

# TAILINGS FACILITY MANAGEMENT

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ANTOFAGASTA PLC

## Introduction

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6 June 2019

# TAILINGS STORAGE FACILITIES DISCLOSURE

Following recent industry events in Brazil, Antofagasta plc understands the investment community's need for greater disclosure regarding the mining sector's tailings dam operations, and in line with our core values, we are committed to open and transparent communication. Therefore, following the request by the Church of England Pensions Board and the Swedish Council on Ethics for the AP Funds, we are making additional disclosures regarding the Group's four tailings storage facilities (TSFs) in the format requested.

Antofagasta's approach to TSF risk management centres on each of our mining companies who are required to assess all risks arising from their operations and to design and implement appropriate measures of control and mitigation. To ensure clear accountability and adequate financial and human resources are available throughout the TSF life cycle, the Group's TSFs are managed by fully resourced organisational units at each mine site. The Group's risk management systems have recently been updated to include best practices with a specific focus on key risks, including critical TSF risk controls which are verified regularly to ensure that they are implemented effectively.

The TSF management systems implemented by our mining companies define how we construct, maintain and monitor our TSFs and the emergency plans we develop in case of a major incident. Monitoring includes the real time measurement of safety and stability factors and regular inspections by an independent international team of experts. Internal, external and independent review and assurance mechanisms are also in place to ensure that the integrity of our processes is regularly tested.

As we strive to continuously improve our TSF controls, we monitor the latest available industry information and events, to ensure we integrate best practice. In 2017, we made changes to the governance of our TSFs to ensure added visibility of the performance of TSF controls at all levels of the business, including by General Managers and the Boards of all of our operating companies.

In addition to the Group's approach to TSF risk management, all of our operations are located in Chile which has construction standards consistent with local seismic conditions. Existing regulations governing the construction and operation of TSFs only allow downstream and centreline construction methods to be used. Current Chilean legislation also requires the stability of tailings dam walls to be analysed, safety measures to be reviewed and detailed emergency plans to be developed in the event of a major incident.

Further, Antofagasta plc is fully supportive of the proposals to introduce an international, independently developed standard for TSFs and is working with the ICMM (International Council on Mining and Metals) and other bodies to ensure its success.

The full response to the information requested on the Group's four tailings storage facilities can be found below. It has been certified by the Group's Chief Executive Officer.



## Deposito Relaves Espesados (DRE), Minera Centinela

Question	Response
1. "Tailings Facility" Name/identifier	<p><b>Depósito de Relaves Espesados (DRE) Minera Centinela (Thickened Tailings Deposit, Minera Centinela)</b></p> <p>Key Facts:</p> <p>Authorised Capacity: 750 Mtons (Last approval by RCA 325 2017)</p> <p>Construction method: Downstream</p> <p>Maximum wall height: 80 metres</p> <p>Operating life based on current mine plan: until 2031</p> <p>Tailings disposal based on thickening tailings to 65% solids using a combination of paste and high-density thickeners</p> <p>The tailings are deposited downstream from the embankment by spigot systems in thin layers resulting in beaches with 2% to 3% slopes</p> <p>Currently lateral dam and starter dam. Main and Secondary dam wall under construction</p> <p>Drainage System</p> <p>Online monitoring in place</p> <p>Diversion channel for water management</p> <p>No communities or settlement for a considerable distance downstream</p>
2. Location	(UTM) N7458487, E487887
3. Ownership	Minera Centinela is a 70%-owned subsidiary of Antofagasta plc. The balance is held by Marubeni Corporation.
4. Status	Active
5. Date of initial operation	2011
6. Is the Dam currently operated or closed as per currently approved design?	Yes, it is operated as per currently approved design.
7. Raising method	High Density Thickened Tailings - downstream
8. Current Maximum Height	25 metres
9. Current Tailings Storage Impoundment Volume	154,000,000 m <sup>3</sup>
10. Planned Tailings Storage Impoundment Volume in 5 years' time.	270,000,000 m <sup>3</sup> , according to 2018 Mine Plan.
11. Most recent Independent Expert Review	<p>i.- Dam Safety Review in 2018 by Knight Piésold.</p> <p>ii.- Independent Technical Review Board: April 2019 (the members of the board are Richard Davidson, Gordon McPhail and Andrew Robertson).</p> <p>iii.- Sernageomin (National Geology and Mining Service, a government entity), April 2019</p>

<p>12. Do you have full and complete relevant engineering records including design, construction, operation, maintenance, and/or closure?</p>	<p>Yes. Reviewed by the Engineer of Record (Wood) and the Dam Safety Reviewer (Knight Piésold).</p>
<p>13. What is your hazard categorisation of this facility, based on the consequence of failure?</p>	<p>Risk Level: Medium, based on Impact (X) Probability (scale – Extreme, High, Medium, Low)</p> <p>Probability: Very unlikely (scale - Very Unlikely, Unlikely, Possible, Likely, Almost Certain)</p> <p>Impact: Significant (scale – Very Low, Low, Moderate, Significant, Severe)</p> <p>Impact is based on the following theoretical impacts:</p> <ul style="list-style-type: none"> <li>• Safety, Environment and Community</li> <li>• Reputation</li> <li>• Financial impact</li> </ul>
<p>14. What guideline do you follow for the classification system?</p>	<p>We follow Antofagasta Minerals’ Risk Evaluation Guideline, which is based on the ISO 31000 risk management standard.</p>
<p>15. Has this facility, at any point in its history, failed to be confirmed or certified as stable, or experienced notable stability concerns, as identified by an independent engineer (even if later certified as stable by the same or a different firm).</p>	<p>No.</p>
<p>16. Do you have internal/in house engineering specialist oversight of this facility? Or do you have external engineering support for this purpose?</p>	<p>We have both, an in-house Senior Tailings Engineer (on a permanent basis) and an external Engineer of Record who inspects the site periodically (Wood).</p>
<p>17. Has a formal analysis of the downstream impact on communities, ecosystems and critical infrastructure in the event of catastrophic failure been undertaken and to reflect final conditions? If so, when did this assessment take place?</p>	<p>Yes, this assessment took place in 2017 and was conducted by Golder. Knight Piésold verified this assessment during the 2019 Dam Safety Review.</p>
<p>18. Is there a) a closure plan in place for this dam, and b) does it include long term monitoring?</p>	<p>a) Closure Plan with engineering at a Conceptual Level. b) Yes. Monitoring is in accordance with Chilean legislation.</p>
<p>19. Have you, or do you plan to assess your tailings facilities against the impact of more regular extreme weather events as a result of climate change, e.g. over the next two years?</p>	<p>Yes, this assessment is planned for 2020. The Dam Safety Review performed in 2019 recommended the evaluation of the effects of climate change on the water management system.</p>
<p>20. Any other relevant information and supporting documentation.</p> <p>Please state if you have omitted any other exposure to tailings facilities through any joint ventures you may have.</p>	

## Tranque El Mauro, Minera Los Pelambres

Question	Response
1. "Tailings Facility" Name/identifier	<p><b>Tranque El Mauro, Minera Los Pelambres</b>  <b>(The Mauro tailings dam at Minera Los Pelambres)</b></p> <p>Key Facts:</p> <p>Authorised Capacity: 1,700 Mtons (Approval by RCA38 2004)</p> <p>Construction method: Downstream</p> <p>Maximum wall height: 237 metres</p> <p>Operating life based on current mine plan until 2035</p> <p>Dam crest width 10 m (minimum). Upstream slope is 2:1, downstream slope <math>\geq</math> 3:1.</p> <p>Dam wall construction based on cycloned sand tailings</p> <p>HDPE Geomembrane lining on upstream embankment slope</p> <p>Tailings transported from the concentrator by two 49km pipelines (either pumped or by gravity)</p> <p>Drainage System (main and laterals)</p> <p>Water recirculation system with capacity of 1100 litres/s</p> <p>Emergency spillway to evacuate water</p> <p>Online monitoring in place</p> <p>Diversion channel for water management</p>
2. Location	(UTM) N6463310, E307270
3. Ownership	Minera Los Pelambres is a 60%-owned subsidiary of Antofagasta plc. The balance is held indirectly by JX Nippon Mining & Metals Corporation, Mitsubishi Materials Corporation, Mitsubishi Corporation and Marubeni Corporation.
4. Status	Active
5. Date of initial operation	January 2009
6. Is the Dam currently operated or closed as per currently approved design?	Yes, it is operated as per currently approved design.
7. Raising method	Downstream
8. Current Maximum Height	164.6 metres
9. Current Tailings Storage Impoundment Volume	419,120,091 m <sup>3</sup>
10. Planned Tailings Storage Impoundment Volume in 5 years' time.	638,950,000 m <sup>3</sup>
11. Most recent Independent Expert Review	<p>i.- Dam Safety Review in 2018, conducted by Knight Piésold.</p> <p>ii.- Independent Technical Review Board: January 2019 (members of the Board are Richard Davidson, Gordon McPhail and Andrew Robertson).</p> <p>iii.- Sernageomin (National Geology and Mining Service, a government entity), April 2019.</p>

<p>12. Do you have full and complete relevant engineering records including design, construction, operation, maintenance, and/or closure?</p>	<p>Yes. Reviewed by the Engineer of Record (Wood) and the Dam Safety Reviewer (Knight Piésold).</p>
<p>13. What is your hazard categorisation of this facility, based on the consequence of failure?</p>	<p>Risk Level: High, based on Impact (X) Probability (scale – Extreme, High, Medium, Low)</p> <p>Probability: Very Unlikely (scale - Very Unlikely, Unlikely, Possible, Likely, Almost Certain)</p> <p>Impact: Severe (scale – Very Low, Low, Moderate, Significant, Severe)</p> <p>Impact is based on the following theoretical impacts:</p> <ul style="list-style-type: none"> <li>• Safety, Environment and Community</li> <li>• Reputation</li> <li>• Financial impact</li> </ul>
<p>14. What guideline do you follow for the classification system?</p>	<p>We follow Antofagasta Minerals’ Risk Evaluation Guideline, which is based on the ISO 31000 risk management standard.</p>
<p>15. Has this facility, at any point in its history, failed to be confirmed or certified as stable, or experienced notable stability concerns, as identified by an independent engineer (even if later certified as stable by the same or a different firm).</p>	<p>No.</p>
<p>16. Do you have internal/in house engineering specialist oversight of this facility? Or do you have external engineering support for this purpose?</p>	<p>We have both, an in-house Senior Tailings Engineer (on a permanent basis) and an external Engineer of Record who inspects the site periodically (Wood).</p>
<p>17. Has a formal analysis of the downstream impact on communities, ecosystems and critical infrastructure in the event of catastrophic failure been undertaken and to reflect final conditions? If so, when did this assessment take place?</p>	<p>Yes, Arcadis conducted it in 2018.</p>
<p>18. Is there a) a closure plan in place for this dam, and b) does it include long term monitoring?</p>	<p>a) Closure Plan with engineering at a Conceptual Level. b) Yes. Monitoring is in accordance with Chilean legislation.</p>
<p>19. Have you, or do you plan to assess your tailings facilities against the impact of more regular extreme weather events as a result of climate change, e.g. over the next two years?</p>	<p>Yes, this assessment is planned for 2020. The Dam Safety Review performed in 2019 recommended the evaluation of the effects of climate change on the water management system.</p>
<p>20. Any other relevant information and supporting documentation.</p> <p>Please state if you have omitted any other exposure to tailings facilities through any joint ventures you may have.</p>	

## Tranque Los Quillayes, Minera Los Pelambres

Question	Response
1. "Tailings Facility" Name/identifier	<p><b>Tranque Los Quillayes</b> <b>(The Quillayes tailings dam at Minera Los Pelambres)</b></p> <p>Key Facts:</p> <p>Authorised Capacity: 396 Mtons (Most recent Sernageomin approval N° 3254 2007)</p> <p>Construction method: Downstream</p> <p>Maximum wall height: 198 metres</p> <p>Dam crest width 10 metres (minimum). Upstream slope is 2:1, downstream slope 4:1</p> <p>Dam wall construction based on cycloned sand tailings. Dam Wall construction complete</p> <p>Quillayes is currently a back-up reservoir, in case of no availability of tailings transport system to El Mauro</p> <p>Drainage System (main and laterals)</p> <p>Emergency spillway to evacuate water</p> <p>Online monitoring in place</p> <p>Diversion channel for water management</p>
2. Location	(UTM) N6475618, E347463
3. Ownership	Minera Los Pelambres is a 60%-owned subsidiary of Antofagasta plc. The balance is held indirectly by JX Nippon Mining & Metals Corporation, Mitsubishi Materials Corporation, Mitsubishi Corporation and Marubeni Corporation.
4. Status	Active
5. Date of initial operation	April 1999
6. Is the Dam currently operated or closed as per currently approved design?	Yes, it is operated as per currently approved design.
7. Raising method	Downstream
8. Current Maximum Height	191 metres
9. Current Tailings Storage Impoundment Volume	272,460,939 m <sup>3</sup>
10. Planned Tailings Storage Impoundment Volume in 5 years' time.	272,460,939 m <sup>3</sup>
11. Most recent Independent Expert Review	<p>i.- Dam Safety Review in 2018, conducted by Knight Piésold.</p> <p>ii.- Sernageomin (National Geology and Mining Service, a government entity), April 2019.</p> <p>iii.- Independent Technical Review Board planned for June 2019 (members of the Board are Richard Davidson, Gordon McPhail and Andrew Robertson).</p>

<p>12. Do you have full and complete relevant engineering records including design, construction, operation, maintenance, and/or closure?</p>	<p>Yes. Reviewed by the Engineer of Record (Wood) and the Dam Safety Reviewer (Knight Piésold). Stability, Hydrological and Deformation Study are being updated.</p>
<p>13. What is your hazard categorisation of this facility, based on the consequence of failure?</p>	<p>Risk Level: High, based on Impact (X) Probability (scale – Extreme, High, Medium, Low)</p> <p>Probability: Very Unlikely (scale - Very Unlikely, Unlikely, Possible, Likely, Almost Certain)</p> <p>Impact: Severe (scale – Very Low, Low, Moderate, Significant, Severe)</p> <p>Impact is based on the following theoretical impacts:</p> <ul style="list-style-type: none"> <li>• Safety, Environment and Community</li> <li>• Reputation</li> <li>• Financial impact</li> </ul>
<p>14. What guideline do you follow for the classification system?</p>	<p>We follow Antofagasta Minerals’ Risk Evaluation Guideline, which is based on the ISO 31000 risk management standard.</p>
<p>15. Has this facility, at any point in its history, failed to be confirmed or certified as stable, or experienced notable stability concerns, as identified by an independent engineer (even if later certified as stable by the same or a different firm).</p>	<p>No.</p>
<p>16. Do you have internal/in house engineering specialist oversight of this facility? Or do you have external engineering support for this purpose?</p>	<p>We have both, an in-house Senior Tailings Engineer (on a permanent basis) and an external Engineer of Record who inspects the site periodically (Wood).</p>
<p>17. Has a formal analysis of the downstream impact on communities, ecosystems and critical infrastructure in the event of catastrophic failure been undertaken and to reflect final conditions? If so, when did this assessment take place?</p>	<p>Yes, the Engineer of Record performed this assessment in 2018.</p>
<p>18. Is there a) a closure plan in place for this dam, and b) does it include long term monitoring?</p>	<p>a) Closure Plan with engineering at a conceptual level. b) Yes. Monitoring is in accordance with Chilean legislation.</p>
<p>19. Have you, or do you plan to assess your tailings facilities against the impact of more regular extreme weather events as a result of climate change, e.g. over the next two years?</p>	<p>Yes, this assessment is planned for 2020. The Dam Safety Review performed in 2019 recommended the evaluation of the effects of climate change on the water management system.</p>
<p>20. Any other relevant information and supporting documentation.</p> <p>Please state if you have omitted any other exposure to tailings facilities through any joint ventures you may have.</p>	



## Depósito Relaves, Compañía Minera Zaldívar

Question	Response
1. "Tailings Facility" Name/identifier	<p><b>Depósito de relaves Zaldívar (Zaldívar Tailings Deposit Dam at Compañía Minera Zaldívar)</b></p> <p>Key Facts:</p> <p>Includes phases 1, 2, 3 and 4.</p> <p>Authorised Capacity: 22 Mtons. (Most recent approval - Phase 4 - by Sernageomin N° 938 2017)</p> <p>Construction method: Downstream</p> <p>Maximum wall height: 45 metres</p> <p>Operating life based on current mine plan until 2031</p> <p>Dam crest width 8 metres (minimum). Upstream slope is 1.5:1, downstream slope 2:1.</p> <p>Dam wall constructed using borrow material (Spent ore with internal granular underdrain)</p> <p>HDPE Geomembrane lining on upstream embankment slope</p> <p>Phase 3 and 3A of mining operation used two separate facilities. Phase 4 creates a single facility (currently in operation)</p> <p>Online monitoring in place</p> <p>Diversion channel for water management</p> <p>No communities or settlement for a considerable distance downstream</p>
2. Location	(UTM) N7324874, E493480
3. Ownership	Compañía Minera Zaldívar SpA is a 50/50 joint venture between Antofagasta plc and Barrick Gold Corporation. It is operated by the Antofagasta plc Group. Antofagasta acquired its 50% interest from Barrick Gold in 2015.
4. Status	Phases 1, 2 and 3 are inactive. Phase 4 is currently active.
5. Date of initial operation	1995
6. Is the Dam currently operated or closed as per currently approved design?	Yes, it is operated as per currently approved design.
7. Raising method	Downstream
8. Current Maximum Height	39 metres
9. Current Tailings Storage Impoundment Volume	9,307,097 m <sup>3</sup>
10. Planned Tailings Storage Impoundment Volume in 5 years' time.	11,206,148 m <sup>3</sup> , according to 2018 Mine Plan.
11. Most recent Independent Expert Review	<p>i.- SRK Consulting, in February 2019.</p> <p>ii.- Sernageomin (National Geology and Mining Service, a government entity), in October 2018.</p>

12. Do you have full and complete relevant engineering records including design, construction, operation, maintenance, and/or closure?	Yes, for Phase 4.
13. What is your hazard categorisation of this facility, based on the consequence of failure?	<p>Risk Level: Medium, based on Impact (X) Probability (scale – Extreme, High, Medium, Low)</p> <p>Probability: Very Unlikely (scale - Very Unlikely, Unlikely, Possible, Likely, Almost Certain)</p> <p>Impact: Moderate (scale – Very Low, Low, Moderate, Significant, Severe)</p> <p>Impact is based on the following theoretical impacts:</p> <ul style="list-style-type: none"> <li>• Safety, Environment and Community</li> <li>• Reputation</li> <li>• Financial impact</li> </ul>
14. What guideline do you follow for the classification system?	We follow Antofagasta Minerals' Risk Evaluation Guideline, which is based on the ISO 31000 risk management standard.
15. Has this facility, at any point in its history, failed to be confirmed or certified as stable, or experienced notable stability concerns, as identified by an independent engineer (even if later certified as stable by the same or a different firm).	No.
16. Do you have internal/in house engineering specialist oversight of this facility? Or do you have external engineering support for this purpose?	We have both an in-house Geotechnical Superintendent (on a permanent basis) and an external consultant who inspects the site periodically.
17. Has a formal analysis of the downstream impact on communities, ecosystems and critical infrastructure in the event of catastrophic failure been undertaken and to reflect final conditions? If so, when did this assessment take place?	Yes, Arcadis performed this assessment in 2015.
18. Is there a) a closure plan in place for this dam, and b) does it include long term monitoring?	<p>a) Closure Plan with engineering at a Conceptual Level.</p> <p>b) Yes. Monitoring in accordance with Chilean legislation.</p>
19. Have you, or do you plan to assess your tailings facilities against the impact of more regular extreme weather events as a result of climate change, e.g. over the next two years?	Yes, this was considered in the 2016 design of the diversion channel.
20. Any other relevant information and supporting documentation.	Q11: Michael Shelbourn, Senior Manager, Geotechnical Engineering at Barrick Gold Corporation also conducted an audit in October 2017. This review was not independent since Barrick Gold Corporation hold 50% of Compañía Minera Zaldívar.

Please state if you have omitted any other exposure to tailings facilities through any joint ventures you may have.

## Cautionary Statement

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This document contains data, which may include figures, numbers, classifications, regulatory status, modelling, and other information regarding tailings dams and Group processes. Unless specified otherwise, the data contained

herein are based on the information available at the date of this document. This document contains views regarding the status of the Group’s tailings dams and tailings facilities as expressed by various internal or external reviews. Those views are based on the information available at the time of those statements, which may predate this document. The data and views contained herein may change or may have changed based on additional or changes in information, circumstances, or other events and should not be relied upon a recommendation or forecast by the Group.

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Past performance cannot be relied on as a guide to future performance.

In this document, the terms “Company”, “Group”, “we”, “us”, “our” and “ourselves” are used to refer to Antofagasta plc and, unless the context requires otherwise, its subsidiaries and joint-venture companies. These terms may be used as collective expressions where general reference is made to the companies in the Group and/or where no useful purpose is served by identifying any particular company or companies.



# TAILINGS FACILITY MANAGEMENT

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ANTOFAGASTA PLC