First Nations Environmental Health Innovation Network

CYANIDE

Fact Sheet

Cyanide is toxic to humans and is released into the environment through waste effluents from organic and chemical gold mining and milling industries, and other industrial processes such as gas works, coke ovens, gas scrubbing in steel plants, metal cleaning and electroplating. Cyanide is a fast-acting poison, but can be detoxified to a certain extent in the body. Cyanide has been used in mining since the late 1800's replacing mercury amalgamation in the mining of gold. Cyanide is used in leach mining and vat and heap-leaching, mostly to extract low-grade gold ore.

USES

Some commercial applications of cyanide include:

- electroplating,
- extraction of ores (gold, silver),
- metal processing
- photographic processes
- production of synthetic rubber
- chemical synthesis
- manufacture of plastics
- pesticide/rodenticide control
- dehairing of hides
- laboratory processes
- manufacture of dyes and pigments.

CYANIDE AND MINING

- Cyanide allows the development of low-grade ore deposits to be developed through heap leach techniques.
- This method produces a lot of waste – as much as 20 tonnes of waste for every one ton of ore.
- Crushed ore or goldmine tailings are piled up on top of a synthetic liner and then sprayed repeatedly with a cyanide solution.
- The cyanide solution trickles through the ore, bonding to the gold and other metals, and then sinks to the bottom of the heap. There it flows into collection ponds, after which the gold is recovered from the solution by adsorption onto carbon/charcoal.
- The resulting pools of cyanide have been known to kill thousands of migratory birds that drink from them.
- Leaks from these pools also contaminate groundwater. The liners beneath the ore heaps — usually made of high density polyethylene — can tear and rip from a variety of factors.
- The ore heaps may reach to as much as 150 feet in height.

CYANIDE IN THE ENVIRONMENT

In addition to mining, cyanide can be released into the environment from:

- mtal finishing plants
- iron and steel mills
- leeching from landfills
- car exhaust
- naturally occurring in: almonds, lima beans, some types of fungi, algae, and bacteria.

AIR: Hydrogen Cyanide Gas from human and industrial pollution can be found in dust particles and last 1-2 years before settling.
WATER: Is extremely persistent in groundwater and can be highly toxic.
SOIL: Cyanide migrates easily to groundwater and can be toxic to soil microorganisms.

Cyanide is not known to bioaccumulate in fish.

(See Factsheet on *Bioaccumulation of Contaminants*)

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Environmental Impact

Because of its toxicity, cyanide has significant impacts to water, soil, fish, and wildlife.

In addition to leaching, there is potential for spills from the overflow of dams, and impacts to birds that may fly into or drink from ponds.

At its most extreme, Cyanide and other heavy metals have contaminated 250 miles of rivers killing millions of fish at mine dam overflow in Baia Mare, Romania.

Environmental Management Criteria for Cyanide

Cyanide is listed on the federal *Metal Mining Effluent Regulations* as a "deleterious substance."

In BC, the regulations for preventing and managing the impacts of mine waste are captured in a range of laws including the federal *Fisheries Act*, the *BC Waste Management Act*, the *BC Mines Act*, and both the *BC and Canadian Environmental Assessment Acts*.

Health Canada has set a maximum acceptable concentration of 0.2 mg/L for free cyanide in drinking water.

Human Health Effects

Short term exposure to high levels of cyanide, by inhaling, drinking, or eating contaminated substances, or by skin exposure is very toxic and sometimes fatal.

The lethal oral dose of cyanide for an adult is 200 mg; airborne concentrations of 270 ppm is immediately fatal, and a 110 ppm for half an hour is life threatening.

Short term, high level exposure can result in brain and heart damage, coma, and death.

Lower level (sub-lethal) exposure over time can also cause problems with:

- breathing
- nervous system disorders
- digestive tract
- heart pains
- vomiting
- blood changes
- headaches
- thyroid enlargement

For More Information

Health Canada
http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/cyanide-cyanure/cyanide-cyanure-eng.pdf

Acid Mine Drainage: Mining and Water Pollution Issues in BC
http://www.miningwatch.ca/index.php?/AMD/AMD_booklet

Safe Drinking Water Foundation
http://www.safewater.org/PDFS/resourcesknowthefacts/Mining+and+Water+Pollution.pdf

Agency for Toxic Substances & Disease Registry
http://www.atsdr.cdc.gov/

CSP2 Fact Sheets Health & Environmental Effects of Trace Elements in Metal Mining Wastes
http://209.85.173.104/search?q=cache:5H-msLUonlIJ:www.csp2.org/reports/Fact_Sheets--Trace_Elements_in_Mining_Waste.pdf+CSP2+FACT+SHEETS&hl=en&ct=clnk&cd=2&gl=ca&client=firefox-a

Metal Mining Effluent Regulations
http://www.ec.gc.ca/nopp/docs/regs/mmer/mmer.pdf

Call us Toll-Free at 1-866-960-5223 for more environmental health resources

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