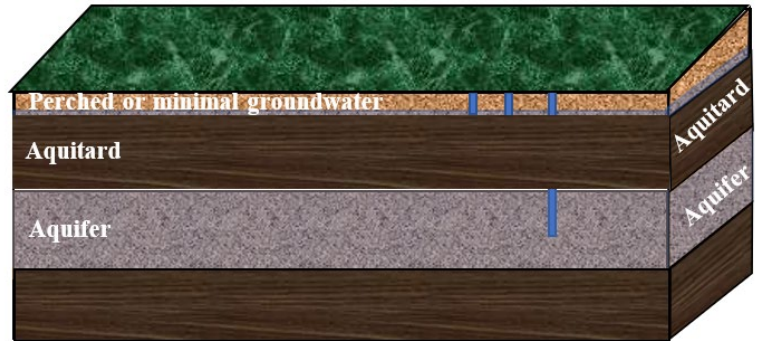


# GROUNDWATER NOT IN AN AQUIFER DETERMINATION

## Resource Materials

In order to promote a consistent and informed approach for Michigan Department of Environment, Great Lakes, and Energy (EGLE) staff, this document was developed by EGLE's Remediation and Redevelopment Division to provide information to EGLE staff and contractors regarding a Groundwater Not in an Aquifer (GWNIAA) Demonstration.



This document is available as a technical reference to assist any person interested in the required analysis and documentation regarding a determination that groundwater is not in an aquifer.

This document is explanatory and does not contain any regulatory requirements. It does not establish or affect the legal rights or obligations for the determination that groundwater is not in an aquifer. It does not have the force or effect of law and is not legally binding on the public or the regulated community. Any regulatory decisions made by the department regarding whether groundwater is in an aquifer will be made by applying the governing statutes and administrative rules to relevant facts.

Approved:

Mike Neller, Division Director  
Remediation and Redevelopment Division  
June 13, 2023

### RESCINDED

The following document is rescinded with the issuance of this document:  
*Storage Tank Division Operational Memorandum 11, Criteria to Eliminate the Potable Groundwater Pathway*, dated August 25, 1997.

## CONTENTS

<b>PURPOSE .....</b>	<b>1</b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
<b>2.0 GWNIAA QUANTITY AND HYDRAULIC COMMUNICATION EVALUATION .....</b>	<b>2</b>
<b>Condition 1 – Groundwater Quantity .....</b>	<b>2</b>
<b>CONDITION 2 – HYDRAULIC COMMUNICATION.....</b>	<b>4</b>
<b>3.0 SITE-SPECIFIC CONDITIONS THAT AFFECT THE GWNIAA EVALUATION .....</b>	<b>4</b>
<b>4.0 DOCUMENTATION OF GWNIAA.....</b>	<b>5</b>
<b>5.0 ADDITIONAL CONSIDERATIONS.....</b>	<b>7</b>
<b>APPENDIX A – KEY DEFINITIONS AND ACRONYMS .....</b>	<b>8</b>
<b>APPENDIX B – CROCK WELL COUNTIES.....</b>	<b>10</b>

---

This publication is intended for guidance only and may be impacted by changes in legislation, rules, policies, and procedures adopted after the date of publication. Although this publication makes every effort to teach users how to meet applicable compliance obligations, use of this publication does not constitute the rendering of legal advice.

EGLE does not discriminate on the basis of race, sex, religion, age, national origin, color, marital status, disability, political beliefs, height, weight, genetic information, or sexual orientation in the administration of any of its programs or activities, and prohibits intimidation and retaliation, as required by applicable laws and regulations.

To request this material in an alternate format, contact [EGLE-Accessibility@Michigan.gov](mailto:EGLE-Accessibility@Michigan.gov) or 800-662-9278.

## PURPOSE

This document is intended to provide guidance on the required analysis and documentation for a determination that groundwater is not in an aquifer (GWNIAA) under Part 201 and Part 213, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). State programs administered under other parts of the NREPA and Federal programs may have requirements in addition to those listed in this guidance. Questions about application of GWNIAA requirements in such programs should be addressed to staff in those programs prior to pursuit of a GWNIAA determination.

### 1.0 INTRODUCTION

A person proposing response activity or corrective action at a site must evaluate all reasonable and relevant exposure pathways based on site conditions and characteristics<sup>1</sup>. This document provides guidance for assessing the relevance of the exposure pathway for the ingestion of groundwater for drinking water (drinking water pathway) with a GWNIAA determination. An acceptable GWNIAA determination will include the required analysis and documentation as set forth in this guidance. If site conditions do not support a GWNIAA determination using this guidance a site-specific evaluation that demonstrates the required principles to determine groundwater is not in an aquifer may be prepared by a geologist, hydrogeologist, or qualified groundwater scientist for review and approval by the department.

Groundwater generic cleanup criteria have been developed<sup>2</sup> for ingestion of groundwater for drinking water (drinking water criteria) and are based upon the exposure assumption that the groundwater is in an aquifer. An aquifer is defined as a geological formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs<sup>3</sup>. The drinking water pathway is a relevant groundwater exposure pathway when the groundwater is in an aquifer or can reasonably be expected to transport contamination to an aquifer above criteria<sup>4</sup>.

To determine that the drinking water pathway is not relevant, the person proposing response activity or corrective action must document that groundwater is not in an aquifer; and must demonstrate that the formation or saturated zone being evaluated for the site is not currently or expected in the future to be in lateral or vertical hydraulic communication with any aquifer and cannot reasonably be expected to transport contamination into an aquifer in concentrations that exceed the generic residential drinking water criteria. Some areas of the State will generally not qualify for a GWNIAA determination (i.e., glacial interlobate areas, extensive outwash areas, etc.). The generic soil criteria developed to assure soils leaching contamination do not pose a

---

<sup>1</sup> Consistent with provisions of Part 201, or Part 213 and the Risk Based Corrective Action (RBCA) Process

<sup>2</sup> Sec. 20120a and Sec. 21304a

<sup>3</sup> R 299.1(e)

<sup>4</sup> R 299.10(1)

risk to the aquifer for drinking water are also not applicable at a site where a GWNIAA determination has been made for a formation or saturated zone<sup>5</sup>.

At a site where a GWNIAA determination has been made for a formation or saturated zone, it is still necessary to evaluate all other groundwater exposure pathways pertinent to that formation or saturated zone (e.g., groundwater venting to surface waters, volatilization to indoor air). Monitoring of, or other response activity or corrective action for, a saturated zone that is determined to be GWNIAA may still be necessary in relation to any other relevant groundwater pathway. At sites where multiple aquifers are present all potentially relevant exposure pathways must be assessed for each aquifer.

It is the responsibility of the person proposing response activity or corrective action for a site to provide the documentation for the determination that groundwater in the formation being evaluated is GWNIAA. If a GWNIAA determination is relied upon in a Final Assessment Report or Closure Report the analysis and documentation must be submitted to EGLE with the report. A No Further Action Report, or Response Activity Plan that relies upon a GWNIAA determination and is submitted for EGLE review and approval must contain the analysis and documentation. EGLE reserves the right to use site-specific data in review of GWNIAA determination proposals for each site or formation.

## 2.0 GWNIAA QUANTITY AND HYDRAULIC COMMUNICATION EVALUATION

Key definitions used for a GWNIAA evaluation are provided in Appendix A.

To substantiate a determination of GWNIAA the following conditions must be satisfied. The conditions address whether the formation or saturated zone yields a significant amount of groundwater and whether it can reasonably be expected to transport contamination to an aquifer above criteria. Information from sites in the immediate vicinity of the formation being evaluated that supported a GWNIAA determination may be substituted to support maximum sustainable yields if validated by an analysis of the areawide conditions. Some glacial interlobate and extensive outwash areas of the State are capable of yielding a sufficient amount of groundwater and will not be able to meet these conditions to qualify for a GWNIAA determination. State of Michigan and EGLE online resources [GeoWebFace](#) and [GIS Open Data](#) can aid in this determination.

### Condition 1 – Groundwater Quantity

The formation does not yield a significant amount of groundwater considering the local and regional hydrogeology. This condition can be met by satisfying any of the following options when the work conducted is overseen by a geologist, hydrogeologist, or qualified groundwater scientist:

---

<sup>5</sup> Sec. 20120a(8), R 299.22

- a. All monitoring wells<sup>6</sup> installed in the formation being evaluated bail or pump dry when pumped at a maximum pumping rate of 0.1 gallons per minute (gpm) and do not recharge to within 80 percent of the original well volume within 24 hours. Well locations must be spaced to accurately characterize the formation being evaluated throughout the site. Monitoring wells must be shown to have been installed properly and be in good condition, be a minimum of two inches in diameter, have at least 5 feet of screen length, and fully penetrate or be set at the base of the saturated zone.
- b. Aquifer testing that demonstrates the maximum sustainable well yield is less than 0.1 gpm. This may be accomplished with either slug tests or pumping tests as follows:
  - i. In situ hydraulic conductivity of the formation being evaluated determined by rising and/or falling head testing (slug tests) at a minimum of 5 separate locations. Results from the 5 locations cannot be averaged. Sieve analyses cannot be used to estimate or establish the hydraulic conductivity. Well locations and construction must be appropriate for the testing and locations and must be representative of the formation being evaluated. The exact number of tests will depend on the size and complexity of the site. Hydraulic conductivity results at or below  $1.0 \times 10^{-5}$  centimeters per second (cm/s) do not require any further determination of the aquifer yield. Maximum sustainable yield may be calculated based on slug test data that exceeds  $1.0 \times 10^{-5}$  cm/s using appropriate hydrogeologic equations that incorporate aquifer conditions (confined or unconfined), hydraulic conductivity and saturated thickness. A site-specific evaluation may demonstrate averaging of the slug test results to calculate the sustainable yield is representative of the site conditions.
  - ii. Pumping tests results that demonstrate the maximum sustainable well yield based on a constant rate pumping test, designed appropriately to test the formation being evaluated. Pumping tests must be run for sufficient time to determine aquifer hydraulic parameters, sustainable yields, the presence of any boundary conditions (e.g., impermeable boundaries, recharge from leaky confining layers), and to determine the effects of pumping on other aquifers. Plotting the drawdown versus time graphs in the field during the pumping test must be completed to determine when the pumping test can be terminated. Wells to be used (or plans for proposed wells) and aquifer analysis techniques must be appropriate to the test performed and site-specific conditions. EGLE [Aquifer Performance Test Guidance](#) is available to assist with design, data analysis and data presentation. Note: pumping test results may also provide data to evaluate Condition 2.
  - iii. Different testing methods that obtain actual site-specific hydraulic conductivity values to develop a maximum sustainable well yield may be proposed for department review and approval on a site-specific basis.

---

<sup>6</sup> Permanent monitoring wells used in this evaluation must be properly constructed, developed, and maintained in accordance with standard methods.

**Condition 2 – Hydraulic Communication**

The groundwater from the formation or saturated zone being evaluated cannot be in hydraulic communications such that the groundwater may reasonably be expected to transport contamination into an aquifer in a concentration that exceeds the generic residential drinking water criteria. This condition can be met by satisfying any of the following options when prepared or approved by a geologist, hydrogeologist, or qualified groundwater scientist or engineer:

- a. Documentation of the regional geology supplemented with site-specific information that supports that the saturated zone is not in communication with any aquifers either vertically or horizontally in the subsurface. Site-specific information may include:
  - i. Pumping tests results that demonstrate all water bearing lithologic units of the formation being evaluated are isolated and discrete, do not provide a means for migration, and are not in communication with an aquifer via any subsurface hydrogeologic route.
  - ii. Boring and/or monitoring well logs, geophysical information, etc.
- b. A demonstration that all of the formation groundwater is directly discharging to a surface water of the State that is not locally recharging an aquifer. This option may support a GWNIAA determination and that the drinking water pathway is not relevant, but the Groundwater-Surface Water Interface pathway must be evaluated as a relevant pathway.
- c. A fate and transport assessment that includes modeling results supported by site-specific information and field data that indicates that contaminants will not reach an aquifer above drinking water criteria.

To provide an acceptable GWNIAA demonstration one of the listed Condition 1 options regarding groundwater quantity and one of the listed Condition 2 options regarding hydraulic communication must be met. Additional considerations, outlined in Section 3.0, may affect the analysis and the GWNIAA evaluation. If these conditions cannot be met and an approvable site-specific GWNIAA evaluation has not been submitted to EGLE, then the groundwater is considered in an aquifer and the drinking water pathway must be evaluated as a relevant pathway.

**3.0 SITE-SPECIFIC CONDITIONS THAT AFFECT THE GWNIAA EVALUATION**

The evaluation regarding groundwater quantity and hydraulic communication should determine if any of the following are applicable to the site conditions:

1. An additional level of characterization and evaluation will be necessary for any site located in the vicinity of a public water supply field or within a wellhead protection area (WHPA) because of the potential for a hydraulic connection to develop between the GWNIAA and the aquifer in use. [Michigan's Wellhead Protection Program's](#) purpose is to protect public water supply systems, which use ground water, from potential sources of contamination. The WHPA is a component of the protection by identifying the area which contributes groundwater to the public water supply system wells. Location information for WHPAs is available from [EGLE's Environmental Mapper](#).

- a. WHPA information may lead to the conclusion that the groundwater yields would not support a GWNIAA determination.
  - b. The hydrogeologic study to identify the contributing area to the public water supply system wells may provide information for the evaluation of whether the aquifer responds as a confined or unconfined aquifer.
2. There are geologic formations around the state in which groundwater yield is limited but may still be a water source using crock wells or drilled wells. The map in Appendix B shows the counties that may have existing crock wells.
- a. If the formation meets the conditions outlined above but is being used for drinking water, a GWNIAA determination that would make the drinking water pathway not relevant is not appropriate protection of public health.
  - b. If the formation meets the conditions outlined above but used for irrigation, stock watering, process waters, or other nondrinking water uses there is evidence of yield capabilities that may be inconsistent with a GWNIAA determination.
3. A confining layer that is being relied upon to provide isolation so that groundwater is not reasonably expected to transport contamination above residential drinking water criteria into an aquifer must be demonstrated to sufficiently provide a hydraulic barrier. If the confining layer is not sufficiently providing a hydraulic barrier, a GWNIAA determination is not appropriate. The following conditions must be evaluated:
- a. If the confining layer contains water bearing seams, it must be determined whether these water bearing seams are isolated from any aquifer.
  - b. If the confining layer has been compromised by historic investigations, oil or drinking water wells, or construction activities, it must be shown that all wells or borings were constructed and/or abandoned properly so that there is not a conduit for groundwater to migrate to an aquifer.
  - c. Based on the contamination released, the potential for migration of NAPL through the confining layer.

#### **4.0 DOCUMENTATION OF GWNIAA**

The evaluation of the geologic and hydrogeologic conditions, which determines that the drinking water pathway is not relevant and that a GWNIAA determination is appropriate, must be documented. It is the responsibility of a geologist or qualified groundwater scientist to prepare or review the documentation for the determination that groundwater in the formation being evaluated is GWNIAA. As a part of the preparation of the documentation the local or county Health Department for the location must be notified that a GWNIAA determination is being considered. The documentation must address the following, if any component is not applicable the documentation must contain the basis for that conclusion.

1. A detailed description of the regional geologic, hydrogeologic and topographic conditions including:
  - a. A representative number of accurately scaled cross-sectional drawings oriented both lateral and perpendicular to the axis of the plume (or to groundwater flow if there is no distinguishable plume), showing topography, geology, groundwater conditions, and other pertinent features such as utility corridors, man-made structures such as drains and tiles, etc.
2. Documentation of whether the site is located in an WHPA and the evaluation of the WHPA information regarding groundwater yields and potential hydraulic connections to the formation being evaluated.
3. An evaluation of the regional geologic, hydrogeologic and topographical conditions in support of a conclusion that the formation being evaluated does not or will not yield a significant amount of groundwater.
  - a. All data and analyses for any aquifer testing, pumping tests, slug tests, other in situ hydraulic conductivity tests and/or well bailing or purging tests.
  - b. The analysis of the areawide conditions and information from sites in the immediate vicinity if substituted for site-specific information to support maximum sustainable yields.
4. An evaluation of the regional geologic, hydrogeologic and topographical conditions in support of a conclusion that the formation being evaluated does not or will not transport contamination into an aquifer in a concentration that exceeds the generic residential drinking water criteria.
  - a. Accurately scaled contour and isopach maps of the site showing, in plan view, the water table surface and the distribution and the thickness of the formation being evaluated and the formations or stratigraphic units that prohibit hydraulic communication with groundwater in an aquifer or other saturated zone.
  - b. A comparison of the groundwater elevations in the formation being evaluated to groundwater levels in the local aquifer(s) (if present). This comparison should identify and evaluate any seasonal variability in static water elevations.
  - c. Accurately scaled map(s) of the site showing pertinent buried utility corridors and other subsurface structures, including wells, surface drains and/or drainage tiles, etc., and the evaluation of whether they may act as contaminant migration routes or otherwise alter groundwater levels due to their depth or proximity to the groundwater.
  - d. Documentation of potential contamination migration routes and evaluation of whether they may result in a hydraulic communication with an aquifer.
    - i. The location of the nearest drinking, irrigation, process or other water supply well(s) and the evaluation of whether there is a hydraulic connection to the aquifer used for such water supply wells.
    - ii. Proximate boring and well logs, area water well logs, and closest municipal water supply well(s) records to evaluate the continuity of the lower confining layer.
  - e. Documentation that a confining layer is a sufficient hydraulic barrier.



- f. Results of any fate and transport assessment if conducted to demonstrate that contamination from the formation will not reach an aquifer above criteria, including modeling inputs, results, and field data to validate.
  - e. If relied upon to support there is no hydraulic connection, documentation that supports the formation groundwater is discharging to surface waters of the state.
  - f. The analysis of areawide conditions and information from sites in the immediate vicinity if substituted for site-specific information to support there is no hydraulic connection.
5. Documentation that the local or county health department was contacted to determine if crock wells or drilled wells for any private water usage exist or could exist in the future in the vicinity of the site, and any concerns that the local health department has regarding the site and/or the GWNIAA determination.

## 5.0 ADDITIONAL CONSIDERATIONS

Consideration should be given to the potential for effects resulting from planned changes in site conditions or reasonably foreseeable potential future uses of the groundwater in the formation being evaluated by any user within the bounds of the site. If there is a reasonably foreseeable change in site conditions due to construction or other subsurface activities that would change the conditions, the GWNIAA determination may not be appropriate. If the GWNIAA is not appropriate, additional controls may be necessary, such as restrictive covenants, local ordinances, permanent markers, etc.

If groundwater at a site is determined to be GWNIAA but contaminant conditions and/or other pathway evaluations at the site would otherwise require land or resource use restrictions, it may also be prudent to include notice of the GWNIAA determination, and impose specific land use restrictions to prevent the authorization of crock wells, the installation of wells through the protective layer that could interconnect aquifers, and the relocation of soils that are not protective of drinking water.

Property owners and operators should be mindful that there may be soil conditions on their property that are not currently a risk because of a GWNIAA Determination, but which could pose a risk if relocated. Likewise, actions could be taken at the property which could cause GWNIAA to become connected to an aquifer (e.g., drilling of wells or construction that penetrates a confining layer). Such actions could result in unacceptable risks and liability for causing a release. Care should be taken to ensure that this does not occur.

## APPENDIX A – KEY DEFINITIONS AND ACRONYMS

### Key definitions and acronyms for terms used in this document:

<b>NREPA:</b>	The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended
<b>Part 201:</b>	Part 201, Environmental Remediation, of the NREPA
<b>Part 213:</b>	Part 213, Leaking Underground Storage Tanks, of the NREPA
<b>Contamination:</b>	Includes hazardous or regulated substances that have been released and are present above criteria
<b>Criteria or criterion:</b>	Includes the cleanup criteria for Part 201 of the NREPA and the Risk Based Screening Levels as defined in Part 213 of the NREPA
<b>EGLE:</b>	Michigan Department of Environment, Great Lakes, and Energy
<b>Site:</b>	Includes “facility” as defined by Part 201 of the NREPA and “site” and “property” as defined by Part 213 of the NREPA

- **Aquifer:** a geological formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs<sup>7</sup>. In the context of a GWNIAA determination, the relevancy of the drinking water pathway must be evaluated regardless of any existing restrictions that prohibit drinking water use for an aquifer.
- **Confining Layer:** geological material through which significant amount of water cannot move, also defined as an aquitard or aquiclude. Aquitard: a geologic formation, group of formations, or part of formation through which virtually no water moves. Aquiclude: a saturated, but poorly permeable bed, formation, or group of formations that does not yield water freely to a well or springs.
- **Crock Well:** a well constructed by excavating or boring a large diameter hole and placing vitrified clay tiles, pre-cast concrete pipe, or stone as casing, side walls or fill to keep the excavation from collapsing. Appendix B shows counties that may have existing crock wells.
- **Drilled Well:** a well constructed through the subsurface to the saturated zone to access groundwater. To evaluate aquifer properties and hydraulic communications the drilled well must be properly constructed and developed in accordance with standard methods.
- **Formation:** a distinctive lithologic and stratigraphic unit that has a consistent set of physical characteristics and distinguishes it from adjacent lithologic units that is large enough to be mappable and traceable. A formation may contain more than a single saturated zone.

---

<sup>7</sup> R 299.1(e)

- **Geologist or qualified groundwater scientist:** a scientist or engineer who has received a baccalaureate or postgraduate degree who has sufficient training and experience in groundwater hydrology and related fields, to support decisions regarding groundwater monitoring, geological conditions, and contaminant fate and transport.
- **Groundwater:** water below the land surface in a zone of saturation<sup>8</sup>.
- **Interlobate Areas:** areas where glacial lobes converged and overlapped, resulting in highly unpredictable geology due to multiple sources of deposition, retreat, outwash and readvance of the glacial fronts. State of Michigan and EGLE online resources [GeoWebFace](#) and [GIS Open Data](#) can aid in this determination.
- **Saturated Zone:** the formation immediately below the water table where the pores, fractures and cavities in soil and rocks are filled with water.
- **Significant amount of groundwater:** a sustained production of groundwater at greater than 0.1 gallons per minute.
- **Surface waters of the state:** the Great Lakes and their connecting waters, inland lakes, rivers, streams, impoundments, open drains, wetlands, and all other water courses and bodies of water within the jurisdiction of the State<sup>9</sup>

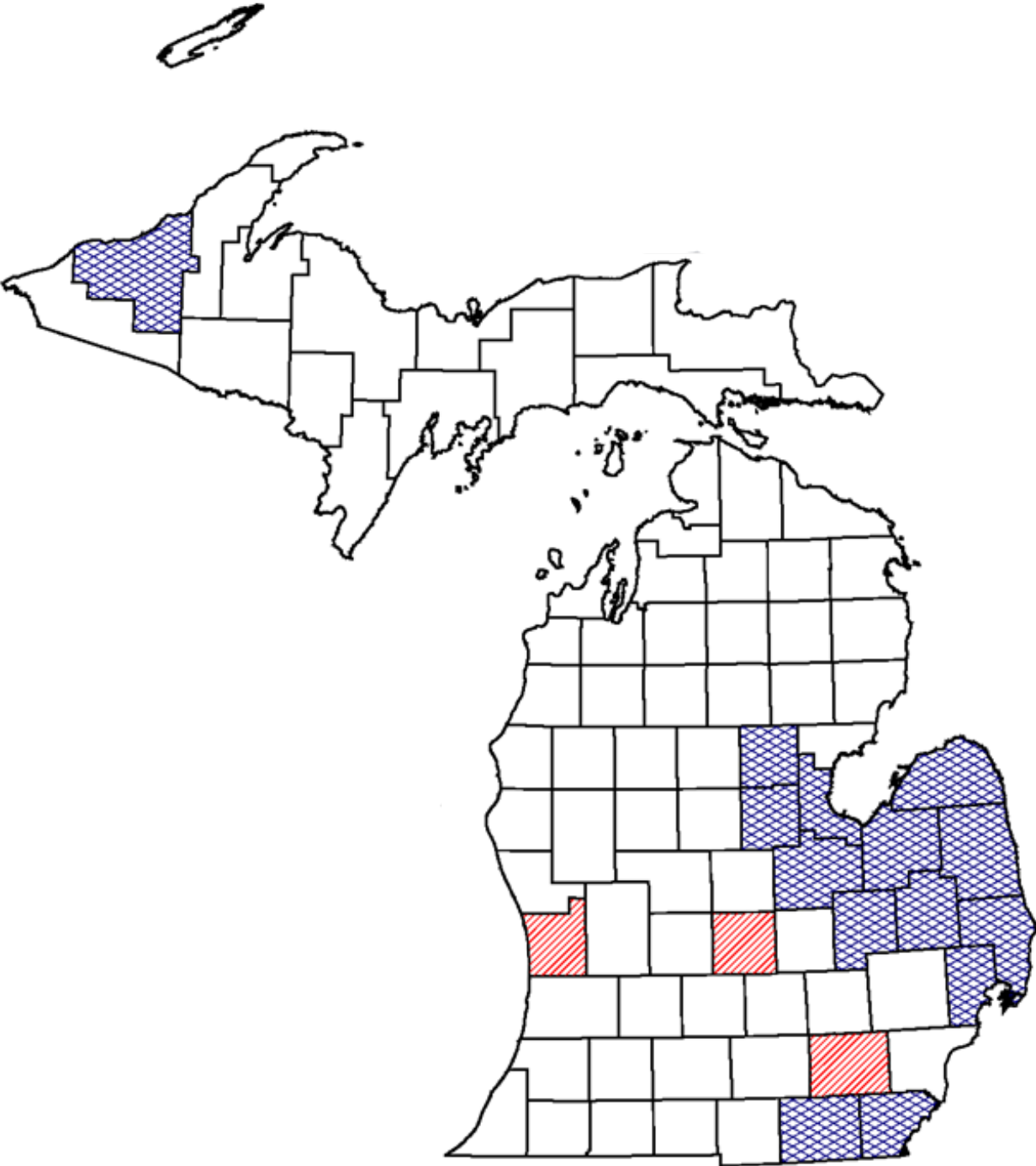
---

<sup>8</sup> R 299.1(m)

<sup>9</sup> R 323.1044(u)

# APPENDIX B – CROCK WELL COUNTIES

Counties with Crock Wells



There may be crock well or drinking water wells in low permeability geologic formations not indicated on this map. Local Health Department should be contacted for confirmation.