

NUCLEAR *facts*

How do we protect the environment in uranium mining?

THE IMPACT FROM MINING ACTIVITIES ON THE ENVIRONMENT RESULTS PRIMARILY FROM THE WASTE PRODUCTS THAT ARE GENERATED.

The ore in the ground contains only a fraction of the metal (or mineral) that is sought by the mining operation. The remaining material in the ore ends up as tailings from the mining and milling operations. This is a fact of mining.

The uranium mines in Canada take great care to ensure that the waste or tailings they produce do not cause damage to the environment. The waste management objective throughout the nuclear industry – from mines to reactors – is the same: to control and limit the release of potentially harmful substances into the environment. While uranium mines account for only 2% of all the mine tailings produced in Canada, they are leading the mining industry in providing environmental protection from potentially harmful mining wastes.

Waste tailings can be defined as those materials that are extracted in the mining process but which contain very little or none of the mineral that is being sought. After ore is removed from the ground, either by underground mining or from an open pit, it is milled. The milling process, in which the ore is crushed and treated with chemicals, extracts the mineral leaving a waste product called mill tailings.

Canada's uranium mines

Although the objective is the same, the method used for the management of tailings from uranium mine operations varies from mine to mine. Much depends on where the mine is located. The quantity of tailings produced at any uranium mine is determined by the grade of the ore. The grade is a measure of the concentration of the uranium in the ore and varies from mine to mine.

At the Elliot Lake uranium mines that operated in northern Ontario up to the 1990s, 1000 kilograms of ore had to be mined to produce 1 or 2 kg of uranium. The high-grade ore bodies in northern Saskatchewan yield between 20 and 300 kg of uranium from 1000 kg of ore. Consequently, for the production of identical amounts of uranium, the mines in Saskatchewan produce much lower volumes of tailings.



The Key Lake uranium mill in northern Saskatchewan.





Mill tailings are carefully analyzed and managed at uranium mining and milling sites.

Different mines use different chemicals in the milling process due to differences in the characteristics of ores. Sometimes, the same chemicals are used in different concentrations. As a result, tailings vary in composition from mine to mine.

In addition, specific environmental conditions at different mine sites require different methods of tailings management. The method used is selected to provide the best environmental protection under the circumstances for each mine.

Protecting the environment

Mill tailings are produced as a slurry of solids and liquids. When the slurry is discharged into a tailings management area, the solids precipitate or settle out and the water drains off. The solid tailings that result are generally similar in composition to the ore that was originally extracted from the ground. As a consequence, the solid tailings are no more hazardous

than was the original rock. They are, however, more mobile, and tailings management efforts are directed primarily to ensuring that the solid materials are contained and immobilized.

The tailings management facility constructed at the Key Lake mine, in northern Saskatchewan, used a bentonite clay liner. At the Rabbit Lake mine, mill tailings were placed into a mined-out open pit. Based on these experiences the current practice is to place mill tailings into mined-out pits and covered with water.

The volume of water that is left from mining and milling processes is too large to be stored indefinitely. At most mines a portion of this water can be reused in the milling process; however, much of it must be discharged to the environment. Before this can happen, the water is cleaned by the addition of certain chemicals. For example, barium chloride is added to remove radium by precipitation.

The water discharged from uranium mines and mills in Canada is monitored to ensure that it meets limits on chemical concentrations that have been prescribed by the government. These limits ensure that the impact on the environment is minimal.



The water discharged from uranium mines and mills is monitored to ensure it meets limits imposed by government.

Excess rock that is removed to gain access to the highly concentrated ore body can be stored on the surface. Acidity of water draining from the storage area is carefully neutralized.

Role of regulatory agencies

Canada's uranium mines are among the most highly regulated industrial operations in the world. Both federal and provincial authorities play a significant role in inspecting and examining the mine operations to ensure that both employees and the environment are protected.

See also the Web site of Cameco Corporation www.cameco.com and Areva Resources www.arevaresources.com

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