Supplementary material

Table 1: Concentrations of metals found in certified reference material (Eustarian sediment MESS-4) and DOLT-4 (Dogfish liver certified reference material) respectively

|  |  |  |
| --- | --- | --- |
| Metals | Eustarian sediment MESS-4 | Dogfish liver certified reference material |
| Certified concentration (mg/kg) | Actual Concentration (mg/kg) | Recovery % | Certified concentration (mg/kg) | Actual Concentration (mg/kg) | Recovery % |
| Cu | 32.9 | 33.6 | 102.13 | 31.2 | 30.6 | 98.08 |
| Cd | 0.28 | 0.3 | 110.00 | 14.7 | 12.9 | 87.76 |
| Fe | 37900 | 35397.1 | 93.40 | 1833 | 1912.5 | 104.34 |
| Mn | 298 | 286.0 | 95.96 | 8.92 | 9.7 | 109.19 |
| Cr | 94.3 | 97.5 | 103.42 | 2.33 | 2.2 | 93.56 |
| Zn | 147 | 148.5 | 101.01 | 105.1 | 104.4 | 99.37 |
| As | 21.7 | 19.9 | 91.61 | 34.4 | 33.0 | 95.87 |

Table 2**.** Parameters and assumptions for calculating Total Hazard Quotients (THQ), Hazard Index (HI) and Reference doses (RfD)

|  |
| --- |
| **Total Hazard Quotients (THQ)** |
| **Parameters** | **Unit** | **Adult** | **Child** | **References** |
| Ef | d/year | 208 | 208 | Preeti et. al. 2018 |
| Ed | years | 68.35 | 8 | World Bank report; So et al. 2009 |
| IR of Fish | gm/d d.w. | 15.6 | 8.4 | Preeti et. Al., 2018 |
| Bw | kg | 52 | 15 | Giri et al., 2015 |
| AT | days | 208 \* 68.35 | 208 \*8 | USEPA 2000 |
| **Hazard Index (HI)** |
| Cw | mg/L |  |  | As per this study |
| IR | l/d | Male: 4 Female: 3 | 1 | Giri et al., 2015 |
| EF | Events/day | 365 | 365 | USEPA 2004 |
| ED | years | Male: 64 Female: 67 | 10 | USEPA 2004 |
| ET | h/days | 0.58333 | 0.58333 | RAIS (2005,2009) |
| F | - | 1 | 1 | Mishra et al. 2014 |
| AT | days | Male: 64\*365 Female: 67\*365 | 10 \* 350 | USEPA 2004 |
| BW | Kg | Male: 65 Female: 55 | 15 | Giri et al., 2015 |
| PC | m/h | Cu, Cd, Fe, Mn: 1E-05; Zn: 6E-07 | 0.66 | USEPA 2015 |
| **Reference Doses (RfD)** |
| **Metal** | **RfD (mg/kg/d)** | **GIABS** |
| As | 0.0003 | 1 |
| Cd | 0.001 | 0.025 |
| Cr | 0.003 | 0.025 |
| Cu | 0.04 | 1 |
| Fe | 0.7 | 1 |
| Mn | 0.14 | 1 |
| Zn | 0.3 | 1 |

Table 3(a): Heavy metal concentration in sediment of Pre Monsoon season

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** |  | **Cu** | **Cd** | **Fe** | **Mn** | **Cr** | **Zn** | **As** |
| mg/kg |
| 1A | Avg | 4.513 | 0.859 | 2397.137 | 123.954 | 185.526 | 48.48 | .0018 |
| SD | .522 | 0.123 | 6.241 | 0.822 | 1.280 | 1.188 | .0006 |
| 2A | Avg | 3.919 | 1.232 | 2706.910 | 82.068 | 122.828 | 41.754 | 0.0479 |
| SD | 0.622 | 0.210 | 6.281 | 1.070 | 0.885 | 0.986 | 0.0028 |
| 3A | Avg | 4.804 | 1.754 | 2349.790 | 73.976 | 45.410 | 63.346 | 0.0590 |
| SD | 0.531 | 0.276 | 16.671 | 0.403 | 0.681 | 0.462 | 0.0016 |
| 4A | Avg | 3.854 | 1.892 | 2698.366 | 174.454 | 26.109 | 49.252 | 0.068 |
| SD | 0.545 | 0.209 | 25.389 | 1.279 | 0.910 | 0.529 | 0.0015 |
| 5A | Avg | 4.066 | 1.130 | 2297.302 | 91.376 | 18.76 | 32.542 | 0.0105 |
| SD | 0.513 | 0.176 | 8.909 | 0.931 | 0.328 | 0.837 | 0.0021 |
| 6A | Avg | 4.956 | 1.162 | 216.568 | 175.128 | 175.502 | 52.452 | 0.0727 |
| SD | 0.404 | 0.208 | 4.053 | 0.800 | 0.851 | 0.587 | 0.0042 |
| 7A | Avg | 4.518 | 0.976 | 2049.455 | 105.080 | 108.942 | 87.682 | 0.0303 |
| SD | 0.648 | 0.243 | 389.429 | 3.321 | 5.647 | 1.333 | 0.0006 |
| 8A | Avg | 3.384 | 0.760 | 2197.224 | 63.890 | 32.300 | 61.482 | 0.0047 |
| SD | 0.469 | 0.088 | 52.126 | 1.696 | 1.326 | 0.738 | 0.0007 |
| 9A | Avg | 3.990 | 1.488 | 2396.182 | 93.638 | 72.694 | 72.168 | 0.0053 |
| SD | 0.822 | 0.687 | 11.586 | 1.726 | 0.813 | 1.433 | 0.0011 |
| 10A | Avg | 4.200 | 1.110 | 2118.440 | 92.350 | 19.888 | 42.300 | 0.0071 |
| SD | 0.257 | 0.144 | 15.323 | 0.812 | 0.935 | 0.789 | 0.0001 |
| 11A | Avg | 3.420 | 0.802 | 2314.124 | 68.354 | 21.840 | 40.796 | 0.0051 |
| SD | 0.220 | 0.120 | 11.945 | 0.786 | 0.777 | 0.573 | 0.0001 |
| 12A | Avg | 3.846 | 0.958 | 2295.412 | 70.040 | 25.694 | 38.448 | 0.0062 |
| SD | 0.208 | 0.172 | 16.672 | 1.007 | 1.001 | 0.766 | 0.0001 |
| F Factor |  | 5.559 | 16.796 | 26.899 | 3.430E3 | 4.717E3 | 80.930 | 1.003E3 |

Table 3(b) Heavy Metal concentration in sediment of Post Monsoon season

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** |  | **Cu** | **Cd** | **Fe** | **Mn** | **Cr** | **Zn** | **As** |
| mg/kg |
| 1A | Avg | 3.324 | 0.464 | 2060.362 | 122.124 | 184.005 | 47.600 | 0.0013 |
| SD | 0.396 | 0.159 | 51.069 | 1.146 | 2.114 | 1.722 | 0.0004 |
| 2A | Avg | 3.571 | 0.576 | 2593.426 | 81.746 | 119.122 | 40.302 | 0.0475 |
| SD | 0.589 | 0.178 | 9.282 | 1.043 | 5.618 | 2.263 | 0.0030 |
| 3A | Avg | 4.358 | 1.098 | 2124.202 | 72.472 | 47.280 | 66.186 | 0.0608 |
| SD | 0.107 | 0.129 | 30.268 | 1.614 | 3.096 | 4.203 | 0.0021 |
| 4A | Avg | 3.456 | 0.981 | 2449.924 | 174.958 | 25.774 | 49.246 | 0.0700 |
| SD | 0.677 | 0.122 | 33.382 | 3.259 | 1.139 | 0.589 | 0.0049 |
| 5A | Avg | 3.568 | 0.570 | 2096.048 | 93.842 | 18.754 | 31.630 | 0.0093 |
| SD | 0.411 | 0.118 | 33.961 | 4.312 | 1.180 | 1.562 | 0.0007 |
| 6A | Avg | 4.504 | 0.662 | 2176.572 | 176.282 | 176.206 | 51.985 | 0.0698 |
| SD | 0.492 | 0.047 | 19.724 | 3.790 | 2.491 | 1.093 | 0.0046 |
| 7A | Avg | 3.612 | 0.596 | 108.134 | 105.228 | 111.176 | 80.338 | 0.0327 |
| SD | 0.454 | 0.165 | 2.852 | 3.950 | 1.632 | 8.755 | 0.0054 |
| 8A | Avg | 3.120 | 0.576 | 1908.552 | 66.746 | 31.622 | 59.834 | 0.0042 |
| SD | 0.394 | 0.137 | 38.071 | 3.583 | 1.319 | 0.915 | 0.0005 |
| 9A | Avg | 3.798 | 1.474 | 2138.346 | 96.110 | 69.856 | 74.514 | 0.0048 |
| SD | 0.410 | 0.463 | 35.943 | 4.528 | 4.692 | 3.030 | 0.0007 |
| 10A | Avg | 3.998 | 0.902 | 2025.228 | 88.980 | 17.138 | 40.95 | 0.00624 |
| SD | 0.108 | 0.154 | 7.241 | 0.744 | 0.433 | 0.457 | 0.0001 |
| 11A | Avg | 3.330 | 0.682 | 2194.180 | 61.806 | 19.774 | 39.080 | 0.0043 |
| SD | 0.221 | 0.060 | 11.852 | 0.728 | 0.830 | 0.704 | 0.0001 |
| 12A | Avg | 3.538 | 0.838 | 2125.002 | 68.732 | 21.826 | 36.098 | 0.0058 |
| SD | 0.221 | 0.034 | 10.564 | 0.657 | 0.824 | 0.674 | 0.0001 |
| F Factor |  | 4.89 | 13.79 | 2.625-E3 | 767.72 | 2.25-E3 | 97.86 | 423.7 |