Attachment 1 Taharoa Ironsands Limited's response to the Panel's RFI

Appendix 1. Taharoa Ironsands Ltd Request for Information

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Substantive Application

1. General

To afford the Panel greater clarity on what is proposed and what is already consented, please clarify/confirm these details:

Name	Location	Consent Granted	Consent Expiry	*Status*
Eastern Block	E of Central	2018	?	*Completed. Rehab underway*
Te Mania Extension	NE of Central	2022	2029[1]	*Yet to commence*
Pit 1	Northern Block	2024	2029[2]	*Currently being mined*
Central Block	Central Block	TBD	TBD	*Proposed*
Southern Block	Southern Block	TBD	TBD	*Proposed*
Northern Block	Northern Block	TBD	TBD	*Proposed*[3]

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Name	Location	Consent ranted	Consent Expiry	*Status*
Eastern Block	E of Central	2018	2028	*Completed. Rehab underway*
Te Mania Extension	NE of Central	2022	2029	*Yet to commence*
Pit 1	Northern Block	2024	2029	*Currently being mined*
Central Block	Central Block	2006	December 2020	*Activity continuing under RMA 124. Subject to Fast-track oplication.*
Southern Block	Southern Block	2006	December 2020	*Activity continuing under RMA 124. Subject to Fast-track oplication.*
Northern Block	Northern Block	N/A	N/A	*Proposed, not consented xcept for Pit 1)1*

2. Mining of southern area

Section 1.1 of Appendix K (Terrestrial Ecology – Wetlands and Vegetation) notes an understanding that there is no intention to mine the area below the escarpment at the southernmost end of the site or south of the Waiohipa Stream (so this area was not surveyed in

[1] Attachment B to Applicant's response to comments in relation to planning at page 30.
[2] Complaint to WRC dated 13 Jan 2025, Roy Wetini Whānau Trust at digital page 195 and letter to Taharoa at digital page 227.
[3] Project summary information provided by Taharoa to local community, Roy Wetini Whānau Trust at digital page 216 and letter to Taharoa at digital page 227.

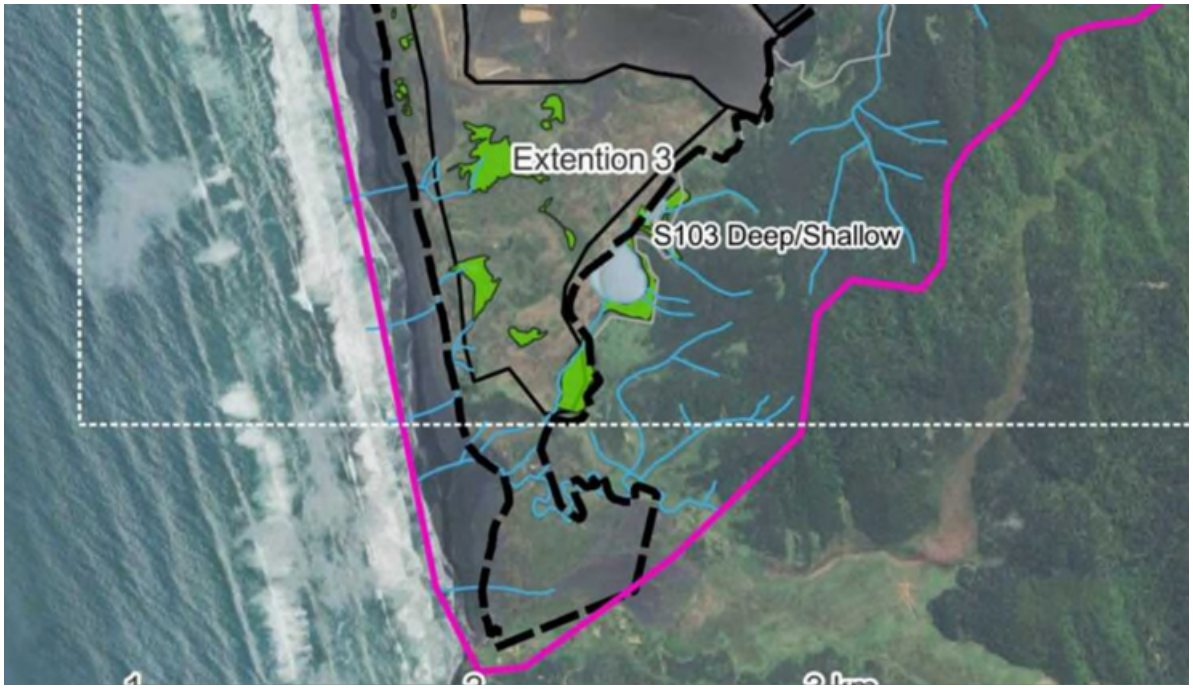
detail). Similarly, the summary of Appendix O (Archaeology) at page 73 states that no mining is proposed in the southern zone of the southern block, which is shown in Figure 31 of that Appendix.

Is that understanding correct and if so **what plan or other reference within the application materials confirms this** as Figure 4.4 of the substantive application and Figure 1 of Appendix N (Hydrogeology) shows extension 3 of the Southern Block mining most of the site?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

That understanding is correct. The area in the extreme south of the Taharoa C Block south of the escarpment is not proposed to be mined and this is accurately shown in both Figure 5 of Appendix O to the Substantive Application and in Figure 1 of Appendix N of the Substantive Application. For example, Figure 1 of Appendix N shows the extent of "Extention 3" area stopping short of the escarpment which aligns with the extent of "EXT 3" area shown in Figure 5 of Appendix O – I have enlarged and annotated the relevant part of Figure 1 from Appendix N below to assist:



3. Buffer

The statement that a 100-metre buffer around the site perimeter would reduce the mine's potential revenues by over $1.5 billion over 35 years equates to 11% of the projected overall revenue of $13.5 billion. This estimated economic loss is noted as being calculated from an assumed average 50 metre depth over an 11 km perimeter which equates to 55 million m^3.

Is this economic loss estimate proportionate given:

- the Southern Block resource is around 57 million m^3 (mine plan in Appendix B of Appendix N); and
- the entire resource is around 300 million m^3 (Substantive Application s2.2).

Response prepared by Wayne Coffey (Director and CEO), Stevo Jokanovic (Senior Mining Engineer) and Modher Barakat (Technical Services Mining Consultant), Taharoa Ironsands Limited:

Introduction

This response has been prepared by Wayne Coffey (Director and CEO of TIL) and TIL's mining engineers, Stevo Jokanovic (Senior Mining Engineer) and Modher Barakat (Technical Services Mining Consultant).

- Mr Coffey holds an Honours degree in Economics from Victoria University of Wellington. Mr Coffey has been Managing Director of TIL since 1 May 2017, and his professional career has spanned over 48 years in business and business management. Mr Coffey has held various company directorships, investments and management roles in the timber, tourism, hospitality, and insurance industries. He also has been responsible for substantial investments in Asia, the United Kingdom, New Zealand, and the Pacific Islands.

- Mr Jokanovic holds a Bachelor of Engineering in Mining Geology from the University of Belgrade and a Postgraduate degree in Surface Mining. He worked as a senior mining engineer for BlueScope at the Taharoa Ironsand Mine (Mine) between 2002 – 2004, a contracted mining engineer at the Mine to New Zealand Steel Mining Limited between 2015 – 2017, a contracted tailings engineer at the Mine to Taharoa Ironsands Limited (TIL) from 2017 – 2018 and has been employed directly by TIL has an engineer since 2021. Mr Jokanovic has a range of additional domestic and internal experience as an engineer, consultant and manager including: as a mine planner for BHP New Zealand Steel for the Waikato North Head Mine from 1996 – 2002, a senior mining engineer for Martson International (Mining Consultancy in Newcastle, New South Wales) from 2004 – 2008, a manager of the mine planning team for PT Bayan Resources Tbk in Indonesia between 2008 – 2011, a consulting mining engineer for RPM Global in Maitland New South Wales between 2011 – 2012, and as a senior mining consultant for MEC Mining in the Greater Newcastle Area for MEC Mining between 2012– 2015.

- Mr Barakat holds a Bachelor of Science in Petroleum and Mining Engineering from the University of Baghdad, and a Master of Engineering in Mining Engineering from the University of Auckland. Mr Barakat has been employed by TIL (formerly New Zealand Steel Mining Limited) since 2001– 2008. Prior to working at the Mine, Mr Barakat was a Production Engineer for the State Organisation of Minerals in Iraq, from 1978 – 1995.

While this response has not been prepared for proceedings before the Environment Court, it has been prepared and reviewed in accordance with the Environment Court's Code of Conduct for Expert Witnesses, as contained in the Environment Court Practice Note 2023. We confirm that the issues addressed are within our area of expertise, that we have not omitted consideration of any material facts known to us that might alter or detract from the opinions expressed, and that we have not been directed in the substance of their findings. Our relationship to Taharoa Ironsands Limited is set out above. For completeness, Mr Coffey also declares that he has a personal interest in the outcome of the proceeding given he is a

shareholder of Melrose Private Capital Limited, which is the ultimate holding company of Taharoa Ironsands Limited.

Response to RFI:

The Panel's questions relating to the economic loss estimate associated with a 100-metre buffer around the site perimeter assume that this buffer would affect only approximately 11% of the overall resource. The Panel asks whether the economic loss estimate is proportionate in that context.

Yes, the economic loss estimate that has been given is 'proportionate' and is an under-estimate. The Panel's breakdown of the economic loss based on available resource understates the true economic and operational impact of a 100-metre buffer around the site perimeter. This is because:

- First, the assessment that underpins the figures cited by the Panel is in the process of being updated. TIL is undertaking a comprehensive JORC-compliant resource study, including a new drilling programme (in the Central and Southern Blocks) and independent laboratory analysis of drilling samples, feeding into an updated block model. The data previously available measured the Southern Block resource to limited depths only, not to basement, and relied on straight-line assumptions that do not reflect the actual distribution of the resource. The updated data is expected to show a substantial upgrade in viable resource.

- Second, the proportionality assessment cannot be determined by reference to volumetric share alone. TIL's mine plan is dictated by a financial model that seeks to maximise cash margin as early as possible. Across the mine there is significant variability in mineable resource by grade, volume, and financial return. It is the financial margin earned on each panel that is most crucial in planning. The material in the 100-m buffer around the site perimeter and in the 30-100m buffer area around perennial waterbodies and natural inland wetlands contains significant deposits of high-grade ironsands, particularly near waterways. The significance of this high-grade material in these areas to TIL's operations is disproportionate to its volume, for the following reasons:

    - High-grade material, due to its free-flowing sand, consistent grade, and lower mechanical breakdown rate, can more than treble daily output compared with low-grade material. Because TIL's costs are largely fixed (long-term fixed-price shipping charters, capital, and energy on a per-day basis), the unit cost of high-grade material mining is substantially lower and the margin per tonne substantially higher.

    - TIL's contracted grade is56.8% Fe magnetics. High-grade material can be processed with scavenger units and mobile concentration spirals unit to produce a higher-grade product for customers of up to 62% Fe. TIL has found that its recent shipments have seen its grade averaging 57.2% - this result is welcomed by TIL and drives support to achieve higher prices. High-grade resource can also be blended in processing and on the stockpile with lower-grade material. Without access to the high-grade areas, much of the lower-grade resource would not be commercially viable to mine. Low-grade mining involves higher mechanical breakdown rates, inconsistent feed, and significantly greater processing complexity.

    - TIL has invested in excess of $50 million in pre-stripping clay layers and low-grade overburden, and in capital plant and equipment, specifically to access the high-

grade resource available in the 100-metre buffer (both around the site perimeter and within 30-100m of perennial waterbodies and natural inland wetlands). TIL incurred a loss of NZD 45 million (for the year ending June 2024) from mining low-grade resource during the pre-stripping phase (which also reduced production to approximately two-thirds of shipping capacity). The plan is to recover that position from the high-grade resource now uncovered. A 100-metre buffer around the site perimeter and within 30-100m of perennial waterbodies and natural inland wetlands would directly strand the benefit of this substantial capital investment. Access to the high-grade resource in the buffer area is critical to TIL's long-term mine plan. It repays capital investment already made and ongoing capital investment, increases stockpile resilience, and effectively subsidises the mining of large low-grade deposits, extending mine life and enabling full utilisation of TIL's shipping capacity. Forcing 100-metre setbacks would, in TIL's assessment, leave it with no choice but to lay off one if not two ships and most of the workforce. The capital investment would be liquidated over a 24-month period.

- The volumetric loss caused by buffer / setback areas is amplified by the angle of repose required in TIL's mining design. TIL's internal calculations show at least a 19% volumetric loss of ironsand and concentrate as a result of the setback. At the crest of the pit, a 30-metre buffer already increases to approximately 47 metres at pond water level and 78 metres at mining floor under a 35-degree face angle. A 100-metre crest buffer would therefore result in significantly greater depths of resource sterilisation.

- Further costs associated with preparing to mine high-grade material in the 100-metre area from site boundaries and waterways include the relocation of the 33kV electrical lines and the construction of a new bridge at the mouth of the Mitiwai. These costs represent additional investment that would be wasted if a 100-metre buffer were imposed.

- The planned mining sequence along the waterways is also time-critical. The preparation for operations in the NTAA area and south of Mitiwai commenced in 2020 and will require at least five further years to complete. The first mining under the mine plan in this area is where costs are highest. Removing this resource in the early years of the mine plan has a disproportionate impact on TIL's financial position relative to the volumetric share alone.

- Third, the Panel's reference to the entire resource being 300 million m^3 is incorrect. The Substantive Application report at section 2.2 notes that the entire resource is 300 million tonnes.

Additionally, based on our operational experience, there is no environmental or technical justification for imposing a setback around site boundaries or increasing the 30m setback from perennial waterbodies.

In respect of perennial waterbodies, our consistent position is that there has been no evidence of water migration from waterways as a result of mining operations maintained up to a 30-metre setback. That position is supported by the MWH hydrogeological study (2015) and by TIL's own continuous monitoring data from active mining operations:

- TIL's wet mining operation (Dredge 08) provides a direct evidential basis for this position. Dredge 08 operated south of the Wainui pit from early 2024 to December 2024,

maintaining a 30-metre buffer from the stream at crest level. With a safe face angle of 35 degrees, the effective distance from the Wainui Stream to the pond water edge was 47 metres at pond water level and 78 metres at mining floor level. Groundwater seepage into the dredge pond was monitored continuously throughout. The seepage recorded was attributable to groundwater alone and not to surface water, streams, or wetland. The actual seepage rates were consistent with the predictions in the MWH hydrogeological study. The north slope (the mining face between the dredge pit and the Wainui Stream) remained stable throughout, with no seepage or slope failure observed. No change in colour or turbidity of the stream was observed, confirming there was no surface water migration from the stream into the mine.

- The same findings apply to the North Te Ake Ake (**NTAA**) pit. From early 2025, the dredge operated in the NTAA pit maintaining a 30-metre buffer at crest from the Mitiwai stream, with the effective distance from the Mitiwai stream to the pond water edge increasing to 124 metres at pond water level and 36 metres or further at mining floor. Continuous water seepage monitoring confirmed no seepage or movement of the north face by the Mitiwai stream. As with the Wainui operation, the seepage recorded was attributable to groundwater only and was approximately 60% of the rate recorded at the southern Wainui pond.

- The results from two concurrent and geographically separate dredging operations alongside the principal waterways affected by the proposed buffer are consistent and unambiguous. The current 30-metre setback is safe for both dry and wet mining operations.

In addition, none of the experts engaged by TIL to assess the environmental effects of TIL's activities as part of the Fast-track application have advised that a setback / buffer from site boundaries, or that a setback from perennial waterbodies or natural inland wetlands greater than 30m, is necessary to manage effects.

In summary, the estimated economic loss of over $1.8 billion (plus other losses identified) arising from a 100-metre perimeter buffer is not proportionate to any identifiable environmental benefit. In reaching that position, TIL asks the Panel to have regard to:

- the understatement of total resource in the figures cited by the Panel, which will be materially corrected by the JORC resource study currently underway;
- the strategic, financial, and operational importance of the high-grade material in the 100-metre perimeter buffer area including the substantial capital already made by TIL specifically to access that resource; and
- the absence of any evidence that a 100-metre buffer is necessary to manage adverse environmental effects, drawn from more than 50 years of operations, and supported by the evidence presented by the experts assessing TIL's Fast-track application.

These points equally and additionally apply to the application of a buffer larger than 30 metres from perennial waterbodies or natural inland wetlands.

4. Rehabilitation

A key issue recorded in Appendix G to the Substantive Application relates to the extent and nature of stabilisation and rehabilitation. The conditions imposed by the Hearings Panel set timeframes within which stabilisation and rehabilitation must be completed across different parts of the site.

The applicant disagrees that conditions should dictate the extent and timing for stabilisation and rehabilitation and appealed the Panel's conditions because of their stated impracticability.

Appendix G also advises that the applicant rehabilitates mined areas in two stages – initial stabilisation to manage dust and erosion, followed by final contouring in line with the Site Rehabilitation Plan. Once tailings have been dewatered, the land is reshaped, topsoiled and replanted using a seasonal planting programme supported by an on-site eco sourced nursery.

The Panel refers to the stated need for flexibility/adaptability to the rehabilitation approach referred to at section 4.18 of the Substantive Application, such that rehabilitation efforts cannot be bound to rigid timeframes or fixed hectare targets.

The Panel nevertheless notes as follows:

- The statement in section 6.1 of the Air Quality Assessment report (Appendix S to the Substantive Application) that progressive rehabilitation is one of the most significant dust mitigation measures, as it reduces the areas of exposed surfaces which consequently reduces the potential for windblown dust emissions to be present. Attachment J of the Applicant's response to comments in relation to Air Quality further references stabilisation and rehabilitation as key for minimising dust generation from the site .

- The recommendation in section 5.2 of Appendix M (Terrestrial Ecology) that tailing cells are rehabilitated "as quickly as possible" after mining operations in each area has finished to ensure any effects associated with loss of grassland habitat are only temporary.

- The mine staging plan (for example as appended as Appendix B and C to Appendix N, Hydrogeology Assessment) which shows a clear sequence of dry mining, dredging and tailings intended over the lifetime of the consent.

- Condition 20 of proposed Schedule 1 contains no specific objectives or timeframes for completion of site rehabilitation (interim or final) sheeted to either air quality or ecological concerns. Instead, the management plan itself would set out the "goals, targets and success criteria" to be followed with the timeline for interim rehabilitation of areas within 200 m of the consent area boundary once mining has been completed (Attachment B of the Applicant's response to comments in relation to planning).

- The revised Condition 9 of proposed AUTH142035.01.01 (Land Use Consent) provides a 12-month timeframe for completion of mining within the Priority Stabilization Area and a 3-month timeframe for stabilisation.

- At the hui, the Panel was advised that previous rehabilitation efforts were successful (when undertaken), and there were no dust problems when there were smaller exposed areas and a greater buffer. However, video footage shown by the Taharoa Lakes Trust Panel at the hui showed widespread, wind-generated dust discharges to air from open, exposed areas of the mine (and not from the beach or sea-spray).[4] The footage accords with visible dust clouds viewed by the Panel on the day of the hui.

- Information presented in the comments from the Roy Wetini Whaanau Trust (Attachment 7) records that under the approved Rehabilitation Plan (WRC doc number 3261348),

[4] [Online] https://www.fasttrack.govt.nz/projects/central-and-southern-block-mining/correspondence

rehabilitation was required at an approximate rate of 10-15 ha per year, with the report citing that information stating that TIL had only completed 7 ha out of 70 ha rehabilitation required between 2017 and 2023. This point was recorded in the Hearing Panel's decision, noting that since the time of that report (April 2024) the applicant had undertaken some rehabilitation but remained "behind schedule" (paragraph 376 of the decision).

For these reasons, **the Panel requests comment from the applicant as to why** (assuming the Substantive Application is to be approved) **conditions consistent with good practice requirements for other quarries and mines in New Zealand should not be imposed requiring**:

- Initial (or interim) stabilisation of tailing deposits within (say) four to six weeks of each stage being completed to manage dust and erosion as the mine sequencing plan is progressed.
- Final stabilisation in accordance with the Site Rehabilitation Plan (in order to achieve the future landforms and ground covers detailed in the Conceptual Site Closure Plan), progressively within (say) three months of mining being completed in each stage according to the mine sequencing plan.

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

It is noted that what is good practice for traditional hard rock and inland sand extraction quarries may not apply the same to the Taharoa mine, which is (with the possible exception of the NZ Steel South Head mine) the only large scale ironsand mine in New Zealand in the coastal environment. The context and circumstances of the mine are important considerations. Tailings are placed hydraulically over large areas and need time to dry out to make them sufficiently stable and accessible/suitable for trafficking by heavy equipment before any stabilisation can be undertaken. Stabilisation techniques themselves are challenging at the site – what might work at an inland open cast mine may not be effective at Taharoa. The surface needs to be shaped to the required landform, a suitable growing matrix needs to be created (typically by mixing in or placing silts and clays) and then planting needs to occur. The time needed to do this is variable and depends on the size of the area being rehabilitated, weather conditions and the availability of silts, plants and water.

Conditions stipulating timeframes for progressive stabilisation are unnecessary for activity on the vast majority of the mine site given the separation distances to site boundaries and residential receptors (eg work in the southern block is at least 1.5kms from any residential receptor). There is only potential for issues to arise when work is occurring in a small part of the site around the edge of the Central Block where adjoining sites contain residential receptors. However, this has already been recognised in the proposed conditions of consent with regards to the Priority Stabilisation Area and associated conditions in terms of duration of work and requirement for stabilisation of that area within 3 months (see Condition 9 of AUTH142035.01.01). The Schedule 1: General Conditions also require the Site Rehabilitation Plan to set out Interim Rehabilitation measures to apply within 200m of the site boundary (see Condition 20(b)).

Further, the Panel requests the applicant's comments as to why the specific goals, targets (including timeframes and spatial areas to be rehabilitated) and success criteria for rehabilitation should not be included within condition 20 itself, in line with established case law whereby management plan objectives and targets must be set in consent conditions, and if so **what goals, targets and success criteria the applicant considers a condition to that effect should include.**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Allowing the goals, targets and success criteria to be established through the Site Rehabilitation Plan (**SRP**) as part of the overall Environmental Management Plan(**EMP**) preparation (rather than set out in Condition 20 of the Schedule 1: General Conditions) is appropriate in this instance because the SRP needs to contribute to achievement of the Conceptual Site Closure Plan, which is to also form part of the overall EMP. Consultation with a range of parties (specifically the Department of Conservation, The Proprietors of Taharoa C Block Incorporated, Taharoa Lake Trustees, Te Ruunanga o Ngaati Mahuta ki te Hauaauru, Te Kooraha Marae, Aaruka Marae and the Waikato Regional Council) is required in the preparation of the EMP. This allows for an iterative process to establish the Conceptual Site Closure Plan and then the SRP provisions to achieve it. Trying to specify the goals, targets and success criteria now through the condition itself in a highly time constrained process will be challenging and may lead to inaccurate or inappropriate outcomes. I also note that the condition is already fairly specific as to what is required – this is not a case where there is a lack of direction in the condition as to what the SRP should contain or what it is trying to achieve.

Given the EMP must be certified by WRC there is a check/balance in place to ensure that the goals, targets and success criteria are appropriately included in the EMP.

Despite the above, if the Panel is minded to include such provisions in General Condition 20 then any rehabilitation area targets would most appropriately be formed around achieving a percentage of tailings complete area for a 12 month period, which would then be reported in the Annual Monitoring Report and Annual Work Plan required by General Conditions 43-45. This would recognise that the spatial extent of mined area depends on the type of mining method used in an area (dredge mining to greater depths moves slower spatially than shallower mining using dry mining units).

Noting the point above regarding the comments from the Roy Wetini Whaanau Trust, in Attachment B to the Applicant's response to comments in relation to planning (page 28), Regional Council correspondence is cited recording confirmation by monitoring staff that all outstanding rehabilitation had been completed and in place as of mid-2025).

What specific rehabilitation works were completed (where, and covering what spatial areas) between the date of the April 2024 compliance report produced by the Roy Wetini Whaanau Trust and Regional Council correspondence referred to in Appendix B?

More broadly, there have been over five years of operation under s124 (since the existing consents for the mine expired) .

How much overall rehabilitation and planting has been undertaken during this period?

> *For the avoidance of doubt the questions on this topic are not put as a matter of compliance but within the context of the issues and effects raised in the comments received on the Substantive Application and in framing conditions for the permits to be approved in the event the application is to be granted.*

Response prepared by Taharoa Ironsands Limited:

The following rehabilitation has been completed at the Mine since December 2020:

- In TA06: Over July 2024 approximately 8 hectares was planted with a mixture of grasses and was stabilised using coconut matting.
- In Eastern Blocks Area 1: Over September 2025 approximately 47 hectares was planted in pine seedlings.
- In Pit 1 Northern Block: Over April 2026 the completed area (being 15 ha) was contoured and spread with vegetative cover that had been removed before mining. This material was used as mulch to support dust control.
- Additionally, all of the tauwhare reserves (approximately 20 ha) were planted and fenced between 2020 and 2024.

Using a fixed time period to trigger the start or completion of rehabilitation (as set out in the Panel's question) is difficult because it is not always straightforward to define when mining in an area is complete, or when rehabilitation can be considered complete with established vegetation. The information above is approximate.

As set out in T+T's response to comments on TIL's application (Attachment B), when an area becomes available for rehabilitation, a plan is prepared for the required stages. These may include contouring, spreading the vegetation layer removed before mining, planting, weed control and fencing. Methodology is varied depending on exposure to the coast, shelter, and the position of the area in relation to raised landforms or existing vegetation.

The timing and transition between stages depends heavily on site and weather conditions. For example, drought and windstorms can affect vegetation growth, and infill or replacement planting may be required.

For these reasons, the time required to achieve established vegetative cover and stabilised ground conditions varies significantly across the mine area. Rehabilitation should therefore be understood as a staged and variable process rather than a linear process with a standard timeline.

A key constraint is that planting is generally limited to winter months, as summer conditions are too harsh for newly planted seedlings to establish successfully. The conditions experienced each summer influence the scope of work required the following winter.

Eco-sourced native species are preferred for rehabilitation planting. However, experience indicates that a combination of exotic and native species provides greater assurance of successful establishment. Exotic species are already present across parts of the site and can self-seed in areas.

Consistent with this context, TIL does not currently have any rehabilitation quantum requirements in its existing resource consents for the Central and Southern Blocks. Any planned timeframes for rehabilitation at the site are always indicative only and are influenced

by the factors set out above. In any case, WRC has indicated (in its February 2026 correspondence to the Roy Wetini Whaanau Trust) that it considers that any 'outstanding rehabilitation' has been completed and in place as of mid-2025.

5. Ridgeline Reinstatement/ Rehabilitation/

The comments lodged by the Roy Wetini Whaanau Trust raised concern about the removal of the ridgeline located on their south western boundary, noting that since mining of that ridgeline commenced they have experienced a noticeable decline in air quality, being exposed to "clouds of dust moving across their land", observed visible dust on surfaces inside the dwelling, and ceased using roof collected drinking water out of concern over clay dust contamination. The removal of the ridgeline is also said to affect visual amenity, and the level of noise and light emissions experienced from within the property.

The Trust points to correspondence with the Regional Council (and produces application material submitted by Taharoa Iron Sand Mine in 2013 in support of a consent variation) advising that a buffer would be maintained between the open mine areas and neighbouring properties.

The Trust seeks reinstatement of the ridgeline adjoining the northern boundary of the Central Block along with its stabilisation and planting as part of the amended conditions of consent requested by that commenting party.

Attachment B of the Applicant's response to comments in relation to planning (at pages 7 - 9) notes that there is no condition of consent requiring a set back from this boundary, and says the issue raised is essentially a compliance matter that is not relevant to Panel's decision because no formal enforcement action has been taken by the Council. Conversely, the correspondence produced by the Trust (Regional Council letter dated February 2026) advises that the Council considers this issue to be a matter for the consent process (as now superseded by the Substantive Application before the Panel). There may also be issues of jurisdiction (consent scope) raised by the statements made in the 2013 application.

Please advise, in these circumstances, whether it would be feasible to reinstate the ridgeline with tailings/overburden removed in carrying out mining activities in the (former) ridgeline area once mining in this specific area is complete and if it is not considered feasible or viable, explain precisely why that is the case and what the implications for the mine would be.

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

TIL advise that partial reinstatement of a ridgeline formation using tailings is feasible and is to be implemented once mining of the sand has occurred in this area. The reinstatement will not be to the same height as the original but will still provide screening for adjacent properties.

I note that this is one measure that responds to General Condition 20(c) that requires, amongst other things, rehabilitation measures to be put in place to provide visual screening of mining operations in the Central Block from the property containing the Wetini dwellings.

TIL also advises that it has been engaging with the Williston and Kana whanau which own and reside in the two dwellings on Taharoa A7J10B Block (which adjoins the Central Block to the north) regarding TIL's activities along the ridgeline, and how TIL are managing potential adverse effects. TIL had concluded positive discussions with these parties about additional private measures it can take to provide them with comfort regarding effects management. TIL has previously sought to have discussions of this nature with the Roy Wetini Whanau Trust, who have a dwelling some distance away from the ridgeline, but the Trust was not willing to engage on a proposal to assist them with potential effects management.

Appendix C Economic Assessment

6. Net Present Value of Project Expenditure

The economic assessment identifies that the anticipated expenditure over the next 30 years will be $9 billion ($298 million per year). Economic assessment of Fast Track projects have typically used the net present value (NPV) of project expenditure over a period relevant to the project to estimate the project contribution to Gross Domestic Product (GDP) for the region.

The Panel requests the Applicant provide such an assessment incorporating project capital and operating expenses and adopting the New Zealand Treasury discount of 8%. The Panel anticipates that the estimate would include both direct and indirect effects of expenditure and employment as generated by a regional input-output model.

The economic assessment records that $1.2 billion has been spent on regional goods and services since 2017 ($150 million/annum). This is projected to increase to $298 million per annum. A similar increase in capital spending is projected. **The Panel requests those numbers be verified in the model**, being clear to differentiate regional/national expenditure from expenditure on overseas goods and services.

The Panel further requests the Applicant **compare the NPV with the most recent Waikato regional GDP** (noting that Appendix C incorrectly refers to the Taranaki region for a GDP comparison).

Response on behalf of TIL:

Response prepared by Kirdan Lees, Sense Partners:

Previous Fast-track applications have adopted input-output methodologies to assess GDP impacts from specific projects. However, in practice, these methodologies have been criticised by: (i) the use of multipliers to quantify impacts when the opportunity cost of labour and capital is not accounted for; (ii) induced effects from the use of second round wage impacts that may simply transfer spending between regions rather than create new opportunities; and (iii) not discounting future revenue streams.

For this proposal, the scale of the expenditure - $9 billion - speaks to the scale of the operation and potential benefits to the region and nation. Rather than engage in modelling multiplier effects that have been criticised, this proposal takes a conservative approach and simply provides the direct impacts through the commercial business plan. This means the

benefits do not rely on indirect or induced impacts that have been widely criticised, including by New Zealand Treasury, for example.[5] Almost surely, if the modelling proposed by the Panel was to be conducted for the Central and Southern Block Mining Proposal, the modelling would continue to show impacts on GDP in terms of billions of dollars, clearly regionally and nationally significant impacts.

A measure such as net present value (NPV) is helpful for a project such as TIL's proposal, with cash flows stretching out 30 years. An 8% discount rate is often used to assess projects, since Treasury recommends this rate to public sector agencies for projects that need to account for commercial returns.[6]

However, the Tahaora Ironsands business model is quite unique. The numbers presented in the Economic Assessment are already a commercial best estimate of NPV for reasons that span the treatment of the iron price, revenue, and costs. Rather than effectively discount revenue twice, which would be the outcome if we were to prepare the model requested by the Panel, we demonstrate below that commercial assumptions across key characteristics of the project –the iron ore price, revenue and costs –already discount future returns by more than 8 %. This is not surprising since the commercial project demands a commercial return.

Iron ore price assumptions are consistent with a net present value greater than 8 percent

Taharoa Ironsands Limited has provided the following assessment of the iron ore market, which underpins the price outlook presented in the Economic Assessment:

- Iron ore prices have continued to be underestimated for the past decade, because forecasters have underestimated the scale and frequency of supply disruptions and the rates of existing mine depletions, not to mention grade or quality decline.
- The iron ore market is currently expected to need 650Mtpa of new iron ore supply from 2035 to meet demand but also help offset around 800Mtpa of depletion of existing mines over the same time frame. To put that challenge in perspective, only 300Mtpa – which includes a full producing Simadou, Guinea – has been committed and expected to come online over the next decade. Up to this point, the sector has underinvested and the time to develop new projects is longer and more challenging than ever. This demonstrates that a conservative iron ore price path was applied (see Figure 1 below).

Revenue assumptions are consistent with a net present value greater than 8 percent

- There is no general inflator for the revenue line. Adding an inflator would be more than 8% compound.
- Taharoa Ironsands Limited's sales volumes are largely fixed by contractual agreement. The big – and most strategically critical – revenue line is in the first 10 years.
- One third of that revenue line is contractually fixed for 10 years, with the remainder for around 5 years, with very strong demand for similar contracts from existing customers seeking for contract extensions and new customers.

[5] See https://www.treasury.govt.nz/publications/guide/guide-social-cost-benefit-analysis
[6] See https://www.treasury.govt.nz/information-and-services/public-sector-leadership/guidance/reporting-financial/discount-rates

Taharoa Ironsands Limited's commercial view of the NPV of the future revenue stream is that the discount will decrease strongly (more than 8% pa) due to the adoption of vanadium extraction technology and also the lift in average grade (from 56.8% fe mags to an average of 57.2% fe mags or more), which is already being achieved in deliveries.

Taharoa could have increased the price by the forecast increase in the net price (Platts less the Taharoa discount). So the price forecast implicitly contains a NPV greater than the 8 percent typical of commercial projects. Table 2 (below) sets out the strength of the revenue forecast.

Cost assumptions are consistent with a net present value greater than 8 percent

- The operation's largest single cost is shipping at around 35% of operating costs.
- Apart from bunkering the charter cost is fixed for the next ten years.
- The indicative charter rate for a new cape size ship is the same as the current rate for the ship it would replace for a further 25 years.
- For energy, the move to new processing technology, and in particular dredging, will lower energy costs per tonne by more than the 8 percent reference discount rate.
- The same applies with labour: any domestic wage inflation will be cancelled out by productivity improvements, especially dredging.
- The repairs and maintenance bill is already 30% lower due to taking heavy vehicle maintenance internally and also benefitting from more competitive sources. Again much more than 8%.
- The bulk of domestic capex has already been incurred with that plant and machinery expected to last for the project period subject to sound maintenance strategies which are in place.
- Here depreciation is not a real cost, reflecting largely in Repairs and Maintenance expenditure.

Figure 1: Platts pricing over 2025 shows a higher price would be warranted

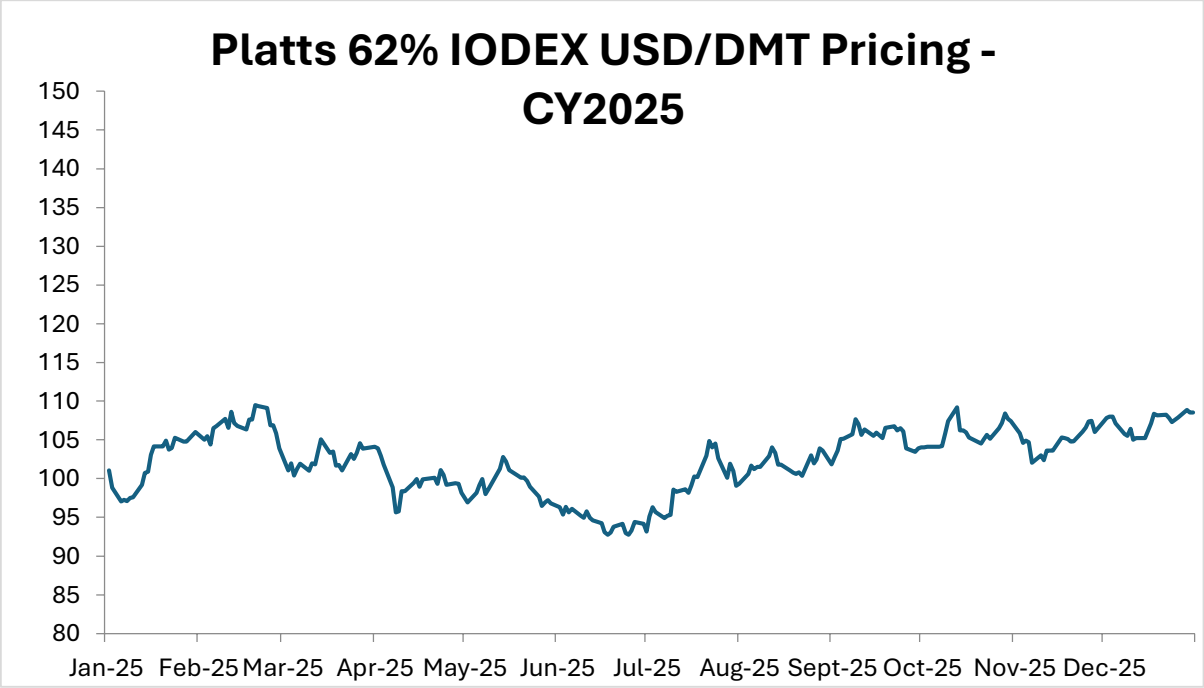


Table 2: Export revenue shows the strength of the mining operation, which will only scale with additional volume

Calendar Year Export Revenue Summary, 2017–2026												
	UoM	**CY2017**	**CY2018**	**CY2019**	**CY2020**	**CY2021**	**CY2022**	**CY2023**	**CY2024**	**CY2025**	**CY2026***	**Total**
Number of shipments	FOB	5	8	7	7	7	7	5	6	7	7	**66**
	CFR	8	9	6	12	11	13	11	12	12	14	**108**
	Total	13	17	13	19	18	20	16	18	19	21	**174**
Platts 62% Fe	US$/DMT	65.97	69.46	93.41	108.87	159.49	120.16	119.75	109.44	102.37	107.18	**105.61**
Tonnage (bill of lading)	WMT	2,108,260	2,654,701	2,102,548	3,077,038	2,901,339	2,571,180	2,021,244	2,632,566	3,051,701	3,367,785	**26,488,362**
	DMT	2,040,962	2,568,581	2,033,796	2,979,051	2,808,622	2,488,761	1,956,618	2,548,723	2,954,484	3,261,105	**25,640,703**
Provisional revenue	US$	68,511,356	83,684,596	91,841,631	158,055,781	219,507,638	146,864,971	116,575,630	144,167,518	155,596,634	174,394,265	**1,359,200,019**
Final revenue	US$	6,221,404	6,931,135	5,314,507	27,323,183	19,755,418	2,895,212	4,617,306	-4,450,722	6,214,234	3,798,330	**78,620,008**

Notes: CY2017 covers 8 months; CY2026 is actual to June plus forecast for the balance of the year. Platts figure in the Total column is the period average. Tonnages are rounded to whole tonnes and revenue to whole US$, so figures may not sum exactly.

7. Export Earnings

The economic assessment refers to $14 billion of export revenue over the next 30 years. The revenue forecast rests on:

(a) iron ore price held constant at $100 USD/tonne for 30 years (the 62% FE fines index has recently been below this);

(b) production ramping from 3.6Mt to 5Mt; and

(c) NZD/USD at 0.55.

What is the sensitivity of revenue to downside scenarios on each of these variables, and **has a low-case scenario been modelled**?

Response on behalf of TIL:

Response prepared by Kirdan Lees, Sense Partners:

Taharoa Ironsands Limited has noted the following in respect of the cost curve and demand outlook that matters for the iron ore price outlook:

- Within the current supply equation is a steep cost curve, with over 100 price sensitive iron ore producers from over 20 countries. The steep cost curve has followed post pandemic inflationary pressures for all countries and the current oil price impact)iron ore production) has pushed about 350Mtpa of iron ore supply to about US$80/t breakeven and 260Mtpa above US$90/t in the contestable cost curve, whilst freight has risen substantially.
- At the top line, demand and top-line growth in steel are expected to continue over the next decade due to: a) population growth; b) urbanisation; c) rising living standards; d) increased military spending by governments; and e) the infrastructure of the digitalisation and decarbonisation mega-trend.
- This means anticipating exporting more tonnages into a deeper, long-term commercial relationship pool of existing buyer steel mills over the next 10 years. The global supply and demand position of steel — and therefore its key raw material ingredient, iron ore — remains positive and price-supported, due to the persistence of several unavoidable global mega-trends.

I am not aware of explicit downside scenarios for each variable set out in the Panel's question, but I agree with the points made above by Taharoa Ironsands Limited. These arguments speak to the conservative assessment of the iron ore price and global drivers.

I would expect the benefits of the project to be lower if growth in production is lower than the expected increase in production to 5Mt but this is substantive economic activity. Modestly lower production still returns regionally and nationally significant economic benefits.

I have not undertaken a sensitivity analysis with respect to the NZD/USD relationship but the rate specified in the proposal is reasonable and it is well known that the USD tends to move in the opposite direction to commodities like iron ore. So, any weaker dollar scenario should be associated with a higher iron ore price.

The economic assessment draws a parallel between the projected export of Taharoa Ironsands and wool exports. The Panel requests that **actual export data from most recent published statistics be provided** to make a comparison with the current $316 million per annum export revenue?

Response on behalf of TIL:

Response prepared by Kirdan Lees, Sense Partners:

The Economic Assessment provided as Appendix C to the Substantive Application Report draws a parallel between the projected export revenue of Taharoa Ironsands Limited's mining operation and the wool industry. As set out in the Economic Assessment, Projected annual average revenue over the next five years is $320 million per year, over the five years between 2030/31 to 2034/35, annual average revenue is $460 million, over the 20 years from 2034/35

to 2053/54, average annual revenue is $480 million. In 2025 (FY to June) wool exports (HS5101) returned $446 million.[7]

8. Employment

The economic assessment identified that there are currently 350 full time employees "indirectly" employed (page 2) and 240 staff "directly" employed (page 13). Counsel's memorandum of 5 December 2025 states that there is a "core workforce" of 70 – 80 employees with 70% of the mine's workers from Ngāti Mahuta hapū (Substantive Application s3.2.3).

Please clarify the employment numbers:

- **Are there 350 full-time employees or 350 full-time equivalent roles (page 20, Appendix C), and if the latter is correct what is the total number of employees, full-time and part-time?**

Response prepared by Taharoa Ironsands Limited:

TIL has approximately 350 full-time employees. These employees are in different roles across the business – including at the Mine, Port and Head Office.

The reference to a "core workforce" of 70-80 employees stems from a reference made in Taharoa Ironsands Application for essential worker status during COVID-19. It explained the core workforce of staff at the Mine site on any one day is 70-80 (with the Mine responsible for the employment of an estimated 300 employees). Thes are not current figures, and the best employment figures to refer to are set out above – TIL having 350 full-time employees.

The assessment that 70% of the Mine workers are from Ngāti Mahuta hapū is an approximate assessment based on TIL's understanding of employees' whakapapa ties, and is current. TIL does not undertake detailed racial profiling. As a percentage of salary, the percentage of Mine workers that whakapapa to Ngāti Mahuta hapū is greater than 70%.

- The Panel viewed onsite staff accommodation at the mine during the site visit and was advised that the mine intends to expand this to accommodate FIFO (fly-in fly-out) mine workers. Concerns were expressed at the hui that employment of local mana whenua in the village was no longer occurring to the extent that it had under previous mine management. The Panel anticipates that such changes need to be factored into the flow of expenditure in the local community in the input-output assumptions if wages and salaries are repatriated and not spent locally.

Response prepared by Taharoa Ironsands Limited:

[7] This data can be downloaded from Statistics New Zealand's infoshare tool: https://infoshare.stats.govt.nz/

In respect of the Panel's comment that "Concerns were expressed at the hui that employment of local mana whenua in the village was no longer occurring to the extent that it had under previous mine management":

TIL's policy is and always has been to provide as much employment as possible to tangata whenua and people with ties to the area, who are familiar with the area and have family support.

However, TIL can obviously not force these individuals take up employment at the Mine, and employees must be willing to fill the vacancies at the Mine and have the necessary skills and experience.
If you were to remove those in the village who are already employed by the Mine, it is likely there would be a remaining population of 15 people, most of whom are part retirement age.
Very few the individuals that spoke at the hui currently live in the village.

Accordingly, there is no 'change' to speak of that need to be factored into the flow of expenditure in the local community in the input-output assumptions.

By way of further background regarding the village:

During the hui at Aaruka Marae the Panel was made aware by a submitter that prior to the commencement of mining in the area Taharoa was very sparsely populated with no community to speak of. The vast majority of families had relocated to urban areas in search of employment opportunities and education for their children, things that Taharoa couldn't offer. What remained was a handful of farms and some holiday dwellings.

The Taharoa village was established at the beginning of mining operations in 1972 as a mining camp to accommodate workers.

We have provided aerial images of the area in 1961 when there was no village and 1974 when the village had been developed. These are attached as **Appendix A** and **Appendix B** to this response.

In the early years of the Mine's operation, the village accommodation was more permanent in nature because it was the employees' primary place of residence, and due to the difficulty of access to Taharoa. Because of the permanence of employees in the village, the mine added community facilities.

As roads improved and access to private vehicles increased, employees began moving their families back to urban areas with employees commuting to the mine and staying in the village only on the days they were rostered to work.

TIL has continued to invest in the village because of its intrinsic relationship to the mine.

Over the last 30 years the 75 houses in the village came un der mine ownership, with 210 employee inhabitants using these houses on a "single quarters" and temporary basis.

However, most of the Mine's workers do not choose to live in the village on a fulltime basis and instead invest in housing in the wider region (Hamilton and Auckland) where they reside when they are not working. These employees commute to the mine and stay in their accommodation for their rostered shifts. The estimated number of employees who live in the village on a more

permanent basis is 23, though most own secondary residences in more urban areas of the Waikato. The local school that serves the wider Taharoa district also has a roll of 24 students.

There are very few houses in the village (and residents) that are not connected to employees of TIL. TIL estimates that the number of individuals who do not work from the mine and live in the village to be 15. There are nine houses located in the village that are not owned/leased by the mine/TIL.

With the addition of over 130 new staff in the last five years, village accommodation has reached capacity. To provide for these workers, TIL provides onsite accommodation for its staff who do not live in the village and work four days on and four days off. While these staff are on site they work four 12 hours shifts (48 hours work in four days). TIL houses these staff on the site so TIL can appropriately manage fatigue. This accommodation is a "satellite" of the village and does not differ in the way the accommodation is used or allocated, nor is there any difference in the type of employee that stays at there.

The onsite accommodation is provided because we have found that in the mining industry in New Zealand and more broadly, in Australia etc, staff are generally looking for a work/life balance which is what we are trying to provide.

9. Adverse effects

There does not appear to have been any attempt to quantify adverse impacts in economic terms, the proportions and thresholds of which are to be weighed in terms of section 85 of the FTAA.

Can examples of any adverse impacts be identified and evaluated where practicable?

Response on behalf of TIL:

Response prepared by Kirdan Lees, Sense Partners:

The FTAA states that adverse impacts need to be considered by the Panel. However, the FTAA does not explicitly require any direct assessment of the economic cost of adverse impacts, and it can be extremely difficult to quantify such impacts.
The Panel is free to receive advice and reports on adverse impacts to inform its decision.

One reason to identify and then separate out the assessment of adverse effects of a proposal from an environmental perspective and the economic benefits of a proposal, is to test if adverse – and typically environmental impacts – can be managed. Assessment of the extent of adverse effects and their potential management can be done separately and compared to benefits or some threshold the panel chooses."

In general, there are economic techniques, including non-market valuation methods, that attempt to value adverse impacts. But it is not clear which adverse impacts, if any, should be assessed. There may also be other positive impacts that are not easily monetised, that also should be assessed.

10. Report Preparation

The authors of the economic report (Appendix C to the Substantive Application) are requested to provide the following declaration (or similar) as to independence:

> *"While this report has not been prepared for proceedings before the Environment Court, it has been prepared and reviewed in accordance with the Environment Court's Code of Conduct for Expert Witnesses, as contained in the Environment Court Practice Note 2023. We confirm that the issues addressed are within our area of expertise, that we have not omitted consideration of any material facts known to us that might alter or detract from the opinions expressed, and that we have not been directed in the substance of their findings."*

Response on behalf of TIL:

Response prepared by Kirdan Lees, Sense Partners:

I confirm and provide the above declaration. In addition, I note that I provided this declaration in the Economic Assessment at page 4.

Appendix I - Hydrology

11. Risk of Flooding

The Executive Summary of Appendix I states that water levels in Lake Taharoa are approximately 2.5 metres higher due to the dam and that lake levels have remained relatively stable between ~9.6 m RL and ~10.4 m RL over the last 10-years.

Section 6.2 notes that a section of Taharoa Road that is of concern regarding flooding during high lake levels is located along a topographic low (~10.5 m RL) and is close to current normal lake water levels. Figure 5 of Appendix I indicates around six occasions in the last eight years when Taharoa Road would have flooded. Given the legal baseline for the existing environment is the dam not being present (Appendix CC, paragraph 17(c)), **how does increasing the lake level by 2.5 metres not increase the risk of flooding at the road?**

Response on behalf of TIL:

Response prepared by Grant Eccles, Planner, Tonkin & Taylor Limited and Josh Mawer, Senior Hydrologist, WWLA:

The road that is subject to periodic flooding was constructed by the government starting in 1968 and completed in the early 1970s as part of the establishment of the mine and village to provide construction and ongoing vehicular access to the mine and village. The road was in place before the dam and weir were constructed in 1971. It is noted that the relevant Road Controlling Authority (Waitomo District Council) has not raised the periodic flooding of the road as an issue.

The road may still be flooded due to the low level of the road relative to the area upstream and high catchment inflow conditions during these times. Therefore, assuming lake levels could be actively lowered (e.g. via increased actual use or abstraction of water), it would not guarantee the road would not flood. However, as set out in more detail in our response to the Panel's question below, it is not practicable to modify the dam / weir structure to reduce higher lake levels. It is also not practicable to actively pump water out of the lake during periods of high lake levels / high inflows.

Section 6.2 of the report states that the box weir is a "passive" structure and cannot be actively operated to increase or decrease outflow rates for given water level, and as such it is not possible for the mine operator to control or affect high lake water levels based on the current weir design.

Is this consistent with the condition structure whereby water must be pumped through the weir to maintain residual flows below the dam, if water levels drop below the invert level of the v-notch (9.36m)? **Why can't maximum lake levels (presenting potential flooding risk) be managed in the same way?**

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

The small flow needed to maintain minimum flows downstream of the weir (~10 L/s) is not comparable to the massive volume required to manage lake levels during heavy rain. Pumping over 5,000 L/s (5 m^3/s) over the weir is physically unrealistic. Given the massive inflows during storms, it is simply impossible without full replacement of the weir structure to discharge water fast enough to prevent the road from flooding.

We also note the road may still flood due to the low level of the road relative to the area upstream and high catchment inflow conditions during these times. Therefore, assuming lake levels could be actively lowered (through pumping or any means), it does not guarantee the road would not flood.

What would be a maximum level, to avoid flooding Taharoa Road?

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Levels in the lake would need to be maintained below approximately 10.5 m RL (Local datum) to avoid backwater flooding onto the road. As noted in our response to the question above, it is not practicable to actively pump water out of the lake during periods of high lake levels / high inflows. The rate of pumping required to make a material difference in reducing lake levels is not realistic. In addition, discharging water downstream of the dam at such a rate would also result in negative effects (e.g., erosion, high turbidity / suspended sediments etc). As noted above, the road may still be flooded due to the low level of the road relative to the area upstream and high catchment inflow conditions during these times. Therefore, assuming lake levels could be actively lowered (e.g. via increased actual use or abstraction of water), it would not guarantee the road would not flood.

12. Climate change projections

Mr Kelsey requested a flood risk assessment on Taharoa Road to consider climate change impacts. Attachment F of the Applicant's response to comments in relation to Hydrology clarifies that flooding has occurred at the low point of Taharoa Road on nine occasions in the 13 years between 2013 and 2025 but declined to provide a flood risk assessment.

The Panel notes that Section 5.1 (page 22) of Appendix I states:

> *Projected climate change is fairly neutral for the Taharoa area, with only a 2% decrease in annual rainfall projected for the period 2041-2060. Summer rainfall is projected to decrease by ~5%,* ***while winter rainfall is projected to increase by ~2%.***

On the face of it, the statement that climate change projections are 'fairly neutral' seem at odds with the extreme events experienced in Auckland in the last five years. It is also inconsistent with the Appendix Q (Coastal Processes Assessment, section 2.1.2) which anticipates increased stormwater discharge volumes due to climate change, to manage effects of extreme events. The Panel also notes the temporal differences between an individual event, and the seasonal/annual effects being discussed in section 5.1.

The Panel wishes to understand **how many additional flood events are anticipated** under MfE's climate change scenario SSP2-4.5?

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

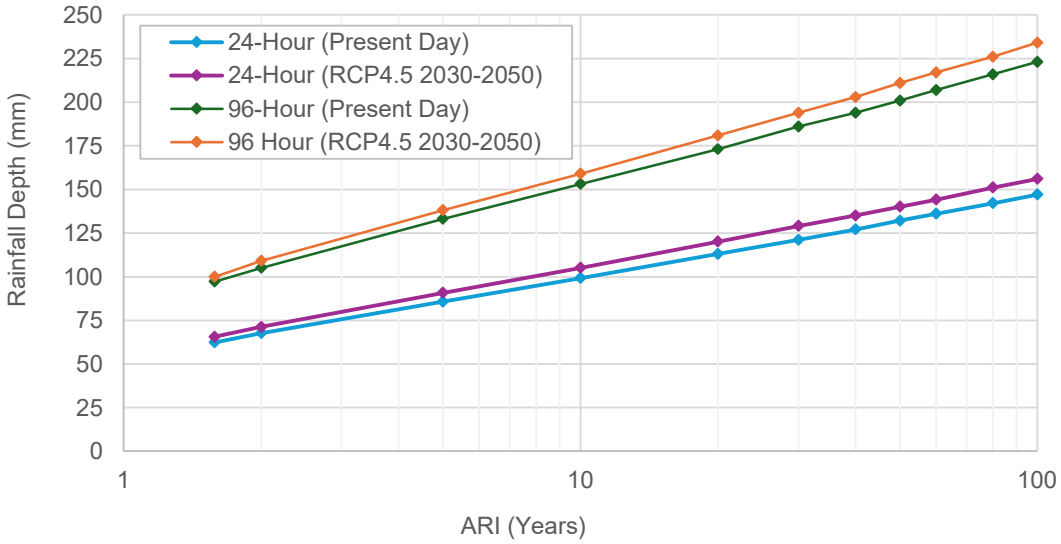
The Panel has identified the difference between long-term average rainfall, and extreme rainfall intensity. We stated that annual and seasonal changes in average rainfall due to climate change will be fairly neutral (over the duration of consent sought). However, whilst not stated we agree that infrequent, large storm events are projected to become more intense.

The frequency and number of high lake level events and inundation of the road is not anticipated to materially change due to climate change over the duration of consent sought. To provide high-level context to the specific question of how many additional flood events may be anticipated for the road, we have compared Earth Science NZ's (formerly NIWA) High Intensity Rainfall Design System (HIRDS) data for the current day and RCP4.5 scenario design storm rainfall, with the following analysis assumptions:

- High intensity rainfall is the primary driver for flooding of Taharoa Road;
- The frequency of road flood events that have occurred in the past (9 occasions in 13 year) is a function of the frequency of the rainfall events;
- The equivalent rainfall event size will be used to compare to the frequency of the same size rainfall under the climate change scenario.

The figure below illustrates the projected increase in 24-hour and 96-hour duration rainfall events under present climate, and the years 2030-2050 under RCP4.5. On the basis that the road has been inundated on 9 occasions in 13 years this is equal to approximately once every 1.4 years. The HIRDS data indicate rainfall events of this frequency (for the 24-hour and 96-hour duration storm events) will increase in magnitude (i.e., increase in rainfall depth) by approximately 4-5%.

A 1.4 year ARI event would become an approximately 1.24 year ARI event under the RCP4.5 2030-2050 climate change scenario. This minor change in frequency is considered immaterial, and we anticipate it would not be discernible/noticeable for current conditions. We also note that if the lake level resides at a lower level on average (due to increased actual use or abstraction), the likelihood of the road becoming inundated is lower than if these events were to occur during periods of higher lake levels.



13. Reference levels and triggers

There are various lake and river level metrics referred to in this report and in consent conditions, including as to when water take must cease or management responses need to be triggered. Section 3.3 of Appendix I refers to a previous understanding that the local datum was the same as mean sea level (MSL), it since being realised that a 2.38m offset was required.

Section 3.4 of Appendix I refers to lake levels being between ~9.6 and 10.4m local datum. Condition 10 of AUTH142035.05.01 (Water Permit for surface water take) requires management responses to be initiated if Lake Taharoa drops "below 9.6m RL *as measured by the Local Datum Survey Marker*" (over a 30-day period)[8] and similarly condition 7 requires that water must not be taken when the Lake Taharoa water level is less than 8.53m *as measured by the Local Datum Survey Marker*.

This creates some confusion in the Panel's mind as to what levels are being referred to i.e. RL or the local datum? It may be that the intention is that the levels are in "RL" terms (set to the New Zealand Vertical Datum) but measured at a local datum survey marker (spatially).

Please clarify the situation for the Panel's understanding of the various triggers, management responses and condition requirements relating to water levels.

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

All water levels, triggers, and management responses specified in the Hydrology Report (Appendix I) and the proposed consent conditions are measured relative to TIL's local datum, unless explicitly stated otherwise.

To address the Panel's specific queries, we can clarify the following points:

- **Definition of "RL":** The Panel noted confusion regarding the term "RL". The acronym RL stands for Reduced Level, which indicates a measurement relative to a designated common datum. It does not automatically refer to Mean Sea Level (MSL) or the New Zealand Vertical Datum. In the context of the Lake Hydrology Assessment and proposed lake level triggers, "RL" refers exclusively to the Reduced Level against TIL's local datum.
- **Consistency with Historical Data:** We have used TIL's local datum for our hydrology assessment and all proposed lake trigger levels to ensure absolute consistency with the site's historical monitoring records.
- **The 2.38m Offset:** Section 3.3 of Appendix I explicitly mentions the 2.38 m offset between TIL's local datum and the Moturiki datum (Mean Sea Level). This was included specifically to avoid ambiguity going forward, as several older technical reports prepared by third parties had incorrectly assumed the two datums were identical.

Application to Consent Conditions: For absolute clarity regarding the conditions raised by the Panel:

[8] Attachment F to Applicant's response to comments in relation to hydrology

- **Condition 10 (AUTH142035.05.01):** The trigger to initiate management responses if the lake drops "below 9.6 mRL as measured by the Local Datum Survey Marker" refers to **9.6 m relative to TIL's local datum**.
- **Condition 7:** The requirement that water must not be taken when the lake level is less than 8.53 m refers to **8.53 m relative to TIL's local datum**.

Figure 5 of Appendix I shows a "consent trigger" level set at 9m – the Panel cannot see a condition linked to 9m (as opposed to 8.53m, 9.6m as above), or for residual flows through the fish pass, 9.3m under condition 7 of AUTH142035.03.01 (Water Permit for surface water take).

Please clarify the purpose of the 9m consent trigger line in Figure 5.

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Figure 5 of Appendix I shows historic measured lake water levels and the consent triggers that were in place at the time (i.e., TIL's consent prior to the RMA hearing). These prior consent conditions are described in Section 2.3.1 and Table 1 of Appendix I.

14. Gaps in modelling database

Section 4.3.5 (page 18) records that there is uncertainty in the exact lake topography and bathymetry behind the dam structure and so the stage versus outflow curve was adjusted as a calibration parameter.

Please explain the calibration approach and any potential consequences of uncertainty in the lake topography and bathymetry that might remain despite calibration.

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

The lake outflow curve is governed by the physical configuration of the weir structure, which over the passage of time has been modified and is poorly documented. The lake outflow curve was initially set based on the conceptual understanding and based available dimensions of the weir structure itself. An iterative process of manually adjusting the outflow curve, re-running the model, and comparing simulated lake levels to the measured lake level dataset was undertaken to refine the lake outflow curve. This process was repeated until the best agreement simulated and measured lake levels was achieved.

All manual adjustments to the outflow curve maintained the physical constraint of increasing outflow with increasing water level (as occurs with all weirs) and seepage losses.

The consequence of this approach was that we cannot accurately separate simulated outflows into weir flows and seepage losses. However, the primary objective of the assessment was the simulation of lake levels - which were unaffected by this approach.

A similar question is raised by section 4.3.6 of Appendix I referring to uncertainties in the exact configuration of the outlet structure, vertical datum offsets and frictional head loss along the Wainui Stream, resulting in adjustment to a model calibration parameter (for the discharge through the outlet dam structure). It is said as a result of this that lake seepage to groundwater was "implicitly accounted for as part of discharge losses" as described in section 4.3.5.

Please explain the significance of this point including for the accuracy of the overall water balance model.

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

The uncertainties and adjustments noted in Sections 4.3.5 and 4.3.6 do not compromise the accuracy of the overall water balance model for its intended purpose.

To explain the significance of this point, the water balance model can be viewed through three fundamental components: **Inflows** → **Storage** → **Outflows**.

- **The Primary Objective (Storage):** The key objective of the model is to accurately simulate lake storage levels, as these levels dictate the availability of water for abstraction and trigger the consent conditions.
- **Lumping the Losses (Outflows):** In hydrological modelling, separating exact groundwater seepage from surface discharge and stream friction is highly complex. Because both seepage and stream discharge ultimately represent "water leaving the system," our methodology pragmatically combined them into a single calibration parameter for discharge losses. This implicitly accounts for seepage without detailed knowledge of the hydrogeological process governing seepage, which is not a focal point of this analysis.
- **Proof of Accuracy:** The model accurately replicates the real-world transitory responses across seasons - specifically the winter storage refill and the summer storage drawdown. This precise matching of historical storage levels confirms that the net balance between inflows and outflows is correct.
- **Operational Significance:** If there were material errors in how the model simulated inflows, the model would fail to replicate the seasonal storage changes so accurately. Furthermore, because the physical outflow is strictly regulated by a minimum flow consent condition, the precise mathematical split between seepage and surface discharge in the model becomes functionally irrelevant to the management of the water take.

Therefore, we consider the uncertainty introduced by implicitly grouping these discharge losses to be negligible, and the model remains highly accurate for managing the proposed consent limits.

Do the calibration results in section 4.4.1 overcome or address any limitations in the modelling inputs as referred to above e.g. uncertainties or absence of data?

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

As indicated by the response above, the calibrated model in our opinion overcomes limitations in modelling inputs. The primary objective of the assessment was the simulation of lake water levels, which ultimately translate to a storage volume of water available for abstraction and use in the mine. The water balance model achieves this objective – as demonstrated by the agreement of simulated and measured lake water levels in Figure 14. If the inputs (catchment inflows) and outflows (lake discharge) were significantly erroneous; we would not have achieved a match to measured water levels – which directly relate to lake storage.

15. Water take scenarios

The amount of water to be taken for ship loading as assumed in Scenarios 3 and 4 (at 21,428 m^3 per day) is substantially less than the average rate of water take for ship loading as recorded at section 2.3.3 prior to expansion of operations (i.e. 37,000 m^3).

It is explained that this assumed ship loading take (21,428 m^3 per day) was set relative to the maximum annual volume of water take provided for in condition 4(b) of AUTH142035.05.01 (Water Permit for surface water take), i.e. 3 million m^3 per annum, for 35 ship loading events per year, at 4 days per event.

It is further assumed that recycled processing water would supply additional requirements for ship loading (as currently occurs). However, given the planned expansion in operations (increase in number of ship loadings per year), use of recycled water would presumably be greater than currently required over an annual cycle of operations.

Are there any implications for the water balance model of using recycled processing water and discharging that to the CMA through the ship loading process, particularly during summer periods when water abstraction rates are greater than summer natural catchment inflows (see bottom of page 23 of Appendix I), and given the planned increase in number of ship loadings proposed?

Response on behalf of TIL:

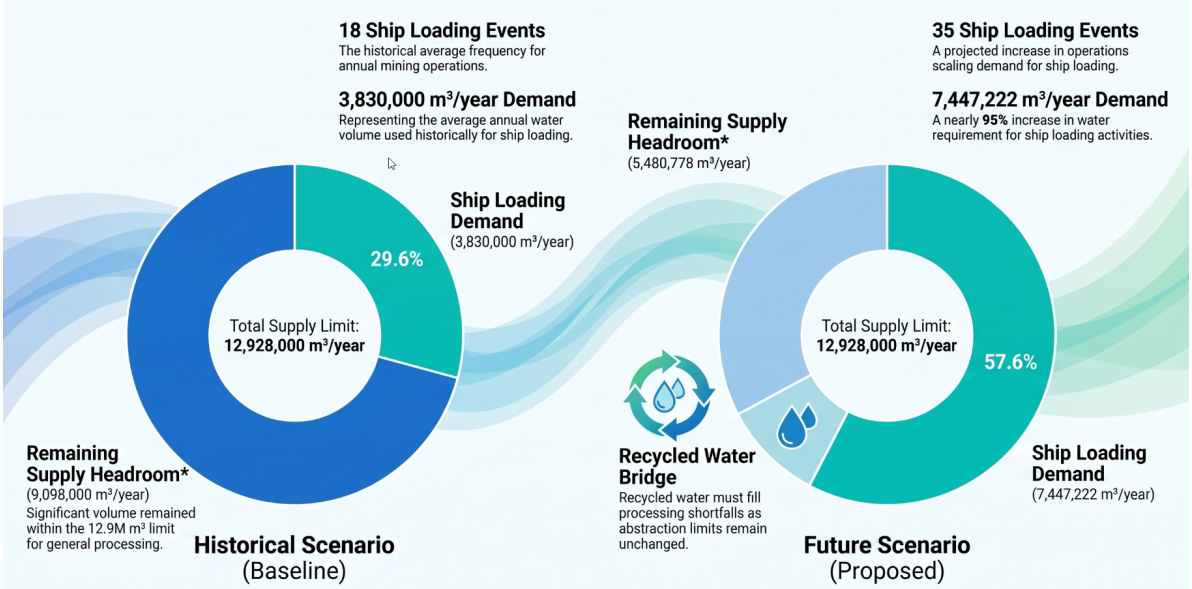
Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Abstraction Scenario S3 (maximum future water takes) represented the maximum abstraction volumes sought under the application. It is assumed that shortfalls will be made up from recycled water and this is expected to increase as mine progresses from dry to wet mining. Conversely, if TIL were to use even greater volumes of recycled water from the mining operation, this would result in less abstraction from the lake, and summer drawdown of the lake would likely be lower.

To contextualise the overall water balance of mining operations, historically they have used an average of approximately 3,830,000 m3/year for ship loading, with an average of 18 ship

loading events per year. The consent limits abstractions from the Wainui Stream/Lake to 3,000,000 m3/year for the purposes of ship loading. The shortfall is made up from recycled process water and groundwater. Scaling the average annual ship loading water requirement above to 35 ship loading events, would result in an average water requirement of approximately 7,447,222 m3/year.

The proposed consent conditions allow for the abstraction of 27,200 m3/day as a 28-day rolling average for process water use. This is equivalent to 9,928,000 m3/year. From an overall mine operation water balance perspective, this provides opportunity for recycling well above the required (at maximum operation) 4,447,222 m3/year (calculated from 7,447,222 – 3,000,000 m3/year) shortfall for ship loading events, as shown in the following graphic.
Please note, TIL are not seeking to consent 35 ship loading events specifically, but rather the lake abstraction volumes proposed. TIL have indicated they intend to scale operations up to 35 ship loading events per year and hence 35 ship loading events per year was adopted in our assessments.



We note TIL did not request an increase in abstraction volumes above what was previously consented. They are comfortable and confident they can progress future operations within these consented limits. If TIL were unable to recycle the volume of water required to satisfy any shortfall above that consented, that becomes an operational risk, not an environmental risk – as they cannot abstract at rates/volumes than those consented.

Is this the reason why there are four occasions under Scenario 3 when **the cease take trigger level of 8.53 m RL is exceeded**, when that has never occurred before and is not permitted under the existing consent? (see section 2.3.1).

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Scenario 3 represented the maximum abstraction volumes sought under the application, and does not reflect historic abstraction regimes. Scenario 4 (S4) is more reflective of their historic process water abstraction regime, and increasing ship loading abstraction.

The scenarios simulated were also conservative (i.e., will tend to indicate greater impacts than reality) as they did not include assumptions on TIL's management responses when the 9.6 m trigger is reached (i.e., when simulated lake levels dropped to less than 9.6 m RL for 30 continuous days, abstractions in the model were not reduced – as is proposed to be required in the current draft consent conditions). The lake water balance model did explicitly include the 8.53 m cease take trigger (i.e., no abstractions occurred if simulated lake levels were below 8.53 m).

At the bottom of page 22 (section 5.2.1 of Appendix I) it is recorded that the temporal variation in lake water levels is due to seasonal variation in natural catchment inflows, and that this will not change with any future increase in the frequency of water abstraction associated with an increased number of ship loading events.

Please explain - this does not appear consistent with the final sentence on the following page (23) whereby abstraction rates are greater than inflows in summer.

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

This text at the bottom of page 22 is referring to the seasonal pattern in lake water levels, where lake levels are higher in winter, and lower in summer. Under all scenarios assessed, lake levels recovered in winter (due to higher inflows during these periods). This seasonal pattern of higher levels in winter, and lower lake levels in summer, will remain. Future abstractions will draw on lake storage as abstractions are greater than summer inflow rates, but will not result in a persistent drawdown of lake levels (i.e., levels recover in winter and will not remain low for extended periods (i.e., multiple seasons)).

16. Lake level management

Proposed Condition 10(a) of AUTH142035.05.01 (Water Permit for surface water take) refers to implementing management responses to "reduce as far as practicable" the water being taken for the purposes of ship loading and sand mining operations, if lake levels fall below RL 9.6.

What would that condition entail i.e. what "practicable" reductions in the water take could be achieved and how pursuant to this requirement of the permit?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

In addressing this issue the Panel should note that any reduction in lake levels will not happen rapidly in an "emergency response" type situation, rather there is a slow and steady reduction that is measurable (lake levels are measured and recorded regularly as part of TIL's monitoring and reporting requirements to the Waikato Regional Council) and provides the mine operator with ample time to plan and put response mechanisms in place. Within that context, the response mechanisms include but are not limited to reducing take volumes to practical minimums, maximising the use of recycled process water, and ensuring the freshwater storage pond on the site is at maximum capacity.

Proposed Condition 10(c) of AUTH142035.05.01 (Water Permit for surface water take) requires a review of the Lake Level and Water Management Plan but only in the event that Lake Taharoa falls below 9.6 metres RL *and* a wetland monitoring report concludes there is an adverse effect. **Isn't this too late - i.e. after the adverse effects have already occurred?**

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA, Jon Williamson, Managing Director and Principal Hydrologist, WWLA, and Hamish Dean, Principal Ecologist, SLR:

The wetlands will not become instantly degraded if lake levels drop below 9.6 m. Rather, the potential effects will follow a continuum based on the magnitude and duration of lower lake levels. Any impacts occurring during such a short period would be temporary and monitoring of wetlands intended to pick up stresses like this, which could lead to more permanent changes if left unchecked, but with a return to more normal hydrological conditions no irreversible or permanent effects would occur.

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited, (note that this response also answers the next Panel question as well):

Noting that the lake margin wetlands are acclimatised to the lake operating levels that have been in place for 50+ years, there is very little evidence to suggest that adverse effects will actually occur on the lake margin wetlands if the lake levels drop below RL 9.6m. Ecological advice from Mr Dean is that the lake margin wetlands may not experience any adverse effects at all at lake levels below RL 9.6m, and if adverse effects do occur, they will be gradual (but detectable) and able to be meaningfully responded to, and not sudden or irreversible. I also note that the first requirement of the condition (clause 10a) is that all practicable measures to reduce water take must occur as soon as the lake level has been below RL9.6m for a 30-day period – these reductions must occur before the "adverse effects survey" (which might conclude there is no evidence of adverse effects occurring) is even undertaken. For these reasons the monitoring and response regime set up by the conditions in question is highly precautionary and does not set up a process that is "too little too late" to address the potential

How does this condition requiring a plan review ensure mitigation measures are undertaken to protect the Lake margins wetlands from such effects arising in the first place?

Please provide a readable Citect (water management) diagram (Attachment 1 of Appendix EE to substantive application).

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

We have been unable to source a version of the process control diagram that reads better on paper. I have been able to clearly read the diagram on a computer screen by magnifying the viewing ratio to at least 150%.

17. Weir Calculations and Minimum Flow

In reference to the dam outlet weir, Section 4.3.5 of the hydrology report (Appendix I) states:

> "*The outlet weir has reportedly been upgraded and modified on a number of occasions since construction in the late 1970's. There do not appear to be any current as-built or design drawings that reflect the current state of the structure which is shown in* ***Figure 11***".

Additionally, Attachment F to the Applicant's response to comments in relation to Hydrology (page 4) response regarding the outlet weir is as follows:

> "*While original construction drawings of the outlet weir are available, the weir has been modified and raised with the V-notch plates. The date and exact construction details of these modifications are unknown. TIL have not been able to accurately survey the current configuration of the weir due to difficult unsafe access requirements.*"

Response on behalf of TIL:

See answer to preceding question.

Section 6.1 of the hydrology report states:

> "*As seen in Figure 6 the lowest water level measured behind the dam structure was 9.45 m RL in early 2014. This is equivalent to 0.09 m head above the invert of the two v-notches in the weir structure (Figure 12). Applying a standard weir flow calculation, the flow through the outlet weir at this level would have been 10 L/s.*"

From the above, it appears that the minimum flow of 10 L/s was calculated based on the original construction drawing of the outlet weir, which has since been modified.

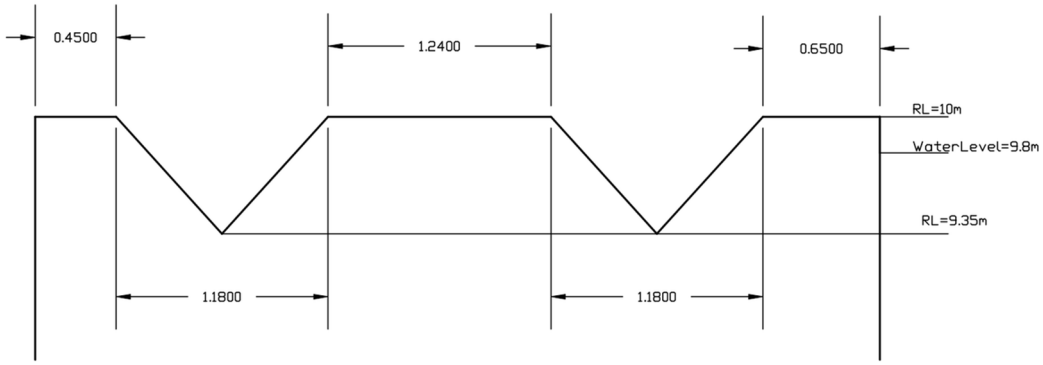
Please provide an updated schematic of the weir with surveyed levels so that minimum flow can be correctly calculated.

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

This residual flow was set based on the minimum record water level behind the dam (9.45 m) based on the ~12 years of data available, and the corresponding flow rate of 10 L/s calculated using a standard v-notch weir equation based on the weir configuration detailed in Section 4.3.5 of the Hydrology Assessment. The calculation was based on TIL's best understanding of the weir dimensions in its current form at the time of preparing our assessment.

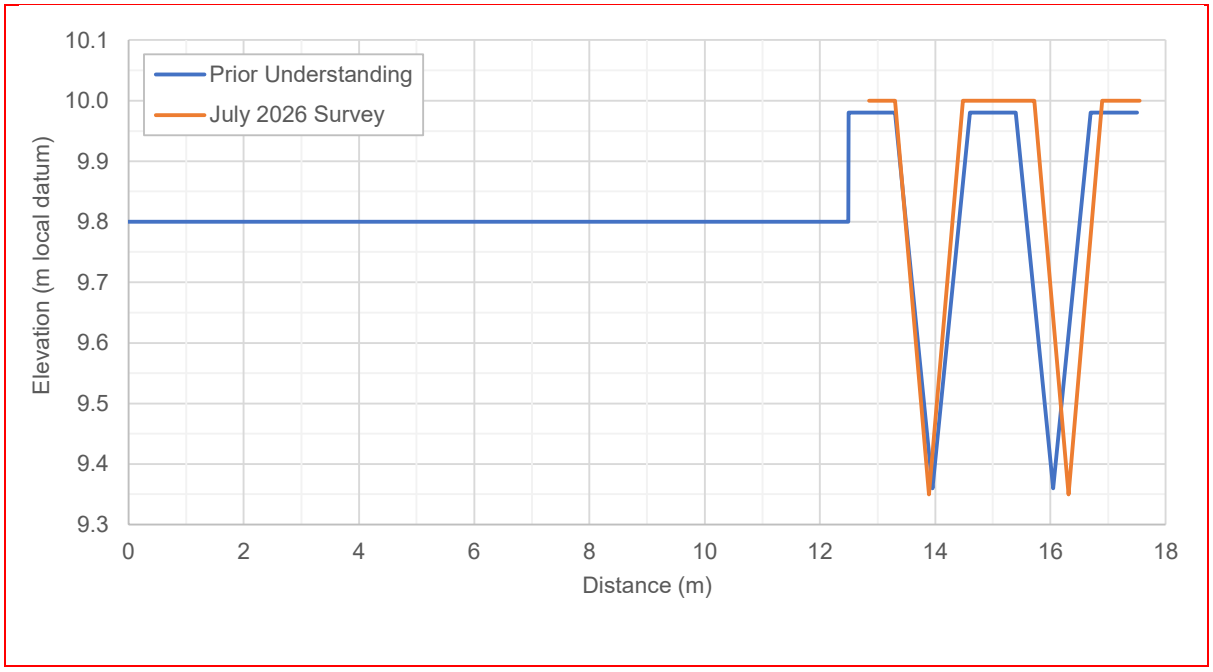
In response to this question from the Panel, TIL resurveyed the weir, and were successful in obtaining accurate dimensions of the two v-notch components of the weir. The surveyed dimensions are illustrated in the schematic below.



This matches relatively closely to our prior understanding of dimensions, and is compared to the schematic used in our assessment (Figure 12 – Appendix I) below. Key differences of note are:

- The 2026 survey has a slightly lower invert at 9.35 m RL (compared with the prior value of 9.36).
- The 2026 survey has a shallower v-notch angle at 84.5 degrees (compared with the prior value of 92 degrees).
- The separation between the two v-notches is 0.44 m wider (note – this has no effect on flow through the two v-notches).

The flow through the two v-notch weir sections at water level of 9.45 m RL (at the weir) (equivalent to 0.1 m head above the invert) is 10 L/s. Hence there is no change to the minimum flow requirement through the weir. The slightly lower invert level from the July 2026 survey dimensions in combination with the shallower v-notch angle results in the same flow rate (rounded to the nearest 1 L/s) as previously determined.



It is understood that Condition 4 of the proposed conditions for AUTH142035.02.01 (Water Permit for dam) already requires a flow of no less than 10 L/s to be maintained. A correct calculation of the minimum flow is critical for this condition.

18. Stream Low-flow trigger and no take level

Attachment F to the Applicant's response to comments in relation to Hydrology (page 8) states:

> **DoC – Section 4.4, Para 2**
>
> *Comment: DoC noted an inconsistency between the draft LL&WMP and proposed consent conditions regarding the 9.6 m RL trigger level. The draft LL&WMP states a trigger level of less than 9.6 m RL for a continuous 30-day periods, whereas the relevant proposed consent condition (Condition 10, AUTH142035.05.01) does not specify a duration (i.e., appears to be an instantaneous trigger).*
>
> *Response: The absence of reference to a continuous 30-day period in Condition 10 appears to be an error. We recommend that Condition 10 is amended to reflect the requirement set out in the draft LL&WMP.*

The Panel queries why is it appropriate to wait 30 days before any of the responses are triggered, and for those 30 days to be continuous.

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

As per the earlier response, the ecological advice is that any adverse effects (if they do occur) will be gradual and able to be responded to. The 30 continuous day period has thus been set as the trigger to avoid the process set out in the condition being initiated by a one off or a short duration (ie a few days) lake level reading below RL9.6m.

Section 2.3.1 of the hydrology report states:

> *"While we have been unable to identify any records which provide a basis for the 8.53 m RL trigger level, we believe it was likely based on the minimum lake level prior to construction of the dam."*

Please provide an assessment of effects of periods when the lake levels are drawn down below the 9.6mRL trigger to the 8.53mRL no-take trigger.

Response on behalf of TIL:

Response prepared by Josh Mawer, Senior Hydrologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA

The potential effects are ecological in nature, and are addressed in the response below. From a hydrological perspective, once the water level at the dam is drawn down below 9.36 m RL, flow would cease to flow over the weir and provide a residual flow downstream. However, TIL are required to maintain this residual flow via pumping should water levels drop below 9.36 m RL and hence the residual flow would be maintained.

Will periods such as these have a significant impact on wetlands bordering the lake?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited, and Hamish Dean, Principal Ecologist, SLR:

The answer provided earlier to the first two questions in Section 16 is equally relevant here.

Noting that historic lake levels have never dropped to the no take trigger level of RL 8.53 (with the lowest recorded lake level being around 9.6m), there is no certainty that any adverse effects will occur in this period. If any adverse effects do occur in these periods the onset of the adverse effects will be gradual though detectable and will be able to be responded to in order to avoid any significant adverse effects. This is the reason that the lake margin wetland monitoring conditions were proposed by TIL as part of the RMA hearing process and ultimately

19. Maximum abstractions

Attachment F to the Applicant's response to comments in relation to Hydrology (page 7) states:

> **DoC – Section 4.1, Para 9**
>
> **Earthtech – RFI17**
>
> *"If TIL continuously abstracted ship loading water at the maximum rate of 75,000 m^3/day they would exhaust their annual limit of 3,000,000 m3 in approximately 40 days. This is the equivalent of 10 ship loading events, assuming an average of 4-days per loading event. While TIL could abstract in this fashion under the consent conditions, it is not realistic given their intention to increase to an average of 35 ship loading events across one year."*

The Panel requests Would the applicant we willing to consider a weekly maximum abstraction to avoid a situation of back-to-back maximum abstractions?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Acknowledging that the question is hypothetical, it is nevertheless based on a scenario that will never practically be achieved. There are only three bulk carrier ships that export product from the Port of Taharoa. Given practicalities such as vessel transit time (ie weeks) to and from Taharoa and export destinations, time needed for vessels to moor at and be connected to the SBM, ship loading time durations (eg 4 days – assuming a ship is fully loaded, which is not always the case (ie half loads do occur, which shortens the loading time duration)), and the impact of weather and sea state on ship loading schedules, any scenario where ship loading could occur continuously for 40 days and daily back to back maximum abstraction could occur is fanciful. Further, a percentage of water used for ship loading purposes is sourced from recycled process water. A weekly maximum abstraction limit for water taken for loading purposes is therefore not necessary.

Appendix K – Terrestrial Ecology – Wetlands and Vegetation Assessment Wetland mapping

20. Wetland mapping

Appendix K covers the ecological effects on retained natural inland wetlands associated with drawdown of groundwater as a result of mining activities, as assessed in Appendix N (Hydrogeology Assessment).

In order to better understand and evaluate these effects along with proposed monitoring and mitigation to address them, the Panel needs to be able to compare and correlate material in the two reports. This is not assisted by the two reports (Appendix K and Appendix N) adopting a different numbering system for the wetlands at issue as well as specifying different study areas.

For example, Appendix K (Table 9 and Figure 4) identifies 29 to 30 wetlands/sites within the central and southern block only, whereas Appendix N identifies 88 wetlands within its study area of the wider catchment which includes the northern block as well as central and southern blocks

(Table 1 and Figure 4) all of which are numbered in a different way to those identified in in Appendix K. Appendix K also refers to seven wetlands being mined (section 6.2.3), whereas Appendix N refers to 13 wetlands being mined (section 6.3.2).

This matter was raised by the Panel in Minute 10 and addressed (in part) in Counsel for the Applicant's memorandum of 23 June, which includes a map and table applying *both* numbering systems, and a table identifying the wetlands being mined adopting both numbering systems (ie from Appendix K and N).

It thus remains difficult to correlate the information in section 6.3.2 of Appendix N (which groups the wetlands referred to in that report into **four** sets according to their location as well as degree of groundwater connection/reliance on surface water versus groundwater), with the assessment of hydrology related ecological effects at section 6.2.4 of Appendix K.

Table 12 of Appendix K is helpful in identifying (and matching) the natural wetlands to be retained as discussed in each of the two reports (i.e. with a column for each numbering system), but not all wetlands referred to in Appendix N are covered in that table, including the proposed new monitoring and proposed offset site 27 (wetland 72 under Appendix N), and it is unclear which wetlands are considered "Wainui Stream" or "Lake Margin" wetlands as referred to in column 2 of that table. Further, the wetlands to the north of Mitiwai Stream identified in Appendix N (notably the wetlands closest to the central block, i.e. 40, 42, 46, 50 and 53 in Figure 4 of Appendix N) are excluded from the assessment in Appendix K.

The Panel requests that a consistent set of mapping be prepared (going beyond that already produced on 23 June) **enabling the Panel to correlate and compare information in the two reports relating to each <u>retained</u> wetland or water body, in order to be able to better understand the significance of the effects on the various wetlands from groundwater drawdown, along with proposed monitoring and mitigation.**

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Updated maps have been prepared identifying the retained wetlands and ponds on the Central and Southern blocks, reconciling the numbering systems used in Appendix N and Appendix K. These maps are attached to this document as **Appendix C** to this response. The updated maps also include the information requested by the Panel below.

This is particularly important as section 6.2.4 of Appendix K refers to potentially high/substantial adverse effects associated with groundwater drawdown on water dependant plant species, with Table 15 recommending specific monitoring and mitigation (including augmentation with supplementary water flow) for wetlands affected in that way, if certain triggers identified in baseline monitoring are exceeded. Section 6.2.4.1 refers to a different degree of effect on lake margin wetlands, again with corresponding monitoring and mitigation outlined in Table 15.

For these reasons, the additional mapping requested by the Panel above should identify which (Appendix N) Grouping each wetland falls within (ie refer Groupings adopted in Table 13 of Appendix N), and adopt the colouring convention (for depth to groundwater) and other information currently on Figure 17 to Appendix N, but also include the numbering for the wetlands

adopted in Appendix K, and a system for the Panel to readily track which wetlands are "Lake margin wetlands" (subject of section 6.2.4.1 of Appendix K), and which are covered in section 6.2.4 (on page 35 of the report). The mapping should also reveal which wetlands are "Wainui Stream wetlands" as referred to in column 2 of Table 12 of Appendix K.

The Panel further requests an assessment of potential (hydrogeology related, i.e. associated with groundwater drawdown from mining activities in the Central or Southern block) **ecological effects on the wetlands to the north of Mitiwai Stream**, specifically the wetlands closest to the central block (wetlands 40, 42, 46, 50 and 53 in Figure 4 of Appendix N).

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

The Hydrogeology Assessment (Groundwater Effects) (Appendix N, pg 38) identifies that wetlands 40, 46 and 53, but not wetland 42 (their numbering), are outside the 0.2 m drawdown contour and are therefore unlikely to be affected in any way by groundwater drawdown.

Wetland 50 is surface-water fed and as a result, any adverse ecological effects associated with groundwater drawdown are expected to be negligible.

As set out in the Hydrogeology Assessment, WWLA has concluded that Wetland 42 is fed primarily by surface water but the groundwater is within 1m of the surface, and there may be a connection and therefore a risk of adverse effects due to drawdown. Without mitigation measures, there is potential for moderate to high levels of adverse ecological effects. Conditions 5 and 6 of AUTH142035.16.01 require monitoring of water levels and a management response to a specified trigger level which includes ceasing dewatering and water augmentation. Water levels in Wetland 42 are already monitored continuously. Provided these mitigation measures are carried out as proposed under the consent conditions, adverse effects on Wetland 42 are expected to be minor or less than minor.

21. Wetland types

Section 3 of Appendix K refers to "margin wetlands" being as extensive as they are now, prior to current mining activity -based on historic aerial photos.

Please confirm if the "margin" wetlands described in **section 3** are those discussed at **section 6.2.4.1** of the report (Lake Margin Wetlands).

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Correct – the "margin" wetlands described in section 3 are those discussed at section 6.2.4.1 of the Appendix K.

Which of the wetlands described in **Table 9** (and shown on Figure 4 of Appendix K) **are "margin" or "lake margin" wetlands**, noting the reference to that term (Lake Margin Wetlands) in the second column of row 1 of Table 12.

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

The wetlands called "Lake Shore" in Table 9 correspond to those called "Lake Margin Wetlands" in Table 12. Table 12 has been updated (as part of the response to the Panel's request below) to refer to "Lake Shore Wetlands" to provide consistency across the two tables.

Specifically, and related to Question 20 (Wetland mapping) above, **please produce a revised Table 12** identifying the Lake Margin Wetlands and "Wainui Stream Wetlands" in the second column by wetland number (as applied on Figure 4). This revised table also needs to include the wetlands north of Mitiwai Stream referred to in Question 20 (appropriately allocated according to degree of groundwater connection) .

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Table 12 has been updated as requested. The updated Table 12 is included in **Appendix D** to this response.

There are also various references in the report to wetlands having been "induced" as a result of mining activities – see e.g. page 18 (section 4.6). The Panel notes that Table 9 identifies a number of Natural Inland Wetlands (shaded green) as having been induced (for example wetlands 5, 6, 9) with Table 11 also referring to some (only) of the southern and eastern wetlands as having been induced.

Do these induced wetlands qualify as Natural Inland Wetlands despite that induction from mining activities **because they have not been 'deliberately constructed',** while other sites (as identified in Table 9) are referred to as 'sites' rather than wetlands (including site 27, the proposed offset site), because they have been deliberately constructed (noting Footnote 4 on page 12 of Attachment H of the Applicant's response to comments in relation to Fauna and Wetlands)? **If not, on what other basis has a distinction been drawn between such 'sites' and Natural Inland Wetlands for the purpose of the wetland assessment and Table 9?**

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

That is correct. Wetlands that have formed in or around deliberately constructed water bodies (like stormwater ponds or reservoirs) since their construction are excluded from the definition of natural inland wetland under the NPS-FM (clause 3.21) and NES-F (reg 3, which cross-refers to the NPS-FM definition). Wetlands that have formed as a result of some other

activity (e.g. poorly sized culverts, depressions being left after earthworks, or earthworks intersecting a groundwater layer) are induced and the NPS-FM/NES-F provisions apply.

Please identify in Table 11 which wetlands, if any, **are habitat for threatened species** identified under clause 3.8 of the NPS-FM, for the purpose of clause 3.21 of the NPS-FM (definition of Natural Inland Wetland, clause (e)).

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

The following wetlands provide at least some habitat for threatened species:

- *Lake shore,*
- *Wetland 8*
- *Wetland 22*
- *Wainui Stream Wetlands,*
- *Wetland 18,*
- *Wetland 19,*
- *Lake Piopio*
- *Wetland 21*
- *Site 27*

We note however that the component of the "natural inland wetland" definition under clause 3.21 of the NPS-FM that the Panel has referred to, namely paragraph (e)(iii) under that definition, only applies to the exclusion of areas of pasture used for grazing. It does not apply to constructed water bodies (these are captured by paragraph (c) under the definition).

22. Pest Plant Species

Sections 4.4 and 4.5 of Appendix K refer to a number of pest plant species listed in the Waikato Regional Pest Management Plan, along with a number of species requiring management in certain locations (including marram grass).

Section 6.2.6 notes that dune vegetation and wetlands are particularly sensitive to pest plants which have the potential to alter the structure and composition of the vegetation by excluding native species, resulting in loss of ecological value. It is also said that mining activities have the potential to further spread pest plants that are already present in the site. In Table 15 (Recommended mitigation of adverse effects), certain measures to address pest plant invasion are recommended, with a Pest Plant Management Plan to be developed as part of the proposed 'Ecology and Rehabilitation Plan'.

It is assumed that this is a reference to the Natural Inland Wetland and Buffer Management Plan (NIWBMP) – **please confirm**.

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Yes – the reference should be to the Natural Inland Wetland and Buffer Management Plan (NIWBMP).

On that assumption, it is noted that there does not appear to be any Plant Pest Management Plan as part of the draft NIWBMP (Appendix DD to the application, including as revised in Attachment Q to the Applicant's response to comments - updated draft NIWBMP). Section 6 of the Draft NIWBMP simply refers to controlling pest plants listed in the Waikato Regional Pest Management Plan in the proposed offset wetland site. It is also noted that Schedule 1 Condition 16(b) has requirements in relation to pest management for the NIWBMP.

It is requested that the NIWBMP be amended to set out the proposed measures to control the pest plant species referred to in Table 15 (page 43 of Appendix K) , and in sections 4.4/4.5 of the report .

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

The Panel's request is noted. A revised NIWMP will be provided following the Panel Facilitated Conference, to ensure that any other changes to the NIWBMP that may be agreed can be incorporated.

Why is marram grass, an introduced pest species, **still proposed for use in site rehabilitation** (Condition 20b, Schedule 1)?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Marram grass has proven successful for ensuring stabilisation at the site. This benefit must be balanced against its pest classification. More recent stabilisation and rehabilitation plantings have however successfully used native brush and sedge species (wiwi). As a result, the condition is proposed to be amended to read as follows:

"(b) A timeline for interim rehabilitation (including stabilisation using, but not limited to, kikuyu, ~~or~~ marram grass or native grass species) of the areas within 200m from the Consent Area boundary once mining has been completed."

23. Wetland 21

Table 9 of Appendix K refers to wetland 21 being used as water storage for the mine with water levels fluctuating significantly as a result.

Is it proposed to continue taking water from wetland 21, and if so under which resource consent, at what volume, and for what purpose?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

TIL has advised that water is no longer taken from Wetland 21.

24. Table 10 (vegetation ecological values)

Table 10 of Appendix K assesses the ecological values for various vegetation type groupings but in doing so appears to only cover 20 of the 39 vegetation types referred to in Table 7. **Is the omission of the remaining vegetation types deliberate and is so on what basis? If not, please amend Table 10 to include all vegetation types in Table 7.**

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

The 19 vegetation types omitted from Table 10 are all wetland types and are included in the assessment of wetland values in Table 11.

Table 10 refers to plantation pine forest as Relevant Vegetation Type 6 (second column) – presumably this is an error and the correct vegetation type would be 20? **Please clarify**.

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Yes, this is an error - Plantation pine forest should reference vegetation type 20.

25. Exclusion Areas/Riparian setbacks

Section 6.1.1 of Appendix K states that various exclusion areas (including land within 30m from any perennial water body or retained natural inland wetland) is as mapped in Figure 5.

Please confirm that Figure 5 includes the 30m exclusion area surrounding all retained natural inland wetlands (as shown on Figure 6). **Please add the proposed offset wetland (with buffer) to Figure 5 or advise why the offset site should not be included.**

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

A new Figure 5 has been prepared and is attached to this response as **Appendix E**.

A number of commenting parties challenge the adequacy of the proposed 30 m buffer width for streams and wetlands (including Waikato Regional Council, Department of Conservation, Ngāti Mahuta, Te Nehenehenui).

Attachment H to the Applicant's response to comments in relation to Fauna and Wetlands (page 5) advises that there is no clear scientific evidence available in New Zealand for any particular buffer width that would be sufficient to manage adverse effects on avifauna, other fauna, species or wetland systems, but considers that a 30 m planted buffer around all retained wetlands, alongside restoration and predator control, would be appropriate to manage the adverse effects of mining activities on wetland birds.

Appendix I (page 8) advises that the 30 m buffer would be appropriate to address adverse effects on the site streams and that narrower planted buffers can be expected to provide beneficial aquatic functions in terms of water temperature control, filtering sediment etc.

With these comments and responses in mind, why has a 30 m width been specified in consent conditions rather than some other (including greater) width, as being necessary to protect ecological values (fauna and aquatic habitats) ?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR and Hannah Mueller, Principal Ecologist, Phoenix Ecology:

The 30 m buffer width was in the previous consents and there was little reason to change it from an effects mitigation perspective. Wider buffers are always preferable, where practicable, but a planted 30 m buffer, along with the other mitigation measures secured through Condition 7 of AUTH142035.01.01 and the Natural Inland Wetland and Buffer Management Plan, is expected to be sufficient to protect wetlands from the adverse effects of adjacent activities.

Buffer zones have many functions, including attenuating overland flow into the wetlands, filtering nutrients from overland flow and shallow groundwater, providing terrestrial organic inputs to the wetland, providing shading which helps regulate temperature, providing wind protection and thus reducing evapotranspiration, habitat provision and protection from disturbance.

Appropriate buffer widths have been extensively studied, and a wide range of buffer width recommendations have been made in the literature. For example, Castelle *et al.* (1994)[9] undertook a review of buffer literature in the USA and found that buffer widths of between 3 and 200 m had found to be effective and concluded that buffers to protect wetlands and streams should be a minimum of 15 – 30 m under most circumstances. Another review in Australia[10] reported a wide range of effective buffer widths depending on purpose (see table below).

In New Zealand, most buffer work has been associated with streams, but a review by NIWA[11] concluded that a buffer > 10 m will achieve most aquatic functions.

Table 2: Recommended buffer zone widths for wetland/riparian ecosystems

Aspect	Objective	Recommended buffer width*	References
Temperature	Water temperature moderation/ shade	12 – 30 m	Castelle *et al.* 1994
		20 m[a]	Davies and Lane 1995
	Maintain microclimate gradient	45 m	Fischer *et al.* 2000
Nutrients	Reduce nutrient inputs (removal)	100 m[b]	Davies and Lane 1995
		200 m (sandy soils)	WRCWA 2000
	(reducing nitrate)	30 m	Wenger 1999
		30 – 48 m	Castelle *et al.* 1994
	(removal of phosphorus)	9 – 30 m	McElfish *et al.* 2008
	(removal of nitrogen)	30 – 48 m	McElfish *et al.* 2008
Pollution	Reduce pollution (heavy metal) input	100 m[b]	Davies and Lane 1995
		200 m (sandy soils)	WRCWA 2000
	Reduce pollution (pesticide removal)	> 15 m	Wenger 1999
Sediment	Reduce sedimentation (removal)	9 – 30 m	McElfish et al 2008
		30 m	Wenger 1999
		10 – 65 m	Castelle *et al.* 1994
		100 m[a]	Davies and Lane 1995; WRCWA 2000
Water quality	Improving/protection of water quality	5 – 30 m	Fischer et al 2000
		≥ 6 m[c]	DSE 2005
	Protection from land use	30 - 60 m	Semlitsch and Jensen 2001
Ecological processes	Maintain ecological processes/major food webs	10 – 30 m	Wenger 1999
	(carbon flow)	20 – 50 m[d]	Davies and Lane 1995; WRCWA 2000
	(large woody debris and organic litter)	30 – 50 m	Wegner 1999
Bank stability	Protect bank stability	20 – 30 m	DPIPWE 2003
Biodiversity	Protect biodiversity (species diversity)/ wildlife/ habitat	30 – 90 m	McElfish *et al.* 2008
		3 – 120 m	Castelle *et al.* 1994
		> 100 m	Wenger 1999
		100 – 170 m	Brown *et al.* 1990; Keller *et al.* 1993
	Bird habitat	40 – 500 m	Fischer *et al.* 2000
	Reptile/amphibian habitat	30 – 1000 m[e]	Fischer *et al.* 2000; Semlitsch and Bodie 2003
	Mammal habitat	> 50 m	Fischer *et al.* 2000
	Maintain benthic invertebrates in streams adjacent to logging	32 m	Erman *et al.* 1977 and Newbold 1980 in Castelle *et al.* 1992
Insects	Nuisance insects	100 – 800 m[f]	Davies and Lane 1995; WRCWA 2000
Groundwater	Protection of inflowing groundwater quality	2000 m[g]	Davies and Lane 1995; WRCWA 2000; DSE 2005
	Minimise groundwater drawdown	[h]35 – 170 m	Brown *et al.* 1990
Salinity	Protection from rising salinity	250 m	Davies and Lane 1995; DSE 2005

Notes: * generally measured from edge of wetland or each side of stream, except where noted otherwise; a = Measured from seasonally inundated zone; b = Measured from wetland dependent vegetation; c = Low overland flow rates; d = Measured from outer edge of open water; e = 130 - 290 m for critical core habitat; f = Measured from permanent water; g = For sandy soils/in direction of groundwater flow; h = Small wetlands, soil type & slope influence

[9] Castelle, A.J., Johnson, A.W, and Conolly, C. (1994) Wetland and Stream Buffer Size Requirements – A Review. Journal of Environmental Quality 23: 878-882.

[10] Newton, G. (2012). Buffer zones for aquatic biodiversity conservation. Australian Plant Conservation 21: 18 - 22

[11] Parkyn, S.; Shaw, W.; Eades, P. (2000). Review of information on riparian buffer widths necessary to support sustainable vegetation and meet aquatic functions. NIWA Client Report ARC00262.

In Te Nehenehenui's comments, a 100 m setback (from the Mitiwai Stream) is requested (noting that other commenting parties have also sought a 100 m setback from the Mitiwai Stream), in part to increase certainty that adverse hydrological effects on wetlands and water bodies would be appropriately minimised.

Attachment H to the Applicant's response to comments in relation to Fauna and Wetlands (page 13) advises that buffers are not intended to help with maintaining wetland hydrology, but are instead focussed on limiting physical disturbance, runoff, weed invasion and fauna disturbance.

Would a greater setback from wetlands and streams nevertheless provide benefits in terms of minimising potential hydrogeological impacts on those water bodies?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR and Hannah Mueller, Principal Ecologist, Phoenix Ecology:

There is no evidence to suggest that a 30 m buffer is ineffective. In theory, the greater the setback, the greater the ability to buffer adverse effects from surrounding activities. However, the 30 m planted buffer is considered sufficient to minimise expected disturbance.

In addition, the proposed management approach relies not only on the implementation of planted buffers (Condition 7 of AUTH142035.01.01), but also on broader fauna management measures (Conditions 31 to 35 of Schedule 1: General Conditions), including habitat restoration and a comprehensive predator control programme (Condition 16(b) of Schedule 1: General Conditions). Together, these measures are expected to minimise mining effects, restore habitat quality of retained wetlands, and improve breeding success, particularly for ground-nesting wetland birds, compared with current site conditions.

26. Wetlands to be removed/retained

Section 6.2.3 of Appendix K states that some of the wetlands to be completely removed were induced by the landform left by historic mining of this area.

Which of the seven wetlands to be completely removed are the induced wetlands? Is it (solely) wetlands 5 and 6 as recorded in Table 9? If not, which of the other wetlands to be removed are induced?

The point is raised because section 4.1.1 of the Substantive Application records that TIL proposes to mine seven wetlands "*that have formed as a result of earlier mining activity*". Conversely, page 97 of the Substantive Application refers to only "some of" the seven wetlands (being removed) having been induced by the landform left by historic mining.

Clarity on the point is therefore requested.

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR and Hannah Mueller, Principal Ecologist, Phoenix Ecology:

Wetlands 5, 6, 23 and 25 are on previously mined landforms and Wetland 20 may also have been affected or induced by previous mining activities.

27. Hydrology related effects on retained wetlands

Section 6.2.4 of Appendix K refers to the level of drawdown of groundwater in the vicinity of the wetlands west of Lake Taharoa (being wetlands 12, 13, 14 and 21) during mining in the southern block, stating that these wetlands could see a 1-3m drop in groundwater over a period of six months or more. These wetlands are all located in the Southern Block and this level of drawdown is described as "significant", with the level and magnitude of the potential effects on wetlands from such drawdown referred to as "substantial and "high".

Section 3.1 of the Natural Inland Wetland and Buffer Management Plan (NIWBMP) records that during mining of the pits on the southern block, groundwater levels beneath "nearby" wetlands will drop by up to 4m, and a groundwater gradient from east to west will be created.

This information raises a number of questions, namely:

- **What information** in Appendix N are these assessments (Appendix K and NIWBMP) based on, i.e. how is it determined that certain wetlands would experience between a 1-3 (or 4) m drop in groundwater levels?
- **What is the full range and extent of drop in groundwater levels** for all wetlands referred to in Table 12 (first row) including the Wainui Stream Wetlands and the Lake Margin Wetlands (noting the information request above, ie a revised Table 12 identifying the Lake Margin Wetlands by number (as applied on Figure 4)).
- **Which <u>retained</u> wetlands** (as numbered in Appendix K) **would experience a 4m drop in groundwater?**
- **Will the existing and proposed new monitoring sites** referred to at section 3.2 of the NIWBMP (and on page 41 of Appendix N**) be able to detect these fluctuations in groundwater levels for <u>all</u> retained and potentially affected wetlands,** with reference to the proposed baseline 'lowest natural water level' monitoring referred to on page 42 of Appendix K, and as required by condition 5 of proposed consent AUTH142035.16.01?
- **What is the full range and extent of drop in groundwater levels for the wetlands to the north of Mitiwai Stream** (wetlands 40, 42, 46, 50 and 53 in Figure 4 of Appendix N)? **Should any monitoring be proposed as conditions for these wetlands?**
- **Why is 5 yearly monitoring of wetland condition** (after the initial baseline survey of extent and health of raupō and flax) **considered adequate** (per Table 15 on page 42 of the report and proposed Condition 8 of AUTH142035.05.01, Water Permit for Surface Take)?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR and Jake Scherberg, Senior Hydrologist, WWLA:

[Note that we have numbered each sub-question above for clarity]

1. The groundwater drawdown contours from Figure 18 in Appendix K were used as the basis of these statements.
2. WWLA have provided additional groundwater drawdown maps as part of the response to Question 51 (see below), which illustrate the extent of groundwater effects on wetlands
3. As above.
4. The wetland groupings defined in Section 6.3.2 of Appendix N highlight the most vulnerable wetland for each group, which is where the recommended monitoring sites are located.
5. Of these wetlands, 46, 50, and 53 are surface water fed wetlands and will not be affected by drawdown. Wetland 40 is outside of the area affected by drawdown across all mine stages. Wetland 42 is within the Mitiwai flood plain and interacts with surface water and groundwater. It is already being monitored by piezometer C103.
6. Five years was considered appropriate because there is expected to be little change in hydrological stressors under normal circumstances and vegetation change is usually very slow to manifest. Change due to significant changes in hydrology is intended to be picked up by the low water trigger level and subsequent monitoring.

It is also noted that wetlands 12, 13, 14 and 21 are said to be groundwater fed (in Table 12 of Appendix K), whilst in the hydrology report these wetlands (appear to be) included within wetland Group 2, whereby surface water is recorded as the primary source of water for those wetlands, and as such controlled by the dam/Wainui Stream levels (see pages 39 and 41).

Attachment H to the Applicant's response to comments in relation to Fauna and Wetlands (page 13) advises that for the high value wetlands up slope of the mine, although there may be drawdown, seepage inflows to those wetlands would be unaffected, and supplementation of surface water can maintain appropriate water levels, should that be necessary.

Given the influence of surface water on these wetlands, how would groundwater levels in these wetlands be detected as falling below the lowest natural seasonal water levels referred to in condition 5 of AUTH142035.16.01 (Consent to Destroy or Disturb Natural Wetlands), as required to be maintained by condition 6 of that permit?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Monitoring refers to water levels, not necessarily groundwater levels so if the water level in the wetland drops below the trigger point, contingency measures will commence.

The issue for the Panel here is untangling groundwater/surface water related issues and effects and ensuring that proposed monitoring and mitigation measures are effective.

In this respect also, Table 15 of Appendix K states that if water levels drop below the lowest natural seasonal water levels recorded from pre-mining baseline monitoring for more than 14 days, supplementary water flow would be provided.

Further details of this proposed mitigation (by way of contingencies) are as set out in section 3.4 of the draft NIWBMP.

Where would this supplementary water be taken from, and under which proposed resource consent? What potential volumes of water would need to be extracted and discharged (noting section 3.4 of the NIWBMP indicates this is yet to be determined)?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The water would be taken from the water take point behind the dam in the Wainui Stream pursuant to AUTH142035.05.01 (Surface Water Take) which specifically authorises the use of the taken water for, amongst other things "....augmentation of flows and water levels in perennial water bodies and all wetlands".

The volumes of water required for augmentation will comply with the requirements of condition 3 of AUTH142035.05.01 which allows 27,200m^3/day to be taken as a 28 day rolling average.

Similarly, is a further resource consent required to discharge any augmentation water of that kind, or would this be covered by WRP permitted activity rule 3.5.4.4 as referred to at section 5.1.8 of the Substantive Application (dealing with augmentation water to the Mitiwai Stream).

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The discharge of water for any wetland augmentation that is required is covered by Waikato Regional Plan permitted activity rule 3.5.4.4. This rule provides for the discharge of water into water as a Permitted Activity subject to the following conditions:

a. There shall be no adverse effect on water quality of the receiving water body.

b. Any adverse erosion effects occurring as a result of the discharge to be remedied as soon as practicable.

c. There shall be no adverse effects from increased water levels downstream of the discharge point.

d. The Waikato Regional Council shall be notified in writing of the discharge, its volume, contaminant concentrations and the water quality of the receiving water body 10 working days prior to the discharge commencing.

How will the quality of the discharged (augmentation) **water be monitored** to ensure it is clean, as required by the rule?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The quality of the augmentation water will be monitored as part of the monitoring required to demonstrate compliance with AUTH16.01 Condition 7. That monitoring data will then form part of the Annual Monitoring Report as required by General Condition 45(b). To make it abundantly clear that the reported data needs to address the quality and composition of water used for stream and wetland augmentation purposes needs to, General Condition 45(b) could be amended as follows:

45. As a minimum the Annual Monitoring Report shall:

...(b) Summarise all the data and information required to be collected by these consents, including for the purposes of demonstrating compliance with the conditions of consent(s) related to the quality and composition of water used for stream and wetland augmentation purposes. This should....

In this context, Attachment I to the Applicant's response to comments in relation to Freshwater Ecology discusses the introduction of new proposed Condition 7 of AUTH142035.16.01 (Consent to Destroy or Disturb Natural Wetlands) in response to issues raised regarding salinity or saltwater intrusion into mining pits requiring baseline temperature, pH, turbidity and electrical conductivity measurements (although the latter is missing from the wording of the condition in Attachment O) .

The report advises (on pages 4 and 5) that augmentation water for stream flows and wetlands does not come from mining pits but instead from the Wainui Stream reservoir or will be "clean water from mining operations".

Where is that commitment recorded in any of the consent conditions or management plan requirements? If not currently referred to or required, the applicant is requested to propose a specific condition to that effect for the Panel to consider **or advise why it is not required.**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

A specific condition is not required. Fundamentally, it is irrelevant where the augmentation water comes from (provided it is lawfully taken) as long it complies with the discharge parameters. The discharge parameters are clearly set out in the proposed conditions, as well as in Permitted Activity Rule 3.5.4.4 of the WRP as set out above. Compliance must be monitored and reported through the Annual Monitoring Plan. The answer to the previous question proposes an amendment to that condition that is equally relevant as an answer this question.

While the proposed new Condition 7 would require that augmentation water be undertaken with freshwater with a maximum electrical conductivity limit, there is no ongoing monitoring requirement in that respect (nor for the other parameters referred to in the new condition).

Given the proposed introduction of new condition 7 requiring baseline monitoring (within three months of commencement of the consent and six months of the establishment of the offset wetland), presumably specific and ongoing monitoring of these parameters in the augmentation water should also be required.

Again, the applicant is requested to propose a specific condition for the Panel to consider on that point.

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

New conditions are proposed below to require explicit monitoring of the augmentation discharge – to apply to augmentation water in the Mitiwai Stream and the wetlands, given the issue is the same.

New proposed condition 5 of AUTH142035.14.01:

Within one week of the commencement of augmentation of stream flow required by condition 2, and every 4 weeks thereafter while the discharge is occurring, manually monitor the augmentation discharge to demonstrate compliance with the discharge parameters set out in condition 7 above.

New proposed condition 8 of AUTH142035.16.01:

Within one week of the commencement of augmentation of wetland water levels required by condition 6, and every 4 weeks thereafter while the discharge is occurring, manually monitor the augmentation discharge to demonstrate compliance with the discharge parameters set out in condition 7 above.

The other management measure proposed in section 3.4 of the draft NIWBMP, in the event that groundwater levels drop below the lowest natural seasonal water levels, is cessation of dewatering in pits in close proximity to the wetlands. **How long would it take for cessation of the watering in nearby pits to improve water levels for these wetlands**?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR and Jake Scherberg, Senior Hydrologist, WWLA:

On reflection, we consider that cessation of de-watering nearby pits may not be the most practical management response because of the time it will take for wetland water levels to recover (likely days or weeks) and the fact that water will likely still seep into the pits regardless of whether it is being pumped. Augmentation of water in affected wetlands therefore remains the primary and most reliable management response in these cases.

Finally on this issue, **the Panel requests the proposed conditions** of AUTH142035.16.01 (Consent to Destroy or Disturb Natural Wetlands) **be amended to refer to these contingency measures**, and when they must be applied, as recorded on page 42 of Appendix K and in sections 3.3 and 3.4 of the draft NIWBMP.

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The proposed conditions will be amended, to the extent appropriate, to reflect the outcome of discussions in relation to wetlands effects management at the Panel Facilitated Conference.

28. Lake margin wetlands – fluctuations in water levels

Section 6.2.4.1 of Appendix K states that the increased number of ship loading events will increase the regularity of natural fluctuations in lake levels to "some extent", and result in "slightly larger" fluctuations in water levels. This is because a greater number of ship loading events are proposed and there will be slightly longer periods of sustained low water in summer (when abstraction exceeds summer low flows into the lake).

Presumably this is based on the information at Section 5 of the hydrology report (Appendix I). However, the hydrology assessment assumes that recycled processing water would supply additional water requirements for ship loading over and above the proposed water take from the Wainui Stream, "as currently occurs".

> *Please refer to the related question on the hydrology report (Question 13) in terms of whether use of recycled processing water in that way (particularly given the planned increase in number of ship loadings per year) would have an impact on the overall water balance model, particularly in periods when abstraction rates are greater than natural catchment inflows*.

If that assumption is not correct, **could this lead to a greater level of impact on Lake Margin Wetlands** than as assessed at section 6.2.4.1? (noting that this section of the report identifies a low risk of potentially "high adverse effect" on wetlands in the event of drought combining with lake drawdown for ship loading). **How would such an impact be monitored and mitigated ?**

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Additional water for ship loading will come from recycled process water and that the allocation from the Wainui Stream for ship loading remains the same as under the current consent. I understand that all of these considerations have been included in the scenarios modelled by WWLA and set out in the Hydrology Assessment. Monitoring to detect an impact on wetlands will be conducted every five years (Condition 8, AUTH142035.05.01), or if the lake level recedes below 9.6m local datum for more than 30 days (Condition 10, AUTH142035.05.01). If lake levels fall below what has been modelled, this will be detected by

the monitoring requirements and TIL will be required to implement management responses in accordance with the conditions.

29. Table 13 (unmitigated effects on terrestrial habitat)

The following points are noted/questions raised for clarification and potential amendments of the table:

- The Stable dune system is referred to in column 2 as having very high ecological value. Table 10 by contrast assesses the overall ecological value of the stable dune system as "high" – **which is correct**?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Table 10 is correct, and Table 13 has been amended accordingly. An updated version of Table 13 is included as part of this response – see **Appendix D**.

- Table 13 does not cover the Kanuka forest habitat grouping referred to in Table 10. **Is this deliberate or an omission** – if the latter – it is requested that Table 13 be amended accordingly.

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

This is an omission that arose during the update of the report after the RMA consent process. Tables 13 and 16 have been updated to correct this (these are included in **Appendix D** to this response) but, for clarity, effects on the one patch of kānuka forest are low and comprise only edge effects and disturbance. The kānuka forest itself is protected from clearance by the buffer around Lake Rotoroa.

- Table 13 notes that there is the potential for damage to the edges of the Active dune system yet this habitat area is presumably protected by the 100m buffer requirement (from Mean High-Water Springs). Section 6.2.2 of Appendix K states that dune vegetation could potentially be damaged or destroyed by mining operations, where it extends beyond 100m. **How much of the Active dune system (said to have very high ecological value) would extend beyond the 100m buffer, and so potentially be subject to the effects of mining**?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

None of the active dune system extends beyond the 100 m buffer and unmitigated level of effect from direct impact on this type was assessed as being low.

- Does the calculated mean high-water springs (MHWS) for the purpose of setting this buffer (refer proposed condition 2 of AUTH142035.01.01, Land Use Consent), take sea level rise into account over the next 35 years?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

MHWS for the purposes of the condition will be set at the time the consent commences in accordance with recognised practice. The definition for MHWS from the New Zealand Almanac, Maritime Transport Division is:

"The average of the levels of each pair of successive high waters during that period of about 24 hours in each semi lunation (approximately every 14 days) when the range of tides is greatest".

There is no consideration of long term sea level rise in this calculation.

Because the location of MHWS in this instance influences the extent of a mining setback, the MHWS location needs to be fixed – it would be unenforceable to have a MHWS mark that moves over time, as this would in effect result in a moving setback line.

30. Table 12 (groundwater connectivity) and Table 14 (unmitigated effects on wetland habitat)

It is difficult to reconcile the assessment of unmitigated effects on wetland habitats as assessed in Table 14 with the information in Table 12 of Appendix K against the Hydrogeology report (Appendix N). For example, the magnitude/level of hydrological effects for the Lakes and Wainui Stream wetlands is said to be "low/moderate", yet Table 12 identifies the Wainui Stream wetlands and Wetland 22 as being groundwater fed. **What specific wetlands is the 'Lakes and Wainui Stream' row of Table 14 referring to** (with reference to the information and revised mapping requested in Question 20 above) and is there are discrepancy between the tables in this respect? (*The points made at page 16 of Attachment H to the applicant's response to comments in relation to Fauna and Wetlands may be relevant here*).

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

The specific wetlands the low/moderate magnitude/level of effect applies to are the Wainui Stream Wetlands, Lake Shore Wetlands, Wetland 8 and Wetland 22. These wetlands are connected to groundwater but because they are directly connected to the lake and stream their hydrology is primarily surface water influenced. Groundwater drawdown is unlikely to impact these wetlands when surface water from the lake and stream is available to keep them wet.

However, in responding to this question we identified an error in Table 14 which is relevant. The Lake Piopio Wetlands, Wetland 19 and Wetland 18 were included in the assessment of effects on the Lake Margin & Wainui Stream wetlands when they should not have been. Those three wetlands are not directly connected to the larger lakes and are not expected to be impacted by fluctuations in lake levels. They were not assessed for impacts by groundwater drawdown, but this has now been remedied:

- These three very high value wetlands are not connected to regional groundwater and are considered to be predominantly perched (refer Appendix N pg. 38, incl footnote), making them not vulnerable to groundwater drawdown.
- There is still a low level of risk that they will be impacted by groundwater drawdown, and they will be monitored and subject to trigger levels and contingency measures as per Conditions 5 and 6 of AUTH142035.16.01.

Updated versions of Tables 12 and 14 are provided in **Appendix D** to this response.

Conversely, it is said that there would be potentially significant drawdown effects on wetland 15 in the second row of Table 14 (dealing with the southern wetlands), yet in Table 12 wetland 15 falls within the "potentially groundwater fed" wetlands.

Again, comment/clarification is requested, noting that wetland 15 is understood to be one of the proposed new monitoring sites for Wetland Group 4 (per Appendix N).

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

A reasonably conservative approach has been taken and 'potentially groundwater fed' has been assumed to mean that groundwater drawdown could impact water levels in the wetland. The potential effects have been assessed as being high magnitude (moderate level) prior to mitigation measures, and low post-mitigation.

Finally on this issue, **what is the total area of wetlands (being retained) that are potentially affected by drawdown of groundwater as a result of mining activities**, as referred to at section 6.2.4 and in Table 12 of Appendix K?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

In total, 9.08 ha of wetland could be affected by groundwater drawdown. A table of the potentially impacted wetlands is included below. These are all the wetlands that are groundwater connected, or likely groundwater connected (noting that wetlands 18, 19 and the Lake Piopio wetlands in the SE have been shown to be perched) and are within the 0.2m groundwater drawdown contour.

WWLA Wetland Number	SLR Wetland Number	Area (ha)
75	Wetland 21	2.90
73	Wetland 21	1.90
70	Wetland 11	0.03
69	Wetland 10	0.15
67	Wetland 9	0.08
66	Wetland 16	0.03
62	Wetland 12	0.24
60	Wetland 13	0.07
59	Wetland 14	0.50
42	N/A	2.99
80	Wetland 15	0.20

31. Offset model

The Panel has a number of questions about the biodiversity offsetting model applied to determine the offset quantum (8.3ha) as follows:

- Appendix K (Section 6.6.3) states that "appropriate quantitative data on the potentially impacted sites was not available" and the use of the more complex Department of Conservation Biodiversity Offset Accounting Model (BOAM) model was not deemed warranted. Attachment H to the Applicant's response to comments in relation to Fauna and Wetlands sets out further justification for the use of the Biodiversity Compensation (BCM) model rather than the BOAM model (Page 14), noting however that the BOAM model is considered to be best practice "but requires a significant amount of data to be collected". **Why was quantitative data sufficient to apply the BOAM model not obtained so that this more detailed 'best practice' model could be applied**?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

The decision to seek consent to destroy wetlands was made after the field survey was completed. The BCM model was used as it uses ecological value scores derived from the EIANZ guideline methodology. However, in response to matters raised in comments and in preparing for expert conferencing, I have since applied the BOAM model to the proposed offset site using vegetation cover data. I am liaising with DOC experts to finalise this updated model, which will then be used to inform the offset site and associated conditions / effects management measures

- The Department of Conservation model is said to be well suited to complex situations. **Is this situation not considered complex** and if not, why is that the case?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

No, I would not consider this a complex situation. The application involves the loss of relatively simple wetland sites rather than multiple different ecosystem types, landforms, vegetation types and threatened species that you might find in a more complex situation.

- The 10% (above no net loss) net gain target applied appears quite low in terms of the biodiversity offsetting principle of achieving net gain in light of the potential risks that the expected level of net gain is not achieved (as outlined in Table 18, namely that hydrological conditions may not be "quite right" or that weed control and maintenance is not done to the desired standard). **Why has a higher net gain target not been applied** given the complexities of the hydrological model and the number of assumptions inherent to the respective assessment reports (noting also the net gain outcome of 10.2% as recorded at Figure 7).

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Provided that drawdown effects are managed, I consider the establishment of the offset relatively low-risk. Note that a full year of water level monitoring is proposed to ensure that wetland hydrology is established and there are well-established methods for achieving appropriate vegetation cover. This will ensure that the targeted outcomes for the wetland offset site are achieved.

- Table 18 assumes only one habitat type (second row) yet Table 9 records several wetland classes for the wetlands being removed. The Panel notes the Department of Conservation's concerns about "aggregation" of wetland types under the BCM model, allowing seepage wetlands to be lost in exchange for gains within other wetland types (Dr Maysek's evidence,

paragraph 31(ii)). The justification in Table 18 records that the "habitats and values" of the wetlands being removed are similar within the group – **is this justified having regard to the wetland descriptions in Table 9 for each of the wetlands that are going to be removed through mining?**

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

This has now been discussed at length during conferencing and an approach agreed. Prior to conferencing I ran a BOAM based on % indigenous cover and water levels. I used vegetation plot data for one seepage wetland and the Atkinson vegetation descriptions (which include vegetation cover classes and were made as part of our assessment) for the remaining sites to assess indigenous vegetation cover in the wetlands being lost. During conferencing we also agreed that seepage hydrology cannot be reliably re-created and therefore cannot be offset. The loss of seepage wetlands must be compensated for. A new offset and compensation memorandum is being prepared to reflect this.

- Table 18 records a discount rate of 3% - **over what period is that discount rate applied**?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

Over the period between loss and finite end point, however this is no longer relevant. See above response.

- **What are the risks associated with the proposed offset site** (site 27) which is recorded as being potentially affected by groundwater drawdown (such that the mitigation requirements in Table 15 need to be applied to that site – refer section 6.6.5). **Does this confuse** (tangle up) **proposed mitigation and offsetting** – contrary to the "additionality" principle of offsetting in the NPS-IB?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

There are risks associated with the groundwater drawdown at the offset site, however these are proposed to be managed in accordance with advice from the project hydrologists. Provided a wetland hydrology can be maintained in accordance with the offset plan and associated consent conditions, the risks for establishing the offset are acceptable in my view. There are always challenges with establishing vegetation cover through planting, but in the context of this project they are well understood, and the local mine team are experienced in establishing plants in the local conditions. There are also standard responses if plantings are not establishing well such as replacement planting, extra maintenance and weed control, watering or adding fertiliser.

I do not think that mitigation and offsetting are being confused here as supplementation of water at the offset site is not mitigating another effect of the project. It is being used to ensure that the offset is successful. Note that the offset site is not a Natural Inland Wetland and not subject to the mitigation measures associated with hydrological effects on wetlands.

- Section 6.6.5 of Appendix K states that the wetland creation process should begin immediately after consent is granted so that the time lag between the impact and the biodiversity gain from the restoration project is minimised. On that basis**, why are the words "as far as reasonably practicable" needed** (reasonable or appropriate) in proposed condition 3 of AUTH142035.16.01 (Consent to Destroy or Disturb Natural Wetlands), having regard to when these wetlands would be removed under the proposed mine staging plan ?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Those words simply recognise that there may be unforeseen events outside of the control of the consent holder (for example, extreme weather events) that might inhibit the ability to establish the offset within the required time period.

For the avoidance of doubt, the Panel requests this information to assist with its consideration of the Substantive Application, despite the proposed expert conferencing on the applicant's offset proposal.

32. Wetland removal

The offset proposal is intended in response to the proposed removal of the wetlands shown on Figure 6 of Appendix K to the Substantive Application (and as also shown on Figure 1 to proposed AUTH142035.16.01, Consent to Destroy or Disturb Natural Wetlands). This includes a number of seepage wetlands which the Department of Conservation's comments describe as "irreplaceable".

The Panel is required to consider clause 3.22 (1) (e) of the NPS-FM (National Policy Statement – Freshwater Management 2020). As such we need to be satisfied that (in addition to being necessary for the purpose of extraction of minerals) there is a functional or operational need for the activity to be done *in that location*.

We also need to be satisfied that the effects would be managed through the effects management hierarchy (which is in part the reason why the Expert Panel is proposing expert conferencing on the offset proposal), including whereby adverse effects must be avoided, where practicable.

Therefore, before we get to the offset in our deliberations, the issue of wetland removal being necessary and there being a functional or operational need for the activity to occur in the area of the wetlands being removed, is raised.

Please advise as to why it is considered necessary, and that there is a functional and operational need within a circa 900 ha site, to carry out mineral extraction activities that

would result in these proposed wetlands being removed, and as to why it would not be practicable to avoid this impact?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

At the outset I note that the NPS-FM Clause 3.22(e)(iii) refers to functional or operational need. Accordingly, the Panel does not need to be satisfied that there is both types of need as asked in the question above.

Functional need is defined in the NPS-FM as meaning "the need for a proposal or activity to traverse, locate or operate in a particular environment because the activity can only occur in that environment". Operational need is defined in the NPS-IB as meaning "the need for a proposal or activity to traverse, locate or operate in a particular environment because of technical, logistical or operational characteristics or constraints".

The definition of operational need is less restrictive than the definition of functional need. The operational need definition recognises that while an activity could technically occur elsewhere, there may be logistical or business reasons why it needs to occur in a particular location.

In this case, inherent in the function and operation of the mine is the need to efficiently maximise extraction of the available resource, which is recognised as regionally significant in the Proposed Waitomo District Plan. The ironsand resource is specific to the area and the site. The mining as an activity cannot therefore be located anywhere else – functionally and operationally it must be located and undertaken where the available resource is, including in the area containing the wetlands.

Additionally, the ironsand resource on the site in raw form is differentiated by quality or "grade". The area of the site containing the wetlands contains high grade raw material not found everywhere throughout the site. Operationally, the mining activity needs to access high grade material because it is (i) more efficient to process high grade material into exportable product, and (ii) the ratio of exportable product recovered from high grade material is greater than for lower grade material - the more high grade material that is recovered the less tailings that need to be placed back on the site.

Operationally, there is also no alternative mining method available to access the ironsand resource other than "top down" mining beginning at the ground surface - underground tunnelling/longwall mining as an extraction method is not practicable on the site given the ground conditions. The ground conditions also eliminate the possibility of mining isolated pockets "in between' the wetlands as might be possible in a hard rock mining/quarrying activity.

Lastly, and from a purely academic/theoretical point of view, it is possible to avoid the wetlands in question by not mining in that part of the site. However, the reality is that the wetlands that are sought to be destroyed/disturbed are underlain by ironsand resource, and have in some instances been induced by the adjacent presence of tailings material produced by mining. Functionally and operationally, the mine needs to be able to destroy/disturb the wetlands in question to efficiently access the underlying high grade ironsand resource in that location/part of the site. The revenue generated by accessing the resource that underlies the wetlands will generate socio-economic benefits through royalties to be paid to Taharoa C that

will arise from the revenue gained from accessing the ironsand resource in the location of the wetlands.

33. Fencing and pest control

The recommended mitigation in Appendix K (Table 15) includes a plan to plant buffers around retained wetlands, along with a maintenance and weed control programme and "*other measures as outlined in the fauna report*".

The fauna report in Appendix M recommends animal pest management for protection of bats and avifauna, including within riparian margins and wetlands (sections 5.1 and 5.2). The draft Natural Inland Wetland and Buffer Management Plan (NIWBMP) as lodged with the Substantive Application refers to fencing of wetland and stream buffers to exclude livestock and feral animals such as pigs (section 5.2) and contains detailed pest animal control measures (section 7).

However, in Attachment B to the Applicant's response to comments in relation to planning, it is stated that fencing of wetlands and planted riparian setback areas against wandering third party stock would generate substantial upfront cost, and that it is not uncommon for fences at the site to be overwhelmed by windblown sand within 12-24 months of establishment (refer page 6).

On the other hand, Attachment H of the Applicant's response to comments in relation to Fauna and Wetlands (page 8) advises that in principle, stock exclusion and buffer planting are an effective management tool for protecting and enabling restoration of habitats (noting the issue and questions above about the adequacy of the 30 m setback, said in part by the authors of Attachment H to be appropriate given proposed restoration and predator control).

The Panel notes that the amended NIWBMP (Attachment Q to the applicant's response to comments) no longer proposes fencing including for wetlands, streams generally, instead just for the proposed offsetting area.

Section 5.2 of the revised NIWBMP states that "plantings and natural wetlands cannot thrive in the presence of grazing animals".

Are the benefits of restoration (particularly buffer planting) within the 30 m riparian and wetland margin areas undermined (or materially reduced) by the proposed removal of any requirement to fence those areas? Is fencing necessary to ensure these benefits are achieved? If not, why not?

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

All wetlands, streams, buffer plantings and offset areas should be protected in some way from livestock. Our recommendation as ecologists is to use a fence to do this because that is the traditional and most functionally simple way. However, if equivalent livestock and feral ungulate exclusion can be achieved in another way without the need for fencing, this is acceptable from an ecological perspective. We understand that fencing in such an environment is challenging (and may be less effective given the tendency for fencing to become inundated with windblown sand) and expensive.

It is also noted that proposed Condition 7 of AUTH142035.01.01 (Land Use Consent) does not refer to either fencing or pest control for the planted buffer areas – **should these measures be referred to in a revised condition 7**?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

In my view, with regards to pest control, such amendment to condition 7 is not necessary as the draft NIWBMP already contains a section on Pest Control (Section 7.0) that specifically relates to planted buffer areas. In turn, Condition 2 in the Schedule 1: General Conditions requires that Management Plans prepared in accordance with the conditions of the consent must be prepared in general accordance with the draft management plans submitted with the Substantive Application.

If the Panel decides that fencing of the planted buffer areas is required (noting TIL's position that such fencing is impracticable and unnecessary), then reference to fencing in condition 7 could easily be included.

The Panel requests a track change (comparison) of the NIWBMP as included with the Substantive Application and as now proposed in Attachment Q to the Applicant's response to comments (updated draft NIWBMP), so that all changes now being proposed can be readily identified.

Response on behalf of TIL:

Response prepared by Hamish Dean, Principal Ecologist, SLR:

A track change version of the NIWBMP has been prepared and is provided as **Appendix F** to this response.

Appendix L Freshwater Ecology

34. Wainui Stream reservoir

Photograph 1 of Appendix L of the Substantive Application ("View of dam reservoir looking towards the dam") shows a clear water body devoid of any significant patches of surface vegetation – as taken in January 2022. On the site visit, the Panel observed that the reservoir had a different appearance including quite a large amount of surface vegetation (as may have an impact on the fish screen). **Please comment on the reasons for this change** in condition of the reservoir and its implications for management of the fish pass/fish screen. **Is the vegetation the Panel observed on the site visit, the Hornwort weed referred to in Appendix Z ? What steps have been taken to manage this pest plant species and how effective have these steps been?**

Response on behalf of TIL:

The vegetation referred to by the Panel in the reservoir is Raupō, and not Hornwort weed. Raupō is a well-known and easily recognisable wetland plant.

TIL regularly undertakes weed control in the Wainui Stream and reservoir to support stream management, maintain the fish passage and provide regular information for reporting and operational decision-making:

- Weed control spraying was carried out in the Wainui Stream on 21 July 2025 using Diquat (a herbicide permitted for use in the Waikato Reiver and other waterways under the Waikato Regional Plan to control aquatic weeds), following consultation with Waikato Regional Council, Waitomo District Council and the Department of Conservation.
- Consultation allowed TIL to provide context for the activity and helped confirm the approach to managing weed growth in the stream. Spraying was carried out primary to manage the growth of Hornwort weed – which comes from further upstream, outside of the Mine site.
- The spraying was effective in controlling weed growth. Following treatment, dead weed material moved downstream to the dam area, where it was removed during two weed clearance exercises completed in December 2025 and June 2026.
- The clearance activities removed Raupō that had migrated downstream, helping to maintain waterway condition and reduce the risk of obstruction.

There have been no implications of Raupō or Hornwort weed on management of the fish pass. For clarity, TIL undertakes the following maintenance measures on the fish pass:

- TIL regularly inspects the condition of the fish pass to identify any maintenance requirements.
- Weed removal is carried out when required to maintain the clear passage and support ongoing flow of the structure.
- Stream flow through the fish pass is monitored to confirm that conditions remain suitable for fish movement.
- Water depth is monitored at the Wainui Stream lower intake to confirm that the water depth is sufficient.
    - TIL regularly inspects the condition of the fish pass to identify any maintenance requirements.
    - Weed removal is carried out when required to maintain the clear passage and support ongoing flow of the structure.
    - Stream flow through the fish pass is monitored to confirm that conditions remain suitable for fish movement.
    - Water depth is monitored at the Wainui Stream lower intake to confirm that the water depth is sufficient.

35. Mullet in the Taharoa Lakes

Appendix L at page 8 records that a school of mullet had been observed in one of the lakes above the fish pass (citing an earlier Tonkin & Taylor repor \t referencing a study by the Waikato Regional Council). However, Appendix L at page 13 also states that "*small school**s** of adult mullet have been observed in the Taharoa lakes*", with a

similar comment made on page 27 i.e. "*schools of mullet have also been observed in the Taharoa lakes"*.

Are these two latter comments based on the one observation cited in the report (referencing the Tonkin & Taylor report) or are there other observations/surveys to confirm the presence of schools (plural) of mullet in the Taharoa lakes?

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

The Tonkin & Taylor report referred to in Appendix L referenced observations of a school of mullet observed in 2014 (David et al. 2014). The reference to "schools" of mullet being observed in the Taharoa Lakes is based on the above reference and the following records of mullet being present, including as schools, upstream of the dam and within Taharoa Lakes:

- A school of large mullet was observed in Lake Taharoa, near Lake Numiti, by SLR ecologists during the 2021/2022 field surveys (Appendix L at page 11).
- eDNA sampling undertaken in late 2021 also recorded mullet in the Wainui Stream upstream of the reservoir and at the interface between Lake Taharoa and Lake Numiti (Appendix L, Table 1 at page 11.
- Juvenile mullet have also been observed and recorded by mine staff utilising the fish pass (Appendix L at page 8).

References:

David, B., Bourke, C., Dean-Speirs, T., Hamer, M., Jepson, A., Lake, M., Scothern, S., Whaley, P., Emmitt, T., Thurley, T., Bridgman, L., Wells, R. D. S., de Winton, M. D., & Taumoepeau, A. (2014).

Taharoa data deficient shallow lakes survey May 2014.Waikato Regional Council Technical Report 2014/64.

36. Monitoring the effectiveness of the fish pass

Appendix L (Section 2.3.2) recommends proposed conditions of consent to confirm the effectiveness of the fish pass for migratory fish species. This includes a fish pass monitoring plan to "add to the understanding of mullet movements, age and population size *within the lakes*". Should condition 4 of proposed AUTH142035.03.01 (Water Permit for Diversion) specifically reference the need for monitoring *within the Taharoa lakes* (or any other specific locations of interest and value) for the various species referred to in the condition?

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

Condition 4 of AUTH142035.03.01 specifies that a programme to monitor the effectiveness of the fish pass be developed in conjunction with a set of interested stakeholders. Mullet, and their movements through the fish pass, have previously been identified as one species of interest to these stakeholders.

The methods for monitoring the effectiveness of the fish pass would be discussed with the stakeholders, so could include monitoring of mullet within the lake, or fish population monitoring elsewhere in the catchment. For example, monitoring of fish in streams feeding into the lake was undertaken as part of the previously agreed monitoring programme.

As a result, the need to specify fish monitoring within the Taharoa Lakes or any other specific locations in Condition 4 is not deemed necessary.

Similarly, Appendix L (section 2.3.3) recommends regular maintenance and monitoring of the fish pass structure, referring to maintenance and monitoring *focusing on clearance of excessive aquatic weed growths, debris blockages and structural integrity checks, including at the inlet and outlet of the pass*.

The report author is requested to confirm that these locational requirements (i.e. inlet and outlet) are adequately covered in proposed Condition 2 of AUTH142035.03.01 (Water Permit for Diversion), noting that Condition 2(d) refers to the pool "at the entrance of the fish pass and access to the main channel" being kept free of aquatic weeds.

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

The recommendation for regular maintenance and monitoring of the fish pass structure, including at the inlet and outlet of the pass, is adequately addressed by proposed Condition 2 of AUTH142035.03.01.

Condition 2(a) requires a fortnightly inspection of the fish pass and any identified cleaning or maintenance to be undertaken as soon as possible. Condition 2(d) specifies that the pool at the entrance of the fish pass and access to the main channel of the Wainui Stream is kept free of aquatic weeds during the main fish migratory period (July – February). These encompass the inlet and outlet to the fish pass. This is also reflected in the Draft Lake Level and Water Management Plan (Appendix EE of the Application), where Table 2 of Section 3 assigns responsibility for the fish pass to be kept clear of weeds.

Similarly, will proposed Condition 4 monitor the effectiveness of the fish pass for downstream eel migration, as recommended in Appendix L (section 2.3.4)**, or is the 0.5m depth**

pool to be maintained at the base of the dam overflow chamber (under proposed Condition 2 (e) of proposed AUTH142035.03.01, Water Permit for Diversion) **sufficient to address the issue?**

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

There are two pathways for the downstream passage of fish, namely through the fish pass or over the dam. The inclusion of the pool below the dam overflow chamber is intended to ensure that fish overtopping the dam will not be damaged as they drop over the dam face.

In my opinion, the inclusion of the pool below the dam overflow chamber required by Condition 2 (e) of proposed AUTH142035.03.01 is sufficient to address the issue. Provided these two safe options for the downstream migration of eels (and other fish) are provided, then specific monitoring of downstream eel migration is not required.

37. Fish screen mesh size

One of the issues in contention recorded in Appendix G to the Substantive Application relates to the size of the intake screening (12mm versus the screen mesh size of 1.5mm set as a standard under the Waikato Regional Plan).

Appendix L (Section 3.4) advises that larvae of galaxiid species such as banded kokopu and potentially īnanga along with juvenile galaxiids (whitebait) and eels (elvers) could be at risk of entrainment when the pumps are on.

Appendix L records the positioning of the fish pass inlet away from the pump inlets and dam spillway as helping to mitigate the potential adverse effects on upstream migrating fish. The Panel also notes the draft Lake Level and Water Management Plan (section 6.3) records that the temporary pump for maintaining residual flow in the fish pass must be no less than 3m from the fish pass entrance.

Appendix L also notes a maximum intake velocity of 0.3 m/s as a standard requirement of the Waikato Regional Plan to reduce the likelihood of impingement for larger fish with Condition 16 of AUTH142035.05.01 (Water Permit for Surface Take) requiring this.

Nonetheless, Appendix L goes on to state that while intake velocities are within acceptable limits, the course mesh size allows for small fish to potentially pass through and enter the pumps. The report then recommends that alternative mitigation measures or retrofitting be considered to "better align with ecological and regulatory expectations".

Appendix L (page 28) recommends that the consent holder undertake a "review of design options" with the aim to minimise screen mesh size while maintaining operational efficiencies.

What specific alternative mitigation measures including retrofitting/design options **have been considered** in response to this recommendation, and to meet the requirement of proposed condition 15 of AUTH142035.05.01 (Water Permit for Surface Take) that the placement of the intake (with a 12mm mesh size) does not cause fish to be entrained?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

TIL advises that some preliminary concept design and costing work has been completed but this has not been progressed further pending the Panel's decision on consent conditions.

In posing this question, the Panel notes that it is aware of the points made in Appendix G regarding the practical issues raised by retrofitting finer mesh screens.

Attachment I to the Applicant's response to comments in relation to freshwater ecology responds to evidence produced through Mr Smith (for the Waikato Regional Council), giving examples of water intake structures used in the Waikato region that meet the Waikato Regional Plan Intake Standards.

The response also refers to the Regional Council's proposed revised condition 15 of AUTH142035.05.01 whereby, within 12 months of the commencement of the consent, the intake would need to be screened with a mesh size not exceeding 1.5 mm, and the consent holder would have three months to submit plans for the upgrade to meet that requirement for Council certification.

The author of Appendix I nevertheless proposes (should Mr Smith's recommendation be accepted by the Panel) that these timeframes be extended to allow 12 months for the plans of the upgraded intake structure to be provided and for new structures to be installed within 24 months of that certification .

Appendix I states (page 7):

> *These timeframes would allow for options, investigations and site-specific design, and any seasonal constraints (such as high winter flow conditions or fish migration periods) that may affect installation.*

The report author is requested to confirm that this opinion (regarding timeframe) is within the author's expertise and experience of the time taken to prepare plans for an upgrade of the water supply intake and complete such an upgrade .

Further, to advise why, from a freshwater ecology perspective a two-year period for installation is considered more appropriate than the timeframes proposed by Mr Smith?

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

The opinion on timeframes was not specifically offered based on an ecological viewpoint, but on the basis of wider experience as an ecologist working on multidisciplinary infrastructure projects, working alongside design engineers through optioneering and final design. It also reflects my experience that construction of infrastructure undertaken in waterways can be impacted by flow conditions, best practice timing to avoid key fish spawning and migration periods, which can notably limit available works periods, as well as operational requirements, including annual budgeting. Therefore, it was provided on the basis that timeframes should be reasonable to ensure that improved ecological outcomes are achieved

and that the Applicant can comply with consent conditions (should such a condition be imposed by the Panel).

In the WRC comments, it was acknowledged that any upgrade to the intake is "not simply a case of swapping out the existing screens for new ones" and "it is anticipated that an amended design of the water intakes will be required" (WRC comments, page 16). This reflects that optioneering may need time.

A 12 to 24 month timeframe following design certification for installation was suggested as a more reasonable and achievable timeframe, to assist the Panel in its determination of a specific timeframe, should the Panel impose a condition as sought by WRC. The timeframes were suggested based on practicalities, as noted above, recognising that the timeframes proposed by WRC, requiring design, certification and installation all within a 12-month timeframe, appeared unreasonably short based on previous experience with the construction of infrastructure in waterways.

I note that WRC provided no evidence or reasoning as to the appropriateness of the timeframes recommended to allow for design and installation.

38. Mitiwai Stream

Appendix L states (page 26):

> *Based on the proposed mining staging plan, dewatering effects on the Mitiwai Stream could occur over summer periods for between 4 to 5 years.*

Over which years (following commencement of consents) would this 4-to-5-year duration impact occur? Please clarify which stage of the mining plan (specifically, which stage) this relates to.

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR, and Jake Scherberg, Senior Hydrogeologist, WWLA:

Based on Figure 15 of the Hydrogeology Assessment (Groundwater Effects) (Appendix N of the Substantive Application), this duration of impact would commence after approximately 1 year of mining in the Central Pit under the new consent, with the peak impact predicted to occur two years into mining. The impact would continue for approximately 5 years after commencement, at which point the effect would dissipate to the point of being undetectable relative to baseline conditions.

Based on what finding (or section) of Appendix N is this statement as to the temporary duration and timing of the impact made?

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

The temporary reduction in base flows was based on modelling undertaken by WWLA. The baseflow reduction under the proposed mining scenarios and sequence of work plan is presented as Figure 15 of the Hydrogeology Assessment (Groundwater Effects) (Appendix N of the Substantive Application). Figure 15 indicates that small-scale changes to groundwater baseflow would occur under summer low flow conditions. Based on the proposed mining sequencing this would extend for approximately 5 years, when mining was occurring closest to Mitiwai Stream.

Appendix L (page 26) also states that water supplementation is proposed to mitigate this potential effect of drawdown on the Mitiwai Stream – with conditions of consent proposed that outline the flow conditions that would trigger the need for flow augmentation to commence.

The Panel assumes that this is a reference to Condition 2 of proposed AUTH142035.14.01 (Water Permit for Diversion and Surface Take) which includes a trigger of 28 L/s and which, in turn, reflects one of the trigger levels set out in Appendix N (Table 10, page 32).

Should the conditions in this permit also refer to the other triggers included within Table 10 of Appendix N (for early warning and water use review) rather than just the trigger for flow augmentation? **If not, why not?**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The condition only refers to the trigger for flow augmentation because the other two triggers only serve as an early warning (at 45 l/s) or trigger an internal review of water use (at 31 l/s) by the mine operator/consent holder. These triggers/measures are of more of an advisory/management nature and do not require any measurable direct action such as flow augmentation to maintain minimum flow. If the Panel were minded, Trigger Level 2 could be included in the condition but without any need for the review to be subject to any form of notice to or certification by the regulator, given that the purpose of the review is to assist the consent holder to prepare for potential augmentation.

Appendix L (page 26) also states that monitoring is proposed to ensure there are no adverse changes in water quality resulting from flow augmentation.

Condition 3 of AUTH142035.14.01 (Water Permit for Diversion and Surface Take) sets controls on the permissible degree of change after any augmentation for temperature, turbidity and pH (after reasonable mixing). **Is this range of parameters adequate** to ensure that augmentation does not result in any adverse changes in water quality, noting that the previous paragraph of the report refers to "water clarity, temperature, dissolved oxygen or other contaminants". **What are the "other contaminants"** the report authors were referring to in their recommendation? **Why**

is no monitoring of these parameters required in the condition to ensure the proposed controls on the degree of change to them are not exceeded ?

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

This range of parameters is considered adequate to ensure that augmentation water is as similar as possible to the Mitiwai Stream receiving waters.

In addition to the parameters listed, a new addition to Condition 2 of proposed AUTH142035.14.01 has been proposed, requiring the electrical conductivity of water used for augmentation of the Mitiwai Stream be within the freshwater range.

The other parameters that could have been considered include nutrient parameters (i.e. nitrogen, phosphorous), but it is not considered necessary to include these parameters in the proposed monitoring regime. Water augmentation, if required, is expected to be from clean process water or the Wainui Stream water take, and the augmentation volume is expected to be low (approximately 5 L/s). Both the Mitiwai Stream and Wainui Stream catchments comprise a mix of farmland, bush cover and forestry, so nutrient levels in the incoming stream flows in each catchment are not expected to be notably different, to a degree that would result in nutrification of the lower Mitiwai Stream. As such, the likelihood of nutrient enrichment as a result of augmentation is considered to be low. As a result, nutrient monitoring of augmentation water was not proposed.

In relation to monitoring of these water quality parameters, Condition 3 implies, but does not specifically state, that monitoring of both the stream water and augmentation water will occur, as a means of demonstrating compliance with Condition 3 requirements. The addition of a condition outlining specific instream water quality monitoring requirements during augmentation periods would remove any ambiguity. In addition, Condition 45 of Schedule 1 requires that an Annual Monitoring Plan be prepared, detailing all environmental monitoring undertaken and summarising the resulting data and information required to be collected by the consents.

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

A new condition is proposed to be added to AUTH142035.14.01 to require explicit monitoring of the augmentation water in the Mitiwai Stream (refer to response to RFI 27).

Noting the Applicant's response to the salinity issue in the wetland context (as referred to in relation to Question 27 above), Attachment I to the Applicant's response to comments in relation to Freshwater Ecology recommends an amendment to Condition 2 of AUTH142035.14.01 (Water Permit for Diversion and Surface Take) to set a maximum level of electrical conductivity in augmentation water for the Mitiwai Stream (page 4)).

Attachment I (page 5) further states that water to augment flows in the Mitiwai Stream would come from the Wainui Stream reservoir or be clean water from mining operations.

This requirement is not included in proposed conditions of consent and nor is specific monitoring of salinity (electrical conductivity) proposed through any amendment to Condition 3 of AUTH142035.14.01 (Water Permit for Diversion and Surface Take).

The applicant is requested to propose revised conditions for this permit to address these issues.

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

A new condition has been set out in response to an earlier RFI with regards to monitoring of the augmentation water discharge should augmentation need to occur.

Appendix L (page 26) then states that if monitoring shows a notable reduction in the characteristics of the stream, management measures would be required to address adverse effects, including review of augmentation source water or flow rate. **Where are the proposed conditions requiring this management response?**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

To be addressed through a new proposed condition 6 of AUTH142035.14.01:

Should the monitoring required by condition 5 show a significant reduction in the parameters set out in condition 5, the consent holder shall initiate management measures to address the reductions which could include, but not be limited to, a change to the source of augmentation water and/or alteration to augmentation flow rates.

Why is Condition 2 of AUTH142035.14.01 (Water Permit for Diversion and Surface Take) **worded so that augmentation of Mitiwai Stream is only required during mining of Pit 3 in the central block, and then only in the summer months, for minimum base flow?**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

At the outset it should be noted that the condition refers to Pit 3 in error and should more correctly refer to Pit 1. That said, the condition should be specific to Pit 1 because:

(i) Pit 1 is the only pit where potential effects on the Mitiwai Stream are modelled by WWLA to occur from; and

(ii) summer (and now extended through autumn to 01 May in response to comments from WRC) is the period when there is the greatest potential for drawdown effects to occur ie when the base flow in the stream is lowest

While section 6.2.1 of Appendix N to the Substantive Application refers to the "maximum base flow reduction" from mining in the Central Block being predicted to occur during excavation of proposed Pit 3, presumably groundwater drawdown associated with mining activities in other areas or stages of the mine sequence could affect the Mitiwai Stream?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

As per the above answer, the modelling undertaken by WWLA does not show that there is any potential effect on the Mitiwai Stream from mining occurring in areas of the Central Block other than in the modelled Pit 1 area, simply given its proximity to the stream.

Further, it should be noted that the modelling undertaken by WWLA is conservative in that it does not take into account any groundwater recharge that will occur from tailings deposition within the mine site. In the case of the Mitiwai Stream, this modelling conservatism is very relevant, given that (as also confirmed elsewhere in this response) TIL intends to re-create a ridge form through tailings deposition once mining is completed in the current mining areas in the north of the Central Block adjacent to the Mitiwai Stream. That tailings deposition and any associated groundwater recharge it generates will be beneficial for base flow in the Mitiwai Stream.

On that basis, **shouldn't the condition be amended to refer to extraction of sand generally rather than just within Central Block Pit 3?**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

On the basis of the above answers, there is no need to make such an amendment.

Appendix L identifies high velocity flows and partial barriers to fish passage that are apparently being successfully navigated by native fish in the lower levels of the Mitiwai Stream (page 23). It further identifies a threat to stream levels in the lower Mitiwai Stream from dewatering effects from mining, with recommendations for ongoing monitoring and flow augmentation if minimum baseline levels are triggered (page 26).

However, monitoring is only proposed for water quality parameters – with no monitoring or reporting on the presence or loss of native fish. The only recommendation is that the "existing level of fish passage" is maintained. **Why was no consideration given to a fish pass** to support migratory fish which are important for (regional plan) high value natural streams upriver, along with **monitoring of native fish species in the stream?**

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

Fish community surveys in the Mitiwai Stream upstream and downstream of the existing culvert (Section 4.1.3 of Appendix L) indicated that a small range of native fish species were recorded within the lower Mitiwai Stream, including īnanga, a species with a relatively poor ability to swim past instream barriers. The culverted public access road crossing was identified as a partial barrier to upstream fish passage, however results indicate that fish passage is not impacted under all conditions, so fish are able to move past the culverts, most likely under higher tide conditions.

The public access road culvert is an existing feature, and no changes are proposed to the road crossing under this Application. Improvements to fish passage were therefore not specifically considered as a component of the application.

Provided potential effects of mining below the near the Mitiwai Stream are managed through seasonal flow augmentation and water quality monitoring, as proposed, habitats for fish communities within the Mitiwai Stream will be maintained. Further monitoring of native fish species was therefore not deemed necessary and has not been proposed.

39. Wainui Stream

Appendix L (page 17) records a proposal to augment flows past the overflow weir (which otherwise ceases at RL 9.36 m) to maintain water flow to the lower Wainui Stream, to a minimum of 10 L/s.

Proposed Condition 4 of AUTH142035.02.01 (Water Permit for Dam) would require maintenance of the residual flow in the Wainui Stream downstream of the dam structure to no less than 10 L/s, but the Panel cannot see a link to the RL 9.36 m trigger for augmentation by manual pumping (as also referenced in the table on page 86 of the Substantive Application). **The Panel requests** this be remedied with **a revised condition** for the Panel to consider.

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

See answer to the following question.

Attachment F to the Applicant's response to comments in relation to hydrology responds to a proposal by the Waikato Regional Council to increase the minimum trigger levels for flow augmentation to 10mRL (albeit in the context of Condition 7 of proposed AUTH142035.03.01, Water Permit for Dam relating to residual flow in the fish pass). The Panel understands this is to ensure that temporary pumping initiates before the stream and fish passage flows fall below 10 L/s and 24 L/s respectively.

In Attachment O to the Applicant's response to comments with revised conditions of consent, for AUTH142035.03.01 (Water Permit for Diversion) the trigger level is now proposed to be set at RL 9.45 m in Condition 7 (setting the fish pass minimum flow of 24 L/s).

However, Attachment F to the Applicant's response to comments in relation to hydrology (page 7) refers to increasing the RL trigger level in the context of Condition 4 of AUTH142035.02.01 (Water Permit for Dam) setting the minimum residual flow for the Wainui Stream at 10 L/s.

The Panel notes in Attachment I to the Applicant's response to comments in relation to Freshwater Ecology (page 3), the author refers to raising the trigger level from 9.36 m to RL 9.45 m in the context of the 10 L/s residual flow for the Wainui Stream rather than the minimum flow through the fish pass of 24 L/s.

Indeed, the author of Attachment I recommends that no change be made to Condition 7 of AUTH142035.03.01 (Water Permit for Diversion) dealing with fish pass augmentation, yet that is the condition proposed to be amended in Attachment O (revised conditions of consent).

Should the amendment therefore be to the conditions of AUTH142035.02.01 (Water Permit for Dam) setting the trigger level at RL 9.45 m for residual flow in the Wainui Stream (rather than RL 9.36 m as referred to above) or increased to RL 9.45 m for both conditions?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Attachment F (Hydrology) to TIL's Response to Comments did not recommend any changes to condition 4 of AUTH142032.02.01 with regards to introducing specific reference to the augmentation trigger into the condition, as such specific reference would be redundant given the overarching requirement to maintain minimum flow downstream of the dam. Instead, the recommendation was to revise the trigger level to RL9.45m in the draft LL&WMP. Attachment I (Freshwater Ecology) supported that recommendation in Attachment F. In turn, the draft LL&WMP was amended accordingly and submitted with the Response to Comments. For that reason, no changes were made to condition 4 of AUTH142032.02.01.

The amendment made to condition 7 of AUTH142035.03.01 to change the trigger level from RL9.3m to RL 9.45m is erroneous. As Attachment I to Response to Comments states: "… fish pass augmentation trigger level of RL 9.3m was previously agreed with WRC as appropriate to commence flow augmentation, if required, to ensure fish in the fish pass are not at risk of being stranded."

In light of the above and if the Panel is minded, the appropriate condition to be amended to include reference to the RL9.45m flow augmentation is condition 4 of AUTH142032.02.01 (Water Permit for Dam).

The Panel understands that the proposed 10 L/s residual flow was calculated from the lowest water level measured behind the dam structure in early 2014, and that this low flow condition only occurred temporarily (Appendix I, Hydrology Assessment, page 26).

The Panel is also aware of the Waikato Regional Plan requirement that a minimum flow of 160 L/s should be required (as reflected in the Hearings Panel decision under appeal – refer Appendix G). Appendix G states that the downstream habitat was not adversely affected by this flow level of

10 L/s, but as noted above, it was a rare (and perhaps single) occurrence, so potential future effects at that flow rate (for longer or repeated periods) have not been determined.

Why/how is such a low residual flow considered adequate to protect aquatic habitat values in the lower Wainui Stream?

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

Despite the presence of the dam and the long-term water take, the lower Wainui Stream was found to support a diverse and abundant population of native fish (Freshwater Ecology Assessment – Appendix L of the Substantive Application, section 2.2.3). These populations have persisted under a range of flow conditions associated with the presence of the dam and the water take.

The proposed minimum residual flow conditions are less than the Waikato Regional Plan minimum flow recommendations, however it is anticipated that such low flow conditions would be rarely encountered or would not persist for extended periods. Aquatic biota can naturally be subject to low flow conditions for extended periods. The minimum residual flow requirements, including the 10 L/s over the dam, are intended to maintain water movement and prevent the potential for stagnant conditions to develop. Provided these conditions are not maintained for extended periods, the risk to aquatic biota is expected to be low. A monitoring requirement is triggered should low flow conditions persist for 14 days (Condition 5 of AUTH142035.02.01).

It is noted that Condition 10 of proposed AUTH142035.05.01 requires that, if Lake levels fall to 9.6m RL, then water management responses are to be implemented to reduce water takes and maintain reservoir levels. This requirement will also help to ensure that residual flow conditions to the lower Wainui Stream, above the minimum levels proposed, are maintained.

Proposed Condition 3 of AUTH142035.02.01 (Water Permit for Dam) would require daily monitoring of the Wainui Stream for a residual flow immediately below the dam structure of no less than 10 L/s (per Condition 4). Condition 5 requires additional monitoring and reporting on instream ecological values by a qualified ecologist if the minimum residual flow "persists for a period exceeding 14 calendar days". Condition 6 requires that, if the ecologist's report concludes adverse effects are occurring, then the consent holder shall identify measures to address these effects.

Given the very low residual flow level being proposed – wouldn't such remedial action be too late, the adverse effects have already occurred before action is taken?

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

As noted above, aquatic biota can naturally be subject to low flow conditions for extended periods. Under the above scenarios, flows within the lower Wainui Stream will not cease, and monitoring of the instream conditions below the dam will be triggered after two weeks of low flow conditions. I would anticipate that those assessments would identify any early signs of adverse impacts of low flow on aquatic biota, or the potential for adverse impacts to occur, should those conditions continue.

Condition 6 of proposed AUTH142035.02.01 also requires that measures to address any identified adverse effects be identified and implemented as soon as practicable. It is anticipated that the engaged ecologist would be able to identify effects and recommend measures for implementation, to reduce adverse effects on site, well ahead of the subsequent reporting requirements. Nonetheless, the reporting requirements requirement for measures to address adverse effects set out in Condition 6 are considered appropriate. Condition 61(a) of Schedule 1: General Conditions also allows the effectiveness of conditions to be reviewed. Should adverse ecological effects result from the residual low flow conditions be identified and cannot be effectively mitigated, the residual flow requirement can be reviewed.

Should the report required by Condition 5 require an assessment of the *adverse effects on* instream ecological values (from the residual flow being at 10 L/s for more than 14 days) rather than the values themselves?

Response on behalf of TIL:

Response prepared by Keren Bennett, Technical Director, SLR:

Yes. The condition could then be amended to:

5. If the minimum residual flow referred to in condition 4 above persists for a period exceeding 14 calendar days, the Consent Holder shall engage a suitably qualified and experienced ecologist to monitor and report on <u>any adverse effects on</u> instream ecological values in the Wainui Stream downstream of the dam. The instream monitoring report shall be provided to Waikato Regional Council within 10 working days of completion.

Appendix M: Terrestrial Ecology – Fauna

40. Habitat loss

The fauna assessment identifies loss of nesting/foraging/commuting habitat for birds as an effect but only quantifies the 4.25 ha area of wetlands permanently lost (at section 4.2.2) . **What is the total area of nesting/foraging/commuting habitat for birds lost in hectares** (i.e., including grassland and terrestrial vegetation) **and when is this proposed to occur** (noting that this occurs in stages over many years according to mine sequencing).

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

At the time of survey and preparation of ecological effects assessment, the following bird habitat was present within the mining footprint:

Wetland habitat: 4.25 ha

Pine forest: 85.5 ha

Grassland (Includes pasture, areas of exotic shrubland, and rushland): 260 ha

Removal of vegetation is proposed over stages or blocks within the mining sequence, as shown in the mine plan (Section 4.6 of the Substantive Application report).

Similarly, the fauna assessment identifies loss of roosting/foraging/commuting habitat for bats. **What is the estimated total roosting/foraging/commuting habitat for bats lost in hectares** (area near Mitiwai Stream and remnant pines to east) and when is this proposed to occur?

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

The following areas of roosting and foraging habitat will be lost:

Pine forest remnant: 85.5 ha (roosting, foraging)

Wetland habitat: 4.25 ha (foraging)

Open grassland was qualified as moderate value habitat for bats since foraging can take place in these areas, but the areas listed above are likely to be the key foraging and roosting areas.

Commuting may take place across the site, but key areas for this are likely to be linear landscape features, which are the pine forest, stream margins (retained) and lake margins (retained).

How do these relate to the 344 ha of moderate value habitat to be removed noted in Appendix K at section 6.2.1?

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

The total area of key foraging, roosting and commuting habitat (namely pine forest remnant) that will be lost, based on the response above, is 85.5 ha. The remainder is made up of grassland habitat (260 ha) making up the total, though I note that there is a small discrepancy in total area in Table 10 of Appendix K, where the total pine forest area is listed at 84.75 ha (not 85.5 ha), and total grassland is 259.21 ha (equalling to 343.96 ha in total). Grassland may occasionally be used for foraging or commuting, but is not likely to form part of the key habitat on site as bats generally prefer to commute and forage along linear landscape features and forest / vegetation edges.

Survey timing and existing environment

Appendix M (Section 1.1) advises that it is informed by surveys undertaken in 2021 with no new surveys having been undertaken since, however recent aerial imagery has been reviewed through which it was determined that the overall character of the site and ecological features have not changed since the survey work was completed.

Does the lack of any more recent field surveys (not least for bats, birds and lizards) **raise any risk** that the "existing environment" is not as assumed in the report, particularly given the cryptic nature of the faunal species involved, which would not be detectable by aerial imagery?

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

The assumptions made relating to the existing environment remain valid. It is possible wetland extents have changed over time, but the overall characteristics of these habitats are likely to have remained the same, including use of areas for roosting or nesting. This is based on the time it takes for trees to become suitable as potential roost trees.

It is not expected that the range and extent of species would have improved, or degraded, over the past 5 years of mining activity. The only clear degradation that would be changing habitat availability in a short period of time would be if the pine plantation forest had been removed since site surveys were conducted. The removal of pine trees would mean that key foraging and potential bat roosting habitat would now be limited to the Mitiwai stream margin (roosting, foraging) and lake wetland edges (foraging).

For example, the range and extent of these species might have improved (habitat expanded through rehabilitation) or conversely have been degraded over the past 5 years of mining activity?

In this respect it is noted under the section "basis of report" that it had been prepared taking account of the timescale and resources allocated to SLR – **do the authors of that report consider the extent of assessment materially constrained by resourcing from the applicant**?

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

The survey efforts undertaken were adequate for the scale and characteristics of the site, and the species present. It is not expected that additional survey time at the time of survey would uncover any additional (threatened) species, or habitats that have not been assessed.

The wording referred to by the Panel is standard wording included in all reports prepared by SLR (including Appendix K and Appendix V to the Substantive Application) – it does not indicate that the extent of survey effort and assessment was constrained by resourcing from the applicant.

There appears to be some circularity in the determination of the existing environment inherent to the report, noting that at section 1.3 it is stated that rehabilitated areas in the "existing environment" are similar to the unmined or previously mined and rehabilitated parts of the site, and so likely to provide habitat for terrestrial fauna as determined by the completed ecological surveys based on the current condition of the land (i.e., as at the survey date of 2021) .

Is the logic here that while the existing environment includes completion of rehabilitation works required under the existing consents, rehabilitation planting would be in a newly established state (on commencement under the consents now being sought) and so effectively the rehabilitated existing environment and the actual existing environment as determined in field surveys are effectively one and the same? – refer paragraph 17(e) of Appendix CC to the substantive application.

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology and Counsel for TIL:

The interpretation set out in the question is broadly correct, subject to the following:

TIL has conservatively adopted a conceptualisation of the existing environment which assumes that the activities authorised by the existing consents have ceased and rehabilitation works required by the existing consents have been completed. This conceptualisation enables a broad assessment of the effects of the project.

As noted in Appendix CC, the state of the environment that is relevant is the environment at the date TIL's current applications are determined. At this date, planting in accordance with the Land Management and Rehabilitation Plan would be in a state where it is newly established, and some planting would have been undertaken progressively over time, so some areas could be more established. As noted in the terrestrial fauna report, in the time between expiry of previous consents and approval of new consents there would not be a substantial change in terrestrial ecosystem values on recently worked and rehabilitated areas, but in areas that are rehabilitated earlier, the existing environment would have taken

on the characteristics of unmined or rehabilitated parts of the Site and therefore would likely provide habitat for terrestrial fauna, including bats, birds and lizards, as determined by the completed ecological surveys.

While the conceptual and actual existing environments would not be exactly the same, it is considered that they are sufficiently similar to enable the existing environment to inform the assessment of the conceptual environment.

Appendix M states (section 1.3):

> *In the context of the existing environment assumptions explained above, the mitigation measures which have been proposed exceed the rehabilitation measures contained in the existing consent conditions.*

Is this (underlined statement) relative to an environment whereby the existing rehabilitation requirements have been *fully* implemented and established, or just as the environment as it actually exists now?

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

This statement is relative to the existing rehabilitation requirements being fully implemented and established. The proposed mitigation measures set out in the proposed consent conditions and draft Natural Inland Wetland and Buffer Management Plan (NIWBMP) go beyond the previous rehabilitation plan provided for under TIL's existing consent conditions by including additional components such as predator control, establishment of an offset site, and planting of buffers with indigenous plant species.

41. Bat surveys and habitat – pine harvesting effects

Appendix M (assessment of terrestrial ecology – fauna, section 4.1.1) states that pine forest habitats supporting bats have a *very high* ecological value, whereas in Appendix K (assessment of terrestrial ecology – wetlands and vegetation, Table 10, page 27) the pine forest habitat grouping is described as having *moderate* ecological value.

Is there a reason for this discrepancy between the two reports?

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology and Hamish Dean, Principal Ecologist, SLR:

The Very High ecological value is based on the fauna (bat) habitat the pine forest provides, whereas the botanical value differs (and is lower). The vegetation assessment (Appendix K) therefore assigned a 'moderate' ecological value.

Section 4.1.1 of Appendix M states that potential roost trees are likely to be low in numbers within the pine plantation forest.

What is the basis for this statement?

Is it to do with the age of the plantation forest (noting the comment on page 29 whereby younger pine trees may not be suitable for highly trafficked bat roosts, albeit that there may be some trees present within the pine plantation forest, and smaller dead spars, that could be suitable as occasional roost habitat).

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

This statement is based on the fact that overall, the age of the trees within the pine plantation mean that trees are not yet mature enough to provide any suitable potential roost features for bats.

However, it is possible for occasional larger trees to grow amongst the stand (such as left over trees from previous harvests) or occasional features such as dead spars to have formed in storms, both of which do provide features suitable for potential bat roosts (but in low numbers as stated in Appendix M).

Appendix M (section 4.2.1, page 28) records wetlands within the range of habitat types as providing habitat for bats, along with lake, stream and wetland margins (also having very high ecological value). Based on the survey data presented in Table 2, **what is the basis** for determining that wetlands provide habitat for bats within the site, noting that those sites where most bats were recorded (4S9, 4S10, 4S14, and 4S15) were all adjacent to remnant stands of pine trees?

The point has potential significance given the comment made at section 4.2.1.1 of the report (page 29) that the nearby wetlands, lake margins, streams and native forest edges all provide suitable habitat for bats and that the pines to be removed under the harvesting consent only form part of foraging habitat available for bats.

It is not clear to the panel whether provision has been made for bat habitat to be retained/ replaced as part of the forestry harvesting (see Appendix U page 7).

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

Monitoring showed highest levels of bat activity amongst the pine plantation, and Mitiwai stream, which alongside recorded feeding passes indicates that these areas are key habitat for foraging, commuting (and potentially roosting). While monitoring did not suggest particularly high activity around wetlands, equipment was not placed in many of the wetlands areas (due to technical challenges in deployment of equipment within wetlands especially in the presence of stock). It has been assumed that any bats present on the site will utilise wetland areas for foraging due to the presence of aquatic insects in these habitats (alongside stream and lake edges).

The pine plantation does provide important foraging and commuting habitat due to the linear features present, but other areas also likely fulfil this function.

Was consideration given to providing offsetting compensation for loss of the (pine forest) habitat for native bats and if not, why not? What would this look like as a condition?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Offsetting or compensation was not considered necessary because the potential adverse effects of the pine forest clearance on long tailed bats are mitigated through the Bat Effects Management conditions on AUTH 142035.17.01 (bat roost protocols, lighting restrictions) and the range of measures set out in the draft Harvest Management Plan which includes staged harvesting of the pine forest in consultation with the project ecologist and retention of existing pine trees within 30m of the edge of Lake Rotoroa. Further, rehabilitation of the Eastern Block into pine trees (at the request of the Eastern Block landowners) has been initiated and these trees over time will provide alternative habitat, as will any replanting of commercial forestry recently harvested by others on the opposite side of Lake Taharoa (without any consent requirement to offset or compensate for that habitat loss). Ample alternative habitat is also available in the wider Taharoa area, noting that long tailed bats are a highly mobile species.

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

The removal of the pine plantation did not form part of the original consent application, through its ecological effects on bats were considered as part of the fauna assessment (Appendix M). Due to the very high value of bat habitat and a moderate level of effect, recommendations were made to minimise the effect of the pine removal. This included the adoption of Bat Roost Protocols, retention of a buffer zone of pines to attenuate mining activity disturbances, and successional replanting of the buffer zone with pines or, preferentially, with natives to retain a forested edge adjacent to Lake Taharoa (see Condition 14 of AUTH142035.17.01 and Appendix U – Draft Harvest and Earthworks Management Plan).

Offsetting was not considered necessary as following implementation of these measures effects on bats arising from the pine removal was assessed to be low (Section 5.1 of Appendix M).

42. Lizard and katipō surveys

Appendix M at Figure 3 on page 8 shows that the Artificial Cover Object sites were principally located in the central block and northern part of the southern block.

The same applies for the Katipō survey sites as shown on Figure 4 on page 9.

Why were no surveys for lizards or katipō undertaken in the central and southern zones of the Southern Block? Noting that no lizards or Katipō were detected, **is there a risk** that survey sites were not more extensively located within the southern block, as might have detected lizards or katipō in that area? If not, why not?

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

Lizard searches were conducted in all areas of potential habitat available across the Site, with large areas subject to active mining deemed unsuitable, and areas currently grazed avoided due to the potential for stock impacting Artificial Cover Object sites (ACOs).

The Southern Block overall presents a largely modified area of present or historic mining, with stock present. Potential lizard habitat was therefore absent or highly degraded, and lizard monitoring focused on the most high value areas for lizards.

It is unlikely that additional monitoring efforts in these areas would have detected lizards given their complete absence in the higher value habitats that were surveyed.

Katipō searches were conducted in areas where suitable habitat was present, focusing on key habitat (i.e. spinifex dune vegetation and suitable logs and debris). The Southern Block only featured a narrow smaller area of spinifex dune vegetation along the coast, with visible stock impact and presence, so survey efforts focused on the key habitats available along the northern extent of the site.

It is possible that additional monitoring efforts in the areas would have detected katipō, but this is considered unlikely given their absence in better quality habitat that was surveyed.

43. Avifauna surveys

Please revise Figure 2 to include the nomenclature used in the report for the avifauna survey ‘dawn and dusk’ (sites 1-7) and 5-minute bird counts (sites B1 – 23).

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology and Hamish Dean, Principal Ecologist, SLR:

An updated Figure 2 has been provided and is attached to this response as **Appendix G**.

The description of the dawn and dusk survey site 5 for avifauna in section 3.2.1 of Appendix M as outside the Central Block does not appear consistent with the site boundary shown on Figure 2 of Appendix M (or Figure 1.1 of the substantive application). **Please clarify.**

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology and Hamish Dean, Principal Ecologist, SLR:

Survey site 5 (dusk and dawn surveys) is located within the TIL property boundary (called the Study Area in Figure 2) but is located outside the proposed mining footprint.

44. Dotterels and Bittern

Appendix M (section 4.2.2) records that there is potential for New Zealand dotterel disturbance from emergency pipeline works. Dotterels are recorded as having been observed during the 5-minute bird counts (section 3.2.2). **Where were New Zealand dotterel found** during the surveys i.e. presumably within the dune areas but on which of the sites shown on Figure 2?

Section 3.2.2 states the New Zealand dotterel 'At-Risk' status is 'recovering' whereas Table 4 lists the threat status of the New Zealand dotterel as 'nationally increasing'. **Are these two terms meant to be the same?**

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology and Hamish Dean, Principal Ecologist, SLR:

NZ dotterel were recorded at survey locations on the coastal margin outside the project footprint, and one recording was made in one of the tailings cells in the southern part of the site, and at Station B10 during a 5MBC. A map showing these locations has been provided and is attached to this response as **Appendix H**.

The reference to "recovering" at section 3.2.2 of Appendix M is an error. New Zealand dotterel (Charadrius obscurus aquilonius) are classified as 'Nationally increasing' (Robertson et al. 2021), as listed in Table 4.

At section 3.2.1.5 it is recorded that Australasian bittern were detected at Site 5 within a 2.53 hectare wetland assemblage.

Which, if any, **of the wetlands identified within Appendix K** (Terrestrial Ecology- Wetlands and Vegetation Assessment) **were the Australasian bittern detected** on in the survey work undertaken?

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

Bittern were only detected at Survey Site 5, which corresponds to Wetland 21 in the wetlands identified in Appendix K.

Would this species (or any other species reliant on wetland habitat) **be potentially affected by the range of effects described at section 6.2.4 of Appendix K** (effects from groundwater drawdown **)?**

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

This species could be affected by the effects of groundwater drawdown, if the result of this was a prolonged change in hydrology that would affect availability of open water feeding areas or plant communities over the long term. Monitoring is proposed to ensure these changes would be detected early, and an ongoing alteration of hydrology prevented through monitoring and adaptive management measures (Conditions 5, 5A and 6 of AUTH142035.16.01).

Would the mitigation and monitoring proposed for remaining wetlands as summarised at page 42 of Appendix K (as referred to at page 31 of Appendix M), along with proposed pest and weed control as detailed in the NIWBMP, **be effective in addressing any such effects on these species**? **What other conditions of consent would assist in protecting these species?**

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

The mitigation and monitoring proposed for the retained wetlands in Appendix K and the NIWBMP will address hydrological effects that could affect bittern and their foraging habitat, though I rely on the hydrological experts on their expertise that the proposed monitoring and adaptive control are sufficient in protecting the hydrological conditions needed to retain wetlands in their current functioning and extent.

Other consent conditions that will also be of benefit to bittern are the planted buffers (to minimise disturbance effects and protect habitat quality – see Condition 7 of AUTH142035.01.01), predator control (expected to enhance breeding success for any breeding birds and improve restoration planting outcomes) and stock exclusion (see draft NIWBMP).

Appendix M (section 5.2.3) recommends a prohibition on planned maintenance works inside the coastal marine area between September and January to protect nesting dotterels – however Condition 4 of proposed AUTH142035.09.01 (Coastal Permit – Structure) refers to avoiding such impacts during these periods "as far as practicable".

The condition also provides an exception where approval is obtained from the Council in consultation with the Department of Conservation. **Why are the words "as far as practicable" needed?**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The inclusion of "as far as practicable" in the condition replicates the wording in the RMA Hearing Panel decision. It provides acknowledgement that the timing prohibition is the only practicable avoidance measure during the September-January period.

45. Mitigation planting and management in riparian areas

Appendix M (section 5.1, page 36) recommends that restoration planting of wetlands and buffer areas include large trees such as kahikatea as part of the overall mitigation package for bats and avifauna including to mitigate for dust, light and other disturbance effects (to bats and birds).

However, the range of species proposed for planting in these areas as set out on page 19 of the NIWBMP does not include kahikatea and it is unclear to the Panel whether any of the other species in the table on page 19 would rapidly grow to a significant height. **The Panel requests the NIWBMP be amended** to reflect this recommendation in Appendix K.

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

Kahikatea were recommended as an indigenous species suitable to wetlands that is cavity-forming (i.e. has the potential to become a bat roost tree over time). While dependent on the size at planting and environmental conditions, kahikatea grow roughly up to 2-3m tall at 5 years after planting, and reach 10 m in height about 25 years after planting.

Kahikatea were not originally included in the NIWBMP because the species is less suitable for growing in the drier buffer areas, but could be suitable for inclusion in wetter planting zones.

To include bat friendly plant species that replace lost roosting habitat, the NIWBMP will be updated to include kahikatea in suitable zones, alongside kanuka and matai that are cavity-forming indigenous species suitable to the restoration area.

Similarly, section 5.1 (page 35) recommends that the pine forest be removed in stages rather than felled in one harvest or a buffer of pine forest be retained to maintain foraging habitat as long as possible. In addition, because indigenous tree species take a long time to become potential

roost sites, replanting of fast-growing exotic species in adjacent areas (not to be mined) is recommended to shorten the lag between habitat loss and new foraging and roosting habitat becoming available.

The report author is requested to **confirm whether these measures are adequately provided for within the draft Harvest and Earthworks Management Plan** (Appendix U to the Substantive Application, pages 7 and 16) **and proposed AUTH142035.17.01 (Land Use Consent for Earthworks, Forestry), and if not, advise what changes to the Management Plan and conditions of this permit should be made.**

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

Removal of pine forest in stages, retaining a buffer to adjacent to the lake and wetlands, and bat roost protocols are all provided for under the draft Harvest and Earthworks Management Plan. Condition 14 of AUTH142035.17.01 specifically requires adherence to Bat Roost Protocols (as published by the Department of Conservation), which include requirements relating to the timing of tree removal, with more detail on these requirements set out in the draft Harvest and Earthworks Management Plan.

Staged harvesting will be undertaken if confirmed to be required by the project ecologist (as set out in Section 4 of the draft Harvest and Earthworks Management Plan, item 3(c)) This will be determined closer to the commencement of harvesting. The exact location and width of buffer of retained pines (to be left to maintain foraging habitat for as long as possible) will also be determined at this time, but these measures must be in place prior to harvesting (Section 4 of the draft Harvest and Earthworks Management Plan, item 3(c)).

Appendix M (section 5.1, page 36) further states that pest control including animal pest management should be undertaken along the edges of neighbouring native forest, riparian margins and wetlands. The NIWBMP (section 7) refers to pest animal control within the "offset site and all buffer zones". **Will this cover all of the areas** referred to in this section of Appendix M? **Would it be more efficient and effective to undertake pest control on the whole site? If not, why not?**

Response on behalf of TIL:

Response prepared by Hannah Mueller, Principal Ecologist, Phoenix Ecology:

As stated in Appendix M, pest/predator control should be undertaken in the offset site, planted buffers, riparian margins and wetlands. This is specifically provided for in section 7 of the draft NIWBMP, and Condition 16(b) of the Schedule 1: General Conditions provides for this to be included in the final NIWBMP.

While pest control across the whole site would be preferable from an ecological perspective, focusing on the key habitat areas (as proposed) will be effective as long as key performance targets are met. Site-wide control would lower re-invasion pressure on these areas, however due to the continued mining disturbance in many areas across the site, establishing predator control may not be suitable to large parts of the site.

46. Grassland and vegetation clearance

Appendix M (section 5.2.6) recommends management steps to guide clearance of habitat suitable for grassland bird species (presumably including New Zealand pipit). **Is that part of the purpose of proposed Conditions 31-34 of Schedule 1**?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Yes, that is correct.

Appendix M (section 5.2) further recommends clear, permanent marking of the 100 m setback from mean high water springs (**MHWS**) and 30 m setback from perennial waterbodies to ensure compliance. **Who is this marking for – mining staff**? **Where are the conditions that implement this recommendation**?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The marking would be for the benefit of the mine staff and management given observance of the setbacks is a compliance matter. There are no conditions to reflect this recommendation because TIL advised that permanent marking/markers would be impracticable to install and maintain given the coastal dune environment, and there may be other ways of demarcating the setbacks eg GPS alerts. Further, given that the 30m perennial waterbody setbacks will be planted, it will be easy to discern the extent of that setback.

The report further recommends tailing cells are rehabilitated "as quickly as possible after mining operations in each area has finished". Noting Question 4, **which conditions implement this recommendation**?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The Site Rehabilitation Plan in condition 20 of the General Conditions will pick this recommendation up. The answer to Question 4 earlier also addresses this question.

Appendix N – Hydrogeology

47. Relationship with Appendix I assessment

Does the Hydrogeology assessment in Appendix N factor in effects associated with the level and rate of water take provided for under the consents for ship loading and mine operations (under AUTH142035.05.01 (Water Permit for Surface Water Take) or simply address groundwater drawdown resulting from pit excavation?

In short **how have cumulative effects from groundwater drawdown and surface water abstraction been considered in the effects assessment**?

Response on behalf of TIL:

Response prepared by Jake Scherberg and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

In summary, drawdown effects from mining are fundamentally separate from the surface water takes related to ship loading, meaning they do not combine to create a cumulative effect.

The surface water takes are not expressly included in the groundwater modelling assessment. The lake level was incorporated in the groundwater model as an external water source using the average water level of the lake. This reflects the fact that groundwater levels around the lake are governed by the lake level, which are tightly controlled by proposed consent conditions (specifically condition 7 and 10 of AUTH142035.05.01, and Schedule 1: General Conditions, Condition 17 relating to the Lake Level and Water Management Plan), while drawdown related to mining occurs adjacent to the mine and is not a function of lake level.

Clarification is required regarding water abstraction and water demand for the proposed sand mining.

Please provide a mine water balance for the groundwater drawdown and surface water abstraction in terms of critical water demand cases associated with slurry pipeline and sand processing needs.

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Given our response above, please refer to the discussion on the mine water balance in the responses to the Panel's RFI relating to Hydrology.

In the water balance assessment, please consider mine staging and demonstrate the feasibility of the proposed Wainui Stream augmentation.

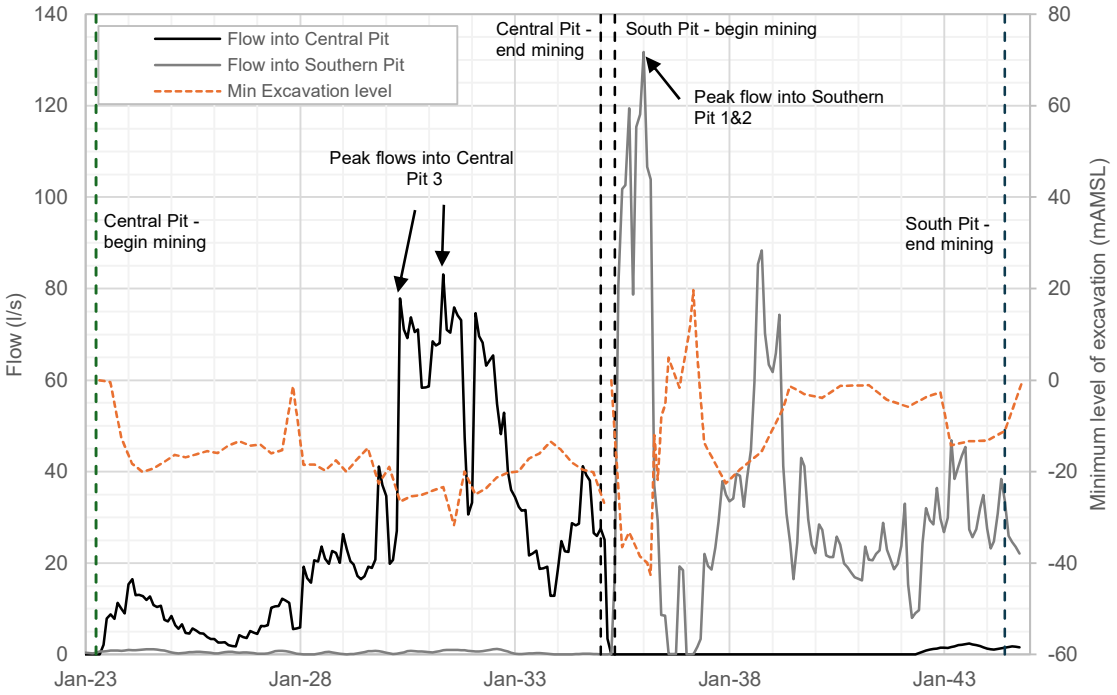
Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Existing conditions require that the total residual downstream flow in the Wainui Stream is maintained at a minimum of 34 L/s (specifically, this includes 24 L/s through the fish passage + 10 L/s through the weir). Situations where it becomes necessary to augment the Wainui Stream may arise if the lake recedes below the lowest allowable operating level due to a combination of heavy abstraction for mine processing combined with the onset of a prolonged drought. This has not occurred historically because of the large storage volume in the lake and the mine's ability to manage the take (i.e. processing takes cease if the water level approaches a critical low point).

If dewatering effects were to manifest on the Wainui Stream, there are times where all or most of the augmentation could be sourced from pit dewatering. For example, if the flow in the Wainui Stream dropped to half of the minimum requirement (17 L/s) the water sourced from pit dewatering would be fully sufficient for augmentation 68% of the time, as evidenced by the dewatering rates shown in the Figure below.

Any additional requirements for augmentation and maintenance of the residual flow in the Wainui Stream can be met by pumping from Lake Taharoa.



48. Borehole depth and data

Section 3.7.4.1 states that some of the permeability (hydraulic conductivity) values measured are unrealistically low and so have been ignored. **What are the potential risks or consequences of ignoring that data and on what basis is it valid to do so?**

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

The range permeability for the native materials is reasonably well established, and the majority of hydraulic testing found conductivities to be within this range. Ignoring extremely low values considered to be anomalies is reasonable because the low permeability materials are: (i) typically only thin localised lenses; and (ii) are homogenised during the mining process with the vast majority of the sandy materials, which are of significantly higher permeability.

We do not consider that any risk arises from ignoring these outliers.

49. Ground Water Model - Appendix A

Does the groundwater model include mining currently being undertaken in Pit 1 or planned in the Te Mania extension? How/does this affect the representativeness of the groundwater model developed for the wider area, particularly with respect to conservatism of predicted impacts?

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

The mining excavations that are included in the groundwater model are shown in Figure 11 of the Hydrogeology Assessment. The model developed reflects the current topography of the site, which reflects alteration by the existing mine. The predicted impacts are representative of the excavation depth and extent included in the proposed mine plan, which will supersede any current mining.

Section 3.2.2 states that the groundwater model is only 'partially' informed by piezometer readings - **why is that? Is this important or not?**

Section 5 of the hydrogeology report states the groundwater model is 'broadly' based on the conceptual groundwater model in Appendix A. **What does 'broadly mean'?**

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

With regard to the question about the model being 'partially' informed by piezometer data: We note that the context of the comment is that drilling results were used to inform the depth of the interface between Layer 1 and Layer 2 of the model. Since the drilling only provides information for a limited number of discrete locations, other sources (Geotechnics 2014) and interpretation of the geologic environment must be applied to complete the task of setting the position of the interface in the model.

Regarding the question 'What does broadly mean?': In this instance, 'broadly' refers to the high-level concepts underpinning the representation of hydrogeological conditions in the groundwater model, which are explained in the conceptual model. These include the materials being classified into two lithological units based on their respective hydrogeological characteristic, the geometry of the ironsand unit, and that percolation of rainfall is the sole recharge source.

50. Modelling assumptions

Section 4.2.1 states as an assumption inherent to the modelling that once a given area is excavated it will be backfilled with engineered landfill as the excavation proceeds to an adjacent area.

This point is repeated at e.g. sections 5.1 and 6.2 (top of page 32) and on that basis, for example, that stream base flows would return to their initial levels within e.g. 15 months of the backfilling.

What is this assumption based on and what condition of any of the consents would require such backfilling?

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

The assumption that excavated areas will be backfilled with engineered landfill is based on the backfilling process, which is undertaken via pumping of reject material (tailings) in a slurry to disposal areas, which are typically the mined out part of the working pit. This is standard practice in a sand quarry, and has been implemented throughout the history of mining operations at the site.

The mine is situated in a dynamic sand dune environment where changing topography is natural and continuous. There is no realistic way to predict topography in this environment, so we have assumed a landscape that approximates a smoothed or subdued version of the present conditions.

Rainfall recharge through the backfilled materials will be similar to the original materials, and once dewatering stops (due to mine progression), it typically takes 15 months for the

backfilling to be completed in an area, and by that time baseflows to adjacent streams have returned to normal. Groundwater recharge will not be affected in terms of the percentage of rainfall that percolates to the water table because the materials will be comprised of the same components (i.e. predominantly sand, with lesser silt and some clay) and given that the site is already an active mine, the ground conditions will not be materially different. Likewise, the pattern of groundwater flow toward the ocean with local convergence on the existing streams will not change.

The assumption that baseflow will return to its present level after mining and backfilling reflects that the source of flow, rainfall percolation, will continue and the materials that govern the flow will also return to approximate their pre-mining composition.

In a similar vein, the modelling assumes a continuous 20 year mine excavation proceeding according to the indicative mine plans as detailed in section 2.2 and included within Appendix B and C to this report . (Refer section 5.2 of the report). This includes a total of 20 years of mining activity (across the 35-year duration of consent sought), as summarised in Tables 7 and 8.

What conditions of which consents require that this mine plan sequence and timing be followed as modelled, and **what are the implications** in terms of the timing or duration of effects on groundwater connected wetlands (and/or for the proposed offset site 27) if that sequence is not followed?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

There are no conditions proposed that require the mine plan sequence to be followed. That sequence, as set out in the Substantive Application, is indicative for the purposes of assessing hydrogeological effects. In that regard, the spatial sequence and timing of mining is not important, rather it is the depth that mining occurs to that is most relevant.

Given the significance of the mining plan for the modelling and effects, and assuming the Substantive Application is to be granted, is there any reason why the Panel should not impose a condition requiring the timing and sequencing of the mining plan to be followed?

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Respectfully, the Panel should not impose conditions requiring the timing and sequencing of the indicative mine plan to be followed in general accordance. The timing of mine operations is subject to environmental and economic conditions that are inherently unpredictable. Any condition requiring adherence to specific timing and sequencing for mining would therefore be impracticable and would not reflect the practical realities of mining operations.

The effects predicted in the groundwater modelling assessment are predominantly governed by the excavation depth and the duration of maximum pit depth. The depth of the excavation is determined by the thickness of the ironsand layer (the resource) above the greywacke

basement material. The predicted maximum potential effects will be applicable when the prescribed excavation depth is reached and maintained for the duration of that mining stage.

The Panel could consider maximum depth constraints overall, and maximum depth and duration constraints within certain buffer distance of wetlands and the coast. However, a condition requiring that the mine plan that was applied in the modelling assessment dictate the mining sequence over the coming decades would not be a realistic or pragmatic.

For the 'baseline scenario' (section 5.2) **does a 22-year period** (historical) **go back far enough** to account for climate change in projecting forward (refer Hydrology Report, Appendix A to the report, page 20).

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Both extreme wet (2022) and extreme dry years (2013) were included in the data set used in the modelling assessment. As addressed in Attachment F – Hydrology response to TIL's response to comments in relation to flooding on Taharoa Road, climate change is expected to contribute a fairly benign annual and seasonal increase in rainfall. This makes the groundwater assessment conservative because groundwater recharge will be slightly greater than modelled under the climate change scenario. This implies that the modelled drawdown is greater than would occur under climate change.

It is understood that the mine pit dewatering drawdown predictions are based on the transient modelling runs extending between 2003 and 2046 (Table 4 of Appendix A).

Please demonstrate that the predictive modelling runs for the period 2026 to 2046 have considered reduced aquifer recharge and lake low levels associated with the 1:10 year and 1:50 year drought conditions. If not please run these cases.

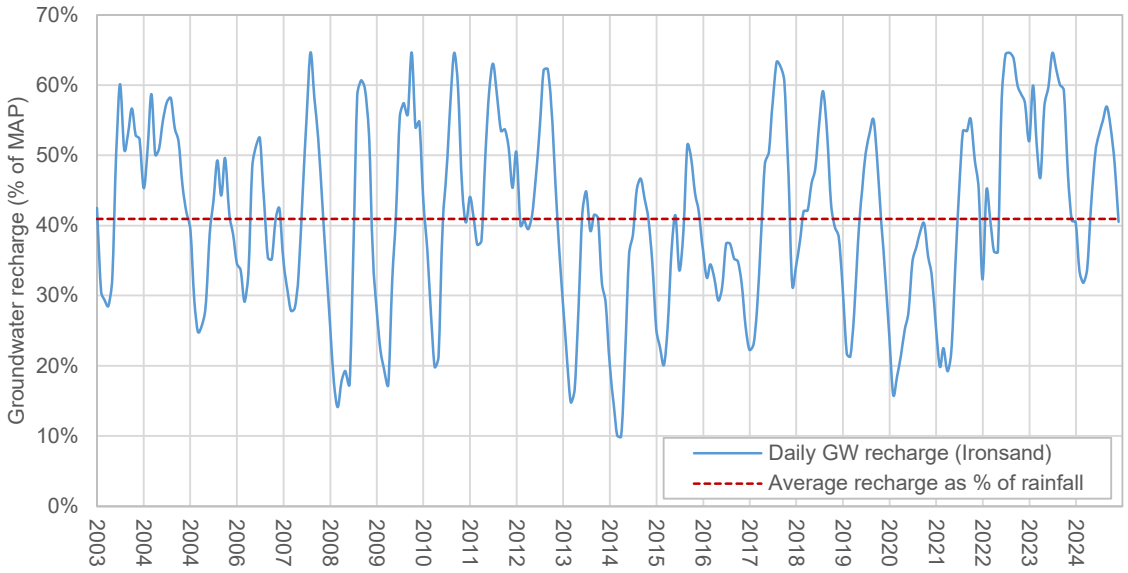
Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Rainfall was assessed over a 43 year period spanning from 1982-2024, as stated Section 3.1 of the Hydrogeology Assessment. The simulation period that was ultimately used for the groundwater model was the 22 year data set spanning form 2003-2024 due to the limitation of available PET data that is required to run the water balance model that generates recharge applied in the numerical groundwater model. The variation in recharge input to the model is shown in the figure below.

Based on the longer data set, the median rainfall was 1,199 mm. 2020 saw 885 mm of rainfall representing a 1:10 year drought and 2013 saw 839 mm of rainfall, which was statistically the closest year to a 1:50 year drought, calculated to have 823 mm of rainfall. Both of these years were included in the forward simulation applied for predicting effects. Since the 22 year data set was repeated twice, the 1:10 year drought was simulated in 2020 and 2042, and the 1:50 drought

was simulated in 2013 and 2035. Hence the recharge applied is representative of the specified drought conditions.



As previously stated, the lake was modelled as a constant head feature representing the average lake level. Variation of the lake level within a realistic range (0.3 m above and 0.3 m below the average, given an average seasonal range of 0.6 m) has negligible influence on the effects of mining on the basis that the hydraulic gradient (the slope of the water table) between the base of the mine pit and the lake is not materially different between a high lake level and a low lake level. Based on this, our analysis of groundwater drawdown and hydrological effects on surface water features is not sensitive to the observed seasonal variation of the lake level.

Will the existing and proposed new monitoring sites for the retained wetlands (as detailed on page 41) **be sufficient** to account for any predictive errors in the modelling and ensure an appropriate management response in the event that groundwater drawdown effects are greater than predicted through that modelling?

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Wetlands were grouped based on their location and hydrological conditions. The groupings were agreed upon by both the ecological and hydrological experts undertaking these assessments, and the monitoring locations are proposed for the most vulnerable wetlands within each of the groups, as explained in Section 6.3.2 of the Hydrogeology Assessment.
If there is a predictive error in the modelling assessment the effects will manifest first in the wetlands that have been selected for monitoring, and the response stated in the contingency measures provided in Section 3.4 of the draft Natural Inland Wetland and Buffer Management Plan will apply, which will by proxy mitigate any adverse effects on all wetlands in the affected group.

What is the significance of the 0.2m drawdown contour as a measure of where hydrological effects on wetlands might occur (as referred to at section 6.3.2 of the report) – i.e. why has 0.2m been selected as the drawdown contour threshold?

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

While there is no rigid, statutory national standard or metric, a 0.2 m predicted groundwater table drawdown is widely accepted as a pragmatic screening threshold to filter out wetlands where effects will be de minimis or negligible. The approach we have taken is supported by i) hydrological behaviour, and ii) RMA case law, expert witness consensus, and regional planning precedents.

Hydrological Behaviour: Palustrine and fen wetlands in New Zealand typically experience natural seasonal water table fluctuations ranging from 0.3 m to over 1.0 m. A modelled 0.2 m change is fully encompassed within this baseline. Furthermore, since shallow groundwater level change is typically three to ten times greater than the water level change in an open water body due to storativity effects of the aquifer materials in an unconfined aquifer, a 0.2 m change in groundwater translates to 0.02 to 0.06 m in water level, which is hydrologically unmeasurable.

The Aupōuri Aquifer Precedent (Environment Court & Expert Consensus). During the extensive hearings and expert conferencing for the Aupōuri Aquifer Water Users Group (AAWUG) and the associated Motutangi-Waiharara Water Users Group (MWUG) water take applications (which progressed through Northland Regional Council hearings into the Environment Court framework between 2020–2022), this exact topic was thoroughly canvassed.

- The "Seasonal Oscillation" Principle: In the technical evidence accepted during those proceedings, it was demonstrated that a predicted drawdown of <= 0.2 m sits entirely within the "background noise" of natural seasonal water table fluctuations. It was argued and accepted that such a minor variation is practically indistinguishable from natural seasonal oscillation.
- The Potential Wetland Risk Analysis Framework: The Joint Witness Statements (JWS) signed by experts representing the Department of Conservation (DOC), the applicants, and the Northland Regional Council (NRC) established a tiered risk matrix. Under this framework, wetlands with minor predicted drawdowns were categorised as low-risk and explicitly screened out from requiring detailed site-specific benchmarking or intensive ongoing Groundwater Management and Contingency Plans (GMCPs).
- Both Jon Williamson (co-author of this response) and James Blyth (author of the Hydrology assessment submitted by DOC in their comments on TIL's application) were participants in this case.

This 0.2 m threshold for wetlands effects assessments was supported in Section 4.2 of the Hydrology assessment (Appendix A to DOC's comments), where James Blyth wrote "I support the inclusion of the potentially affected wetlands (with water tables within 3 m of the land surface) and the identification of these sites from a starting drawdown of 0.2 m as an appropriate conservative measure by the WWLA modellers".

The standard was also implicitly supported by the WRC hydrologist Dr. Sung Soo Koh by stating, in Section 3.3 of the Hydrology Memo (Appendix B to WRC's comments), that he agrees with the "technical thresholds used to define these classes" in reference to the 0.2 m drawdown threshold."

Consenting could consider a maximum envelope of effects approach. Consent condition monitoring would simply ensure that all effects remain within the defined envelope.

To assess this option further please provide:

i) Maximum drawdown extend from all mine stages. A plot of maximum combined extent for drawdown contours plus groundwater level contours (in terms of RLm) required.

ii) Maximum dewatering levels (in terms of RLm) for the Central and Southern mine blocks.

iii) Maximum groundwater abstraction rates (understood to be 131.8 L/s)

iv) Maximum salinity of discharge water as measured by Electrical Conductivity (understood to be EC ≤ 1,000uS/cm).

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

i. The groundwater level (mRL) and cumulative drawdown (m) for key stages of mining defined by pit depth and proximity to sensitive receptors are **attached** to this document as **Appendix I**. The plans have been produced for the following times:
   - deepest operational pit in the Central Block (model time July, 2011);
   - deepest operational pit in the Southern Block (model time March, 2016);
   - operational pit closest to the coast (model time June, 2018);
   - operational pit closest to the Lake Taharoa area wetlands (model time June, 2016); and
   - operational pit closest to the wetlands south of Southern Block (model time May, 2024).

ii. Dewatering levels are shown in Figure 29 of the Hydrogeology Assessment – reproduced in the response to the third question under RFI 47 (refer to the orange trace corresponding to R axis). Also, the figures prepared above provide the groundwater levels during operation of the mine.

iii. Maximum groundwater abstraction is also shown for each pit in Figure 29.

iv. The maximum salinity of the discharge water (EC ≤ 1,000uS/cm) was defined on the basis of what could be considered freshwater, whilst recognising that the shallow groundwater is influenced by saline aerosols from the ocean.

Confirmation that the effects assessments provided are consistent with the maximum drawdown extent.

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

The drawdown effects presented in Section 6.1 of the Hydrogeology Assessment are based on the end time for the greatest pit depths of the mining sequence as provided by TIL. In addition, potential effects of each wetland and stream are considered in the context of the maximum drawdown of the particular feature that may occur over the course of the mining sequence.

The groundwater level and drawdown at times representing the peak of effects in different areas deemed to be potentially sensitive (i.e. Lake Taharoa area wetlands, Southern wetlands, the coastal environment) are shown in Figures A1-A5 of **Appendix I** to this response. In addition, a plan showing the maximum horizontal extent of drawdown that could occur at any one time, as defined by the 0.2 m contour is included as Figure A6 in **Appendix I** to this response.

Offsite bore impacts

Table 9 (section 6.1.2) identifies five neighbouring (offsite) bores for which only two are known to be used for community drinking water. **Were these five locations the only offsite receptors used to assess impacts? Are there likely to be any other offsite bores** in the study area?

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

Based on WRC data records and information provided by TIL, these were the only registered bores in the model domain which covered the entire area affected by drawdown.

Please also note that TIL fund and maintain the community water supply and wastewater treatment plant.

51. Groundwater Availability

No assessment of groundwater availability has been provided.

Please provide an assessment of groundwater availability in terms of the modelled maximum groundwater abstraction rate of 131.8 L/s (equivalent to 4,156,400 m^3/yr) and the Waikato Regional Plan.

Response on behalf of TIL:

Response prepared by Jake Scherberg, Senior Hydrogeologist, WWLA and Jon Williamson, Managing Director and Principal Hydrologist, WWLA:

The reason why no assessment of groundwater availability is provided is because the groundwater take is non-consumptive. For that reason, we did not consider such an assessment relevant.

Groundwater taken from the mine is ultimately discharged back into the aquifer via the tailings disposal system, discussed earlier and in the response to the Panel's RFI relating to Hydrology. Furthermore, the volume of water discharged back into the aquifer exceeds that taken by dewatering activities because the tailing slurry also includes mine operational water, which was originally abstracted from the Wainui River.

A further point to note is that the model has not included tailings disposal in the assessment. The inference of this is that the model is conservative in terms of drawdown extent, but unconservative in terms of dewatering rate (i.e. recharge from tailings would require a greater rate of dewatering to achieve a set drawdown point).

Appendix O – Archaeology

52. Destroyed sites

In discussing the attributes of the various archaeological sites recorded within the Central and Southern blocks on pages 49-68, there are repeated references to sites being "assumed" or "considered" or "believed" to be destroyed, sometimes in the absence of (what appears to the Panel) to be any direct evidence of that e.g. not all sites descriptions refer to on-site probing having been undertaken in the 2025 survey. Yet in Table 1, these sites are recorded as Destroyed without qualification. Does it necessarily follow that because sites are within areas that have been mined or subject to foresting activity, they have actually been destroyed? **For example, could a site simply be buried in tailings (now revegetated) and therefore be present and potentially affected by reactivating mining to deeper levels in these areas (e.g. in the Southern block area)?**

Response on behalf of TIL:

Response prepared by Glen Farley, Director, Clough & Associates:

It was recognised prior to the field survey, based on previous assessments undertaken for TIL, that a number of issues associated with the environmental context and history of land modification would make this project more challenging than many archaeological assessments in terms of accurately identifying archaeological sites during field investigation. The original archaeological records were created decades ago within a highly active dune environment, with many sites not subsequently revisited. Since that time, the landscape has

been substantially modified through mining and forestry activities, affecting the preservation and visibility of surface archaeological evidence.

Accordingly, the assessment and reporting incorporated a systematic review of landscape modification history, field observations, historic aerial imagery, and available archaeological survey data to provide a robust evaluation of the potential archaeological values within the project area. While the report does not document the full analytical process undertaken for each individual site, this reflects a reporting approach rather than an absence of assessment. Each recorded site location was considered on a case-by-case basis. A key component of the assessment was the systematic review of historic aerial photography and oblique imagery spanning multiple decades, referenced against recorded site locations and original site descriptions. This allowed changes in ground surface conditions and patterns of disturbance to be assessed through time across the wider landscape.

The imagery sequence reviewed included aerial and oblique photography from 1944, 1958 (oblique), 1961, 1974, 1975 (oblique), 1976, 1983, 1997, 2001, 2010, 2013, 2018, 2021, and 2023. The 1944–1961 imagery provides a baseline representation of pre-mining landform conditions across significant parts of the study area. From the early 1970s onwards, the imagery documents the commencement and progressive expansion of mining-related disturbance, including extensive excavation and landscape reconfiguration.

Oblique aerial photographs from 1975 were particularly informative in demonstrating the scale and depth of excavation in the early stages of mining activity. Excavation resulted in ground reduction of several tens of metres in places. Importantly, this disturbance was not a single event but a progressive and spatially shifting process, resulting in repeated and cumulative impacts across different areas over time. When considered alongside forestry operations and ancillary mining activities, this imagery sequence provides strong evidence for extensive and repeated landscape modification across the recorded site locations. This supports the interpretation that many sites within the Central and Southern blocks have either been removed or substantially truncated to the extent that they no longer retain archaeological integrity. The possibility that archaeological material may have survived through burial beneath later tailings or redeposited soils was explicitly considered. However, the scale, depth, and cumulative nature of disturbance documented from the 1970s onwards significantly reduces the likelihood that intact in situ archaeological deposits remain within the affected areas.

Accordingly, the “destroyed” classification represents a reasoned archaeological interpretation based on cumulative landscape change, supported by a long-term photographic record, field observations, and review of available archaeological information. This interpretation necessarily relies on remote assessment techniques, including comparative aerial imagery analysis and documentary sources, consistent with standard archaeological practice in extensively modified landscapes.

Pages 63 and 64 of the report record that sites 153, 154 and 156 were not able to be "safely accessed" during the 2025 survey. Given these sites are within the Te Kapua Reserve, **why could they not be accessed?**

Response on behalf of TIL:

Response prepared by Glen Farley, Director, Clough & Associates:

Sites R16/153, R16/154 and R16/156 were not able to be safely accessed during the 2025 survey due to the presence of livestock. Specifically, a number of bulls were present within the area at the time of inspection. As a result, direct physical inspection of these sites was not undertaken on safety grounds.

Site 327 appears to be a highly significant site including recorded presence of human bones which are assumed to have been removed (collected by elders with reburial elsewhere - see page 65 and with page 81 saying that it is assumed that all known kōiwi were interred in the nearby reserve at that time).

Page 65 also records that it is "thought that" the grid coordinates are not accurate and that the site is actually situated slightly further to the east, just within the reserve.

Given the significance of the site, and rather than relying on accidental discovery protocols, **shouldn't steps be taken to ensure that all bones have actually been recovered and appropriately interred** before works recommence in the Southern block area?

Response on behalf of TIL:

Response prepared by Glen Farley, Director, Clough & Associates:

Site R16/327 is identified as a significant archaeological and cultural site due to the recorded historic presence of kōiwi. The available records indicate that kōiwi were recovered by elders at the time of identification and reinterred at an appropriate nearby location.

R16/327 is explicitly identified within the archaeological authority application and is subject to specific conditions and controls under the archaeological management plan. These include requirements that all personnel undertaking works in the vicinity are briefed on archaeological and cultural heritage requirements prior to works commencing.

The management framework does not rely solely on accidental discovery protocols. It provides for proactive archaeological management, including the requirement that the recorded location of R16/327 is subject to machine stripping under archaeological supervision. This ensures that initial ground disturbance within the defined risk area is actively monitored, allowing for immediate identification and appropriate management should any subsurface cultural material be present.

The protocols proposed within the Archaeological Management Plan, and approved by Heritage New Zealand Pouhere Taonga as part of the archaeological authority process, are standard archaeological management measures for works in the vicinity of sites where there is a known or potential presence of kōiwi.

A number of intact sites (sites 135-143) are recorded and referred to on pages 67-68 – all of which are said to be outside the mining lease area. They are nevertheless within the consented area. Table 2 of the report assumes that these sites would not be affected (as does the subsequent assessment of effects on pages 74-78). **What guarantee is there that there would not be mining activities outside the lease area?**

Appendix P – Preliminary Site Investigation

Section 2.3 identifies an "area of stockpiling and storing old materials". Table 3 and Figure 2a in Appendix A identify this activity as waste being disposed to land.

a. Please clarify the nature of this activity.

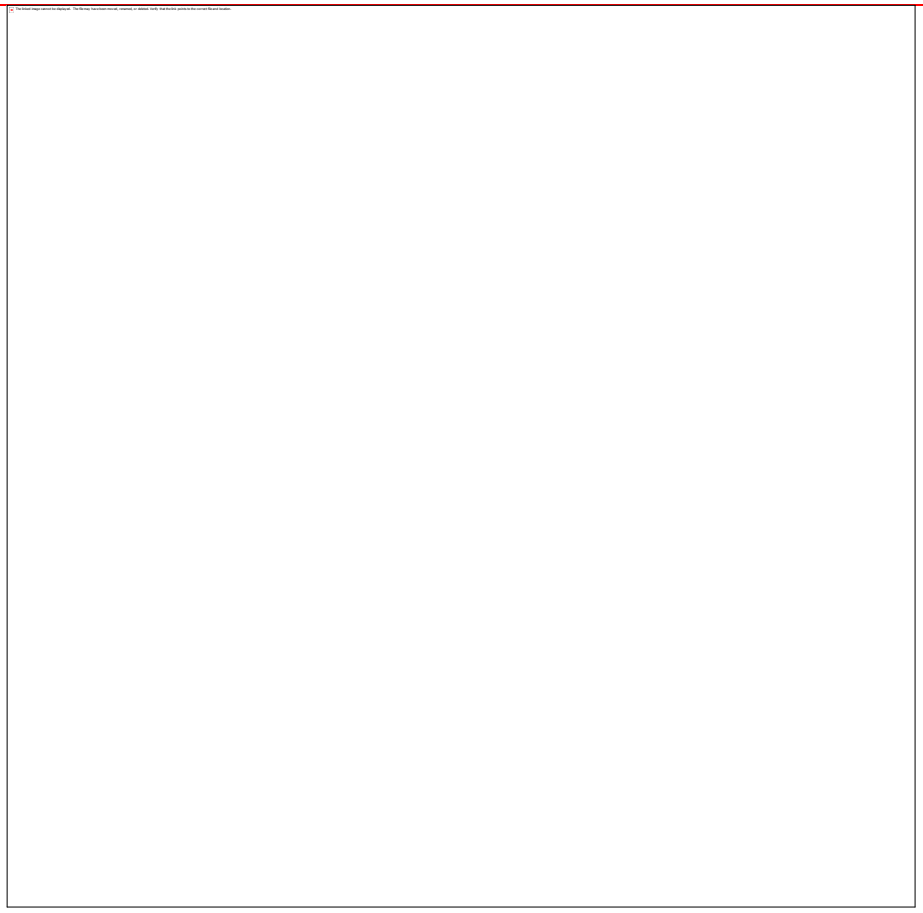
b. Is consent required for discharges to land from such onsite disposal and is it to be sought now or pursuant to the conceptual site closure plan?

c. Is this waste explicitly addressed in the site rehabilitation plan?

Matter (a)
A description of the stockpiled waste is covered in Section 2.3 of the PSI and includes:

An area for stockpiling and storing old materials is located south of the administration block.

This includes steel, pipes, treated timber pallets and poles, empty IBCs (intermediate bulk containers), appliances including washing machines and fridges, vehicle engines (refer Photographs 5 and 6 below). No materials have been intentionally buried, however some windblown sand now partially covers some waste materials.



Based on the information available for the PSI, HAIL Activity G5: *Waste disposal to land* was assigned to this area due to partial soil cover of the stockpiled waste material. However, this material may be taken offsite and recycled so it may not be permanently retained on site.

Matter (b)

There are no resource consent requirements for discharges from this part of the site under the Waikato Regional Plan as no actual disposal of waste is occurring. Any necessary consents required for soil disturbance at the time of site closure will be sought under legislation in place at the time.

Matter (c)

The stockpiled waste is not explicitly covered in the Site Rehabilitation Plan. However, it is addressed in the Site Closure Plan which sets out the closure processes which will occur at the end of the commercial life of the mine. All plant, materials and infrastructure will be shut down and removed progressively, and land disturbed by mine operations will be restored to a state consistent with the surrounding environment. A schedule and specific sequence of closure will be determined as the closure date approaches.

In addition to the management and disposal of the waste material, soil will need to be considered. The PSI concludes that the NES CS will be applicable to any soil disturbance areas that intersect the HAIL areas identified on Figure 2a and Figure 2b of the PSI. This will include a requirement for site investigation that will inform soil management procedures (and remediation, if required) and suitable disposal facilities of soil (if appropriate).

Appendix Q – Coastal Processes Assessment

(including Appendix FF – Discharge Dispersion Modelling Assessment)

53. Sediment characterisation

Appendix Q appears to use the terms “sediment” and “sand” interchangeably – referring to the along shore transport of “sediment” at 620,000 m^3 per year to the north and 440,000 m^3 per year to the south in the Executive Summary, while section 3.3.3 refers to those same volumes of “sand” rather than “sediment” being transported north and south.

Section 3.5.1 refers to “sediment” delivery to the coast from the rivers and harbours within 100 kms of the site.

Section 4.2 compares the volumes of sediment discharged into the coastal marine area via the de-watering plume, in comparison with gross along shore sediment transport, and sediment delivery to the coast from the rivers and harbours.

However, section 4.3 explains that sediment discharged from the stormwater ponds would be a combination of sand and silts, compared to the plume from ship loading which is “primarily silts that leak out through decanting”. Appendix GG (Marine Mammals Assessment) refers to this material as “clay” (section 2.3).

The Panel queries whether it is valid to use the terms “sediment”, “silt” and “sand” interchangeably and specifically whether the nature of the “sediment” discharged in the plume is comparable in characteristics to the type of sediment (presumably sand) transported up and down the coast by wave action or discharged from rivers and the harbour.

These comparisons are important given the emphasis in Appendix Q on putting the volume of “sediment” discharged from the ship during ship loading (via the plume) into their natural context.

Please clarify and explain any differences in characteristics between the type of sediment naturally transported or discharged into and along the coast, from the sediment discharged during ship loading.

The point is also relevant in terms of comparing the concentrations of naturally suspended sediment as measured offshore and in the beach areas referred to at section 3.5.2 of Appendix Q, with the sediment concentration assumed in the discharge modelling as referred to at section 2.1.1.

Response on behalf of TIL:

Response prepared by Eddie Beetham, Senior Coastal Scientist, Tonkin & Taylor Limited:

Standard terminology has been used in reference to sand and sediment. There is some interchangeability, for example alongshore sediment transport calculations were based on sand size material but the standard term for this is still alongshore sediment transport. Where available, the actual or assumed grain sizes or sediment size classes are presented in the report

Calculations of alongshore sediment naturally transported resulting in values of 620,000 m^3 per year to the north and 440,000 m^3 per year to the south were based on *fine sand size grains* with a median grain size of 0.15 mm and density of 2,700 kg/m^3. This was informed by the grain size review presented in Section 3.3.1 'Coastal Morphology' section of the report. If a smaller grain size were used in these calculations, the alongshore transport rates would be higher. If a larger grain size were used the alongshore transport rates would be lower.

Since the sediment being released by the de-watering plume and stormwater management is finer (e.g. more silt fraction), the comparisons made to the capacity of the natural process environment to transport the released sediments is conservative.

In terms of sediment delivery to the coast, there is little information on the composition of grain sizes, but this would likely be a mix of sand and silts.

54. Consents sought

Why is there no increase in the proposed volumetric flow of dewatering fluid (maximum 7.5 million m^3/year) when exported product is projected to increase by 39% (3.6 million tonnes/year -> 5 million tonnes/year) for increased ship loading (from 24 to 35 ships) per year?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Because TIL do not at this time envisage that any greater volume of water take will be required, taking into account water efficiency measures implemented at the site on an ongoing basis. I note that whether or not the parameters of the consents sought in terms of overall take and discharge volumes are sufficient to cater for the applicant's planned increase in production and associated ship loading events, is not a matter that the Panel needs to consider. The risk of not having enough water to cater for increased production resides solely with the consent holder, and there must be a presumption that the consent holder will comply with consents granted and any associated conditions.

Clarify/confirm consent is sought for:

- **Maximum annual discharge of 7,258 m^3/year of sediment to the coastal marine area**

  Estimated from (fine-grained) sediment in **dewatering** (**5,250m^3/year** in section 2.1.1) **plus** (coarse-grained) sediment in **process water** (**2,008m^3/year** = daily discharge in section 2.1.2 of 5.5 m^3/day x 365).

- **Maximum daily discharge of 37 m^3/day sediment to the coastal marine area**

  Estimated from (fine-grained) sediment in **dewatering** (**14 m^3/day** = 5,250m^3/year ÷ 365 days/year) **plus** (coarse-grained) sediment in **process water** (**23 m^3/day** maximum during high rainfall events in section 2.1.2).

Where are the monitoring and reporting requirements to support these, and the maximum discharge limits in Condition 2 and 3 of AUTH142035.12.01 (Coastal Permit Discharge to Water) being enforceable conditions of consent?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

General Conditions 44 and 45 – Annual Monitoring Report, which must be prepared and submitted to WRC each year for the 12 month period ending 30 June. The Annual Monitoring Report must (amongst many other things) as a minimum (a) detail all environmental monitoring undertaken and (b) summarise all the data and information required to be collected by these consents. The Annual Monitoring Report has proven to be an effective compliance reporting mechanism over several decades.

Where/how exactly at the mooring buoy (Executive Summary, Appendix Q), via the export pipeline (page 20, Appendix Q), **does the *process water* discharge to the coastal marine area**? Is there a figure or photograph of this showing the height above sea level for this discharge?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

TIL advise that the process water is discharged from the SBM at sea surface level.

55. Sediment deposition rates

The Panel has compared the de-watering plume deposition rates summarised in Table 4.2 of Appendix Q with the information in Appendix FF (section 3.4) and cannot readily track the figures stated in that table (and discussed at the bottom of page 18 through to page 19 of Appendix Q) with the information in the Discharge Dispersion Modelling Assessment.

Please explain how the information in Table 4.2 (Appendix Q) **was generated** based on the information presented in section 3.4 of the Discharge Dispersion Modelling Assessment (Appendix FF).

Response on behalf of TIL:

Response prepared by Eddie Beetham, Senior Coastal Scientist, Tonkin & Taylor Limited:

Figure 4.2 of the Appendix Q (Coastal Processes report) was created using the same underlying data that is presented in Figure 3.17 of the Appendix FF Discharge Dispersion Modelling report. The two figures show the same data but use different colour scales so it may look slightly different.

Table 4.2 of Appendix Q is a GIS calculation of the area of harbour where deposition exceeds different grain size levels.

56. Modelled discharge rates

In section 4.2 of Appendix Q (at the top of page 18) information is presented as to the modelling assumptions applied in Appendix FF for each of the 3-month periods modelled in that report.

The summary in Appendix Q records that for each of the modelled three-month winter and summer periods, 12.5 de-watering events (each being at 15,000 m^3 over 48 hours) were included in the model.

This can be compared with the information at section 2.2.4 of Appendix FF (12.5 discharges per three-month period, with each event being over 48 hours and a total of 150,000 m^3 per discharge).

(It is assumed that the reference to 15,000 m^3 in Appendix Q is a typo and intended to refer to 150,000 m^3 over 48 hours, being the daily limit of 75,000 m^3 per day x 2).

However, the Panel understands from page 43 of the Substantive Application, along with the information presented on page 21 of Appendix I (Hydrology Assessment), that 35 ship loading events per annum are proposed (following expansion in operations) with each event occurring over four days (rather than two). That is 35 days of discharge per quarter, not 25 as assumed (i.e. 12.5 events, 2 days per event).

On that basis, sediment loading would occur approximately every three days during a given three-month period, not every six days as assumed in the Discharge Dispersion Modelling Assessment report and Appendix Q (coastal processes assessment), as well as Appendix V (Marine Ecology assessment) in turn.

The Metocean modelling appears to apply the correct fraction of the 7,500,000 m^3 annual volume for each three-month period (1,875,000 m^3) but not the correct number of days per three-month period or volumes released over the four days of each discharge event.

The authors of these reports are requested to clarify the situation and advise as to whether this makes any difference to the information presented in these reports as to concentrations of sediment in the water column, and at the surface of the seabed including in the Aotea and Kawhia harbours.

Response on behalf of TIL:

Response prepared by Eddie Beetham, Senior Coastal Scientist, Tonkin & Taylor Limited:

It does appear that reference to 15,000 m^3 at the top of page 18 in Appendix Q is a typo and should be 150,000 m^3 as referred to earlier in Section 2.2.1 of Appendix Q.
From a coastal process perspective, the MetOcean modelling represented the annual discharge volume and the relevant seasonal influence on dispersion with suitable practical staging of release events. It is very unlikely that the results would change in any meaningful way if the same annual volume was released over events spanning 2 or 4 days and spaced every 3 or 6 days. Operationally, it is not practical to model a 4 day operation spaced every 3 days, so the modelled configuration is a practical and suitable scenario of the consent being sought.

Response prepared by Brett Beamsley, General Manager, MetOcean Solutions:

The modelling was set up to simulate the maximum daily discharge volume of 75,000 m^3/day. In the model, this was represented as a two-day discharge event occurring every six days, resulting in a total discharge of 150,000 m^3 per event. This approach appropriately represents the maximum daily discharge and is considered a conservative modelling scenario.

If the same total discharge volume of 150,000 m^3 were released over four days, the daily discharge rate would be approximately half that used in the modelling, resulting in lower suspended sediment concentrations and greater dilution during the discharge period. The results presented in the MetOcean modelling report demonstrate the rapid dilution and dispersion of the sediment plume. Modelled suspended sediment concentrations decreased to below 0.2 mg/l one day after the discharge ceased and to below 0.1 mg/l after two days (Report Figures 23.7 and 3.13).

The total annual sediment discharge volume would remain unchanged. Therefore, the predicted annual patterns of seabed deposition are not expected to differ significantly whether discharges occur every six days or every three days.

From an operational perspective, the dewatering process is expected to take approximately 18 hours to complete. The discharge schedule adopted in the modelling therefore represents the most realistic operational scenario.

Attachment C to the Applicant's response to comments in relation to Coastal Processes includes a number of responses to comments made by Natasha Willison-Reardon/Mirumiru Pā ki Marokopa – Marokopa Marae) relating to that invited party's concerns about potential impacts of sand extraction on the coastline/coastal processes at Marokopa and on the beach profile at Taharoa.

The response advises that monitoring of beach profiles is not necessary because the mining activity has *negligible* effect on the active dune system and that there is "no effect" of the sand mining activity on the littoral sand budget between Taharoa and Marokopa.

In dealing with the section of the coastline between Marokopa and Kawhia more broadly, the report states that TIL's operations export *land-based* sediment deposits and therefore have no "material" effect on the littoral drift sediment budget between Marokopa to Kawhia.

The report author is requested to confirm that:

- **There is no mechanism by which a land-based sand mining activity at the scale proposed could have an impact on the active dune system/beach profile (at Taharoa in particular).**
- **Similarly at Marokopa, including in response to the stated concern that up to 4 million tonnes a year is extracted at Taharoa (a further 140 million tonnes proposed over the next 35 years), and the suggestion in the comments that the mining operation intercepts and permanently removes sand, thereby gradually depleting sand available to Marokopa's beach and dune system (longshore drift row of this invited party's comments table).**

Response on behalf of TIL:

Response prepared by Eddie Beetham, Senior Coastal Scientist, Tonkin + Taylor Limited:

In response to the above questions:

- Over a 35 year consent period of the mining activity, the mining site is setback sufficiently from the active coastal environment so there is no mechanism by which a resulting volumetric deficit will impact the active beach.
- The export of land based iron sands from Taharoa will not influence coastal dynamics at Marokopa over the 35 year consent.

Appendix R – Geotechnical Assessment

57. Conditions

The summary and conclusions (page 14) record that the proposed pit slopes up to 60 m height are expected to perform acceptably provided slopes are limited to 33° /30 (Te Ake Ake/Mitiwai respectively); the 30 m buffer separating the crest of pit slopes from perennial waterways is implemented along with a 20 m buffer adopted between the crest of pit slopes and archaeological reserves etc.

In addition, the report refers to weekly monitoring of the mining areas with annual independent geotechnical reviews of ponds and tailings to include pit slope performance in proximity to property boundaries and reserves.

Where are these requirements referred to in any of the proposed conditions or management plans (noting Condition 1 (f) of proposed AUTH142035.01.01, Land Use Consent covers mapping of the buffer area for urupā and wāhi tapu sites) and the general requirements of Condition 4 of proposed AUTH142035.08.01, Discharge to Land and Condition 9 of Schedule 1)?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The conditions noted in the question are all of the relevant conditions. These are considered sufficient to address the matter, noting that (with the exception of Condition 1 (f) of proposed AUTH142035.01.01) these conditions have been in place and effective for at least 20 years.

Appendix S - Air Quality

58. Representative Receptors

How have the 'Representative Receptor' locations shown in Figure 6 (and listed in Table 2) **been identified**?

Response on behalf of TIL:

*Response prepared by Andrew Curtis, Air Quality Consultant, Pattle Delamore Partners (**PDP**):*

A combination of site visits, including one undertaken on 17 March 2025, and a desktop GIS study were used to inform a selection of discrete sensitive receptors that are deemed to be representative of the sensitivity of the surrounding environment to air quality effects.

What about the structures that appear to be residences at the southern end of the site?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

The relevant Waikato Regional Plan rule refers to effects beyond the boundary of the site – as the structures are within the application site it is not appropriate to use them as Representative Receptors. Further, the structures are located within the Taharoa C Block, and the owners of the Taharoa C Block have provided written approval to the application (as appended to the Substantive Application Report).

59. Historical (TSP) Monitoring

Section 5.1 refers to a colocation study between one (only) of the nephelometers in December 2020. How long was the study undertaken for? If less than a year, how representative is the developed K-factor for other time periods and other locations? **What confidence intervals should be applied** to the TSP data presented in this assessment?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP, based on additional information supplied from Paul Baynham, Senior Scientist, Mote Limited (Mote is TIL's current dust monitoring provider):

The co-location site that was selected was near the airfield, situated to the south of the Central Block. I understand that one of the reasons this site was selected was proximity to a mains power supply which was not powered by a portable diesel generator (unlike many other powered sites around the mine). Mains power is required for the higher airflow of a reference-grade air quality monitor whereas the non-reference ES-642 monitors can be solar powered. The airfield monitoring site is typical of the Taharoa area although is possibly more exposed to the south-westerly winds than other Taharoa non-reference grade monitoring sites. A comparison of the co-located site with other nephelometers during the study period revealed generally similar hourly and daily concentrations across the monitoring locations.

The period of the co-location study was between 14 February and 13 April 2020 (mid-late summer). During this period, higher air temperatures coupled with low soil moisture content often result in higher TSP concentrations during windy conditions than what would occur at other times of the year. Mote notes that correction factors (K-factors) determined during this time period are higher than during wetter periods as denser particulate matter has a greater likelihood of becoming airborne primarily due to low soil moisture content.

If it is assumed that the site is relatively homogenous and that the period of co-location (late summer) is typical of the remainder of the year, then Mote calculates a 95% confidence interval for the 60 data points of +/-22% with upper and lower bounds of +/-16 to +/-29%. This reduces to +/- 20% (15-24) if one outlier is removed.

Given the differences in the time series data presented in Figures 8-10, **what are the % valid data for each of the monitoring sites presented in Table 5**? **What mining activities were being undertaken** in relation to these monitors during this period?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

The TSP monitors described in the Air Quality Assessment (**AQA**) (Appendix S to the Substantive Application Report) and in PDP's response to comments (Attachment J to the Applicant's response to comments) have been operating across a number of years.

Table 4 shows the date range of the TSP dataset for each monitor used for analysis (reported at Tables 5, 6 & 9 of the AQA), as well as the percentage of valid data within this date range.

Summary of TSP Monitoring Data			
Monitor	Data Range		
	Start Date	End Date	Valid data capture (%)
MP1	1/07/2023	31/01/2025	92.4%
MP2	1/07/2023	31/01/2025	90.3%
MP3	1/07/2023	31/01/2025	88.7%

MP4	1/07/2023	31/01/2025	95.4%
MP5 (Location 1)	1/07/2023	26/07/2024	95.5%
MP5 (Location 2)	27/07/2024	31/01/2025	85.8%
MP6	1/07/2023	31/01/2025	93.2%
MP7	2/10/2024	31/01/2025	99.97%
MP8	2/10/2024	31/01/2025	99.97%

With regard to the mining activities, a PDF presentation prepared by TIL has been included with the response to RFI as **Appendix J**. This presentation sets out what, where, and when mining activities were undertaken during the dust monitoring data analysis period.

Section 7.2 states that Table 9 shows the mean 1-hour average TSP concentrations across all monitors "*are well below the MfE suggested trigger level of 200 µg/m^3*". **Is this supposed to be referring to Table 5?**

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

Yes, this is an error, and the text is supposed to refer to Table 5 of the AQA which shows that typical (mean) 1-hour average TSP concentrations at all monitoring locations were well below 200 µg/m^3.

If so, **what is the purpose of this comparison** of the MfE suggested trigger level as a 1-hour mean with data averaged over 1.5 years (1 July 2023 to 31 January 2025)?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

The purpose of this comparison at section 7.2 of the AQA (with reference to the Intensity factor of the FIDOL assessment) was to describe the typical short-term intensity of dust (as an 1-hour average concentration), with the values compared to the MfE suggested trigger level as a guide. For greater context, AQA Table 5 also presents the 75th percentile, and 99th percentile 1-hour average values across the datasets. Further analysis of individual 1-hour periods that exceeded the MfE suggested trigger level is provided at Table 6 and Table 9 of the AQA.

Table 9 shows the MfE suggested trigger level as a 1-hour mean was exceeded a total of 98 times over the period of monitoring (approximately 1.5 years) at monitors MP2, MP3, MP4 and MP8. Please describe available monitoring data in comparison with the *daily* suggested MfE trigger level for TSP of 60 µg/m^3 and provide an assessment of the implications for chronic impacts.

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

The below table shows the daily 24-hour average TSP concentrations for the monitors nearest to off-site receptors (MP2, MP3, MP4 & MP8). These daily averages have then been compared to the MfE suggested trigger levels for assessing chronic dust effects in high sensitivity environments (dwellings, 60 µg/m^3) and moderate sensitivity environments (rural areas, 80 µg/m^3). The date ranges for this data are provided above.

TSP Monitoring Daily Averages and Exceedances

Monitor	Daily Mean (µg/m³)	Number of days with valid data capture	Daily exceedances high sensitivity (60 µg/m³)		Daily exceedances moderate sensitivity (80 µg/m³)	
			Number	%	Number	%
MP2	10.8	518	15	2.9%	7	1.4%
MP3	9.1	503	5	1.0%	1	0.2%
MP4	12.2	550	15	2.9%	10	1.9%
MP8	9.4	121	1	0.2%	0	0%

The above table demonstrates that exceedances of the MfE suggested daily average trigger levels occur very rarely. Many of the trigger level exceedances occurred at all of the monitors at the same time, which indicates that these were likely caused by specific meteorological conditions and/or background sources rather than activities from the mine.

Figure 8 shows at least 3 exceedances of 200 µg/m^3 *as a daily average* at MP1. **Why was MP1 not included in Table 9? Did any of the other monitoring locations record exceedances** of the MfE suggested trigger level as a 1-hour mean (other than those presented in Table 9)?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

Table 9 of the AQA sets out the recorded 200 µg/m^3 exceedance events. The AQA states (below Table 9) that "as *shown in Figure 7, these monitors* [MP2, MP3, MP4, and MP8 included in Table 9] *are closest to the nearby receptors and PDP considers these are the most representative of the 1-hour average TSP concentrations expected at the nearest receptors*."

Monitor MP1 is located on the edge of a tailings area in the Eastern Block (which does not form part of the application area) and therefore I consider this monitoring location is not representative of TSP concentrations at the Taharoa township caused by mining activities undertaken within the Central and Southern blocks. For this reason, it was excluded from the analysis presented in Table 9.

1-hour average data for each of the monitors is summarised in Table 5 of the AQA. The monitors nearer to the operational areas not included in Table 9 (MP1, MP5, MP6, and MP7) did record exceedances of the MfE suggested 1-hour average trigger level. Table 6 of the AQA also presents the percentage of time that every monitor recorded data below the MfE suggested trigger level of 200 µg/m^3.

60. Stokes Law

The air quality assessment (Appendix S to Substantive Application) and Attachment J to the Applicant's response to comments in relation to Air Quality include multiple figures purporting to present deposition distances for various size particles using Stokes' Law. None of these figures include a particle size for PM_{10}. **Why was PM_{10} not included in these presentations?**

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

I consider there is a very low abundance of sub 10 µm particles discharged from the site. The particle size distribution analysis undertaken to respond to comments (Section 5.1 of Attachment J to the Applicant's response to comments) supports this. The Stokes' Law analysis presented at Figure 16 of the AQA and in Appendix A to Attachment J of the Applicant's response to comments includes 20 µm particles.

Stokes' Law is derived under very specific conditions, most of which do not hold in the real atmosphere. **Please explain the limitations of Stoke's law and justify its application** in an air quality assessment so that it does not systematically underestimate transport distances and therefore underestimate the spatial extent of impact.

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

I acknowledge that Stokes' Law is a model of particle dynamics derived under a set of assumptions that does not fully represent the complexity of atmospheric particle transport. These assumptions include spherical particles, laminar flow around the particle, low particle Reynolds numbers, isolated particles, and constant air conditions. In reality, particles have irregular shapes with varying densities and moisture contents, as well as being affected by wind turbulence, surface roughness and topographical influences.

Notwithstanding these limitations, I consider that there is currently no more reliable or widely accepted screening-level method available for estimating the potential transport distance of deposited particles. I therefore consider that Stokes' Law remains a well-established and useful approach for indicating the likely transport distances of different particle size fractions under different wind speeds.

Furthermore, I consider that the limitations of Stokes' Law do not necessarily result in a systematic underestimation of transport distances. While wind turbulence may in some circumstances increase the distance travelled by particles before deposition, other real-world factors such as particle agglomeration, screening by vegetation and structures, site and surrounding environment topography, and faster gravitational settling of non-spherical particles can reduce transport distances compared to the distances estimated by Stokes' Law. The resulting impacts of these processes vary with particle properties and environmental conditions and therefore cannot be accurately quantified using a simple screening level equation. Consequently, Stokes' Law is used as a first-order estimate rather than either a conservative or non-conservative model of transport distance. I acknowledged this assumption in the response to comments (Attachment J to the Applicant's response to comments) and has used the Stokes' Law calculations as one component of the overall assessment methodology, rather than relying on the calculated transport distances as a definitive prediction of particle behaviour to assess the potential for effects to occur off-site.

61. Particulate discharges to air

From a public health perspective, the key pollutant of interest in discharges to air from mines and quarries is particulate matter less than 10 micrometres in diameter (**PM_{10}**) (MfE 2016).[12] The Panel notes Appendix S and Attachment J do not provide any information on the scale or significance of PM_{10} discharges to air from the proposed mining operations despite these being readily estimated from published emission factors (e.g. US EPA AP-42 or Australian National Pollutant Inventory Emission Estimation Technique Manual for Mining).

Using published emissions factors for mining activities please calculate (in table form) how much PM_{10} is discharged to air from the existing and proposed mining operations (in kg/day and tonnes/year) from the proposed stages of mining operations in the central and southern blocks.

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

I do not consider that estimating PM_{10} emissions using generic emission factors from AP-42 or the Australian National Pollutant Inventory (NPI) guidance would provide a reliable or

[12] Ministry for the Environment, 2016. *Good Practice Guide for Assessing and Managing Dust*. Wellington. November. [Online]

meaningful estimate of PM_{10} discharges from the proposed mining operations. Further, I agree with the Good Practice Guide for Assessing and Managing Dust (MfE, 2016) that such theoretical quantification of potential PM_{10} emissions is not useful for the purposes of assessing off-site effects and prioritising mitigation, and that it is more appropriate to focus on methods to control dust at the source instead.

The emission factors published by AP-42 and NPI guidance are derived from datasets collected at a range of American and Australian mining and quarrying operations with material characteristics that are likely to differ substantially from the on-site material. In particular, they do not likely to account for the site-specific properties of iron sand deposits, which, as indicated by PDP's PSD analysis, have relatively coarse particle sizes and contain a lower proportion of fine material. The density of materials at the site also differs from the quarrying operations that informed these theoretical emission factors.

Therefore, I do not consider that such calculations would provide a robust or useful basis for assessing potential air quality effects from PM_{10}.

I acknowledge that the AQA did not contain a detailed assessment of PM_{10} as I consider the key potential off-site effects to occur are from nuisance dust. This consideration remains unchanged, however for public peace of mind and completeness, PDP undertook an assessment of potential effects from PM_{10} discharged by mining operations as part of the Applicant's response to comments, and TIL has agreed to replace the current on-site TSP monitoring with PM_{10} monitoring and install a reference grade PM_{10} monitor off-site. These monitors will be used to monitor the potential effects at the Taharoa school from mining operations and have been included in the draft consent conditions.

It would be helpful, to identify PM_{10} discharges to air from existing consented activities (Pit 1 and Te Mania Extension) separately.

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

Given my response to the Question 63 of this RFI, theoretically estimating PM_{10} discharges to air from existing consented activities (Pit 1 and Te Mania Extension) is not warranted as there is no reliable way to do this that is specific to the site conditions. Without site-specific PM_{10} monitoring, of which none has been undertaken to date, PDP is unable to quantitatively assess the potential PM_{10} discharges from these two areas. In addition, and as noted in the question, Pit 1 and the Te Mania Expansion areas are not within the scope of the Central and Southern Block Mining Project application.

For these reasons, PDP has not estimated PM_{10} discharges to air from these areas.

62. PM_{10} assessment

What was the minimum sieve size held by the Geotechnics laboratory that undertook the (sand grab sample) size fraction analyses? **What is the relevance of this size fraction analysis** of sand samples to PM_{10} discharges *to air* (e.g. generated by vehicle tracking) from the site?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

The minimum sieve size held by the Geotechnics laboratory is 63 µm. To further categorise the PSD of the samples into smaller fractions than 63 µm, PDP requested a hydrometer analysis also be performed by Geotechnics, which separates particles down to 1.4 µm in diameter, and includes particles less than approximately 10 µm in diameter. However, to perform the hydrometer analysis, Geotechnics requires a minimum of 10% of the sample to pass the 63 µm sieve size. None of the samples collected achieved this requirement, which therefore demonstrates that a very low percentage of the sampled material was less than 63 µm in diameter, and suggests that there is likely a very low percentage of particles less than 10 µm particles (PM_{10}).

The workplace exposure monitoring undertaken for inhalable particulate (roughly equivalent to PM_{10}) indicates *onsite* measured concentrations of PM_{10} ranged from 90 µg/m^3 – 840 µg/m^3 with a mean exposure of 440 µg/m^3 (all as 12-hour averages, n = 12). These measured onsite concentrations were all well within *workplace* exposure standards, however they are considerably elevated in comparison with *ambient* exposure standards, notably the national environmental standard for PM_{10} of 50 µg/m^3 (noting this is a 24-hour average).

Attachment J to the Applicant's response to comments in relation to Air Quality states (page 5):

> *The observed trend of consistently higher TSP concentrations at MP4 compared to MP2 is therefore more reflective of the dispersion of concentrations as onshore winds blow across the site and towards the township*.

Table 4 of Attachment J shows that the annual average TSP at MP4 is 11.0 µg/m^3 and at MP2 is 10.7 µg/m^3. Is it correct, therefore, to infer that the dispersion provided by the distance between MP4 and MP2 (which appears to be ~ 650 m) is **less than 3% reduction** (in annual TSP)?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

It is not correct to infer from the 2024 annual average TSP concentrations at MP4 (11.0 µg/m^3) and MP2 (10.7 µg/m^3) that dispersion over the approximately 650 m separating the monitors results in less than a 3% reduction in annual TSP concentrations.

The annual average TSP concentrations represent the combined influence of multiple potential dust sources and wind conditions over the course of the year 2024 year, including background TSP sources unrelated to the site's activities. Different wind directions transport dust from different parts of the site and the surrounding environment to each monitor location. The annual average TSP concentrations therefore reflect the cumulative effect of various dust sources at each monitor, rather than a direct comparison of concentrations arising from a single source along a single linear dispersion pathway.

While MP4 was used as a relative upwind monitoring location in the AQA, this was primarily because no other monitoring site was available that consistently captured background conditions of the operation during the prevailing southwesterly wind of the analysis period. I acknowledge that concentrations measured at MP4 can be influenced by site-related and natural dust sources under some wind conditions. This limitation subsequently helped inform my recommendation that MP5 be relocated to a more representative upwind location to ensure that background concentrations during prevailing wind conditions are better measured.

I further note that care is required in correlating workplace exposure monitoring results for inhalable dust as per the method prescribed by AS 2985:2009 with the different PM_{10} monitoring methods for ambient air quality exposure.

Given the workplace measurements likely included in-cab locations for the truck/excavator operators, **please clarify how average *onsite* PM_{10} concentrations** of 440 µg/m^3 as 12-hour average **will not result in exceedances of the NES *offsite***, particularly at residential locations R2, R3 and R4 which are all less than 300 metres of the site boundary.

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

The on-site inhalable sampling results represent worker exposure to inhalable particulates by workers within active mine areas. These results are comparatively discrete 'spot-samples' with the monitoring period being the length of the workers' shift (12 hours).

I included reference to these results in my response to comments in relation to air quality (Attachment J) as part of a wider assessment of potential off-site PM_{10} effects. The inclusion of this data was to show that for worker exposure effects, the maximum recorded concentration of inhalable particulates (0.84 mg/m^3) is approximately 6 times lower than the relevant Workplace Exposure Standard (WES) (5 mg/m^3). It is important to note as well that these results are likely to be affected by sources of inhalable particles near to the workers being monitored and micro-scale exposure pathways, which neither I nor TIL are able to quantify. For example neither I or TIL know how close the workers were to each dust source during the duration of the sampling.

However, given the order of magnitude between the maximum recorded concentration and the WES, and the fact that the monitoring results were likely influenced by near-monitor sources, I conclude that this sampling suggests that the potential for off-site effects from PM_{10} is very low given the low on-site concentrations and the dispersion that occurs between a source and the receptors.

The purpose of workplace exposure monitoring is to assess worker exposure and associated health risks over the length of a shift. It is not designed to assess compliance with the National Environmental Standards for Air Quality (NES-AQ) (which is a 24-hour average concentration), nor can it be used directly to reliably calculate ambient PM_{10} concentrations off-site.

I acknowledge that residential receptors R2, R3, and R4 are located within approximately 300 m of the site boundary, however PDP considers that the workplace monitoring data alone is not sufficient or appropriate to determine whether PM_{10} concentrations at these residences would exceed the NES-AQ standard. I also note that the methods of monitoring for inhalable particulates and PM_{10} are different, and using on-site workplace exposure inhalable particulate results to directly infer off-site PM_{10} concentrations for comparison to the NES-AQ is not valid. The on-site inhalable workplace exposure monitoring results have therefore only been used as a screening level indicator to contribute to PDP's risk-based assessment of off-site health effects being caused by on-site discharges of PM_{10}.

Appendix S (section 9) of the Substantive Application concludes that "*it is extremely unlikely that direct health effects can be associated with the type of dust generated by TIL's mining operations in the CSB*". Given no measurements are available for background PM_{10} and no quantitative assessment has been undertaken of the PM_{10} discharges to air, **where is the science to support this statement?**

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

I remain comfortable with the AQA's conclusion that it is extremely unlikely that direct health effects can be associated with the type of dust generated by TIL's mining operations in the CSB. This is based on the material size distribution data which provides information on the nature of the material being handled on-site and the size fractions of the material present in dust generated on site. These results support my longstanding opinion that there is a low abundance of PM_{10} particles in the on-site material.

The on-site inhalable dust workplace exposure monitoring, as discussed in my response to RFI 64, has been used as a screening level indicator. This workplace exposure monitoring data, separation distance guidelines, the TSP monitoring and size-fraction analysis all support PDP's assessment of a low risk of health effects to occur off-site as a result of dust discharged by TIL's mining operations in the CSB.

Both I and TIL acknowledge that no direct PM_{10} ambient air quality monitoring has been required or undertaken to date, and consequently, TIL has proffered draft consent conditions which included the conversion of some existing TSP monitors to monitor for PM_{10}. In addition, the establishment of a reference grade PM_{10} monitor at the Taharoa School has been included as a draft condition of consent. The data collected by these monitors, when assessed together with the on-site meteorological monitoring station, will enable assessment of likely contribution to ambient air PM_{10} concentrations from the CSB operations.

The Panel has the following unresolved questions:

- **What are the likely daily and annual PM_{10} concentrations** (in µg/m^3) **at the nearest neighbours and in the village**?
- **How much does current mining likely contribute to daily and annual PM_{10} levels at these locations?**
- **How will daily and annual PM_{10} levels likely change** at these locations over the proposed mining stages in central and southern blocks?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

With regard to the first question (in relation to likely daily and annual PM_{10} concentrations at the nearest neighbours and in the village) PDP cannot accurately quantify this without having direct ambient air PM_{10} data available, for the reasons set out in PDP's responses to the various other questions posed in this RFI in relation to PM_{10}.

The proposed PM_{10} monitoring will enable this question to be assessed directly. This is one of the primary reasons for proposing the PM_{10} monitoring programme, as I (and TIL) recognise the importance of protecting the health of the surrounding community.
With regard to the second two questions (relating to current mining contribution to off-site daily and annual PM_{10}, and the potential change to daily and annual PM_{10} levels) I cannot accurately

quantify daily and annual PM_{10} concentrations off-site without detailed, site-specific long term PM_{10} monitoring data.

While accurate quantification of PM_{10} concentrations is not possible, I note that various published PM_{10} monitoring data for representative rural coastal areas of New Zealand exists. This data has been interpolated by NZTA (2020) to estimate likely background PM_{10} concentrations. This NZTA data estimates that PM_{10} concentrations of 30 µg/m^3 (24-hour average) and 11.3 µg/m^3 (annual average) are likely in the Taharoa area. As noted at section 2.3 of the AQA, TSP concentrations (and PM_{10}) in the Taharoa area are also likely impacted by marine aerosol and wind erosion of natural sand dunes.

PDP's assessments of dust discharges from the proposed TIL mining activities conclude qualitatively that there are not likely to be significant increases to PM10 concentrations at dwellings beyond the boundary. Dust management measures, including continuous PM10 monitoring with contingency levels, are offered as part of the application.

63. Respirable crystalline silica discharges to air

Table 4 of Attachment J of the Applicant's response to comments in relation to Air Quality provides estimates of likely *offsite* annual respirable crystalline silica (RCS) concentrations estimated as a fraction of annual average TSP concentrations measured in 2024. The annual TSP values appear low, given the relatively high wind speeds of the area. Please provide upper and lower bound estimates for the estimated RCS concentrations using the confidence intervals requested for TSP (refer Question 61).

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP, based on further information provided from Mote:

If it is assumed that the site is relatively homogenous and that the period of co-location (late summer) is typical of the remainder of the year, then Mote considers there is a 95% confidence interval for the 60 TSP data points is +/-22% with upper and lower bounds of +/-16 to +/-29%. This reduces to +/- 20% (with upper and lower bounds of 15% to 24%) if one outlier is removed.

When assuming the outlier is removed, and the mean confidence interval is applied (+/- 20%), the following table for predicted annual average RCS is derived, which is based on Table 4 of PDP's response to comments memorandum. As seen, even the upper bounds of the <38 µm Crystalline Silica Annual Average concentrations are all well below the California OEHHA chronic Reference Exposure Level (REL) concentration limit is 3 µg/m^3 for RCS[1]. PDP therefore remains confident with our conclusion that there is an extremely low potential of adverse health effects from RCS to be experienced off-site.

2024 TSP Annual Average and Assumed RCS Annual Average						
Monitor	TSP Annual Average	<38 µm Crystalline Silica Annual Average			OEHHA Chronic REL for RCS	Percentage of OEHHA REL[1]
		Lower Bound	Calculated	Upper Bound		
	µg/m^3					
MP1	9.7	0.14	0.17	0.20	3	6%
MP2	10.7	0.14	0.18	0.22		6%
MP3	8.0	0.11	0.14	0.17		5%
MP4	11.0	0.15	0.19	0.23		6%
MP5	5.9	0.08	0.10	0.12		3%
MP6	6.9	0.10	0.12	0.14		4%
MP7	11.2	0.15	0.19	0.23		6%
MP8	9.4	0.13	0.16	0.19		5%

Notes:

1. *Assumes <38µm crystalline silica content is the same as the respirable (<4µm) crystalline silica content which is highly conservative.*

64. Mitigation

In Appendix S of the Substantive Application, **how are the inactive and clay stockpile areas** (section 2.4.4 and section 2.4.6 – the latter said to have significant potential for dust generation) **managed on the site**? For example, see Table 7, which refers to dampening silt clay exposed areas that are trafficked – **what about inactive/tailing areas** including clay deposits that are not disturbed by vehicle movements but might nevertheless generate dust in higher windspeeds?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

TIL has committed to a number of ongoing stabilisation and rehabilitation methods that will apply to inactive/tailing areas. These are set out in AUTH142035.01.01 proposed draft consent conditions 8, 9, and 10 as well as Schedule 1 of the proposed draft – General Conditions 13, 14, 18, and 20 and Chapter 6 of the Draft Environmental Management Plan.

Response prepared by Taharoa Ironsands Limited:

Augmentation of the fish pass has not had to occur since 2017 (since the Mine was acquired by the current owners).

The lake and dam levels are monitored in real time in 5-minute intervals. This data is uploaded to a third-party platform where it is downloaded and used for reporting, review and operational monitoring. The average lake level and the fish-pass intake depth are reported to Waikato Regional Council each month. Real-time flow monitoring is also undertaken on the Wainui and Mitiwai Streams. The stream flow data is also uploaded to a third-party platform for download, monitoring and supporting awareness of changing conditions across the waterway system.

Section 6.4 of the draft environmental management plan (EMP) in Appendix T to the Substantive Application refers to "Additional operational controls" including "minimising the height of stockpiles" – **what does minimise mean**? Is there a maximum height limit that could be imposed to be clear and enforceable?

Response on behalf of TIL:

Response prepared by Enviser Limited:

Minimise in this context (and noting that this clause is part of wider suite of requirements that will all work together to address dust emissions from silt/clay stockpiles) simply means keeping any stockpiles as low as practicable with regards to surrounding natural ground. What is practicable in any given part of the site will differ. It is therefore not practicable or necessary to specify a maximum stockpile height in this regard.

Similarly, the draft EMP states "where practicable", 'shape and compact' the surface of stockpiles, **what does 'where practicable' mean and why would that not be practicable in all instances**?

Response on behalf of TIL:

Response prepared by Enviser Limited:

It would not be practicable to shape and compact the surface of stockpiles if the material was wet (i.e. after rainfall) and could not be easily trafficked by heavy equipment. In addition, sand does not compact in the same way as other material, so there are limitations as to how well and to what extent it can be shaped.

Rehabilitation appears to be extremely important to minimising dust generation from the site. Attachment J of the Applicant's response to comments in relation to Air Quality repeatedly refers to stabilisation and rehabilitation methods in "*draft consent conditions 8 – 10, Schedule 1 conditions 13 – 14 and 20, as well as chapter 6 of the draft Environmental Management Plan*". However, the Panel notes that the actual details of stabilisation and rehabilitation methods are not in these conditions:

- Condition 8 is a performance requirement;
- Condition 9 requires 'compaction and surface stabilisation within 3 months of mining operations being completed' within the priority stabilisation area only – and does not state how this is to be achieved;
- Condition 10 is a monitoring requirement;
- Schedule 1 Condition 13 is a performance requirement for the EMP;
- Schedule 1 Condition 14 outlines the minimum requirements for the EMP;
- Schedule 1 Condition 20 requires a site rehabilitation plan (which includes pest grasses);

- Chapter 6 of the EMP includes Table 6-5 which has some mitigation measures (NB: not stabilisation or rehabilitation methods) linked to trigger levels, but these triggers are still linked to TSP concentrations whereas PM_{10} monitoring is now proposed.

Is it adequate that stabilisation and rehabilitation measures are not specified and addressed in the EMP only given the ability for EMP provisions to change over the duration of the consent?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited

Refer to response to the second question under RFI 4.

The Panel queries if the proposed conditions of consent for mitigating and controlling PM_{10} discharges to air are **consistent with good practice consent conditions for quarries and mines in New Zealand.**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

What is "good practice" is context specific.

The controls proposed to mitigate discharges from on-site mining activities are consistent with good practice across other quarries and mines in New Zealand/

It is important to note the exposed, coastal nature of the site, with sea-spray being a source of PM_{10} that cannot be fully mitigated or controlled. This means that the site is not necessarily comparable with more standard quarries and mines in New Zealand.

65. Proposed (PM_{10}) Monitoring

Please provide the updated proposed air quality monitoring locations in latitude and longitude coordinates suitable for location on Google Earth.

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

Set out below are indicative latitude and longitude coordinates in decimal degrees for input into Google Earth, noting that these locations may be modified slightly due to on-site practicality reasons.

Table: Indicative Coordinates of Proposed Monitoring Locations		
Monitor	**Latitude (°)**	**Longitude (°)**
Reference Monitor (Taharoa School)	-38.149634	174.732518
MP1	-38.153161	174.727790
MP2	-38.153462	174.733271
MP3	-38.150006	174.718040
MP4	-38.157342	174.727650
MP5	-38.173727	174.707250
MP6	-38.151648	174.724209
MP7	-38.150190	174.711861
MP8	-38.149135	174.715096

Revised Condition 10 of AUTH142035.01.01 (Land Use Consent) requires monitoring using PM_{10} dust monitors in at least six locations, including one upwind and one downwind of the Consent Area.

Condition 11 requires that only one of these six monitors be a reference method monitor, which is to be used at Taharoa School /Te Kura.

Condition 14 requires that concentrations of PM_{10} "*as a result of mining operations recorded as at the monitor adjacent to Taharoa school /Te Kura shall not exceed 50 µg/m^3 as a 24-hour average*".

If only one reference monitor is proposed, how will background concentrations of PM_{10} which are necessary to determine PM_{10} "*as a result of mining operations*" (as required by Condition 14) **be accurately assessed**?

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

Upwind Monitor MP5 will be moved from its current location to the indicative location set out in PDP's response to comments in relation to Air Quality memorandum (and Google Earth coordinated set out in response to the previous question). This monitor, while not proposed to be a reference grade monitor, will have the most up-to-date and therefore accurate correction factor (k-factor) applied to it (as with the data collected by the rest of the non-reference monitors) to improve accuracy to nearer to reference grade. The installation of the permanent reference grade monitor at the school will allow for more frequent co-location analysis of non-reference monitors to ensure the k-factor remains relevant, and the data collected by MP5 in its proposed location is fit for purpose for determining whether the NES-AQ limit is exceeded at the Taharoa School / Te Kura as a result of mining operations.

The Panel queries typical good practice PM_{10} trigger limits in other mine and quarry consents around New Zealand and requests consideration of their inclusion in AUTH142035.01.01 (Land Use Consent).

Response on behalf of TIL:

Response prepared by Andrew Curtis, Air Quality Consultant, PDP:

I acknowledge that other mines and quarries around New Zealand use PM_{10} monitors to monitor for both health effects and nuisance dust. While these sites do have similar trigger levels, each of which often triggering different action items, I consider that the same trigger levels are not appropriate for TIL's site.

As discussed in Section 2.3 of the AQA, natural sources of particulate are present at the site (in particular marine aerosols) given the exposed coastal nature of the environment. These marine aerosols can be transported significant distances across the site given the proximity of the crashing waves of the west coast and the prevailing, and often strong, southwesterly winds.

Based on work by GNS Science1 the existing ambient concentrations of dust (including size-differentiated particulate matter, PM_{10} and $PM_{2.5}$) within coastal areas will include contributions from natural sources, including from the long-range transport of marine aerosols (sea salt), wind-blown dust and secondary sulphates. Marine aerosol from the Tasman Sea and the Southern Ocean has been found to notably impact air quality across New Zealand.2
I therefore consider that marine aerosols will contribute to the PM_{10} concentrations being recorded by the on and off-site monitors, and therefore the typical trigger levels being used at other mines and quarries in NZ to control dust (which are not located in a coastal environment) may be triggered by non-mining activities, causing non-required mitigation to be implemented.
To determine appropriate PM_{10} trigger levels, as set out in the draft conditions of consent, TIL will undertake sufficient monitoring to determine an appropriate baseline, with background/upwind monitoring data considered, from which trigger levels can be set.

References:

1. GNS Science. (2024). Evaluation of New Zealand's background particulate matter sources. Consultancy Report 2024/53.
2. Revell, L., et al. (2024). Marine aerosol in Aotearoa New Zealand: implications for air quality, climate change and public health: http://dx.doi.org/10.1080/03036758.2024.2319753

Appendix U Draft Harvest and Earthworks Management Plan

66. Readable plan

Please provide a readable (legible) version of the Figure for the Harvest Plan in (Appendix A) that includes the 30 m buffers.

A copy of this plan is attached as **Appendix K** to this response.

Appendix V – Marine Ecology Assessment

67. Survey effort

The Hearing Panel's decision notes that, as stated in the Executive Summary and explained further in section 3.0 of Appendix V, the conclusions in this report are supported by a "one off" sampling assessment conducted in 2021. This included monitoring of sediment in only four locations.

Do the authors of this assessment consider a one-off survey adequate and proportionate to the potential range and extent of effects from the discharge of water associated with ship loading (and the discharge of process water and stormwater into the coastal marine area) as assessed in this report, and if so why?

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

Mining operations at Taharoa have been ongoing since the early 1970s, including offshore ship-loading and dewatering. The Marine Ecology Assessment therefore considered effects in a receiving environment that has already been exposed to mining activity for several decades. In that context, if the discharges had caused substantive long-term accumulation of fine sediment, metals, or associated changes in benthic communities near the mooring, those effects would reasonably be expected to be detectable in the seabed sediment characteristics and macrofaunal communities sampled in 2021.

The 2021 survey was not relied on in isolation. The assessment was based on multiple lines of evidence, including:

- The desktop review of the receiving environment and relevant ecological values;
- Site-specific sediment chemistry, grain-size, and benthic macrofauna sampling undertaken near the mooring and at reference locations;
- The discharge and dispersion modelling, including predicted suspended sediment concentrations and seabed deposition patterns; and
- The coastal processes assessment, insofar as it informed likely sediment transport, deposition, and dispersal behaviour.

The results of the one-off sampling confirm that the level of effect of the discharges on the marine environment are low, with regard to sediment metal concentrations not being of ecotoxicological concern, and small changes in benthic community composition.

In my opinion, the survey effort was adequate and proportionate for assessing the potential marine ecological and water-quality effects of the ship-loading dewatering discharge, because:

- The activity is long-established, so the survey provided an opportunity to detect cumulative or chronic effects, rather than only predicting effects from a new discharge;

- The survey targeted the most relevant effect pathways, namely sediment quality, grain size, and benthic macrofaunal condition; and
- The level of effect from previous assessments was low, so a more intensive or repeated ecological survey programme would not have been proportionate to the scale of effect.

On this basis, I consider the one-off survey to be adequate and proportionate to the potential range and extent of marine ecological effects from the discharge of water associated with ship loading. For process-water and stormwater discharges, my assessment also relied on the source-material assumption, modelling, and proposed discharge-quality monitoring addressed in the response below.

68. Process water and stormwater discharge concentration

Appendix V (section 2.2) states an assumption that the quality of the water being discharged (within the 32,000m^3 per day of process water and stormwater to the coastal marine area) would have a similar concentration to that of the de-watering discharge from ship loading (i.e. a total suspended solids concentration of approximately 1 kg/m^3). It also states that sampling has not been undertaken for these discharges. **Where then is the basis for this assumption?**

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

The assumption that stormwater and process-water discharges would have a similar suspended-sediment character to the ship-loading dewatering discharge is a broad screening assumption. The basis for that assumption is that the stormwater and process water interact with the same iron sands that are extracted, processed, transported, and loaded for export. They are therefore exposed to the same source material and the same potential contaminants as the dewatering discharge.

I understand that stormwater and process water are typically intercepted on site and recycled into the mine process water system. The proposed discharge to the CMA is intended to provide for infrequent discharges, such as during heavy rainfall or other high flow events, when water may need to be released to manage site water levels. As such, representative sampling of these discharges under the conditions in which they are intended to occur is difficult.

I acknowledge that direct sampling of those specific discharges had not been undertaken at the time of preparing the Marine Ecology Assessment. The assumption should therefore be understood as a reasonable source-material assumption for assessment purposes, rather than a site-specific measured concentration for the infrequent stormwater and process-water discharge.

The effects of the proposed discharges will be managed by the proposed consent conditions (see question below).

Why is no monitoring proposed for these discharges to the coastal marine area?

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

In relation to monitoring, the proposed consent conditions attached to the Substantive Application Report (Appendix BB) include monitoring requirements for the discharge of stormwater and process wastewater to water in the Coastal Marine Area.

In particular, Condition 7 (AUTH142035.13.01) requires that, prior to discharge into the CMA, water from the holding ponds must be sampled and analysed for turbidity, pH, heavy metals, and hydrocarbons. This monitoring would provide a direct check on the quality of water proposed to be discharged and would test the assessment assumption that the discharge quality is consistent with the expected sediment and contaminant profile of the mined ironsands.

The report notes "slightly elevated" levels of total suspended solids could extend up to 20 km south towards Tirua Point and over 30 km north past Kawhia and Aotea Harbours up to 10% of the time. **What does this mean?**

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

The statement in the Marine Ecology Assessment that "slightly elevated" TSS concentrations could extend up to approximately 20 km south toward Tirua Point and more than 30 km north past Kawhia and Aotea harbours relates to the modelled ship-loading dewatering discharge, not the stormwater and process-water discharge. The statement is based on the hydrodynamic modelling results in the Discharge and Dispersion Modelling Assessment (Appendix FF), particularly the 90th percentile suspended-sediment concentration outputs shown in Figure 3.5.

In practical terms, the 90th percentile result means that the modelled concentrations would be at or below the concentrations shown for 90% of the modelled period and would exceed those concentrations for only 10% of the time. Therefore, the mapped plume extent does not represent a continuous or persistent plume of that size. Rather, it represents the wider spatial extent within which very low suspended-sediment concentrations may occur intermittently under particular hydrodynamic conditions.

The modelled concentrations at those distances are also very low. The Discharge and Dispersion Modelling Assessment reports a maximum predicted TSS concentration of approximately 0.62 mg/L, which is well below expected natural variability in suspended sediment in energetic west coast marine environments (see pages 29 and 32 of that report). On that basis, the reference to "slightly elevated" TSS should be interpreted as a very small, intermittent increase above background, rather than a persistent or ecologically meaningful increase in suspended sediment concentration.

69. Mooring sampling locations

Why was a distance of approximately 250m north and south of the mooring selected for the mooring sampling sites, rather than a distance closer to the mooring where sedimentation effects may have been greater than at that distance from the mooring?

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

The mooring sampling sites were located approximately 250 m north and south of the mooring because this was the closest practical and safe sampling distance achievable during the field survey. Sampling closer to the mooring created a risk of the survey vessel's anchor becoming entangled with the mooring buoy anchor lines.

The sites were within the general near-field area potentially influenced by the dewatering discharge and were considered appropriate for assessing whether detectable changes in sediment quality, grain size, or benthic ecology were present near the mooring.

Note that the answer to the next Question (72) below may be relevant to this question as well.

70. Sediment deposition depths

Appendix V (Section 3.1) states that the findings of the MetOcean report "suggest" that sediment deposition from de-watering over a three-month modelled period would be very low near the mooring (less than 0.002 mm) and in the nearby Kawhia and Aotea harbours (less than 0.006 mm).

What specific information in the MetOcean report is that data based on – for example is it taken from Figure 3.15 on page 43 of Appendix FF, or does the report author (for Appendix V) have access to more detailed data used in generating Figure 3.15? **If so, please provide that data.**

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

The sediment deposition depths referred to in the Marine Ecology Assessment were taken from Figure 3.15 on page 43 of Appendix FF – Discharge and Dispersion Modelling Assessment. I did not have access to any further underlying model data used to generate that figure.

Similarly, section 3.1 states that the "maps" presented in the MetOcean report show that the 'Mooring' sampling sites are located within the highest likely deposition area near the mooring. **Which "maps" is this section of the report referring to?**

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

The reference in the Marine Ecology Assessment to the mooring sampling sites being located within the area of highest likely deposition was an inference based on the modelled bottom-water suspended sediment concentrations shown in Appendix FF of TIL's Substantive Application – Discharge and Dispersion Modelling Assessment. Because the modelled deposition depths were very low, the likely deposition area was inferred from the predicted suspended sediment concentrations, particularly the bottom-water concentration plots in Figures 3.4, 3.5, and 3.6 (i.e., "maps"). Those figures generally show the highest predicted suspended sediment concentrations occurring near the mooring, with concentrations reducing with distance from the discharge point.

71. Numbers of sediment samples/cores taken

Section 3.1 of Appendix V records difficulties in extracting the intended number of samples from each location due to the compaction of sediment, technical difficulties and limited bottom time of the divers.

Sub sampling of two sediment cores for the southern sampling sites is noted at the top of page 3 of the report.

Do these limitations have any impact on the reliability of the data obtained and the conclusions reached in the report? If not, why not?

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

Some practical limitations were encountered during the field survey, including difficulty recovering the intended number of intact sediment cores at some locations. When cores were brought to the surface, the most intact and complete cores were prioritised for benthic macrofaunal analysis. This was appropriate because benthic faunal results are more sensitive to sample volume, depth, and core integrity.

The cores used for benthic faunal analysis were filled to the required level. Accordingly, I do not consider that the field limitations materially affected the reliability of the benthic faunal data, beyond the normal variability associated with subtidal benthic sampling.

Subsampling was undertaken for grain-size and contaminant analysis. This is not expected to have materially affected the reliability of those results because those analyses targeted the upper 2 cm of sediment, which is the relevant surface layer for assessing recent sediment quality, fine-sediment content, and potential contaminant accumulation. Smaller or less complete cores can still provide suitable material for those analyses, provided the surface sediment layer is intact and representative.

On that basis, I do not consider that the sampling limitations materially affect the reliability of the data obtained, or the conclusions reached in the Marine Ecology Assessment. The primary effect of those limitations was to reduce the number of samples that could be collected within the available field time.

Attachment D to the Applicant's response to comments in relation to marine ecology refers to the vanadium concern raised in the comments from Natasha Willison-Reardon/Mirumiru Pā ki Marokopa – Marokopa Marae and notes that vanadium was not included in the metals analysed in seabed sampling (as discussed in Appendix V to the Substantive Application), but given that the metals analysed did not indicate elevated concentrations or accumulation near the discharge, the author would not expect vanadium to show a materially different pattern.

The Panel requests information as to the relative concentration of vanadium in titanomagnetite compared to the other metals that were subject of sampling and reporting in Appendix V (refer section 4.1.1).

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

I found limited information on this following a literature review.

Te Ara (New Zealand online encyclopaedia) reports that concentrated New Zealand titanomagnetite [from an unspecified location] contains approximately 0.6% vanadium oxide, alongside 8% titanium oxide, 3% manganese oxide, and 79.5% magnetite (Hogan & Williamson, 1999, as cited in Templeton, 2009). Vanadium is also identified by GNS Science as occurring in association with iron and titanium in placer titanomagnetite deposits on the west coast of the North Island (GNS Science, n.d.).

Published data indicate that the vanadium content of titanomagnetite ores varies substantially between deposits. For example, a Chinese vanadium-titanium magnetite study reported raw ore containing 0.050% V_2O_5, 1.67% TiO_2, and 8.53% Fe, while the upgraded concentrate contained 1.14% V_2O_5, 22.22% TiO_2, and 42.51% Fe (Xu et al., 2017). Therefore, published values can be used only as an indicative guide, rather than as a site-specific measure of vanadium concentration at Taharoa.

Published composition information located during this review does not provide relative concentrations for all metals analysed in the Marine Ecology Assessment. However, it does provide useful comparative information for iron and manganese, both of which were analysed in the seabed sediment samples. Based on the Te Ara composition, 1 kg of concentrated New Zealand titanomagnetite would contain approximately:

- Iron: 79.5% Fe_3O_4, equivalent to approximately 57.6% Fe, or 576,000 mg/kg Fe;
- Manganese: 3% MnO, equivalent to approximately 2.3% Mn, or 23,000 mg/kg Mn; and
- Vanadium: 0.6% V_2O_5, equivalent to approximately 0.34% V, or 3,400 mg/kg V.

On that basis, vanadium would be expected to be present at a substantially lower concentration than iron, and lower than manganese, in the titanomagnetite source material.

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Xu, C., Zhang, Y., Liu, T., & Huang, J. (2017). Characterization and pre-concentration of low-grade vanadium-titanium magnetite ore. Minerals, 7(8), Article 137. https://doi.org/10.3390/min7080137

72. Grain size

The graphs presented at section 4.1.2 of Appendix V show a statistically significant difference in mud content near the mooring, as opposed to at the reference sites.

Is this a reflection of the character of the sediment in the discharge plume as discussed (or explained) at section 4.3 of Appendix Q (Coastal Processes Assessment) noting that the plume is primarily comprised of silts that leak out through decanting (rather than sand)?

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

It is not clear why a small increase in fine sediment was recorded near the mooring. There is no direct evidence confirming the cause, and it may reflect several interacting factors, including the complex local hydrodynamic environment, interaction of the near seabed currents with the mooring and anchor system, or the character of fine sediment in the dewatering discharge plume.

The one-off sampling results differ from the hydrodynamic modelling, which did not identify substantial seabed deposition near the mooring. It also needs to be considered in the context of the Coastal Processes Assessment, which describes the receiving environment as high energy and notes that fine sediment in the dewatering discharge is more likely to be dispersed and resuspended than to accumulate (see Appendix Q, page 19).

The higher mud content near the mooring may therefore reflect the character of the sediment in the discharge plume, but this cannot be confirmed from the available data.

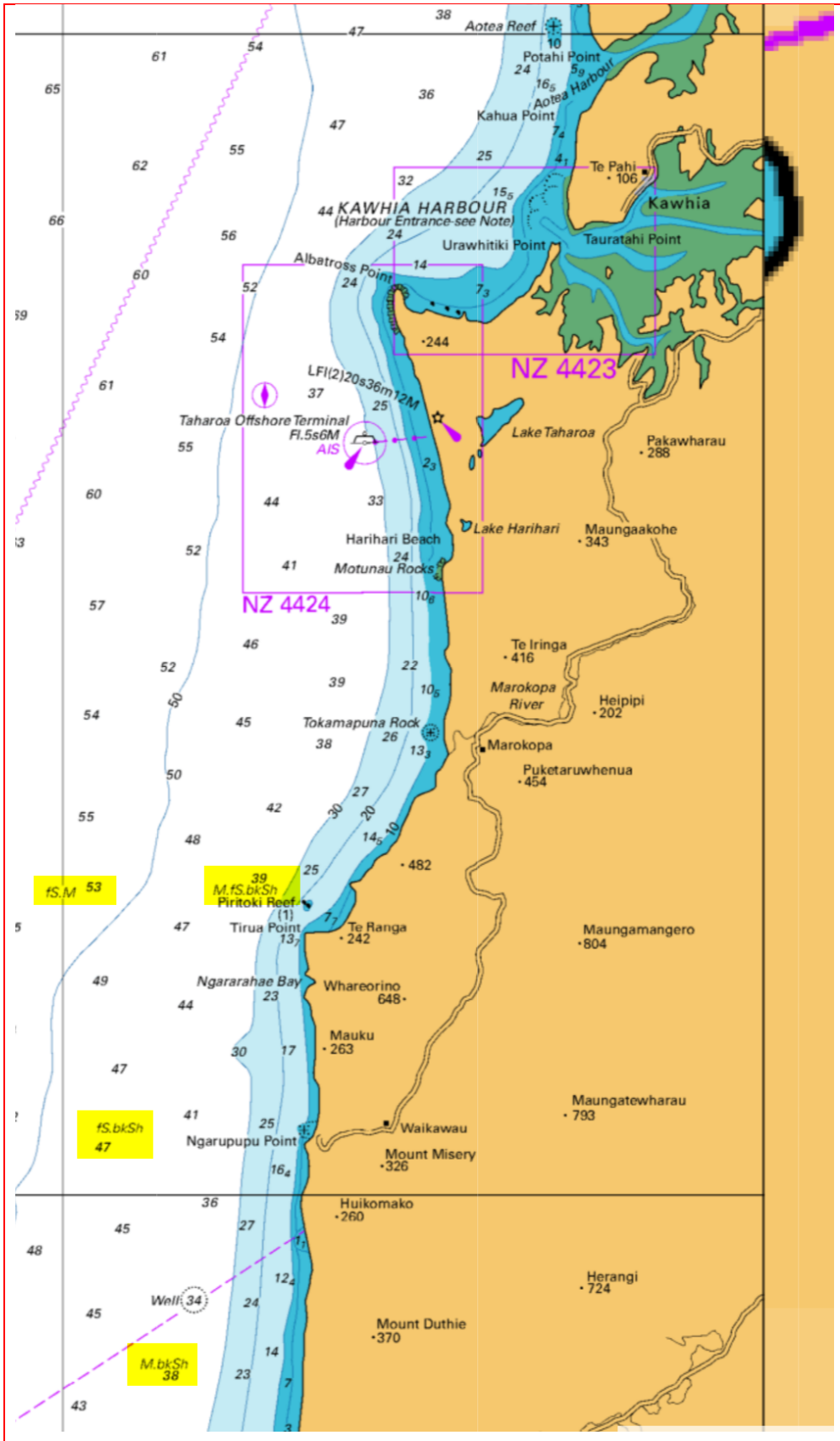

Figure: LINZ Marine Chart with spot sediment sample characteristics highlighted. fS = fine sand; M = mud; bkSh = broken shell.

73. Sediment deposition depths and sediment concentrations

(Refer Question 57 above in relation to Appendix Q – Coastal Processes)

Please explain the specific information upon which the concentrations and depths of sediment referred to at section 5.2 of Appendix V are derived, including the percentage areas of the Kawhia and Aotea harbours as referred to in the last paragraph on page 11 of that report.

Response on behalf of TIL:

Response prepared by Dr Pete Wilson, Principal Consultant, Ecology and Marine Science, SLR:

The sediment deposition depths and percentage coverage values referred to in section 5.2 of the Marine Ecology Assessment were taken from Table 4.2 of Appendix Q – Coastal Processes Assessment. That table reports the predicted sedimentation depths and spatial extent of deposition, including the percentage areas of Kawhia and Aotea harbours referred to in the Marine Ecology Assessment. They were not independently derived in the Marine Ecology Assessment but used for the purpose of assessing potential marine ecological and water-quality effects.

Dr Beetham has provided further detail on how the numbers were derived in his response to Question 57.

Appendix W – Noise

74. Monitoring and modelling

The report advises that noise monitoring was undertaken on one day (1 October 2024**). Is that an adequate monitoring period** (covering different wind conditions, etc) to base a conclusion that noise levels would generally be compliant with the District Plan standards?

Response on behalf of TIL:

Response prepared by Darran Humpheson, Technical Director of Acoustics, Tonkin & Taylor Limited:

The monitoring undertaken on 1 October 2024 was adequate for the purpose for which it was used, namely to: characterise site noise at the nearest receivers during active mining, to confirm whether mining noise was discernible above the existing environment, to obtain reliable dry mining unit (DMU) source noise data, and to provide measured data against which the noise model used for the broader compliance assessment could be checked.

In my opinion, additional attended monitoring over further days would not have materially altered the conclusions of the assessment. That is because the survey demonstrated that, at the nearest receivers, mining noise was generally very low and was not distinguishable from the existing environmental noise environment, even during the quietest periods. The

monitoring also confirmed reliable source levels for the DMUs, which was an important input to the SoundPLAN modelling and was not previously available. Source levels for the other key mobile plant, including bulldozers, are known from T+T's acoustic dataset.

The conclusion that mining noise would generally comply with the relevant District Plan standards was not based solely on one day of receiver measurements. It was based on a combination of:

1. attended noise measurements at the nearest receivers during active mining operations;
2. source measurements of the DMUs;
3. known source data for other key mobile plant, including bulldozers;
4. subjective observations by the acoustic consultant on site, allowing the mining noise contribution to be separated from other environmental noise sources;
5. consideration of meteorological effects, including a conservative allowance for more favourable sound propagation conditions; and
6. noise modelling of the mining activities, using the measured source data and conservative modelling assumptions.

The attended monitoring approach was appropriate because the measured noise environment at the receivers was dominated by sources unrelated to mining activities, such as wind in vegetation and birds. Mining noise was generally not discernible, even during the quieter periods. At the Wetini property, the only mining related noise identified by the acoustic consultant comprised brief events such as excavator bucket impacts and reversing alarms. Those events were short in duration and did not cause a notable increase in the measured sound levels.

That is an important point. Where the source under assessment is clearly audible and materially contributing to the measured sound level, longer term monitoring can provide useful information on variability over time. However, where the source is very low relative to the existing ambient noise environment, long term unattended monitoring would not, by itself, provide a better or more reliable assessment of the mining noise contribution.

Attended monitoring was therefore preferred because the acoustic consultant could identify the actual source of the measured sound in real time. This was important at Taharoa because the measured receiver levels were controlled by environmental noise sources rather than mining noise. In those circumstances, repeating attended measurements over further days would be unlikely to produce materially different conclusions unless the mining activity was occurring in a materially different location or configuration.

The measured levels were low. During active daytime mining, the measured levels were:

- Old Homestead: 44 dB LAeq, 15 min and 48 dB LA10, 15 min;
- New Homestead: 37 dB LAeq, 15 min and 39 dB LA10, 15 min; and
- Wetini: 37 dB LAeq, 15 min and 39 dB LA10, 15 min.

Those levels included all other environmental noise present at the time, not just mining noise. Because mining noise was generally not discernible at the receivers, the actual mining contribution was assessed as being materially lower than the measured ambient levels. The February 2025 monitoring report estimated the operational mining noise contribution to be in the order of 22–24 dB LAeq at the receivers during the survey period.

The monitoring conditions were also suitable for noise measurements. NZS 6801 and NZS 6802 require noise measurements to be undertaken in appropriate meteorological conditions

(including wind), including avoiding conditions where wind induced noise would invalidate the results. While the local weather station recorded higher wind speeds than would likely have occurred at the receiver and mining locations, the acoustic consultant's onsite observations were that winds at the monitoring positions were light to light/moderate, with the DMU source measurements being sheltered and subject to minimal weather influence. The acoustic consultant was able to identify and account for wind related noise.

It is also important to distinguish between measurement under suitable weather conditions and assessment of all possible propagation conditions. Noise measurements are normally undertaken under conditions suitable for measurement, rather than by attempting to measure every possible wind condition. The effect of other propagation conditions can then be assessed by calculation or modelling. That approach was adopted here.

The assessment did not assume that the monitored meteorological conditions represented the worst case. The monitoring report considered the potential effect of more favourable sound propagation conditions, including light downwind propagation from the mine to the receivers. A conservative allowance of up to 10 dB was considered for such conditions. Even with that allowance, and also allowing a conservative 5 dB special audible characteristic penalty for reversing alarms, the predicted operational noise rating level was assessed to remain in the order of 37–39 dB LAeq at the receivers. That remains below the relevant 40 dB night-time criterion and substantially below the daytime and evening limits.

The measured data were also used to inform and validate the noise model. T+T's July 2025 Noise Assessment (Appendix W to the Substantive Application Report) used SoundPLAN noise modelling, based on ISO 9613-2 propagation calculations, local topography, measured DMU source levels, known bulldozer source levels, and conservative plant assumptions. The modelling assessed both DMU and bulldozer operations, including worst case locations relative to the nearest receivers. The model showed that:

- mining can occur throughout the Southern Block without exceeding the relevant noise limits;
- the main potential risk area is limited to parts of the Central Block, particularly the northern ridge area closest to Wetini, New Homestead and Old Homestead;
- the model is conservative, because it assumes worst case plant locations, source heights and operating assumptions; and
- in practice, noise levels are expected to be lower as plant moves, mining progresses below ridgelines, and topographical screening increases.

This is the key reason why more general attended monitoring was not necessary. The monitoring and modelling show that mining noise is very low when activities are not in the most exposed locations close to the receivers. The potential for higher levels arises primarily when mining occurs near the northern ridge of the Central Block, where topography, elevation and line-of-sight to receivers become important. That is the specific situation where further compliance monitoring has been recommended and committed to (see chapter 11 Noise of Appendix T – Draft Environmental Management Plan)

Therefore, if further monitoring were undertaken away from the ridge, it would most likely confirm the same result already obtained: mining noise is very low or not discernible at the receivers, and the measured levels are dominated by the existing environmental noise. Further monitoring may have value for general reassurance, complaint response, or compliance auditing, but it would not be expected to materially improve the technical basis of the assessment.

The report discusses the need for limitations on the location and operation of machinery particularly during the nighttime period (section 8.1), with a potential for noise exceedances when mining occurs on the ridge area at the northern end of the block near the Kana and Wetini homesteads, with the summary to the report stating that:

- TIL will implement a modified mining methodology to meet maximum noise levels in table 7.1.
- The methodology will be verified by a qualified acoustic specialist.
- Ridge mining would be restricted to 7.00 am to 7.00 pm until operations progress below the ridgeline.

Is it adequate that this is covered in section 11 of the draft EMP only, rather than in consent conditions, given the ability for management plan provisions to change over the duration of the consent?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Reference within the EMP is sufficient given that noise is not an issue within the jurisdiction of the Regional Council nor in the context of consents sought under the Waikato Regional Plan.

Section 8.1 also advises that a tailored mining methodology would be needed to comply with daytime noise limits, and advises that this would be developed in consultation with an acoustic expert – again **where is that requirement in either the consent conditions or the management plan** (noting no update to the EMP has been provided)**?**

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

See answer above.

Finally, the Panel queries why two of the best practice measures set out at section 9.3 of the report (timing of activities, DMU location) are not included in section 11.3 of the draft EMP.

Response on behalf of TIL:

Response prepared by Enviser Limited:

These matters are included in Section 11.3 of the Draft EMP (Appendix T).

There is a list of best practice control measures to minimise noise disturbance from the site. This includes undertaking atypical, high-noise activities during daylight hours only.

There is also a list of additional control measures to be implemented when mining the northern boundary ridge, which includes evening and night-time restrictions, and using alternative mining methods and quieter equipment.

It is noted that the EMP is a draft version will be updated prior to submitting it to the regional council for certification (if the application is granted).

Given the issues raised above, and assuming the Substantive Application is to be approved, is there any reason (other than the legal point noted in the following question) why the Panel should not impose a condition in e.g. Schedule 1 requiring all activities to comply with the District Plan noise standards?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

Given that the control of noise is not a Regional Council function, and the consents sought will ultimately fall to the Waikato Regional Council to administer, imposing a condition restricting noise from mining activity would be impracticable given that WRC would then have no ability enforce it.

The Panel notes that in Attachment B to the applicant's response to comments in relation to planning it is stated that conditions addressing noise (or amenity) cannot be included in regional level permits (page 24). Counsel for the applicant is requested to provide case law authority to support that statement.

Response on behalf of TIL:

Response prepared by counsel for TIL:

The Fast-track Approvals Act 2024 (**FTAA**) expressly provides that, when setting conditions on a resource consent sought under the FTAA, the provisions of Part 6 of the RMA apply to the Panel and all references to a consent authority must be read as a reference to the Panel (see clause 18, Schedule 5).

Section 108AA(1) of the RMA provides that a consent authority must not include a condition in a resource consent for an activity unless:

(a) the applicant for the resource consent agrees to the condition;
(b) the condition is directly connected to 1 or both of the following:
    (i) an adverse effect of the activity on the environment:
    (ii) an applicable district or regional rule, or a national environmental standard
(c) the condition relates to administrative matters that are essential for the efficient implementation of the relevant resource consent.

The Environment Court's findings in *Lindis Catchment Group Inc v Otago Regional Council* [2020] NZEnvC 120, [2020] ELHNZ 191 provide useful guidance as to the meaning and application of s108AA(1):

- With respect to s108AA(1)(a), the Court noted that this effectively legislatives the *Augier* principle, namely that an applicant who volunteers a condition is bound by it (see paragraphs [63] and [64]).
- With respect to s108AA(1)(b)(i), the Court found that in order to be lawful under section 108AA(1)(b)(ii), a condition "*must be directly connected to adverse effects of a proposed activity not to the activity itself*" (see paragraph [67]).

Applying s108AA to the condition suggested by the Panel:

- In terms of s108AA(1)(a), TIL has not volunteered or agreed to the type of condition suggested by the Panel, therefore it cannot be imposed on an *Augier* basis.

- With respect to s108AA(1)(b)(i), the Noise Assessment (Appendix W to the Substantive Application) concluded that mining can occur anywhere within the Southern Block without exceeding noise limits, at any time, and that TIL can achieve compliance with noise limits in the Central Block by implementing the recommended management measures (which TIL set out in its application). As such, TIL can comply with the noise limits under the Waitomo District Plan. Any adverse noise effects arising from TIL's mining activities are therefore explicitly contemplated by the Waitomo District Plan given their permitted activity status. It would therefore not be reasonable to apply a condition of the kind suggested by the Panel in this instance, in terms of the *Newbury* principles (as set out in *Newbury DC v Secretary of State for the Environment* [1981] AC 578, [1980] 1 All ER 731). This is discussed further below.

- With respect to s108AA(1)(b)(ii), section 108AA(4) provides that, for the purposes of s108AA, a district or regional rule or a national environmental standard is "applicable" if the application of that rule or standard "*is the reason, or one of the reasons, that a resource consent is required for the activity*". The condition suggested by the Panel is clearly not directly connected to an applicable regional rule, as the control and management of noise effects is not within the jurisdiction of Waikato Regional Council. There is also no applicable district rule to which this condition is directly connected, as no resource consent is required for the proposed activity under the Waitomo District Plan, as TIL will at all times comply with the permitted activity standards (as noted above).

- With respect to s108AA(1)(c), the condition suggested by the Panel does not relate to an essential administrative matter.

Accordingly, there is no basis under s 108AA for the condition suggested by the Panel to be imposed on TIL.

In addition to the above:

- The control of the emission of noise and the mitigation of the effects of noise is a function of district councils (not regional councils) under section 31 of the RMA. A regional council does not have the ability to monitor compliance or enforce conditions of this nature in a regional resource consent.
- It is not necessary to repeat the district plan standards in a condition of consent in order to monitor or control the effects in question – this is already achieved through the district plan standards, which TIL is required to comply with in undertaking its activities.
- For these reasons, imposing the condition proposed by the Panel would be inconsistent with the *Newbury* principles which are of general application to conditions of resource consent in New Zealand (see for example *Housing NZ Ltd v Waitakere CC* [2001] NZMRA 202 (CA)) in the context of section 108 of the RMA. In particular the principle of reasonableness and the requirement for a condition to serve a resource management purpose.

TIL has also discussed this matter with WRC, who have confirmed their agreement with TIL's position on this point.

Appendix

GG Marine Mammals

75. Whale strike and underwater noise

Has a whale strike ever occurred for ships attending Port Taharoa?

Response on behalf of TIL:

Response prepared by Grant Eccles, Lead Planner, Tonkin & Taylor Limited:

TIL advise that no whale strikes have ever occurred.

Should the noise survey required by Condition 7 of proposed AUTH142035.12.01 (Coastal Permit Discharge to Water) be focused specifically on the noise frequency range relevant to Māui dolphin, as recorded in Table 1 of Appendix GG?

Response on behalf of TIL:

Response prepared by Deanna Clement, Team Leader, Marine Mammal Ecology, Cawthorn Institute:

The physiological (TTS, PTS) and behavioural noise thresholds for the different types of marine mammal hearing sensitivity groups, as referred to in Appendix GG and Table 1, are calculated using information on how sound travels at the location of interest. The depth, type of seafloor

and currents can all affect how introduced noise (e.g. project vessels) travels and which frequencies can be detected above natural ambient (background) levels, such as surf, waves, etc.

By understanding the ambient noise levels, a suitably qualified and experienced underwater noise expert can then model the spatial extent or propagation of all the frequencies levels generated by the vessels / activity and predict at what distance from the activities certain frequencies might exceed any species-specific hearing sensitivities (e.g. Table 1 groups) (which is considered unlikely). Hence, the current standard noise monitoring methods are more than adequate for collecting the noise levels necessary to assess Maui dolphins specific noise frequencies, as well as any other marine mammal species.

The underwater noise monitoring in condition 7 is intended to collect and model the propagation extent of all the various noise frequencies and levels generated by the vessel and the ship loading activities along with any data on ambient noise of the area. This condition has been proposed only for the reason that it would be useful to record noise levels of the export vessels. The verification monitoring only needs to be done once as a one-off basis. Further monitoring is only required if vessels use substantially different methods or equipment or new vessels for loading Ironsand and associated dewatering, are used.

Will the one-off verification survey measure noise from all three ships used at the Port of Taharoa? If not, why not?

Response on behalf of TIL:

Response prepared by Enviser Limited:

All three ships are very similar (if not identical), and it is therefore unnecessary to measure noise from all three.

Attachment E to the Applicant's response to comments in relation to marine mammals advises that the conditions requested by Te Nehenehenui in relation to marine mammal sighting, strike incident reporting and underwater noise monitoring etc are all set out and included in the draft Environmental Management Plan (section 13.3 and table 13-2 of Appendix T to the Substantive Application).

The applicant is requested to advise as to why these specific measures (as summarised in Table 3 of Appendix GG) should not be expressly referenced in consent conditions themselves, rather than left to the content of a management plan which could be changed over the duration of the consents sought under the Substantive Application.

Response on behalf of TIL:

Response prepared by Enviser Limited:

We note that underwater noise verification modelling is already a proposed condition of consent. The EMP requires certification by WRC, including in respect of any material amendments to the EMP that may be made over the lifetime of the consents. Material amendments to the EMP also require consultation with the Department of Conservation and a range of tangata whenua parties. As a result, WRC would have the ability to scrutinise any EMP changes related to marine mammals that were proposed by the consent holder, including the views of the consulted parties, in deciding whether or not to certify any changes. There is thus no need for the specific measures (other than the underwater noise verification monitoring already proposed) to be included as consent conditions in their own right.

Proposed Condition 8 of AUTH142035.12.01 (Coastal Permit Discharge to Water) would require a further noise monitoring assessment to be undertaken if new vessels *that use substantially different methods or equipment for loading iron sand and associated dewatering* are to be used. The Panel understands that the applicant intends to procure new vessels to support the future mining operations at Taharoa (refer Appendix C).

Please explain why the condition should not refer to the use of new vessels *and* different methods or equipment for loading iron sand i.e. as to why the vessels themselves might not generate a different noise level or character than as assessed in the one-off verification survey required by condition 7 within six months of the commencement of consent.

Response on behalf of TIL:

Response prepared by Enviser Limited:

It may be that new vessels are procured that are identical to the existing vessels, given that the vessels are specifically designed for TIL's infrastructure setup. It is unnecessary to measure the noise of a new identical vessel, as the noise effects will be the same as under the vessels that operate currently. The potential noise level or character of new vessels would only differ from the current vessels if different methods or equipment are included in that vessel.

Simply put it might not just be the different methods or equipment for loading iron sand that creates a change in noise levels or character, but the different vessels themselves?

Response on behalf of TIL:

Response prepared by Enviser Limited:

The noise is from the engines, the loading system, the internal dewatering system and the discharge system. If these elements are the same, or very similar, the difference in noise levels would be negligible.

Appendix EE Lake Level Management Plan

1. Section 6.3 (Fish passage). Has, and how often, augmentation of the fish pass occurred in the past? What type of screens are used for temporary pumping?

Response on behalf of TIL:

Response prepared by TIL and Enviser Limited:

The consent holder is required to augment the flow in the fish pass when the dam level drops below 9.3 m RL. Water level monitoring data between 2013 and 2025 shows that the level has not dropped below the trigger level, therefore augmentation has not been required (see Appendix I Hydrology Assessment, Figure 6).

2. Table 3 identifies housekeeping as a key control for workshops, stores & yards. More generally, are there **any conditions of consent relating to housekeeping** on site?

Response on behalf of TIL:

Response prepared by Enviser Limited:

There are no consent conditions relating to housekeeping on the existing consents and none are proposed.

The controls set out in Table 3 include a range of both conditions and good management practices to ensure that all consents held for the Site are complied with.

Schedule 1 (General Conditions) requires an environmental management plan (EMP) to be prepared (condition 13) and includes a list of matters which the EMP must include (condition 14). Sub-clause (c) requires the EMP to include *procedures* to be following during mining activities on land and activities authorised in the CMA. The reference to 'procedures' is purposefully broad to enable the consent holder to implement the most appropriate procedures to ensure compliance consent conditions, rather that unnecessarily restrict the consent holder to a procedure which may not be best practice for the entire proposed consent term.

3. Table 3 refers to waste collection facilities for the laboratory. **How is general waste from the site dealt with**?

Response on behalf of TIL:

Response prepared by TIL and Enviser Limited:

General waste is collected at various locations at the site and is disposed of at appropriate off-site facilities.

4. Section 11.1.1 notes the fortnightly visual inspection is carried out of the Fish Pass for "*significant changes from the normal condition*". **Where is this reflected in the conditions of consent?** The Fish Pass (installed in 1972 and upgraded in 2010 which is now 16 years ago)[13] did not appear to be in especially good condition during our site visit. **Are there any plans to upgrade it?**

Response on behalf of TIL:

Response prepared by Enviser Limited:

The latest version of the proposed consent conditions is provided in Attachment O to the Applicant's response to comments received. Proposed consent AUTH142035.03.01, condition 2(a), requires the consent holder to inspect the fish pass every fortnight to identify whether any cleaning, maintenance or repairs are required and undertake any necessary works.

There are no plans to upgrade the fish pass as part of this project. If the Application is granted, the fish pass will be maintained in accordance with all consent conditions which relate to it.

5. Where is a diagram showing the fish pass, plunge pool, weir rip-rap, low flow channel and low weir, overflow weir?

Response on behalf of TIL:

Response prepared by Enviser Limited:

Appendix L- Freshwater Ecology Assessment describes the dam and fish pass structures, including photographs. See Section 2 and Photos 2 and 3.

In addition, the 2011 Tonkin + Taylor Fish Pass As-Built drawings are attached as **Appendix X** to this document.

6. The Lake Level Plan refers to one to two yearly performance checks of the Fish Pass. **Where is this reflected in the conditions of consent?**

[13] Section 3.5.3 of Substantive application at page 36.

Response on behalf of TIL:

Response prepared by Enviser Limited:

The latest version of the proposed consent conditions are provided in Attachment O to the Applicant's response to comments received. Consent AUTH142035.03.01 includes several conditions to ensure the fish pass is maintained in working order at all times.

Condition 3 requires the consent holder to maintain and modify, if required, the fish pass to ensure its effectiveness at all times.

Condition 4 requires the consent holder to develop and implement a monitoring programme to confirm the ongoing effectiveness of the fish pass. The programme shall be developed in consultation with the Department of Conservation, The Proprietors of Taharoa C block Incorporated, Taharoa Lakes Trustees, Te Runanga o Ngaati Mahuta ki te Hauaauru, Te Kooraha Marae, Aaruka Marae, and the Waikato Regional Council. This must be submitted to WRC for approval within 6 months of the commencement of the consent.

7. Attachment 2 states that plant shutdown occurs when Ponds 1 & 4 level reaches the RL16.5 m. Which ponds are these? This also states that during this trigger, water supplied to Ponds 1 and 4 remain active. Why?

Response on behalf of TIL:

Response prepared by Enviser Limited:

These are process ponds located in the Spiral Separation Plant (SSP). They supply process water required to run the SSP (refer to Section 5.1 and Figure 1 of the LL&WMP). Water supplies to Ponds 1 and 4 remain active during plant shutdown to allow the pond levels to be re-established to a healthy level (RL17.4m).