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MINING DAMS CLOSURE AND DE-CHARACTERIZATION PLANS

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Mining dams are structures that are part of the ore beneficiation process and refer to the place where the finer portions of the tailings from this beneficiation are allocated. Generally, during processing, three types of products are generated:

• Ores – defined as a product, that is, the materials that are traded;

• Sterile – materials with a coarser granulometric fraction, without an attractive commercial potential, which are submitted to storage processes by stacking (sterile piles); and

• Tailings – materials with a finer fraction, generally with a high percentage of water, called pulp, which are destined for temporary or temporary storage structures.

Tailings dams are one of the ways of disposing of this non-commercialized material. There are ways to remove significant percentages of water during processing, increasing the resistance of these materials when deposited, and allowing them to be used in other forms of storage, such as piles. In this case, thickening and filtering systems must be considered, which generally have a considerable cost of implementation and operation, and must be part of an integrated planning of the entire mining activity.

The removal of part of the water can also occur at the disposal point, after the tailings are transported from the processing plant in the form of pulp. In this case, there is also the possibility of piling up part of the dewatered material, with a smaller portion of fines deposited in the dams and, thus, reducing the size of these constructions.

There are several techniques and processes for the construction of dams and, in general, it is considered a body of clayey material, called massive, which will create a potential reservoir for the storage of these tailings. Foundation treatment systems, internal and rainwater drainage systems, in addition to spillage structures and control instrumentation, among others, must be provided for, all of which are devices to guarantee the stability of the dams. The design and operation of dams is very particular and depends on the conditions of the construction site, the material to be deposited and what is expected from the management and monitoring of the structure.

The dams have a useful life and, after having used all the storage capacity, they must be closed. Closing may consider decommissioning stages, when the structure stops receiving tailings, or extends to de-characterization stages. In the de-characterization, there may be the partial removal of the massif and the deposited tailings, and these tailings may even be reused and commercialized. In some cases, the removal is complete, allowing a broader environmental return in the region, close to the initial conditions before the use of the region as a tailings deposit. In this sense, the Closure Plan is the document that considers the activities that will be carried out, after the end of the dam's useful life, considering decommissioning and de-characterization stages, related to the particularities of each structure.

The term "closure" is not recent in the literature, nor in the processes of dam management and operation. If a mine is active and a dam is closed, it is necessary to establish elevations to extend this useful life or even look for new places for disposal or new forms of storage. That is, if there is a proactive and effective management, the closure plan is prepared at the beginning of the activities, allowing actions that allow the closure to be implemented gradually and, at the end of the useful life, there is a more favorable condition for closure.

In relation to the legal system, the term

has also been recurrent for some time, being provided for in:

• Decree Number: 97,632/1989 – Cites the PRAD – Plan for the recovery of degraded areas, and the obligations of mining activities subject to the preparation of EIA/ RIMA – Environmental Impact Studies/ Environmental Impact Report

• DN COPAM Number: 220, of March 21, 2019 - Mentions the obligation to prepare PRAF and PAFEM - Mine Closure Plan, in the state of MG

• ANM Resolution Number: 13, of August 2019 - Established deadlines for decharacterization of dams raised by amount, and the projects must be delivered by December/2019, stabilization completed by September/2021 and the de-characterization would depend on the volume of structure, with deadlines in September/2022, 2025 and 2027.

• State Law Number: 23,291 of February 2019 – Establishes the PESB – State Policy for Dam Safety and, as an item of the LI – Implementation License, the obligation to deliver the Deactivation Plan (or Closure Plan).

• Federal Law Number: 14,066 of September 2020 – Revised the PNSB – National Policy on Dam Safety, established by Law Number: 12,334/2010, setting the deadline for mining dams with elevation by amount to be de-characterized by 02/25 /2022.

• State Decree Number: 48,140 of February 25, 2021 – Established that all mining dams raised by upstream, in the state of MG, must submit a project to de-characterize the FEAM, but without setting deadlines.

• ANM Resolution Number: 95, of February 7, 2022, effective from 02/22/2022 - Maintained the period for decharacterization of structures by amount for the date of 02/25/2022, establishing that this period could be extended if there was technical justification for such, filed until the 25th.

The decommissioning of dams does not make structures immune to failures, given that ceasing the disposal of waste still requires monitoring and maintenance of that structure. In this sense, the ideal is that these EU structures no longer receive the input of tailings or, even, critical structures that are at unacceptable levels of safety, are de-characterized.

According to the II Annual Mining Dam Safety Report, prepared by the ANM and published in early 2022, a total of 22 structures were unregistered from the national mining dam control system (Table 1). For the year 2020, there were 14 structures (Table 2). The registration usually occurs by decharacterization of the structures.

On February 21, 2022, there were 64 dams raised by amount in the public register of dams, made available by the ANM through the SIBG-public. Of these, 15 were in some level of emergency (Level 1, 2 or 3), and the remaining 49 were in normal condition. Comparing with the other types of dams, there is a total of 41 structures in emergency level and, therefore, 36% refer to dams raised by upstream with some type of emergency level. From the total number of mining dams considered in the ANM register, based on the extract issued on the 21st:

Dams included in the PNSB = 455 (64 with upstream elevation)

• At emergency level – 41
o With elevation by amount – 15
§ All are located in MG
§ All without attested stability in the 2021/2 campaign
o Other elevations – 26
• No emergency level – 414
o With elevation by amount – 49
o Other elevations – 365

	Dam name	Entreprenur	State	City
1	Santa Helena	Edimilson Alves Pereira	MT	Nova Santa Helena
2	Vão das Cobras	J. G. de A. FERREIRA MINERADORA EIRELI	MA	Pastos Bons
3	Bacia C Usina	Vale S.A.	PA	Canaã Dos Carajás
4	Dique 02 Pilha PAG 03	Márcio José Rodrigues	GO	Alto Horizonte
5	BARRAGEM ECOLÓGICA 2	MINERIOS NACIONAL S.A.	MG	Rio Acima
6	BARRAGEM POÇO FUNDO	CSN MINERACAO S.A.	MG	Congonhas
7	Captação Trovões	VALE S.A.	MG	Rio Acima
8	Ingleses	Vale S.A.	MG	Barão De Cocais
9	PDE Temporária II	Vale S.A.	MG	Mariana
10	Captação	Vale S.A.	MG	Santa Bárbara
11	Tarumã	Rodrigo Marcos Volpato	MT	Poconé
12	Bacia de Rejeitos 14/15	Serabi Mineração S.A.	PA	Itaituba
13	Mata Porcos	Vale S.A.	MG	Itabirito
14	Barragem 3	Mineração Bom Retiro	SP	Leme
15	Dique B11 - Pilha de Estéril Alegria E (Dique do Córrego dos Macacos)	Samarco Mineração S A	MG	Ouro Preto
16	Barragem MINAR	Minar Mineração Aredes Ltda.	MG	Itabirito
17	MD 01/2012	Mineração Descalvado Ltda	SP	Descalvado
18	Captação Córrego das Almas	VALE S.A.	MG	Mariana
19	Conjunto de Baias Viga	Vale S.A.	MG	Congonhas
20	Barragem de Rejeito 1	Mbl Materiais Básicos Ltda	MG	Itaúna
21	Patrimônio	Vale S.A.	MG	Barão de Cocais
22	Fernandinho	Vale S.A.	MG	Rio Acima

Table 1 – Dams unregistered in the year 2021.

Source: Dam Safety Report, ANM-2022.

	Dam name	Entreprenur	State	City	Inserted PNSB?
1	areal eskema	Areal Eskema Ltda	RJ	SEROPÉDICA	Não
2	B1	Arthur Henrique de Melo	MT	NOSSA SENHORA DO LIVRAMENTO	Sim
3	BARRAGEM B5	Csn Mineração S.a.	MG	CONGONHAS	Sim
4	Barragem de Água do Igarapé Bahia	Vale Minas Gerais	PA	PARAUAPEBAS	Não
5	Barragem de rejeito não magnético 01	Vanádio de Maracás SA	BA	MARACÁS	Sim
6	Cobras	Vale S A Filial: Vale Mariana	MG	CATAS ALTAS	Sim
7	Dique BIII-4	Mbl Materiais Básicos Ltda	MG	ITAÚNA	Sim
8	Dique BIII-5	Mbl Materiais Básicos Ltda	MG	ITAÚNA	Sim
9	JBS2	Empresa de Mineração e Artefatos de Cimento Jbs Ltda Epp	SP	MOGI DAS CRUZES	Não
10	JBS3	Empresa de Mineração e Artefatos de Cimento Jbs Ltda Epp	SP	MOGI DAS CRUZES	Não
11	Lavra Azul	Vale S A Filial: Vale Mariana	MG	CATAS ALTAS	Sim
12	Pilha Barragem	EXTRATIVA MINERAL LTDA	MG	NOVA LIMA	Sim
13	Santa Felicidade	Filadelfo dos Reis Dias	MT	NOSSA SENHORA DO LIVRAMENTO	Não
14	SP25	GUIDO ROBERTO CAMPOS GERMANI	PA	ORIXIMINÁ	Não

Table 2 – Dams unregistered in the year 2020.

Source: Dam Safety Report, ANM-2021.

Dams not included in the PNSB = 451
Total registered mining dams = 906

Based on these data, there are still 64 structures to be de-characterized, referring to those dams with heightening by upstream, without considering the number of dams built and raised by another methodology that are close to the end of their useful life or, already completed. .

In the quarterly report, issued by the ANM in November 2021, referring to the processes of decharacterization of dams raised by amount, 07 structures were declared by the entrepreneur as having been decharacterized (Table 3). However, most of these dams have not yet been deregistered and are included in the record obtained on February 21, 2022.

Still, there is a list with 08 structures that presented complete de-characterization and that were unregistered from SIGBM. However, these structures are not included in the 2021 annual report, as previously presented in Table 1.

The challenge is still great. The implementation of ESG - Environment, Social and Governance policies has been discussed repeatedly in the industry, especially in activities where the social and environmental impact is significant.

Mining cannot stop, given the expressiveness and need to use mineral resources in all other activities, especially when discussing the expansion of the use of renewable energies and the need to create new machines, new industries and new technologies. But there is still a lot to be improved and it is necessary that awareness happens in all parts of society.

We need to explore, but do we need to explore without worrying about resource depletion? Can't we implement more sustainable solutions or give up a little profit in favor of a more effective tailings disposal system or more robust monitoring and operation techniques? Do we really need to have all these dams, with all this size, or can we significantly reduce the disposal of this material in pulp, which is geotechnically difficult to control? Isn't it better when, instead of abandoning these structures and these scars in the environment, we recover the area and return a more integrated scenario? How long will we continue to justify dam ruptures and live with the fear of living with such unstable structures? How long will professionals without experience be allowed to work and sign off as responsible for these structures? How long will we postpone deadlines? How long will we have in mining, the issue being seen as privatization of profits and socialization of losses? Until when....

Dam name	Entreprenur	State	City
Pondes de Rejeitos do Igarapé Bahia	Vale S.A.	PA	Parauapebas
Barragem auxiliar do Vigia	CSN Mineração S.A.	MG	Ouro Preto
Barragem 2	Mosaic Fertilizantes P&K Ltda	SP	Cajati
Fernandinho	Vale S.A.	MG	Rio Acima
Barragem Bacia de Finos da Mina do Cerro	Copelmi Mineração Ltda.	RS	Cachoeira do Sul
MBR II Sul	Mineração Bom Retiro II Eireli	SP	Ibiúna
Barragem 01 – José Jaime	Minerita Minérios Itaúna Ltda.	MG	Itatiaiuçu

Table 3 – Dams with decharacterization considered by the entrepreneur.

Source: Quarterly de-characterization report, ANM-November 2021

Dam name	Entreprenur	State	City	Removal of register
Bocaína	Gerdau Açominas S/A	MG	Ouro Preto	Fev/2019
Cimpor	Mosaic Fertilizantes P&K Ltda	SP	Cajati	Abr/2019
B2 – Água Preta	CSN Mineração Ltda.	MG	Conselheiro Lafaiete	Abr/2019
Boa Vista	Carbonífera Catarinense	SC	Lauro Muller	Jun/2019
8B	Vale S.A.	MG	Nova Lima	Fev/2020
Pilha Barragem	Extrativa Mineral S.A.	MG	Nova Lima	Ago/2020
Pilha Mina Oeste (Somisa)	Mineração Usiminas S.A.	MG	Itatiaiuçu	Nov/2020
Bacia de Rejeitos 14/15	Serabi Mineração S.A.	PA	Itaituba	Abr/2021

Table 3 – Dams with complete de-characterization and unregistered from the SIBM.

Source: Quarterly de-characterization report, ANM-November 2021