches that have been used in other jurisdictions in Michigan that have potential to be used in Mid-Michigan.

MSHDA Loans

The state currently provides funding support to homeowners that can be used to finance septic system repairs or replacements through the MSHDA Property Improvement Program. The state uses a public-private partnership model in which funds are administered through private lenders, such as Chemical Bank, which serves Mid-Michigan. Loans of up to $25,000 may be made available for up to 20 years. Interest rates charged are determined by credit score and a sliding scale is used based on household income. More information is available on the program website.
http://www.michigan.gov/mshda/0,4641,7-141-45866_47906_49317-187374--,00.html

Oakland County Program

Oakland County provides funding support to homeowners that can be used to finance septic systems through its Home Improvement Program. The program leverages county dollars with grant funding from the federal Department of Housing and Urban Development Community Development Block Grant Program. Loans of up to $18,000 are available to homeowners. The program is structured as a zero percent loan, and loan recipients do not have to make any payments until they sell their house. Eligibility is determined by household size and income. More information is available on the program website:

https://www.oakgov.com/advantageoakland/communities/Pages/Home-Improvement-Program-and-Contractor-Opportunities-.aspx

Through the Community Development Block Grant program, larger communities such as Oakland County may receive funding directly from the federal government to address local priorities. Smaller communities, such as Clinton, Gratiot, and Montcalm Counties, may be required to access the funds through a state-administered program. Additional research would be needed to determine the potential to establish a similar program in Mid-Michigan.

State Watershed Implementation Grants

The MDEQ will issue grants to support septic management activities in areas with demonstrated water quality problems. To be eligible for this grant funding, the local health department must adopt a septic management ordinance that requires inspections.

This approach has been utilized by Ottawa and Shiawassee Counties. To date, Shiawassee County has received $375,000 through this program, which is administered through the conservation district to fund septic management activities in the portion of the Upper Maple River watershed in the county. The program will grant residents 75 percent of the cost to replace a septic system and provide funding to support septic inspections and pumping. Ottawa County has received $155,500 in grant funding and has a pending request of $262,000.

More information about the Shiawassee County program is available:
http://shiawasseeccd.org/wp/index.php/essential_grid/septic-system-replacement/

More information about the Ottawa County program is available:
http://www.ottawacd.org/pdfs/Septic_Assistance_Contract.pdf

The Clinton Conservation District has requested state funding to establish a similar program that could be available for residents in the Upper Maple River watershed, if the health department and its member counties choose to enact a septic management ordinance. Similar funding could be pursued in partnership with the Gratiot and Montcalm Conservation Districts to focus on other watersheds in the region.

ALTERNATIVE ORDINANCE STRUCTURES

The Mid-Michigan Water Quality Management Committee was charged with identifying sensible strategies to include in an ordinance that would enhance public and environmental health and garner support within the region. The committee evaluated two alternative ordinance structures. The first was a "time-of-sale model" that would require septic systems to be inspected when a property transaction occurs. The second was a "discharge permit model" that would require all developed properties to have their septic systems inspected on a periodic basis to verify the system is functioning as designed. For each approach, the committee was asked to consider the strengths and weaknesses, key elements of program design, and public reception. Key findings from the committee's discussion are provided in Exhibit 5. A detailed summary follows.

EXHIBIT 5. Alternative Ordinance Structure Summary

Points of Consideration	Time-of-sale Approach	Discharge Permit
Ordinance Structure	• Septic systems are inspected during a property transaction. Systems identified as failing need to be repaired or replaced.	• Properties receive a permit to discharge water from their septic system. Inspections are conducted periodically to make sure they continue to work as designed.
Strengths	• Inspections occur when money is changing hands. Buyers and sellers can negotiate costs of repairs and can include any costs in a mortgage or sale price. • This approach piggybacks on inspections that frequently occur during a transaction.	• Public health concerns would be addressed more quickly and consistently. • This mechanism ensures that systems operate as designed after installation. • This approach means a more predictable workload for stakeholders. • Some may consider this approach more equitable because all property owners are equally affected.
Weaknesses	• Many homes within the region do not sell frequently. Thus, the approach may not fully address public health problems. • Many properties transfer within families that may not be included within a time-of-sale model. • Time is of the essence during a real estate transaction. Some stakeholders have concerns about this approach delaying or complicating a sale. • After a sale occurs there is no mechanism to ensure that systems continue to function and protect public health. • This may cause a more unpredictable workload for stakeholders. • Some consider this approach less equitable because it only affects some properties.	• The approach would have a larger administrative footprint than alternatives. • Some property owners may be resistant to government intrusion onto private property. • There would be added costs for residents to complete inspections on a periodic basis.

Time-of-sale Approach

The committee discussed the strengths, weaknesses, and key elements of program design for the time-of-sale approach, which are summarized below.

Strengths

- Inspections usually occur during a transaction. This approach would require reporting results of the inspection to the health department, and nonfunctioning systems would be fixed when a large amount of money is changing hands during a transaction.
- Structuring the program to enable a sale to proceed regardless of the results of an inspection would resolve some of the concerns experienced in other jurisdictions that have implemented a time-of-sale ordinance.
- The approach would start to address the problem of identifying failing systems and illicit discharges.

- Structuring the program with a risk-based component would resolve some of the concerns experienced in other jurisdictions. Examples of a risk-based program could include providing exemptions for homes with a recently installed septic system or properties that would be demolished.
- An education and outreach component could target Realtors, pumpers, and inspectors. This approach could be simpler to implement than other alternatives.
- This approach involves a smaller-scale program than alternatives, which could reduce the administrative requirements for the health department and enhance public reception.

Weaknesses

- A time-of-sale model would only identify a limited number of properties within the region. Many homes do not sell for prolonged periods of time or are transferred within a family.
- Some members suggested that this approach may be less equitable than others because it would only affect some property owners rather than everyone with a septic system.
- Some members are concerned about slowing or complicating a home sale—even if a program is structured in a way that would allow a transaction to proceed regardless of the outcome of the inspection.
- The approach does not take steps to ensure that maintenance occurs after a sale.
- Both options may create economic hardships for residents, especially those of limited means.
- Health department systems need to ensure a speedy process. If health department staff are required to complete an inspection it could delay a sale. If proceeding with this approach, the health department should consider use of private inspectors.
- There will be additional fees for either the buyer or seller.
- The program may require additional health department capacity.

Key Elements of Program Design

To assist in its evaluation of the alternative approaches and to provide the board of health the information it would need to implement a program, the committee discussed the key elements of program design, if the approach was selected. If implemented, a time-of-sale ordinance should:

- Ensure the program is structured in a way that prevents or reduces delays for home transactions from being completed. The program should require an inspection but allow a transaction to proceed regardless of the results. Properties identified as failing would still need to be fixed.
- Use a narrow definition of failure that focuses on water quality and public health rather than the type of system installed.
- Utilize a risk-based approach that excludes certain properties (e.g., properties scheduled for demolition, a new system was recently installed).
- Include clear definitions of what transactions trigger an inspection and what constitutes a failure.
- Be transparent about the program budget including fees, income, expenditures and revenue.
- Include low fees that do not generate surplus revenue for the health department.
- Develop educational programs for residents.
- Create a simple method to enter data into the health departments new online system.
- Develop a process to certify third-party inspectors. Reciprocal arrangements should be pursued with neighboring jurisdictions.
- Ensure that an inspection is valid for a reasonable period of time.

- Identify a reasonable period of time for a system to be brought into compliance after an inspection has occurred.
- Include financial support mechanisms for families in need of assistance.
- Be structured to avoid conflict of interest scenarios where inspectors should not also perform repairs. Installers should not inspect systems they installed.
- Be implemented in a consistent and transparent manner.

Discharge Permit Approach

The committee discussed the strengths, weaknesses, and key elements of program design for the discharge permit approach, which are summarized below.

Strengths

- This approach would be more consistent than alternatives and would more quickly address public health concerns caused by failing systems because every property would be included. Unlike the time-of-sale approach, it would identify properties that are not sold often (or ever). It would also create a mechanism to identify and correct illicit discharges in a relatively short period of time.
- Unlike alternatives, this approach would create a mechanism for period maintenance that would better ensure properties continue to function as designed.
- Property owners would become more educated about septic system maintenance because they would be required to act periodically.
- This approach would enable faster home sales because, over time, systems would be fixed. It wouldn't slow transactions when issues are identified.
- The approach could create a more predictable workload for the health department.

Weaknesses

- There may be resistance from some property owners of government intrusion onto private property.
- Under both options, there would be added costs for homeowners that may create a financial burden on some, especially those of limited means.
- The health department workload would substantially increase, and additional staff may be necessary. The public may perceive this as government overreach. Some also expressed concerns about whether the program would generate revenue for the health department.

Key Elements of Program Design

To assist in its evaluation of the alternative approaches and to provide the board of health the information it would need to implement a program, the committee discussed the key elements of program design, if the approach was selected. If implemented, a discharge permit ordinance should:

- Require developed properties not connected to a municipal or community sewer system to be inspected on a periodic basis.
- Implement a risk-based approach that requires less frequent inspections for lower risk properties. For example, newly installed systems should not need to be inspected for a long period of time.
- Include a process to certify third parties to complete inspections.
- Consider including guidelines for prices charged by pumpers and inspectors.
- Include a robust outreach and education campaign to make sure residents are aware of requirements.

- Consider delaying implementation for a relatively short period while education and outreach occur.
- Create a simple reporting process with minimal data entry.
- Include financial support mechanisms for families in need of assistance.
- Use a performance-based approach; if an existing system meets water quality (public health) standards then it should "pass"—the type of system should not be the driving factor.
- Develop enforcement mechanisms that address properties where pumping and inspections have not occurred.
- Focus on properties for which no septic permit is on file and those near bodies of water when first implementing the program.
- Standardize pumping and reporting methods. Results should be reported to the health department.
- Stagger renewal dates throughout the year to help manage workload for pumpers, inspectors, and the health department.
- Include low fees that do not generate surplus revenue for the health department.

RECOMMENDATIONS

To address public health concerns in Mid-Michigan associated with septic system management, the Mid-Michigan Water Quality Management Committee offers a series of recommendations for the board of health's consideration. These recommendations include enhancing education and outreach, providing better access to financial support mechanisms, and updating the region's sanitary code to more proactively manage septic systems in the region. Implementing these recommendations would significantly reduce public health risks from failing septic systems.

EDUCATION AND OUTREACH

1. The health department should continue to collaborate with organizations such as the conservation districts, Realtors, septic inspectors, septic pumpers, lenders, and others to enhance education and outreach of residents regarding appropriate septic management practices and their relationship to local water quality.

FINANCIAL SUPPORT MECHANISMS

2. The health department, in collaboration with other stakeholders, should enhance awareness of existing financial support programs such as the MSHDA Property Improvement Loan Program to help residents access financial assistance related to septic management. The health department and partner organizations should proactively assist residents pursuing these funding opportunities. Additionally, the health department and its member counties should evaluate establishing additional local financial assistance programs.

UPDATE THE SANITARY CODE

3. The health department should update its sanitary code to require a discharge permit for all developed properties—including residential, commercial, agricultural, and industrial structures—with wastewater plumbing that is not connected to a municipal or community sewer system regulated by the state. Septic discharge permits should include the following elements:

a. Mandatory inspections of all septic systems at least every ten years. The health department may require more frequent inspections using a risk-based approach that includes the following features: age of system, condition of system, type of system, proximity to a water course, soil conditions, and water quality results. To develop and administer a transparent and consistent program, the health department should continue to engage stakeholders to create outcome-based guidelines that clearly articulate conditions under which inspections would occur more frequently.
b. Septic pumpers would be required to share records with the health department using a standardized reporting method, which will be maintained electronically by the health department. The health department should reserve the right to require an inspection and or repairs if pumping suggests a failure.
c. A narrow definition of system failure that grandfathers in systems that continue to operate as designed through a variance, even if they are not up to current installation standards, provided that no imminent health, safety, or environmental hazard is observed. The health department should communicate a clear definition of "failure" within these parameters. Systems identified as failing would require corrective action(s) to obtain a discharge permit. The health department should maintain its existing process that provides residents an opportunity to appeal a health department decision.

4. The code should provide the health department (or a designated agent) authority to inspect septic systems to ensure they meet discharge permit requirements.
5. The health department should develop a process to certify third-party entities to complete inspections. However, the code should also enable the health department to conduct inspections itself. While inspections may be completed by third parties, determinations of whether a system has passed or failed should be made by the health department following an inspection report. Inspections should utilize a standardized and streamlined process to collect and report information. As part of the certification process of third-party entities, the health department should develop quality assurance/quality control (QA/QC) processes to ensure certified inspectors are meeting health department standards. Certification processes should also be structured to eliminate real and perceived conflicts of interest that could occur if the same entities are performing inspections and completing repairs or replacements of systems.
6. The initial rollout of the program should be staggered over multiple years. Additionally, permit renewal dates should be staggered throughout the year to stabilize the workload for inspectors, pumpers, and the health department.
7. The program should be primarily funded through user fees collected by the issuance of discharge permits. To streamline collection of fees, inspectors should collect administrative fees directly from property owners when an inspection occurs; however, these fees are separate from the cost of an inspection itself. Administrative fees should provide adequate funding to the health department to administer the program, but should not create excess revenue for the health department. In other words, the program should be revenue neutral for the health department. The board of health should review fees annually.

IMPLEMENTATION

8. The health department should partner with a wide range of entities to inform residents about the updated ordinance as it is implemented.

9. The health department should develop and implement an education and outreach strategy that targets key stakeholder groups that would be affected by the updated ordinance, including Realtors, lenders, builders, septic inspectors, septic installers, local units of government, and watershed groups, such as the Friends of the Maple River.
10. The health department should phase in septic discharge permits over ten years. While all homes with septic systems would be required to obtain a permit, the following should be considered in a phased implementation approach listed in decreasing priority:

    a. All properties that interact with the health department regarding septic systems. In other words, any time a property owner seeks a permit related to a septic system (e.g., installation of a new system, or repairs to an existing system), the property should be inspected and issued a discharge permit.
    b. Properties that are adjacent to a watercourse such as a lake, river, stream.
    c. Properties located in a region with water quality samples that exceed safe levels.
    d. Properties for which no septic system construction permit is available at the health department.
    e. Properties for which septic system construction permits show that a system was installed at least 20 years ago.
    f. Properties for which septic system construction permits show that a system was installed ten to 19 years ago.
    g. Properties for which septic system construction permits show that a system was installed less than ten years ago.

Additionally, any property owner should be able to request a discharge permit at any time regardless of where their property fits within the priority schedule outlined above.

11. The conservation districts, in partnership with the health department, watershed groups, and other community partners, should continue to conduct water quality sampling of lakes, rivers, and streams within the three-county region. Sampling should assess E. *coli* levels and sources to monitor changes in public health risks associated with failing septic systems.
12. The health department should report on program achievements in its annual report and work with agencies such as conservation districts to regularly disseminate that information to the public.

NEXT STEPS

The committee's recommendations will be presented to the board of health for its consideration. If the board decides that it would like to pursue updates to its sanitary code, health department staff may be tasked with developing updated ordinance language. The language would be developed in coordination with stakeholders and presented in a draft form for approval by the board of health before going through a public review process. If the board decides to adopt updates, it must then also be approved by the boards of commissioners for Clinton, Gratiot, and Montcalm Counties to go into effect.

CONCLUSION

Mid-Michigan is facing a threat to public health. The lakes, rivers, and streams of Clinton, Gratiot, and Montcalm Counties are consistently showing bacteria levels too high to safely interact with the water through common recreational activities such as fishing, boating, and swimming. The conservation

districts of these counties have led efforts to assess conditions of the waterways and have shown that in every watershed where sampling has occurred, that E. *coli* levels exceed safe levels, sometimes at alarming rates. These sampling results have also demonstrated that human sewage from failing septic systems is a significant source of the contamination.

To begin to address these concerns, the Clinton, Gratiot, and Montcalm Conservation Districts, in collaboration with the health department, convened a group of community leaders that represent diverse interests from the three counties to discuss public health concerns associated with septic systems. The committee was charged with developing recommendations that would reduce public and environmental health risks associated with failing systems for consideration by the MMDHD Board of Health and the boards of commissioners from its member counties. The committee developed a series of recommendations to enhance education and outreach, provide better access to financial support mechanisms to repair and replace failing septic systems, and update the region's sanitary code to more proactively manage septic systems. The committee expects that implementing these recommendations would significantly reduce public health risks from failing septic systems without being overly burdensome on residents in the region.

The committee's recommendations will be presented to the MMDHD Board of Health, which is responsible for regulating septic systems in the region to ensure the protection of public health. The board will be faced with a decision of whether it will pursue a more proactive approach to keep the region's waterways safe from contamination or whether it will maintain a business-as-usual approach that has resulted in lakes, rivers, and streams that at times are unsafe to swim, boat, or fish.

GLOSSARY OF TERMS

This glossary may be useful as the board of health and community partners consider septic management practices within Clinton, Gratiot and Montcalm Counties. The following terms are included within the Mid-Michigan District Health Department's environmental health regulations or the MDEQ's water quality standards.

Alternative onsite sewage treatment system: Any proven method of onsite sewage treatment other than the conventional treatment tank with absorption trenches, bed, or seepage pit, providing for the protection of the environment through uniform distribution of the effluent to the final disposal system, enhanced treatment to the final disposal system or combinations thereof. Alternative systems include, but are not limited to, aeration treatment systems, pressurized mounds, and sand filters.

Absorption field, trench, or bed: A means of distributing septic tank effluent or outflow below the ground surface by means of a series of lines or drain tile laid on a bed of aggregate with openings, so as to allow the effluent or outflow to be absorbed by the surrounding soil and thence dispersed by evaporation, transpiration, or percolation.

Partial body contact recreation: Any activities normally involving direct contact of some part of the body with water, but not normally involving immersion of the head or ingesting water, including fishing, wading, hunting, and dry boating.

Septic tank: A watertight receptacle used for the purpose of receiving all domestic and organic sewage and so designed to permit the separation of solids in suspension from such wastes and to permit such retained solids to undergo decomposition therein, permitting the effluent or overflow to be disposed of in a manner consistent with the Departments Environmental Health Regulations.

Sewage: A combination of the domestic liquid or semi-solid wastes from a dwelling or habitable building. This includes human excreta, garbage disposal wastes, dishwater, bath water, laundry wastes, basement drains, etc.; but excludes roof storm water, water softener backwash discharge, footing drains and storm water discharge"

Sewage failure (existing MMDHD definition): A sewage failure shall include, but not be limited to, any condition where effluent from any sewage absorption system is exposed to the surface of the ground or is permitted to drain on or to the surface of the ground, into any ditch, storm sewer, lake or stream, or when the odor, appearance, or presence of this material may have an obnoxious or detrimental effect on or to the senses and/or health of persons. A sewage absorption system is considered to have failed if any one of the following conditions exists:

- The system does not accept effluent at the rate of application
- Sewage effluent seeps from, or ponds, on or around the absorption system, or contaminates the surface and/or groundwater
- When the backup of sewage effluent in a basement, indoor plumbing, or crawl space occurs

Total body contact recreation: Any activities normally involving direct contact with water to the point of complete submergence, particularly immersion of the head, with considerable risk of ingesting water, including swimming.

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