
Under	the Fast-track Approvals Act 2024 ('FTAA')
In the matter of	a substantive application under the FTAA for an alteration to an existing designation, resource consents, a wildlife approval, archaeological authorities and a complex freshwater fisheries activity, to construct, maintain and operate the Belfast to Pegasus Project
By	New Zealand Transport Agency Waka Kotahi Applicant

Statement of Evidence of Patrick Lees (Canterbury mudfish and additional stream taxa surveys)

Dated 15 May 2026

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Statement of evidence of Patrick Lees

1 Introduction

- 1.1 My full name is Patrick Lees.
- 1.2 I am a Freshwater Ecologist at Tonkin & Taylor Limited ('**T+T**'). I hold a Bachelor of Science from University of Canterbury.
- 1.3 I have been practising freshwater ecology for over 16 years across Aotearoa New Zealand and have worked at T+T for six years as a Senior Freshwater Ecologist. Prior to this I worked at Pattle Delamore Partners and Environment Canterbury as an Aquatic Ecologist. I am a member of the New Zealand Freshwater Sciences Society and was a member of the New Zealand Fish Passage Advisory Group between 2018 and 2024.
- 1.4 I have been involved in the State Highway 1 North Canterbury – Woodend Bypass Project (Belfast to Pegasus) ('the **Project**') since February 2025. I am the principal author of freshwater – stream assessments within the Ecological Impact Assessment Report ('**Ecia**') lodged as Volume 3I of the Project's substantive application.
- 1.5 My evidence has been prepared to support the New Zealand Transport Agency Waka Kotahi ('**NZTA**') response to comments from invited parties. This statement of evidence responds to comments from:
 - a Environment Canterbury ('**ECan**'); and
 - b Department of Conservation ('**DOC**').

2 Code of conduct

- 2.1 While the application is not before the Environment Court, I confirm that I have read and am familiar with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023, and agree to comply with it.
- 2.2 Unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

3 Scope of evidence

- 3.1 My evidence addresses the following:

- a The presence of mudfish (kōwaro) habitat and mudfish within the wetlands assessed as part of the Project;
- b An assessment of effects on kōwaro if they are present; and
- c Additional taxa surveys at sites identified by ECan.

4 Executive summary

- 4.1 Kōwaro (Canterbury mudfish; *Neochanna burrowsius*) are known to be present in coastal wetland habitats associated with the lower Taranaki Stream near the Project area. In addition, kōwaro would have potentially been present within the historical large coastal wetlands that existed in the Project area prior to European land development. Kōwaro have a Threatened - Nationally Critical conservation status.
- 4.2 I have provided an update, in this evidence (tabulated in **Appendix A** and expanded in the text) to the wetland assessment completed in the EclA. This was completed to qualitatively assess kōwaro habitat presence / absence at the wetlands affected by the Project. This qualitative assessment showed that the Waihora Stream, particularly in the stream - wetland complexes that have formed in edges and low-lying connected floodplains (e.g., WC_W2 to WC_W6; but not WC_W5) provide suitable habitat for kōwaro and, in terms of WC_W6, this wetland area is impacted directly by the Project.
- 4.3 After considering the material provided by ECan and DOC, I agree that a kōwaro specific survey is required to increase certainty that kōwaro are not present. I recommend that a survey is completed within the Waihora Stream and in the immediate surrounds of WC_W6. I also recommend new resource consent conditions are developed, to address potential effects on kōwaro, if the survey confirms the presence of kōwaro.
- 4.4 In addition, I have now reviewed environmental DNA ('eDNA') data and confirm additional aquatic taxa are present at the sites identified by ECan and raised by DOC. However, this has not changed the outcomes within the EclA or the ecological values (fauna) assigned to the sites identified by ECan.

5 Response to DOC

- 5.1 I provide the following responses to Dr Amber McEwan and Dr Nicholas Rex Dunn, whose Statements of Advice were used to inform DOC's Section 53 report. This statement of evidence is restricted to discussion on the potential presence of Kōwaro (Canterbury mudfish (*Neochanna burrowsius*); Threatened - Nationally

Critical))¹ within the Project area. The remaining points raised in the evidence of Dr McEwan and Dr Dunn are discussed in NZTA's response to comment tables and the evidence provided by Fiona McIntosh. As outlined in Paragraph 4.4, I have also provided a response to DOC's joint comments around additional taxa surveys.

Areas of agreement

- 5.2 I agree with a number of points raised by both Dr McEwan and Dr Dunn. Specifically this includes:
- a The overview of kōwaro habitat characteristics and preference.
 - b The conservation status of and threats posed to kōwaro.
 - c The potential for historic presence of kōwaro within the large coastal wetlands that would have existed within the Project area prior to European land development which has reduced these wetlands to the watercourses which are now present, i.e., McIntosh Drain, Waihora Stream, Rossiters Drain, and Wilsons Drain; and any remnant wetland habitat (i.e. through drainage and land modification).
 - d That kōwaro are known to occur in habitat near the Project area. Particularly within the coastal wetlands associated with the lower Taranaki Stream (approximately 2km from the site). I note that there is no direct connection between these sites and the Project wetlands.
 - e That some of the wetlands surveyed for the Project may provide potential habitat for kōwaro.

Potential kōwaro habitat assessment

- 5.3 To aid the Panel in understanding where in the Project area potential kōwaro habitat persists, this evidence provides an updated assessment of potential kōwaro habitat and whether, if it does persist, it will be impacted by the Project. The results of this assessment have been tabulated and mapped and are provided in **Appendix A**.
- 5.4 I have expanded on my additional assessment in the paragraphs below, with the exception of the Quarry Lakes wetlands (as the whole complex has historically

¹ Dunn, N.R., Closs, G.P., Crow, S.K., David, B.O., Goodman, J.M., Griffiths, M., Hicks, A.S., Hickford, M.J.H., Jack, D.C., Kitson, J.C., Ling, N., Waters, J.M., Wylie, M.J., Hitchmough, R.A., Makan, T. 2023. New Zealand Threat Classification Series 46. Department of Conservation, Wellington. 66 p

been impacted by quarrying activities, therefore removing any potential for kōwaro and their habitat to be present) and the Barkers Road wetland complex (as the whole wetland complex is unaffected by the Project).

- a Cam River/ Ruataniwha - CR W1 and CR W2: These two wetlands are present on / within paleo river channels and substrates formed by the historic path of the Cam River / Ruataniwha prior to its realignment. Kōwaro are not known to have been present in the Cam River / Ruataniwha (i.e., the area prior to the wetlands formation) and these sections of the river do not support known kōwaro habitat preferences (e.g., due to tidal influences, fluctuations in salinity, and at times a channel with high flow / velocity). Furthermore, the substrate saturation is highly variable and heavily dependent on rainfall rather than consistent inundation or saturation. Whilst kōwaro do aestivate when conditions are drier, the occurrence of drier periods in this substrate is frequent, which limits the habitat suitability further. Therefore, I consider it is highly unlikely kōwaro will be present within these wetlands and these locations are not considered further.
- b Fuller's Road wetland complex - FR W1 - FR W4: A wetland complex that receives overland flow in combination with groundwater seepage to support sustained water levels. These wetlands appear to all be interconnected and have open water habitat present to some degree within the northern two wetlands of this complex (FR_W3 and FR_W4). Potential for kōwaro habitat is present within these wetlands. However, these wetlands are unaffected, either directly or indirectly, by Project operational activities. Any temporary effects due to construction activities will have a low to negligible effect (if any at all) and will be avoided due to the implementation of good environmental construction methods. Consideration of Project impacts on potential kōwaro in these wetlands is therefore not relevant.
- c Waihora Creek stream wetland complex - WC W1– WC W6 (excluding WC W5): The lower Waihora Stream (downstream of State Highway 1) would have historically formed part of the pre-European wetland complex. Significant land development has since resulted in the Waihora Stream being modified to its current habitat type, primarily being a permanent to intermittent stream wetland complex.
- d Additionally, through the construction of the Ravenswood subdivision and the subsequent diversion of the Taranaki Stream, the wetland and spring headwaters of the Waihora Stream have been lost. This has resulted in the stream being disconnected from its natural upper catchment (which now

forms part of the main Taranaki Stream channel). Flows within the Waihora Stream are now supplemented via flow allocation from the Taranaki Stream.

- e Potential habitat for kōwaro is present in the Waihora Stream, particularly in the stream, stream - wetland complexes that have formed, and includes the edge and low-lying connected floodplain habitats of WC_W2, WC_W3, WC_W4, and WC_W6. These stream – wetland habitats are similar in structure and type to where kōwaro populations have been identified within the wider Canterbury region. Initial Project fish surveys (eDNA and electric fishing, completed between February and March 2025) and historical surveys (via fyke netting not completed for this Project in 2023) have been completed within the Waihora Stream and no evidence of kōwaro was identified. However, I note that:
 - i these surveys were completed to target stream fishes rather than kōwaro.
 - ii eDNA is not a preferred method for determining presence/ absence of kōwaro. eDNA provides an initial screening tool for determining kōwaro presence but does not determine absence.
- f The wetland WC_W1 is located at the terminal end of the Waihora Stream (i.e., where the surface water flows terminate and flows become entirely sub-surface). In this location water level is highly variable and heavily dependent on a combination of rainfall, groundwater level, and the supplementary flows from the Taranaki Stream, rather than consistent inundation or saturation. Shallow water (< 5 cm deep) will pond in this area but it does not last long as shown by the presence of a groundcover dominated by dryland grasses. Whilst kōwaro do aestivate when conditions are drier, the frequency of drier periods is high at this location, which limits habitat suitability. In addition, habitat at this location is predominantly willows over rank grasses, with very little structure and complexity. Therefore, the presence of kōwaro at this location is highly unlikely and is not considered further.

- 5.5 My assessment shows that, of the wetlands affected by the Project, potential kōwaro habitat requiring further consideration is limited to WC_W6 and its immediate surrounds. Although potential habitat is present at WC_W6, it is of lower quality than in other surveyed wetlands (see Paragraph 5.6) and I consider it a low likelihood that kōwaro are present. In addition, of the Waihora Stream wetlands only WC_W6 is impacted by the Project, therefore potential kōwaro habitat impact is restricted to the stream – wetland habitats in, and in the immediate surrounds of, WC_W6.

- 5.6 Of the other wetlands surveyed the habitat is either unsuitable for kōwaro, or where habitat is suitable these wetlands are unaffected by the Project, or in some cases the potential effects are limited to hydrological catchment changes that result in no to very limited changes in the wetland extent (permanent or temporary). In my opinion it is not relevant to consider the effects of these changes on potential kōwaro at these sites.
- 5.7 To provide greater certainty that kōwaro are unlikely to be present within the area directly affected by the Project, I consider the survey measures recommended by Dr Dunn are appropriate to be undertaken in and in the immediate surrounds of WC_W6. Surveys are not proposed at Waihora wetland locations where habitat has not been identified as being potentially present (i.e., WC_W1 and WC_W5), nor at WC_2, WC_W3 and WC-W4, because while potential habitat may be present, the Project effects on these wetlands are limited to negligible and temporary changes in wetland extents during construction only, with no effects post construction..
- 5.8 Surveys in and in the immediate surrounds of WC_ W6 would be completed by a suitably qualified ecologist with experience in mudfish surveys and follow the methods outlined by Ling et al 2013.² In brief, it is intended that these would include setting Gee's Minnow Traps (at 3 mm mesh sizing) overnight.
- 5.9 Should these surveys identify that kōwaro are present, then a mudfish relocation plan should be prepared in consultation with DOC and to be certified by ECan. The purpose of the mudfish relocation plan should be to relocate kōwaro to alternative habitat.
- 5.10 I have provided input into proposed conditions that require targeted kōwaro survey, and if kōwaro are detected, preparation and implementation of a mudfish management plan, based on the approach proposed by DOC / ECan, but with amendments. In my opinion, these conditions provide an appropriate level of protection for kōwaro, should they be present in the affected stream wetland habitat associated with WC_W6.

² Ling, N.; O'Brien, L.K.; Miller, R.J.; Lake, M. 2013: A revised methodology to survey and monitor New Zealand mudfish. Department of Conservation, Wellington, New Zealand. 45 p.

Kōwaro effects assessment

- 5.11 I have provided an assessment following the effects management hierarchy and the same framework used in the EcIA (namely, that of EIANZ guidelines³), which provides a basis to move to a conditioned approach pertaining to kōwaro.
- 5.12 If kōwaro are identified in and in the immediate surrounds of WC_W6, the kōwaro would be assessed as having very high value due to their threat status and risk of extinction.
- 5.13 The area of the Waihora Stream that is impacted by the Project will see full habitat loss (i.e., extent of habitat) and reinstatement as a realigned stream channel, which is unlikely to have mudfish habitat characteristics like those lost. The loss of this habitat corresponds to a high magnitude of effect because it will result in the major alteration and loss of key habitat features. The loss of any kōwaro habitat also represents a significant reduction in the range of kōwaro.
- 5.14 A second effect is the mortality of any kōwaro that become stranded and are not successfully relocated via the implementation of CMMP and eventually perish when their tolerance of living out of water is exceeded. The magnitude of effect of this has been assessed as high.
- 5.15 The overall level of effect is assessed as very high due to the very high values associated with kōwaro and the high magnitude of effects associated with habitat loss and direct mortality. This overall level of effect assumes that no effects management has been applied. Any increases in ranking of ecological values or magnitude of effect would not increase the overall level of effect as this is the highest ranking possible. Effects assessed as being 'Moderate' or greater generally warrant efforts to manage residual effects.
- 5.16 Managing effects on kōwaro will be challenging, and a fulsome approach to management should be developed within the CMMP. However, I have provided initial rationale on how the effects management hierarchy (as defined in Section 3.21 of the National Policy Statement for Freshwater 2020 ('NPS-FM')) could be adhered to during the development of an effects management approach in the CMMP.
- 5.17 Avoiding impacts is the preferred mechanism for managing adverse ecological effects. However, as WC_W6 and its immediate surrounds is positioned centrally

³ Environment Institute of Australia and New Zealand; per Roper-Lindsay, J., Fuller, S. A., Hooson, S., Sanders, M. D., & Ussher, G. T. (2018). Ecological impact assessment. EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems. 2nd edition.

within the Project designation, no feasible options for avoiding effects from construction of the Project have been identified. Avoidance is not practicable. I do note that the Project alignment does avoid higher quality wetlands with potential kōwaro habitat. If the alignment were to be shifted beyond the designation, it could impact further areas of potential kōwaro habitat.

- 5.18 Some of the direct effects of construction on kōwaro habitat and, if identified, kōwaro individuals/the local population can be minimised to an extent. Direct mortality of kōwaro caused when the habitat is lost can be minimised through the implementation of appropriate fish salvage methodologies. Approaches to locating, capturing and transporting freshwater fish as part of construction projects in New Zealand are generally well established and can minimise effects if implemented successfully. Any proposed relocation methodology shall be detailed and implemented via the CMMP.
- 5.19 Remedying the effects of habitat loss is also not considered feasible from a practicality perspective as the habitat is being lost during the construction of the motorway. Remediation would therefore require a very high degree of further disturbance and the almost complete reconstruction of habitat which cannot occur due to the space that would be present post motorway construction. Therefore, remediation of effects is not possible.
- 5.20 The development of an aquatic offsetting model for the loss of kōwaro habitat is not currently considered feasible because of an inability to quantifiably measure, with any precision, the quality of kōwaro habitat or the abundance of kōwaro that utilise that habitat. This technical constraint makes it impossible to measure impacts or gains with adequate precision to meet all the offset principles that underpin good biodiversity offsetting. In other words, offsetting is unlikely to be a feasible option to address residual effects on kōwaro. Aquatic offsetting is not possible.
- 5.21 The approach used to manage the residual effects of kōwaro habitat loss is therefore most accurately described as a form of environmental compensation, where the use of non-quantified biodiversity benefits are offered to compensate for biodiversity losses. However, the type of compensation approach adopted in the CMMP should adhere to as many of the biodiversity offsetting principles as possible including an estimate of the amount of compensation required to achieve habitat outcomes.
- 5.22 The CMMP will provide the compensation approach, how this will be implemented, and how the compensation principles will be adhered to. For

context, compensation will broadly include the restoration / enhancement of new kōwaro habitat to a quantum that achieves the outcomes outlined in the CMMP. Any restoration will occur prior to the relocation of any kōwaro and to a site agreed upon prior to any kōwaro relocation through the implementation of the CMMP.

- 5.23 Experience on other mudfish relocation programmes (e.g., Rangiriri, Waikato Expressway - Hamilton Section, Rotokauri Greenway) has shown that kōwaro habitat creation or enhancement has a high rate of failure and to be successful will require several years of implementation because it is dependent on the establishment of appropriate vegetation and habitat. Even when the habitat is sufficiently developed it will also take several surveys to determine if relocated mudfish have successfully established in created habitats.
- 5.24 Despite the uncertainty, the most ecologically appropriate response given the ecological values at stake and principles of effects management and biodiversity offsetting / compensation, is to implement restoration first and then relocation at any agreed upon site.
- 5.25 However, should the attempt to establish new habitat and a relocated population of kōwaro fail, additional compensatory mechanisms must be available to provide more certainty to NZTA. These should recognise that NZTA is not the best organisation to lead species recovery work. In general, these mechanisms may include providing monetary compensation that would be more effectively utilised by DOC / ECan.
- 5.26 For clarity, I am not suggesting that monetary compensation is immediately provided. I am of the opinion that due to the ecological value of kōwaro as a species, that restoration and relocation are undertaken first, with further compensation if success cannot be demonstrated within a set timeframe.

The value of wetlands as potential kōwaro translocation sites

- 5.27 Dr McEwan refers in Paragraph 9 of her advice statement that “the wetlands that would be affected by this proposal might comprise some of the few suitable habitats available for future Canterbury mudfish translocation efforts that could make a significant contribution towards preventing the extinction of this species.”
- 5.28 Although I do agree with the observation regarding the conservation status and wider environmental risks to kōwaro, I do not agree that all the wetlands affected by the Project provide suitable kōwaro habitat and should have their values raised due to their potential for translocation sites. As I have outlined above,

wetland WC_W6 and the stream – wetland complexes in its immediate surrounds provide suitable potential habitat. Where other potential kōwaro habitat is present, and likely of higher value (e.g., Barkers Rd and Fullers Rd wetland complexes), these areas are not impacted by the Project.

- 5.29 Furthermore, the Waihora Stream wetland complex is on private land and under ongoing pressure from associated land use practices. Even though habitat might be available for kōwaro, that does not mean owners of the land would agree to their land being utilised for translocation and any associated restoration activity. Therefore, earmarking these stream – wetland complexes as translocation habitat (and raising their respective value) is not considered appropriate in the context of the Project and my assessment.

6 Response to comments from ECan

- 6.1 I provide the following responses to the comment from ECan that additional taxa surveys are required at the sites identified in Appendix 3 of ECan's S53(2)(a) report.
- 6.2 In my opinion further surveys to identify whether other stream taxa are present are not required to inform the ecological values assessments of streams within the Project.⁴
- 6.3 During site surveys conducted for the Project, environmental DNA (eDNA) was sampled from the sites identified by ECan. A taxa list, showing threat status and location is provided in **Appendix B**.
- 6.4 The eDNA results show that various mollusca, rotifer, algae, worms, and crustacea were present at the sites identified within the Appendix 3 of ECan's S53(2)(a) report.
- 6.5 No threatened species were detected via eDNA and only one has been assigned an At Risk – declining status, being kākahi (*Echyridella menziesii*). Kākahi were detected (via eDNA) only at the Kaiapoi River and Cam River/ Ruataniwha. This species has been addressed at these sites within the EclA.
- 6.6 It is my opinion that the additional taxa that were detected through the eDNA sampling do not change the outcomes presented in the EclA or the ecological values (fauna) assigned to the sites identified by ECan.

⁴ The Statements of Evidence of Dr Jamie Mackay and Fiona McIntosh provide commentary on additional taxa surveys to inform wetland and terrestrial values, and I do not comment on these taxa.

7 Conclusion

- 7.1 I have provided an additional assessment of potential kōwaro habitat that may be present within the wetlands and stream – wetland complexes impacted by the Project. The results of this assessment indicate that, of the wetlands affected by the Project, potential kōwaro habitat requiring consideration is restricted to WC_W6 and its immediate surrounds.
- 7.2 To confirm whether this wetland is utilised by kōwaro, a survey will be conducted following best practice methods and completed by a suitably qualified ecologist. I have proposed a condition that sets out a process for the initial survey, and the measures to be taken if mudfish are recorded.
- 7.3 This will provide an appropriate basis to establish whether kōwaro are present in the impacted stream - wetland complex WC_W6, and in my opinion, a suitable process to protect kōwaro.
- 7.4 I have provided an effects assessment of the ecological values associated with kōwaro. This showed that, after measures to avoid, minimise, remedy, and my consideration that offset measures are not applicable or principles met, that compensatory measures will be required to address residual effects. This will include the restoration of habitat prior to mudfish being relocated. Details on the compensation process shall be provided in the CMMP.
- 7.5 In terms of further surveys for stream taxa, eDNA showed various additional taxa were detected. However, the outcomes within the EclA have not changed, and that the ecological values (fauna) assigned to the sites identified by ECan stand.

Patrick Lees
15 May 2026

Appendix A Updated assessment of potential kōwaro habitat

Wetland name	Potential kōwaro habitat and kōwaro present	Reason for yes/ no	Wetlands impacted by the project	Type of impact	Conclusion
Cam River/ Ruataniwha					
CR_W1_NPSFM	Yes – possible habitat is present. No- kōwaro are not expected to be present	Complex structure and habitat creating vegetation Open water habitats present.	Yes	- Modification to wetland hydrology - Sedimentation	Even though possible habitat is present it is highly unlikely that kōwaro will be present due to: - The wetlands being present on paleo channels of the lower Cam River/ Ruataniwha. The Cam River/ Ruataniwha doesn't provide mudfish habitat. - Substrates not being aligned with mudfish habitat and aestivation - Highly variable saturation extent
CR_W2_NPSFM	Yes - possible habitat is present (in part). No- kōwaro are not expected to be present	Seasonal wetland only retains water after periods of heavy rain. A small area at the southernmost end of this wetland, may provide habitat.	Yes	- Permanent loss of wetland habitat - Modification to wetland hydrology - Permanent fragmentation - Sedimentation	
Quarry Lakes					
QP_W1_NPSFM	No - habitat is not present. No- kōwaro are not expected to be present	Seasonal wetland with shallow water (< 5 cm), water will pond during prolonged rain. Highly modified through quarry activities No Complex structure and habitat creating vegetation Shallow water Soils are heavy consist of clays and sands.	No	N/A	No habitat. Consideration of impacts on kōwaro is therefore not considered relevant

Wetland name	Potential kōwaro habitat and kōwaro present	Reason for yes/ no	Wetlands impacted by the project	Type of impact	Conclusion
QP_W2_NPSFM	No- habitat is not present. No - kōwaro are not expected to be present	Seasonal wetland Highly modified through quarry activities No Complex structure and habitat creating vegetation Shallow water (< 5 cm), water will pond during prolonged rain.	No	N/A	No habitat. Consideration of impacts on kōwaro is therefore not considered relevant
Barkers Road wetland complex:					
BR_W1_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present	Complex structure and habitat creating vegetation. Open water habitats present. Sustained water level with minimal fluctuations. Highly likely that kōwaro will persist if present due to habitat.	No	N/A	These wetlands have been assessed as unaffected, either directly or indirectly by Project activities in the EclA. Consideration of impacts on kōwaro is therefore not considered relevant
BR_W2_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present				
BR_W3_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present				
BR_W4_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present				
Fuller’s Road wetland complex:					

Wetland name	Potential kōwaro habitat and kōwaro present	Reason for yes/ no	Wetlands impacted by the project	Type of impact	Conclusion
FR_W1_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present	Complex structure and habitat creating vegetation Open water habitats present	During construction – Negligible Post construction – Negligible	- Modification of wetland catchment hydrology – negligible. Refer to the Hydrogeological Assessment. Associated dewatering activities are identified at Woodend Beach Road and at McIntosh Drain. Assessments described in the Hydrogeological Assessment (Volume K of the Substantial Application) have identified that this wetland is located beyond the extent of the assessed dewatering effects and there will be no temporary modifications to wetland hydrology from the assessed dewatering activities.	Consideration of impacts on kōwaro is therefore not considered further as wetland not impacted.
FR_W2_NPSFM	No	No complex structure and habitat creating vegetation	During construction – Yes Post construction - No	N/A – no habitat	No habitat. Consideration of impacts on kōwaro is therefore not considered relevant
FR_W3_NPSFM	No	No complex structure and habitat creating vegetation	During construction – Yes Post construction - No	N/A– no habitat	No habitat. Consideration of impacts on kōwaro is therefore not considered relevant
FR_W4_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present	Complex structure and habitat creating vegetation Open water habitats present	During construction – Low Post construction - Low	- Modification of wetland <i>catchment</i> hydrology The hydrogeological assessment (Volume 3K) notes that post construction – there is no permanent loss of wetland extent but 11% loss of wetland catchment. During	Consideration of impacts on kōwaro is therefore not considered further due to scale of impact.

Wetland name	Potential kōwaro habitat and kōwaro present	Reason for yes/ no	Wetlands impacted by the project	Type of impact	Conclusion
				construction – no temporary loss of wetland extent but temporary loss of 16 % of wetland catchment. Impacts on the wetland are considered to be low (EclA Section 6.3).	
Waihora Creek stream wetland complex:					
WC_W1_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present	No complex structure and habitat creating vegetation. Surface water inputs only during and following heavy and very heavy / prolonged rainfall events and linked to supplementary flow and groundwater. Shallow (≤ 5 cm depth) water will pond in this area at times	Yes	- Permanent loss of wetland habitat	No habitat. Consideration of impacts on kōwaro is therefore not considered relevant
WC_W2_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present	Complex structure and habitat creating vegetation Open water habitats present	During construction - moderate Post construction - Low	- Moderate temporary magnitude effects limited to hydrological catchment of wetland only. Assessments described in the Hydrogeological Assessment (Volume K of the Substantial Application) identifies negligible temporary changes (i.e. 0 – 2%) to the wetland extents during construction and no changes to the wetland extent post construction. It is worth noting, the level of assessed effects (which included the wider catchments) are conservative	These wetlands have been assessed as having a very limited effect due to the Project. Consideration of ongoing impacts on kōwaro is therefore not considered relevant.
WC_W3_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present				
WC_W4_NPSFM	Yes – potential habitat				

Wetland name	Potential kōwaro habitat and kōwaro present	Reason for yes/ no	Wetlands impacted by the project	Type of impact	Conclusion
	Yes – potential for kōwaro to be present			because there will be continued stream flows to the wetland extents from Waihora Stream.	
WC_W5_NPSFM	No- habitat is not present. No - kōwaro are not expected to be present	Very small floodplain wetland that only receives small volumes of water during heavy and very heavy / prolonged rainfall events. Depth of water that is retained in this area is likely to be very shallow	Yes	N/A- no habitat	No habitat. Consideration of impacts on kōwaro is therefore not considered relevant
WC_W6_NPSFM	Yes – potential habitat Yes – potential for kōwaro to be present	Complex structure and habitat creating vegetation Open water habitats present	Yes	- Permanent loss of wetland habitat	This wetland has been assessed as having mudfish habitat and potential for kōwaro to be present. The effects due to the Project will result in complete loss of this wetland. Mudfish survey required and if present follow requirements to implement a mudfish relocation plan.



Figure 1: Assessed Project wetland habitats with potential mudfish habitat. Where Project stream and wetlands show where various surveys have been completed through the Project.

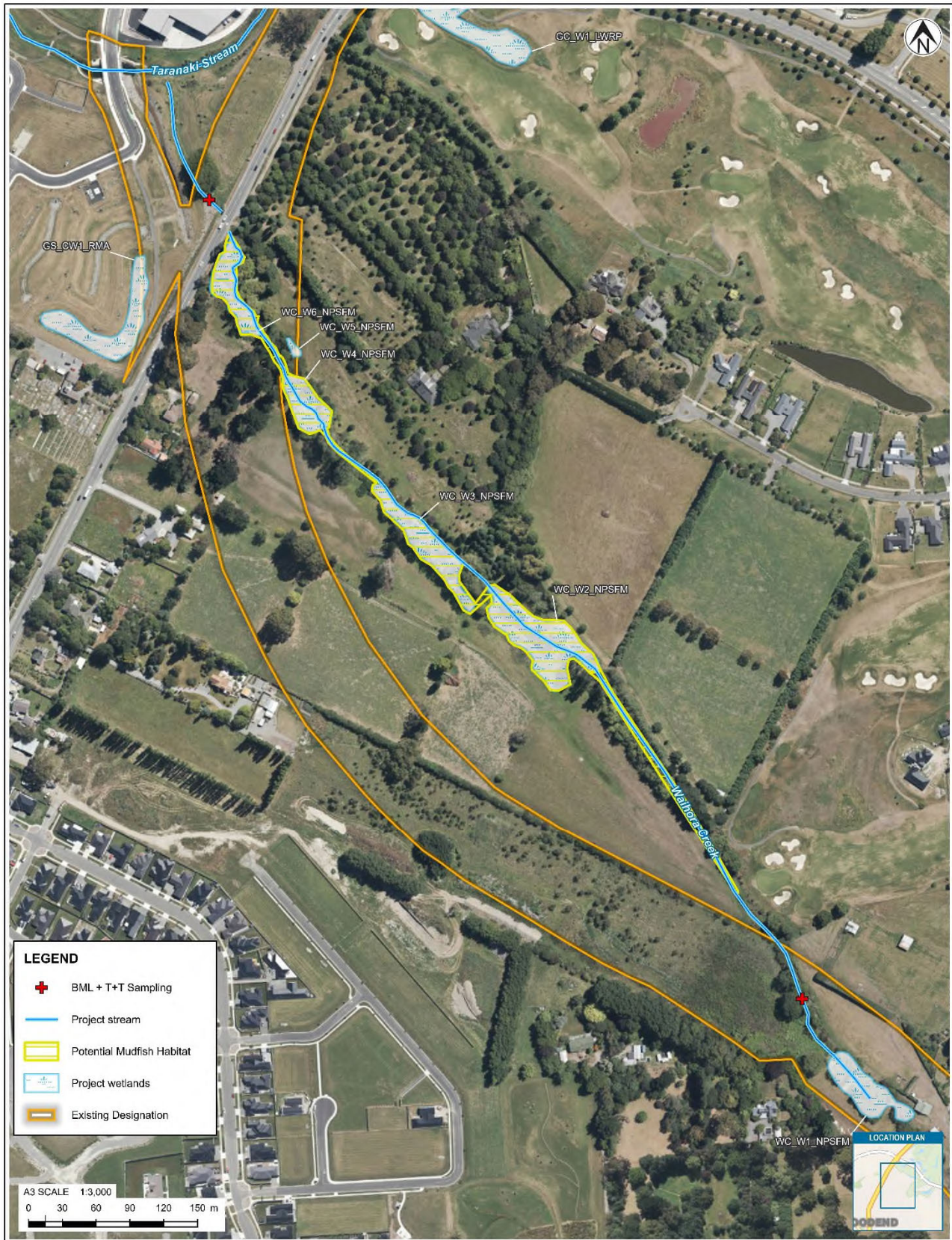


Figure 2: Assessed Project wetland habitats with potential mudfish habitat. Where Project stream and wetlands show where various surveys have been completed through the Project

Appendix B Taxa list, showing threat status and location

Phylum	ScientificName	CommonName	Threat status	Kaipoi River	Rositors Drain	Wilson's Drain	Cam River/ Ruamahanga	McIntosh Drain	Waihora Stream	Taranaki Stream	Taranaki Stream - tributary
Mollusca	Echyridella menziesii	Freshwater mussel; kākahī; kāeo; torewai	At Risk - Declining	✓			✓				
	Physella acuta	Left handed sinistral snail	N/A				✓	✓	✓	✓	✓
	Potamopyrgus antipodarum	Mud Snail	Not Threatened						✓	✓	✓
	Potamopyrgus	Mud snails	N/A				✓		✓	✓	✓
Rotifer	Eurotatoria		N/A						✓		
Freshwater algae	Nothocladus	Freshwater red alga	Data deficient				✓				
	Sheathia transpacific	Red alga	N/A	✓			✓				
Segmented worms	Aulodrilus pluriseta	Aquatic oligochaete worm	N/A				✓		✓	✓	✓
	Bothrioneurum	Worm	N/A				✓		✓		
	Bothrioneurum vej dovskyanum	Worm	N/A	✓			✓				
	Chaetogaster diaphanus	Oligochaete worm	N/A	✓			✓	✓	✓	✓	✓
	Chaetogaster diastrophus	Oligochaete worm	N/A	✓			✓		✓	✓	✓
	Chamaedrilus aff. glandulosus B SM-2014	Worm	N/A					✓			
	Dero	Worm	N/A								✓
	Eiseniella tetraedra	Squaretail worm	N/A						✓		
	Ilyodrilus	Worm	N/A	✓							
	Limnodrilus	Worm	N/A	✓	✓	✓		✓			
	Limnodrilus hoffmeisteri	Redworm	N/A	✓		✓	✓	✓	✓	✓	✓
	Lumbriculus variegatus	Blackworm	N/A	✓	✓	✓	✓	✓	✓	✓	✓
	Nais	Sludgeworm	N/A	✓			✓		✓	✓	
	Nais communis	Sludgeworm	N/A		✓				✓	✓	✓
	Nais communis/variabilis complex sp. A1	Sludgeworm	N/A		✓				✓	✓	✓
	Nais elinguis	Sludgeworm	N/A	✓							
	Pristina	Worm	N/A			✓					
	Spirosperma ferox	Worm	N/A				✓		✓		
	Tubifex	Worm	N/A								✓
	Tubifex tubifex	Sludge worm	N/A	✓	✓	✓	✓	✓	✓	✓	✓
	Tubificinae		N/A			✓	✓		✓	✓	✓
	unclassified Chaetogaster		N/A							✓	✓
Crustacea	Acanthocyclops americanus	Copepod	N/A			✓					✓
	Acanthocyclops robustus	Copepod	N/A		✓	✓		✓	✓	✓	✓
	Chydorus brevilabris	Water flea	N/A						✓		
	Chydorus sphaericus complex sp. A1		N/A		✓	✓		✓	✓		
	Cyclopidae		N/A	✓	✓			✓			✓
	Daphnia obtusa group sp. 3 EUR		N/A		✓						
	Hemigrapsus crenulatus	Hairy-handed crab; papaka huruhuru	N/A	✓		✓					
	Paracalliope fluviatilis	Amphipod crustacean	Not threatened	✓			✓			✓	
	Simocephalus		N/A		✓	✓		✓			
	Simocephalus vetulus	Water flea	N/A			✓					
	unclassified Podocopida							✓			