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 $C_{12}H_{22}O$, a derivative of decalin. Its name is derived from the Greek γεω- "earth" and ὀσμή "smell".

2-Methylisoborneol (MIB) is an organic chemical with a strong odor. It is a derivate 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.[1] 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?

Test results, from Auburn University's accredited laboratory, continue to 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?

Before 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. The June 2024 results for MIB were the largest recorded since 2013 at just over 400 parts per trillion.

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 and MIB are 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 underwent a pilot study with granular activated carbon (GAC) to test its efficiency in removing the compounds. It proved that the GAC system could remove the compounds to acceptable levels in most instances. CEW&SA has employed the help of the engineering firm Ardurra, to design the system. It should be ready for bid in late spring to early summer of 2025.

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 are common in many jurisdictions across Canada, the United States, and elsewhere in the world. Here locally, many water systems are 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 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. This study took longer since the compound numbers fluctuate throughout the year with numbers during the winter nearing zero. The result was that the GAC pilot system was effective in removing Geosmin and MIB to levels below the human detection threshold.

In April of 2024, CEW&SA met with ADEM to request funding specifically for a GAC system. ADEM was very responsive to CEW&SA's request indicating that some funding could become available for CEW&SA by the end of the year. In May of 2024, the CEW&SA Board of Directors approved to proceed with plans on a GAC system. On May 29th, CEW&SA management met with the consulting engineering firm in preparation to move forward with plans for a GAC system for submittal to ADEM. The GAC system will help to lower Geosmin and MIB levels; which will help with the taste and odor issues that are currently being experienced. AS of January 2025, there have been no funds released by ADEM for this project, but we remain hopeful. CEW&SA will strive to maintain quality water at an affordable price.

The plans were completed in March 2025. Since March, CEW&SA has been in constant contact with ADEM, requesting grants to help fund this project. As of July 2025, ADEM informally informed CEW&SA that they would be getting approximately $2M in grants to help fund this project. The lead time for some of the material is approximately 40 weeks. We have decided to bid the material early so the project will not be delayed. Our goal is to have the new GAC system up and functional by this time next year, but many factors will contribute to a successful and on-time project.

As of February 2025, ADEM has promised only $67,000 in grants towards this $8 million project.

As of July 2025, ADEM has informally informed CEW&SA that they may be getting approximately $2 million in grants for the project.

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