

WATER QUALITY SAMPLING RESULTS
FOR
NEOFIT[®] LINED
LEAD DRINKING WATER SERVICE LINES

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The following report details the protocol and technique used to gather water quality samples from Neofit[®] lined lead drinking water services in Louisville, KY., and the water quality test results. This report has been prepared exclusively for use and distribution by Flow-Liner, LTD.

PROJECT HISTORY

In April 2008 Louisville Water Company (LWC) partnered with Utility Services, LTD of Melbourne, AU to install Neofit[®], an expandable PET lining system in several of their lead service lines as a means to eliminate lead pipe to drinking water contact. As part of this project LWC agreed to install new copper service lines to those homes whose lead supply pipes would be lined with Neofit[®]. The lead lines were to remain connected to the water main and be accessible, but left off, in the meter vault. This allowed for the PET lined pipes to be available for future sampling and testing.

Six lines were successfully lined; however, only five of those are still available for testing:

- 100 N. Birchwood Ave.
- 101 N. Birchwood Ave.
- 118 S. Birchwood Ave.
- 120 S. Birchwood Ave.
- 2520 Meadow Rd.

To my knowledge these services have remained idle since 2008 until this most recent round of sampling and testing.

In January 2016 a request to sample these services was received by LWC from Jeff Tanner, President of Flow-Liner Systems, LTD. Flow-Liner is the distributor of the Neofit[®] lining system in the United States.

LOUISVILLE WATER COMPANY SAMPLING/TESTING

On February 8, 2016 Louisville Water Company (LWC) staff installed flushing hoses directly to the existing brass meter stops on the five Neofit[®] lined lead services. The meter stops were used to start, stop, and regulate flow during the flushing, contact time, and sample gathering. The services were allowed to flush for approximately 48-hours.

On February 10, 2016 the lines were shut off allowing minimum of 8-hours of contact time with the Neofit[®] lining.

On February 11, 2016 LWC staff collected the following sample sets from each service:

- first flush
- after a 2-minute flush
- after a 10-minute flush

The first flush samples exhibited the highest lead content with readings between 5.2ppb and 238ppb.

The samples taken after the 2-minute flush and after the 10-minute flush, in every instance contained <2.5ppb, the lower limit of LWC laboratory equipment.

The procedure used by LWC to collect the samples included operating the original brass meter stops and disconnecting and reconnecting flushing hoses with brass end-fittings. LWC staff visually inspected the samples and detected debris in the first flush samples. This may have been a result of dislodging corrosion deposition in the meter stops by operating the valves repeatedly. This, along with connecting and disconnecting brass fittings at the end of the flushing hoses, may have contributed to the particulate and the lead content in the “first flush” samples.

INFRASTRUCTURE RENEWAL SERVICES, LLC SAMPLING/TESTING

In March 2016 Jeff Tanner contacted Infrastructure Renewal Services, LLC (IRS) and shared the sample results from LWC’s testing. Mr. Tanner requested IRS resample the Neofit[®] lined services.

A revised protocol was developed to obtain samples. A secondary valve was installed in the flushing/sampling device downstream of the original brass meter stop. This allowed the meter stop to remain open during the flushing and sampling routine. The newly installed valve was to be operated to initiate flushing, turn service off, and throttle the flow to obtain samples. PVC components were installed for any new piping in the flushing system and, to the extent possible, existing brass fittings were removed from the water stream.

On March 31, 2016 and April 1, 2016 PVC flushing connections were installed on the five services. All brass fittings, with the exception of the meter stop were removed from the services at 101 N. Birchwood Ave. and 118 S. Birchwood. The flushing connections at 100 N. Birchwood Ave., 120 S. Birchwood Ave., and 2520 Meadow Rd. contained the meter stop and a brass street elbow.

On April 3, 2016 services were turned off at approximately 8:00 A.M. using the newly installed PVC ball valve. One liter samples were collected from the services on April 3, 2016 at approximately 4:00 P.M. Only two samples were taken at each service; the first out and a sample after a 2-minute flush. The sample after a 10-minute flush was deemed unnecessary, as such samples had never tested positive for excessive lead. The ball valves were left in the closed position after sampling.

Samples were delivered to Beckmar Laboratory at approximately 8:30 A.M. on April 4, 2016.

Beckmar Laboratory performed tests for both ‘dissolved’ lead and ‘total’ lead content in each sample. The results for ‘dissolved’ lead from the April 3rd first flush samples were <1ppb for all services except Meadow Rd. which contained 12ppb. The ‘total’ lead readings in the first flush were <1ppb with the exception of 101 N. Birchwood Ave. (2ppb) and Meadow Rd. (15ppb). ‘Dissolved’ lead test results following the 2-minute flush were <1ppb except for 100 N. Birchwood Ave. (1ppb). ‘Total’ lead found in the samples following the 2-minute flush was 1ppb at 100 N. Birchwood Ave and Meadow Rd. The other three services tested at <1ppb.

Services were sampled again on April 5, 2016 at approximately 5:00 P.M. These samples represented a 48-hour contact time with the Neofit[®] lining. Again 2-samples were taken from each service, first flush and a second sample after a 2-minute flush.

Samples delivered to Beckmar Laboratory at approximately 9:00 A.M. on April 6, 2016.

Results from the April 5th sampling after 48-hours of contact time with the Neofit[®] lining were similar to the results following the 8-hour contact time. The majority of the samples contained <1ppb with 101 Birchwood Ave. and 2520 Meadow Rd. being the outliers. 101 Birchwood Ave. contained 1ppb of 'dissolved' and 2ppb 'total' lead in the first flush sample and <1ppb 'dissolved' and 1ppb 'total' lead in the sample taken after the 2-minute flush. 2520 Meadow Rd. contained 8ppb 'dissolved' and 10ppb 'total' lead in the first flush sample and <1ppb 'dissolved' and 2ppb 'total' lead in the post 2-minute flush sample.

In an effort to reduce potential contamination of the sample from existing brass fittings the brass street elbow in the meter stop at 2520 Meadow Rd. was replaced with a PVC elbow on April 13, 2016. The service was allowed to flush overnight, approximately 12-hours.

At approximately 6:15 A.M. on April 14, 2016 the flushing connection was turned off. The service line was sampled at approximately 2:15 P.M. the same day following an 8-hour contact time. A single sample was taken, first flush only.

The samples were delivered immediately to Beckmar Laboratory.

The results of the April 14th samples from 2520 Meadow Rd. were significantly better with the brass elbow removed. Both the "dissolved" and "total" lead concentration in the first flush sample were <2ppb.

CONCLUSION

As noted by the sample results it would seem appropriate to eliminate as many of the existing brass fittings as possible at the time the Neofit[®] liner is installed. Any brass fittings that will remain in the service line and will be in contact with the potable water should be approved "lead free" fittings.

It is this author's opinion the Neofit[®] PET sliplining process has successfully proven it can be installed as a barrier between lead service lines and potable water in small diameter pipes. By virtue of the installation process, expanded in place using water pressure, the liner is essentially fool-proof in that a breach in the liner would result in a loss of pressure during the expansion phase of installation. A successful installation of the liner results in a 100% coverage of the host pipe.

RESULTS FROM WATER QUALITY TESTING OF NEOFIT LINED LEAD SERVICES IN LOUISVILLE, KY						
Date Sampled	Address	TOTAL LEAD		DISOLVED LEAD		Comments
		1st Flush (ppb)	Post 2-min Flush (ppb)	1st Flush (ppb)	Post 2-min Flush (ppb)	
No Information Available on Hours of Contact with Neofit Lined Lead Service						
October 8, 2008	100 N. Birchwood Ave.	1.7	<0.5	N/A	N/A	1,2,3
October 8, 2008	101 N. Birchwood Ave	1.6	<0.5	N/A	N/A	1,2,3
October 8, 2008	118 S. Birchwood Ave.	2.0	1.0	N/A	N/A	1,2,3
October 8, 2008	120 S. Birchwood Ave.	3.8	1.9	N/A	N/A	1,2,3
October 8, 2008	2520 Meadow Rd.	1.6	<0.5	N/A	N/A	1,2,3
Samples Taken After an 8-Hour Contact Time with Neofit Lined Lead Service						
April 3, 2016	100 N. Birchwood Ave.	<1.0	1.0	<1.0	1.0	2,3
April 3, 2016	101 N. Birchwood Ave	2.0	<1.0	<1.0	<1.0	2,4
April 3, 2016	118 S. Birchwood Ave.	<1.0	<1.0	<1.0	<1.0	2,4
April 3, 2016	120 S. Birchwood Ave.	<1.0	<1.0	<1.0	<1.0	2,3
April 3, 2016	2520 Meadow Rd.	15.0	1.0	12.0	<1.0	2,3
Samples Taken After a 48-Hour Contact Time with Neofit Lined Lead Service						
April 5, 2016	100 N. Birchwood Ave.	<1.0	<1.0	<1.0	<1.0	2,3
April 5, 2016	101 N. Birchwood Ave	2.0	1.0	1.0	<1.0	2,4
April 5, 2016	118 S. Birchwood Ave.	<1.0	<1.0	<1.0	<1.0	2,4
April 5, 2016	120 S. Birchwood Ave.	<1.0	<1.0	<1.0	<1.0	2,3
April 5, 2016	2520 Meadow Rd.	10.0	2.0	8.0	<1.0	2,3
Samples Taken After an 8-Hour Contact Time with Neofit Lined Lead Service						
April 14, 2016	2520 Meadow Rd.	<2.0	N/A	<2.0	N/A	2,4

1. Samples were taken prior to installing additional Neofit® linings in lead and copper service lines. No information is available on the contact time with the PET liner prior to taking samples.
2. Original brass corporation stop and meter stop remained in place during contact time and sampling.
3. Original brass street elbow remained in place during contact time and sampling.
4. Original street ellbow removed during contact time and sampling.