

MEMO

DATE: 1 July 2026

TO: Christina Brodnax, Resource Management Planner

CC: Gen Hewett, Senior Fast-track Advisor
Emily Funnell – Freshwater Species Manager

FROM: Dr Nicholas Dunn, Senior Freshwater Science Advisor

SUBJECT: FTA – 2512-1157 – Assessment of potential habitat for Canterbury mudfish within the State Highway 1 North Canterbury – Woodend Bypass Project (Belfast to Pegasus) Fast Track approval application project area.

Introduction

An issue of concern in the State Highway 1 North Canterbury – Woodend Bypass Project (Belfast to Pegasus) Fast Track approval application of the New Zealand Transport Authority (NZTA) is the adequacy of surveys for *Neochanna burrowsius* (Canterbury mudfish), a Nationally Critically threatened indigenous freshwater fish (Dunn et al. 2025), and a taonga species under the Ngai Tahu Deed of Settlement 1997.

In their draft decision, dated 26 June 2026, the expert panel¹ state (paragraph 318) that “the lack of sampling for Canterbury mudfish was a considerable oversight in the Substantive Application, because Canterbury mudfish have a Nationally Critical threat status and they occur in waterways nearby”, in response to concerns raised by several parties including the Department of Conservation and Canterbury Regional Council, as indicated in paragraphs 225 and 227 respectively.

To address DOC's concerns, NZTA proposed a condition requiring further survey work for *N. burrowsius* but restricted this to a single wetland habitat (WC_W6_NPSFM). This habitat has since been surveyed in May 2026, which resulted in no *N. burrowsius* being located, however further survey in spring at this habitat has been proposed (paragraph 308).

While the panel considers that the May 2026 survey and proposed spring survey at wetland habitat WC_W6_NPSFM address the earlier lack of sampling for *N. burrowsius* in the substantive application, there remains concern as to the adequacy of the selection of habitats for survey in an area previously acknowledged as having a high probability of containing *N. burrowsius*. These ongoing concerns are based on differences in the description of habitats between the assessments reported on by Tonkin & Taylor (2025) and the statement of Mr Patrick Lees (2026a), and the previous lack of sampling to inform opinions. Particularly as stated by O'Brien and Dunn (2007, page 16) “areas of suitable habitat are now generally small, fragmented and modified, and thus easily overlooked”, even by freshwater ecologists who may not have experience with the habitats of *N. burrowsius*.

¹ Record of Draft Decision of the Expert Panel under Section 87 of the Fast-track Approvals Act 2024. Dated 26 June 2026. Before the State Highway 1 North Canterbury Woodend bypass project (Belfast to Pegasus) [ftaa-2512-1157] expert panel in the matter of The Fast-track Approvals Act 2024 and Approvals sought under the Resource Management Act 1991, Wildlife Act 1953, Heritage New Zealand Pouhere Taonga Act 2014, and the Freshwater Fisheries Regulations 1983

The purpose of this memo is to address the descriptions of habitats provided by Tonkin & Taylor (2025) and Mr Patrick Lees (2026a, b), and to provide a desktop assessment of potential further habitats potentially surveyed for *N. burrowsius*. It is intended that this assessment assists by providing a basis to determine if additional survey work in additional habitats needs to be attended to through consent conditions to address the concerns of DOC.

Methods

Wetlands were the focus of this assessment to determine their potential to provide *N. burrowsius* habitat. While *N. burrowsius* do occur in stream habitats, the fish communities in this area, dominated by *Anguilla* eel species means *N. burrowsius* would more likely occur in marginal habitats such as wetlands where hydrological conditions may preclude *Anguilla* species. Moreover, based on descriptions and images of habitats provided by Tonkin & Taylor (2025) and Lees (2026a, b), high stream flow velocities may have also precluded *N. burrowsius* from habitats due to their limited locomotory abilities (O'Brien & Dunn 2007). My expert opinion-based assessment considers botanical, soil, hydrological, and animal descriptions and data, based on the principles of the definition of wetlands in the Resource Management Act 1991, and the wetland delineation protocols (Allen et al. 2025; MfE 2022), combined with my knowledge and experience of *N. burrowsius* habitats based on O'Brien (2005), O'Brien & Dunn (2005, 2007), Dunn (2024), and Dunn & O'Brien (2022).

Initially the proximity of identified wetlands (Tonkin & Taylor 2025) to the existing designation (the project area) was determined to assess if a wetland was directly, indirectly, or not affected by the project. In the assessment of Tonkin & Taylor (2025) a buffer of 100m (being different from the 10 m buffer on maps in Appendix A) around the existing designation was applied to assess indirect impacts of the project, particularly hydrological modification, habitat fragmentation, and sedimentation. The same principle has been applied in my assessment as the project may create longer term hydrological modifications that affect surface and groundwater water flow paths and permeance, potentially impacting hydrological security – a key threat to *N. burrowsius* habitats (Dunn et al. 2025). An assumption here however is that the assessment of the effects of the project take a longer-term view, rather than only assessing effects during the construction phase, this also appears to be the approach of Tonkin & Taylor (2025).

Assessments were also made by examining mapped data in the GIS software ArcPro, being:

Historic wetland typology (Leathwick et al. 2010)

Fundamental Soils Layer as at 16 May 2024 (Manaaki Whenua - Landcare Research 2024)

S-map as at 29 June 2026 (Manaaki Whenua - Landcare Research 2025) and interpreted using Fraser et al. (2018) and Hewitt (1998, 2010)

Landcare S-map Layers as at 30 June 2026 (Canterbury Maps 2026)

Soil interpretation relied on a combination of both FSL and S-map, noting differences between datasets and data sources

LINZ Aerial Basemap as at 30 June 2026 (LINZ 2026a)

LINZ Hillshade Igor DEM as at 30 June 2026 (LINZ 2026b)

LINZ Hillshade Igor DSM as at 30 June 2026 (LINZ 2026)

Results

A total of 22 wetland habitats were assessed (Table 1). Of these 8 were considered directly affected, 4 indirectly affected, and 10 not affected by the project. Seven wetlands were considered to potentially contain *N. burrowsius* habitat and are recommended for further survey, 15 wetlands were considered to not warrant further survey as they were not considered to contain *N. burrowsius* habitat or are not considered to be affected by the project.

Wetlands potentially containing *N. burrowsius* habitat and recommend for further survey are:

Cam River / Ruataniwha

CR_W1_NPSFM

CR_W2_NPSFM

Williams Street - Woodend Beach Road bridge

FR_W4_NPSFM

Gladstone Road bridge - State Highway 1

WC_W2_NPSFM

WC_W3_NPSFM

WC_W4_NPSFM

WC_W6_NPSFM

It is noted that wetland WC_W6_NPSFM has already been surveyed in May 2026 as reported on by Lees (2026b) with further survey work proposed for the coming spring. During the May 2026 survey no adult *N. burrowsius* were captured.

Conclusion

- Consideration should be given to including the wetlands identified as potentially containing *N. burrowsius* habitat in further survey work as part of assessment work for the project prior to works beginning.
- Methods to survey for adult *N. burrowsius* should follow the methodologies of Ling et al. (2013) and implemented in a similar way as for the survey reported on by Lees (2026b).
- Larval *N. burrowsius* surveys should also be considered as part of the spring survey work. Larvae can readily be observed swimming in the water column in open water areas and are a rapid indicator of presence and distribution of adults. Larval surveys should follow the guidance of Ling et al. (2013).

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Table 1. Descriptions summarised or taken from Tonkin & Taylor (2025) and Lees (2026a) for each wetland identified in Tonkin & Taylor (2025), and the authors assessment based on these.

Wetland	Tonkin & Taylor (2025) -summarised	Lees (2026a) - summarised	Dunn (this assessment)
<i>Cam River / Ruataniwha</i>			
CR_W1_NPSFM	• Very small (circa 0.03 ha) area of wetland habitat comprising a small, shallow pond within a depression • Crack willow canopy, with a few sedges • The wetland is connected to and receives water from the Cam River at high tide and some overland flow, potentially not connected to groundwater • Direct effect: none identified • Indirect effect: moderate hydrological modification and temporary construction sedimentation	• Yes - possible habitat is present • No- <i>N. burrowsius</i> are not expected to be present • Even though possible habitat is present it is highly unlikely that <i>N. burrowsius</i> will be present due to: - The wetlands being present on paleo channels of the lower Cam River. The Cam River doesn't provide mudfish habitat - Substrates not being aligned with mudfish habitat and aestivation - Highly variable saturation extent	• Directly affected – within 100 m buffer of existing designation • Cam River catchment: NZFFD (New Zealand Freshwater Fish Database) contains a historic <i>N. burrowsius</i> record (dated 1946) – Lees is incorrect to state the Cam River doesn’t provide <i>N. burrowsius</i> habitat (likely arisen as Tonkin & Taylor (2025) only assessed records from the last 20 years) • Historic wetland type: swamp • Soil type: poorly drained silty Typic Orthic Gley Soils (hydric soil) • T&T photo: indicates potential <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination indicates potential <i>N. burrowsius</i> habitat • <i>N. burrowsius</i> can tolerate high salinity due to their euryhaline ancestry • Further survey recommended
CR_W2_NPSFM	• Small (circa 0.33 ha) wetland located within a paleo-channel of the Cam River • Dominated by willow with swamp forest subcanopy and understory • Hydrology is transitional from seasonally wet to permanently wet/damp, water received from the Cam River at high tide and some overland flow and groundwater recharge • Direct effect: permanent partial loss of extent • Indirect effect: very high hydrological modification, permanent habitat fragmentation and temporary construction sedimentation	• Yes - possible habitat is present • No- <i>N. burrowsius</i> are not expected to be present • Even though possible habitat is present it is highly unlikely that <i>N. burrowsius</i> will be present due to: - The wetlands being present on paleo channels of the lower Cam River. The Cam River doesn't provide mudfish habitat - Substrates not being aligned with mudfish habitat and aestivation - Highly variable saturation extent	• Directly affected – predominantly overlaps existing designation • Cam River catchment: NZFFD contains a historic <i>Neochanna burrowsius</i> record (1946) – Lees is incorrect to state Cam River doesn’t provide <i>Neochanna burrowsius</i> habitat (likely as Tonkin and Taylor incorrectly only assessed records from the last 20 years) • Historic wetland type: swamp • Soil type: poorly drained silty Typic Orthic Gley Soils (hydric soil) • T&T photo: indicates potential <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination indicates potential <i>N. burrowsius</i> habitat • <i>N. burrowsius</i> can tolerate high salinity due to their euryhaline ancestry • Further survey recommended

Wetland	Tonkin & Taylor (2025) -summarised	Lees (2026a) - summarised	Dunn (this assessment)
Williams Street - Woodend Beach Road bridge			
QP_W1_NPSFM	• Small (circa 0.34 ha) area of wetland • Vegetation is a mosaic of willow, scrub, rushes, exotic grasses • Seasonal wetland with shallow surface water, received from rainfall and overland flow, not considered connected to groundwater • Soils are fine loamy sand over sand with redox mottles • Direct effect: permanent partial loss of extent • Indirect effect: moderate hydrological modification, permanent habitat fragmentation and sedimentation	• No - habitat is not present. • No- <i>N. burrowsius</i> are not expected to be present • No habitat. Consideration of impacts on <i>N. burrowsius</i> is therefore not considered relevant	• Directly affected – partial overlap with remainder wholly within 100 m buffer of existing designation • Historic wetland type: not identified as wetland • Soil type: well drained sandy Mottled Sandy Recent Soils and Typic Sandy Brown Soils • T&T photo: not of a view to determine potential as <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
QP_W2_NPSFM	• Not assessed • Connected directly to the shallow unconfined aquifer. • Highly unlikely to be impacted by construction or operation of the quarry lake embankment	• No - habitat is not present. • No- <i>N. burrowsius</i> are not expected to be present No habitat. Consideration of impacts on <i>N. burrowsius</i> is therefore not considered relevant	• Not affected – outside of existing designation • Historic wetland type: not identified as wetland • Soil type: imperfectly drained sandy loam Mottled Sandy Recent Soils • T&T photo: not provided • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
QP_W3_NPSFM	• Not assessed • Hydrology sustained by water levels within the East quarry lake, which is directly connected to the shallow unconfined aquifer. • Highly unlikely to be impacted by construction or operation of the quarry lake embankment. • Potential for sedimentation effects assessed as part of the early works package and found to be very low potential for effects.	• No assessment	• Not affected – outside of existing designation • Historic wetland type: not identified as wetland • Soil type: not identified • T&T photo: not provided • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
QP_W4_NPSFM	• Small (circa 0.13 ha) area of wetland within a slight depression • Vegetation: mosaic of rushland, and grassland • Area of shallow surface water, seasonally connected to groundwater, also fed by overland flow and rainfall • Soil: fine light to medium brown loamy sand over light grey clay soils indicating localised saturated conditions • Direct effect: none identified • Indirect effect: low hydrological modification	• No assessment	• Indirectly affected – majority of area within 100 m buffer of existing designation • Historic wetland type: not identified as wetland • Soil type: well drained sandy Mottled Sandy Recent Soils • T&T photo: not provided • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended

Wetland	Tonkin & Taylor (2025) -summarised	Lees (2026a) - summarised	Dunn (this assessment)
Williams Street - Woodend Beach Road bridge continued			
Barkers Road wetlands: BR_W1_NPSFM, BR_W2_NPSFM, BR_W3_NPSFM, BR_W4_NPSFM	• Medium-sized (circa 2.74 ha) area of wetland habitat within a shallow relict lagoon channel • Vegetation dominated by willow canopy over mosaic of sedgeland, trees, shrubs, exotic grasses • Areas of open water, connected to shallow ground water, also receives overland flow • The historic presence of a lagoon channel in this location (ECan Blackmaps) suggests that this area is directly connected to shallow groundwater that is independent from the south quarry lakes • Considered highly unlikely to be impacted by construction, compaction, or operation of the quarry lake embankment or any enabling works • Considered highly unlikely to be impacted by partial filling of the South Lake remnant	• Yes - potential habitat • Yes -- potential for <i>N. burrowsius</i> to be present • These wetlands have been assessed as unaffected, either directly or indirectly by Project activities in the EclA. Consideration of impacts on <i>N. burrowsius</i> is therefore not considered relevant	• Not affected – outside of existing designation • Historic wetland type: swamp in northern area, not identified as wetland in southern area • Soil type: poorly drained clayey Typic Orthic Gley Soils (hydric soil) • T&T photos for BR_W1_NPSFM, BR_W2_NPSFM, BR_W4_NPSFM all indicate potential <i>N. burrowsius</i> habitat, no photo given for BR_W3_NPSFM • Aerial and LiDAR imagery: examination indicates potential <i>N. burrowsius</i> habitat • No further survey recommended as outside project area
FA_W1_NPSFM	• Very small (circa 0.15 ha) area of wetland habitat within a shallow depression • Vegetation primarily exotic grassland • Seasonal wetland receiving water from rainfall and overland flow, not permanently connected to ground water • Soils are dense saturated clay containing redox mottles below 300 mm • As the wetland will not be directly impacted by construction of the road and associated infrastructure, any impact to this wetland is considered highly unlikely	• No assessment	• Not affected – outside of existing designation • Historic wetland type: swamp • Soil type: poorly drained silty Typic Orthic Gley Soils (hydric soil) • T&T photo: indicates winter wetted pasture area not indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
FR_W1_NPSFM	• Medium-sized (circa 3.4 ha) wetland area within larger wetland complex (circa 6.1 ha) within a very shallow valley system • Vegetation comprises willow with variable understory and groundcover • Permanently saturated soils • Wetland fed by upgradient wetlands, overland flow and groundwater seepage • Direct effect: none identified • Indirect effect: low hydrological modification during construction, negligible hydrological modification post construction	• Yes – potential habitat • Yes - potential for <i>N. burrowsius</i> to be present • Consideration of impacts on <i>N. burrowsius</i> is therefore not considered further as wetland not impacted	• Not affected – outside of existing designation • Historic wetland type: not identified as wetland • Soil type: very poorly drained silty Raw Soils • T&T photo: indicates area or deeper open water under willows indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination indicates potential <i>N. burrowsius</i> habitat • No further survey recommended as outside project area

Wetland	Tonkin & Taylor (2025) -summarised	Lees (2026a) - summarised	Dunn (this assessment)
Williams Street - Woodend Beach Road bridge continued			
FR_W2_NPSFM	• Small (circa 0.4 ha) wetland area within wetland complex (circa 6.1 ha) within a shallow valley system • Vegetation comprises exotic grassland and rushland • Seasonally wetted area receiving overland flow and flood flow from adjacent wetland areas • Direct effect: none identified • Indirect effect: low hydrological modification during construction, negligible hydrological modification post construction	• No • No habitat. Consideration of impacts on <i>N. burrowsius</i> is therefore not considered relevant	• Not affected – outside of existing designation • Historic wetland type: not identified as wetland • Soil type: very poorly drained silty Raw Soils • T&T photo: indicates winter wetted pasture area not indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
FR_W3_NPSFM	• Medium sized (circa 1.56 ha) wetland area within wetland complex (circa 6.1 ha) within a shallow valley system • Vegetation defined by surface water permanence, mostly comprises rushland and grassland, with more regularly wet grassland areas dominated by sweetgrass • Wetland likely connected to shallow groundwater and/or upgradient spring within same swale wetland complex, as well as receiving overland flow • Direct effect: none identified • Indirect effect: low hydrological modification during construction, negligible hydrological modification post construction	• No No habitat. Consideration of impacts on <i>N. burrowsius</i> is therefore not considered relevant	• Not affected – outside of existing designation • Historic wetland type: swamp • Soil type: imperfectly drained silty Mottled-weathered Fluvial Recent Soils • T&T photo: indicates wetted pasture area not indicative of <i>N. burrowsius</i> habitat as lacking areas of permanently deep or open water • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat as no canopy and no open water or channels apparent • No further survey recommended
FR_W4_NPSFM	• Small (circa 0.71 ha) wetland area within wetland complex (circa 6.1 ha) within a shallow valley system • Vegetation defined by willow over open shallow water with floating aquatic macrophytes, as well as areas of rushland and grassland • Wetland likely connected to shallow groundwater and/or upgradient spring within same swale wetland complex, as well as receiving overland flow • Direct effect: none identified • Indirect effect: low hydrological modification during construction, low hydrological modification post construction	• Yes – potential habitat • Yes - potential for <i>N. burrowsius</i> to be present • Consideration of impacts on <i>N. burrowsius</i> is therefore not considered further due to scale of impact	• Directly affected –wholly within 100 m buffer of existing designation with 10 m buffer within designation proposed in area of wetland immediately adjacent to designation • Historic wetland type: swamp • Soil type: imperfectly drained silty Mottled-weathered Fluvial Recent Soils • T&T photo: indicates open area of water with willow canopy and floating macrophyte cover indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat as no open water or channels apparent in available aerial imagery, some channelling present in LiDAR imagery but areas does not appear to hold permanent water • Further survey recommended based on Tonkin & Taylor (2025) and Lees (2026a) assessments

Wetland	Tonkin & Taylor (2025) -summarised	Lees (2026a) - summarised	Dunn (this assessment)
Gladstone Road bridge - State Highway 1			
FA_W2_NPSFM	• Very small (circa 0.05 ha) area of wetland habitat within an old swale • Vegetation dominated by exotic pasture grasses • Seasonal wetland connected to shallow groundwater, also receives rainfall and overland flow • Soils contain redox mottling • Direct effect: none identified • Indirect effect: low hydrological modification and sedimentation	• No assessment	• Indirectly affected – majority of area within 100 m buffer of existing designation • Historic wetland type: swamp • Soil type: well drained loamy Mottled-weathered Fluvial Recent Soils and poorly drained Typic Orthic Gley Soils (hydric soil) • T&T photo: area appears to have become dry and developed as paddock, despite being within an old swale on the edge of mapped historic wetland and hydric soils • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
WC_W1_NPSFM	• Small (circa 0.20 ha) area of wetland habitat within larger wetland and stream complex (combined wetland area of circa 1.1 ha) alongside Waihora Stream • Vegetation comprised of willow and scrub over open shallow water and grasses • Seasonal wetland receives water from Waihora Stream at higher flows. In this area the stream ceases to have surface flow • Direct effect: permanent complete loss of extent • Indirect effect: none identified	• Yes – potential habitat • Yes - potential for <i>N. burrowsius</i> to be present • No habitat Consideration of impacts on <i>N. burrowsius</i> is therefore not considered relevant	• Directly affected – wholly within existing designation • Historic wetland type: swamp • Soil type: well drained loamy Mottled-weathered Fluvial Recent Soils • T&T photo: area appears to have shallow areas of open water under canopy not indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
WC_W2_NPSFM	• Small (circa 0.38 ha) area of wetland habitat within larger wetland and stream complex (combined wetland area of circa 1.1 ha) alongside Waihora Stream • Vegetation comprised of willow with shallow water areas with rushlands, sedgelands and grasslands and instream macrophytes • Wetland receives water from Waihora Stream and overland flow, and is connected to shallow groundwater • Direct effect: none identified • Indirect effect: moderate hydrological modification during construction, low hydrological modification post construction	• Yes – potential habitat • Yes - potential for <i>N. burrowsius</i> to be present	• Indirectly affected – majority of area within 100 m buffer of existing designation • Historic wetland type: swamp • Soil type: imperfectly - well drained silty - loamy Mottled-weathered Fluvial Recent Soils • T&T photo: area appears to have shallow areas of open water with canopy cover grading to wetted grass areas , overall indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination indicates potential <i>N. burrowsius</i> habitat • Further survey recommended

Wetland	Tonkin & Taylor (2025) -summarised	Lees (2026a) - summarised	Dunn (this assessment)
Gladstone Road bridge - State Highway 1 continued			
WC_W3_NPSFM	• Small (circa 0.23 ha) area of wetland habitat within larger wetland and stream complex (combined wetland area of circa 1.1 ha) alongside Waihora Stream • Vegetation comprised of willow forest with understory of flax, cabbage tree and blackberry, and scattered shrubs and ferns. Other areas are sedgeland • Wetland receives water from Waihora Stream and overland flow • Direct effect: none identified • Indirect effect: moderate hydrological modification during construction, low hydrological modification post construction	• Yes – potential habitat • Yes - potential for <i>N. burrowsius</i> to be present	• Indirectly affected – majority of area within 100 m buffer of existing designation • Historic wetland type: swamp • Soil type: imperfectly - well drained silty - loamy Mottled-weathered Fluvial Recent Soils • T&T photo: not provided • Aerial and LiDAR imagery: examination indicates potential <i>N. burrowsius</i> habitat • Further survey recommended
WC_W4_NPSFM	• Small (circa 0.14 ha) area of wetland habitat within larger wetland and stream complex (combined wetland area of circa 1.1 ha) alongside Waihora Stream • Vegetation comprised of willow forest with understory of flax, cabbage tree and blackberry, and scattered shrubs and ferns. Other areas are sedgeland • Wetland receives water from Waihora Stream and overland flow • Direct effect: none identified • Indirect effect: moderate hydrological modification during construction, low hydrological modification post construction	• Yes – potential habitat • Yes - potential for <i>N. burrowsius</i> to be present	• Directly affected – overlaps existing designation, majority of area within 100 m buffer of existing designation • Historic wetland type: not identified as wetland • Soil type: imperfectly - well drained silty - loamy Mottled-weathered Fluvial Recent Soils • T&T photo: area has canopy over open water and understory indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination indicates potential <i>N. burrowsius</i> habitat • Further survey recommended
WC_W5_NPSFM	• Very small (circa 0.01 ha) area of wetland habitat within larger wetland and stream complex (combined wetland area of circa 1.1 ha) alongside Waihora Stream • Vegetation comprised of rushland and exotic grasses • Wetland located in shallow hollow with standing water, receives water from Waihora Stream and overland flow • Direct effect: none identified • Indirect effect: moderate hydrological modification during construction, low hydrological modification post construction	• No- habitat is not present. • No - <i>N. burrowsius</i> are not expected to be present • No habitat Consideration of impacts on <i>N. burrowsius</i> is therefore not considered relevant	• Directly affected – overlaps existing designation • Historic wetland type: not identified as wetland • Soil type: imperfectly - well drained silty - loamy Mottled-weathered Fluvial Recent Soils • T&T photo: area is wetted pasture grass with no discernible wetland-terrestrial margin, not indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended

Wetland	Tonkin & Taylor (2025) -summarised	Lees (2026a) - summarised	Dunn (this assessment)
Gladstone Road bridge - State Highway 1 continued			
WC_W6_NPSFM	• Small (circa 0.15 ha) area of wetland habitat within larger wetland and stream complex (combined wetland area of circa 1.1 ha) alongside Waihora Stream • Vegetation comprised of areas of willow forest with sedge understory, willow scrub, or pasture grasslands and sedgeland • Wetland receives flood flows from Waihora Stream and overland flow, and shallow groundwater • Direct effect: none identified • Indirect effect: moderate hydrological modification during construction, low hydrological modification post construction	• Yes – potential habitat • Yes - potential for <i>N. burrowsius</i> to be present • This wetland has been assessed as having mudfish habitat and potential for <i>N. burrowsius</i> to be present • The effects due to the Project will result in complete loss of this wetland • <i>N. burrowsius</i> survey required and if present follow requirements to implement a mudfish relocation plan	• Directly affected – overlaps existing designation, majority of area within 100 m buffer of existing designation • Historic wetland type: not identified as wetland • Soil type: imperfectly - well drained silty - loamy Mottled-weathered Fluvial Recent Soils • T&T photo: wetted area with sedge and willow canopy indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination indicates potential <i>N. burrowsius</i> habitat • Further survey recommended
Project construction works adjacent to State Highway 1 at Pegasus and the northern end of the Project designation			
GS_CW1_RMA	• Small (circa 0.26 ha) area of constructed stormwater wetland • Vegetated margin of giant rush and floating sweatgrass • Wetland hydrology is maintained by stormwater inputs from the Ravenswood subdivision. • Road construction works in the area are highly unlikely to have any impacts on this area.	• No assessment	• Not affected – outside of existing designation • Historic wetland type: not indicated as wetland • Soil type: well drained loamy Weathered Fluvial Recent Soils • T&T photo: indicates a permanently inundated constructed swale not indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
GC_W1_LWRP	• Small (circa 0.86 ha) area of open water constructed for amenity purposes • Vegetated margin of raupo • Connected directly to the shallow coastal aquifer. • Road construction works and dewatering for culvert installation are highly unlikely to have any impacts on this area.	• No assessment	• Not affected – outside of existing designation • Historic wetland type: swamp • Soil type: imperfectly drained silty Weathered Fluvial Recent Soils • T&T photo: indicates a constructed relatively large pond with open water not indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended
GC_W2	• Small area of open water • Vegetated margin • Wetland hydrological connections are unknown. • Minor road widening works are highly unlikely to have any impacts on this area	• No assessment	• Not affected – outside of existing designation • Historic wetland type: swamp • Soil type: moderately well drained silty Pallic Soils • T&T photo: indicates a constructed relatively large pond with open water not indicative of <i>N. burrowsius</i> habitat • Aerial and LiDAR imagery: examination does not indicate potential <i>N. burrowsius</i> habitat • No further survey recommended