Flint Sampling Summary
March 16, 2016

Department of Environmental Quality (DEQ):

1. **Residential lead and copper sampling** – all residents are encouraged to collect samples to determine lead and copper levels at their specific residence. Free analysis is provided via the DEQ lab. Residents are provided written instructions in the test kits regarding how to collect these samples in accordance with the Lead and Copper Rule (LCR). 15,438 sample results to date. 92.4 percent were at or below the federal lead action level of 15 parts per billion (ppb).
2. **Sentinel site lead and copper sampling** – specific sites (approximately 600) selected to represent for ongoing lead and copper monitoring. Residents participating in this program receive personal instruction regarding how to collect these samples in accordance with the LCR. These sites will be resampled every two weeks to help determine when the drinking water advisory can be discontinued and to help determine the effectiveness of corrosion control treatment. The sites were selected based on spatial distribution assuring all nine wards of the city are adequately covered and includes all known lead service lines. Additional sites were selected in areas identified by Dr. Mona Hanna-Attisha as having high blood levels. Additional sites were selected based on Environmental Justice considerations; specifically, lead paint indicators, minority population, and low income. The first two rounds of sentinel site monitoring results are now complete. Results from round two show 91.6 percent were at or below the federal lead action level of 15 ppb and 8.4 percent were above 15 ppb. These are better results than round one, which had 90.4 percent at or below 15 ppb, and 9.6 percent above the federal action level of 15 ppb. Data from the sentinel sites will continue to be collected for two more rounds or approximately another five weeks.

City of Flint:

1. **Water Quality Parameter (WQP)** monitoring - occurs at 10 locations each week in the distribution system including temperature, conductivity, pH, alkalinity, calcium, hardness, turbidity, iron, chloride, orthophosphate and lead.
2. **Bacteriological** – 100 samples are collected each month for analysis of total coliform bacteria. Approximately 1/4 of these samples are collected each week.
3. **Chlorine Residual** – 100 samples are collected each month at the bacteriological monitoring stations for free and total chlorine analysis. Approximately 1/4 of these samples are collected each week.
4. **Plant Tap** – Monitoring for the also occurs routinely at the Flint Water Treatment Plant Tap for the parameters listed above plus additional items.

The following observations were made based on the WQP monitoring that occurred during the week of March 6, 2016:

- The supplemental phosphate dosage was consistent and ranged between 2.62 and 2.73 milligrams per liter.

- All of the phosphate residuals in the distribution system were at or above the minimum of 3.1 milligrams per liter to be maintained at all distribution monitoring locations, ranging between 3.10 and 3.70 milligrams per liter.
- The city of Flint began parallel testing of phosphate residuals in the distribution system to compare a field kit with the laboratory analytical procedure. Results look comparable. The field kit takes 10 to 15 minutes while the lab procedure takes 90 minutes to report a result after the sample is transported to the lab.
- One pH measurement at 3742 Davison Road was below 7.0, at a value of 6.94. This site is also the one that has periodically reported unexpectedly low chlorine residuals. An investigation has revealed that the owners installed point of use treatment, including a charcoal filter, which reduces or removes the chlorine residual and may impact pH. The city is moving their monitoring station (#1) to an adjacent site.
- All other pH measurements were greater than 7.0 at the remaining Enhanced Water Quality Monitoring (EWQP) sites and the Point of Entry to the system. The pH levels ranged from 7.07 to 7.31.
- The DEQ will assist the city of Flint in contacting the Great Lakes Water Authority (GLWA) Lake Huron Water Treatment Plant (WTP) to discuss their levels of pH leaving the plant and to discuss the recent trend of lower pH levels being delivered to the city and to determine if the GLWA may be able to increase pH levels.
- The magnesium concentration reported in the plant tap on March 6, 2016, was unusually low, at 0.5 milligrams per liter. The average concentration in March thus far is 3.5, and the range other than this result is 2.4 to 5.3. The city indicated that magnesium concentrations are calculated based on the calcium level measured by use of an analytical procedure (titration) in the laboratory. The low magnesium level is thought to be the result of an "over-titration" for calcium that should have triggered repeated titrations to verify the abnormal results.
- Iron levels ranged between 0.01 and 0.05 milligrams per liter at all EWQP sites. Plant tap iron concentrations ranged from 0.01 to 0.04 in the last week.
- Free chlorine residuals reported at monitoring stations ranged from 0.3 to 1.15 milligrams per liter in the distribution system.
- All of the lead samples collected from the EWQP sites this week reported no lead detected.

United States Environmental Protection Agency (U.S. EPA):

1. **Sequential sampling at residences** – timed sampling to determine the relative contributions of lead and metals from the various plumbing components from the water main to the tap. 105 sampling events so far.
2. **Filter challenge testing** - sampling for lead up and downstream from tap filters to determine the efficacy of the filters. 232 sampling events collected to date. This program has shown the filters are very effective at removing the lead up to the rating of the manufacturer (150 ppb). The U.S. EPA is no longer collecting filter challenge samples.

3. **Grab Sampling (cold and hot)** – collecting samples at the request of residences. Grab samples are collected from the cold unfiltered water, then two samples are collected from hot water at different intervals between samples to represent various areas from the hot water tank.
4. **Health complaint samples** – many of these are connected to rash follow up investigations. In addition to the full suite of metals (including lead and copper), they include sampling for general water quality parameters, including chlorine residuals and coliform bacteria (where chlorine is trace). 68 samples have been collected to date.
5. **System Optimization / Chlorine residuals** – sampled Monday through Wednesday every other week. These are combined with the city's chlorine residual monitoring and reported with their monthly operation reports. If chlorine is trace or undetected, a bacti sample is also collected. Total Trihalomethane sampling is also conducted monthly during at the chlorine locations. During the summer months, chlorine will be increased to weekly monitoring. The U.S. EPA will recommend and assist with flushing protocols to optimize disinfection and corrosion control.

Wayne State University: (per Dr. Shawn McElmurry)

1. Sampled at 69 different locations.
2. Major sampling campaigns occurred on October 18, 2015; December 15, 2015; and January 29, 2016.
3. Samples were analyzed for 16 chemical parameters (Pb, Cu, P, pH, etc.) plus additional 17 metals and 4 other anions.
4. In October and January, biological samples were collected. January samples (30 homes) were analyzed for *E. coli* and *legionella*. All samples came back negative. We have not yet analyzed October samples.
5. Take away messages:
    - We have seen the chlorine levels improve over time. When we initially sampled we found at least 1/3 of samples with little or no free chlorine. In December this fell to ~25 percent. Jan 29, 2016, we only found a few houses with extremely low levels of chlorine.
    - We have seen the phosphate levels increase.

Virginia Tech:

1. Lead and copper sampling at approximately 280 residences. The 90th percentile lead level was approximately 26 ppb. Follow-up sampling occurring now at those same residences.
2. Legionella testing is also occurring at this time at homes as well as some institutions and businesses.

Michigan State University:

Dr. Susan Masten is analyzing results from the DEQ and city. She is reviewing the residential lead and copper results to assess what statistically valid conclusions can be drawn. She is also analyzing corrosivity indicators.

Water Defense:

According to Mr. Scott Smith, Chief Technology Officer for Water Defense, in a conversation with Mr. Bryce Feighner, DEQ, they are testing for a full spectrum of chemicals of concern including metals, volatile organic compounds, semi-volatile organic compounds, and probably more. Based on press reports, they are doing total trihalomethanes monitoring in addition to lead and copper. We are meeting soon to ferret out what they are doing.