Regulating Copper in Urban Stormwater Runoff[1]

G. Fred Lee, PhD, PE, DEE and Anne Jones-Lee, PhD
G. Fred Lee & Associates, El Macero, California
email: gfredlee33@gmail.com website: www.gfredlee.com

In many situations where TMDLs need to be developed to control exceedances of water quality standards, the regulated constituents exist in a variety of chemical forms, only some of which are toxic/available. The development of TMDLs for constituents of this type requires evaluation of an appropriate TMDL goal that will protect the beneficial uses of the listed waters without significant unnecessary expenditures for constituent control. This discussion focuses on the appropriate approach for regulating copper in urban area street and highway stormwater runoff (runoff) within the TMDL framework where receiving waters for this runoff contain copper above the US EPA national water quality criterion or a site-specific water quality standard/objective.

The concentrations of copper in runoff frequently exceed the US EPA national water quality criterion for fresh and marine waters for total and dissolved copper. NPDES-permitted runoff managers will, under current regulatory approaches, be required to control the copper concentrations in the runoff so that they do not cause or contribute to violations of water quality standards by any amount more than once every three years at the point of discharge for the runoff. Under the California Toxics Rule (CTR) (US EPA, 2000), copper will be regulated based on dissolved concentrations in the ambient receiving waters. If the dissolved copper, either directly or through a translator, in the runoff waters exceeds the water quality standard (objective), then the stormwater runoff can be judged to be a contributor to the water quality standard violation and may require a load allocation as part of TMDL implementation.

Some groups, such as Sustainable Conservation (2000), are advocating that the use of copper in automobile brake pads be eliminated in order to reduce the copper in runoff. This approach is not based on an evaluation that shows that the copper present in the runoff is in a toxic/available form. It has evolved out of a mechanical comparison between the concentrations of copper in runoff to national water quality criteria and state standards. From the information available, it appears that the elimination of copper from automobile brake pads will not eliminate the exceedance of the copper criterion at the point of discharge of runoff to receiving waters.

A number of studies of runoff (see review by Lee and Taylor, 1999) have shown, however, that the heavy metals in this runoff are in nontoxic/non-available forms. Therefore, from the substantial evidence available, it appears that the exceedance of the national or site-

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specific water quality criterion/standard for copper in runoff at the point of discharge represents an "administrative" exceedance that reflects the overly protective nature of the criteria/standards when applied to runoff.

As discussed by Lee and Jones-Lee (1997), this is to be expected, based on the aqueous environmental chemistry of copper. Only a small part of the total copper and, for some sources, dissolved copper is in a toxic/available form. From the information available, it appears that the brake pad-derived copper is in nontoxic/non-available forms. That situation does not apply to all sources of copper in all waterbodies. Copper from some industrial and mining sources is in a toxic form and, while for many waterbodies it is rapidly converted to nontoxic forms through chemical reactions, there are some types of waters where it would remain or could become toxic. As a result, in evaluating the need to eliminate the use of copper in automobile brake pads, as well as developing stormwater runoff treatment works to control copper concentrations from all sources, it is important to conduct the necessary studies to determine whether the copper in the stormwater runoff is in a toxic/available form at the point of discharge, as well as in the receiving water column and sediments. Conducting these studies will likely show that, with respect to runoff-associated copper, there is no need to restrict the concentrations of copper in the runoff for many receiving waters for this type of runoff.

If a stormwater management agency finds, after appropriately conducting studies and adjusting the water quality criteria/standards for site-specific conditions in accord with current US EPA (1994) guidance, that the state and/or federal regulatory agencies are requiring that funds be spent unnecessarily to control copper in stormwater runoff because of an administrative exceedance of a water quality standard, then the stormwater management agency may need to work with their federal and state legislators to bring about changes in US EPA and/or state policy so that funds spent for copper control in runoff address real, significant water quality problems/ impairment of beneficial uses of concern to the public.

References

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