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REPORT: REVIEW OF ANALYTICAL RESULTS FROM ELEMENTS LABORATORIES OF ANALYSES CONDUCTED ON SEDIMENTS AND WATER (MARINE AND FRESH WATER) COLLECTED ON 28 JULY 2021

I received the consolidated analytical report from Elements on Friday 20 August 2021 with results of the analyses conducted on freshwater sediments, fresh water, beach sediments and sea water for metals, pesticides (these include insecticides and fungicides) and volatile organic compounds. I did the following:

1. Conducted an in-depth review of the beach sediments and sea water analysis for arsenic and other pesticides. Apart from arsenic that was found in both beach sediments and sea water, the only pesticides that were detected at any concentration of interest in the beach sediment and sea water samples were –
 - a. Atrazine at a very low concentration of 6.11 ug/l (0.0061 mg/kg) beach sediments. ADI = 0.1 mg/kg body mass per day for human beings which requires the oral ingestion of an impossible quantity of 16 kg beach sand per day to reach the ADI.
 - b. Atrazine at very low concentrations in sea water ranging from 1.05 to 1.5 ug/l (0.0001 to 0.00015 mg/l) in sea water. ADI = 0.1 mg/kg body mass per day for human beings which means drinking 667 litres of sea water per day to reach the ADI. Worst case scenario for aquatic organisms is LC₅₀ (96hr) = 430 ug/l for guppies which exceeds the analyzed concentration by 2.9 million times.
 - c. Diuron at a concentration of 18 ug/l (0.018 mg/l). ADI = 0.007 mg/kg body mass per day for human beings which means a person drinking 2.5 litres sea water per day will exceed the ADI for diuron. Worst case scenario for marine organisms is LC₅₀ (7 days) = 18.3 ug/l for *Lemna gibba* which is equal to the sea water concentration of diuron.
 - d. Chlorpyrifos at a concentration of 0.9 ug/l (0.00009 mg/l). ADI = 0.01 mg/kg body mass per day. This concentration is, however, at a level of notable toxicity to Korean shrimps (LC₅₀ (96hr) = 0.05 ug/l).

This confirms my opinion that the pesticides that entered the sea via the estuary mouth underwent significant dilution (due to dissipation to a point of no concern for human exposure at the date of sampling. None of these substances will singularly pose a risk to human health because of the insignificant concentrations which are all well below the ADIs of each individual substance. Diuron and chlorpyrifos that were detected and quantified pose a risk to marine invertebrates and these concentrations are also reflected in Nicolette's observations on dead marine invertebrates.

It is very likely that the concentrations of these substances will be lower by now due normal degradation and dissipation, but I am awaiting new results of samples taken more recently and submitted for analysis.

2. A comprehensive review of the MSMA (reflected as arsenic in analytical data but reverse calculated to MSMA quantities) for the beaches and sea water is available in the attached EXCEL PDF document. The MSMA at the date of sampling posed no acute risk to people and most probably no chronic risk to people either (my personal opinion). If the MSMA is reduced to elemental arsenic, chronic exposure to a daily intake of between 0.05 and 0.5 mg/kg body mass may result in serious health effects such as liver cancer. The conditions during the fire and in the environment into which MSMA was deposited are not conducive to total reduction of MSMA to elemental arsenic. The significant difference in sediment and sea water concentration of the MSMA indicates very strongly that MSMA is still intact and has not reduced to elemental arsenic.
3. Since there is only one comprehensive set of analytical data available at present, I cannot make any assumptions about the reduction in the pesticide "load" in the sediments and water of the other sample site, suffice to say that as expected some substances reflect in low to extremely high concentrations in the sediments -
 - a. Dimethoate was detected at a low concentration of 3.8 ug/kg (0.0038 mg/kg at SS2A).
 - b. Bromoxynil was detected in concentrations from 37,632mg/kg (37.632 gram per kg) and declined in concentration in site downstream from the warehouse site.
 - c. Clopyralid was detected at 5,167.4 mg/kg (5.167 gam per kg) and declined in concentration downstream from the warehouse site.
 - d. Ioxynil was detected at 10,451 mg/kg (10.45 gram per kg) and declined in concentration in sites downstream from the warehouse site.
 - e. Picloram was detected at 235,308 mg/kg (235,3 gram per kg) in the sample sites closest to warehouse site and declined in concentration downstream from the warehouse site.
 - f. Ametryn was detected at 267 mg/kg (0.267 gram per kg) in the sample sites closest to warehouse site and declined in concentration downstream from the warehouse site.
 - g. Atrazine was detected at 673 mg/kg (0.673 gram per kg) in the sample sites closest to warehouse site and declined in concentration downstream from the warehouse site.
 - h. Terbutylazine was detected at 553 mg/kg (0.553 gram per kg) and declined in sites downstream from the warehouse site.
 - i. Other triazine herbicides were detected at <10 mg/kg and declined in concentration downstream from the warehouse site.
 - j. Diuron was detected at 243 mg/kg (0.243 gram per kg) in the sample sites closest to warehouse site which means a direct deposit of the substance from the warehouse to the tributary.
- And in the surface waters insecticides and herbicides that were detected include -
 - a. Chlorpyrifos-ethyl (insecticide) at 0.157 mg/.
 - b. Dichlorvos (dichlorvos) at 0.0898 mg/l.
 - c. Clopyralid (herbicide) at 0.071 mg/l.

- d. Atrazine (herbicide) at 12.596 mg/l.
 - e. Diuron (herbicide) at 4.977 mg/l.
4. I did not see any analytical results for Tebuthiuron in the analyses conducted by Elements and have no doubt that this herbicide must be in the polluted water courses. The other substance that I thought they should have detected in the sediments and surface water due the high volumes that were present in the warehouse, is Amicarbazone and its primary metabolite benomyl. These compounds were as far as I could see not analyzed for by Elements. It is very likely that these two substances are present in sediments and surface waters.
5. MSMA in the water courses at the time samples showed concentrations (retro-calculated from arsenic concentrations) ranging from 2.45 mg/k to 443 mg/kg in sediments and lower concentrations in the surface waters ranging from 2.205 mg/l to 32.34 mg/l. This is still of human health and environmental health concerns.

Recent samples for the beach sediment and estuary have been submitted to two South African SANAS accredited laboratories with requests to analyze for specific substances of concern and for substances that can be used as markers for the rate of chemical decomposition of the pesticides.



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