

# CENTRAL ELMORE WATER & SEWER AUTHORITY (CEW&SA)

## Geosmin & MIB

Geosmin is an [organic compound](#) with a distinct earthy flavor and aroma, and is responsible for the earthy taste of [beets](#) and a contributor to the strong scent ([petrichor](#)) that occurs in the air when rain falls after a dry spell of weather or when soil is disturbed. It is produced by a variety of microorganisms. Chemically, it is a [bicyclic alcohol](#) with [formula C<sub>12</sub>H<sub>22</sub>O](#), a derivative of [decalin](#). Its name is derived from the Greek γεω- "earth" and ὄσμη "smell".

2-Methylisoborneol (MIB) is an [organic chemical](#) with a strong [odor](#). It is a derivative of [borneol](#). Its [odor detection threshold](#) is very low and it is one of the chemicals with major influence on the [quality](#) of [drinking water](#). Some [algae](#), particularly [blue-green algae](#) (cyanobacteria) such as [Anabaena](#), produce MIB together with other odorous chemicals such as [geosmin](#).<sup>[1]</sup> They give a musty or earthy odor that can be quite strong if an [algal bloom](#) is present. Subsequent death of the cyanobacteria will also release MIB that is trapped in the cells. These chemicals can be smelled at very low levels, in the parts-per-trillion range ([ppt range](#)), and are responsible for many "taste and odor" issues in [drinking water](#) treatment and distribution.

### Frequently Asked Questions (FAQ)

#### What is causing the taste and odor experienced by some customers served by CEW&SA?

Recent test results, from Auburn University's accredited laboratory, confirm the presence of geosmin and/or MIB, a naturally occurring compound found in surface waters (ie. lakes, rivers, streams, and dams).

#### What is geosmin & MIB?

Geosmin is a naturally occurring compound produced by bacteria in soil and algae found in surface water. Geosmin produces the odor of overturned rich soils and is present in foods such as beets, spinach, and mushrooms. Geosmin and MIB (2-Methyl-iso-Borneol) are naturally occurring compounds found in surface waters (rivers and dams) as organic molecules produced by blue-green algae. Bright sun, warm temperatures and nutrients result in ideal growing conditions for the algae. The compounds are produced inside the algae cells and are only released when the algae die.

#### Why does it occur?

Apart from the sunlight and raised temperatures, algae require nutrients to grow and some of the reservoirs have suffered from upstream negative environmental impacts that have raised the nutrient levels, which support these algal blooms.

#### Where is the odor and taste occurring?

There are reports of an earthy, musty-type odor/taste in the water coming from a variety of areas served by Central Elmore Water & Sewer Authority. We have experienced most of the calls from Customers who live on a dead-end line.

#### Is the water quality affected?

While the taste and odor can be unpleasant, geosmin and MIB are ***not toxic or harmful***. The ***water remains safe to drink***. On-going testing continues to show an absence of harmful bacteria and other pathogens in the water.

## How long will the taste and odor last?

It is impossible to predict the onset of an incidence of geosmin, or how long it will last. Geosmin compounds have been shown to remain in lakes and reservoirs for days to months. In 2017, CEW&SA partnered with Dr. Alan Wilson with the School of Fisheries, Aquaculture and Aquatic Sciences at Auburn University to monitor the algal blooms at our intake on Lake Martin. His research continues to help us better prepare for the future.

## Can the taste and odor be reduced at the tap?

It is recommended to use a carbon-based filter on your faucet for those that are sensitive to the compounds.

## What does it smell like?

Geosmin and MIB typically produces an earthy or musty odor as is found in the odor of overturned rich soils, and is present in some foods such as beets, spinach, and mushrooms.

## Why do we smell it?

The human nose is extremely sensitive to geosmin. If you poured a teaspoon of geosmin into the equivalent of 200 Olympic-sized swimming pools, you would still be able to smell it.

The general threshold for human detection is about 15 ng/l (15 nanograms per liter = 15 parts per trillion). However, people with sensitive palate can detect these compounds in drinking water when the concentration is as low as 5 ng/l.

Heating the water increases the volatility of these compounds, which explains why the smell is more easily detected when you are in the shower or when used for hot beverages.

## How does CEW&SA detect it?

Prior to September of 2013 CEW&SA had never experienced geosmin or MIB in the water supply; so, had not routinely tested for this naturally occurring compound. CEW&SA has since engaged Auburn University's accredited laboratory to provide on-going testing for geosmin and MIB.

CEW&SA continues to follow a rigorous protocol of regular monitoring of both the raw and treated waters across our service area. On-going testing continues to show an absence of harmful bacteria and other pathogens in the water. *[The water remains safe to drink.](#)*

## Can it be removed from the drinking water?

Geosmin is not removed by conventional water treatment processes used by CEW&SA's water treatment facility.

There are several proven treatment technologies for removing geosmin from drinking water including granular or powdered activated carbon in certain applications; oxidation with ozone or advanced oxidation processes (AOPs); bio filtration; or some combination of each. The actual technology used at a specific plant is highly dependent on the chemistry of the source water. Any engineered treatment solution must first be evaluated to ensure the installation of a system to treat geosmin and MIB does not negatively impact the current treatment processes. CEW&SA is currently undergoing a pilot study with granular activated carbon (GAC) to test its efficiency in removing the compounds.

Cost can be a prohibiting factor for smaller water systems as some of these treatments can have multi-million-dollar price tags. Of the treatment processes reviewed, GAC was the most effective and least expensive at almost 7-million dollars.

## Does geosmin and MIB occur elsewhere?

Geosmin and MIB is common in many jurisdictions across Canada, the United States, and

elsewhere in the world. Here locally, there are many water systems facing the same issues that CEW&SA is facing.

### **Will CEW&SA be investing in treatment processes to remove geosmin?**

As always, the health and safety of customers will be foremost. CEW&SA has consulted with Regulatory Agencies, Engineering Consultants, Equipment Manufacturers as well as other Water Systems and Chemical Companies. After reviewing all the research available in an effort to identify future infrastructure investments to improve water quality including taste and odor control; in 2013 the Board of Directors voted unanimously to invest in a Powder Activated Carbon (PAC) System to be installed at our Intake Facility. Since that time further research has revealed that Copper Sulfate has been successful in treating taste and odor complaints. In 2014, CEW&SA began adding Copper Sulfate to the raw water. Since that time, complaints have been minimal. In 2020, ADEM lowered the amount of residual Copper Sulfate in released water to a point where it was not able to be used any longer. In 2021, CEW&SA engaged the engineers to conduct a Taste and Odor Feasibility Study. With the recommendation of the engineers, CEW&SA began a pilot study for a GAC system. CEW&SA will strive to maintain quality water at an affordable price.

**Chadwick Shaw, P.E.**  
**General Manager**