Before the Independent Hearings Panel appointed by Waitomo District Council

Under the Resource Management Act 1991 (RMA)

In the matter of the Proposed Waitomo District Plan

Statement of Evidence of Hamish Dean for Taharoa Ironsands Limited

Terrestrial Ecology

Tranche 2 - Ecosystems and Indigenous Biodiversity

Dated 21 October 2024

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MAY IT PLEASE THE COMMISSIONERS

INTRODUCTION

1. My full name is Hamish Alston Dean.

2. I hold the qualifications of Bachelor of Science (Ecology and Zoology) from Victoria University of Wellington, and Master of Science in Biological Sciences (Ecology) from the University of Waikato.

3. I have worked in the fields of ecology and natural resource management for 21 years, working in consultancy, not for profit organisations and at Bay of Plenty Regional Council (**BOPRC**). I am currently a Principal Ecologist at SLR Consulting (**SLR**). I have held this position since June 2021. Prior to joining SLR (then 4Sight Consulting) I was a Consents Team Leader at BOPRC.

4. I have considerable experience in ecological assessment of terrestrial and wetland ecosystems, significance assessments, ecosystem restoration, catchment management, and fauna survey. I have experience in Significant Natural Area (**SNAs**) assessment and have worked on both the Waikato District and Hamilton City Council SNA projects, as well as smaller site-by-site assessments of significance. Projects of particular relevance to these proceedings include:

   (a) I provided technical oversight, site assessment, undertook quality control, and co-authored the Ecology Technical Report for the Hamilton City Significant Natural Area project. I provided technical evidence at the Hamilton City Council Plan Change 9 (**PC9**) hearing as well as additional written evidence relating to the impacts of the National Policy Statement for Indigenous Biodiversity on the PC9 process.

   (b) I managed the desktop site assessment phase of the Waikato District Significant Natural Area project and was part of a team that assessed more than 1,600 potential sites, using a similar methodology and the same criteria as the current SNA project.

   (c) I was lead ecologist on the Franklin Ward Ecological Prioritisation Project which involved assessment of approximately 170 reserves. A

rapid assessment methodology was used to assess vegetation and habitat values at each site, along with threats and pressures.

(d) I have undertaken numerous wetland assessments since the introduction of the wetland delineation protocols under the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (**NES-F**) and National Policy Statement for Freshwater Management 2020 (**NPS-FM**) framework, for solar farms, wind farms, and residential and commercial developments.

5. I provide this evidence in relation to Taharoa Ironsand Limited's (**TIL**) submission on the Proposed Waitomo District Plan (**PWDP**) in respect of the provisions which may affect the Taharoa Ironsand Mine (**Mine**).

6. I have visited the Mine on several occasions, and assessed the SNA areas in question in September and December 2021 during which habitat types were mapped and flora and fauna was surveyed.

7. I have no personal interest in the outcome of these proceedings or any relationship with the parties involved, although I note that I was previously employed by Mr Kessels who has produced evidence for Waitomo District Council in this matter.

8. In preparing this evidence I have had regard to:

(a) TIL's submission and further submission on the PWDP;

(b) The section 42A report for topic Ecosystems and Indigenous Biodiversity;

(c) The relevant sections of the Proposed Waitomo District Plan, including Schedule 6; and

(d) The geospatial data which details the extent of each SNA.

Code of Conduct for Expert Witnesses

9. I have read and am familiar with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2023, and agree to comply with it. My qualifications as an expert are set out above. Other than where I state that I am relying on the advice of another

person, I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of my evidence:

10. My evidence relates only to specific SNAs identified in and adjacent to the Taharoa C Block which forms part of the Mine and is currently actively mined by TIL. Specifically, these are:

    (a) R17UP183 Coastal Strip

    (b) R16UP014.01 Lake Rotoroa

    (c) R16UP015.01 Lake Numiti

    (d) R16UP002 Lake Taharoa

11. In my Statement of Evidence I:

    (a) summarise the SNAs in and adjacent to the Taharoa C Block;

    (b) explain why a small area of R16UP002 does not meet the definition of a natural inland wetland under the NPS-FM and does not meet the Waikato Regional Policy Statement (**WRPS**) criteria for SNAs, and therefore should be removed from the SNA; and

    (c) explain issues associated with the delineation of the other PWDP SNAs in and adjacent to the Taharoa C Block and propose clearer / improved boundaries.

SIGNIFICANT NATURAL AREAS AT TAHAROA

12. The Taharoa C block comprises the area south of the Mitiwai Stream and north of the Waiohipa Stream. It is bounded by the Tasman Sea to the west and Lakes Taharoa, Numiti, Rotoroa, Piopio and Rototapu to the east. Historically this area featured tall active dunes but has been mined for ironsand since the early 1970s. The current environment is highly modified from its previous natural state, but significant natural values are retained both within and adjacent to the site.

13. A fringe of natural dune vegetation remains along the coast to the west and there are high quality wetlands around the margins of the lakes to the east.

14. As part of previous work for TIL during the reconsenting of TIL's mining activities in the Central and Southern Block, I was part of a team that assessed the ecological values of the Taharoa C Block. This included some areas that have been designated SNAs. We undertook a field survey over multiple visits to the Site during the summer of 2021 - 2022. Vegetation types were mapped using the most up to date aerial photography available, in combination with the on-the-ground survey. Vegetation types were described, and all wetlands were assessed against the NPS-FM wetland definition and mapped either using aerial photography or handheld GPS.

15. Although the consent pathway for mining under the NES-F was introduced in early 2022, TIL does not intend to modify or destroy any natural wetlands within the Central and Southern blocks as part of the current reconsenting process.

R16UP002 LAKE TAHAROA

16. Because the movement of the mined ironsand, refined titanomagnetite and tailings around the site requires large quantities of water, there are numerous artificial ponds and swales scattered through the site as well as some large water storage ponds.

17. One such pond has been mapped in the PWDP planning maps as part of SNA R16UP002 (Lake Taharoa). I do not agree that it should be considered an SNA. The area in question is marked as 'A' in Figure 1 below.

18. Although the artificial pond identified as part of R16UP002 includes some wetland vegetation, this area was a remnant of previous mining and is used as a water storage area. It experiences large fluctuations in water level and at the time of our assessment, grey willow on the margins had been killed by these fluctuations and the site had a large pump operating in it which supplied water to some parts of the mining process.

19. Photos 1 & 2 show the area as it was in late 2021.

Photo 1: Western part of the artificial pond in R16UP002

Photo** 2**: Eastern part of the artificial pond in R16UP002 This part of the mapped SNA polygon differs from the adjacent area, which was historically a wetland, whereas the pond in question is completely artificial. The 1961 aerial photo in Figure 1 illustrates this.

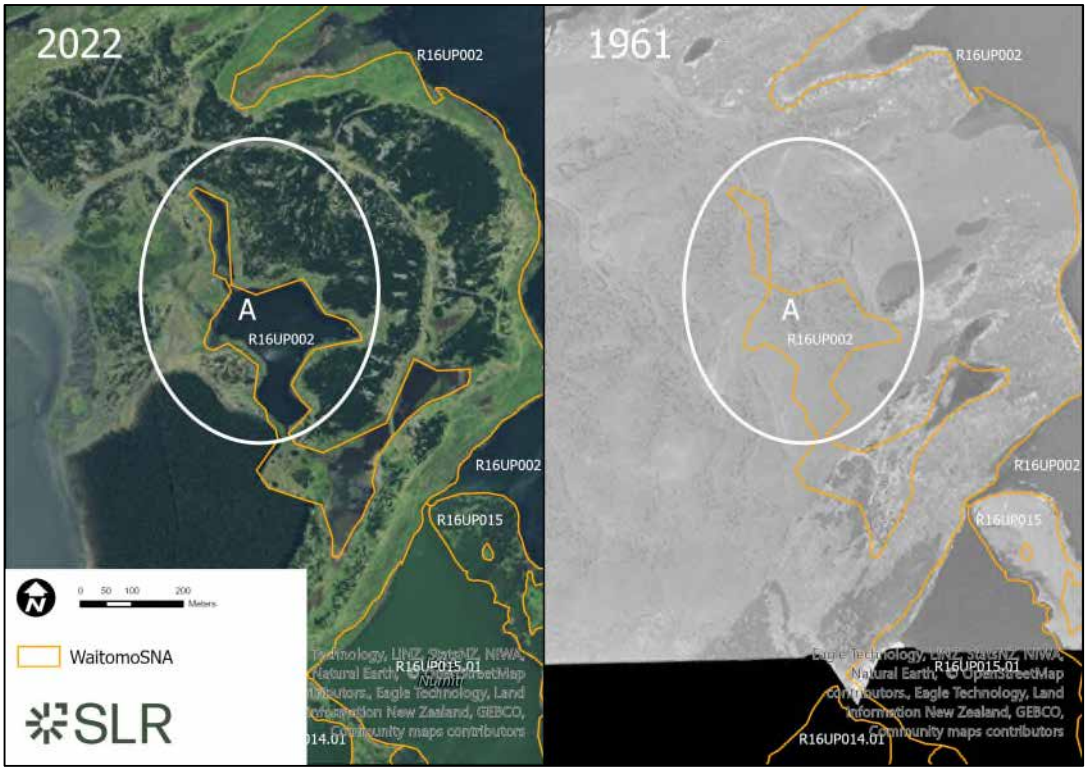

Figure 1: Artificial pond (Marked 'A')

20. This artificial pond is part of a much larger SNA which includes Lake Taharoa and several nearby wetlands. The SNA methodology allows for grouping of nearby, similar sites but one of the downsides of this is that it can artificially lift the values of lower-quality sites in the group. In this case, the artificial pond was captured as part of R16UP002 in error and this needs to be rectified. I have completed a revised assessment of the artificial pond included in R16UP002 against the criteria for identifying SNAs in the WRPS below.

	Criterion	**Assessment**
1	It is indigenous vegetation or habitat that is currently, or is recommended to be, set aside by statute or covenant or by the Nature Heritage Fund, Ngā Whenua Rāhui committees, or the Queen Elizabeth the Second National Trust Board of Directors specifically for the protection of biodiversity, and meets at least one of Criteria 2-11.	Not applicable. Not recommended for protection.
2	In the Coastal Marine Area, it is indigenous vegetation	Not applicable. Not in the CMA.

	Criterion	Assessment
	or habitat for indigenous fauna that has been reduced in extent or degraded due to historic or present anthropogenic activity to a level where the ecological sustainability of the ecosystem is threatened.7,8	
3	It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: • Classified as threatened or at risk, or • Endemic to the Waikato Region, or • At the limit of their natural range.	It is highly likely that threatened species such as matuku huurepo and spotless crake use the site for foraging as these were recorded in the neighbouring part of the site during our survey. However, these species are highly mobile and use wetlands and other habitat across the landscape and this pond is unlikely to provide critical habitat when compared with the adjacent lakes and their marginal wetlands. Matuku huurepo utilise a wide range of habitats for feeding. For example, on a trip to Marakopa in 2023 I observed three bitmatuku huurepo feeding in a paddock, but it would be unreasonable to call the paddock ecologically significant. The ramping experienced by the pond in question due to the regular water take and discharge would also make the site unsuitable for most waterfowl and cryptic wetland species to nest.
4	It is indigenous vegetation, habitat, or an ecosystem type that is under-represented (20% or less of its known or likely original extent remaining) in an Ecological District, Ecological Region, or nationally.	Around 40% of vegetation type WL Swamp Mosaic remains in the Waikato Region compared with the historic extent, while in the Kawhia Ecological District approximately 58.8% remains.[1] At the time of our assessment vegetation at this site comprised raupoo reedland in narrow bands on the margins of parts of the pond. Given that this is a constructed water body and is therefore no different to a stock water pond this criterion should be disregarded.
5	It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon, such as geothermal, Chenier plain, or karst ecosystems, hydrothermal vents or cold seeps.	No. Historically this area was part of an active dune system, but this is no longer accurate.
6	It is wetland habitat for indigenous plant communities and/or indigenous fauna communities	No. Artificially created and maintained and meets exception (d) for water storage.

[1] Wildland Consultants 2022 Updated guidelines for determining areas of significant indigenous vegetation and habitats of indigenous fauna in the Waikato region. Waikato Regional Council Technical Report dated March 2023 at page 66.

	Criterion	Assessment
	(excluding exotic rush/pasture communities) that has not been created and subsequently maintained for or in connection with: (a) waste treatment; or (b) wastewater renovation; or (c) hydroelectric power lakes (excluding Lake Taupō); or (d) water storage for irrigation; or (e) water supply storage; unless in those instances they meet the criteria in Whaley et al. (1995).	
7	It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type.	The area is not large relative to other sites.
8	It is aquatic habitat (excluding artificial water bodies, except for those created for the maintenance and enhancement of biodiversity or as mitigation as part of a consented activity) that is within a stream, river, lake, groundwater system, wetland, intertidal mudflat or estuary, or any other part of the coastal marine area and their margins, that is critical to the self-sustainability of an indigenous species within a catchment of the Waikato Region, or within the coastal marine area.	Not applicable. Artificial water bodies are excluded.
9	It is an area of indigenous vegetation or habitat that is a healthy, representative example of its type because: • its structure, composition, and ecological processes are largely intact; and, • if protected from the adverse effects of plant and animal pests and of adjacent land and water use (e.g. stock, discharges, erosion, sediment	No. Small patches of raupoo reedland with low diversity and influenced heavily by the fluctuating water regime.

	Criterion	Assessment
	disturbance), can maintain its ecological sustainability over time.	

21. When the site was assessed for the consent process in 2021-2022 against the NPS-FM Natural Inland Wetland definition it was dismissed because it is specifically excluded as it is *"a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body".*[2] While this is helpful, it is not determinative in concluding whether the artificial pond area is an SNA. Significance is assessed only against the WRPS criteria, and this is what I have focussed my assessment on.

22. In summary, while this artificial pond area does contain some indigenous wetland vegetation and may provide temporary feeding habitat for mobile wetland avifauna, I do not believe that it can be considered significant indigenous vegetation or significant habitats of indigenous fauna warranting protection under section 6 of the Resource Management Act 1991.

REVISED SNA BOUNDARIES

23. In addition to the removal of the area discussed in paragraphs 16 – 22 above from R16UP002, I propose several smaller adjustments to the boundaries of R16UP002, R16UP014.01, R16UP015.01 and R17UP183.

24. These changes are to improve the alignment of the mapped SNA with the natural feature and exclude areas of active mine, pasture and exotic shrubland which are not ecologically significant. In some areas the proposed SNAs covering lakes and wetlands did not fully cover the wetland area, and in other areas they covered areas of pasture and exotic shrubland which in my opinion should not be included.

25. To map these proposed revisions, I relied on the wetland mapping I completed for TIL during the reconsenting process, which is included in **Appendix B**, but because more recent aerial imagery[3] is now available, further refinements can

[2] NPS-F clause 3.21.

[3] The dataset used was the Waikato 0.3m Rural aerial imagery set flown between 2021 and 2023 and provided by Waikato Regional Aerial Photography Service. Accessed through the LINZ Data Service.

be made. Using the best available aerial photography to map natural feature boundaries is consistent with the SNA methodology used in other parts of the Waikato Region.[4]

26. It should be noted that the wetland assessment included in Appendix B provides an assessment of whether some of the proposed SNAs are wetlands.

27. As proposed, SNA R16UP002 (Lake Taharoa) includes areas of rough pasture adjacent to the lake margin wetlands. These areas appear to have been included in error and while they have potential to provide a buffer to the wetlands, should not be included as part of the SNA itself. In addition, several areas of wetland extended beyond the SNA boundary but should be included within the SNA. These are contiguous with the rest of the site and there is no reason to exclude them. These are likely to have been missed due to lower definition aerial imagery and mapping during the SNA assessment process.

28. Proposed SNA R16UP015.1 (Lake Numiti) also included areas of pasture grassland on the margins of the lake that are not ecologically significant and should be excluded. One area of lake margin wetland at the northern end of this proposed SNA was also missed and this is proposed to be added to the mapped extent of the SNA.

29. R16UP014.1 (Lake Rotoroa) did not include any exotic habitat but an area of contiguous wetland at the northern end of the site has been missed and is proposed to be added in. In addition, an area of kanuka treeland at the northern end adjacent to a pine plantation should be added for consistency as it provides an indigenous buffer and is similar to and almost contiguous with another are of kanuka scrub and treeland which has been included in the proposed SNA slightly further southwest.

30. Along the coastal fringe, R17UP183 includes areas of sand and exotic grassland that are part of the mining operation and do not have any natural vegetation. These areas are regularly impacted by machinery, have very little ecological value, and in my opinion should be excluded from the SNA.

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[4] Van der Zwan W, Kessels G 2017 "*Significant Natural Areas of the Waikato District: Terrestrial and Wetland Ecosystems"* Waikato Regional Council Technical Report 2017/36.

31. None of the changes proposed will adversely affect the integrity of the SNA and in some cases will enhance them.

32. Maps of all the proposed changes have been included as **Appendix A** to my evidence, and geospatial data has been provided to Mr Kessels for consideration.

CONCLUSION

33. For the reasons set out in this evidence I consider that an alteration to SNA R16UP002 to remove the artificial water storage pond, and other minor changes to R17UP183, R16UP014.01 and R16UP015.01 should be made to exclude non-significant areas without compromising the integrity of the remaining SNA.

Dated this 21 day of October 2024.

Hamish Dean

APPENDIX A

Proposed SNA boundary changes

Service Layer Credits:
Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

0 25 50 100 150 m

LEGEND

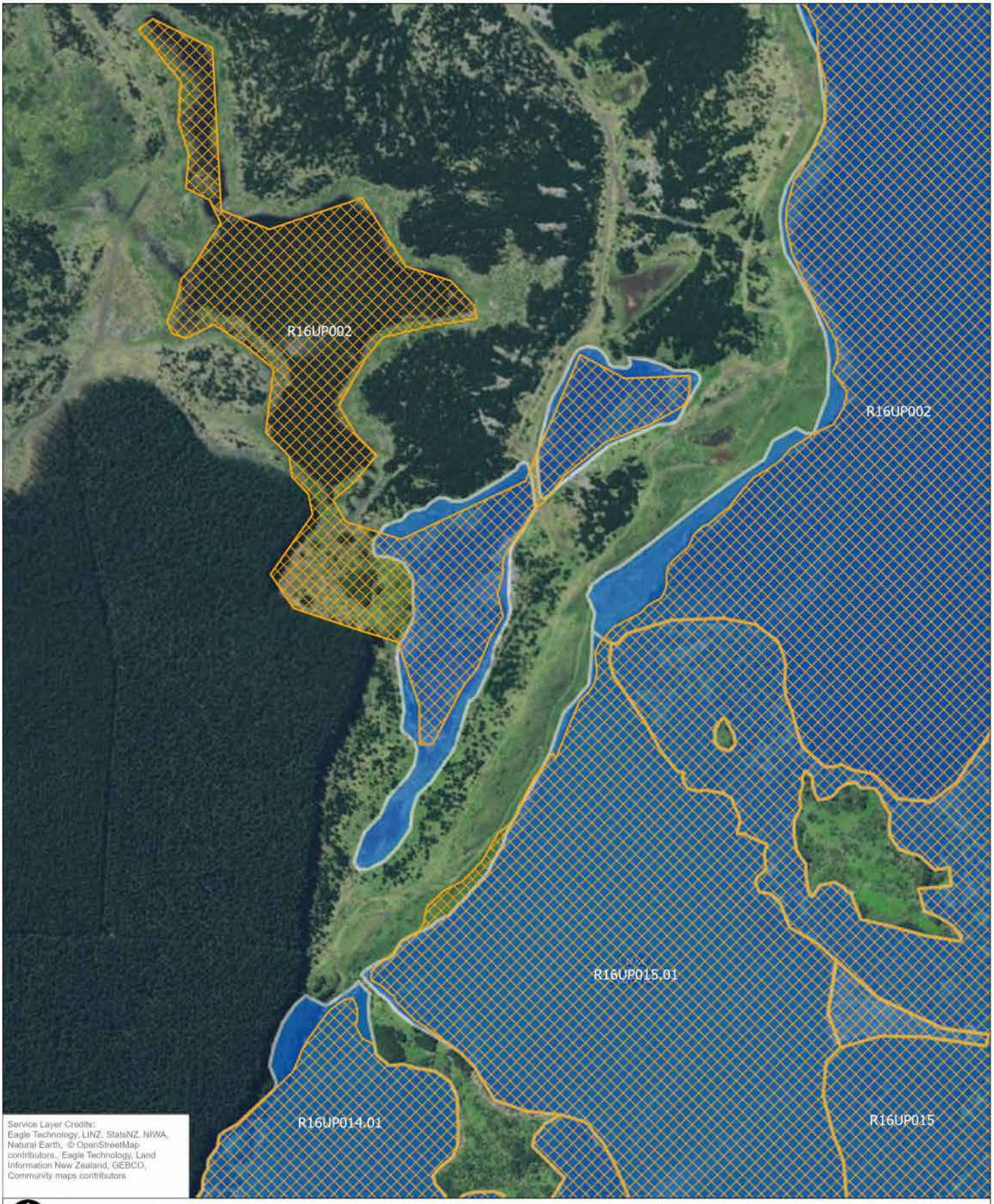
- Proposed SNA revisions
- Waitomo Notified SNA

Coordinate System:	NZGD 2000 New Zealand Transverse Mercator
Scale:	1:5,000 at A4
Project Number:	
Date Drawn:	17-Oct-2024
Drawn by:	HD

SLR

R16UP002 North

Path: H:\Projects-SLR\850-TRG\850.016639.00001 Taharoa Ironsands Waitomo DP s\06 SLR Data\01 GIS\GIS\TaharoaWaitomoDP\TaharoaWaitomoDP.aprx\L_A4_P_NZ



Service Layer Credits:
Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

0 25 50 100 150 m

LEGEND

- Proposed SNA revisions
- Waitomo Notified SNA

Coordinate System:	NZGD 2000 New Zealand Transverse Mercator
Scale:	1:5,000 at A4
Project Number:	
Date Drawn:	17-Oct-2024
Drawn by:	HD

SLR

R16UP002 South, R16UP015.01 & R16UP014.01

Path: H:\Projects-SLR\650-TRG\650.016639.00001 Taharoa Ironsands Waitomo DP s\06 SLR Data\01 GIS\GIS\TaharoaWaitomoDP\TaharoaWaitomoDP.aprx\L_A4_P_NZ

Service Layer Credits: Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

0 25 50 100 150 m

LEGEND

- Proposed SNA revisions
- Waitomo Notified SNA

Coordinate System:	NZGD 2000 New Zealand Transverse Mercator
Scale:	1:5,000 at A4
Project Number:	
Date Drawn:	17-Oct-2024
Drawn by:	HD

SLR

R17UP183 North

Path: H:\Projects-SLR\850-TRG\850.016639.00001 Taharoa Ironsands Waitomo DP s\06 SLR Data\01 GIS\GIS\TaharoaWaitomoDP\TaharoaWaitomoDP.aprx\L_A4_P_NZ

Service Layer Credits: Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

0 25 50 100 150 m

LEGEND

- Proposed SNA revisions
- Waitomo Notified SNA

Coordinate System:	NZGD 2000 New Zealand Transverse Mercator
Scale:	1:5,000 at A4
Project Number:	
Date Drawn:	17-Oct-2024
Drawn by:	HD

SLR

R17UP183 Central

Path: H:\Projects-SLR\850-TRG\850.018639.00001 Taharoa Ironsands Waitomo DP s\06 SLR Data\01 GIS\GIS\TaharoaWaitomoDP\TaharoaWaitomoDP.aprx\L_A4_P_NZ

Service Layer Credits:
Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

0 25 50 100 150 m

LEGEND

- Proposed SNA revisions
- Waitomo Notified SNA

Coordinate System:	NZGD 2000 New Zealand Transverse Mercator
Scale:	1:5,000 at A4
Project Number:	
Date Drawn:	17-Oct-2024
Drawn by:	HD

SLR

R17UP183 South

Path: H:\Projects-SLR\850-TRG\850.016639.00001 Taharoa Ironsands Waitomo DP s\06 SLR Data\01 GIS\GIS\TaharoaWaitomoDP\TaharoaWaitomoDP.aprx\L_A4_P_NZ

APPENDIX B

Assessment of wetlands on the Taharoa C Block from TIL reconsenting work

The table below provides a summary of each of the wetlands and potential wetland on the Taharoa C Block and is extracted from the technical report prepared for Taharoa Ironsands Ltd as part of the reconsenting of mine operations.[5] Maps of the locations of each of these wetlands are included below.

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
Site 1	Palustrine	Shallow water	Swale	Jointed rush rushland	A very small wetland in the base of a constructed drain and fed by a culvert. Similar vegetation continues along the drain which eventually disappears underground. The vegetation is Jointed rush - kikuyu - ferny azolla - (water celery) - [broad-leaved dock] - rushland. No plot was established here.	0.02	GPS	N/A	Yes	-	-	Yes	Yes	No	This is a constructed sediment pond fed by a culvert and drained through an artificial channel.
Site 3	Palustrine	Artificial	Artificial	Raupō reedland	A small, constructed wetland within the active mine area. Vegetation is raupō / [*Juncus sarophorus*] / white clover	0.11	GPS/Aerial	n/a	Yes	-	-	Yes	Yes	No	Created and managed as part of site stormwater system
Site 4	Palustrine	Artificial	Artificial	Sea aster herbfield	This wetland is fed by a large pipe and serves as a water storage pond, although at the time of visit it was only damp. The substrate is clay, and the vegetation is sea aster dominated in the centre, with bachelor's buttons and Epilobium ciliatum. Dense *Juncus sarophorus* dominates the edges and there is a patch of raupō in one corner. The hydrology is artificial, and the wetland appears to be used periodically for mine operations.	0.41	GPS	n/a	Maybe	Yes (from cover estimates)	Maybe (from cover estimates)	Yes	Yes	No	Created and managed as part of site stormwater system

[5] Dean 2022. Taharoa Ironsands Mine Reconsenting Terrestrial Vegetation and Wetlands. Response to s92a request for further information. 4Sight – Part of SLR contract report prepared for Taharoa Ironsands Limited.

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
Wetland 5	Palustrine	Seepage	Flat	Jointed rush rushland	A flat area approximately 150m inland from the beach. This is a seepage wetland which discharges via a small stream to the beach. The vegetation is a low, reasonably diverse turf dominated by *Juncus articulatus* but with a range of other species including swamp plantain, lotus, *Cyperus congestus, Myriophyllum votschii,* water purslane, and narrow-leaved carpet grass. The landform is unnaturally undulating which has resulted in a wetland of irregular shape whose boundaries were difficult to delineate. A large tailings disposal area is located upslope of this wetland to the northeast which receives large quantities of water as part of the sand slurry. The hydrology of this wetland and the one immediately to the northeast may be artificially enhanced by this.	2.18	GPS	WetP5	No	Yes	Yes	Yes	No	Yes	Likely induced by previous mining activity
Wetland 6	Palustrine	Seepage	Basin	Jointed rush rushland	This is a seepage area adjacent to Wetland 5 and very similar in vegetation composition and structure. This site is also fed by groundwater seepage and is likely to be affected by the discharge of slurry water upslope.	0.37	GPS	n/a	No	Yes - Inferred from Wetland 5		Yes	No	Yes	Likely induced by previous mining activity

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
Wetland 7	Palustrine	Seepage	Basin	(Oioi) - [knobby club rush] / jointed rush rushland & [jointed rush] / Myriophyllum propinquum water field	A gully floor wetland within 75m of the beach. At the time of survey there was standing water in the northern part of this wetland in an area dominated by *Isolepis prolifera.* The remaining part of the wetland includes patches of oioi and knobby clubrush over a turf dominated by jointed rush with pasture grasses. The wetland is heavily grazed by cattle and horses. It drains to the south through a narrow channel.	1.08	Aerial photo	n/a	Yes	-	-	Yes	No	Yes	This is a modified natural wetland that is evident on aerial photographs from 1944.
Wetland 8	Palustrine	Swamp	Basin	(Raupō) / rautahi sedgeland	This is a small wetland separated from the lake margin wetlands by a raised track but obviously connected hydrologically. This wetland was not closely inspected but vegetation includes raupō, dense swards of rautahi, *Isolepis prolifera*, jointed rush and soft rush.	0.13	Aerial photo	n/a	Yes	-	-	Yes	No	Yes	
Wetland 9	Palustrine	Shallow water	Basin	Ferny azolla - common duckweed floating fernland	This is an induced wetland in a hollow which appears to have been created during the harvest of the pine trees. The only wetland vegetation is *Azolla pinnata* and *Lemna disperma* floating on open water. The water levels appear to fluctuate considerably, and it may be hydraulically connected to the water body to the	0.08	GPS	n/a	Yes	-	-	Yes	No	Yes	

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					southeast. Pine slash has been deposited in this area. This site still constitutes a wetland despite the paucity of wetland plants. It has a wetland hydrology although water levels appear to fluctuate a lot and is likely to develop more wetland vegetation over time. It is of very low ecological value and has been induced relatively recently.										
Wetland 10 & 11	Palustrine	Shallow water	Basin	Ferny azolla floating fernland	Two depressions left after mining or pine harvest which are subject to seasonal ponding and likely to dry up during the drier months. These areas have a few sapling pines, patches of giant umbrella sedge, soft rush and raupō, above water or bare ground covered in ferny azolla.	0.18	GPS	n/a	Yes	-	-	Yes	No	Yes	
Wetland 12	Palustrine	Swamp	Basin	*Carex virgata* - (giant umbrella sedge) sedgeland	This wetland sits in a small gully and is dominated by *Carex virgata* with patches of raupō and giant umbrella sedge. Grazed.	0.24	GPS	n/a	Yes	-	-	Yes	No	Yes	
Wetland 13	Palustrine	Swamp	Floodplain	Sharp spike sedge sedgeland	A shallow gully adjacent to the Wainui Stream but with no surface connection to it. The vegetation includes occasional emergent raupō, patches of sharp spike sedge, giant umbrella sedgeland rautahi. In the wetter areas water purslane	0.07	GPS	n/a	Yes			Yes	No	Yes	

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					forms a dense groundcover.										
Wetland 14	Palustrine	Swamp	Floodplain	Raupō / sharp spike sedge sedgeland, *Carex virgata* sedgeland, and manuka scrub	This wetland has formed in a basin adjacent to the Wainui Stream but does not have a surface connection to the stream. Three main vegetation types are present. At the southwest end there is a patch of manuka scrub with scattered grey willow. The understorey is rautahi, *Carex virgata* and soft rush with patches of royal fern. The northern half of the wetland is sedgeland with rautahi, and *Carex virgata,* while at the eastern end there is occasional raupō, manuka, and grey willow over dense sharp spike sedge and *Isolepis prolifera.*	0.5	GPS	n/a	Yes	-	-	Yes	No	Yes	
Wetland 15	Palustrine	Seepage	Flat	Giant umbrella sedge / *Isolepis prolifera* - sharp spike sedge sedgeland	This is a seepage wetland formed on a coastal terrace just above the beach. Occasional harakeke and patches of giant umbrella sedge. There is one area of sparse kuawa and dense patches of *Isolepis prolifera* and sharp spike sedge are common. Jointed rush is also common. Other species present include *Carex virgata,* oioi, knobby clubrush, saltwater paspalum, water primrose, water purslane, ferny Azolla,	0.2	GPS	n/a	Yes	-	-	Yes	No	Yes	

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					purple-backed duckweed, *Isolepis cernua,* water starwort and kikuyu.										
Wetland 16	Palustrine	Shallow water	Basin	Raupō reedland	This small wetland has formed in a shallow gully which may have been left after mining or may have been natural and has been dammed during mining operations or pine harvest. It is dominated by dense raupō with *Isolepis prolifera* around the margins and has had pine slash pushed into it after the last pine harvest.	0.03	GPS	n/a	Yes	-	-	Yes	No	Yes	
Wetland 17	Palustrine	Shallow water	Basin	jointed rush - common water milfoil water field	This wetland occupies a shallow basin southwest of Lake Rototapu. The vegetation comprises jointed rush and floating sweetgrass over *Myriophyllum propinquum,* starwort, and Centella, with giant umbrella sedge around the margins. This site is likely to be subject to seasonal inundation.	0.33	Aerial photo	n/a	Yes	-	-	Yes	No	Yes	
Wetland 18	Palustrine	Swamp	Basin	*Machaerina rubiginosa - purei* sedgeland, jointed twig rush - raupō reedland, *Isolepis prolifera* sedgeland	This is a large wetland to the south of Lake Rototapu at the southeast corner of the site. Historically this wetland was connected to the lake, and it is probable that there is still a hydraulic connection. The vegetation comprises three main types: *Machaerina rubiginosa - purei* sedgeland occupies the centre of	1.56	Aerial photo	n/a	Yes	-	-	Yes	No	Yes	

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					the wetland while in the southwest corner there is an area of jointed twig rush and raupō. Around the margins *Isolepis prolifera* dominates. Harakeke is common throughout. The margins of this wetland have been impacted by grazing.										
Wetland 19	Lacustrine	Swamp	Shore	Jointed twig rush - raupō reedland	Marginal wetlands around Lake Rototapu, the majority of which fall outside the Taharoa Ironsands property and as such were not closely inspected. The vegetation is similar to Wetland 18 and comprises dense stands of jointed twig rush and raupō with harakeke scattered throughout. This site is included in the draft Waitomo DC Significant Natural Area R16UP016.[6]	0.005	Aerial photo	N/A	Yes	-	-	Yes	No	Yes	
Wetland 20	Palustrine	Swamp	Basin	(Knobby clubrush) - (giant umbrella sedge / jointed rush rushland	A small wetland in a gully to the west of lake Rototapu and draining to the northwest. This wetland was not closely inspected. Vegetation includes knobby clubrush and occasional giant umbrella sedge over jointed rush and pasture grasses.	0.17	Aerial photo	n/a	Yes	Yes		Yes	No	Yes	Dominance test based on cover estimates from photograph. Clear seepage wetland hydrology at this site however.
Wetland 21	Palustrine	Shallow water	Basin	Raupō - kuta reedland	This site comprises two wetlands separated by a sand causeway. These wetlands and the lake to the west were left when this part of the site was mined and	4.81	Aerial photo	n/a	Yes	-	-	Yes	No	Yes	

[6] Data obtained from Waikato Regional Council geospatial portal. https://maps.waikatoregion.govt.nz/arcgis/rest/services/OurMaps/Environmental_Assessment_ICM/MapServer

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					koiwi were found here, although 1944 aerial photography shows that wetlands have been present in this locality since then. They are currently used as water storage for the mine and water levels fluctuate significantly as a result. The wetlands comprise a mosaic of emergent vegetation and open water. Large patches of kuta and raupō dominate over a lower tier of swamp millet and there are a few grey willows. Several threatened or at risk bird species were observed here, and this site is included in the draft Lake Taharoa Significant Natural Area (R16UP002) by Waitomo DC.										
Wetland 22	Palustrine	Swamp	Basin	*Carex virgata* - sharp spike sedge sedgeland	This wetland is directly connected to Lake Taharoa and occupies a shallow gully. Raupō is common around the margins and scattered elsewhere and *Carex virgata* is common throughout. Sharp spike sedge is abundant and dominates the groundcover in places. Swamp kiokio is scattered throughout. Raupō becomes more dominant towards the lake edge where the water is deeper, and in the northeast part *Isolepis prolifera* is common. A few scrubby grey willows are present in one patch, along with a few hukihuki. This	2.17	Aerial photo	n/a	Yes	-	-	Yes	No	Yes	

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					wetland has been heavily grazed but was in the process of being fenced in late 2021 as part of the fencing of the Lake Taharoa shoreline. This site has been included in the Lake Taharoa draft Significant Natural Area by Waitomo DC.										
Wetland 23	Palustrine	Ephemeral	Basin	Raupō reedland	This small wetland appears to have formed in a shallow basin left after mining operations. The vegetation is dominated by raupō with ferny azolla and *Lemna minor* floating on the wetland surface. Mercer grass was common along with jointed rush and a range of pasture species.	0.03	Aerial photo	n/a	Yes	-	-	Yes	No	Yes	
Site 24	-	-	-	-	This is a very small area of ponded water with a few raupō but otherwise dominated by kikuyu grass. It was investigated as a potential wetland. It periodically floods but likely dry over summer. There is a groundwater bore located here and the site is bunded, whether intentionally or otherwise.	0.02	Aerial photo	N/A	No	No	No	No	Yes	-	Dominance and prevalence test based on estimates of cover data only.
Wetland 25	Palustrine	Seepage	Flat	Jointed rush - water purslane rushland	This seepage wetland occupies the coastal terrace above the beach. A few giant umbrella sedges and knobby clubrush are emergent over a groundcover dominated by Jointed rush and water purslane. This	0.09	Aerial photo	n/a	Yes	-	-	Yes	No	Yes	

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					wetland was heavily grazed at the time of visit.										
Site 26	Palustrine	Shallow water	Basin	Raupō water field	This is a very small, ponded area resulting from earthworks. Drainage appears to be confined by a hard clay layer, but the surrounding soil is predominantly sand. A small patch of raupō occurs at the deeper end along with *Potamogeton cheesemanii.* Submerged terrestrial species such as kikuyu suggest that the water level is often much lower.	0.05	Aerial photo	N/A	Yes	-	-	Yes	Yes	No	This is a constructed wetland likely put there as part of the drainage of adjacent areas and not yet removed.
Lake shore	Lacustrine	Swamp	Shore	Raupō reedland, *Juncus* rushland	Marginal lacustrine wetlands occur on all three of the larger lakes. These comprise raupō reedland with scattered harakeke where there is standing water, grading into low stature rush- and sedgeland with species such as *Isolepis prolifera*, *Juncus prismatocarpus, J. tenuis,* and *J. articulatus,* as well as a range of exotic grass species such as narrow-leaved carpet grass and Yorkshire fog. These wetlands have all been grazed although they are now being fenced off. Stock grazing has influenced the vegetation and low turf occurs where they have easy access. At Lake Taharoa these wetlands are contiguous with	0.28	Aerial photo	Lake shore	No	Yes	Yes	Yes	No	Yes	

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					those along the margins of the Wainui Stream. Most of the lake shore wetlands are outside the Taharoa land parcels. This site includes parts of the Waitomo DC draft Significant Natural Areas R16UP014.01 and R16UP002.										
Site 27	Palustrine	Shallow water	Basin	Raupō reedland	This is a large pond or lake which was left after the previous mining in the area and is now used as water storage for the mining operations. There are patches of raupō around the margins and aerial photography shows that the water level has been increased significantly between 2019, when there was a dense raupō fringe, and 2021. Examination of 1944 aerial photography showed only sand dune in this locality. This site has been included in the Lake Taharoa draft Significant Natural Area by Waitomo DC.	7.75	Aerial photo	N/A	For margins	-	-	Yes	Yes	No	Constructed wetland/pond used as water storage of mining operations.
Sites 2 & 3	Palustrine	Shallow water	Basin	n/a	Two ponded areas in an actively mined area which appear to have been used for water storage. These are mostly unvegetated, but one had swamp lily growing in it and kikuyu was common around the margins.	0.29	Aerial photo	n/a	No	-	-	Yes	Yes	No	These are constructed, transient ponds which are the product of an active mine site.
Wainui Stream Wetlands	Riverine	Shallow water	Riparian	Raupō reedland, *Carex* sedgeland	The Wainui Stream wetlands are contiguous with those around the	3.03	Aerial photo	N/A	Yes	-	-	Yes	No	Yes	

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	Area (Ha, within Taharoa Parcel	Edge delineation	Plot	Rapid test	Dominance test	Prevalence test	Wetland?	Deliberately Constructed?	Natural (as defined in the NPS-FM)?	Justification
					margins of Lake Taharoa. They comprise marginal emergent vegetation of raupō with scattered harakeke and in some areas grey willow. In low lying areas away from the stream there are areas of *Carex virgata* and *C. geminata* along with sharp spike sedge, blackberry, and pampas.										

The following table provides an assessment of the values of the wetlands on the Taharoa C Block and includes the areas identified as SNAs either wholly or in part. This table was extracted directly from the terrestrial vegetation and wetlands report which was prepared in response to a Section 92 request during the Taharoa mine reconsenting process.

Wetlands	Relevant wetland identifier	Area (ha) within Taharoa boundary	Representativeness		Rarity/distinctiveness		Diversity & Pattern		Ecological Context		Overall Ecological Value
Lakes and Wainui Stream	Lake shore, Wetland 8 Wetland 22, Wainui Stream Wetlands, Wetland 18, Wetland 19, Lake Piopio	7.175	High	Although modified by grazing, these are all high-quality wetlands and contain the species assemblages expected of such habitat. They are part of a much larger area of wetlands extending beyond the Taharoa boundary which make up a significant proportion of the wetlands in the Kawhia ED. Part of a previously identified Significant Natural Area of National importance (R16UP002)	High	Wetlands are not rare within the Kawhia ED where approximately 56% of the 1840 extent of swamp, and swamp/fen mosaic remains. However, on a national scale, wetlands have been severely reduced in extent and their protection is a national priority (MfE 2007). Lake Margins have been identified as a Naturally Uncommon Ecosystem and were classified as Vulnerable by Holdaway *et. al (2012)*. These wetlands also provide habitat for a range of threatened and at risk fauna including the Nationally Critical Australasian bittern	Moderate	These wetlands contain the species and assemblages expected from such habitats as well as a high diversity of fauna species. They contain a range of vegetation types and habitat conditions from deep water through to periodically wet ground supporting turf vegetation	High	These sites are part of a large complex of wetlands, forest, and scrub around the lakes. The smaller lakes to the south provide stepping-stones of wetland habitat between the larger lakes and wetlands to the south including Lake Harihari, while those along Wainui Stream link the lakes with the coast	**Very High**

Wetlands	Relevant wetland identifier	Area (ha) within Taharoa boundary	Representativeness		Rarity/distinctiveness		Diversity & Pattern		Ecological Context		Overall Ecological Value
Southern wetlands	Wetlands 5, 6, 7, 15, 17, 20, 23 & 25	4.45	Low	These wetlands are highly modified by grazing and many of the species assemblages found within them are novel and contain a high proportion of exotic species	Moderate	Wetlands are under-represented at a national scale and are a national priority for protection (MfE 2007), although locally they are reasonably well represented. These degraded and in some cases induced wetlands may provide temporary habitat for threatened and at risk bird species found in nearby areas, although none were recorded here	Moderate	These grazed wetlands include a moderate diversity of native and exotic species, two wetland forms (basin & flat) and four wetland classes (swamp, seepage, shallow water and ephemeral)	Moderate	Wetlands provide a range of ecosystem services including water filtration and carbon sequestration. These sites provide somewhat limited habitat for indigenous flora and fauna and are part of a mosaic of wetlands in the wider landscape	**Moderate**
Eastern wetlands	Wetlands 9, 10, 11, 16	0.29	Low	These wetlands are induced and include highly modified vegetation types. They are dominated by exotic species not representative of the typical wetlands of the Kawhia ED	Moderate	Wetlands are under-represented nationally, although these have been induced by mining and forestry operations and are of low quality. They may provide habitat for indigenous waterfowl and wetland birds which are present in nearby areas	Low	Very low species diversity, one wetland form, and one wetland class	Low	These sites provide very limited habitat for indigenous flora and fauna and are part of a mosaic of wetlands in the wider landscape	**Low**
Wetland 21	Wetland 21, Site 27	12.56	Moderate	Wetland comprises two excavated areas which were left after mining in the area, but which were historically wetlands, while Site 27 has been excavated. The vegetation indigenous and is similar to that surrounding Lake Taharoa, although it is sparse in Site 27, and diversity is lower than the lake margin wetlands. Part of a previously identified Significant Natural Area of National importance (R16UP002)	High	Wetlands are under-represented at a national scale and are a national priority for protection (MfE 2007), although locally they are reasonably well represented. These wetlands provide habitat for a range of indigenous wetland birds and waterfowl including Nationally Critical Australasian bittern and grey duck, spotless crake (At Risk - Declining), and dabchick (At Risk - Recovering)	Low	With only one wetland form (basin) and one class (shallow water) the species diversity was not high. This is likely impacted further by the irregular water level fluctuations resulting from pumping water from these sites	Moderate	These sites are part of a large complex of wetlands, forest, and scrub in the area and provide good habitat for several threatened or at risk species, additional to that around the lakes	**Moderate**
East Wainui Stream wetlands	Wetlands 12, 13, 14	0.81	Moderate	These three small wetlands include areas of good quality natural wetland habitat as well as degraded areas. Species in Wetland 14 are typical of lower-nutrient sites	High	This site includes a lower nutrient wetland and the only example of a manuka-dominated wetland on the Taharoa land, although there are others in the wider landscape. Wetlands are under-represented at a national scale and are a national priority for protection, although locally they are reasonably well	Moderate	Several vegetation communities are present in these wetlands, representing a diversity of water regime and nutrient levels, as well as grazing pressure. One wetland class (swamp) and two wetland forms (floodplain, basin) are present	Moderate	These sites are part of a large complex of wetlands, forest, and scrub in the area and are essentially a continuation of the wetlands along the Wainui stream and around lake Taharoa. They provide good habitat for indigenous birds, including two at risk species	**Moderate**

Wetlands	Relevant wetland identifier	Area (ha) within Taharoa boundary	Representativeness		Rarity/distinctiveness		Diversity & Pattern		Ecological Context		Overall Ecological Value
						represented. Spotless crake and fernbird (both At Risk - Declining) utilise these wetlands					

Legend

Study Area

Potential wetlands

Natural wetland

Constructed

Not wetland

Client: Taharoa Ironsands Ltd
Project: s92 Response
Map Description: Wetlands- North
Date: 10/10/2022
Version: 2.0
Author: HD
Approved: KB


N
Wainui Stream Wetlands
Wetland 13
Wetland 12
Wetland 22
Wetland 14
Wetland 16
Lake Taharoa
Wetland 9
Wetland 10
Wainui Stream
Wainui Stream Wetlands
Wetland 11
Site 27
Wetland 8
Lake Shore
Wetland 21
Lake Shore
Lake Numiti
Lake Rotoroa
Site 24
Wetland 23
Wetland 25
Wetland 6
Wetland 5
Wetland 15
Wetland 20
Lake Piopio Wetland
Lake Rototapu
Wetland 7
Wetland 19
Wetland 17
Wetland 18
0 100 200 400 600 800
m
Legend
Study Area
Potential wetlands
Natural wetland
Constructed
Not wetland
Client: Taharoa Ironsands Ltd
Project: s92 Response
Map Description: Wetlands- South
Date: 10/10/2022
Version: 2.0
Author: HD
Approved: KB
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