Internal Monitoring Report

Policy #: O-2B Water Quality **Date**: April 24, 2018

I certify that the following information is true.

Policy Language:

Madison Water Utility consumers will receive high quality water that meets or is better than all primary and secondary drinking water standards, including their public notification requirements, and complies with board-adopted water quality goals, incorporated by attachment.

The Madison Water Utility recognizes that drinking water standards are subject to revision and that new compounds of concern will be determined. This dynamic is a result of health studies being conducted by health organizations and government agencies on the state, national and international level. The technology to quantify compounds at increasingly minute levels is constantly improving.

The Madison Water Utility shall maintain and promulgate a Watch List of compounds of concern by unit well of compounds that are increasing and may approach the primary and secondary drinking water standards. The Watch List shall identify which wells require action.

General Manager's interpretation and its justification:

Few things are more vital to a community than the availability of high quality drinking water. It promotes public health, public safety, and the economic interests of our community. To that end, the water utility will consistently deliver water that meets the primary, health-based drinking water standards, the secondary (aesthetic) standards, and the additional policy goals established by the Board.

Water Utility Board Procedural Guideline GUIDE 8 – Executive Summary of Water Quality Treatment Policies – establishes monitoring requirements and the utility's approach for responding to increasing contaminant levels. Generally, the policy establishes two thresholds – one when a contaminant exceeds 50% of a maximum contaminant level (MCL), secondary MCL, or other numerical guideline, and two when it surpasses 80% of this mark. The first triggers increased monitoring and an investigation into treatment

alternatives, operational changes, or other actions to reduce contaminant levels while the second leads to implementation of a mitigation strategy.

The policy applies to any contaminant, regulated or not, that is capable of impairing the health, safety, or aesthetic quality of drinking water. Utility staff will remain vigilant in following developments related to currently unregulated and emerging contaminants like pharmaceuticals, endocrine disruptors, chromium(VI), 1,4 dioxane, and perfluorinated compounds that may pose challenges in the future.

The utility will use multiple communication methods to adequately inform consumers of the safety and quality of their drinking water including the federally-required Consumer Confidence Report (CCR), the water utility website, e-mail distribution lists, neighborhood listservs, citizen meetings, and through direct staff contact in the field and office.

Data directly addressing the General Manager's interpretation:

Contaminants with a primary MCL, Action Level or Enforcement Standard

Coliform Bacteria - Between October and March, 1794 water samples were collected from routine monitoring points in the system including the entry point at the well houses (395 samples). A single sample tested positive for coliform bacteria; however, repeat samples did not confirm the original positive test result. Forty-four raw water samples were collected during this reporting period. All were found to be free of coliform bacteria.

Volatile Organic Compounds – Wells with previous VOC detections are sampled quarterly. They include Wells 6, 9, 11, 14, 15 and 18. PCE is the most commonly detected VOC; it is found at five wells with levels ranging from 0.5 to 2.2 µg/L. The maximum contaminant level (MCL) for PCE is 5 µg/L. The range of test results at each well is shown in **Table 1**.

While PCE and TCE are both found in the source water at Well 15, the air stripper installed several years ago reduces these contaminants to below detectable levels (<0.28 and <0.30 µg/L, respectively). Finally, low levels of ethyl benzene and xylene were recently detected in the water delivered from Well 9. These contaminants are not present in the source water; they derive from paint coatings applied to the interior surface of the reservoir

last fall. Levels are well below the regulatory limits and are expected to diminish in the coming months.

Radium - In accordance with GUIDE 8, seven wells are tested quarterly for radium because previous tests show that combined radium (radium 226 + 228) exceeds 2.5 pCi/L, or one half the MCL. Compliance with the MCL is based on running annual average of quarterly samples rather than a single test result. Results for samples collected during the monitoring period are summarized in **Table 2**. Although results are variable from one sampling period to the next, radium concentrations appear stable at each of these seven wells.

Contaminants with a secondary MCL

Iron and Manganese - Monthly well samples are collected when iron and manganese are elevated. During the period from October to March, one sample each from Well 8 and Well 19 were at or exceeded the secondary MCL for manganese [50 µg/L], and all five samples collected at Well 8 exceeded the standard for iron [0.3 mg/L]. Test results are shown in **Tables 3 and 4**. Filters at Well 7 and Well 29 continue to show iron and manganese reductions in excess of 95%.

Iron and manganese monitoring occurs in the distribution system at all coliform sample locations. Test results, summarized in the **Table 5**, show iron and manganese infrequently exceed the established benchmarks and over 95% of the samples are below one half the policy goals.

Chloride - Chloride levels have been steadily rising at a number of wells, especially those that are not cased through the Eau Claire shale layer. The increase has been attributed to road salt use on roadways and parking lots. Annual testing shows chloride exceeding 100 mg/L at two Madison wells (#14 and #23) and chloride between 60 and 100 mg/L at four other wells. Monthly chloride monitoring continues at Well 14. Six samples were collected between October and March; the chloride level ranged from 137 to 145 mg/L, compared to the secondary MCL – 250 mg/L.

Previous work identified the storm sewer outlet into Lake Mendota at Spring Harbor as a potential source of chloride contamination to Well 14. In December, two temporary monitoring wells were installed in Spring

Harbor Park to investigate this potential source. Sampling takes place monthly and will continue through June 2019. The initial test results are summarized in **Table 6**.

A data logger was temporarily installed in one monitoring well to continuously measure water level, temperature and conductivity (a proxy for chloride). A comparison of these measurements to data gathered from a US Geological Survey monitoring station in Spring Harbor during rainfall and snowmelt runoff events is also planned. A preliminary review of the data suggests an influence of both stormwater drainage and municipal well pumping on water level and water quality at the monitoring wells.

Funding for an alternatives evaluation study was included in the Water Utility's 2018 Operating Budget. The study will identify and compare treatment solutions, and their corresponding costs, to mitigate increasing chloride and sodium levels at Well 14.

Finally, water utility staff continue to work with regional partners to help raise awareness on the issue of chloride contamination of the lakes and our ground and drinking water resources. The partnership helped develop and implement a Winter Salt Certification program emphasizing training, equipment calibration, and record keeping. Outreach efforts promote the training workshops that are a prerequisite to individual or organization-level certification.

Unregulated and Emerging Contaminants

Sodium - In accordance with GUIDE 8, monthly sodium testing continued at Well 14. Six samples were collected between October and March with samples measuring between 48 and 52 mg/L sodium. The US EPA recommends that drinking water not exceed 20 mg/L. These guidelines are intended for high-risk populations including individuals with high blood pressure or those on severe sodium-restricted diets. A total of six Madison wells produce water with sodium in excess of 20 mg/L: three in the 20-25 mg/L range, one between 25 and 30 mg/L, and the remaining two above 30 mg/L sodium.

1,4-Dioxane – Wells 11, 14, and 15, wells in which dioxane was previously detected, were again tested in December. The results ranged from 0.16 to 0.37 µg/L; the highest level was found at Well 11. Dioxane often co-exists with chlorinated solvents; however, it is not readily removed from water. Air stripping is mostly ineffective.

Perfluorinated Compounds – A group of six perfluorinated compounds were monitored twice in 2015 at all Madison wells as part of the UCMR3 [Unregulated Contaminants Monitoring Regulation – Cycle 3] process. None of the PFCs were detected at any Madison well. In 2016, US EPA issued a health advisory for PFOA and PFOS establishing 70 ng/L as the combined concentration of PFOA and PFOS above which drinking water systems should perform additional monitoring and take action to lower the levels of PFOA and PFOS in drinking water.

In 2017, the utility tested five wells again using methods nearly a hundred times more sensitive. The wells were located near landfills or the airport, places where PFCs can be found. PFCs were detected at low levels at two of the wells tested: Wells 15 and 16. Initial testing occurred in August and confirmation testing took place in December. Results were comparable in the two monitoring periods. **Table 7** shows the December results for the six PFCs tested at Wells 15 and 16.

WDNR notified utility staff earlier this month that a study was initiated by the National Guard Bureau to investigate the presence of perfluorinated compounds in soil and groundwater at the Truax Air National Guard Base. The report will detail the presence of the six UCMR3 PFCs in soil and shallow groundwater at the Madison base.

Perfluorinated compounds are manufactured chemicals used in industrial and consumer applications. They are responsible for the non-stick, stain-resistant and fire-retardant properties of cookware, clothing, fabrics, food packaging, and foams. Once in the environment, these chemicals are very stable and slow to degrade due to the strong carbon-fluoride bonds that make them resistant to microbial degradation. Conventional drinking water treatment is mostly ineffective at removing or destroying these widespread and persistent chemicals. However, studies show that activated carbon and ion exchange are two promising technologies for removing PFCs from drinking water.

Water Quality Watch List

The Water Quality Watch List has been updated with current test results for inorganic, organic, radiological, and unregulated contaminants. Minor changes were made to the list since the last reporting period. In particular, the list updates the action plans for some wells to reflect the approved 2018 Capital Budget and Capital Improvement Program (2019-2023).

Water Quality Technical Advisory Committee

This committee met once since the last monitoring report. At the February meeting, Eric Oelkers (SCS Engineers) presented his findings on the Kipp Plume Evaluation study. The discussion centered on the potential location of a sentinel well for Well 8 and how the sentinel well is to be constructed. Because none of the Kipp monitoring wells penetrate the Eau Claire shale, and therefore there is no information about whether the contamination has reached the lower Mt. Simon aquifer, there is staff interest in having the sentinel well open to the lower aquifer. Construction of this nature must be performed with care to ensure that this well does not provide a conduit for the delivery of contaminants from the upper aquifer if the shale layer has been providing a protective barrier. Additional details are provided in the meeting notes as an attachment including the other topics discussed. The meeting notes for the October meeting are also attached.

Annual Water Quality Report – Consumer Confidence Report

Preparations are underway for the release of the 2017 consumer confidence report (CCR) next month. This year additional language was added on lead and how customers can further reduce lead exposure risk in drinking water, particularly from household plumbing that may still contain lead. A new section was added to describe perfluorinated compounds as what our recent testing has found. The report layout and format are similar to previous years; however, the color scheme has changed. Instead of a blue background with green highlights, the colors have been reversed.

Postcards will be sent to all City of Madison mailing addresses (>130,000) directing water customers to an electronic CCR posted on our website. A note will also be included on the Municipal Services Bill announcing the availability of the water quality report. Paper copies will be available at the Water Utility, and distributed to branches of the Madison Public Library and various community centers located throughout the city.

Additional Water Quality Outreach

Water Utility staff attended two neighborhood meetings earlier this year (Sunset Village neighborhood – February 15, Rocky Bluff neighborhood – April 18). The focus of the remarks were water quality issues at Well 14.

In addition, a project page for the Well 14 Chloride Study was added to our website with a corresponding e-mail distribution list. Project updates are communicated via the e-mail list.

Joe Grande was invited to participate in the Environmental Symposium at Spring Harbor Middle School on May 3. The talk will focus on chloride issues in drinking water and the on-going work at Well 14. This talk will complement student-led research on chloride levels in Spring Harbor and the nearby springs.

Attachments:

Tables 1-7
Water Quality Watch List
Water Quality Technical Advisory Committee Notes – February 2018
Water Quality Technical Advisory Committee Notes – October 2017

Table 1. Summary of VOC Detections (in µg/L), October to March

	Samples	DCE, cis	PCE	TCFM
MCL		70	5	NA
Well 6	2	<0.30	**0.60-0.99**	<0.30
Well 9	1	<0.30	**2.1**	<0.30
Well 11	2	<0.30-**0.48**	**0.56-0.59**	**0.63-0.73**
Well 14	2	<0.30	**0.45-0.59**	<0.30
Well 18	2	<0.30	**1.8-2.2**	<0.30
	TCFM = Trichlorofluoromethane			

Table 2. Combined Radium Results (226+228) measured in pCi/L

	Nov 2017	Feb 2018	Annual Average of Quarterly Samples
Well 7	2.4	2.1	**2.3**
Well 8	3.2	2.9*	**3.1**
Well 19	3.7*	3.5	**3.4**
Well 24	1.7	3.0	**2.5**
Well 27	4.6	Inactive	**3.8**
Well 28	3.3	2.3	**2.7**
Well 30	3.0	2.2	**2.1**

*Average of two sample results

Table 3. Monthly Iron Test Results, in mg/L

Source	Oct	Nov	Dec	Jan	Feb	Mar
Well 7 - filtered	0.02	<0.02	<0.01	0.01	0.01	<0.01
Well 8	**0.62**	**0.59**	**0.57**	**0.55**	**0.57**	n/s
Well 17	0.13	n/s	n/s	n/s	n/s	n/s
Well 19	0.22	0.22	0.22	0.20	0.20	0.21
Well 24	0.22	0.21	0.20	0.19	0.20	0.19
Well 26 – deep well	<0.02	<0.02	<0.02	0.01	<0.02	<0.02
Well 27	0.18	0.18	0.13	n/s	n/s	n/s
Well 28	0.16	0.14	0.16	0.16	0.18	0.17
Well 29 - filtered	<0.02	<0.02	0.01	0.01	<0.01	0.01
Well 30	0.21	0.21	0.21	0.20	0.21	0.20

Table 4. Monthly Manganese Test Results, in µg/L

Source	Oct	Nov	Dec	Jan	Feb	Mar
Well 7 - filtered	1.4	<1.0	<1.0	<1.2	<1.2	<1.2
Well 8	**50**	47	49	47	49	n/s
Well 17	31	n/s	n/s	n/s	n/s	n/s
Well 19	45	44	48	**56**	42	47
Well 24	31	33	34	32	32	31
Well 26 – deep well	5.5	13	2.2	<1.2	<1.2	<1.2
Well 27	33	33	33	n/s	n/s	n/s
Well 28	21	21	22	21	22	22
Well 29 - filtered	2.8	<1.0	<1.0	<1.2	<1.2	<1.2
Well 30	14	14	14	<1.2	15	<1.2

Table 5. Summary of iron and manganese levels in the distribution system.

Manganese, µg/L

	Oct - Mar	2017
Policy Goal	**50**	**50**
Median	1.2	1.6
Average	3.2	3.5
95th Percentile	***15***	***10***
Maximum	47	52
Number of Samples	169	338
>50	0	1

Iron, mg/L

	Oct - Mar	2017
Policy Goal	**0.3**	**0.3**
Median	<0.02	<0.02
Average	0.02	0.03
95th Percentile	***0.05***	***0.05***
Maximum	0. 18	0.31
Number of Samples	169	338
>0.3	0	1

Table 6. Chloride and sodium levels at Well 14 and two monitoring wells located in Spring Harbor Park (MW-1 and MW-2)

	MW-1 (North)		MW-2 (South)		Well 14	
	Chloride, mg/L	Sodium, mg/L	Chloride, mg/L	Sodium, mg/L	Chloride, mg/L	Sodium, mg/L
Jan 2018	150	51	180	69	145	49
Feb 2018	160	57	200	91	137	50
Mar 2018	200	68	170	75	140	52

Table 7. Perfluorinated compounds test results.

2017	MRL	EP 15	EP 15	DW 15	EP 16	EP 16	EP 16
Perfluorinated Compounds	(ng/L)	12/4	12/4	12/4	12/4	12/4	12/4
perfluorooctanoic acid (PFOA)	0.43	**5.0**	**4.9**	**3.6**	ND	ND	ND
perfluorooctanesulfonic acid (PFOS)	0.45	**5.0**	**4.8**	**4.7**	ND	ND	ND
perfluorohexanesulfonic acid (PFHxS)	0.63	**19**	**20**	**17**	**2.4**	**2.5**	**2.6**
perfluorobutanesulfonic acid (PFBS)	0.32	**2.1**	**2.3**	**2.1**	ND	ND	ND
perfluoroheptanoic acid (PFHpA)	0.65	ND	ND	ND	ND	ND	ND
perfluorononanoic acid (PFNA)	0.69	ND	ND	ND	ND	ND	ND
Combined PFC Concentration	--	31	32	27	2.4	2.5	2.6

Notes: MRL - method reporting limit
EP - entry point to distribution system; after treatment
DW - deep well; untreated well water
ng/L – nanogram per liter; equivalent to one part per trillion

MADISON WATER UTILITY
WATER QUALITY WATCH LIST

Organics - Regulated

Contaminant	Maximum*	Units	MCLG	PAL	MCL	Detects Below PAL%	Watch List	Action Plan	Reference
Atrazine	0.03	µg/L	3	0.3	3	#29	none		NR 809.20
1,2-Dichloroethane	0.20	µg/L	zero	0.5	5	#17	none		NR 809.24
1,2-Dichloroethylene (cis)	0.57	µg/L	70	7	70	#8, #11	none		NR 809.24
Tetrachloroethylene [PCE]	3.5	µg/L	zero	0.5	5	#27	#6, #9, #11, #14, #18	Quarterly Monitoring	NR 809.24
1,1,1-Trichloroethane	0.28	µg/L	200	40	200	#18	none		NR 809.24
Trichloroethylene [TCE]	0.40	µg/L	zero	0.5	5	#11, #14, #18, #27	none		NR 809.24
Xylene, Total	3.7	µg/L	10000	400	10000	#9	none		NR 809.24

* Maximum detection observed at any Madison well from 2014 through 2018 % Detected in at least one sample collected from 2014 through 2018

Organics - Unregulated

Contaminant	Maximum*	Units	HAL	PAL	ES	Detects Below PAL%	Watch List	Action Plan	Reference
1,1-Dichloroethane	0.08	µg/L	n/a	85	850	#9	none		NR 140.10
1,4-Dioxane	0.43	µg/L	0.35~	0.3	3	#9, #14, #15, #17, #18	#11	Semi-Annual Monitoring	NR 140.10
Metolachlor	0.01	µg/L	n/a	10	100	#14	none		NR 140.10
Perfluorinated Compounds: PFOA, PFOS, PFHxS, PFBS, PFHpA	0.04	µg/L	0.07^	n/a	n/a	#15, #16	none		US EPA
Trichlorofluoromethane	1.1	µg/L	n/a	698	3490	#11	none		NR 140.10

* Maximum detection observed at any Madison well from 2014 through 2018 % Detected in at least one sample collected from 2014 through 2018 ~ 10^{-6} Cancer Risk Level ^ PFOA + PFOS

Radionuclides (2017)

Contaminant	Maximum	Units	MCLG	Watch	MCL	Wells with Detects	Watch List	Action Plan	Reference
Gross alpha	10	pCi/L	zero	5	15	All Except Well#14	#7, #8, #19, #27, #28, #30	Quarterly Monitoring	NR 809.50
Gross beta	7.1	pCi/L	zero	10	50	All Except Well#14	none		NR 809.50
Combined Radium	4.6	pCi/L	zero	2.5	5	All Wells	#8, #19, #24 #27, #28, #30	Quarterly Monitoring	NR 809.50

ES - Enforcement Standard (NR 140 - Groundwater Quality) **HAL** - Health Advisory Level **MCL** - Maximum Contaminant Level Legal Limit **MCLG** - MCL Goal (Public Health Goal) **PAL** - Preventive Action Limit (NR 140 - Groundwater Quality)

MADISON WATER UTILITY
WATER QUALITY WATCH LIST

Inorganics - Regulated

Substance	Maximum*	Units	MCLG	PAL	MCL	Detects Below PAL	Watch List	Action Plan	Reference
Arsenic	0.8	µg/l	zero	1	10	All Except #17 & #27	none		NR 809.11
Barium	68	µg/l	2000	400	2000	All Wells	none		NR 809.11
Cadmium	0.3	µg/l	5	0.5	5	All Except #8, #12, #17, #18, #20, #23, #27, #28	none		NR 140.10
Chromium, Total	2.9	µg/l	100	10	100	All Wells	none		NR 809.11
Nickel	7.3	µg/l	100	20	100	All Wells	none		NR 809.11
Nitrogen-Nitrate	4.2	mg/l	10	2	10	#9, #12, #18, #20, #25, #26, #27, #29	#6, #11, #13, #14, #15, #16, #23	Annual Monitoring	NR 809.11
Selenium	2.0	µg/l	50	10	50	#6, #14	none		NR 809.11
Thallium	0.3	µg/l	0.5	0.4	2	#11, #12, #15, #17, #19, #23, #26, #27	none		NR 809.11

* Based on 2017 annual test data

Inorganics - Unregulated

Substance	Maximum*	Units	MCLG	Watch	SMCL	Wells with Detects	Watch List	Action Plan	Reference
Aluminum	3.2	µg/l	n/a	50	200	#14, #23, #24	none		NR 809.70
Chloride	150	mg/l	n/a	125	250	All Wells	#14	GW Investigation; Mitigation (2023)	NR 809.70
Iron	0.58	mg/l	n/a	0.15	0.3	All Wells	#8, #19, #24, #27, #28 #30	Install Filtration: Well #8 (2027) Well #19 (2019) Well #24 (2024) Well #28 (2021) Well #30 (2022)	NR 809.70
Manganese	47	µg/l	n/a	25	50	All Wells	#8, #17, #19, #23, #24, #27		NR 809.70
Sodium	49	mg/l	n/a	20	n/a	All Wells	#6, #11, #14, #15, #16, #23	Annual Monitoring	EPA DWEL
Sulfate	43	mg/l	n/a	125	250	All Wells	none		NR 809.70
Zinc	24	µg/l	n/a	2500	5000	All Except #25	none		NR 809.70

* Based on 2017 annual test data

DWEL - Drinking Water Equivalency Level **MCL** - Maximum Contaminant Level (Legal Limit) **MCLG** - MCL Goal Public Health Goal **PAL** - Preventive Action Limit (NR 140 - Groundwater Quality) **SMCL** - Secondary MCL (Aesthetic Guideline)

Water Quality Technical Advisory Committee - DRAFT

Meeting Notes
Olin Avenue Conference Room
February 13, 2018 – 1:00 p.m.

Attending: Janet Battista, Jocelyn Hemming, Gary Krinke, Amy Barrilleaux, Joe DeMorett, Joseph Grande, Al Larson

Absent: Greg Harrington, Henry Anderson, Sharon Long, Tom Heikkinen

Guest: Eric Oelkers, SCS Engineers

1. Agenda Repair/Announcements

Future 2018 meeting dates include April 10, mid-July, and October 9. Joe to send a survey to verify committee member's availability for dates in July.

2. Review of Meeting Notes

No changes to the October 19, 2017 notes.

3. Madison Kipp Plume Evaluation Report & Discussion – Eric Oelkers, SCS Engineers

Previously, Arcadis concluded that the plume was stable and not a threat to Well 8. Dr. Meyer then reviewed Aracdis' work and highlighted some inconclusive points. Eric was contracted to follow up on Dr. Meyer's work.

Arcadis performed model calibration (Cray Flush) - fracture flow model shows movement primarily in Wonnewoc formation but it was based on a limited data set. Current work evaluated new data collected from monitoring well network and asked whether increasing, decreasing or stable trend. Of 61 monitoring points, five show increasing trend based on new data. All are located north of the site. It suggests the plume is heading north – less concern for Well 8 but possibly a larger concern for MKC with plume "getting away" from the source.

Figure 2 presents DCE trend at Well 8. If increasing, it is not at an appreciable rate based on MWU test results. At MKC, PCE was first observed followed by degradation products (TCE, DCE, etc.); however, PCE is not found at Well 8. Would expect to see PCE at well now if impacted by MKC plume, which is not the case.

The groundwater flow model shows slow movement vertically (from water table to lower aquifer), but more rapid transport once in the bedrock aquifer. Lateral transfer occurs primarily in the Mt. Simon formation. Travel time to Well 8 is 30-40 years from MKC unless contamination is already in the lower aquifer, in which case it could be six years. Projection assumes no mitigation – dilution, adsorption, or dispersal – and is therefore very conservative.

Additional wells in the upper bedrock would not be as useful as one in the lower aquifer. Recommended sentinel well in the deeper bedrock (Mt. Simon) where Well 8 pumps. MWU and WDNR equally concerned about drilling that could introduce contaminants to lower aquifer by bridging two aquifers. During construction, care must be taken to reduce this possibility. Potential well locations identified in right-of-way near Lowell School. Locations closer to MW-6 and MW-17 have higher PCE concentrations and DNR would have higher concern compared to location closer to MW-25 - the trade-off being less time to plan for remediation if contamination is detected.

Mike Schmoller, WDNR, more comfortable penetrating lower aquifer if upper aquifer is sealed. It would require 265' of steel casing. Eric suggested 10" hole to the shale layer followed by 6" welded steel casing dropped into hole and grouted 30-40' into the sandstone. Next step is to confer with WGNHS staff on the approach, potential drillers, and likely cost. Expect to bid as a Public Works project.

Eric briefly addressed the potential impact of the test hole at Well 8 assuming that it cross connects the aquifers. By adding an un-pumped borehole into the model, concluded that 2% of the pumping volume contributed by the upper aquifer (17/1100 gpm).

The recovery well at MKC (GWE-1) pumps 45 gpm and has a small radius of influence. It primarily treats the contamination on the MKC site and does not affect any contamination that has already left the site.

4. Chlorine Residuals Review

The most recent DNR Sanitary Survey (2017) recommended that MWU maintain a 0.5 mg/L residual throughout the distribution system. However, the Partnership for Safe Water and AWWA recommend a minimum chlorine residual of 0.2 mg/L for systems using free chlorine. Systems are considered optimized if at least 95% of routine readings each month achieve this disinfectant level.

In 2017, 2,819 free chlorine readings were taken at routine total coliform sample sites. Forty-seven readings were 0.1 mg/L or lower. MWU stated goal is to maintain a minimum of 0.1 mg/L at all points in our distribution system. Four sites had readings below 0.1 mg/L included Isthmus Engineering (IEM); Hawks Landing Golf Course (HLG); East Madison Community Center (EMCC); and the Village of Maple Bluff (MB). Each of these sites are on a long pipe run, have low water use, and are at the end of our system.

Previous research showed we must maintain a minimum residual at the entry point in order to achieve at least a 0.1 mg/L residual at the far reaches of the distribution system. Virus occurrence studies lead to a re-evaluation of these minimum chlorine levels; they were subsequently increased to 0.3 mg/L at the entry point. The MWU target range is 0.3 – 0.55 mg/L; this range balances effective disinfection and public health protection with aesthetics including taste and odor. When adjustments are made, chlorine levels are gradually increased in order to allow people to acclimate to the change. No significant change in disinfectant policies have been made in recent years.

There is no national standard or requirement to disinfect but if disinfection is undertaken, there are requirements for operation and maintenance. The utility has found that good source water, systematic flushing and adequate disinfection work well together. Several weeks ago, the utility had its first coliform positive sample in many years. Nine follow up samples, including a repeat; upstream; downstream; and six well samples, all tested safe, free of coliform bacteria.

5. Water Quality Treatment Goals

Previously, the committee developed water quality treatment policies that were ultimately adopted by MWU. Two threshold levels were established: 50% of an MCL, SMCL, ES or other guideline triggers additional monitoring and a treatment alternative analysis, while an 80% threshold exceedance triggers action to implement treatment or other alternative. The policy has helped MWU implement short- and long-term strategies for delivering high quality drinking water.

The committee was tasked with (1) reviewing the current treatment policies to either affirm the existing goals or recommend revisions and (2) proposing goals when treatment is implemented. For the second task, if wellhead treatment were implemented for iron, manganese or VOC removal, what level of contaminant reduction (below detection or some fraction of a guideline or regulatory limit) would be acceptable. MWU would like to develop a general policy or one tailored to specific contaminants being reduced/eliminated. Treatment goals directly affect the capital investment and long-term operating costs.

The specifics of any adopted policy may affect a current MWU project. Iron and manganese treatment is being implemented at Well 19 where elevated radium has occasionally been an issue. MWU is weighing whether to add radium removal capabilities, which will significantly affect the footprint of the building. A treatment goal for radium removal would address some design questions that have arisen.

6. Well 14 – Chloride Study Update

The committee was briefly updated on the monitoring activities occurring in Spring Harbor Park.

7. Future Agenda Items

- MWU Master Plan & Capital Improvement Plan
- Annexations – Town of Madison; Town of Blooming Grove
- Private Well Program Policies

8. Adjournment - Next meeting: Tuesday, April 10 at 1 p.m. in the Olin Avenue Conference Room.

Water Quality Technical Advisory Committee

Meeting Notes
Paterson Street Conference Room
October 19, 2017 – 10:00 a.m.

Attending: Janet Battista, Jocelyn Hemming, Gary Krinke, Henry Anderson, Sharon Long, Joseph Grande, Al Larson

Absent: Greg Harrington, Tom Heikkinen, Joe Demorett, Amy Barrilleaux

1. Agenda Repair/Announcements

2. Review of Meeting Notes - No changes to the July 11, 2017 meeting notes were proposed.

3. Meeting Schedule & Administration

Announced proposed 2018 meeting dates: 1/9, 4/10, 7/10, and 10/9. Committee affirmed quarterly meeting frequency while some committee members expressed concern about afternoon meetings – particularly those involved with laboratory research. For now, meetings will continue to occur on Tuesdays at 1 p.m.

4. Radium Monitoring Discussion

Concluded on-going discussion on radium analytical methods. Committee received radium results with detection limits and uncertainties for the 2016 Laboratory Comparison Study. Technique (including sample prep, volume used, and count time) is very important especially for dependable radium-228 results. Lower MDL/uncertainty values imply longer counts and larger volumes. Good correspondence between results from Lab A and WSLH in which two completely different methods (7500 – Georgia Tech, EPA 903.1) were used. Lab A provided good consistent results with few outliers. The committee recommended the continued use of Lab A for radium analysis.

Water Utility Board policies mandate quarterly sampling for wells in which combined radium (226+228) exceeds one-half the MCL. The committee received results from three years of monitoring under this policy for Wells 07, 24, 28, and 30. Due to results consistently falling below the MCL, the committee recommended annual sampling at three wells (07, 24, & 28) with samples collected when radium is historically the highest at these sites – which appears to be during the third quarter (July to September) when water demands are likewise higher. Quarterly sampling would continue at Well 30 with sampling frequency reassessed in one year.

5. Water Quality Monitoring Results – PFC, VOC, SOC

Results of perfluoroalkyl substances (PFAS – including PFOA & PFOS) testing were presented and discussed. Previously, the committee recommended testing a suite of six PFASs using lower detection limits (<1 ng/L or parts per trillion, ppt) than those in UCMR3 (range: 10-90 ppt) when none were detected at any well. Five wells were identified based on their presumed vulnerability and likelihood of detections – proximity to landfills, military installations, and airports. Wells 07, 18, and 29 were free of all six PFASs, even at these lower limits, while one (PFHxS – an ingredient common in fire-fighting foams) was detected at Well 16 at the 2.4-2.7 ppt level. Well 15 also showed the presence of PFHxS and four other PFASs including PFOA and PFOS. The combined level of PFASs at Well 15 was 31-35 ng/L. Most research on health effects has focused on PFOA and PFOS. In 2006, the US EPA established a combined health advisory level of 70 ng/L for PFOA and PFOS.

The proximity of Well 15 to the Truax landfill and other unlined (military) waste disposal areas around the former Oscar Mayer facility make it a vulnerable well. The committee questioned whether there is an on-going source from the spray jets inside fighter jets at Truax field. Recommended communication with military about tightening operations to reduce potential pollution. Also wondered where else fire-fighting foams may be deployed.

The committee was also presented with data from Well 18 at the deep well start-up showing elevated levels of PCE, TCE, and TCA initially then stabilizing over a period of 1-2 hours. Presence of the three co-contaminants suggests that it is not a new source. Committee members speculated that past spill (PCE) led to product being sorbed in micropores and diffusion triggered kinetics following periodic disturbances (deep well cycling) leads to temporary contaminant peaks. The level of PCE observed at the entry point has generally ranged from 1-2 μg/L for several years. The MCL is 5 μg/L.

Synthetic organic compound (SOC) results were briefly discussed. Atrazine was detected at Well 29 (27 ng/L) and metolachlor at Well 14 (12 ng/L). Both pesticides were detected just above the detection limits, which were lower than previous monitoring periods in which neither was found at any well. Both wells will be re-tested in 2018 for SOCs including the two detected pesticides.

6. Lead Monitoring & Mitigation

The 2017 lead results for Lead and Copper Rule monitoring were discussed. Results demonstrate compliance with the rule and the contributions of premise plumbing (copper piping with lead solder) to low lead levels that consumers experience at the tap. Much of the reduction in lead exposure from drinking water since the early 1990's is attributed to the replacement of lead service lines, which were the greatest source of lead.

7. Chlorine Residuals Management

The 2017 Sanitary Survey Report completed by the DNR recommended that MWU increase the free chlorine residual to 0.5 mg/L based on AWWA guidelines for disinfection. Discussion ensued about the rationale for higher residuals in our distribution system following virus detections in raw water samples from some deeply cased wells – those cased below the shale. Cell cultures were negative for viruses and research showed the potential for viruses but not viability following chlorination. Whether viruses were infectious was not confirmed. Maintaining higher chlorine residuals is a preventive action to protect public health and avoid potential water-borne illness.

8. Future Agenda Items

- MWU Master Plan & Capital Improvement Plan
- Annexations – Town of Madison; Town of Blooming Grove
- Private Well Program Policies

9. Adjournment