

**Attachment E –
Results of Special Lead Sampling
at Decatur (AE II) School**

Attachment E

Seattle Public Schools Drinking Water Quality Program

Overview of Water Quality Testing Results at AE II / Decatur December 2005

This document provides an overview of the water quality testing that has been performed at AE II / Decatur from May 2004 to the present. Detailed data tables are attached.

There have been eight separate rounds of testing performed at Decatur. Each is briefly described below. Table 3 (attached) provides an abbreviated summary of the testing events.

Initial Testing – May 12, 2004. This part was the initial phase (Phase 1) of water quality testing that was done at all schools in the District to determine the baseline water quality conditions. Like many other schools, the water service to all sources in the school had been turned off since January 2004 and bottled water was being provided. The results showed quite high lead levels in first-draw (standing) samples throughout the school with 27 out of 30 fixtures having lead concentrations above 20 ppb, and 13 with lead over 100 ppb and one location with the highest lead level measured in any of the District's water testing (1600 ppb). Lead levels in samples collected after 30 seconds of flushing were much lower with 3 of the 30 locations above 20 ppb. Copper levels were measured at 8 locations and 3 of these were above 1.3 ppm. No elevated cadmium was found, but iron levels in the samples collected indicated that iron was a concern. The entire school remained on bottled water.

Follow-up Testing #1 – July 9, 2004. Because of the extent and magnitude of the lead levels found in the initial testing, a follow-up round of testing for lead only was performed to confirm the initial test results. The results showed 13 of the 30 locations above 20 ppb and 18 of 30 above 10 ppb in first-draw samples, but the overall magnitude of lead levels were significantly lower than the initial testing results – only one location was above 100 ppb and no others were 44 ppb. In the flushed samples, there were 2 locations above 10 ppb with the rest quite low. Copper and cadmium were not re-tested as part of this follow-up testing event, as the focus was on the lead levels. The entire school remained on bottled water.

Because there were so few elevated copper results in the initial (Phase 1) copper testing of all schools, HDR conducted routine follow-up field investigations of every fixture at any school that had failed the copper criterion, including those at Decatur, in October 2004. It was noted that there may be a concern with the grounding of a 100-amp electrical subpanel. Shortly after this investigation, the District had prepared a proposed list of schools to close for budgetary reasons starting in the 2005/2006 school year. Because Decatur was one of the schools on this list, the decision was made to keep the school on bottled water and not move ahead with any remediation efforts until a later time.

Special Testing – Late August through Early October, 2004. Because of the large differences in lead levels between the initial and follow-on testing events described above, the District directed HDR to develop and carryout a special lead testing program with the intent of determining possible factors that may explain the large differences in the results.

In developing the special testing plan, it was noted that the May and July 2004 testing events were identical except in two respects, as described below.

1. In the May event, school was in session but all drinking water fixtures were out-of-service and bottled water was being used by students and faculty. To flush or draw a water sample from any fixture it was necessary to open the shut-off valve to the fixture, then turn the valve off again after flushing or sample collection. However, for the July testing, because school was not in session, the shut-off valves were opened for the initial flushing (recommissioning) and left open until after sample collection was complete. Therefore, the May testing resulted in much more cycling of the shut-off valves than was done during the July testing.
2. In the May testing event, school was in session, but in the July testing event school was not in session. Therefore, even though all drinking water fixtures at the school were out-of-service during both testing events, there may have been some differences in the overall water use at the school due to other uses such as restroom use, custodial work, etc.

Therefore, the objectives of the special testing at Decatur were to:

1. Simulate the conditions of the May and July testing events to the extent practicable to determine if operation of the shut-off valves impacted lead levels at the fixtures.
2. Measure the influence of standing (stagnation) time on lead levels in first-draw samples at fixtures.
3. If possible, gain an indication of the magnitude of the variability in lead levels at fixtures when sampled under similar hydraulic conditions.

For this testing, the 8 fixture locations that had the highest first-draw lead levels in the initial (May) testing were evaluated. The special testing was performed using the same basic sampling protocol that was used for all other routine water quality testing, which is as follows:

- For the two consecutive days prior to collecting samples, all fixtures to be sampled were flushed (recommissioned) for 2 minutes. Because the school was using bottled water and all drinking water fixtures had been shut off, the purpose of the recommissioning was to move fresh water through the fixtures to simulate normal water use and establish similar water conditions at all fixtures prior to sampling.
- After the second day of flushing, water at each fixture was allowed to stand stagnant for 16 – 18 hours (from late afternoon until the following morning).

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- On the morning of the third day, a first-draw (standing) sample was collected at each fixture, the fixture then flushed for 30 seconds, and a second (flushed) sample was collected. Both the first-draw and flushed samples were 250 mL in volume.

However, to meet the objectives for the special testing program, two additional items were added:

- Samples were collected after standing times of 1, 2, and 3 hours on the same day subsequent to the initial sample collection to gain an understanding of the effects of standing time on lead level “rebound”, and
- Sampling was carried out for two more consecutive days after the first day of sampling to gain a better understanding of the potential variability in lead levels at a given fixture under similar hydraulic conditions.

The special testing plan consisted of 3 testing events. The first special testing event (August 24 – 26) was designed to simulate the July testing event, where the shut-off valves to the fixtures were opened for the initial flushing and left open until after sample collection was complete. The second two special testing events (August 30 – September 3 and October 5 – 8) were designed to simulate the May testing event, where the shut-off valves were turned on/off daily during the testing program.

The results of special lead testing at Decatur are presented in Tables 1 and 2. In both tables the fixture identification numbers and locations for the eight fixtures tested are shown. Table 1 shows the impact of shut-off valve cycling frequency on first-draw lead levels. The results strongly indicate that more frequent cycling of the shut-off valve (such as was done in the May 12 sampling event) causes significantly greater lead levels in first-draw samples.

Table 1
Impact of Shut-off Valve Operation on First-Draw Lead Levels

Site #	Average 16 – 18 hour Lead Level (ppb) with Valve Cycling	Average 16 – 18 hour Lead Level (ppb) without Valve Cycling
8	40	22
12	96	32
13	103	13
14	101	48
16	352	31
22	109	32
23	125	25
26	78	13
<i>Total</i>	<i>126</i>	<i>27</i>

Table 2 shows the influence of standing (stagnant) time on lead levels in first-draw samples. The results indicate that after a fixture has been flushed and then allowed to stand stagnant, lead levels elevate (“rebound”) fairly quickly after just 1 hour of standing time and can then continue to increase up 3 hours of standing time. For the eight fixtures examined in this testing program, the median lead level in first-draw samples collected after 1 hour standing time was 17 ppb; 20 ppb after 2 hours standing time; and 38 ppb after 3 hours standing time. (Note: Table 2 shows the results of the 1-hour and 16-hour standing times only.) While the numbers of samples collected in this study are not enough to provide a statistically meaningful analysis, the results do indicate that the lead level in a fixture can be expected to “rebound” subsequent to flushing after just 1 hour standing time to roughly one-half of the lead level in a sample that has stood stagnant for 16 – 18 hours.

Table 2
Influence of Standing Time on Lead Levels

Site #	Average Lead Levels (ppb) – Sample Events 3, 4, and 5			Percent of 1 hr Lead to 16-18 hrs Lead Levels
	Flushed (0 hours)	1 hour	16 – 18 hours	
8	2	8	17	47%
12	3	29	50	58%
13	2	43	52	83%
14	5	33	48	69%
16	< 2	78	75	104%
22	4	42	56	75%
23	4	39	87	45%
26	1	25	32	78%
<i>Total</i>	<i>3</i>	<i>37</i>	<i>52</i>	<i>71%</i>

The results of the special lead testing at Decatur also demonstrated that lead levels in standing samples are much greater than in samples collected after 30 seconds of flushing, as shown in Table 2. These results are typical of the results from most of the SPS schools tested. For the eight fixtures examined in this special testing program, the median lead level in first-draw

samples collected after 16 – 18 hours standing time was 33 ppb, while the median lead level of the flushed samples from the same fixtures was 2 ppb.

Follow-up Testing #2 – Sept. 1, 2004. A quality control review of the testing program revealed that 3 fixtures in the portable buildings at the school had been missed, so samples were collected from these. All 3 passed all water quality criteria.

Follow-up Testing #3 – May 26, 2005. To meet the requirements of the Board-approved Water Policy, sampling for cadmium and copper was performed at many schools in spring 2005 that had not previously had all drinking water sites sampled for these metals. The results showed that 9 locations failed for copper, but all locations passed the cadmium criterion.

August/September 2005. The Board determined that Decatur (as well as all other active schools) would not be closed, so it was decided to move ahead with remediation efforts. As part of this effort, the potential issue of electrical grounding and the copper levels was discussed and plans were made to have a licensed electrical inspection company perform a grounding inspection at this school.

Electrical Grounding Inspection – October 12, 2005. CES Electric performed a standard electrical ground resistance test to determine if the building electrical system is properly grounded. The results indicate that it is adequately grounded. CES also checked the electrical service switchgear in the school and noticed a couple items that do not meet the current electrical code (see Attachment A). Work is currently underway by the District to correct the items noted in the test report. Once corrected, the school's electrical system should be fully in compliance with the electrical code and will have no known electrical conditions that may contribute to unusually high copper levels in drinking water.

Follow-up Testing #4 – Nov. 16, 2005. The remediation of all fixtures that had failed a water quality criterion based on previous testing was complete in early November 2005 and follow-up testing was performed. The remediation included the installation of filters at 8 locations that had failed copper. The test results show that the filtered sites are performing very well for removal of all metals – all fixed locations passed all water quality criteria. In particular, at those sites that previously had high copper levels, the filters are removing copper to very low levels. Therefore, it was determined that filters are a very appropriate remediation measure at Decatur and that they should stay in-place until such time as new piping is installed.

Table 3
Summary of Testing Events at AE II / Decatur

Testing Event / Date	Reason for Testing	Overview of Results
Initial Testing – May 12, 2004	Part of the Phase 1 testing program	<ul style="list-style-type: none"> • Many Pb failures (27/30) – some of the highest Pb levels measured in Phase 1 testing at any school. • Indications of Fe problems. • Some high Cu results. (See attached data tables)
Follow-up Testing #1 – July 9, 2004	Special testing for Pb because of high Phase 1 Pb results	<ul style="list-style-type: none"> • Still many Pb failures (18/30), but magnitude of Pb levels significantly lower than in Phase 1 samples. • Most Pb failures in 1st draw samples; flushed Pb levels quite low.
Special Lead Testing #1 – Aug. 24 – 26, 2004	Determine influence of sampling procedures on Pb levels.	<ul style="list-style-type: none"> • Frequency of shut-off valve operation influences the magnitude of Pb levels. • Pb levels after standing 1 hr “rebound” to ~70% standing levels after 16 – 18 hrs. • Flushed Pb levels quite low. (See attached memo dated 11/18/04)
Special Lead Testing #2 – Aug. 30 – Sept. 3, 2004	Determine influence of standing time on Pb levels.	
Special Lead Testing #3 – Oct. 5 – 8, 2004		
Follow-up Testing #2 – Sept. 1, 2004	Sampling for 3 sinks in portables that had been missed in Phase 1 testing	All 3 sites passed for Pb.
Follow-up Testing #3 – May 26, 2005	Obtain copper and cadmium data from all locations, per Water Policy (typical of many schools)	<ul style="list-style-type: none"> • Nine locations failed for Cu. • Cd met standards, all locations.
Follow-up Testing #4 – Nov. 16, 2005	Post-remediation testing	<ul style="list-style-type: none"> • All locations that had required remediation pass all water quality criteria. (Note: filters were installed at 8 locations.)