Providence Water
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March 1, 2013

June Swallow, PE
Chief, Drinking Water Quality
R.I. Department of Health
Cannon Building, Room 209
Three Capitol Hill
Providence, R.I. 02908-5097

RE: pH Transition Implementation Plan
Philip J. Holton Water Purification Plant
January/February 2013 Monthly Report
PWSID 1592024

Dear Ms. Swallow:

Providence Water is pleased to submit the attached January/February 2013 Monthly Report of the activities related to corrosion control during this period, as requested per RIDOH's December 6, 2012 letter.

The Report was formulated using the above letter's outline of items requiring a monthly status submittal to RIDOH for review.

The Report was also coordinated in advance with the Expert Panel to keep them abreast of the current status of the pH transition and associated work. As you know, the Panel was formulated at RIDOH's request in an advisory capacity to provide recommendations for addressing the issue of elevated lead levels in the Providence Water system. The Panel did not recommend any distinct overall changes to the Report and was supportive of the approach and progress to date, but did provide insights based on their experience which have been incorporated into the Report.

Should you have any questions, please call me at 521-6300, Ext. 7291. More importantly, we feel that it would be more beneficial to meet and discuss the progress to date and would like to coordinate a meeting with you. We are available to meet at your earliest convenience. Please let us know of your availability for such a meeting.

Respectfully,
PROVIDENCE WATER SUPPLY BOARD

Gregg Giasson, PE
Senior Director of Operations

Attachment: January/February 2013 Monthly Report

cc: Boyce Spinelli, Joseph Spremulli, Ricky Caruolo, Peter LePage, Rich Razza, Paul Gadoury, PE, Steve Soito, PE, Fred Crosby, Mike Covellone, Steve Santaniello, John Phillips, PE

Providence Water

pH Transition Implementation Plan
Philip J. Holton Water Purification Plant
Monthly Report
January/February 2013

This Monthly Report follows the outline of the RIDOH December 6, 2012 letter requesting monthly updates on all activity related to corrosion control.

1. pH Transition

The transition to a higher pH began on Wednesday, February 6, 2013. It was originally scheduled to begin on Monday, February 4 but the Plant had to shut down to accommodate work under the Filtration System Improvements Project.

As per the August 3, 2012 Memorandum to RIDOH from Providence Water, the Lime and CO_2 doses were to be lowered to achieve an initial incremental rise in pH of 0.2, with the ultimate goal of an initial 9.9 pH. The Lime and CO_2 doses were adjusted throughout the month of February, and as of February 22, the Effluent pH rose from 10.06 to 10.29. In the Distribution System, at 552 Academy Avenue, Providence, the pH rose from 9.75 to 9.91. Once the pH stabilizes at the desired level, water quality data from the various testing sites will be evaluated over a subsequent period of three weeks. If no adverse effects are observed over this period, the next planned step for an additional .2 increase in pH in the Distribution System will be implemented.

See Attachment No. 1 - January/February pH and Alkalinity Data Tables.

2. Special Sampling Studies of Lead Service Line

A. Sequential and LSL Sampling & Testing

A Sampling Protocol for both inside faucet and outside spigot sampling with both field and laboratory testing was formulated, and approved by both the Panel and RIDOH. Eight volunteer participants meeting the Protocol's criteria were culled from a pool of 190 addresses, and the internal plumbing of each participant's home was measured.

The sequential sampling and testing of the eight sites for the Pre-CCTC (Corrosion Control Treatment Change) was accomplished by the end of January to establish baseline conditions, and the Post-CCTC sampling began on February 11, and continues based on the Protocol.

Note that, per the Protocol, the sampling is done after a minimum of 6 hours of stagnation. For the Inside sampling, the faucet is kept fully open because of the inability to always attain a consistent flow rate since most inside faucets are of the single handle/arm type. On the other hand, the conventional Outside spigot is a turn type of valve, where the same flow rate of 2± gpm can be achieved each time we sample, by marking the handle to a reference point. Representative samples of water from within the LSL are collected.

The data presented to date is raw and has yet to be analyzed. It is noted that there are some elevated lead levels in sequential samples taken of water residing within the lead service line. We believe that some of the reasons for this are not only the 6 hour stagnation, but the higher pipe flow velocities associated with higher flow rates from the faucets. Higher lead levels under these higher flow conditions appear to concur with similar observations noted by Marc Edwards (Expert Panel Member) in independent testing which he has previously performed within the system, and his theory of a relationship between dislodged particulate iron and lead release. (See Item 3 below). Furthermore, the Lead (particulate) and Dissolved Lead levels show that the particulate lead is significantly higher. There may be a drop in particulates and lead levels as we proceed on with the flushing of these lead service lines.

There has been some discussion of performing sequential sampling (and testing) at a lower flow rate at some of the participants' homes to compare the lead concentrations at more normal rates of water usage.

See Attachment No. 2 - Samples from Lead Service Line, for the eight participant site/address test results, for essentially all metals.

B. PRS Stations' Monitoring (Academy Ave., Brown University, Commercial Building)

The PRS Stations sampling and testing was resumed at the end of January, again to establish Pre-CCTC baseline conditions, and sampling with both field and laboratory testing continues Post-CCTC.

C. Virginia Tech (VT) Pipe Loop Rigs (Academy Ave., Water Treatment Plant)

The VT Rigs were place back in service the last week in February, and samples have been taken and testing is in progress. The intention is to sample and test once per month.

See Attachment No. 3 - Virginia Tech Pipe Loop Rig Instructions.

3. Special Sampling Studies - Lead attached to Iron Particles

A member of the Expert Panel, Marc Edwards, with his associate Sheldon Masters (both from Virginia Tech), studied the relationship between elevated iron concentrations and lead release. On January 15, 2013, Sheldon, along with Marc, presented the findings of their study to date to Providence Water in a PowerPoint presentation entitled "Effect of Particulate Iron, Natural Organic Matter and Orthophosphate on Corrosion in Low Alkalinity, High pH Water". For the study, synthetic water, similar to Providence's water, was formulated and used. Further study is on-going and arrangements are being considered to ship actual Providence water for use in further experimental work in this regard. (Also see Item 2A for additional tests.)

See Attachment No. 4 - Referenced Power Point presentation.

4. Special Sampling Studies - TCR Sites, LCR Sites, WTP Finished Water

A. Special Total Coliform Rule (TCR) Sites (4)

Four TCR sites were chosen for ease of sampling and their dispersed geographical locations. Additional Pre-CCTC sampling and testing began at these sites on February 1. Post-CCTC sampling in on-going and being conducted once every two weeks.

B. Lead and Copper Rule (LCR) Sites

The additional testing of the LCR sites (100) during the normal 6 month semesters began in December 2012. The additional tests being conducted, as requested by the Expert Panel, are for Dissolved Lead, Total Iron, and Total Zinc.

C. Total Coliform Rule (TCR) Sites (44)

In addition to normal testing for Free Chlorine in the field and Total Coliforms in the Lab, Turbidity testing has been added.

D. WTP Finished Water Sampling

Providence Water has added Oxygen Reduction Potential (ORP) to their daily analyses of the finished water. In addition, both field and laboratory sampling and tests have occurred one week Pre-CCTC, with weekly field tests and laboratory tests every 8 weeks Post-CCTC.

5. Experimental Pipe Loops

Eight, four (4) foot lead service lines (5/8" inch) have been harvested for use in the pipe loop racks. A more detailed pipe loop rack (8 loops) schematic was developed for fabrication at the Water Treatment Plant in the CO_2 Feed Room. A commensurate List of Materials has been completed along with a detailed Operational and Sampling/Testing Protocol. Presently, certain instruments, pumps, valves etc will be salvaged from the Iron Pipe Loops at the Bath Street Pump Station including those used in pipe loops in DC. The initial procedure will be to condition 16 lead pipe sections and use the best 8 for future experiments/pilot studies. The actual fabrication of the test loops is expected to begin in March.

As per the Expert Panel's report, further consultation with the Panel is in order once the data is analyzed to determine what future experiments/pilot studies may be warranted.

See Attachment No. 5 - Pipe Loop Schematic, List of Materials, and Protocol.

6. Providence Water Distribution System Improvements

A. Unidirectional Flushing Program (UDF)

Keeping the Expert Panel's advice to not corrupt the data from the various treatment change sampling and monitoring sites, which are numerous and throughout the system, the UDF Program has been modified to avoid the sampling areas, and limited to non-obtrusive, isolated areas. Because of this, presently, Providence Water envisions that unidirectional flushing can only be performed on 100± miles of unlined cast iron water main this coming year. UDF will be accomplished in six sequenced areas, A-2, A-4, A-5, PA-1, PA-3, and PA-5.

See Attachment No. 6 - Unidirectional Flushing (UDF) Program map.

B. Infrastructure Program (Cleaning & Lining, and Replacement of Water Mains)

Two Water Main Replacement Contracts (WMR PW-2 and WMR PW-2) will restart in the Spring using three contractors. Cleaning and lining were included. In addition, two additional WMRs (WMR PW-3 and WMR PW-4) are currently being designed for construction start in June and July 2013 using four contractors. PW-3 will be advertized in March and PW-4 in April. These four contracts will replace 55,200 linear feet of unlined cast iron water main, and an additional 12,310 linear feet will be cleaned and lined.

In addition, other smaller specific water quality driven water main replacements have been accomplished, amounting to 7,650 linear feet.

Furthermore, through coordination with work being performed by the Narragansett Bay Commission (NBC), additional water main replacements are being accomplished amounting to 26,950 linear feet in a span of 3 years.

In combination, a total of 102,110 linear feet of unlined cast iron water main is presently scheduled to be replaced or relined.

Due to budgetary constraints, the level of effort for water main replacement and rehabilitation contracts is predicated on whether the LSR Program continues to be placed in abeyance. Additional funding to expand water main replacement work is also being requested in our upcoming rate filing before the Public Utilities Commission (PUC).

See Attachment No. 7 - Water Main Replacement Program map indicating the WMR PW-1, 2, 3, and 4 locations.

pH/Alkalinity Data

January

Date	Effluent Water pH SU	Effluent Water T. Alk. mg/l	Academy Ave., Tap pH SU	Academy Ave., Tap T. Alk. mg/l
1/1/2013				
1/2/2013	9.96	15.00	9.72	14.20
1/3/2013	10.03	15.40	9.66	13.70
1/4/2013	10.03	15.00	9.67	13.80
1/5/2013	10.00	15.40		
1/6/2013				
1/7/2013	10.04	15.30	9.67	14.30
1/8/2013	10.01	15.60	9.79	14.00
1/9/2013	10.04	15.10	9.74	14.00
1/10/2013	9.93	15.40	9.65	14.40
1/11/2013	10.02	15.60	9.62	14.60
1/12/2013	9.96	15.00		
1/13/2013				
1/14/2013	9.96	15.40	9.77	14.90
1/15/2013	9.97	15.10	9.70	14.50
1/16/2013	10.00	16.10	9.70	14.60
1/17/2013	10.03	15.40	9.68	14.50
1/18/2013	9.97	16.00	9.77	14.50
1/19/2013	9.96	16.40		
1/20/2013				
1/21/2013				
1/22/2013	10.04	16.10	9.84	14.30
1/23/2013	10.14	15.70	9.79	14.10
1/24/2013	10.03	15.40	9.83	14.10
1/25/2013	9.97	15.40	9.87	13.80
1/26/2013	10.13	15.70		
1/27/2013				
1/28/2013	10.03	15.70	9.66	14.70
1/29/2013	10.00	16.00	9.80	14.50
1/30/2013	9.96	16.00	9.76	14.80
1/31/2013	10.00	15.70	9.82	14.20
Minimum	9.93	15.00	9.62	13.70
Maximum	10.14	16.40	9.87	14.90
Average	10.01	15.56	9.74	14.31

February

Date	Effluent Water pH SU	Effluent Water T. Alk. mg/l	Academy Ave., Tap pH SU	Academy Ave., Tap T. Alk. mg/l
2/1/2013	9.99	15.60	9.68	13.90
2/2/2013	10.02	16.10		
2/3/2013				
2/4/2013	10.03	15.80	9.77	14.30
2/5/2013	10.12	15.60	9.77	14.50
2/6/2013	10.06	16.70	9.75	14.60
2/7/2013	10.08	15.50	9.80	14.20
2/8/2013	10.06	15.50		
2/9/2013				
2/10/2013				
2/11/2013	9.96	15.60		
2/12/2013	10.10	15.70	9.81	14.20
2/13/2013	10.16	16.40		
2/14/2013	10.34	16.20	9.64	14.60
2/15/2013	10.10	15.80	9.89	14.80
2/16/2013	10.16	16.00		
2/17/2013				
2/18/2013				
2/19/2013	10.20	16.00	10.00	14.40
2/20/2013	10.17	15.60	9.96	14.20
2/21/2013	10.22	15.70	9.97	14.30
2/22/2013	10.29	16.00	9.91	14.10
2/23/2013				
2/24/2013				
2/25/2013				
2/26/2013				
2/27/2013				
2/28/2013				
Minimum	9.96	15.50	9.64	13.90
Maximum	10.42	16.70	10.00	14.80
Average	10.14	15.87	9.83	14.34

ATTACHMENT NO. 1

Loc #1, 57 Holburn Ave

Date: 1/4/13; inside faucet E301238

Flow rate = 1.49 gpm pH = 9.33 / 9.53

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0052	0.0010	0.20	0.051	0.0520	0.0100	0.0051	0.0048	0.0710
#02, 1/2 Liter	0.0028	0.0010	0.19	0.051	0.0430	0.0110	0.0051	0.0038	0.0071
#03, 1 Liter	0.0010	0.0010	0.22	0.051	0.0110	0.0026	0.0051	0.0071	0.0051
#04, 1 Liter	0.0010	0.0010	0.23	0.051	0.0110	0.0021	0.0051	0.0073	0.0062
#05, 1 Liter	0.0012	0.0010	0.22	0.051	0.0082	0.0023	0.0051	0.0071	0.0051
#06, 1 Liter	0.0012	0.0010	0.23	0.051	0.0078	0.0021	0.0051	0.0073	0.0040
#07, 3 min 1 Liter	0.0010	0.0010	0.22	0.051	0.0120	0.0025	0.0051	0.0070	0.0072

Date: 1/18/13; outside spigot E301D07

Flow rate = 1.69 gpm pH = 9.61 / 9.90

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	1.3000	0.0440	0.43	0.065	0.4100	0.0480	0.056	0.0150	0.6000
#02, 1/2 Liter	0.0045	0.0010	0.21	0.051	0.0160	0.0031	0.0051	0.0042	0.0095
#03, 1 Liter	0.0100	0.0010	0.20	0.051	0.0093	0.0026	0.0051	0.0040	0.0250
#04, 1 Liter	0.0260	0.0019	0.21	0.051	0.0076	0.0019	0.0051	0.0047	0.0280
#05, 1 Liter	0.0190	0.0013	0.21	0.051	0.0044	0.0016	0.0051	0.0050	0.0290
#06, 1 Liter	0.0180	0.0045	0.22	0.067	0.0032	0.0015	0.0051	0.0058	0.0250
#07, 1 Liter	0.0042	0.0010	0.24	0.083	0.0026	0.0015	0.0051	0.0075	0.0190
#08, 3 min 1 Liter	0.0010	0.0010	0.24	0.064	0.0010	0.0010	0.0051	0.0076	0.0210

ATTACHMENT NO. 2

Date: 1/22/13; outside spigot E301F54

Flow rate = 1.75 gpm pH = 9.61 / 9.89

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01 1/2 Liter	0.2600	0.0023	0.30	0.051	0.3200	0.0150	0.0084	0.0084	0.4400
#02 1 Liter	0.0150	0.0024	0.24	0.051	0.0100	0.0024	0.0051	0.0038	0.0056
#03 1 Liter	0.0180	0.0031	0.24	0.051	0.0037	0.0031	0.0051	0.0042	0.0061
#04 1 Liter	0.0230	0.0041	0.24	0.051	0.0022	0.0014	0.0051	0.0042	0.0073
#05 1 Liter	0.0260	0.0044	0.22	0.051	0.0021	0.0017	0.0051	0.0051	0.0051
#06 1 Liter	0.0024	0.0010	0.23	0.051	0.0015	0.0010	0.0051	0.0070	0.0051
#07 3 min 1 Liter	0.0010	0.0010	0.23	0.051	0.0010	0.0010	0.0051	0.0071	0.0051

Date: 1/25/13; outside spigot E301H01

Flow rate = 2.52 gpm pH = 9.55

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01 1/2 Liter	0.035	0.001	0.21	0.051	0.0170	0.0027	0.0051	0.0045	0.0051
#02 1 Liter	0.110	0.051	0.20	0.051	0.0100	0.0016	0.0051	0.0045	0.0051
#03 1 Liter	0.030	0.020	0.21	0.051	0.0038	0.0036	0.0051	0.0052	0.0051
#04 1 Liter	0.014	0.009	0.20	0.051	0.0031	0.0021	0.0051	0.0053	0.0051
#05 1 Liter	0.012	0.004	0.21	0.051	0.0027	0.0031	0.0051	0.0060	0.0051
#06 1 Liter	0.009	0.005	0.22	0.051	0.0023	0.0011	0.0051	0.0068	0.0051
#07 3 min 1 Liter	0.001	0.001	0.22	0.057	0.0010	0.0010	0.0051	0.0068	0.0051

ATTACHMENT NO. 2

Date: 1/30/13; outside spigot E301K64

Flow rate = 2.36 gpm pH = 9.61 / 9.80

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01 1/2 Liter	0.0300	0.0013	0.2800	0.0510	0.0220	0.0140	0.0051	0.0043	0.0068
#02 1 Liter	0.0240	0.0042	0.2600	0.0510	0.0072	0.0032	0.0051	0.0041	0.0120
#03 1 Liter	0.0860	0.0056	0.2700	0.0530	0.0027	0.0011	0.0051	0.0046	0.0140
#04 1 Liter	0.0170	0.0024	0.2600	0.0510	0.0016	0.0010	0.0051	0.0056	0.0120
#05 1 Liter	0.0120	0.0037	0.2700	0.0810	0.0013	0.0016	0.0051	0.0068	0.0140
#06 1 Liter	0.0038	0.0010	0.2800	0.0540	0.0010	0.0010	0.0051	0.0080	0.0096
#07 3 min 1 Liter	0.0010	0.0010	0.3000	0.0740	0.0010	0.0010	0.0051	0.0086	0.0096

Date: 2/11/13; inside faucet E302596

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0049	0.001	0.22	0.051	0.032	0.011	0.0051	0.005	0.009
#02, 1 Liter	0.003	0.001	0.2	0.051	0.0011	0.0011	0.0051	0.0057	0.01
#03, 3 min 1 Liter	0.001	0.001	0.2	0.051	0.001	0.001	0.0051	0.0063	0.016

Date: 2/13/13; outside spigot E302953

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.026	0.001	0.26	0.051	0.017	0.0034	0.0051	0.0043	0.0075
#02, 1 Liter	0.021	0.0032	0.3	0.078	0.0036	0.0012	0.0051	0.0057	0.012
#03, 3 min 1 Liter	0.0036	0.001	0.44	0.076	0.001	0.001	0.0051	0.012	0.0084

ATTACHMENT NO. 2

Loc #2 26 Keith Avenue

Sample date 1/8/2013; Outside spigot; E301631

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0095	0.0016	0.100	0.051	0.0430	0.0110	0.0051	0.0038	0.0590
#02, 1/2 Liter	0.0067	0.0010	0.150	0.051	0.0110	0.0045	0.0051	0.0039	0.0180
#03, 1 Liter	0.0370	0.0050	0.150	0.051	0.0073	0.0031	0.0051	0.0042	0.0063
#04, 1 Liter	0.0530	0.0098	0.160	0.051	0.0021	0.0010	0.0051	0.0046	0.0051
#05, 1 Liter	0.0550	0.0058	0.160	0.051	0.0011	0.0010	0.0051	0.0048	0.0051
#06, 1 Liter	0.0580	0.0093	0.150	0.051	0.0010	0.0010	0.0051	0.0048	0.0051
#07, 1 Liter	0.0170	0.0023	0.110	0.051	0.0010	0.0010	0.0051	0.0042	0.0051
#08, 3 min 1 Liter	0.0033	0.0010	0.093	0.051	0.0130	0.0041	0.0051	0.0032	0.0062

Sample date 1/9/2013; Inside faucet; E301690

Flow rate = 2.10 gpm pH = 9.46 / 9.54

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0036	0.0010	0.140	0.051	0.0160	0.0059	0.0051	0.0032	0.0470
#02, 1/2 Liter	0.0048	0.0010	0.120	0.051	0.0092	0.0034	0.0051	0.0030	0.0240
#03, 1 Liter	0.0051	0.0010	0.130	0.051	0.0076	0.0032	0.0051	0.0036	0.0220
#04, 1 Liter	0.0046	0.0010	0.110	0.051	0.0074	0.0032	0.0051	0.0032	0.0170
#05, 1 Liter	0.0220	0.0033	0.110	0.051	0.0073	0.0037	0.0051	0.0036	0.0062
#06, 1 Liter	0.0260	0.0019	0.100	0.051	0.0037	0.0018	0.0051	0.0038	0.0060
#07, 1 Liter	0.0270	0.0041	0.096	0.051	0.0015	0.0011	0.0051	0.0031	0.0051
#08, 1 Liter	0.0280	0.0039	0.097	0.051	0.0013	0.0011	0.0051	0.0034	0.0052
#09, 3 min 1 Liter	0.0080	0.0010	0.100	0.051	0.0016	0.0014	0.0051	0.0032	0.0055

Sample date 1/16/2013; Outside spigot; E301C03

Flow rate = 1.57 gpm pH = 9.60 / 9.69

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0078	0.0019	0.061	0.051	0.0370	0.0130	0.0051	0.0025	0.0490
#02, 1/2 Liter	0.0068	0.0010	0.094	0.051	0.0130	0.0048	0.0051	0.0022	0.0200
#03, 1 Liter	0.0320	0.0066	0.085	0.051	0.0055	0.0030	0.0051	0.0020	0.0051
#04, 1 Liter	0.0380	0.0068	0.085	0.051	0.0011	0.0012	0.0051	0.0020	0.0051
#05, 1 Liter	0.0400	0.0091	0.084	0.051	0.0013	0.0010	0.0051	0.0020	0.0250
#06, 1 Liter	0.0370	0.0066	0.085	0.051	0.0011	0.0010	0.0051	0.0020	0.0051
#07, 1 Liter	0.0065	0.0011	0.100	0.051	0.0010	0.0010	0.0051	0.0026	0.0051
#08, 3 min 1 Liter	0.0013	0.0010	0.100	0.051	0.0010	0.0010	0.0051	0.0028	0.0051

Sample date 1/23/2013; Outside spigot; E301G29

Flow rate = 1.46 gpm pH = 9.70 / 9.81

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0089	0.0010	0.120	0.051	0.0280	0.0048	0.0051	0.0023	0.0860
#02, 1/2 Liter	0.0120	0.0032	0.092	0.051	0.0210	0.0054	0.0051	0.0020	0.0410
#03, 1 Liter	0.0170	0.0050	0.098	0.051	0.0051	0.0011	0.0051	0.0021	0.0320
#04, 1 Liter	0.0180	0.0020	0.090	0.051	0.0021	0.0015	0.0051	0.0020	0.0051
#05, 1 Liter	0.0200	0.0070	0.091	0.051	0.0010	0.0010	0.0051	0.0020	0.0051
#06, 1 Liter	0.0068	0.0015	0.095	0.051	0.0010	0.0010	0.0051	0.0023	0.0051
#07, 3 min 1 Liter	0.0012	0.0010	0.098	0.051	0.0010	0.0010	0.0051	0.0026	0.0051

ATTACHMENT NO. 2

Sample date 1/30/2013; Outside spigot; **E301K65**

Flow rate = 1.59 gpm pH = 9.66 / 9.73

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0090	0.0010	0.1100	0.0510	0.0160	0.0074	0.0051	0.0020	0.0750
#02, 1 Liter	0.0330	0.0110	0.0970	0.0510	0.0072	0.0039	0.0051	0.0020	0.0150
#03, 1 Liter	0.0430	0.0110	0.0940	0.0510	0.0014	0.0014	0.0051	0.0020	0.0180
#04, 1 Liter	0.0450	0.0100	0.0950	0.0510	0.0016	0.0017	0.0051	0.0020	0.0140
#05, 1 Liter	0.0460	0.0100	0.0940	0.0510	0.0010	0.0018	0.0051	0.0020	0.0110
#06, 1 Liter	0.0098	0.0028	0.1100	0.0510	0.0010	0.0012	0.0051	0.0033	0.0120
#07, 3 min 1 Liter	0.0012	0.0010	0.1100	0.0510	0.0010	0.0010	0.0051	0.0033	0.0099

Sample date 2/12/2013; Inside spigot; E302848

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.005	0.001	0.11	0.051	0.0092	0.0046	0.0051	0.0025	0.027
#02, 1 Liter	0.027	0.0058	0.07	0.051	0.001	0.001	0.0051	0.002	0.011
#03, 3 min 1 Liter	0.001	0.001	0.11	0.058	0.001	0.001	0.0051	0.0031	0.009
#04, 3 min 1 Liter	0.001	0.001	0.11	0.051	0.001	0.001	0.0051	0.0033	0.0051

Sample date 2/13/2013; Outside spigot; E302952

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.062	0.0024	0.19	0.051	0.02	0.0075	0.0051	0.0053	0.053
#02, 1 Liter	0.031	0.0053	0.086	0.051	0.001	0.001	0.0051	0.0023	0.0091
#03, 3 min 1 Liter	0.001	0.001	0.089	0.051	0.001	0.0012	0.0051	0.0022	0.0086
#04, 3 min 1 Liter	0.001	0.001	0.089	0.051	0.001	0.001	0.0051	0.0022	0.0085

Loc #3, 32 Lorimer Ave

Date: 1/10/13; outside spigot E301770

Flow rate = 2.04 gpm pH = 9.50 / 9.63

	Units	**ppm**	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Parameter	**Lead**	Diss Lead	Iron	Diss Iron	Copper	Diss Copper	Tin	Manganese	Zinc
#01, 1/2 Liter	Result	0.0140	0.0050	0.051	0.051	0.0160	0.0060	0.0051	0.0020	0.1300
#02, 1/2 Liter	Result	0.0230	0.0014	0.220	0.051	0.0100	0.0071	0.0051	0.0058	0.2000
#03, 1 Liter	Result	0.0240	0.0042	0.200	0.051	0.0360	0.0120	0.0051	0.0042	0.0280
#04, 1 Liter	Result	0.0850	0.0100	0.210	0.051	0.0064	0.0027	0.0051	0.0042	0.0230
#05, 1 Liter	Result	0.0870	0.0100	0.210	0.051	0.0019	0.0014	0.0051	0.0041	0.0220
#06, 1 Liter	Result	0.0470	0.0052	0.190	0.051	0.0018	0.0012	0.0051	0.0036	0.0220
#07, 1 Liter	Result	0.0049	0.0010	0.058	0.051	0.0012	0.0010	0.0051	0.0020	0.0220
#08, 3 min 1 Liter	Result	0.0023	0.0010	0.053	0.051	0.0010	0.0010	0.0051	0.0020	0.0210

Date: 1/11/13; outside spigot E301806

Flow rate = 2.03 gpm pH = 9.50 / 9.56

	Units	**ppm**	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Parameter	**Lead**	Diss Lead	Iron	Diss Iron	Copper	Diss Copper	Tin	Manganese	Zinc
#01, 1/2 Liter	Result	0.0160	0.0054	0.051	0.051	0.0120	0.0080	0.0051	0.0020	0.1100
#02, 1/2 Liter	Result	0.0120	0.0020	0.052	0.051	0.0120	0.0068	0.0051	0.0020	0.1000
#03, 1 Liter	Result	0.0210	0.0099	0.051	0.051	0.0250	0.0140	0.0051	0.0020	0.0280
#04, 1 Liter	Result	0.0520	0.0230	0.053	0.051	0.0041	0.0032	0.0051	0.0020	0.0220
#05, 1 Liter	Result	0.0500	0.0210	0.051	0.051	0.0018	0.0016	0.0051	0.0020	0.0250
#06, 1 Liter	Result	0.0220	0.0025	0.150	0.051	0.0017	0.0012	0.0051	0.0042	0.0230
#07, 1 Liter	Result	0.0040	0.0010	0.150	0.051	0.0012	0.0010	0.0051	0.0048	0.0190
#08, 3 min 1 Liter	Result	0.0025	0.0010	0.140	0.051	0.0010	0.0010	0.0051	0.0049	0.0230

Date: 1/14/13; inside faucet **E301A06**

Flow rate = 1.75 gpm pH = 9.17 / 9.31

	Units	**ppm**	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Parameter	**Lead**	Diss Lead	Iron	Diss Iron	Copper	Diss Copper	Tin	Manganese	Zinc
#01, 1/2 Liter	Result	0.0120	0.0036	0.074	0.051	0.0450	0.0240	0.0051	0.0026	0.0290
#02, 1/2 Liter	Result	0.0170	0.0012	0.088	0.051	0.0320	0.0140	0.0051	0.0026	0.0490
#03, 1 Liter	Result	0.0180	0.0054	0.084	0.051	0.0300	0.0150	0.0051	0.0022	0.0330
#04, 1 Liter	Result	0.0370	0.0130	0.076	0.051	0.0190	0.0095	0.0051	0.0020	0.0210
#05, 1 Liter	Result	0.0700	0.0240	0.082	0.051	0.0042	0.0026	0.0051	0.0021	0.0180
#06, 1 Liter	Result	0.0640	0.0180	0.074	0.051	0.0028	0.0018	0.0051	0.0020	0.0160
#07, 1 Liter	Result	0.0140	0.0042	0.054	0.051	0.0023	0.0018	0.0051	0.0024	0.0160
#08, 3 min 1 Liter	Result	0.0026	0.0015	0.051	0.051	0.0020	0.0017	0.0051	0.0020	0.0170

Date: 1/22/13; outside spigot **E301F55**

Flow rate = 2.66 gpm pH = 9.74 / 9.76

	Units	**ppm**	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Parameter	**Lead**	Diss Lead	Iron	Diss Iron	Copper	Diss Copper	Tin	Manganese	Zinc
#01 1/2 Liter	Result	0.0290	0.0034	0.130	0.051	0.0210	0.0080	0.0051	0.0040	0.5600
#02 1 Liter	Result	0.0230	0.0120	0.051	0.051	0.0200	0.0150	0.0051	0.0020	0.0200
#03 1 Liter	Result	0.0450	0.0220	0.051	0.051	0.0048	0.0047	0.0051	0.0020	0.0140
#04 1 Liter	Result	0.0390	0.0190	0.051	0.051	0.0023	0.0018	0.0051	0.0020	0.0140
#05 1 Liter	Result	0.0120	0.0027	0.072	0.051	0.0017	0.0016	0.0051	0.0020	0.0099
#06 1 Liter	Result	0.0035	0.0010	0.065	0.051	0.0014	0.0011	0.0051	0.0020	0.0067
#07 3 min 1 Liter	Result	0.0022	0.0010	0.064	0.051	0.0010	0.0010	0.0051	0.0020	0.0051

ATTACHMENT NO. 2

Date: 1/24/13; outside spigot E301G88

Flow rate = 2.21 gpm pH = 9.64

	Units	**ppm**	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Parameter	**Lead**	Diss Lead	Iron	Diss Iron	Copper	Diss Copper	Tin	Manganese	Zinc
#01 1/2 Liter	Result	0.0150	0.0028	0.056	0.051	0.0310	0.0150	0.0051	0.0020	0.0710
#02 1 Liter	Result	0.0370	0.0200	0.051	0.051	0.0170	0.0120	0.0051	0.0020	0.0090
#03 1 Liter	Result	0.0500	0.0390	0.051	0.051	0.0029	0.0020	0.0051	0.0020	0.0051
#04 1 Liter	Result	0.0350	0.0250	0.053	0.051	0.0021	0.0018	0.0051	0.0020	0.0051
#05 1 Liter	Result	0.0085	0.0015	0.070	0.051	0.0016	0.0014	0.0051	0.0020	0.0051
#06 1 Liter	Result	0.0032	0.0020	0.060	0.051	0.0016	0.0012	0.0051	0.0020	0.0051
#07 3 min 1 Liter	Result	0.0021	0.0014	0.062	0.051	0.0012	0.0015	0.0051	0.0020	0.0051

Date: 2/11/13; inside faucet E302695

	Units	**ppm**	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Parameter	**Lead**	Diss Lead	Iron	Diss Iron	Copper	Diss Copper	Tin	Manganese	Zinc
#01, 1/2 Liter		0.016	0.0041	0.051	0.051	0.031	0.016	0.0051	0.002	0.019
#02, 1 Liter		0.044	0.016	0.051	0.051	0.0029	0.0021	0.0051	0.002	0.01
#03, 3 min 1 Liter		0.0023	0.001	0.063	0.051	0.0014	0.0013	0.0051	0.002	0.0092

Date: 2/14/13; outside spigot E302A39

	Units	**ppm**	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Parameter	**Lead**	Diss Lead	Iron	Diss Iron	Copper	Diss Copper	Tin	Manganese	Zinc
#01, 1/2 Liter		0.0340	0.0043	0.1600	0.0510	0.0150	0.0049	0.0051	0.0029	1.4000
#02, 1 Liter		0.0480	0.0150	0.0510	0.0510	0.0020	0.0017	0.0051	0.0020	0.0160
#03, 3 min 1 Liter		0.0018	0.0010	0.0510	0.0510	0.0010	0.0010	0.0051	0.0020	0.0110

ATTACHMENT NO. 2

Loc #4, 56 Gentian Ave

Date: 1/15/13; inside faucet — E301A44

Flow rate = 1.48 gpm — pH = 9.50 / 9.59

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0077	0.0019	0.051	0.051	0.0220	0.0150	0.0051	0.002	0.0220
#02, 1/2 Liter	0.0080	0.0025	0.051	0.051	0.0120	0.0088	0.0051	0.002	0.0051
#03, 1 Liter	0.0055	0.0010	0.120	0.051	0.0140	0.0059	0.0051	0.002	0.0240
#04, 1 Liter	0.0081	0.0012	0.130	0.051	0.0052	0.0034	0.0051	0.002	0.0190
#05, 1 Liter	0.0042	0.0012	0.051	0.051	0.0024	0.0018	0.0051	0.002	0.0300
#06, 1 Liter	0.0021	0.0010	0.051	0.051	0.0024	0.0020	0.0051	0.002	0.0200
#07, 1 Liter	0.0019	0.0010	0.051	0.051	0.0021	0.0021	0.0051	0.002	0.0180
#08, 1 Liter	0.0013	0.0010	0.051	0.051	0.0012	0.0012	0.0051	0.002	0.0180
#09, 1 Liter	0.0013	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0220
#10, 3 min 1 Liter	0.0012	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0150

Date: 1/17/13; outside spigot — E301C76

Flow rate = 1.30 gpm — pH = 9.84 / 9.91

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#02, 1/2 Liter	0.0150	0.0078	0.051	0.051	0.0043	0.0031	0.0051	0.002	0.0080
#03, 1 Liter	0.0039	0.0016	0.051	0.051	0.0028	0.0024	0.0051	0.002	0.0190
#04, 1 Liter	0.0034	0.0010	0.051	0.051	0.0017	0.0016	0.0051	0.002	0.0170
#05, 1 Liter	0.0019	0.0010	0.051	0.051	0.0011	0.0010	0.0051	0.002	0.0310
#06, 1 Liter	0.0015	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0170
#07, 1 Liter	0.0016	0.0010	0.051	0.051	0.0010	0.0012	0.0051	0.002	0.0170
#08, 1 Liter	0.0014	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0220
#09, 1 Liter	0.0013	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0160
#10, 3 min 1 Liter	0.0012	0.0010	0.051	0.051	0.0010	0.0012	0.0051	0.002	0.0051

Date: 1/23/13; outside spigot E301G28

Flow rate = 1.38 gpm pH = 9.61 / 9.75

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0170	0.0055	0.051	0.051	0.0090	0.0054	0.0051	0.002	0.0051
#02, 1 Liter	0.0086	0.0033	0.051	0.051	0.0052	0.0034	0.0051	0.002	0.0091
#03, 1 Liter	0.0110	0.0030	0.051	0.051	0.0018	0.0013	0.0051	0.002	0.0051
#04, 1 Liter	0.0036	0.0010	0.051	0.051	0.0014	0.0011	0.0051	0.002	0.0051
#05, 1 Liter	0.0016	0.0010	0.051	0.051	0.0013	0.0010	0.0051	0.002	0.0051
#06, 1 Liter	0.0014	0.0010	0.051	0.051	0.0012	0.0010	0.0051	0.002	0.0051
#07, 1 Liter	0.0014	0.0010	0.051	0.051	0.0010	0.0011	0.0051	0.002	0.0051
#08, 1 Liter	0.0013	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0051
#09, 3 min 1 Liter	0.0012	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0051

Date: 1/25/13; outside spigot E301H02

Flow rate = 1.52 gpm pH = 9.66 / 9.79

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0084	0.0019	0.051	0.051	0.0200	0.0080	0.0051	0.002	0.0300
#02, 1 Liter	0.0110	0.0030	0.051	0.051	0.0120	0.0062	0.0051	0.002	0.0330
#03, 1 Liter	0.0180	0.0038	0.051	0.051	0.0022	0.0016	0.0051	0.002	0.0051
#04, 1 Liter	0.0044	0.0010	0.051	0.051	0.0016	0.0013	0.0051	0.002	0.0051
#05, 1 Liter	0.0016	0.0010	0.051	0.051	0.0016	0.0018	0.0051	0.002	0.0051
#06, 1 Liter	0.0014	0.0010	0.051	0.051	0.0013	0.0013	0.0051	0.002	0.0051
#07, 1 Liter	0.0014	0.0010	0.051	0.051	0.0022	0.0023	0.0051	0.002	0.0051
#08, 1 Liter	0.0014	0.0010	0.051	0.051	0.0010	0.0012	0.0051	0.002	0.0051
#09, 3 min 1 Liter	0.0012	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0051

Date: 1/28/13; outside spigot **E301H38**

Flow rate = 1.57 gpm pH = 9.52 / 9.72

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0230	0.0077	0.055	0.051	0.0250	0.0200	0.0051	0.002	0.0051
#02, 1 Liter	0.0180	0.0100	0.051	0.051	0.0170	0.0140	0.0051	0.002	0.0190
#03, 1 Liter	0.0300	0.0160	0.051	0.051	0.0030	0.0025	0.0051	0.002	0.0051
#04, 1 Liter	0.0063	0.0020	0.051	0.051	0.0022	0.0015	0.0051	0.002	0.0051
#05, 1 Liter	0.0017	0.0010	0.051	0.051	0.0016	0.0014	0.0051	0.002	0.0051
#06, 1 Liter	0.0015	0.0012	0.051	0.051	0.0019	0.0016	0.0051	0.002	0.0051
#07, 1 Liter	0.0014	0.0010	0.051	0.051	0.0012	0.0010	0.0051	0.002	0.0051
#08, 1 Liter	0.0013	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.002	0.0051
#09, 3 min 1 Liter	0.0012	0.0010	0.051	0.051	0.0010	0.0012	0.0051	0.002	0.0051

Date: 2/11/13; inside faucet **E302594**

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0041	0.001	0.051	0.051	0.0055	0.0034	0.0051	0.002	0.0051
#02, 1 Liter **	0.0013	0.001	0.051	0.051	0.0012	0.0012	0.0051	0.002	0.0088
#03, 3 min 1 Liter	0.001	0.001	0.051	0.051	0.001	0.001	0.0051	0.002	0.0087

Date: 2/12/13; outside spigot **E302694**

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.011	0.001	0.055	0.051	0.0045	0.0025	0.0051	0.002	0.0051
#02, 1 Liter **	0.0013	0.001	0.051	0.051	0.001	0.001	0.0051	0.002	0.0096
#03, 3 min 1 Liter	0.001	0.001	0.051	0.051	0.001	0.001	0.0051	0.002	0.0092

ATTACHMENT NO. 2

Date: 2/18/13; inside faucet E302A72

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0100	0.0022	0.0510	0.0510	0.0061	0.0041	0.0051	0.0020	0.0051
#02, 1 Liter **	0.0012	0.0010	0.0510	0.0510	0.0010	0.0010	0.0051	0.0020	0.0086
#03, 3 min 1 Liter	0.0010	0.0010	0.0510	0.0510	0.0010	0.0010	0.0051	0.0020	0.0083

Date: 2/19/13; outside spigot E302C07

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0110	0.0020	0.0510	0.0510	0.0045	0.0022	0.0051	0.0020	0.0056
#02, 1 Liter **	0.0018	0.0010	0.0510	0.0510	0.0010	0.0010	0.0051	0.0020	0.0096
#03, 3 min 1 Liter	0.0010	0.0010	0.0510	0.0510	0.0010	0.0010	0.0051	0.0020	0.0091

ATTACHMENT NO. 2

Loc # 5, 42 Harkness Street

Date: 1/8/13; outside spigot — E301630

Flow rate = pH = 9.66 / 9.79

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0110	0.0065	0.051	0.051	0.0470	0.0330	0.0051	0.0036	0.0180
#02, 1/2 Liter	0.0083	0.0039	0.051	0.051	0.0690	0.0290	0.0051	0.0034	0.0067
#03, 1 Liter	0.0038	0.0023	0.051	0.051	0.0460	0.0280	0.0051	0.0027	0.0270
#04, 1 Liter	0.0220	0.0150	0.051	0.051	0.0059	0.0046	0.0051	0.0022	0.0190
#05, 1 Liter	0.0150	0.0093	0.051	0.051	0.0021	0.0019	0.0051	0.0020	0.0051
#06, 3 min 1 Liter	0.0019	0.0010	0.051	0.051	0.0059	0.0043	0.0051	0.0020	0.0051

Date: 1/9/13; outside spigot — E301689

Flow rate = 2.20 gpm pH = 9.44 / 9.57

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0150	0.0061	0.051	0.051	0.1000	0.0300	0.0051	0.0020	0.0150
#02, 1/2 Liter	0.0067	0.0017	0.051	0.051	0.0460	0.0240	0.0051	0.0020	0.0051
#03, 1 Liter	0.0150	0.0088	0.051	0.051	0.0140	0.0099	0.0051	0.0020	0.0730
#04, 1 Liter	0.0330	0.0190	0.051	0.051	0.0021	0.0016	0.0051	0.0020	0.0058
#05, 1 Liter	0.0047	0.0010	0.051	0.051	0.0014	0.0012	0.0051	0.0041	0.0051
#06, 3 min 1 Liter	0.0017	0.0010	0.051	0.051	0.0031	0.0019	0.0051	0.0042	0.0062

ATTACHMENT NO. 2

Date: 1/23/13; inside faucet **E301G27**

Flow rate = 0.99 gpm pH = 9.43 / 9.40

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0028	0.0010	0.051	0.051	0.0099	0.0091	0.0051	0.0020	0.0540
#02, 1 Liter	0.0026	0.0012	0.051	0.051	0.0130	0.0094	0.0051	0.0020	0.0560
#03, 1 Liter	0.0029	0.0017	0.051	0.051	0.0200	0.0160	0.0051	0.0020	0.0160
#04, 1 Liter	0.0084	0.0026	0.051	0.051	0.0150	0.0100	0.0051	0.0020	0.0480
#05, 1 Liter	0.0280	0.0170	0.051	0.051	0.0034	0.0028	0.0051	0.0020	0.0160
#06, 1 Liter	0.0096	0.0028	0.055	0.051	0.0018	0.0015	0.0051	0.0026	0.0051
#07, 3 min 1 Liter	0.0010	0.0010	0.064	0.051	0.0010	0.0010	0.0051	0.0029	0.0051

Date: 1/25/13; outside spigot **E301G94**

Flow rate = 3.31 gpm pH = 9.37 / 9.63

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0360	0.0100	0.120	0.051	0.0230	0.0110	0.0051	0.0023	0.0910
#02, 1 Liter	0.0220	0.0074	0.094	0.051	0.0046	0.0024	0.0051	0.0030	0.0051
#03, 1 Liter	0.0013	0.0010	0.065	0.051	0.0027	0.0025	0.0051	0.0032	0.0051
#04, 1 Liter	0.0011	0.0010	0.064	0.051	0.0020	0.0012	0.0051	0.0031	0.0051
#05, 3 min 1 Liter	0.0010	0.0010	0.058	0.051	0.0010	0.0010	0.0051	0.0031	0.0051

Date: 1/30/13; outside spigot **E301J95**

Flow rate = 2.95 gpm pH = 9.25 / 9.61

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0150	0.0023	0.0520	0.0510	0.0940	0.0300	0.0051	0.0020	0.0092
#02, 1 Liter	0.0120	0.0059	0.0510	0.0510	0.0460	0.0200	0.0051	0.0020	0.0780
#03, 1 Liter	0.0300	0.0160	0.0510	0.0510	0.0033	0.0028	0.0051	0.0020	0.0160
#04, 1 Liter	0.0057	0.0010	0.0510	0.0510	0.0022	0.0027	0.0051	0.0020	0.0110
#05, 3 min 1 Liter	0.0010	0.0010	0.0510	0.0510	0.0010	0.0014	0.0051	0.0020	0.0130

Date: 2/13/13; outside spigot **E302845**

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0021	0.001	0.051	0.051	0.011	0.0072	0.0051	0.002	0.055
#02, 1 Liter	0.02	0.0087	0.051	0.051	0.0072	0.004	0.0051	0.002	0.046
#03, 3 min 1 Liter	0.001	0.001	0.051	0.051	0.002	0.0012	0.0051	0.002	0.011

Date: 2/15/13; outside spigot **E302A02**

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.016	0.0021	0.051	0.051	0.75	0.038	0.0051	0.002	0.01
#02, 1 Liter	0.024	0.014	0.051	0.051	0.0093	0.0059	0.0051	0.002	0.041
#03, 3 min 1 Liter	0.001	0.001	0.051	0.051	0.001	0.001	0.0051	0.002	0.0091

ATTACHMENT NO. 2

Loc #6, 104 Shaw Ave

Date: 1/11/13; inside faucet — E301808

Flow rate = 1.30 gpm — pH = 9.43 / 9.60

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0780	0.0042	0.16	0.051	0.3200	0.0160	0.0051	0.0025	3.3000
#02, 1/2 Liter	0.0085	0.0010	0.12	0.051	0.0570	0.0190	0.0051	0.0020	0.0900
#03, 1 Liter	0.0086	0.0021	0.11	0.051	0.0550	0.0250	0.0051	0.0020	0.0350
#04, 1 Liter	0.0092	0.0023	0.11	0.051	0.0460	0.0220	0.0051	0.0020	0.0160
#05, 1 Liter	0.0250	0.0055	0.10	0.051	0.0290	0.0130	0.0051	0.0020	0.0150
#06, 1 Liter	0.0360	0.0043	0.11	0.051	0.0140	0.0062	0.0051	0.0020	0.0140
#07, 1 Liter	0.0510	0.0087	0.11	0.051	0.0064	0.0029	0.0051	0.0020	0.0340
#08, 1 Liter	0.0580	0.0090	0.12	0.051	0.0032	0.0017	0.0051	0.0020	0.0210
#09, 1 Liter	0.0580	0.0088	0.14	0.051	0.0034	0.0018	0.0051	0.0020	0.0280
#10, 1 Liter	0.0500	0.0065	0.20	0.051	0.0026	0.0014	0.0051	0.0020	0.0060
#11, 1 Liter	0.0310	0.0035	0.24	0.051	0.0024	0.0022	0.0051	0.0031	0.0220
#12, 1 Liter	0.0100	0.0011	0.29	0.051	0.0021	0.0014	0.0051	0.0042	0.0210
#13, 3 min 1 Liter	0.0026	0.0010	0.30	0.058	0.0015	0.0010	0.0051	0.0044	0.0240

Date: 1/17/13; outside spigot — E301C78

Flow rate = 1.80 gpm — pH = 9.61 / 9.78

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#02, 1/2 Liter	0.0078	0.0014	0.36	0.051	0.1000	0.0300	0.0051	0.0033	0.0068
#03, 1 Liter	0.0072	0.0032	0.18	0.062	0.0580	0.0350	0.0051	0.0021	0.0051
#04, 1 Liter	0.0072	0.0029	0.13	0.051	0.0430	0.0250	0.0051	0.0020	0.0051
#05, 1 Liter	0.0082	0.0037	0.13	0.051	0.0470	0.0290	0.0051	0.0020	0.0051
#06, 1 Liter	0.0120	0.0014	0.12	0.051	0.0230	0.0100	0.0051	0.0020	0.0210
#07, 1 Liter	0.0450	0.0077	0.11	0.051	0.0071	0.0036	0.0051	0.0020	0.0051
#08, 1 Liter	0.0550	0.0140	0.12	0.051	0.0036	0.0022	0.0051	0.0020	0.0051
#09, 1 Liter	0.0600	0.0190	0.12	0.051	0.0031	0.0020	0.0051	0.0020	0.0200
#10, 1 Liter	0.0570	0.0200	0.12	0.051	0.0028	0.0019	0.0051	0.0020	0.0240
#11, 1 Liter	0.0240	0.0070	0.21	0.057	0.0025	0.0014	0.0051	0.0030	0.0051
#12, 3 min 1 Liter	0.0024	0.0010	0.25	0.051	0.0013	0.0010	0.0051	0.0041	0.0051

ATTACHMENT NO. 2

Date: 1/22/13; outside spigot **E301F56**

Flow rate = 1.15 gpm pH = 9.55 / 9.74

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01 1/2 Liter	0.1400	0.0024	1.40	0.078	0.1400	0.0310	0.015	0.0065	0.0470
#02 1 Liter	0.0100	0.0031	0.32	0.062	0.0610	0.0260	0.0051	0.0025	0.0220
#03 1 Liter	0.0059	0.0011	0.32	0.058	0.0220	0.0077	0.0051	0.0034	0.0260
#04 1 Liter	0.0046	0.0026	0.31	0.074	0.0150	0.0066	0.0051	0.0037	0.0200
#05 1 Liter	0.0049	0.0010	0.30	0.051	0.0110	0.0037	0.0051	0.0033	0.0051
#06 1 Liter	0.0130	0.0027	0.30	0.056	0.0058	0.0025	0.0051	0.0035	0.0240
#07 1 Liter	0.0240	0.0070	0.30	0.082	0.0036	0.0023	0.0051	0.0034	0.0200
#08 1 Liter	0.0260	0.0049	0.29	0.051	0.0025	0.0017	0.0051	0.0035	0.0150
#09 1 Liter	0.0260	0.0066	0.29	0.068	0.0025	0.0020	0.0051	0.0034	0.0180
#10 1 Liter	0.0210	0.0048	0.27	0.057	0.0022	0.0017	0.0051	0.0034	0.0051
#11 3 min 1 Liter	0.0025	0.0010	0.24	0.072	0.0014	0.0010	0.0051	0.0033	0.0051

Date: 1/24/13; outside spigot **E301G91**

Flow rate = 1.12 gpm pH = 9.68 / 9.86

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01 1/2 Liter	0.0900	0.0010	3.20	0.051	0.1900	0.0087	0.005	0.0220	0.0680
#02 1 Liter	0.0160	0.0031	0.47	0.086	0.0710	0.0310	0.0051	0.0045	0.0250
#03 1 Liter	0.0110	0.0039	0.18	0.063	0.0570	0.0290	0.0051	0.0022	0.0120
#04 1 Liter	0.0110	0.0056	0.17	0.074	0.0560	0.0360	0.0051	0.0020	0.0091
#05 1 Liter	0.0140	0.0061	0.15	0.058	0.0400	0.0250	0.0051	0.0020	0.0053
#06 1 Liter	0.0420	0.0080	0.14	0.051	0.0160	0.0095	0.0051	0.0020	0.0051
#07 1 Liter	0.0810	0.0160	0.14	0.051	0.0060	0.0041	0.0051	0.0020	0.0051
#08 1 Liter	0.0900	0.0210	0.14	0.051	0.0035	0.0025	0.0051	0.0020	0.0051
#09 1 Liter	0.0940	0.0140	0.14	0.051	0.0033	0.0019	0.0051	0.0020	0.0051
#10 1 Liter	0.0740	0.0260	0.16	0.051	0.0049	0.0031	0.0051	0.0020	0.0051
#11 3 min 1 Liter	0.0026	0.0010	0.24	0.051	0.0013	0.0011	0.0051	0.0030	0.0051

Date: 1/29/13; outside spigot **E301I73**

Flow rate = 1.35 gpm pH = 9.62 / 9.85

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01 1/2 Liter	0.0620	0.0010	1.60	0.051	0.1400	0.0110	0.005	0.0081	0.0260
#02 1 Liter	0.0450	0.0044	0.55	0.064	0.1000	0.0300	0.0051	0.0043	0.0260
#03 1 Liter	0.0170	0.0047	0.24	0.066	0.0610	0.0370	0.0051	0.0022	0.0140
#04 1 Liter	0.0240	0.0043	0.20	0.053	0.0620	0.0270	0.0051	0.0021	0.0160
#05 1 Liter	0.0220	0.0049	0.16	0.051	0.0420	0.0160	0.0051	0.0020	0.0130
#06 1 Liter	0.0510	0.0100	0.15	0.051	0.0150	0.0056	0.0051	0.0021	0.0120
#07 1 Liter	0.0770	0.0150	0.12	0.051	0.0049	0.0021	0.0051	0.0020	0.0150
#08 1 Liter	0.0850	0.0180	0.13	0.051	0.0033	0.0020	0.0051	0.0020	0.0095
#09 1 Liter	0.0860	0.0160	0.13	0.051	0.0033	0.0019	0.0051	0.0020	0.0090
#10 1 Liter	0.0590	0.0120	0.18	0.051	0.0028	0.0015	0.0051	0.0026	0.0100
#11 3 min 1 Liter	0.0025	0.0010	0.29	0.056	0.0013	0.0010	0.0051	0.0046	0.0085

Date: 2/14/13; inside faucet **E302954**

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0089	0.001	0.12	0.051	0.059	0.017	0.0051	0.002	0.0051
#02, 1 Liter	0.045	0.0043	0.11	0.051	0.003	0.0029	0.0051	0.002	0.01
#03, 3 min 1 Liter	0.0023	0.001	0.23	0.053	0.0015	0.001	0.0051	0.0039	0.0091

Date: 2/15/13; outside spigot **E302999**

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0180	0.0012	1.5000	0.0510	0.1200	0.0220	0.0050	0.0056	0.0150
#02, 1 Liter	0.0560	0.0110	0.1200	0.0510	0.0053	0.0030	0.0051	0.0020	0.0120
#03, 3 min 1 Liter	0.0021	0.0010	0.2700	0.0510	0.0013	0.0012	0.0051	0.0033	0.0087

ATTACHMENT NO. 2

Loc #7, 183 Laurel Hill Ave

Date: 1/15/13: inside faucet E301A41

Flow rate = 1.24 gpm pH = 9.29 / 9.33

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#02, 1/2 Liter	0.0068	0.0010	0.097	0.051	0.0400	0.0160	0.0051	0.0030	0.0085
#03, 1 Liter	0.0042	0.0010	0.095	0.051	0.0280	0.0150	0.0051	0.0028	0.0200
#04, 1 Liter	0.0044	0.0011	0.092	0.051	0.0310	0.0160	0.0051	0.0028	0.0210
#05, 1 Liter	0.0054	0.0013	0.090	0.051	0.0300	0.0140	0.0051	0.0027	0.0220
#06, 1 Liter	0.0078	0.0019	0.095	0.051	0.0190	0.0098	0.0051	0.0027	0.0370
#07, 1 Liter	0.0370	0.0044	0.092	0.051	0.0060	0.0035	0.0051	0.0023	0.0300
#08, 1 Liter	0.0480	0.0097	0.090	0.051	0.0028	0.0019	0.0051	0.0024	0.0180
#09, 1 Liter	0.0200	0.0064	0.058	0.051	0.0021	0.0020	0.0051	0.0020	0.0180
#10, 3 min 1 Liter	0.0013	0.0010	0.051	0.051	0.0013	0.0021	0.0051	0.0020	0.0180

Date: 1/18/13; outside spigot E301D06

Flow rate = 1.49 gpm pH = 9.59 / 9.72

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0030	0.0010	0.051	0.051	0.0300	0.0200	0.0051	0.0020	0.0069
#02, 1 Liter	0.0034	0.0030	0.051	0.051	0.0310	0.0220	0.0051	0.0020	0.0051
#03, 1 Liter	0.0051	0.0029	0.051	0.051	0.0300	0.0180	0.0051	0.0020	0.0340
#04, 1 Liter	0.0096	0.0052	0.051	0.051	0.0200	0.0120	0.0051	0.0020	0.0420
#05, 1 Liter	0.0280	0.0160	0.051	0.051	0.0044	0.0040	0.0051	0.0020	0.0290
#06, 1 Liter	0.0330	0.0150	0.051	0.051	0.0020	0.0019	0.0051	0.0020	0.0220
#07, 1 Liter	0.0100	0.0037	0.051	0.051	0.0015	0.0014	0.0051	0.0020	0.0170
#08, 3 min 1 Liter	0.0012	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.0020	0.0190

ATTACHMENT NO. 2

Date: 1/24/13; outside spigot E301G89

Flow rate = 1.56 gpm pH = 9.61 / 9.70

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0120	0.0033	0.051	0.051	0.0360	0.0180	0.0051	0.0020	0.0460
#02, 1 Liter	0.0054	0.0030	0.051	0.051	0.0230	0.0180	0.0051	0.0020	0.0210
#03, 1 Liter	0.0110	0.0067	0.051	0.051	0.0110	0.0085	0.0051	0.0020	0.0150
#04, 1 Liter	0.0200	0.0130	0.051	0.051	0.0040	0.0034	0.0051	0.0020	0.0051
#05, 1 Liter	0.0150	0.0079	0.051	0.051	0.0019	0.0019	0.0051	0.0020	0.0051
#06, 1 Liter	0.0056	0.0014	0.051	0.051	0.0012	0.0014	0.0051	0.0020	0.0051
#07, 1 Liter	0.0024	0.0010	0.051	0.051	0.0016	0.0015	0.0051	0.0020	0.0051
#08, 3 min 1 Liter	0.0011	0.0010	0.051	0.051	0.0010	0.0014	0.0051	0.0020	0.0051

Date: 1/25/13; outside spigot E301H00

Flow rate = 2.82 gpm pH = 9.78 / 9.97

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0068	0.0013	0.055	0.051	0.0550	0.0260	0.0051	0.0020	0.0420
#02, 1 Liter	0.0057	0.0025	0.051	0.051	0.0320	0.0230	0.0051	0.0020	0.0160
#03, 1 Liter	0.0190	0.0088	0.051	0.051	0.0190	0.0120	0.0051	0.0020	0.0200
#04, 1 Liter	0.0370	0.0160	0.051	0.051	0.0050	0.0037	0.0051	0.0020	0.0120
#05, 1 Liter	0.0280	0.0079	0.051	0.051	0.0019	0.0017	0.0051	0.0020	0.0051
#06, 1 Liter	0.0100	0.0023	0.051	0.051	0.0014	0.0012	0.0051	0.0020	0.0051
#07, 1 Liter	0.0018	0.0010	0.051	0.051	0.0012	0.0010	0.0051	0.0020	0.0051
#08, 3 min 1 Liter	0.0011	0.0010	0.051	0.051	0.0010	0.0011	0.0051	0.0020	0.0051

ATTACHMENT NO. 2

Date: 1/30/13; outside spigot E301J96

Flow rate = 2.38 gpm pH = 9.58 / 9.68

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0031	0.0010	0.051	0.051	0.0370	0.0220	0.0051	0.0020	0.0092
#02, 1 Liter	0.0035	0.0015	0.051	0.051	0.0380	0.0200	0.0051	0.0020	0.0140
#03, 1 Liter	0.0043	0.0017	0.051	0.051	0.0320	0.0180	0.0051	0.0020	0.0140
#04, 1 Liter	0.0070	0.0030	0.051	0.051	0.0200	0.0120	0.0051	0.0020	0.0450
#05, 1 Liter	0.0300	0.0130	0.051	0.051	0.0035	0.0026	0.0051	0.0020	0.0190
#06, 1 Liter	0.0330	0.0130	0.051	0.051	0.0020	0.0031	0.0051	0.0020	0.0110
#07, 1 Liter	0.0057	0.0013	0.051	0.051	0.0013	0.0014	0.0051	0.0020	0.0110
#08, 3 min 1 Liter	0.0010	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.0020	0.0099

Date: 2/11/13; inside faucet E302596

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0095	0.0043	0.051	0.051	0.03	0.02	0.0051	0.002	0.007
#02, 1 Liter	0.03	0.014	0.051	0.051	0.0043	0.0031	0.0051	0.002	0.018
#03, 3 min 1 Liter	0.0011	0.001	0.051	0.051	0.0012	0.0011	0.0051	0.002	0.0089

Date: 2/12/13; outside spigot E302693

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0032	0.001	0.051	0.051	0.05	0.025	0.0051	0.002	0.012
#02, 1 Liter	0.027	0.01	0.051	0.051	0.0039	0.0032	0.0051	0.002	0.016
#03, 3 min 1 Liter	0.001	0.001	0.051	0.051	0.001	0.001	0.0051	0.002	0.0094

Date: 2/18/13; inside faucet E302A73

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0036	0.0020	0.0510	0.0510	0.0380	0.0260	0.0051	0.0020	0.0053
#02, 1 Liter	0.0320	0.0130	0.0510	0.0510	0.0047	0.0039	0.0051	0.0020	0.0220
#03, 3 min 1 Liter	0.0010	0.0010	0.0510	0.0510	0.0012	0.0010	0.0051	0.0020	0.0093

ATTACHMENT NO. 2

Loc #8, 70 Sandringham Ave

Date: 1/10/13; inside faucet — E301688

Flow rate = 1.49 gpm — pH = 9.33 / 9.53

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0110	0.0011	0.230	0.051	0.0780	0.0140	0.0051	0.0089	0.0730
#02, 1/2 Liter	0.0073	0.0010	0.160	0.051	0.0095	0.0045	0.0051	0.0056	0.0710
#03, 1 Liter	0.0086	0.0014	0.140	0.051	0.0130	0.0063	0.0051	0.0050	0.1000
#04, 1 Liter	0.0100	0.0014	0.150	0.051	0.0098	0.0047	0.0051	0.0058	0.0660
#05, 1 Liter	0.0310	0.0060	0.120	0.051	0.0041	0.0025	0.0051	0.0041	0.0150
#06, 1 Liter	0.0600	0.0077	0.140	0.051	0.0015	0.0010	0.0051	0.0045	0.0055
#07, 1 Liter	0.0480	0.0073	0.150	0.051	0.0028	0.0029	0.0051	0.0050	0.0051
#08, 1 Liter	0.0260	0.0030	0.170	0.051	0.0020	0.0011	0.0051	0.0057	0.0059
#09, 3 min 1 Liter	0.0082	0.0010	0.083	0.051	0.0450	0.0019	0.0051	0.0028	0.0580

Date: 1/11/13; outside spigot — E301807

Flow rate = 1.74 gpm — pH = 9.62 / 9.73

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0430	0.0059	0.150	0.051	0.1500	0.0390	0.0052	0.0043	0.7800
#02, 1/2 Liter	0.0099	0.0026	0.051	0.051	0.0120	0.0074	0.0051	0.0020	0.0390
#03, 1 Liter	0.0390	0.0170	0.051	0.051	0.0038	0.0024	0.0051	0.0020	0.0270
#04, 1 Liter	0.0460	0.0230	0.051	0.051	0.0020	0.0016	0.0051	0.0020	0.0190
#05, 1 Liter	0.0310	0.0110	0.051	0.051	0.0023	0.0017	0.0051	0.0020	0.0210
#06, 1 Liter	0.0093	0.0016	0.070	0.051	0.0016	0.0010	0.0051	0.0027	0.0190
#07, 3 min 1 Liter	0.0016	0.0010	0.062	0.051	0.0010	0.0010	0.0051	0.0032	0.0051

Date: 1/15/13; outside spigot — E301A48

Flow rate = 1.54 gpm — pH = 9.48 / 9.60

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0140	0.0071	0.056	0.051	0.0660	0.0420	0.0051	0.0026	0.0380
#02, 1/2 Liter	0.0083	0.0016	0.056	0.051	0.0120	0.0079	0.0051	0.0021	0.0550
#03, 1 Liter	0.0270	0.0130	0.051	0.051	0.0036	0.0033	0.0051	0.0020	0.0210
#04, 1 Liter	0.0420	0.0240	0.051	0.051	0.0012	0.0012	0.0051	0.0020	0.0260
#05, 1 Liter	0.0300	0.0130	0.051	0.051	0.0020	0.0016	0.0051	0.0020	0.0180
#06, 1 Liter	0.0120	0.0041	0.051	0.051	0.0012	0.0010	0.0051	0.0020	0.0170
#07, 3 min 1 Liter	0.0013	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.0020	0.0150

Date: 1/17/13; outside spigot — E301C74

Flow rate = 1.69 gpm — pH = 9.63 / 9.80

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#02, 1/2 Liter	0.0089	0.0012	0.063	0.051	0.0120	0.0075	0.0051	0.0037	0.0470
#03, 1 Liter	0.0270	0.0140	0.051	0.051	0.0040	0.0039	0.0051	0.0020	0.0290
#04, 1 Liter	0.0420	0.0250	0.051	0.051	0.0014	0.0013	0.0051	0.0020	0.0051
#05, 1 Liter	0.0300	0.0150	0.051	0.051	0.0017	0.0015	0.0051	0.0020	0.0051
#06, 1 Liter	0.0100	0.0052	0.051	0.051	0.0011	0.0013	0.0051	0.0020	0.0170
#07, 3 min1 Liter	0.0013	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.0020	0.0160

Date: 1/18/13; outside spigot — E301D08

Flow rate = 1.86 gpm — pH = 9.60 / 9.82

	ppm Lead	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc
#01, 1/2 Liter	0.0088	0.0028	0.051	0.051	0.0140	0.0066	0.0051	0.0020	0.0400
#02, 1 Liter	0.0330	0.0200	0.051	0.051	0.0036	0.0024	0.0051	0.0020	0.0280
#03, 1 Liter	0.0400	0.0230	0.051	0.051	0.0019	0.0015	0.0051	0.0020	0.0051
#04, 1 Liter	0.0260	0.0100	0.051	0.051	0.0018	0.0014	0.0051	0.0020	0.0051
#05, 1 Liter	0.0067	0.0029	0.051	0.051	0.0012	0.0011	0.0051	0.0020	0.0210
#06, 3 min 1 Liter	0.0013	0.0010	0.051	0.051	0.0010	0.0010	0.0051	0.0020	0.0200

ATTACHMENT NO. 2

Date: 2/12/13; outside spigot E302846

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc	
#01, 1/2 Liter	0.0072	0.0015	0.056	0.051	0.01	0.0059	0.0051	0.002	0.075	
#02, 1 Liter	0.047	0.016	0.051	0.051	0.0052	0.0028	0.0051	0.002	0.016	
#03, 3 min 1 Liter	0.0013	0.001	0.051	0.051	0.0023	0.001	0.0051	0.002	0.011	
#04, 3 min 1 Liter	0.0011	0.001	0.051	0.051	0.001	0.001	0.0051	0.002	0.012	

Date: 2/13/13; inside spigot E302846

	ppm **Lead**	ppm Diss Lead	ppm Iron	ppm Diss Iron	ppm Copper	ppm Diss Copper	ppm Tin	ppm Manganese	ppm Zinc	
#01, 1/2 Liter	0.034	0.003	0.077	0.051	0.025	0.022	0.0051	0.002	0.24	
#02, 1 Liter	0.043	0.019	0.051	0.051	0.002	0.0015	0.0051	0.002	0.014	
#03, 3 min 1 Liter	0.0011	0.001	0.051	0.051	0.001	0.001	0.0051	0.002	0.0084	
#04, 3 min 1 Liter	0.0011	0.001	0.051	0.051	0.001	0.001	0.0051	0.002	0.009	

ATTACHMENT NO. 2

PROVIDENCE WATER SUPPLY BOARD

WRF 4317 CER Sampling Protocol
Virginia Tech Pipe Loop Rigs
(Academy Avenue & Water Treatment Plant)

1. PRESS "Circuit", "1", "ON".
2. Take Ammeter readings at the 3 lower pipe loops: LC–1, LC–2, LC-3.
3. Collect 0.5 L at all 9 pipe loops.
4. To FLUSH system, record time, then open the manual bypass valve on the bottom layer of piping. Let FLUSH for **10** minutes to drain.
5. At inlet collection point, let FLUSH for **1** minute to drain, then collect 1 L of sample: I-1 inlet. Note time of collection.
6. PRESS "Circuit", "1", "OFF".
7. Pour DI Blank into new bottle.
8. Measure pH, Temperature F, and time of each collected pipe loop and collected inlet sample. Be sure to rinse electrode with Ultra pure H2O between each sample. Record results on Sample Collection Log.
9. Submit collected inlet sample I-1 or "J" to Providence Water Laboratory for further required testing.
10. Repeat at both Academy and Plant CER sites.
11. All bottles and Providence Water report is sent out to Virginia Tech within 24 hours of completion.

ATTACHMENT NO. 3

Effects of particulate iron, natural organic matter and orthophosphate on corrosion in low alkalinity high pH water

Marc Edwards and Sheldon Masters
January 14^{th}, 2013

ATTACHMENT No. 4

Overview: Low alk high pH waters

- Utilities control Pb release by maintaining conditions (i.e. pH and alkalinity) that suppress soluble Pb(II) (Sheiham & Jackson, 1981)
- Disinfectant also plays an important role [i.e. Pb(IV)] (Schock, Wagner, & Oliphant, 1996; Edwards & Dudi, 2004; Lytle, Schock, & Scheckel, 2009; Xie & Giammar, 2011)
- Factors not widely studied are:

1. Impact of iron
2. Impact of NOM

Objectives

1. Determine if low levels of NOM influence Pb release at high pH & low alkalinity
2. Determine relative amount of iron release at representative orthophosphate, pH and NOM levels
3. Examine if iron particulates exacerbate particulate Pb release
4. Examine disinfectant stability

Intellectual Merit

- Fill knowledge gap for utilities with low alkalinity & high pH
- Advance knowledge about the impact of particulate iron, NOM, and phosphate on Pb corrosion
- Improve LCR compliance for utilities with unlined iron pipes

Background

1. Iron:

Several studies identified potential link between Pb mobilization & Fe in both natural and engineered systems

(Hulsmann, 1990; Erel, Morgan, and Patterson, 1991 ; Erel and Morgan, 1992 ; DeRosa & Williams, 1992 , Deshommes et al., 2010 , McFadden et al., 2010 , Camara & Gagnon, 2012, Cartier, 2012)

2. NOM:

Several studies identified link between presence of NOM and increased Pb corrosion

(Samuels and Merange, 1984; Lin and Valentine, 2008; Dryer and Korshi, 2007; Mota et al, 1996; Korshin, Ferguson, & Lancaster, 2005 ; de Mora et al., 1987 ; Arnold, 2011)

3. Orthophosphates:

Can act as a corrosion inhibitor by creating barrier between pipe and water, but implication of higher lead in higher pH water

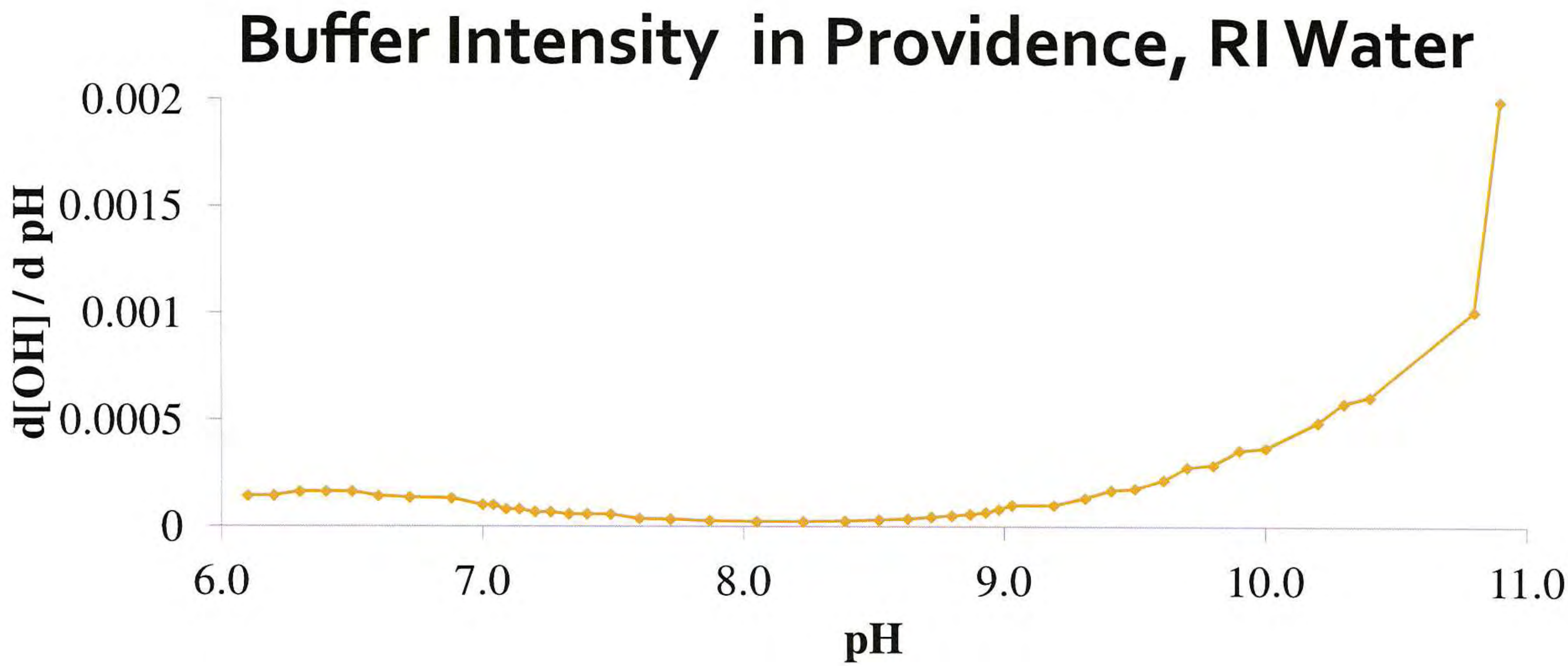
(McNeill, 2000; Vik et al., 1996; Ryder & Wagner, 1985)

Factor affecting iron corrosion

- NOM: lower iron corrosion rate but more soluble iron
- pH: weight loss increases between pH 7 & 9. Weight loss decreases at higher pH (McNeill, 2000) Impacts of pH>9.5 not widely studied
- Phosphate: Acts a corrosion inhibitor

Factor affecting iron corrosion

- Alkalinity & Buffer intensity: Higher Alkalinity and higher BI = lower corrosion rate



Experimental Approach

Two phases:

- **Phase 1:** Investigate the effects of orthophosphate, NOM, and pH on iron corrosion
- **Phase 2:** Develop an understanding of the impact of iron particulates on Pb release

Phase 1

- Batch reactors with 3 waters

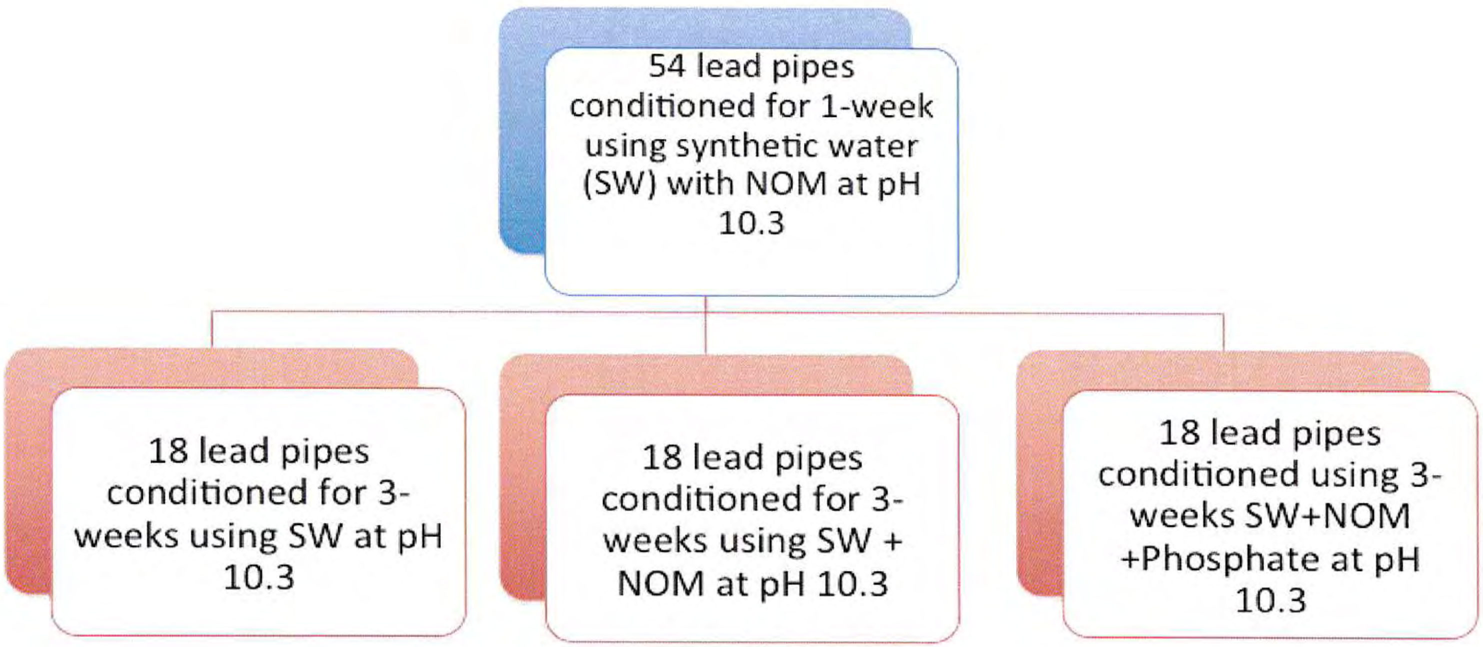
1. Synthetic water
2. Synthetic water + NOM
3. Synthetic water + NOM + Phosphate

- 3 different pH conditions (8.3, 9.7, 10.4)
- With and without iron coupons

Total of 18 reactors

Phase 2

Phase 2a: 1-Month Conditioning of Lead Pipes

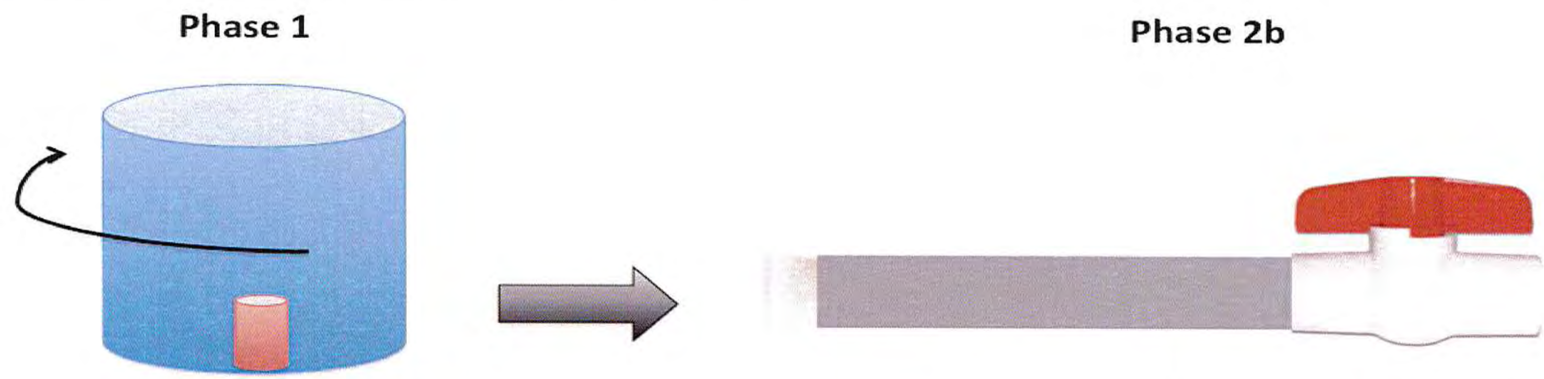


Each group of 18 pipes is separated into 6 groups (3 pHs x 2 levels of iron) with triplicate at each condition.

Phase 2

Phase 2b: Exposure of Pb pipes to Fe particles

- Water from Phase 1 used to fill lead pipes
- Water changes MWF



Batch reactor with and without Fe coupon mixed on shaker table. SA:V= 0.10. This is equivalent to a 40inch pipe.

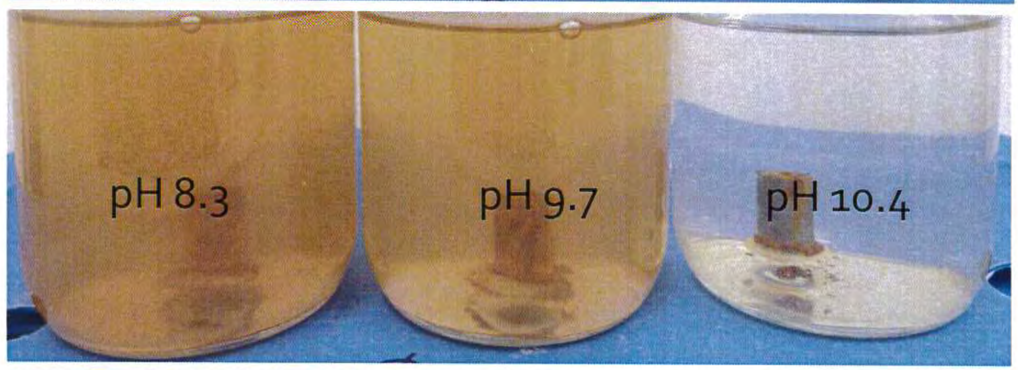
Pb pipe batch reactor. Water changes MWF. Weekly composite samples

4 weeks of conditioning + 11 weeks of runtime to date

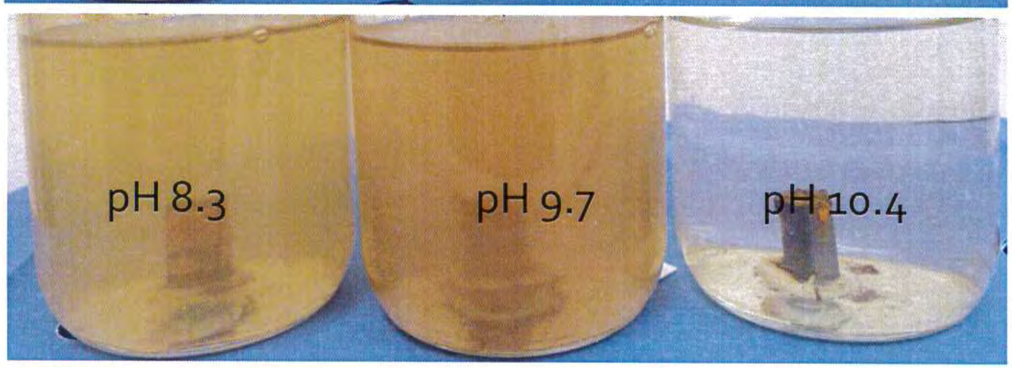
Preliminary results: Phase 1

SW +NOM+P

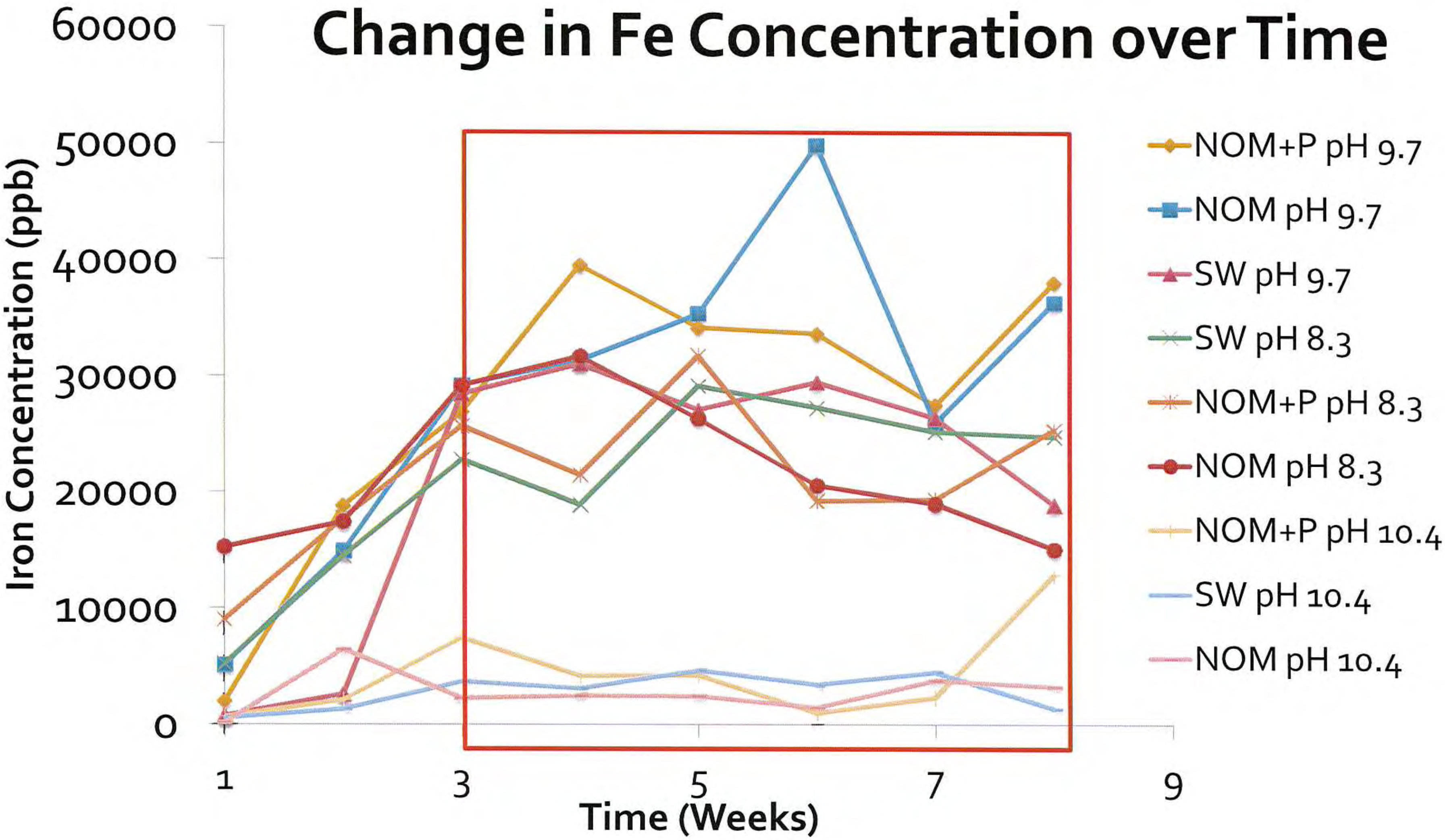
SW



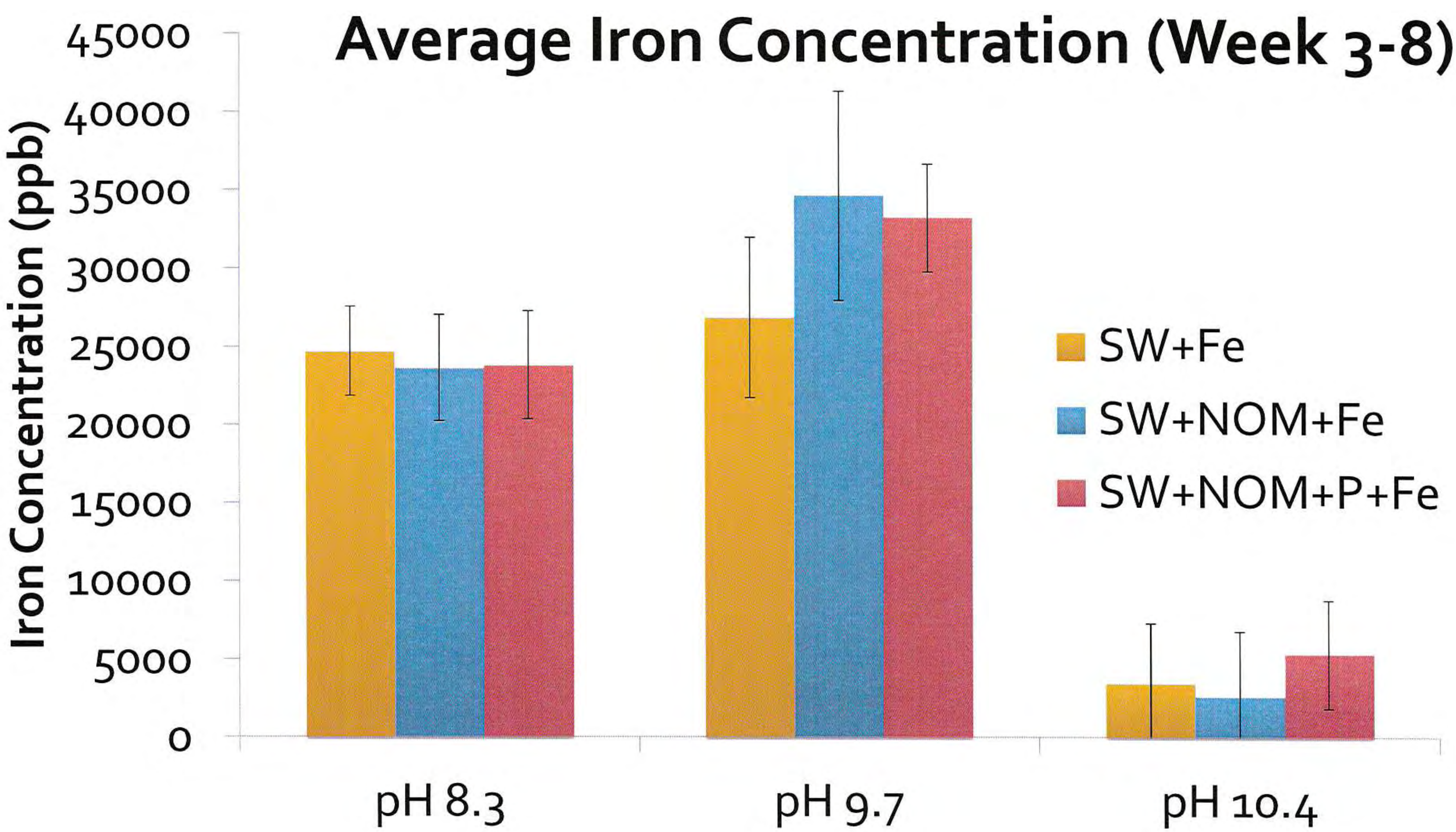
SW +NOM



Preliminary results: Phase 1



Preliminary results: Phase 1



Preliminary results: Phase 1

pH 8.3

pH 10.4

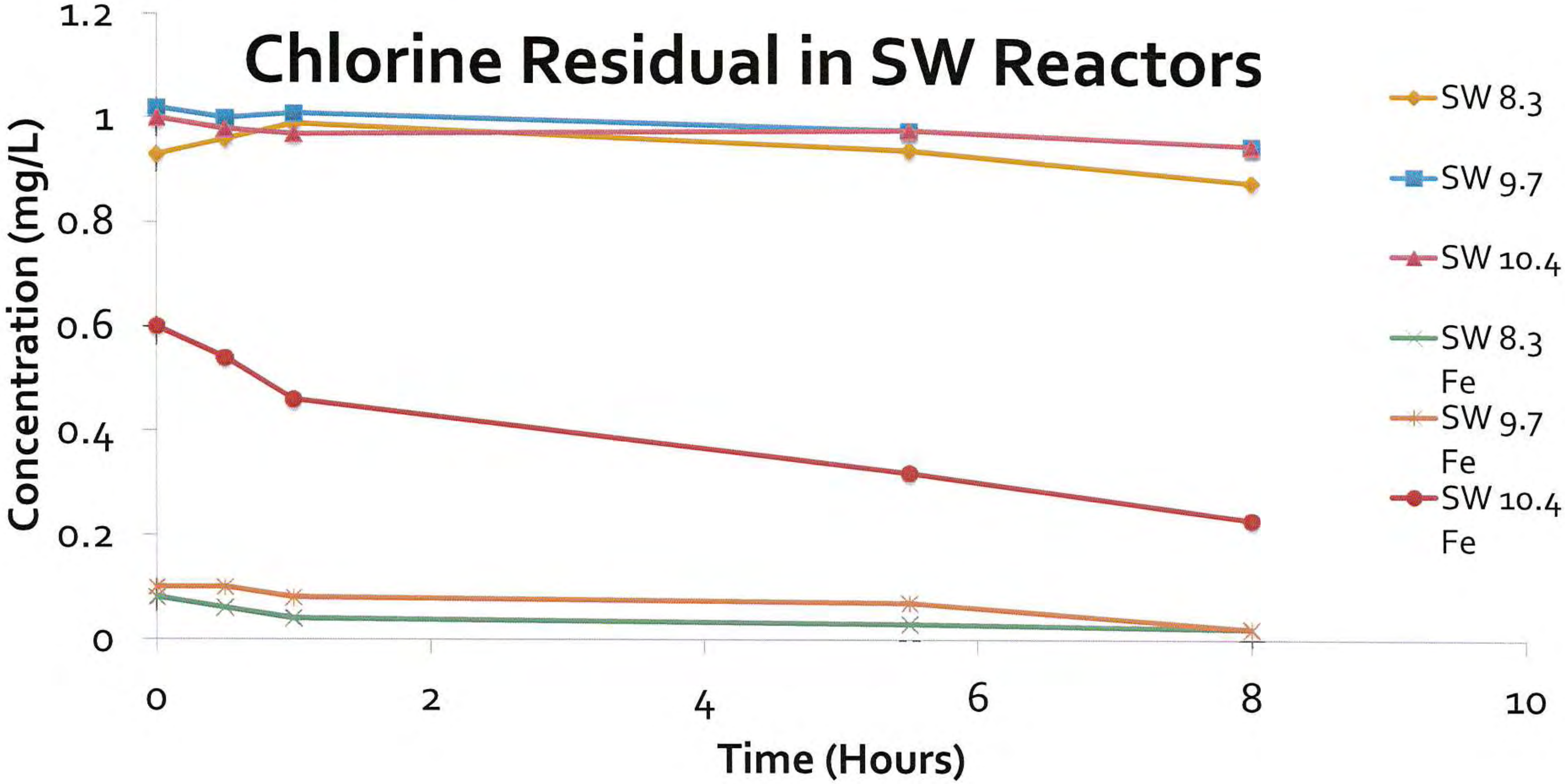
Amount of iron and morphology vary by pH

Preliminary results: Phase 1

pH 8.3

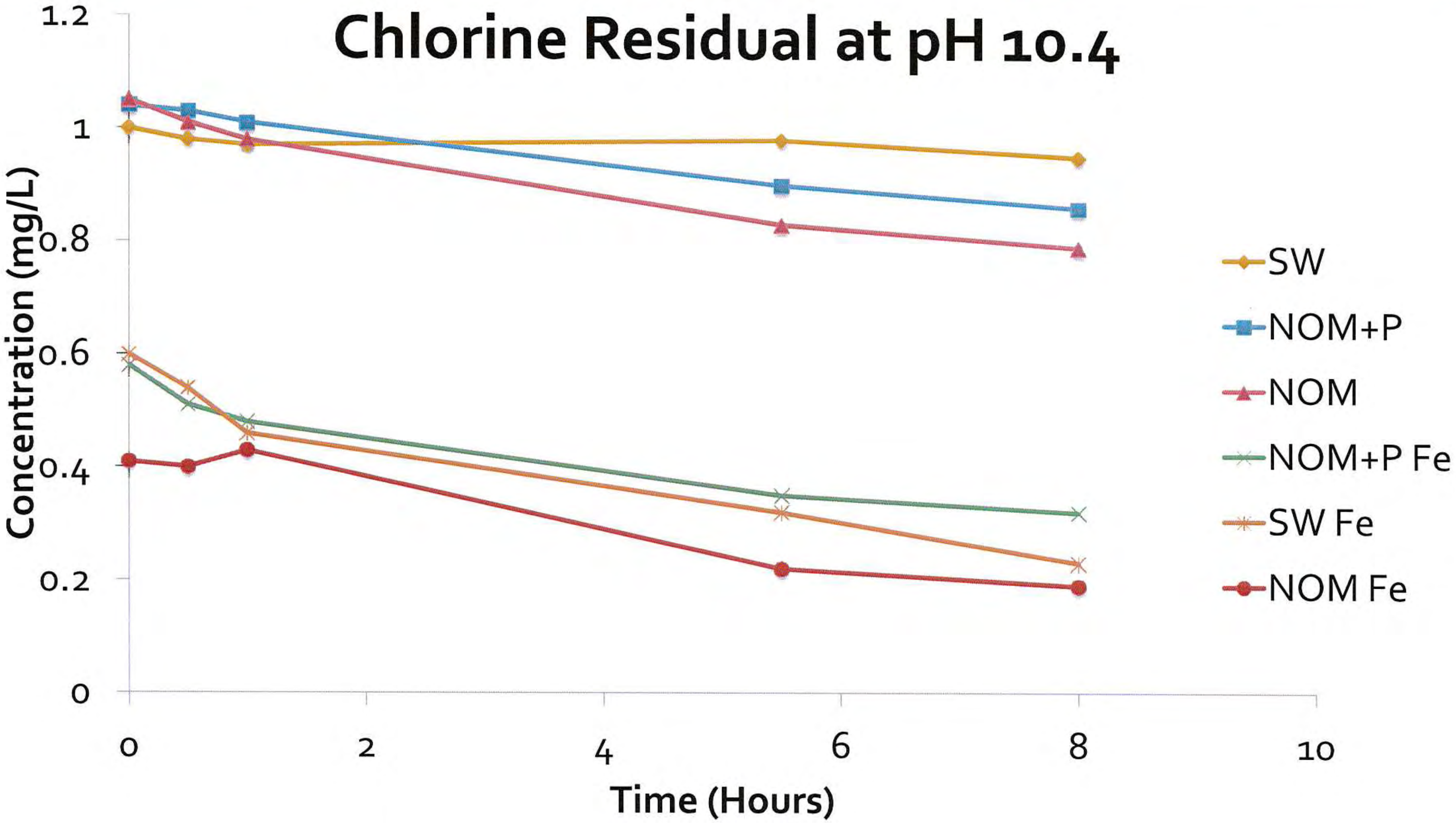
pH 10.4

Preliminary results: Phase 1



Similar trends were observed for SW+NOM and SW+NOM+P Reactors

Preliminary results: Phase 1

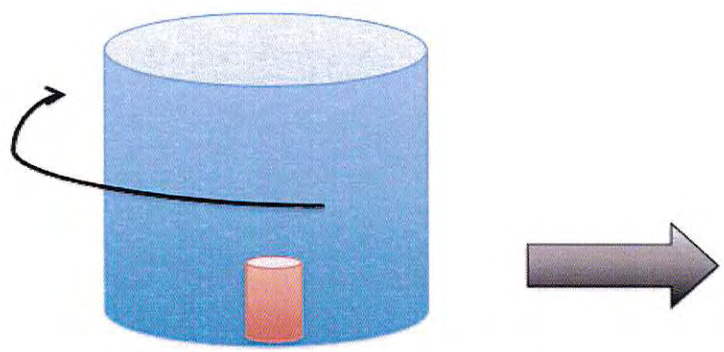


Phase 2

Phase 2b: Exposure of Pb pipes to Fe particles

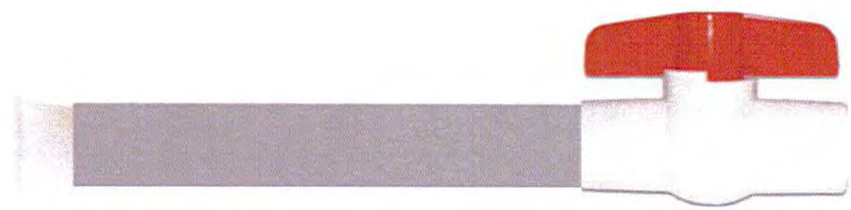
- Water from Phase 1 used to fill lead pipes
- Water changes MWF

Phase 1



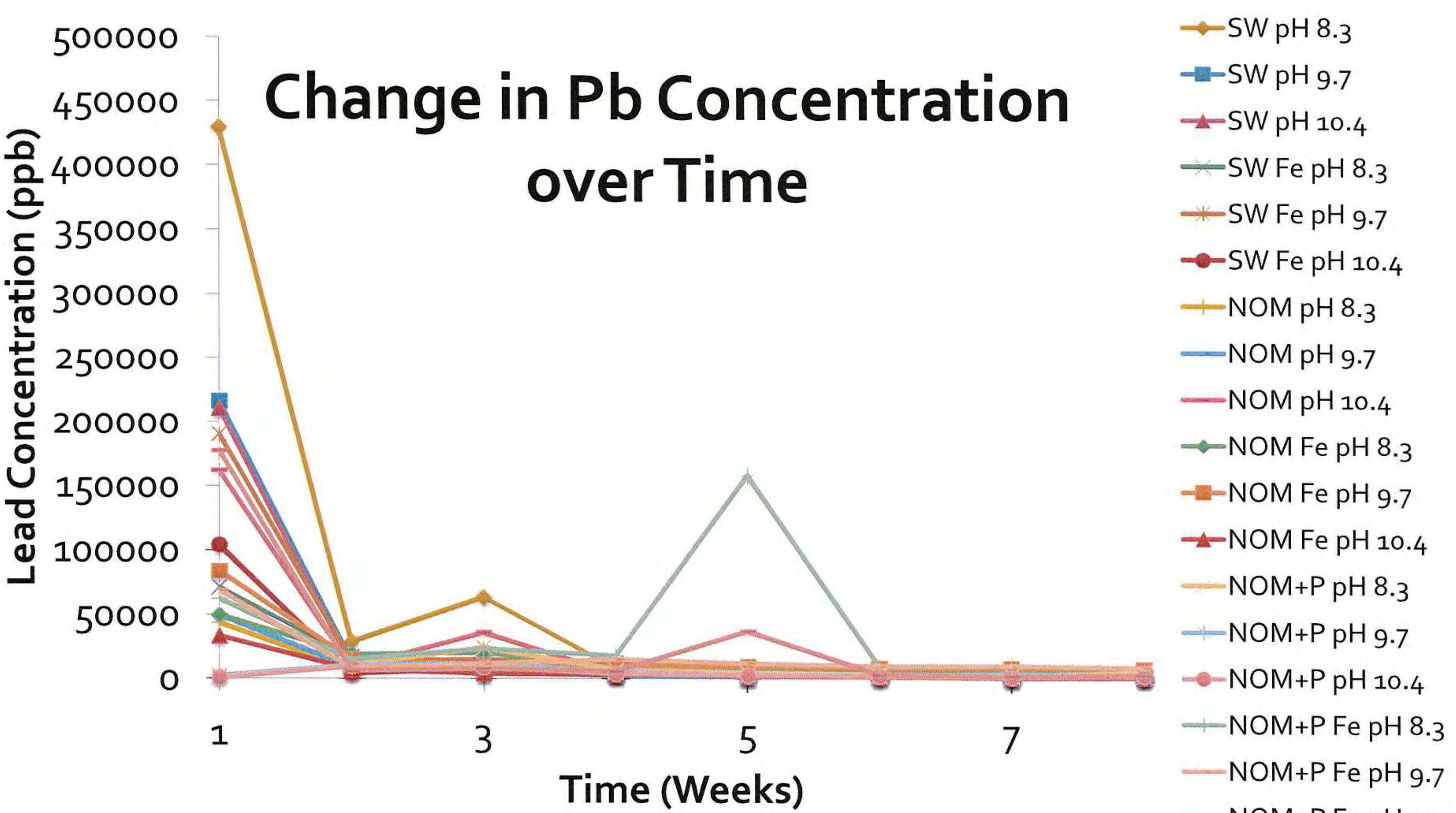
Batch reactor with and without Fe coupon mixed on shaker table. SA:V= 0.10. This is equivalent to a 40inch pipe.

Phase 2b

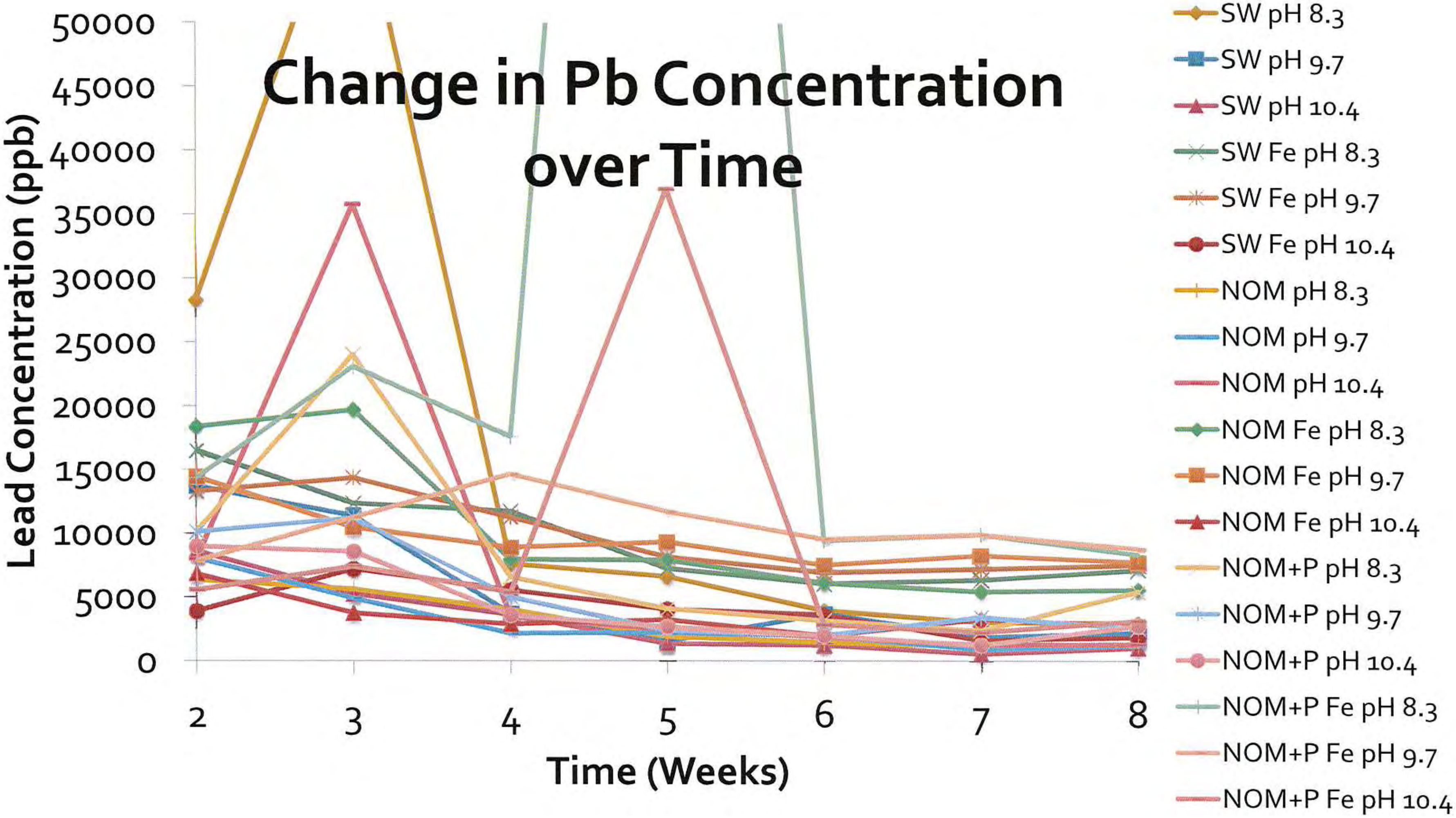


Pb pipe batch reactor. Water changes MWF. Weekly composite samples

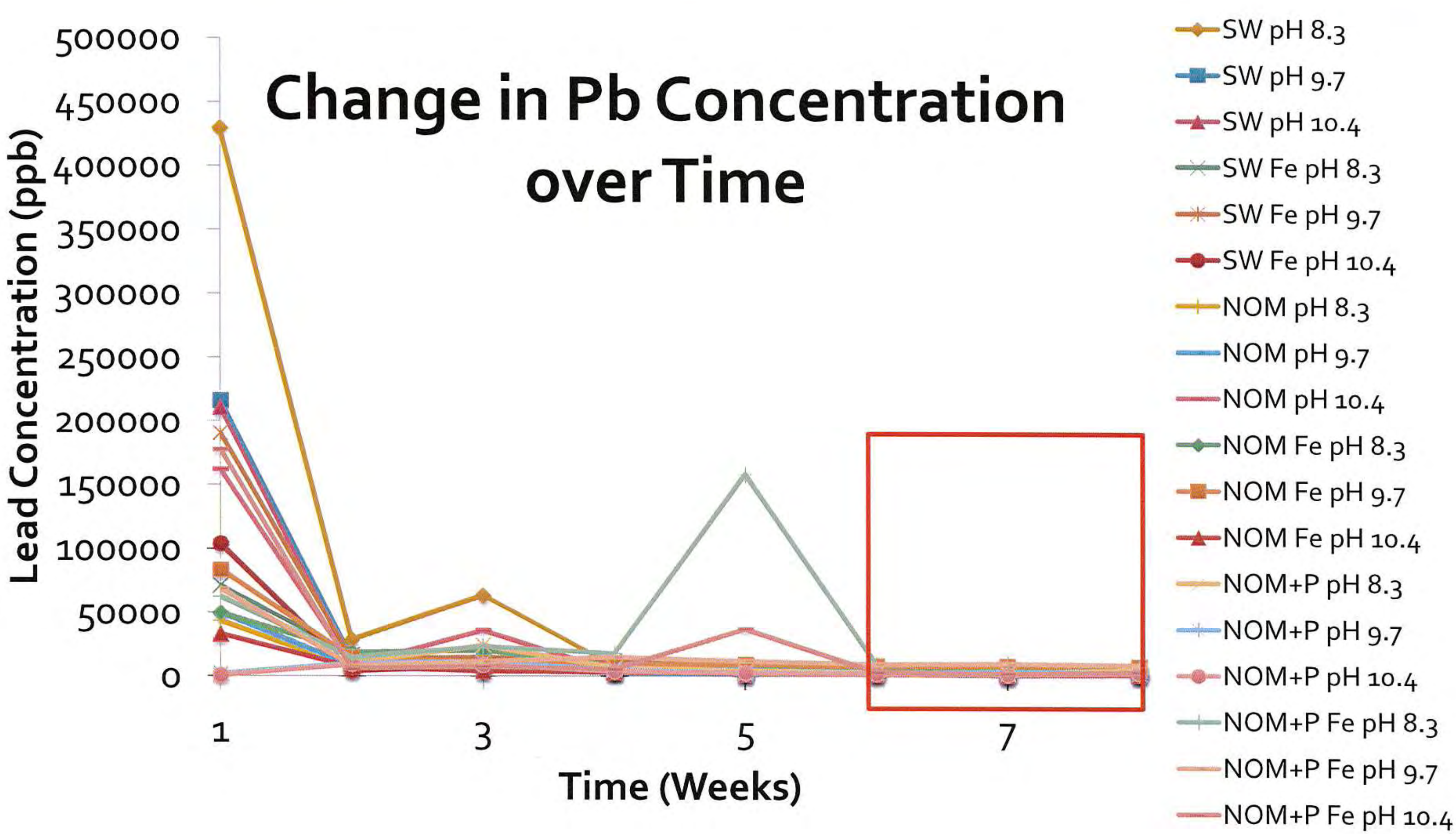
Preliminary results: Phase 2



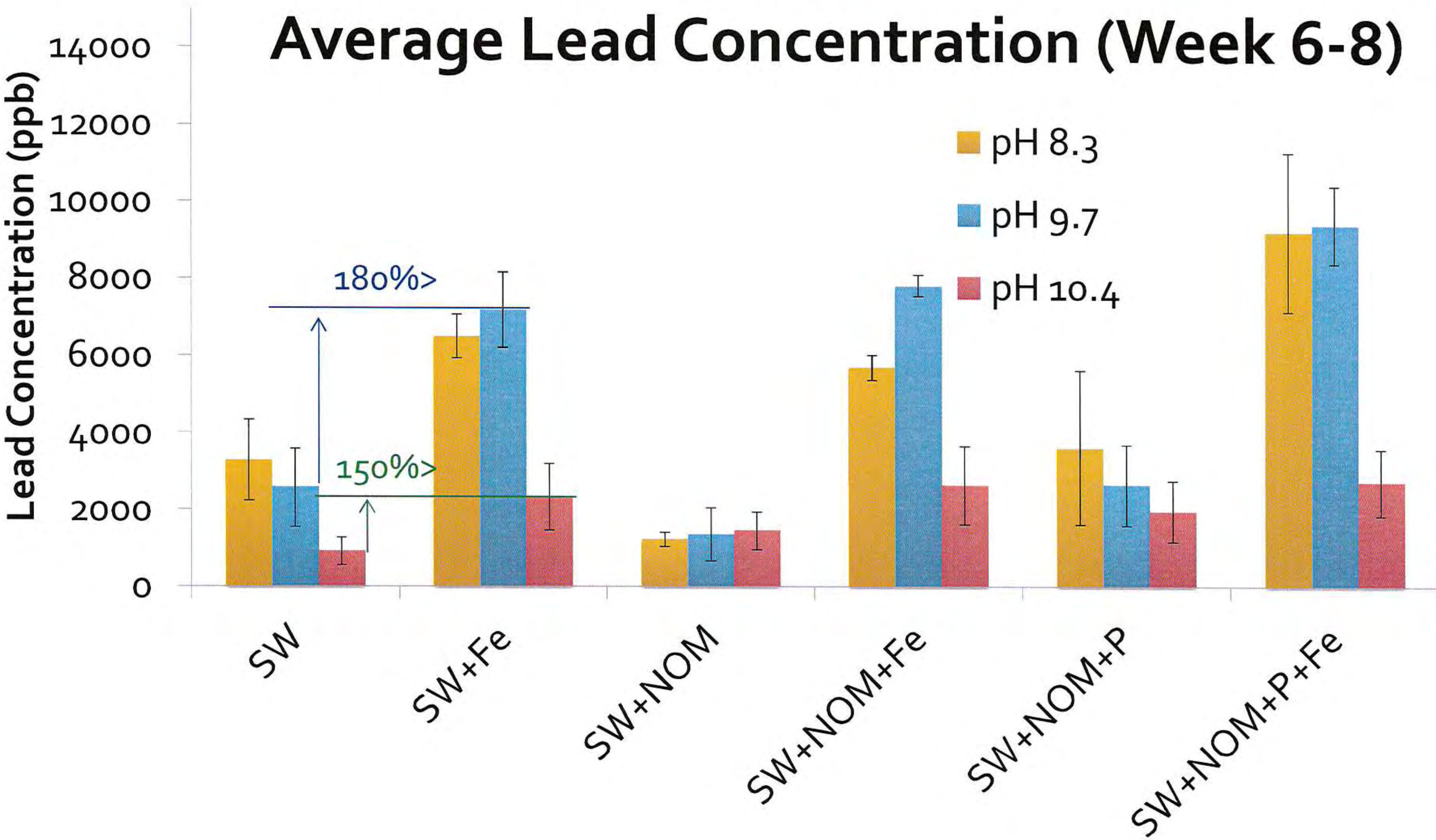
Preliminary results: Phase 2



Preliminary results: Phase 2



Preliminary results: Phase 2

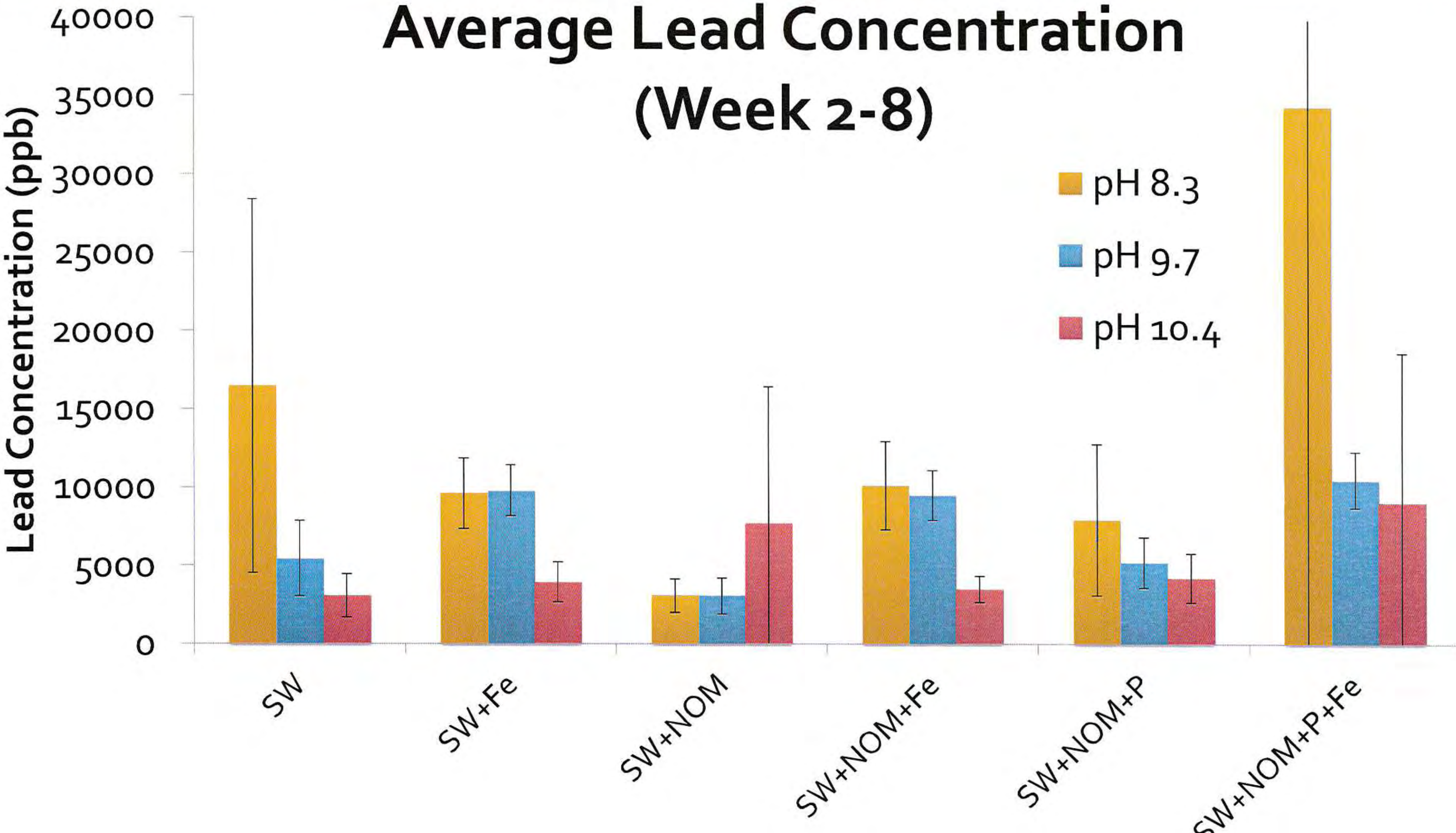


Future Work?

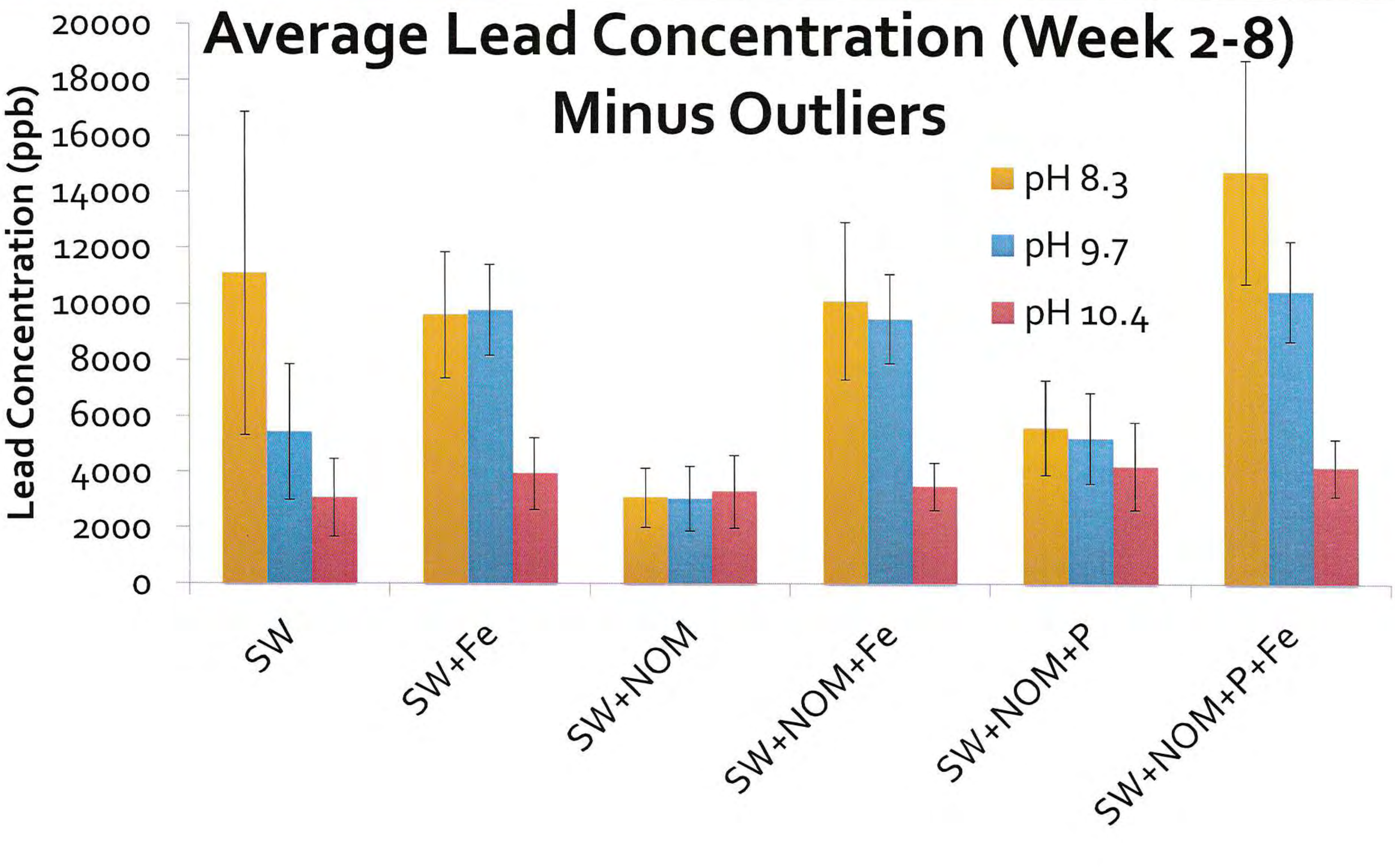
- Repeating iron work but (triplicates)
  1. Estimate variability
  2. Identify outliers
  3. Increase precision
  4. Increase confidence
- Add one more condition with only orthophosphate
- Measure weight loss from iron coupons
- Change to real water?

Questions?

Preliminary results: Phase 2



Preliminary results: Phase 2



TO: File **cc:**
FROM: Greg Welter
RE: Providence Water lead pipe conditioning
FILE:
DATE: January 22, 2013 - rev1

The purpose of this memo is to give a summary overview of a proposed concept for lead pipe conditioning for use in subsequent experiments for lead corrosivity treatment optimization. The following general concepts are proposed and are further detailed below:

1) The test specimens would be used lead pipe harvested for this purpose from the Providence system.

2) The initial phase of conditioning would be done with the pipe specimens unmounted, using a "dump-and-fill" method of water exposure. Periodic filling and sampling would be done until lead release appeared to have reached a general steady state, at which time half the specimens would be selected for further conditioning based on their similarity of lead release results.

3) The second phase of conditioning would be done with the selected pipe specimens installed in a test rack configured for optimization testing. At this time, a preliminary configuration for the test rack has been developed, with a capacity of testing two groups of four pipe specimens, or eight in all. (Note: This is based on the assumption of running concurrent experiments for one "control" and one "test" system. If more than one corrosion inhibition alternatives is to be tested concurrently, then additional rack capacity would be needed.)

Further details of the proposed conditioning program are described below.

1. Lead pipe harvesting

The objective of the program is to have eight pipe specimens fully conditioned for subsequent experiments, based on having two parallel experiments (typically one control group of four pipes and one experimental group.) There will be a preliminary off-rack step which will involve preliminary conditioning of twice the final number of pipes, thus sixteen pipes are needed altogether.

The pipes will be harvested during normal construction operations, but will be extracted from the ground after exposing sufficient length so that at least two feet can be harvested. Pipe will not be pulled from the ground for harvesting so as to minimize the effects on existing scale. It is recommended that tubing shears be used for cutting the pipe rather than saw tools. To facilitate use in the standard test rack, and to promote similarity of pipe behavior, all pipe will be the same inner and outside diameter, anticipated to be nominal 5/8-inch pipe size. The harvested pipe will be labeled with the address, date of harvest, and in-service flow direction. To preserve the pipe specimens before conditioning, a thoroughly wetted sponge will be inserted in each end of pipe and the pipe end sealed with tape to minimize dessication of the existing pipe interior scale.

2. Initial phase of "fill-and-dump" conditioning

The harvested pipe will unsealed and the sponges examined to confirm that they have not dried out.

a) The pipe length will be trimmed to a uniform 24 inches, and the ends will be resealed using a plastic cap. (If necessary to eliminate end leakage at the cap, use of a radiator hose clamp over the cap is suggested.)

b) One end of the pipe will be uncapped, the pipe segment filled with Providence tap water, and the pipe recapped.

c) Twice a week the pipe will be uncapped and the water contents dumped, after having taken a sample for laboratory analysis. The sample will be analyzed for total lead. The pipe segment would then be refilled with tap water and held for the next biweekly sampling and refill.

d) This would be continued until the results appear to show an approximate steady-state condition, at least for most of the pipes. Then, the eight pipe specimens would be selected for further conditioning in the pipe rack. They would be selected based on exhibiting the most similar characteristics.

3. Second phase – pipe rack conditioning

The second phase will consist of further conditioning with the eight selected pipe specimens mounted in the test rack.

a) Pipe rack description

The pipe rack (shown on attached schematic) is configured to run two concurrent experiments, each with four test lead pipe segments. Each experiment will have its own source tank. (During the conditioning phase both tanks would be filled with treated tap water. During the test phase, the tank for the "control" would again be filled with tap water, while the "test" rack tank would be filled with the water representing the desired corrosion inhibitor.)

Each rack assembly (i.e. set of four lead pipes) would also have its own feed pump, which would be turned on and off using a digital timer on its power supply. Anticipated schedule of pump operation would provide three short (~ 3 minutes) periods of flow interspersed with about eight hours of stagnation each day. Each individual pipe run is configured with an upstream and downstream vent, so that water is retained in the lead pipe segment during the stagnation periods (that is, so it is not emptied by siphon action.)

Each individual pipe run is also provided with an upstream throttling valve and rotameter (i.e. variable area flow meter) so that the normal and sample flow rates can be individually set. It is planned that the throttling valves will be adjusted so that the normal daily flows are identical for all pipe runs. Each pipe run is also equipped with upstream and downstream valves so as to provide for manual sample draw.

Each set of four pipes will have a common discharge line, which can be either routed to a floor drain (for single flow through operation) or back to the respective source tank for that rack (for recirculating flow operation.) If the experiments are set up on a recirculating flow basis, the source tank will have to be emptied periodically (perhaps, weekly). This will involve acidification of the tank contents to mobilize any lead sorbed to the tank walls, sample collection, and then emptying the tank. If the experiments are set up for single flow through operation, they will have to be refilled each day.

b) The selected 24-inch lead pipe segments will be mounted in the test racks as indicated in the schematic.

c) Depending on whether a "flow through" or "recirculation" experiment is being conducted, routine rack operation will entail either daily refilling the source tanks (i.e. five days per week) for the "flow through", or weekly tank acidification, sampling, dumping and refilling.

d) The throttling valves on all eight pipe runs will be set to deliver identical flow rates during the normal thrice-daily flow periods.

e) Twice weekly the operator will manually take samples from the sample port on each pipe run. During the second phase of the pipe conditioning, it is proposed that two different flow rates will be used for the sampling operation. In each of the two racks of four pipes, two of the pipe assemblies will be sampled at a flow rate of 2 gpm, while the other two will be sampled at a flow rate of 1 gpm. This will require adjustment to the throttling valves to pre-set positions for either all or half of the pipe assemblies.

f) Samples will be analyzed for total lead.

g) Conditioning and sampling will continue until the lead results show an approximate steady state, hopefully with all pipes yielding similar results. It is anticipated that this will last for two months.

h) After pipe conditioning is completed, the pipes will be maintained in a conditioned state by continued operation of the pipe racks. In this post-conditioned maintenance phase, the pipe racks can be run in a recirculating flow basis, with weekly changing of the source tank water (but without acidification or tank water sampling.) The pipe racks would be sampled monthly, as described in item "e" above, except that all sample flow rates can be the same. No adjustment to throttling valves required. This maintenance procedure will be maintained until the pipes are needed for treatment optimization testing.

LSR Joint Venture

Providence Water

Lead Water Service Samples (5/8" Dia., ~ 48" Long)			Date: February 8, 2013	
#	**Address/Stop No.**	**Date Harvested**	**Date of Installation**	**Age (Yrs)**
1	55 Grotto Ave., Providence/33178	October 18, 2012	April 21, 1914	98
2	* 250 President Ave., Providence/26463	October 24, 2012	July 14, 1905	107
3	47 Grotto Ave., Providence/32883	October 23, 2012	January 14, 1914	98
4	25 Cottage St., Cranston/35245	November 1, 2012	April 20, 1017	95
5	11 Sabra St., Cranston/33186	November 9, 2012	June 20, 1914	98
6	15 Sabra St., Cranston/35126	November 9,2012	November 14, 1916	96
7	9 Sabra St., Cranston/32922	November 12, 2012	March 17, 1914	98
8	173 Eldridge St., Cranston/41124	November 15, 2012	June 7, 1924	88
9	14-16 Cottage St., Cranston/28872 (36" Long)	November 19, 2012	May 5, 1909	103
10	18 Molter St., Cranston/35345	November 20, 2012	May 2, 1917	95
11	37 Cottage St., Cranston/34942	November 24, 2012	August 21, 1916	96
12	* 165 Blackstone Blvd., Providence/35999	December 4, 2012	June 6, 1919	93

Note: Upon harvest, the Sample No., direction of flow, location, date of the Public Side PLSLR was noted on the pipes, a damp sponge(s) inserted, and both ends were sealed with duct tape and plastic. All samples were excavated, not pulled with an inserted cable, and cut with a ratcheted quillotine blade (PVC cutter), not an abrasive cutting wheel.

* 1" Diameter - Very Large Mansions

** 3/4" Diameter

Yellow: Remains

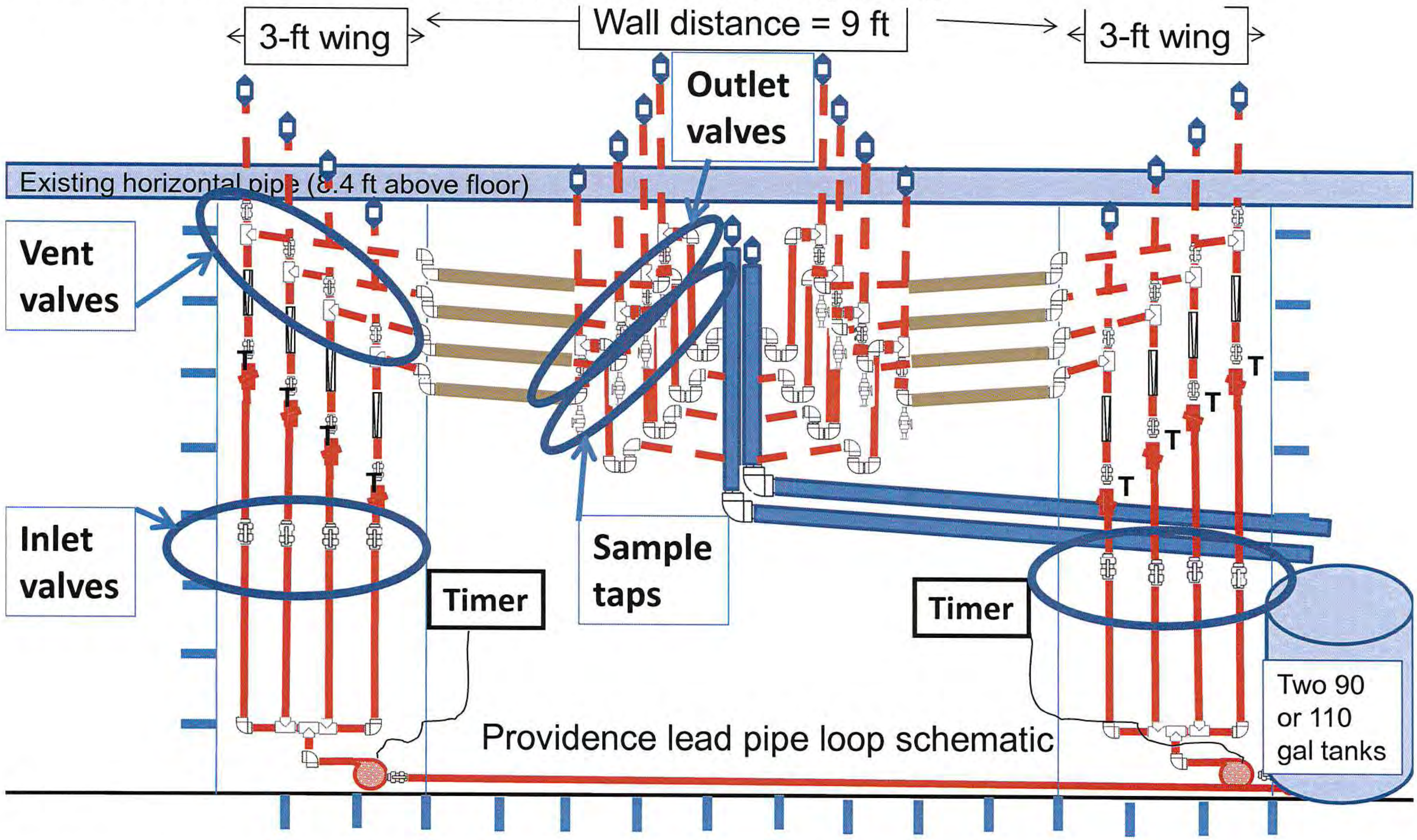
Blue: Shipped

LSR Joint Venture

Providence Water

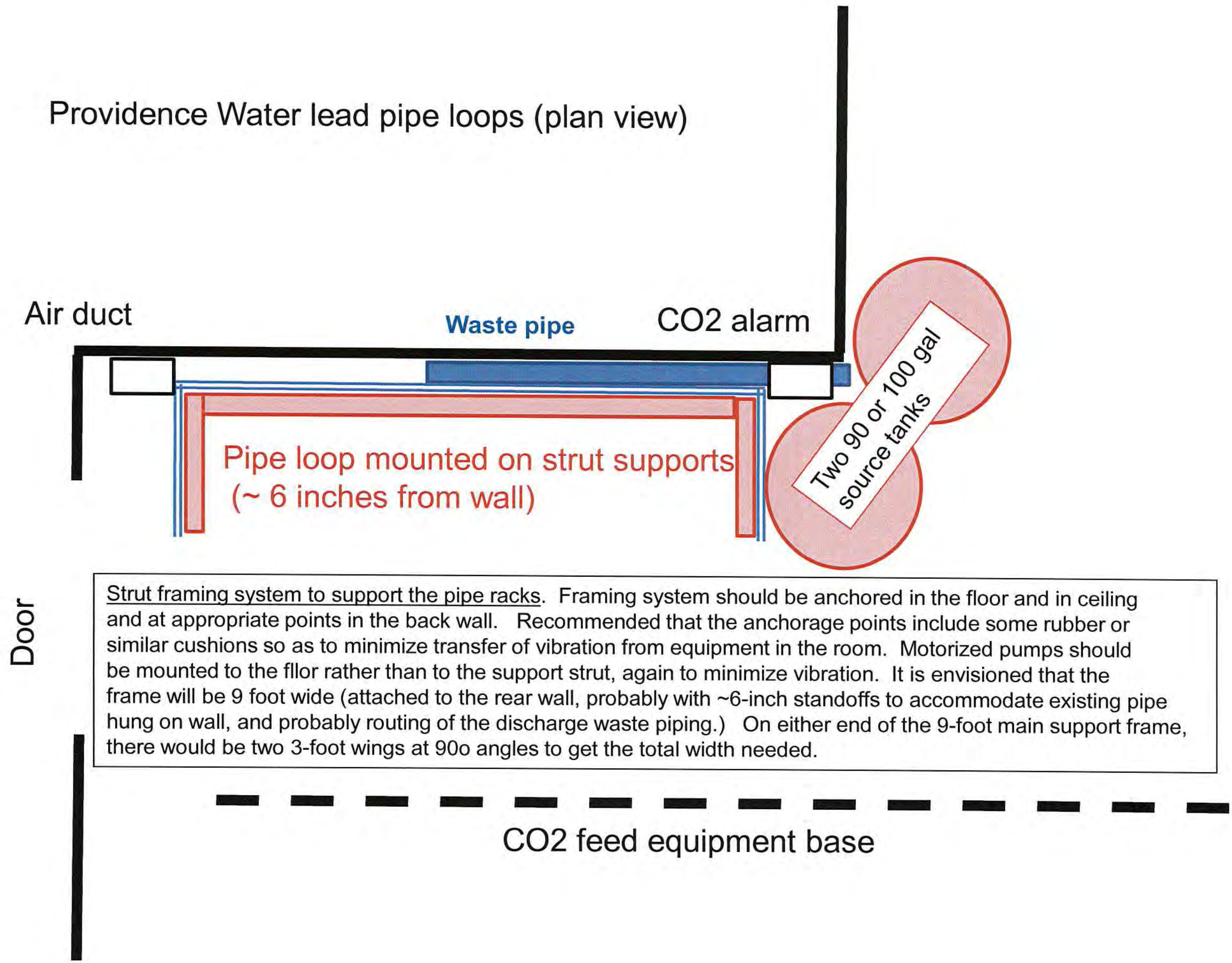
Lead Water Service Samples (5/8" Dia., ~ 48" Long)			Date: February 8, 2013	
#	Address/Stop No.	Date Harvested	Date of Installation	Age (Yrs)
13	190 Upton Ave., Providence/51138	December 5, 2012	August 11, 1936	76
14	120 Grotto Ave., Providence/32844	December 6, 2012	December 13, 1913	93
15	** 138 Grotto Ave., Providence/34637	December 7, 2012	May 13, 1916	96
16	** 138 Grotto Ave., Providence/34637	December 7, 2012	May 13, 1916	96
17	53 Sabra St., Cranston/35580 (43" Long)	December 18, 2012	October 18, 1917	97
18	52 Manhasset St., Cranston/45705	December 18, 2012	May 2, 1928	85
19				
20				
21				
22				
23				
24				

1. Influent piping contains a check valve, throttling ball valve, and rotameter.
2. The is an isolation ball valve on each vent, which is also equipped with a vent filter.
3. Discharge piping for each loop contains a sample port on the elbow, followed by an isolation ball valve.
4. The elevation of the discharge piping tee should be above the top of the lead pipe, but below the influent tee.
5. Waste line is valved so it can either recirculate to source tank, or discharge to waste.



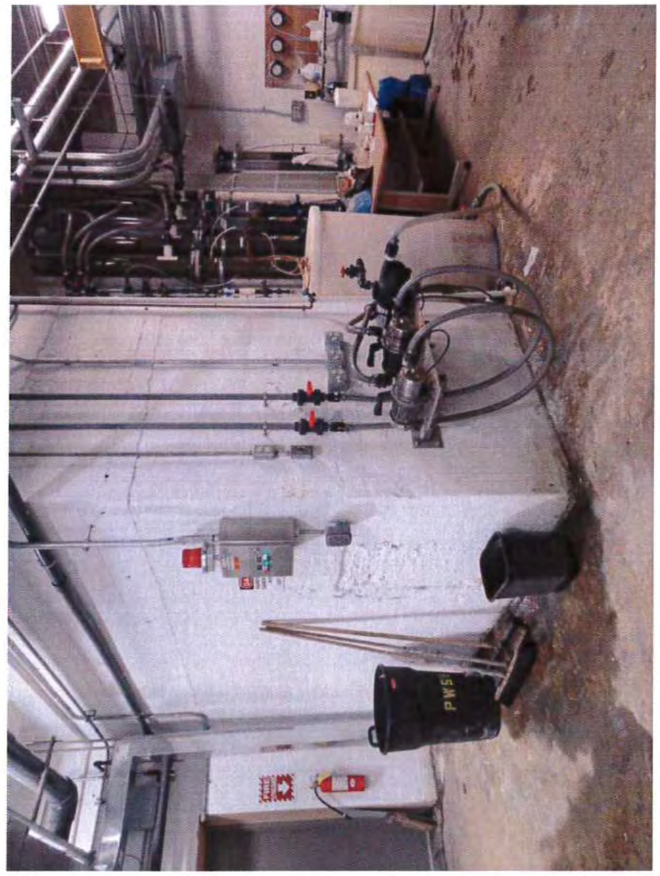
Hash marks are at approximately 1-foot intervals

Providence Water lead pipe loops (plan view)

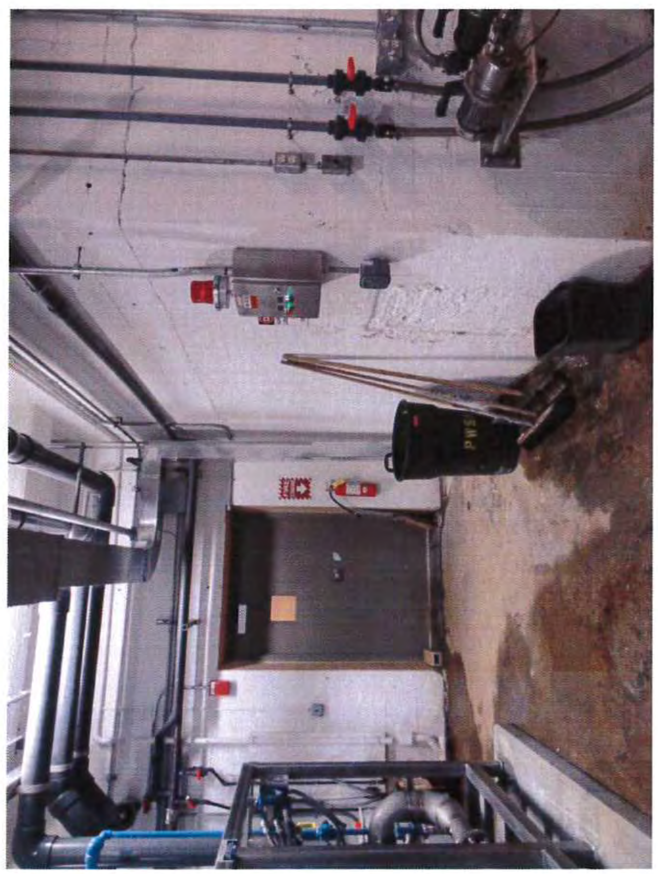


<u>Strut framing system to support the pipe racks</u>. Framing system should be anchored in the floor and in ceiling and at appropriate points in the back wall. Recommended that the anchorage points include some rubber or similar cushions so as to minimize transfer of vibration from equipment in the room. Motorized pumps should be mounted to the fllor rather than to the support strut, again to minimize vibration. It is envisioned that the frame will be 9 foot wide (attached to the rear wall, probably with ~6-inch standoffs to accommodate existing pipe hung on wall, and probably routing of the discharge waste piping.) On either end of the 9-foot main support frame, there would be two 3-foot wings at 90o angles to get the total width needed.


DANGER


PWS


DANGER


PWS

Fort Reno Pipe Rack Bay 5

(Bays 2 and 6 are reversed [mirror image])

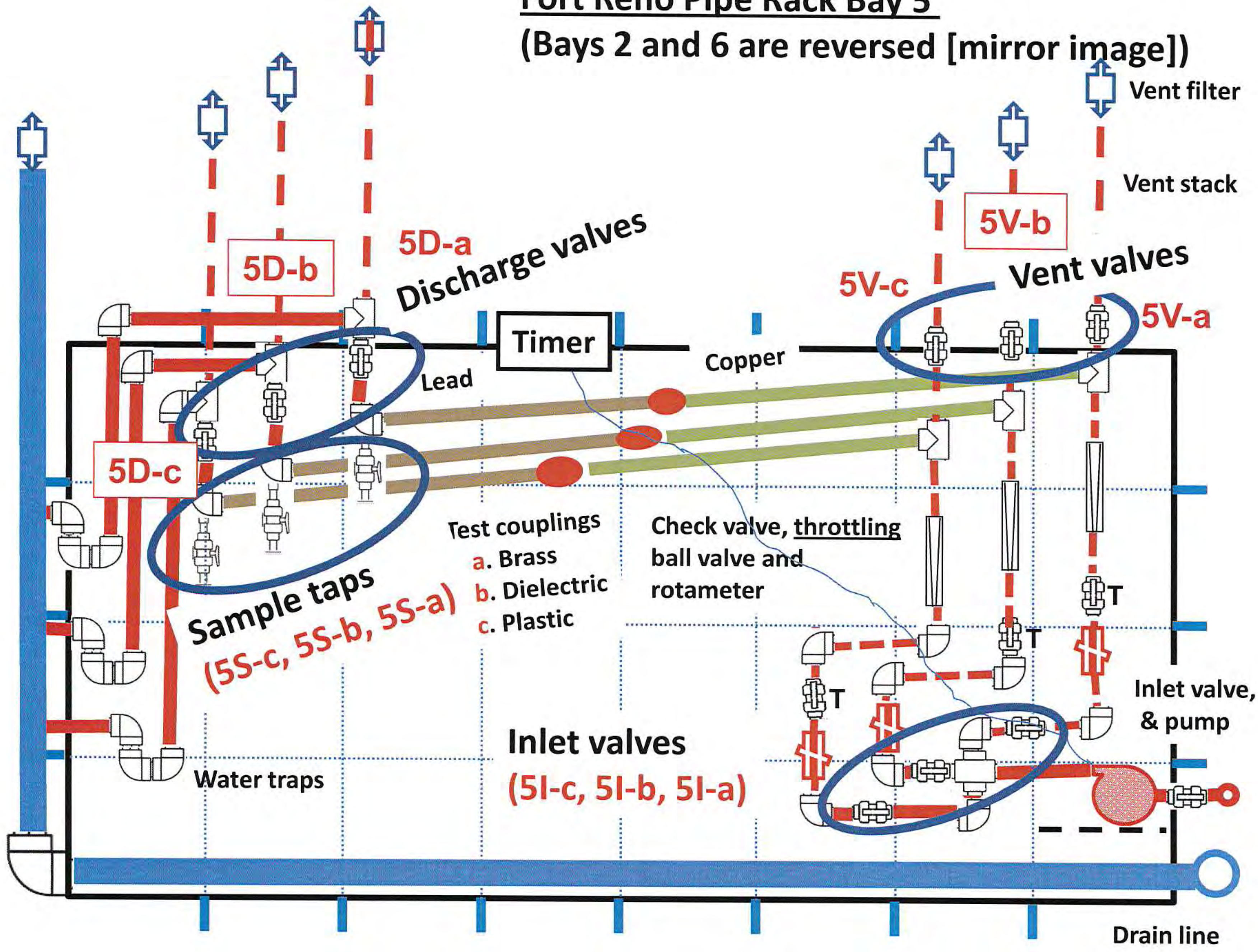
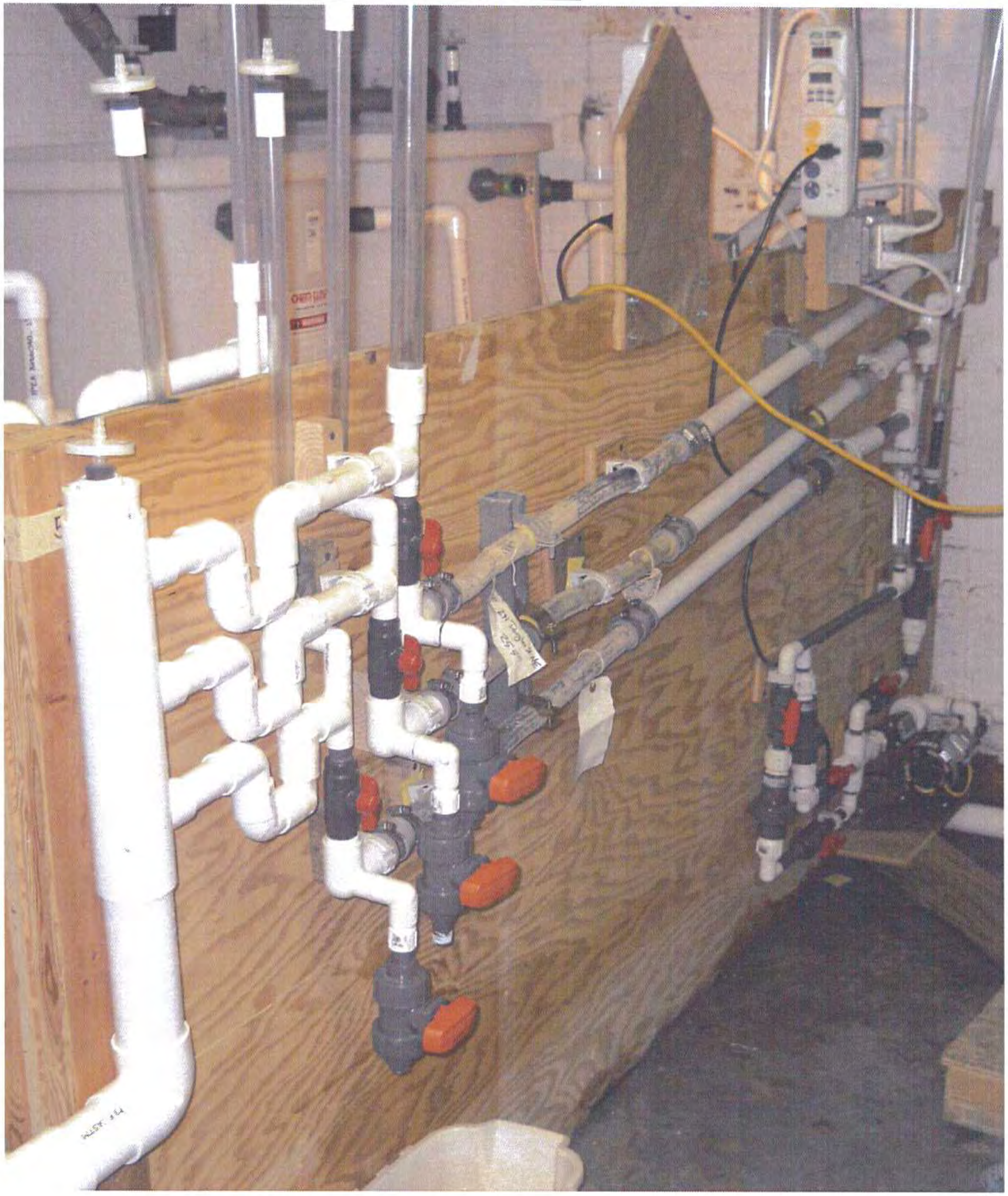


Figure 2. Fort Reno Rack 5

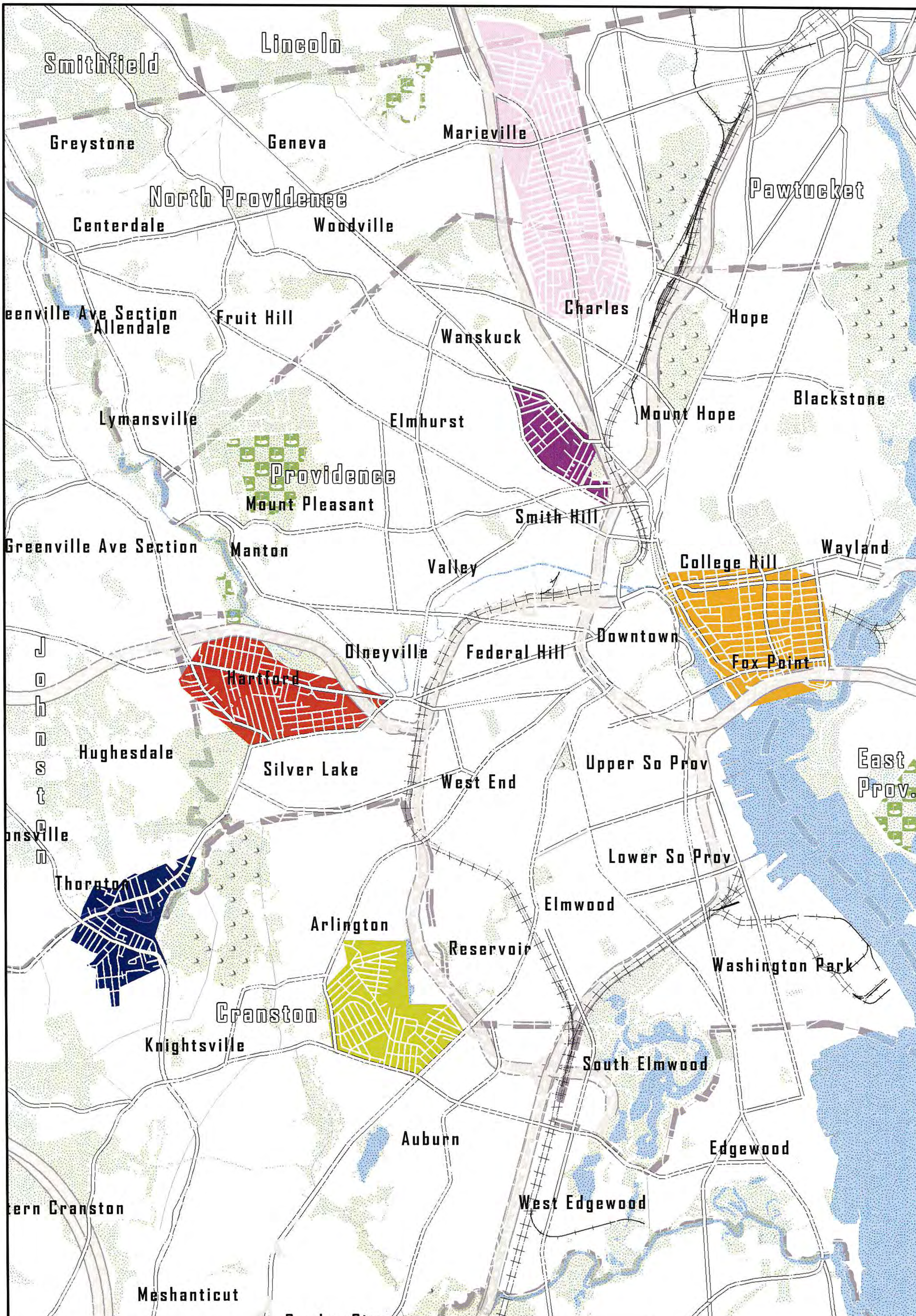


Material takeoffs for the ProvWater pipe loop, running from upstream to downstream.

date: 1/9/13

Num	Description	Qty	Mfr / Model / Source (for pricing only)	Unit cost	Total cost
1	90 gal or 110 gal vert cyl tank; polyethylene w/ 4 penetrations (0.75" fill, 1" overflow, 1" outlet, 0.5" sampling port) w/ overhanging lid	2	Chemtainer (TC2448AA); Harrington Industrial Plastics (page 543) - [adjust for special lid and for volume]	$374.00	$748
1a	Float valve, PVC, rod-type	2	US Plastics (23148)	$31.51	$63.02
1b	3/4" PVC FPTxfem quick-connect adaptor, plus dust plug	2	US Plastics - #30665 + 30756; pg 151	$7.63	$15.26
1c	Fill valve downshaft assembly (3/4" FPT x sock adaptor, 42" 3/4" PVC pipe; 3/4" elbow)	2	US Plastics - #30370 and 30091, or **Harrington, 435-007 and 406-007**	$1.37	$2.74
1d	3/4" pipe for #1c	12	Harrington 400-007	$1.04	$12.48
2	1" tru-union ball valves, PVC (for outlet piping, and for diversion to waste from pump discharge)	4	Asahi - Type 21 (Harrington #1601010 pg 164)	$62.00	$248.00
2a	1"x garden hose adaptors for pumped waste outlet	2			
3	Pump	2	Little Giant MD-5 15.1 gpm (1" inlet x 1/2" outlet)	$400.00	$800.00
4	Timer	2	Intermatic HB800 or DT620 digital timer	30	$60.00
5	1/2-inch elbows	6			
6	1/2" tees	6			
7	1/2" ball valves (inlet shutoff for each test loop)	8			
8	Throttling ball valves (Georg Fischer GF Typ 323) - 1/2-inch	8	US Plastics 20224; pg 116	$99.97	$799.76
9	1/2" check valves	8			
10	Rotameter (variable area flow meters)	8	Blue-White - F-40500LN-8; Harrington pg 302 - 1/2" PVC; 0.5 - 5 gpm scale	$79.39	$635.12
11	1/2" x 3/4" tees (inlet vent)	8			
12	1/2" ball valves (inlet vent shutoff for each test loop)	8			
13	3/4" elbows (inlet dogleg leading to lead test pipe)	16			
14	1" Fernco condensate couplings	16	Fernco condensate couplings F1056100	$3.80	$102.60
14a	3/4" Flex PVC nipples and couplings for connection to Fernocs from PVC pipe	16			
15	3/4" tees (outlet vent) plus 3/4"x1/2" reducer	8			
16	3/4" elbows for discharge piping, including trap	32			
17	2" PVC pipe for waste discharge line, plus misc fittings (elbows, 3/4" x 2" tees, etc.)				
18	1" PVC pipe for influent piping from tanks to the pumps; and for tank overflow lines				
19	1/2" PVC piping from pumps to the lead pipe, and for the various vent stacks				
20	3/4" PVC piping from the lead pipe to the 2" waste pipe stack.				
21	Vent filters (plus holder assemblies, consisting of 1/2" coupling and #3 rubber stoppers); 2 for tanks, 8 for inlet piping, 8 for outlet piping and 2 for waste lines	20	Vacu-Guard filter (GE - #6722-5001; Fisher Scientific - 800-766-7000) (10 per pack)	143	$286

22 Strut framing system to support the pipe racks. Framing system should be anchored in the floor and in ceiling and at appropriate points in the back wall. Recommended that the anchorage points include some rubber or similar cushions so as to minimize transfer of vibration from equipment in the room. Motorized pumps should be mounted to the fllor rather than to the support strut, again to minimize vibration. It is envisioned that the frame will be 9 foot wide (attached to the rear wall, probably with ~6-inch standoffs to accomodate existing pipe hung on wall, and probably routing of the discharge waste piping.) On either end of the 9-foot main support frame, there would be two 3-foot wings at 90° angles to get the total width needed.



Unidirectional Flushing (UDF) Program

	A2		PA-1
	A4		PA-3
	A5		PA-5

Providence Water

ATTACHMENT

NO. 6


Greystone
Geneva
Marieville
North Providence
Centerdale
Woodville
Pawtucket
Greenville Ave Section
Allendale
Fruit Hill
Wanskuck
Charles
Hope
Lymansville
Elmhurst
Mount Hope
Blackstone
Providence
Mount Pleasant
Smith Hill
Greenville Ave Section
Manton
Valley
College Hill
Wayland
Olneyville
Federal Hill
Downtown
Fox Point
Hartford
Hughesdale
Johnston
Silver Lake
West End
Upper So Prov
Thornton
Lower So Prov
Elmwood
Arlington
Reservoir
Washington Park
Cranston
Knightsville
South Elmwood
Auburn
Edgewood
Western Cranston
West Edgewood
Meshanticut
Garden City
Warwick
Water Main
Replacement Program
2012 Water Main Contract 1
2012 Water Main Contract 2
2013 Water Main Contract 3
2013 Water Main Contract 4
N
W
E
S
0 1,000 2,000 3,000 4,000 5,000
Feet
1 inch = 3,000 feet
0 0.25 0.5 0.75 1
Miles
1 inch = 0.57 miles
Providence Water
ATTACHMENT NO. 7