King County Industrial Waste Program
Loading Limits for Metals
Bruce Tiffany, engineer
July 2014
www.kingcounty.gov/environment/wastewater/IndustrialWaste/Limits/KClimits.aspx

Loading Limits for Metals

In 2010 the King County Industrial Waste Program evaluated the adequacy of the current local discharge limits for metals. This was the first evaluation of this type since the local discharge limits were first developed in 1990. The 2010 evaluation did not result in a change to the local discharge limit concentrations for metals, but the analysis did indicate a need to control the total mass of metals we can allocate to a given industrial user. To understand how this allocation is applied, a little background information is needed.

King County Public Rule PUT 8-13-1 establishes local discharge limits for metals, although several facilities are covered under more stringent federal limits based on a given industrial category (categorical limits). Both of these approaches to regulating discharges are based on the concentration of the particular metal, typically measured as milligrams of metal per liter of wastewater (mg/L).

The EPA procedure for developing local discharge limits is conducted for each wastewater treatment plant. The development process involves determining the most stringent environmental standard, typically either water quality standards for the treatment plant wastewater discharge, biosolids acceptance standards for land application, or the metal concentrations which could inhibit the biological activity of the beneficial microorganisms in the wastewater treatment process. The efficiency of the treatment plant to remove a particular metal is determined and used with the most stringent environmental standard to determine the amount of that metal that can be received at the very beginning point of the wastewater treatment process (referred to as the “headworks”). This value is referred to as the Maximum Allowable Headworks Loading (MAHL). From this value, the metal loading from non-controllable sources, such as residential sewer users, is subtracted from the MAHL. After a safety factor is applied, the resulting value is what is available to industrial users of the sewer system and is referred to as the Maximum Allowable Industrial Loading (MAIL).

Most pretreatment programs throughout the nation will use the MAIL, estimate the total volume of industrial wastewater in the wastewater service area, and calculate concentration-based local discharge limits. This strictly concentration-based approach can result in local discharge limits that have fairly low concentrations. In contrast, the King County public rule for local discharge limits allows for mass-based limits also to be included in waste discharge permits. This allows King County to have higher concentration-based limits, which is protective under typical industrial flows, but allows for periodic higher flows at the industrial facility, as long as the mass-based limit also is not exceeded.

The mass allocation procedure that the Industrial Waste Program uses involves reviewing the influent data for the applicable King County wastewater treatment plant and statistically determining the loading amount, in pounds-per-day (lb/day), associated with one standard deviation of the average flow rate. The reasoning behind this is that on any given day a single discharger should not be allowed to discharge a mass of metal that would exceed the typical range of fluctuation of the wastewater treatment plant.

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As a pretreatment program we need to make sure that the concentration or mass limits that are in our permits will not cause problems at the wastewater treatment plants.

After the 2010 local limits evaluation was completed, a review of the loading limits in effect at that time indicated that the Industrial Waste Program was significantly over-allocated in relation to the MAIL for several of the metals in the permits that we issue. To correct this, the updated MAIL values and wastewater treatment plant influent data were used to develop revised mass loading limits. The revised loading information for the three large King County wastewater treatment plants is provided in the table below.

Influent Data at Brightwater, West Point, and South Treatment Plants

	Daily Average Influent Concentration (mg/L)	Daily Average Influent Loading (lb/day)	Loading Available to Industrial User (lb/day)	MAIL: Maximum Allowable Industrial Loading - Biosolids Quality Basis (lb/day)
Brightwater Treatment Plant				
Arsenic	0.0015	0.237	**0.043**	0.850
Cadmium	0.0002	0.029	**0.024**	0.482
Chromium	0.0024	0.372	**0.376**	---
Copper	0.0457	7.092	**1.010**	11.134
Lead	0.0022	0.343	**0.165**	3.302
Mercury	0.0001	0.015	**0.015**	0.191
Nickel	0.0041	0.640	**0.376**	7.526
Silver	0.0004	0.061	**0.026**	---
Zinc	0.1169	18.155	**1.729**	32.093
South Treatment Plant				
Arsenic	0.0020	1.262	**0.266**	5.318
Cadmium	0.0005	0.297	**0.170**	2.365
Chromium	0.0044	2.765	**1.202**	---
Copper	0.0714	45.302	**6.890**	68.900
Lead	0.0050	3.155	**1.202**	16.863
Mercury	0.0001	0.077	**0.061**	1.218
Nickel	0.0050	3.184	**2.494**	49.884
Silver	0.0012	0.742	**0.438**	---
Zinc	0.1419	90.053	**12.312**	123.124
West Point Treatment Plant				
Arsenic	0.0026	2.362	**0.388**	3.884
Cadmium	0.0003	0.307	**0.160**	2.056
Chromium	0.0040	3.631	**2.739**	---
Copper	0.0525	47.977	**5.077**	50.773

Lead	0.0122	11.112	**0.573**	5.727
Mercury	0.0001	0.082	**0.059**	1.177
Nickel	0.0054	4.912	**2.603**	38.158
Silver	0.0013	1.150	**0.275**	---
Zinc	0.1272	116.239	**9.114**	91.136

Some industrial users have raised concerns to the Industrial Waste Program about the lower metals limits. Anytime a standard is lowered it raises concerns, which is why the impact of this revision was studied during the 2010 evaluation of the King County local discharge limits. This analysis involved reviewing data from our industrial users, which resulted in only a few instances of loading exceedances of the proposed MAIL values. And of these, about half of the exceedances were from non-detected values associated with large volume discharges (Note, it is a common environmental practice to use one-half (1/2) of the detection limit for evaluating data). The other half of the exceedances were for concentrations that exceeded discharge limits, and would be considered violations anyway.

The allocation of loadings is a challenging endeavor. On any given day, industrial users are discharging a fraction of what is allocated, and often a very small fraction of what is allocated at that. This needs to be balanced against exposing the wastewater treatment system to risks posed by several permits being given with metal loading allocations that, in a cumulative sense, exceed what the wastewater system can accommodate.

Update: In 2011, the Washington State Department of Ecology approved the 2010 King County evaluation of the local discharge limits for metals. This approval allowed KCIW to continue to enforce the existing local discharge limits throughout the King County service area after the new Brightwater treatment plant came on-line. However, because the Brightwater treatment plant was so new, Ecology wanted more years of operational data prior to undergoing a local discharge limits development specifically for the Brightwater service area. Therefore, in 2015 and 2016, KCIW will conduct seasonal sampling in the Brightwater service area with the goal of developing local discharge limits for Ecology approval in late 2017.

It is difficult to say what the outcome will be of the Brightwater local limits development project until the data collection and analysis have been conducted. However, the existing local limits that are in effect are producing acceptable results in terms of environmental compliance for the Brightwater treatment plant. Therefore, it is not anticipated that the local discharge limits at the Brightwater treatment plant will change substantially.