

Buyat Bay Environmental Monitoring of 2007

By

Independent Scientific Panel

SUMMARY

The Independent Scientific Panel (ISP) was established under the “Goodwill Agreement” entered into by the Government of Indonesia and PT Newmont Minahasa Raya, to monitor and assess the marine environment adjacent to mine tailings placed in Buyat Bay, North Sulawesi for a further 10 years. The tailings placement occurred between 1996 and 2004 as part of the operation of the Mesel gold mine.

The ISP compiled a complete “ISP Environmental Monitoring Plan, 2007”, covering seawater quality and sediment/tailings quality sampling, benthic marine invertebrate communities identification, metal content analyses of fish tissue, coral reef communities survey, water column stratification survey, seabed bathymetry mapping, seafood consumption study, a market basket fish metals content study and a desktop human biomarker review study in relation to human health. Contractors were selected to carry out the environmental monitoring program as set forth in the ISP Environmental Monitoring Plan, 2007, through a tender/bidding process. Monitoring items in the ISP Environmental Monitoring Plan, 2007 were grouped into Human Health, Environmental Geochemistry, and Marine Biology. Successful candidates to carry out each individual group monitoring were Universitas Sam Ratulangi/SEAMEO Universitas Indonesia, BPPT-Engineering, and Institut Pertanian Bogor, respectively. The first survey of the ISP program took place in late September 2007, the results from which are provided in this report.

Seawater samples were collected from several locations and water depths in Buyat Bay and reference locations which are far away from the deposited tailings. Seawater quality parameters that were measured were dissolved arsenic, dissolved mercury and total suspended solids. Arsenic and mercury concentrations in all seawater samples were below the Indonesian Seawater Quality Standard for Marine Biota. Total suspended solids data showed no significant difference between samples from Buyat Bay and the reference sites. Seawater data from this survey indicate that arsenic, mercury and total suspended solids concentrations in seawater overlying the tailings were the same as the reference stations away from the tailings and are present at concentrations typical of unimpacted coastal marine waters.

In order to determine the physical structure of the marine water column in Buyat Bay as well as coastal areas in the vicinity of the bay, water column profiling using a Conductivity_Temperature_Depth (CTD) probe was conducted during the September 2007 survey. The data show that seawater temperature decreases and density increases with depth. The observed thermocline in Buyat Bay during September 2007 varied between a water depth of 20 to 60 meters, with an average depth of the thermocline at approximately 40 meters.

Sediment samples were collected from several locations in Buyat Bay and reference locations which are far away from the deposited tailings. Sediment samples were analyzed for total arsenic and mercury as well as aluminum, iron, manganese, silicon, total organic carbon and grain size. As expected, total arsenic and mercury concentrations in the sediments in the tailings footprint area are higher than the background range. There are no marine sediment standards for arsenic and mercury set by Indonesian regulatory authorities due to a lack of scientific evidence on the correlation between the sediment chemistry and the availability of metals in the sediment that can be utilized by organisms.

The survey results of marine benthic invertebrate samples collected from several locations in Buyat Bay and reference locations which are far from the deposited tailings indicate that the number of different organisms and the abundance of organisms at each station did not differ greatly among the stations.

A bathymetric survey of Buyat Bay, extending 1.5 km offshore, providing information on the location of tailings footprint in Buyat Bay, was conducted during the September 2007 survey. The survey results show that the present dimensions of the tailings mound is approximately 750 m in length (N-S axis), 500 m in width (E-W axis) and 12 meters high.

Fish were caught from Buyat Bay and a reference site, more than 10 kms away from the tailings for the purpose of sampling total arsenic and mercury in muscle tissue. Twenty five (25) specimens were analyzed from each location. The concentrations of total arsenic and mercury in fish from both Buyat Bay and the reference site were below international standards for the protection of human health (New Zealand and WHO).

Coral reef and fish observation was conducted at six locations in Buyat Bay, Ratatotok Peninsula and at reference locations. The coral reef results show that there is no correlation between the types of coral observed and proximity to the area of tailings deposition. All monitored stations showed relatively similar numbers of total fish and fish species observed.

The fish consumption study was to use a standard pre-trialed and quality assured questionnaire to determine the levels of consumption of freshwater and marine fish and other

seafood in the Buyat Bay, Buyat, Basaan and Ratatotok communities. The survey of the village-specific food consumption frequency patterns and quantification of the amounts consumed was conducted in October 2007, representing the dry season consumption patterns. The fish consumption of adults and children in Buyat Pante was higher than that in the other three locations. The daily consumption of sea fish was higher than that of fresh water and other sea food both in all groups of age, sex, and location observed.

Monitoring of total arsenic and total mercury in fish flesh composite samples sourced from the fishermen living at Buyat Bay, from the local fish markets at Buyat and Ratatotok villages and from the fish market at Manado City was undertaken in October 2007. The sample collection, pre-preparation and analysis program were conducted to best international practice, including the procedures recommended by the World Health Organisation (WHO) for the preparation of “as consumed” fish. All mean total mercury levels for the present monitoring were below the FAO/WHO Codex standard values for mercury. Inorganic arsenic levels in fish were also below international food standards (Thailand, Australia & New Zealand). The total arsenic and mercury results from the Buyat-Ratatotok area are very similar to those reported for the Manado City and Jakarta fish markets as well as being within the mean values reported by national total diet surveys in Australia, New Zealand the United Kingdom and the United States.

This report constitutes the result of the first Buyat Bay Environmental Monitoring undertaken from September to October 2007; as such the ISP has not been able to draw a conclusion on the data obtained to answer if the tailings placement has caused impact after 3 years of mine closure. Inputs from the field monitoring result and responses given will be used by the ISP to perfect the next monitoring.
