PANGUNA MINE
LEGACY IMPACT ASSESSMENT
PREPARATORY PHASE

Summary

Bougainville Copper Limited (BCL) operated the Panguna mine from 1972 to 1989. Located in the centre of Bougainville Island in the Autonomous Region of Bougainville (Figure 1), the Panguna mine has a complex history. From the outset of the granting of leases and approval of the mine there was opposition from the local community. Deep concerns during the 1980s about the perceived social, cultural and environmental impacts of the mine resulted in physical attacks on the mine and because of this it stopped operating in 1989. Since the mine stopped it has never re-opened and there has been no implementation of formal closure, maintenance of mining or process infrastructure or remediation work on the mine or downstream receiving environment.

In September 2020, 156 residents from villages downstream of the Panguna mine, represented by the Human Rights Law Centre (HRLC), filed a complaint against Rio Tinto Limited (Rio Tinto) with the Australian National Contact Point for the Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises (AusNCP). The Complaint was about the environmental impacts of the mine and the effects these have on the lives of people living near and downstream of the mine for things like pollution of rivers, lack of access to clean water, flooding and land destruction, collapsing levees, food shortages, disease and illness.

Figure 1 Bougainville Island location

PANGUNA MINE LEGACY IMPACT ASSESSMENT

Rio Tinto and the community members represented by HRLC have agreed to an independent assessment of the mine called the Panguna Mine Legacy Impact Assessment. The assessment will investigate the environmental impacts caused by the mine since the mine stopped in 1989 (including impacts that are happening now or may happen in the future) and the social and human rights impacts directly connected to these and will develop recommendations for what needs to be done to address them. This work is being overseen by the Panguna Mine Legacy Impact Assessment Oversight Committee, an independent body made up of representatives from the the Autonomous Bougainville Government, the Government of Papua New Guinea (PNG), key landowner and community representatives, BCL (as former operator) and the parties to the Complaint, chaired by an Independent Facilitator.

The first step in the Panguna Mine Legacy Impact Assessment is called the Preparatory Phase. Because a lot of information about the mine is at least 30 years old, this phase has:

- Collected existing information about what is known about the environmental impacts of the mine
- Tried to assess which parts of the Panguna mine present the biggest safety risks to people now
- Identified gaps where more study is needed
- Recommended which studies should happen next.

The 10-week Preparatory Phase involved Tetra Tech Coffey reviewing satellite imagery and aerial photos of the mine, historical reports and data held by BCL and some additional reference information such as books provided by Rio Tinto and HRLC. The Preparatory Phase was done as a desktop assessment so there was no visit to Panguna to see the mine and its impacts to the Kawerong and Jaba rivers, talk to people about these impacts and their concerns about how the mine has affected their lives or to collect environmental samples. The Preparatory Phase was limited to assessing: the state of infrastructure at the mine; potential for levee failure and flooding risks; changes in landcover and local populations; river water quality and ecology impacts; and tailings deposition in Empress Augusta Bay.

It is important to understand that the results of the Preparatory Phase are preliminary and further work is needed to provide better answers about the current environmental and social impacts of the Panguna mine. This work, including site visits, will happen in the next phases of the Legacy Impact Assessment.

SUMMARY OF MAIN RESULTS FROM THE PREPARATORY PHASE

State of mining and process infrastructure

Detailed aerial imagery taken during mining in 1979, when operations stopped in 1989 and during 2020 was looked at to see how the mine infrastructure has changed over time. The current state of infrastructure such as buildings, townships, storage tanks, machinery and the port which supported the mine, as well as the process plant, open pit and waste rock dumps, was assessed.

Potential physical and chemical risks to people and/or the environment were identified for approximately half of the infrastructure. This means that there is a physical risk to people from something falling down, or a chemical risk to people and/or the environment from potential exposure to stored or leaked contaminants.

Detailed assessments are not possible at this stage due to the limitations of available information and will need to be undertaken during the next phase of the Legacy Impact Assessment. Areas of future work will focus on those areas of greatest safety risk to people.

Levee failure

During the operation of the mine, BCL diverted river channels and constructed tailings retaining walls (also known as levees) to try and keep tailings discharged by the mine within the Tailings Lease boundary around the Jaba River from its junction with the Kawerong River (Plate 1) to the mouth of the river at Empress Augusta Bay.

Plate 1 Levee at Kawerong-Jaba river junction looking upstream, 1981

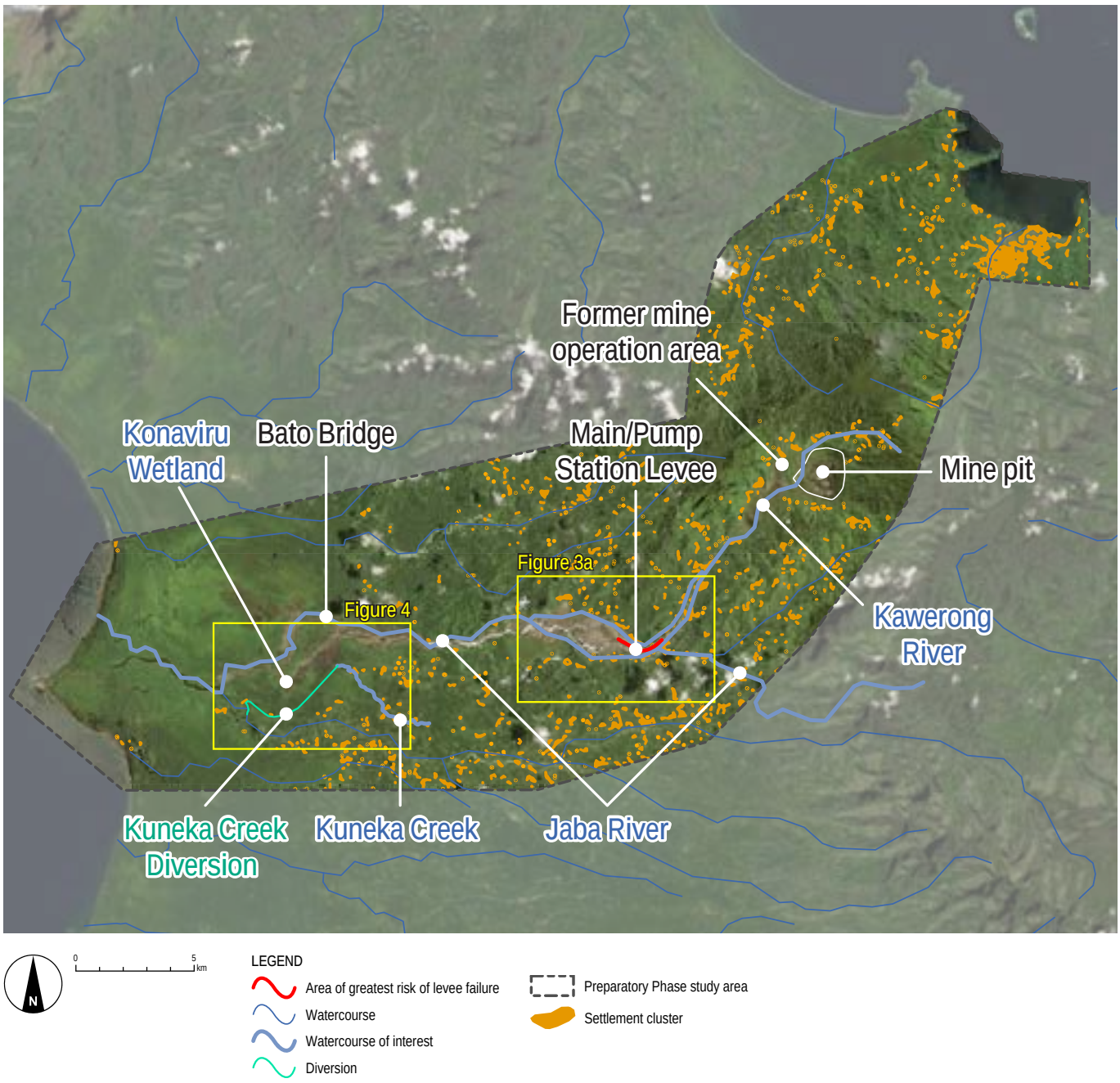


Figure 2 Location of the levee at the junction of the Kawerong and Jaba rivers

During operations, disposal of tailings to the Kawerong River meant that there was a constant supply of sediment to the top of the river system. This meant that the river bed built up with sediment. When the mine stopped, there was no more tailings discharged to the river, which stopped the supply of sediment. This means that since the mine stopped, the top of the river near where tailings used to be discharged has eroded down, washing sediment downstream. No maintenance has been done on the levees for more than 30 years and they have become less stable because the river has eroded down near them.

One of the most important parts of the Preparatory Phase assessment has been to try and assess the potential for levees to fail in the future. Aerial imagery, photographs and videos from 2019/2020 show that the levee at the junction of the Kawerong and Jaba rivers known as the Main/Pump Station Levee (Figure 2) is almost certain to collapse at some stage in the future but when this will happen and how severe the impact would be is unknown. This may happen due to flooding, earthquake, seepage or water flowing through tunnels which form under the levee wall. If the levee collapsed, structures and people that live on the floodplain downstream of the Jaba River would be directly impacted by flooding or landslide effect.

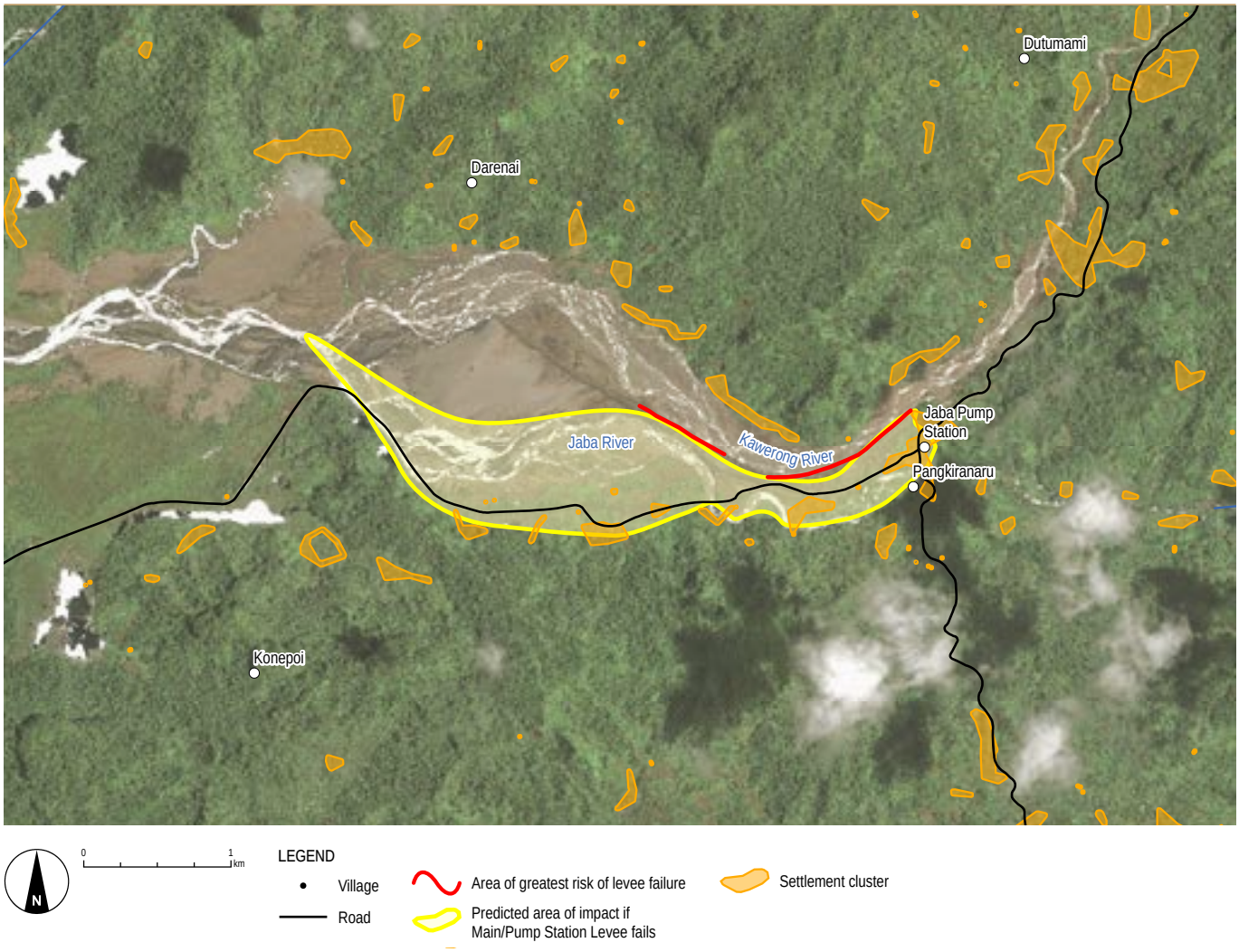


Figure 3a View from the air of the levee at risk of failure (red line) and predicted area of direct impact (yellow line), showing groups of structures (orange) where people live

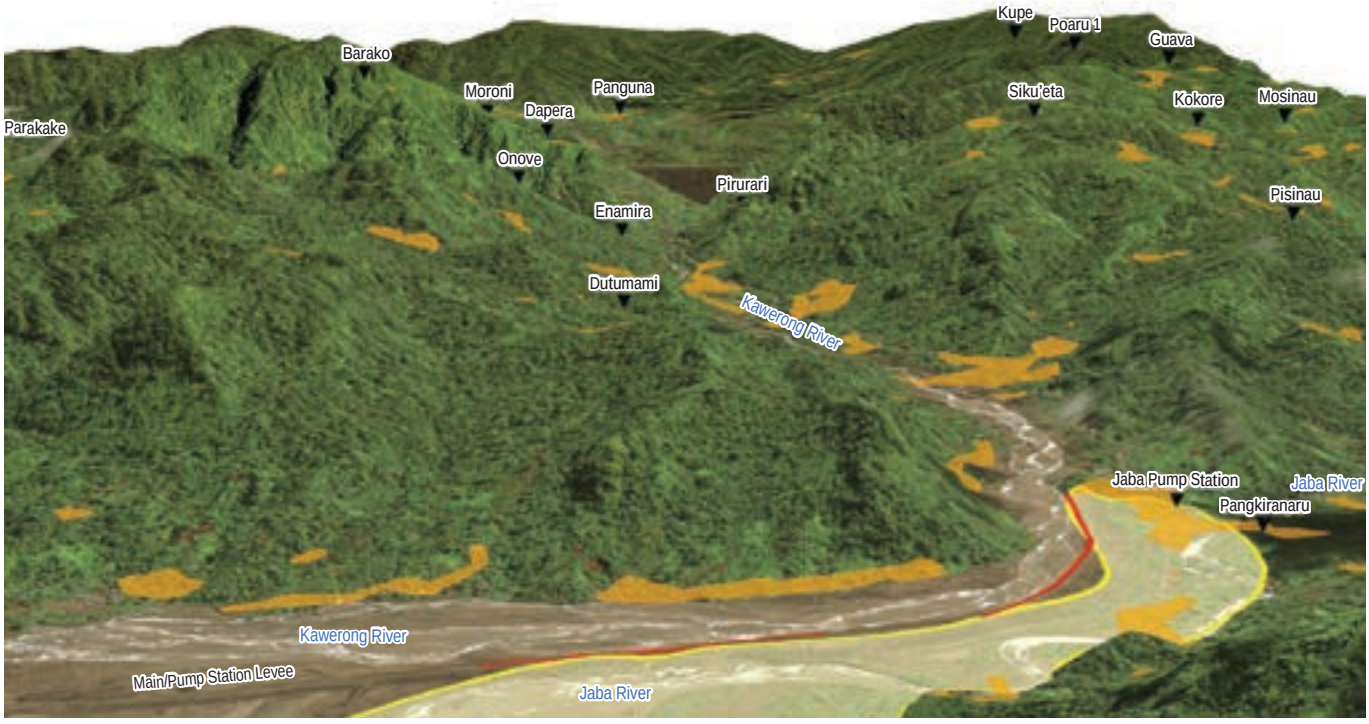


Figure 3b View looking up the Kawerong River towards the Panguna mine showing the predicted area of direct impact (yellow line) and groups of structures (orange) where people live

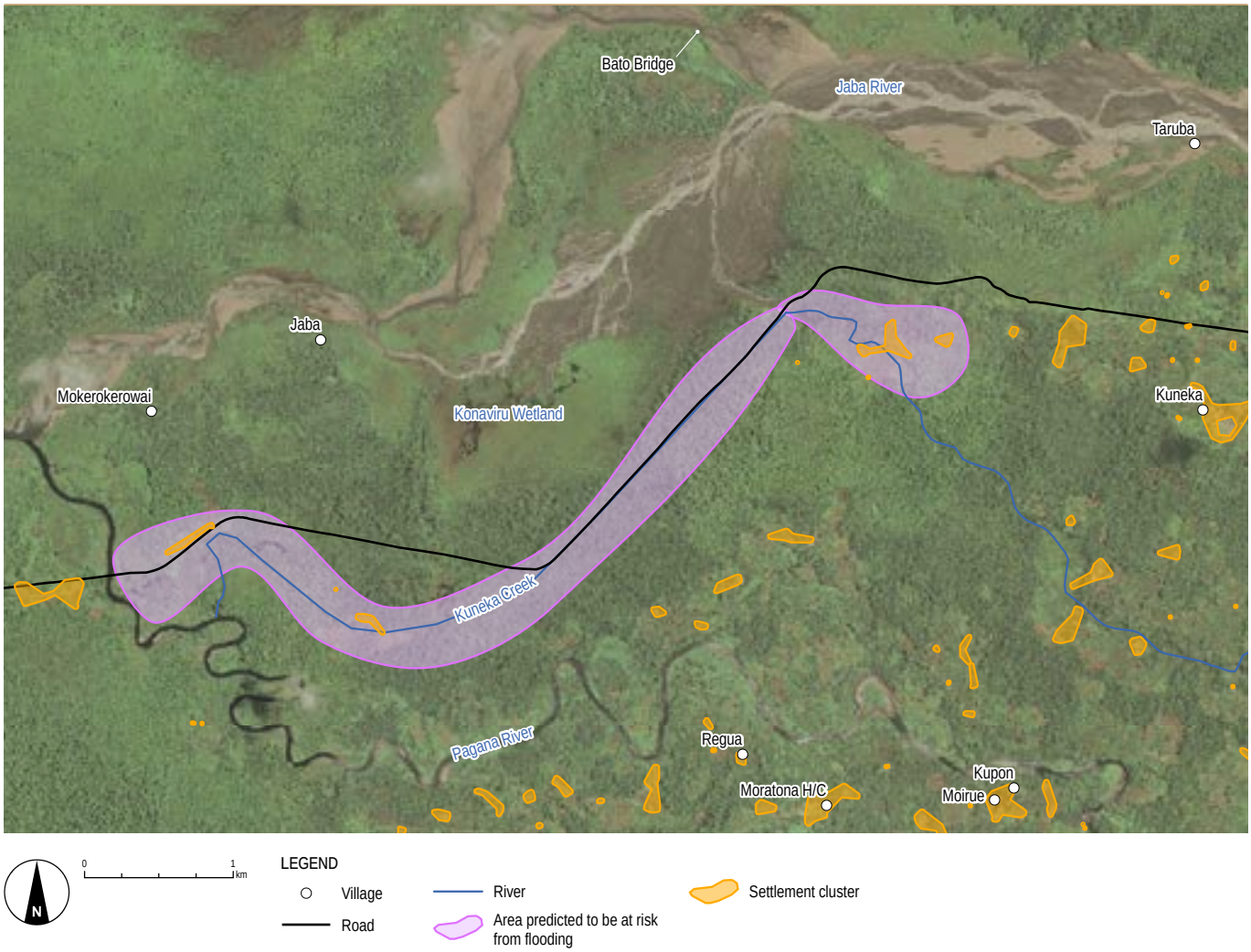


Figure 4 Area of flooding risk to nearby structures and people with the predicted area of direct impact (purple line), showing groups of structures (orange) where people live

The yellow line on Figure 3a (view from the air) and Figure 3b (view looking up the Kawerong River towards the Panguna mine) shows the area currently expected to be directly impacted if the levee collapses, and the orange colours show the groups of structures where people live. There are estimated to be 85 dwelling structures in this predicted area of direct impact, with a potential population of approximately 370 people, conservatively assuming all structures are occupied. In addition to this, if the levee collapsed there would be an increase in erosion of the Kawerong River and more sediment would be transported into the Jaba River which could result in more flooding downstream.

It is not yet possible to predict when the levee at the junction of the Kawerong and Jaba rivers may fail or how severe its failure may be due to limitations of current information. Further site assessments are required to better understand this risk and these will be a focus of the next phase of the Legacy Impact Assessment.

Flooding

Another important part of the Preparatory Phase assessment was to look at where flooding may occur in the future, particularly from changes in river flow due to movement of tailings down the river. The bed of the Jaba River has raised over time due to flooding and build-up of previously deposited tailings, such as at the lower Jaba River near Bato Bridge. In 2017, the Jaba River changed course and started to flow into the Konaviru wetland and lower Kuneka Creek (Figure 4), changing their flooding patterns and depositing tailings into them.

Based on assessment of 2020 aerial imagery, this change of flow into Konaviru wetland is likely to remain and become the focus of further tailings deposition in the future. Figure 4 shows the risk of flooding from the change in river course to the south of the Jaba River into the Konaviru wetland, with the currently expected area of direct impact from flooding shown in the purple line and groups of structures where people live shown in orange. There are estimated to be 50 dwelling structures in this predicted area of direct impact, with a potential population of approximately 200 people, conservatively assuming all structures are occupied.

It is not yet possible to predict when this will happen and whether the change will be permanent. Further site assessments are required to better understand this risk and these will be a focus of the next phase of the Legacy Impact Assessment.

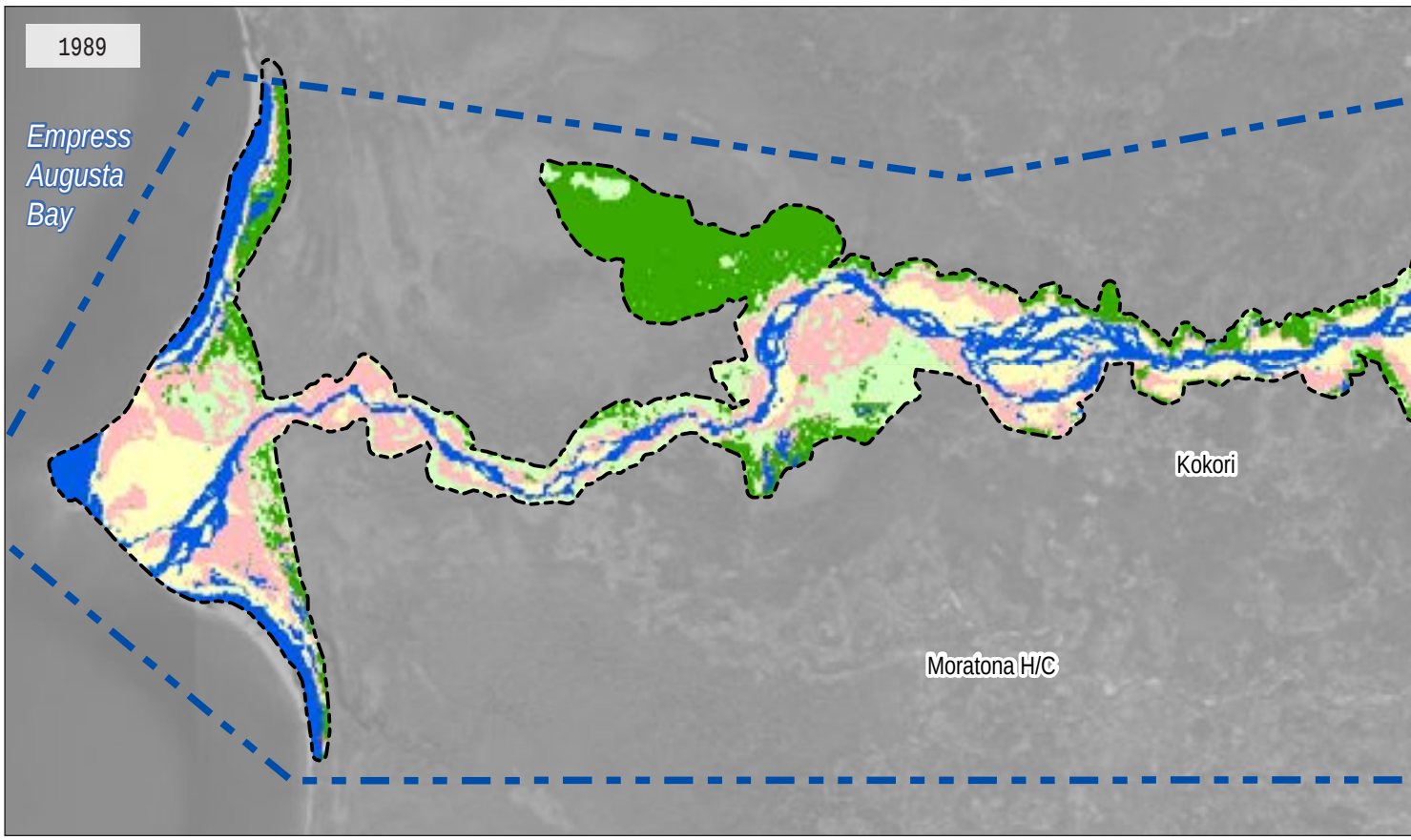


Figure 5 Landcover classification – Riverine footprint 1989

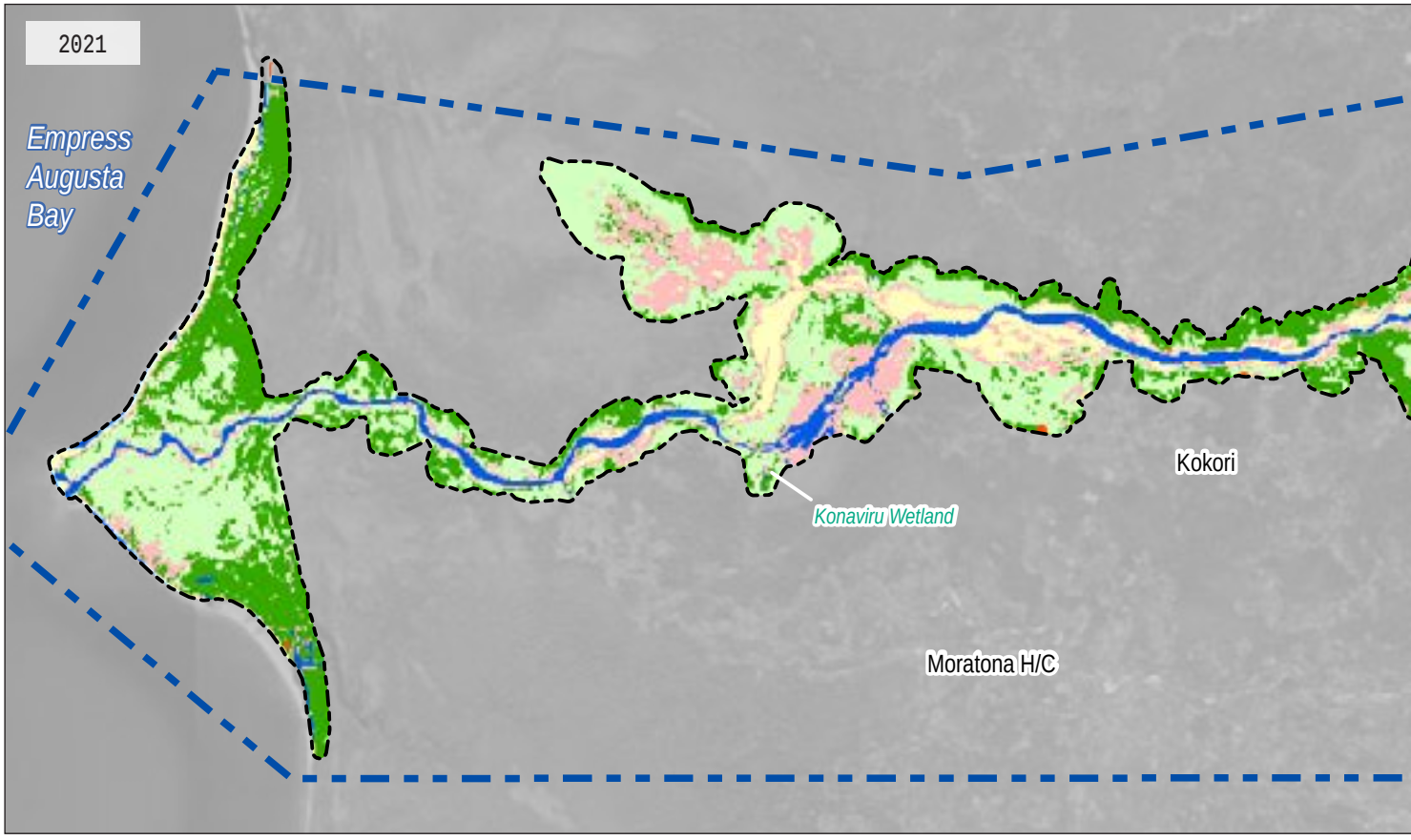
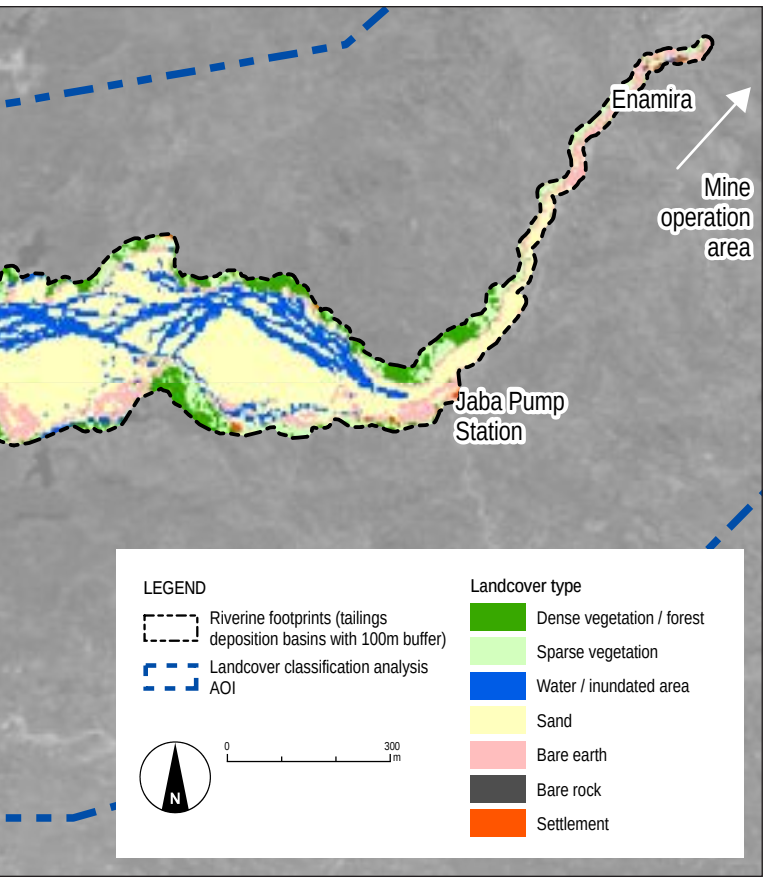
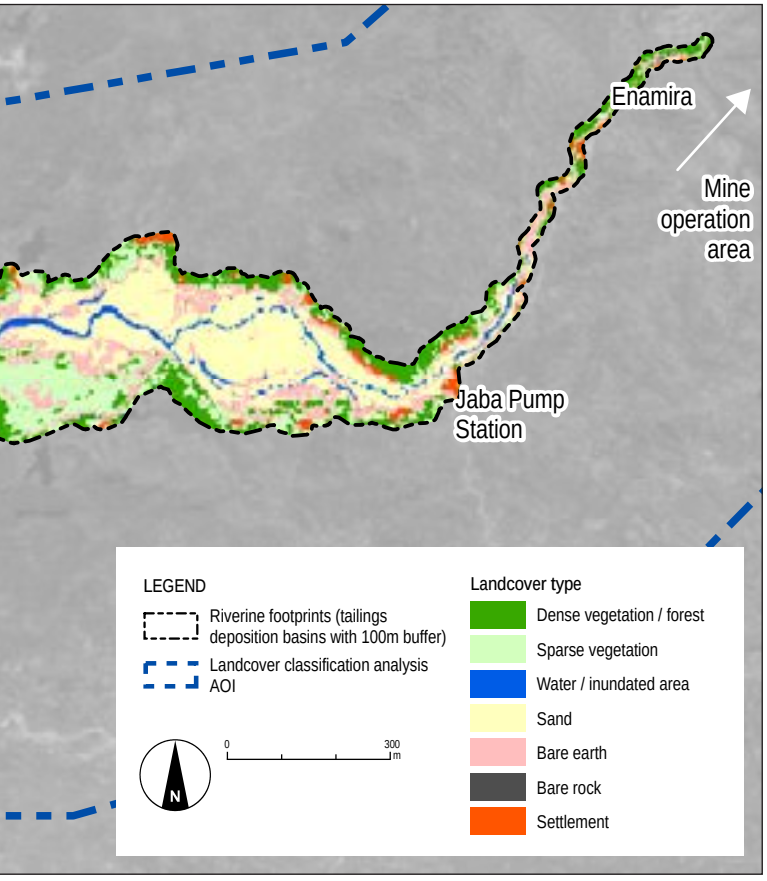


Figure 6 Landcover classification – Riverine footprint 2021





Landcover change

Figure 5 shows the landcover type for the riverine area in 1989. This shows large areas of sand (i.e., tailings) throughout the highly braided river system, little to no dense vegetation along the Jaba River, no tailings deposition in the area of dense vegetation north of the Jaba River downstream from Bato Bridge, no revegetation of the Jaba River Delta and very few settlements along the margins of the riverine footprint. In comparison, Figure 6 shows the landcover classification for the riverine area in 2021. This shows reduced areas of sand along the less braided river system with large areas that were sand in 1989 now being sparse or dense vegetation, conversion of the dense vegetation north of the Jaba River downstream from Bato Bridge into sparse vegetation and bare earth due to the deposition of tailings in this area, the change in the course of the Jaba River through the Konaviru wetlands, revegetation of most of the Jaba River Delta and more settlements along the margins of the riverine footprint, particularly along the north and south of the edge of the river near the Jaba Pump Station.

The results of the landcover change assessment will be used during the next phase of the Legacy Impact Assessment to focus areas of investigation for aspects such as resource use and human health risks.

Water quality and aquatic ecology

The assessment of river water quality and aquatic ecology has been based on historical data from during mining operations, with limitations in the type of data collected 30 years ago.

Mining had a clear influence on water quality and the number and type of fish in the Kawerong and Jaba rivers due to metals in the water and sediment discharged by the mine.

The amount of acid and metal discharge from the open pit, waste rock dump and tailings remains poorly understood and the current impacts of this to the water and fish in downstream watercourses are unknown. Further work is needed to understand the current downstream river water quality and aquatic ecology and to quantify people's use of these resources to better understand the human health risks from this.

Tailings deposition in Empress Augusta Bay

Sixty (60) percent of tailings discharged by the mine was washed into Empress Augusta Bay during operations. Between 50 and 60% of the Empress Augusta Bay seabed was contaminated with tailings to some extent between 1979 and 1986. Figure 7 shows the area of the floor of Empress Augusta Bay contaminated by tailings in 1971 (left), 1981 (middle) and 1986 (right). The darker brown colour shows the higher concentration of copper: the area of dark brown (high copper concentration) appears to gradually reduce from 1979 to 1986 but it is not known if this trend has continued.

The current area of contamination and its impact on marine ecology and marine resource use in Empress Augusta Bay is not known and will need to be determined during the Legacy Impact Assessment.

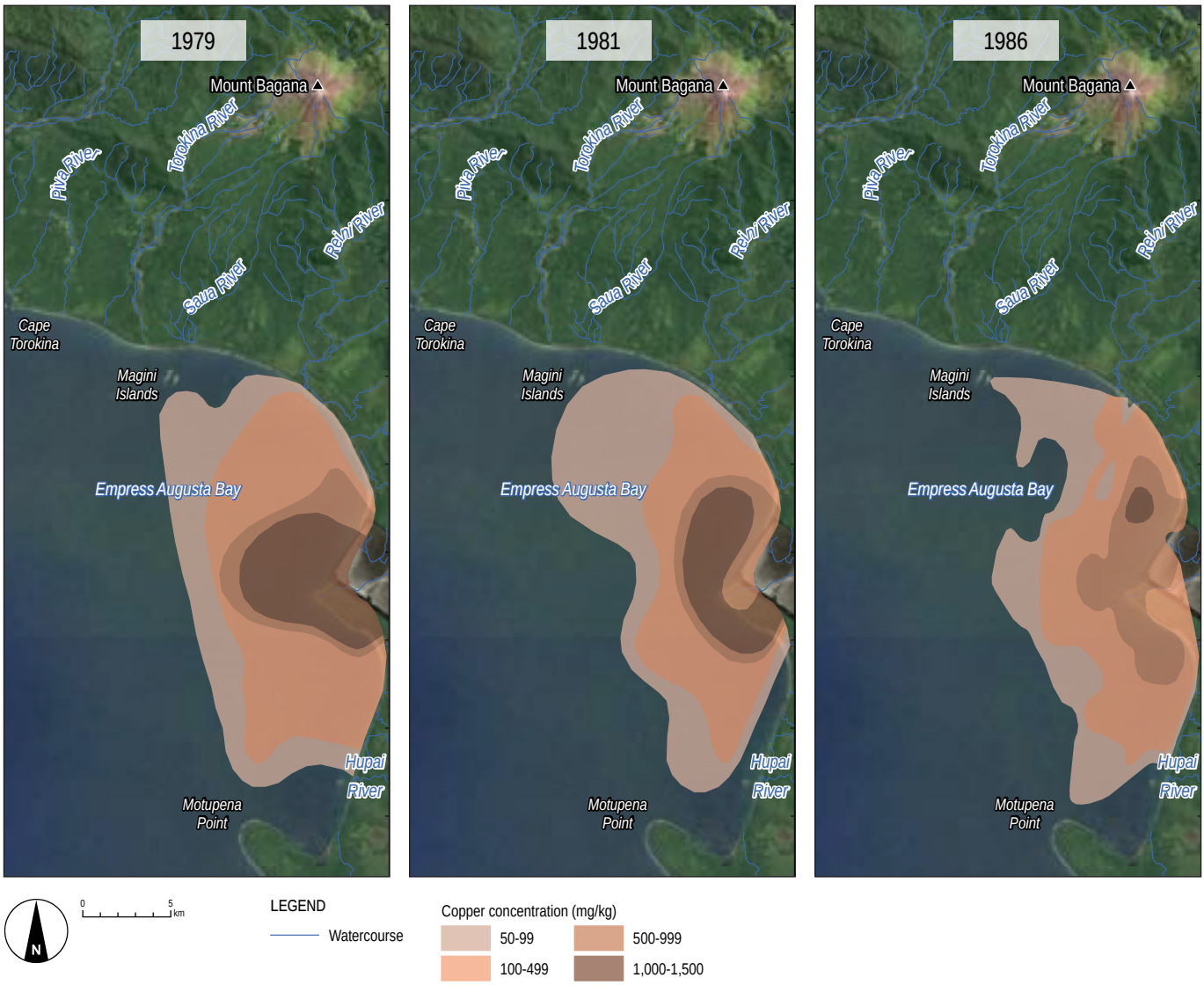


Figure 7 Contamination of the seabed in Empress Augusta Bay in 1971, 1981 and 1986

Recommendations

The Preparatory Phase work has recommended areas for further investigations, prioritised as follows:

- Recommendations for an initial screening assessment at the commencement of Phase 1 for investigations related to acute actual and potential risks to local communities that are required to refine or inform the scope and prioritisation of subsequent investigations. For example:
  - Site inspection and limited data collection to refine the assessment of the risk of failure of the Main/ Pump Station levee
  - Site inspection of levees and diversions and reported locations of flooding and tailings deposition to identify areas of particular risk
  - Site assessment of mining and process infrastructure
  - Collection of water samples along the Kawerong-Jaba river system
- Recommendations for detailed investigations for areas of highest risk to be conducted in the rest of Phase of the Legacy Impact Assessment. For example:
  - Evaluation of geologic and geotechnical hazards (e.g., open pit, drainage tunnel, waste rock dump)
  - Environmental geochemistry assessment
  - Sediment sampling along the Kawerong-Jaba river system and in Empress Augusta Bay
  - Hydraulic and sediment transport modelling to estimate future river behaviour and the impacts on levee stability and flooding
  - Aquatic ecology surveys along the Kawerong-Jaba and Pangana river systems

These recommendations will assist the Panguna Mine Legacy Impact Assessment Oversight Committee focus investigations during the next phase of the Legacy Impact Assessment.

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