State of Michigan

Department of Environmental Quality
Environmental Response Division

Measurement of Low-Level Mercury in Groundwater to Assess Movement to Surface Waters

USEPA Sampling and Analytical Methods

In order to measure mercury in the environment at low levels, the United States Environmental Protection Agency (EPA) developed Method 1631: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry (821/R-96-001). Method 1631 allows quantification of mercury at 0.5 ng/l (parts per trillion). In addition, the EPA developed EPA Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (821/R-96-008), because measurement at such low levels requires new ultra-clean sampling techniques.

ERD Groundwater Sampling Procedure for Low Level Mercury

The Department of Environmental Quality (DEQ) Environmental Response Division (ERD) modified EPA Method 1669, a surface water sampling procedure, to provide groundwater sample collection procedures for low level mercury. Method 1669 was modified by eliminating the surface water sampling portions of Method 1669, combining portions of Method 1631, and incorporating Low-Flow (Minimal Draw Down) Ground-Water Sampling Procedures by Puls and Barcelona (1996), published in EPA Ground Water Issues, U.S. EPA Office of Research and Development. This new procedure, "Groundwater Sampling from Monitoring Wells for Low Level Analysis of Mercury", is available on the Internet at: _____.

The ERD low level groundwater sampling procedure is intended for use by ERD staff and contractors involved with investigation, monitoring or remedial activities, where low level analysis is necessary, under Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451. This procedure is also appropriate for use by private parties in the investigation or closure of environmental contamination sites under Part 201.

The procedure relies on ultra-clean techniques to avoid and control contamination sources during the sampling event. Contamination sources can include the surfaces of pumps and tubing used for sampling equipment, carry over from previous sampling, vehicle exhaust, dust, and the sampling crew themselves.

Use of the New GSI Criterion for Mercury at Part 201 Facilities

ERD revised the groundwater-surface water interface (GSI) criterion, the Target Detection Level (TDL), and the recommended analytical methods consistent with this low level methodology. Part 201 criteria tables were revised on June 7, 2000 and the mercury GSI criterion was reduced from 200 ng/l to 1.3 ng/l consistent with Part 31, Water Resources Protection, of the NREPA. The TDL was changed from 200 ng/l to 0.5 ng/l for GSI purposes and the January 12, 2001 version of Operational Memorandum #6 incorporates this change.

Section 20120a(15) of Part 201 requires that contaminated groundwater venting to surface water comply with the requirements of Part 31. The process for addressing groundwater contaminants at the GSI is described in Operational Memorandum #17 (http://www.deq.state.mi.us/erd/opmemos/om17i.html).

The new TDL and GSI criterion applies to new or existing facilities under part 201 where mercury contaminated groundwater vents to surface waters after September 30, 2000. Use of EPA Method 1631 will be appropriate at all sites that are not presently covered by an approved Remedial Action Plan (RAP) and where there is a possibility that a groundwater plume containing mercury is, or could be reaching the GSI. Moreover, under appropriate circumstances, a previously approved RAP under Part 201 could be reopened based on the new criterion. Appropriate circumstances might include a facility that is found to be a major contributor to a fish contaminant problem, or other effects on public health or the environment. A decision to reopen a RAP as described above can only be made at the ERD Division Chief level.

Management of mercury contaminated groundwater using the new 1.3 ng/l criterion may be superceded by the naturally occurring background levels under Part 20120(a)(11) and R 299.5707 of the Michigan Administrative Code. Consequently, in those cases where a groundwater investigation for low level mercury is planned, careful evaluation of the naturally occurring groundwater levels as well as possible contamination from well construction materials should also be built into the investigation.

To date, the range of background levels for mercury from Michigan groundwater and environmental monitoring wells is not well established. ERD will be obtaining more background data on mercury as a result of these new capabilities. The possible levels of naturally occurring mercury in groundwater and mercury from well construction materials should become more apparent as additional data become available. This will likely be a learning process derived in part from monitoring information and best professional judgement. Ultimately, construction materials for monitoring wells used for low level mercury monitoring may need to be carefully selected to reduce sources of mercury.

DEQ Laboratory Capabilities for Low Level Mercury

The DEQ-Drinking Water and Radiological Protection Division (DWRPD) Laboratory began running EPA Method 1631 in January 2001. Please contact Ms. Sandra Gregg of the DEQ-Drinking Water and Radiological Protection Division (DWRPD) at (517) 335-9800 for information or questions concerning implementation of this method at the state laboratory EPA Method 1631. Consistent with USEPA performance based philosophy, modifications to Method 1631 are permissible provided that method performance criteria can be met.

Directory of Michigan Environmental & Drinking Water Testing Laboratories

The DEQ has not yet compiled a list of laboratories with low-level mercury capability. To contact a laboratory near you to determine if they offer EPA Method 1631 analyses, please go to the Directory of Michigan Environmental & Drinking Water Testing Laboratories Internet website at http://www.deq.state.mi.us/ead/tasect/labs.

Additional Information

- For more information about the mercury strategy in Michigan, please go to Mercury homepage at http://www.deq.state.mi.us/ead/p2sect/mercury/index.htm.
- For environmental cleanup criteria or screening level information, please go to http://www.deq.state.mi.us/erd/critguide/index.html.
- To locate environmental sites of contamination affected by mercury, please go to http://www.deq.state.mi.us/erd/sites/index.jsp.
- To review reporting limits and recommended methods of analyses for chemicals, please go to http://www.deq.state.mi.us/erd/opmemos/opmemo6/om6tbl1r6.htm #met.
- For questions about Michigan's mercury strategy and home page, please contact Mr. Steve Kratzer at kratzerS@deq.state.mi.us or (800) 662-9278.
- For information about the sources of mercury and mercury pollution prevention efforts, please contact Ms. Lucy Doroshko at doroshkoL@deq.state.mi.us or (800) 662-9278.
- For Internet information on all of Michigan's mercury pollution prevention activities, please go to our mercury homepage at: http://www.deq.state.mi.us/ead/p2sect/mercury.
- For questions related to the cleanup of mercury at sites of environmental contamination, please contact your nearest ERD District Office staff at http://www.deq.state.mi.us/erd/workunit/whoerd.html or by calling (800) 662-9278.
- For more information on the application of EPA Method 1631 to NPDES discharges, etc., please go to the DEQ- Surface Water Quality Division (SWQD) website at: www.deq.state.mi.us/swq/gleas/gleas.htm.
- To review the EPA Method 1631, please go to: http://www.epa.gov/ost/methods/1631.html.