

Ok Birim Tailings Storage Facility Project

Environmental and Social Impact Assessment

Chapter 6

Description of the proposed development



6. DESCRIPTION OF THE PROPOSED DEVELOPMENT

This chapter provides a description of the proposed Ok Birim Tailings Storage Facility (TSF) Project (the project), including its location in relation to Ok Tedi Mining Limited (OTML) existing operations, key project components, development schedule, required materials and equipment, workforce, and the main activities proposed during the construction, operations, and decommissioning, closure and rehabilitation phases.

6.1 PROJECT LOCATION AND EXISTING OPERATIONS

The project is located in the northwestern corner of Western Province, south of the Central Cordillera Mountain range which runs east-west along the length of Papua New Guinea (PNG). The TSF is proposed approximately 1 km west of the confluence of the Ok Birim and Ok Tedi, and about 55 km south of the existing Ok Tedi Mine and 90 km by road from the mine via the Kiunga–Tabubil Highway.

6.1.1 The Ok Tedi Mine

The Ok Tedi Mine (Plate 6.1) is a large-scale open pit mining operation using conventional drill and blast techniques with shovel and excavator loading equipment. Ore is mined and processed at an on-site processing plant capable of treating up to 24 million tonnes per annum (Mtpa) (Plate 6.2). The plant recovers copper, gold and silver into a saleable concentrate. Power for the mine is generated by a combination of hydroelectric and thermal power generation to meet the peak demand of up to 70 MW.

Primary mine access is via the Kiunga–Tabubil Highway maintained and being progressively upgraded and sealed by OTML (Plate 6.3). This road connects the mine to Bige and regional centres Tabubil, Ningerum and Kiunga; it also serves as a crucial link for transporting materials between the mine and Kiunga Port.

A 156-km-long pipeline runs buried along the Kiunga–Tabubil Highway, transporting copper-gold concentrate to the Kiunga Port located on the Fly River (Plate 6.4). At Kiunga, the concentrate is dried, stored and shipped by barge down the Fly River to a transfer vessel anchored at Port Moresby's Fairfax Harbour for export to smelter customers in Japan, the Philippines, Germany, South Korea and India.

Pyrite concentrate (PCon) produced at the tailings processing plant (TPP) (see Plate 6.2) near the mine is transported via a 125-km-long pipeline to subaqueous storage pits on the west bank at Bige, within OTML's lease boundary. These pits are designed and operated to permanently submerge sulfide-rich material to prevent oxidation and acid generation. Residue sand tailings from the TPP are discharged via a 1.5-km-long tailings river disposal pipeline to Ok Kumiup, which flows into the Ok Tedi via Harvey Creek (Plate 6.5). Waste rock is also disposed to the creek system at the mine. This material is then transported downstream, and the coarser sand-sized material settles in a dredged slot near Bige, where dredged material is hydraulically placed into long-term engineered stockpiles on the east and west banks of the Ok Tedi (Plate 6.6), which joins the Fly River approximately 25 km downstream at D'Albertis Junction.

At Bige, the stockpiles range from 12 m to 22 m in height and incorporate swaled embankments engineered for surface water control. Current geochemical studies indicate that dredged material is uniformly non-acid forming (NAF). Progressive rehabilitation trials to date have demonstrated successful establishment of primary and secondary vegetation.

Both the project and the mine are located entirely within the upper Ok Tedi catchment. The project area experiences high rainfall and is dominated by dense, relatively intact, tropical vegetation. Terrain varies from steep-sided valleys and rugged mountains near the mine site, transitioning towards more gently undulating land and low-lying floodplains around the proposed TSF site (Plate 6.7 to Plate 6.9).



Photo credit: OTML

Plate 6.1
View of the existing Ok Tedi Mine

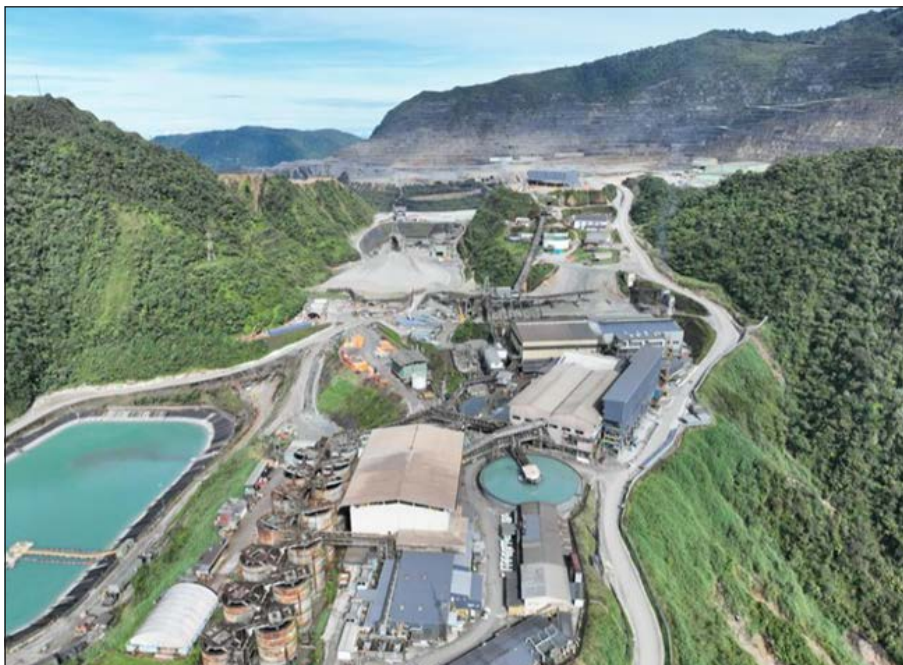


Photo credit: OTML

Plate 6.2
View of the existing tailings processing plant adjacent to the mine



Photo credit: Tetra Tech Coffey, 2025

Plate 6.3
View of the existing Kiunga-Tabubil Highway at intersection with Alice Pit access road



Photo credit: OTML

Plate 6.4
View of the existing Kiunga Port

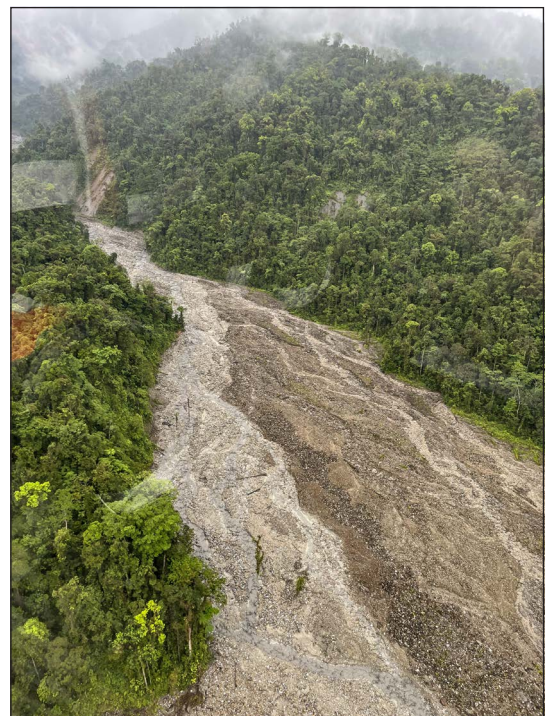


Photo credit: Tetra Tech Coffey, 2024

Plate 6.5
View of the Ok Kumiup, which flows into the
Upper Ok Tedi via Harvey Creek



Photo credit: OTML

Plate 6.6
View of the existing Bige dredge
and stockpile operations



Plate 6.7

View of the proposed TSF development area



Plate 6.8

View of existing dirt road to be upgraded as part of the approved ITCS Road project



Plate 6.9

View of Alice Pit and proposed Alice Bridge crossing as part of the ITCS Road project

There are several hamlets and villages close to the proposed TSF development area. A formal compensation process will be required to address potential losses of and/or access to customary land, livelihoods and physical assets due to the project development. This process will be managed separately to the environmental and social impact assessment (ESIA) in accordance with relevant PNG legislation and OTML's existing policy framework and voluntary international benchmarks.

6.1.2 Related development

As a separate but related development under the Infrastructure Tax Credit Scheme (ITCS), OTML is designing and supervising construction of the 14.5 km Alice Pit–Border Post Road (the 'ITCS Road') on the western bank of the Ok Tedi in North Fly District. This includes a planned bridge over the Ok Tedi to connect to the existing Kiunga–Tabubil Highway near Alice Pit. The project is expected to improve regional accessibility for local communities in the Ningerum Local Level Government area as well as enhance cross-border connectivity at the Yetetkun PNG–Indonesian border post. The assessment, approval and construction of ITCS Road is separate to the project and this ESIA.

OTML recently signed a road construction contract for this project with China Railway Construction Engineering Group Co., Ltd and construction is well underway with completion expected within 12 months (OTML press release, unspecified date) (see Plate 6.8). Construction of the planned bridge is scheduled to commence in 2027 and is expected to be completed by 2029.

The road will generally be constructed as a two-lane, unsealed road with an all-weather road base, with single lane sections and passing bay areas provided where required. The river crossing and approaches will extend approximately 2.4 km long (see Plate 6.9), including a 400 m long bridge supported on piers and concrete abutments on steel piles designed to accommodate seismic loading, scour and river bank erosion. The bridge will be constructed progressively from the east bank and sequentially advance span-by-span westward with a total of eight spans, 50 m wide each. Two traffic lanes and a 1.5 m wide pedestrian walkway will be provided. The bridge design is expected to accommodate anticipated OTML construction and operational traffic and provide a minimum of 1.5 m freeboard above high-water level for a 1-in-2,000-year flood (KCB 2026a). Gravel will be applied as needed for dust suppression along the road, such as near existing villages. A speed limit of 40 km/hr will be enforced along the road, with appropriate road safety signage installed where needed.

The ITCS Road will provide initial access to the proposed TSF, and its final alignment is expected to be modified as required over the project life to accommodate the staged development of the TSF.

6.1.3 Project area and footprint

Based on the proposed layout, the total disturbance footprint is estimated at approximately 1,980 ha. Project activities will primarily occur in the following two areas:

- TSF development area – This includes the TSF footprint, hydro-cyclone house and ancillary infrastructure, surface water management facilities and internal roads and tracks. The area is within a lowland setting with regional topography gently sloping to the south. The TSF site is in a sub-catchment of the Ok Yep, to the west and south of the Ok Birim and Ok Tedi confluence. The northern part of the TSF site is approximately 1 km west of this confluence. The TSF site is generally flat with undulated shallow valleys ranging in elevation from approximately 40 m to 80 m above mean sea level (AMSL) (see Plate 6.7).
- Infrastructure corridor development area – This includes the proposed pipeline access road, bridges and water/ravine crossings, tailings pipeline and supporting facilities outside the TSF development area. The corridor area varies from the rugged, steep-sided valleys near the mine to the more gently undulating terrain and floodplains towards the TSF site (Plate 6.7).

Table 6.1 provides an indicative breakdown by project component. These figures will be confirmed as detailed design progresses.

Table 6.1 Potential areas of disturbance associated with the project

Component	Potential disturbance area (ha)*
Tailings storage facility development area	1,500
TSF footprint	1,410
Hydro-cyclone house and ancillary facilities (i.e., laydown area, camp and site offices)	10
Surface water management facilities	60
Perimeter road and site access roads/tracks	10
Borrow and gravel pits	10 (excluding in the river)
Infrastructure corridor development area	480
Pipeline access road, bridges (x3) and crossings, tailings pipeline, choke stations and ancillary facilities	410 [†]
Construction laydown and working areas	70
Total	~1,980

* Indicative only, conservatively rounded up to the nearest 10 ha. Final disturbance footprint is expected to be less pending further design work.

† Estimate includes contingency for conservatism.

Tenements will be required from the Mineral Resources Authority (MRA) for a Lease for Mining Purposes (LMP) for the TSF and Mining Easement(s) for the tailings pipeline. Figure 6.1 shows the proposed LMP boundary for the TSF.

6.2 PROJECT COMPONENTS

Key components of the project are:

- A hydro-cyclone house for separating coarse and fine tailings, with coarse underflow sand used for embankment construction and overflow fines/slimes directed to the TSF impoundment.
- A ring-dyke TSF comprising internal storage cells developed progressively, with embankments primarily constructed using cyclone underflow sand.
- An 87 km long tailings delivery pipeline from the existing TPP at Ok Tedi Mine to the proposed TSF site, including associated pumping and piping distribution systems (i.e., one pump station at the mine site and two intermediate choke stations, and one terminal choke station adjacent to the hydro-cyclone house).
- A pipeline access road corridor including three bridges and several minor water/ravine crossings.
- Ancillary infrastructure including site offices, laydown areas, workshops, maintenance stations, waste and sewage management facilities, fuel storage, borrow and gravel pits, and accommodation camps (as required).
- Power supply primarily from on-site diesel generators, with an installed capacity of up to 11 MW during operations.
- Water supply sourced primarily from existing mine site supply, TSF decant water during operations, supplemented by rainfall and potential abstraction from nearby watercourses or groundwater for construction and potable water (as required).

Figure 6.1 and Figure 6.2 shows the proposed location and layout of the TSF and infrastructure corridor route. These are subject to further refinement during detailed design.

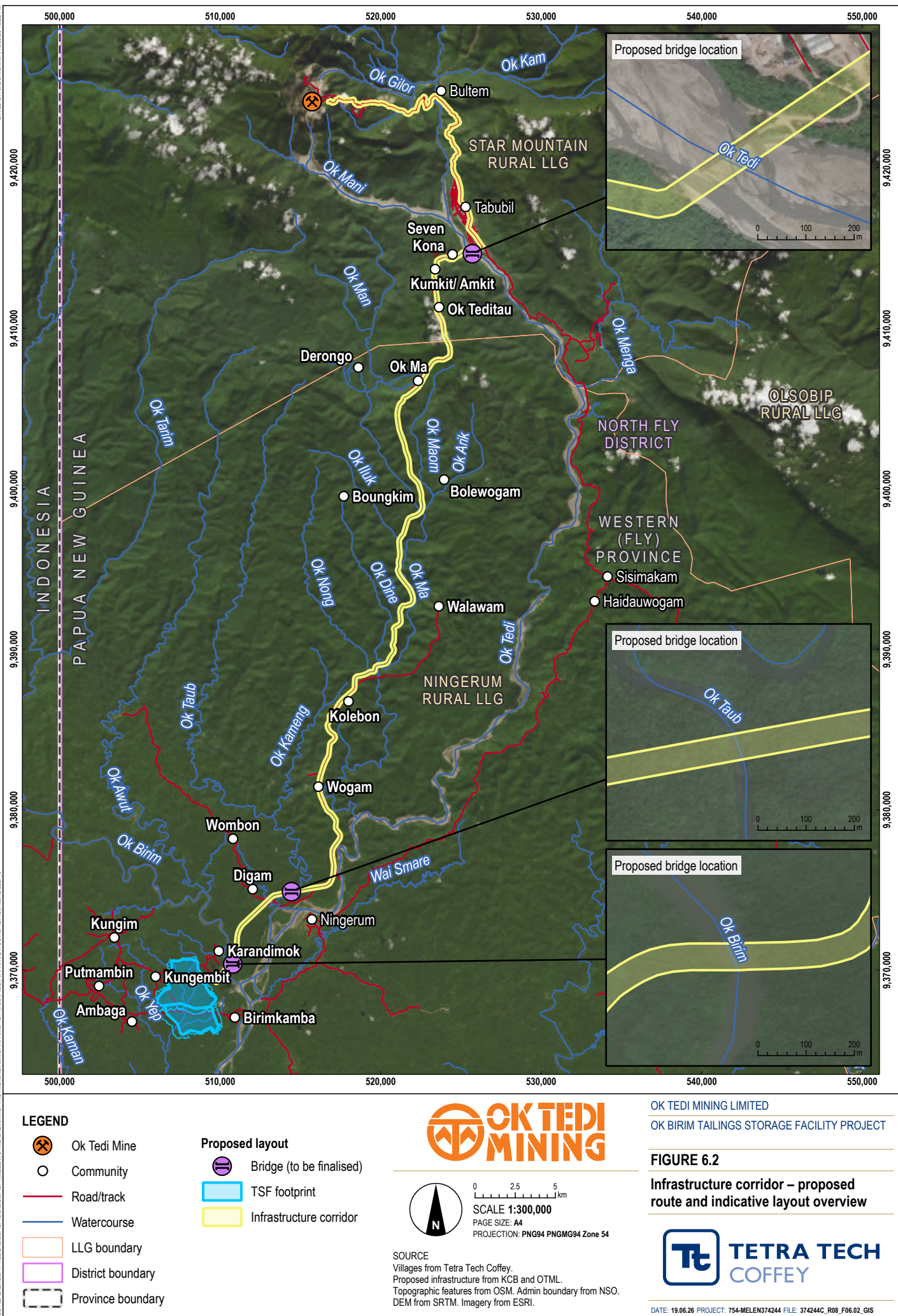


Table 6.2 provides a high-level summary of key project details, followed by a description of the proposed TSF stewardship approach, layout and staging of the TSF, hydro-cyclone house and associated infrastructure. Section 6.4 provides further detail on the construction and operation of these components.

Table 6.2 Overview of the project

Aspect	Description
Project location	Approximately 1 km west of the Ok Birim confluence with the Ok Tedi, Western Province, PNG.
Project footprint	TSF development area: approximately 1,500 ha. Infrastructure corridor development area: approximately 480 ha.
Initial construction capital expenditure*	>US\$830 million - includes detailed design, construction of initial TSF starter dam, tailings pipeline, hydro-cyclone house, diversion drains, access roads/tracks, bridge and water crossings, and associated construction vehicle and equipment fleet.
TSF sustaining cost estimate*	>US\$900 million - includes continuous ring-dyke lifts and TSF embankment earthworks for cells 1 and 2.
Annual operating cost estimate*	~US\$10 million - includes TSF management and maintenance, deposition of tailings in the impoundment, and operational vehicle and equipment fleet. Excludes land access compensation/community support and road maintenance (which is an operating cost for OTML's existing operations).
Key project components	
TSF	
Tailings volume	Current TSF design provides storage for approximately 368 Mt of tailings material.
TSF design and staging	<p>TSF to be developed in stages, with two conceptually defined storage cells to be constructed, operated and closed consecutively. Embankments will be primarily constructed using cyclone underflow sand.</p> <p>TSF starter embankment, diversion drains, perimeter and access roads/tracks to use local borrow material sourced from the Ok Tedi or from within the TSF footprint.</p> <p>Centerline-raised embankments of cyclone underflow primarily via hydraulic cell construction, and downslope spigot deposition from the downstream embankment crest, compacted to the density specified in the design to retain cyclone overflow and uncycloned tailings.</p> <p>No permanent water cover is expected to be required for tailings in the TSF impoundment area as the tailings are NAF based on geochemical characterisation results.</p> <p>TSF ultimate embankments will reach a maximum height of 36 m with a final crest elevation of 80 m reduced level (RL).</p>
TSF water management	<p>TSF lies entirely within the Ok Tedi catchment to minimise introducing new impacts to other catchments such as the Ok Birim, which remains unaffected by current mining activities.</p> <p>TSF has been positioned above the high banks of the Ok Birim and Ok Tedi to minimise flood interaction. Pending ongoing design work, some flood protection controls such as small levees may be required in the southeast corner of the TSF to meet the 1:2,000 annual exceedance probability (AEP) flood event.</p> <p>Planned discharge of excess TSF decant water will flow to the Ok Tedi after reduction of suspended solids via sedimentation ponds.</p> <p>Surface water diversions will be established to divert existing streams and clean surface water flows away from the TSF during all phases of the project. Sedimentation ponds will be constructed strategically to reduce fugitive sediment.</p> <p>TSF and emergency spillways have been designed to accommodate the probable maximum flood (PMF) of 1:100,000 AEP storm event with minimum 3 m operational freeboard.</p> <p>During operations, the TSF will operate as a flow-through system with excess decant water reporting to the Ok Tedi in a controlled manner via a siphon system. Each TSF cell will incorporate a siphon system, associated pipelines and outlet, and emergency spillway to enable planned and emergency release of excess TSF decant water.</p> <p>TSF seepage flow is expected to be within the shallow weathered profile and in any structures acting as preferential flow paths. Seepage collection at the south (downstream) of the TSF will be transferred to a sedimentation pond, while un-intercepted seepage is expected to report to</p>

Aspect	Description
	<p>the Ok Tedi. Based on current studies, groundwater seepage flows toward the Ok Birim are unlikely.</p> <p>Sedimentation pond volumes will vary by cell but will be designed as wet (constant flow) systems with flow capacity based on exceeding a 1:10 AEP event.</p> <p>During post-closure, the TSF will be configured as a stable, water-shedding and erosion-resistant landform that comprises benched embankment slopes and designed to safely convey PMF flows away from rehabilitated surfaces to the receiving environment via appropriately sized closure spillways and channels.</p>
Hydro-cyclone and recycling of TSF decant water	<p>Construction of the hydro-cyclone house is planned to separate the following streams:</p> <ul style="list-style-type: none"> • Underflow sand – to be used for embankment construction. • Overflow slimes/fines – to be deposited into the TSF impoundment. • Decant water from the TSF will be re-used as process water via dedicated pumping and piping distribution infrastructure.
Ancillary infrastructure	Other supporting facilities required for the TSF include laydown areas, site office, workshops, maintenance stations, waste and sewage management facilities, fuel storage, borrow and gravel pits, and accommodation camps (as required).
Power supply	On-site diesel generators with up to 11 MW installed capacity for operations. Additional power supply for tailings pipeline infrastructure will be drawn from the existing TPP power supply.
Water supply	<p>Temporary construction water supply: approximately 2 ML/year to provide initial water supply for construction activities for the TSF and infrastructure corridor. Raw water may be sourced from construction sediment ponds (after decanting), existing water supply or nearby watercourses, subject to confirmation by ongoing studies.</p> <p>Process water for hydro-cyclone and associated flush water systems: estimated to be approximately 32,000 ML/year and 34 ML/year respectively; initially sourced from mine site water supply then from TSF decant water and rainfall. Water required for the tailings pipeline flush water system is expected to be approximately 23 ML per flush.</p> <p>Raw water for dust suppression, vehicle washdown and progressive rehabilitation: approximately 1 ML/year, planned to be sourced from suitable clean water such as from TSF decant water (if deemed adequate) or on-site rainfall collected within the TSF footprint.</p> <p>Potable water for the workforce, camp, kitchens and ablutions: estimated to be approximately 1.3 ML/year, to be trucked daily from Kiunga or mine supply, extracted from groundwater boreholes or nearby upstream watercourse after adequate treatment to meet drinking water quality standards.</p>
Primary modes of transportation	<p>Construction materials, consumables and equipment:</p> <ul style="list-style-type: none"> • Shipping freight via boat from Port Moresby to OTML's Kiunga Port. • By road via truck transportation to/from Kiunga and mine site facilities to project site. <p>Workforce:</p> <ul style="list-style-type: none"> • Transportation of workforce to/from work sites via bus.
Infrastructure Corridor	
Access roads	Construction and upgrade of access roads/tracks, including an 87 km long pipeline access road from the Ok Tedi Mine to the proposed TSF (comprising 22 km along the existing highway from the mine to Tabubil and 65 km of new road); three permanent bridges over the Ok Tedi, Ok Taub and Ok Birim; and several minor water/ravine crossings. Generally two-lane, unsealed roads with an all-weather road base, with single lane sections and passing bay areas where required. Gravel will be applied as needed for dust suppression, such as near villages. Single or two-lane bridges will be provided with dedicated pedestrian footpaths. A speed limit of 40 km/hr for internal roads/tracks and 65 km/hr for roads shared with the community with appropriate road safety signage where needed.
Tailings pipeline	Construction of 87-km-long pipeline to transport final tailings from the TPP at the Ok Tedi Mine to the proposed TSF. Approximately 80% buried and 20% above ground. Pipeline is expected to be constructed along the pipeline access road for the entire route with minor deviations as required.

Aspect	Description
Main phases of the project	
Detailed design phase	Approximately 6 months (Quarter 4, 2026 to Quarter 1, 2027)
Construction phase	Approximately 36 months (Quarter 1, 2027 to Quarter 1, 2030)
Operations phase	Approximately 20 years (2030-2050), with target date for commissioning of the start of tailings deposition by 2030.
Decommissioning, closure and rehabilitation phase	Approximately 36 months (2050 to 2053).
Workforce	
TSF operational hours	Continuous operation, 24 hours per day, 7 days per week.
Employees and contractors	Construction: peak of approximately 300 people (including contractors). Operations: approximately 150 people (including contractors).
Accommodation	Locally sourced workers are expected to be housed in surrounding hamlets and villages and be bussed to and from the work sites on a shift basis. Non-local TSF construction workforce will primarily be housed in a permanent modular camp sized for approximately 150 persons at Ningerum as part of OTML's broader workforce accommodation strategy to develop this town in line with local development plans. Tailings pipeline construction workforce may be accommodated in existing OTML camps in Tabubil, Alice Pit, Ningerum or Bige, as appropriate. A small temporary portable construction camp with capacity for up to 100 people will be established along the pipeline route as required. A small number of operational staff will be accommodated at permanent on-site facilities. Other staff are expected to be lodged in surrounding villages if that is where they live, or at existing OTML camps, as needed.

Source: Adapted from GRES (2024).

* The estimate is $\pm 25\%$ accurate with a base date of Q2, 2024.

6.2.1 Tailings storage facility

The TSF is designed to store approximately 368 Mt of tailings material generated by the Ok Tedi Mine over a 20-year operational period, at a nominal annual rate of 20 Mtpa of tailings produced by the TPP.

Key design criteria for the TSF comprise:

- Conformance with OTML internal standards and industry guidelines, including *Global Industry Standard on Tailings Management* (GISTM) (ICMM et al. 2020), Australian National Committee on Large Dams (ANCOLD) - *Guidelines on Tailings Dams* (ANCOLD 2019a) and International Commission on Large Dams (ICOLD) *Bulletin 194 on Tails Dam Safety* (ICOLD 2022).
- Adoption of conservative criteria under ANCOLD and GISTM to address potential uncertainties associated with hydro-cyclone performance, foundation conditions and final tailings characteristics.
- Capacity to accommodate both current life-of-facility (LOF) with provision to consider a potential and proposed mine life extension to 2050.
- Integration of risk-informed approach incorporating credible TSF failure modes into the design, operation and closure strategy.
- Ability to withstand credible extreme rainfall and seismic events consistent with best practice for operations and post-closure, including structural resilience to withstand seismic events with a 1:10,000 AEP based on site-specific probabilistic seismic hazard assessment (PSHA), as per GISTM and ICOLD guidelines.

- A post-closure landform that is geotechnically and geochemically stable, and compatible with the surrounding environment and intended end land-use.
- Measures to minimise impacts to surface water and groundwater.

The proposed TSF design involves the staged construction of the cyclone-sand ring-dyke (paddock) facility to minimise the operational footprint and enable progressive closure. The TSF is conceptually expected to comprise two sequentially constructed storage cells to store tailings, covering a total operational footprint of approximately 1,410 ha. Table 6.3 outlines the anticipated tailings production plan for storage in the TSF, including volumes of sand available for embankment construction and tailings to be impounded.

Table 6.3 Anticipated tailings production plan for the proposed TSF

Operation year	Calendar year	Tailings production (dry tonnes)*	Embankment sand available for construction (m ³)†	Tailings to be impounded (m ³)‡
1	2030	18,554,367	2,828,995	8,734,825
2	2031	18,714,947	2,853,479	8,810,421
3	2032	18,714,618	2,853,429	8,810,266
4	2033	17,756,818	2,707,392	8,359,364
5	2034	18,337,333	2,795,904	8,632,652
6	2035	17,999,072	2,744,329	8,473,409
7	2036	17,799,026	2,713,828	8,379,234
8	2037	17,975,269	2,740,700	8,462,204
9	2038	18,324,161	2,793,896	8,626,451
10	2039	18,640,363	2,842,107	8,775,309
11	2040	16,970,472	2,587,498	7,989,176
12	2041	18,581,055	2,833,064	8,747,389
13	2042	17,682,546	2,696,068	8,324,399
14	2043	20,217,753	3,082,613	9,517,896
15	2044	22,635,554	3,451,256	10,656,122
16	2045	17,394,498	2,652,149	8,188,794
17	2046	18,180,059	2,771,924	8,558,612
18	2047	20,123,330	3,068,216	9,473,445
19	2048	16,571,144	2,526,612	7,801,185
20	2049	16,559,889	2,524,896	7,795,886
Total from 2030 to 2049		367,732,274	56,068,355	173,117,040

* Source: KCB (2026b)

Final tailings output from the TPP, excluding PCon.

† Values based on a dry density of 1.7 t/m³ and 26 % of final tailings for 'embankment sand'.

‡ Values based on a dry density of 1.3 t/m³ and 18% of final tailings for 'cyclone house downtime' and 43% of final tailings for 'overflow tailings'. The remaining 13% is the 10% loss at the TPP and 3% loss during hydraulic placement.

Sensitivity modelling has been undertaken based on this design to test the influence of changes in external slope, plant downtime and hydro-cyclone splits. The results confirm that under modelled scenarios, the LOF storage requirements for the TSF can be met (KCB 2025a). As contingency, the excess volume of embankment sand and impounded tailings storage capacity shown in Table 6.3 can allow the TSF to operate for an additional two years beyond its planned operation, if required (KCB 2025b).

The subsequent subsections further describe the planned approach for TSF stewardship, layout and staging of the TSF, and hydro-cyclone and associated infrastructure.

6.2.1.1 Tailings storage facility stewardship

TSF stewardship refers to OTML's commitment to the safe, responsible management and governance of the proposed TSF from design through to post-closure. A comprehensive TSF stewardship framework will be established for the project to meet company obligations and align with relevant industry standards including GISTM (ICMM et al. 2020), ANCOLD Guidelines on Tailings Dams (2019a) and ICOLD Bulletin 194 on Tailings Dam Safety (2022). This framework will also draw on lessons learned from comparable operations in PNG, the wider region, and other tropical settings, where appropriate.

The framework will guide all phases of the TSF lifecycle with a focus on achieving practicable standards of safety and environmental performance consistent with relevant industry standards. Key components of the TSF stewardship program will include:

- Governance and accountability: senior management and board-level oversight of TSF safety, supported by defined roles and responsibilities, and integration with OTML's corporate risk systems.
- Qualified personnel and independent oversight: appointment of a suitably experienced Engineer of Record and establishment of an Independent Tailings Review Board to conduct periodic technical reviews.
- Construction phase: all construction activities for the TSF and associated infrastructure to be planned, executed, verified, and documented in a manner that safeguards structural integrity, environmental protection, and public safety, in compliance with GISTM and ANCOLD requirements.
- Operations, maintenance and surveillance: development of a detailed operations, maintenance and surveillance manual with procedures for record-keeping, regular compliance reviews and routine inspections, geotechnical instrumentation, performance monitoring and independent dam safety audits.
- Monitoring and risk management: on-site laboratory for testing of material suitability and real-time monitoring of TSF stability and seepage using piezometers and other typical surveillance instrumentation, with defined performance thresholds and response actions.
- Emergency preparedness: conduct of tailings facility breach analysis and consequence classification assessment, emergency response planning, and development of early warning systems for downstream communities in consultation with regulatory authorities.
- Stakeholder engagement and transparency: ongoing disclosure of TSF risks and performance through the ESIA process, OTML's annual environmental reporting and community engagement activity, in alignment with GISTM (ICMM et al. 2020), ANCOLD (2019a) and ICOLD (2022).
- Permit and legal compliance: conformance with OTML's Integrated Management System, supporting standards and relevant environment permit requirements, including performance monitoring, audit and reporting obligations.
- Knowledge, training and awareness: targeted training, knowledge sharing and continuous improvement to promote learning, communication and early identification of issues during all phases of the TSF lifecycle.
- Integrated closure planning: integration of TSF-specific measures in the overall mine closure plan to support long-term safety and environmental performance.

External parties, particularly PNG Government's MRA and Conservation and Environment Protection Authority (CEPA), as well as independent experts, will play a critical role in the stewardship of the TSF. Prior to TSF construction, OTML plans to host technical workshops with key government agencies to present the TSF design, address queries and seek feedback. In addition, the TSF's design, construction, and operation will be subject to independent expert review by internationally recognised specialists across key disciplines such as geotechnical engineering, geochemistry and water chemistry, tailings management, seismicity, hydrology and hydraulics.

6.2.1.2 Seismic considerations

A site-specific Seismic Hazard Assessment was completed for the TSF, cyclone house, Alice Bridge river crossing and associated infrastructure (KCB 2026c), with results summarised in this section. The assessment evaluated earthquake-induced ground motions using PSHA and deterministic seismic hazard assessment methods.

The assessment evaluated both crustal and subduction-related seismic sources (0 to 50 km depth) within a radius of approximately 300 km from the site. The assessment also evaluated contributions from subduction intraslab sources (50 to 200 km depth) and more distant regional crustal source zones. The PSHA identified the Southern Highlands Thrust as the nearest major active tectonic structure, located approximately 50 km from the TSF.

The consequence of TSF failure has been classified as 'Extreme' in accordance with ICOLD (2022), reflecting the potentially severe downstream impacts associated with TSF failure. This is consistent with international tailings management guidance requiring design criteria based on the greater of the 1:10,000 annual exceedance probability (AEP) probabilistic seismic hazard, or the 84th percentile deterministic Maximum Considered Earthquake event.

Current geotechnical investigations indicate that the underlying geology comprises thick residual and weathered soils of low to moderate strength derived from the Awin Formation, which overlie moderately to highly weathered Awin Formation bedrock.

Mean probabilistic peak ground acceleration (PGA) values varied depending on the assumed shear wave velocity (the speed a seismic wave can travel) of the underlying bedrock. Mean probabilistic PGA values are approximately:

- 0.39 g to 0.49 g for the 1:475-year return period
- 0.63 g to 0.76 g for the 1:2,000-year return period
- 0.99 g to 1.15 g for the 1:10,000-year return period.

Deterministic analyses for the Southern Highlands Thrust 'worst case' scenario produced 84th percentile PGA values of approximately 0.84 g to 0.89 g.

The assessment provides the basis for development of seismic design criteria for the TSF and associated infrastructure. The project has been designed in accordance with this assessment, noting the assessment recommends that additional geotechnical investigations, site response analyses and refinement of seismic hazard inputs be undertaken during detailed design as further site-specific information becomes available.

6.2.1.3 Tailings characterisation

Geochemical characterisation of the coarse- and fine-grained tailings streams produced from hydro-cycloning has been completed to inform the TSF design and understand its acid and metalliferous drainage potential (Appendix A). Daily composite samples of Feed and Final Tailings were collected from Unit 1 and Unit 2 of the TPP over the period of 7 to 23 June 2025. On three of these days (18, 20, and 21 June 2025), two composite samples were taken. Fifteen samples (5 TPP feed and 10 TPP tailings) were selected for detailed geochemical characterisation by EGi. Samples prepared by OTML were shipped to Steritech in Brisbane for gamma irradiation treatment, before release from biosecurity control and shipment to ALS Laboratories in Brisbane and EGi Laboratory in Sydney for geochemical testing. Tailings were size fractionated and samples were taken from the various size fractions for either characterisation or for kinetic leach column testing. Fractions used for kinetic column testing included Bulk, +75 µm fraction, and -75 µm fraction.

The geochemical investigations can be summarised as:

- The static tests classify both the fine- and coarse-grained tailings as strongly NAF, determined by negative net acid producing potential (NAPP) and neutral net acid generating pH (NAGpH).
- Four months of kinetic testing, using both free draining and saturated conditions, have started simulating the range of conditions likely to be found in the TSF cells and embankments. Kinetic testing of the tailings material is ongoing; however, the first four months of kinetic testing indicates:
 - Tailings oxidation rates are reduced by one to two orders of magnitude when saturated, suggesting on average TSF tailings oxidation rates are likely to be relatively low.
 - Leachate pH for all samples under both free draining and saturated conditions remained neutral, consistent with the NAF classification of these materials.
 - Leachate chemistry for all samples is dominated by calcium and sulfate, consistent with on-going sulfide oxidation and concomitant calcite dissolution and acid neutralisation, albeit at a much-reduced rate in saturated columns.
 - Metal(loid)s concentrations in leachates for all samples are very low, except for manganese which is likely associated with calcite.
 - Leachate copper concentrations are similar for saturated and free draining columns in contrast to apparent dissimilar sulfide oxidation rates. This suggests that copper is not readily mobilised from these tailings, even under the oxidising conditions of the free draining columns.
 - Low risk of metalliferous, neutral or acid leachate.
- Based on testing to date, a water cover or engineered store and release cover is not expected to be required during operations or closure.

These results have been considered in the design and operation of the TSF.

Concentrations of arsenic, cobalt, copper, manganese, nickel and zinc in tailings were measured by EGI (Appendix A). Results have been compared against the concentrations in the Australian National Environment Protection (Assessment of Site Contamination) Measure (NEPC 2013) soil health investigation levels (HILs) for a residential setting with garden/accessible soil (HIL-A Low Density Residential). These HILs provide a conservative screening level for exposure to metal concentrations in the tailings. Table 6.4 shows that all are well below the HILs.

Table 6.4 Comparison of concentrations of metals in tailings with soil health investigation levels

Parameter (mg/kg)	Bulk tailings	>75 µm fraction	<75 µm fraction	38–75 µm fraction	<38 µm fraction	HIL A*
As	6.9	4.9	10.7	6.9	13.1	100
Co	11	7.1	15.6	12.2	17.2	100
Cu	512	491	607	184	832	6,000
Mn	1,425	1,185	1,680	1,485	1,800	3,800
Ni	6.6	5.4	9.8	6.1	12.4	400
Sr	653	759	593	647	560	-
Zn	92	63	128	78	160	7,400

* Strontium does not have an HIL A.

6.2.1.4 Gravel borrow characterisation

The gravel borrow material to develop the starter embankment of the TSF has been physically characterised so it meets physical stability requirements. Geochemical characterisation of this material has not yet been completed to assess acid and metalliferous drainage (AMD) risks. A study to characterise this material will be completed prior to construction to confirm the material is geochemically suitable for use and/or managed to minimise potential AMD risks. This will include representative testing down to maximum extraction depths to understand changes in AMD risk with depth, where near-surface material is expected to be NAF, but deeper material may have an increased AMD risk.

6.2.1.5 Dam breach analysis

KCB Australia Pty Ltd (KCB) conducted a dam breach analysis to inform the consequence classification assessment and design of the TSF and confirm that appropriate factors of safety have been applied in accordance with GISTM (ICMM et al. 2020), ANCOLD (2019a) and ICOLD (2022). The analysis modelled critical credible failure scenarios under operational and post-closure conditions to identify potential downstream inundation zones and communities at risk. These scenarios are generally described in Chapter 13. Table 6.5 summarises the population at risk (PAR) and potential loss of life (PLL) consequence classifications for both sunny day failure (SDF) and rainy day failure (RDF) scenarios.

Table 6.5 Preliminary consequence classifications for the proposed TSF

Failure transect	Scenario	Incremental PAR	Incremental PLL	ANCOLD PLL consequence category*	GISTM consequence category†
Cell 1 East	SDF	12.2	12.2	High A	Very High
	RDF	12.2	12.2	High A	Very High
Cell 1 South	SDF	0	0	Low	High
	RDF	0	0	Low	High
Cell 1 West	SDF	0	0	Low	High
	RDF	0	0	Low	High
Cell 2 East	SDF	6.1	6.1	High A	High
	RDF	12.2	6.1	High A	High
Cell 2 West	SDF	0	0	Low	High
	RDF	0	0	Low	High

Source: KCB (2026c).

* ANCOLD consequence category based on PLL estimates and considers 'major' severity of damage and loss

† Minimum allowable GISTM consequence category is 'high'.

The ANCOLD severity of damage and loss associated with the dam break assessment was determined to be 'Major', due to an assessment of damage type across infrastructure, business importance, public health, social dislocation, impact area, impact duration and impact on natural environment. The minimum GISTM dam failure consequence classification derived from the environment, health, social and cultural, and infrastructure and economics incremental loss categories is 'high'.

In assessing each dam breach scenario for impact extent, depth of water and tailings flow, velocity and time of arrival, the key conclusions include:

- The townships of Kungembit and Birimkamba are not inundated by the SDF runout, and there is no incremental PAR identified in the RDF scenario at the townships.
- Two dwellings identified north of the proposed ITCS bridge (Alice Bridge) are affected by the SDF runout, with incremental RDF flood depth increases of approximately 900 mm and 750 mm respectively.

- The ITCS Road is subject to significant impact, particularly in the cell 1 southern breach scenario.

Based on OTML's operational experience at Bige for constructing and managing similar large landforms in a high rainfall climate, recovery from a hypothetical breach is considered technically feasible through early warning systems and use of cofferdams, dewatering pumps and reinstatement of containment using hydraulic deposition of tailings.

Key components of the emergency preparedness and response planning for the project will include:

- Real-time surveillance monitoring of the TSF embankment stability and integrity using piezometers and other appropriate instrumentation.
- Early warning systems and communication protocols for downstream communities potentially at risk.
- Evacuation procedures for site personnel and downstream communities potentially at risk.
- Emergency support planning for essential services in downstream affected communities.

The MRA has regulatory responsibility for dam safety aspects of the project. Detailed emergency preparedness measures and procedures will be developed in consultation with MRA, CEPA, local authorities and downstream communities prior to TSF operation commencing.

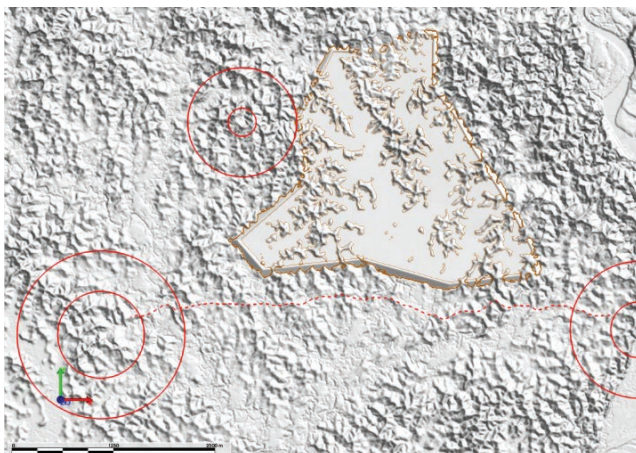
6.2.1.6 Layout and staging

The proposed TSF will comprise two cells: a northern cell (Cell 1) and an adjoining southern cell (Cell 2). Both cells will be fully enclosed by ring-dyke embankments and separated by the new ITCS Road alignment. Development of the cells will follow a staged approach consistent with the proposed TSF staging plan for a nominal two-cell configuration illustrated in Figure 6.3 and outlined in Table 6.6.

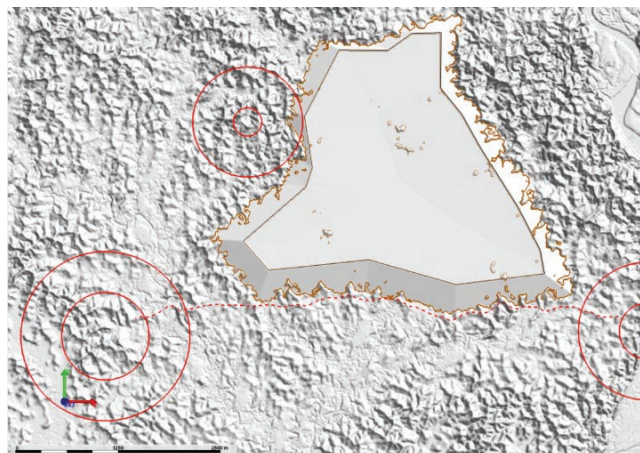
Table 6.6 Staging details for proposed TSF design

TSF Cell	Brief description
Starter embankment	<ul style="list-style-type: none"> • A starter dam will be built to a crest elevation of 62 to 65 m RL using suitable local borrow fill. • The crest elevation of the starter embankment was specifically selected to minimise the volume of borrow fill required and increase the storage capacity. • Cell 1 shares a centerline with the starter embankment. The centerline of the starter embankment was set back from the ITCS Road to prevent the Cell 1 raise from interfering with the current alignment of the ITCS Road. • Located entirely to the north of the ITCS Road to allow time for the potential re-alignment of this road as the TSF expands.
Cell 1	<ul style="list-style-type: none"> • The dam will be raised to 80 m RL using underflow sand. • Cell 1 will be raised to the ultimate crest elevation of the TSF along the same centerline of the starter embankment. • Cell 1 will be specifically aligned to allow the current ITCS Road alignment to remain in operational use for longer. • The footprint of Cell 1 is adjusted to allow room for infrastructure associated with the TSF, minimise surface water diversion works and increase the buffer distance between the toe of the TSF and the Ok Tedi as well as surrounding communities such as Kungembit.
Cell 2	<ul style="list-style-type: none"> • Cell 2 will be constructed following completion of Cell 1 and built with underflow sand supplemented as needed with local borrow material, reaching a final elevation of 80 m RL. • Cell 2 occupies the remainder of the overall TSF footprint and is adjusted to minimise surface water diversion works and increase the buffer distance between the toe of the TSF and the Ok Tedi. • Cell 2 overlies the ITCS Road and therefore requires re-alignment of the road prior to Cell 2 being constructed.

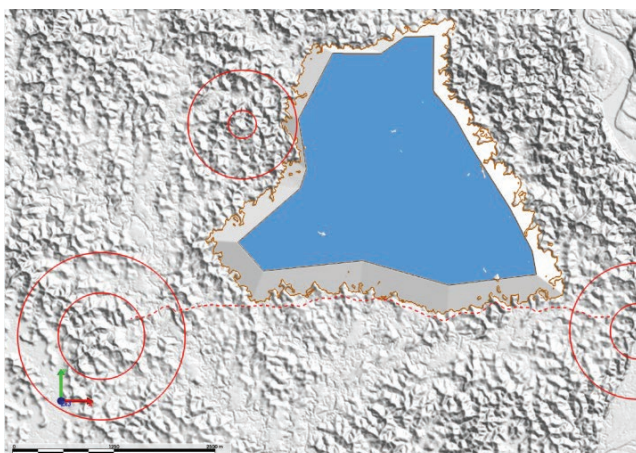
Source: KCB (2025b, 2025c).



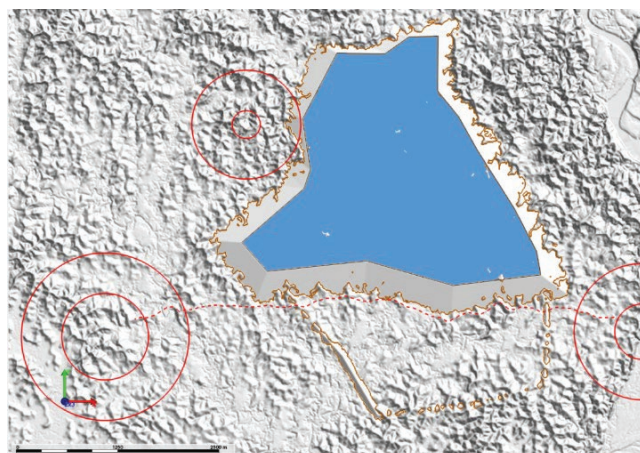
(a) Starter Embankment – 65 m RL



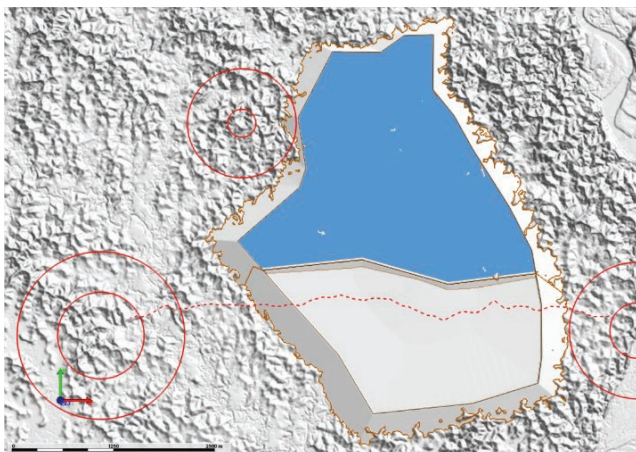
(b) Cell 1 – 80 m RL



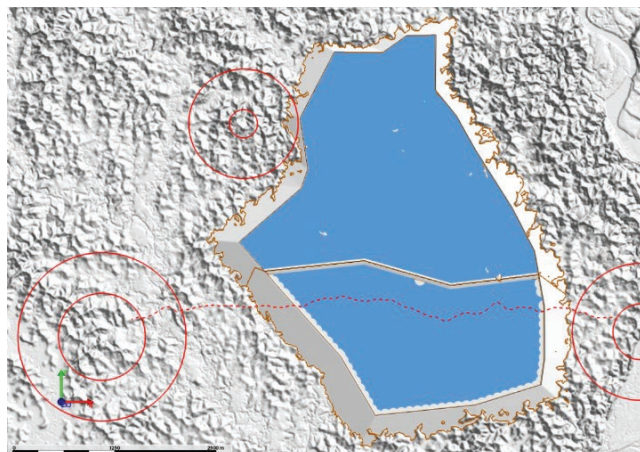
(c) Cell 1 with pond – 80 m RL



(d) Starter Bunds for Cell 2 – 57 m RL



(e) Cell 2 – 80 m RL



(f) Cell 2 with pond – 80 m RL

Note: The red circles represent the village locations and offset extents; the red dotted line represents the TCS Road; the brown lines represent the embankment toe and tailings outline; and, the blue shape represents the pond surface extent.

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FIGURE 6.3
Proposed Ok Birim TSF conceptual staging plan



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The TSF staged development will include:

- Construction of a starter embankment using locally sourced borrow material from the Ok Tedi or within the TSF footprint and suitable cyclone underflow sand, where available. This will provide initial containment for the first two years of tailings deposition, allowing contingency for initial operational challenges and upfront embankment sand volume requirements.
- Progressive construction, raising and closure of Cells 1 and 2 in accordance with the staging sequence outlined in Table 6.6, Table 6.7 and Table 6.8. Embankment lifts will use cyclone underflow sand placed and compacted to the density specified in the design primarily via hydraulic sand cell construction methods.
- Installation of sedimentation ponds to manage decant, runoff and seepage water, and reduce suspended solids prior to controlled discharge to the receiving environment.
- Provision of operational siphon system, associated discharge pipelines, drainage channels, outlets, and emergency spillways designed to enable planned and emergency release of excess TSF decant water to the Ok Tedi.
- Optimised design of Cells 1 and 2 to minimise the extent of surface water diversion works and increase the buffer distance between the toe of the TSF and the Ok Tedi as well as surrounding communities.

Table 6.7 Conceptual construction details for the proposed TSF design

Aspect	Starter embankment	Cell 1	Cell 2	Total
Borrow fill volume (Mm ³)	4	0.5	0.5	Up to 5
Embankment sand volume (Mm ³)	-	29	27	56
Impounded tailings volume (Mm ³)	15	88	70	173
Downstream bench height (m)	From top: 10 m, 10 m, 10 m			
Bench width (m)	50			
Downstream bench slope	Upstream/from top: 6.5H:1V, 9H:1V, 11H:1V			
Downstream overall slope	11H:1V			
Crest elevation (m RL)	62 to 65	80	80	80 m RL plus 1 m for final cover upon closure
Tailings elevation (m RL)	59	77	77	77
Minimum operational freeboard (m)	3			
Maximum embankment height (m)	15	36	38	38
Storage capacity duration (years)	1.5	10	8	20

Source: KCB (2025b).

* May be required to create starter bunds for protecting the embankment foundation between construction and initial deposition.

Table 6.8 Conceptual staged raising details for the proposed TSF design

Operation year	Calendar year	Crest elevation (m RL)	Minimum raise height (m)	Raising dam	Operating dam
0	2029	62 to 65	21	Starter embankment	-
1	2030	66.5 to 68	1.5 to 3.0	-	Starter embankment
2	2031	69.5	1.5 to 3.0	Cell 1	Cell 1
3	2032	71	1.5		
4	2033	72.5	1.5		
5	2034	74	1.5		
6	2035	75.5	1.5		
7	2036	77	1.5		
8	2037	77	0		
9	2038	77	0		
10	2039	78.5	1.5		
11	2040	78.5	0		
12	2041	Cell 1: 80 Cell 2: 62	Cell 1: 1.5 Cell 2: 20	Cell 2*	Cell 2
13	2042	65	3		
14	2043	69.5	4.5		
15	2044	72.5	3		
16	2045	74	1.5		
17	2046	77	3		
18	2047	78.5	1.5		
19	2048	80	1.5	-	
20	2049	80	0		
Closure	2050-2052	81	1	Final TSF closure	

Source: Adapted from KCB (2025b).

* The construction of the first raise of Cell 2 should be completed by end of Operational Year 12 to accommodate consolidation periods most likely needed for pore water dissipation; ideally constructed over several years.

Analyses indicate that the TSF has adequate storage capacity for the total planned tailings production, and sufficient cyclone underflow sand is expected to be available to support the staged construction of TSF embankments in line with planned sequencing (supplemented as needed by local borrow fill). This is based on the current 'base case' assumptions of tailings conveyed to the TSF via the pipeline represent 90% of the total tailings produced (it is assumed the remaining portion will not be impounded in the TSF); 20% cyclone house downtime; approximately 40% of the cycloned tailings will report to the underflow sand with the remainder constituting overflow slimes; an estimated 10% of the underflow sand placed in the TSF embankment will be lost due to runoff during hydraulic cell construction; and a dry density of 1.7 t/m³ (KCB 2026b).

Under normal operating conditions, cyclone underflow sand volumes are expected to be sufficient for embankment construction assuming no unplanned downtime on the TPP and tailings pipeline (i.e., all produced tailings are transported to the TSF).

Table 6.9 summarises the conceptual design parameters for the TSF embankments, which will be confirmed during detailed design. The coarse underflow sand will be piped to the final deposition location and placed to form the ring dyke, with an ultimate nominal embankment slope of 11H:1V m with 15 m crest width and 36 m maximum height to meet long-term seismic stability design criteria.

Table 6.9 Conceptual TSF embankment design parameters

Embankment type	Downstream slope	Upstream slope	Minimum crest width	Maximum embankment height	Construction material
TSF starter embankment	6.5H:1V	4H:1V	12 m	15 m	Suitable borrow fill material sourced from bulk earthworks and the Ok Tedi.
TSF ultimate embankment	11H:1V for effective dam heights of >20 m	Subvertical	15 m	36 m	Cyclone underflow sand supplemented with suitable borrow fill material sourced from the Ok Tedi, as needed.

Source: KCB (2025b).

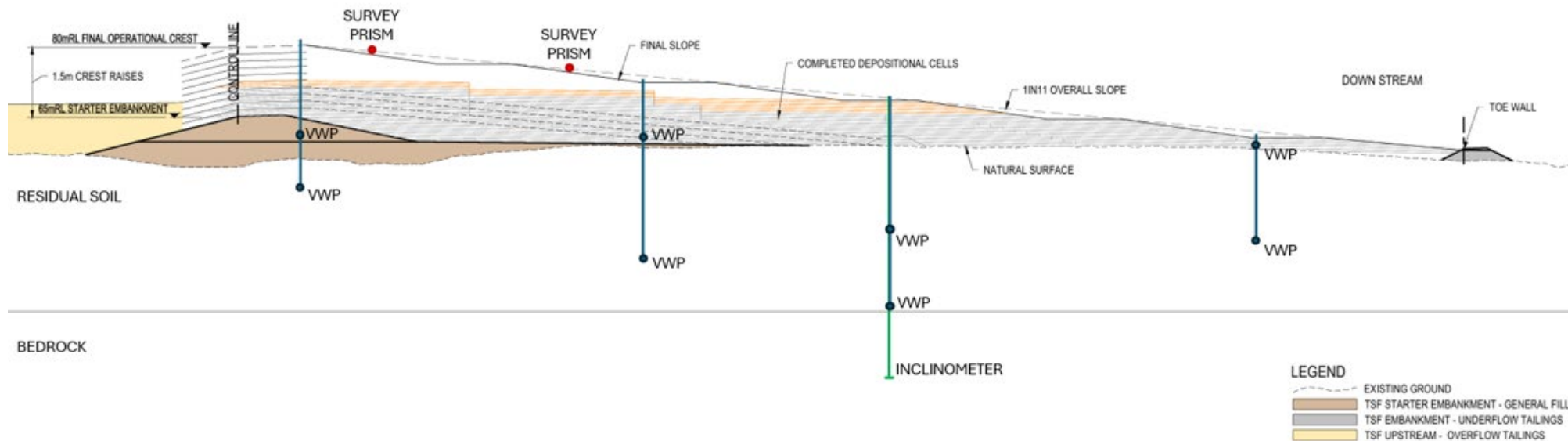
Figure 6.4 illustrates a typical cross-section of the TSF ultimate embankment, including deposition layers and relevant monitoring instruments.

Placement of sand will be by slurry discharge, followed by compaction and final shaping with dozers and excavators. Cyclone overflow slimes (i.e., the low solids content fine-fraction) will be deposited and stored upstream in the impoundment formed by the TSF embankment, and spigotted from the embankment crests to develop an upstream beach to keep the TSF pond away from the embankment for geotechnical stability. Further studies underway will confirm the suitability of using finger drains and local gravel sourced from the Ok Tedi (or from within the TSF footprint) to support initial TSF construction.

All embankments will include a gravel drainage system beneath the downstream slope to manage pore pressure. Drainage aggregate will typically be coarse grained, filter compatible, and most likely sourced from the Ok Tedi.

The placement areas will require preparation works as shown on Figure 6.5 and anticipated as follows:

- Cell formation:
 - Cyclone overflow slimes will be deposited using a perimeter discharge strategy, with the associated distribution pipeline and spigots resting on the upstream shoulder of the perimeter embankment. Deposition stations will be installed at nominal 300 m intervals along the distribution header located on the TSF crest. Nominal spigot spacing of 100 m will be adopted.
 - Cyclone underflow sand placement will be primarily undertaken using hydraulic cell construction, with downslope hydraulic placement where appropriate as spatial and topographic constraints evolve. These methods involve:
 - Hydraulic cell construction: Each hydraulic sand cell will be formed by containment berms constructed by pushing sand from within the cell using dozers. Cell sizes will vary depending on local topography, dozer operations and discharge pipe layout. Figure 6.5 shows the general configuration for hydraulic sand cell construction.
 - Downslope hydraulic placement: Hydraulic placement of cyclone underflow sand from spigots fitted with short spray-bar pipes located at the embankment crest, with deposited sand flowing downslope from the crest towards the outer toe of the TSF embankment on the downstream side.



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KCB, 2025



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FIGURE 6.4
Typical cross-section of the ultimate embankment for the proposed TSF



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- Drainage system:
 - Outlet pipes will be installed within the containment berms, typically 0.5 m to 1 m above the base of the cell, to drain surplus water and fines to the sedimentation ponds. The outlet pipe will be raised and/or relocated, as necessary, as the fill area is raised.
 - A network of drains on the downstream dam face will direct flows from cells to sedimentation ponds.
- Installation of relevant monitoring instrumentation, including (see Figure 6.4):
 - Piezometers to measure pore pressure in the material. These will be placed at strategic locations along slip surfaces identified in the slope stability analysis, where pore pressure may increase during shear, as well as in the downstream shell and filter blanket to monitor efficiency of the filter system.
 - Inclinometers to measure horizontal displacement along the full depth of a casing. These will be installed at locations where shear may occur, particularly in areas with identified weak layers or where movement is possible within rock joints and discontinuities.
 - Survey prisms on the surface to measure superficial movements.
 - Flow meters may be installed at the filter blanket outlets to measure discharge and assess the performance of the drainage system.
- During fill placement, the following typical approach will be used:
 - The underflow sand is continuously distributed from the hydro-cyclone house to the embankment via cyclone underflow pipelines. Two placement methods are proposed: hydraulic cell construction (bottom-up) and downslope deposition with compaction (top-down). Both methods satisfy the dewatering and compaction requirements for embankment stability.
 - Hydraulic cell construction (bottom-up) is the primary method for raising the TSF embankments. This method involves the sequential construction of confined, banded cells along the embankment toe, which are filled with cyclone underflow sand to progressively raise the embankment. Controlled deposition within the cells facilitates drainage and densification through self-weight consolidation and evaporation, promoting uniform material properties and controlled embankment geometry. Each pipeline outlet operates a three-cell arrangement comprising one active cell, one standby cell, and one cell under construction. Cells will be filled over a two-day period. Cell preparation and construction are sequenced to maintain continuous operations during pipeline relocation.
 - Downslope deposition with compaction (top-down) involves discharging underflow sand from the crest and allowing it to flow downslope in thin layers, followed by mechanical spreading and compaction. This method achieves the required density through controlled layer thickness and compaction rather than confinement. Downslope deposition with compaction is applied to selected embankment sections to reduce scheduling constraints and simplify construction. It is preferentially used within 150 m of the downstream crest, where operational limitations restrict hydraulic cell construction. Tailings placed using this method are compacted *in situ* to meet design performance requirements.
 - Underflow sand will be placed in controlled lifts, spread, and densified using dozer packing methods. Each lift of cyclone underflow will be placed hydraulically and compacted in the cell using standard methods appropriate to site conditions and consistent with current practice at Bige operations. This is expected to involve sequential filling and compaction before progressing to the next cell. Compaction methods may include a combination of downward seepage forces, vibration and load from dozers.
 - The base of the placement cell will be graded gently towards the drains during fill placement to convey the flow of water into the outlet drains. The surface of the placement cell will be typically graded between 0.5% and 2%. Between 1% and 5% of the cyclone underflow sand by volume is expected to leave the cell as suspended sediment and will be directed to the sedimentation pond.
 - Following completion of a lift, the cell will be left to drain for about 8 to 12 hours prior to *in situ* density testing. Drainage times may vary significantly depending on seasonal fluctuations in temperatures and size of the hydraulic sand cell.

- Exterior dam slopes will be re-graded to the design slope and compacted by tracked dozers once work in the area has been completed.
- For the TSF phreatic surface, the TSF impoundment surface will be close to near horizontal to encourage filtration and saturation.

6.2.1.7 Hydro-cyclone house and associated infrastructure

An on-site hydro-cyclone house will be constructed to separate piped tailings into slimes/fines (overflow) and coarse (underflow) sands prior to TSF disposal, with coarse sands used for embankment construction. The hydro-cyclone house has been sited where elevation is highest to maximise potential gravity flow to the TSF and minimise pumping requirements and associated energy use and greenhouse gas emissions.

Figure 6.6 shows a flow diagram of the proposed single-stage cyclone system. The design assumes that piped tailings will be processed through a fixed first stage cyclone cluster at the hydro-cyclone house, with two cyclone duty clusters integrated in parallel with two spare clusters on standby (Plate 6.10). Figure 6.7 provides a simplified overview of the material flow through the TPP and cyclone house to the TSF, including the approximate proportion of final tailings directed to the cyclone house and the distribution of cyclone underflow (sand) and overflow (slimes) between the TSF embankment and TSF impoundment.

The hydro-cyclone house will be constructed on concrete foundations with a steel superstructure and include a 20 t overhead crane, pipe racks, sunshade, walkways, electrical systems enclosures and site offices. Site lighting for normal, emergency and exit lighting will be provided. There will be a dedicated piping and pumping network to transport slurry materials and decant water between the hydro-cyclone house and TSF. All equipment will be designed to operate automatically without full-time operator attendance, with operational surveillance, telemetry and alarm systems installed as required (KCB 2026d).

The cyclone underflow sand and overflow fines/slimes will be distributed to Cell 1 and Cell 2 through separate slurry process streams. Each stream will consist of two short distribution pipeline systems and two long distribution pipeline systems arranged in parallel in a manner to provide flexibility for directing slurry to different regions within a cell (KCB 2026d).

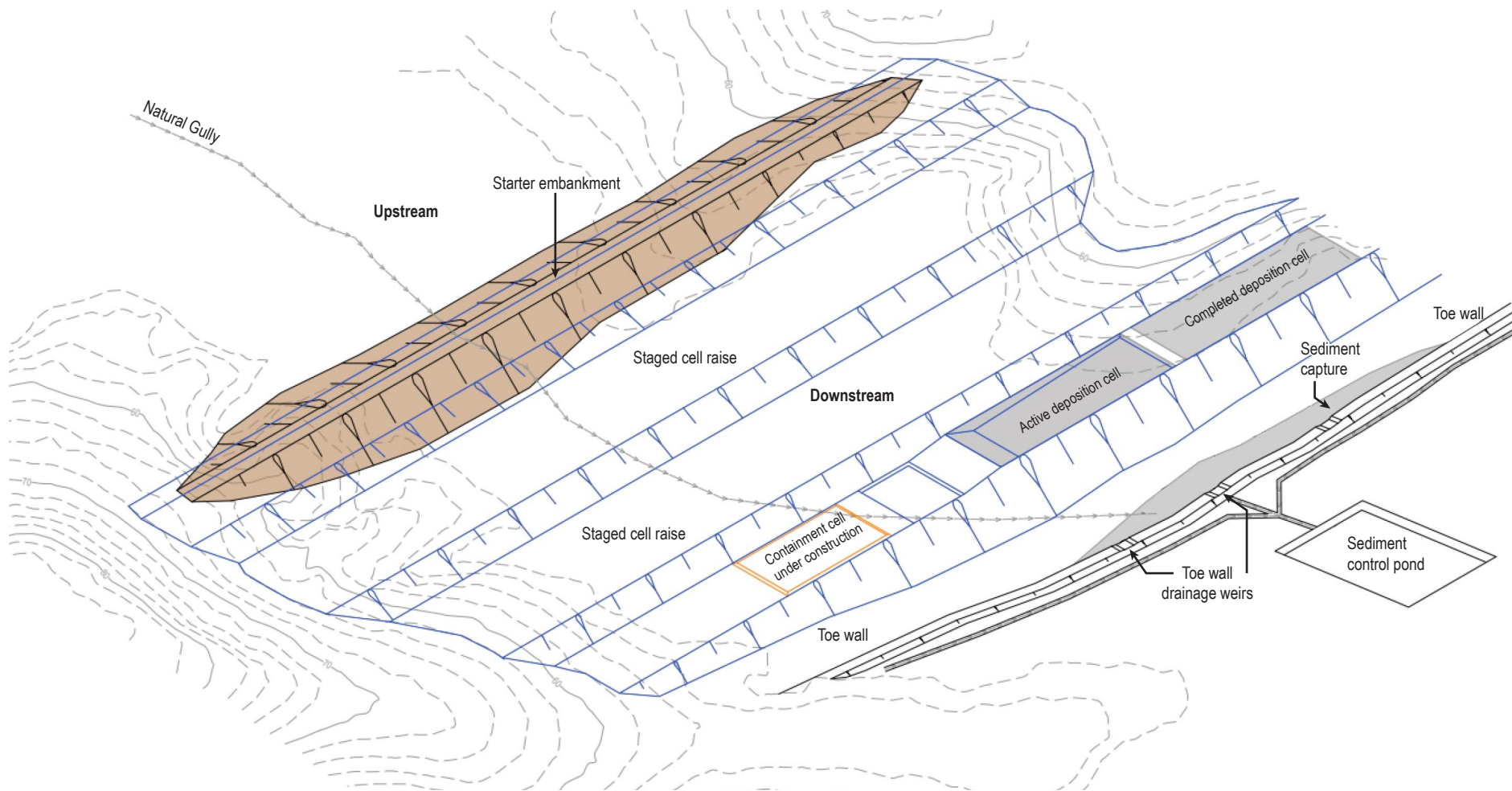
Deposition will progress sequentially along the distribution headers, beginning at the most upstream deposition stations. As the deposition front advances, the area ahead becomes the next construction zone. This sequencing minimises flushing requirements and supports an efficient, continuous deposition process. The pipelines will be lifted progressively in accordance with the staged embankment raises (KCB 2026d).

Decant water will be continuously reclaimed using mobile barge pump stations equipped with shallow-water floating intake devices with capacity to accommodate reclaim water flows of up to 5,000 m³/hr (with an additional standby unit). Decant water will be pumped back to the hydro-cyclone house via two return decant water pipelines attached to the pump system.

Further details on the final cyclone system will be confirmed during detailed design.

6.2.2 Roads, bridges and tailings pipeline infrastructure

The project includes access roads, bridges and water crossings as well as an 87-km-long tailings delivery pipeline and associated pipeline access road connecting the Ok Tedi Mine to the proposed TSF site, as described below.



SOURCE
KCB, 2026

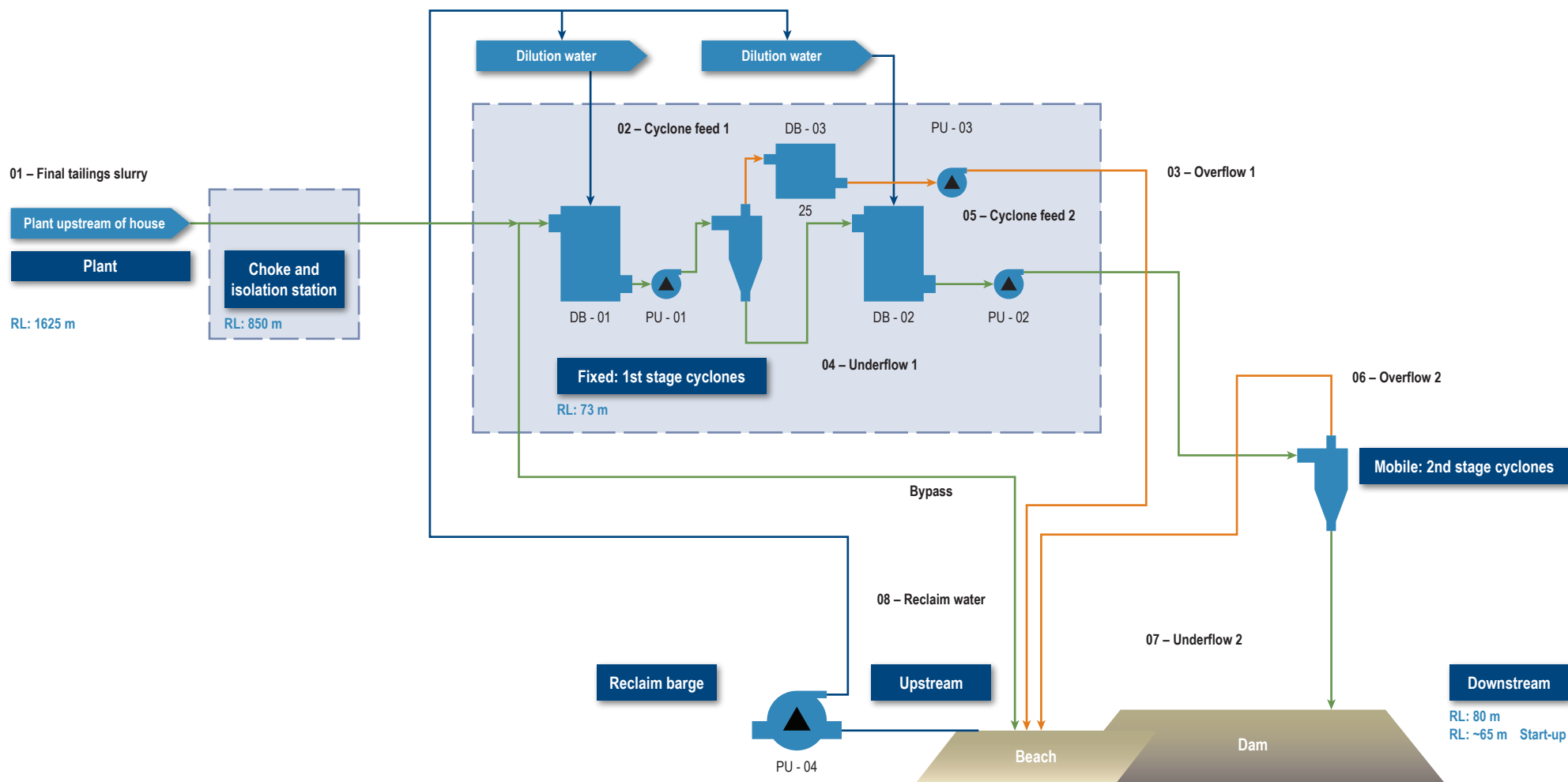


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FIGURE 6.5
Typical layout of hydraulic sand cell construction



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SOURCE
Adapted from KCB, 2024

Note: Graphic is based on the current design development and is subject to change. Detailed design is ongoing, and information shown may be refined as the design progresses

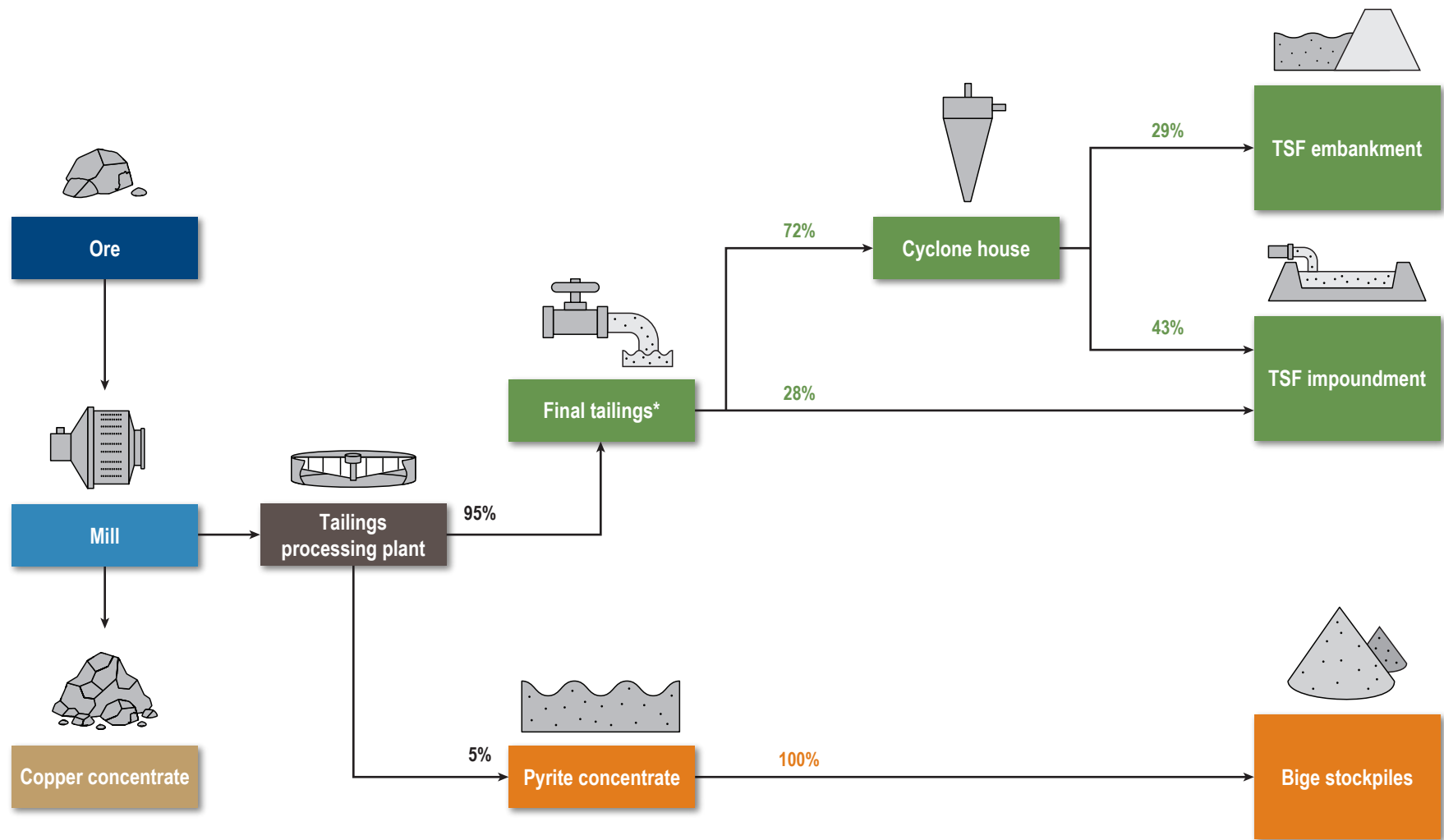


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FIGURE 6.6
Conceptual flow diagram of the proposed hydro-cyclone house configuration



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% of total tailings tonnage

% of total pyrite concentrate tonnage

Note: * About 10% of final tailings may be discharged as per currently approved practice to the Ok Tedi when pipeline is offline

SOURCE
Adapted from KCB, 2024



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FIGURE 6.7
Simplified process flow diagram of materials



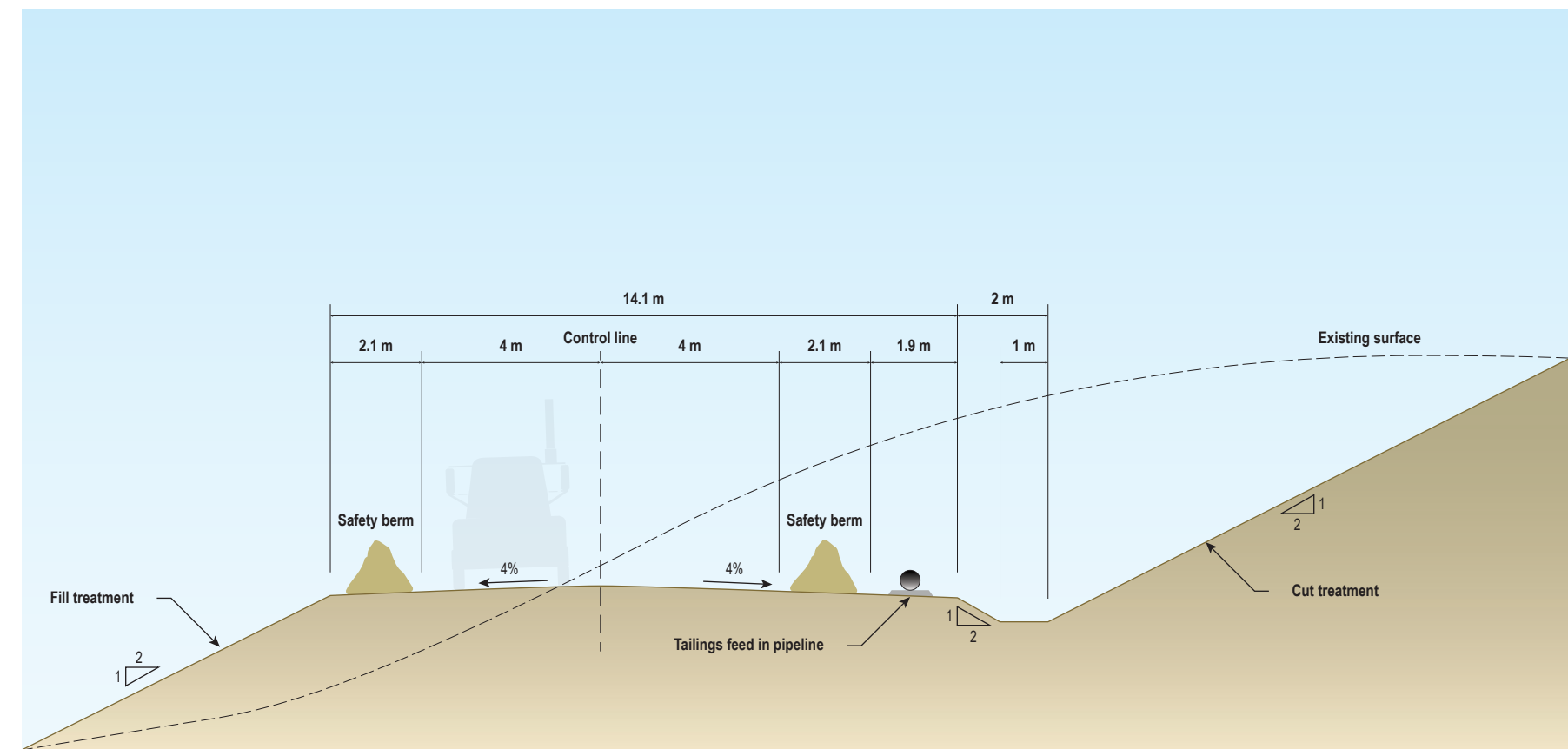
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6.2.2.1 Access roads, bridge and water crossings

Key proposed access roads, bridge and water crossings are:

- Pipeline access road to hydro-cyclone house (see Figure 6.2 and Figure 6.8):
 - Construction and upgrade of an 87-km-long two-way pipeline access road from the Ok Tedi Mine to the TSF comprising 22 km along the existing highway from the mine to Tabubil and approximately 65 km of new road; three permanent bridges constructed over the Ok Tedi (immediately south of Tabubil), Ok Taub (approximately 10 km northeast from TSF) and the Ok Birim (approximately 1.2 km east of the TSF); and several minor crossings over creeks and ravines using culverts and/or standard crossing structures. The tailings pipeline will generally follow the Kiunga–Tabubil Highway for approximately 22 km from the mine site, crossing the highway between the TPP and Tabubil (see Figure 6.2). After passing through Tabubil and crossing the Ok Tedi, the tailings pipeline will turn south near the village of Kumkit and follow the proposed pipeline access road alignment to the TSF site. From kilometre point (KP) 22 to the TSF site, the pipeline and access road will be located within an infrastructure corridor covering approximately 410 ha, conservatively assuming a construction footprint of 50 m in width plus contingency to account for minor changes during detailed design. Following construction, the operational footprint for the tailings pipeline and access road is expected to be reduced to approximately 130 ha (including $\pm 25\%$ contingency); assuming progressive rehabilitation of disturbed areas no longer required.
- Hydro-cyclone house access road (see Figure 6.1):
 - A new approximately 3-km-long two-way access road will be constructed from the ITCS Road near Birimkamba to the hydro-cyclone house. This road will provide initial access to the TSF site for construction works with a temporary laydown area proposed at the junction of ITCS Road and Kiunga–Tabubil Highway east of the planned Alice Bridge for storage of construction materials, equipment and supplies before transfer to the TSF site. The road will be built with two lanes approximately 3.25 m wide with 1 m shoulder for up to approximately 150 vehicles/day including 50% heavy vehicles.
- TSF perimeter road (see Figure 6.1):
 - A perimeter road will be constructed prior to TSF Cell 1 commencement and progressively in line with the TSF cell development stages to provide access to operational facilities around the TSF footprint; using a similar construction approach to the pipeline access road. This road is planned to be shared for community use and enhance accessibility for surrounding communities such as Birimkamba, Karandimok, Kungembit and Ambaga.
- Temporary construction access roads and tracks (Figure 6.9 and Figure 6.10):
 - Temporary minor access roads and tracks will be required for site access and supply during the construction phase. These will be located around the TSF and along sections of the tailings delivery pipeline and intermediate choke stations that do not follow existing roads or tracks. These roads/tracks are planned to be cut to final design width but initially constructed as temporary facilities, with sections upgraded as required for the ITCS Road re-location. Final locations will be confirmed through further studies and will be located within already disturbed areas to the extent possible.
- During operations, ITCS Road re-location:
 - The TSF footprint will intersect the new ITCS Road. To maintain continued use of this road during construction and operation of TSF Cell 1 (northern cell), the ITCS Road will initially remain in its current alignment. In 2041 (Operational Year 12), the ITCS Road will be re-aligned over the crest of the southern embankment of Cell 1 to enable construction of TSF Cell 2 (see Figure 6.3).

Further details on the design of the proposed access roads, bridge and water crossings are provided below.



SOURCE
Adapted from KCB, 2025

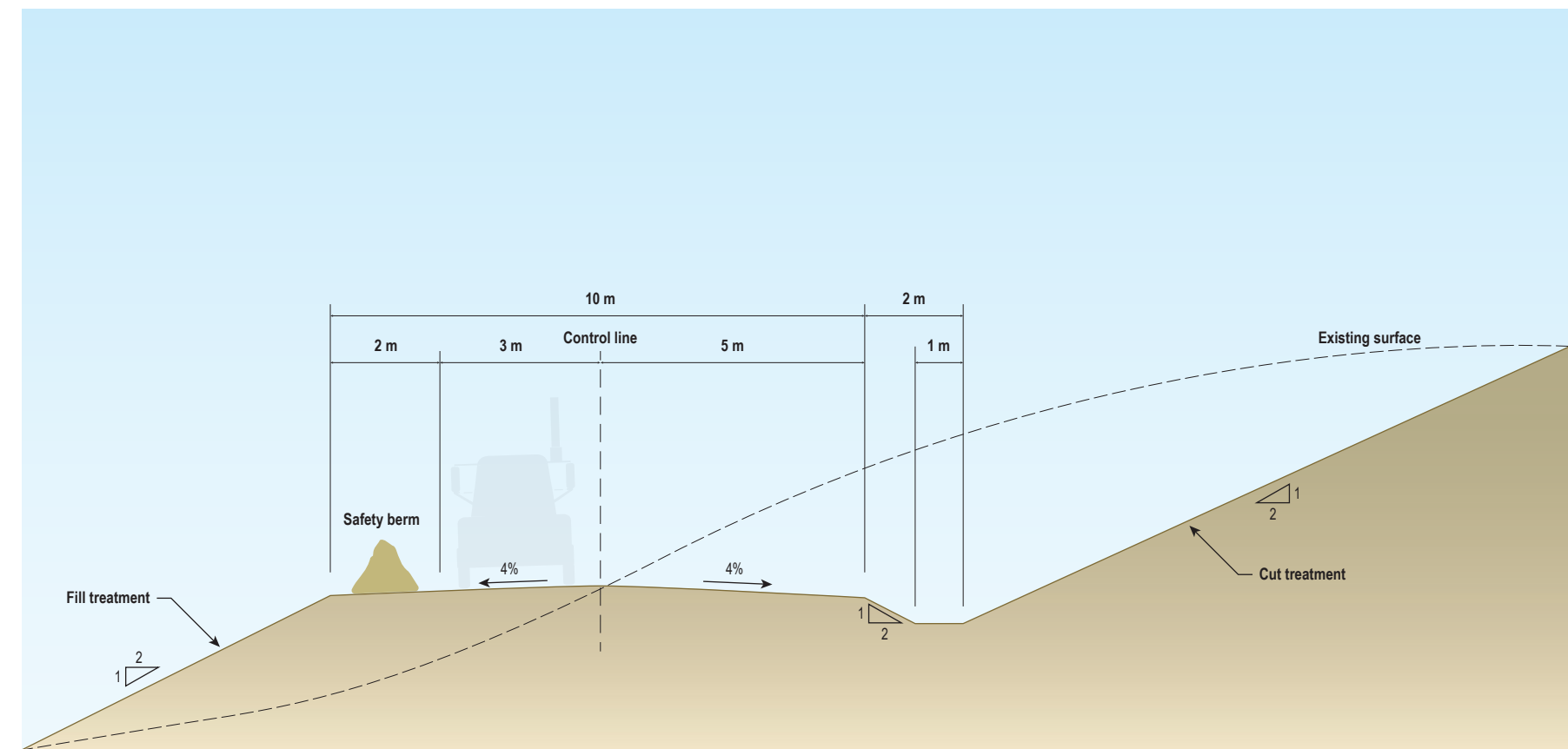


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FIGURE 6.8
Conceptual cross-section of major access
road co-located with tailings delivery pipeline

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SOURCE
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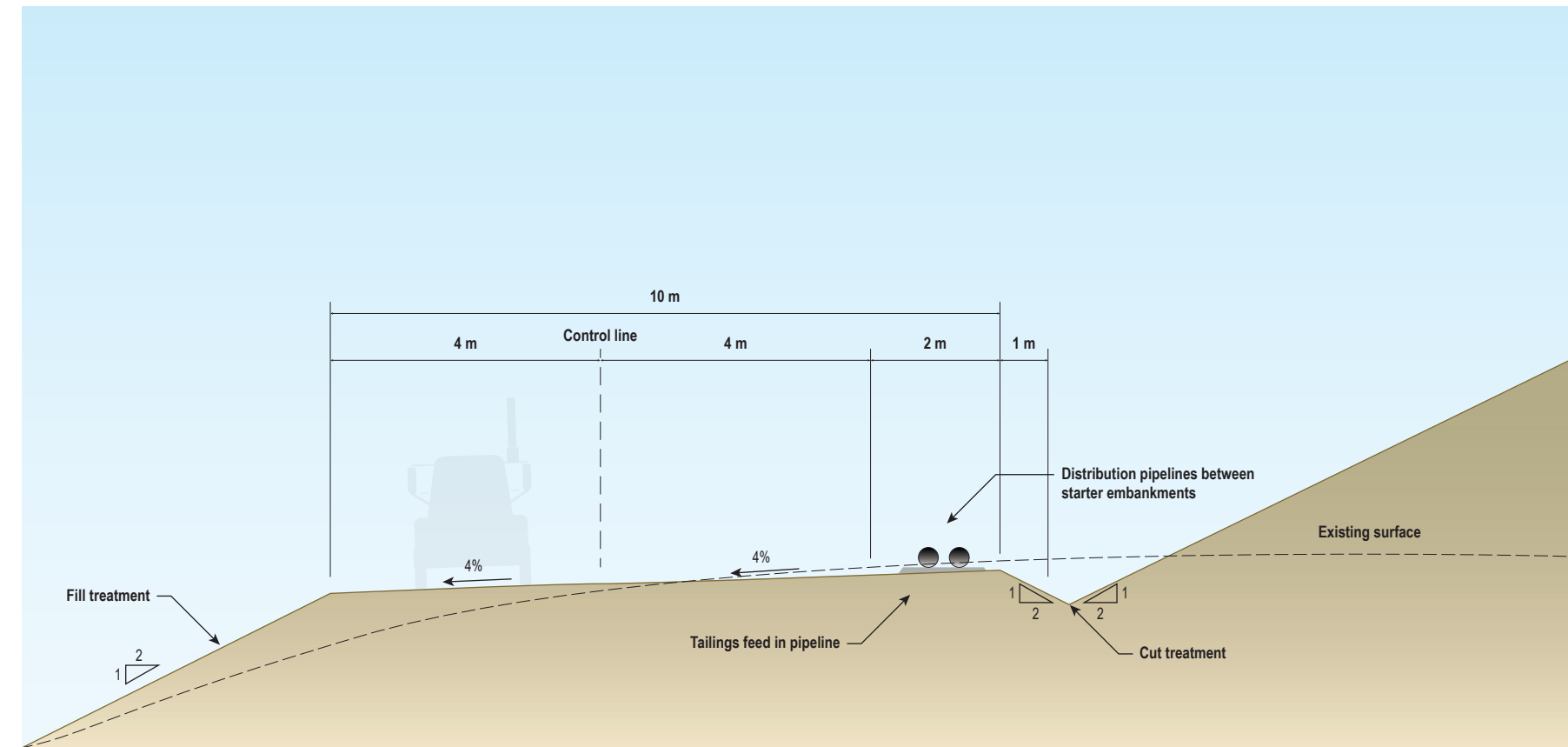


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FIGURE 6.9
Conceptual cross-section of minor access road



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SOURCE
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FIGURE 6.10
Conceptual cross-section of temporary construction road/track

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Road, bridge and water crossing design

Table 6.10 provides key details of the proposed pipeline access road and associated bridges and crossings. Table 6.11 presents the conceptual design parameters for major access road, bridge and water crossing infrastructure and Figure 6.8 illustrates a representative cross-section of a major access road co-located with the tailings delivery pipeline.

Table 6.10 Summary details of proposed pipeline access road and associated bridges and crossings

Design aspect	Indicative details
Total length of the pipeline access road from the mine site to the TSF	Approximately 87 km
Total length of new pipeline access road construction	Approximately 65 km
Length of road shared with existing highway	Kiunga–Tabubil Highway: 22 km (mine to Tabubil)
Length of road through villages	5 km (Tabubil)
Major river crossings (permanent bridges)	3
Total length of permanent bridge structures (x 3 in total)	430 m

Table 6.11 Conceptual design parameters for major access roads, bridges and water crossings

Aspect	Design basis	Comments/reference
Major access roads (pipeline access road/hydro-cyclone house access road/TSF perimeter road)		
Design life	10 to 20 years.	Subject to confirmation during detailed design.
Road surface	Gravel (unsealed), with all-weather road base as required	Gravel applied to minimise fugitive dust generation.
Enforced speed limit	Speed limit of 40 km/hr to be enforced on internal roads/tracks and 65 km/hr for roads shared with the community with appropriate road safety signage provided as needed.	For Light Traffic Classification.
Typical Design Vehicle and Traffic volumes	2-3 axle 40-60 t capacity tractor-trailer (Austroads classification – Class 4) ITCS Road/main access roads: Assume road traffic volumes of 150 vehicles per day as per PNG Public Works Standard.	To accommodate project construction and operational vehicle fleet and current traffic. Table 3.12, <i>Australian Research Board Unsealed Roads Best Practice Guide, Edition 2 Published October 2020</i> .
Heavy vehicle traffic (% HV)	50%	Table 3.13, <i>Australian Research Board Unsealed Roads Best Practice Guide, Edition 2 Published October 2020</i> .
Maximum grade	8%	Table 3.10, <i>Australian Research Board Unsealed Roads Best Practice Guide, Edition 2 Published October 2020</i> .
Minimum grade	0.5%	Table 8.5 - <i>Guide to Road Design – Part 3 Geometric Design, Austroads 2021</i> .
Lanes	Two lanes/two-way, except for pinch points requiring single lane and temporary construction tracks.	Pinch points to be kept at a minimum and include passing bays.
Road width	Major access roads: nominally up to 14 m wide Minor access roads and construction tracks: approximately 10 m wide.	Total width may vary at pinch points requiring a single lane.
Lane width	3.25 m to 3.7 m, with 1 m shoulder as required.	Consistent with national and OTML road standards, including Table 4.2.6(b) - <i>Road Planning and Design Manual (Edition 2: Volume 3) – Supplement</i>

Aspect	Design basis	Comments/reference
		to Austroads Guide to Road Design (Part 3: Geometric Design) for Queensland (2025).
Cross fall	4%	For gravel surfaces. Chapter 8 - <i>Queensland Design and construction of mine roads</i> (Department of Natural Resources, Mines and Energy 2019).
Table drains ('V' ditch) minimum geometry	Top width: 1 m Inner slope: 2H:1V Outer slope: 0.75H:1V Longitudinal grade: 0.5% minimum	Proposed along both sides of road to manage surface water runoff. Typical table drain design as per applicable PNG Standards 1985. Minimum longitudinal grade per Table 3.15, Australian Road Research Board.
Fill and cut slopes	Fill slopes: 2H:1V Cut slopes: 2H:1V	Where possible, access road alignments have been designed to follow natural ridgelines to minimise cut and fill requirements. For Light Traffic Classification.
Design flood event	Main access roads: 1:100 yr Construction and minor roads/tracks: 1:20 yr	<i>Papua New Guinea Flood Estimation Manual</i> (SMEC 2018). Based on hydrological assessments.
Water crossings/drainage structures	Major crossings: Refer to below for bridges. Minor crossings: Culverts sized for 1:10 year or small prefabricated timber bridges as required, with 300 mm freeboard for drains and culverts. 1:10 year (or 10%) AEP storm event for table drains and cross drains.	PNG DOW 2015 AS 5100.2 Queensland Urban Drainage Manual
Bridges and water crossings		
Bridge approximate span length	Ok Tedi: 300 m Ok Taub: 40 m Ok Birim: 90 m	See Figure 6.2 for general location.
Lanes	For bridges: Single or two-lane bridge with dedicated pedestrian footpath provided. For minor crossings: One to two lanes depending on linked road.	Where practicable, match number of lanes to linked road.
Deck width	Minimum deck width ranging from 6.2 m to 9.5 m. Allows for one 3.7 m lane or two 3.5 m lanes with 600 mm shoulder on each side for maintenance space and 1.5 m pedestrian walkway on one side.	Pipeline to be mounted on side of bridge except for Ok Tedi crossing, which will be installed under the river via horizontal directional drilling (HDD).
Design life	Bridge: 100 years	As per <i>Australian Standard (AS) 5100.1, Design life of bridge</i>
Design speed	50 km/hr (with speed limit of 30 km/h to be enforced).	For Light Traffic Classification.
Typical design vehicle and traffic volumes	Bridges: Assume road traffic volumes of 400 vehicles per day as per PNG Public Works Standard.	To accommodate project construction activities and associated vehicle fleet.
Seismic loads	Return Period: 1 in 2,000. PGA: 0.76g	Interim Amendment to PNGS 1001-1982 Seismic Code Zone 3. Based on Ok Birim 2026 PSHA (Draft) (v30 – 360 m/s set). Design loads as per AS 5100.2 – Section 15. Non-collapse with repairable damage.

Aspect	Design basis	Comments/reference
Flood immunity	Major bridges: 1:2,000 yr rainfall event with minimum 4 m freeboard above typical high-water levels observed	AS 5100.1 Section 11. In accordance with TMR Bridge Design Guidance.
Additional crossing design considerations	<p>Minor crossings shorter than 70 m for ravines and large creeks in undulated terrain areas: the bridge superstructure will be designed as a single span structure supported by concrete abutments on spread footings at each end.</p> <p>Bridges and major crossings longer than 70 m: The Ok Tedi and Ok Birim bridges are planned to be multi-span bridges similar to the examples shown in Figure 6.11. The bridge superstructure will be designed as multi-span structures supported by piers and concrete abutments on large diameter steel piles to reduce potential damage from scour and bank erosion caused by floods. Several spans will be installed sequentially on bridge piers at approximate 25 m intervals with the remainder of the crossing comprising culverts below embankments. Bridge abutments will be set back to a safe distance from edge of active river corridor to account for river movement. Final bridge layouts will be confirmed based on further hydrology analysis, flood studies and geomorphological assessment.</p> <p>Placement of the bridge superstructure for crossing rivers will be at an elevation with a minimum of 4 m of freeboard above typical high-water levels observed at site; future design phases will confirm the elevation requirements for a flood design event.</p> <p>Provision of protection against large river debris during flood events may be installed on piers and abutments, depending on results of evaluations during the detailed design phase.</p> <p>Traffic safety barriers may be installed as required for construction and operational maintenance, particularly for bridges and approaches.</p> <p>Minimum longitudinal grade of 0.5% and cross-fall of 2.5% on bridges to promote drainage.</p>	

Source: Adapted from KCB (2024a, 2025d, 2026a).

Accessibility

Proposed road and bridge infrastructure has been planned, where practicable, to improve accessibility for surrounding communities near the TSF site and along the infrastructure corridor. The road infrastructure is expected to provide year-round, all-weather access for local residents, improving accessibility to essential services and markets such as at Tabubil or Ningerum, employment opportunities, and regional connectivity between villages.

Design of road infrastructure has been informed by consultation with local communities and seeks to minimise disruption to existing community access routes, avoid resettlement, and maintain appropriate buffers between the TSF and villages. A minimum offset distance of approximately 500 m has been adopted where feasible. However, in response to community requests, the pipeline access road and TSF perimeter road have been designed to pass close to villages where practicable to enhance access to services and local connectivity.

The pipeline access road will also provide OTML and local communities with an alternative access route to Tabubil and the mine for transporting fuel, goods and supplies, including from nearby Indonesia, in the event of disruption to the Kiunga–Tabubil Highway (e.g., earthquake or landslide) or Kiunga Port operations (e.g., restrictions to river transport).

Re-alignment of the ITCS Road will be required during TSF operations. Staged planning will minimise disruption and allow continued use of the ITCS Road for as long as practicable. Where re-alignment is necessary, the road will be constructed to an equivalent or higher standard to maintain community accessibility and functionality.

6.2.2.2 Tailings pipeline

An 87-km-long pipeline will be constructed to transport tailings slurry from the existing TPP at the Ok Tedi Mine to the proposed TSF (see Figure 6.2). Where feasible, the pipeline will be constructed within already disturbed areas within the right-of-way of roads and tracks (see Figure 6.8).



SOURCE
KCB, 2025



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FIGURE 6.11
**Conceptual 3D visualisation of
proposed bridge crossings**



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The tailings pipeline crossing over the Ok Tedi near Tabubil is proposed to be constructed using HDD to install the pipeline beneath the river, consistent with the approach used for the existing PCon pipeline to Bige. The tailings pipeline crossings over Ok Birim and Ok Taub are planned to be integrated with bridge infrastructure, with the pipeline attached on the side of the bridge. The tailings pipeline crossings over minor creeks and ravines will be constructed using suitable crossing structures as required.

Subject to further detailed design, approximately 80% of the pipeline will be buried and 20% will be aboveground at specific locations such as creek and ravine crossings. The tailings pipeline has been designed to leverage the significant elevation difference between the TPP (1,628 m) and the hydro-cyclone house at the TSF site (~70 m AMSL) and operate partly by gravity flow. A pump station will be required to accommodate the range of design conditions exceeding the gravity flow limits. The area for the pump station will be approximately 1 ha in size and located within the existing mine footprint.

Table 6.12 summarises the pipe specifications under consideration for the tailings pipeline.

Table 6.12 Tailings pipeline specifications

Pipe size	Pipe material	Wall thickness	Start	End	Length
DN600	Carbon steel, API 5L-X70	23.3 mm (average)	0 m, at mine site	87,000 m, at TSF site	87 km

Key design parameters and features include:

- Tailings pipeline to have a 20-year design life and designed to transport up to 24 Mtpa of tailings in slurry form. It will be constructed from high-pressure carbon steel. No internal liner is proposed.
- Pipeline will be equipped with flow meters at strategic locations to detect pressure anomalies and potential leakage in real time through the plant control system, which will include automated alarms to alert operators to potential failures or ruptures.
- To minimise tailings loss in the event of a pipeline rupture, the design includes protective features such as valves, pump station and choke stations installed as needed to dissipate excess head, maintain pipeline pressure within safe operating limits, and allow controlled shutdowns and isolation of pipeline sections during maintenance or emergency shutdowns.
- Two intermediate choke stations indicatively at KP15.5 and KP37 (with a combined potential disturbance area of approximately 1 ha) and one terminal choke station adjacent to the hydro-cyclone house are planned to enable the pipeline to operate under a gravity-packed flow regime (i.e., flowing full at a controlled velocity) to prevent slack flow conditions and pressure buildup.
- Cathodic protection and pigging systems will be installed to allow for corrosion control, cleaning and maintenance, and internal inspection. A pig launcher will be incorporated into the pumping station and a pig receiver into the intermediate choke stations and terminal choke station near the cyclone house.

Additional design considerations to be confirmed through ongoing studies will aim to avoid and minimise the risk of tailings spillage entering high-value watercourses in the event of a pipeline rupture. Key considerations include:

- Locating the pipeline entirely within the Ok Tedi catchment.
- Installing rupture discs/pressure relief valves and bypass lines within the choke stations to prevent over-pressurisation and potential spillage to the environment.
- Incorporating control logic to minimise the magnitude of pressure transients during operational interruptions.
- Providing containment troughs, diversion structures or catch ponds at the most sensitive locations along the pipeline, to control and contain any accidental or emergency discharge from the pipeline.

- Installing a fibre-optic communication backbone, connecting flow and pressure instrumentation along the system with acoustic/vibration detection capabilities. This communication method will enable the necessary data feed and delivery for a robust pipeline leak and location system to provide accurate and rapid leak and pig tracking capabilities.

6.2.3 Ancillary infrastructure

6.2.3.1 Power supply and distribution

As the TSF site and surrounding areas are not currently connected to an established electricity grid, diesel-powered generators will be installed on-site to supply the required power to operate the hydro-cyclone house and on-site ancillary infrastructure.

During construction, up to five diesel generators (Genset 55kVA) will be used to supply construction power at maintenance stations along the tailings pipeline and the TSF site; and an additional 26 smaller 7 kVA diesel generators will be deployed across work sites to supply construction power to the mobile pipeline crew.

During operations, the estimated annual average power demand for the project is approximately 30 to 38 GWh/year. Power will be generated on-site via approximately ten 1,250 kVA (3.3 kV) diesel generators, with additional standby generators as backup. These units are sized to provide a total installed capacity of up to 11 MW to meet the peak operational load for the TSF, hydro-cyclone house and ancillary infrastructure. The generators will be contained within an enclosure in or near the hydro-cyclone house.

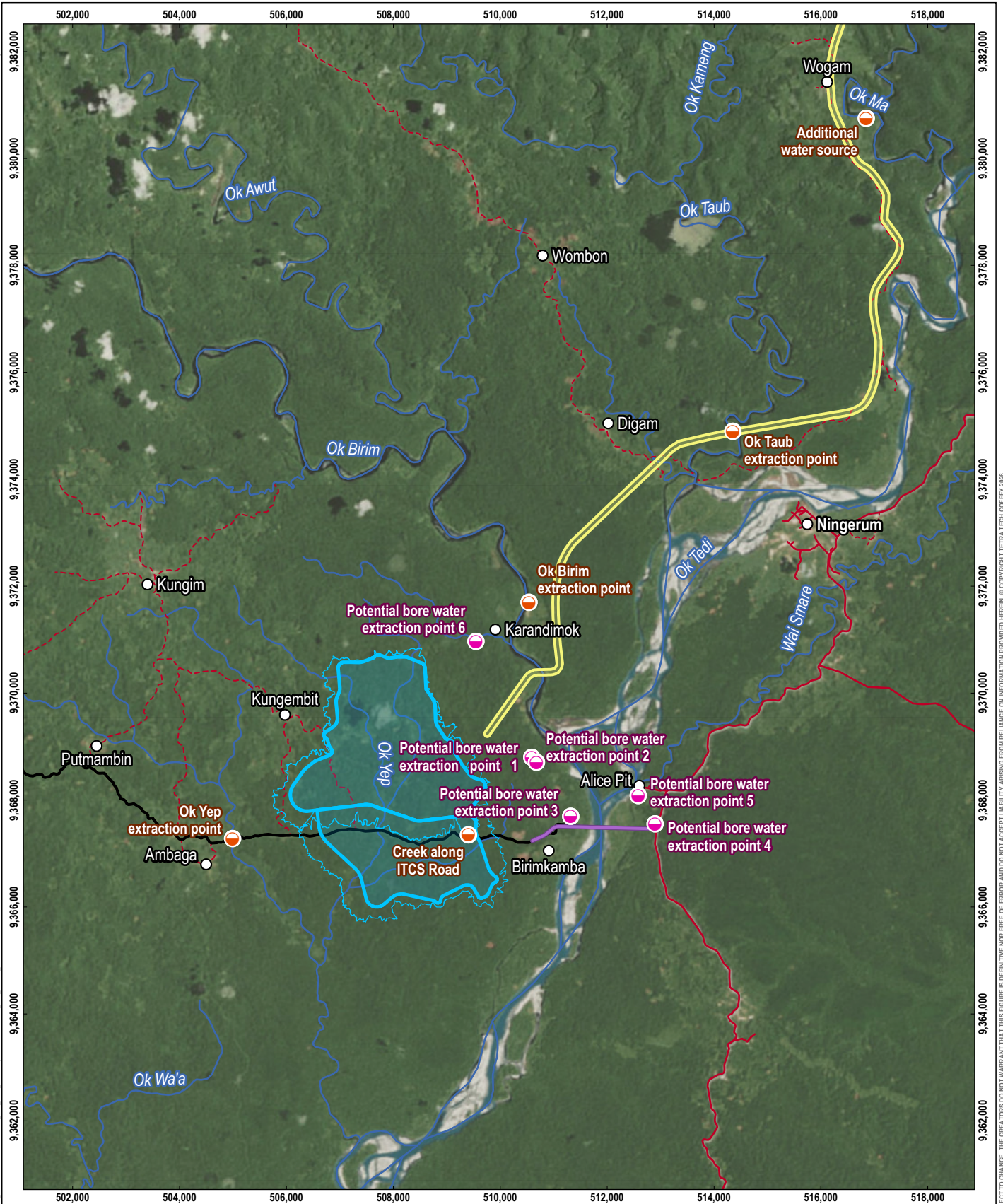
Power distribution around the TSF site will be via a low-voltage system.

At the TPP, power supply to operate new equipment (including new final tailings storage tanks agitators, and flush water pumps) and the tailings pipeline will be drawn from the existing TPP electrical infrastructure.

6.2.3.2 Water supply and management

Project water supply requirements have been preliminarily assessed as:

- Temporary construction water supply: approximately 2 ML/year to provide initial water supply for construction activities associated with the TSF and infrastructure corridor. Raw water may be sourced from construction sediment trap ponds (after decanting), existing water supply or nearby watercourses - subject to confirmation by ongoing studies.
- Process water for hydro-cyclone and associated flush water systems: estimated to be approximately 32,000 ML/year and 34 ML/year respectively, initially sourced from mine site water supply then TSF decant water and rainfall. The tailings pipeline flush water system is expected to require approximately 25 ML per flush, including 10% contingency.
- Raw water for dust suppression, vehicle washdown and progressive rehabilitation: approximately 1 ML/year, planned to be sourced from suitable clean water such as from TSF decant water (if deemed adequate) or on-site rainfall collected and stored within the TSF footprint.
- Potable water for the workforce, camp, kitchens and ablutions: estimated to be approximately 1.3 ML/year, either trucked daily from Kiunga or mine supply, groundwater boreholes or nearby upstream watercourse after adequate treatment to meet drinking water quality standards.
- A total volume of up to approximately 3.3 ML/year of water may be required from nearby surface water and groundwater sources during the construction phase, with a smaller volume required during operations primarily to supply raw water for concrete batching, other construction activities and potable water (after adequate treatment if required). Figure 6.12 shows identified potential groundwater and surface water extraction locations from nearby rivers and major watercourses. The exact abstraction volumes and locations will be confirmed during detailed design.



LEGEND

- Community
- Road
- - - Track
- Watercourse
- Potential water extraction**
 - Groundwater source for extraction
 - Surface water source for extraction
- Proposed layout**
 - TSF footprint
 - Infrastructure corridor
- ITCS road project (separately approved)**
 - Alice Pit bridge
 - Road



0 1 2 km
SCALE 1:100,000
PAGE SIZE: A4
PROJECTION: PNG94 PNGMG94 Zone 54

SOURCE
Villages from Tetra Tech Coffey. Sampling locations from OTML.
Proposed infrastructure and from KCB and OTML.
Topographic features from OSM.
DEM from SRTM. Imagery from ESRI.

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FIGURE 6.12

Potential water extraction locations for the project



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The TSF has been designed to safely pass designated flood events and operate as a flow-through system (i.e., a full reservoir with little capacity for storage of flood events above the spillway invert level). This design is necessary due to the significant surplus of rainfall over evaporation at the site, which makes containment of inflows neither technically practical nor safe. As such, the TSF water management strategy has been developed to enable planned discharge to report to the Ok Tedi, which has already been heavily impacted by mining activities.

The total catchment area for the TSF is approximately 1,410 ha, equivalent to the surface area of the two conceptually defined storage cells in the proposed TSF. Surface water management will convey TSF discharge water to the Ok Tedi, with a focus on minimising the amount of sediment discharged from the TSF to the receiving environment. For this, sedimentation ponds will be constructed downstream of the ultimate embankment toe for each cell to capture and settle TSF decant water. Sedimentation ponds will require regular removal of captured sediment during operation.

The design allows for an average TSF pond volume of 200 ML under normal operating conditions, with an operational maximum of 1,000 ML to accommodate fluctuations in operational demands and environmental conditions. These values were derived from iterative modelling that considered tailings beach development, site topography, operational inputs, rainfall sequences, and decant release rates.

Given the site's very high rainfall, the site water management strategy incorporates the following key design and management considerations:

- Siting of the TSF:
 - Fully contained within the Ok Yep sub-catchment (an upper tributary of Ok Tedi) to avoid discharges to or surface runoff from external catchments (such as the Ok Birim catchment).
 - Strategically located above the high banks of the Ok Birim and Ok Tedi to minimise flood interaction. The southeast corner of the TSF closest to the Ok Tedi is within a flood prone area and pending ongoing design work, some flood protection controls such as small levees may be required to meet the 1:2,000 AEP flood event.
- Controlled drainage, sediment control and discharge:
 - 'Clean' water (i.e., surface or groundwater unaffected by project activities) will be separated from 'dirty' water that contains elevated total suspended solids (TSS) requiring settling in a sedimentation pond prior to discharging into the receiving environment.
 - The TSF footprint covers the eastern arm of the Ok Yep and surface water diversion works will be required to divert clean water around the TSF site (see Figure 6.1).
 - Drainage channels will be constructed where appropriate to manage stormwater flows and allow settling prior to discharge into the receiving environment.
 - Sedimentation ponds will be designed as a 'wet' or constant flow system, with a design capacity to a 1:1.58 AEP, providing extended detention and controlled release. For larger events, the ponds are designed to a 1:50 AEP flow-through capacity, safely conveying inflows via the primary outlet and spillway system without overtopping or compromising embankment stability.
 - All surface water diversions have been designed to accommodate at minimum the greater of a 2-hour and 24-hour 1:100 AEP flood event; erosion protection designed to protect from damage or flooding for the 1:100 AEP peak streamflow; side slopes no steeper than 2H:1V overall.
 - Planned discharge of excess water flow will report to the Ok Tedi without requiring treatment except for sediment settling.
 - The TSF ultimate embankment slopes will have an overall gradient of 1V:11H and an average 0.5% slope for the tailings beach during operations to facilitate controlled runoff and promote drainage based on experience in other comparable high rainfall locations.

- During operations, each TSF cell will incorporate a siphon system, associated discharge pipelines or channels and outlet, and emergency spillway to enable planned and emergency release of excess TSF decant water to the Ok Tedi (see Figure 6.1, Plate 6.10, Plate 6.11 and Plate 6.12).
- The TSF and spillways are designed to accommodate the probable maximum flood (PMF) of 1:100,000 AEP storm event with a minimum 3 m operational freeboard for the TSF.
- During post-closure, the TSF will be configured as a stable, water-shedding and erosion-resistant landform that comprises benched embankment slopes (at 1V:11H) and designed to safely convey PMF flows away from rehabilitated tailings surfaces to the receiving environment via appropriately sized closure spillways and channels, aligned with operational emergency spillways where feasible. Concrete-lined stilling basins will be constructed at the base of the closure and outlet channels to dissipate energy prior to discharge to the receiving environment.
- Discharge outlets and spillways will discharge to riprap-lined energy dissipators, then into riprap-lined channels leading to the Ok Tedi.
- Additional flood storage and freeboard contingency for emergency scenarios as follows:
 - Water in the TSF will be carefully managed to allow for maximum operational storage volume plus additional contingency storage for wet season inflows (30 days), extreme rainfall event (1:100 AEP, 72-hour duration) and wind wave run-up (1:10 AEP) prior to activation of the emergency spillway. Although an emergency spillway is included in the design, the Extreme Storage Allowance volumes are insufficient to raise the pond elevations above the emergency spillway.
 - Pond storage critical duration storm allowance of 1:100 AEP (72-hr event) in accordance with ANCOLD (2019a) and 1:10,000 in accordance with GISTM (ICMM et al. 2020).
 - Minimum overall freeboard of 3 m, which is based on a combination of:
 - Operational freeboard of 3 m to provide adequate contingency for potential extreme seismic deformations, as per ANCOLD (2019a) and ICOLD.
 - Dry freeboard for overall flood storage requirements, which incorporates the hydrologic freeboard determined by the design flow depth in the spillway channel for the 1:1,000 AEP event, inclusive of the 1:10 AEP wind-wave run-up with an additional 0.5 m freeboard allowance as per ANCOLD (2019a).

The final siting, design and sizing of surface water management infrastructure will be confirmed through detailed design.

6.2.3.3 Wastewater and sewage management

An on-site wastewater treatment system will be established to treat wastewater and stormwater captured on-site, incorporating pH adjustment and suspended sediment removal. Greywater from ablutions, kitchens and mess facilities will be treated appropriately and directed to the sedimentation ponds, concrete stilling basins, or TSF impoundment.

Contaminated water from on-site workshops, wash bays, and fuel storage areas will be captured and, where required, treated through oily water separators prior to discharge into the TSF impoundment. Waste oil and sludge will be securely stored and transported off-site for disposal at the Ok Tedi Mine's existing waste management facilities at Tabubil.

Sewerage for the project will be designed, constructed and operated according to OTML's current practices using an on-site sewage treatment plant. Where applicable for temporary accommodation camp facilities and site offices, sewage and wastewater will be treated via on-site modular treatment systems with treated effluent discharged to leach drains, soak-away trenches, or collected in septic tanks for treatment and disposal at OTML's nearest sewage treatment facilities at Bige or Tabubil (depending on suitability and capacity). Sludge generated from the sewage will be disposed at the Tabubil Sanitary Landfill.



Plate 6.10

Representative example of hydro-cyclone house with primary cyclone cluster



Plate 6.11

Representative example of siphon system used at a TSF



Plate 6.12

Representative example of siphon discharge outlet to the receiving environment

While PNG lacks specific national guidelines for sewage discharge effluent, all project-related discharges will be managed and treated in accordance with the IFC General Environmental, Health and Safety (EHS) Guidelines on Environmental Wastewater and Ambient Water Quality (IFC 2007a). Point source discharges from project facilities into the receiving environment will also meet applicable IFC *EHS Guidelines for Mining effluent guidelines to surface waters* (IFC 2007b).

6.2.3.4 Waste management

Solid and liquid wastes generated on-site by the project will be managed in accordance with relevant PNG regulations as well as current OTML waste avoidance, reuse, recycling and disposal practices.

The project will adopt the waste hierarchy principles of reduction, reuse, recycling, treatment and disposal (in that order). General waste will be segregated, collected and placed skips then transported to approved landfill disposal and recycling facilities at Tabubil or Bige.

Hazardous waste such as used oily rags, waste oil and lubricants, paint, batteries, etc. will be separated and temporarily stored in an appropriately constructed secure storage area until responsible disposal as per OTML's current waste management practices.

Table 6.13 describes the main types of non-mineral solid and liquid wastes generated by the project during construction and operations.

Table 6.13 Main types of non-mineral wastes produced during the construction and operations phases

Waste	Details
General waste	Non-hazardous wastes from consumption of supplies and goods for project activities. Including, but not limited to, office waste, inert construction and industrial waste, consumables, packaging, rubble and concrete. Excludes putrescible wastes and recyclables.
Recyclable waste	Materials that can be reused, re-processed and recycled. Including, but not limited to, scrap paper, cardboard, plastics and metals and used tyres. Excludes timber waste.
Sewage and Putrescible Wastes	Waste containing organic material that readily decomposes through biological processes, generating odours and potentially attracting birds, insects, or vermin. This includes food waste, cooking oils and greases, sewage sludge, and other biodegradable organic waste generated from camps, kitchens, mess halls, and sewage systems.
Hazardous waste	Includes waste materials (excluding radioactive material) that, due to their physical, chemical or infectious characteristics, pose a significant hazard to human health or the environment if improperly treated, stored, transported, disposed of or otherwise managed. Includes but not limited to medical and laboratory waste, solvents and chemicals, coolants, reagents, paint and aerosol cans, batteries (lead-acid or lithium) and e-waste, light bulbs, drums and containers contaminated with chemicals, contaminated soils and spillage.
Hydrocarbon waste	Hydrocarbon wastes include waste oils, lubricants, oily rags and used oil filters, greases, oily water, spillage and containers contaminated with hydrocarbons.
Wood/green waste	Cleared vegetation and trees, construction timber, untreated wood pallets.

The majority of general, recyclable and timber waste is expected to be generated during the construction phase, including packaging materials and cleared timber and vegetation. Smaller quantities of hazardous waste and maintenance waste (lubricants, rags, metal offcuts) may be generated during construction and operations and will be managed through OTML's existing recycling and waste management facilities.

Except for cleared timber and vegetation waste, it is anticipated that non-mineral wastes associated with the construction and operations of the infrastructure corridor will be relatively minor. Estimates of cleared vegetation and timber waste volumes will be confirmed once construction methods are finalised and a construction contractor is engaged.

Table 6.14 provides a preliminary estimate of waste quantities and the anticipated disposal pathway for each waste stream during construction and operations. Quantities are based on the utilisation of equipment and personnel derived from OTML's Bige operations.

Table 6.14 Estimated annual mine waste generation during construction and operation

Waste stream	Total waste (tpa)		Waste treatment
	Construction	Operations	
General waste	200	150	<ul style="list-style-type: none"> To be disposed at designated OTML landfill facilities at Tabubil or Bige. Inert waste may be stockpiled and used as backfill.
Recyclable waste	30	20	<ul style="list-style-type: none"> Segregated and stored for reuse or recycling at existing waste management facilities at Tabubil or Bige. Sale to certified recyclers (e.g., scrap metal). Tyres/rubber to be stockpiled and disposed by pyrolysis with recycling of by-products (e.g., pyrolysis oil and recovered steel). Only tyres unsuitable for pyrolysis (e.g., contaminated) will be disposed in designated cell of approved landfill with leachate collection system.
Sewage and Putrescible Wastes	40	20	<ul style="list-style-type: none"> Raw sewage to be managed and treated via packaged modular sewage treatment plant as per current practices at Bige. Sewage sludge and biosolids to be disposed in Tabubil Sanitary Landfill. Putrescible waste to be disposed in designated organic waste pit within OTML's landfill facilities at Tabubil or Bige. Opportunities for composting and anaerobic digestion technologies under consideration.
Hazardous waste	2	6	<ul style="list-style-type: none"> Hazardous wastes to be stored in secure, banded facilities and disposed as per OTML's current waste management practices, including: <ul style="list-style-type: none"> Incineration (medical and laboratory wastes, hydrocarbon waste) with residues disposed in designated OTML landfill. Return to certified recyclers (batteries and e-waste) and suppliers (paints and chemicals). Licensed hazardous treatment facility. Bioremediation of contaminated soils (where feasible).
Wood/green waste	100	200	<ul style="list-style-type: none"> Salvaging for community use or sale. Chipping and mulching for use in rehabilitation activities.
Hydrocarbon waste	2000 L	3000	<ul style="list-style-type: none"> Waste oil and sludge to be incinerated at Tabubil Oil Treatment Plant for power generation at OTML's lime kiln. To be stored in appropriately constructed secure storage area until responsible disposal as per OTML's current hazardous waste management practices.

6.2.3.5 Fuel and hazardous materials

Hazardous materials such as hydrocarbons, lubricants and reagents (e.g., flocculants if used) will be stored in accordance with manufacturer guidance and OTML's existing hazardous substance management plans.

Fuel for the project is expected to be stored in a 380,000 L self-banded bulk fuel tank at the TSF site, designed to minimise the risk of spills and comply with relevant safety and environmental standards.

In addition, smaller mobile fuel tanks (i.e., fuel trucks) may be deployed as needed across work sites to support mobile crew for construction and operational activities. Section 6.2.4.1 provides a preliminary estimate of fuel consumption for both construction and operations.

6.2.3.6 Accommodation facilities

OTML plans to accommodate part of the construction workforce, particularly for tailings pipeline construction works, in existing OTML camps at Tabubil, Alice Pit, Ningerum or Bige, where there is capacity. A small temporary portable construction camp with capacity for up to 100 persons will be established along the pipeline route as required. Locally sourced workers are expected to be housed in surrounding hamlets and villages and be bussed to and from the work sites on a shift basis.

Accommodation for the non-local TSF construction workforce will be provided in a permanent modular camp sized for approximately 150 persons at Ningerum as part of OTML's broader workforce accommodation strategy to develop this town in line with local development plans.

Accommodation camp facilities will include air-conditioned sleeping quarters, ablution facilities, kitchen and mess, recreation facilities, male/female ablution blocks, laundry facilities, power, water and telecommunication services, appropriate medical facility, and site administration office. Sewage will be treated using a modular packaged sewage treatment plant (see Section 6.2.3.3). Potable water for drinking will be trucked in regularly from Kiunga or mine supply or sourced from groundwater boreholes or nearby upstream watercourse after adequate treatment to meet appropriate drinking water quality standards. Electricity to the site will be supplied via on-site appropriately sized diesel generators (with standby units for emergency supply).

During operations, a small number of operational staff will be housed in permanent on-site accommodation facilities at the TSF. Other staff are expected to be lodged in surrounding villages if that is where they live, or at existing OTML camps such as in Ningerum, where needed.

6.2.3.7 Laydown areas

A dedicated laydown area will be constructed within the TSF development area to store materials for initial and progressive TSF construction works and maintenance (Figure 6.1). Additionally, a temporary laydown area is proposed at the junction of the ITCS Road and Kiunga–Tabubil Highway east of the planned Alice Bridge for storage of construction materials, equipment and supplies before transfer to the TSF site.

Temporary laydown areas will also be established along the tailings pipeline and access road within already disturbed areas to the extent possible. Exact locations will be confirmed pending further studies.

6.2.3.8 Borrow and gravel pits

General sand fill for construction will primarily be sourced from bulk earthworks associated with the project development followed by suitable material from the hydro-cyclone house. Where required, these sources may be supplemented by local borrow and gravel extraction from the Ok Tedi, including for the construction of the TSF starter dam, drainage infrastructure and access roads.

River extraction will involve excavating unconsolidated sediments from selected sections of the Ok Tedi shore identified as suitable borrow sources. Extracted material will be dewatered and trucked to designated placement areas for use as general fill or construction material, subject to suitability testing (such as for potential geotechnical and geochemical risks).

Figure 6.1 shows the potential borrow and gravel extraction area on the Ok Tedi. Approximately 10 ha of land may be required to support river extraction activities for the project, including for stockpiling/dewatering areas, offices, equipment storage and truck operations. Where practicable, these facilities will be located within or adjacent to disturbed areas associated with the ITCS Road development.

During the construction phase, the river extraction program is anticipated to involve approximately 4 Mm³ of material over 24 months using excavation, crushing and screening, loading and truck haulage equipment; similar to but larger than OTML's current practices at Alice Pit on the eastern bank of the Ok Tedi. During operations, approximately 1 Mm³ of material may be sourced from borrow areas to support ongoing drainage works and road construction and maintenance activities.

The final location, extraction method and suitability of borrow sources will be confirmed during detailed design to minimise potential impacts on the river and downstream users.

6.2.3.9 Other infrastructure

Additional project-related infrastructure is expected to include:

- Internal access roads/tracks.
- Site office and administration buildings.
- Laboratory and workshops.
- Warehouse and secured storage areas.
- Site lighting.
- Appropriate medical facilities.
- Gatehouse, security checkpoints and perimeter fencing at key locations to restrict unauthorised public access (such as the TSF, hydro-cyclone house, pump and choke stations).

6.2.4 Materials and equipment

6.2.4.1 Materials required

The project will require a significant volume of construction materials, mechanical equipment, and consumables to establish the TSF and associated infrastructure. Quantities provided in Table 6.15 are indicative based on pre-feasibility study (PFS)-level estimates; final requirements will be refined through detailed design.

Table 6.15 Indicative materials and quantities required for the project

Component	Activity	Unit	Total*	Construction†	Operations	Closure
TSF	TSF footprint	ha	1,410	Starter embankment: 65	Cell 1: 905.5 Cell 2: 505	-
	Sub-excavation (depositional cuts)	m ³	586,000	Cell 1: 575,000 Cell 2: 11,000	-	-
	Embankment general fill†	m ³	55,850,000	3,500,000	52,350,000	-
	Gravel drainage system*	m ³	1,150,000	400,000	750,000	-
	TSF piping	m	34,000	34,000	-	-
	Hydraulic cell construction (underflow embankment)	m ³	52,000,000	-	52,000,000	-
	TSF access roads cut	m ³	300,000	300,000	-	-
	TSF access roads fill	m ³	110,000	110,000	-	-
	TSF access roads surfacing	m ³	10,000	10,000		
	Hardstand pads cut	m ³	560,000	560,000		
	Hardstand pads fill	m ³	155,000	155,000		
	Hardstand surfacing	m ³	20,000	20,000		

Component	Activity	Unit	Total*	Construction†	Operations	Closure
Surface water management	Operational siphon discharge pipe length (if applicable)	m	8,000	-	2,000 per pipe	-
	Channels and stilling basins	m ³	1,800,000	1,600,000	200,000	-
	Sedimentation ponds	m ³	150,000	100,000	50,000	-
	Diversions	km	13	Cell 1: 12	Cell 2: 1	13
TSF closure	Revegetation surface area	ha	1,410	-		1,410
	TSF closure channels	m ³	11,440	-	4,760	6,680
	Erosion protection	m ³	4,450	-	3,300	1,150
Infrastructure corridor	Final tailings pipeline (TPP to TSF)	m	87,000	87,000	-	-
	Pipeline access road	m	65,000	65,000		
	Pipeline access road - clearing, grubbing, and stripping	ha	410	410		
	Pipeline access road – cut	m ³	1,360,000	1,360,000	-	-
	Pipeline access road – fill	m ³	950,000	950,000		
	Pipeline access road – pavement	m ³	195,840	195,840		

Source: KCB (2024a).

* General fill/sand/gravel material may be sourced from bulk earthworks and local borrow and gravel pits along the Ok Tedi (subject to suitability testing), then from suitable cyclone underflow sand.

† This estimate considers conventional earthworks required to establish the initial starter dam for Cell 1 of the TSF (Year 1).

‡ Sourced from KCB (2025a).

Table 6.16 provides a preliminary estimate of fuel consumption for both construction and operations.

Table 6.16 Estimated fuel consumption for the construction and operations phases

Estimated fuel usage	Quantity
Construction phase	
Diesel fuel consumption for TSF construction	3,349 kL/year
Diesel fuel consumption for pipeline and access road construction	5,023 kL/year
Diesel fuel consumption for transport vehicles	2,475 kL/year
Diesel fuel consumption for on-site power generation	437 kL/year
Operations phase	
Diesel fuel consumption for transport vehicles	1,165 kL/year
Diesel fuel consumption for mobile plant	3,931 kL/year
Diesel fuel consumption for on-site power generation	11,418 kL/year

Source: OTML (pers. comm.), KCB (pers. comm.)

In addition, large volumes of concrete will be required for construction of bridges and crossings, the hydro-cyclone house, pump and choke stations and camp facilities. Cement will be sourced from regional towns such as Lae. Water required for concrete batching is expected to be approximately 6,000 kL and will be sourced as outlined in Section 6.2.3.2.

6.2.4.2 Project vehicles and equipment

Construction equipment will be mobilised for earthworks, TSF embankment placement, trenching, pipeline welding, and general logistics support. Table 6.17 provides a preliminary list of required construction vehicles and mobile equipment, which will be confirmed during detailed design.

Table 6.17 Preliminary list of construction vehicle and mobile equipment (including for establishment of TSF starter embankments)

Mobile equipment/vehicle type	Quantity	Comment
Mobile equipment		
30 t Excavator	9	For earthmoving, piping, trenching and TSF construction
Dozer (D6 and D8)	7	For spreading, shaping
Grader (140M)	2	For spreading, shaping
Pipe loaders	3	For pipeline construction
Wheel loader (980) / integrated tool loader (IT38)	6	For earth moving, material handling and placement
50 t Hydraulic mobile crane	3	For major lifting (pipeline, bridge, modules)
Pipe floater	1	For buoyancy during pipe-laying across water
Mobile crushing plant	2	For crushing aggregate for TSF construction
Lighting tower - LED	1	Night-time works (as required)
Diesel generator (7 kVA)	10	To supply construction power to mobile pipeline crew
Diesel generator (Genset 50 kVA)	6	To supply construction power at maintenance stations along pipeline and at TSF site
Water truck and water supply		
20 t Water truck	1	For water spraying
Water pumps	Various	For piping TSF decant water back to hydro-cyclone house, flush water pump systems, spillage pumps, gland service water pump station, groundwater/seepage pump stations, and site water distribution including at maintenance stations along the infrastructure corridor
Surface water supply pump and intake (if required)	4-6	For raw water abstraction from a watercourse or waterbody.
Borehole water supply pump (if required)	4-6	For groundwater abstraction for camp drinking water, shower, laundry ablutions and fire truck
Water tank	1	For water storage
Trucks and vehicles		
Dump trucks (20 t)	10	For hauling local borrow fill and gravel for pipeline, access road and bridge construction
Haul trucks (45 t)	6	For haulage of local borrow fill and gravel for TSF
Crew bus (25–57 seater)	6	For bussing workforce to/from work areas on shift basis
Convoy truck (long haul semi-trailers)	12-16	For haulage of construction materials, supplies and equipment in up to two convoys of 8 trucks each
Four-wheel drive/Utes	8	For supervision, inspection and maintenance
Service truck	2	For mobile repairs and maintenance
Fuel truck	2	For fuel supply
Fuel tank trailer – 1,000 L (self-bunded)	1	For fuel supply (if required)

Mobile equipment/vehicle type	Quantity	Comment
Genset fuel tank – 2,000 L (self-bunded)	1	For fuel supply (if required)
8 t tray top truck	1	For rubbish collection and disposal off-site

Source: Adapted from Ok Birim TSF PFS Update Capital and Sustaining Cost Estimate (GRES 2024).

During operations, general and specialised equipment and vehicles will be required for TSF embankment lifts, tailings deposition, operation of hydro-cyclone house and regular maintenance of infrastructure.

Table 6.18 provides a preliminary list of required operations mobile equipment and vehicles, which will be confirmed during detailed design.

Table 6.18 Preliminary list of operations vehicle and mobile equipment

Mobile equipment/vehicle type	Quantity	Comment
Mobile equipment		
Excavator (45 t)	4	For hydraulic cell/embankment operations
Dozer (D8)	4	For hydraulic cell/embankment operations
Pumps	Various	For TSF decant water
Portable diesel pump	1	For general use (as required)
Lighting plant	6	For site lighting (as required)
Diesel generator (Genset 50 kVA)	3	To supply mobile power along pipeline and around TSF site
Diesel generator (Genset 1250 kVA/3.3 kV)	10 (2 on standby)	To provide operational power for hydro-cyclone house and on-site ancillary facilities
Vehicles		
Crew bus (25–57 seater)	3	For bussing workforce to/from work areas on shift basis
Service truck	4	For general use
Convoy truck (long haul semi-trailers)	6–16	For haulage of materials, supplies and equipment in up to two convoys of 8 trucks each
Fuel truck	4	For fuel re-supply
Dump truck (20 t)	10	For hauling local borrow fill and gravel for pipeline and access road upgrades, maintenance and repairs
Haul (45 t)	6	For haulage of local borrow fill and gravel for staged TSF development as needed
20 t Water truck	1-2	For water spraying in TSF and pipeline access road areas
Water tanker (if required)	1	For drinking water supply (if required)
Four-wheel drive/Utes	9	For routine supervision, inspection and maintenance

Source: Adapted from GRES (2024) and KCB (2024a).

6.2.5 Traffic

Table 6.19 provides a summary of estimated traffic movements related to the project.

Table 6.19 Summary of traffic estimates related to the project

Item		Route/approximate distance	Total vehicles		Period/Phase	Key assumptions
			Daily (one way)	Weekly (one way)		
Construction phase						
Materials, supplies and equipment	Convoys	Kiunga to Tabubil (approx. 140 km, one-way)	16	112	Construction	Assumes 100% of project convoys go to Tabubil from 2027–2030, consisting of 2 project convoys/day of 8 semi-trailer trucks each (carrying fuel, pipes, concretes, etc) to cyclone house via ITCS Road from Kiunga
Construction workforce	TSF Construction	Ningerum to TSF site (approx. 12 km, one-way)	3	21	Year 1–4	
	Pipeline construction	Tabubil to pipeline worksite (north)	6	42	1.5 years	
		Alice Pit to pipeline worksite (south)	6	42	1.5 years	
Gravel extraction	Gravel haulage	Ok Tedi to TSF site (via ITCS Road, approx. 2.5 km one-way)	207	1,452	Early works and construction (up to 4 years)	Assumes 302,000 truck movements, one-way, using 45 t haul truck
Operations phase (2030 to end of 2049)						
Materials, supplies and equipment	Convoys	Kiunga to Tabubil (approx. 140 km, one-way)	13	90	Operation	Assumes 80% of project convoys will go to Tabubil then back to Kiunga, dropping off items at Ningerum on return trip Assumes 11 project convoys per week
	Convoys	Kiunga to Ningerum (approx. 70 km, one-way)	3	22	Operation	Assumes 20% of project convoys will go directly to Ningerum then back to Kiunga Assumes three project convoys per week
Gravel extraction	Gravel haulage for TSF Cell 2 development works	Ok Tedi to TSF site (via ITCS Road, approx. 2.5 km one-way)	62	436	During 2039 and 2040 (over 2 years)	Assumes 1.2 Mm ³ of local borrow fill may be required over 2 years for Cell 2 starter embankment. This equates to approximately 45,340 one-way 45 t truck loads of fill material with a bulk density of 1.7 t/m ³

Item		Route/approximate distance	Total vehicles		Period/Phase	Key assumptions
			Daily (one way)	Weekly (one way)		
	Ongoing gravel extraction for TSF operations	Ok Tedi to TSF site (via ITCS Road, approx. 2.5 km one-way)	5	37	Over 20 years	Gravel may be required for maintenance/upgrade of access roads, filters/drainage fills, erosion protection, gabions/reno mattress fill, etc. Assumes approximately 50,000 m ³ /year from the Ok Tedi over 20 years, which conservatively equates to approximately 1,700,000 tonnes or 38,000 45 t truck loads one-way
Operational workforce	TSF operations	Ningerum to TSF site (approx. 12 km, one-way)	6	42	Operation	Assumes three buses from Ningerum to TSF site and back daily
Maintenance and inspections	Pipeline operations	Pipeline access road (approx. 87 km, one-way)	0	1.5	Operation	Assumes fortnightly routine inspections/maintenance patrols along the pipeline access road using x1 light vehicles
	TSF operations	TSF access roads (approx. 2.5 km, one-way)	10	70	Operation	Assumes routine inspections/operational/maintenance activities will be approximately 10 light vehicles/day via TSF access roads

Source: Adapted from information obtained from OTML.

6.2.6 Workforce

The project will be implemented in line with OTML's existing policy regarding employment, recruitment and labour conditions. Recruitment will prioritise local PNG labour and seek to draw upon existing OTML operations staff where appropriate. Expatriates may be employed where specialised skills and experience are not available locally. Specific contractor obligations and expectations are to align with OTML's established practices for employment, recruitment and labour conditions.

During the construction phase, the workforce is anticipated to peak at approximately 300 persons (including 40 OTML staff and 260 contractors), comprising up to 90 expatriate skilled labour, 70 locally skilled labour and 140 local unskilled workers. The workforce will be transported by bus to their respective work locations on a shift basis. The workforce will be primarily divided into those involved in the TSF site establishment and access road construction works, and the tailings pipeline construction.

Once fully operational, the project will employ approximately 150 people including contractors, the majority being full-time. Operational roles are planned to include TSF management and monitoring, embankment lifts (hydraulic sand cells), cyclone house operations and maintenance, and site maintenance, inspections, and general support. The operational workforce will work on a 2-week-on and 2-week-off roster based on 12-hour days.

6.3 PROJECT DEVELOPMENT SCHEDULE

The PFS studies were completed in 2024 and the project is in the feasibility stage with the feasibility study scheduled for completion in parallel with the ESIA. Table 6.20 outlines the expected timeline for environmental permitting, detailed design and engineering, construction, operations and decommissioning and closure. This timetable may change depending on the outcomes of ongoing technical studies, engineering and detailed design, and the PNG Government approvals process.

Table 6.20 Indicative schedule for project development

Project milestone	Expected completion date
Pre-feasibility study	Completed June 2024
Capital expenditure (CAPEX) study	Completed June 2024
Submission of Environmental Inception Report and permit amendment application to CEPA	Completed June 2025
Preparation of ESIA and associated specialist studies	April 2025 to June 2026
Submission of ESIA to CEPA	Quarter 2, 2026
Presentation of ESIA to stakeholders (ESIA roadshow)	Quarter 3, 2026
Completion of the TSF feasibility study	Quarter 2, 2026
Grant of amended environment permit	Quarter 4, 2026
Completion of detailed design and engineering studies	Quarter 2, 2027
Commencement of construction activities	Quarter 1, 2027 (for approximately 36 months)
Completion of commissioning of TSF (start tailings deposition)	Quarter 1, 2030
Operations phase	2030 to 2050 (20 years)
Decommissioning, closure and rehabilitation phase	2050 to (36 months)

6.4 DESCRIPTION OF PROPOSED PROJECT ACTIVITIES

Project activities will occur over the following main phases:

- Detailed design phase - approximately 6 months from 2026 to 2027.
- Construction phase - approximately 36 months from 2027 to 2030.
- Operations phase - 20 years, from 2030 to end of 2049.
- Decommissioning, closure and rehabilitation - approximately 36 months, from 2050 to 2053.

Each phase is further described in the following sub-sections.

6.4.1 Detailed design phase

The detailed design phase will include development and finalisation of design work initiated during the Feasibility Study and include tendering and award of key project materials and equipment packages and award of supply, installation and construction packages.

6.4.2 Construction phase

The construction phase will include early works followed by construction and is anticipated to last up to three years (36 months), starting tentatively in Q1, 2027. The following sections provide an overview of the construction program.

6.4.2.1 Early works

Early works will involve initial activities to support the main construction program. This includes constructing/establishing the following components:

- Infrastructure corridor:
 - Bridge crossings (sequentially in line with road construction).
 - Track development and upgrade along infrastructure corridor route between west bank of Ok Tedi and Ok Birim.
 - Borrow pit development.
 - Temporary construction camps.
 - Erosion and sediment control works associated with early works infrastructure.
- TSF development area:
 - Accommodation camp at Ningerum.
 - Perimeter road around TSF, including access tracks to villages.
 - Construction laydown areas and contractor facilities.
 - Gravel extraction from Ok Tedi for stockpiling in laydown yards in preparation for starter embankment construction.
 - Ancillary activity/disturbance to facilitate site investigations, such as groundwater bores, drill pads, etc
 - Site fencing and security infrastructure.
 - Diversions, erosion and sediment control works associated with early works infrastructure.

Early works activities will also require site clearing and preparation and waste management. It may require blasting if hard rock is encountered during access track construction, particularly in mountainous or karst terrain. During the early works phase, key equipment, materials and personnel required for the construction phase will be mobilised.

The following sections provide further details on work to support key activities.

Site clearing and preparation

Early works will commence with site clearance and preparation works. These initial works will include:

- Clearing and grubbing trees, shrubs, undergrowth, and debris.
- Stripping and stockpiling topsoil and organic materials for reuse during rehabilitation, where practical.
- Placing excavated cut and fill material in designated stockpile areas for later reuse, if suitable (such as for construction of roads and TSF starter dam).
- Site grading and installing surface water management controls (e.g., sediment control ponds, drains, diversions).

Where feasible, economically valuable trees will be salvaged prior to clearance for sale or use by local landowners. Seed harvesting from native species may also be conducted to support progressive and final rehabilitation efforts. Non-commercial timber may be made available to local communities for use as cooking fuel and building materials. To the extent possible, cleared trees and vegetation will be chipped and mulched for use in rehabilitation activities.

Establishing access roads, bridges and crossings

Parts of the pipeline access road, bridges and crossings within the infrastructure corridor as well as initial TSF access roads and temporary construction tracks will be constructed or upgraded during early works to facilitate site access for subsequent construction activities. Drill and blast may be required where hard rock is encountered for access road construction (refer to drill and blast under Section 6.4.2.2).

Development of the infrastructure corridor will be undertaken in stages, commencing from Tabubil, the Ok Birim TSF site and Ningerum, with construction advancing progressively to connect in the middle section. Access roads and temporary construction tracks will be established progressively in sections to facilitate safe transport of materials, personnel and equipment. Where practicable, the alignment and design minimises deep cuts and fills (>5 m) and follows ridge lines to reduce construction complexity in high rainfall terrain; however, deep cuts and fills cannot be avoided entirely and will be required in some locations, such as near Birimkamba. The construction footprint for the pipeline access road is conservatively assumed to be 50 m wide while internal roads around the TSF will typically have a construction footprint of approximately 15 m.

Permanent major bridge crossings will be constructed over the Ok Tedi, Ok Taub and Ok Birim, along with suitable crossing structures and culverts at smaller crossings and drainage structures at strategic locations. Bridge construction will follow a similar method and sequence to the planned Alice Bridge.

6.4.2.2 Construction works

Key construction activities include:

- Constructing the TSF starter dam and hydro-cyclone house.
- Trenching and installing the tailings pipeline
- Drilling and blasting of hard rock for pipeline installation, access road and TSF construction (if required).
- Establishing surface water management infrastructure.
- The following sections provide further details on these activities.

TSF starter dam construction

Starter dam construction will use a conventional excavator and dump truck fleet, with material levelled and shaped by dozers. The dam will be elevated using suitable local fill material sourced from the Ok Tedi. Key activities are planned to include:

- Excavation and foundation preparation.
- Underdrainage installation.
- TSF embankment fill materials:
 - Loading, hauling, placing, and compacting soil or borrow fill sourced primarily from suitable local fill material from the Ok Tedi, and supplemented by available excavated material if adequate.
 - Supplying and placing sand and gravel with no more than 15% fines content, for use as filter medium where applicable. Gravel aggregate will be sourced from the Ok Tedi or from within the TSF footprint (<5 km haul distance).
 - Constructing hydraulic sand cells as described in Section 6.2.1.6.
 - Installing relevant monitoring instrumentation, including vibrating wire piezometers, down-hole inclinometers, survey prisms, flowmeters (as required) and automated data loggers.
- Hydro-cyclone house construction.

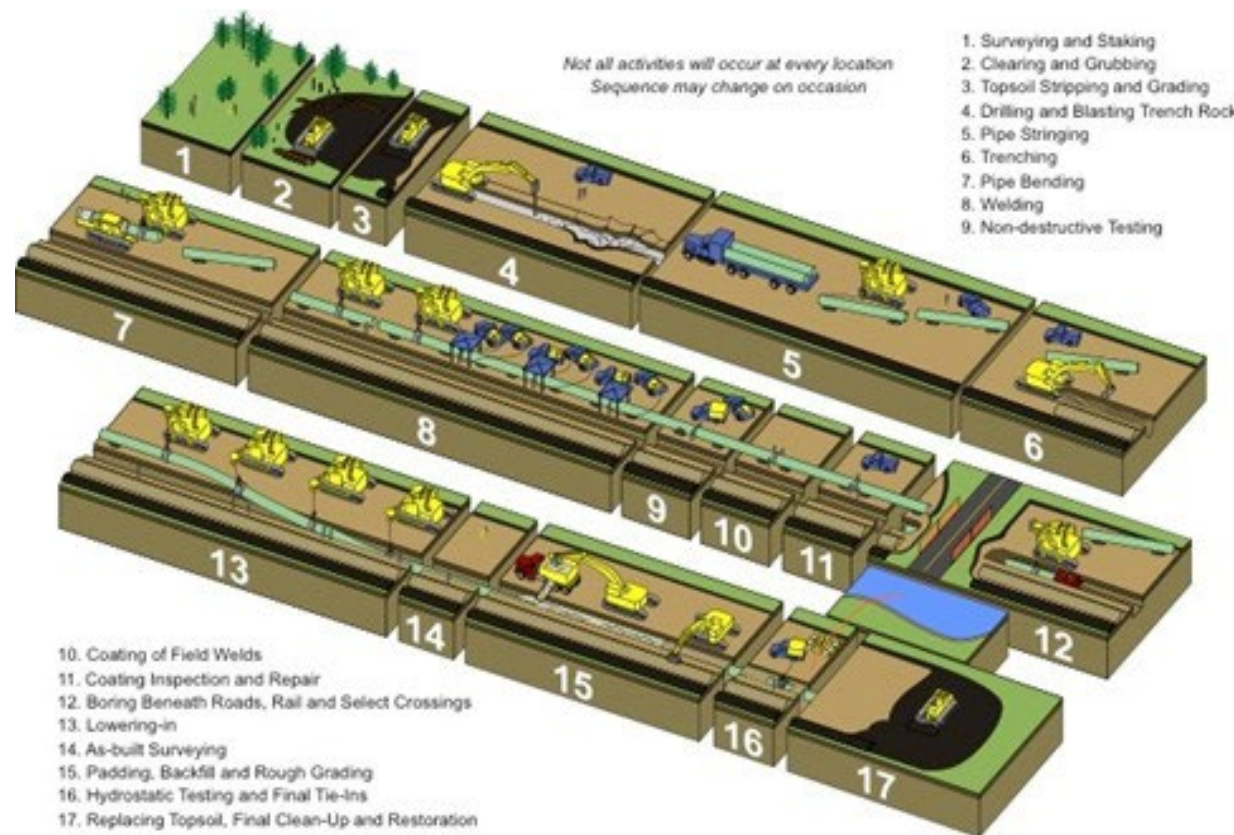
Tailings pipeline

The tailings pipeline will be buried in trenches for approximately 80% of its length, and 20% aboveground on concrete footings or pipe supports for specific locations such as river and ravine crossings. The rate of pipeline trenching will depend on the nature of the soils and terrain traversed but typically ranges from 50 m/day in steep terrain to 150 m/day in undulating, high water table areas. Construction of the pipeline from the TPP to the TSF is expected to take up to 24 month using conventional construction methods.

Figure 6.13 illustrates a typical construction sequence for buried large diameter pipelines, while Figure 6.14 presents a typical cross-section of the pipeline corridor.

The sequence for pipeline construction will be generally staged and planned as follows:

- Establishing work sites and hardstand laydown areas along the pipeline to receive materials and pipe.
- Shipping pipe and materials from Port Moresby via barge to Kiunga Port, and truck to laydown areas.
- Constructing maintenance stations along the pipeline to support installation and operations.
- Surveying and marking the location of pipeline construction.
- Clearing and grading the site for pipeline construction.
- Deploying and aligning pipe along the construction area via truck, crane, and pipe jinker systems.
- Applying Denso wrap and sealing with PVC tape after torque has been achieved on each flange.
- Grading, compacting and contouring the ground to promote settlement and ground stabilisation. Stockpiled topsoil will be re-used to promote natural revegetation if available. Side casting will be avoided to the extent practicable, particularly in steep terrain.
- Installing ground safety warning signage, tailings pumps, choke stations as needed along the pipeline.
- Conducting pipeline pressure testing and commissioning.
- Undertaking progressive rehabilitation of disturbed areas.



SOURCE
KCB, 2025

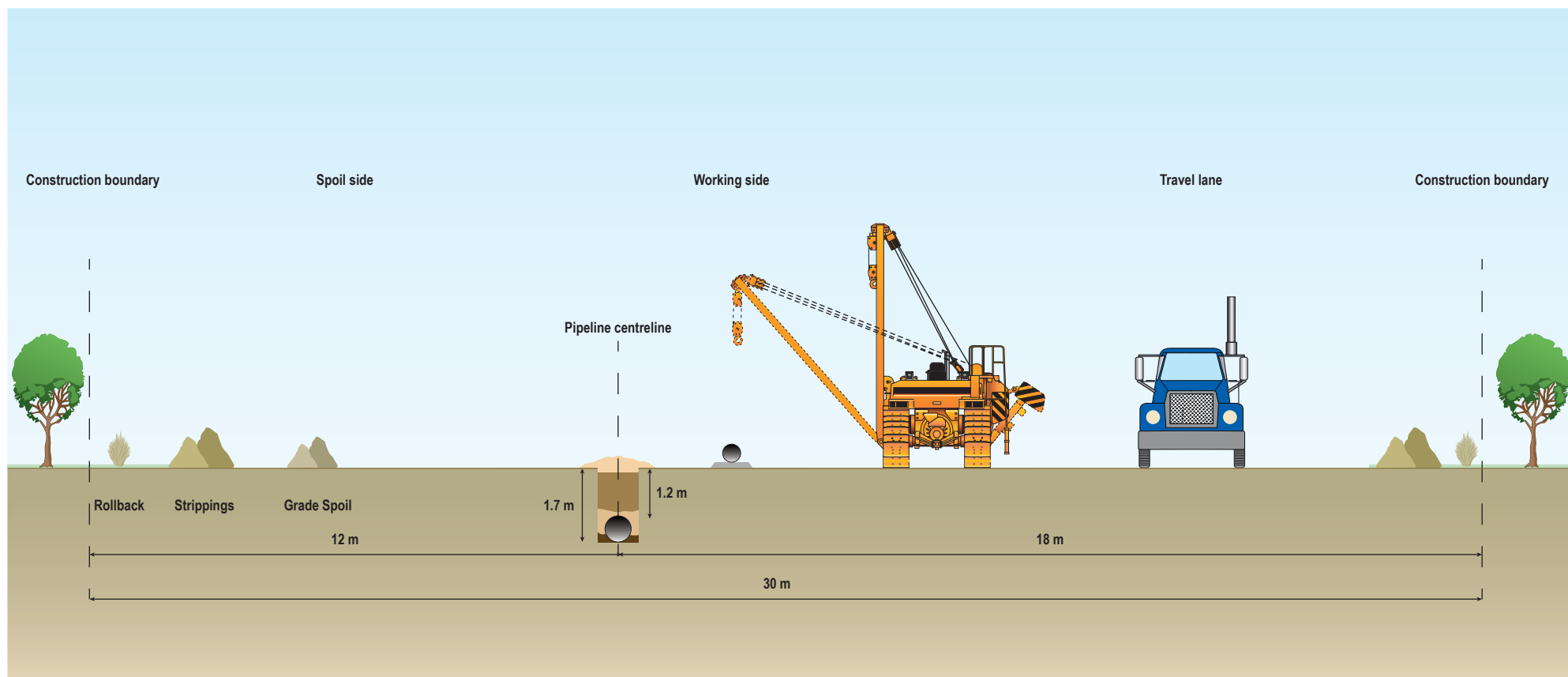


OK TEDI MINING LIMITED
OK BIRIM TAILINGS STORAGE FACILITY PROJECT

FIGURE 6.13
**Typical large diameter pipeline
construction sequence**



DATE: 19.06.26 PROJECT: 754-MELEN374244 FILE: 374244C_R08_F06.13_GRA



SOURCE
Adapted from KCB, 2025



OK TEDI MINING LIMITED
OK BIRIM TAILINGS STORAGE FACILITY PROJECT

FIGURE 6.14
Typical pipeline corridor cross-section



DATE: 19.06.26 PROJECT: 754-MELEN374244 FILE: 374244C_R08_F06.14_GRA

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Flushing and hydro-pressure testing of the entire pipeline system will require a substantial volume of water. The estimated volume of water required for flushing is approximately 25 ML including 10% contingency, which represents approximately 10% of the raw water storage capacity at Ok Tedi Mine. This water will be sourced from Tinaroo Dam and the existing mill area. Approximately 23 ML of water will remain in the pipeline between the completion of shutdown flushing and recommencement of plant operations. This water will be discharged to the TSF for appropriate management and disposal, bypassing the hydro-cyclone house. Design optimisation is underway to develop the pipeline operation and flushing strategy with a focus on improving overall water use efficiency. Detailed procedures on the management of this process will be developed during the detailed design phase.

Pipeline integrity will be tested through industry-standard hydrostatic/hydrotesting using water as the test medium following pigging of the pipeline with water to fill the pipeline. During hydrotesting, the pipeline will be pressurised above its maximum operating pressure for a defined period to confirm the integrity of the pipe material and welded joints. Detected leaks or failed pipe and joints will be repaired and the test repeated until compliance is achieved.

Drilling and blasting

Blasting requirements will be confirmed during detailed design and construction planning. Drilling and blasting may be required during early works where hard rock is encountered, particularly for pipeline installation and access road construction in mountainous or karst terrain.

Where required, blasting will be undertaken in accordance with current OTML practices, using controlled blasting techniques and appropriate explosives (such as ammonium nitrate-based emulsions). Blast design will be tailored to site-specific ground conditions to minimise flyrock, noise, vibration, air overpressure and potential disturbance to nearby communities. Community safety measures will include early community notification protocols for blasting, and the establishment of restricted access and blast exclusion zones. There will also be controls regarding blasting near caves that may support bat colonies.

Surface water management infrastructure

The proposed TSF site has been specifically selected and designed to prevent project runoff from entering the Ok Birim catchment. This reflects the project's overarching commitment to avoid introducing new impacts to the Ok Birim.

Surface water management infrastructure will be established at strategic locations early in the construction phase to manage surface water runoff, minimise erosion, and limit sediment-laden water from entering the surrounding environment. Key surface water management works include:

- Constructing drainage structures to separate clean surface water from contaminated water requiring specific management. Construction of the starter and Cell 1 is expected to require five upstream clean water diversions (about 12 km total in length). Cell 2 is expected to require one significant surface water diversion (about 1 km total in length).
- Installing sedimentation ponds, where appropriate, to manage decant slurry water and suspended tailings fines runoff during hydraulic sand cell construction. Water will then be pumped back to the TSF pond for reuse or discharged to the Ok Tedi (after settling).
- Excavating on a regular basis stilling basins to trap suspended sediments, with outlet channels directing settled water to the receiving environment and then the Ok Tedi.
- Installing geotextile lining in channels and placement of riprap for erosion protection, sourced from gravel pits located in the Ok Tedi area (within 5 km).
- Directing all seepage water flow from the drainage system and embankment surface runoff safely away from infrastructure into sedimentation ponds via existing natural drainage lines and diversion channels (where required) around the embankment toe.

These surface water management structures will be incorporated into the overall site layout and progressively adapted as needed to support the staged expansion of the TSF.

6.4.2.3 Construction traffic and transport

Project logistics for the transportation of key construction materials, equipment, fuel and consumables required for the project will involve a combination of ship, barge and road transport modes, as follows:

- International freight will be shipped to Port Moresby and stored at Motukea.
- Domestic shipping from Motukea up the Fly River to OTML's Kiunga Port by shallow draft vessels.
- Road transport from Kiunga Port via the Kiunga–Tabubil Highway and ITCS Road to the TSF site. Most cargo will be delivered by up to two project convoys per day, each comprising up to eight semi-trailer trucks, to a laydown area at the junction of ITCS Road and Kiunga–Tabubil Highway before being transported to the TSF site.
- Workforce transportation during both construction and operations will be provided via buses, operating on scheduled basis between accommodation sites and designated work areas.

During construction, traffic volumes along the ITCS Road and Kiunga–Tabubil Highway are expected to increase significantly due to the daily movement of the project workforce, construction materials, pre-fabricated structures and pipe sections, large equipment, and daily consumables. Table 6.19 provides details on expected additional traffic for the construction phase. As the highway and some access roads are shared with local communities, a traffic and transport management plan will be implemented to manage road safety and minimise potential traffic disruption.

6.4.3 Operations phase

The operations phase of the project is scheduled to commence in 2030, following completion of TSF construction and commissioning, and will continue for 20 years until 2050. During this phase, TSF operations will run 24 hours per day, 7 days per week. Key activities during this phase include earthmoving activities associated with staged TSF expansion works, day-to-day management of the TSF, deposition of tailings in the impoundment, maintenance and repairs, and operational and administration duties.

6.4.3.1 TSF management

This section summarises the proposed management during TSF operations.

Tailings transport, management and storage

Final tailings will be transported to the proposed TSF in slurry form by pipeline. The pipeline is expected to be offline for short periods of time over the life of the project; however, it will be designed with an estimated availability exceeding 95%. During these periods, it has been conservatively assumed that 10% of total tailings volume annually may require direct discharge into the Ok Kumiup as per current practice. OTML is also investigating the potential for co-disposal of tailings within a second engineered waste rock dump (EWRD2), but this is outside the scope of this ESIA and will be assessed separately at a later date, should it prove viable.

Routine inspections of the TSF and ancillary facilities will be undertaken.

Table 6.3 provides the anticipated TSF storage volumes based on the current conceptual design. Once a TSF cell has reached its ultimate configuration, the cell will be progressively closed and rehabilitated.

TSF water balance and planned discharges

An initial water balance and water quality model has been developed specifically for the TSF to assess projected water volumes and screen geochemical conditions associated with TSF discharges over the life of the project based on the TSF staging plan, start-up construction, TSF operations, and 20 years post-closure. The water balance model is based on the projected tailings production schedule and surface water management strategy, and accounts for the flow of water through the TSF system.

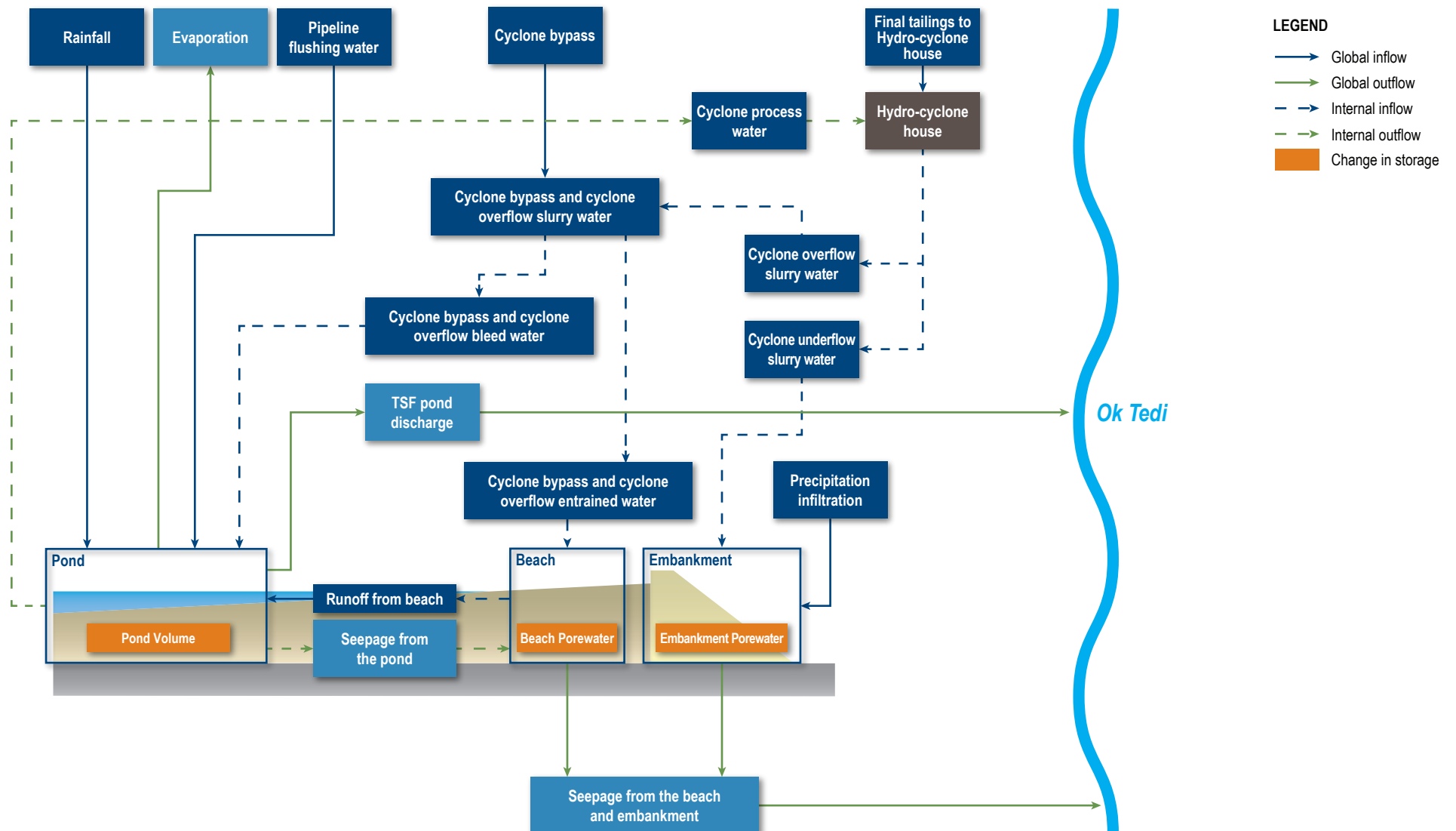
Figure 6.15 provides a conceptual representation of primary inflows and outflows for the TSF system. Primary inflows to the TSF include decant water contained in the final tailings slurry, rainfall and beach runoff entering the TSF impoundment. Primary outflows from the TSF include reclaimed decant water pumped back to the for hydro-cyclone process water demand, TSF decant water discharge to the receiving environment via siphon system, and minor losses from evaporation/evapotranspiration and foundation/embankment seepage.

Over the 20-year operational life of the TSF, approximately 265,000 ML of water is expected to be delivered in the final tailings slurry, of which around 38 ML/day of TSF decant water will be re-used as process water to meet dilution water demand at the hydro-cyclone house. Excess TSF decant water will be pumped and discharged to the Ok Tedi via a siphon system. The total release of excess TSF decant water to the receiving environment via the siphon discharge system is expected to be approximately 1,200 GL over a 20-year operational period (at an average of about 2 kL/s) discharged to the Ok Tedi on a continuous basis.

Groundwater seepage is expected to constitute a relatively small component of overall TSF water balance. Appendix D provides numerical modelling and assessment undertaken to assess groundwater flow paths and total seepage from the TSF. Preliminary results from the seepage modelling indicate that predicted toe seepage water quality under conservative assumptions is expected to have a pH neutral to slightly alkaline (pH ~7–8) and characterised by elevated solute concentrations, including total dissolved solids of approximately 3,200 mg/L, sulfate concentrations of around 2,200 mg/L, copper concentrations up to 70 µg/L, and arsenic concentrations up to 10 µg/L. The groundwater model predictions indicate that the spatial extent of the predicted seepage into groundwater is limited and generally confined to within approximately 300 to 500 m of the TSF, with more mobile parameters such as sulfate extending to about 1 km at low concentrations. Contaminant migration is predicted to occur primarily within deeper groundwater systems (typically more than 10 m below ground level), with limited upward migration in the shallow groundwater system that directly interacts with surface water and springs. Seepage is not expected to impact the Ok Birim catchment or exceed potable drinking water criteria at village drinking water sources.

Overall, the modelled water balance results indicate that the TSF design (i.e., pond and discharge capacities via siphon system) will have sufficient capacity to accommodate expected inflows under current climate conditions, allowing for extremes (KCB 2026e).

TSF performance will be monitored using geotechnical instrumentation, routine inspections, water monitoring and documented performance records. Where applicable, the type of instrument, location, monitoring plan, and threshold values will be defined as part of the TSF Operations, Maintenance, and Surveillance Manual to be developed prior to TSF construction. Exceedance of defined thresholds will be managed through a Trigger Action Response Plan framework, which will set out predefined response and escalation actions, including contingency measures and emergency response protocols, where appropriate. Chapter 13 provides further details on TSF-specific emergency response and management procedures to be developed.



SOURCE
Adapted from KCB, 2026



OK TEDI MINING LIMITED
OK BIRIM TAILINGS STORAGE FACILITY PROJECT



FIGURE 6.15
TSF conceptual water balance during operations

DATE: 19.06.26 PROJECT: 754-MELN374244 FILE: 374244C_R08_F06.15_GRA

TSF discharge quality

Predicted TSF discharge quality modelling undertaken by EGi (Appendix C) indicates TSF discharges are expected to have elevated sulfate and copper concentrations compared to upstream Ok Tedi water quality sampling sites, with discharge loads increasing as each cell is completed. However, these discharges will only have a minor and localised effect on surface water quality in the Ok Tedi immediately downstream of the discharge point, irrespective of flow conditions. Water quality in the Ok Tedi has been impacted for decades by riverine tailings and waste rock disposal; the minor, localised effect needs to be considered in the context of the removal of direct discharge of tailings into the Ok Kumiup.

At completion of Cell 2, where the greatest changes are expected, sulfates are likely to increase by approximately 9 mg/L under median flow (i.e., from 37 mg/L upstream of TSF discharge to 46 mg/L downstream), and copper is predicted to have an incremental increase in dissolved copper of only 0.2 µg/L, as most of the added copper (around 60%) adsorbs to suspended solids. This is relatively minor in comparison to the dissolved copper concentration of 6 µg/L upstream of the discharge point. pH is not expected to change.

Chapter 10 provides further detail regarding this.

6.4.3.2 Tailings pipeline

During operations, the nominal volumetric flow rate of the tailings pipeline system is expected to range between 2,000 and 3,600 m³/hr. Choke stations will be installed along the tailings pipeline to manage operating pressures and protect pipeline integrity. These stations will be fitted with pressure relief devices and bypass lines (as required) to prevent over-pressurisation during pressure transient events and to reduce the risk of tailings spillage to the environment.

The tailings pipeline will be equipped with flow meters to detect pressure anomalies and potential leakage. Additionally, a fibre-optics cable installed in the pipeline trench will provide acoustic/vibration sensing to rapidly provide feedback of anomalies such as leaks/ruptures with the accurate location. Plant operators will continuously monitor the flow readings in real time through the plant control system, which will include automated alarms to immediately alert operators to potential failures or ruptures.

In addition to automated monitoring, routine visual inspections and patrols of the pipeline will be conducted using utility vehicles on a weekly basis.

In the event of a tailings pipeline rupture, control room personnel will immediately shut down the pipeline pumps to halt flow and dispatch a mobile maintenance crew to the affected section. Spillage material will be contained, excavated where possible, and returned to the TPP or TSF (whichever closest) for safe management and disposal. Where practicable at strategic locations such as low points or directly upstream of high-value watercourses, OTML will install purpose-designed containment features (such as lined troughs, diversion structures or catch ponds) to capture and contain slurry released during a pipeline rupture. Following completion of repairs, the pipeline will be re-commissioned using flush water to remove residues within the pipeline to the TSF prior to resuming normal operations. Re-commissioning procedures will include system integrity checks, re-pressurisation, and flow verification.

OTML will develop a detailed operational manual for the tailings pipeline with specific procedures adapted from OTML's experience and existing operating manuals implemented for the PCon and copper-gold concentrate pipelines and aligned with relevant international guidelines. The manual will include detailed procedures for routine operation, inspection and maintenance, leak detection response, emergency shutdown and response, recommissioning, and monitoring.

6.4.3.3 Operational traffic and transport

Throughout operations, the pipeline access road, ITCS Road and Kiunga–Tabubil Highway will continue to be used as the primary transport routes for delivering materials (such as locally sourced gravel), goods, supplies and personnel to/from the TSF site. Table 6.19 shows project-related operational traffic on roads.

As the pipeline access road, TSF perimeter road and ITCS Road are intended for community use, the roads may also cater for other users including heavy vehicles, four-wheel drives, cars, motorbikes and pedestrian traffic.

6.4.3.4 ITCS Road realignment

Use of the ITCS Road will be maintained throughout construction of the starter dam and Cell 1. The road will be re-aligned in 2041 (Operational Year 12) prior to construction of Cell 2 as the ITCS Road intersects the TSF footprint.

6.4.4 Decommissioning, closure and rehabilitation phase

Decommissioning and closure of the project is expected to occur over a three-year period from 2050 to 2053, following completion of tailings deposition. Early closure planning is essential to avoid or minimise long-term environmental impacts and reduce rehabilitation and environmental management costs at closure.

The planned approach will be aligned with OTML's Mine Area Rehabilitation Plan (OTML 2025a) and Mine Closure Plan (OTML 2025b) implemented at the Bige stockpiles areas. The conceptual closure planning and design for the TSF will be guided by the successes and lessons learned from progressive closure activities at the existing dredged sand stockpiles in Bige as these efforts progress in the coming decades. Examples of this include the opportunity for improved biodiversity of local species in rehabilitated areas with a particular focus on conservation-significant species (where the agreed final land use allows).

Stakeholder consultation for closure of the project will build on OTML's broader stakeholder engagement strategy established for current operations. This will allow the interests and concerns of stakeholders to be holistically considered during the closure planning process.

Attachment 3 provides the conceptual closure and rehabilitation plan developed for the TSF. Further studies will inform the continued integration of closure aspects of the TSF into the current LOF planning and consistent with OTML's standards and requirements.

6.4.4.1 General infrastructure

All project infrastructure and services under OTML's direct control will be decommissioned at the cessation of operations. This will include for electricity, water supply and sewerage.

Where possible, assets eligible for salvage will be transferred or sold to third parties for continuing use or demolished/dismantled to be sold as scrap metal or recycled.

The general sequence of the decommissioning and closure phase will be:

- Undertake stakeholder consultation for early TSF closure planning as part of the OTML's broader ongoing engagement strategy regarding mine closure.
- Maintain access roads during closure and transfer to community for future use.
- Make equipment safe, including decontamination if required.
- Dismantle infrastructure (with the exception of sub-surface pipelines which will remain in situ) and bury or remove off-site for responsible disposal as per OTML's current waste management practices.
- Transfer assets or infrastructure to third parties (as agreed).

- Re-shape landforms (where practicable) and implement erosion control measures.
- Reinstall topsoil (if feasible) and revegetate drawing on ongoing revegetation trials from Bige stockpiles and progressive rehabilitation of the TSF.
- Carry out monitoring and adaptive management as required.

Refinement of closure risks, objectives and criteria will occur during operations through ongoing stakeholder engagement, collection of data and improvement of closure predictions. This will inform subsequent iterations of the Conceptual Closure and Rehabilitation Plan as more detailed information becomes available.

6.4.4.2 Tailings storage facility closure

The overarching objective of the conceptual TSF closure plan is to create a long-term landform which is physically and geochemically stable, and compatible with the region's ecology and land use/s. The analogue for the TSF closure plan will be the ongoing reclamation works at Bige. The TSF closure design will be adapted as closure of the Bige site progresses in the coming decades.

Conceptually, the following closure design considerations will be implemented:

- TSF cells will be progressively reclaimed once the ultimate configuration of each cell is achieved.
- The ultimate TSF will be shaped into a landform that does not retain surface water.
- Ultimate TSF embankments will be benched for erosion control and to promote vegetation growth.
- Surface water will be directed to engineered reinforced channels and discharged to the receiving environment.
- Ultimate TSF beach will be shaped to facilitate infiltration and gently sloped to shed excess stormwater runoff in a controlled manner.
- Swales with erosion protection may be established to direct excess stormwater runoff to engineered reinforced channels on the TSF embankment downstream slopes.
- Wetland formation will be encouraged on the TSF surface without the formation of lakes.
- Emergency spillways will be converted to a closure channel, where appropriate.

The TSF closure design will direct all surface water discharges to the Ok Tedi near Cell 2. The closure channel will incorporate armouring where required to provide a stable, long-term structure. This may require the channel to be stepped using riprap, stacked gabions, reno mattresses, or concrete slabs excavated into the TSF embankment surface to convey PMF flows.

The general sequence of key decommissioning and closure activities for the TSF will be:

- Flush tailings transport, management, and delivery systems with clean water.
- Install embankment slope closure cover, benching and closure growth medium if required (e.g., chipped organics from clearing stockpiles on-site).
- Install riprap resistant to breakdown as needed for concentrated flows.
- Process, pump, and spigott fill to displace ultimate supernatant pond.
- Excavate channel into ultimate embankment downstream slope (i.e., cyclone overflow slimes).
- Excavate stilling basin and tie to outlet channel to discharge to the Ok Tedi receiving environment.
- Install reinforced concrete slabs to line the stilling basins and outlet channels.
- Undertake periodic monitoring, care and maintenance activities.

Table 6.21 summarises the conceptual closure design basis.

Table 6.21 Conceptual TSF and closure spillway and outlet channel closure design basis

Component	Aspect	Design basis
General	Post-closure land use	Self-sustaining, native vegetation cover supporting agreed future land use.
	Closure design life	Embankments and impoundment: 1,000 years with a 10 % probability of failure. This considers 'at the end of mine life, closure spillways should be designed for PMF flows for all Consequence Categories, given the time frame of the expected life in the order of 1000 years.' (ANCOLD 2012). Supporting components (ditches, low permeable liners, etc.): Individual components of the landform may not achieve the required 200-year design life, without repair or replacement (such as all concrete structures, drain linings and seepage collection pipework, geosynthetics exposed to UV).
	Closure timeline/schedule	Operations/progressive rehabilitation: integrated throughout TSF operations. Closure implementation: 2 years. Post-closure monitoring and maintenance: 15 years. Land and asset relinquishment: subject to regulatory approval and demonstrated long-term landform stability.
TSF	TSF downstream embankments	Benched for erosion control and to promote vegetation growth.
	TSF beach	Undulated/hummocky to facilitate infiltration. Closure channels and spillways to safely route the design stormwater flows off the beach towards spillways.
	Closure cover	Closure cover: Vegetated cover comprising growth media with a typical thickness of up to 1 m for long-term stabilisation and erosion control. Closure cover type: Provide an erosion-resistant growth medium and assist in limiting oxygen ingress to the underlying TSF materials.
	Revegetation	Species mix to be compatible with the constructed landform and agreed post-closure land use. Where available, organic materials such as mulch and woody residue may be incorporated to improve surface protection and early nutrient availability during vegetation establishment Pioneer species established to stabilise the substrate and begin organic matter development. Plant tree tube stock, supported by soil and bark mulch where practical, to improve establishment success to establish islands of framework tree species to increase structural complexity and provide wildlife resources and other community valued functions. Follow-up infill planting of late successional tree species, including culturally significant species.
Closure spillway and outlet channel	Design event	Peak runoff resulting from the critical duration probable maximum precipitation estimate based on 1:100,000 AEP event (with site-specific PMP estimate to be completed in next stage of design.
	Channel type	Tailings surface: riprap/gravel lined open channel. Spillway: concrete lined open channel or cut into natural competent rock.
	Baseflow	No baseflow. The TSF surface is elevated from the natural topography.
	Hydraulic sizing	Manning's Equation.
	Inlet channel grade	0.5%.
	Spillway channel grade	Equal to the ultimate embankment downstream slope.

Source: Adapted from KCB (2025c).