

Supporting Documentation for the File
City of Flint, Water Treatment Plant
90th Percentile Lead & Copper Calculation
For Monitoring Period
January 1 – June 30, 2017

The following documentation has been compiled to explain how the 90th Percentile Lead and Copper calculation was reached. Because of the complexity of the situation surrounding the water crisis and the lack of clarity from the way the Lead and Copper Rule was written, a lot of questions were raised of how to accurately validate all the samples that were taken during the compliance period. The DEQ relied on the guidance of the EPA to navigate our way through the challenges we faced while trying to put this list together during the monitoring period of January 1- June 30 and July 1 – December 31, 2016. We used the same guidelines to compile this list for the monitoring period of January 1- June 30, 2017.

The following appendices are copies of the questions DEQ posed to EPA for further clarification. Some of the information in the appendices does not pertain to the calculation for the monitoring period from January 1- June 30, 2017, but is being included for context. From these answers, we were able to essentially create a “decision tree” as to whether a sample was considered valid or invalid for the final calculation. For the compliance period July 1 –December 31, 2016, in Appendix B “DEQ Note” to question #2, an 8th criteria category was added to address a situation that was not encountered until the monitoring period of July 1- December 31, 2016.

Table of Contents:

Appendix A:	3 Questions posed by DEQ to EPA on June 3, 2016
Appendix B:	2 Questions posed by DEQ to EPA on July 5 & 6, 2016
Appendix C:	3 Questions posed by DEQ to EPA on July 28, 2016

Appendix A

The following questions were posed to EPA by DEQ on June 3, 2016. EPA responded on June 20, 2016. These communications were done via email.

EPA Response to MDEQ Questions Regarding Flint's LCR 90th Percentile Calculation

1. If a resident submitted a sample through the residential testing program during the current monitoring period but before the sentinel program began, should these samples be included if the address meets the Tier 1 criteria given that the resident had not received formal instructions as to how to properly take a sample?

EPA Response: It is our understanding that with the residential sampling effort in Flint, sample collection instructions were provided to the residents with the sample bottles. If the sample site meets the Tier 1 criteria and instructions were provided to the sampler, the result must be considered in making the 90th percentile calculation.

2. Identifying lead service lines that run from the main to the curb box (goosenecks) is difficult without excavation. One potential approach being considered is to use a hydro-vac to go up and down the street to identify these goosenecks. If a gooseneck is identified and a sample was taken at that home prior to replacement does that sample need to be retroactively included in a 90th percentile calculation if the sampling period was already closed at the time that the gooseneck was identified? This would be particularly problematic as such an interpretation could lead to a monitoring period being subject to retroactive calculations for potentially years.

EPA Response: The Lead and Copper Rule does not require additional sample results to be retroactively added to a prior monitoring period. The 90th percentile calculation must be done with the sample results that are determined to be valid within that particular monitoring period.

3. In addition, none of the School samples will be included for three reasons. 1) The school did not have a lead service line. 2) The 1 liter samples that were taken were NOT first draw samples. As you know the school sampling consisted of four 125 ml samples and at the end of the sampling 10 one liter sequential samples were taken at strategic points to look deeper into the plumbing. 3) Schools are generally not used for LCR testing except under certain specific conditions. Please indicate if you agree with this assessment.

EPA Response: We agree with MDEQ that based on the specific site tested, these school samples should not be included in the 90th percentile calculations as these samples do not appear to meet the criteria for Lead and Copper Rule samples.

EPA Response to MDEQ Questions Regarding Flint's LCR 90th Percentile Calculation June 20, 2016

1. If a resident submitted a sample through the residential testing program during the current monitoring period but before the sentinel program began, should these samples be included if the address meets the Tier 1 criteria given that the resident had not received formal instructions as to how to properly take a sample?

EPA Response: It is our understanding that with the residential sampling effort in Flint, sample collection instructions were provided to the residents with the sample bottles. If the sample site meets the Tier 1 criteria and instructions were provided to the sampler, the result must be considered in making the 90th percentile calculation.

DEQ Note: In the beginning of the residential sampling effort, we provided residents with the standard form that the lab uses to collect information for any sampling analysis. There was no information on how to properly collect a lead/copper sample (i.e. the stagnation period, first draw, etc.) and so we disqualified 2 samples because they were submitted on this form.

2. Identifying lead service lines that run from the main to the curb box (goosenecks) is difficult without excavation. One potential approach being considered is to use a hydro-vac to go up and down the street to identify these goosenecks. If a gooseneck is identified and a sample was taken at that home prior to replacement does that sample need to be retroactively included in a 90th percentile calculation if the sampling period was already closed at the time that the gooseneck was identified? This would be particularly problematic as such an interpretation could lead to a monitoring period being subject to retroactive calculations for potentially years.

EPA Response: The Lead and Copper Rule does not require additional sample results to be retroactively added to a prior monitoring period. The 90th percentile calculation must be done with the sample results that are determined to be valid within that particular monitoring period.

DEQ Note: The only samples we retroactively included were homes we identified as being Tier 1 (having a lead service line or built between '83-'88 and have original copper interior plumbing) during our in-home investigations that submitted samples anytime during the monitoring period of January 1-June 30, 2016. These samples also had to meet the criteria clarified in the remaining questions stated here in this document.

3. In addition, none of the School samples will be included for three reasons. 1) The school did not have a lead service line. 2) The 1 liter samples that were taken were **NOT** first draw samples. As you know the school sampling consisted of four 125 ml samples and at the end of the sampling 10 one liter sequential samples were taken at strategic points to look deeper into the plumbing. 3) Schools are generally not used for LCR testing except under certain specific conditions. Please indicate if you agree with this assessment.

EPA Response: We agree with MDEQ that based on the specific site tested, these school samples should not be included in the 90th percentile calculations as these samples do not appear to meet the criteria for Lead and Copper Rule samples

DEQ Note: School samples were not included in our list of compliance samples.

Appendix B

EPA Response to MDEQ Questions Regarding Flint's LCR 90th Percentile Calculation July 8, 2016

Two Additional MDEQ Questions Submitted to EPA by George Krisztian, MDEQ, on July 5 & 6, 2016

1. "There are 7 out of 33 samples [in MDEQ's Disqualified by Rule Tab] that we plan to put back into the calculation. These samples were originally disqualified based on the paperwork. We had staff call residents to find out if they simply misread the instructions with respect to the question regarding if they bypassed the filter. In these 7 cases we were able to get confirmation that they had in fact bypassed the filter and that they did not understand the question, which I will grant is somewhat confusing."

EPA Response: Based on 141.86(f)(1)(ii), MDEQ should invalidate any samples known to be collected through a filter, since these samples do not meet the site selection criteria per 141.86(a). If MDEQ was able to get confirmation from the resident that the filter was bypassed during sample collection, and the sample site meets the Tier 1 criteria, the result must be considered in making the 90th percentile calculation.

2. "There are a number of Tier 1 samples where the homeowner failed to include the sample collection date on the request for analysis form. Normally, this means an inability to confirm whether the sample was collected during the compliance period and analyzed within laboratory hold-time requirements. Per our discussion, you indicated a majority of this monitoring was conducted through the sentinel sampling program and, therefore, we know when bottles were dropped off, picked up, and transported to the lab. With this information, there is a high level of confidence that most, if not all, of these samples were collected during the compliance period and analyzed within 14 days. Can you please confirm with EPA that they agree these samples should be included in the 90th percentile calculation? It is DEQ's opinion that the samples described [above] were likely submitted to the lab within the 14 day requirement for acid preservation. As such we believe that these samples should be included in the LCR calculation. Please indicate if you concur with the inclusion of these samples for the city of Flint's dataset for the monitoring period that just concluded on June 30, 2016."

EPA Response: As long as MDEQ has documentation that the sample bottles in question "were dropped off, picked up, and transported to the lab" within the compliance period, preserved in accordance with approved methods for lead in 40 CFR Section 141.86(b)(2), and the sample site meets the Tier 1 criteria, the result must be considered in making the 90th percentile calculation. MDEQ should include all of the Sentinel site data since these are known to have been collected within the compliance period. See answer to #1 above as well.

The following document includes the DEQ's rationale that was used as a "decision tree" to invalidate samples that didn't meet the criteria referred to in the question.

**EPA Response to MDEQ Questions Regarding Flint's LCR 90th Percentile Calculation July 8, 2016.
Two Additional MDEQ Questions Submitted to EPA by George Krisztian, MDEQ, on July 5 & 6, 2016.**

1. "There are 7 out of 33 samples [in MDEQ's Disqualified by Rule Tab] that we plan to put back into the calculation. These samples were originally disqualified based on the paperwork. We had staff call residents to find out if they simply misread the instructions with respect to the question regarding if they bypassed the filter. In these 7 cases we were able to get confirmation that they had in fact bypassed the filter and that they did not understand the question, which I will grant is somewhat confusing."

*EPA Response: Based on 141.86(f)(1)(ii), MDEQ should invalidate any samples known to be collected through a filter, since these samples do not meet the site selection criteria per 141.86(a). If MDEQ was able to get confirmation from the resident that the filter was bypassed during sample collection, **and** the sample site meets the Tier 1 criteria, the result must be considered in making the 90th percentile calculation.*

DEQ Note: In the "comments" column of the compliance samples list, there is a brief statement, including the date and confirmation the homeowner did not sample through a filter. An attempt was made at several residences to obtain this information, but only a few were able to be reached for comment.

2. "There are a number of Tier 1 samples where the homeowner failed to include the sample collection date on the request for analysis form. Normally, this means an inability to confirm whether the sample was collected during the compliance period and analyzed within laboratory hold-time requirements. Per our discussion, you indicated a majority of this monitoring was conducted through the sentinel sampling program and, therefore, we know when bottles were dropped off, picked up, and transported to the lab. With this information, there is a high level of confidence that most, if not all, of these samples were collected during the compliance period and analyzed within 14 days. Can you please confirm with EPA that they agree these samples should be included in the 90th percentile calculation? It is DEQ's opinion that the samples described [above] were likely submitted to the lab within the 14 day requirement for acid preservation. As such we believe that these samples should be included in the LCR calculation. Please indicate if you concur with the inclusion of these samples for the city of Flint's dataset for the monitoring period that just concluded on June 30, 2016."

*EPA Response: As long as MDEQ has documentation that the sample bottles in question "were dropped off, picked up, and transported to the lab" within the compliance period, preserved in accordance with approved methods for lead in 40 CFR Section 141.86(b)(2), **and** the sample site meets the Tier 1 criteria, the result must be considered in making the 90th percentile calculation. MDEQ should include all of the Sentinel site data since these are known to have been collected within the compliance period. See answer to #1 above as well.*

DEQ Note: After careful consideration of the data available to make this determination, we were able to come up with a decision tree as to what could be considered for compliance.

The following criteria were used in lieu of a “Collection Date”:

1. If we had a date for bottle drop-off, bottle pick-up, and an acidification date, and all 3 dates were within the 14 day hold time criteria; regardless if it was signed and dated, they were included.
2. If we had a date for bottle drop-off, bottle pick-up, and an acidification date, but were outside the 14 day hold time criteria; the signature and date on the back of the form was used as an alternative to “collection date”. If that date was within the 14 day hold time, it was included.
3. If we didn’t have a bottle drop-off date, but had a pick-up and acidification date, and they signed and dated the back of the form, and those 3 dates were within the 14 day hold time criteria, they were included.
4. If we only had the acidification date and they signed and dated the back of the form, and they were within the 14 day hold time, they were included.
5. If they had a bottle pick-up and/or an acidification date, did not sign or date the back of the form, but filled in the date they last used the water in their home and were within the 14 day hold time, they were included.
6. If we had an actual or “approximate” drop-off date (meaning we know for Extended Sentinel Rounds 7-9 and CLEAR Round 1, the earliest date we delivered bottles were 2/20, 4/17, 5/15 and 4/3 respectively) and the acidification date, but they did not sign or date the back of the form, and it was within the 14 day hold time, they were included.
7. If we had the pick-up and acidification date, or only the acidification date, and they did not sign or date the back of the form, there was no information for us to make a determination that it was collected during the 14 day hold time. Therefore, the results were invalidated and not used in the 90th percentile calculation.
8. If the collection date was provided, but was written with an inconsistent “month” from the timeframe of the submitted date, and also had a pre-printed label, it was assumed the resident possibly misprinted the collection date, and so was included in the calculation.

Appendix C

Three Additional Questions from MDEQ: Post Pb ALE Follow-up.
Questions Received July 28, 2016 – EPA Response by Wednesday, August 3 if possible.

Per our teleconference on Wednesday (7/27/16) the Michigan Department of Environmental Quality (MDEQ) is making a formal request for clarification on some key issues regarding the Lead and Copper Rule (LCR). As has been the case on a number of occasions, the situation in Flint is providing some rather unique circumstances and the MDEQ would like to ensure that we have concurrence with the United States Environmental Protection Agency (EPA) in how the LCR is interpreted. Your willingness to provide clarification on numerous issues has made our efforts much easier and is greatly appreciated.

The questions for which the MDEQ requests clarification are as follows:

- 1) A water supply that exceeds the lead Action Level (AL) after corrosion control treatment is installed must begin Lead Service Line (LSL) replacement at a rate of at least 7% per year. The City conducted monitoring during the treatment optimization phase. Based on our understanding of the LCR, this monitoring was not a requirement. The monitoring in question was conducted during the period of January 1, 2016 thru June 30, 2016. The 90th percentile calculation for this testing period exceeded the lead AL of 15 PPB. Given these circumstances, is the requirement to replace 7% of LSL triggered after treatment installation or after treatment optimization? The MDEQ plans to assist the City with their Fast Start initiative to replace LSL and has already provided funds to the City towards these efforts but is seeking a determination as to whether the LSL replacement activities that have taken place and or in the process of taking place are mandatory under the LCR, since sampling was conducted before optimization was complete.

EPA Response: EPA does not agree with MDEQ's assertion that the monitoring Flint conducted between January and June of 2016 was not required. It was required under 40 C.F.R. 141.86 (d), and the exceedance of the action level triggers the lead service line replacement requirements in 40 C.F.R. 141.84.

On February 29, 2016, MDEQ issued a letter to the Flint PWS that provided the system's 2016 Drinking Water Monitoring Schedule, which required lead and copper monitoring at 60 sites during two consecutive six-month monitoring periods: Jan-June and July-Dec of 2016. That letter is consistent with EPA's understanding that Flint PWS is subject to the standard monitoring requirements of the LCR at this time, which requires two consecutive six month monitoring periods per year under 141.86(d)(2).

Section 141.84(a) of the lead and copper rule requires "systems that fail to meet the lead action level in tap samples taken pursuant to 141.86(d)(2), after installing corrosion control and/or source water treatment (whichever sampling occurs later), shall replace lead service lines in accordance with the requirements of this section." Section 141.84(b)(1) provides that "the first year of lead service line replacement shall begin on the first day following the end of the monitoring period in which the action level was exceeded." It also provides that "if the State has established an alternate monitoring period, then the end of the monitoring period will be the last day of that period."

EPA recognizes that Flint continued working to improve its corrosion control treatment after October 2015 to address the problem created as a result of failing to maintain corrosion control treatment when it switched to the Flint River Water in April 2014. The LCR does not explicitly provide for a period of re-optimization before triggering the lead service line replacement requirements in 40 C.F.R. 141.84. Nor does EPA think that there is a reasonable interpretation that would justify allowing Flint additional time to re-optimize corrosion control treatment before being required to conduct lead service line replacement under 141.84.

- 2) Since the City has an incomplete/unreliable distribution materials inventory, it is difficult to determine an accurate number of LSL, and, therefore, an accurate 7%. Current estimates indicate there could be as many as 8,000 LSL, but this number is unconfirmed. If it is determined that LSL replacement is required as discussed in question #1, the MDEQ suggests a minimum replacement requirement of 7% of 8,000 (560 LSL) for the first year, with the caveat that the number may be adjusted in the future as the inventory is validated. Do you concur with this approach?

EPA Response: No, we are concerned that the approach you describe may well underestimate the annual LSL replacement number that Flint must achieve, because the initial estimate of 8000 is well below earlier estimates we heard. To meet the requirements in 141.84 (d), which assumes an accurate inventory, MDEQ should use the highest reasonably reliable estimate of LSLs. This is to ensure that at least 7% of the initial LSLs are removed. In the present case, the first year of lead service line replacement shall begin on the first day following the end of the monitoring period in which the action level was exceeded, i.e., on July 1, 2016 - 141.84(b)(1). The initial number of LSLs is the number in place at the time the LSLR program begins - 141.84(b)(1). Flint should complete an accurate and complete inventory as soon as possible.

We agree that the total number of lead service lines in the system at the start of the LSL program should be adjusted as the initial inventory data are validated. However, because section 141.84(e) of the LCR requires States to put a system on a shorter replacement schedule if feasible, EPA does not think that a reduction in the number of LSLs in the initial inventory warrants a reduction in the number of LSLs that would need to be replaced in a year.

- 3) The LCR requires customer notice of lead results be provided to residents of tested homes. Does this requirement apply only to validated compliance sites (i.e. Tier 1) or to any monitoring conducted? MDEQ will ensure all validated Tier 1 sites receive consumer notice of lead results (or equivalent). Do you concur with this approach?

EPA Response: No, the public notification requirement does not apply only to validated compliance sites. Pursuant to 40 CFR 141.85(d), "all water systems must provide a notice of the individual tap results from lead tap water monitoring carried out under the requirements of § 141.86 - " That includes "additional monitoring by systems" described in 141.86(e) – i.e., monitoring conducted in addition to the minimum requirements. Even if it is not included in the 90th percentile calculation, in an effort to increase public trust and transparency, the PWSs should send out the required consumer notice.

EPA understands that all lead sample tap results were provided to the customers, however not all customers received all of the information required under the LCR for lead consumer notice. As explained above, based on the LCR citations below, consumer notice of tap sampling results is required for tap samples carried out under 141.86.

40 CFR § 141.85 Public education and supplemental monitoring requirements. All water systems must deliver a consumer notice of lead tap water monitoring results to persons served by the water system at sites that are tested, as specified in paragraph (d) of this section.

(d) Notification of results—(1) Reporting requirement. All water systems must provide a notice of the individual tap results from lead tap water monitoring carried out under the requirements of § 141.86 – ”

One suggestion is that when the city sends the required notices to each residence informing them of their lead tap water monitoring results that they use that as an opportunity to gather additional inventory information. The notice could provide information on how to check their service lines to see if they have a full LSL. Since the residents understandably want their LSLs replaced, we think this would be an incentive for the residents to self-report whether they have a LSL coming into their home. This will not yield a complete inventory but it would be better than what they have now.

During the compliance period from January 1 to June 30, 2017, the DEQ Lab analyzed 3,898 lead and copper samples. Of those, 387 were determined to be Tier 1 samples and included in the compliance calculation. The remaining 3,511 samples were invalidated per one of the rules stated below:

1. R 325.10710a(1)(a) Lead and copper in tap water; monitoring requirements.

Rule 710a. (1) Sample site location provisions for lead and copper monitoring in tap water of community and nontransient noncommunity water supplies are as follows:

(a) By the applicable date for the commencement of monitoring under subrule (4)(a) of this rule, each water supply shall complete a materials evaluation of its distribution system to identify a pool of targeted sampling sites that is in compliance with the requirements of this rule and that is large enough to ensure that the water supply can collect the number of lead and copper tap samples required under subrule (3) of this rule. All sites from which first draw samples are collected shall be selected from the pool of targeted sampling sites. Sampling sites may not include faucets that have point of use or point of entry treatment devices designed to remove inorganic contaminants.

40 CFR §141.86(a)(1) Monitoring requirements for lead and copper in tap water.

(a) *Sample site location.* (1) By the applicable date for commencement of monitoring under paragraph (d)(1) of this section, each water system shall complete a materials evaluation of its distribution system in order to identify a pool of targeted sampling sites that meets the requirements of this section, and which is sufficiently large to ensure that the water system can collect the number of lead and copper tap samples required in paragraph (c) of this section. All sites from which first draw samples are collected shall be selected from this pool of targeted sampling sites. Sampling sites may not include faucets that have point-of-use or point-of-entry treatment devices designed to remove inorganic contaminants.

2. R 325.10710a(1)c

(c) The sampling sites selected for a community water supply's sampling pool (tier 1 sampling sites) shall consist of single family structures to which either or both of the following provisions apply:

(i) The structures contain copper pipes soldered with lead and installed after 1982 or that contain lead pipes.

(ii) The structures are served by a lead service line. When multiple family residences comprise not less than 20% of the structures served by a water supply, the supply may include these types of structures in its sampling pool.

40 CFR §141.86(3)

(3) The sampling sites selected for a community water system's sampling pool ("tier I sampling sites") shall consist of single family structures that:

(i) Contain copper pipes with lead solder installed after 1982 or contain lead pipes; and/or

(ii) Are served by a lead service line. When multiple-family residences comprise at least 20 percent of the structures served by a water system, the system may include these types of structures in its sampling pool.

3. R 325.10710a(2)b

(b) Each first draw tap sample for lead and copper shall be 1 liter in volume and have stood motionless in the plumbing system of each sampling site for not less than 6 hours. First draw samples from residential housing shall be collected from the cold water kitchen tap or bathroom sink tap. First draw samples from a nonresidential building shall be 1 liter in volume and shall be collected at an interior tap from which water is typically drawn for consumption. Non-first draw samples collected instead of first draw samples under subdivision (e) of this subrule shall be 1 liter in volume and shall be collected at an interior tap from which water is typically drawn for consumption. First draw samples may be collected by the supply or the supply may allow residents to collect first draw samples after instructing the residents about the sampling

procedures specified in this subdivision. To avoid problems of residents handling nitric acid, acidification of first draw samples may be done up to 14 days after the sample is collected. After acidification to resolubilize the metals, the sample shall stand in the original container for the time specified in the approved EPA method before the sample can be analyzed. If a supply allows residents to perform sampling, the supply shall not challenge the accuracy of the sampling results based on alleged errors in sample collection.

40 CFR §141.86(b)(2)

(b) *Sample collection methods.* (1) All tap samples for lead and copper collected in accordance with this subpart, with the exception of lead service line samples collected under §141.84(c) and samples collected under paragraph (b)(5) of this section, shall be first-draw samples.

(2) Each first-draw tap sample for lead and copper shall be one liter in volume and have stood motionless in the plumbing system of each sampling site for at least six hours. First-draw samples from residential housing shall be collected from the cold water kitchen tap or bathroom sink tap. First-draw samples from a nonresidential building shall be one liter in volume and shall be collected at an interior tap from which water is typically drawn for consumption. Non-first-draw samples collected in lieu of first-draw samples pursuant to paragraph (b)(5) of this section shall be one liter in volume and shall be collected at an interior tap from which water is typically drawn for consumption. First-draw samples may be collected by the system or the system may allow residents to collect first-draw samples after instructing the residents of the sampling procedures specified in this paragraph. To avoid problems of residents handling nitric acid, acidification of first-draw samples may be done up to 14 days after the sample is collected. After acidification to resolubilize the metals, the sample must stand in the original container for the time specified in the approved EPA method before the sample can be analyzed. If a system allows residents to perform sampling, the system may not challenge, based on alleged errors in sample collection, the accuracy of sampling results.

The data in the workbook contains all the lead and copper samples that were collected during this monitoring period January 1 – June 30, 2017. The first tab contains the 387 validated and confirmed Tier 1 samples, sorted by lead concentration. These samples were collected through one of 3 sampling efforts in Flint; Extended Sentinel (ES#), CLEAR (C#), or Residential. The highlighted cells (2) represent an anomaly in the collection date, which is explained in the comments column of the spreadsheet. The second tab represents the same data, but are arranged by sample number to correlate with the copies of the analysis forms that accompany this dataset.

The third tab contains the 1,092 samples that were invalidated. While there could be more than one justification for the sample not meeting the criteria specified in the LCR, the rule most clearly recognized for invalidation is cited in the last column of the spreadsheet. The specific language of the rules is provided on pages 12 and 13 of this document.

The fourth tab contains a list of 2,419 2-bottle sampling kits (250mL and 750mL) that were distributed for submitting residential samples. These samples have not been confirmed to meet the criteria of a Tier 1 site. Also, these samples do not meet the definition of a 1L sample and so are not valid for inclusion in the calculation.

During this monitoring period, there were not any samples from a known Tier 1 site that had to be deemed invalid due to the resident sampling through a POU or whole home filtration system that could not be bypassed.