

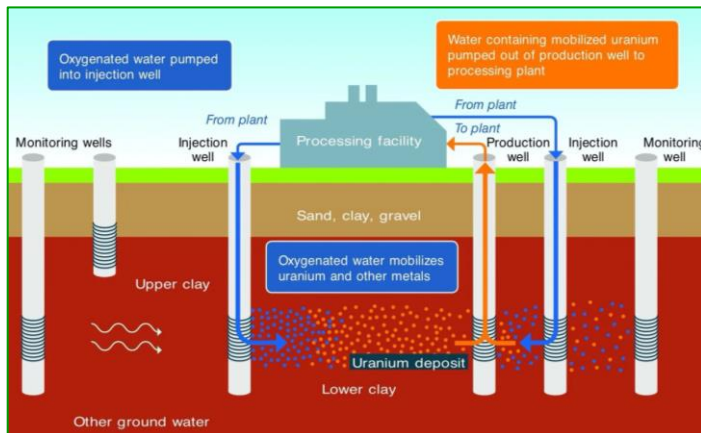
## FACTSHEET: In-situ Leaching (ISL)

Conventional uranium mining involves removing uranium ore from the ground. In contrast, in-situ leaching (ISL), also known as in-situ recovery (ISR), leaves uranium ore in the ground, and recovers the uranium by dissolving the uranium-bearing minerals and subsequent pumping of the uranium-containing solution to the surface. The solution is then further treated in a plant to retrieve the uranium in much the same way as in any other conventional uranium recovery plant. Consequently, there is little surface disturbance, and no open pits, tailings or waste rock are generated. Uranium ISL uses groundwater circulating in the orebody, which is mixed with either acid or alkaline leaching agents. In both cases, the fortified groundwater is pumped into the aquifer via a series of injection wells, it then slowly migrates through the ore body leaching the uranium on its way to strategically placed arrays of extraction wells surrounding the injection well, where pumps bring the liquid to the surface for processing. Contamination of the aquifer outside the orebody needs to be carefully avoided by constantly pumping extraction boreholes at a higher rate than the injection well. Control boreholes surrounding the array are used to immediately detect any leaks.

Uranium deposits suitable for ISL occur in permeable sand or sandstones, confined above and below by impermeable strata, and which are below the water table. Such deposits were formed by the movement of uranium-bearing groundwater through an aquifer, with precipitation of uranium minerals occurring when the oxygen content decreases along extensive oxidation-reduction interfaces. Common uranium minerals forming in this way are uraninite [ $UO_2$ ] and coffinite [ $U(SiO_4) \cdot nH_2O$ ], usually as coatings on individual sand grains.

Currently, 57% of the uranium mined in the World is from ISL methods. The majority of uranium mining operations in the USA, Kazakhstan and Uzbekistan use ISL, however, it is also undertaken in Australia, China, and Russia. ISL is widely seen as the most cost effective and environmentally acceptable method of uranium mining.

Techniques for ISL have evolved to the point where it is a controllable, safe, and environmentally benign method of mining, which operates under strict operational and regulatory controls. Due to the low capital costs relative to conventional mining, it can often be a more effective method of mining low-grade uranium deposits.



An ISL operation in Australia

Source: WNA; US Environmental Protection Agency; Geoscience Australia

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