SUPPLEMENTARY MATERIAL

Table 1 – Complete water quality dataset of the Formoso River basin

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sigla** | **Turbidity** | **S.S.** | **Color** | **Total Hard.** | **Alkalinity** | **HCO3-** | **CO32-** |
|  | NTU | (mg.L-1) | (mg Pt-Co/L) | (mg CaCO3/L) | (mg CaCO3/L) | (mg.L-1) | (mg.L-1) |
| P01 | 33.0 | 18.8 | 55 | 42 | 59.4 | 72.4 | 0.0 |
| P02 | 41.8 | 20.8 | 56 | 28 | 28.6 | 34.9 | 0.0 |
| P03 | 26.0 | 12.4 | 29 | 20 | 26.4 | 32.2 | 0.0 |
| P04 | 35.8 | 14.8 | 16 | 22 | 22.0 | 26.8 | 0.0 |
| P05 | 63.0 | 7.6 | 92 | 60 | 50.6 | 61.7 | 0.0 |
| P06 | 34.1 | 20.8 | 35 | 22 | 28.6 | 34.9 | 0.0 |
| P07 | 20.8 | 13.6 | 19 | 16 | 24.2 | 29.5 | 0.0 |
| P08 | 34.9 | 16.36 | 34 | 38 | 41.8 | 51.0 | 0.0 |
| P09 | 43.4 | 31.5 | 49 | 22 | 28.6 | 34.9 | 0.0 |
| P10 | 30.1 | 8.5 | 84 | 22 | 26.4 | 32.2 | 0.0 |
| P11 | 6.0 | 1.5 | 3 | 44 | 30.8 | 37.6 | 0.0 |
| P12 | 14.3 | 7.5 | 15 | 8 | 11.0 | 13.4 | 0.0 |
| P13 | 13.5 | 1 | 10 | 8 | 11.0 | 13.4 | 0.0 |
| P14 | 0.9 | 4 | 16 | 12 | 11.0 | 13.4 | 0.0 |
| P15 | 31.5 | 15.5 | 61 | 18 | 20.0 | 24.4 | 0.0 |
| P16 | 29.1 | 19.5 | 46 | 6 | 24.2 | 29.5 | 0.0 |
| P17 | 11.5 | 3.5 | 24 | 6 | 19.8 | 24.1 | 0.0 |
| P18 | 10.5 | 1 | 34 | 32 | 24.2 | 29.5 | 0.0 |
| P19 | 10.5 | 3.5 | 16 | 14 | 13.2 | 16.1 | 0.0 |
| P20 | 21.0 | 3 | 23 | 10 | 8.8 | 10.7 | 0.0 |
| P21 | 25.1 | 4.4 | 2 | 42 | 44.0 | 53.7 | 0.0 |
| P22 | 34.0 | 2.7 | 43 | 32 | 41.8 | 51.0 | 0.0 |
| P23 | 17.9 | 1.9 | 9 | 34 | 22.0 | 26.8 | 0.0 |
| P24 | 25.5 | 2.4 | 3 | 68 | 72.6 | 88.5 | 0.0 |
| P25 | 14.3 | 0.4 | 0 | 80 | 85.8 | 104.6 | 0.0 |
| P26 | 34.0 | 5.5 | 0 | 118 | 125.4 | 152.9 | 0.0 |
| P27 | 0.0 | 5.4 | 20 | 136 | 118.8 | 144.9 | 0.0 |
| P28 | 28.0 | 2.9 | 26 | 40 | 39.6 | 48.3 | 0.0 |
| P29 | 20.0 | 4 | 3 | 40 | 52.0 | 63.4 | 0.0 |
| P30 | 19.7 | 2 | 10 | 138 | 147.4 | 179.8 | 0.0 |
| P31 | 14.7 | 1.9 | 6 | 130 | 145.2 | 177.1 | 0.0 |
| P32 | 14.7 | 1.6 | 24 | 28 | 33.0 | 40.2 | 0.0 |
| P33 | 17.5 | 1.3 | 18 | 22 | 6.6 | 8.0 | 0.0 |
| P34 | 24.5 | 3.8 | 7 | 30 | 11.0 | 13.4 | 0.0 |
| **Mean** | 24.5 | 4.0 | 19.5 | 29.0 | 28.6 | 34.9 | 0.0 |
| **SD** | 12.5 | 7.7 | 23.2 | 37.4 | 38.5 | 47.0 | 0.0 |
| **Min** | 0.9 | 0.4 | 0.0 | 6.0 | 6.6 | 8.0 | 0.0 |
| **Max** | 63.0 | 31.5 | 92.0 | 138.0 | 147.4 | 179.8 | 0.0 |
| **CV** | 0.5 | 1.9 | 1.2 | 1.3 | 1.3 | 1.3 | - |
| **CONAMA CLASSE.II** | **100** | 500 | 75 |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sigla** | **Cl-** | **N-NO3-** | **NO3-** | **N-NH3** | **NH3** | **PO4** | **Ca2+** | **Mg2+** | **Na+** |  |
|  | (mg.L) | (mg.L-1) | (mg.L-1) | (mg.L-1) | (mg.L-1) | (mg.L-1) | (mg.L-1) | (mg.L-1) | (mg.L-1) |  |
| P01 | 5 | 0.1 | 0.3 | 0.0 | 0.0 | 0.1 | 12.8 | 2.4 | 6.88 |  |
| P02 | 3 | 0.1 | 0.5 | 0.0 | 0.0 | 0.0 | 7.2 | 2.4 | 2.84 |  |
| P03 | 3 | 0.1 | 0.2 | 0.0 | 0.0 | 0.1 | 4.8 | 1.9 | 1.91 |  |
| P04 | 3 | 0.1 | 0.7 | 0.0 | 0.0 | 0.0 | 8.8 | 0.0 | 4.24 |  |
| P05 | 16 | 0.1 | 0.5 | 0.1 | 0.1 | 0.1 | 13.6 | 6.3 | 14.32 |  |
| P06 | 4 | 0.1 | 0.3 | 0.0 | 0.0 | 0.1 | 8.1 | 0.4 | 2.92 |  |
| P07 | 3 | 0.1 | 0.3 | 0.0 | 0.0 | 0.1 | 6.4 | 0.0 | 2.55 |  |
| P08 | 4 | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 | 10.4 | 2.9 | 1.44 |  |
| P09 | 3 | 0.1 | 0.4 | 0.0 | 0.0 | 0.1 | 9.6 | 0.0 | 2.67 |  |
| P10 | 4 | 0.1 | 0.6 | 0.0 | 0.0 | 0.0 | 4.8 | 2.4 | 2.51 |  |
| P11 | 37 | 1.3 | 5.6 | 0.0 | 0.0 | 0.0 | 11.2 | 3.9 | 14.43 |  |
| P12 | 6 | 0.1 | 0.4 | 0.0 | 0.0 | 0.0 | 2.4 | 0.5 | 0.98 |  |
| P13 | 6 | 0.1 | 0.4 | 0.1 | 0.1 | 0.0 | 3.2 | 0.0 | 1.54 |  |
| P14 | 6 | 0.1 | 0.5 | 0.0 | 0.0 | 0.0 | 5.6 | 0.0 | 1.11 |  |
| P15 | 5 | 0.1 | 0.6 | 0.0 | 0.0 | 0.0 | 4.8 | 1.5 | 1.77 |  |
| P16 | 8 | 0.1 | 0.5 | 0.0 | 0.0 | 0.0 | 5.6 | 0.0 | 1.87 |  |
| P17 | 9 | 0.1 | 0.5 | 0.0 | 0.0 | 0.0 | 2.4 | 0.0 | 1.27 |  |
| P18 | 6 | 0.1 | 0.5 | 0.0 | 0.0 | 0.0 | 9.6 | 1.9 | 1.17 |  |
| P19 | 6 | 0.1 | 0.4 | 0.0 | 0.0 | 0.0 | 3.2 | 1.5 | 1.25 |  |
| P20 | 9 | 0.1 | 0.5 | 0.0 | 0.0 | 0.0 | 3.2 | 0.5 | 1.29 |  |
| P21 | 3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | 2.9 | 2.10 |  |
| P22 | 7.5 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 8.0 | 2.9 | 2.41 |  |
| P23 | 10 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 5.6 | 4.9 | 2.51 |  |
| P24 | 12 | 0.0 | 0.1 | 0.2 | 0.2 | 0.0 | 13.6 | 8.3 | 1.95 |  |
| P25 | 7 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 24.0 | 4.9 | 1.44 |  |
| P26 | 3 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 23.2 | 14.6 | 0.59 |  |
| P27 | 3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 40.0 | 8.8 | 0.63 |  |
| P28 | 9 | 0.0 | 0.1 | 0.2 | 0.2 | 0.0 | 11.2 | 2.9 | 1.42 |  |
| P29 | 15 | 0.1 | 0.7 | 0.0 | 0.0 | 0.0 | 12.8 | 1.9 | 13.90 |  |
| P30 | 4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 34.4 | 12.7 | 0.86 |  |
| P31 | 3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 36.0 | 9.7 | 0.78 |  |
| P32 | 4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.2 | 2.4 | 1.40 |  |
| P33 | 13 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 5.6 | 1.9 | 2.24 |  |
| P34 | 5 | 0.0 | 0.0 | 0.2 | 0.2 | 0.0 | 8.0 | 2.4 | 2.06 |  |
| **Mean** | 5.5 | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 | 8.1 | 2.4 | 1.9 |  |
| **SD** | 6.4 | 0.2 | 0.9 | 0.1 | 0.1 | 0.0 | 9.5 | 3.7 | 3.7 |  |
| **Min** | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 | 0.0 | 0.6 |  |
| **Max** | 37.0 | 1.3 | 5.6 | 0.2 | 0.2 | 0.1 | 40.0 | 14.6 | 14.4 |  |
| **CV** | 1.2 | 2.8 | 2.8 | - | - | - | 1.2 | 1.5 | 2.0 |  |
| **CONAMA CLASSE. II** | - | 10 | - | 3.7 | - - | - - | - |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sigla** | **EC** | **TDS**  | **pH** | **DO** | **Fe-T.** | **Fe-dis** | **Mn** | **Si** | **Sr** |
|   | us/cm | ppm |  - | ppm | (mg.L-1) | (mg.L-1) | (mg.L-1) | (mg.L-1) | (mg.L-1) |
| P01 | 167 | 93 | 7.6 | 4.5 | 1.96 | 0.405 | 0.043 | 10.781 | 0.084 |
| P02 | 70 | 35 | 6.9 | 4.8 | 2.30 | 0.273 | 0.029 | 6.604 | 0.041 |
| P03 | 48 | 24 | 7.0 | 5.5 | 1.28 | 0.181 | 0.019 | 7.547 | 0.029 |
| P04 | 77 | 39 | 6.9 | 4.8 | 1.57 | 0.302 | 0.145 | 4.305 | 0.024 |
| P05 | 230 | 115 | 7.2 | 4.1 | 6.33 | 0.679 | 0.606 | 6.602 | 0.076 |
| P06 | 80 | 40 | 6.9 | 5.8 | 1.61 | 0.217 | 0.030 | 7.421 | 0.045 |
| P07 | 42 | 21 | 6.5 | 3.8 | 0.88 | 0.166 | 0.025 | 5.629 | 0.022 |
| P08 | 74 | 37 | 7.2 | 7.1 | 0.06 | 0.062 | 0.003 | 4.493 | 0.028 |
| P09 | 55 | 27 | 7.0 | 5.8 | 1.71 | 0.302 | 0.023 | 6.752 | 0.044 |
| P10 | 49 | 25 | 6.8 | 4.3 | 2.23 | 0.415 | 0.026 | 7.051 | 0.032 |
| P11 | 201 | 101 | 6.9 | 5.8 | 0.31 | 0.129 | 0.018 | 3.822 | 0.045 |
| P12 | 21 | 9 | 6.5 | 5.9 | 0.87 | 0.043 | 0.008 | 2.767 | 0.003 |
| P13 | 21 | 10 | 6.3 | 5.4 | 0.19 | 0.007 | 0.003 | 1.934 | 0.007 |
| P14 | 23 | 11 | 6.1 | 2.7 | 0.68 | 0.031 | 0.010 | 1.890 | 0.005 |
| P15 | 53 | 26 | 6.6 | 5.3 | 1.36 | 0.216 | 0.002 | 4.227 | 0.031 |
| P16 | 48 | 24 | 6.5 | 4.3 | 1.23 | 0.274 | 0.001 | 4.395 | 0.033 |
| P17 | 28 | 14 | 6.3 | 3.9 | 0.77 | 0.131 | 0.004 | 3.684 | 0.012 |
| P18 | 59 | 30 | 6.6 | 4.3 | 0.70 | 0.199 | 0.005 | 3.763 | 0.019 |
| P19 | 24 | 12 | 6.1 | 4.95 | 0.92 | 0.098 | 0.049 | 3.585 | 0.01 |
| P20 | 16 | 8 | 5.8 | 5.6 | 0.47 | 0.162 | 0.012 | 3.560 | 0.009 |
| P21 | 80 | 40 | 6.8 | 5.4 | 0.61 | 0.014 | 0.011 | 5.829 | 0.078 |
| P22 | 89 | 45 | 7.0 | 4.4 | 0.04 | 0.134 | 0.006 | 3.345 | 0.078 |
| P23 | 80 | 40 | 7.4 | 5.4 | 0.01 | 0.019 | 0.001 | 0.545 | 0.052 |
| P24 | 161 | 81 | 7.1 | 3.1 | 0.82 | 0.003 | 0.233 | 2.432 | 0.095 |
| P25 | 165 | 82 | 7.0 | 3.7 | 0.89 | 0.003 | 0.222 | 3.238 | 0.068 |
| P26 | 208 | 104 | 8.0 | 5.5 | 0.24 | 0.003 | 0.007 | 7.088 | 0.039 |
| P27 | 209 | 104 | 8.0 | 5.2 | 0.26 | 0.003 | 0.002 | 6.714 | 0.042 |
| P28 | 105 | 53 | 6.9 | 5.4 | 0.32 | 0.039 | 0.006 | 2.360 | 0.047 |
| P29 | 155 | 77 | 7.4 | 5.1 | 0.11 | 0.013 | 0.001 | 1.204 | 0.023 |
| P30 | 244 | 122 | 8.0 | 5.8 | 0.23 | 0.036 | 0.005 | 5.824 | 0.065 |
| P31 | 244 | 122 | 7.9 | 5.8 | 0.19 | 0.031 | 0.002 | 5.788 | 0.064 |
| P32 | 61 | 31 | 7.6 | 6.3 | 0.85 | 0.237 | 0.019 | 5.173 | 0.025 |
| P33 | 44 | 22 | 6.9 | 5.2 | 1.19 | 0.314 | 0.041 | 5.893 | 0.022 |
| P34 | 44 | 22 | 6.8 | 6.0 | 0.00 | 0.074 | 0.001 | 5.588 | 0.044 |
| **Mean** | 72.0 | 36.0 | 6.9 | 5.3 | 0.8 | 0.1 | 0.0 | 4.4 | 0.0 |
| **SD** | 72.2 | 36.5 | 0.6 | 1.0 | 1.1 | 0.2 | 0.1 | 2.2 | 0.0 |
| **Min** | 16.0 | 8.0 | 5.8 | 2.7 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 |
| **Max** | 244.0 | 122.0 | 8.0 | 7.1 | 6.3 | 0.7 | 0.6 | 10.8 | 0.1 |
| **CV** | 1.0 | 1.0 | 0.1 | 0.2 | 1.4 | 1.2 | 10.8 | 0.5 | 0.7 |
| **CONAMA CLASSE.II** |  - | 500 | 6.0 - 9.0 | <5 | -  | 0.3 | -  | -  | -  |



Figure 1 – Riverbed of a stream (sampled site P05) downstream of a groundwater spring where the high input of aqueous Fe2+ into the river water followed by its subsequent oxidation cause the precipitation of species