

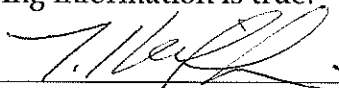
# Internal Monitoring Report

Policy # O-2E Sustainability

Date: May 19, 2014

Frequency: Twice a year

I certify that the following information is true.

Signed  General Manager

## Policy Language:

Madison residents will benefit from a sustainably managed ground water supply to ensure that water is available to protect public health, and to maintain and improve the economy and environment in Madison, now and in the future.

Accordingly,

1. Aquifers and wells will be monitored and the data evaluated to identify trends in water levels and potential contaminants.
2. Appropriate city, county, state and federal agencies will be called upon to enforce all pollution control and prevention measures within their authority, in order to protect water quality in the well head protection area of each unit well.
3. The adopted Conservation Plan shall be monitored and evaluated regarding progress to fulfill the goal of a reduction per capita residential use of water by 20% by 2020, which is 58 gallons/capita/day. (Residential is defined as single family and duplex dwellings.)
4. The water supply system shall be expanded so that the pumpage from individual unit wells shall not exceed 50% of the annual rated capacity of the unit well.
5. Water rates will complement economic growth in Madison (as stated in O-2D).

## General Manager's interpretation and its justification:

This policy prescribes certain activities intended to ensure the long term environmental, public health, and economic sustainability of Madison's water supply. Our actions relating to these objectives are detailed below.

## Data directly addressing the General Manager's interpretation:

*1. Aquifers and wells will be monitored and the data evaluated to identify trends in water levels and potential contaminants.*

### Water Levels

Water levels in the aquifers beneath Madison continue to vary on a seasonal basis. Levels at a long term monitoring well located in the basement of the State Capitol indicate that overall levels appear to be holding relatively steady with an increase (approximately 12' of rebound) occurring over the last 10 years. The water levels beneath the central part of our city during the last 30 years are displayed in Figure 1.

The static and pumping water levels in many of the Utility's wells varied slightly during 2013

and the first half of 2014. Variations however were significantly less than those experienced during the 2012 year when we were subjected to an extremely hot and dry summer. Water levels in the wells continue to fluctuate seasonally and are greatly influenced by precipitation events. A review of the water level data indicates that, with the exception of several wells, most of the water levels have recovered from their summer lows and are close to 2011 levels. Average static and pumping water levels for 2011 – 2014 are depicted in Table 1.

#### University Crossing/UW #14

A set of three shallow monitoring wells were installed at the University Crossing Development to observe groundwater quality during site re-development. The wells were installed in March of 2012 with the Utility paying 50% of the installation costs. These wells and UW #14 were sampled and analyzed on a quarterly basis for a period of two years. All sampling costs were paid 100% by the Utility. There have been eight sampling rounds to date, the most recent in November of last year. To date, no Volatile Organic Compounds have been detected in any of the three monitoring wells. Elevated levels of several inorganic compounds exist in the wells (chloride and sodium) and have increased over the last 24 months. These compounds, however, do not appear to be increasing at similar rates in UW 14 as the site development nears completion.

Although the original monitoring is complete, the Utility is hoping to continue using these wells to monitor local chloride levels. The City owns one of the wells located in the Whitney Way ROW (MW-2) and has asked the Lenhart Company for use of the two wells (MW-1 and MW-3) located on their property. The Lenhart Company has expressed interest and has asked for some paperwork.

#### Madison Kipp Corporation/UW #8 Sentinel Well

The Madison Kipp Corporation (MKC) recently implemented a series of remedial measures at their site to clean up the area's contaminated groundwater:

1. They began installing an on-site groundwater extraction system. A groundwater recovery well was drilled in the facility's northern parking lot in January of this year. The 12 inch diameter well, which was drilled to a total depth of 186 feet, is screened from 60 to 175 feet below the surface. The screened interval covers the area of highest VOC concentrations and intersects the aquifer's primary fracture intervals. It is hoped that the recovery well will remove volatile organic compound (VOC) mass and hydraulically contain VOC contaminated groundwater present in the upper bedrock aquifer.

A pump test on the recovery well was conducted utilizing pumping rates between 20 and 60 gpm in January and February of this year. Results included the following:

- The zone of hydraulic response was determined and used to estimate the capture zone around the recovery well.
- The maximum sustainable flow for the well was determined to be 45 gpm.
- PCE concentrations between 1,200 ug/l and 3,200 ug/l were encountered at the

recovery well during the testing.

- Iron and manganese concentrations indicated a low scaling potential.

They are proposing to treat the recovery water with an on-site air stripper. Approximately half of the treated water (22 gpm) will be used in some phase of their manufacturing process. The other half (23 gpm) will be discharged to the storm sewer under a WPDES Discharge Permit. They have applied for a permit.

2. They have requested a temporary exemption from the WDNR for injection of remedial materials for an In-Situ Chemical Oxidation (ISCO) groundwater treatment. They are proposing to inject approximately 2,350 gallons of sodium permanganate into the shallow unconsolidated aquifer (30' - 60' depth) to treat the high concentrations of VOCs that are present there. A pilot test using this technology has already been completed here and results were favorable.

3. They installed one additional offsite deep groundwater monitoring well nest (MW-27D and MW-27D2). The nest, equipped with two sampling intervals was installed north of the site at the intersection of Oak and Milwaukee Streets. It was installed to help in delineating the northern edge of the PCE plume.

The Utility continues to work with MKC, their consultant ARCADIS, the WDNR, and the WGNHS on the area's groundwater contamination issues. The Utility is currently reviewing an ARCADIS technical memorandum received on May 19<sup>th</sup>, 2014 evaluating the plume stability and fate and transport modeling of PCE in the bedrock below and adjacent to the MKC site.

Groundwater at and adjacent to the facility continues to be monitored for VOCs. The installation of the sentinel well, proposed to be installed adjacent to Elmside Circle Park, remains on hold.

#### UW #29 Sentinel Well

Water from the sentinel well located between UW #29 and the Sycamore Landfill continues to be monitored for both inorganic and volatile organic compounds on a semi-annual basis. Sampling is conducted in April and October of each year with ten samplings conducted to date. Results from the latest April 2014 sampling reveal one minor detect for toluene (0.22 ug/l in Port 2), which can be attributed to the coating on the well liner. The MCL for toluene is 1000 ug/l. Trichlorofluoromethane was also detected in the two lowest ports at levels of 0.26 ug/l (Port 5) and 0.18 ug/l (Port 6). There is no MCL for this compound which occurs in the upper aquifer throughout the area. Sampling indicates that the migration of contaminants from the Sycamore landfill is not a significant threat to water quality at Unit Well 29 at this time.

#### UW #31 - Zone 4 Production Well

The production well at the Tradewinds Parkway site was completed this winter. After completion, it was test pumped for a period of two weeks. Water quality samples were collected and the well's specific capacity was calculated. The pump house and reservoir are

scheduled to be constructed in 2015.

GE Healthcare continues to sample, on a quarterly basis, the monitoring well located on Water Utility property at 5802 Femrite Drive. Trichloroethylene (TCE) is consistently found at the 10 to 15 ug/L level – two to three times the enforcement standard for groundwater quality. No TCE or any other volatile organic compounds were detected at either the now abandoned test well or the recently completed production well located at the Tradewinds Parkway site. The Tradewinds Parkway site is located about a mile southwest of the Femrite monitoring well and over 6000 feet from the source of the TCE contamination.

*2. Appropriate city, county, state and federal agencies will be called upon to enforce all pollution control and prevention measures within their authority...*

As previously mentioned, the Utility continues to work with the Mayor's office and the WDNR in monitoring the remediation of the PCE contaminated groundwater at the Madison Kipp site. At the request of the WDNR, the Madison Water Utility, City Engineering, and Public Health continue to review the remedial strategies and plans proposed by MKC and their consultants. The Utility recently contacted the WDNR and reminded them of the City's plans to upgrade UW #8 with an iron and manganese filter. An upgraded UW #8 would be pumped throughout the year at a much higher volume.

*3. The adopted Conservation Plan shall be monitored and evaluated regarding progress to fulfill the goal of a reduction per capita residential use of water by 20% by 2020...*

Residential consumption in gallons per capita by year:

2002-2007	73.0
2008	69.8
2009	67.8
2010	65.0
2011	65.2
2012	70.1
2013	56.9 (Number not final.)
<b>Goal: 2020</b>	<b>58.0</b>

*4. The water supply system shall be expanded so that the pumpage from individual unit wells shall not exceed 50% of the annual rated capacity of the unit well.*

Our service level for capacity planning is 50% utilization, and system expansion is being planned to accomplish this level. Overall, 2014 to date utilization rates were slightly lower than those experienced in 2013. Well repair/reconstruction projects continue to significantly influence individual well rates. Seasonal wells 6, 23, and 27 were kept in service over the winter months. Actual utilization rates for 2013 and 2014 are shown in Tables 2 and 3.

5. *Water rates will complement economic growth in Madison (as stated in O-2D).*

Please refer to the Monitoring report for the Affordability Outcomes Policy (O2-D).

**I report compliance.**

*Other sustainability initiatives:*

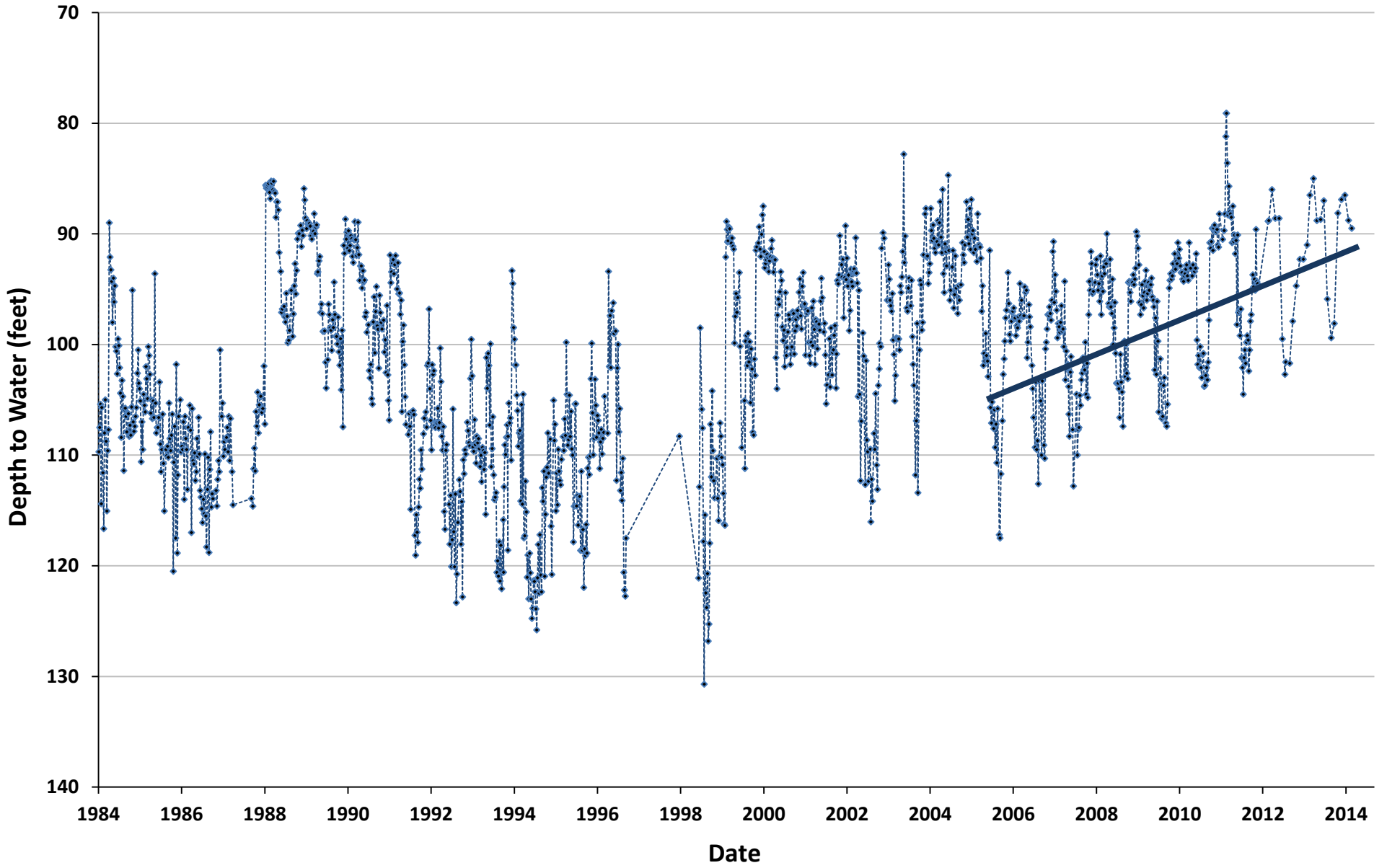
Energy Conservation Assessment

The Utility's UW Engineering Grad student, Nick Baniel, completed his Master's Thesis in December on energy conservation and presented his findings to the Water Board at the January 2014 meeting. Matt Hayes, our current student is looking at energy use at the Utility's wells and evaluating pump efficiency, operational optimization, and overall energy use. Matt will be investigating energy use in the distribution system, pressure requirements, friction loss and other areas looking for potential energy saving opportunities. Through the summer of 2014, Matt will be gathering data and evaluating pump stations and refining efficiency calculations to allow the development of energy savings projects. He will be using the distribution system model to test various energy conservation theory's and operational configurations. The overall objective of his thesis will be to develop some potential energy saving projects for consideration during 2015.

**Attachments:**

Aquifer Water Levels Graph  
Unit Well Water Levels Table  
Unit Well Capacity Tables

**Figure 1: Aquifer Water Levels - State Capitol Well**









### Table 3: 2014 Unit Well Capacity

Start Date: January 01, 2014

End Date: May 17, 2014

Unit Well	DW Capacity GPM	Total Daily Capacity MGD	Total Capacity To Date Mil Gal	Actual Pumpage To Date Mil Gal	% DW Utilization		DW Run Hours To Date	DW Rest Hours To Date	% DW At Rest To Date	% DW Running To Date
6	2,927	4.2	577.3	218.8	37.9%		1,282.1	2,005.9	61.0%	39.0%
7	2,479	3.6	489.0	90.6	18.5%		598.4	2,689.6	81.8%	18.2%
8		0.0	0.0	0.0	0.0%		0.0	3,288.0	100.0%	0.0%
9	1,815	2.6	358.2	158.5	44.3%		1,484.6	1,803.4	54.8%	45.2%
11	2,152	3.1	424.5	212.9	50.2%		1,678.2	1,609.8	49.0%	51.0%
12	2,259	3.3	445.7	178.0	39.9%		1,308.5	1,979.5	60.2%	39.8%
13	2,786	4.0	549.6	259.2	47.2%		1,572.6	1,715.4	52.2%	47.8%
14	2,213	3.2	436.6	287.5	65.8%		2,202.8	1,085.2	33.0%	67.0%
15	2,200	3.2	434.0	72.5	16.7%		1,061.6	2,226.4	67.7%	32.3%
16	2,504	3.6	494.0	99.2	20.1%		670.6	2,617.4	79.6%	20.4%
17	2,440	3.5	481.4	53.0	11.0%		373.7	2,914.3	88.6%	11.4%
18	1,775	2.6	350.1	118.1	33.7%		1,130.6	2,157.4	65.6%	34.4%
19	2,199	3.2	433.9	144.8	33.4%		1,101.5	2,186.5	66.5%	33.5%
20	2,135	3.1	421.2	239.3	56.8%		1,906.0	1,382.0	42.0%	58.0%
23	1,095	1.6	216.1	51.9	24.0%		841.8	2,446.2	74.4%	25.6%
24	2,057	3.0	405.7	142.6	35.2%		1,160.1	2,127.9	64.7%	35.3%
25	2,000	2.8	397.4	128.4	32.3%		1,340.2	1,947.8	59.2%	40.8%
26	2,113	3.0	416.8	313.2	75.1%		2,500.3	787.7	24.0%	76.0%
27	2,152	3.1	424.5	163.6	38.5%		1,269.3	2,018.7	61.4%	38.6%
28	2,200	3.2	434.0	2.7	0.6%		20.9	3,267.1	99.4%	0.6%
29	2,200	3.2	434.0	196.1	45.2%		2,819.3	468.7	14.3%	85.7%
30	2,556	3.7	504.3	230.7	45.7%		1,547.7	1,740.3	52.9%	47.1%

## Table 2: 2013 Unit Well Capacity

Start Date: January 01, 2013

End Date: December 31, 2013

Unit Well	DW Capacity GPM	Total Daily Capacity MGD	Total Capacity To Date Mil Gal	Actual Pumpage To Date Mil Gal	% DW Utilization		DW Run Hours To Date	DW Rest Hours To Date	% DW At Rest To Date	% DW Running To Date
6	2,742	3.9	1,441.0	642.4	44.6%		3,934.9	4,825.1	55.1%	44.9%
7	2,451	3.5	1,288.4	357.7	27.8%		2,454.0	6,306.0	72.0%	28.0%
8		0.0	0.0	0.1	0.0%		223.3	8,536.7	97.5%	2.5%
9	1,767	2.5	928.6	468.0	50.4%		4,419.7	4,340.3	49.5%	50.5%
11	2,089	3.0	1,098.0	526.0	47.9%		4,227.2	4,532.8	51.7%	48.3%
12	2,249	3.2	1,182.1	441.0	37.3%		3,276.1	5,483.9	62.6%	37.4%
13	2,700	3.9	1,419.0	692.1	48.8%		4,378.3	4,381.7	50.0%	50.0%
14	2,216	3.2	1,164.7	865.2	74.3%		6,510.1	2,249.9	25.7%	74.3%
15	1,474	2.1	775.0	264.8	34.2%		5,523.9	3,236.1	36.9%	63.1%
16	2,475	3.6	1,300.6	354.8	27.3%		2,398.7	6,361.3	72.6%	27.4%
17	2,344	3.4	1,231.8	248.6	20.2%		1,772.4	6,987.6	79.8%	20.2%
18	1,770	2.5	930.2	364.5	39.2%		3,461.4	5,298.6	60.5%	39.5%
19	2,267	3.3	1,191.7	575.8	48.3%		4,243.3	4,516.7	51.6%	48.4%
20	2,046	2.9	1,075.2	713.5	66.4%		5,843.7	2,916.3	33.3%	66.7%
23	1,050	1.5	552.1	119.1	21.6%		2,008.5	6,751.5	77.1%	22.9%
24	2,005	2.9	1,053.9	423.6	40.2%		3,560.0	5,200.0	59.4%	40.6%
25	2,000	2.2	1,051.2	448.1	42.6%		4,832.3	3,927.7	44.8%	55.2%
26	2,068	3.0	1,086.7	853.1	78.5%		6,882.7	1,877.3	21.4%	78.6%
27	2,076	3.0	1,091.0	319.5	29.3%		2,587.6	6,172.4	70.5%	29.5%
28	2,160	3.1	1,135.3	74.7	6.6%		577.0	8,183.0	93.4%	6.6%
29	2,200	3.2	1,156.0	438.1	37.8%		6,371.8	2,388.2	27.3%	72.7%
30	2,421	3.5	1,272.4	711.5	55.9%		4,899.6	3,860.4	44.1%	55.9%