



Halides and other chemicals as tracers of contaminant origin

ENVIRONMENTAL FORENSICS IN ACTION

DR. CLINT RISSMANN

LAND AND WATER SCIENCE LTD

ADJUNCT SENIOR FELLOW

WATERWAYS CENTER FOR FRESHWATER MANAGEMENT

UNIVERSITY OF CANTERBURY/LINCOLN UNIVERSITY

Fingerprinting Contaminants – Chemical DNA

- ▶ **Most if not all wastes have distinct chemical fingerprints**
 - ▶ Different constituents
 - ▶ Metabolic processes
- ▶ **Using chemistry to trace the origin and likely source of a contaminant in a natural water body is a common practice internationally**
- ▶ **There are a gazillion (non-technical term), internationally peer reviewed articles on the use of conservative tracers to assess contaminant signatures – *please see me for some light bedtime reading***
 - ▶ Established science and well recognised

The Best Tracers of Contaminant Source are '*Conservative*'

Conservative tracers are chemicals in waste and natural waters that:

▶ **Do not change due to physical, chemical or biological processes!**

▶ Retain the signature of the contaminant as it travels from source to receiving environment

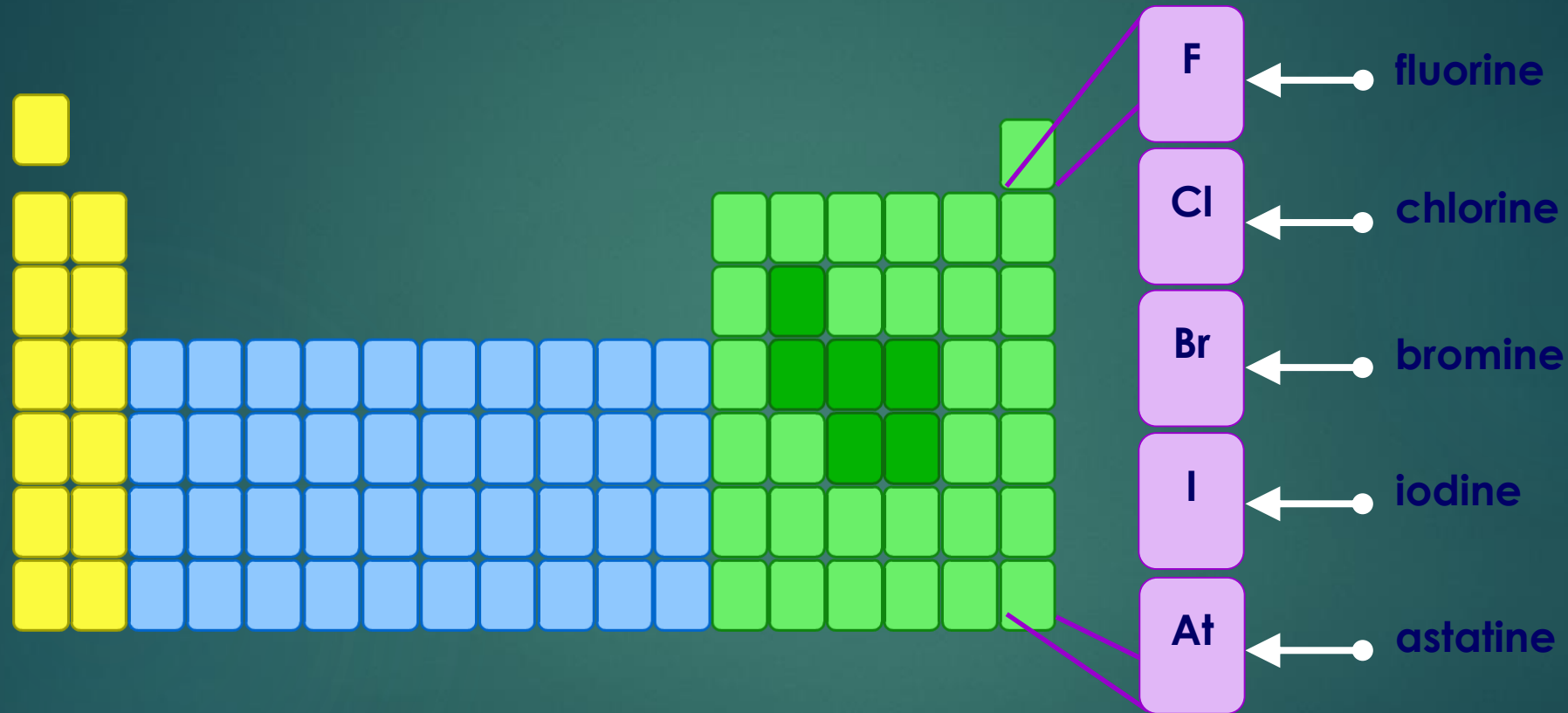
▶ **Other important characteristics of a good tracer are:**

▶ Easy of measurement with adequate detection limits

▶ Good sensitivity and repeatability

▶ Can be analysed by a commercial lab

Halides are the Most Commonly Applied Tracers of Contaminant Source



The elements in group 7 of the periodic table, on the right, are called the **halogens**.

Halides Are Everywhere

- ▶ Rock and soil
 - ▶ Seawater
 - ▶ Precipitation
 - ▶ Surface and groundwater
 - ▶ Wastes of all kinds
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- ▶ You add halides to your fish n' chips
 - ▶ Drink them from your tap

Everywhere but often Unique!

- ▶ **The ratios of conservative tracers such as the halides tend to be unique for most waste streams and distinct from natural waters**
 - ▶ Winter grazing run-off
 - ▶ Municipal and onsite septage
 - ▶ Landfill leachate
 - ▶ Industrial wastes
 - ▶ Meat processing effluents
 - ▶ Silage leachate etc
 - ▶ Fertilisers
 - ▶ Aluminum smelter slag
 - ▶ Dairy processing waste
 - ▶ etc..
- ▶ **The fact that they do not interact with much and often have unique signatures makes them ideal tracers of contaminant source**

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- ▶ Figure of ratios from source library

Application to Two Compliance Incidents in Southland

Land based application of meat processing effluent

Illegal discharge event