Viçosa, February 27th, 2021.

Letter to Reviewers

Chief Editor Jack T. Trevors

We appreciate the considerations about our manuscript entitled ***Water quality of the Gualaxo do Norte and Carmo rivers after the Fundão dam collapse, Mariana, MG.*** Below you can find the answers to all comments inserted in the article, as well about opinions.

1. The paper needs to be substantially re-written to assist the reader to track when the dam collapse occurred, that the experimental design is addressing a key management question and that past investigations are compared in greater detail.

*Redone*

*(Line 53 until 57)*

*In November 2015, after successive adaptations to increase the containment volume, occur the Fundão tailing dam collapse in zone releasing 43.8 million cubic meters of mining waste, directly at the Doce River watershed, reaching more than 600 km downstream to the mouth of the Doce River, and the Atlantic Ocean (Marta-Almeida et al. 2016; Golder Associates 2017).*

*(Line 83 until 89)*

*Previous water quality data obtained in 1999 by Costa (2001) of the Gualaxo do Norte and Carmo rivers from was used on pre-collapse reference. For water quality data after the collapse, we used physical and chemical characteristics and spectral behavior of the contaminated waters in the Gualaxo do Norte and Carmo rivers obtained in 2016 by Foesch et al. (2020). It must be emphasized that the upper Carmo river sector before the Gualaxo do Norte mouth was not affected by any tailing deposition after the Fundão dam collapse, representing a reference for local background.*

1. The paper needs to have a full grammar and spelling check. Some examples of changes needed are given below but the authors need to ensure a detailed edit is conducted.

*Redone*

*The article was grammatically revised by a company accredited in the review and translation of academic scientific papers, after the review we carried out the review by the co-authors and then made the submission. We performed another review before sending the document. We attached the grammar review certificate of the article by experts in the field.*

1. Throughout the paper comment is made about "recovery activities". Please provide more clarity and detail on this to guide the reader.

*Done*

*(Line 149 until 162)*

*The recovery activities implemented were the impediment of access to animals and people in the areas of springs and Permanent Preservation Areas (PPA), allowing natural regeneration, along with revegetation with native species, these actions took place throughout the area of the Doce river basin.* *The species used in revegetation started with the planting of legumes, such as crotalaria sp., Mucuna aterrima, Cajanus cajan; grasses: Brachiaria and Pennisetum purpureum, after this phase of biomass insertion, native tree species such as Acacia mangium were planted. The mud deposit areas, which comprise the areas of riverbed and banks of the Gualaxo do Norte, Carmo and Doce rivers, including its trainers and tributaries, in the municipalities of Mariana, Barra Longa, Rio Doce and Santa Cruz do Escalvado, not only the revegetation of the PPA was carried out, but also the revegetation in the entire deposit area of the dam sediment, also installed rocking of stones in the intricacies, drainages of the terraces with installation of bio blankets to reduce the speed of water and surface transport of sediment to the river (Renova 2019).*

1. UTMs - not sure what this is

*(Line 37 and 38)*

*In mining, the process of processing and concentration of ore, including crushing, grinding, concentration, which can be by wet or dry route, are included in ore treatment units (OTU), the* *OTU is the* *place that allocates the residue from the plants to the tailing’s dams (Ghose and Sen* *2001; Srivastava et al. 2001; Rao et al. 2016).*

1. Check Methods - provide detail of detection limits for metals, more detail on the brand/manufacturer of any equipment used

*Done*

*(Line 120)*

*The detection limit was determined, according to RDC Number 166, where the detection limit is the smallest amount of the analyte present in a sample that can be detected, however, not quantified, that is, reliably determined and distinct from zero. Therefore, determined based on the inclination of the calibration curve and the standard deviation of the standard deviation of the intercept with the Y axis of 3 calibration curves (Brasil 2017). For the recovery metals use Agilent Technologies 200 Series AA Model 240 FS.*

1. L120 more information on dry and wet season means annual rainfall for study period

*Done*

*(Line 125)*

*In the study area there is less rainfall in winter when compared to summer, in the months of October to March the precipitation is more than 100 mm per month, already in the dry period that goes from April to September less than 100 mm per month, and the average annual precipitation is 1804 mm, for the history data (Pedreira and Souza 2011). For the study period rainfall in 2017 was 1048,3 mm, 283,2 mm in dry and 765,1 mm in wet season; in 2018 was 1538,9 mm, 219,7 in dry and 1319,2 in wet season; in 2019 was 1049,65 mm, 206,05 mm in dry and 843,6 mm in wet season.*

1. L126 Check what PCA could achieve for this data-set - is there a meta-data summary for number of records for the three study periods APHA (2005) used - more recent methods available

*Done*

*(Line 143 until 146)*

*In the PCA, 50 samples were used for the Carmo River downstream (affected), 34 in the dry period and 16 in the wet period; 200 samples for the Gualaxo do Norte, 136 in the dry period and64 in the wet period; and 75 samples for the Carmo River upstream (unaffected), 51 in the dry period and 24 in the wet period.*

1. Figure 2 - what is colour scale on right hand side - more information in caption

*Done*

*(Line 222 until 225)*

*The scale color represents the correlation between the variables, indicating that the closer to blue the more positively correlated the variables are, the closer to red, the more negatively correlated the variables are.*

1. L252 Check significant figures throughout paper eg "Regarding TSS, a value of 646.75 mg L-1"

*Done*

*These numbers are real, not outliers, this fact occurs due to precipitation in tropical climate countries that receive large volume of precipitation in the hydrographic basin that raises the average speed and height of rivers, mainly influencing the physical variables linked to sediments that are revolving from the bottom, and those deposited on the banks that are carried to the river track (Ling* *et al 2017).*

1. More discussion on the impacts of rainfall during the three study periods is needed to assist the reader

*Done*

*(Line 298 until 312)*

*The three stretches have similar changes in physical parameters when comparing the measured mean values, however, they have different intensities. While in the Carmo Upstream stretch (unaffected), for example, in the rainy season Turbidity and TSS are 9 times higher than the dry season, in the affected stretches the intensity is lower, on average 3 times higher in the wet period when compared to the dry period.*

*In general, after precipitation variables such as Color, Turbidity and TSS are changed by increasing their values, this is because these variables are causally related to fine particles. Therefore, when precipitation occurs in the area increases the flow of the river allowing the entry of new sediments and the revolving of the bottom of the river. Even in tropical rivers that high physical variables (Color, Turbidity and TSS) are normal for a few months, changes in the concentration of these variables can occur due to rainfall, allowing the tailings deposited in the margin to be taken to the river trough, favoring resuspension processes (Hatje et al. 2017). In the dry period, due to the lower velocity of the rivers, the suspended particles tend to sediment, with this the variables Cor, Turbidity and TSS reduce (Gong et al. 2016).*

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