

Interim Report on High Lead Levels in Flint Michigan Timeline of Events

1. June 2011
 - a. The Walters' home was renovated in 2011 and had no plumbing when purchased. Plastic water pipes and plumbing components were installed by the Walters throughout the home. The Walters family moved into the home at 212 Browning Avenue in June 2011.
 - b. A whole-home iron filter installed for aesthetic reasons. The iron filter cartridge was changed every 6 months during the time when Flint purchased finished water from Detroit. Subsequent to the switch to the Flint River source on April 30, 2014, the filter was required to be changed every 2-3 weeks and eventually required replacement every 6-14 days due to much higher iron levels.
 - c. Tap water treated by the refrigerator filter was consumed in the household from April 2014 through late November/early December 2014. The filters used were not NSF certified to remove lead.
2. October 2012
 - a. The Walters had their twin boys' blood lead levels (BLLs) tested and the result for each child was 2 ug/dL.
3. April 30, 2014
 - a. The City of Flint switches from purchased Detroit water to treating raw water from the Flint River.
 - b. Michigan Department of Environment Quality requires City of Flint to conduct two six-month rounds of monitoring for lead and copper (July-December 2014 and January-June 2015).
4. August 2014
 - a. The City of Flint Violates the National Primary Drinking Water Regulations Maximum Contaminant Level (MCL) for E. Coli bacteria (Acute Coliform MCL violation)
5. August 2014
 - a. The City of Flint Violates the National Primary Drinking Water Regulations MCL for Coliform bacteria (Monthly Coliform MCL violation)
6. September 2014
 - a. The City of Flint Violates the National Primary Drinking Water Regulations MCL for Coliform bacteria (Monthly Coliform MCL violation)
7. Later November/Early December 2014
 - a. The Walters family stops drinking water from the tap due to water quality.
8. November 2014
 - a. Lockwood, Andrews and Newnam, Inc. produces an "Operational Evaluation Report" to assess the factors contributing to high TTHM levels in Flint following the source change. This report is required by the National Primary Drinking Water Regulations when water tests show TTHM or HAA5 levels in excess of 80 percent of the MCL. The focus of this report is to identify potential causes and remedial actions for lowering TTHM levels.
9. December 2014
 - a. The City of Flint Violates the National Primary Drinking Water Regulations MCL for Total Trihalomethanes (Average TTHM MCL violation)
10. February 4, 2015
 - a. Walters' child develops skin rashes over entire body after bathing. The video is shown to City of Flint by Ms. Walters.
11. February 11, 2015
 - a. The City of Flint tests drinking water iron level at Walters' residence and the level exceeds the capability of the measurement (>3.3 mg/L).
12. February 18, 2015
 - a. The City of Flint tests the drinking water at the Walters residence for lead and iron.
 - b. Tests reveal high lead in the drinking water (104 ug/L) and iron level once again exceeds the limit of the test (>3.3 mg/L).
 - c. The Walters' water is tested after pre-flushing for "3-4 minutes" the night before (see sampling instructions). The sample was collected from the kitchen tap with the iron filter in place.
13. February 25, 2015
 - a. EPA Region 5 receives a call from Ms. Walters regarding high lead levels discovered in her home.

- b. The City of Flint once again tests the drinking water iron level at the Walters' residence and the result is once again beyond the measurement capability (>3.3 mg/L).
14. February 26, 2015
 - a. The Walters have their children's blood lead levels tested and their child's blood lead level is 3 ug/dL.
15. March 2015
 - a. The City of Flint increases the Ferric Chloride dosage used in the filtration process to improve the removal of disinfection byproduct precursor material, in an effort to lower the TTHM levels.
16. March 03, 2015
 - a. The City of Flint re-tests lead levels in drinking water at Walters' residence. The lead level measured is 397 ug/L. The water is once again tested after pre-flushing for 3-4 minutes the night before but this time with the iron filter removed (see sampling instructions).
17. March 11, 2015
 - a. The City of Flint re-tests the iron levels in drinking water at Walters' residence The iron level once again exceeds the limit of the test (>3.3 mg/L).
18. March 12, 2015
 - a. Veolia (hired as a consultant by City of Flint) to assess water quality issues, submits "Water Quality Report" to City of Flint which provides recommendations and a roadmap for water quality and operational improvements, primarily focused on lowering TTHMs.
19. March 19, 2015
 - a. EPA Region 5 calls MDEQ expressing concern regarding the high lead levels found.
 - b. The MDEQ response received via voicemail states that the high lead levels at the Walters' home are due to lead sources in the homeowner's plumbing. In previous and subsequent conversations with Ms. Walters, she stated that the plumbing has always been all plastic. An inspection conducted by EPA Region on April 27, 2015, confirmed that all pipes, fittings and valves in the Walters' home are NSF-approved CPVC pipe (certified for drinking water use) and sequential sampling results following the replacement of the service line found that there are no sources of lead in the home plumbing.
20. March 26, 2015
 - a. EPA R5 learns that the local Health Department is looking at whether there is a potential uptick in cases of Legionella in the County, which includes the City of Flint.
 - b. Due to recent bacteriological and other distribution system water quality issues, EPA Region 5 contacts EPA ORD (Cincinnati) to discuss possible support for assessing whether the potential uptick in Legionella being assessed by Genesee County, which includes the City of Flint, could be caused by or related to the distribution system upsets from the water quality changes and subsequent flushing events by the City of Flint which can mobilize sediment from within the water mains and dislodge microbial contaminants, including Legionella bacteria from biofilm within the water mains.
 - c. EPA ORD indicates that they are available and willing to provide support to the local health department and City of Flint should they conclude there has been an increase in Legionella cases in the county.
21. March 27, 2015
 - a. Based on a suspected conflict of interest at the local health department that conducted the February 2015 BLL testing, the Walters' take their child to a healthcare facility in a different location to have his blood lead re-tested. The result from this BLL test (6.5 ug/dL) is significantly higher than the February BLL test (3 ug/dL) and he is found to also be iron deficient as well (anemic).
22. April 3, 2015
 - a. The water is shut off at Walters' residence due to the high lead levels.
 - b. The Walters' home is provided water via garden hose from neighboring home (hose spigot to hose spigot). The Walters use this water only for bathing, washing dishes and washing clothes.
23. April 27, 2015
 - a. EPA Region 5 visits the Walters' home and reviews the internal plumbing, bringing back water samples, iron filter cartridges and relevant photographs.
 - b. The internal plumbing at the Walters' residence is confirmed as all plastic as had been stated by Ms. Walters.
24. April 28, 2015
 - a. The water at the Walters' residence was turned back on temporarily to collect additional water samples. The water in the service line had been shut off since April 3, 2015.

- b. The kitchen tap was flushed at low flow for 25 minutes the night before (on April 27, 2015) the sequential sampling conducted on April 28, 2015.
 - c. On April 28, 2015, 30 Sequential samples were collected at Walters residence
 - d. The drinking water samples are sent to Virginia Tech for analysis. All samples are analyzed for Ag, Al, As, Ba, Ca, Cd, Cl, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Se, Si, Sn, Sr, Ti, U V, and Zn.
 - e. Extremely high lead levels were found in all samples. The minimum lead value was 200 ug/L; the average lead value was 2,429 ug/L; and the maximum lead value was 13,200 ug/L.
 - f. A review of the analytical results by Virginia Tech shows lead levels in all water samples correlated with phosphate levels, cadmium levels and uranium levels found in the samples and most of the lead was found to be in particulate form.
 - g. The correlation between lead and phosphate would be consistent with the dislodging of the pipe scale from the service line outside the home containing lead and phosphate which would have formed during the period of time when Flint was purchasing water from the City of Detroit that was treated with orthophosphate. Additional analyses are being conducted to confirm the chemical compositions.
25. May 6, 2015
- a. EPA Region 5 visits Walters' home to collect pipe samples from service line. Three sections of the service line were extracted and sent to Virginia Tech for analysis.
 - b. EPA inspection reveals that the portion of the Walters' service line from the water main to the external shut-off valve on the corner of Bryant Street and Browning Avenue is made of lead. EPA's inspection also confirms that the portion of the Walters' service line from the home to the external shut-off valve appears to be galvanized iron pipe. Additional analyses are underway at Virginia Tech on the third piece of service line extracted.
 - c. The service line to the Walters' residence is replaced with a new copper service to the water main in front of the Walters' residence on Browning Avenue.
 - d. Sample bottles are left with Ms. Walters for collecting sequential samples following the replacement of the service line to the Walters' home.
 - e. EPA Region 5 collects a set of sequential samples from each of two residences on Bryant Street which are connected to the same main as the Walters' old service line. These samples were analyzed by Chicago Regional Laboratory. The results indicate that home #1 (4526 Bryant Street) does not appear to have a lead service line and lead results in all samples are low. The results from home #2 (4614 Bryant Street) indicate that the portion of the service line from the external shut-off valve to the water main is likely made of lead, which is consistent with the historical practice in Flint. The sampling had a high lead result (peak value) of 22 ug/L.
26. May 6, 2015
- a. The City of Flint tests the water at 216 Browning Avenue at resident's request, again using a first-draw, pre-flushed sampling protocol, which yielded a high lead result (22 ug/L).
 - b. The City of Flint tests the water at 631 Alvord Avenue, yielding a high lead result (42 ug/L).
27. May 13, 2015
- a. Water samples are collected at Walters' residence following the replacement of the service line.
 - b. 15 sequential samples were collected from kitchen tap, 1 sample was collected from the bathroom tap and 2 samples were collected from the water heater.
 - c. The samples were shipped to the EPA CRL and received on May 14, 2015.
 - d. All kitchen tap and bathroom tap results for lead and copper were low, confirming that the sources of lead were external to the home. Residual lead was found in the water heater samples (31.7 ug/L), very likely from deposition of lead-containing particulate coming into the home via the old service line which was disconnected and replaced on May 6, 2015.
28. June 2015
- a. The City of Flint Violates the National Primary Drinking Water Regulations MCL for Total Trihalomethanes (Average TTHM MCL violation)