

the ironic thing about
IRON

Oh, the irony...

The irony about this pollutant is that it's considered a pollutant even though it is the most common element found on Earth! It's already in the soil. It's in foods. It's already found in drinking water in trace amounts. And it's also a part of some manufacturing processes. It's everywhere, yet it's a pollutant that you have to watch out for. Iron does seem to be a bit of an ironic pollutant. Especially when it comes to some NECs. In this month's edition of **The Rain Events**, we are going to be discussing this common pollutant and ways your facility can tackle this issue.

Iron is the most commonly used metal, and the most common element found on Earth. Because of its widespread occurrence, it's also one of the toughest pollutants to trace back to industrial activity. Elevated iron levels could be coming from any number of sources – exposed metal equipment, soil erosion, industrial products and additives, or even from cast iron storm drain grates! Iron is an essential element for almost all living things,

and is found in the human body in the range of 3 to 415 ppm. In excess, iron can be toxic, and overconsumption of iron containing supplements is one of the more common toxicological causes of death in children under the age of six. Iron deficiency is a much more common problem, though, and if left untreated will develop into anemia. In terms of mass, iron is the most abundant single element on Earth, and is thought to be

the main component of the Earth's inner and outer cores, which together comprise about 35% of the Earth's mass. In its pure form, iron is a relatively soft, lustrous silver-gray metal. Fresh iron surfaces will quickly oxidize in normal air to give hydrated iron oxides, or common rust. Since the iron oxides occupy more volume than the metal itself, the rust will flake off and expose a fresh surface to oxidation. Because of the quick oxidation process, most of the iron found on the Earth's crust is in iron oxide minerals such as hematite, magnetite, and siderite. As a metal, iron has been used since antiquity, most notably during the Roman era. Though pure iron is a relatively soft metal, it can be considerably strengthened by impurities, such as carbon. Adding a small proportion of carbon (from 0.002% to 2.1%) produces steel, which can be up to 1000 times harder than pure iron. Today, iron is the most widely used metal, accounting for over 90% of metal production worldwide. Most iron is alloyed with other elements to make steel or other iron alloys. So, where might iron be coming from on an average industrial facility? Well, because iron is such a commonly used and naturally occurring element on Earth, it could be coming from any number of places. One obvious source would be an iron alloy metal

Oxidation

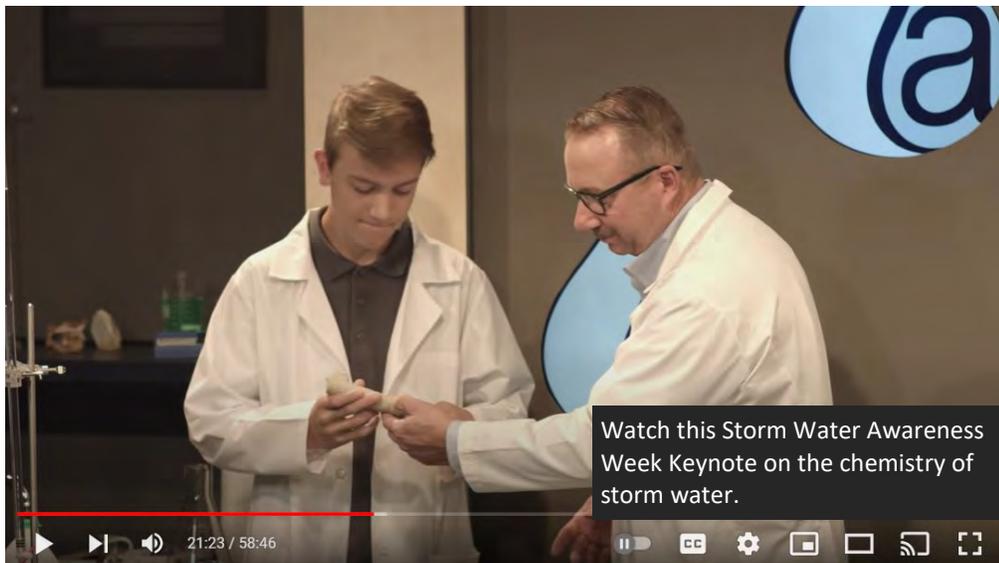
Oxidation is the loss of electrons or increase in oxidation state of an atom, ion, or molecule in a chemical reaction.

Example: Rusting of iron



that is exposed to the weather – such as steel equipment and parts. But iron could also come from erosion and sediment problems. We've all seen the black sludge commonly caused by standing water and organic material – the black (or brown) color and pungent odor is usually from iron sulfide. But maybe a more important topic is not the possible iron sources at your facility, but whether those iron sources should be considered as industrial or non-industrial sources. This is especially important to discuss if the General Permit doesn't require facilities with your SIC code to analyze storm water samples for iron.

If your SIC code doesn't require you to sample for iron, that is, if your industrial facility could conceivably apply for NEC coverage regarding your use of iron, there's a good chance that your sources of iron are non-industrial. For instance – steel buildings and forklifts that are well maintained could very well be sources of iron, but would both be allowed under NEC permit coverage, and hence are non-industrial sources. But if your facility processes metal products or stores them outdoors, then you'll have to analyze for iron in your storm water. On the other hand, if you've determined that there are industrial sources of iron on your site, it becomes a bit of an interesting situation. Because iron has such a widespread occurrence, there probably are many non-industrial sources of iron on your facility that can significantly contribute to your iron levels. For example – even the cast iron storm drain grate could introduce iron and rust flakes directly into your sample bottle if you're not careful. Because of this, it's in your best interest to design a BMP strategy that targets all sources of iron on your facility, industrial or not. Remember, a good BMP strategy includes source control, pollution prevention, and treatment. Control iron sources by keeping exposed metal inside rain-proof structures. Prevent pollution by painting, powder coating, or covering metal that is used or stored outdoors. Since sediment can be an iron source, control



erosion on your site with vegetation, hydroseeding, erosion control mats, or similar measures. Use filtration technologies to reduce pollutant loads – depending on your site and how many iron sources you have, it could entail installing some compost socks, or possibly a passive or active treatment system.

Facts and Sources Of Iron:

Iron's a pretty common element. But here's a few not-so-common uses of iron that you might not have thought about:

- Flocculant in wastewater and drinking water applications (iron chloride or iron sulfate)
- Additive in animal feeds (iron chloride)
- Copper etchant in producing circuit boards (iron chloride)
- Manufacturing inks and pigments (iron chloride, iron sulfate)
- Manufacturing fortified foods (elemental iron, iron sulfate)
- Manufacturing dietary supplements (iron fumarate, iron sulfate)
- Concrete staining (iron sulfate)
- Reducing chromate in cement manufacturing (iron sulfate)
- Treated wood (iron sulfate)

There are also interesting correlations between iron and TSS. The higher the TSS, usually the higher the iron concentration is. What causes high TSS numbers? The obvious culprit is sediment – but what may not be so obvious is the source of the sediment. Sediment could be coming from erosion, industrial activities (sawdust, concrete or lime dust, etc.), tracked in from off-site, or blown onto your facility from next door. Fortunately, sediment is almost always visible, and can be cleaned up fairly easily.

Interestingly, many times we have noticed a direct link between metals and TSS – high TSS tends to correlate with high metals, and vice versa. So, staying on top of any loose sediment, dust, or dirt on your site can have the added advantage of keeping your other sampling parameters under control.

Often, iron manufacturers will use a process called "bluing" to make iron resistant to rust. There are different types of bluing methods, some of the more popular ones involve using substances with nitrates. Nitrates can be used as an oxidizing agent, and is sometimes used in glass, metal, and plastic production, as well as in the use of production of explosives, and concrete manufacturing. And remember that even if nitrites or nitrates are used indoors, they can still impact storm water by escaping through roof vents in particle (such as fertilizer dust) or gas (such as fumes from oxidizing reactions) forms. So, if your facility works with iron and either treats or works with nitrite treated iron, be on the lookout for potentially higher nitrate concentrations in your water samples.

Sources:

Emsley, John (2003). *Nature's Building Blocks: An A-Z Guide To The Elements*. Oxford University Press.

Wikipedia—Iron <https://en.wikipedia.org/wiki/Iron>

The Rain Events

Lead Editor: John Teravskis
 QSD/QSP, QISP, CPESC, ToR, IGPTT Participant
 jteravskis@wgr-sw.com
 (209) 334-5363 ext. 110 or (209) 649-0877

Supporting Editors:

Aaron Ortiz, QISP, ToR, aortiz@wgr-sw.com
 (209) 334-5363 ext. 114

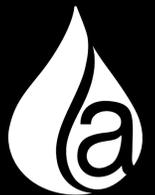
Rebekah Teravskis, rteravskis@wgr-sw.com
 (209) 334-5363 ext. 118

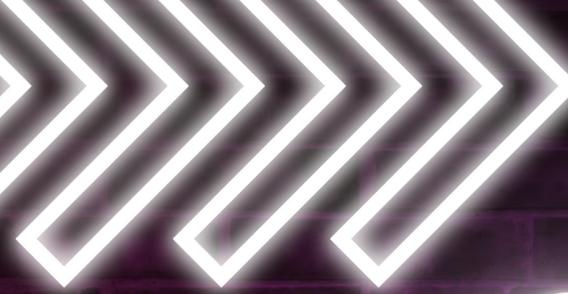
SAVE THE DATES

AUGUST 25:
deadline for
workshop host
registrations

SEPTEMBER 1:
attendee
registration
opens

SEPTEMBER 25-29:
storm water
awareness week





Voices OF STORM WATER

2023 KEYNOTES SCHEDULE

WHAT TO EXPECT WHEN YOU GET INSPECTED:
ADVICE FOR INDUSTRIAL FACILITIES
MONDAY, SEPTEMBER 25TH AT 10 AM PDT

WHICH PERMIT DOES MY PROJECT NEED? - NEW
DE-WATERING REQUIREMENTS IN THE 2022 CGP
WEDNESDAY, SEPTEMBER 27TH AT 10 AM PDT

visit stormwaterawareness.org to register for the keynotes



SNEAK PREVIEW

of 2023 Storm Water Awareness Week Workshops

Summary of the New CGP - Part 1

Presenting a brand new BMP (Kai Pono Solutions)

Ion Exchange and Iron Oxide Media for Heavy Metals and Emerging Contaminants Removal

Passive Treatment Technologies: The Power of Polyacrylamide

QSD Field Bootcamp 101

Erosion Control BMPs vs. Passive Treatment (LSC Environmental Products)

IGP Basics Part 1: What is the IGP?

Summary of the New CGP - Part 2

IGP Basics Part 2: What Am I Expected To Do?

IGP Basics Part 3: "How To" Tips of Sampling

BMP Selection For Stormwater Management and Sediment Control

Stormwater Management: How to Safely Manage Stormwater with PFAS

America's Proven First Line of Defense for Stormwater Runoff Pollution Abatement

Kick the Can

Summary of the New CGP - Part 3

Municipal Stormwater BMPs for Public Agencies

SWAW Keynote: Which Permit Does My Project Need? -New De-watering Requirements in the 2022 CGP

The Fundamentals of Stormwater Treatment

2022 CGP Significant Changes

Caltrans WPCM Training updated for 2022 CGP

Summary of the New CGP - Part 4

The Soil Carbon/Storm Water Management Connection: Why It's Important!

Industrial Storm Water Engineering Assessments

Municipal Storm Water BMP Inspections - Observations from the Field

Jobsite Safety for Storm Water Professionals

Creative PDH Ideas - Stop Watching Boring Videos!

Summary of the New CGP - Part 5

SWAW Keynote: What To Expect When You Get Inspected (Industrial Facilities)

The Voices of the Watershed

And more....





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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 show 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 contest question was:

What is the difference between BOD and COD?

Congratulations to Sandy who replied "*The difference between BOD & COD is: the analytical procedure.*" Which is definitely a part of the difference between the two, but check out the article to see more differences! Sandy, we hope you enjoy your next Amazon shopping trip!

...This Month's Contest

What other pollutants are strangely correlated with iron?

We need industrial storm water sleuths to help us with this month's question. Submit your answers by Friday, September 8th. Email your answer to jteravskis@wgr-sw.com. One winner will be selected by a random drawing to receive a \$25 gift card to Starbucks.

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