

Site characterization of gold mining for arsenic dispersion

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Gold mining is the potential source of arsenic dispersion. Arsenic occurs naturally with gold ore as Arsenopyrite. When gold is extracted, tailings contaminated with arsenic are usually disposed at a secured landfill site. However, arsenic may leach into soil and water if the disposal site is not appropriately managed.

Gold mining at Wansapung District, Loei Province, Thailand has been suspected of dispersing arsenic into the local environment. Villagers in the nearby villages have complained about water contamination by arsenic since 2006. Such contamination is harmful to the environment and human health on intake or contact. A determination of arsenic in surface water by the responsible agency found the concentration was very low, less than 0.01 mg/l of the designated maximum concentration level (MCL) set by the US EPA. However, so far as known by the researchers, there has been no investigation arsenic levels in soil and sediment of the area. This paper reports investigations at sites with potentially high levels of arsenic contamination, and examined the transportation or dispersion behaviour of arsenic.

A total of 37 surface soil samples were taken from 30 stations located in the catchment of the gold mining area and 7 stations located outside the mining area or in another catchment. Similarly, a total of 30 surface water samples were taken from 23 stations inside and 7 stations outside the catchment of the gold mining area.

The results indicated arsenic was present in surface soil (inside: 0.33–56.17 mg As/kg of soil; outside 0.64-10.46 mg As/kg of soil) and water in both catchments, but it was most evident in soil. The highest arsenic level was found near Phulek Creek, which has been designated for the study of arsenic dispersion and transportation.

As arsenic was found at higher concentrations in soil than water, it was decided to determine arsenic in sediment and surface water at Phulek Creek in rainy and winter seasons (Figures 1.1). The findings are preliminary but can be summarized as follows.

Arsenic contamination was higher in sediment than in surface water. In both rainy and winter seasons, the arsenic level was detected in surface water and sediment at the upstream stations (close to the mining area). Arsenic contamination was highest in the rainy season except for locations (SD19, SD20, SD-21 and SW-21). Similarly, higher levels of arsenic were found 50 cm below the surface sediment.

Arsenic concentrations on land adjacent to sites returning high arsenic concentrations were also tested. Soil profiles were sampled near SD-21 along a 12 m transect. Arsenic levels at 3-7 m were 500-1,000 mg/Kg. This might influence the higher winter concentrations of arsenic at SD19, SD20, SD-21 and SW-21. In addition, it was noted that this Creek has been overgrown with vegetation. Natural phytoremediation may also occur and influence arsenic concentration in sediment.

Further research should investigate the transportation and dispersion of arsenic in Phulek Creek in order to identify mitigation measures for environment arsenic contamination.

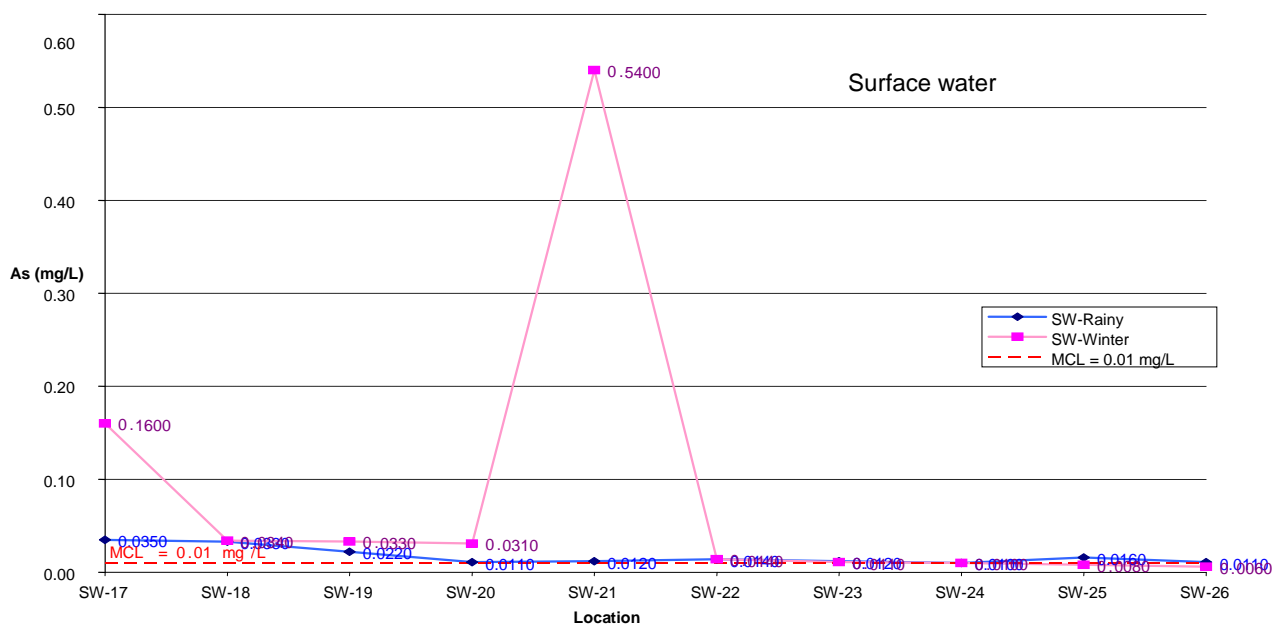
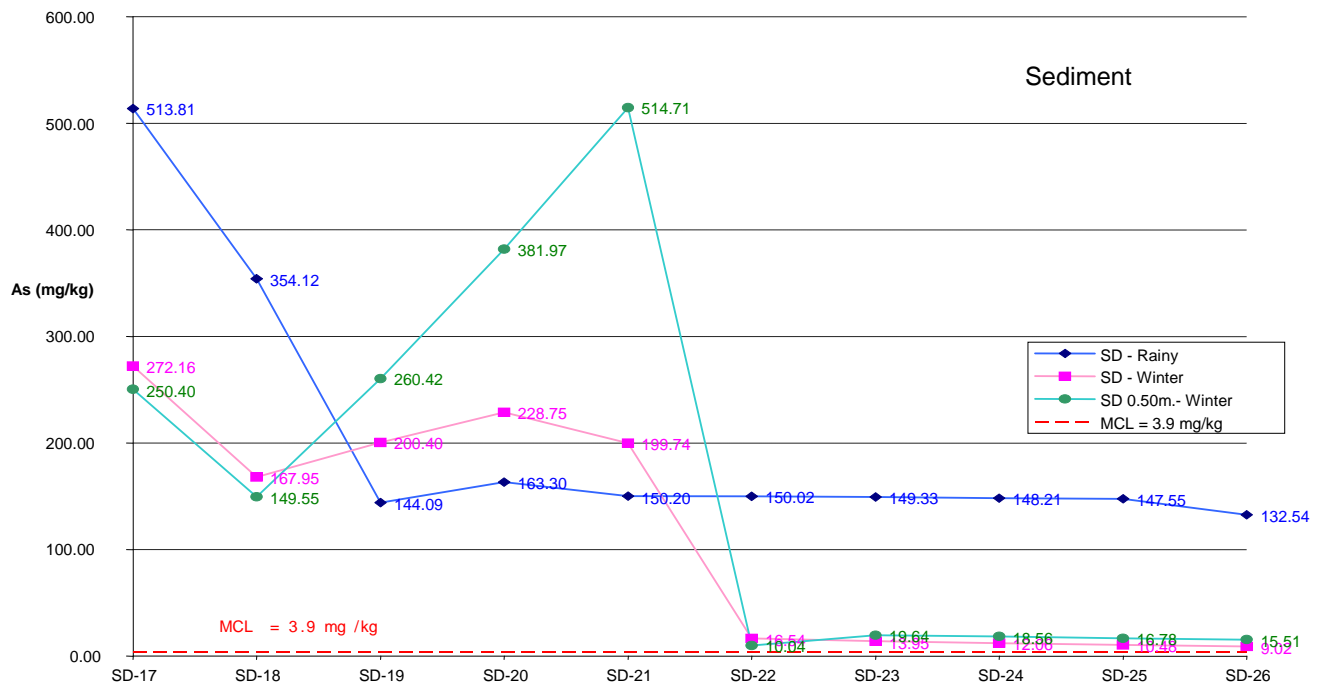


Figure 1.1 Arsenic contamination in sediment and surface water at each location in Phulek Creek

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