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29 May 2026

Expert Panel Chair
Central and Southern Block Mining Project
Taharoa Mine Expansion
C/- Environmental Protection Agency
Wellington

Attention: Dave Sergeant
[redacted]

Dear Dave

RE: TECHNICAL PEER REVIEW REPORT NO. 1 FOR FAST TRACK APPLICATION FTAA-2512-1153
– APPENDIX N: HYDROGEOLOGY ASSESSMENT
– APPENDIX I: HYDROLOGY ASSESSMENT

1. Review Brief

Following Minute 10 of the Expert Panel, the Environmental Protection Agency (EPL) has engaged Earthtech Consulting Limited (ECL) to undertake the following:

"[4] The scope of work is:

(i) To review two independent technical assessment reports appended to the substantive application:
a. Appendix I – Hydrology Assessment
b. Appendix N – Hydrogeology Assessment (Groundwater Effects).

(ii) To provide the reviewer's opinion of whether the data relied on and any assumptions made in reaching the conclusions in these assessment reports are sufficiently robust; i.e. to identify any material gaps/omissions in the data, or assumptions that in the reviewer's opinion mean the conclusions reached in these reports are not valid or need to be qualified (and if so how, to what extent).

(iii) To provide the reviewer's opinion on the conclusions/findings in the two assessment reports, with reasons for any material differences of opinion regarding those findings/conclusions.

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(iv) *To identify any specific issues on which the Panel should seek further information.*

(v) *To comment on proposed conditions of consent/mitigation (including for monitoring) as recommended in the two assessment reports in terms of their effectiveness/appropriateness in managing relevant effects, and any improvements that could/should be made for that purpose, along with hydrogeology related monitoring and mitigation as recommended in Appendix K – Terrestrial Ecology – Wetlands and Vegetation Assessment Redacted."*

This report provides the initial peer review of the Appendix N – Hydrogeology Assessment (Groundwater Effects)[1] and Appendix I – Hydrology Assessment[2] by identifying specific issues on which the Panel should seek further information as per items (i), (ii) and (iv) of the above scope of work, before substantive review reporting covering items (iii) and (v) of the above. The substantive review report is to address proposed conditions and management plans together with matters raised by the s53 submissions.

As part of the initial review, the s53 reports from the Waikato Regional Council[3] and the Department of Conservation[4] have also been read for context.

2. Review of Appendix N – Hydrogeological Assessment

2.1 <u>Conceptual Groundwater Model</u>

The conceptual groundwater model cross-sections A-A' to D-D' (Appendix A, Figures 2 to 6), are based on limited borehole information from April 2025 investigations, with (from Figure 1):

i. Central Pit – 197*ha*
   - Six investigation bores C101 to C106

ii. Southern Pit – 309*ha*
   - Three investigation bores S101 to S103

For the Southern Pit area, cross-sections A-A' and D-D' only have single bores to provide a control for the base of the "Ironsand" model layer.

All of the geological units above the greywacke basement have also been modelled (both in the conceptual and numerical groundwater models) as a single layer described as the "Ironsand" unit. From geological information provided by Geotechnics (2014)[5] which is attached to this report, the "Ironsand" unit consists of a series of sand and silt rich horizons resulting in a layered

[1] WWLA (2025). Assessment of Groundwater Effects, Taharoa Mine Expansion. Report prepared for Taharoa Ironsand Limited. Ref WWLA 1303 Rev 6 dated 17 September 2025. Appendix N of Application.
[2] WWLA (2025). Lake Taharoa Hydrology Assessment Report. Report prepared for Taharoa Ironsand Limited. Ref WWLA 0546 Rev 5 dated 5 September 2025. Appendix I of Application.
[3] Mitchell Daysh (2026). Waikato Regional Council s53 Comments. Central and Southern Blocks Mining Project [FTAA-2512-1153], Taharoa Ironsands Limited dated 20 May 2026.
[4] Department of Conservation (2026). Central and Southern Block Mining, Taharoa – s53 Comments. Report from D-G Conservation (FTAA-2512-1153) dated 21 May 2026.
[5] Geotechnics (2014). Revised Geological Model. Taharoa Ironsand Deposit. Report prepared for NZ Steel/Bluescope Steel Limited dated June 2014.

sequence of aquifers and aquitards. Geotechnics (2014) also references various drilling programmes carried out in 2012, 2013 and 2014 that do not appear to have been considered in the Hydrogeological Assessment..

The Appendix N numerical groundwater model provides precise predictions regarding drawdown, stream depletion and hydraulic connection to wetlands. Insufficient definition and oversimplification of the conceptual groundwater model introduces significant prediction uncertainty.

With a thinner near surface groundwater table aquifer than modelled, the predicted groundwater effects could be understated.

RFI 1 – Conceptual Groundwater Model

1a. *Please incorporate all available site drilling information to revise the conceptual hydrogeological model presented in Section 2 of Appendix A.*
1b. *Please consider refinement of the single Ironsand unit into a series of aquifers and aquitards as informed by the geological model.*
1c. *Please revise the conceptual model cross-sections A-A' to D-D' and the numerical groundwater model as required.*
1d. *Provide Central Pit C101 to C106 and Southern Pit S101 to S103 bore logs.*

2.2 Hydraulic Conductivity (Permeability)

The most sensitive parameter in the groundwater model is hydraulic conductivity. Field testing of the hydraulic conductivity has been carried out (Table 6), however, this information has not been assigned to soil type or to any specific aquifer or aquitard layers within the Ironsand unit.

The assignment of hydraulic conductivity to the single Ironsand layer in the groundwater model has used pilot points through model calibration. While the pilot point method is statistically valid, the Hydrogeological Assessment has not demonstrated that the hydraulic conductivity settings represent actual groundwater conditions.

Figure 1 from Geotechnics (2014) shows the Mitiwai Stream channel incised into moderately permeable black sand deposits. The calibrated hydraulic conductivity plot presented in Appendix A, Figure 10, shows the Mitiwai Stream directly underlain by a low permeability zone which limits predicted stream depletion effects.

RFI 2 – Hydraulic Conductivity (Permeability)

2a. *Please provide an assessment of the Table 6 – Summary of Slug Test Results, against soil texture from each piezometer test zone.*
2b. *Please provide the groundwater model assigned hydraulic conductivity settings for the Appendix A cross-sections A-A', B-B', C-C' and D-D' so that this data can be compared to the information requested in RFI 1 above.*
2c. *Please provide verification of the low hydraulic conductivity setting adopted for the Mitiwai Stream Layer 1 area.*

2.3 Groundwater Recharge

Appendix A Table 2 describes groundwater recharge at 476*mm/yr,* equivalent to 41% of rainfall. This recharge is high compared to groundwater studies in dune areas typically showing recharge at 20% to 30% of annual rainfall.

RFI 3 – Groundwater Recharge

3a. Please verify the modelled high groundwater recharge rate of 476mm/yr. [Reviewer suggests the water table rise method of Healy and Scanlon (2010)[6] be considered to verify recharge.]

2.4 Groundwater Availability

RFI 4 – Groundwater Availability

4a. Please provide an assessment of groundwater availability in terms of the modelled maximum groundwater abstraction rate of 131.8ℓ/s, equivalent to 4,156,400m³/yr.

2.5 Saline Intrusion

Figures 24 and 25 show probable saline intrusion into the Central and Southern Pits respectively.

RFI 5 – Saline Intrusion

5a. Please provide an assessment of the expected maximum groundwater salinity which can be considered for conditions of consent.
5b Please assess if saline water within mine pits will have any adverse effects on surrounding groundwater or surface water.
5c. Please describe where saline impacted groundwater is to be discharged to (from pumping) and how this discharge will avoid adverse water quality effects to groundwater and surface water.

2.6 Groundwater Level Monitoring

The groundwater model calibration is based on levels limited to a short duration between 16 April and 28 May 2025. The limited monitoring record provides a constraint to model predictions.

RFI 6 – Model Verification

6a. Please test the calibration of the groundwater model against a likely interseasonal range (with respect to summer low levels) of groundwater levels.
6b. Please undertake groundwater model re-calibration using 2026 summer low groundwater levels.
6c. Reconsider groundwater model predictions following 6a and 6b above.

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[6] Healy, R.W. and Scanlon, B.R. (2010). Estimating Groundwater Recharge. Cambridge University Press (Section 6.2).

2.7 Lake Effects

The groundwater model has set all four lakes as constant head boundaries. While this is appropriate for determining maximum pit pumping rates, the constant rate setting does not allow drawdown effects on lakes to be assessed.

RFI 7 – Lake Effects

7a. Please provide an assessment of potential groundwater drawdown effects on lakes. Please consider interseasonal background groundwater and lake level variability.

2.8 Groundwater Drawdown Contour Plots

The reviewer understands that the maximum groundwater level drawdown predictions provided in Figure 13 relate to the final mine stage (at the time of maximum mine extent). Groundwater drawdowns from earlier mine stages have not been provided. For the assessment of effects and for drawdown condition limits it would be helpful if the maximum extent of drawdown from all mine stages in each of the pits were provided.

RFI 8 – Predicted Groundwater Drawdown

8a. Please provide maximum drawdown plots (drawdown and total head plots) for each of the Central and Southern Mine pits that can be adopted for the maximum consented drawdown limits.
8b. Southern Pit Drawdown – Figure 13 does not agree with Figure 18 regarding maximum extent of drawdown associated with pit staging. Please clarify.
8c. For all drawdown plots, please also provide total head plots so that the effects in terms of groundwater levels can be better understood.

2.9 Groundwater Model Predictions

RFI 9 – Groundwater Model Predictions

9a. Please provide the predicted groundwater drawdowns and effects assessments for all lake levels, wetlands, stream depletion and saline intrusion for reduced recharge conditions associated with 1:10 year and 1:50 year drought conditions. Please include consideration of anticipated climate change impacts on drought conditions over the next 50 years.

2.10 Groundwater Connected Wetlands

Section 3.3 states *"that the groundwater model was used to assess the degree of connection or disconnection between the wetlands and groundwater."*

Section 6.3.2 refers to Figure 13 for wetland drawdown effects. Figure 13 is understood to present the maximum drawdown for a particular mine stage.

RFI 10 – Wetland Verification and Drawdown Predictions

10a. Please provide verification of wetlands disconnected to groundwater with for example groundwater level monitoring data.

10b.	*Please assess wetland effects for maximum groundwater drawdown plots which include all stages within the Central and Southern Pits.*

2.11 Mine Water Balance

RFI 11 – Mine Water Balance	
11a.	*Please provide a site water balance in terms of groundwater and surface water take, including mine water use for the slurry pipeline and processing needs.*

2.12 Mitiwai Stream MALF

Appendix D of the Hydrogeology Assessment shows that the Mitiwai Stream MALF (Mean Annual Low Flow) = 45*ℓ/s* was determined using the Soil Moisture Water Balance Model.

RFI 12 – Mitiwai Stream MALF	
12a.	*Please verify the Mitiwai Stream MALF with an alternative analysis such as using the measured stream flow data and comparison with a control catchment.*

2.13 Groundwater Modelling of Rehabilitation

Groundwater modelling has assumed that the mine backfilling with tailing materials (ELF – Engineered Landfill) has the same hydraulic conductivity as the existing in-situ Ironsand resource. This has resulted in groundwater model predictions of full recovery to pre-mining conditions. The tailings materials are expected to have a much higher silt content and lower hydraulic conductivity than the in-situ Ironsand which would influence the mine recovery predictions.

RFI 13 – Rehabilitation	
13a.	*Please provide hydraulic conductivity testing results for the tailings backfill material.*
13b.	*Please consider how lower permeability mine backfill may influence the groundwater effects assessment and specifically baseflow conditions in the Mitiwai and Wainui Streams in the long-term.*

3. Review of Appendix I – Hydrology Assessment

3.1 Surface Water Abstraction – Regulatory Framework

The regulatory framework (relevant section of the Waikato Regional Plan) under which the proposed abstraction is to operate has not been clearly identified in the report. The text infers that the take would operate as a lake/reservoir abstraction, as opposed to a stream abstraction, however this is not explicitly stated.

Section 2.2 states, *"The reach of the Wainui Stream behind the dam is essentially an extension of the lake."*

RFI 14 – Regulatory Framework

14a. *Please provide an explanation which details the relevant section of the Waikato Regional Plan that the proposed abstraction is to operate under and whether or not plan-based abstraction allocation limits and minimum flows apply at the abstraction point on the Wainui Stream.*

3.2 Lake Water Balance Assessment – Catchment Inflows

Section 4.3.3, Table 6, presents the Taharoa Lake catchment water balance summary as % of mean annual rainfall. Groundwater recharge at 31% appears to be high for a predominantly greywacke geology catchment and may suggest that the *Soil Moisture Water Balance Model (SMWBM)* does not accurately model the catchment water balance.

Section 4.3.3 states *"No measured stream flow data exists within the catchments that flow into the lake, hence an uncalibrated model was used to estimate stream flow."*.

RFI 15 – Catchment Inflows

15a. *Please ensure calibration of the Soil Moisture Water Balance Model by undertaking stream flow gauging of the Mangatangi Stream and using this to calibrate the model.*

3.3 Lake Water Balance Assessment – Lake Water Balance Model Calibration

The lake water balance model has successfully simulated historical measured water levels in Lake Taharoa from 2013 to 2025 with a good degree of alignment, as shown in Section 4.4.1, Figure 14. However, the model has not used Wainui Stream flow monitoring data which would allow for the direct simulation of flows within the Wainui Stream and a more accurate overall water balance.

Section 4.3.5 states, *"There is uncertainty in the exact lake topography and bathymetry behind the dam structure, and the amount of head loss (i.e., decrease in water level) along the length of the Wainui Stream behind the dam. Therefore, ultimately the stage vs outflow curve was adjusted as a calibration parameter, while maintaining the general shape determined from the hydraulic equations (i.e., increasing outflow volume with increasing water levels)."*

Section 4.3.6 states, *"Due to uncertainties in the exact configuration of the outlet structure, vertical datum offsets, and frictional headloss along the Wainui Stream, the discharge through the outlet dam structure curve was adjusted as a model calibration parameter to provide the best match to measured water levels. Therefore, lake seepage to groundwater was implicitly accounted for as part of discharge losses described in Section 4.3.5."*

From the two quotations above, it appears that stream discharge through the outlet structure and groundwater seepage losses have been lumped into a single calibration parameter for the lake water balance model.

RFI 16 – Lake Water Balance Model Calibration

16a. *Please use the available dam level record (2020-present) (Section 3.4, Figure 6) and the weir construction information, to develop a record of the Wainui Stream flow over this period. This would allow for the separate quantification of Wainui Stream flows and groundwater seepage losses in the Lake Water Balance Model.*

16b. *Please provide a verification of the Lake Water Balance Model with the results of the stream gaugings that were conducted in 2024 and 2025 in the Wainui Stream (Section 3.5, Table 4).*

3.4 Water Take Scenarios

Simulated water abstraction scenarios do not appear to align with the maximum proposed extraction limits set out in Section 2.3.2, Table 2. Simulating the maximum proposed extraction would allow for a more comprehensive analysis of potential effects on Lake Taharoa levels.

Section 5.1, Table 8 is as follows:

Table 8. Exploratory scenarios.

#	Name	Description
S1	Calibration / Historic Water Takes (presented in **Section 4.4**)	Historic measured water takes (as described in **Section 3.4**). Note: measured water level data were only available for the period August 2013 to present.
S2	No Water Takes	No water takes, but assuming the dam outlet structure is still present
S3	Maximum Future Water Take	Maximum consented (and proposed) processing water take (27,200 m^3/day) each day, and 35 ship loading events per year (21,428 m^3/day x 4 days per ship loading event)
S4	Increased Ship Loading Take and Average Processing Water Take	Average current processing water take (17,500 m^3/day) each day, and 35 ship loading events per year (21,428 m^3/day x 4 days per ship loading event)
S5	Naturalised – No Dam and No Water Takes	Assumed removal of the dam structure, and no water takes (i.e. the existing environment for the purpose of the resource consenting process).

Section 5.1 states, *"The volume and duration of ship loading events will vary each year, depending on available supply, demand, and weather conditions. Therefore, to develop a representative water take time series, a Monte Carlo approach was used to randomly select 35 four-day ship loading periods each year within the simulation period. The processing water take was assumed to occur every day of the year.*

To assess the potential future operating regime of Lake Taharoa under the proposed water take limits, it was assumed the ship loading take would operate at 21,428 m3/day (3,000,000 m3/year ÷ 35 ship loadings/year ÷ 4 days per ship loading event). It was assumed that recycled processing water will supply the additional water requirements for ship loading over and above the proposed take from Wainui Stream, as currently occurs."

RFI 17 – Water Take Scenarios

17a. *Scenario S3 – Maximum Future Water Take, uses a maximum ship loading water abstraction of 21,428 m3/day. Would the Applicant accept this as the maximum abstraction limit for ship loading use? If the higher limit of 75,000 m3/day for ship loading use is sought (as per Section 2.3.2, Table 2), please integrate this value into the Scenario S3 simulation.*

17b. *In addition to using the Monte Carlo approach to randomly select ship loading events within the simulation period, please consider critical cases for Lake Taharoa levels where ship loading is to occur during late summer/early autumn periods (stream low-flow periods).*

3.5 Minimum Flows in Wainui Stream

A minimum flow of 10ℓ/s through the outlet weir on the Wainui Stream is proposed. This minimum flow has been derived from historical minimum flows, in conjunction with consultation with TIL's project ecologist. However, this value has not been benchmarked against minimum flow standards for streams as set out in the Waikato Regional Plan, which would provide an additional means of verifying the appropriateness of the proposed value.

Section 6.1 states, *"Flows through the outlet weir are controlled based on the water level directly behind the dam structure. Historically, there does not appear to have been a residual flow requirement for flows through the outlet weir. Through discussions with TIL's project ecologist, it was agreed that a minimum flow requirement could be set at the minimum flow from available monitoring records, on the basis that habitat downstream had remained when this level (and consequent downstream flow rate) had occurred, provided flows were not reduced to this level for extended periods of time.*

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."

RFI 18 – Minimum Flows in Wainui Stream

18a. Please provide an assessment of the suitability of the proposed minimum flow of 10l/s by comparing it with the Waikato Regional Plan minimum flow requirement (calculated as a % of Q5) for the Wainui Stream.

3.6 Flooding

Section 6.2 states, *"It is understood based on a review of road elevations that the primary area of concern regarding flooding during high lake levels is the section of Taharoa Road, approximately 500 metres south-west of Taharoa community. This section of road is located along a topographic low (~10.5 m RL) and is close to current normal lake water levels, as illustrated in Figure 18."*

RFI 19 – Flooding

19a. Please consider how a high-flow bypass of the dam structure could alleviate the flooding risk of the Taharoa Road during periods of high lake level.
19b. Please carry out a flooding risk assessment on Taharoa Road, including anticipated climate change impacts that could influence high intensity rainfall events over the next 50 years.

3.7 Historic Water Level Data

Section 3.4 states, *"Measured lake water level data covering the period August 2013 to 2024 (inclusive) were provided by TIL (Figure 5). Lake levels appear to have remained relatively stable between ~9.6 m and 10.4 m, with a seasonal cycle of higher levels in winter, and lower levels in summer."*

RFI 20 – Historic Water Level Data

20a. From mid-2022, minimum lake water levels are around 10m local datum. The preceding level record from 2013 to 2022 shows a seasonal drop to around 9.6m local datum. Was the dam structure/weir structure modified in 2022? Or is this effect climatic/abstraction related?

Yours sincerely

P I KELSEY
Principal Hydrogeologist
EARTHTECH CONSULTING LTD

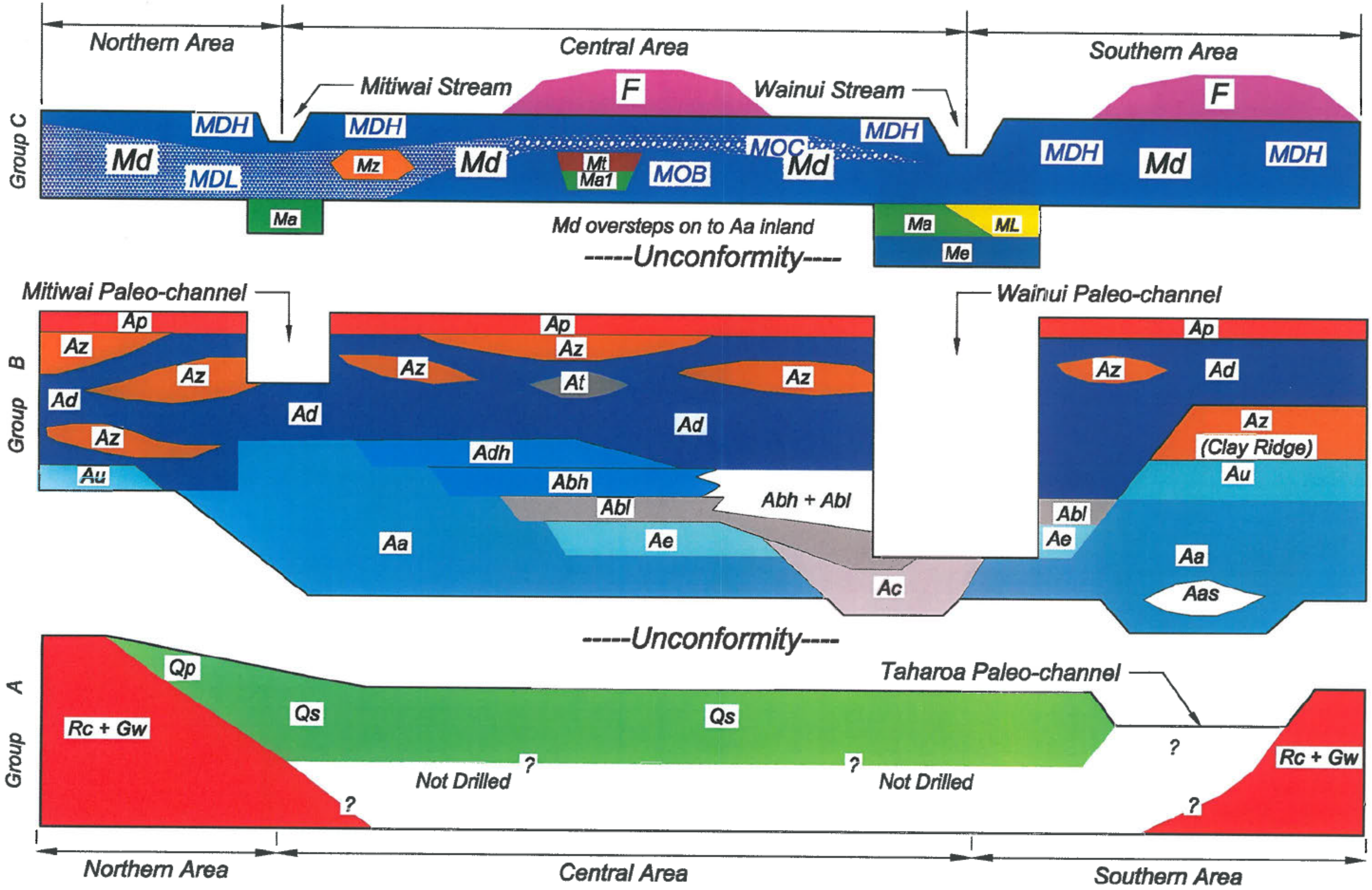
Encls: Appendix A – Revised Geological Model of Tahaora Ironsand Deposit from Geotechnics (2014)

Appendix A

Revised Geological Model of Tahaora Ironsand Deposits

FROM GEOTECHNICS (2014)

Figure1 : Visual summary of Geological units and spatial relationships,Taharoa, based on north-south sectional alignment. Not to scale.



Revised Taharoa Ironsands Stratigraphic Column after 2014 drilling program

Geological Unit				Lithology		Description	PLYS		Ply Description
Age (Ma)	Tauranga Group Subaqueous deposits		Kaihu Group Subaerial deposits	Units	Unit colour		Updated convention	Redundant convention	
Pliocene to Holocene		Titano-magnetite dominated facies sands	Mitiwai Formation; Paparoa and Nukimiti Sand	F		Tailings and fill	F	Tailings	Tailings
				Md		Free flowing grey to black sand	MDH MDL MOC MOB	VGCA VGCA LVGC VGCB	>30% mags <30% mags Dark grey to brown, <30% mags, <50% FeMags >30% mags
				Mz		Localised thin layers of silt and sandy silt	MZ		Localised silt layers
				Mt		Peat	Mt		Mud and peat, generally within MOC/MOB
	(Upper) Tauranga Group			Ma1		Clay and alluvium	Ma1		
				Ml		Sloppy brown lacustrine mud	Ml	MLF	Uneconomical Mitiwai Base
				Ma		Greenish to bluish clays and silts (alluvium)	Ma		
				Me		Bluish mud and sandy mud with shell, at base of Md in paleochannel	Me		
			Waiau Formation; Te Ake Ake Sand	Ap		Ash and paleosol (brown to orange silt and clay)	Ap	BV CLAY	Semi continuous ash/paleosol
				Az		Silt, sandy silt and clay, brown to orange to reddish brown, as layers and lenses within Ad; forms homogeneous deposits in southern area (Clay ridge, Az1)	Az	BVGCA HBVGC BVGCB HBVGL	Low mags, high slimes
				Ad		Silty fine sand, brown, and grey, may be consolidated.	Ad		Low grade sand <30% mags
				At		Peat,as localised lenses within Ad	At		
				Adh		fine to medium sand, some silt, black, high mags, below Ad	Adh		High grade black sand >30% mags
				Abh		Medium to fine sand, clean, black, may contain gravel. High mags	Abh		
				Abl		Medium to fine sand, clean, brown to orange to grey-black, low mags, may contain gravel. May interfinger with Ac	Abl		Low grade sand <30% mags
	(Lower) Tauranga Group			Ac		Silty sand, silt and sand, local peat; dark brown, grey, black, low mags	Ac		Subeconomical to uneconomical Te Ake Ake Base
				Ae		Bluish grey to grey incompetent mud, muddy sand; some shell	Ae		Uneconomical Te Ake Ake Base
				Au		Pumiceous and siliceous sand and silt, light brown to white to pink	Au		
				Aa		Alluvial silt and clay,competent, bluish grey, green, brown; some peat	Aa		
			Awhitu Sand	Qs		Silty quartzofeldspathic sand, yeallow to orange to green	Qs	Silica Clay Base	Uneconomical Material
Mesozoic	Greywacke basement			Rc		Residual soils: clay and silty clay, orange to red to yellow; (weathered greywacke)	Rc		
				GW		Greywacke basement	GW		