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## MEMORANDUM

TO: Bernard Lenz-PE, Leland Anderson

FROM: Randy Sandford-PE, Brian Kent, CHMM

DATE: June 14, 2019

RE: Well 23H Perflourinated Compound Testing  
SEH No. LACRS139514 14.00

The La Crosse Water Utility (LCWU) was a participant in US Environmental Protection Agency's third round of its Unregulated Contaminant Monitoring Rule (UCMR3) program. US EPA published in 2012 the list of unregulated contaminants to be sampled by selected water utilities throughout the country. La Crosse was included in this list of utilities. UCMR3 included sampling and testing for 28 chemicals and two viruses, including Perflourinated Alkyl Acids (PFAS). Perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) were detected above recommended levels in the UCMR3 water samples collected for La Crosse Well 23H during 2014 and 2016.

PFOS and PFOA are unregulated fluorinated organic chemicals which should be monitored by public water systems under UCMR3. The chemicals PFOA and PFOS were widely used to make carpets, clothing, fabrics for furniture, paper packaging for food and other materials that are resistant to water, grease or stains. They were also used for firefighting at airfields and in a number of industrial processes. Most people have been exposed to these chemicals through consumer products, but drinking water can be an additional source of exposure in communities where these chemicals have been identified within the water supplies.

During 2016 the LCWU retained SEH to design a water sampling and testing plan for Well 23H for the LCWU to implement that would document the presence (and concentration) or lack of PFOS in the Well 23H water supply. The first step in the water and testing plan development involved a comprehensive review of available testing information for Well 23H, and other vicinity production wells, a review of potential contaminant sources, and review of existing aquifer modeling.

The EPA health advisory for PFOS is 70 parts per trillion (0.070 µg/L) and the EPA asks water utilities to make some actions if the individual or combined concentration of these two compounds are greater than 70 ppt. Since 2016, the EPA and the Wisconsin Department of Natural Resources (WDNR), have recognized the growing concerns with the presences of PFAS in groundwater and the limited information relating to health risks, treatability and industry practices related to sample collection and integrity. During February 2019 the EPA published a PFAS Action Plan (EPA823R18004, February 2019) to lead the national effort to understand PFAS and reduce PFAS risks to the public through active engagement and partnership with other federal agencies, states, tribes, industry groups, associations, local communities, and the public. Five key elements of the plan are summarized below:

- EPA has initiated actions to develop a Maximum Contaminant Level, or MCL, for PFAS, and specifically for two PFAS compounds, PFOS and PFOA. EPA indicated it will begin the MCL creation process by the end of 2019. The EPA Administrator stated that this would be the first substance to have an MCL established since the Safe Drinking Water Act was amended in 1996. The EPA maintains that the 70

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parts per trillion (ppt) standard is a federally enforceable groundwater standard, despite misconceptions to the contrary.

- EPA will continue to pursue enforcement actions utilizing the existing Health Advisory Level for PFAS of 70 ppt.
- The EPA will expand monitoring and data gathering related to PFAS, including adding PFAS to the toxics release inventory, which should generate additional information on the extent of PFAS in industry and in the environment. The EPA is using enhanced mapping tools to identify where and in what communities PFAS is in the groundwater and in the environment.
- The EPA will expand research into the impacts of PFAS on human health and the environment, studying fate and transport issues associated with PFAS. The EPA wants to “close the gap” on the science related to PFAS, including the more recently manufactured perfluorinated compound known as “GenX”.
- The EPA will develop a “risk communication toolbox” that will provide information to the public and the regulated community more clearly.

Meanwhile, the WDNR’s Remediation and Redevelopment (RR) Program has convened a PFAS Technical Advisory Group to discuss PFAS-related concerns that are specific to the assessment and cleanup of environmental contamination. The goal of the group is to examine the “what, where, when and how” of PFAS investigation and remediation by sharing concerns, identifying current and proposed practices and strategizing on issues requiring solutions.

SEH was provided with PFOS sampling results by the City of La Crosse for 13 wells sampled for PFOS and other PFAS (EPA Method 537). Detections of PFOS and PFHxS were detected in Well 23H. No other wells sampled showed detections of PFOS, including nearby Well 24H and Well 26H. Since water sampling results showed that Well 23H contains PFOA and PFOS greater than 70 parts per trillion, EPA recommended that the utility undertake additional sampling on a voluntary basis.

A review of potential contaminant sources identified a historic environmental repair site located hydraulically upgradient of Well 23H. A report prepared by RMT detailed groundwater impacts originating from burn pits on the La Crosse Municipal Airport property. These burn pits are located approximately 3200 feet hydraulically upgradient from Well 23H. Historical records indicate volatile organic compounds (VOCs) were the primary contaminant of concern relating to the burn pits, and VOCs had impacted production wells 23H and 24. Records further indicate that remediation was implemented at the burn pits, consisting of soil vapor extraction and air sparging. During 2010, the WDNR issued closure permits for the project indicating contaminants in the production wells were at or below regulatory limits. PFAS analysis was not conducted, or was not available, from investigation and remediation efforts relating to the burn pits and impacts to production wells 23H and 24. WDNR did conclude that airfield fire suppression materials used on the up-gradient burn pits are the likely source of PFOS/PFOA impacts at Well 23H.

A review of the City of La Crosse wellhead protection plan suggests that the former test burn pits are a likely source of contaminants to Well 23. The groundwater flow field for the calibrated groundwater flow model shows groundwater flow generally from north to south, turning towards the southeast in the vicinity of the municipal wells. Particle traces show that the source of a portion of the groundwater for Well 23 is from the vicinity of the former burn pits. The aquifer geology is considered homogenous and well connected. It has transmissivity properties that lend itself well to high capacity wells. It also means that any contamination plumes would flow as easily towards high capacity wells making this geology highly susceptible. Conversely this geology has greater opportunities to reduce contamination plumes through mechanical pumping.

During February 2017 SEH and the City met to discuss the above findings and initial recommendations relating to the sampling plan. Due to the aquifer characteristics in the vicinity of the burn pits and Well 23H, and the City’s desire to remediate the source of contaminants as well as understand the degree and extent of PFOS and PFOAs, the sampling plan involved actively pumping water from Well 23H, using several different operation scenarios, while routinely collecting analytical data to assess contaminant response to each scenario. Water

pumped from Well 23H was planned to be discharged to the Black River, assuming approval from the WDNR. The LCWU obtained approval from the WDNR to discharge water pumped from Well 23H during early 2017, and implemented pumping and testing of Well 23H during late June 2017. However, shortly after the pumping program was started, the well field was struck by lightning the pump starter for Well 23H was damaged. Pumping was re-initiated following repair on July 26, 2018. Pumping and testing activities were concluded on April 15, 2019.

The following is a summary of the pumping and testing program:

- From July 26, 2017 to approximately August 27, 2017 Well 23H was operated 12 hours/day, 5 days/week at a pumping rate of 2300 gallons per minute (gpm). The 5 day sequence started on Wednesday evenings and ended Monday morning, then sat idle until the next Wednesday. Samples were collected at start up (Sunday evening) and shut down (Monday morning) of the last day of the 5-day cycle.
- From August 30, 2017 to approximately October 1, 2017 Well 23H was operated 12 hours/day, 3 days/week (Wed-Friday) and 24 hours/day for 2 days (weekend) at a pumping rate of 2300 gpm. Samples were collected Monday morning on the last day of the 5-day cycle.
- From October 1, 2017 to November 18, 2017 Well 23H operated 12 hours/day, 5 days/week and 24 hours/day on the weekend at a pumping rate of 2300 gpm. Samples were collected Monday mornings following the 24 hour/day cycle.
- From November 18, 2017 until March 14, 2018 Well 23H operated 24 hours/day, 7 days/week at a pumping rate of 2300 gpm. Samples were collected Monday mornings.
- From March 14, 2018 until April 25, 2018 Well 23H operated 24 hours/day, 7 days/week at a pumping rate of 1800 gpm. Samples were collected Monday mornings.
- April 25, 2018 until April 30, 2018 Well 23H was off
- On April 30, 2018 Well 23H was started at a pump rate of 1800 gpm, immediately sampled (approximately 6:52 am) and sampled 2 hours later (approximately 8:52 am), then shutdown.
- Between April 30, 2018 and May 13, 2018 Well 23H was off.
- On May 13, 2018 Well 23H was started at a pump rate of 1800 gpm, immediately sampled (approximately 9:35 pm), operated for 11 hours, resampled (May 14, 2018; 8:35 am), and shut down.
- Between May 14, 2018 and July 31, 2018 Well 23H was off.
- On July 31, 2018 Well 23H was started at a pump rate of 1800 gpm, immediately sampled (approximately 9:40 pm), operated for 11 hours, resampled (August 1, 2018; 8:30 am), and shut down.
- Between August 1, 2018 and August 27, 2018 Well 23H was off.
- From August 27, 2018 to November 4, 2018 Well 23H operated 12 hours/day, 5 days/week and 24 hours/day on the weekend at a pumping rate of 1800 gpm. Samples were collected on September 4, September 24 and October 1 following the 24 hour/day cycle.
- From November 5, 2018 until March 31, 2019 Well 23H operated 24 hours/day, 7 days/week at a pumping rate of 2150 gpm. Samples were collected the first Monday of each month.
- From April 1, 2019 until April 15, 2019 Well 23H operated 24 hours/day, 7 days/week at a pumping rate of 1800 gpm. Samples were collected on April 1 and April 15, just prior to shutdown.
- On April 15, 2019 Well 23H was shut off and remains off.

### **Test Results Summary**

- The PFOA/PFOS resulted in a small decline with results well below 70ppt during the City's pumping period of 5 days per week with 12 hour run times at 2300gpm from July 26<sup>th</sup> – August 27, 2017
- The PFOA/PFOS resulted in an increase and above 70ppt during the City's pumping period of 3 days per week with 12 hour run times at 2300gpm from August 30 – October 1 2017.
- Between December 2017 and April 2018; PFOA/PFOS is below 70ppt, with consistent decline- however, the system was operating 24/7 with little opportunity for rebound. SEH suggested shutdowns in April/May 2018 to assess rebound. Not much of a rebound during this time frame, but it was only off 5 days
- During the month of May 2018 the pumping rate was 1800gpm run for 24 hours for two days which yielded elevated levels but still below 70ppt
- Well 23H was shut down on May 14 until July 31 (@2.5 months). The startup sample on July 31 was low (@24ppt PFOA/PFOS combined), but the sample collected after approximately 11 hours on August 1 was

high (91ppt PFOA/PFOS combined). This rebound was not identified by the City until late August when the sample analysis was complete.

- This alarmed the City and they responded with a much more aggressive sampling protocol during the summer/fall of 2018, and ran it continuously over the winter to avoid freeze up. PFOA/PFOS results during this time were below 70ppt and consistent while pumping at 2150gpm 24hr/day 7 days per week.
- The City contacted the WDNR to see if they could extend their discharge permit, but was rejected. The WDNR stipulated that the discharge to the Black River would need to be terminated by April 15. The City shut down Well 23H on April 15 2019.

### **Conclusions**

The homogenous properties of the aquifer that the City of La Crosse receives its potable water from, yields high transmissivity properties and is considered an excellent source of safe reliable drinking water. The above tests conducted were done voluntarily by the City of La Crosse. The testing procedures took 2 years to complete. Water from well 23H was approved by WDNR to discharge to the Black River during this time period.

The results above indicate that the PFOA/PFOS can be reduced over of time using high capacity pumps. Pumping results from well 23H indicate that during longer periods of shut down the PFOA/PFAS can rebound. The testing procedures deliberately varied the pumping times and rates in order to identify trends. One trend that seemed consistent, indicated that with greater pumping for more than 5 days of run time, a decline of PFOA/PFOS were observed. However there was a limit to the lowest levels measured. Lowest levels ranged between 24-30ppt. Conversely the higher ranges of PFOA/PFOS were reported during pumping rates of less than 5 days of run time. The highest levels ranged from 175-210ppt.

PFOAS and PFAS are now on the EPA's most recent action plan (EPA823R18004) and has next steps planned to implement a Maximum Contaminant Level (MCL). Whether to add well 23H back into its normal supply rotation should be discussed between the City of La Crosse Utility and City of La Crosse City Council. As part of the decision making process discussion should include public safety, maximum daily customer demands and observation and trend review as it pertains to the needs of the Utility during the summer months.

These test results indicated that with maximum pumping capacity, paired with long runtimes without interruption will yield PFOA/PFOS results that are under the EPA's health advisory levels of 70ppt. If the decision is to reinstate this well we recommend that the Utility staff monitor the PFOA/PFOS on a monthly basis during its use.

BLK & RJS

Attachments

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## Well 23 Operation Schedule

June 28<sup>th</sup> / June 29<sup>th</sup> - 12 Hour runs 2300 GPM

June 30<sup>th</sup> Well starter blows... Replaced starter, operations resume July 26<sup>th</sup>.

July 26<sup>th</sup>, 27<sup>th</sup>, 28<sup>th</sup>, 29<sup>th</sup>, 30<sup>th</sup> -5 days /12 Hour runs @2300 gpm

August 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> - 5 days /12 Hour runs @ 2300 gpm

August 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>, 12<sup>th</sup>, 13<sup>th</sup> -5 days /12 Hour runs @2300 gpm

August 16<sup>th</sup>, 17<sup>th</sup>, 18<sup>th</sup>, 19<sup>th</sup>, 20<sup>th</sup> -5 days /12 Hour runs @2300 gpm

August 23<sup>rd</sup>, 24<sup>th</sup>, 25<sup>th</sup>, 26<sup>th</sup>, 27<sup>th</sup> -5 days /12 Hour runs @2300 gpm

August 30<sup>th</sup>, 31<sup>st</sup>, Sept. 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> -3 days /12 Hour runs -3 days /24 Hour runs @2300 gpm

September 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup> -3 days / 12 Hour runs -2 days /24 Hour runs @2300 gpm

September 13<sup>th</sup>, 14<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup>, 17<sup>th</sup> -3 days /12 Hour runs -2 days /24 Hour runs @2300 gpm

September 20<sup>th</sup>, 21<sup>st</sup>, 22<sup>nd</sup>, 23<sup>rd</sup>, 24<sup>th</sup> -3 days /12 Hour runs -2 days /24 Hour runs @2300 gpm

September 27<sup>th</sup>, 28<sup>th</sup>, 29<sup>th</sup>, 30<sup>th</sup> Oct. 1<sup>st</sup> -3 days / 12 Hour runs -2 days /24 Hour runs @2300 gpm

Beginning October 1<sup>st</sup> Runs 12 Hours a day on weekdays/ 24 Hours a day on Weekends @2300 gpm

Beginning November 18<sup>th</sup> Runs 24/7 @2300 gpm

Beginning March 14<sup>th</sup> 2018 Runs 24/7 @ 1800 gpm

April 25<sup>th</sup> 2018 shutdown

April 30<sup>th</sup> started at 6:52 am @ 1800 gpm and sample collected. Shutdown on April 30<sup>th</sup> at 8:52 am- sample just prior to shutdown

May 13<sup>th</sup> 2018 started at 935 pm @ 1800 gpm and sample collected. Shut down May 14<sup>th</sup> at 835 am- sample just prior to shutdown

July 31<sup>st</sup> 2018 started at 940 pm @ 1800 gpm and sample collected. Shut down August 1<sup>st</sup> at 830 am- sample just prior to shutdown

Beginning August 27<sup>th</sup> Runs 12 Hours a day on weekdays/ 24 Hours a day on Weekends @1800 gpm

Beginning November 5<sup>th</sup> Runs 24/7 @2150 gpm

April 1<sup>st</sup> 2019 to April 15<sup>th</sup> 2019 Runs 24/7 @1800 gpm

Shutdown on April 15<sup>th</sup> 2019 (WDNR will not extend discharge approval)

SUMMARY OF RESULTS FROM SAMPLING PROGRAM AT WELL 23

SAMPLE DATE	Well 23H pumping capacity (gpm)	PFOA* RESULT ppt	CHANGE FROM	PFOS** RESULT ppt	% OF HEALTH ADVISORY	CHANGE FROM	Sample number	PFOA/PFOS
			PREVIOUS SAMPLE		LEVEL	PREVIOUS SAMPLE		
JUNE 28, 2017		7.09		43.4	62.0%		1	50.49
JUNE 29, 2017		12.7	5.61	16.3	23.3%	-27.1	2	29
JULY 30, 2017		17.7	5	14	20.0%	-2.3	3	31.7
JULY 31, 2017		18.1	0.4	14.7	21.0%	0.7	4	32.8
AUGUST 6, 2017		21.5	3.4	15.3	21.9%	0.6	5	36.8
AUGUST 7, 2017		15.6	-5.9	19.7	28.1%	4.4	6	35.3
AUGUST 13, 2017		14.1	-4	26.5	37.9%	11.8	7	40.6
AUGUST 14, 2017		18.2	4.1	15.9	22.7%	-10.6	8	34.1
AUGUST 20, 2017		20.7	5.1	16.6	23.7%	-3.1	9	37.3
AUGUST 21, 2017		13.8	-6.9	35.1	50.1%	18.5	10	48.9
AUGUST 27, 2017		20.8	0.1	22.2	31.7%	-12.9	11	43
AUGUST 28, 2017		16.9	-3.9	56.4	80.6%	34.2	12	73.3
SEPT. 5, 2017		19.5	2.6	123	175.7%	66.6	13	142.5
SEPT. 11, 2017		19.9	0.4	155	221.4%	32	14	174.9
SEPT. 18, 2017		22.3	2.4	188	268.6%	33	15	210.3
SEPT. 25, 2017		20.5	-1.8	165	235.7%	-23	16	185.5
OCTOBER 2, 2017		20.5	0	154	220.0%	-11	17	174.5
October 9, 2017		18.4	-2.1	111	158.6%	-43	18	129.4
October 16, 2017		18.6	0.2	83.7	119.6%	-27.3	19	102.3
October 23, 2017		18.6	0.0	75	107.1%	-8.7	20	93.6
October 30, 2017		18.7	0.1	89.5	127.9%	14.5	21	108.2
November 6, 2017		15.5	-3.2	87.7	125.3%	-1.8	22	103.2
November 13, 2017		16.4	0.9	81	115.7%	-6.7	23	97.4
November 20, 2017		15.9	-0.5	71.9	102.7%	-9.1	24	87.8
November 27, 2017		15.6	-0.3	60.8	86.9%	-11.1	25	76.4
December 4, 2017		14.7	-0.9	53.2	76.0%	-7.6	26	67.9
December 11, 2017		13.7	-1.0	51	72.9%	-2.2	27	64.7
December 18, 2017		12.5	-1.2	48.9	69.9%	-2.1	28	61.4
December 26, 2017		13.8	1.3	47	67.1%	-1.9	29	60.8
January 2, 2018		12.9	-0.9	44.9	64.1%	-2.1	30	57.8
January 16, 2018		11.8	-1.1	38.8	55.4%	-6.1	31	50.6
January 29, 2018		10.9	-0.9	39	55.7%	0.2	32	49.9
February 12, 2018		9.87	-1.0	36.7	52.4%	-2.3	33	46.57
February 26, 2018		8.22	-1.7	31.9	45.6%	-4.8	34	40.12
March 12, 2018		9.42	1.2	33.6	48.0%	1.7	35	43.02
March 26, 2018		9.51	0.1	34.8	49.7%	1.2	36	44.31
April 9, 2018	2300	8.97	-0.5	33.4	47.7%	-1.4	37	42.37
April 30, 2018		13.6	4.6	23.4	33.4%	-10	38	37
April 30, 2018		10.8	-2.8	29.4	42.0%	6	39	40.2
May 13, 2018		11.7	0.9	38.9	55.6%	9.5	40	50.6
May 14, 2018		11.5	-0.2	29.7	42.4%	-9.2	41	41.2
July 31, 2018		7.7	-3.8	16.3	23.3%	-13.4	42	24
August 1, 2018		11.7	4.0	79.3	113.3%	63	43	91
September 4, 2018		11.5	-0.2	47.0	67.1%	-32.3	44	58.5
September 24, 2018		9.3	-2.2	33.9	48.4%	-13.1	45	43.2
October 1, 2018	1800	7.9	-1.4	32.8	46.9%	-1.1	46	40.7
November 5, 2018		8.4	0.5	33.7	48.1%	0.9	47	42.1
December 3, 2018		9.2	0.8	40.2	57.4%	6.5	48	49.4
January 2, 2019		9.2	0.0	33.6	48.0%	-6.6	49	42.8
February 4, 2019		7.45	-1.8	28.2	40.3%	-5.4	50	35.65
March 4, 2019	2150	8.73	1.3	30.6	43.7%	2.4	51	39.33
April 1, 2019		11.9	3.2	30.8	44.0%	0.2	52	42.7
April 15, 2019	1800	10.2	-1.7	22.5	32.1%	-8.3		32.7

\* PFOA = perfluorooctanoic acid  
 \*\* PFOS = perfluorooctanesulfonic acid  
 Current Health Advisory level for PFOS is 70 ppt.