



Follow up for a MAHL Exceedance in the Annual Report

By Karl Heil

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Introduction

- NPDES permit requires that the Northglenn, CO (“the City”) Wastewater Treatment Facility (WWTF) sample its influent quarterly for pollutants listed in 40 CFR Part 122, Appendix D, Table III
- Maximum Allow Headworks Loadings (MAHLs) are developed for those pollutants
- MAHLs are the most restrictive loadings derived from the NPDES permit limits, biosolids limits or water quality criteria
- MAHLs help predict problematic pollutant levels in the WWTF effluent or biosolids, which could cause a violation of the NPDES permit limits
- Copper and selenium are among the listed pollutants which MAHLs were developed for by the City
- Routine sampling of pollutants is performed on the WWTF influent, identifying pollutant levels above their respective MAHLs

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Background

Previous to 2007

- Prior to 2004 EPA 200.7 test method was used
- The City has conducted collection system sampling every year since the initial selenium exceedance in 2004
- Copper levels have violated its MAHL every year since 2005
- The collection system sampling was developed to either identify a geographic location or a user group contributing to the increased levels of selenium and copper
- These efforts proved largely unsuccessful

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2007 Annual Report MAHL Source Identification Study

- The City has attempted to characterize pollutant levels in all components of the City's water system
- The City has examined historical data in its entirety

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2007 Annual Report MAHL Source Identification Study

2007 Data for Copper

Location ID	Copper Average ($\mu\text{g/l}$)	Percent Change
Standley Lake	7.6	NA
WTF SLP	7.0	-7.9%
WTF Raw	6.0	-14.3%
WTF Clearwell	1.0	-83.3%
Distribution	58.5	+5750%
Collection	66.2	+13.2%
Influent	85.0	+28.4%
BNR Effluent	14.4	-83.1%
R4	6.5	-54.9%
Effluent @ BC	5.4	-16.9%

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2007 Annual Report MAHL Source Identification Study

2007 Data for Selenium

Location ID	Se Average ($\mu\text{g/l}$)	Percent Change
Standley Lake	3.5	NA
WTF SLP	BDL	NA
WTF Raw	BDL	NA
WTF Clearwell	1.42	-63.3%
Distribution	BDL	NA
Collection	3.35	+135.9%
Influent	5.18	+54.6%
BNR Effluent	6.66	+28.6%
R4	2.5	-62.5%
Effluent @ BC	3.39	+35.6%

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2007 Annual Report MAHL Source Identification Study

Conclusions drawn from the data:

- Substantial amounts of copper come from the water distribution system
- Selenium enters in through the wastewater collection system



2007 Annual Report MAHL Source Identification Study

Follow up items for the 2008 Annual Report:

- Scheduling sampling events during the same time interval should give the City a more accurate portrayal of the copper and selenium levels in the system.
- The City lacks a strong data set capable of characterizing the local groundwater. Is inflow and infiltration (I&I) a substantial source of selenium in the influent?
- The City does not know if the selenium in the reclaim ponds was introduced by groundwater infiltration, or if it originated from the filter backwash process.
- The City cannot accurately say there is no selenium present in the distribution system without EPA method 200.8 data.

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Early Part of 2009

- Audit by the EPA and local limits need to be updated
- City's local limits were from 1992
- Industrial Pretreatment (IP) position becomes vacant
- Training for establishing local limits

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2008 Annual Report Update to the MAHL Source Identification Study

Copper Data, 2008 Collection System Sampling

Sample Date	Manhole Numbers (Cu results in mg/L)						LSAV	WWTF Influent
	10-3-39	11-2-27	11-2-4	11-2-78	3-3-07	35-2-1		
2/8/2008	0.0798	0.0762	0.131	0.0554	0.0352	0.057	0.0618	0.0861
3/5/2008	0.047	0.0854	0.0657	0.0579	0.0533	0.069	0.061	0.036
4/2/2008	0.0636	0.0681	0.0699	0.0649	0.0353	0.047	0.0764	0.0818
5/7/2008	0.0515	0.071	0.0617	0.0477	0.0435	0.0373	0.0642	0.0137
6/4/2008	0.071	0.0629	0.0328	0.0484	0.0638	0.026	0.0894	0.0734
7/2/2008	0.131	0.131	0.0777	0.0581	0.0375	0.0335	0.0983	0.0871
8/6/2008	0.457	0.0585	0.0762	0.0571	0.006	0.242	0.065	0.0881
9/3/2008	0.0299	0.054	0.071	0.0349	0.138	0.0199	0.151	0.114
10/8/2008	0.198	0.102	0.0652	0.037	0.0462	0.0517	0.206	0.0782
11/19/2008	0.068	0.063	0.0398	0.0713	0.0988	0.0404	0.0779	0.0426
Min	0.0299	0.054	0.0328	0.0349	0.006	0.0199	0.061	0.0137
Max	0.457	0.131	0.131	0.0713	0.138	0.242	0.206	0.114
Average	0.11968	0.07721	0.0691	0.05327	0.05576	0.06238	0.0951	0.0701
StandDv	0.128155	0.023554	0.02628	0.0114	0.0373	0.0647	0.0474	0.0300
Copper average of all manholes (mg/L)			0.0729					

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2008 Annual Report Update to the MAHL Source Identification Study

Selenium Data, 2008 Collection System Sampling

Sample Date	Manhole Numbers (Se results in mg/L)						LSAV	WWTF Influent
	10-3-39	11-2-27	11-2-4	11-2-78	3-3-7	35-2-1		
5/7/2008	<0.0008	0.0019	0.0079	0.0025	0.002	0.0022	0.0031	No Data
6/4/2008	<0.0008	0.0015	0.0069	0.0042	<0.0008	0.002	0.0024	No Data
7/2/2008	0.002	0.0017	0.005	0.0058	<0.0008	0.0016	0.0025	No Data
8/6/2008	0.0017	0.0018	0.0041	0.0056	0.0012	0.003	0.0032	0.0024
9/3/2008	0.0018	0.0016	0.006	0.0071	0.0008	0.002	0.0025	0.0031
10/8/2008	0.0021	0.0022	0.007	0.0073	0.001	0.0036	0.0036	0.0026
11/19/2008	0.0014	0.0012	0.0047	0.0018	<0.0008	0.0014	0.0022	No Data
12/17/2008	0.0029	0.0029	0.0093	0.0044	0.0014	0.0048	0.0043	0.0036
Min	0.0008	0.0012	0.0041	0.0018	0.0008	0.0014	0.0022	0.0013
Max	0.0029	0.0029	0.0093	0.0073	0.002	0.0048	0.0043	0.0036
Average	0.00168	0.00185	0.00636	0.00483	0.0011	0.00257	0.00297	0.0026
Standard Dev.	0.000697	0.000515	0.00175	0.00199	0.000427	0.00115	0.000716	0.000863
Selenium average of all manholes (mg/L)			0.00305					

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2008 Annual Report Update to the MAHL Source Identification Study

WWTF Influent Copper MAHL Violations 2008

Sample Date	Flow (mgd)	Cu (mg/L)	Loading Lbs/Day	Current MAHL lbs/day	Violation
4/17/2005	4.008	0.111	3.710	3.09	YES
5/3/2005	4.174	0.0968	3.369	3.09	YES
6/5/2006	3.584	0.107	3.198	3.09	YES
2/12/2007	3.698	0.116	3.577	3.09	YES
5/9/2007	4.311	0.112	4.026	3.09	YES
7/17/2007	4.132	0.171	5.892	3.09	YES
9/3/2008	3.317	0.114	3.153	3.09	YES

In-stream standard is 0.025 mg/l potentially dissolved

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WWTF Influent Selenium MAHL Violations 2008

Sample Date	Flow (mdg)	Se (mg/L)	Lbs/Day	Current MAHL lbs/day	Violation
2/6/2008	3.071	ND		0.06	NO
5/7/2008	8.457	0.0053	0.374	0.06	YES
7/3/2008	3.33	0.0023	0.064	0.06	YES
8/6/2008	4.01	0.0024	0.080	0.06	YES
9/3/2008	3.32	0.0031	0.086	0.06	YES
10/7/2008	3.37	0.00282	0.079	0.06	YES
10/8/2008	3.573	0.0026	0.077	0.06	YES
11/12/2008	3.447	0.00877	0.252	0.06	YES
11/20/2008	2.994	0.0013	0.032	0.06	NO
11/21/2008	3.22	0.0018	0.048	0.06	NO
12/18/2008	3.261	0.0036	0.098	0.06	YES
12/19/2008	3.473	0.0037	0.107	0.06	YES

WWTF Effluent Permit Limit is 0.0046 mg/l

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Conclusions drawn from the data:

- MAHL seems low for selenium
- MAHL seems low for copper too
- Recalculate MAHL for copper and selenium
- Let's see how many violations of the newly calculated MAHL the City would have had.

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Selenium MAHL Comparisons

Sample Date	Flow (MGD)	Se (mg/L)	Lbs/Day	Current MAHL lbs/day	Violation	New MAHL Lbs/day	Violations Under New MAHL
2/4/2004	3.073	0.0027	0.0691	0.06	YES	0.14	NO
8/4/2004	4.148	0.0044	0.152	0.06	YES	0.14	YES
5/11/2005	4.008	0.00295	0.0986	0.06	YES	0.14	NO
8/3/2005	4.174	0.0029	0.101	0.06	YES	0.14	NO
11/29/2005	3.399	0.00663	0.187	0.06	YES	0.14	YES
1/4/2006	2.991	0.00501	0.124	0.06	YES	0.14	NO
8/1/2006	4.223	0.00279	0.0982	0.06	YES	0.14	NO
5/9/2007	4.311	0.00939	0.337	0.06	YES	0.14	YES
7/17/2007	4.132	0.00801	0.276	0.06	YES	0.14	YES
5/7/2008	8.457	0.0053	0.374	0.06	YES	0.14	YES
7/3/2008	3.33	0.0023	0.064	0.06	YES	0.14	NO
8/6/2008	4.01	0.0024	0.080	0.06	YES	0.14	NO
9/3/2008	3.32	0.0031	0.086	0.06	YES	0.14	NO
10/7/2008	3.37	0.00282	0.079	0.06	YES	0.14	NO
10/8/2008	3.573	0.0026	0.077	0.06	YES	0.14	NO
11/12/2008	3.447	0.00877	0.252	0.06	YES	0.14	YES
12/18/2008	3.261	0.0036	0.098	0.06	YES	0.14	NO
12/19/2008	3.473	0.0037	0.107	0.06	YES	0.14	NO
				Number of Violations	17	Number of Violations	6

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Copper MAHL Comparisons

Sample Date	Flow (MGD)	Cu (mg/L)	Loading Lbs/Day	Current MAHL lbs/day	Violation	Newly Calculated MAHL Lbs/day	Violation Under New MAHL
4/17/2005	4.008	0.111	3.710	3.09	YES	4.61	NO
5/3/2005	4.174	0.0968	3.369	3.09	YES	4.61	NO
6/5/2006	3.584	0.107	3.198	3.09	YES	4.61	NO
2/12/2007	3.698	0.116	3.577	3.09	YES	4.61	NO
5/9/2007	4.311	0.112	4.026	3.09	YES	4.61	NO
7/17/2007	4.132	0.171	5.892	3.09	YES	4.61	YES
9/3/2008	3.317	0.114	3.153	3.09	YES	4.61	NO
				Number of Violations	7	Number of Violations	1

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2008 Annual Report Update to the MAHL Source Identification Study

- As Tables suggest, the average pollutant levels from the collection system and from the influent seem to converge as more data points become available.
- The City has concluded that updating the MAHL will make it unlikely the MAHL for copper will be violated based on the available data. The copper data over the last four years indicates that the concentrations are relatively consistent year to year with the exception of the sample on July 17, 2007.
- The distribution system sampling seemed unnecessary at this time because the collection system sampling data suggests the selenium issue is caused by I&I.
- City to conclude that the selenium seems to be coming from two specific areas of the collection system.
- The selenium data for the past five years shows relatively consistent concentrations. Five of the violations in the column titled "Violations Under New MAHL" were one standard deviation from the mean of the results or flow which suggests the data was abnormal.

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Moral of the Study

You may not get mauled by a new MAHL

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