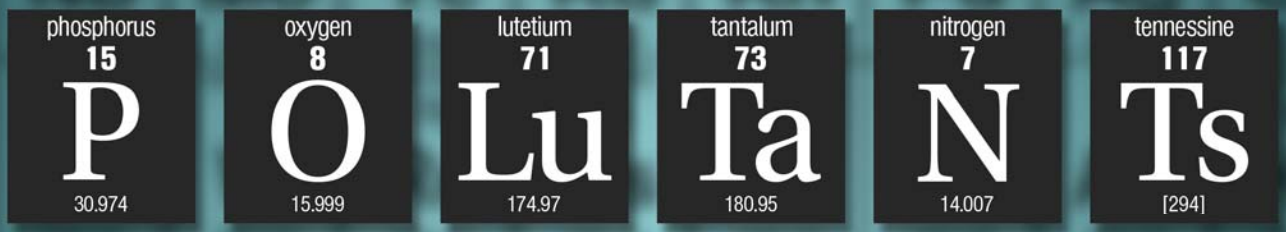
the Rain events

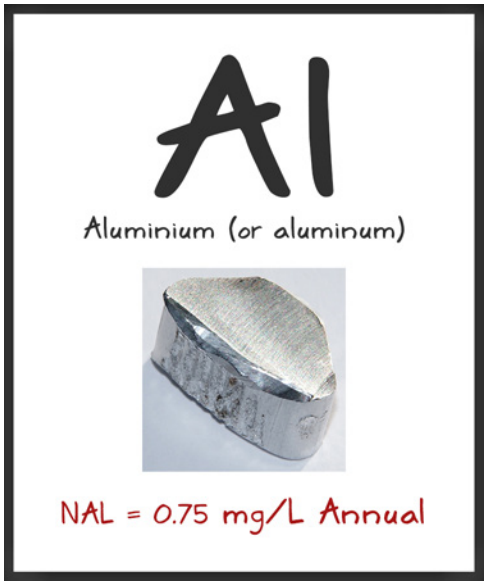
May 2018



Part 10 of a 12-part **exclusive series** on understanding storm water pollutants

Aluminium (or aluminum) is the most abundant metal in the Earth's crust. Yet surprisingly, it was not discovered or isolated in its elemental form until 1824. Because of its high chemical reactivity, native aluminium is extremely rare on Earth, and the metal must be smelted from ores, such as bauxite. But today, aluminium is an ubiquitous metal, used in many applications ranging from food and drink containers, pharmaceuticals, under-arm deodorant, transportation vehicles, construction, and many more. And many industrial facilities in California will recognize aluminium as one of the notorious IGP Table 2 pollutants with a NAL – and that's why it's the subject of this month's edition of ***The Rain Events.***

Pure aluminium is a silvery-white lustrous metal with great reflectivity properties. It is soft, nonmagnetic, and ductile. Two highly-prized properties of aluminium are its low density and its resistance to corrosion. The addition of even a small amount of other minerals or metals can greatly increase the strength of the aluminium alloy, without significantly increasing the density of the metal. Aluminium resists corrosion because of a phenomenon called passivation – where a protective coating (in this case, aluminium oxide) forms on the outside of the metal, preventing the inner metal from being corroded. The main ore used to produce aluminium is bauxite, a sedimentary rock with large reserves in Guinea, Australia, Vietnam, Jamaica, and Brazil.



So on an industrial site, where do high aluminium storm water numbers come from? While aluminium metal is widespread, there is some doubt as to how much dissolved aluminium it contributes to storm water runoff. Several studies have shown that the high aluminium numbers in certain California creeks and rivers occur upstream of anthropologic influences, and are directly linked to the amount of suspended sediment.

Aluminium is the most common metal in the Earth's crust (it's a component of clay, feldspar, granite, and many other common minerals), so it stands to reason that natural sources may be the biggest contributor to high levels of aluminium in storm water runoff. This does not exempt your industrial facility from analyzing for aluminium, if Table 1 requires you to do so – but, because of its widespread natural occurrence, it may not be the best Section XI.B.6.c "indicator parameter," if you have a choice. Talk to your storm water consultant to see what your options are.

But if you have no choice in the matter and you're having aluminum issues, what to do? Well, we have a couple ideas.

As mentioned earlier, there is a strong correlation between sediment load and aluminium levels.

So, the first step in bringing your aluminium back under control should be to minimize your Total Suspended Solids, or TSS. This can be done by a variety of ways, but first and foremost by good housekeeping. A clean yard typically doesn't have high TSS numbers, which lowers your chance of high aluminium numbers. Also, any aluminium that actually comes from industrial sources is probably in some sort of particulate stage (aluminium grindings, clay dust, etc.), which can be controlled by sweeping.

But as we say at The Rain Events, the best BMP strategy is the one that uses a combination of source control, good housekeeping, and treatment. *(continued on next page)*

Sweeping is good, but for the best results, make sure you're hitting the other two points as well. Keep any industrial aluminium sources under cover (source control), and use some treatment BMPs. Treatment BMPs don't have to be expensive active treatment systems; remember, the majority of aluminium could be coming from natural sources, so focus your efforts on removing sediment from your storm water runoff. Use compost socks, vegetated swales, or erosion control BMPs first. If those don't work, then maybe it's time to look into a more aggressive treatment option.

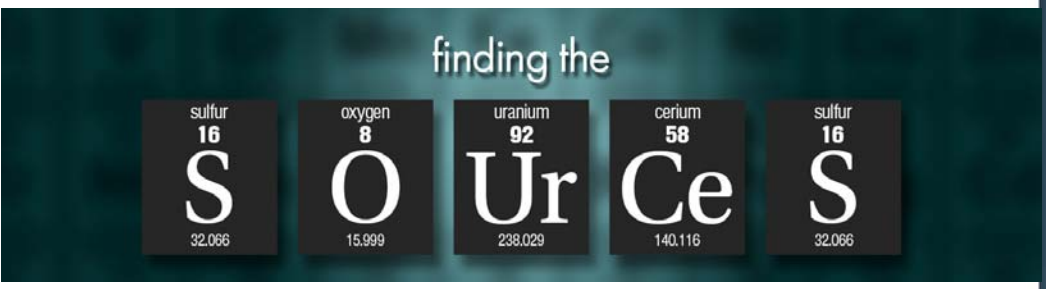
Sources:

1. Bradford, G.R., A.C. Change, A.L. Page, D. Bakhtar, J.A. Frampton, and H. Wright, "Background Concentrations of Trace and Major Elements in California Soils," (Kearney Foundation Special Report, Kearney Foundation of Soil Science Division of Agriculture and Natural Resources University of California, March 1996).
2. "Historical Data Evaluation of Aluminum in the Ventura River, Santa Clara River, and Calleguas Creek Watersheds," (Report for Ventura Countywide Stormwater Quality Management Program, Larry Walker Associates, June 2014).
3. "International Stormwater Best Management Practices Database, Pollutant Category Summary: Metals," (Wright Water Engineers, Inc. and Geosyntec Consultants, Inc., August 2011).
4. Wikipedia, s.v., "Aluminium," *Wikipedia The Free Encyclopedia,* last modified May 25, 2018, https://en.wikipedia.org/w/index.php?title=Aluminium&oldid=842961287

Real-World Soil Problems

Interestingly, the staff at The Rain Events recently ran into a situation where a client had extremely high levels of iron and aluminum in their storm water runoff – but it was apparent that it wasn't coming from industrial activities. After a series of soil samples, we found that the soil had high concentrations of both iron and aluminum, and it appeared that the background pollutants were impacting the storm water runoff. Here's some of the results:

Sample Location	Aluminium Concentration	Iron Concentration	Comments
Storm water conveyance swale	18,000 mg/kg	27,000 mg/kg	Sandy loam soil with a light reddish hue, having no apparent contact with industrial activities.
Newly constructed conveyance swale	16,000 mg/kg	24,000 mg/kg	Sandy loam soil with a light reddish hue; freshly exposed soil with no apparent contact with industrial activities. No water has flowed through this swale.
Retainment pond floor	40,000 mg/kg	47,000 mg/kg	Clay texture with dark gray color. Pond receives water from a wood mulch storage area.



We mentioned in the article that because of its resistance to corrosion, bare aluminum metal does not readily leach out into water. But here are some other sources of aluminum to consider:

- Aluminosilicates – kaolinites (clay soil, pottery, ceramics, etc) and zeolites (often used for water treatment)
- Aluminium Oxide (used in plastics, cosmetics, glassmaking, as an abrasive, in paint, and more)
- Aluminium Sulfates (used as a filler in paper, in fire extinguishers, and as a food additive)
- Aluminum chloride (in petroleum refining, rubber manufacture)

Have questions about the Industrial General Permit?
Give us a call at (209) 334-5363, ext. 114

"To Do List" for May:

- Perform the May monthly inspection
- It's ACFCE time! Need help with your facility's annual evaluation? Give us a call.

Are all pollutants directly linked to industrial activities?

If you take a look at Table 2 in the Industrial General Permit, you'll notice that none of the elements listed are "man made," or synthetic chemicals. Is it possible that these elements could be causing pollution in rivers and streams without any input from anthropological sources?

Well, yes and no. Yes, in that many of these elements are naturally occurring, and pollution due to natural occurrence is not only possible, but probable, as we saw with aluminium. Also, background concentrations of many of these pollutants have not been widely studied or documented, and the public tends to blame the most visible industry when an environmental problem crops up – so it's hard to say how much pollution is being contributed by industry as opposed to occurring naturally.

But also no, in that by handling these pollutants as part of industrial operations, industry *does* contribute to pollution by upsetting the natural distribution of the elements.

After all, what is pollution other than an imbalance in the distribution of naturally occurring elements? Petroleum in the form of crude oil is a natural occurrence underground – but when it ends up on the beach because of a spill, it's an imbalance in the natural distribution. Whether that imbalance is caused by man-made or natural sources, it still has the same devastating effect on Earth's delicate ecosystems.

Reference: Background Concentrations of Trace and Major Elements in California Soils, Kearney Foundation of Soil Science.

Please contact us if you have any questions …

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Storm Water Contest...

Each month, we invite our readers to participate in a contest to test their knowledge of the Industrial General Permit and their storm water compliance program. We enter all submittals to our monthly newsletter question into a drawing, and one person is selected at random to receive a $25 gift card. Last month's question was:

Take a guess - will milk (a colloid) have a higher reading from TSS or from Turbidity? Why?

Good job, **Elizabeth Quilici,** you're correct! Milk will have a high turbidity reading, but a low TSS reading. Unless, as Elizabeth pointed out, the milk is curdled :)

This Month's Contest Question:

Are vegetated swales an effective treatment BMP for removing aluminum or other dissolved metals from storm water runoff?

By June 22, 2018, submit your response to the above question by sending an email to jteravskis@wgr-sw.com. All persons submitting the correct answer will be placed in a drawing. The winner will receive a $25 gift card to Cold Stone Creamery.

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