Triennial 2021 – 2022
External Environmental Audit

FINAL REPORT

Prepared for:

PT FREEPORT INDONESIA

PT.LAPI ITB

FINAL REPORT

TRIENNIAL 2021-2022
EXTERNAL ENVIRONMENTAL AUDIT

EXECUTIVE SUMMARY

PT Freeport Indonesia (PTFI) operates a large copper and gold mine and concentrator in the Mimika District on the south coast of Papua, Indonesia. PTFI is a subsidiary of Freeport-McMoRan (FCX), which is one of the world's largest publicly traded copper mining companies headquartered in Phoenix, Arizona, USA and MIND ID, Indonesia's state-owned mining enterprise. The government of Indonesia, through MIND ID, owns 51.24% of PTFI, and FCX owns 48.76% and controls and operates PTFI pursuant to its shareholders agreement.

In late 2018, the Indonesia government granted PTFI a new special mining license (IUPKOP) to replace its former Contract of Work (CoW). Under the terms of the IUPKOP, PTFI has been granted an extension of mining rights through 2031, with further extension to mining rights through 2041.

PTFI's IUPKOP includes an area of 100 square kilometers (km^2) at high elevations with an associated IUPKOP support area of 1167 km^2. The area is characterized by extreme terrain, extending from the mining areas in the Highlands at 4,200 meters elevation, to the concentrator at 3,000 meters, and then down to the port and power plant at sea level on the coast, approximately 115 km to the south. The city of Timika is located near the coast and the town of Tembagapura is located in the Highlands.

The operations of PTFI began in the early 1970's at a production level of approximately 7,500 tons of ore per day and have expanded over the years as new reserves were identified to a nominal 230,000 tons per day from the Grasberg Minerals district open pit and underground mines.

With the completion of mining at the Grasberg open pit in 2020, which has served as the main copper ore producer in the area for almost 30 years, ore production at PTFI now comes exclusively from its underground mines. Currently, the existing operating mines include the Grasberg Block Cave (GBC), the Deep Mill Level Zone (DMLZ) and Big Gossan (BG). The Kucing Liar (KL) mine is currently under development and, once operational, will support future ore production.

This 2021-2022 External Environmental Audit (the 2021-2022 Audit) is PTFI's 7th environmental audit since 1996 and was conducted as part of PTFI's voluntary commitment as written in the 1997 AMDAL 300K, which commits PTFI to conducting an external audit on a triennial basis to evaluate the environmental management of its operational area. This 2021-2022 External Environmental Audit sought to independently evaluate the adequacy of PTFI's environmental management strategies in achieving the best and most feasible environmental management practices within its operational area and to review its progress in implementing those strategies compared to the previous external audit completed in 2017. Additional objectives of the 2021-2022 Audit included evaluating PTFI's compliance with the various applicable national environmental laws, government (central, province and regency) regulations, and the effectiveness of its ISO 14001 certified Environmental Management System (EMS).

The 2021-2022 Audit specifically focused on seven (7) strategic environmental areas which were defined and selected based on interest and perception of stakeholders, including the national government, the provincial government, district governments, and the community (including local communities), as well as the importance from the company's perspective. These focus areas include:

1) Tailings management,
2) Grasberg open pit closure,
3) Underground mining operations,
4) Water quality,
5) Waste management,
6) Reclamation and biodiversity; and
7) Climate change related issues.

This audit also encompassed selected sustainability issues relevant to the global mining industry, specifically corporate governance as well as certain regulatory aspects and a review of performance against portions of the International Finance Corporation (IFC) Performance Standards. It excludes the issues that are related to social, economic, and cultural aspects.

2021-2022 Audit – Key Focus Area Summary

(1) Tailings Management

PTFI's current riverine tailings management system was selected and subsequently approved by the Indonesia government as the most technically appropriate site-specific alternative for the Grasberg operations. Given the unique and challenging site-specific topographical, hydrological, and geotechnical conditions at PTFI, this tailings management strategy remains the best approach when considering the challenging physical factors as well as the volume of tailings produced (1.2 billion tons[1]), the limited storage capacity available for conventional-style tailings storage facilities, high annual rainfall (up to 12m/yr), and active seismic loads (i.e. situated in the tectonically active "Ring of Fire" with earthquakes > MM7.0 common).

Routine monitoring and special investigations continue to demonstrate that environmental impacts from this tailings management strategy are physical in nature and are related to the deposition of tailings on-shore and limited deposition of tailings in the mangrove and near-shore environment. The physical impact of the tailings deposition (other than topographic changes) is also temporary and reversable as revegetation of impacted areas is nearly immediate as illustrated by several of PTFI's large-scale reclamation demonstration projects on site.

<u>The Tailings Management Roadmap</u>

The terrestrial portion of PTFI's tailings management deposition area (termed the Modified Ajkwa Deposition Area or "ModADA") covers an area of 219 km^2 and receives the tailings and other sediments that are transported from the Highlands via the Aghawagon/Otomona River. The northern boundary of the ModADA is the Otomona Bridge, while its southern boundary is defined by a line between the Pandan Lima (PL) and Kelapa Lima (KL) discharge points. Below the terrestrial portion of the ModADA is the estuarine part of the tailings management area encompassing approximately 220 km^2. In 2005, the Ajkwa River flow was rerouted out of the ModADA into a channel to the west confined by the Old and New West Levees. The tailings deposition area is now confined to the west and east by the New West Levee and the East Levee, respectively.

There are limited site-specific alternative options for tailings management at PTFI. Accordingly, the effective tailings management of PTFI's riverine tailings system continues to be one of the

[1] 1.2 billion tons as of 2020 and calculated north of K5/P5. Estimates through to 2041 (current date of PTFI's mining rights) are approximately 1.7 billion tons and assume a coarser grind size. Note these volumes are a function of grind size and sediment retention.

most important environmental aspects of PTFI operations. In December 2018, the Ministry of Environment and Forestry (MoEF) issued Decree No. 594/2018 regarding the implementation of PTFI's tailing management (the Tailings Management Roadmap), which was subsequently amended by Decree No. 101 in 2019.

The Tailings Management Roadmap is a process that was agreed and established with MoEF to support the continuous improvement of PTFI's environmental practices and tailings management strategy including achieving certain targets established in Decree No. 175 in early 2018. The Tailings Roadmap objectives for PTFI include (1) reducing non-tailings (i.e. mine-derived, non-process) sediments flowing into the ModADA, (2) increasing and further controlling the retention and distribution of tailings within the ModADA and downstream area, and (3) increasing the re-use of tailings in various infrastructure projects (such as for road construction and as building materials).

The observation conducted by the Audit Team shows that PTFI's tailings management efforts, which is an ongoing process, has complied to date with the Tailings Management Roadmap for 2019 – 2024. The Audit Team's observations of PTFI's progress on the Tailings Management Roadmap objectives are summarized below:

Objective 1: Control of Non-tailings Sediment from Mining Area

From above, one aspect of the Tailings Management Roadmap addresses efforts to reduce mine-derived (non-process) sediments. The sources of non-tailings sediments are the open pit's Wanagon overburden stockpile (Wanagon OBS) and suspended solids in the underground mine drainage water flowing out from AB1 and AB2 tunnels. The performance in controlling sediment loads from the mining area, particularly from Lower Wanagon Overburden Stockpile (LWOBS) and underground mines, is in compliance with the measures set in the MoEF Decree No. 594/2018, and it is recommended to report the performances in general environmental standard unit, for example in mg/L unit for total suspended solids. This will give a better picture of efficacy of the sediment control operations.

Since the underground mines are expected to be expanded in the future with the development of Kucing Liar, it is recommended to review if there is more improvement opportunity to the existing method of controlling sediment in the mine drainage channels.

Objective 2: Increase Control of Tailings Retention in ModADA

The ModADA, bounded by the levees PTFI constructed to the east and west, is open at the southern end. Finer tailings and other sediments, transported by the Otomona River, are expected to settle due to reduction in flow velocity. However, to maximize the tailings deposition in such an open system, a cross levee(s) would have to be built which would be very challenging due to levee dimension (length and height), constructability, levee material supply, high risk of geotechnical failure owing to incompetent foundation conditions, and the overall cost.

To increase tailings retention, PTFI has implemented three methods, namely channelling the flow to the depression area using swamp excavator, using biofilter and construction of spur dikes. Although these methods are quite appropriate and cost-effective, there are still challenges for Pandan Lima and Kelapa Lima as monitoring points to comply, particularly for total suspended solids (TSS), with the environmental standard as set in MoEF Decree No. 175/2018. It is recommended to study the most appropriate location for new points of compliance in the downstream of ModADA which could be managed to comply with effluent standard for copper and gold mining activity.

The result of this study should be discussed with MoEF to seek the possibility for replacement of Pandan Lima and Kelapa Lima as points of compliance.

Objective 3: Increase Beneficial Tailings Re-use

The third aspect of the Tailings Management Roadmap was to look at the potential for additional tailings utilization possibilities. This external audit did not examine tailings utilization.

Pyritic Materials

Pyritic materials will be produced from high pyritic ore, the type of ore that will be mined in GBC and Kucing Liar where the pyrite content in the ore could be as high as 24%. To prevent the generation of acid rock drainage (ARD) in tailings deposition area, PTFI currently has a proposed plan to support the reduction of the pyrite content in its tailings, however this plan is still in the process of technical approval from the MoEF.

(2) Grasberg Open Pit Closure

Wanagon Overburden Stockpile (OBS)

PTFI has continued to make significant progress in detailed planning and implementation of surface mine closure including the Grasberg open pit infrastructure and overburden stockpiles. Due to the size, scale, and depositional characteristics of the Wanagon Overburden Stockpiles (OBS), the 2021-2022 Audit has focused on the current status of the Wanagon OBS closure and progress since the 2017 audit.

The Wanagon OBS is situated in steep terrain that experiences high rainfall conditions which can lead to high erosion and associated high TSS in the Wanagon watershed if stormwater is not diligently managed. Due to the geochemistry of the overburden material, there is also the potential for ARD drainage (ARD) generation to occur if proper cover and drainage are not constructed and maintained until permanently established.

Since the 2017 audit, there has been a demonstratable and documented reduction in erosion and TSS from the Wanagon OBS as measured both at Banti and total sediment and associated metal load entering the ModADA. Erosion control efforts from the Wanagon OBS have met the Tailings Roadmap targets to date. Regrading of the upper benches of the Wanagon OBS has advanced with the upper 6 benches completed and active regrading of the middle benches. The Kaimana high pyrite area is improving with most of the material relocated to a more secure area that includes a 5-meter limestone cover.

Regarding the ARD mitigation in overburden stockpiles, surface ARD streams from the Upper Wanagon stockpiles (including Koteka and Kaimana) and high sulphide zone stockpiles are treated with limestone in drainage channels and sumps to neutralize ARD and precipitate dissolved metals. These precipitated metals, which are in a hydroxide form and can present a high risk to the aquatic environment, mix with tailings and flow to the ModADA, estuary and sea. There is a systematic program in place to identify and remediate localized ARD point sources.

Lower Wanagon OBS

The West Wanagon Slope Stability Project has resulted in significant reduction of sediment loading to the downstream river system evidenced by reduction of total suspended solids (TSS) at Banti (Station #57) which ranged from 10,000 to 60,000 mg/L in 2017 and from <1,000 to 3,000 mg/L in 2019-2022. In 2021, the TSS discharge in all months was below the

MoEF Roadmap target of 5,500 tons of TSS with the highest measured value being in October 2021 at 2,496 tons of TSS.

Despite the fact that sediment discharges from the outlet channels are well below the sediment load target established in the Tailings Management Roadmap, the reclamation works on the Wanagon OBS will continue for several years and additional strategies are being considered to reduce sediment loading from the outfall channels. These include additional sediment traps along the existing channels/roads, more frequent excavation of sediments in the sediment traps to maximize settling and acceleration of revegetation efforts, including hydroseeding of the slopes.

(3) Water management in Underground Mining Operations

The underground water from various underground mining operations report to the AB tunnels or are pumped to Amole Drift for use in the mill. Water exiting the AB tunnels is directed to sediment traps then subsequently discharged to surface waters which comingle with the tailings discharge reporting to the ModADA.

PTFI has plans to increase pumping rates to the Amole Drift in order to utilize more of this underground water in processing operations at the mill. Additionally, PTFI is implementing plans to install additional sediment control structures and more frequent excavation of sediments in the existing sediment traps which will support the requirements under the Tailings Roadmap to increase the removal of sediments prior to discharge to surface waters.

The Audit Team recommends that PTFI maximize the underground water pumping to Amole Drift and use it in the mill to further reduce sediment discharges from AB 1 and AB 2 tunnels. There is limited space close to the portal and prior to AB tunnel discharge points for significant expansion of sediment control structures, which has caused elevated TSS concentrations of underground water discharges and it is above mine discharge standards stipulated in KepMenLHK No.202 of 2004.

(4) Water Quality

PTFI has multiple water quality monitoring programs for surface waters, groundwater, drinking water and various effluents. The 2021-2022 Audit focused on surface water quality in discharges from the ModADA and groundwater sulphate management. An increase in dissolved copper levels in the ModADA, still far below values stated in KepMenLHK No.202 of 2004, was noted in the 2017 audit and was attributed to the processing of partially oxidized ore (containing more soluble Cu-oxide phases) from surface mine ore stockpiles. These values decreased in 2021, corresponding to increased processing of fresh ore from underground mines. In groundwater, elevated sulphate concentrations have been noted and have been shown attributable to the dissolution of anhydrite and/or gypsum present in the tailings, and not from oxidation of sulphide minerals. A mitigation strategy has been developed that involves lowering the water level in a series of lakes to maintain to maintain a hydraulic barrier between the ModADA and Timika, and channel the sulphate to the sea which contains naturally-occurring high sulphate. From these conditions, it is recommended to continue to monitor the ore stockpile management and continue management and monitoring of the lake levels.

(5) Waste Management

PTFI had approximately 28,300 employees and contractors at the end of 2021, resulting in the generation of significant amounts of various wastes requiring management (separate from mining wastes). Organic (putrescible) waste generated in 2021 was 7,358 tons, general

wastes (scrap metal, wood, used tires and general office wastes) were 25,607 tons, and B3 (toxic and hazardous) wastes were 25,607 tons.

The Audit Team has confirmed that PTFI has fulfilled compliance in waste management efforts through various permits. The previous external environmental audits concluded that waste management remains a central theme for the annual PTFI internal facilities environmental inspection program. There were four (4) key waste issues addressed in the 2017 audit, however the focus was slightly changed in this audit to address the following: impact on waste management from closure of the Grasberg operation, waste management (segregation, temporary storage, transfer, and disposal); chain of custody (CoC) tracking system; and waste management analysis or review.

Following recommendation of the 2017 external audit, PTFI commissioned a waste stream audit by third party experts in 2021. The scope of the waste audit was to evaluate the performance of PTFI's current solid and hazardous waste management from Portsite to Grasberg. This work resulted in 14 recommendations for improvement addressing 9 high, 4 medium and 1 low priority items. Some of waste audit recommendations have been addressed and others are still on going.

According to the types of waste generated and its handling practices at PTFI, there are 3 (three) groups for waste management and handling facilities that will be addressed in this external audit report, namely: a) Hazardous Waste Management; and b) Non-hazardous Waste Management and c) Wastewater.

Hazardous Waste Management

The improved Chain of Custody (CoC) system for hazardous waste management in PTFI is being implemented, which requires waste generator (or coordinator of Waste Transfer Point / WTP) to generate CoCs prior to requesting the transporter (Contractor - KPI) to transfer this waste from waste generator point or WTP to Temporary Hazardous Waste Storage (THWS). It is also required for the Environmental Department to conduct inspections prior to transferring this waste to THWS. However, some deficiencies and inconsistencies were found during the waste audit. Therefore, the Management of Change (MoC) SOP was revised and existing SOPs on waste management that were issued between 2019 – 2020 need to be updated.

Non-hazardous Waste Management

Solid Waste Handling

PTFI has developed a Waste Management Plan (WMP), dated 2017, that gives projections until 2020. The plan should be updated with 2021 waste stream audit results and consider production projections to prepare appropriate waste management infrastructure.

Cleaner production indicators (i.e., waste prevention, energy efficiency, recycling and material recovery target and achievement) should be reported systematically. PTFI should develop their objectives from compliance to beyond compliance targets.

Landfills

There are three solid waste disposal sites: Milepost (MP) 38 Landfill, MP73 Landfill, and Koteka Landfill. (Note that MP nomenclature is used to designate locations relative to the main road, running roughly from south to north; MP 01 is on the coast, while MP 74 is at the mill). All inert waste generated from Grasberg Area are disposed of at Koteka Landfill. All the inert waste from MP 68 to MP74 can be disposed of at MP73 Landfill. All food waste generated from PTFI work areas and households are to be disposed of at MP 38 Landfill. A new

department, the Solid Waste Management (SWM) department, is responsible to operate these landfills.

It is recommended to improve training and awareness of SWM department operators and PTFI environmental inspectors on various type of hazardous waste. This includes management of used chemical containers and develop SOPs for handling various metal scrap, spare part materials and other non-hazardous waste in Yard 6, including formal procedures on what kind of material that are allowed to be stored, status of waste or material and notification process to the Yard 6 owner.

Oil-Water Separator (OWS)

PTFI maintains and operates 44 OWSs under permit from the Province of Papua. A best practice of routine monitoring and inspecting individual OWS operations was noted through an available weekly information board, including information on sludge transfer from an OWS and the monthly status of its effluent wastewater quality. It was observed that storm water is discharged to select OWSs that may cause a dilution of wastewater from workshop and heavy equipment washing. Therefore, it is recommended to prevent this rainwater flow to OWS through provision of separated drainage or other practicable means.

(6) Reclamation and Biodiversity

PTFI continues to demonstrate strong commitment in conducting reclamation/ revegetation and monitoring, both in the Highland and Lowland areas of its operations area. Reclamation activities at PTFI include the reclamation of disturbed post-mining sites (overburden stockpiles and decommissioned surface mine infrastructure) in the Highland areas, and reclamation on areas of tailings deposition and other substrate in the Lowland and estuary areas. Management of reclamation areas must comply with the 2018 RKL-RPL revision of PTFI's 300K AMDAL (Environmental Impact Assessment) commitments approved by Government of Indonesia in 1997 (Decree of the Minister of Environment and Forestry No. 546/Menlhk/Setjen/PLA.4/11/2018).

In Highland areas, management and monitoring plans (RKL and RPL) according to the 300K AMDAL require PTFI to conduct reclamation of overburden stockpiles to form a condition with ecological function that is similar and as close as possible to the original, pre-mining condition. In Lowland areas, the effects of tailings deposition in the ModADA and the flow of tailings into the estuary require particular attention because of the high volume of tailings being deposited.

Reclamation in post-mining Highland areas, where the Grasberg open pit is located, primarily uses the local species *Deschampsia klossii* for revegetation with noted improvements in hydroseeding capabilities and the use of native seedlings since the previous audit. In the lowland areas, reclamation includes planting on the ModADA tailings deposition and double levee area, planting of mangroves in the Ajkwa estuary, and planting in disturbed or cleared forest areas surrounding Kuala Kencana.

Since the PTFI 2017 External Environmental Audit, reclamation activities at disturbed sites have continued to be in compliance with the MEMR-approved 5-Year Reclamation Plan. PTFI has demonstrated commitment and significant effort to comply with the various regulations concerning environmental management and monitoring efforts (RKL and RPL, revision in 2018 of the 300K of PTFI's AMDAL commitments approved in 1997) as well as the suggestions/recommendations made both through studies and external audits by the regulatory authorities and relevant stakeholders, such as Proper and ISO audits.

The reclamation target as planned in the revised Reclamation Plan document for the 2019 – 2021 period covering a Highland area of 22.5 hectares and Lowland area of 20 hectares has

been achieved in 2021. The cumulative total of reclaimed overburden area up through 2021 has amounted to 455 hectares. Cumulative total of mangrove areas planted up through 2021 has amounted to 471 hectares, with 70 hectares planted in 2021.

(7) Climate change related Issues

Stationery source air emissions are monitored for compliance as required by applicable permits. In general, air pollution units are capable of meeting the maximum concentration of parameters as stipulated in the relevant regulations (particulate, SOx, NOx) except for NOx emissions from a number of diesel generators used intermittently for producing electricity. It was noted that PTFI has in place an action plan to address this issue, specifically EMP Action Plan #2/2021. 2021 results from continuous air quality monitoring show compliance with the more stringent values introduced in GR No. 22 of 2021.

In 2021, PTFI's operating shareholder, FCX, committed to reduce GHG emissions intensity at PTFI by 30% per metric ton of payable copper by 2030 from a 2018 baseline. Annual GHG inventory of PTFI has been conducted since 2007 through 2021 and reported publicly under FCX's GHG inventory, available here: (REPORTS AND DOCUMENTS | Freeport-McMoRan (fcx.com). However, mandatory Indonesian reporting of PTFI's energy management implementation as per MEMR no. 14/2012 via POME (*Pelaporan Online Manajemen Energi*) has not been done. It is recommended to conduct annual reporting of energy management implementation through the POME application and receive POME certificate from MEMR as evidence that this reporting has been approved.

Additionally, monitoring of energy efficiency also needs to be improved by adding new indicators for monitoring energy efficiency performance, i.e., energy consumption per output product in Mahaka lime plant or Portsite dewatering plant.

Sustainability Management and Performance Review

PTFI's Grasberg Mine operations and management systems substantially conform to, and align with, the relevant requirements as set out under the Equator Principles' Applicable Standards, which include the Indonesian regulatory requirements, the IFC Performance Standards and the IFC Environment, Health and Safety Guidelines. PTFI, following FCX policies, utilises a Sustainable Development Risk Register (which includes Action and Monitoring Plans), ICMM Performance Expectations, and Copper Mark Integrated Assessment Tool and Sustainability Assurance Management Reports by a third-party assurance provider to track year-on-year progress and sustainability commitments, in addition to delineating areas of concern and actions being taken to remediate any failures or exceedances.

FCX has committed to respecting internationally recognized human rights, including the rights under the International Bill of Human Rights, and is committed to implementing the United Nations Guiding Principles on Business and Human Rights (UNGPs). FCX has also committed to comply with the UK Modern Slavery Act, aimed at minimizing the risk of slavery and human trafficking throughout FCX's business and supply chain.

In late 2021, FCX initiated planning for a Human Rights Impact Assessment (HRIA) at PTFI and hired an external third-party consultant to conduct this work, which remains ongoing at the time of this audit publication. In regard to the 2015 Paris Agreement and climate change risk assessment, FCX has recently reported its progress in advancing their climate strategy and commitments, including their aspirational target of net zero by 2050 for Scope 1 and 2 GHG emissions.

Given that the PTFI mine area lies adjacent to the Lorentz National Park (also a declared World Heritage Site by UNESCO), the conservation and protection of Papua's biodiversity and ecosystems continues to be a high priority for both PTFI and FCX. Since 1994, PTFI has continued to collaborate with national and international scientists on comprehensive surveys of vegetation, mammals, birds, amphibians, reptiles, freshwater and estuarine fish, aquatic and terrestrial insects. PTFI has developed appropriate biodiversity conservation programs using principles of restoration ecology to guide rehabilitation and reclamation works of mining disturbed areas in the Grasberg minerals district.

Legal and Regulatory Aspects

In the last few years, there have been several important updates in Indonesian and local laws and regulations related to mining and the environment. Law No. 3 year 2020 on minerals and coal mining was issued to update Law No. 4 year 2009. Law No. 11 year 2020 on job creation changes articles in both Law No. 32 year 2009 on environmental protection and management as well as Law No. 41 year 1999 on forestry. Both laws and their implementing regulations are important considerations in the environmental management of PTFI's operation.

The process of a new AMDAL (environmental and social impact assessment) and technical approvals (Pertek) started in 2020 and remains in progress, covering topics related to planning and development of the underground mines and the supporting infrastructure not included in the latest environmental document (DELH of 2019),. The process has been delayed mainly due to the changes in regulations and procedures of the environmental permitting system in Indonesia.

Regulatory Review

As a part of this 2021-2022 Audit, a regulatory review was undertaken to examine and to determine the extent to which PTFI's environment-related activities have fully complied with its obligations of environmental management, as stated in the 2018 Environmental Evaluation Document (DELH) approved by the Decree of Minister of Environment and Forestry No. SK 546/Menlhk/Setjen/PLA.4/11/2018 concerning Environmental Permit of Changes in Mining Business Activities and Supporting Facilities as Contained in the Regional Environmental Impact Analysis (ANDAL), Environmental Management Plan (RKL) and Environmental Monitoring Plan (RPL) of the Expansion Plan for Copper and Gold Mining and Supporting Activities Up To Maximum Capacity of 300,000 Ore Tons Per Day in Mimika Administrative Regency, Province Irian Jaya (AMDAL 300 K) by PTFI based on Decree of the State Minister of Environment No. KEP-55/MENLH/12/1997.

PTFI's application for appropriate permits in order to implement environmental management activites represents PTFI's initial compliance with laws and regulations, as well as meeting PTFI's other internal technical standards and procedures.

The Environmental Permit was approved by the Minister of Environment and Forestry through the Decree of Minister of Environment and Forestry No. SK 546/Menlhk/Setjen/PLA.4/11/2018 which consists of PTFI's obligations in regard to environmental impact management and monitoring of: a) open pit mine; b) underground mine; c) the ore processing process; and d) supporting facilities. In additional, an approval by the Decree of Minister of Environment and Forestry No. SK 991/Menlhk/Setjen/PLA.4/10/2021 has been issued as well, which consisted of: a) Operation of underground mine Deep Mill Level Zone (DMLZ); b) The resultant subsidence area covering 698 Ha; c) Supporting facilities built in the DMLZ underground mine; and d) Operation of the haulage lorries at the GBC Mine.

At time of this audit, PTFI was preparing new AMDAL documents for future mine development and ore production. The scope of environmental impact analysis will consist of a) Big Gossan underground mine (BG), Grasberg Block Cave underground mine (GBC), the Kucing Liar underground mine (KL); and b) all supporting activities.

In relation to tailings management, Minister of Environment and Forestry issued the Decree No. SK 594/Menlhk/Setjen/PLA.0/12/2018 concerning Implementation of the Tailings Management Roadmap by PT Freeport Indonesia in the Regency of Mimika, the Province of Papua, which should be carried out with the following steps: a) preparation of the tailings management conceptual study; and b) preparation of the activity work plan in the framework of systematic tailings management.

Decree of the Minister of Environment and Forestry No. SK 594/Menlhk/Setjen/PLA.0/12/2018 has been amended by Decree of the Minister of Environment and Forestry No. SK.101/Menlhk/Setjen/PLA.0/I/2019 concerning Amendment to the Decree of the Minister of the Environment and Forestry No. SK.594/Menlhk/Setjen/PLA.0/12/2018 regarding the Implementation of the Roadmap on Tailings Management of PT Freeport Indonesia in the Mimika Regency, Papua Province. The amendment stated the Tailings Management Roadmap of 2018 – 2024 and the Total Suspended Solid (TSS) value targeted to be achieved in 2019 - 2024 is based on the production capacity. The Tailings Management Roadmap of 2018 – 2024 consists of: a) material handling in the mine area in the upstream and ModADA; and b) utilization of tailings and regional development. The observation conducted by the Audit Team shows that PTFI's tailings management is an ongoing progress which has complied to date with the Tailings Management Roadmap for 2019 – 2024. The Tailings Management Roadmap is a step to achieve the targets in tailings management set in the Decree No. 175 year 2018 and as a compliance reference in tailings management.

GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS

2021-2022 Audit	2021-2022 External Environmental Audit
300K AMDAL	1997 Environmental Impact Assessment; Expansion Plan for Copper and Gold Mining and Supporting Activities Up To Maximum Capacity of 300,000 Ore Tons Per Day in Mimika Administrative Regency, Province Irian Jaya
AFEs	Authorizations for Expenditure
AMDAL	Environmental Impact Assessment (procedure)
ANDAL	Environmental Impact Analysis (document)
ANFO	Ammonium nitrate/fuel oil
ARD	Acid Rock Drainage
Audit Team	2021-2022 External Environmental Audit Team
B3	Hazardous and toxic waste
BBKSDA	Conservation Centre Papua
BDA	Behre Dolbear Australia
BDL	Below detection limit
BG	Big Gossan
BSAP	Biodiversity Strategic Action Plan
BSI	British Standards Institution
CABI	Centre for Agriculture and Bioscience International
CCRA	Climate Change Risk Assessments
CD	Cargo Dock
CDM	Cargo Dock Marine
CNV	Carbonate Neutralization Value
CoC	Change of custody
COP	Codes of Practice
CoW	Contract of Work
CPT	Cone Penetration Tests
CQA	Construction Quality Assurance
DB	Drainage Bench
DELH	Environmental Evaluation Document
DHI	Danish Hydraulic Institute
DMLZ	Deep Mill Level Zone
DOZ	Deep Ore Zone
DWP	Dewatering Plant
DWPSE	Dewatering Plant Dryer
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EM270	Ajkwa estuary monitoring point
EM275	Tipuka estuary monitoring point
EM330	Kamora estuary monitoring point
EM430	Minajerwi estuary monitoring point
EM770	Mawati estuary monitoring point

EM870	Otakwa estuary monitoring point
EMA	East Levee Monitoring Area
Emissions Inventory	The 2021 greenhouse gas (GHG) emissions inventory
EMP	Environmental Management Program
EMS	Environmental Management System
EP	Environmental Projects
EP actions	Equator Principle actions
EP4	Equator Principles (IV) ("EP4") version (October 2020)
ERA	Environmental Risk Assessment
ERC	Engineered rock cover
ESMS	Environmental and Social Management System
FBSAP	Freeport Indonesia's Biodiversity Strategic Action Plan
FCPA	U.S. Foreign Corrupt Practices Act 1977
FCX	Freeport-McMoRan
FITA	Final Tailings Monitoring Point
FM	Facilities Management
FMC	Freeport Minerals Corporation
FPIC	Free, Prior, and Informed Consent
FTM	Facilities and Town Management
GBC	Grasberg Block Cave
GBR	Grasberg
GBT	Gunung Bijih Timur
GHD	GHD Limited
GHG	Greenhouse Gases
GIS	Geographic Information System
GISTM	Global Industry Standard on Tailings Management
GOI	Government of Indonesia
GR	Government Regulation
GRI	Global Reporting Initiative
GRS	Grasberg
HDPE	High-density polyethylene
HEAT Road	Heavy Equipment Access Trail Road
HL	Highland
HPGR	High-Pressure Grinding Roll
HRIA	Human Rights Impact Assessment
HSE	Health, Safety, and Environmental
IBSAP	Indonesia Biodiversity Strategy and Action Plan
ICMM	International Council on Mining and Metals
ICOLD	International Conference on Large Dams
ID	Indonesia
IDR	Indonesian Rupiah
IFC	International Finance Corporation
InSAR	Interferometric Synthetic Aperture Radar
IOZ	Intermediate Ore Zone
IPAL	Domestic wastewater treatment plants

ISO	International Organization for Standardization
ISO 14001	International Standard for Environmental Management Systems
ISO 14064	Greenhouse Gases and the Greenhouse Gases Protocol
ITB	Bandung Institute of Technology
IUPK	Special Mining Business Permit
IUPKOP	Special Mining Permit for Operation-Production
IVI	Species importance value indices
K5	Kelapa Lima
KA ANDAL	The Terms of Reference of ANDAL
KHP	Kaimana High Pyrite
KL	Kucing Liar (ore body)
KL	Kelapa Lima (monitoring point)
KPH	Kaimana High Pyrite
KPI	PT. Kuala Pelabuhan Indonesia
Lemasa	Amungme Tribal Council
Lemasko	Kamoro Tribal Council
LiDAR	Light Detection and Ranging
LIP	Light Industrial Park
LL	Lowland
LOM	Life of Mine
LS SP	Limestone Stockpile
LTP	Leachate Treatment Plant
LWOBS	Lower Wanagon Overburden Stockpile
MASW	Multichannel analysis of geophysical surface waves
MASL	Meters above sea level
MEMR	Ministry of Energy and Mineral Resources
MHK	Mahaka Lime Plant
MIKE21C	Computer program developed by DHI
MIND ID	Indonesia's state-owned mining enterprise
MLA	Mill Level Adit
MM	Modified Mercalli (seismic intensity scale)
MMB	ModADA Management Board
MoC	Management of Change
ModADA	Modified Ajkwa Depositional Area
MoE	Ministry of Environment
MoEF	Ministry of Environment and Forestry
MP	Mile Post
MP	Monitoring Program
MPA	Maximum Potential Acidity
MWH	Montgomery Watson Harza Global Inc.
NAG pH	Net acid generation pH
NGOs	Non-governmental organizations
NGSD	New Guinea Singing Dog
NSDP	Natural Succession Discovery Park
NWL	New West Levee

OB	Overburden
OBS	Overburden Stockpile
OC	Outlet Channel
OECD	Organisation of Economic Co-operation and Development
OHS	Overburden Handling System
OWL	Old West Levee
OWS	Oil Water Separator
P5	Pandan Lima
PBC	Principles of Business Conduct
PCBs	Polychlorinated Biphenyls
Pertek	Technical approvals
PKSPL-IPB	Center for Coastal and Marine Studies – Institut Pertanian Bogor (IPB)
PL	Pandan Lima
PLTD	Diesel Power Plants
PLTMG	Gas Engine Power Plant
PM10	Particulate Matter less than 10 µm
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
POME	Ministry of Energy and Mineral Resources (MEMR) energy management application (Pelaporan Online Manajemen Energi)
PPA	Wastewater pollution controller
PPLI	PT Prasadha Pamunah Limbah Industri
PPU	Air pollution controller
PROPER	Indonesia's program for pollution control, evaluation, and rating
PS	Portsite
PT LAPI ITB	A unit under the Bandung Institute of Technology (ITB)
PTFI	PT Freeport Indonesia
PTSI	PT. Syntegra International
PUPR	Minister of Public Works of the Republic of Indonesia
RC	Ridge Camp
RKL-RPL	Environmental Management and Monitoring plans (RKL and RPL)
RoR	Rate of Rise
RoRo	Roll-on roll-off
RW A	Rukun Warga A
SAG	Semi-autogenous grinding
SBTi	Science Based Target Initiative
SCR	Selective Catalytic Reduction
SKKNI	National competency standard
SOP	Standard Operating Procedure
SPPLH	Statement of Ability to Manage and Monitor Environment
SQRA	Semi-quantitative risk assessment
SRK 2016	SRK 2016 Groundwater Model
STP	Sewage Treatment Plant
SWM	Solid Waste Management
TCFD	Task Force on Climate-related Financial Disclosures

THWS	Temporary Hazardous Waste Storage
TMP	Tailings Management Plan
TNA	Training Need Analysis
TOE	Tonne of oil equivalent
TPA	Landfill
TPRA	Tembagapura
TPS LB3	Temporary B3 waste storage facilities
TRMP	Tailings Riverine Management Project
TSP	Total Suspended Particulate
TSS	Total Suspended Solid
UG	Underground
UGM	Gadjah Mada University
UK	United Kingdom
UKL	Environmental Management Efforts
ULF	Unspecified limestone fill
UN	United Nations
UNCEN	University of Cendrawasih
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGPs	United Nations Guiding Principles on Business and Human Rights
UPL	Environmental Monitoring Efforts
USA	United States of America
USD	United States Dollar
VPA	Vertical Pressure Airblown
VPs	Voluntary Principles on Security and Human Rights
Wanagon OBS	Wanagon Overburden Stockpile
WB	Wanagon Bench Slopes
WDB	Wanagon Drainage Bench
WDD	Wanagon Drainage Drift
WI	Working Instructions
WIUPKOP	Special Mining license Production Area
WMA	West Levee Monitoring Area
WMP	Waste Management Plan
WOBS	Wanagon Overburden Stockpile
WPIUPKOP	Special Mining License Support Area
WSPs	Water Supply Plants
WSS	Water and Sewage System
WTP	Waste Transfer Point
WWSS	West Wanagon Slope Stabilization
WWTP	Wastewater Treatment Plant
YAMAK	Anti Violence Humanitarian Foundation
YPMAK	Amungme and Kamoro Community Empowerment Foundation

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1. 1. Background

PT Freeport Indonesia (PTFI) is a subsidiary of Freeport McMoRan (FCX), among the world's largest publicly traded copper mining companies headquartered in Phoenix, Arizona, USA and MIND ID, Indonesia's state-owned mining enterprise. The government of Indonesia (GOI), through MIND ID, owns 51% of PTFI, while FCX continues to be the site operator of PTFI operations, supported by corporate offices in Phoenix and New Orleans in the USA. PTFI operates a large copper and gold mine and concentrator in the Mimika District on the south coast of Papua, Indonesia. In late 2018, the 1991 Contract of Work (CoW) with the government of Indonesia was converted to a new special mining license (Izin Usaha Pertambangan Khusus Operasi Produksi or IUPKOP), which grants PTFI mining rights initially through 2031, coupled with an extension of mining rights through 2041.

The IUPKOP covers an area of 100km^2 (10,000 Ha) with a support area of 116,783 Ha and is characterized by diverse and extreme terrain. The mining areas in the Highlands operate at 4,200 m elevation with a concentrator complex located at 3,000 m elevation. The Port operations and coal-fired power plant are located on the coast, 115 km away. Essentially all support and services must be provided by the company, and town sites in the Highlands and the Lowlands provide housing and services for approximately 30,000 employees and contractors including schooling and medical care.

Operations construction began in 1967 and the first production was in 1973 with an early production level of approximately 4,000 tons of ore per day. These have expanded over the years as new reserves were identified to a nominal 230,000 tons per day from an open pit and underground mines. Open pit operations ceased in 2020, and ore is now being produced from a series of underground mines. Concentrates are moved by pipelines to the Port where they are dried and stored for shipment. PTFI uses a controlled riverine tailings management system, whereby tailings are transported from the mill in the Highlands by a dedicated river to an engineered and managed deposition area in the Lowlands and coastal zone, termed the Modified Ajkwa Deposition Area (ModADA). The river, located in a very narrow, steep valley, also carries high natural sediment loads from rain runoff and erosion. It is not navigable and is not used for potable water, agriculture, fishing or other domestic or commercial uses, nor was it used for these purposes before operations began. The tailings deposition area is a portion of the river's flood plain in the Lowlands. PTFI has designed and constructed a system of levees to manage the deposition of what will ultimately be about 3 billion tonnes of tailings within the designated terrestrial area and associated estuary. The use of this riverine tailings system is not typical for mining operations around the world and is a driver for the expansive monitoring and management programs implemented by PTFI. This practice also draws criticism from external parties.

The weather is cool in the Highlands and hot in the Lowlands with an average rainfall of approximately 5,000 mm per year. The entire region of southern Papua exhibits one of the highest levels of biodiversity in Southeast Asia. The IUPKOP area is adjacent to the Lorentz National Park, a 2.5-million-hectare area which was designated a UNESCO World Heritage Site in 1999. Similar to the PTFI project area, the park encompasses a continuous, intact transect from high mountains to tropical marine environment, including extensive wetlands and mangrove forests near and along the coast.

In the last few years there have been several important revisions and updates in laws and regulations related to mining and the environment. Law No. 3 year 2020 on minerals and coal mining was issued to update Law No. 4 year 2009. Law No. 11 year 2020 on job creation changes articles both in Law No. 32 year 2009 on environmental protection and management and Law No. 41 year 1999 changes practices regarding forestry. Both these and other laws and their implementing regulations are important considerations in PTFI environmental management. Another important item is the Tailings Management Roadmap as guided by the decrees of Minister of Environment and Forestry No. 594 year 2018 and No 101/2019 regarding PTFI's tailings management.

It is PTFI's voluntary commitment as written in the 1997 AMDAL 300 K to conduct an External Environmental Audit on a triennial basis to evaluate the implementation and effectiveness of its environmental management throughout the entire operational area. The last audit was conducted in 2017 by PT LAPI ITB. This year, PT LAPI ITB has been selected again to conduct the Triennial 2021-2022 External Environmental Audit of PTFI's copper and gold mining operation in Papua. The scheduled audit in 2020 was delayed due to the COVID pandemic.

1. 2. Objectives, Methodology and Scope of Audit

The Triennial 2021-2022 External Environmental Audit was conducted with the primary objective to independently evaluate the adequacy of PTFI's environmental management strategies and systems in achieving the best and most feasible environmental management practices, the compliance status with the applicable national environmental laws, government (central, province and regency) regulations, and the effectiveness of the environmental management systems, practices and procedures in the actual implementation toward continuous improvements.

The changes in various laws and regulations regarding the environment affected the environmental management of PTFI. Specifically, issuance of Law No. 11 year 2020 on job creation amended many articles of the environmental Law No. 32 year 2009, its implementing government regulations and various MoEF decrees. The environmental permitting system, standards and procedures were significantly changed by the new regulations. Accordingly, a review of regulation aspects is necessary as part of the present audit.

With the completion of mining from the Grasberg open pit in 2020, which served as the main copper ore source in the area for almost 30 years, the ore production of PTFI now comes from the underground mines and has recently become the largest active underground mining complex in the world. This transition has required modifications of infrastructure including increased ventilation, installation of an electric underground ore hauling system, expanded solid waste management procedures, and additional power requirements. The existing operating mines such as Big Gossan (BG), Grasberg Block Cave (GBC), and Deep Mill Level Zone (DMLZ) as well as the future mine Kucing Liar (KL) serve as the production backbone into the future.

Related to tailings management, in 2018 the Ministry of Environment and Forestry (MoEF) issued the Decree No. 594/MENLHK/SETJEN/PLA.O/12/2018 on the implementation of the Tailings Management Roadmap, with its addendum Decree No. 101/MENLHK/SETJEN/PLA.O/1/2019. These decrees outline efforts to control non-tailings sediments from mining areas, methods to further tailings retention in the Modified Ajkwa Depositional Area (ModADA), implementing additional procedures to decrease sediment impacts in the Ajkwa estuary as well as initiatives to increase beneficial uses of tailings in infrastructure construction and other uses.

The process of a new AMDAL (environmental and social impact assessment) and associated technical approvals (persetujuan teknis or pertek) began in 2020 and is still pending final approval. The covered activities are related to the planning and development of various underground mines and supporting infrastructure which were not included in the latest Environmental Evaluation Document (DELH) of 2019. The approval process has been delayed from its original schedule mainly due to changes by the 2020 Omnibus Law in environmental permitting regulations and procedures, a situation shared in common with many other projects throughout Indonesia.

Important internal and external environmental issues are major considerations in this audit. The audit reviews the current position or status of PTFI's environmental management based on the company's policies, strategy, and its implementation, as well as an evaluation of environmental management performance using a variety of monitoring results.

This audit focused on seven (7) strategic environmental topics defined and selected based on interest and perception of various stakeholders, including the national, provincial, and district governments, the community (including local communities) as well as importance from the company's perspective. These issues are:

a) Tailings management
b) Grasberg open pit closure program
c) Underground mining operations
d) Water quality
e) Waste management
f) Reclamation and biodiversity
g) Climate change related issues

This audit does not attempt to examine in detail issues related to social, economic, and cultural aspects. However, this audit does include a chapter examining key sustainability issues relevant to the global mining industry, particularly corporate governance.

The assessment examined existing procedures, operations and practices relating to the following:

a) Improvements made compared to the 2017 External Environmental Audit results.
b) Obligations relating to environmental aspects.
c) Environmental management commitments.
d) Consensus with international best practices in environmental management of mining operations.

Figure 1-1 shows a diagram of the approach and methodology used during the 2021-2022 External Environmental Audit.

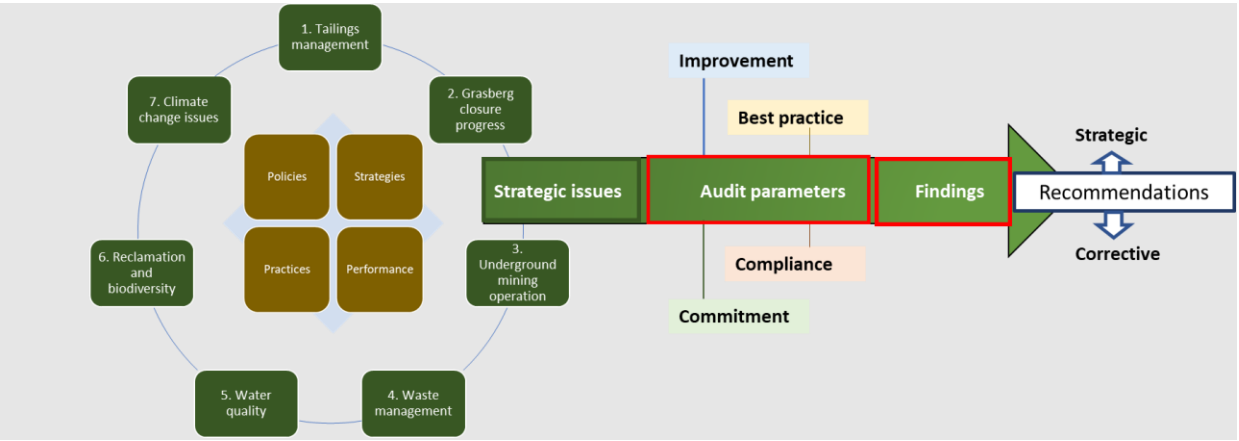

Figure 1-1 Audit approach and methodology

1. 3. Audit Team Qualifications

The Triennial 2021-2022 External Environmental Audit was carried out by PT LAPI ITB, a unit under the Bandung Institute of Technology (ITB). As a notable institute of technology in Indonesia, ITB is home to a wide range of experts with expertise relevant to the present environmental audit exercise. The Audit Team and qualifications are presented below.

Professor Rudy Sayoga Gautama (PT LAPI ITB) – Audit Project Manager

Dr. Rudy Sayoga Gautama is a Professor of Mining Engineering at ITB. He has extensive experience in the mining and environment sectors with a focus on mining hydrology, acid rock drainage (ARD), and other environmental issues relating to mining activities. Teaching at the Mining Engineering Department of ITB, he formerly served as head of ITB's Centre for Environmental Studies. He has extensive experience with geochemistry/acid rock drainage issues at PTFI as well as other aspects of mining operations at PTFI. He was a team member in the 2005 and 2008 External Environmental Audits as a mining expert particularly in the field of mine dewatering and control of acid rock drainage. He was the project manager for the 2011, 2014 and 2017 External Environmental Audits. In this exercise he also served as an active auditor in these same areas of expertise.

Randy Ismail (PT LAPI ITB) – Auditor

Randy Ismail is a certified and experienced environmental auditor. He was responsible for developing the audit methodology and conducted evaluations of PTFI's Environmental Management System (EMS). He was also involved in various Health, Safety, and Environmental (HSE) compliance audits, performance audits, ISO 14001 audits for mining companies such as PTFI, PT Vale Indonesia, PT Aneka Tambang, PT Kaltim Prima Coal, PT Indominco Mandiri and PT Kideco Jaya Agung. He served as a member of 2014 and 2017 External Environmental Audits.

Dr. Benno Rahardyan (PT LAPI ITB) – Auditor

Dr. Benno Rahardyan is associate professor of Environmental Engineering at ITB and has extensive experience in solid and hazardous waste management and waste recycling. He is a BSI-ISO 14001 EMS Lead Auditor and member of the technical team for the Research Centre on Water and Sanitation of Ministry of Public Works. He was responsible for the evaluation of waste management in PTFI's IUPKOP area, including hazardous (B3) wastes. He has also served as a member of 2014 and 2017 audits.

Hesti Nawangsidi (PT LAPI ITB) – Auditor

Hesti Nawangsidi has been affiliated with the Center for Environmental Studies (*Pusat Studi Lingkungan Hidup*) of ITB since the initial development of the center in early 1980s. She is a senior researcher with extensive experience in environmental issues and studies. She was responsible for a review of PTFI's regulatory compliance with the applicable laws and regulations. She was also involved as auditor in the 2017 External Environmental Audit.

Dr. Devi Choesin (PT LAPI ITB) – Auditor

Dr. Devi Choesin is an associate professor in plant ecology at the Faculty of Life Sciences and Technology of ITB. She supported the evaluation of audit areas that involve biodiversity and ecology specialties. She was the auditor in the aspect of biodiversity and ecology in the 2017 External Environmental Audit.

Dr. Ginting Jalu Kusuma (PT LAPI ITB) – Auditor

Dr. Ginting Jalu Kusuma is lecturer at the Department of Mining Engineering of ITB with specialization in mine drainage, environment and geomechanics. He supported the evaluation of audit in relation to surface and underground mining operations as well as mine water drainage.

Alan Krause – Auditor

Mr. Krause is former Chairman and CEO of Montgomery Watson Harza (MWH) Global Inc., with more than 35 years of international experience in the mining sector. He is a geotechnical engineer with expertise in tailings and overburden management and environmental issues. Mr. Krause acted as Project Manager during the 1999, 2005 and 2008 PTFI External Environmental Audits and as a team member in the 2011, 2014 and 2017 audits.

Dr. Ali Sahami (PT Lorax Indonesia) – Auditor

Dr. Ali Sahami is the President Director of PT Lorax Indonesia. He is an environmental geochemist with over 25 years of experience in academic research, mining and consulting industries. He is a mining environmental specialist with extensive audit and environmental assessment experience at large mining projects both internationally (including North America, South America, Africa and SE Asia) and in Indonesia. He was involved as auditor in the 2014 and 2017 audits.

Adrian Brett (Epps and Associates Pty Ltd) **– Auditor**

Adrian Brett is Senior Environmental Specialist and Director of Environmental Management Consultants International (Epps and Associates Pty Ltd). He is an environmental scientist and regulatory legal specialist with more than 40 years of experience in environmental projects including audit internationally.

Additionally, PTFI invited representatives from Central, Provincial, and Regency government institutions to participate as audit observers, including Ministry of Environment and Forestry (MoEF) and the Ministry of Energy and Mineral Resources (MEMR). The following five observers were able to participate:

1) Himawan S. Saputra – Ministry of Energy and Mineral Resources
2) Nafila Taufik Arinafril – Ministry of Environment and Forestry
3) Steveson Ronald Kayoi – Papua Province Office of Forestry and Environment
4) Nurul Matin – Papua Province Office of Forestry and Environment
5) Munawir Nuhuyanan – Mimika Regency Office of Environment

6. CONCLUSIONS AND RECOMMENDATIONS

6. 1. Conclusions

In late 2018, the PTFI 1991 Contract of Work (CoW) with the government of Indonesia was converted to a new special mining license (Izin Usaha Pertambangan Khusus Operasi Produksi or IUPKOP), which grants PTFI mining rights initially through 2031, coupled with an extension of mining rights through 2041.

PTFI has shown its commitment in conducting voluntary external environmental audits on a triennial basis as written in its 300K AMDAL. The triennial 2021-2022 External Environmental Audit is the 9th audit since 1996 and is aimed to review the environmental management in PTFI's IUPK area and its implementation compared to the previous audit in 2017. The audit was scheduled to be conducted in 2020 but was delayed until this time due to Covid-19 pandemic. The audit focused on seven strategic environmental issues linked to PTFI activities, namely tailings management, Grasberg open pit closure, underground mining operation, waste management, water quality, reclamation and biodiversity, and climate change related issues. Analyses were conducted by evaluating the improvements related to recommendations issued under the 2017 audit and reviewing the obligations to be met, environmental commitments, best practices, and future challenges.

In the last few years there were important updates in laws and regulations related to mining and the environment. Law No. 3 year 2020 on minerals and coal mining was issued in 2020 to update Law No. 4 year 2009. Whereas Law No. 11 year 2020 on job creation changes most of the articles in Law No. 32 year 2009 on environmental protection and management as well as Law No. 41 year 1999 on forestry. Both laws and their implementing regulations are important considerations in the environmental management of PTFI operations.

Overall, there have been improvements in environmental management in the PTFI mining area compared with the previous audit conducted in 2017 and best practices were also maintained.

Another important issue is the Tailings Management Roadmap as guided by the decrees of Minister of Environment and Forestry No. 594 year 2018 and No 101/2019 regarding the PTFI's Tailings Management Roadmap. It is the opinion of the Audit Team that tailings management still represents the largest challenge for PTFI, especially related to retention performance in the ModADA as well as the potential operational impacts on the estuary and sea prior to the reversal of those impacts post closure. In the Tailings Management Roadmap, erosion from the Lower Wanagon OBS (LWOBS) has been identified as an important source of non-tailings sediment flowing into ModADA. Monitoring has shown the efforts to control this erosion is effective and meeting Roadmap targets, and that the LWOBS rehabilitation project is achieving safe, stable, and environmentally acceptable closure.

In general, waste, water and air quality management has been improved. PTFI should maintain diligent implementation of management standards to ensure that SOPs are properly followed.

The analysis on legal performance in environmental management of PTFI concludes that PTFI has fulfilled the requirements and its obligation outlined in the various government regulations, Ministry of Environment decrees, as well as letters from the Governor of Papua and Regent of Mimika.

6. 2. Recommendations

This audit formulated recommendations based on observations and reviews conducted throughout the audit. These recommendations discussed in previous chapters, in particular Chapter 4, aimed at improving and enhancing environmental management at PTFI's mining operations, have been compiled and summarized in Table 6.1.

Table 6.1 Summary of the Recommendations for Environmental Issues

Environmental Issues	Recommendations
Tailings	1. Continue reporting the performances in mg/L unit for total suspended solids for non-tailigns sediment monitoring, giving a better picture of efficacy of the sediment control operations. 2. Since the underground mines will be expanded in the future with the development of Kucing Liar, it is recommended to further develop appropriate and efficient methods to control the sediment from these potential underground mine TSS sources. 3. There are still challenges for Pandan Lima and Kelapa Lima monitoring points to comply, particularly for TSS, with the environmental standard, and it is recommended to study the most appropriate location for new points of compliance in the downstream of ModADA which could be managed to comply with effluent standard for copper and gold mining activity. The result of this study should be discussed with MoEF to seek the possibility for replacement of Pandan Lima and Kelapa Lima as points of compliance. A thorough study on the potential management strategies and impacts to the surrounding environment, mitigation, and management during the operational phase as well as post closure is on-going as part of the Tailings Management Roadmap. 4. The occurrence of pyritic materials will increase the potential for acid rock drainage in the ModADA if not managed properly. A thorough study on the potential management and mitigation strategies (including contingencies) to prevent impacts to the surrounding environment during the operational phase as well as post closure is necessary and underway. 5. High rainfall conditions and potential earthquakes are outside the TRMP's direct control and must continue to be addressed with robust levee designs that use acceptable and defensible storm and earthquake parameter return intervals. *6.* TRMP should continue to strategically direct tailings flow to low areas in the ModADA using their swamp excavator fleet. Highest priority should be to infill areas of ponded water in contact with the levee embankment. This recommendation will result in both improved tails retention and increased levee embankment stability. *(Reference Tailings Management Roadmap Section II – Handling of Material in ModADA, [5] The increase of tailings retention, [c] Filling of depressed areas)*

Environmental Issues	Recommendations
	7. The placement, operation, and maintenance of spur dikes to direct tailings flow away from the levee embankment toe should continue. These spur dikes can be unarmored (i.e., without rip-rap protection), with periodic inspection and repair if scour or erosion occurs. These spur dikes serve two primary purposes. First, they force the tailings river away from the levee embankment and second, they create lower energy depositional environments immediately downstream of the spur dike structure. Use of Dolos in strategic areas versus managing scour through widened crest widths or placement of sacrificial spur dikes should also remain as alternative scour protection methodology and will require a tradeoff around effectiveness, cost, and availability. *(Reference Tailings Roadmap Section II – Handling of Material in ModADA, [5] The increase of tailings retention, [b] Spur dikes and groins)* 8. Pending approval of the current AMDAL, PTFI should maintain their current action plan addressing tailings containment options and consequences. This plan identifies material transportation, stockpile sizes, RoR impacts, freeboard management, as well as potential mangrove and social impacts from delayed containment provided by the structures. 9. Following approvals, focus should be concentrated on areas of the mangrove protection structures below both the East and West levee sections. It is realistic to assume that in the south extension area, the acceptable Rate of Rise (RoR) required to avoid deformation and differential settlement may not initially allow the placement of adequate fill material to meet freeboard design parameters. 10. Test fill options using a larger pioneer layer, geogrid and uncompacted fill should be benchmarked with empirical data collected by TRMP over the last several decades. 11. It is recommended that PTFI continue to evaluate the geotechnical stability of the NWL and also address potential ARD generation as required. 12. The results of the LiDAR surveys should continue to be incorporated into the crest requirement calculations on a regular basis and also used to provide a database to inform the SQRA. PTFI's target should be to have accurate system wide survey data, at a minimum annually, and potentially on a 6-month basis in specific areas (e.g., annual LiDAR with semi-annual infill surveys). 13. Maintain current monitoring program scopes and frequencies (CQA, instrumentation, LIDAR, observations). TRMP has demonstrated continual improvement in construction quality assurance over the five years. These programs should remain institutionalized and

Environmental Issues		Recommendations
		embedded in Standard Operating Procedures (SOPs) for TRMP. The test fills planned should be logistically situated as far south as practicable to simulate actual foundation conditions.
Grasberg Open Pit Closure	Wanagon Overburden Stockpile Geotechnical Management and Water Management	1. Finalize the Surface Mine Detailed Closure Implementation Plan 2. Continue to maintain resources and management attention to complete the WWSS project and ensure the successful stabilization of the LWOBS. It is recognized that the WWSS has been impacted by the geometry around the south knob and the ability to get equipment to the LWOBS to assess foundation conditions. 3. Address the residual staining in the Kaimana Stockpile and complete limestone capping accordingly. 4. Progress re-shaping and placement of limestone covers on all dumps and exposed material to mitigate any localized surface ARD loads as well as lower oxygen ingress and potential ARD generation in the underlying overburden. 5. While the Wanagon drain zone hydrogeologic model suggests it is not necessary to maintain the WDD after closure is complete, the Audit Team recommends maintaining the WDD as an active and operating dewatering and additional depressurization system for the Wanagon OBS for as long as conditions might be practical. 6. Construction of the lower Wanagon toe buttress is anticipated in 2027-29. This structure will require a detailed design to ensure the buttress is keyed in the abutting foundation sidewalls and that the foundation floor is free of weak foundation material. Any weaker materials will need to be removed prior to the construction of the LWOBS buttress. Upon completion of access, planned geophysical and geotechnical investigations will provide information key to project design and execution. 7. PTFI is currently executing a groundwater piezometer plan, and maintaining the schedule to install, maintain and monitor each well should remain a priority. The predictive groundwater models currently indicate a significant portion of the flow within the drain zone occurs in unsaturated flow near the base of the OBS. Functioning and reliable piezometers

Environmental Issues		Recommendations
		will be necessary to confirm the phreatic level in the OBS relative to the designed drain system, including above and below groundwater pinch points (i.e., the 3,775 and 3,505 lower rock lip) identified in modelling. 8. Continue to refine the hydrologic mass balance of the Upper, Middle and Lower Wanagon OBS important to further validate and predict groundwater flows. This balance should be used in conjunction with the piezometers as they are installed to calibrate the water balance model. 9. PTFI's ability to act on predicted block cave behavior will have notable influence on lower Wanagon OBS management. Continued observation, mapping, and modelling of block caving as it relates to the Wanagon OBS, followed by appropriate mitigation plans that can be quickly implemented, is recommended.
Underground mining operation		1. To the degree practicable maximize underground water pumping to Amole Drift and use in the mill to reduce sediment discharges from AB 1 and AB 2 tunnels. 2. Further assess various technologies which might be used in conjunction with sediment traps to further decrease the TSS underground discharge.
Water quality		1. A noted increase and subsequent decrease in dissolved copper concentration in ModADA surface waters appears associated with the processing of stockpiled ore. This demonstrates the importance of ore stockpile management and should be considered in future stockpiling and processing plans (i.e., minimizing the duration of ore stockpiling) with the expansion of underground mining operations. 2. Proactive management and monitoring of the lake levels is important subsequent to further excavation of the drainage channel to ensure maintaining the design 1 m lowering of water levels, especially in view of the increasing trend in sulphate concentrations in ModADA.

Environmental Issues		Recommendations
Waste management (Hazardous [B3] Waste Management)		1. Existing SOPs on waste management issued between 2019 – 2020 need to be updated to align with the change of the PTFI department responsible for waste management and reflect changes outlined in, Government Regulation no. 22 year 2021. 2. Ensure that a CoC is always generated by any user prior to waste transfer to WTP or THWS. Increase training and awareness of waste handlers and environmental inspectors, including examination to demonstrate competency. 3. Address MoC SOP updates to encompass the identification, handling and reporting of hazardous waste and contaminated soil generated from GRS surface mine decommissioning activity. 4. Maintain relevant records on the type and quantity of hazardous waste generated and contaminated soils excavated, as well as status of disposal,.
Waste management (Hazardous Waste Management)	Operation Maintenance and Contractor Workshop in Highland Observation	1. Conduct socialization and training for waste handlers in Highland shops operation to improve awareness by and ensure consistency of safe storage of B3 containers, including the filling of used oil cubes and appropriate waste labelling. 2. Additional training of new personnel and more frequent environmental inspections may be required to maintain consistency of waste management practices. 3. Ensure the integrity of oil and lubricant storage locations is maintained. 4. Improve practices of used oil storage in the Terra Shop and improve waste transfer point (WTP) area.
	Mill Concentrating and Underground Mining	Record all generated B3 waste from Fire assay lab both fire assay waste and used dust filter
	Solid Waste Management	Include criteria for waste transfers from generator to transporter (e.g., rejection by transporter if waste container is improperly labelled or packaged) and specification for transporter's truck (e.g., provision of spill kits) in the relevant SOP.

Environmental Issues		Recommendations
	Light Industrial Park (LIP)	Improve the competency of wastewater operators though training and testing
	Dewatering Plant (DWP)	Finalize the Training Need Analysis (TNA) for environmental training, accounting for mandatory training as required by the national competency standard (SKKNI) regulation, covering personnel in the roles of air pollution controller (PPU), wastewater pollution controller (PPA) and hazardous waste controller (POLB3). Based on TNA results, PTFI may set up a competency mapping and annual training program.
	Hospitals (Tembagapura and Kuala Kencana)	Lesson learned of Covid-19 outbreak should be incorporated into the medical waste management SOP in preparedness for unwanted conditions in the future. Contingency planning is needed in case medical waste transport or transfer is interrupted.
Waste management (Non-hazardous Waste Management)	Solid waste handling	1. The current 2017 Waste management plan gives projections though 2020. The plan should be updated with 2021 waste stream audit results and consider production projection to prepare adequate waste management infrastructure. 2. Cleaner production indicators i.e., waste prevention, energy efficiency, recycling and material recovery target and achievements should be reported systematically. PTFI should develop their objectives from compliance to beyond compliance targets.
	Landfills	1. Conduct socialization and training to improve SWM operators and inspectors awareness regarding various type of hazardous waste including used chemical containers. 2. Develop SOP for handling various metal scrap, spare part materials and other non-hazardous waste in MP73 Yard 6, including formal procedures regarding material types, storage, status, and notification procedures. Formal handover of Yard 6 from GRS Earth Work Department to Ore Flow Department is necessary to have clear accountability for the area owner. Clear layout and demarcation for storage items and the provision of gate and fence surrounding this area are required.
	Oil-water Separator	Prevent stormwater flow from entering the Surabaya Fuel Station OWS through provision of separated drainage or other practicable means.

Environmental Issues		Recommendations
Reclamation and biodiversity	Reclamation and Revegetation Activities	1. As follow-up to the previous audit recommendation, a comprehensive analysis and synthesis of existing reclamation monitoring data should be conducted in order to better understand the biological and physical phenomena of reclamation. 2. Monitoring of post-mining reclamation success in terms of ecological function (as stated in 300K RPL) should include measurement of a parameter to demonstrate ecological processes of nutrient cycling and energy flow, e.g., through monitoring of soil fauna/arthropod community. 3. Routine analysis of substrate/soil samples is needed to systematically monitor the changes in reclamation site condition and capacity to support vegetation growth. 4. PTFI should maintain an inventory database of species and a management plan that includes monitoring for the possibility of invasive species (plant or animal) and the potential impact to local biodiversity. 5. PTFI should further assess the potential impact of subsidence on overburden stockpiles and how this in turn might affect reclamation and revegetation efforts and the eventual success of the actions taken.
	Biodiversity and Natural Ecosystems	1. A formal biodiversity strategy and action plan as currently written has not been fully executed owing to security concerns. PTFI should proceed with plans to organize another biodiversity discussion forum/workshop in the near future. All action plans should consider and be in line with current developments at the national level, e.g., by keeping abreast of developments in the renewal process of IBSAP (Indonesia Biodiversity Strategy and Action Plan). 2. Activities in raising public awareness and education on biodiversity could be developed further, and facilities or programs which have experienced setbacks due to Covid protocols or other reasons should be revitalized. Maintain documentation of these efforts. 3. PTFI should continue to demonstrate its commitment to biodiversity conservation by encouraging and supporting more scientific research into the biodiversity within the IUPK area, which is representative of much of the unique biodiversity along the Papua southern

Environmental Issues		Recommendations
		coast. Plans to restore the use of permanent plots curtailed owing to security concerns, is encouraged. 4. PTFI has the opportunity to further contribute biodiversity data on a national level and set an example for other corporations in the private sector. The mechanism or procedure to contribute this data should align with policies and regulations concerning Indonesia's national targets and global commitments in the Convention on Biological Diversity.
Climate change related issues	Air quality and GHG	1. Conduct annual reporting of energy management implementation through POME application and receive POME certificate from MEMR as evidence that this reporting has been approved. 2. Add indicators for monitoring energy efficiency performance at the Mahaka Plant and DWP, i.e., energy consumption per unit product output at both facilities. .
Regulatory Aspects		1. The issuance of the Job Creation Law No. 11 of 2020 as an amendment to the Environmental Protection and Management Law No. 32 of 2009 and its derivative regulations necessitates a proper and precise interpretation of the substance of the provisions. The new law as well as government regulations consists of many articles and are valid since the date of stipulations. For the sake of implementing recent regulations in a correct way PTFI should engage in communications and dialogue to share the perceptions and interpretations about the regulations, both with the regulators and within PTFI. Special consideration should be given to the substance of administrative and bureaucratic procedures and mechanisms, new nomenclatures, validity of the permits and their extension, criteria of changes regarding environmental approvals, the parties conducting supervision, and the criteria and standards of environmental quality. 2. PTFI should continue to conduct dissemination process for better understanding of the new regulations on environmental protection and management to personnel from relevant departments, as continuation of the on-going PTFI training and workshop program 3. Towards a continuous improvement in environmental management and monitoring related to the new regulations, updating and improvement of SOPs would be appropriate as guidance for operational activities and other operating and technical procedures.

Environmental Issues	Recommendations
	4. In relation to the Decree of the Minister of Environment and Forestry No. SK 991/Menlhk/Setjen/PLA.4/11/2021 on Approval for Environmental Evaluation Document of Changes to Business and/or Underground Mine Operation Activities That Have Been Running and That Have Not Been Covered in PT Freeport Indonesia 2018 Environmental Permit, PTFI has undertaken the environmental management plan (RKL) and environmental monitoring plan (RPL) attached in this Decree in the implementation of RKL and RPL during 2022 as a supplement to the implementation report of RKL and RPL stated in Decree of the Minister of Environment and Forestry No. SK.546/Menlhk/Setjen/PLA.4/11/2018 until the issuance of the new environmental approval.