UNDERSTANDING RISK: WHAT'S BEHIND THE NUMBERS
Per- and polyfluoroalkyl substances (PFAS)

What is PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a family of man-made chemicals, including PFOS, PFOA, PFBS, PFHxS, PFNA, and many others, that have been used in manufacturing and commercial products since the 1940s. Practical uses of PFAS include non-stick surfaces on cooking pans and food wrappers, waterproofing chemicals, foams used to fight fires, and in industries to keep fumes down for worker safety. PFAS have also strayed outside of the factory and can now be found in food, drinking water, surface water, groundwater, air, and wild game.

PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PFNA	Perfluorononanoic Acid
PFHxA	Perfluorohexanoic Acid
PFHxS	Perfluorohexane Sulfonic Acid
PFBS	Perfluorobutane Sulfonic Acid
GenX™	GenX™

Roles of Agencies Protecting Public Health

Several organizations throughout the government work to ensure that public health is protected when it comes to drinking water and contaminants. Some work to enforce regulations; others are focused on learning about where the contamination is coming from and where it has spread in the area; others assess who is at risk of exposure to ensure contaminant levels remain within acceptable limits based on the best available science of the time.

The Centers for Disease Control and Prevention's (CDC) Agency for Toxic Substances and Disease Registry (ATSDR) and the U.S. Environmental Protection Agency (US EPA) develop health-based values, screening levels, regulatory standards, and laws to protect the environment and general population from exposure to hazardous levels of contamination on a national basis. Locally, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) is charged with developing and implementing legally enforceable criteria and laws that protect the environment and general population in Michigan.

The Michigan Department of Health and Human Services (MDHHS) uses health-based values and screening levels as a part of their effort to determine when public health investigations are necessary to assess sites of contamination where people are at risk from breathing, eating, drinking, or touching the chemicals.

Overview of Screening Levels, Criteria, and Laws

Screening levels, criteria, and laws are determined by the:

- population they are meant to protect,
- amount of time the population needs protection,
- life stage and/or age of the population that needs protection, and
- negative health outcomes they are meant to protect against - whether it's cancer or another health problem (aka *non-cancer risk*).

Screening levels, criteria, and laws may take into account the:

- multiple ways people can be exposed to the chemical,
- length of time people have been exposed to the chemical,
- age of people when they were exposed to the chemical,
- technologies available to address the chemical, and
- economic considerations for regulations.

Developing health-based values, screening levels, criteria, and laws for well-studied chemicals, like lead or arsenic, is complicated. It's even more complicated when the chemicals in question (PFAS) have a number of chemical variations (for example, PFOS, PFOA, PFNA) and an ever-growing body of scientific knowledge.

UNDERSTANDING RISK: WHAT'S BEHIND THE NUMBERS

Terms & Decisions

Individual vs. Population Health

There is no way to predict if health effects - cancer or not - will occur in any individual if they are exposed to harmful chemicals, including PFAS. The numbers used by the US EPA, ATSDR, EGLE, and MDHHS are meant to protect the population as a whole based on what we know about the population and the known health effects of the chemical.

Although PFAS have been used since the 1940s, the science around PFAS is still in its early stages. We do not yet understand everything there is to know about how PFAS travel in the environment and where they go, how many there are, and the effects they may have on human health. However, we do know, based on CDC studies, that almost everyone has some amount of several PFAS, as well as other industrial chemicals, in their bodies at any given time.

If you think you've been exposed to PFAS and are concerned about your health, talk to your healthcare provider. They can watch more closely for signs of health problems linked to PFAS.

Why do different levels exist for the same chemical?

Health-based values, screening levels, criteria, and laws serve different roles. Where criteria and laws are meant to be a hard stop – a red light at the intersection that applies to everyone equally, public health drinking water screening levels are a blinking yellow – meaning proceed with caution and consider the various factors on a case-by-case basis. Criteria and laws can include technological and economic considerations, whereas public health screening levels do not. This can result in lower public health screening level values and may prompt public health actions even when regulations are being met.

Decision points

Because all of these levels serve different purposes, toxicologists need to have an understanding about why a level is being developed. Once they know that, there are several factors that require a decision.

Any one of the decisions made can result in a level being different at the end of the calculation. However, the level should still be protective for the reason it was calculated. For the purpose of this document, these places where decisions need to be made will be called Decision Points.

Exposure assumptions or scenario

All decisions need to be critically evaluated and justifiable. Data-driven decisions are the most scientifically defensible; however, it is not uncommon to have inputs for which there are no data. In the cases where there are no data, toxicologists may use the US EPA Exposure Factors Handbook to find commonly agreed upon assumptions about pathways and lifestyles to plug into their equations.

Since it is impossible for scientists to develop custom exposure assumptions for each of us individually, it is necessary for them to make certain assumptions about exposure pathways and lifestyles in general when calculating public health risk. The assumptions used by most toxicologists come from the US EPA Exposure Factors Handbook. This handbook is available at http://1.usa.gov/1Zx5wI2. These assumptions are developed through careful review of numerous scientific studies from a variety of sources and are widely used by toxicologists for this purpose.

Terms

The following pages provide definitions for all of the factors that may go into determining a screening level or criterion and show the levels used by various states and federal agencies currently. These levels will continue to change - not just in Michigan, but also nationally - and more PFAS chemicals will likely be added in the future as more is learned.

The terms defined in this document include:

- Populations at risk
- Relative Source Contribution (RSC)
- Unacceptable risk
- Critical study/Co-studies
- Point of Departure (POD)
- Uncertainty and Modifying factors
- Toxicity value
- Screening levels

Terms & Decisions

Decision Point: *Populations at risk*

Before they start developing a screening level or criterion, toxicologists need to know: who is this level supposed to protect? If the level is going to be used to protect workers in a job setting, they won't have to account for children or anyone for more than 8 to 12 hours at a time. However, if it's a chemical that can be found in many places, then other decisions have to be made, including assessing who is most at risk. For example, if the chemical affects human development, then it would be important to protect to a level that is safe for children rather than adults. Changing the target population can result in changes in calculation methods and the resulting screening level and criterion.

To ensure these levels are sufficiently protective for everyone who consumes water, toxicologists considered PFAS exposures for:

- infants that may be breast- or formula-fed
- children
- adults

Concerned about protecting the most vulnerable in the population, MDHHS evaluated toxicokinetic models that account for the transfer of PFAS from the mother to the fetus during pregnancy, along with exposure from breast milk or reconstituted formula made with tap water following birth.

Because certain chemicals, including PFAS, can remain in the body for a long time and chemical exposures that happened well in the past may eventually be harmful to the fetus, MDHHS considered fetal exposure when calculating their screening levels.

Decision Point: *Relative Source Contribution*

The Relative Source Contribution (RSC) takes into account where else people may be exposed to a certain chemical in their everyday lives, excluding the source of concern for which the screening levels are being developed (in this case, drinking water). RSCs typically vary between 20% and 80% to account for people's exposure through a source other than the environmental media being considered. For example, use of an RSC of 20% for a drinking water screening level indicates that 20% of an individual's total exposure is assumed to come from drinking water while 80% of the individual's total exposure is assumed to come from other non-drinking water sources.

Because you can be exposed to PFAS from many sources besides water – including fish and game – including an RSC is a decision point that toxicologists need to consider when calculating screening levels.

Decision Point: *Unacceptable Risk*

Toxicologists use the term "unacceptable risk" when calculating levels to signal a point at which risk extends beyond that which an individual would be expected to take on otherwise. Individuals make choices each day that involve some degree of risk to them and their families. Similar to other risks, a person needs to decide how much risk is acceptable or unacceptable to them. Screening levels provide individuals who have PFAS in their drinking water a comparison to consider their level of risk tolerance compared to a health protective and science-based value. Criteria and laws standardize the risk level to ensure that everyone has the same baseline of protection.

(continued on the next page)

Terms & Decisions

Decision Point: *Critical Study & Co-critical Studies*

When developing toxicity values (see page 5 for definition), toxicologists start by looking at scientific studies that have been conducted and published in science journals that have high integrity. The studies are reviewed, and one is selected to be the critical study for the purpose of developing the toxicity value. Sometimes, if multiple adverse health effects are identified, more than one study may be selected:

Critical study

- Selected because it has the most conservative health effect observed in all of the studies.
- Typically, this is the health endpoint resulting from the lowest dose laboratory animals were given.

Multiple co-critical studies

- Used when different health effects result from relatively similar exposures.
- A toxicity value may be selected that represents an average of these exposures, if needed

A study using laboratory animals is often selected as the critical study. Animal studies ensure exposure amounts to contaminants are controlled and adverse health effect have been caused by exposure to those controlled amounts.

In some situations, humans have been exposed to a contaminant and health effects have actually been linked to exposure to that contaminant. In these cases, epidemiological studies can provide information on potential health effects in humans. This weight of evidence can provide additional support to adverse health effects seen in animal studies. In rare situations, a human epidemiological study can be used as the critical study, but only if information on the human exposure is very detailed.

If the study was conducted in laboratory animals, health effects identified in the critical study should be biologically relevant and plausible for humans.

The selected critical study helps inform the toxicologist's decision points for:

- a point of departure
- uncertainty and modifying factors

These three decision points from the critical study are used to develop a toxicity value. To develop a toxicity value, the point of departure is divided by the uncertainty factor and the modifying factor.

Decision Point: *Point of Departure (POD)*

The point of departure (POD) may be the amount of an administered dose, a modeled (estimated) dose, or a serum level typically from laboratory animal studies. These PODs may represent doses or levels where health effects were or were not found. The POD selected helps to inform the uncertainty factors (described below).

Examples of PODs are:

- No Observed Adverse Effect Level (NOAEL)
- Lowest Observed Adverse Effect Level (LOAEL)
- Benchmark Dose Lower Limit (BMDL)

Decision Point: *Uncertainty Factors & Modifying Factors*

Choosing uncertainty and modifying factors allows toxicologists to account for:

- uncertainties due to differences among humans,
- uncertainties due to differences between laboratory animals and humans,
- characteristics of the critical study, and

Terms & Decisions

Decision Point: *Uncertainty Factors & Modifying Factors (continued)*

- the amount and type of available information on the chemical.

Individual uncertainty and modifying factors can range from 1 (greater certainty) to 10 (greater uncertainty). The total uncertainty is the product of the individual uncertainty and modifying factors.

Decision Point: *Toxicity Value*

Toxicity values can take myriad forms to serve many purposes, but the goal of all is to identify a number that can be used as a basis for toxicologists to determine how much exposure to a substance is unlikely to result in an increased risk of developing health effects over a defined period of time, typically a lifetime. Toxicity values are based on a critical study or studies. They are determined by dividing the estimated human dose converted from laboratory animal doses or serum levels (point of departure) by the product of the uncertainty and modifying factors.

The types of toxicity values include:

US EPA's Reference Doses (RfD)
An estimate (with uncertainty spanning up to an order of magnitude) of how much of a chemical humans (including the vulnerable populations) can be exposed to daily that is unlikely to cause an increased risk of harmful effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. These are generally used in US EPA's non-cancer health assessments.

Agency for Toxic Substances and Disease Registry's Minimal Risk Levels (MRL)
An estimate of the amount of a chemical a person can eat, drink, or breathe each day without a detectable risk to health. MRLs are developed for health effects other than cancer.

Toxicity values are used to develop regulatory and screening levels.

Decision Point: *Screening levels*

A screening level is the amount of a chemical in an environmental media, like drinking water or soil, for which there is minimal or no risk of developing a health effect for the populations exposed to that chemical.

Calculations for screening levels and criteria consider the real-world circumstances that result in exposure, including the:

- multiple ways people can be exposed to the chemical,
- duration of exposure to the chemical
- age(s) at time of exposure to the chemical

The assumptions that toxicologists use to develop these numbers are also determined by:

- the population(s) they are meant to protect
- the amount of time this population needs protection
  (e.g., is this a one-time exposure with limited impact or is there potential for long-term, exposure)
- consideration for the life stage/age of population that needs protection
- negative health effects they are meant to protect against - whether it's cancer or another health problem (aka non-cancer effects)

UNDERSTANDING RISK: WHAT'S BEHIND THE NUMBERS

PFOS

What are the health effects?

Scientists are still learning about PFAS and how they affect humans. To date, the most is known about health effects linked to PFOS and PFOA.

Non-Cancer Health Effects

- Pregnancy-induced hypertension/preeclampsia
- Liver damage, as evidenced by increases in serum enzymes and decreases in serum bilirubin levels
- Increases in serum lipids, particularly total cholesterol and low-density lipoprotein (LDL) cholesterol
- Increased risk of thyroid disease
- Decreased antibody response to vaccines
- Increased risk of decreased fertility
- Small decreases in birthweight

Screening values and criteria are meant to be protective of the population as a whole. Individual health factors and genetics determine your actual personal risk. Exposure does not guarantee that you will experience adverse health effects.

Why do the numbers vary?

When developing screening values and criteria, scientists will use the best available science at the time. When it comes to emerging contaminants like PFAS, science is constantly evolving, and therefore so are the public health recommendations.

To learn about the various assumptions and methods that are used to develop these numbers, please see page 1-6.

70 ppt - US EPA (2016)

- Lifetime Health Advisory (LHA) developed by the US Environmental Protection Agency (US EPA)
- For PFOS individually or in combination with PFOA (2016)
- Uses the US EPA Reference Dose (RfD)
- Assumes drinking water intake for a woman who is breast-feeding
- Assumes daily exposure

52 ppt - ATSDR - Adults (2018)

- Environmental Media Evaluation Guide for adults only developed by the CDC's Agency for Toxic Substances and Disease Registry (ATSDR)
- Uses the ATSDR intermediate Minimal Risk Level (MRL)
- Assumes adult drinking water intake
- Assumes daily exposure
- Assumes no Relative Source Contribution

15 ppt - New Hampshire (2019)

- Proposed Maximum Contaminant Level developed by the New Hampshire Department of Environmental Services
- Uses the Minnesota Department of Health Reference Dose (RfD)
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes drinking water intake varies by age
- Assumes a 50% Relative Source Contribution

15 ppt - Minnesota (2019)

- Short-term, Subchronic, and Chronic Non-Cancer Health-based Value developed by the Minnesota Department of Health
- Protective of breastfeeding infants, both from exposure they may receive prenatally and while breastfeeding
- Uses the Minnesota Department of Health RfD
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes drinking water intake varies by age
- Assumes daily exposure

14 ppt - ATSDR - Children (2018)

- Environmental Media Evaluation Guide for children only developed by ATSDR
- Uses the ATSDR MRL
- Assumes drinking water intake for children less than 1 year
- Assumes daily exposure
- Assumes no Relative Source Contribution

13 ppt - New Jersey (2017)

- Proposed health-based Maximum Contaminant Limit (MCL) developed by the New Jersey Department of Environmental Protection
- Uses the New Jersey RfD
- Assumes adult drinking water intake
- Assumes daily exposure
- Assumes a 20% Relative Source Contribution

8 ppt - Michigan (2019)

- Screening level developed by the Michigan Department of Health and Human Services
- Uses the ATSDR MRL
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes water intake varies by age
- Assumes daily exposure
- Assumes a 50% Relative Source Contribution

UNDERSTANDING RISK: WHAT'S BEHIND THE NUMBERS

PFOA

What are the health effects?

Scientists are still learning about PFAS and how they affect humans. To date, the most is known about health effects linked to PFOS and PFOA.

Non-Cancer Health Effects

- Pregnancy-induced hypertension or preeclampsia
- Liver damage, as evidenced by increases in serum enzymes and decreases in serum bilirubin levels
- Increases in serum lipids, particularly total cholesterol and low-density lipoprotein (LDL) cholesterol
- Increased risk of thyroid disease
- Decreased antibody response to vaccines
- Increased risk of asthma diagnosis
- Increased risk of decreased fertility
- Small decreases in birthweight

Potential Cancer Risk

- PFOA is also linked to testicular and kidney cancer.

Screening values and criteria are meant to be protective of the population as a whole. Individual health factors and genetics determine your actual personal risk. Exposure does not guarantee that you will experience adverse health effects.

Why do the numbers vary?

When developing screening values and criteria, scientists will use the best available science at the time. When it comes to emerging contaminants like PFAS, science is constantly evolving, and therefore so are the public health recommendations.

To learn about the various assumptions and methods that are used to develop these numbers, please see page 1-6.

78 ppt - ATSDR - Adults (2018)

- Environmental Media Evaluation Guide for adults only developed by the CDC's Agency for Toxic Substances and Disease Registry (ATSDR)
- Uses the ATSDR Minimal Risk Level (MRL)
- Assumes adult drinking water intake
- Assumes daily exposure
- Assumes no Relative Source Contribution

70 ppt - US EPA (2016)

- Lifetime Health Advisory (LHA) developed by the US Environmental Protection Agency (US EPA)
- For PFOA individually or in combination with PFOS (2016)
- Uses the US EPA Reference Dose (RfD)
- Assumes water intake for a woman who is breastfeeding
- Assumes daily exposure

35 ppt - Minnesota (2018)

- Short-term, Subchronic, and Chronic Non-Cancer Health Risk Limit developed by Minnesota Department of Health
- Protective of breastfeeding infants, both from exposure they may receive prenatally and while breastfeeding
- Uses the Minnesota Department of Health RfD
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes water intake varies by age
- Assumes daily exposure
- Assumes a 50% Relative Source Contribution

21 ppt - ATSDR - Children (2018)

- Environmental Media Evaluation Guide for children developed by ATSDR
- Uses the ATSDR MRL
- Assumes water intake for children less than 1 year
- Assumes daily exposure
- Assumes no Relative Source Contribution

14 ppt - New Jersey (2017)

- Proposed health-based Maximum Contaminant Limit (MCL) by New Jersey Department of Environmental Protection
- Uses the New Jersey RfD
- Assumes adult drinking water intake
- Assumes daily exposure
- Assumes a 20% Relative Source Contribution

12 ppt - New Hampshire (2019)

- Proposed Maximum Contaminant Level developed by the New Hampshire Department of Environmental Services
- Uses the New Hampshire RfD
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes drinking water intake varies by age
- Assumes a 50% Relative Source Contribution

9 ppt - Michigan (2019)

- Screening level developed by the Michigan Department of Health and Human Services
- Based on the ATSDR MRL
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes water intake varies by age
- Assumes daily exposure
- Assumes a 50% Relative Source Contribution

UNDERSTANDING RISK: WHAT'S BEHIND THE NUMBERS

PFNA

What are the health effects?

Scientists are still learning about PFAS and how they affect humans. To date, the most is known about health effects linked to PFOS and PFOA.

Non-Cancer Health Effects

- Increases in serum lipids, particularly total cholesterol and low-density lipoprotein (LDL) cholesterol

Screening values and criteria are meant to be protective of the population as a whole. Individual health factors and genetics determine your actual personal risk. Exposure does not guarantee that you will experience adverse health effects.

Why do the numbers vary?

When developing screening values and criteria, scientists will use the best available science for the time. When it comes to emerging contaminants like PFAS, science is constantly evolving, and therefore so are the public health recommendations.

To learn about the various assumptions and methods that are used to develop these numbers, please see page 1-6.

78 ppt - ATSDR - Adults (2018)

- Environmental Media Evaluation Guide for adults only developed by the CDC's Agency for Toxic Substances and Disease Registry (ATSDR)
- Uses the ATSDR Minimal Risk Level (MRL)
- Assumes adult drinking water intake
- Assumes daily exposure
- Assumes no Relative Source Contribution

21 ppt - ATSDR - Children (2018)

- Environmental Media Evaluation Guide for children developed by ATSDR
- Uses the ATSDR MRL
- Assumes water intake for children less than 1 year
- Assumes daily exposure
- Assumes no Relative Source Contribution

13 ppt - New Jersey (2015)

- Health-based Maximum Contaminant Limit (MCL) by New Jersey Department of Environmental Protection
- New Jersey-developed target serum level
- Uses a 200:1 ratio between PFNA serum levels and drinking water concentrations, which is meant to represent a central tendency estimate
- Assumes adult drinking water intake
- Assumes a 50% Relative Source Contribution

11 ppt - New Hampshire (2019)

- Proposed Maximum Contaminant Level developed by the New Hampshire Department of Environmental Services
- Uses the New Hampshire Reference Dose (RfD)
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes drinking water intake varies by age
- Assumes a 50% Relative Source Contribution

9 ppt - Michigan (2019)

- Screening level developed by the Michigan Department of Health and Human Services
- Uses the ATSDR MRL
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes water intake varies by age
- Assumes daily exposure
- Assumes a 50% Relative Source Contribution

UNDERSTANDING RISK: WHAT'S BEHIND THE NUMBERS

PFHxS

What are the health effects?

Scientists are still learning about PFAS and how they affect humans. To date, the most is known about health effects linked to PFOS and PFOA.

Non-Cancer Health Effects

- Liver damage, as evidenced by increases in serum enzymes and decreases in serum bilirubin levels
- Decreased antibody response to vaccines

Screening values and criteria are meant to be protective of the population as a whole. Individual health factors and genetics determine your actual personal risk. Exposure does not guarantee that you will experience adverse health effects.

Why do the numbers vary?

When developing screening values and criteria, scientists will use the best available science for the time. When it comes to emerging contaminants like PFAS, science is constantly evolving, and therefore so are the public health recommendations.

To learn about the various assumptions and methods that are used to develop these numbers, please see page 1-6.

520 ppt - ATSDR - Adults (2018)

- Environmental Media Evaluation Guide for adults only developed by the CDC's Agency for Toxic Substances and Disease Registry (ATSDR)
- Uses the ATSDR Minimal Risk Level (MRL)
- Assumes adult drinking water intake
- Assumes daily exposure
- Assumes no Relative Source Contribution

140 ppt - ATSDR - Children (2018)

- Environmental Media Evaluation Guide for children developed by ATSDR
- Uses the ATSDR MRL
- Assumes water intake for children less than 1 year
- Assumes daily exposure
- Assumes no Relative Source Contribution

84 ppt - Michigan (2019)

- Screening level developed by the Michigan Department of Health and Human Services
- Uses the ATSDR MRL
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes water intake varies by age
- Assumes daily exposure
- Assumes a 50% Relative Source Contribution

47 ppt - Minnesota (2019)

- Short-term, Subchronic, and Chronic Non-Cancer Health-based Value developed by the Minnesota Department of Health
- Protective of breastfeeding infants, both from exposure they may receive prenatally and while breastfeeding
- Uses the Minnesota Department of Health Reference Dose (RfD)
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes water intake varies by age
- Assumes daily exposure
- Assumes a 50% Relative Source Contribution

18 ppt - New Hampshire (2019)

- Proposed Maximum Contaminant Level (MCL) developed by the New Hampshire Department of Environmental Services
- Uses the New Hampshire RfD
- Uses the Goeden et al. (2019) toxicokinetic model
- Assumes drinking water intake varies by age
- Assumes a 50% Relative Source Contribution

UNDERSTANDING RISK: WHAT'S BEHIND THE NUMBERS

PFBS

What are the health effects?

Scientists are still learning about PFAS and how they affect humans. To date, the most is known about health effects linked to PFOS and PFOA.

Screening values and criteria are meant to be protective of the population as a whole. Individual health factors and genetics determine your actual personal risk. Exposure does not guarantee that you will experience adverse health effects.

Why do the numbers vary?

When developing screening values and criteria, scientists will use the best available science for the time. When it comes to emerging contaminants like PFAS, science is constantly evolving, and therefore so are the public health recommendations.

To learn about the various assumptions and methods that are used to develop these numbers, please see page 1-6.

400,000 ppt - US EPA (2014)

- Regional Screening Level for children
- Uses the US Environmental Protection Agency (US EPA) Provisional Peer-reviewed Toxicity Value Reference Dose (RfD)
- Assumes drinking water intake for children less than 6 years
- Assumes 350 days of exposure per year
- Assumes no Relative Source Contribution

2,000 ppt - Minnesota (2017)

- Chronic Non-Cancer Health-based Value developed by the Minnesota Department of Health
- Uses the Minnesota Department of Health RfD
- Assumes water intake varies by age
- Assumes daily exposure
- Assumes a 20% Relative Source Contribution

1,000 ppt - Michigan (2019)

- Screening level developed by the Michigan Department of Health and Human Services
- Uses a modified US EPA Provisional Peer-Reviewed Toxicity Value RfD
- Assumes water intake varies by age
- Assumes lifetime of 70 years
- Assumes daily exposure
- Assumes a 20% Relative Source Contribution