Appendix 3: Plan Change 81 to the Tasman Resource Management Plan – Assessment against the National Policy Statement for Natural Hazards risk matrix, likelihood and consequences tables

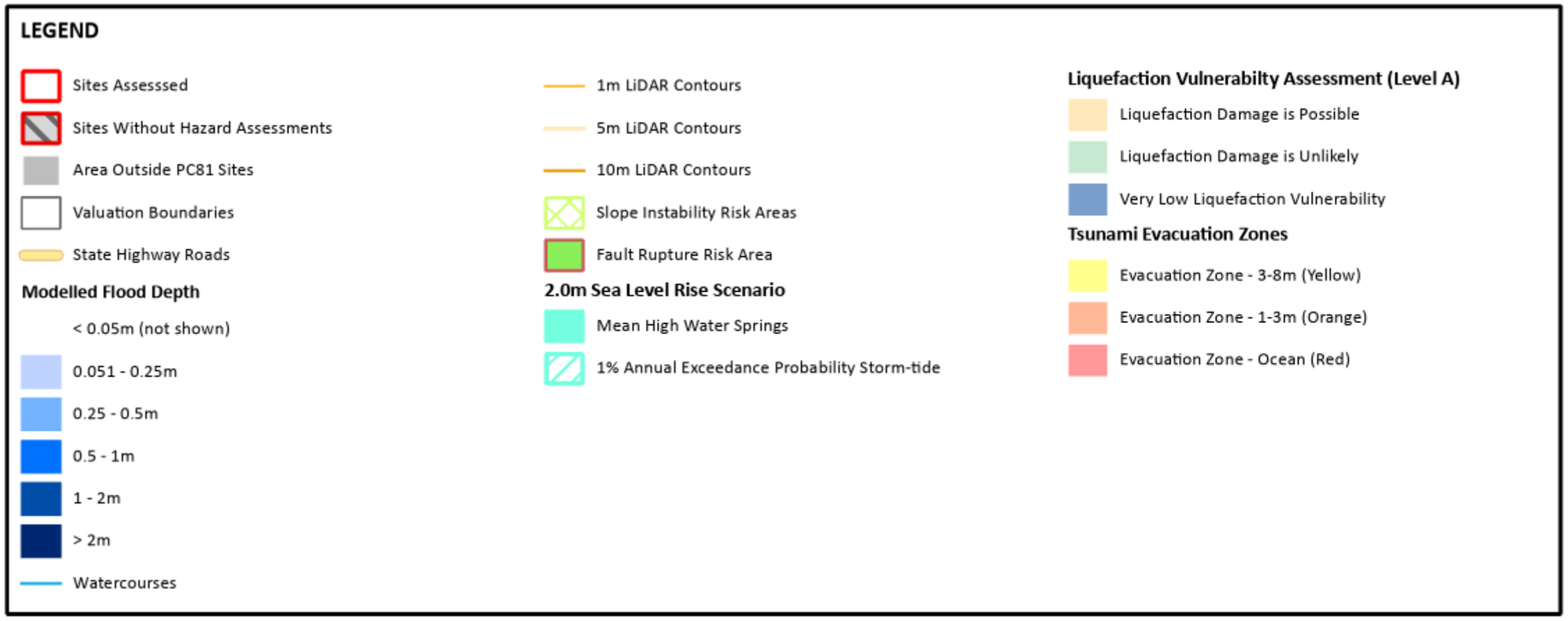
Purpose

This appendix presents the natural hazard risk level assessments undertaken for Plan Change 81 (PC81) The assessments have been prepared in accordance with the methodology set out in *Methodology: Natural Hazard Risk Level Assessment for Proposed Zoning Changes (PC81)* and are intended to help inform plan-making decisions.

The background, context and methodology for these assessments are set out in *Methodology: Natural Hazard Risk Level Assessment for Proposed Zoning Changes (PC81)* and should be read prior to reviewing the assessments below.

Legend for maps

The legend provides a visual key to the colours and linework shown on the maps. It is used throughout this document to ensure each map is interpreted consistently, allowing readers to quickly identify site locations and the mapped natural hazard information.



Richmond Central – T-22a, T-22b, T-22c, T-22d, T-112a, T-112b and T-112c (Richmond Central Intensification)

Current and proposed zoning:

T-22a: Residential Zone to Medium Density Residential Zone with a Richmond Intensive Development Precinct. Add Outline Spatial Plan overlay to 120 Wensley Road.

T-22b and T-112b: Residential Zone to Medium Density Residential Zone. Add Outline Spatial Plan overlay to 330 Hill Street.

T-22c Central Business Zone to Medium Density Residential Zone with a Richmond Intensive Development Precinct.

T-22d: Central Business Zone to Open Space Zone

T-112a: Tourist Services Zone to Medium Density Residential Zone. Add Outline Spatial Plan overlay.

T-112b: Residential Zone to Medium Density Residential Zone

T-112c: Tourist Services Zone to Open Space Zone. Add Outline Spatial Plan overlay.

Yield:

1720 total for all sites

Natural Hazard comment:

Sites T-22a, and T-22b are largely free from flood hazard. Isolated ponding and overland flows may occur in places should the stormwater network become overwhelmed. Such overland flows will be strongly influenced by the presence of existing drains/swales, buildings, fences, vegetation and other landscaping both onsite and in the surrounding area. T-22c is largely free from flood hazard.

Parts of site T-112a, and to a lesser extent site T-112b, may experience ponding and overland flows should the stormwater network become overwhelmed. However, much of these sites remain free from flood hazards. though overland flows will be strongly influenced by the presence of existing drains/swales, buildings, fences, vegetation and other landscaping both onsite and in the surrounding area. All of site T-112c is subject to flood hazards.

The extreme northern end of sites T-112a and T-112b, and all of site T112c, are in an area where seismic liquefaction damage is possible.

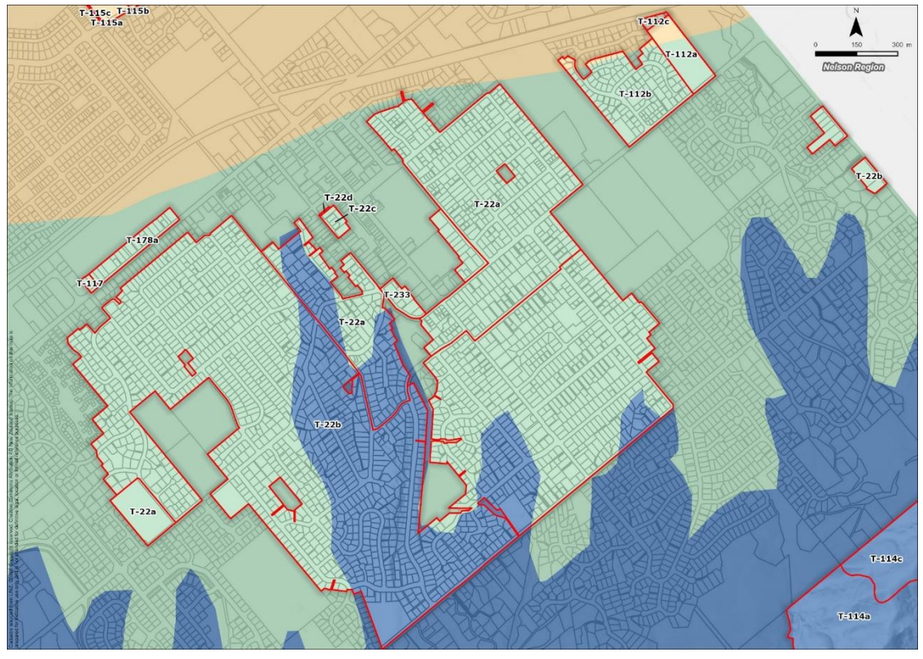
The northern corner of site T-22a and all of site T-112a and much of site T-112b are in the yellow tsunami evacuation zone. All of site T-112c and the northern end of site T-112a are in the orange tsunami evacuation zone.

As per the natural hazards assessment methodology, T-22d and T-112c have not been assessed against the NPS-NH as the proposed zoning is Open Space.

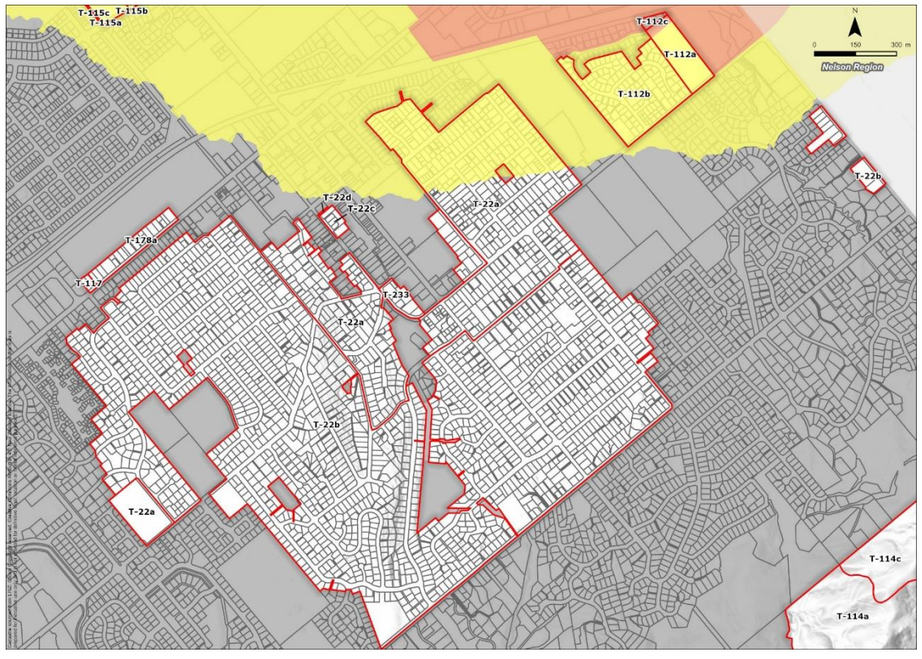
Site and Natural hazard maps for Richmond Central – T-22a, T-22b, T-22c, T-22d, T-112a, T-112b and T-112c (Richmond Central Intensification)

Site location map

Liquefaction vulnerability assessment

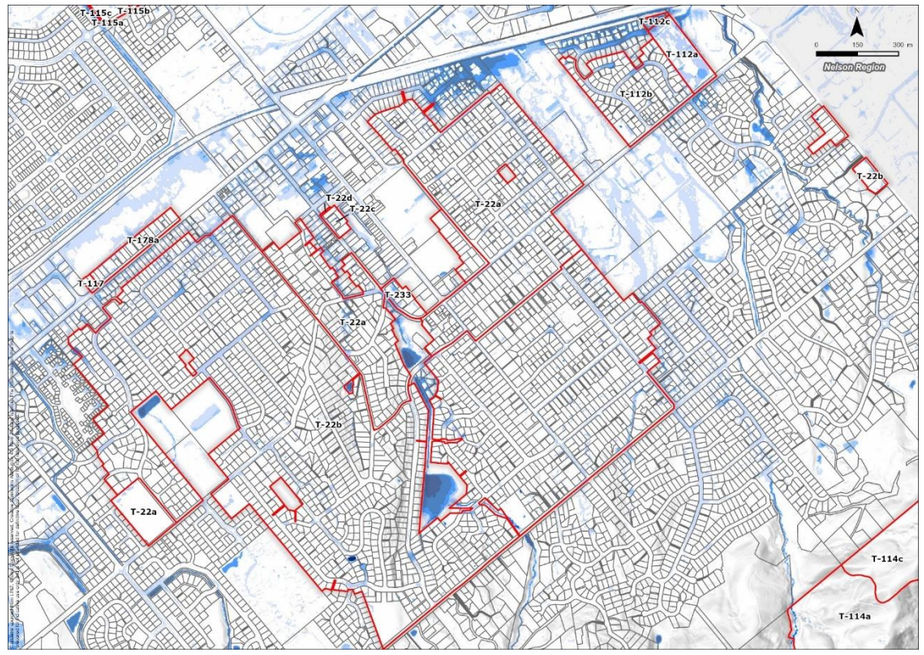


Tsunami evacuation zones

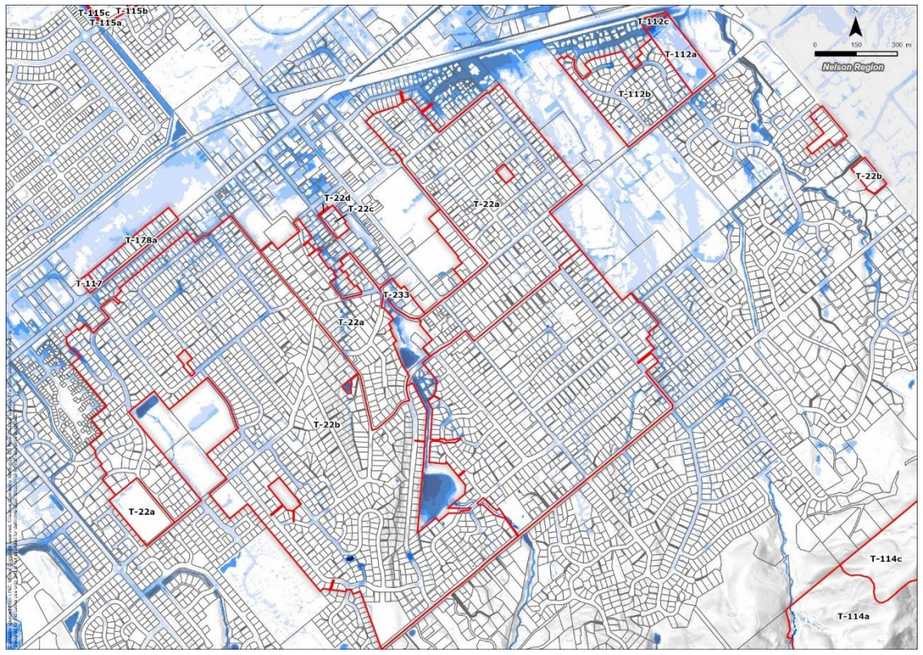


Modelled flood depths maps for Richmond Central – T-22a, T-22b, T-22c, T-22d, T-112a, T-112b and T-112c (Richmond Central Intensification)

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2130)



Natural hazards risk assessment table for Richmond Central – T-22a, T-22b, T-22c, T-22d, T-112a, T-112b and T-112c (Richmond Central Intensification)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-22a	1% AEP Possible	Managed stormwater reticulation, including detention ponds	Minor	Minor	Medium	On site detention Network upgrades Building platform levels Overland flow path management	Low	Negligible	Negligible	Low	Ponding or overland flows across small parts of the site if Culvert blockages, significant rain fall greater than 1%AEP, or when detention ponds are exceeded. Risk remains low	Yes, majority of site not impacted	Modelling assumptions Recent model 2026 Only isolated areas will be impacted.
Flooding (river/surface) T-22b	1% AEP Possible	Managed stormwater reticulation	Minor	Minor	Medium	On site detention Network upgrades Building platform levels Overland flow path management	Low	Negligible	Negligible	Low	Ponding or overland flows across small parts of the site if culvert blocks, or significant rain fall greater than 1%AEP. Risk remains low	Yes, majority of site not impacted	Modelling assumptions Recent model 2026
Flooding (river/surface) T-22c	1% AEP Possible	Managed stormwater reticulation, including detention ponds	Negligible	Negligible	Low	On site detention Network upgrades Building platform levels Overland flow path management	Low	Negligible	Negligible	Low	Ponding or overland flows across small parts of the site if Culvert blockages, significant rain fall greater than 1%AEP, or when detention ponds are exceeded. Risk remains low	Yes, majority of site not impacted	Modelling assumptions Recent model 2026 Oxford Street is included as part of this site, but was not considered for the hazard assessment
Flooding (river/surface) T-112a T-112b	1% AEP Possible	Managed stormwater reticulation	Minor	Minor	Medium	On site detention Network upgrades Building platform levels Overland flow path management	Low	Negligible	Negligible	Low	Ponding or overland flows across small parts of the site if culvert blocks, or significant rain fall greater than 1%AEP. Risk remains low	Yes, majority of site not impacted	Modelling assumptions Recent model 2026
Liquefaction T-112a T-112b	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Tsunami T-112a T-112b T-22a	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **The Richmond Central sites have generally limited flood hazard, with T-22a, T-22b, T-22c and T-112b largely unaffected except for isolated overland flows should the stormwater network become overwhelmed, while parts of T-112a may experience shallow ponding and overland flows. A small area of T-22a, and all of T-112a and T-112b fall within the yellow tsunami evacuation zone, and liquefaction damage is possible at the northern ends of T-112a and T-112b.** **Once mitigation measures are applied, all hazard risk levels except for tsunami are assessed as low, and residual risks remain low. For tsunami the risk level and residual risk are assessed as medium.**												

Richmond central T-233 (McGlashen redevelopment)

Current and Proposed zoning:

T-233 Rezone from Commercial Zone to Central Business Zone

Yield:

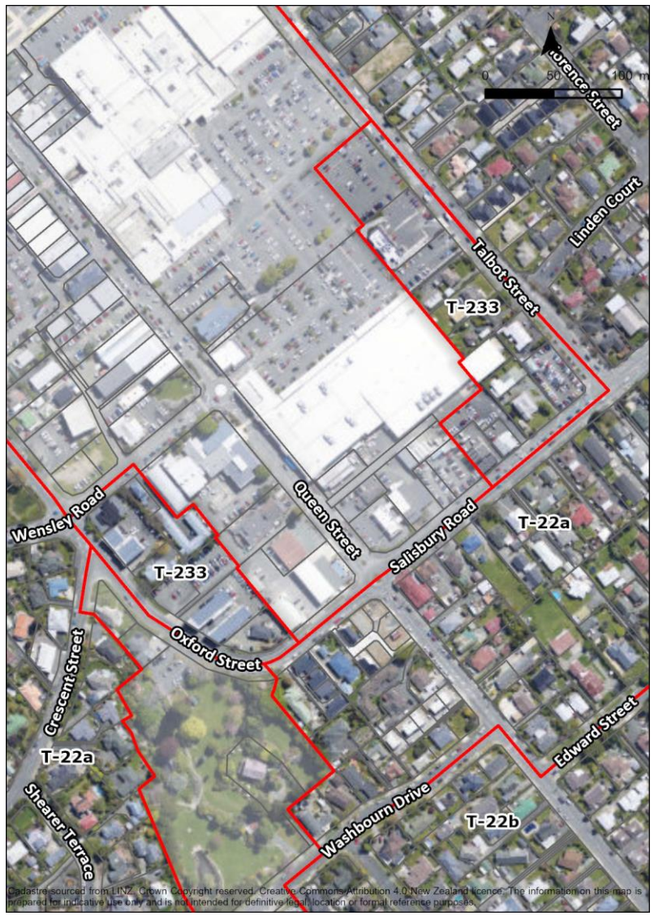
3.0 hectares of business land

Natural Hazard comments:

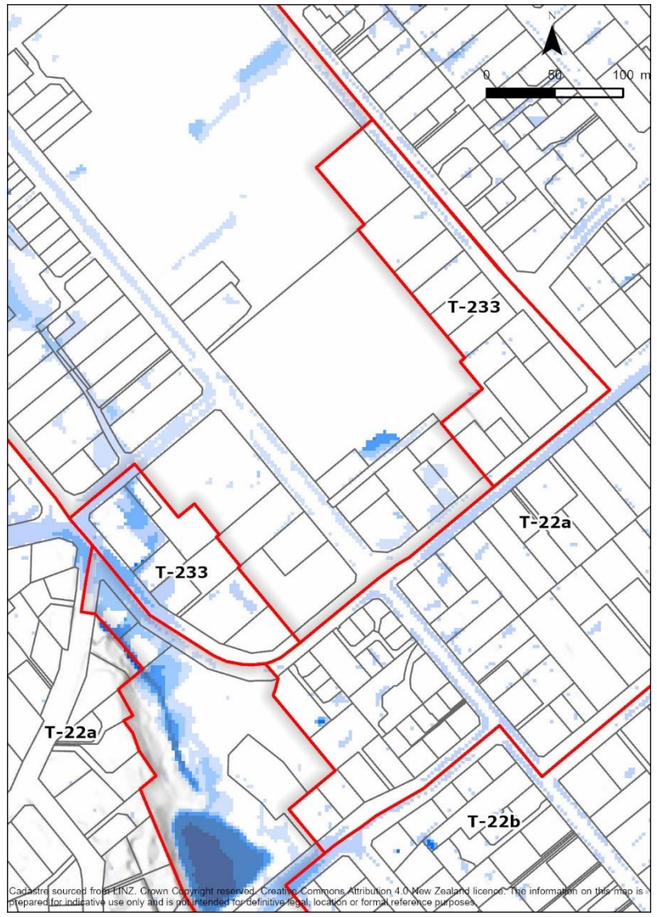
Flood modelling shows the extreme western corner (Oxford Street/Wensley Road) of T-233 being subject to flood hazards should the stormwater network become overwhelmed. Such flooding will be dominated by relatively shallow, northwardly flowing, overland flows. These flood flows will be strongly influenced by the presence of existing drains/swales, buildings, fences, vegetation and other landscaping both onsite and in the surrounding area.

Site and Natural hazard maps for Richmond central T-233 (McGlashen redevelopment)

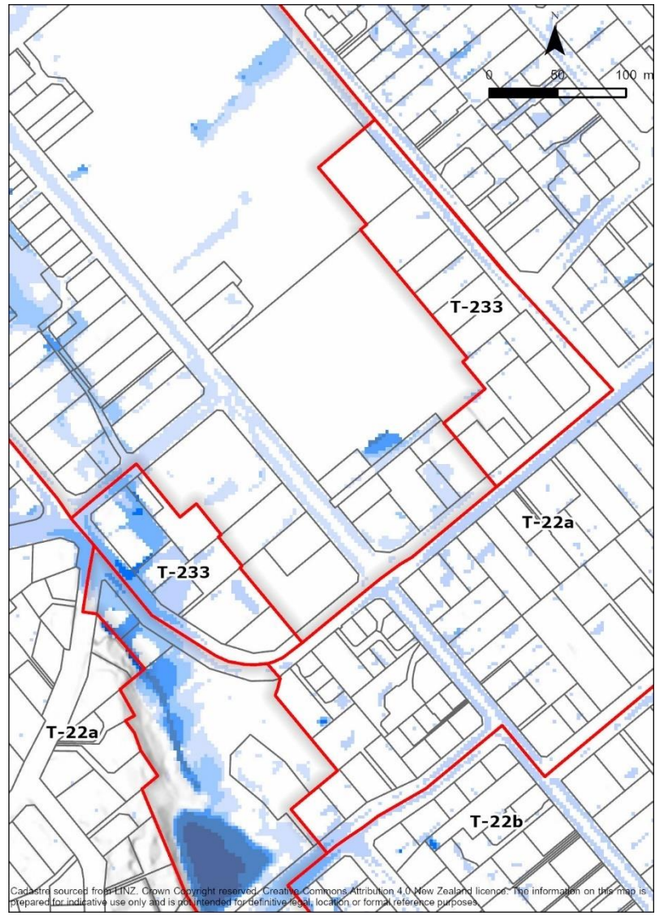
Site location map



Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2130)



Natural hazards risk assessment table for Richmond central T-233 (McGlashen redevelopment)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-233	1% AEP Possible	Managed stormwater reticulation, including detention ponds	Negligible	Negligible	Low	Keeping culverts clear and functioning	Low	Negligible	Negligible	Low	Culvert blocks or significant rain fall greater than 1%AEP when detention ponds exceeded, small part of site may be impacted Risk remains low	Yes, majority of site not impacted	Modelling assumptions Recent model 2026
Natural hazard risk level assessment summary: **Most of the site has limited exposure to flood hazards with only the western corner of the site exposed to shallow overland flood flows should the stormwater network become overwhelmed. The risk level from flood hazards is assessed as low once mitigation measures are applied. Residual risk remains low, with only a small part of the site potentially affected during events where the stormwater drainage capacity is exceeded.**													

Richmond T-117 and T-178a (Gladstone Road and 2 Poutama Street)

Current and Proposed zoning:

T-117: Residential Zone to Mixed Business Zone

T-178a: Residential Zone to Medium Density Residential Zone with a Richmond Intensive Development Precinct

Yield:

T-178a - dwelling yield is included in the large Richmond central site (1720 dwellings)

T-117 - 1.8 hectares of business land

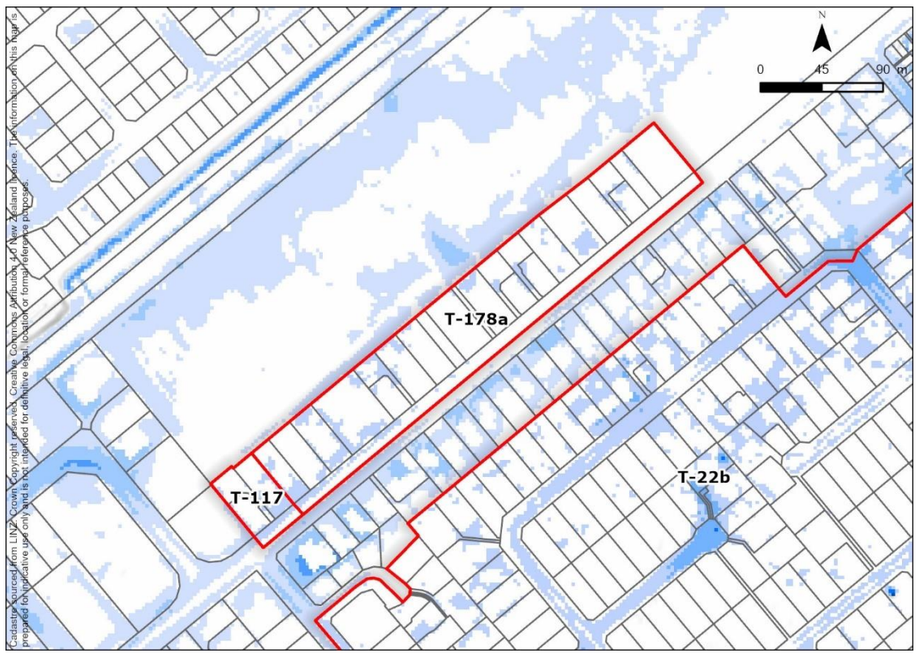
Natural Hazard comments:

Flood modelling shows these sites are presently subject to limited flood hazards during rainfall events. Such flooding is dominated by surface ponding though overland flows can still occur. Flood hazards at these sites will increase into the future as a result of increasing rainfalls associated with projected climate change. The extent that the sites are impacted is largely dependent on the capacity and continued functioning of the stormwater network and secondary flow paths. Gradients at the sites and its vicinity are low and this can impact the conveying of stormwater away from the site.

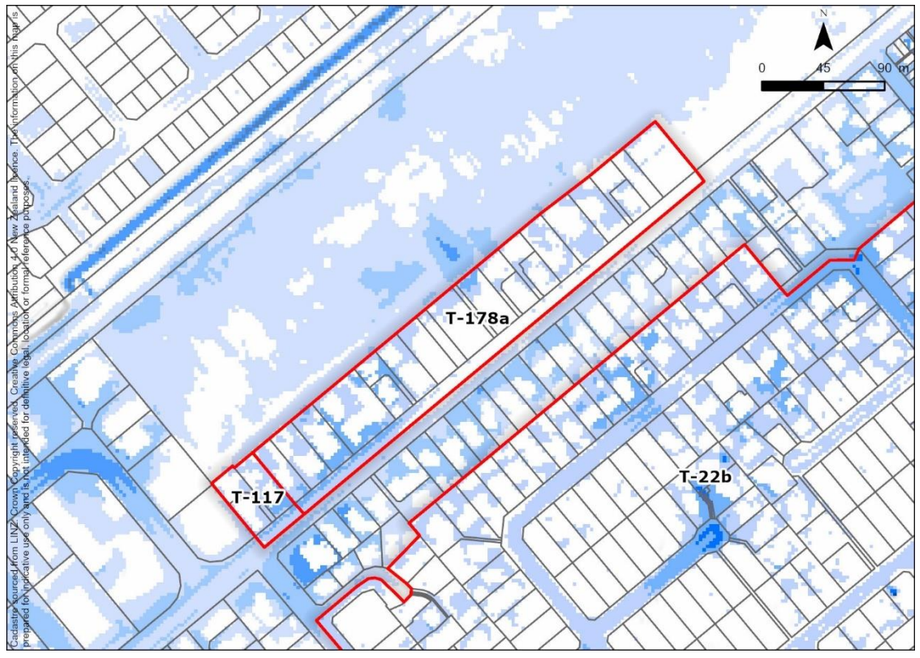
Site and Natural hazard maps for Richmond T-117 and T-178a (Gladstone Road and 2 Poutama Street)

Site location map

Modelled flood depths (1% AEP, present day



Modelled flood depths (1% AEP, future day RCP8.5 to 2130)



Natural hazards risk assessment table for Richmond T-117 and T-178a (Gladstone Road and 2 Poutama Street)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-178a	1% AEP Possible	Stormwater network	Minor	Negligible	Medium	Onsite stormwater design (flowpaths) Building platform heights	Low	Negligible	Negligible	Low	Ponding if stormwater reticulation is overwhelmed. With appropriate design risk should remain low.	Yes, raising of building platforms is required in most places to mitigate flood hazard.	Modelling assumptions Recent model 2026
Flooding (river/surface) T-117	1% AEP Possible	Stormwater network	Minor	Negligible	Medium	Onsite stormwater design (flowpaths) Building platform heights	Low	Negligible	Negligible	Low	Ponding if stormwater reticulation is overwhelmed. With appropriate design risk should remain low.	Yes, raising of building platforms is required in most places to mitigate flood hazard.	Modelling assumptions Recent model 2026
Natural hazard risk level assessment summary: **These sites are presently subject to limited flood hazards, dominated by surface ponding during rainfall events. Flood hazards at these sites will increase into the future as a result of climate change. The sites are assessed as having a medium risk level, which reduces to a low risk level once mitigation measures are applied. Residual flood risk remains low.**													

Richmond T115a, T-115b and T-115c (405 Lower Queen St)

Current and Proposed zoning:

T-115a: Mixed Business Zone to Medium Density Residential Zone. See Outline Spatial Plan.

T-115b: Mixed Business Zone to Commercial Zone

T-115c: Mixed Business Zone to Open Space Zone

Yield:

90 dwellings T115a

5.4ha of business land T-115b

Natural Hazard comments:

These sites are only exposed to limited flood hazards. Flood modelling shows surface ponding in the northern corner of site T-115b can occur. The occurrence and extent of such ponding is dependent on the capacity of the surrounding stormwater network. This network includes a constructed watercourse that flows adjacent to the southwestern boundary of site T-115a and is approximately 120 metres southwest of site T-115b.

These sites are in an area where seismic liquefaction damage is possible, however the underlying soils are typically gravelly.

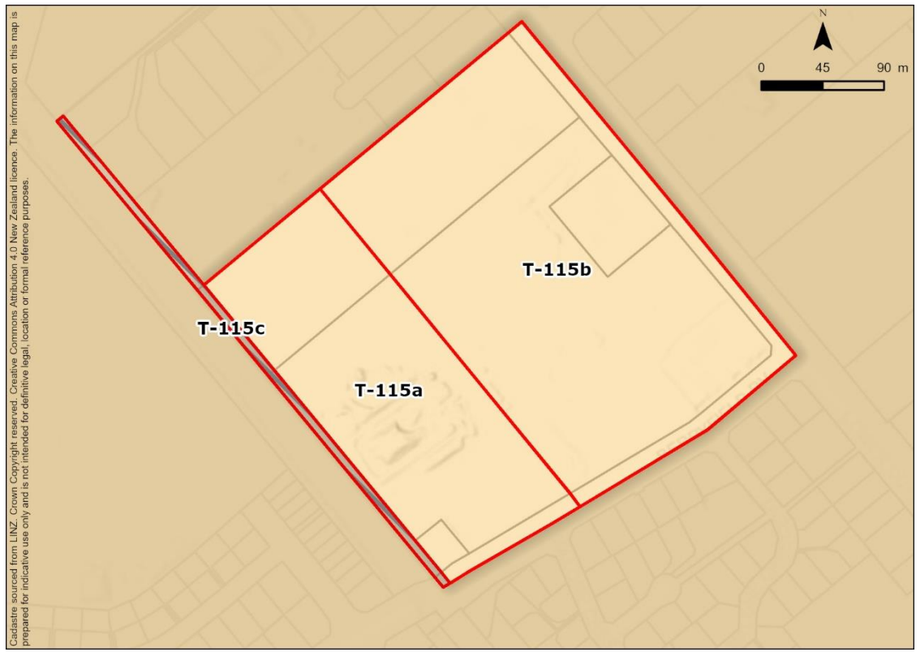
Sites T-115a, T-115b and T-115c are located within the yellow tsunami evacuation zone.

As per the natural hazards assessment methodology, T-115c has not been assessed against the NPS-NH as the proposed zoning is Open Space.

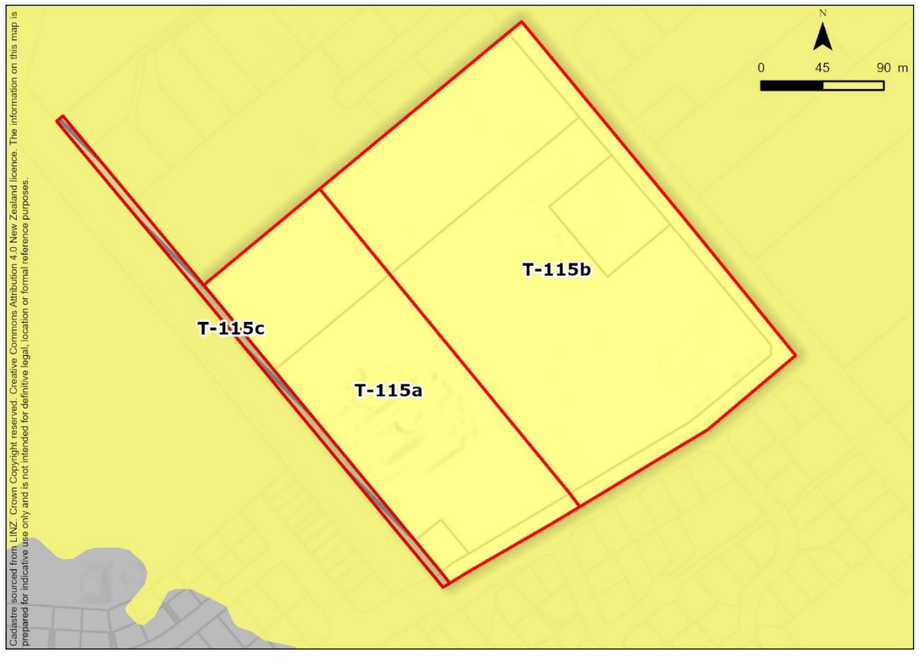
Site and Natural hazard maps for Richmond T115a, T-115b and T-115c (405 Lower Queen St)

Site location map

Liquefaction vulnerability assessment

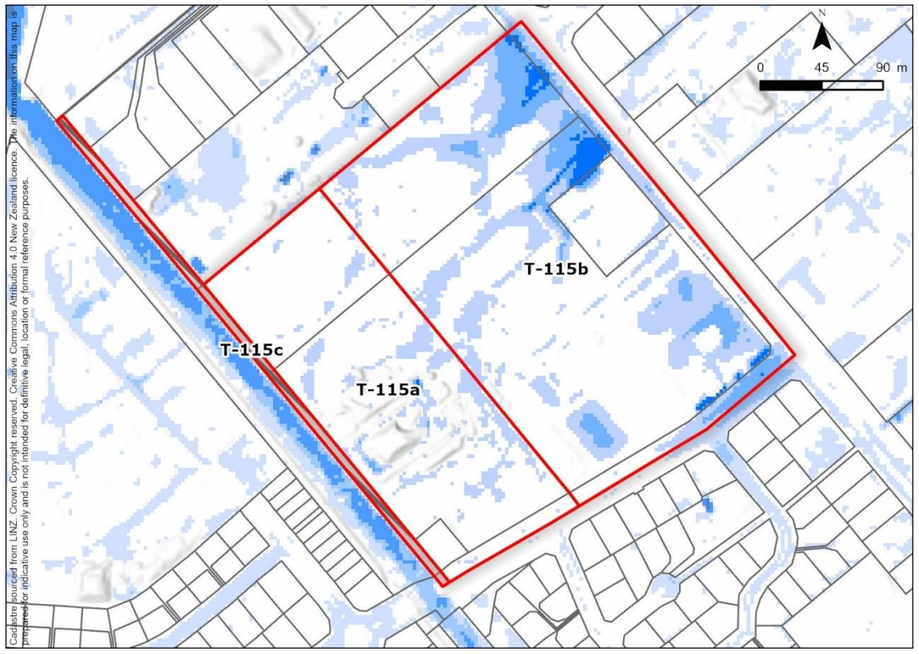


Tsunami evacuation zones

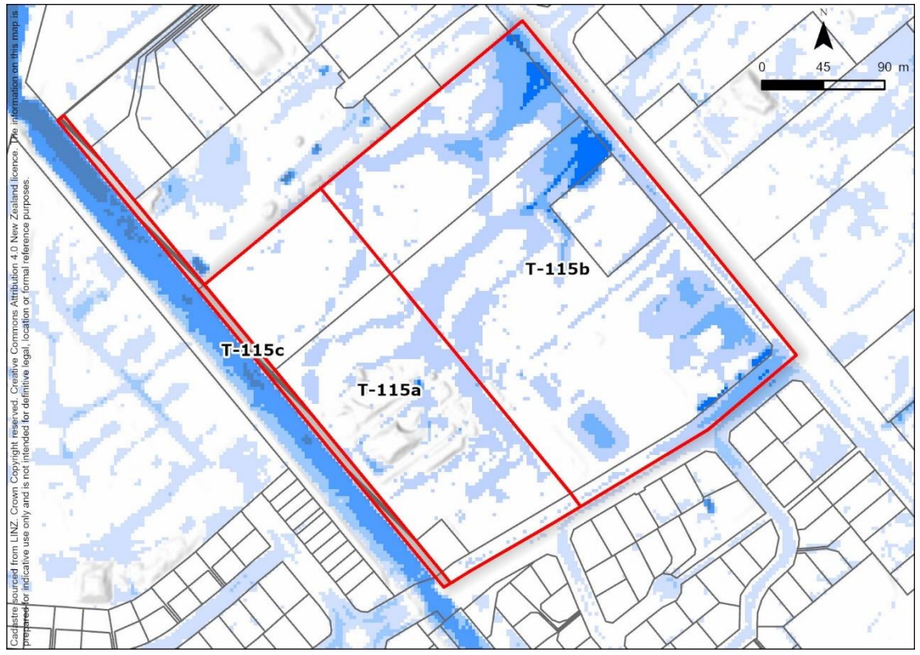


Modelled flood depth maps for Richmond T115a, T-115b and T-115c (405 Lower Queen St)

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2130)



Natural hazards risk assessment table for Richmond T115a, T-115b and T-115c (405 Lower Queen St)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes)
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-115a	1%AEP Possible	Stormwater drains (Poutama Drain/Borck Creek))	Negligible	Negligible	Low	Onsite stormwater design (flowpaths) Building platform heights	Low	Negligible	Negligible	Low	Ponding if stormwater reticulation is overwhelmed. With appropriate design risk should remain low.	Yes, raising of building platforms is required in most places to mitigate flood hazard.	Modelling assumptions Recent model 2026
Liquefaction T-115a	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-115a T-115b	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Flooding (river/surface) T-115b	1%AEP Possible	Stormwater drains (Poutama Drain/Borck Creek))	Minor	Negligible	Medium	Onsite stormwater design (flowpaths) Building platform heights	Low	Negligible	Negligible	Low	Ponding if stormwater reticulation is overwhelmed. With appropriate design risk should remain low.	Yes, raising of building platforms is required in most places to mitigate flood hazard.	Modelling assumptions Recent model 2026
Liquefaction T-115b	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Natural hazard risk level assessment summary: **The sites are exposed to limited flood hazards, however, surface ponding can occur in the northern corner of T-115b, depending on the capacity of the surrounding stormwater network. Liquefaction damage is possible on both sites, and they are located within the yellow tsunami evacuation zone. The hazard risk levels for flooding and liquefaction have been assessed as low once mitigation measures are applied. The residual risks remain low, with only limited effects expected if stormwater capacity is exceeded. The tsunami risk level has been assessed as medium, with the residual risk remaining medium.**													

Richmond T-232a and T-232b (28 Appleby Highway)

Current and Proposed zoning:

T-232a: Rezone from Light Industrial Zone to Medium Density Residential Zone

T-232b: Rezone Rural 1 deferred Residential Zone to Medium Density Residential Zone

Yield:

30 dwellings (T-232a and T-232b)

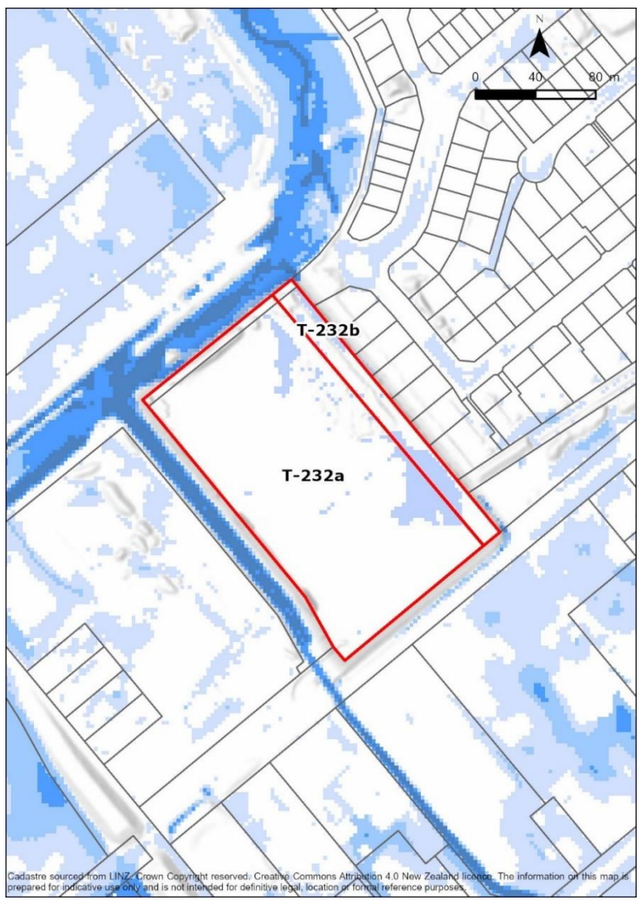
Natural Hazard comments:

These sites and surrounding area have been subject to flooding in the past from the watercourses draining the Richmond Range foothills to the south and southeast, notably in January 1986. Such flooding was dominated by shallow overland flows. Borck Creek now flows adjacent to the northwestern boundary of the site, and an associated drain flows adjacent to the southwest boundary of site T-232a. The flood hazard to these sites has been significantly reduced by recent upgrades to the capacity of the Borck Creek channel and associated drains and stormwater network. This drainage network has been designed and constructed to contain the runoff from a 1% annual exceedance probability rainstorm.

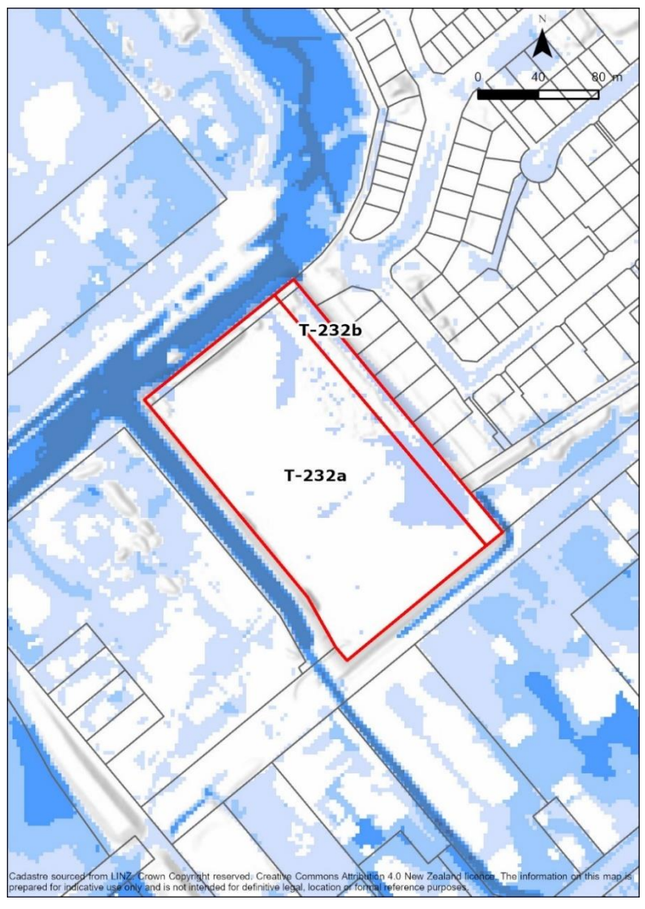
Site and Natural hazard maps for Richmond T-232a and T-232b (28 Appleby Highway)

Site location map

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2130)



Natural hazards risk assessment table for Richmond T-232a and T-232b (28 Appleby Highway)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-232a	1% AEP Possible	Borck Creek stormwater management	Negligible	Negligible	Low	Standard onsite stormwater design and management	Low	Negligible	Negligible	Low	Borck Creek exceeding capacity. Risk remains low	Yes, minimal mitigation measures required	Modelling assumptions Recent model 2026
Flooding (river/surface) T-232b	1% AEP Possible	Borck Creek stormwater management	Negligible	Negligible	Low	Standard onsite stormwater design and management	Low	Negligible	Negligible	Low	Borck Creek exceeding capacity. Risk remains low	Yes, minimal mitigation measures required	Modelling assumptions Recent model 2026
Natural hazard risk level assessment summary: **Historically these sites were exposed to flood hazards from shallow overland flows originating from the foothills to the south and southeast. Recent upgrades to the Borck Creek channel and associated drains have significantly reduced this flood hazard. The risk level from flood hazards is assessed as low. Borck Creek exceeding its capacity presents some residual risk though this is assessed as low with appropriate onsite mitigation measures.**													

Richmond South T-35a and T-122a (Main Road, Hope)

Current and Proposed zoning:

T-35a: Rezone Rural 1 Zone to Rural 1 deferred Light Industrial Zone.

T-122a: Rezone Rural 1 Zone to Rural 1 deferred Mixed Business Zone.

Yield:

19 hectares of light industrial (T-35a)

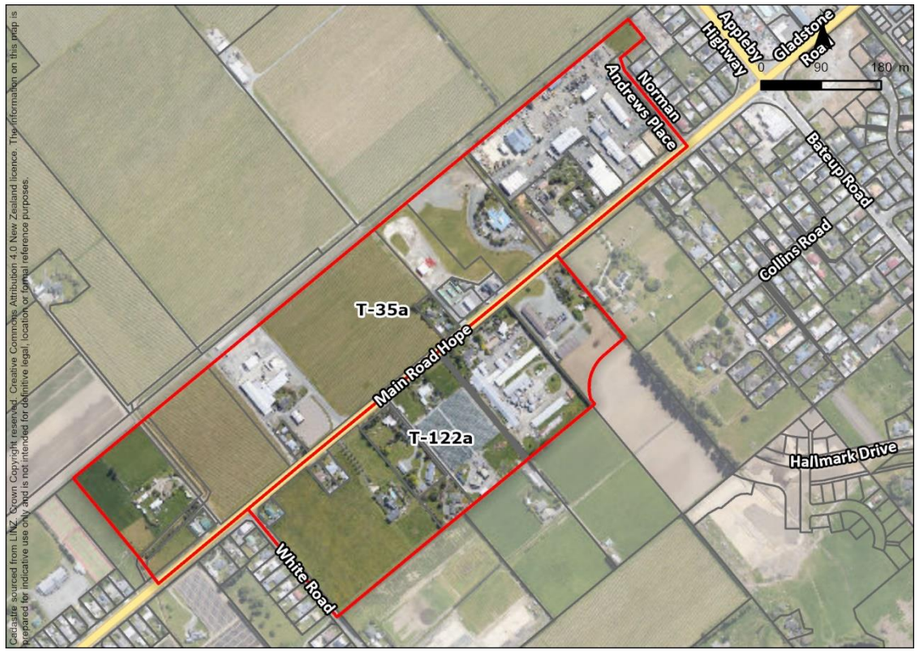
11.5 hectares of business land (T-122a)

Natural Hazard comments:

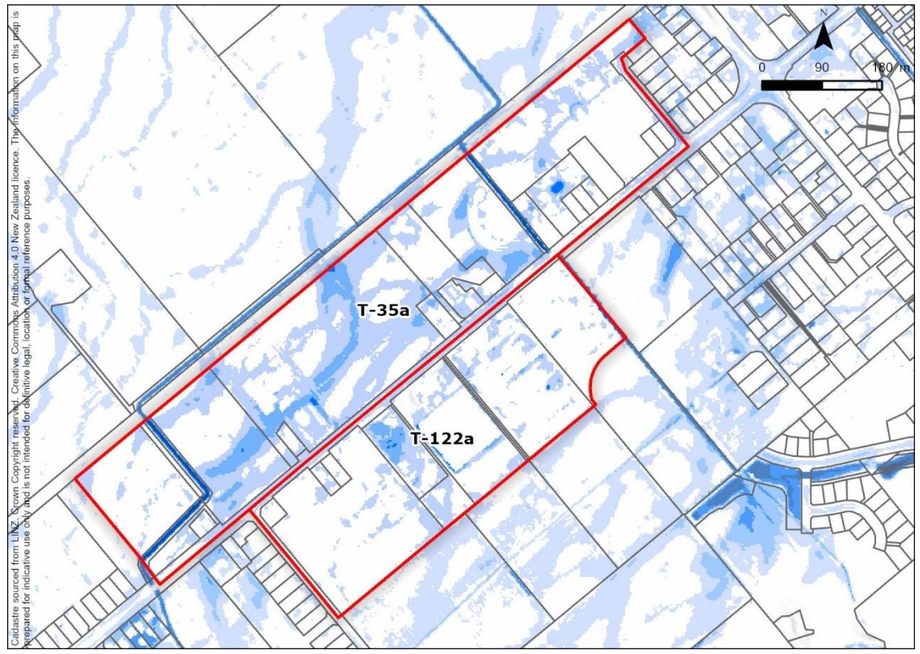
Flood modelling shows that Site T-35a is subject to flood hazards during rainfall events where the stormwater network becomes overwhelmed with overland lows and ponding across the site. Site T122a is exposed to a lesser flood hazard with some overland flows and ponding across part of the site. These flood flows across the sites will be strongly influenced by the presence of existing drains/swales, buildings, fences, vegetation and other landscaping both onsite and in the surrounding area. Flood hazards at both sites will increase under a future climate without improvements to the stormwater network. Presently, Council has no plans or funding in place to undertake such network improvements. Flood modelling shows that flood hazards at these sites could be reduced if upgrades to the stormwater network and channels upgradient of the site are completed.

Site and Natural hazard maps for Richmond South T-35a and T-122a (Main Road, Hope)

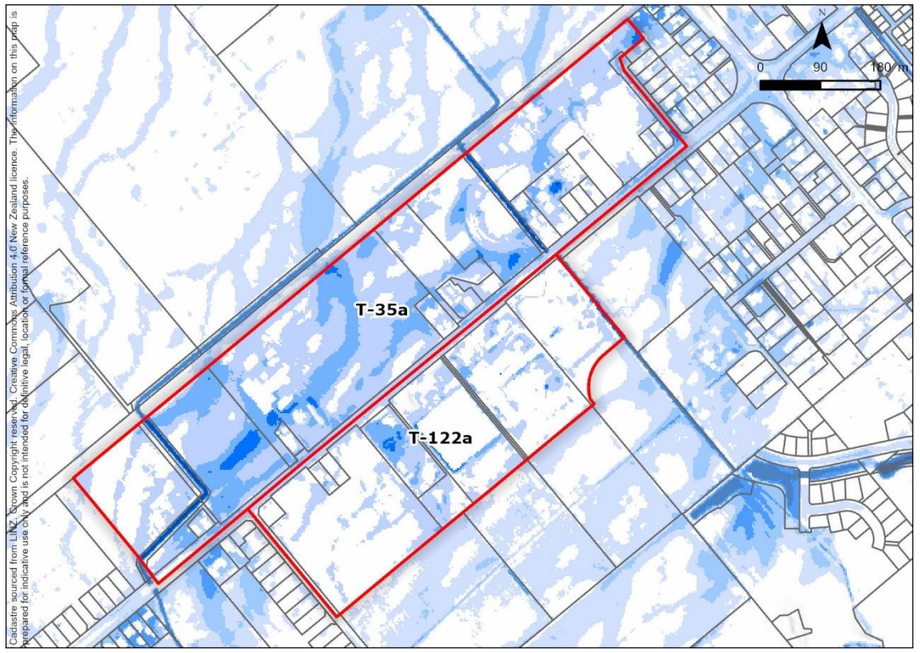
Site location map



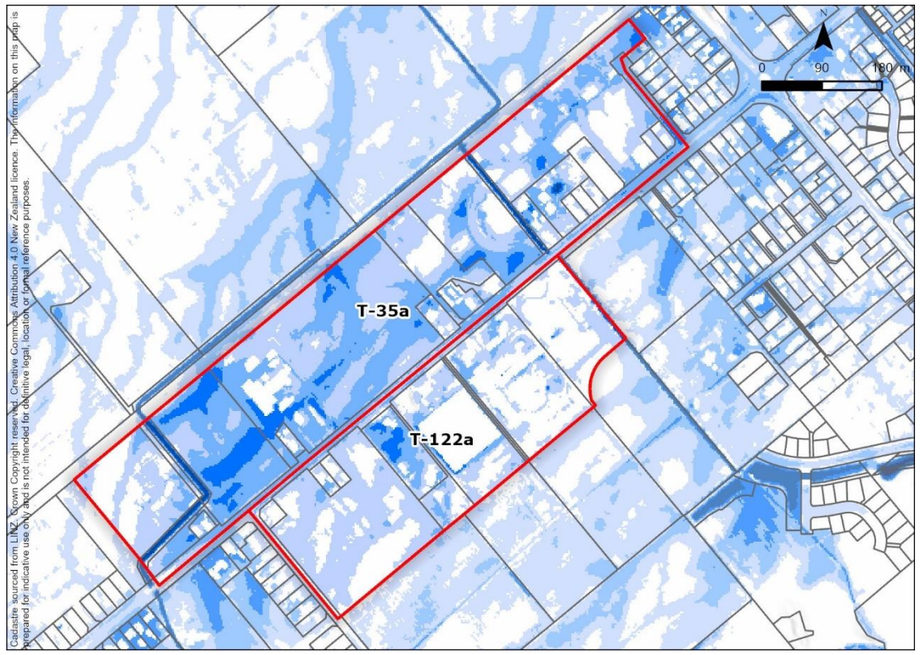
Modelled flood depths (10% AEP, present day)



Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2130)



Natural hazards risk assessment table for Richmond South T-35a and T-122a (Main Road, Hope)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-35a	10% AEP Almost Certain	Existing Borck Creek channel	Moderate	Minor	High	Borck Creek works extended or site-specific stormwater mitigation works	Medium - High	Negligible	Negligible	Low	Residual risk is medium - dependant on stormwater management and channel upgrades in the wider vicinity.	Yes, as the cost of Borck Creek upgrade not just for these sites and will service a wider area	Modelling assumptions Recent model 2026 Uncertainty to capacity and timing of stormwater upgrade works.
Flooding (river/surface) T-35a	1% AEP Possible	Existing Borck Creek channel	Major	Moderate	High	Borck Creek works extended or site-specific stormwater mitigation works	Medium - High	Minor	Minor	Medium	Residual risk is medium - dependant on stormwater management and channel upgrades in the wider vicinity.	Yes, as the cost of Borck Creek upgrade not just for these sites and will service a wider area	Modelling assumptions Recent model 2026 Uncertainty to capacity and timing of stormwater upgrade works.
Flooding (river/surface) T-122a	10% AEP Almost Certain		Negligible	Negligible	Low	Standard onsite stormwater design and management	Low	Negligible	Negligible	Low	Risk remains low with the provision of suitable secondary flow paths.	Yes, minimal mitigation measures required	Modelling assumptions Recent model 2026
Flooding (river/surface) T-122a	1% AEP Possible		Minor	Negligible	Medium	Standard onsite stormwater design and management	Low	Negligible	Negligible	Low	Risk remains low with the provision of suitable secondary flow paths.	Yes, minimal mitigation measures required	Modelling assumptions Recent model 2026
Natural hazard risk level assessment summary: **These sites are exposed to northward flowing overland flows during rainfall events where the stormwater network becomes overwhelmed. Flood hazards at both sites will increase under a future climate without improvements to the stormwater network. Presently, Council has no plans or funding in place to undertake such network improvements. For flood hazards site T-35a is assessed as having a high risk level which reduces to a medium risk level once site specific mitigation measures are applied. The risk level could be lowered further with additional off site mitigation measures. T-122a is assessed as having a medium risk level, which reduces to a low risk level once mitigation measures are applied. Residual risk for T-122a is low and for site T-35a is medium reflecting the uncertainty around the timing and capacity of the wider stormwater upgrade works.**													

Richmond T-223a and T-223b (144 Champion Road)

Current and Proposed zoning:

T-223a: Rural Residential Serviced Zone to Rural 2 Zone

T-223b: Rural Residential Serviced to Residential Zone

Yield:

11 dwellings (T-223b)

Natural Hazard comments:

T-223a is steeply sloping with limited development potential. This site is within the current TRMP Slope Instability Risk Area (SIRA).

Saxton Creek flows along the southern and eastern sides of site T-223b. The creek has a well incised channel and only presents a flood hazard to low lying land adjacent to the creek. The extreme northern end of the site was flooded in 2013 when the culverts under Champion Road became blocked, with floodwaters backing up and spilling down Champion Road. Since that time the culverts have been significantly upgraded. The remainder of the site is not subject to flood hazard from Saxton Creek.

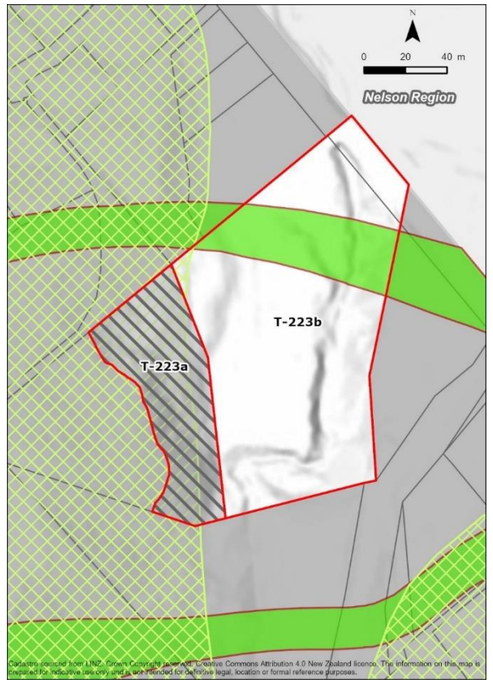
Site T-223b is adjacent to steep slopes and a small area of the western margin is potentially susceptible to debris runout from landslides/slope failures. A trace of the active Waimea Fault crosses the northern end of site T-223b.

As per the natural hazards assessment methodology, T-223a has not been assessed against the NPS-NH as the proposed zoning is Rural 2.

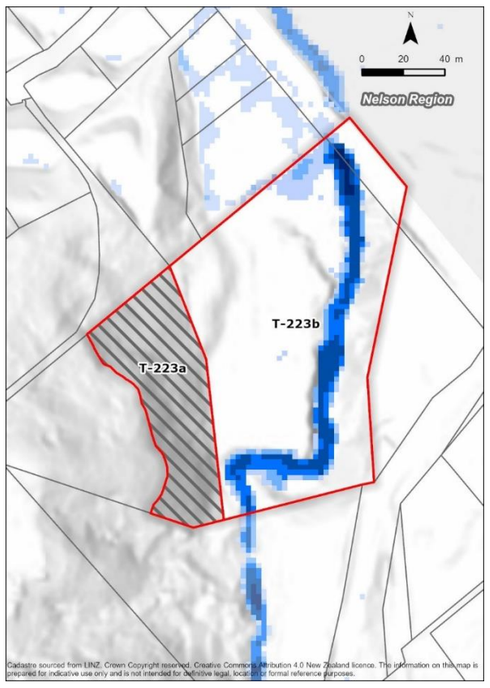
Site and Natural hazard maps for Richmond T-223a and T-223b (144 Champion Road)

Site location map

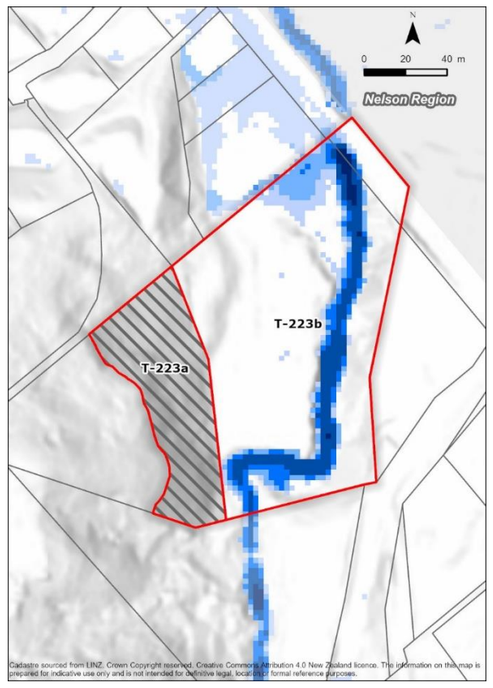
Fault rupture risk area and slope instability risk area



Modelled flood depth (1% AEP, present day)



Modelled flood depth (1% AEP, future day RCP8.5 to 2130)



Natural hazards risk assessment table for Richmond T-223a and T-223b (144 Champion Road)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-223b	1% AEP Possible	Improved culvert under Champion Road Incised stream bed	Moderate	Moderate	Medium	Sensible layout including provision for stream corridor Minimum building platform levels Setbacks from stream	Low	Negligible	Negligible	Low	Saxton Creek exceeding capacity. Risk remains low	Yes, minimal mitigation measures required	Modelling assumptions Recent model 2026
Landslides / slope instability T-223b	Possible	Existing TRMP provisions	Moderate	Moderate	Medium	Sensible layout Setback from slopes Geotechnical assessments	Low	Moderate	Moderate	Medium	Risk remains medium	Yes, only small portion of site potentially impacted by debris runout	Uncertainty around frequency of damaging landslides
Active fault rupture T-223b	Recurrence interval 5000 – 10,000 years Very rare	Existing TRMP provisions	Moderate	Moderate	Low	Sensible layout Setbacks from faultline Geotechnical assessments	Low	Moderate	Moderate	Low	Risk remains low	Yes, sets backs easy to achieve and only impacts a small portion of the site	
Natural hazard risk level assessment summary: **For site T-223b only a small portion of the site is exposed to landslide and fault rupture hazards. The risk level for those parts impacted by landslides is assessed as medium, while the parts impacted by fault rupture are assessed as low. Flood hazards are largely limited to the incised Saxton Creek channel and with mitigation measures the risk level is level is assessed as low. For T-223b the residual risk is low for flood hazards and fault rupture hazards.**													

Richmond T-114a (Eyles Road)

Current and Proposed zoning:

T-114a: Rezone from Rural 2 Zone to Rural Residential Zone

Yield:

65 dwellings total for all sites

Natural Hazard comments:

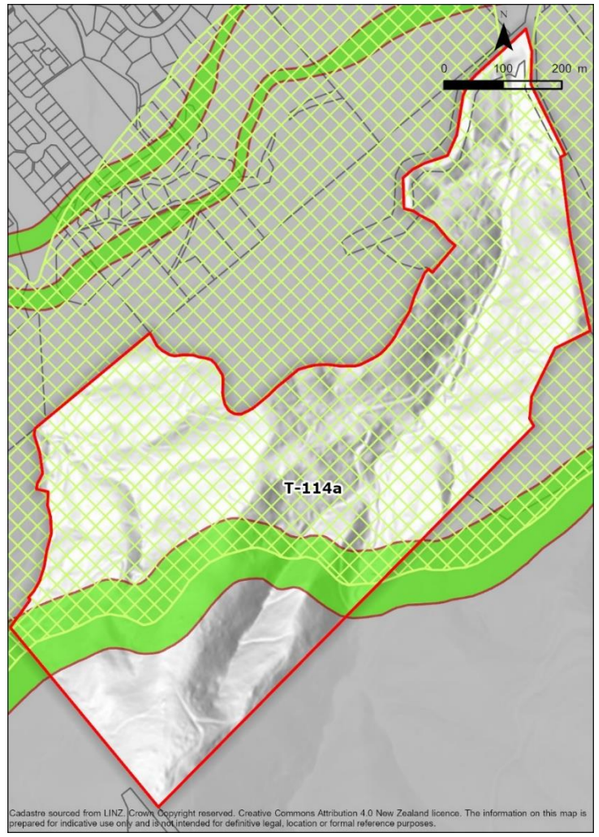
The site is relatively steeply sloping but include a number of ridges/spurs that are more gently sloping. The steeper sloping land is subject to varying degrees of slope instability hazards which will constrain their developability. The majority of site T-114a is within the TRMP Slope Instability Risk Area (SIRA). The remaining area to the south, while not covered by the SIRA extends across similar terrain.

The Eighty-eight Fault crosses the southern corner of site T-114a.

Site and Natural hazard maps for Richmond T-114a (Eyles Road)

Site location map

Fault rupture risk area and slope instability risk area



Natural hazards risk assessment table for Richmond T-114a (Eyles Road)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Landslides / slope instability T-114a	Possible	Existing TRMP provisions - geotech	Moderate	Moderate	Medium	Sensible layout Setback from slopes Geotechnical assessments and design Slope engineering (e.g. retaining walls, recontouring, shear keys, toe buttressing)	Medium	Moderate	Moderate	Medium	Risk remains medium	Yes, because Rural residential and lower density layout, mitigation measures are likely only required for building platforms and access	Uncertainty around frequency of damaging landslides. Currently there is limited access proposed for this site. The access has the potential to be affected by landslides (rainfall or earthquake triggered).
Active fault rupture T-114a	Recurrence interval 3,500 – 5,000 years Rare	Existing TRMP provisions - setbacks	Moderate	Moderate	Low	Sensible layout Setbacks from faultline Geotechnical assessments	Low	Moderate	Moderate	Low	Risk remains low	Yes, sets backs easy to achieve due to low density rural residential.	
Natural hazard risk level assessment summary: **This site is predominantly steeply sloping with some gentler ridges and spurs, and much of the land lies within the TRMP Slope Instability Risk Area. The risk level for slope instability hazards is assessed as medium across site T-114awith mitigation measures. The active Eighty-eight Fault passes through Site T-114a and is assessed as a low risk level with appropriate setbacks. The residual risk remains medium for slope instability hazards and low for fault rupture hazards.**													

Redwood Valley T-226 (Stringer Road)

Current and Proposed zoning:

T-226: Rural 3 Zone to Papakāinga Zone

Yield:

Unknown

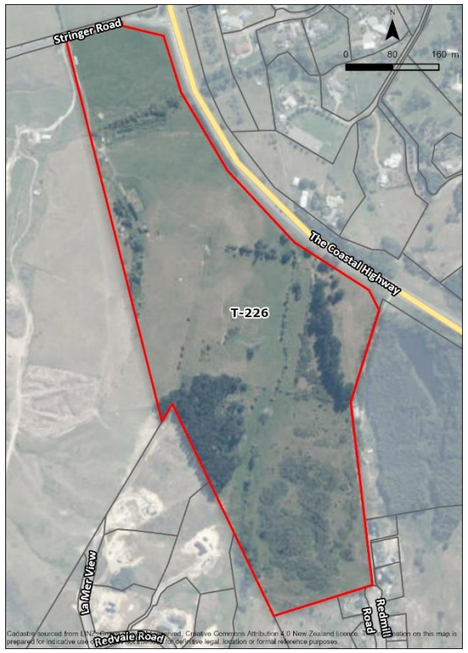
Natural Hazard comments:

This site is undulating with two small watercourses and associated tributaries flowing across the site. Low lying land adjacent to these watercourses, particularly at the northern end of the site, will be subject to flooding from time to time during periods of prolonged or intense rainfall.

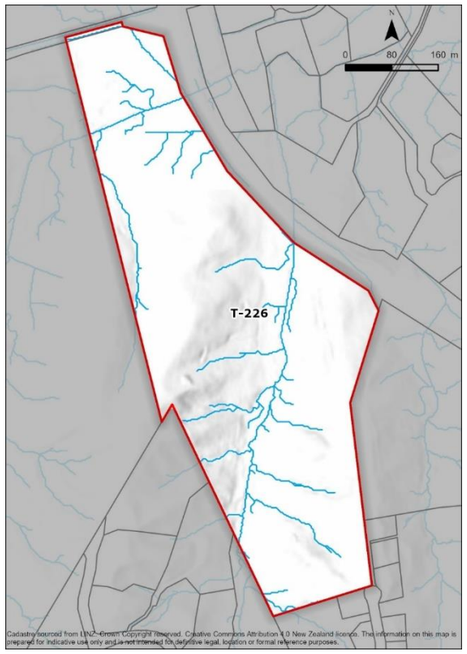
The low-lying area to the north of the site is considered an area where seismic liquefaction damage is possible and is also in the yellow tsunami evacuation zone.

Site and Natural hazard maps for Redwood Valley T-226 (Stringer Road)

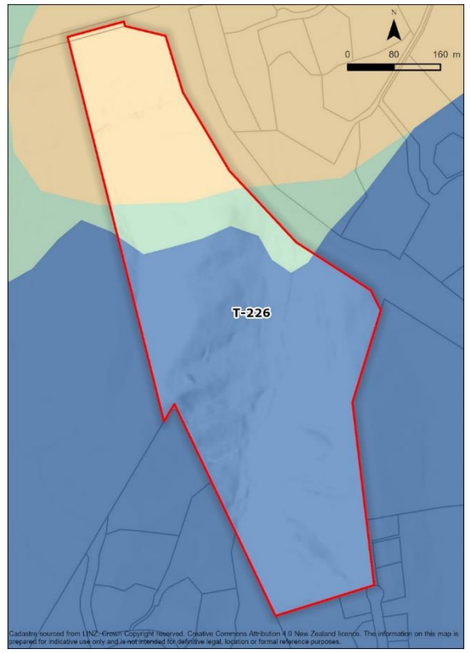
Site location map



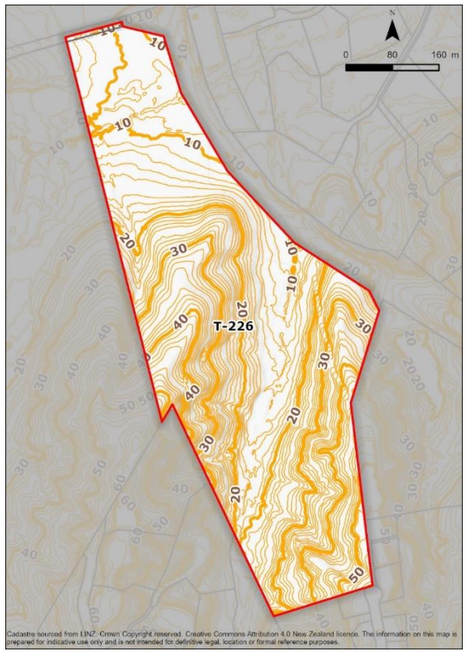
Watercourses



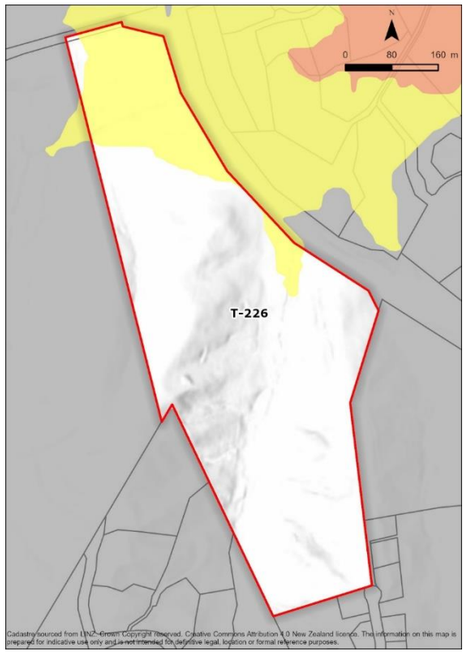
Liquefaction vulnerability assessment



Elevation contours showing slope steepness



Tsunami evacuation zones



Natural hazards risk assessment table for Redwood Valley T-226 (Stringer Road)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-226	1% AEP Possible	None	Minor	Negligible	Medium	Sensible layout Avoiding low lying areas Setbacks from stream corridor	Low	Negligible	Negligible	Low	Residual is medium if the State Highway culvert blocks	Yes, Low cost that results in risk level being lowered	No modelling available. Expert staff knowledge and DEM used in the assessment
Liquefaction T-226	500 year shaking Unlikely	None	Moderate	Minor	Medium	Sensible layout to avoid the hazard Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-226	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **The site is undulating with two watercourses and low-lying land—especially at the site's northern end— will be subject to periodic flooding during prolonged or intense rainfalls. This northern low-lying area is also identified as exposed to potential liquefaction hazards and lies within the yellow tsunami evacuation zone. The risk levels for flooding and liquefaction hazards are low if the lower lying parts of the site are avoided. There remains some residual risk from flood hazards if the downstream culverts block.**													

Brightwater T-104a and T-104b (Katania Heights)

Current and Proposed zoning:

T-104a: Residential Zone to Residential Zone with the Brightwater Development Area overlay.

T-104b: Rural 1 Zone to Residential Zone with the Brightwater Development Area overlay.

Yield:

30 dwellings

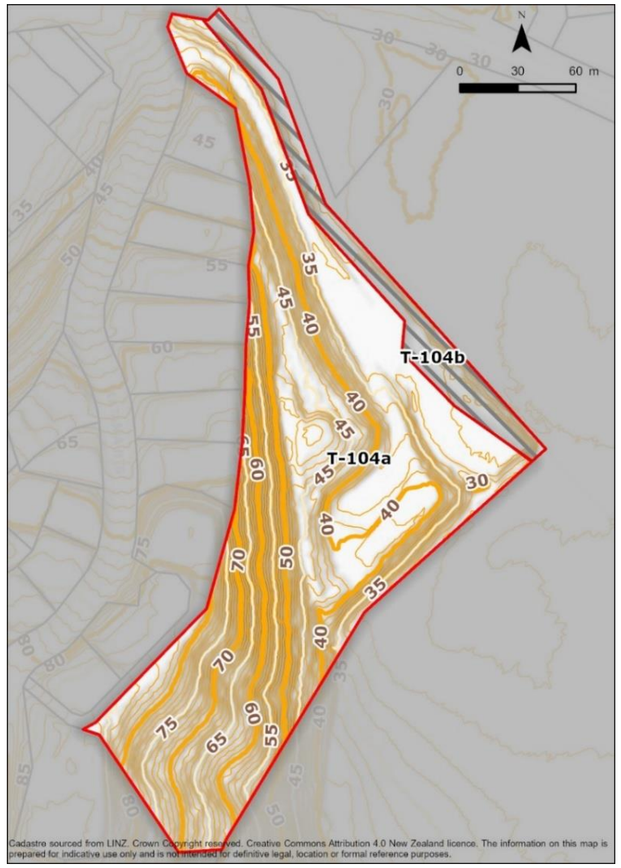
Natural Hazard comments:

The west of site T-104a is steeply sloping with limited development potential. The eastern portion of site T-104a and the entirety of site T-104b is flat and is the developable portion. The sites are not considered to be subject to flood hazards from the Wairoa River and Mount Heslington Stream. Site T-104b is a sufficient distance away from the hill slope such that it is not considered exposed to landslide hazards.

Site and Natural hazard maps for Brightwater T-104a and T-104b (Katania Heights)

Site location map

Elevation contours showing slope steepness



Natural hazards risk assessment table for Brightwater T-104a and T-104b (Katania Heights)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Landslides / slope instability T-104a	Possible	None	Moderate	Moderate	Medium	Sensible layout with majority of allotments on the flat area Setback from slopes Geotechnical assessments	Low	Minor	Minor	Medium	Risk remains low	Yes, if the steep slopes are avoided	Uncertainty around frequency of damaging landslides Expert staff knowledge used for used desktop assessment
Natural hazard risk level assessment summary: **The western part of T-104a contains steeply sloping land with limited development potential, while the eastern part of T-104a and all of T-104b are on flat, developable land. The flat part of the sites are not subject to flood hazards from the Wairoa River or Mt Heslington Stream. For site for T-104a the risk level for slope instability hazards is assessed as medium, and the residual risk as remaining low provided the steeper western slopes are avoided.**													

Brightwater T-171 and T-171a 46A and 30 (Factory Road)

Current and Proposed zoning:

T-171: Tourist Services Zone to Light Industrial Zone

T-171a: Rural Industrial to Light Industrial Zone

Yield:

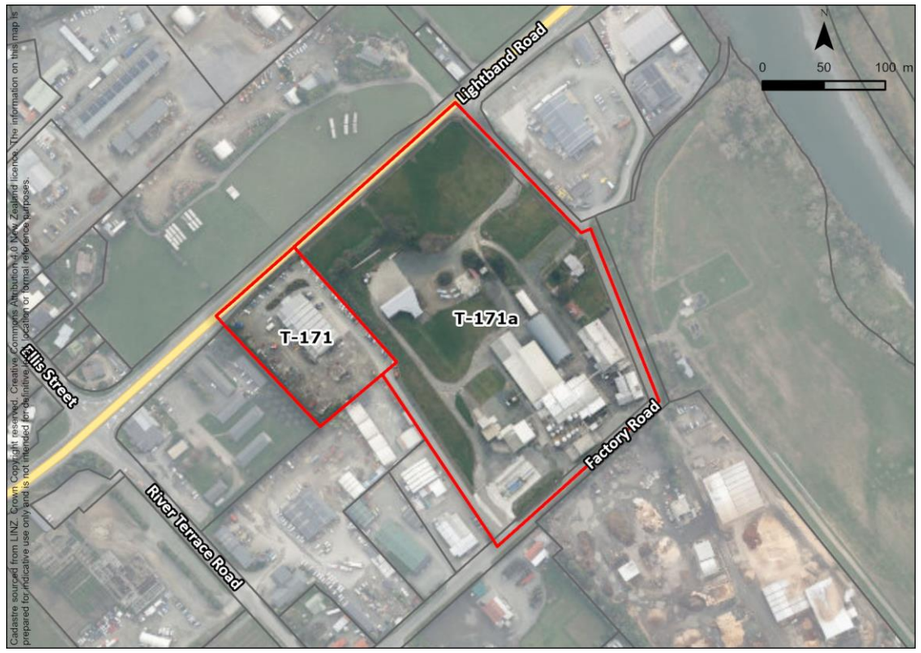
6.5 hectares of Light Industrial in total

Natural Hazard comments:

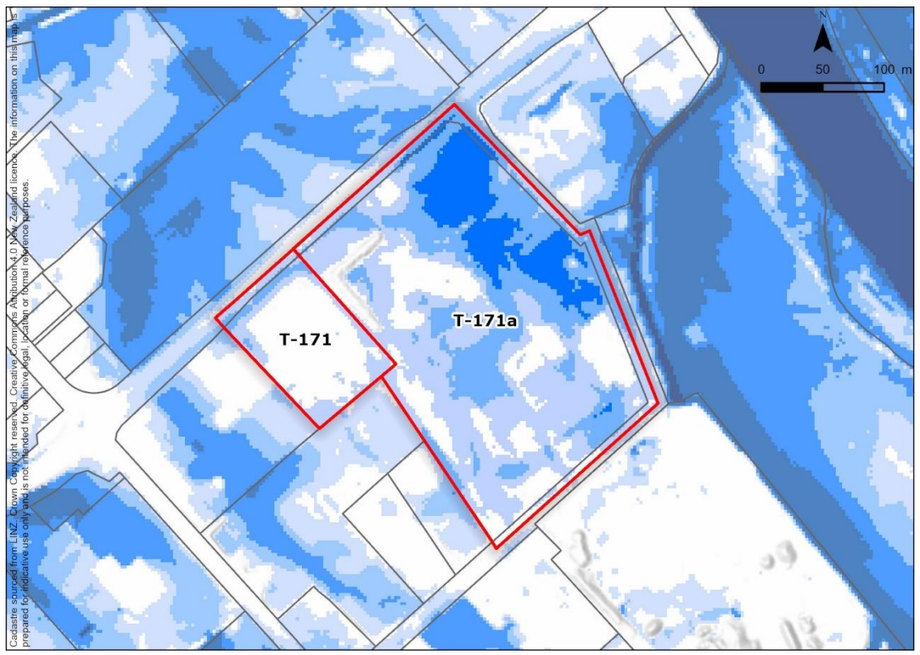
Sites T 171 and T-171a are located on the wider flood plain of the Wairoa River and are subject to inundation in 2% to 5% AEP flood event. Much of site T-171a will be impacted by north-westward overland flows and/or ponding. The centre of the site T-171 has been raised and flood modelling shows that it is not subject to the same flood hazard as T-171a. Any new development would need to ensure the passage of floodwaters past or through these sites.

Site and Natural hazard maps for Brightwater T-171 and T-171a 46A and 30 (Factory Road)

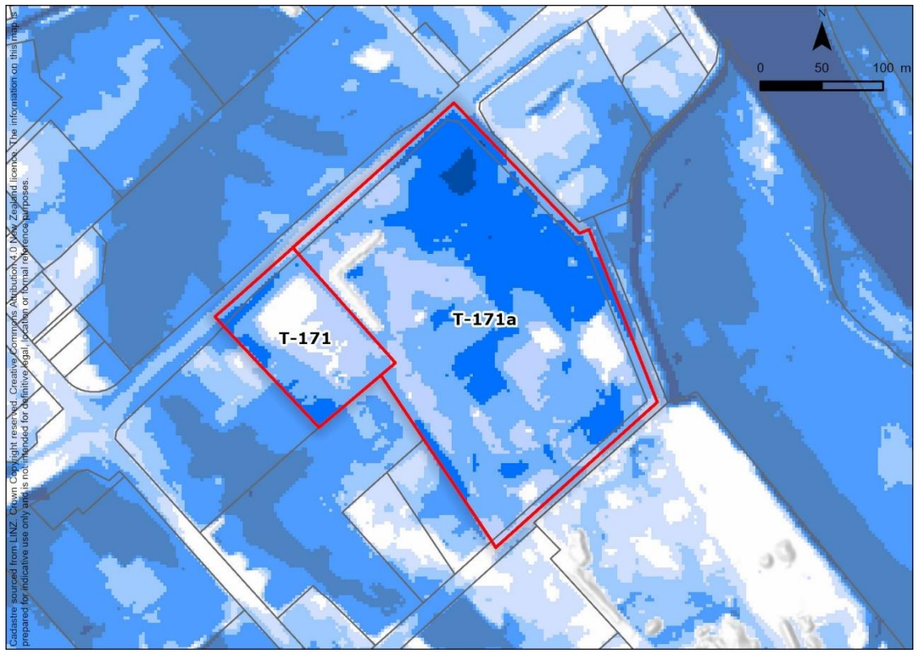
Site location map



Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Brightwater T-171 and T-171a 46A and 30 (Factory Road)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-171a	1% AEP Possible	None	Major	Major	High	Raised building platforms Provision of flow pathways	Medium	Negligible	Negligible	Low	Residual risk is medium, dependent on mitigation measures adopted	Yes, dependent on the type of mitigation and the resilience of the land use.	Modelling assumptions Updated model 2024 The type of development is light industrial that is resilient to flooding
Flooding (river/surface) T-171	1% AEP Possible	Raised building platform and curtilage in centre of site	Moderate	Minor	Medium	Raised building platforms Provision of flow pathways	Low	Negligible	Negligible	Low	Residual risk remains low due to mitigations already in place.	Yes, portions of the land have already been raised	Modelling assumptions Updated model 2024
Natural hazard risk level assessment summary: **These sites are located on the wider floodplain of the Wairoa River and are subject to inundation during flood events, although T-171 is less exposed due to previously raised ground levels. The risk level from flood hazards is assessed as low for both sites once mitigation measures are applied. The residual risk for T-171a is considered medium, and low for T-171, dependant on the mitigation measures adopted.**													

Brightwater T-106 (34 and 1/36 Ellis Street)

Current and Proposed zoning:

T-106: Light Industrial Zone to Commercial Zone

Yield:

0.3 hectares of commercial land

Natural Hazard comments:

This site is not considered to be subject to flood hazards from the Wairoa River. No hazard risk level assessment undertaken.

Brightwater T-198a (65 Higgins Road)

Current and Proposed zoning:

T-198a: Rural 1 Zone to Rural Residential Zone

Yield:

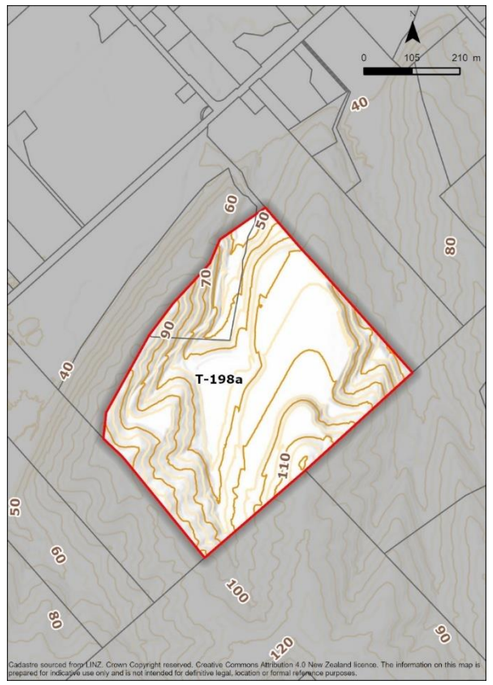
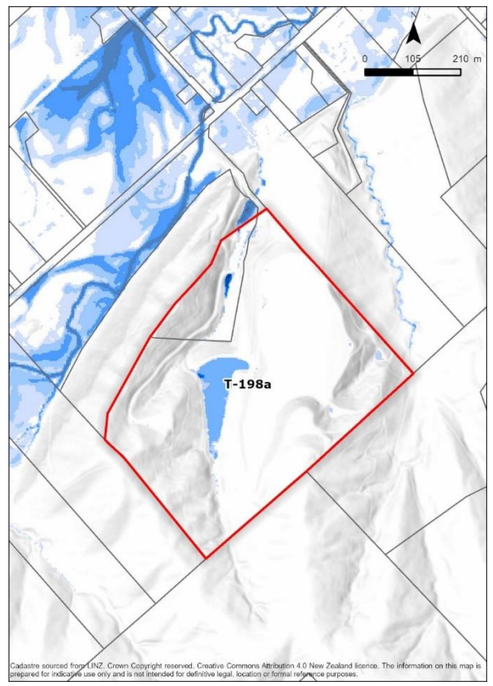
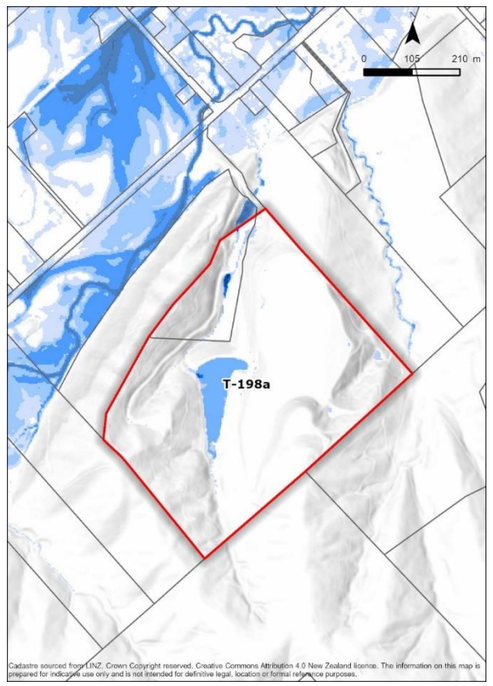
27 dwellings

Natural Hazard comments:

The bulk of the site extends across hill slopes, parts of which are relatively steep, but the site includes a significant area of more gentle slopes across the east of the site.

A small stream and its tributaries are present on the site. A dam and associated pond have been constructed in this watercourse. Low lying land adjacent to this watercourse can be expected to flood from time to time.

Site and Natural hazard maps for Brightwater T-198a (65 Higgins Road)

Site location map	Elevation contours showing slope steepness
	
Modelled flood depths (1% AEP, present day)	Modelled flood depths (1% AEP, future day RCP8.5 to 2090)
	

Natural hazards risk assessment table for Brightwater T-198a (65 Higgins Road)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-198a	1% AEP Possible	None	Negligible	Negligible	Low	Sensible layout accommodating stream channel	Low	Negligible	Negligible	Low	Residual risk is low, if development is setback from stream channel	Yes, minimal mitigation measures required	Modelling assumptions Updated model 2024
Landslide T-198a	Possible	Part of land has been recontoured	Moderate	Moderate	Medium	Sensible layout with appropriate accommodation for sloping land Setback from slopes Geotechnical assessments	Low	Negligible	Negligible	Low	Residual risk is low, with sensible layout of building locations	Yes, minimal mitigation measures required	Uncertainty around frequency of damaging landslides Expert staff knowledge used for used desktop assessment
Natural hazard risk level assessment summary: **The site contains sloping land with a small stream. The risk level from both flooding and landslide hazards are assessed as low once mitigation measures are applied. The residual risk also remains low.**													

Brightwater T-002 and T-103 (Brightwater town centre intensification)

Current and Proposed zoning:

T-002 and T-103: Residential Zone to Medium Density Residential Zone

Yield:

29 dwellings over 30 years

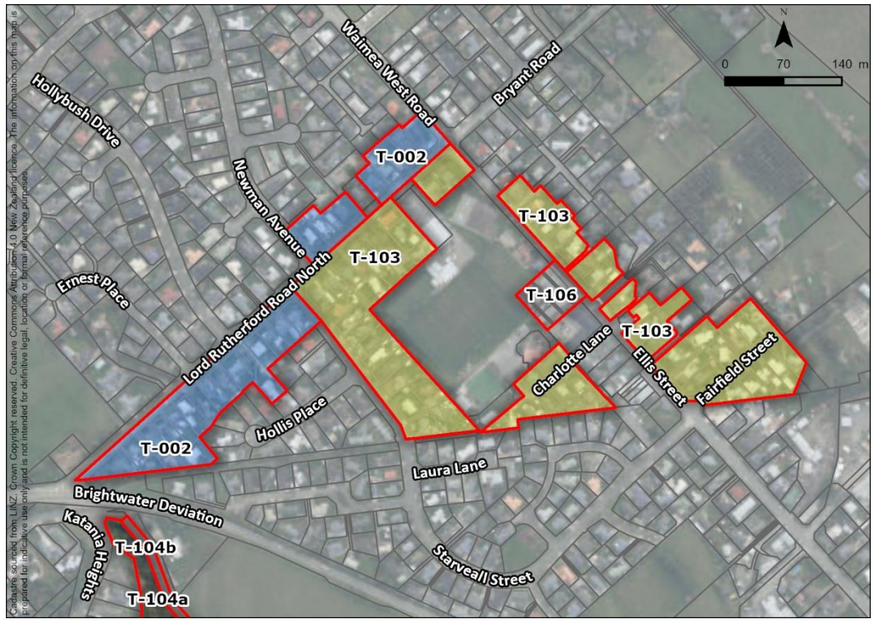
Natural Hazard comments:

Sites T-002 and T-103 are largely free from flood hazards during a large flood (1% AEP, present) in the Wairoa River and Mt Heslington Stream. More localised runoff from incident rainfall, including from the hillslopes to the south and southeast, can result in overland flows and/or ponding on parts these sites in the vicinity of Starveall Street and Lord Rutherford Road. Under a future climate flood modelling shows additional areas near Fairfield Street in the east and near Lord Rutherford Road as also being affected. The localised runoff from incident rainfall, including from the hillslopes to the south and southeast, are not well represented in this part of the flood model (where the model over estimates the stormwater flows) and there remains uncertainty in the actual extent of the resulting ponding and overland flows.

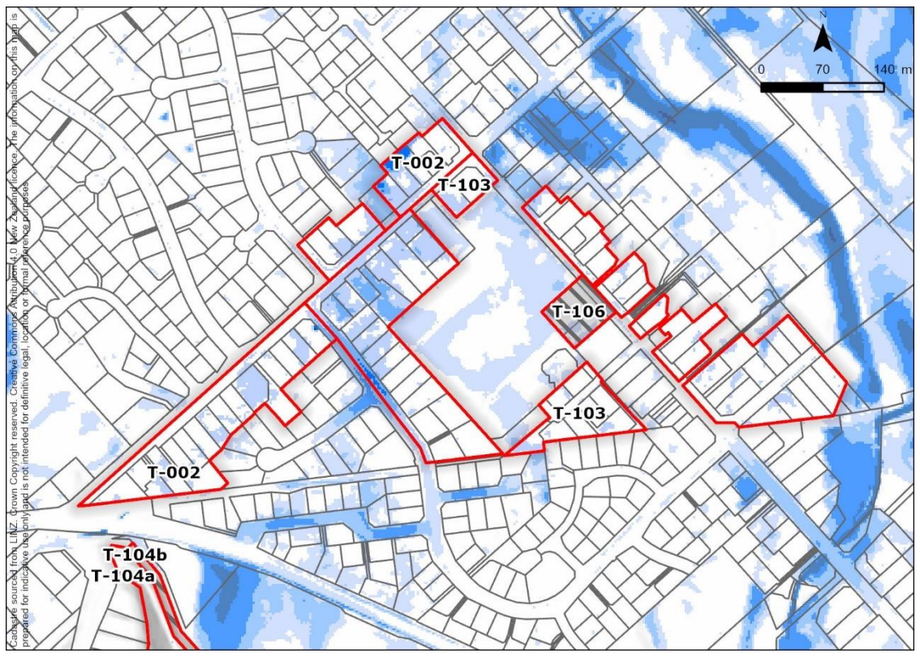
Ponding and/or overland flows from incident rainfall/stormwater may impact these sites should the stormwater network become overwhelmed. The impact of this will be dependent on the performance of the urban stormwater reticulation and the management of secondary flow paths.

Site and Natural hazard maps for Brightwater T-002 and T-103 (Brightwater town centre intensification)

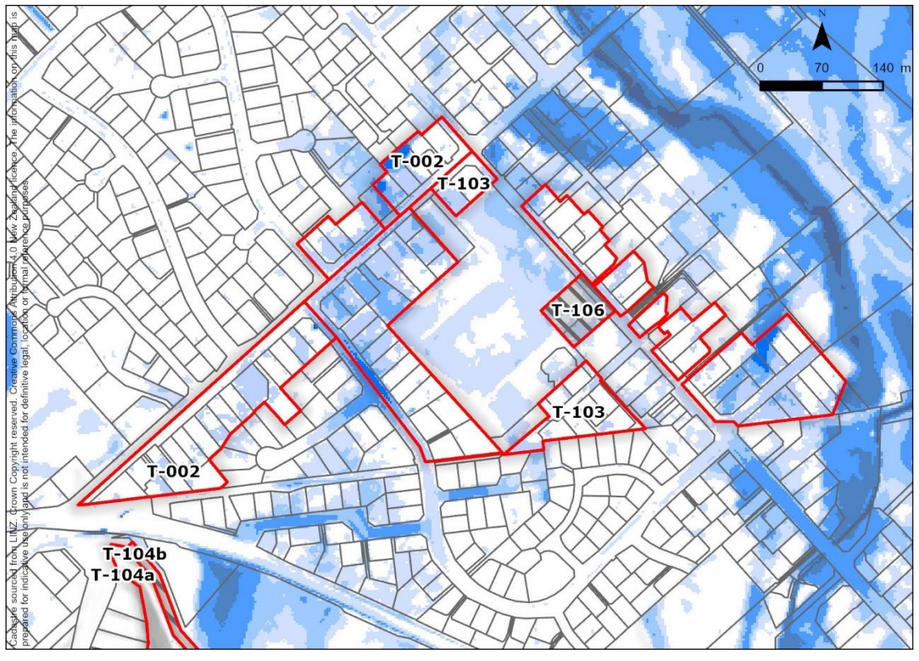
Site location map



Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Brightwater T-002 and T-103 (Brightwater town centre intensification)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flood T-002	1% AEP Possible	None	Minor	Negligible	Medium	Standard onsite stormwater design and management	Low	Negligible	Negligible	Low	Residual risk is medium due to uncertainty in stormwater modelling	Yes, potential mitigation measures are typical for residential infill development	Modelling assumptions Known inaccuracies with parts of the flood model Uncertainty in degree of infill development, management of stormwater and the exact location of any intensification
Flood T-103	1% AEP Possible	None	Minor	Negligible	Medium	Standard onsite stormwater design and management, with the exception of the Fairfield Street block which may need additional mitigation measures.	Low	Negligible	Negligible	Low	Residual risk is medium due to uncertainty in stormwater modelling	Yes, potential mitigation measures are typical for residential infill development	Modelling assumptions Known inaccuracies with parts of the flood model Uncertainty in degree of infill development, management of stormwater and the exact location of any intensification
Natural hazard risk level assessment summary: **Overall, these sites are not subject to flood hazards from the Wairoa River or Mt Heslington Stream, although shallow ponding and overland flows from incident rainfall may impact parts of the sites, particularly if the stormwater network becomes overwhelmed. The risk level for flood hazards is assessed as low with mitigation measures. The residual risk is assessed as medium due to some uncertainty with parts of the flood model.**													

Wakefield T-29a, T-29c and T-30 (Wakefield town centre intensification)

Current and Proposed zoning:

T-29a and T-30: Residential to Medium Density Residential Zone

T-29c: Light industrial to Medium Density Residential Zone

Yield:

48 dwellings in total over 30 years

Natural Hazard comments:

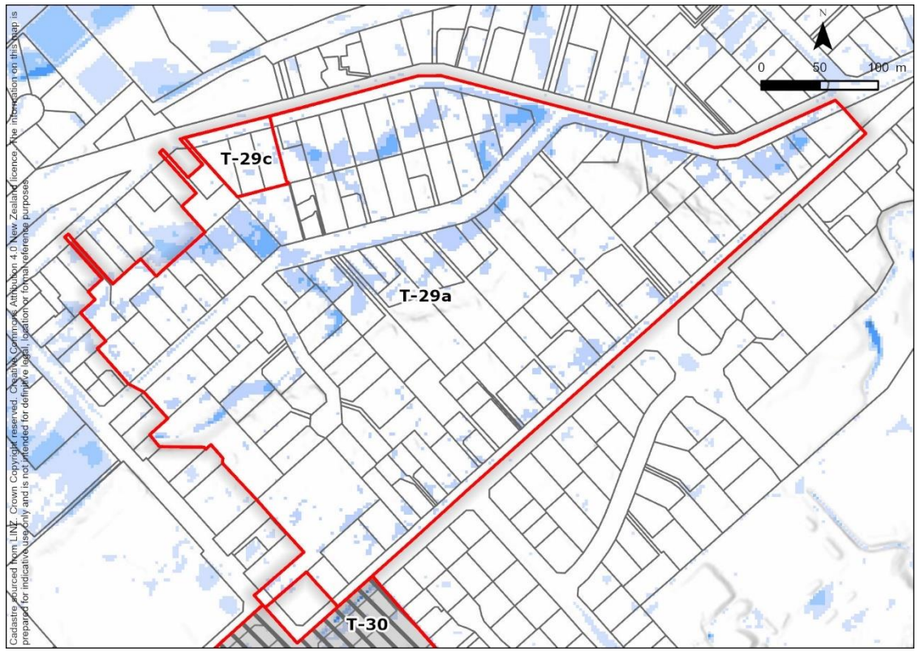
Approximately half of site T-29a is located on a terrace elevated some 3 to 4 metres above the remainder of the site to the northwest. Site T-30 is located on the elevated terrace and site T-29c is located on the lower terrace to the northwest. The higher terraced area is sufficiently elevated so that it is not subject to flood hazards from the Wai-iti River.

Council's flood/stormwater modelling shows the lower lying northwestern half of site T-29a and T-29c as subject to shallow ponding and overland flood flows in places. The modelling shows these flood flows as being derived from incident rainfall from shallow overland flows from the west and southwest, with some originating from Eighty-eight Valley Stream in a large flood event (1%AEP). Such overland flows will be strongly influenced by the presence of existing drains/swales, buildings, fences, vegetation and other landscaping both on the site or in the surrounding area. The hazard presented by these flows will be dependent on the performance of the urban stormwater reticulation and the management of secondary flow paths. The southeastern half of sites T-29a and site T-30 are not considered to be subject to flood hazards but may be subject to minor stormwater ponding should the stormwater network become overwhelmed.

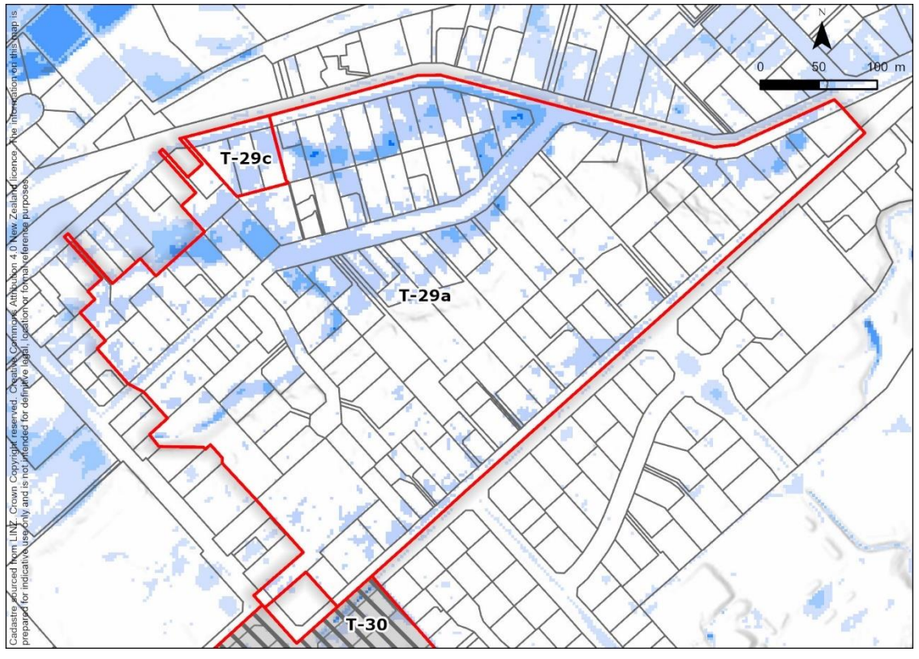
Site and Natural hazard maps for Wakefield T-29a, T-29c and T-30 (Wakefield town centre intensification)

Site location map

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Wakefield T-29a, T-29c and T-30 (Wakefield town centre intensification)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flood T-29a	1% AEP Possible	Existing stormwater network	Moderate	Moderate	Medium	Raised building platform levels Additional stormwater management, particularly for the northern-western half of the site. Cut-off of flows from the west is being investigated through the development of the Brightwater & Wakefield Urban Catchment Management Plan.	Medium	Negligible	Negligible	Low	Residual risk is low, dependent on mitigation measures adopted	Yes, potential mitigation measures are typical for residential infill development	Modelling assumptions Updated model 2024 Uncertainty in degree of infill development, management of stormwater and the exact location of any intensification
Flood T-29c	1% AEP Possible	Existing stormwater network	Minor	Negligible	Medium	Additional stormwater management	Medium	Negligible	Negligible	Low	Residual risk is low, dependent on mitigation measures adopted	Yes, potential mitigation measures are typical for residential infill development	Modelling assumptions Updated model 2024 Uncertainty in degree of infill development, management of stormwater and the exact location of any intensification
Natural hazard risk level assessment summary: **The northwestern half of T-29a and all of T-29c extend across a lower terrace and are exposed to shallow ponding and overland flows should the stormwater network become overwhelmed. The elevated terrace at the southeastern half of T-29a and all of T-30 is considered to be free from flood hazards. The risk level from flood hazards on sites T-29a and T-29c is assessed as low with appropriate mitigation measures. The residual risk remains low and is dependent on mitigation measures. Site T-30 is assessed as not exposed to natural hazards and was not assessed for risk level.**													

Wakefield T-108 (412 Main Road/Bird Lane, Spring Grove)

Current and Proposed zoning:

T-108: Rural 1 Zone to Deferred Light Industrial Zone

Yield:

13 hectares of Light Industrial Land

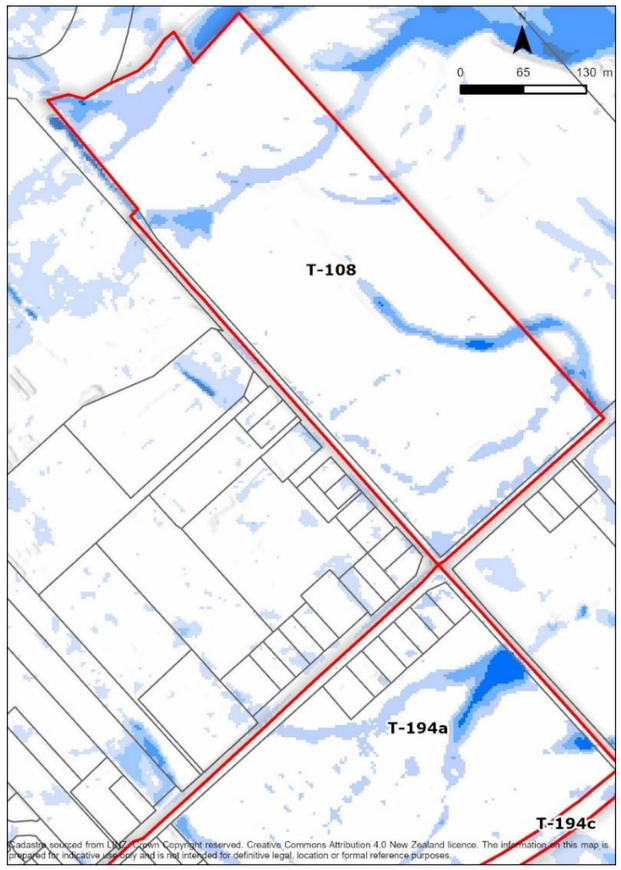
Natural Hazard comments:

The northwestern end of this site extends onto a lower terrace and is subject to flood hazard from the Wai-iti River. The remainder of the site is not considered to be subject to flood hazards, though isolated ponding of incident rainfall could occur in places.

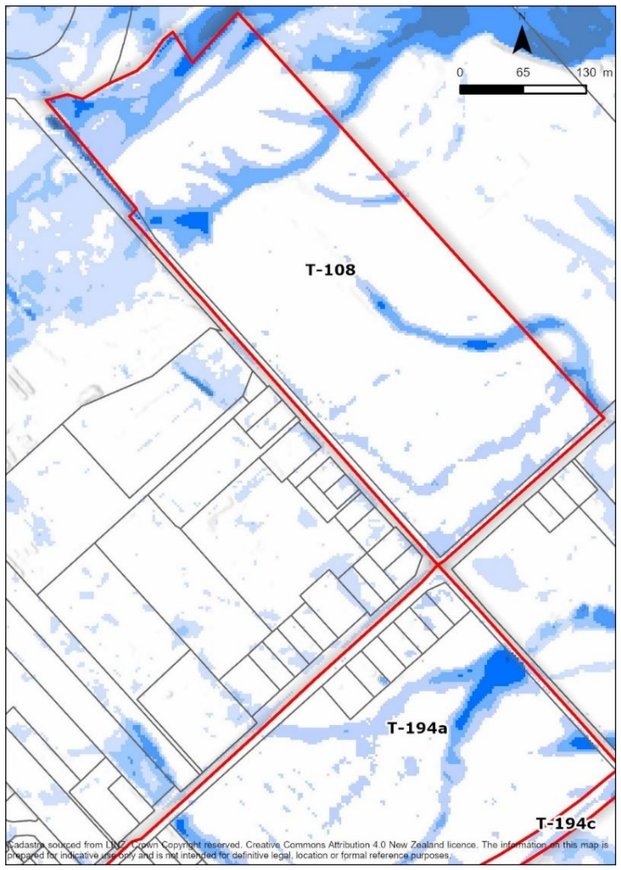
Site and Natural hazard maps for Wakefield T-108 (412 Main Road/Bird Lane, Spring Grove)

Site location map

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Wakefield T-108 (412 Main Road/Bird Lane, Spring Grove)

Hazard and Site location number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk?	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flood T-108	1% AEP Possible	None	Moderate	Moderate	Medium	Raised building platforms on lower terrace Provision of flow pathways on lower terrace The type of development is light industrial that is resilient to flooding	Medium	Negligible	Negligible	Low	Residual risk is medium, dependent on mitigation measures adopted	Yes, dependent on the type of mitigation and the resilience of the land use.	Modelling assumptions Updated model 2024
Natural hazard risk level assessment summary: **The north-western end of the site extends onto a lower terrace that is exposed to flooding from the Wai-iti River during flood events, while the remainder of the site is not considered subject to flood hazards. The risk level from flood hazards is assessed as low with mitigation measures. The residual risk remains medium dependent on the mitigation measures adopted.**													

Wakefield T-194a, T-194b, and T-194c (144 and 200 Whitby Road)

Current and Proposed zoning:

T-194a: Rural 1 to Rural 1 deferred Medium Density Residential Zone

T-194c: Rural 2 to Rural 2 deferred Medium Density Residential Zone

T-194b: Rural 2 to Rural 2 deferred Residential with the Wakefield Development Area overlay

Yield:

240 dwellings in total (T-194a and T-194c)

59 dwellings (T-194b)

Natural Hazard comments:

Council's flood/stormwater modelling show that parts of site T-194a and T-194c are subject to shallow flooding, though greater depths can occur on site T-194a adjacent to Bird Road. Such flooding is derived largely from incident rainfall, but overland flood flows from the Pitfure Stream can contribute in larger flood events. It is anticipated that the flooding on these sites can be managed through appropriate design of the development and provision of stormwater reticulation. Site T-194c is the former railway formation and in places parts of the raised embankment remain. In some places in T-194c the modelled depths may not be accurate due to discrepancies in the LiDAR DEM, likely resulting over estimating the flood depths.

Site T-194b is located on a terrace elevated above the active flood plain of the Pitfure Stream. Immediately to the southeast of the site there is a small catchment which drains north-westwards. Two dams and associated ponds have been constructed in this catchment. Three dam break assessments[1] have been undertaken and concluded that, depending on the specific location and nature of the dam failure, much of T-194b would be inundated presenting a high hazard to both property and life safety. Site T-194b is therefore proposed as 'Rural 2 deferred Residential' with the requirement that upzoning of the land to residential is deferred until sufficient evidence is provided demonstrating that any risk posed from the dam to downstream residential areas has been effectively mitigated or eliminated (and the NPS-NH assessment has been completed on the basis of this requirement).

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[1] "Plan Change 65 Dambreak Assessment"; Tonkin and Taylor Ltd; 3 July 2017

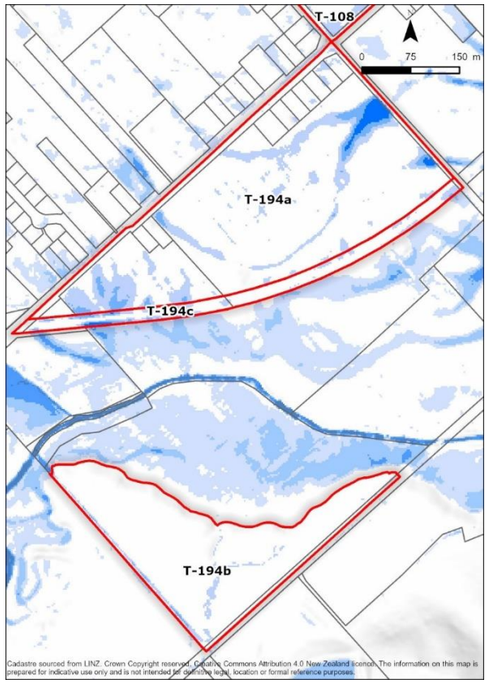
"335 Higgins Rd Irrigation Dam"; Tonkin and Taylor Ltd; July 2019

"PC81 dam break assessment – 335 Higgins Road Irrigation Dam, Wakefield"; Tonkin and Taylor Ltd; 5 September 2025

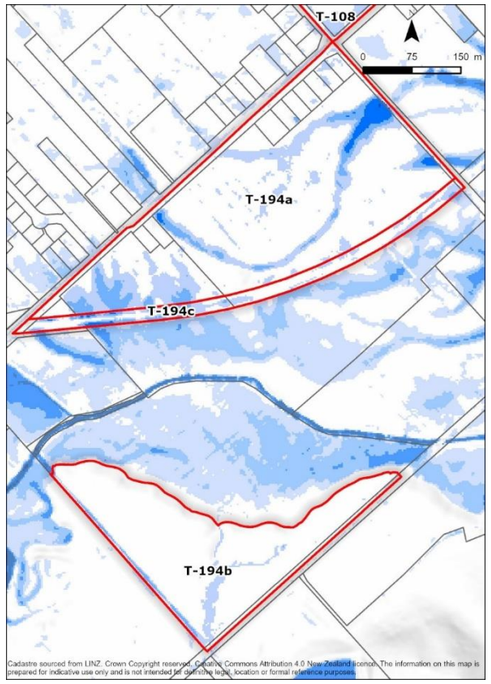
Site and Natural hazard maps for Wakefield T-194a, T-194b, and T-194c (144 and 200 Whitby Road)

Site location map

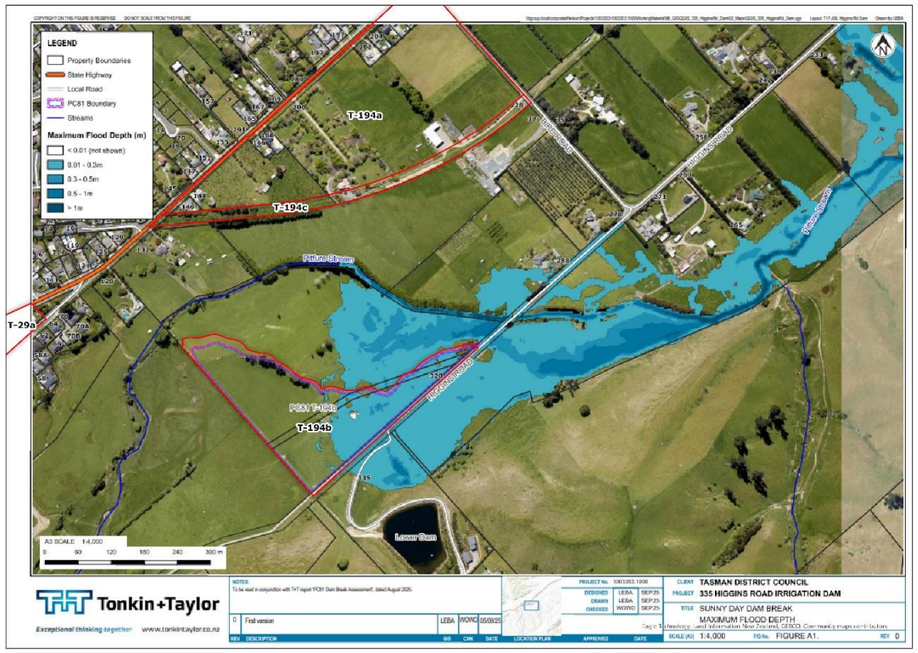
Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Sunny day dam break analysis (maximum flood depth) Tonkin + Taylor 2025



Natural hazards risk assessment table for Wakefield T-194a, T-194b, and T-194c (144 and 200 Whitby Road)

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-194a	1% AEP Possible	None	Moderate	Moderate	Medium	Sensible layout with establishment of overland flow paths and additional culvert capacity under Bird Road	Low	Negligible	Negligible	Low	Residual risk remains low with well-designed stormwater mitigations including secondary flow paths	Yes, potential mitigation measures are typical for medium density residential development	Modelling assumptions Known inaccuracies with parts of the flood model Updated model 2024
Flooding (river/surface) T-194c	1% AEP Possible	None	Negligible	Negligible	Low	Sensible layout Standard onsite stormwater design and management	Low	Negligible	Negligible	Low	Residual risk remains low with well-designed stormwater mitigations including secondary flow paths	Yes, potential mitigation measures are typical for medium density residential development	Modelling assumptions Known inaccuracies with parts of the flood model Updated model 2024
Flooding (river/surface) T-194b	Possible		Major	Major	High	Upzoning to residential will only take place once the dam break hazard is effectively mitigated or eliminated Drain (dewater) the impounded reservoir and permanently prevent re-impoundment OR Structural improvements to dam	High	Negligible	Negligible	Low	Residual risk is low if dam is drained and decommissioned, but remains high if dam stays in place (with impounded water) even with structural improvements	Possibly, depending on the mitigation used to reduce the dam break hazard. The costs of structural improvement are likely to be high, but the risk level is also high, and residual risk is also high if water remains impounded. The cost of dewatering the reservoir is not likely to be as high as structural improvements, and the residual risk is significantly reduced.	Modelling assumptions Updated model 2024 Likelihood of dam failure
Natural hazard risk level assessment summary:													

Sites T-194a and T-194c contain some areas subject to shallow flooding from incident rainfall and overland flow from the Pitfure Stream. Sites T-194a and T-194c are assessed as having a low risk level from flood hazards and low residual risk with mitigation measures. Site T-194b is elevated above the Pitfure Stream flood plain but is exposed to flood hazards from a dam located in a watercourse to the south should the dam fail. For site T-194b, the risk level from such flood hazards is assessed as high unless the dam-break hazard is mitigated (either through decommissioning and draining, or structural improvements to the dam). The residual risk is assessed as low if the dam is decommissioned and dewatered, but the residual risk will be higher if water remains impounded behind the dam.

Motueka T190a, T-190b, T-190c, T-190d (Motueka West greenfield intensification (Whakarewa St))

Current and Proposed zoning:

T-190a: Tourist Services deferred Residential Zone to Tourist Services deferred Medium Density Residential Zone.

T-190b: Rural 1 deferred Residential Zone to Rural 1 deferred Medium Density Residential Zone.

T-190c: Residential Zone to Medium Density Residential Zone.

T-190d: Residential Zone to Residential deferred Medium Density Residential Zone.

Yield:

174 dwellings in total

Natural Hazard comments:

These sites are located on the wider Motueka plains and are exposed a degree of flood hazard from both localised rainfall runoff and from overland flood flows form the Motueka River. The sites are afforded a level of protection from flood waters from the Motueka River by the Lower Motueka River stopbanks located approximately 2,000 metres to the northwest. A stopbank breach in the vicinity of the western end of Whakarewa Street can result in overland flood flows adjacent to and on parts of these sites. The stopbanks are designed and constructed to contain a 2% AEP flood with 0.6 metres freeboard. The recent refurbishment works undertaken by Council increased the stopbanks resilience and restored their capacity to 2% AEP but did not increase the level of protection that they provide. However, it is noted that the stopbanks held up, albeit with reduced freeboard, during the larger June/July 2025 flood event which was close to a 1% AEP event in the lower reaches of the Motueka River. There are existing flow paths (historic drainage channels) and areas of lower lying ground on parts of the sites, and as with much of Motueka, incident rainfall can result in overland flows and surface ponding in these areas. Development on these sites will need to plan to manage ground levels to control stormwater.

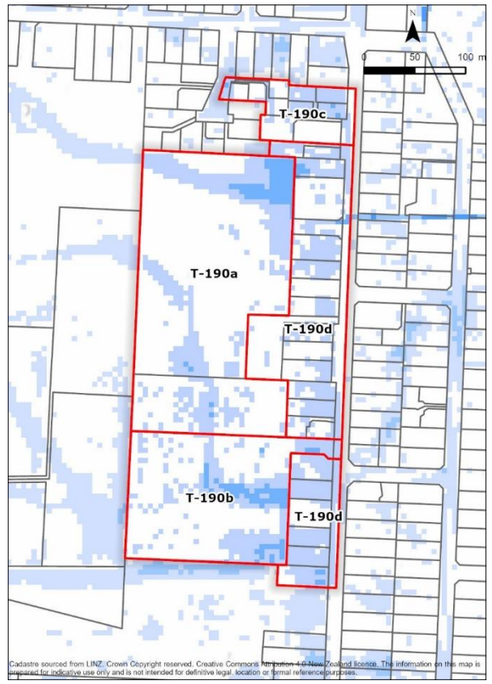
These sites are located within the yellow tsunami evacuation zone and within a location where seismic liquefaction damage is considered possible in places.

Ground levels for these sites are approximately 3.5-4.5m NZVD 2016 and the coastline is approximately 1400m east of the sites. MWHS is 1.70m NZVD 2016. Current relative sea-level rise projections for 100 years are approximately 2m (based on climate change scenario SSP5-8.5 H+). Storm-tides and sea-level rise are expected to progressively impact these sites over the 100-year planning horizon. Sea level rise presents a compounding hazard with stormwater flooding at these sites over the 100-year planning horizon.

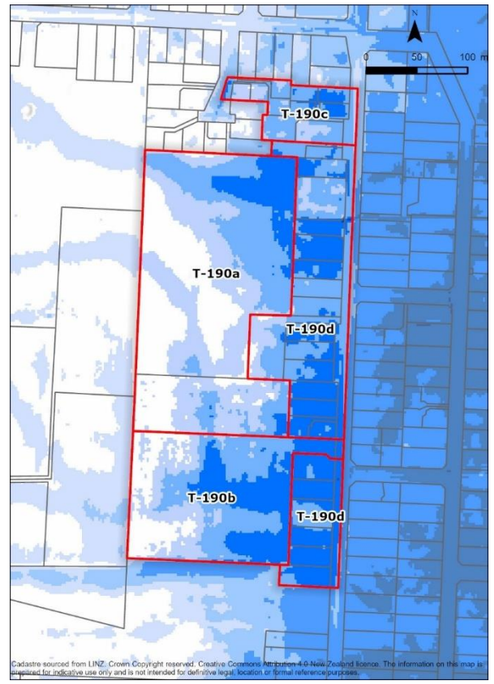
Site and Natural hazard maps for Motueka T190a, T-190b, T-190c, T-190d (Motueka West greenfield intensification (Whakarewa St))

Site location map

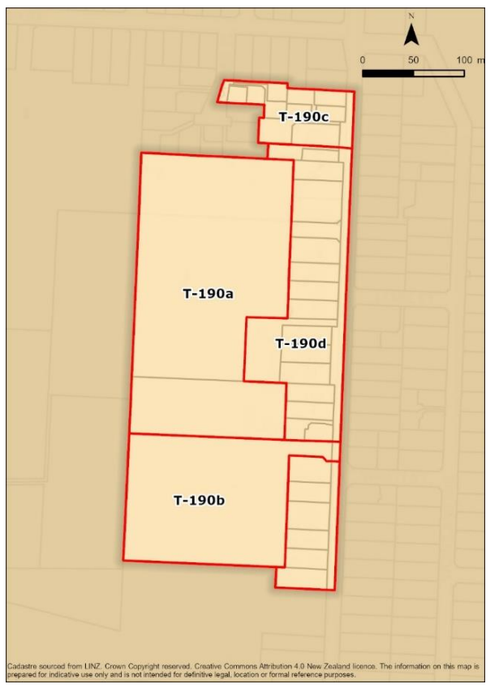
Modelled flood depths (1% AEP, present day)



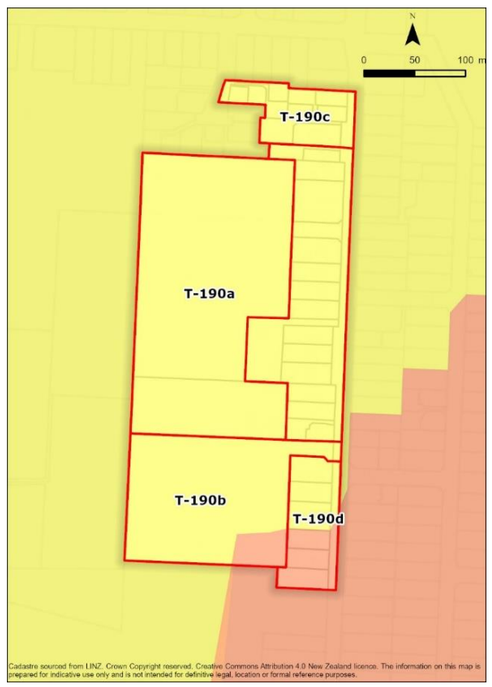
Modelled flood depths (1% AEP, future day RCP6.0 to 2090 with sea level rise)



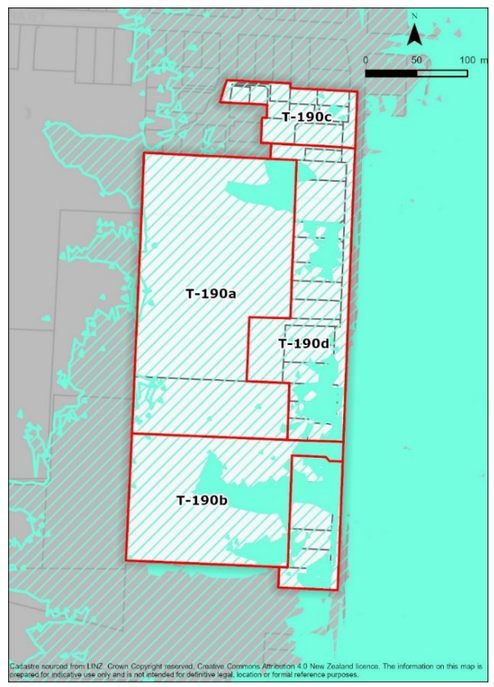
Liquefaction vulnerability assessment



Tsunami evacuation zones



1% AEP storm tide + 2m sea-level rise



Natural hazards risk assessment table for Motueka T190a, T-190b, T-190c, T-190d (Motueka West greenfield intensification (Whakarewa St))

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-190a T-190b	1% AEP Possible	T-190a: major pipe upgrade recently completed Existing urban drainage/overland flow paths influence shallow ponding/flows.	Moderate	Moderate	Medium	Site design to re-contour / channelise shallow overland flows e.g. secondary flow paths Minimum building platform levels appropriate to mapped ponding/flow areas.	Low	Moderate	Moderate	Medium	Residual risk remains low with well-designed stormwater mitigations including secondary flow paths With onsite stormwater mitigation measures, the residual risk from a stopbank failure at these sites is low.	Yes – mitigation is largely typical subdivision/site design (levels, flow path management, floor levels).	Modelling assumptions Updated model 2020 Reliant on stormwater upgrades within the wider urban area Stormwater hazards at these sites will compound into the future as sea levels rise.
Flooding (river/surface) T-190c T-190d	1% AEP Possible	The site is an established residential area with existing stormwater infrastructure.	Moderate	Moderate	Medium	Site design to re-contour / channelise shallow overland flows e.g. secondary flow paths Minimum building platform levels appropriate to mapped ponding/flow areas. On site stormwater detention	Low	Moderate	Moderate	Medium	Residual risk remains low with well-designed stormwater mitigations including secondary flow paths With onsite stormwater mitigation measures, the residual risk from a stopbank failure at these sites is low.	Yes – the mitigation is low-cost and practical for intensification, and proportionate to reducing a medium baseline risk to low.	Uncertainty how to retro fit stormwater mitigation Modelling assumptions Updated model 2020 Stormwater hazards at these sites will compound into the future as sea levels rise.
Liquefaction T-190a T-190b T-190c T-190d	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-190a T-190b T-190c T-190d	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Coastal Inundation T-190a T-190b T-190c T-190d	1% storm tide with 2m sea-level rise Almost certain		Moderate	Moderate	High	Minimum building platform levels	Low	Minor	Minor	Medium	Residual risk is low. However, residual risk will be greater if sea-level rise occurs at a rate greater than currently projected.	Yes, based on current sea-level rise projections	Sea level rise presents a compounding hazard with stormwater flooding.
Natural hazard risk level assessment summary: **These sites are exposed to shallow flooding from incident rainfall and local overland flows during rainfall events. These sites are also exposed to overland flood flows from the Motueka River should the stopbanks fail. The Lower Motueka River stopbanks are designed to contain a flood flow with a 2% AEP. These sites are located in an area where liquefaction damage is possible, within the yellow tsunami evacuation zone, and where long-term sea-level rise is expected to begin affecting the area towards the end of the 100-year planning horizon. With appropriate mitigation measures the hazard risk levels have been assessed as low for flooding and liquefaction. Coastal inundation hazards are assessed as having a medium risk level under a 2m sea level rise. With mitigation measures the residual risk also remains low for these hazards. Tsunami risk level has been assessed as medium, and the residual risk remains medium.**													

Motueka T-189a (82 and 84 Pah Street)

Current and Proposed zoning:

T-189a: Residential Zone to Papakāinga Zone

Yield:

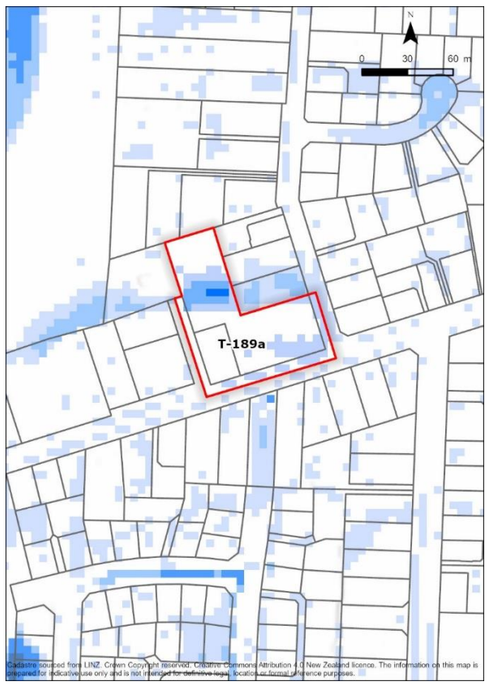
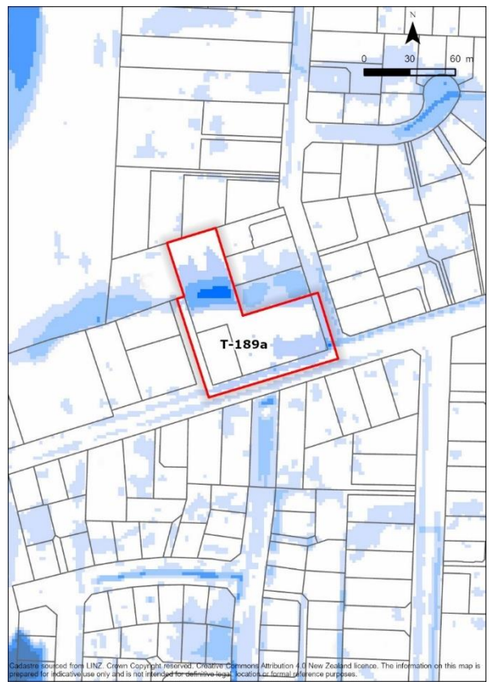
10 dwellings

Natural Hazard comments:

Flood modelling of various stopbank breach scenarios show this site is not subject to flood hazards from the Motueka River. As with much of Motueka, incident rainfall may result in overland flows and surface ponding to low lying parts of the site.

Desktop mapping shows this site as an area where seismic liquefaction damage is possible, however the underlying soils are typically gravelly.

Site and Natural hazard maps for Motueka T-189a (82 and 84 Pah Street)

Site location map	Liquefaction vulnerability assessment
	
Modelled flood depths (1% AEP, present day)	**Modelled flood depths (1% AEP, future day RCP6.0 to 2090)**
	

Natural hazards risk assessment table for Motueka T-189a (82 and 84 Pah Street)

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-189a	1% AEP Possible	Existing urban drainage/overland flow paths influence shallow ponding/flows.	Moderate	Minor	Medium	Site design to re-contour / channelise shallow overland flows e.g. secondary flow paths Minimum building platform levels appropriate to mapped ponding/flow areas.	Low	Negligible	Negligible	Low	Residual risk remains low with well-designed stormwater mitigations including secondary flow paths	Yes – mitigation is largely typical site design (levels, flow path management, floor levels).	Modelling assumptions Updated model 2020 Reliant on stormwater upgrades within the wider urban area
Liquefaction T-189a	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Natural hazard risk level assessment summary: **The site is not subject to flood hazards from the Motueka River, although localised rainfall may result in shallow overland flows and surface ponding in places. Liquefaction damage may be possible in places. With mitigation, the hazard risk levels are assessed as low for both flooding and liquefaction and the residual risk remains low.**													

Motueka Valley T-17a, T-17b, T-17c, T-17d, T-213 and T-205

Current and Proposed zoning:

T-17a, T17d, T213 and T-205: Rezone from Rural 2 Zone to Rural Residential Zone

T-17b: Rural 1 Zone to Papakāinga Zone

T-17c: Rural 1 Zone to Rural Residential Zone

Yield:

T-17a: 45 dwellings

T-17b: Papakainga - Unknown dwellings

T-17c: 21 dwellings

T-17d: 10 dwellings

T-213: 7 dwellings

T-205: 7 dwellings

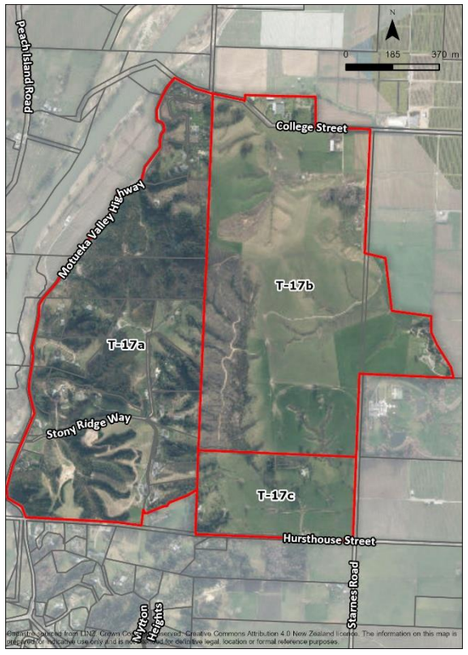
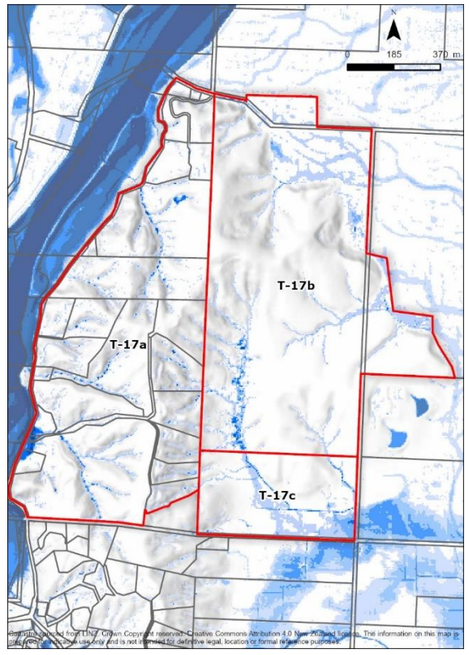
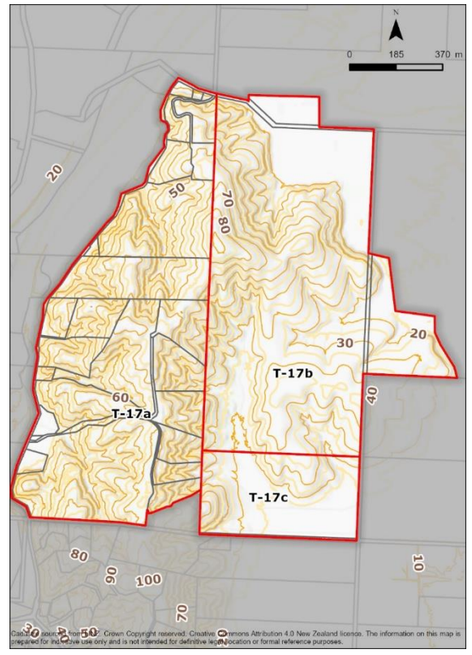
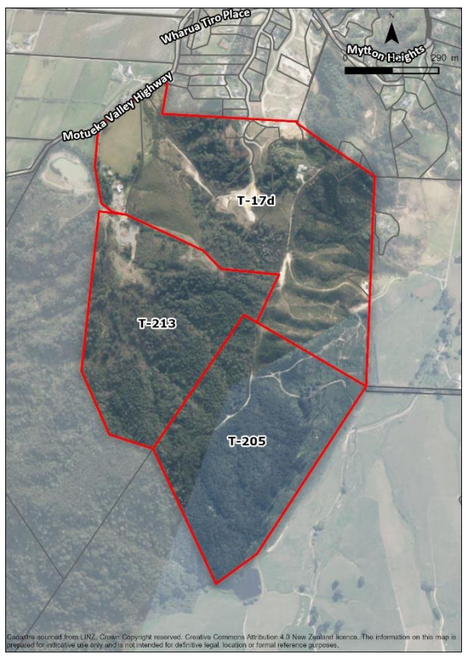
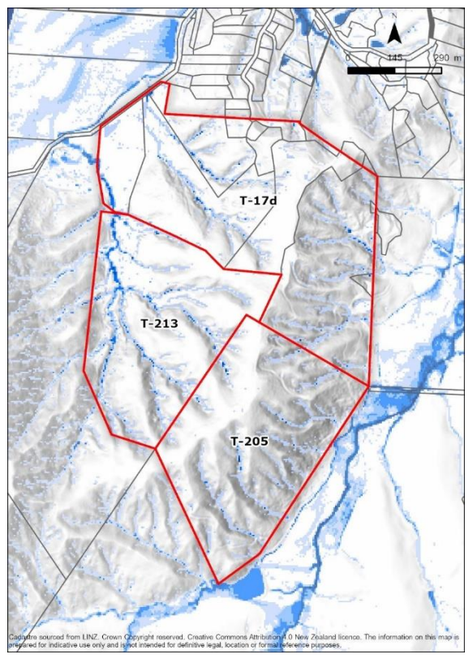
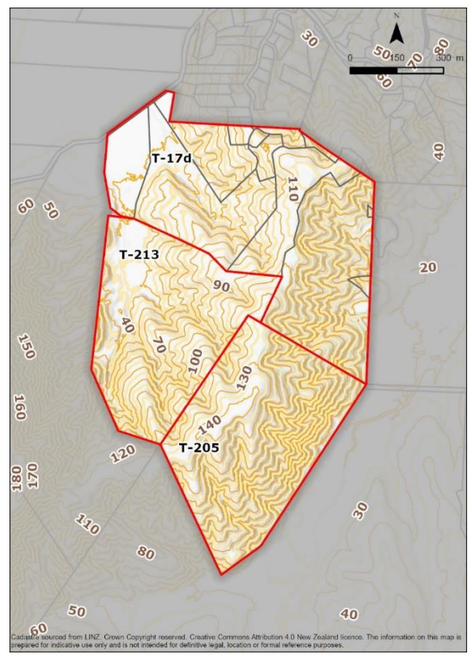
Natural Hazard comments:

Sites T-17a, T-17d, T213 and T-205 comprise relatively steeply sloping land underlain by Separation Point granite geology (SPG). These granites are typically deeply weathered at the surface and soils forming on them are susceptible to severe erosion when exposed, such as during earthworks and/or following vegetation removal. Slope failures on steeper slopes may occur if significant and prolonged rainfall results in deep saturation of the soil layer. Only the western margin of T-17b is underlain by SPG with the remainder underlain by Moutere Gravel formation which is typically more stable than SPG. Site T-17c is predominately underlain by Moutere Gravels and alluvial plains, with only a very small area of SPG at the western margin.

A number of small tributary streams are present across these sites. The south and south-east of site T-17c extends across the floodplain of Powley Creek. Low lying land adjacent to these watercourses and at the south and south-east of site T-17c are subject to flood hazards.

The terrain and underlying geology will constrain lot sizes. Most earthworks and building will require geotechnical assessment. The underlying geology also presents constraints to wastewater disposal.

Site and Natural hazard maps for Motueka Valley T-17a, T-17b, T-17c, T-17d, T-213 and T-205

Site location map	Modelled flood depth (1% AEP, present day)	Elevation contours showing slope steepness
		
Site location map	Modelled flood depth (1% AEP, present day)	Elevation contours showing slope steepness
		

Natural hazards risk assessment table for Motueka Valley T-17a, T-17b, T-17c, T-17d, T-213 and T-205

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flood T-17c	1% AEP Possible	None	Moderate	Negligible	Medium	Raised building platforms Provision of flow pathways	Low	Negligible	Negligible	Low	Residual risk is low, dependent on mitigation measures adopted	Yes, because rural residential mitigation measures only required for building platforms and access	Modelling assumptions Updated model 2020
Landslide T-17a T17d T213 T-205	Likely	None	Moderate	Moderate	High	Sensible layout Setback from steeper slopes Geotechnical assessment	Medium	Minor	Negligible	Medium	Residual risk remains medium	Yes, because rural residential and lower density mitigation measures are likely limited to be required for building platforms and access	Uncertainty around frequency of damaging landslide Expert staff knowledge used for desktop assessment
Landslide T-17b T-17c	Likely	None	Moderate	Moderate	High	Sensible layout Setback from steeper slopes Geotechnical assessment	Low	Minor	Negligible	Medium	Residual risk remains medium for the part of the site where SPG are present Residual risk could be reduced to low if development on SPG is avoided	Yes, mitigation measures only required for a small portion of the site.	Uncertainty around frequency of damaging landslide Expert staff knowledge used for desktop assessment
Natural hazard risk level assessment summary: **Sites T-17a, T-17d, T213 and T-205 and the western margins of sites T-17b and T-17c are underlain by Separation Point granite which can be susceptible to slope instability hazards. The remainder of sites T-17b and T-17c to the east are underlain by more stable Moutere Gravel formation. The southeastern corner of site T-17c is exposed to shallow flooding from Powley Creek. The hazard risk levels from slope instability hazards for the sites underlain by Separation Point granite are assessed as medium, and the residual risk as medium, when mitigation options are adopted. The risk level from flood hazards for site T-17c is assessed as low, and with a low residual risk, when appropriate mitigation measures are adopted.**												

Tākaka T-182a and T-140a (315 Tākaka-Collingwood Highway)

Current and Proposed zoning:

T-182a: Rezone from Rural 2 Zone to Light Industrial Zone. Add Wastewater Management Area

T-140a: Rezone from Rural 2 Zone to “Little Ōnahau” Rural Residential Zone. Add Wastewater Management Area

Yield:

6 hectares of light industrial land (T-182a)

42 dwellings (T-140a)

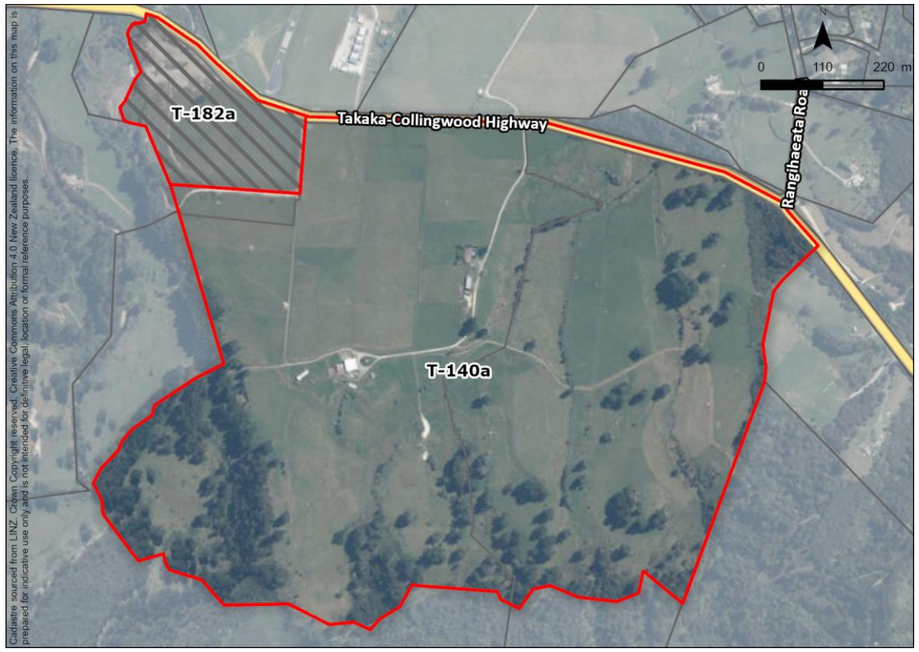
Natural Hazard comments:

Site T-182a is not considered to be subject to natural hazards.

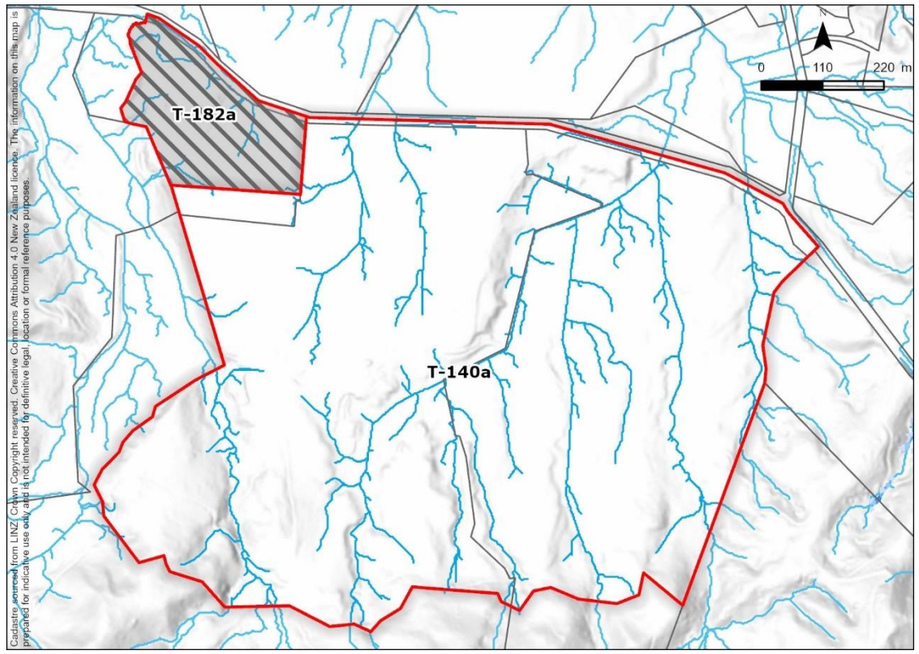
Site T-140a includes a number of relatively small tributary streams draining the hill slopes to the south that flow across this site. Low lying land adjacent to these watercourses can be expected to flood from time to time.

Site and Natural hazard maps for Tākaka T-182a and T-140a (315 Tākaka-Collingwood Highway)

Site location map



Watercourses



Natural hazards risk assessment table for Tākaka T-182a and T-140a (315 Tākaka-Collingwood Highway)

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flood T-140a	1% AEP Possible	None	Minor	Minor	Medium	Sensible layout to avoid low lying areas Setback from watercourses Raised building platforms Provision of flow pathways	Low	Negligible	Negligible	Low	Residual risk is low, given lower density and anticipated mitigation measures	Yes, dependent on the type of mitigation measures	No modelling available DEM used for desktop assessment of potential flood hazards
Natural hazard risk level assessment summary: **Site T-182a is not considered to be subject to natural hazards. Site T-140a contains a number of small tributary streams. For site T-140a the hazard risk level from flood hazards is assessed as low, with residual risk remaining low, with mitigation measures adopted.**													

Tākaka T-228, T-229 and T-230 (46-56A, 38, 78 Motupipi Street)

Current and Proposed zoning:

T-228 and T-230: Rezone both Rural 1 Zone to Light Industrial Zone

T-229: Rezone Residential Zone to Light Industrial Zone

Yield:

7.5 hectares of light industrial land in total (T-229, T-228, T-230)

Natural Hazard comments:

Flood modelling shows these sites as subject to flood hazards from the Tākaka River to varying depths and velocities. Site T-229 and the southwestern end of the site T-228 are modelled as having flood depths in the order of 0.8 to 1.2 metres deep in a 1% AEP flood. These sites are impacted more frequently than a 1% AEP, but with lesser flood depths. Flood modelling for a 10% AEP shows flood depth in the order of 0.4 to 0.8 metres deep at these sites.

Site T-230 and the northeastern end of site T-228 are slightly higher and have modelled flood depths in the order of 0.4 to 0.6 metres deep in a 1% AEP flood. There are existing flow channels on the sites where flood depths are deeper. In a 10% AEP flood the modelling shows flooding is confined to the existing flow channels with depths typically 0.2 to 0.5 metres, though deeper towards the eastern boundary of site T-230.

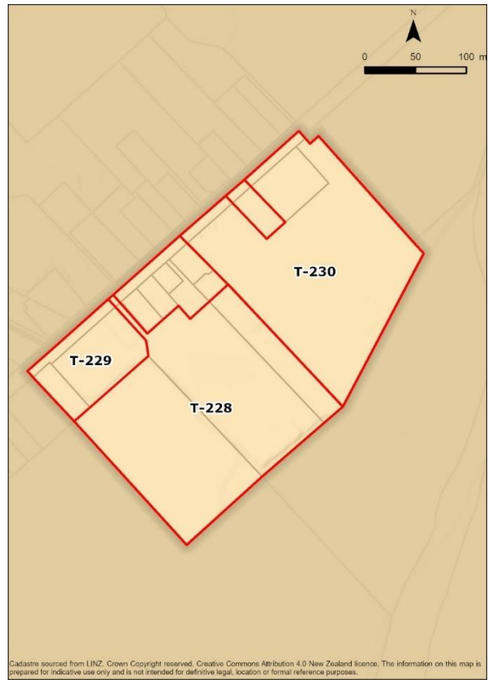
The flood hazard will constrain the type and extent of development that can occur on these sites. Any development on these sites will need to ensure the continued conveyance of flood flows across or around the sites.

Desktop mapping shows these sites as an area where seismic liquefaction damage is possible, however the underlying soils are typically gravelly.

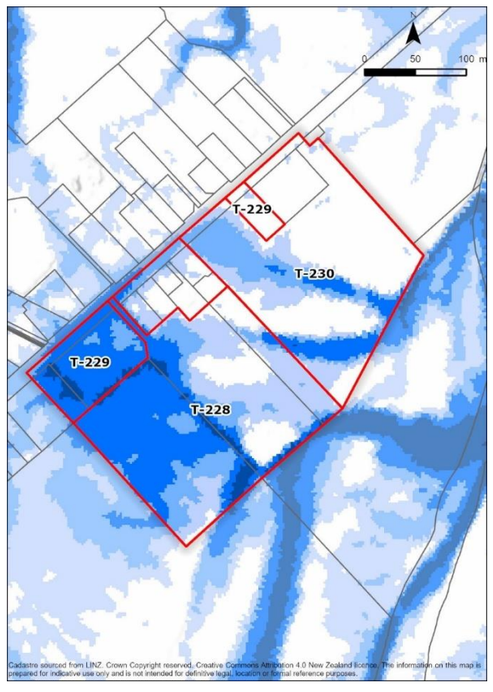
Site and Natural hazard maps for Tākaka T-228, T-229 and T-230 (46-56A, 38, 78 Motupipi Street)

Site location map

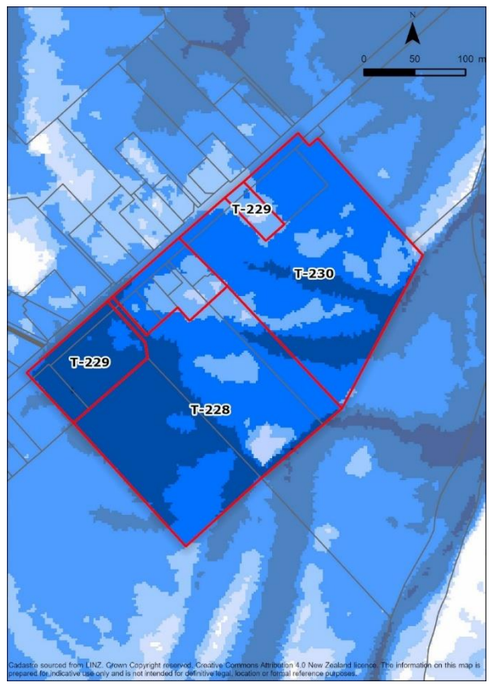
Liquefaction vulnerability assessment



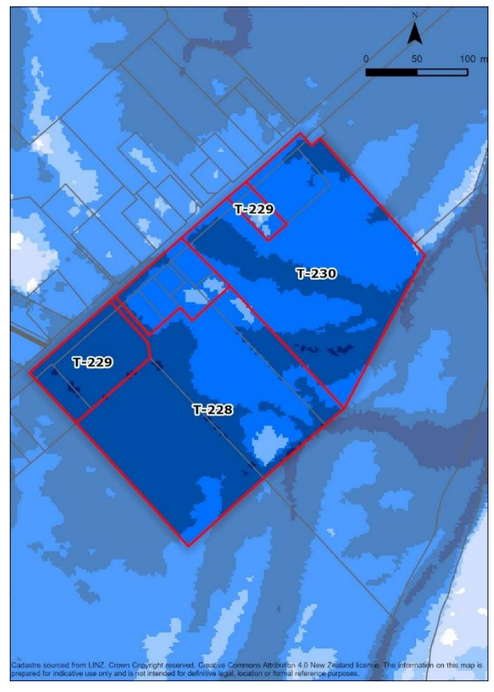
Modelled flood depths (10% AEP, present day)



Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2100)



Natural hazards risk assessment table for Tākaka T-228, T-229 and T-230 (46-56A, 38, 78 Motupipi Street)

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flood T-228	1% AEP Possible	None	Major	Moderate	High	Sensible layout (to preserve flow paths) Raised building platforms Provision of flow pathways The type of development is light industrial that is resilient to flooding	High	Moderate	Minor	Medium	Residual risk is medium, dependent on mitigation measures adopted	Possibly, dependent on the type of mitigation and the resilience of the land use.	Modelling assumptions Updated model 2023 The type of development is light industrial that is resilient to flooding
Flood T-228	10% AEP Almost certain	None	Moderate	Moderate	High	Sensible layout (to preserve flow paths) Raised building platforms Provision of flow pathways The type of development is light industrial that is resilient to flooding	High	Moderate	Minor	Medium	Residual risk is medium, dependent on mitigation measures adopted	Possibly, dependent on the type of mitigation and the resilience of the land use.	Modelling assumptions Updated model 2023 The type of development is light industrial that is resilient to flooding
Flood T-229	1% AEP Possible	None	Major	Moderate	High	Sensible layout (to preserve flow paths) Raised building platforms Provision of flow pathways The type of development is light industrial that is resilient to flooding	High	Moderate	Minor	Medium	Residual risk is medium, dependent on mitigation measures adopted	Possibly, dependent on the type of mitigation and the resilience of the land use.	Modelling assumptions Updated model 2023 The type of development is light industrial that is resilient to flooding
Flood T-229	10% AEP Almost certain	None	Moderate	Moderate	High	Sensible layout (to preserve flow paths) Raised building platforms Provision of flow pathways The type of development is light	High	Moderate	Minor	Medium	Residual risk is medium, dependent on mitigation measures adopted	Possibly, dependent on the type of mitigation and the resilience of the land use.	Modelling assumptions Updated model 2023 The type of development is light industrial that

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
						industrial that is resilient to flooding							is resilient to flooding
Flood T-230	1% AEP Possible	None	Moderate	Moderate	Medium	Sensible layout (to preserve flow paths) Raised building platforms Provision of flow pathways The type of development is light industrial that is resilient to flooding	Medium	Moderate	Minor	Medium	Residual risk is medium, dependent on mitigation measures adopted	Yes, dependent on the type of mitigation and the resilience of the land use.	Modelling assumptions Updated model 2023 The type of development is light industrial that is resilient to flooding
Liquefaction T-228 T-230 T-229	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Natural hazard risk level assessment summary: **These sites are exposed to flood hazards of varying depths and velocities, with T-229 and the southwestern part of T-228 experiencing deeper and more frequent flooding. Development will need to retain flood flow paths across or around these sites. With appropriate mitigation measures the risk level from flood hazards can be reduced to medium, reflecting the inherent exposure across the sites. The residual risk from flood hazards remains medium and will be dependent on the resilience of the land use. The risk level from liquefaction hazards is assessed as low with mitigation measures.**													

Tākaka - T-144 (Park Ave)

Current and Proposed zoning:

T-144: Rezone Rural 1 Zone to Rural 1 deferred Residential Zone

Yield:

66 dwellings

Natural Hazard comments:

This site is not considered to be subject to natural hazards.

Tākaka – T-138a (Rototai Road)

Current and Proposed zoning:

T-138a: Rezone from Rural 1 Zone to Medium Density Residential Zone

Add Outline Spatial Plan overlay

Yield:

98 dwellings

Natural Hazard comments:

This site is essentially free from flood hazards from the Tākaka River, with flood modelling showing only the western corner and northwestern boundary being subject to shallow flood flows in a 1% AEP event.

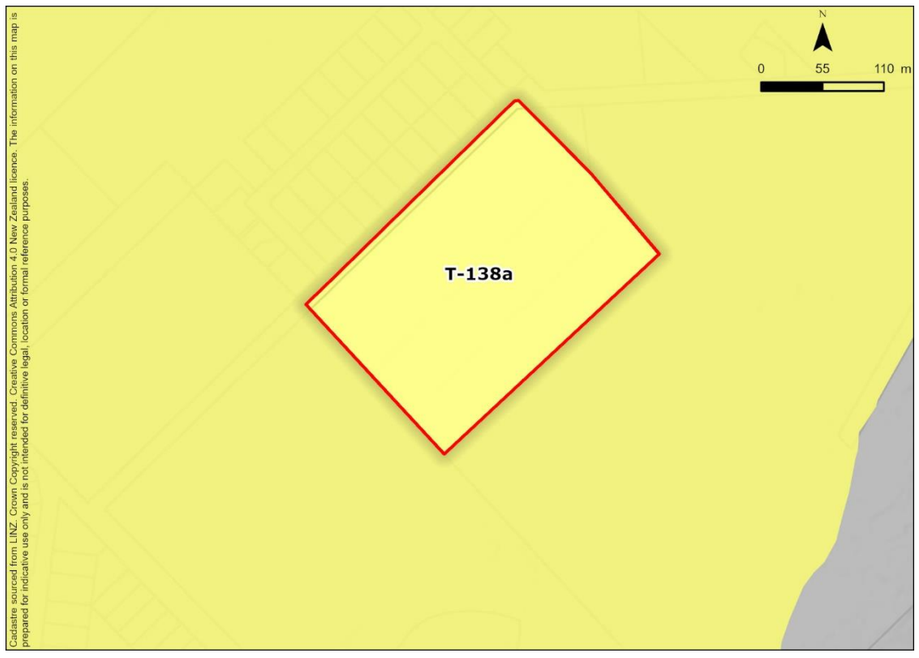
Desktop mapping shows this site as an area where seismic liquefaction damage is possible, however the underlying soils are typically gravelly. Site T-138a is located within the yellow tsunami evacuation zone.

Site and Natural hazard maps for Tākaka – T-138a (Rototai Road)

Site location map

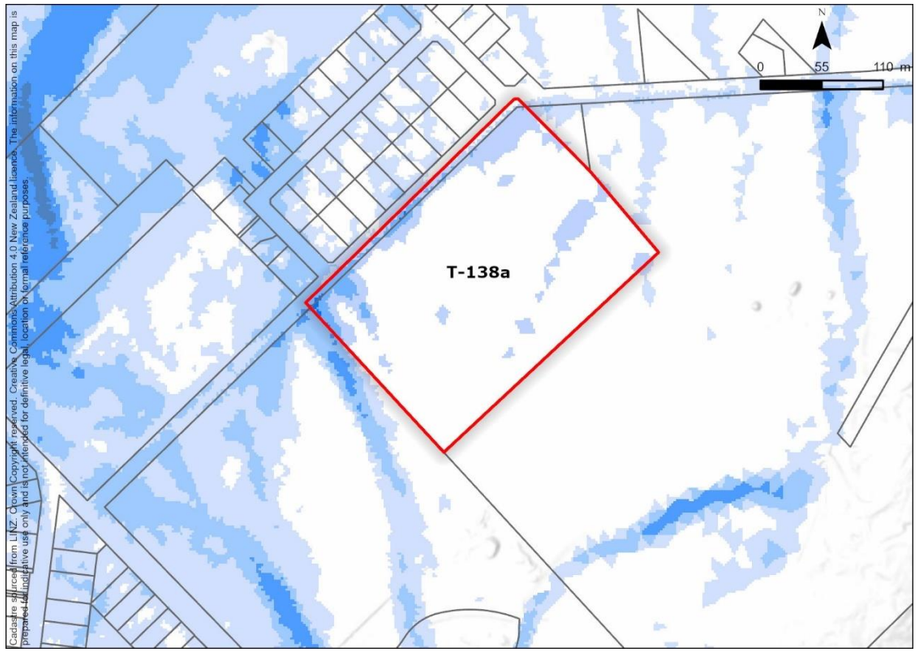
Liquefaction vulnerability assessment

Tsunami evacuation zones

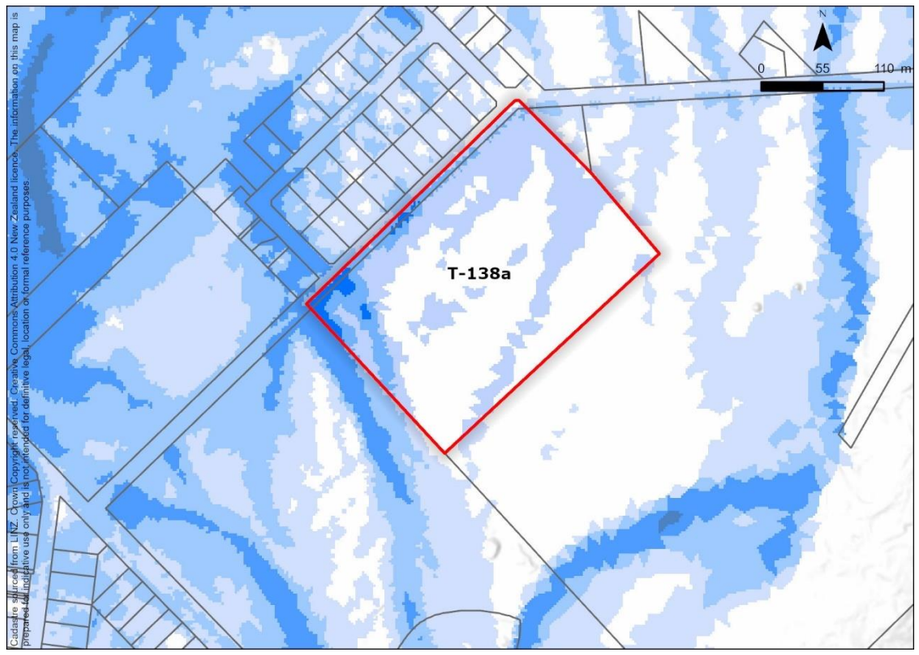


Modelled flood depth maps for Tākaka T-138a (Rototai Road)

Modelled flood depth (1% AEP, present day)



Modelled flood depth (1% AEP, future day RCP8.5 to 2100)



Natural hazards risk assessment table for Tākaka – T-138a (Rototai Road)

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-138a	1% AEP Possible	None	Minor	Negligible	Medium	Provision of flow paths Standard onsite stormwater design and management	Low	Negligible	Negligible	Low	Residual risk remains low subject to mitigation measures	Yes Risk and cost are low therefore proportionate	Inherent model assumptions Model developed 2023
Liquefaction T-138a	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-138a	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **The site is essentially free from flood hazards from the Tākaka River. Liquefaction is possible although the underlying soils are typically gravelly. The hazard risk levels for flood and liquefaction hazards are assessed as low after mitigation measures, with the residual risk also remaining low. The tsunami risk level is assessed as medium and the residual risk remains medium.**													

Tākaka T-227 (Onetahua Marae 72 Pōhara Valley Road)

Current and Proposed zoning:

T-227: Rezone from Residential Zone to Papakāinga Zone

Yield:

6 dwellings

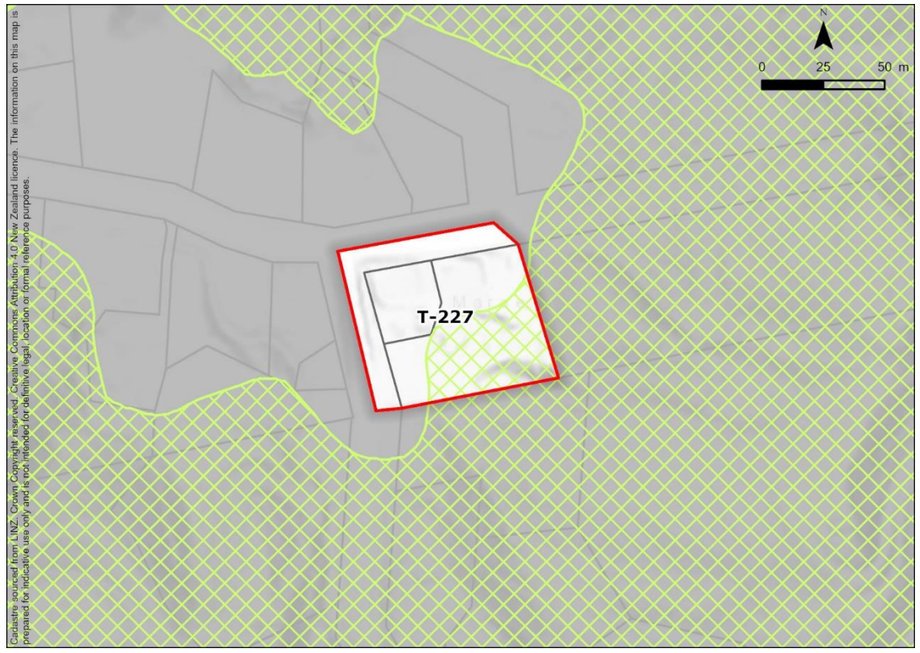
Natural Hazard comments:

The eastern part of the site and the adjacent land to the east is within the TRMP Slope Instability Risk Area.

Site and Natural hazard maps for Tākaka T-227 (Onetahua Marae 72 Pōhara Valley Road)

Site location map

Slope instability susceptibility area



Natural hazards risk assessment table for Tākaka T-227 (Onetahua Marae 72 Pōhara Valley Road)

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Landslides / slope instability T-227	Possible	Existing TRMP provisions - geotech	Moderate	Moderate	Medium	Sensible layout Setback from slopes Geotechnical assessments	Low	Moderate	Moderate	Medium	Residual risk remains medium	Yes, subject to mitigations measures proposed for the type of development.	Uncertainty around frequency of damaging landslides
Natural hazard risk level assessment summary: **The eastern part of the site is within the TRMP Slope Instability Risk Area. The hazard risk level from slope instability hazards is assessed as medium after mitigation measures are adopted. The residual risk is assessed as medium.**													

Murchison T234 (20, 24 and 26 Fairfax Street)

Current and Proposed zoning:

T-234: Rezone from Rural 2 Zone to Light Industrial Zone

Yield:

1.6 hectares of business land

Natural Hazard comments:

The site is located on an elevated terrace and is not considered to be subject to natural hazards.

Murchison T-150 (28-34 Fairfax St and 50-54 Waller Street)

Current and Proposed zoning:

T-150: Residential Zone to Commercial Zone

Yield:

0.6 hectares of business land

Natural Hazard comments:

This site is not considered to be subject to natural hazards.

Tapawera T-217 (79 Main Road)

Current and Proposed zoning:

T-217: Rezone from Light Industrial Zone to Residential Zone

Yield:

4 dwellings

Natural Hazard comments:

Immediately to the west of the site is a lower terrace comprising the active flood plain of the Motueka River which is subject to flood hazards. Flood modelling shows Site T-217 to be elevated above the 1% AEP flood level.

T-217 has not been assessed for flood hazard risk level.

St Arnaud T-181a and T219a (3103 and 3177 Korere-Tophouse Road)

Current and Proposed zoning:

T-181a and T-219a: Rezone from Rural 2 Zone to Rural Residential Zone

Yield:

T-181a and T-219a: 20 dwellings

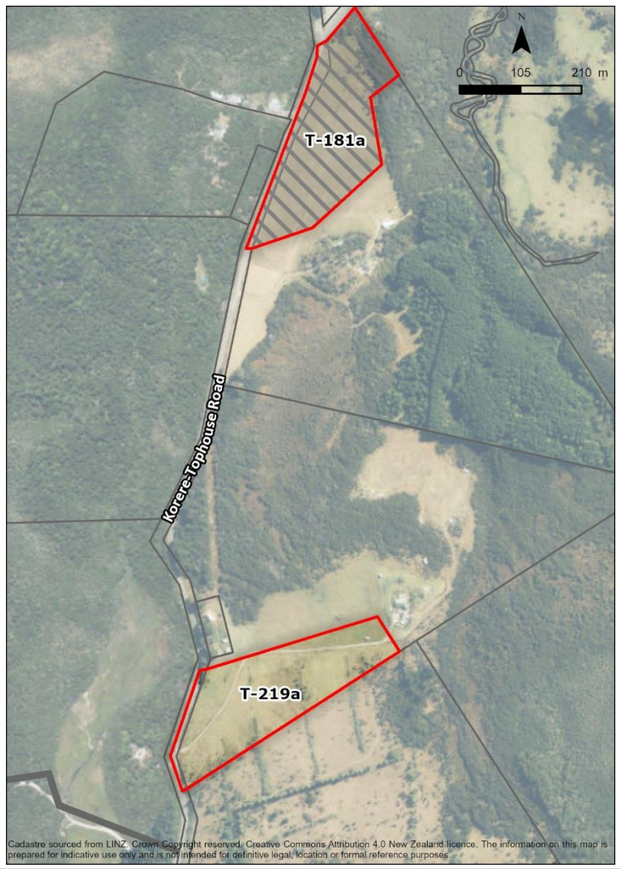
Natural Hazard comments:

These sites (T-181a and T-219a) are both essentially flat sites. The active Waimea Faultline crosses the northwestern edge of T-219a and needs to be accommodated in any development (such as ensuring buildings and structures are set back away from the fault).

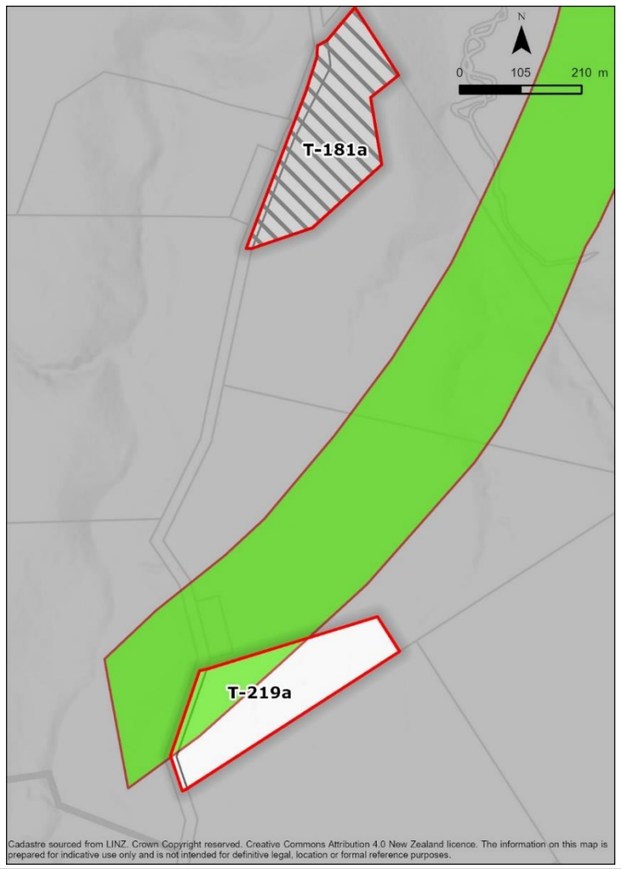
While wildfire can potentially occur anywhere across the Tasman district, there are some communities that are particularly vulnerable. While T-181a and T-219a are flat and open sites, it is recognised that the wider area of St Arnaud and Tophouse have large areas of dense fire-prone vegetation (kanuka/manuka), hilly areas (where fire spreads quicker), and limited access routes. The NPS-NH does not include wildfire as a natural hazard requiring management under the NPS, likely due to the complexity of determining a risk level, and therefore wildfire has not been assessed in the table below. It is recognised that there are potential measures that can be applied to help mitigating wildfire on these sites, including existing TRMP rules that require water storage for firefighting purposes in the Rural Residential zone, and non-regulatory measures such as the St Arnaud 'FireSmart Programme' guidance and fire-resistant native planting guide, and education programmes and activities run by local community groups such as Lake Rotoiti Volunteer Fire Brigade.

Site and Natural hazard maps for St Arnaud T-181a and T219a (3103 and 3177 Korere-Tophouse Road)

Site location map



Fault Rupture Risk Area



Natural hazards risk assessment table for St Arnaud T-181a and T219a (3103 and 3177 Korere-Tophouse Road)

Hazard	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Active fault rupture T-219a	Recurrence interval 3500– 5,000 years Rare	existing TRMP provisions	Moderate	Moderate	Low	Sensible layout Setbacks from faultline Geotechnical assessments	Low	Moderate	Moderate	Low	Risk remains low	Yes, sets backs easy to achieve and only impacts a small portion of the site	
Natural hazard risk level assessment summary: **The active Waimea Fault crosses the northwestern edge of T-219a. The hazard risk level from fault rupture hazards is assessed as low once mitigation measures are adopted, with the residual risk also remaining low.**													

Māpua T-235a and T235b (6, 8, 10, 12, 14, 16 Tahi Street)

Current and Proposed zoning:

Residential and Residential Coastal Zone with a small portion of Open Space Zone on sites 10-16 rezoning to Recreation and Open Space Zone

Yield:

NA

Natural Hazard comments:

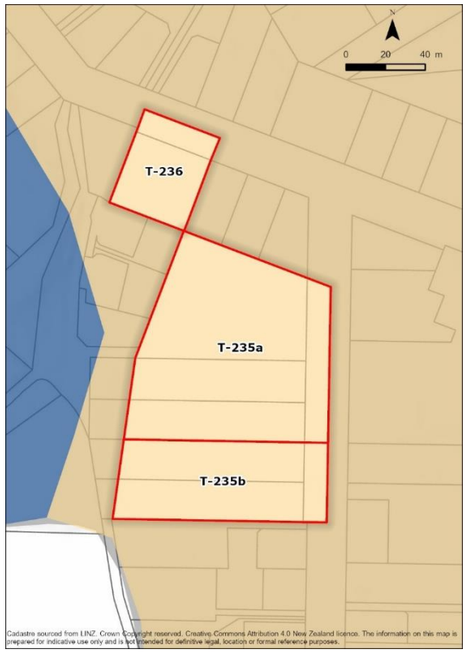
The land is flat, relatively low-lying and subject to coastal inundation hazards under future sea levels. As sea levels rise, this area is progressively impacted, particularly to the south. By 2130, half the area is projected to be inundated by a high tide and all of the property inundated when a high tide coincides with a 1% AEP storm tide and wave setup. This area is further exposed to storm impacts due to its proximity to Māpua Inlet and the open coast. These sites are not subject to rainfall flooding. However, the management and disposal of stormwater from the sites will become increasingly constrained as sea levels rise. These sites are located within the orange tsunami evacuation zone.

No assessment of the risk level these hazards present has been undertaken due to the proposed Recreation and Open Space zoning.

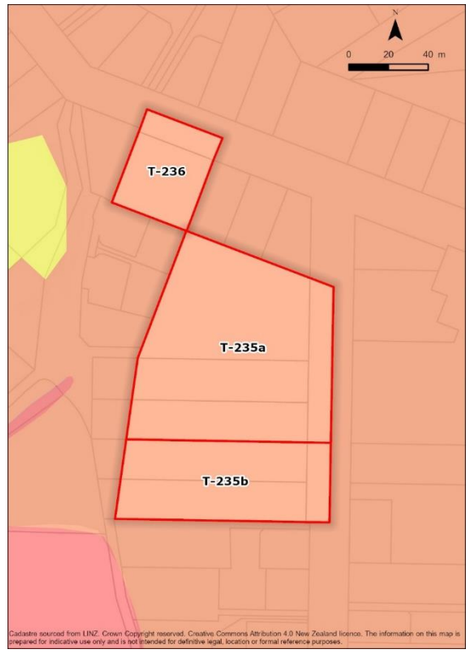
Site and Natural hazard maps for Māpua T-235a and T235b (6, 8, 10, 12, 14, 16 Tahi Street)

Site location map

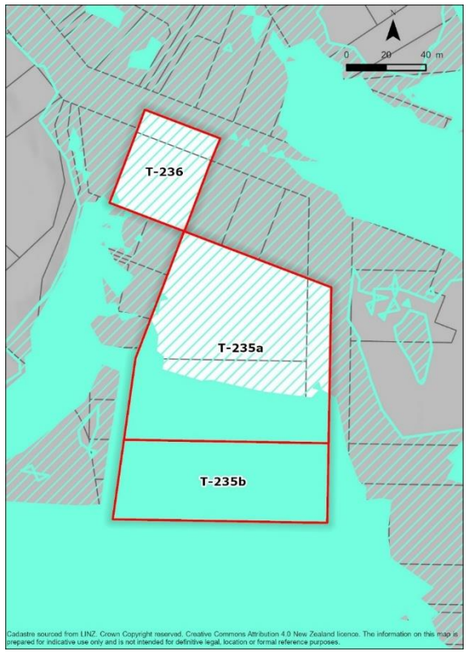
Liquefaction vulnerability assessment



Tsunami evacuation zones



1% AEP storm tide + 2m sea-level rise



Māpua T-236 (23 and 25 Aranui Road)

Current and Proposed zoning:

Residential zone to Commercial Zone

Yield:

0.14 hectares of business land

Natural Hazard comments:

The land is flat, relatively low-lying in nature and exposed to coastal hazards under future sea levels.

As sea levels rise, this area is progressively vulnerable to coastal inundation hazards

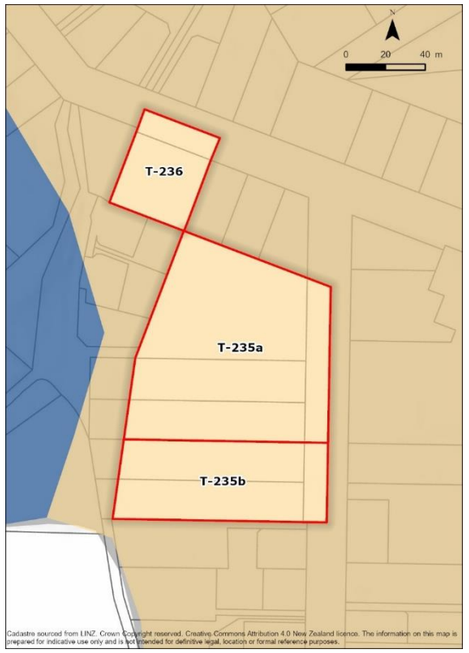
Ground levels for this site are approximately 3.9 to 4.1 meters elevation (NZVD 2016) and the estuary margin is approximately 160 meters south and 230 meters east of the site. MWHS is 1.71meters (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2meters (based on climate change scenario SSP5-8.5 H+). Storm-tides and sea-level rise may begin to impact these sites towards the end of the 100yr planning horizon.

Desktop mapping shows this site as an area where seismic liquefaction damage is possible. This site is also located within the orange tsunami evacuation zone.

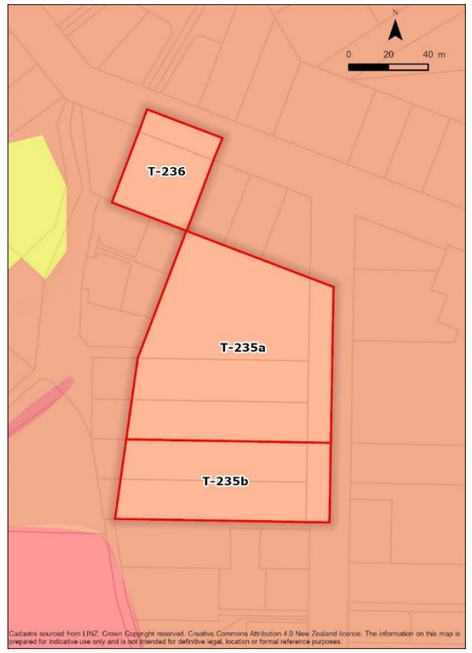
Site and Natural hazard maps for Māpua T-236 (23 and 25 Aranui Road)

Site location map

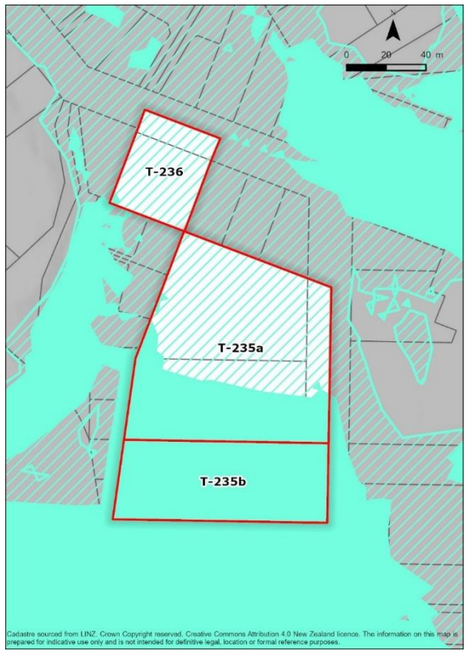
Liquefaction vulnerability assessment



Tsunami evacuation zones



1% AEP storm tide + 2m sea-level rise



Natural hazards risk assessment table for Māpua T-236 (23 and 25 Aranui Road)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Liquefaction	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-236	Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Coastal Inundation T-236	1% storm tide with 2m sea-level rise Possible		Minor	Minor	Medium	Minimum building platform levels	Low	Negligible	Negligible	Low	Residual risk is low. However, residual risk will be greater if sea-level rise occurs at a rate greater than currently projected.	Yes, based on current sea-level rise projections	Sea-level rise occurs as projected
Natural hazard risk level assessment summary: **The site is relatively low-lying and exposed to future coastal inundation hazards as sea levels rise, with the area expected to be inundated by 2130 during a 1% AEP storm-tide event with wave setup. Liquefaction damage is possible in places, and the site is within the orange tsunami evacuation zone. The risk levels from liquefaction, coastal inundation and tsunami hazards have been assessed as low with mitigation measures applied. The residual risk remains low, although exposure to coastal hazards is expected to increase over the 100-year planning horizon.**													

Māpua T-246a and T-246b (Higgs Road)

Current and Proposed zoning:

Residential zone to Residential deferred Medium Density Residential Zone (T-246a) and Medium Density Residential Zone (T-246b)

Yield:

50 dwellings in total (over 30 years)

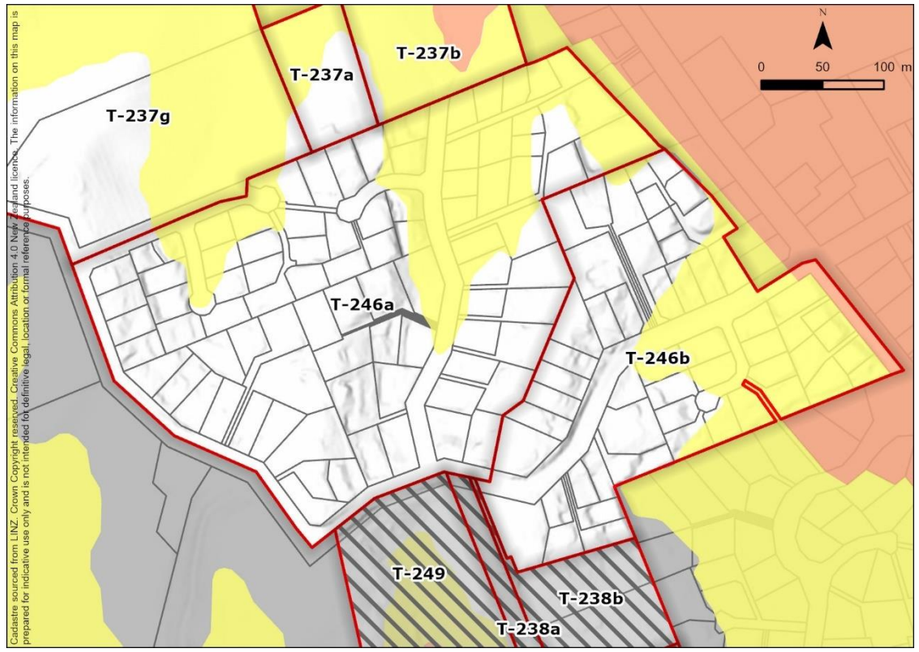
Original Natural Hazard comments:

T-246a and T246b are predominantly elevated but parts of these sites are located within the yellow tsunami evacuation zone.

Site and Natural hazard maps for Māpua T-246a and T-246b (Higgs Road)

Site location map

Tsunami evacuation zones



Natural hazards risk assessment table for Māpua T-246a and T-246b (Higgs Road)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Tsunami T-246a T-246b	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **These sites are predominately elevated, but parts are located within the yellow tsunami evacuation zone. The risk level has been assessed as low and residual risk remains low.**													

Māpua T-11a and T-11b (Seaton Valley Greenfield Land)

Current and Proposed zoning:

T-11a: Rural Residential to Rural Residential deferred Residential

T-11b: Rural 1 (part 49 Stafford Drive) to Rural 1 deferred Medium Density Residential Zone

Yield:

T-11a:31 dwellings

T-11b: 90 dwellings

Natural Hazard comments:

Seaton Valley Stream flows through northern extent of T-11a. Lower lying land adjacent to the stream is subject to flooding. Any development will need to accommodate this watercourse and its flood flows, and in turn allowing the remainer of the site to be developed.

Site T-11b comprises land at the edge of the wider Seaton Valley Stream flood plain of which the northwestern part is elevated above the flood plain. The remaining lower lying south-eastern part is subject to a degree of flood hazard. A smaller tributary stream flows across the centre of the site.

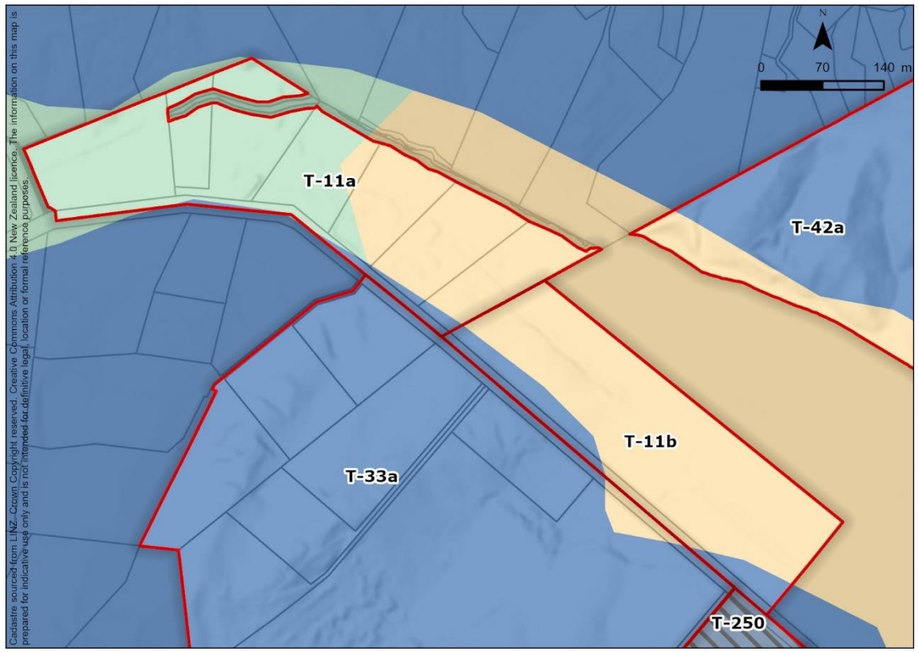
Ground levels in the southeastern part are approximately 2.2 meters elevation (NZVD 2016) and the coastline is approximately 1000m north-east of the site. Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on a climate change scenario of SSP5-8.5 H+) and as such the site will be progressively impacted by coastal hazards. Increasing sea levels will also progressively impact the management of stormwater at this site and the discharge from the wider stream network to the coast.

Site T-11b and part of site T-11a is in an area where seismic liquefaction damage is possible. Site T-11b and part of site T-11a are located within the yellow tsunami evacuation zone.

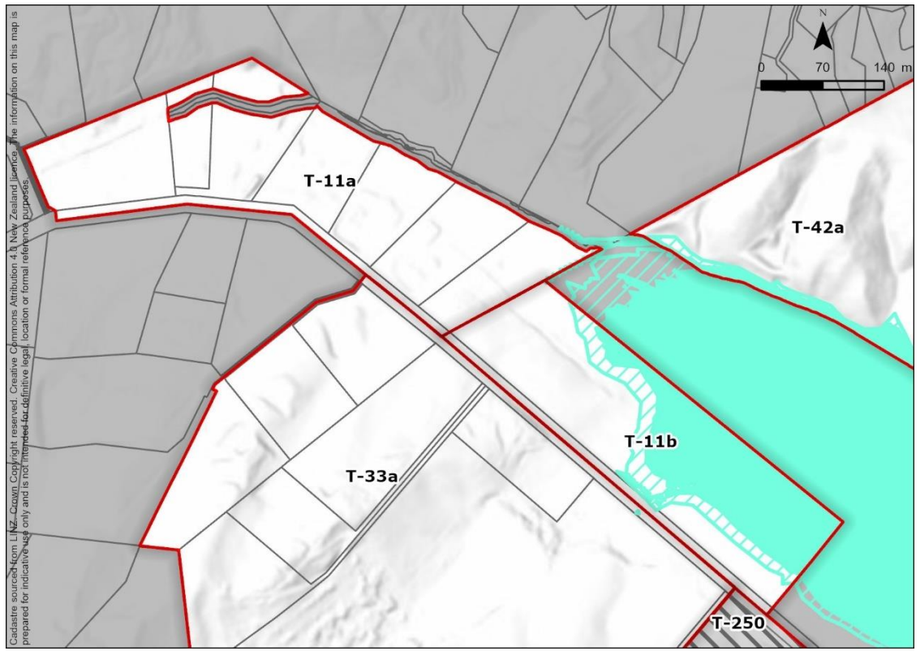
Site and Natural hazard maps for Māpua T-11a and T-11b (Seaton Valley Greenfield Land)

Site location map

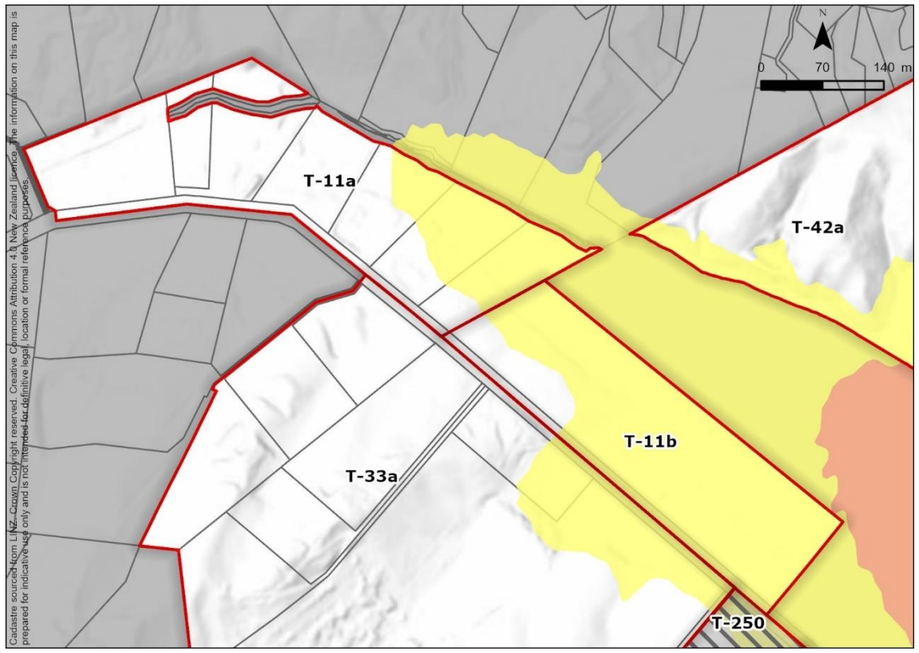
Liquefaction vulnerability assessment



1% AEP storm tide + 2m sea-level rise

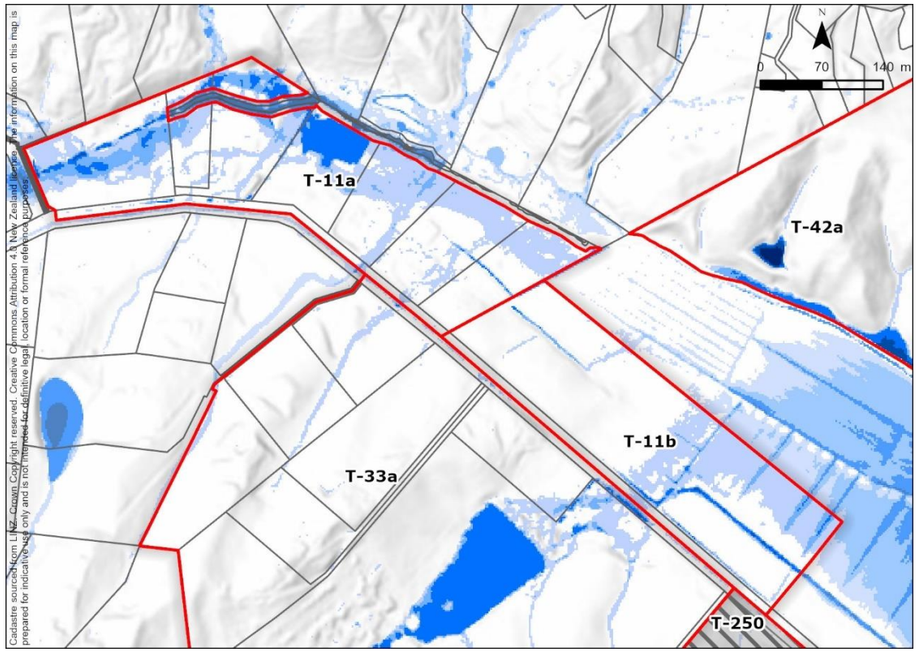


Tsunami evacuation zones

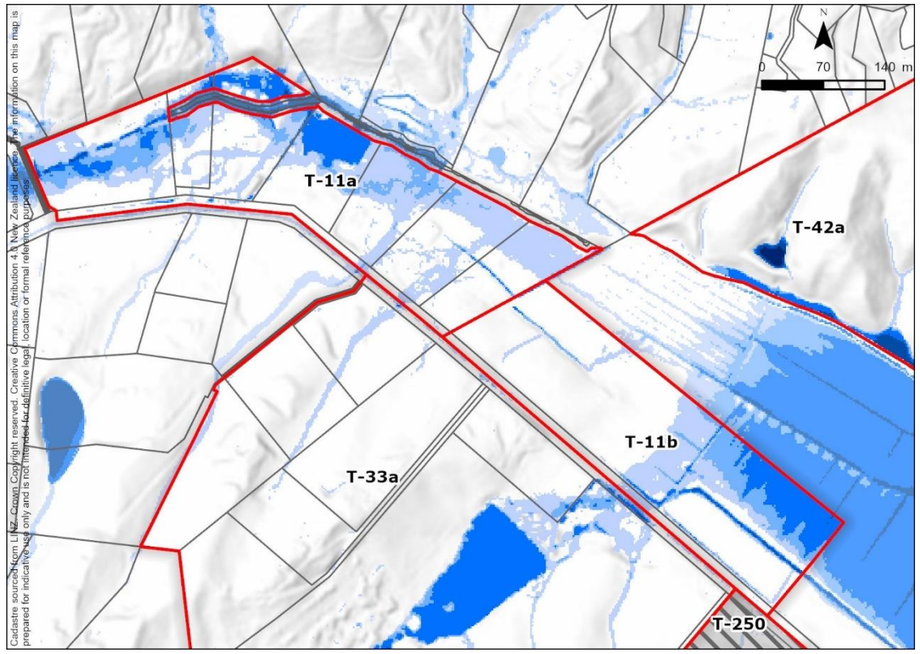


Modelled flood depth maps for Māpua T-11a and T-11b (Seaton Valley Greenfield Land)

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-11a and T-11b (Seaton Valley Greenfield Land)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-11a	1% AEP Possible	None	Moderate	Moderate	Medium	Sensible layout Provision of flow path Stream corridors	Medium	Negligible	Negligible	Low	With well engineered flow/flood corridor residual risk is low	Yes, potential mitigation measures are typical for residential development.	Model assumptions Updated 2021
Flooding (river/surface) T-11b	1% AEP Possible	None	Moderate	Moderate	Medium	Raise land on some of low lying areas of the site where inundation hazard present Sensible lay out Provision of flow path	Medium	Negligible	Negligible	Low	With raised land residual risk remains low	Yes, potential mitigation measures for medium density residential	Model assumptions Updated 2021
Coastal Inundation T-11b	1% storm tide with 2m sea-level rise Almost certain (100yr timeframe)	Māpua Leisure Park causeway and flap gated culverts	Moderate	Minor	High	Raise land on some of low lying areas of the site where inundation hazard present Sensible layout	Medium	Negligible	Negligible	Low	With raised land residual risk remains low.	Yes, potential mitigation measures for medium density residential	Sea-level rise occurs as projected
Liquefaction T-11a	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes Risk and cost are low therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Liquefaction T-11b	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Medium	Minor	Minor	Low	Residual damage possible.	Yes, depending on mitigation measures for medium density residential	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others Cost of mitigation measures (fill required to raise land)
Tsunami T-11a	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will	

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
T-11b												evacuate. There is no further potential mitigation and hazard event is rare to very rare.	

Natural hazard risk level assessment summary:
Site T-11a contains lower-lying land adjacent to Seaton Valley Stream that is subject to flooding. Site T-11b includes low-lying areas exposed to flooding and is also progressively threatened by coastal inundation over the 100-year planning horizon due to projected sea-level rise. Liquefaction damage is possible at both sites, and both sites lie within the yellow tsunami evacuation zone. The risk levels from flooding, coastal inundation and liquefaction hazards have been assessed as low once mitigation measures are applied, with the residual risk remaining low. The tsunami hazard risk level has been assessed as medium and the residual risk remains medium.

Māpua T-33a and T33b (Seaton Valley Greenfield Land)

Current and Proposed zoning:

T-33a: Rural Residential zone to Rural Residential deferred Medium Density Residential Zone.

T-33b: Residential deferred Medium Density Residential Zone

Yield:

293 dwellings in total

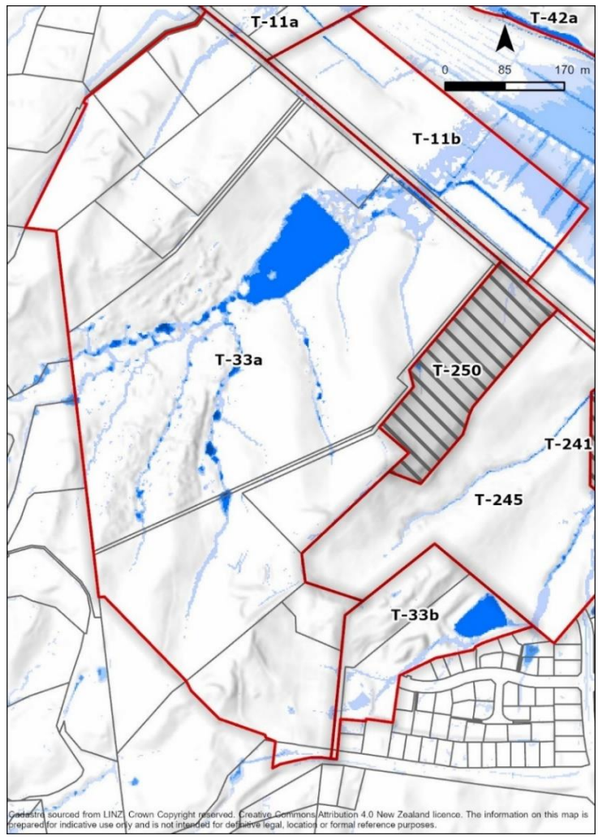
Natural Hazard comments:

For these sites, the land is undulating and contains a number of small, typically ephemeral, tributary streams. Both sites have streams that have been dammed to form ponds.

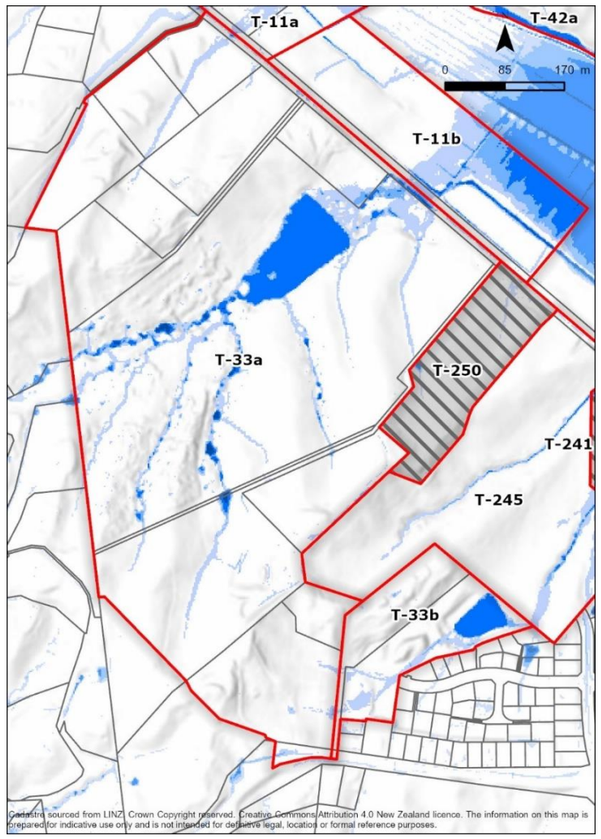
Site and Natural hazard maps for Māpua T-33a and T33b (Seaton Valley Greenfield Land)

Site location map

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-33a and T33b (Seaton Valley Greenfield Land)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-33a T-33b	1% AEP Possible	None	Moderate	Moderate	Medium	Sensible layout Provision for watercourses and stormwater reticulation	Low	Negligible	Negligible	Low	With well engineered flow paths and stormwater reticulation residual risk is low	Yes, depending on mitigation measures for medium density residential	Model assumptions Updated 2021
Natural hazard risk level assessment summary: **These sites contain undulating land with several small tributary streams with lower lying land adjacent to these streams exposed to flood hazard. For both sites the risk level from flood hazards is assessed as low once mitigation measures are adopted and the residual risk remains low.**													

Māpua T-237a, T-237b, T-237c, T-237d, T-237e, T-237f and T-237g (Higgs Road / Jessie Street)

Current and Proposed zoning:

Rural 1 deferred Residential zone to Medium Density Residential (T-237a and T-237b)

Rural 1 deferred Residential zone to Standard Residential (T-237c/d)

Rural 1 deferred Residential zone to Open Space (T-237-e/f)

Rural 1 deferred Residential zone to Rural 1 deferred Medium Density Residential (T-237g)

Yield:

255 dwellings in total for all sites

Natural Hazard comments:

The land at sites T-237a, T-237b and T-237g is undulating and contains small, typically ephemeral, tributary streams and will need to be accounted for when development occurs. T-237c, T-237d are not considered to be subject to natural hazards.

A small area adjacent to Aranui Road of site T-237b extends over an area where seismic liquefaction damage is possible.

Ground levels at the eastern end of site T-237b are approximately 3.5 to 4.2 meters elevation (NZVD2016) with the remainder of the site well elevated above these levels. The open coastline is approximately 1,000 meters north-east of the site and a pocket of the estuary is approximately 500 meters east of the site. Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on a climate change scenario of SSP5-8.5 H+) and as such the eastern end of the site will be progressively impacted by coastal hazards.

At site T-237g the northeastern boundary is aligned to existing property boundary, which is largely but not completely, aligned to base of the hillslopes. The land immediately adjacent to the site (to the northeast) is lower lying and will become subject to coastal hazards as sea levels rise into the future. Whilst a very small part of this lower lying land overlaps the boundary of site T-237g, this is considered negligible and the site is not considered subject to coastal hazards. Similarly, a very small area at the eastern corner of site T-237a extends on to lower lying land. Again, this is considered negligible and the site is not considered subject to coastal hazards.

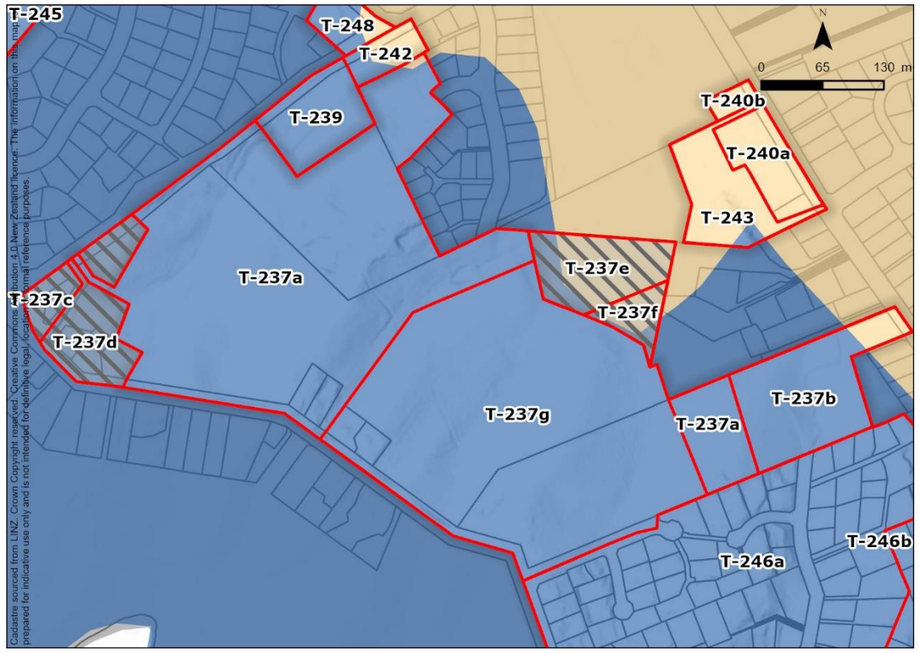
Part of sites T-237a, T237b and T-237g are located within the yellow tsunami evacuation zone. The eastern part of Site T-237b is located within the orange tsunami evacuation zone. Sites T-237e and T-237f are both in an area where seismic liquefaction damage is possible.

Sites T237e and T-237f are also in the orange tsunami evacuation zone and will be progressively impacted by sea-level rise. As per the natural hazards assessment methodology, T-237e and T-237f have not been assessed against the NPS-NH as the proposed zoning is Open Space.

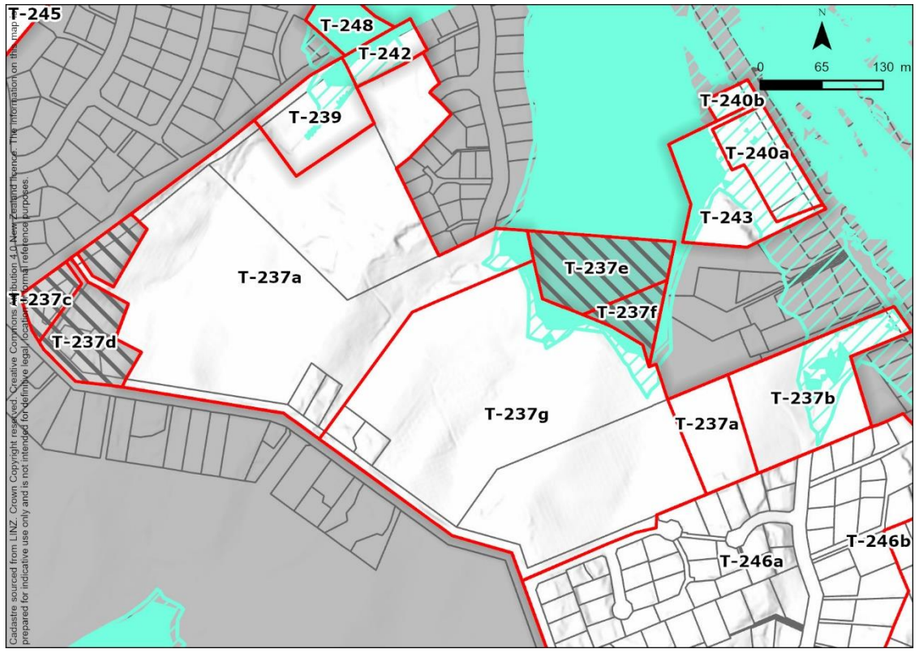
Site and Natural hazard maps for Māpua T-237a, T-237b, T-237c, T-237d, T-237e, T-237f and T-237g (Higgs Road / Jessie Street)

Site location map

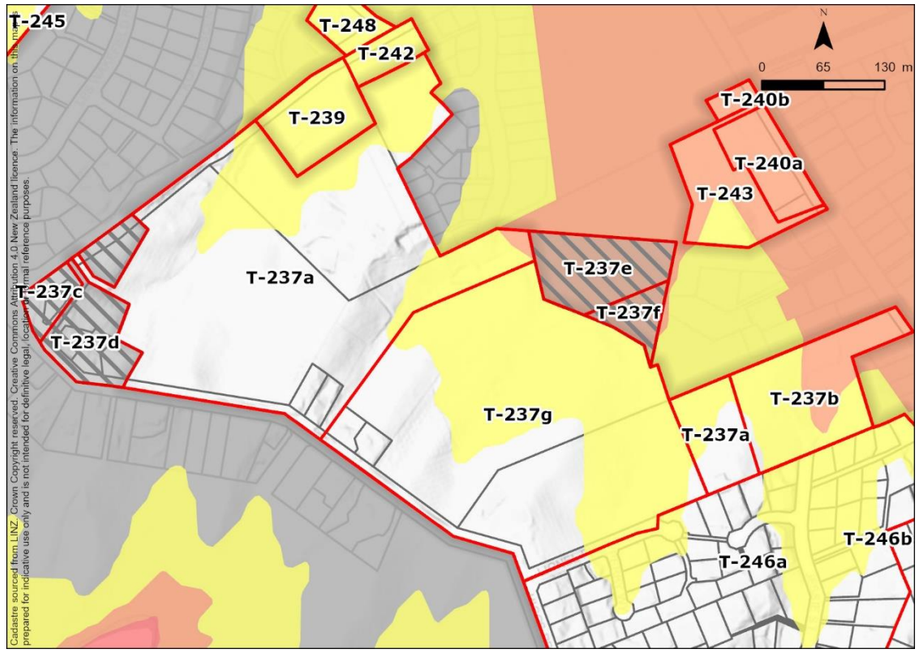
Liquefaction vulnerability assessment



1% AEP storm tide + 2m sea-level rise

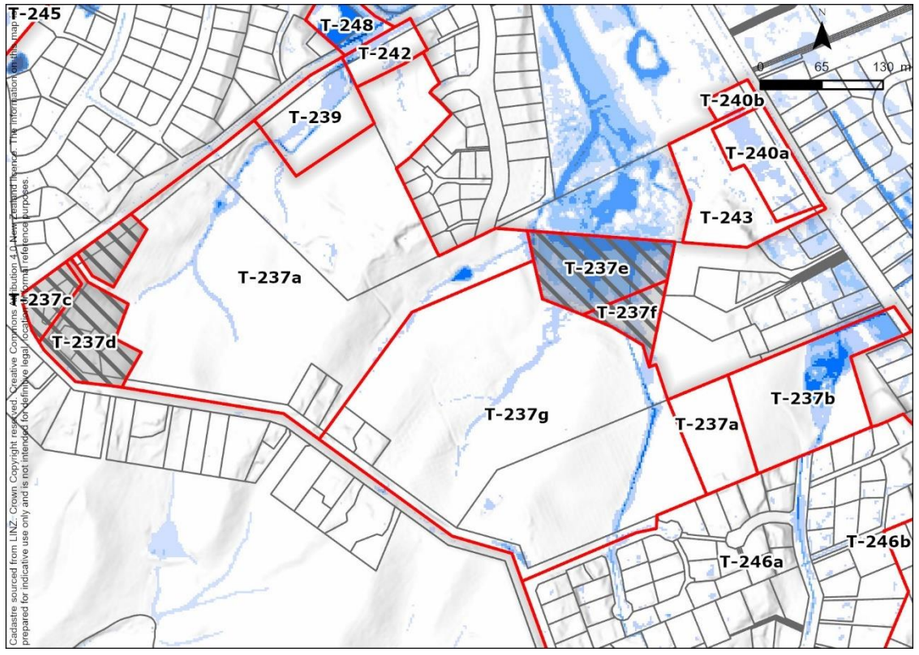


Tsunami evacuation zones

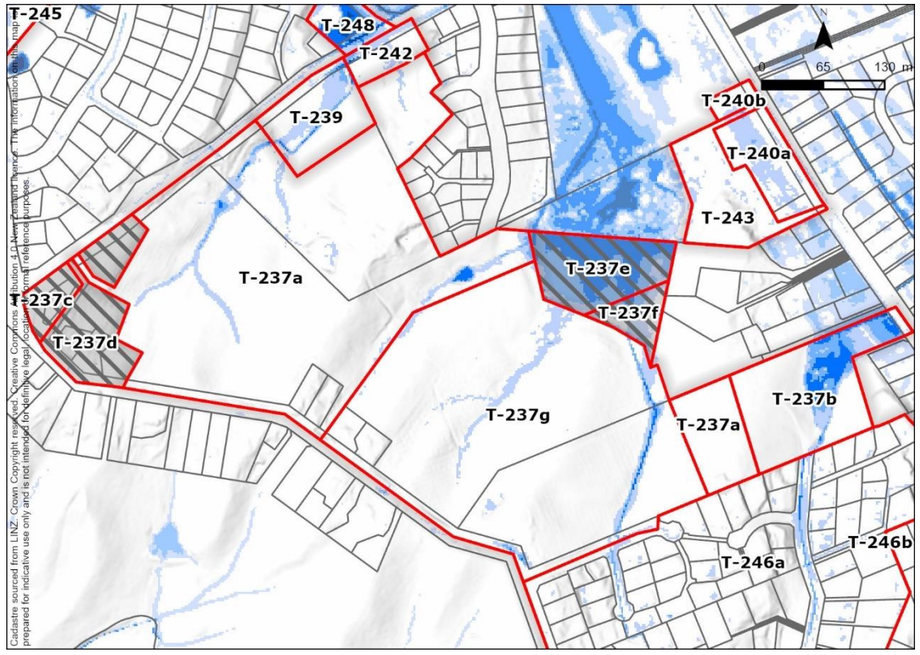


Modelled flood depth maps for Māpua T-237a, T-237b, T-237c, T-237d, T-237e, T-237f and T-237g (Higgs Road / Jessie Street)

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-237a, T-237b, T-237c, T-237d, T-237e, T-237f and T-237g (Higgs Road / Jessie Street)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-237a T-237b T-237g	1% AEP Possible	None	Moderate	Moderate	Medium	Sensible layout Provision for watercourses and stormwater reticulation	Low	Negligible	Negligible	Low	With well engineered flow paths and stormwater reticulation residual risk is low	Yes, depending on mitigation measures for medium density residential	Model assumptions Updated 2021
Coastal Inundation T-237b	1% storm tide with 2m sea-level rise Possible (100yr timeframe)	Māpua Leisure Park causeway and flap gated culverts	Minor	Minor	Medium	Maintenance of existing mitigation measures Minimum building platform levels	Low	Negligible	Negligible	Low	With raised land residual risk remains low.	Yes, risk and costs are low, therefore proportionate	Sea-level rise occurs as projected Assessment for eastern end of the site.
Liquefaction T-237b	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes, depending on mitigation measures for medium density residential	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others Assessment for eastern end of the site adjacent to Aranui Road .
Tsunami T-237a T-237g	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Tsunami T-237b	Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Natural hazard risk level assessment summary: **Sites T-237a, T-237b and T-237g contain undulating land with small tributary streams with lower lying land adjacent to these streams exposed to flood hazard. Coastal inundation associated with future sea-level rise may progressively affect the eastern margins of site T-237b over the 100-year planning horizon. Parts of sites T-237a, T-237b and T-237g are located within the tsunami evacuation zones (yellow and orange), and localised liquefaction potential is present at parts of T-237b. Once mitigation measures are applied, the risk level from flooding and coastal inundation hazards is assessed as low T-237a, T-237b and T-237g. The risk level of liquefaction on parts of site T-237b has been assessed as low. The risk level for tsunami has been assessed as low for sites T-237a and T-237g, and medium for site T-237b.The residual risk remains low across these sites for flood hazard, liquefaction and coastal inundation be remains as medium for tsunami hazard.**												

Māpua T-238a, T-238b, T-238c (33 and 35 Higgs Road)

Current and Proposed zoning:

Rural 1 deferred Residential zone to Medium Density Residential (T-238a/b) and part Rural 1 (T-238c).

Yield:

T-238a and T-238b total: 28 dwellings

Natural Hazard comments:

These three sites extend across undulating land. T-238a and T-238b are not considered to be subject to natural hazards.

Site T-238c is not subject to flood hazards. The southern end of the site extends to the coast and includes a small area of lower lying land that will be exposed to coastal hazards within the 100-year planning horizon. The adjacent estuary is sheltered from wave action and this coast is subject to very low erosion hazard.

The majority of site T-238c is in the yellow tsunami evacuation zone and the lower lying southern end of the site is within the orange tsunami evacuation zone.

As per the natural hazards assessment methodology, T-238c has not been assessed against the NPS-NH as the proposed zoning is Rural 1.

Māpua T-239 (Part 120 Higgs Road)

Current and Proposed zoning:

Rural 1 deferred Residential zone to Commercial Zone.

Yield:

7000m2 of commercial land

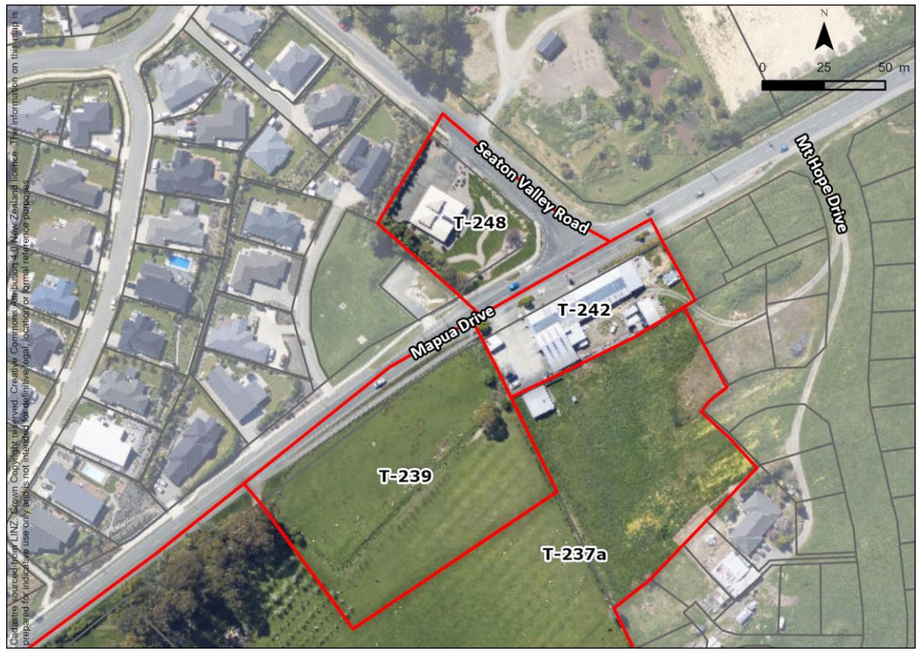
Natural Hazard comments

The site is located in a relatively gently sloping gully with a small, ephemeral stream flowing through it. Development of the site will need to accommodate this watercourse. Ground levels in the northern corner of the site are approximately 3.4 meters elevation (NZVD 2016) and the coastline is approximately 1150m northeast of the site. Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on climate change scenario SSP5-8.5 H+) and as such this part of the site will be progressively impacted by coastal hazards. Increasing sea levels will also progressively impact the management of stormwater at this site and the discharge from the wider stream network to the coast.

Site T-239 is located within the yellow tsunami evacuation zone.

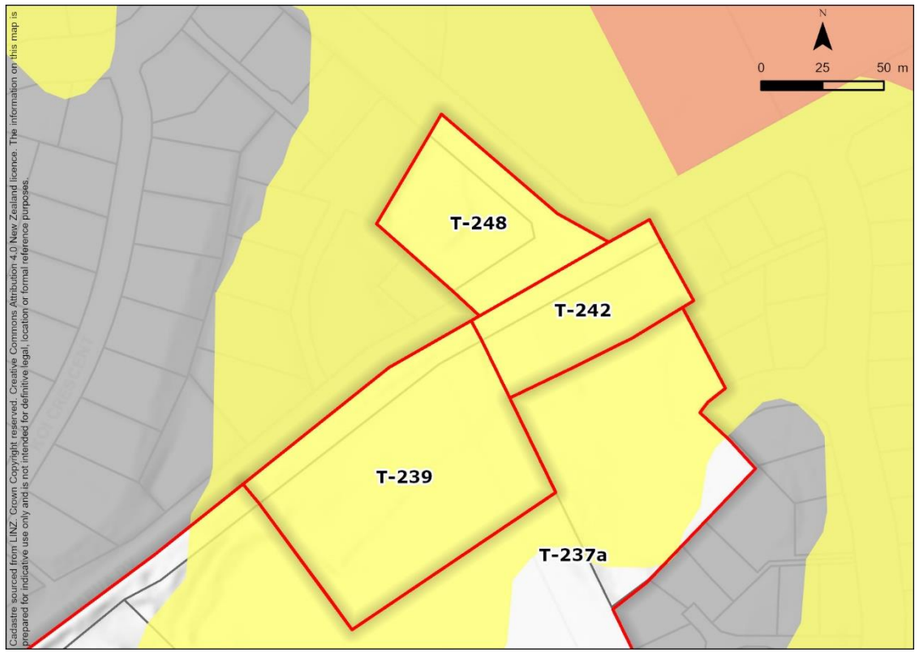
Site and Natural hazard maps for Māpua T-239 (Part 120 Higgs Road)

Site location map



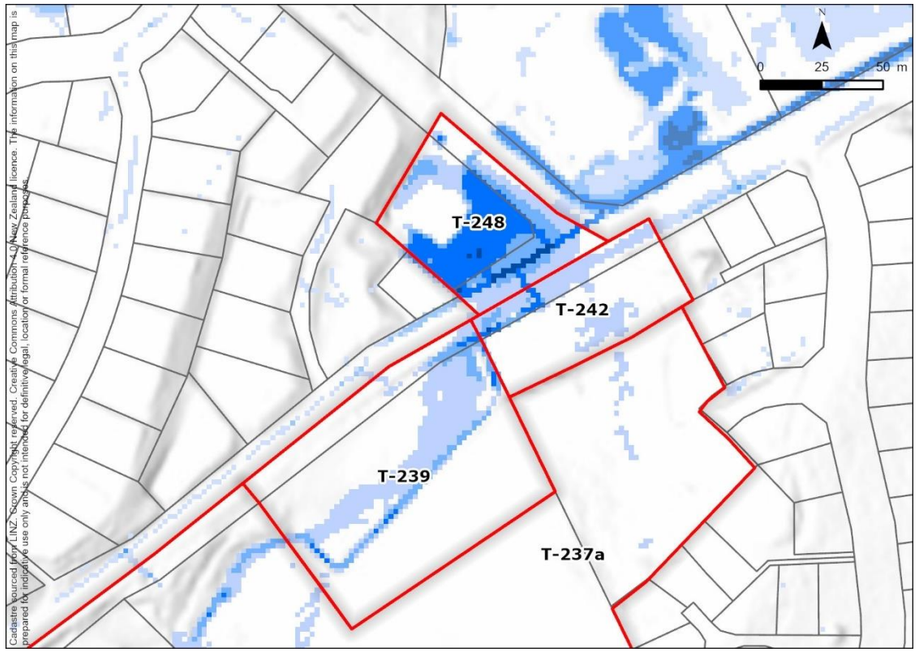
1% AEP storm tide + 2m sea-level rise

Tsunami evacuation zones

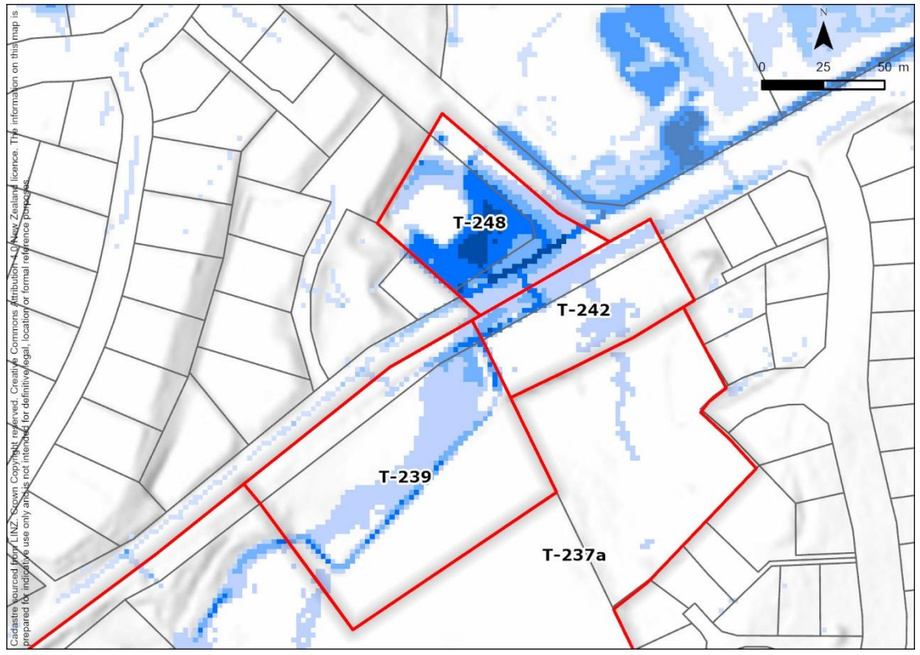


Modelled flood depth maps for Māpua T-239 (Part 120 Higgs Road)

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-239 (Part 120 Higgs Road)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Coastal Inundation T-239	1% storm tide with 2m sea-level rise Almost certain (100yr timeframe)	Māpua Leisure Park causeway and flap gated culverts	Moderate	Minor	High	Raise land on some of low lying areas of the site where inundation hazard present Sensible layout that avoids the northern corner	Medium	Negligible	Negligible	Low	With raised land residual risk remains low.	Yes, potential mitigation measures for medium density residential	Sea-level rise occurs as projected
Flooding (river/surface) T-239	1% AEP Possible	None	Moderate	Moderate	Medium	Sensible layout that avoids the northern corner Provision of flow path	Medium	Negligible	Negligible	Low	With well engineered flow/flood corridor residual risk is low	Yes	Model assumptions Updated 2021
Tsunami T-239	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **The site contains a small ephemeral stream and a low-lying area in its northern corner. Lower lying land adjacent to the stream and in the northern corner is exposed to flood hazard. The low-lying area in the northern corner will be progressively exposed to coastal inundation hazards over the 100-year planning horizon due to projected sea-level rise. The risk levels from flooding and coastal inundation hazards are assessed as low once mitigation measures are applied. The residual risk remains low, although the exposure to coastal hazards is expected to increase over time. The tsunami risk level is assessed as medium and the residual risk remains medium.**													

Māpua T-240a and b (109 and 119 Aranui Road and 123 Aranui Road)

Current and Proposed zoning:

T-240a: Rural Residential deferred Residential zone to Medium Density Residential Zone

T-240b: Residential zone to Medium Density Residential Zone

Yield:

10 dwellings total

Natural Hazard comments:

T-240a and T-240b are located on the landward edge of the Māpua coastal plain. These sites are relatively low lying but well separated from the coast (which is approximately 660 metres southeast of the site). Parts of both sites have ground levels as low as approximately 3.8 meters elevation (NZVD 2016). Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on climate change scenario SSP5-8.5 H+) and as such the site will be progressively impacted by coastal hazards.

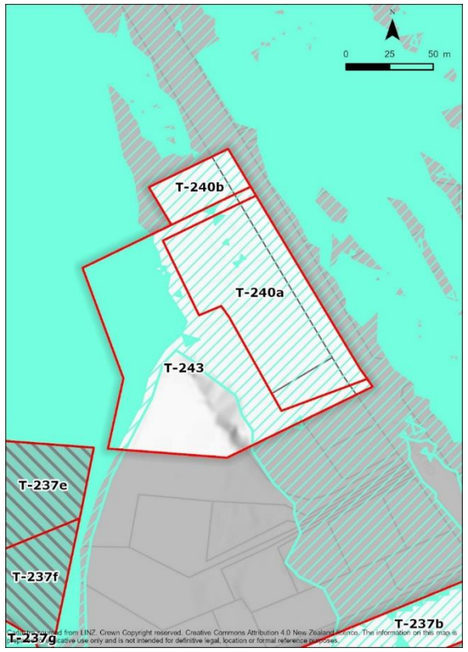
Stormwater modelling shows ponding can occur on this site during periods of prolonged or intense rainfall.

These sites are both in an area where seismic liquefaction damage is possible and are located within the orange tsunami evacuation zone.

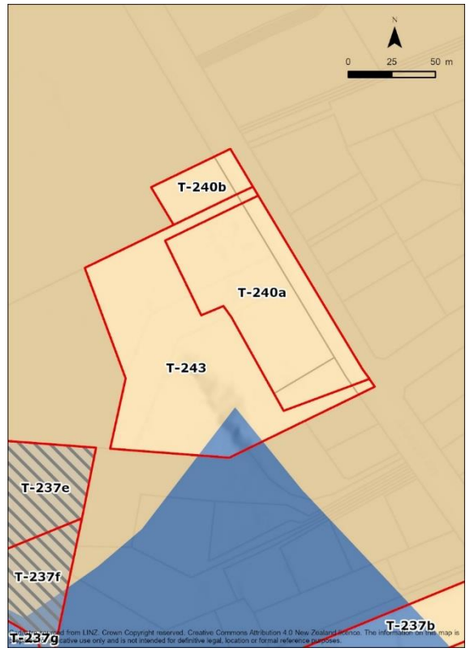
Site and Natural hazard maps for Māpua T-240a and b (109 and 119 Aranui Road and 123 Aranui Road)

Site location map

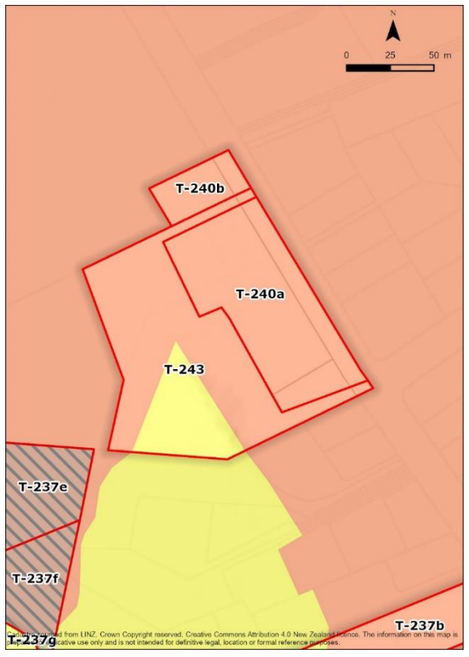
1% AEP storm tide + 2m sea-level rise



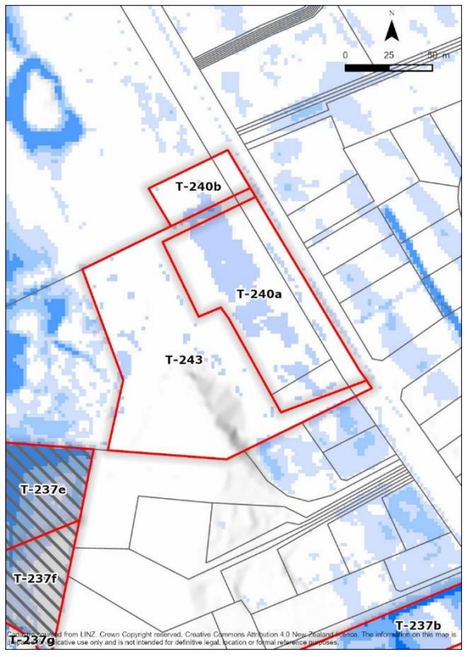
Liquefaction vulnerability assessment



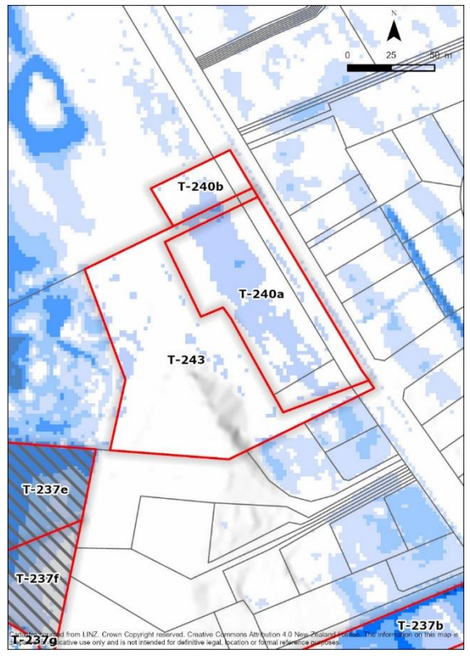
Tsunami evacuation zones



Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-240a and b (109 and 119 Aranui Road and 123 Aranui Road)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-240a	1% AEP Possible	None	Minor	Minor	Medium	Raise land and building platforms Provision of stormwater Sensible lay out	Low	Negligible	Negligible	Low	Residual risk remains low with well-designed stormwater mitigations and raised building platform levels	Yes, potential mitigation measures for medium density residential	Model assumptions Updated 2021
Coastal Inundation T-240a T-240b	1% storm tide with 2m sea-level rise Possible (100yr timeframe)	Māpua Leisure Park causeway and flap gated culverts	Minor	Minor	Medium	Raise land and building platforms Provision of stormwater Sensible lay out	Medium	Negligible	Negligible	Low	With raised land and provision of stormwater residual risk remains low.	Yes, potential mitigation measures for medium density residential	Sea-level rise occurs as projected
Liquefaction T-240a T-240b	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes, depending on mitigation measures for medium density residential	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-240a T-240b	Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **These sites are relatively low-lying and located on the landward edge of the Māpua coastal plain and will be progressively exposed to coastal inundation hazards over the 100-year planning horizon due to projected sea-level rise. Liquefaction damage is possible in places, and both sites lie within the orange tsunami evacuation zone. The risk levels from rainfall and coastal inundation and liquefaction hazards are assessed as low once mitigation measures are applied, with the residual risk remaining low. The risk level for tsunami is assessed as medium and the residual risk remains medium.**													

Māpua T-241 (0 Seaton Valley Road)

Current and Proposed zoning:

Rural 1 deferred Residential (Stage 2) to Open Space

Yield:

N/A

Natural Hazard comments:

The site currently contains a stormwater detention pond and therefore by definition is subject to periodic inundation. Prior to the construction of the stormwater detention pond, a drainage channel (a straightened tributary stream) flowed across the site. The centre of the site is low lying with ground levels as low as 2.3 metres elevation (NZVD2016) (i.e. approximately 0.5 meters above present day MHWS).

As per the natural hazards assessment methodology, T-241 has not been assessed against the NPS-NH as the proposed zoning is Open Space.

Māpua T-242 (150 Māpua Drive)

Current and Proposed zoning:

Rural 1 deferred Residential Zone to Commercial Zone

Yield:

0.23 Hectares of Business land

Natural Hazard comments:

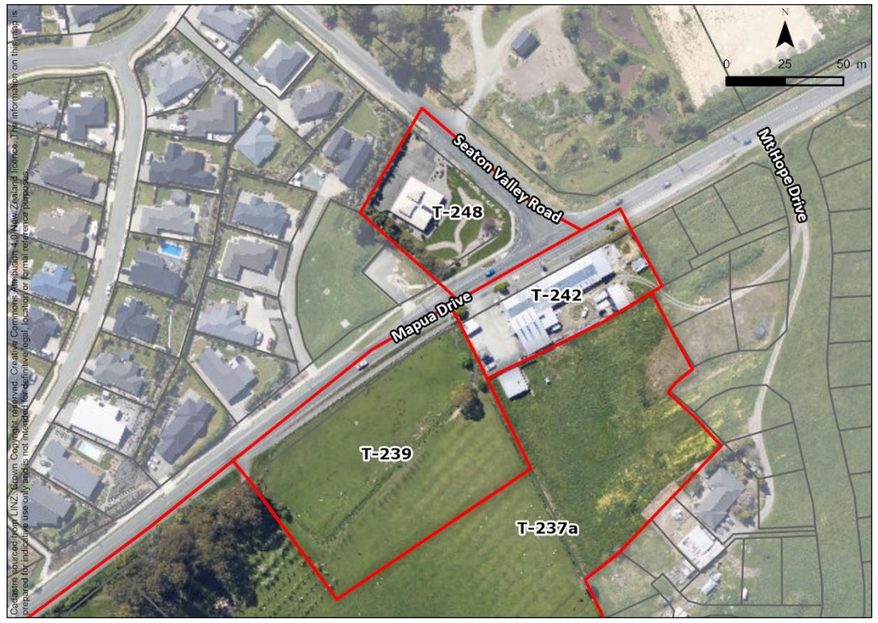
Site T-242 extends to the centre of the adjacent road (Mapua Drive), however, the developable part of the site does not include the road formation and is effectively confined to Lot 1 DP 479544. Whilst the lower lying road formation is subject to some flood hazard the developable area (Lot 1 DP 479544) is not considered subject to rainfall flood hazards.

The site is relatively low lying and on the margin of the coastal plain close to the mouth of Seaton Valley. It is well separated from the open coast (which is approximately 1,100 metres northeast and southeast of the site). Ground levels across the developable parts of this site are approximately 3.5 meters elevation (NZVD 2016) or higher. Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on the climate change scenario SSP5-8.5 H+) and as such the northwestern margins of the site will be progressively impacted by coastal hazards.

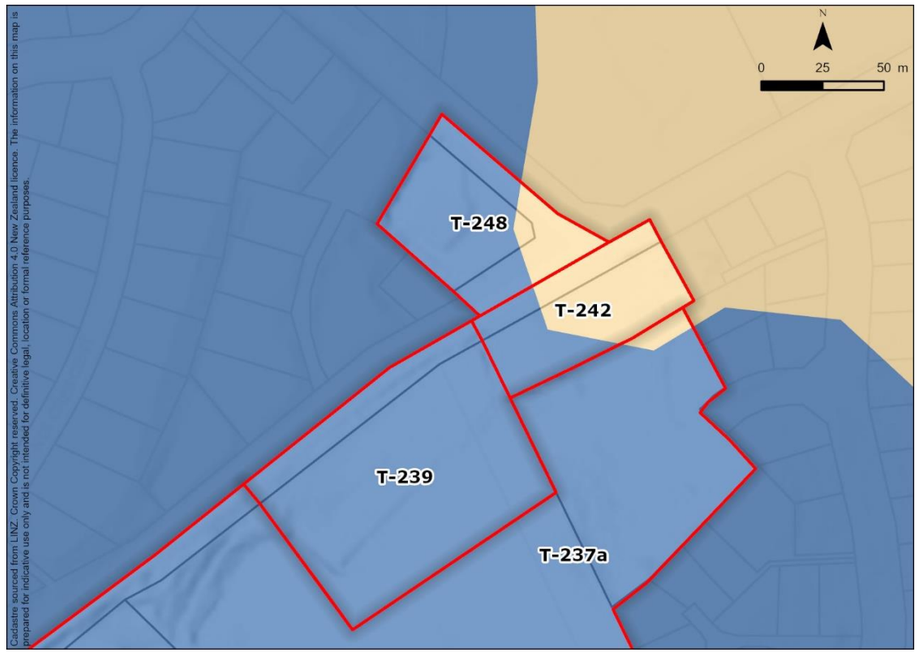
This site is located within the yellow tsunami evacuation zone and part of this site is in an area where seismic liquefaction damage is possible.

Site and Natural hazard maps for Māpua T-242 (150 Māpua Drive)

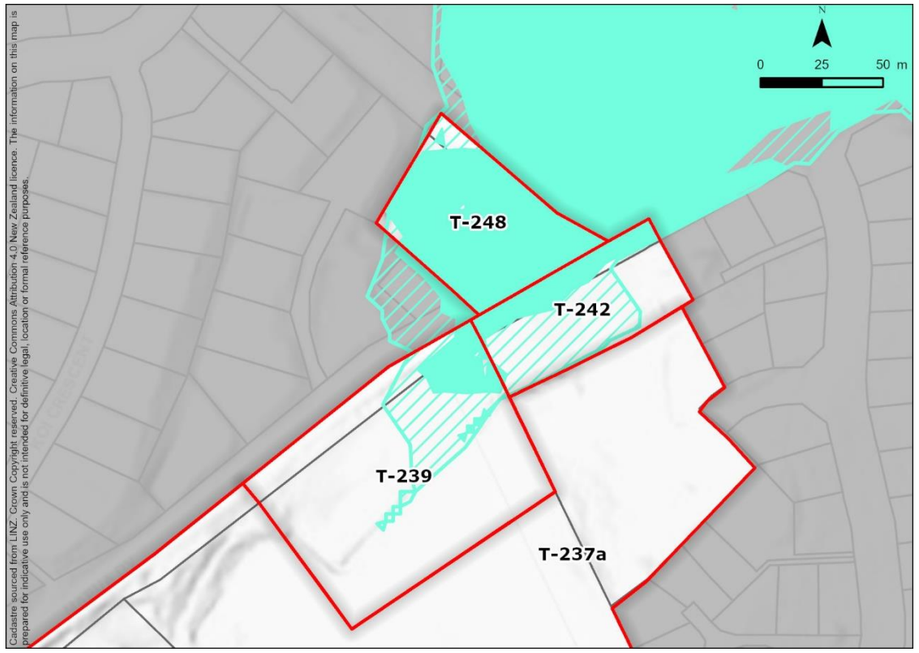
Site location map



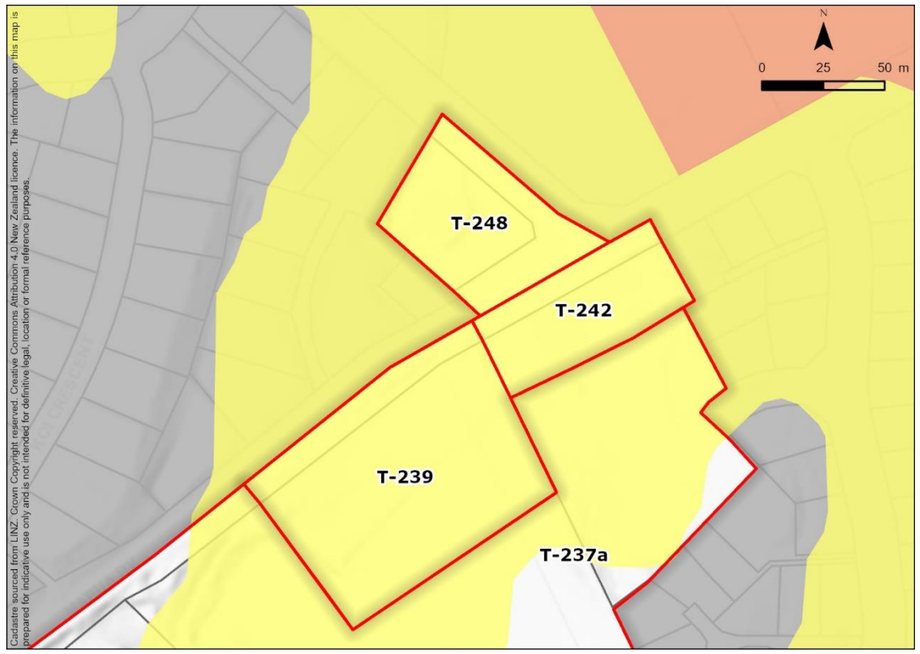
Modelled flood depths (1% AEP, present day)



1% AEP storm tide + 2m sea-level rise

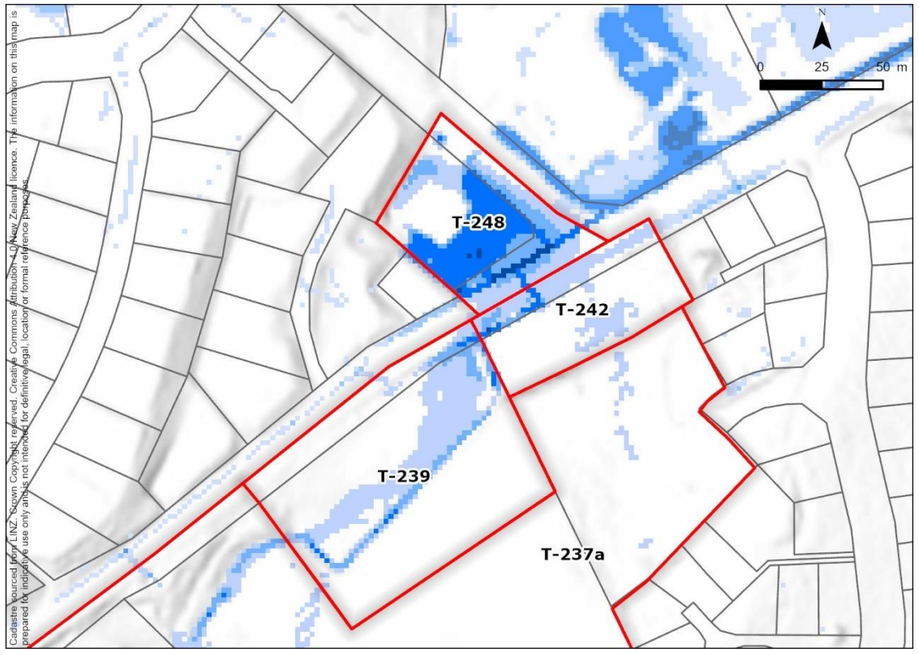


Tsunami evacuation zones

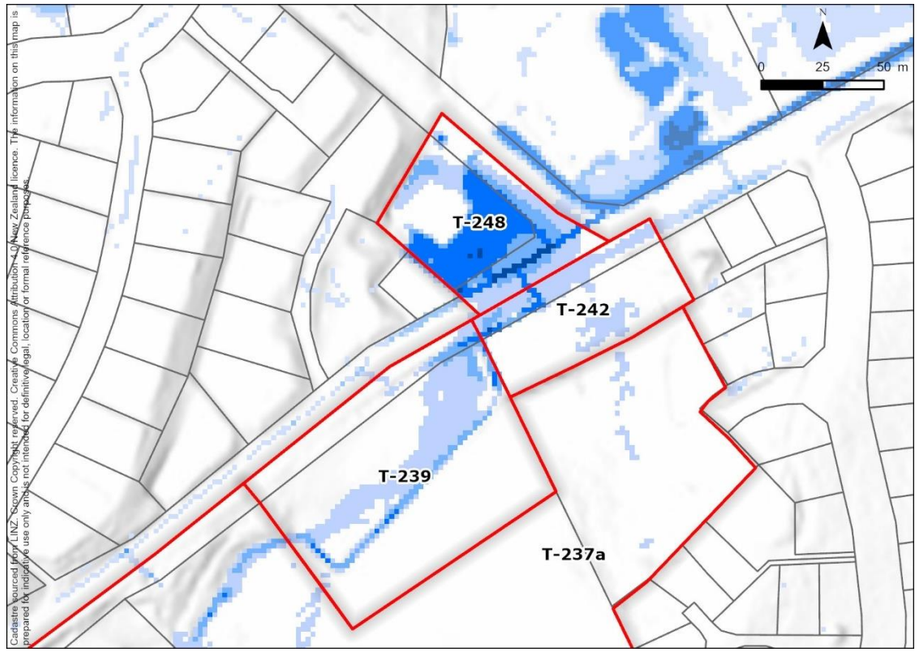


Modelled flood depth maps for Māpua T-242 (150 Māpua Drive)

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-242 (150 Māpua Drive)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-242	1% AEP Possible	None	Minor	Minor	Medium	Raise land and building platforms Sensible lay out Stormwater provision	Low	Negligible	Negligible	Low	Residual risk remains low with well-designed stormwater mitigations and site layout	Yes	Model assumptions Updated 2021
Coastal Inundation T-242	1% storm tide with 2m sea-level rise Possible	Māpua Leisure Park causeway and flap gated culverts	Minor	Minor	Medium	Raise land and building platforms Sensible lay out Stormwater provision	Low	Negligible	Negligible	Low	With raised land and building platforms residual risk remains low.	Yes, risk and costs are low, therefore proportionate	Mapua Drive (road) is included as part of this site, but was not considered for the hazard assessment
Liquefaction T-242	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes, risk and costs are low, therefore proportionate	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-242	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **The site is relatively low-lying and located on the margin of the coastal plain and will be progressively exposed to coastal inundation hazards over the 100-year planning horizon due to projected sea-level rise. Liquefaction damage is possible in places, and the site lies within the yellow tsunami evacuation zone. The risk levels from rainfall and coastal inundation and liquefaction are assessed as low once mitigation measures are applied, with the residual risk remaining low. The tsunami risk level has been assessed as medium and the residual risk remains medium.**													

Māpua T-243 (107a/b Aranui Road)

Current and Proposed zoning:

Rural Residential deferred Residential Zone to Rural Residential (serviced) zone

Yield:

No yield change

Natural Hazard comments:

T-243 is located on the landward edge of the Māpua coastal plain. Apart from an area of elevated land at the southern corner of the site, much of the site is relatively low lying, but well separated from the open coast (which is approximately 700 metres southeast of the site). Ground levels across part of the site are as low as approximately 2.8 meters elevation (NZVD 2016). Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on the climate change scenario SSP5-8.5 H+) and as such the site will be progressively impacted by coastal hazards.

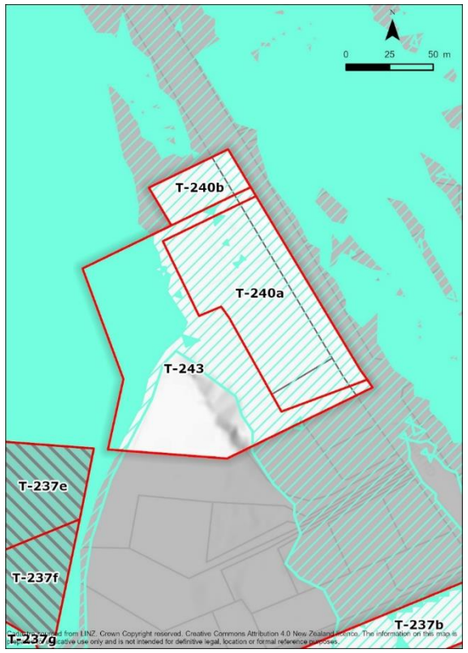
This site is located within the orange tsunami evacuation zone and part of this site is in an area where seismic liquefaction damage is possible.

While there is no additional yield proposed for this site, a natural hazards assessment has been undertaken as there may still be potential to develop or redevelop further on the site under the Rural Residential (serviced)zone.

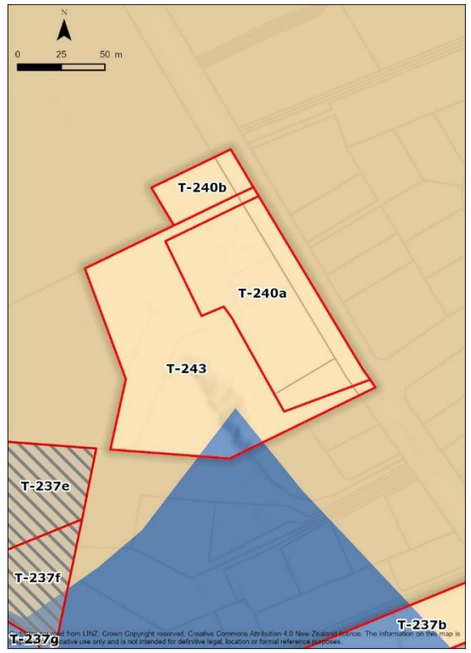
Site and Natural hazard maps for Māpua T-243 (107a/b Aranui Road)

Site location map

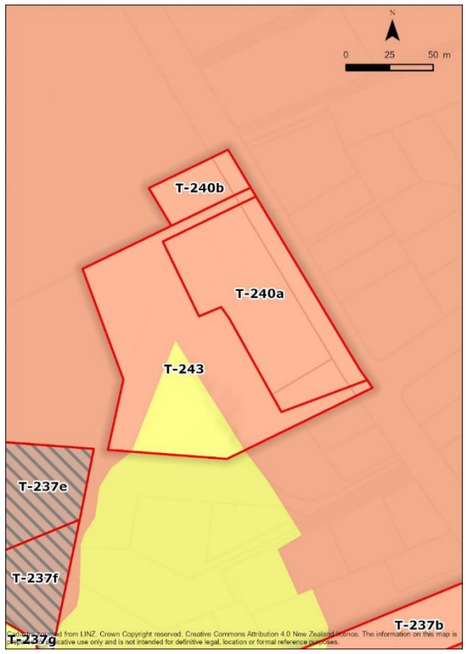
1% AEP storm tide + 2m sea-level rise



Liquefaction vulnerability assessment



Tsunami evacuation zones



Natural hazards risk assessment table for Māpua T-243 (107a/b Aranui Road)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Coastal Inundation T-243	1% storm tide with 2m sea-level rise Almost certain (100yr timeframe)	Māpua Leisure Park causeway and flap gated culverts	Moderate	Minor	High	Sensible layout Raise land for building platforms Provision of stormwater	Low	Negligible	Negligible	Low	With raised building platforms and provision of stormwater residual risk remains low.	Yes, depending on mitigation measures for Rural Residential (serviced)	Sea-level rise occurs as projected
Liquefaction T-243	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes, depending on mitigation measures for Rural Residential (serviced)	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-243	Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **Site T-243 is located at the landward edge of the Māpua coastal plain with much of the site relatively low-lying and will be progressively exposed to coastal inundation over the 100-year planning horizon. The southern corner is elevated and not subject to coastal hazards. The site is located in an area where liquefaction damage is possible and lies within the orange tsunami evacuation zone. The risk levels from coastal inundation and liquefaction hazards are assessed as low once mitigation measures are applied. The residual risk remains low, though long-term exposure to coastal hazards will increase as sea-level rise progresses. The risk level for tsunami is assessed as medium and the residual risk remains medium.**												

Māpua T-244 (18 and 34 Stafford Drive)

Current and Proposed zoning:

Rural 1 deferred Light Industrial to Light Industrial

Yield:

1.7 hectares of light industrial land

Natural Hazard comments:

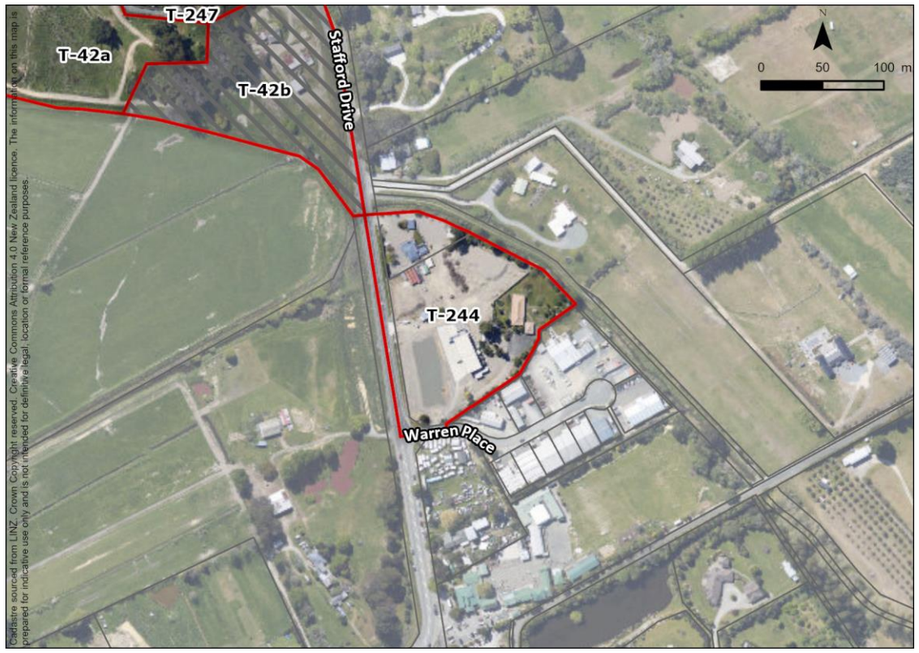
T-244 is located on the Māpua coastal plain, is relatively low lying, and is located some 450m inland from the open coast. Ground levels across parts of the site are as low as approximately 3.5m elevation (NZVD 2016). Mean High Water Springs (MHWS) is currently 1.71m elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on climate change scenario SSP5-8.5 H+) and as such the site will be progressively impacted by coastal hazards.

The Seaton Valley Stream flows adjacent to the site. Flood modelling indicates that it does not present a pluvial/fluvial flood hazard to this site during a 1% AEP rainfall provided the channel capacity is maintained. The modelling shows ponding can occur on this site during periods of prolonged or intense rainfall.

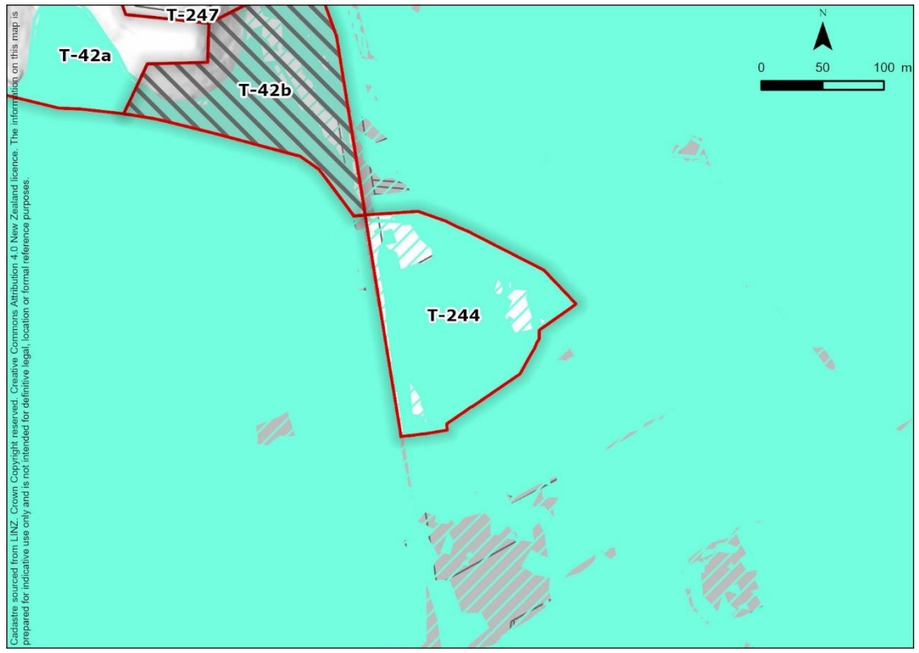
This site is located within the orange tsunami evacuation zone and part of this site is in an area where seismic liquefaction damage is possible.

Site and Natural hazard maps for Māpua T-244 (18 and 34 Stafford Drive)

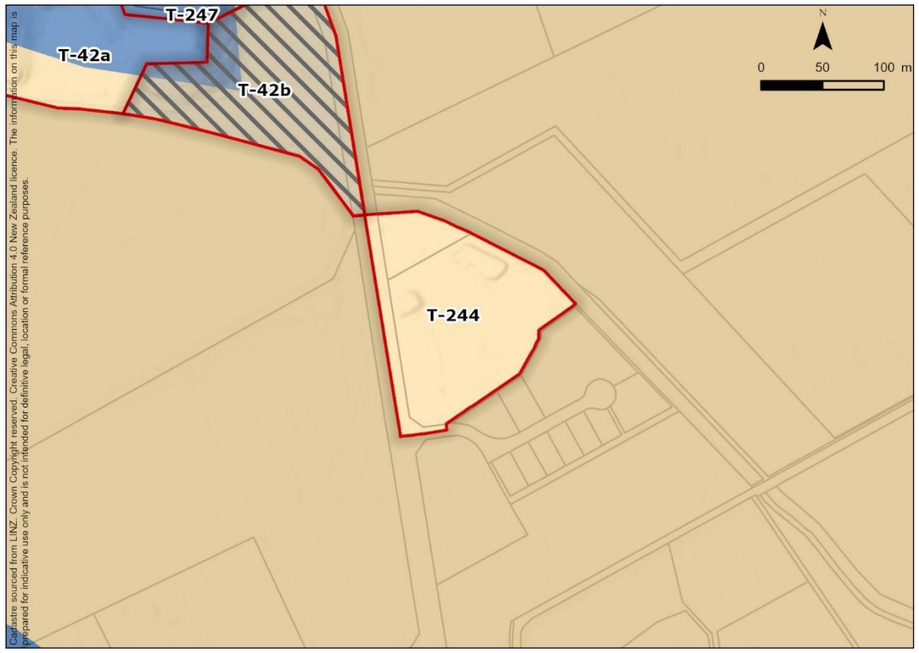
Site location map



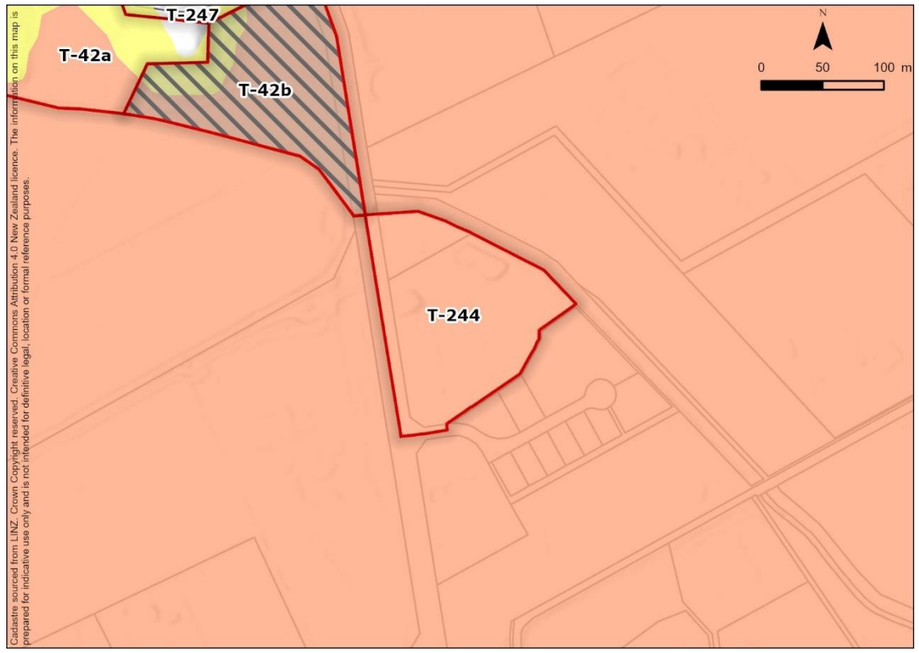
1% AEP storm tide + 2m sea-level rise



Liquefaction vulnerability assessment

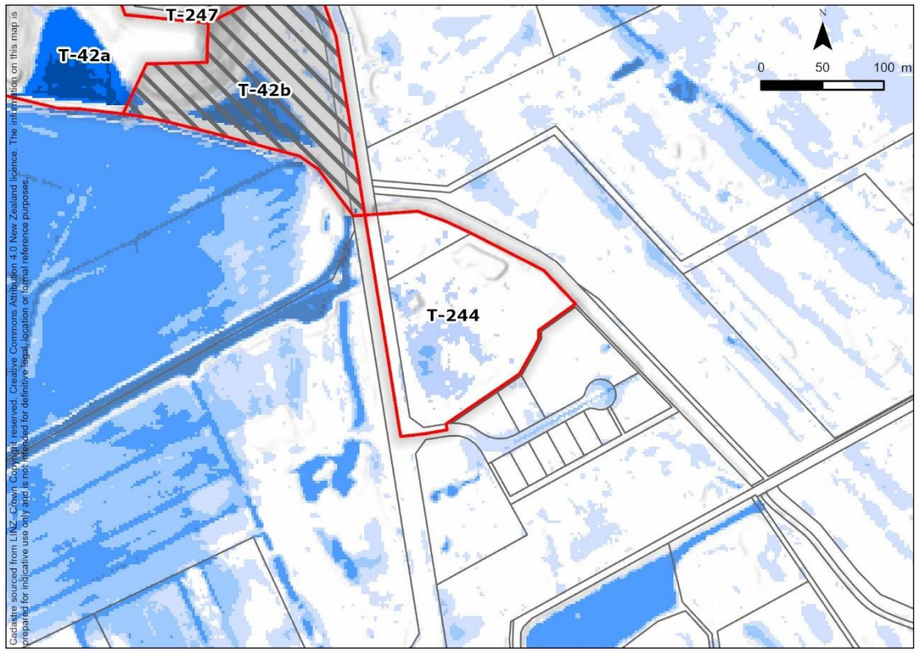


Tsunami evacuation zones

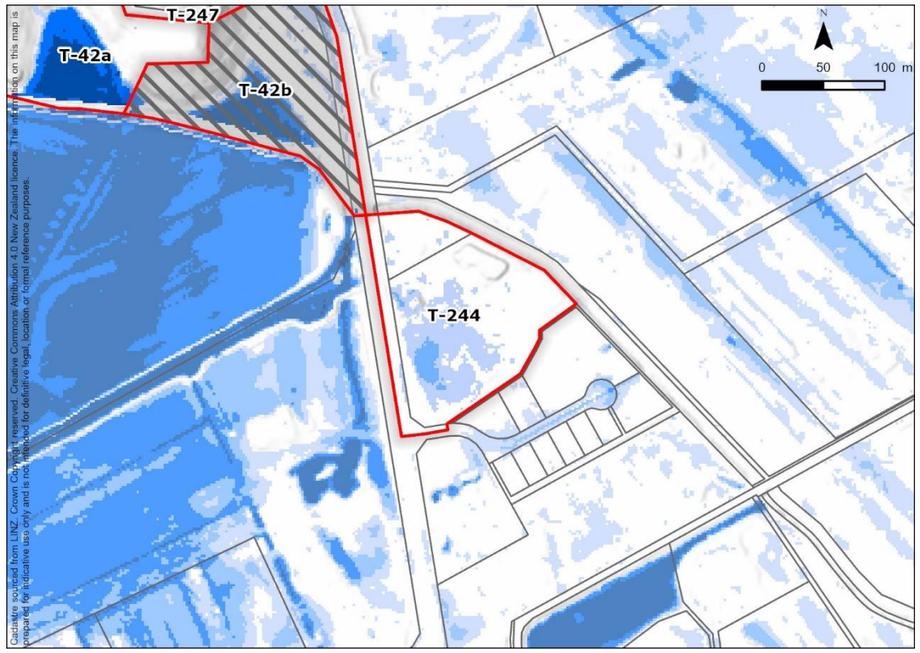


Modelled flood depth maps for Māpua T-244 (18 and 34 Stafford Drive

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-244 (18 and 34 Stafford Drive)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-244	1% AEP Possible	None	Minor	Minor	Medium	Sensible lay out Raise land for building platforms Provision of stormwater	Low	Negligible	Negligible	Low	Residual risk remains low with well-designed stormwater mitigations and raised building platforms	Yes	Model assumptions Updated 2021
Coastal Inundation T-244	1% storm tide with 2m sea-level rise Almost certain (100yr timeframe)	Māpua Leisure Park causeway and flap gated culverts	Moderate	Minor	High	Sensible lay out Raise land for building platforms Provision of stormwater	Low	Negligible	Negligible	Low	With raised building platforms and provision of stormwater residual risk remains low.	Yes, depending on mitigation measures for Light Industrial	Sea-level rise occurs as projected

Liquefaction T-244	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes, depending on mitigation measures for Light Industrial	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-244	Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not every will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **Site T-244 is relatively low-lying and located on the Māpua coastal plain and will be progressively exposed to coastal inundation over the 100-year planning horizon. The site is located in an area where liquefaction damage is possible and within the orange tsunami evacuation zone. The risk levels from rainfall and coastal inundation and liquefaction are low once mitigation measures are applied, with residual risk remaining low, although exposure to coastal hazards will increase as sea-level rise progresses. The risk level from tsunami is assessed as medium and residual risk remains medium.**												

Māpua T-245 (29 and 53 Seaton Valley Road)

Current and Proposed zoning:

Rural 1 deferred Medium Density Residential to Residential Zone

Yield:

122 dwellings

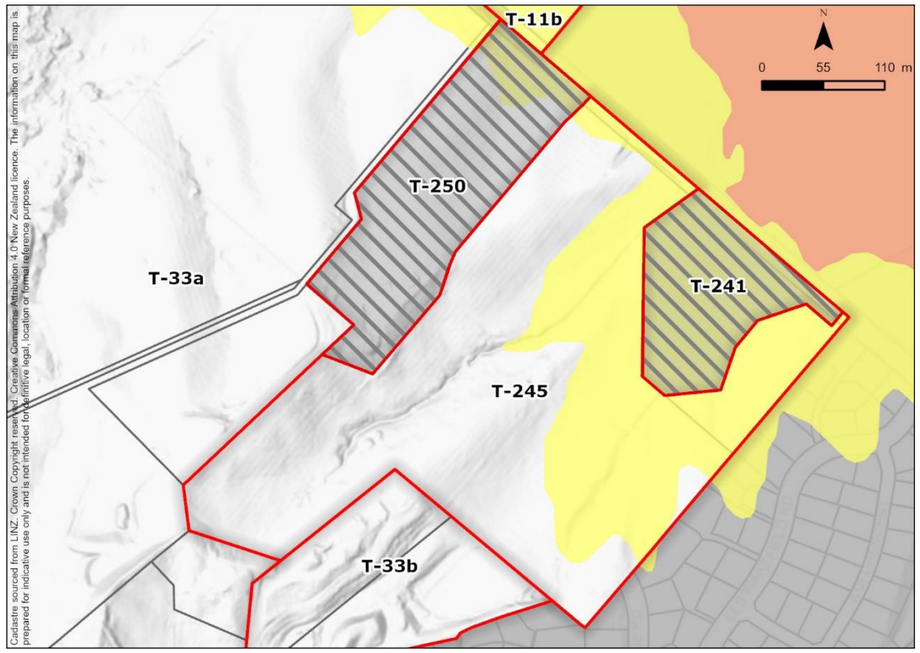
Natural Hazard comments:

The land is undulating and contains two small, ephemeral, tributary streams. Apart from the existing stream channels the site is elevated above expected inundation levels from a 1% AEP rainfall. Part of the site is in the yellow tsunami evacuation zone.

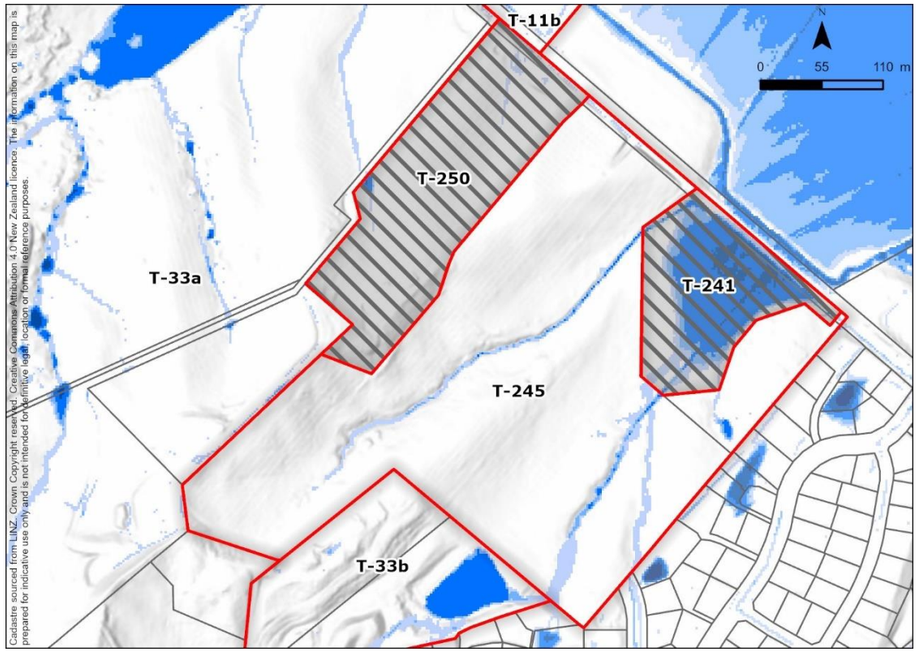
Site and Natural hazard maps for Māpua T-245 (29 and 53 Seaton Valley Road

Site location map

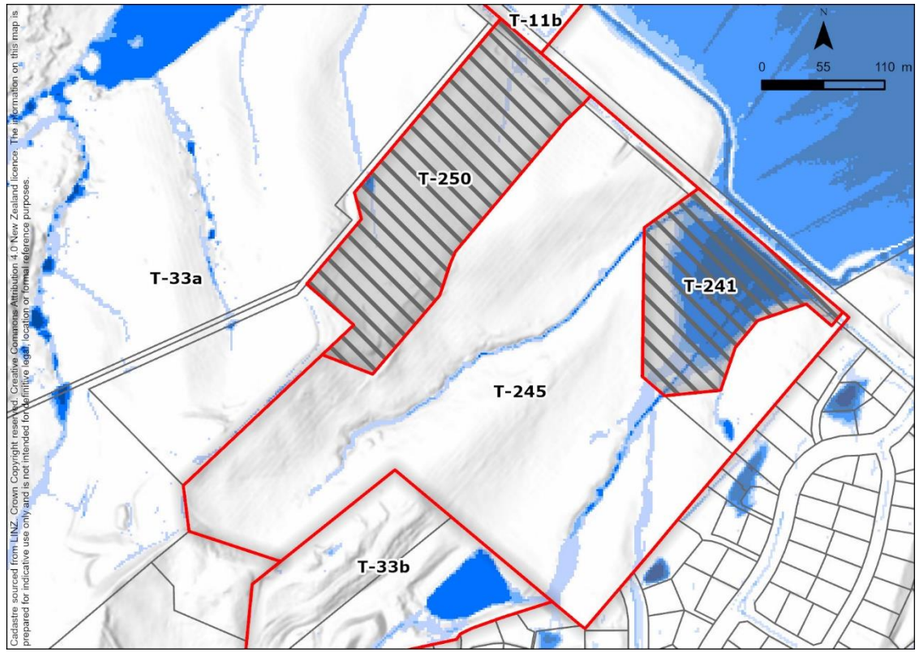
Tsunami evacuation zones



Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-245 (29 and 53 Seaton Valley Road

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes NPS- NH 3.4 (1) & (2)
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-245	1% AEP Possible	None	Minor	Minor	Medium	Sensible layout Provision for watercourses and stormwater reticulation	Low	Negligible	Negligible	Low	With well engineered flow paths and stormwater reticulation residual risk is low	Yes, depending on mitigation measures for residential density	Model assumptions Updated 2021
Tsunami T-245	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **Site T-245 consists of undulating land with two small ephemeral streams, and apart from the existing stream channels, the wider site not considered to be subject to flood hazard. The risk level from flood hazards is low, with the residual risk remaining low. The risk level from tsunami is assessed as medium and residual risk remains medium.**													

Māpua T-247 (57, 59 and 69 Stafford Drive)

Current and Proposed zoning:

Rural 1 deferred Rural Residential (serviced)

Yield:

Unlikely yield increase (already developed)

Natural Hazard comments:

Much of the site is well elevated above expected inundation levels (both from coastal flooding and from the Seaton Valley Stream). The eastern margin of the site is lower lying and separated from elevated land by a relatively steeply sloping remnant of a former sea cliff (up to 20 meters high). The coast is approximately 350 metres to the northeast of this site. Ground levels across the lower lying eastern part of the site are approximately 3.2 to 3.5 meters elevation (NZVD 2016). Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on climate change scenario SSP5-8.5 H+) and as such this part of the site will be progressively impacted by coastal hazards.

Stormwater modelling shows ponding can occur along the Stafford Drive boundary during periods of prolonged or intense rainfall.

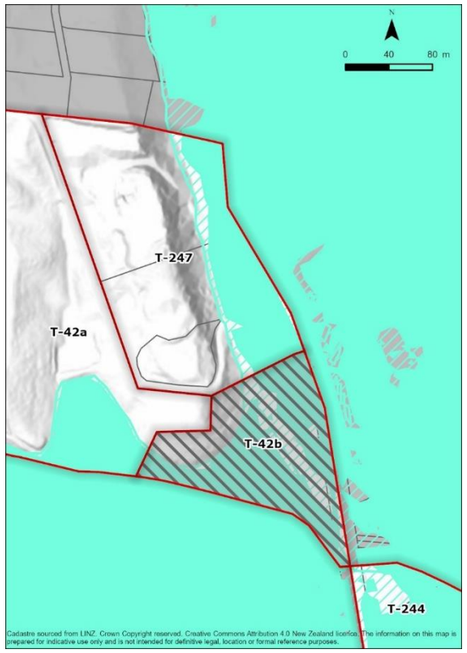
The lower lying eastern part of this site is located within the orange tsunami evacuation zone and is an area where seismic liquefaction damage is possible.

While there is no additional yield proposed for this site, a natural hazards assessment has been undertaken as there may still be potential to develop or redevelop further on the site with the change in zoning to Rural Residential (serviced).

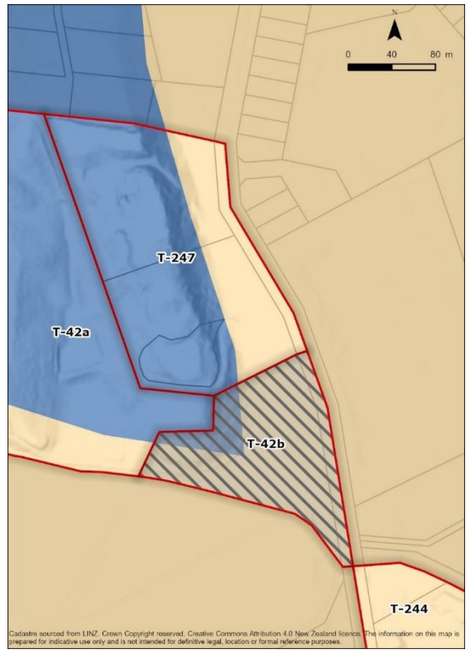
Site and Natural hazard maps for Māpua T-247 (57, 59 and 69 Stafford Drive)

Site location map

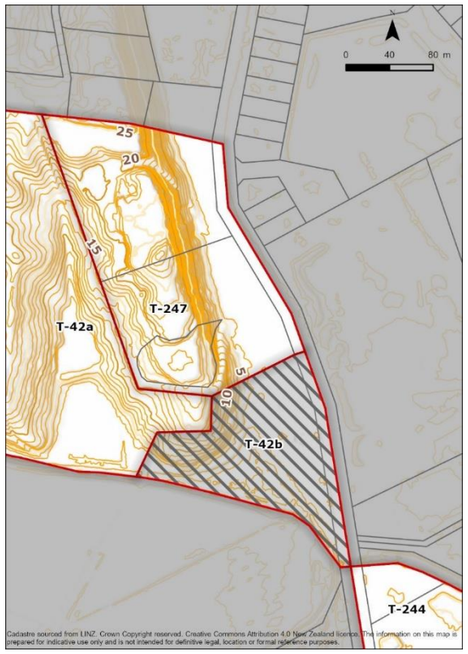
1% AEP storm tide + 2m sea-level rise



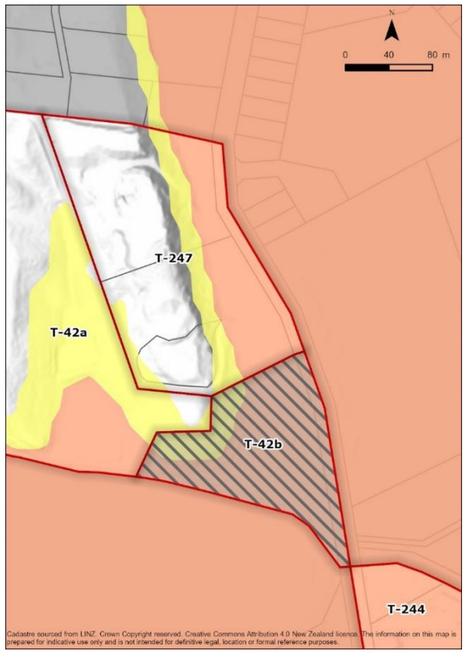
Liquefaction vulnerability assessment



Elevation contours showing slope steepness

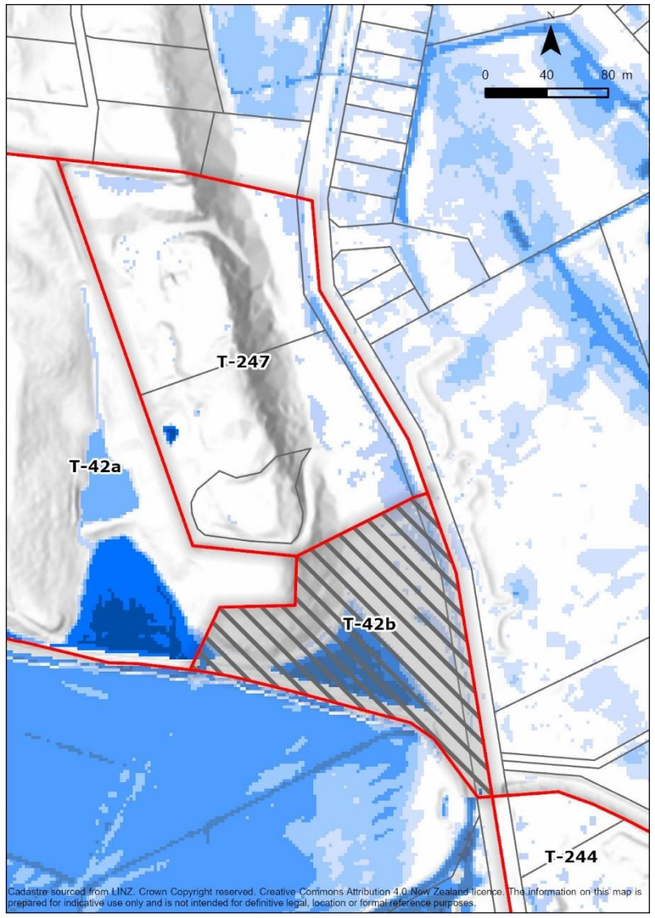


Tsunami evacuation zones

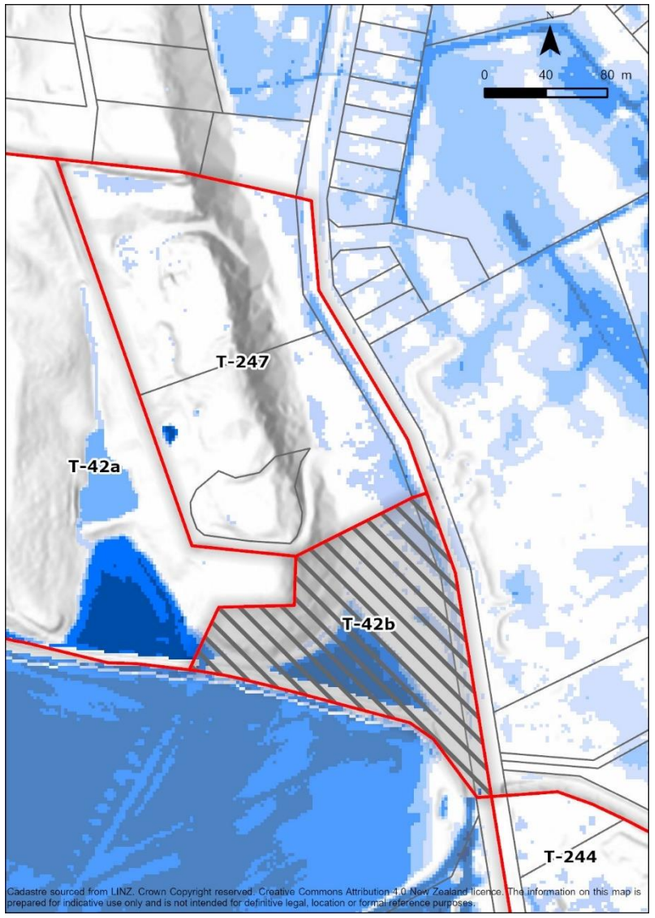


Modelled flood depth maps for Māpua T-247 (57, 59 and 69 Stafford Drive))

Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-247 (57, 59 and 69 Stafford Drive)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes NPS- NH 3.4 (1) & (2)
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-247	1% AEP Possible	None	Minor	Minor	Medium	Sensible lay out Raise land for building platforms Provision of stormwater	Low	Negligible	Negligible	Low	With raised building platforms and provision of stormwater residual risk remains low.	Yes, with typical mitigation measures for Rural Residential	Model assumptions Updated 2021
Coastal Inundation T-247	1% storm tide with 2m sea-level rise Almost certain (100yr timeframe)	Māpua Leisure Park causeway and flap gated culverts	Moderate	Minor	High	Sensible lay out Raise land for building platforms Provision of stormwater	Low	Negligible	Negligible	Low	With raised building platforms and provision of stormwater residual risk remains low.	Yes, depending on mitigation measures for Rural Residential	The majority of the site is elevated above coastal hazards
Landslides / slope instability T-247	Possible	None	Moderate	Moderate	Medium	Sensible layout Setback from slopes Geotechnical assessments	Low	Minor	Minor	Medium	Risk remains medium	Yes, subject to mitigations measures proposed for the type of development.	Uncertainty around frequency of damaging landslides
Liquefaction T-247	500 year shaking Unlikely	None	Moderate	Minor	Medium	Engineered foundations Building code requirements	Low	Minor	Minor	Low	Residual damage possible.	Yes, depending on mitigation measures for Rural Residential	Uncertainty with specific ground strata and some specific locations maybe more susceptible than others
Tsunami T-247	Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **Site T-247 is largely elevated above expected inundation levels. The eastern margin of the site is lower-lying and separated from the remainder of the site by a relatively steep former sea-cliff. The low-lying eastern part of the site will be progressively exposed to coastal inundation over the 100-year planning horizon and is an area where liquefaction damage is possible. The risk levels from rainfall and coastal inundation and liquefaction hazards are assessed as low once mitigation measures are applied. The residual risk remains low, although long-term exposure to coastal hazards will increase as sea-level rise progresses. The risk level for landslides and tsunami is assessed as medium, and the residual risk remains medium.**													

Māpua T-248 (5 Seaton Valley Road)

Current and Proposed zoning:

Rural 1 deferred Residential zone to Commercial zone

Yield:

0.21 hectares of business land

Natural Hazard comments:

The site is located on the margin of the coastal plain close to the mouth of Seaton Valley. The coast is approximately 1000 metres to the northeast of this site. Ground levels across the southeastern half of the site are as low as approximately 2.4 meters elevation (NZVD 2016), rising to approximately 3.4 metres elevation (NZVD 2016) across much of the northwestern half of the site. Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on climate change scenario SSP5-8.5 H+) and as such this part of the site will be progressively threatened by coastal hazards.

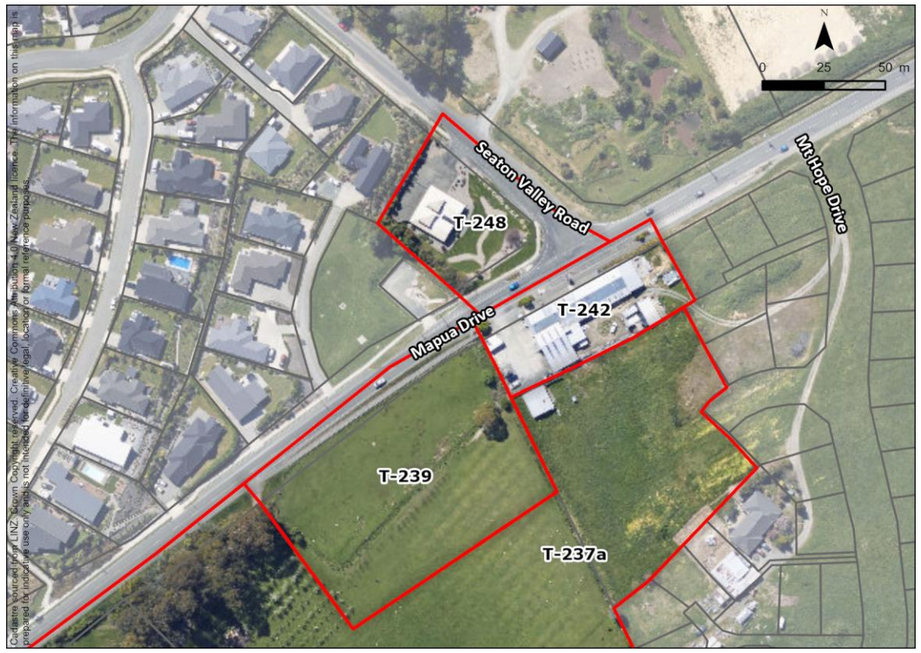
The lower lying southeastern half of this site is subject to ponding during rainfalls. The volume and extent of ponding is governed by the roads bounding the site and the capacity of the culverts beneath the roads.

The existing land use (electricity sub-station) is confined to the higher northwestern part of the site and is above inundation levels relevant to that land use and associated planning timeframes.

Site T-248 is located within the yellow tsunami evacuation zone.

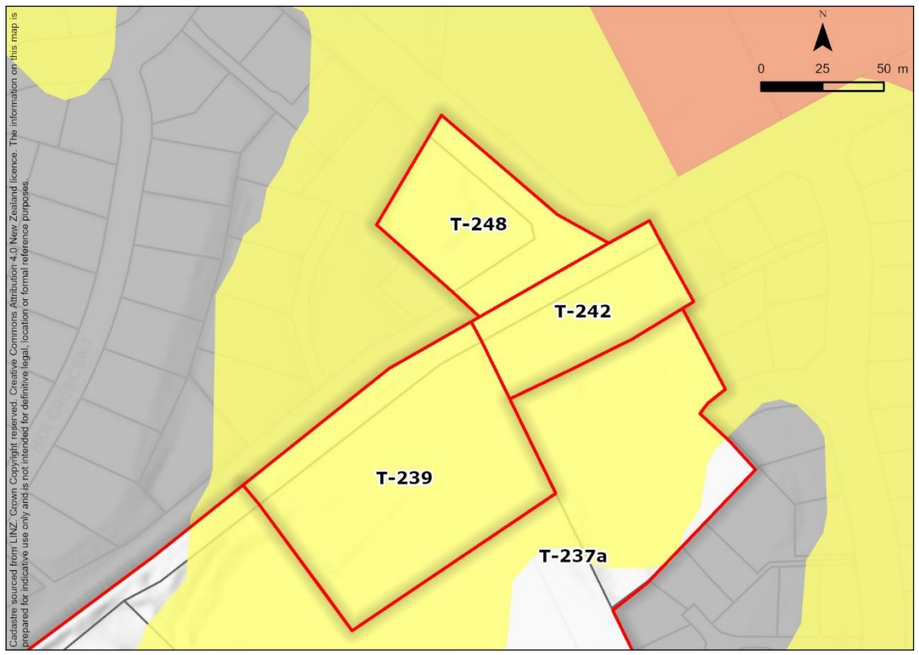
Site and Natural hazard maps for Māpua T-248 (5 Seaton Valley Road)

Site location map

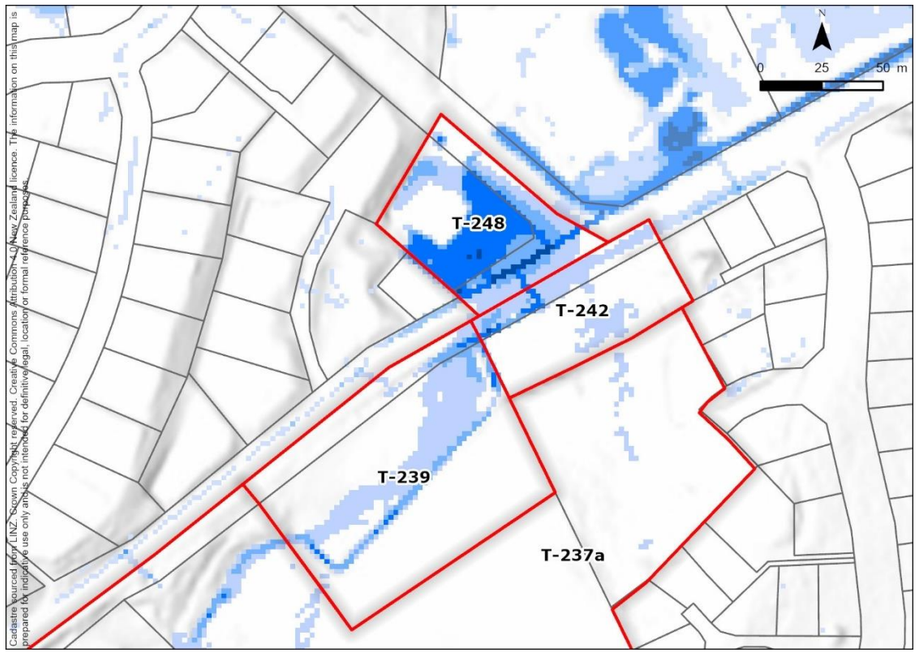


1% AEP storm tide + 2m sea-level rise

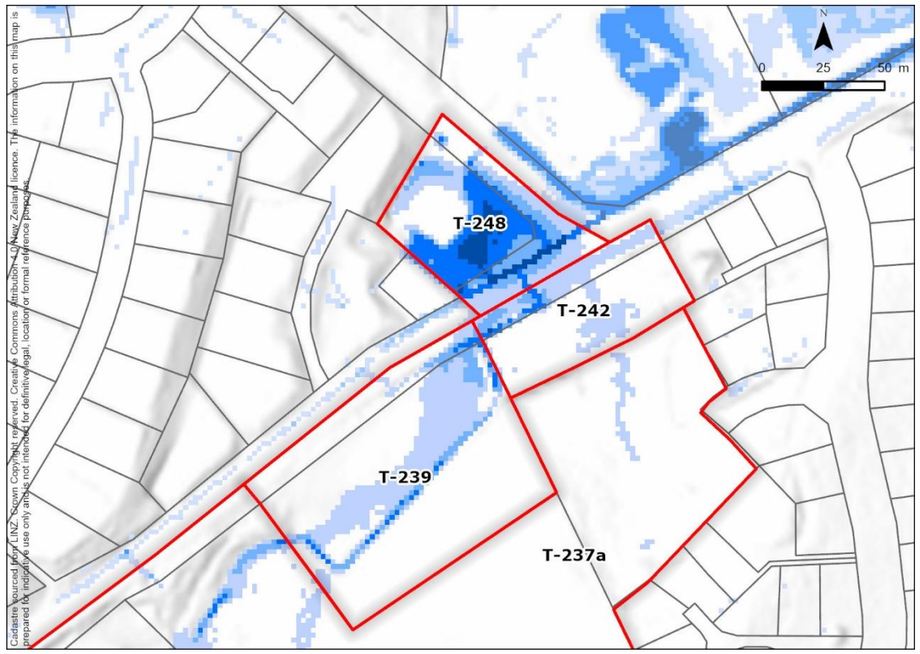
Tsunami evacuation zones



Modelled flood depths (1% AEP, present day)



Modelled flood depths (1% AEP, future day RCP8.5 to 2090)



Natural hazards risk assessment table for Māpua T-248 (5 Seaton Valley Road)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flood	1% AEP Possible	Māpua Leisure Park causeway and flap gated culverts Existing development including raised building platform and provision for stormwater	Minor	Negligible	Medium	Maintenance of existing mitigation measures Avoiding the lower lying southeastern portion of the site		Negligible	Negligible	Low	With raised land residual risk remains low.	Yes, risk and costs are low, therefore proportionate	
Coastal Inundation T-248	1% storm tide with 2m sea-level rise Almost certain	Māpua Leisure Park causeway and flap gated culverts Existing development including raised building platform and provision for stormwater	Moderate	Minor	High	Maintenance of existing mitigation measures Additional measures may be necessary over the 100 year planning horizon	Low	Negligible	Negligible	Low	With raised land residual risk remains low.	Yes, risk and costs are low, therefore proportionate	Sea-level rise occurs as projected
Tsunami T-248	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	

Natural hazard risk level assessment summary:
Site T-248 is located on the margin of the Māpua coastal plain and contains low-lying areas that may experience ponding during rainfalls and will be progressively exposed to coastal inundation over the 100-year planning horizon. The site is within the yellow tsunami evacuation zone. The risk level from flooding and coastal inundation hazards are assessed as low with the adopted mitigation measures. The residual risk remains low, although the site will be progressively exposed to coastal hazards over the 100-year planning horizon as sea levels rise. The tsunami risk level is assessed as medium and the residual risk remains medium.

Māpua T-249 (Part 55 Higgs Road)

Current and Proposed zoning:

Rural 1 deferred Residential zone to Rural 1 zone

Yield:

N/A

Natural Hazard comments:

The land is undulating and includes a small gully. The site extends to the coast with the land sloping upwards directly from the coastal margin. Being located inside an estuary and sheltered from wave action, this coast is subject to very low erosion hazard.

The valley area adjacent to the coast of site T-249 is in the yellow tsunami evacuation zone.

As per the natural hazards assessment methodology, T-249 has not been assessed against the NPS-NH as the proposed zoning is Rural 1.

Māpua T-250 (59 Seaton Valley Road)

Current and Proposed zoning:

Rural 1 deferred Residential zone to Rural 1 deferred Medium Density Residential

Yield:

54 dwellings

Natural Hazard comments:

The site is undulating and is not considered to be subject to natural hazards.

Māpua T-42a and T-42b (Part 49 Stafford Drive)

Current and Proposed zoning:

Rural 1 deferred Rural Residential (serviced) zone to Rural 1 deferred Residential (T-42a) and Rural 1 (T-42b)

Yield:

140 dwellings in total

Natural Hazard comments:

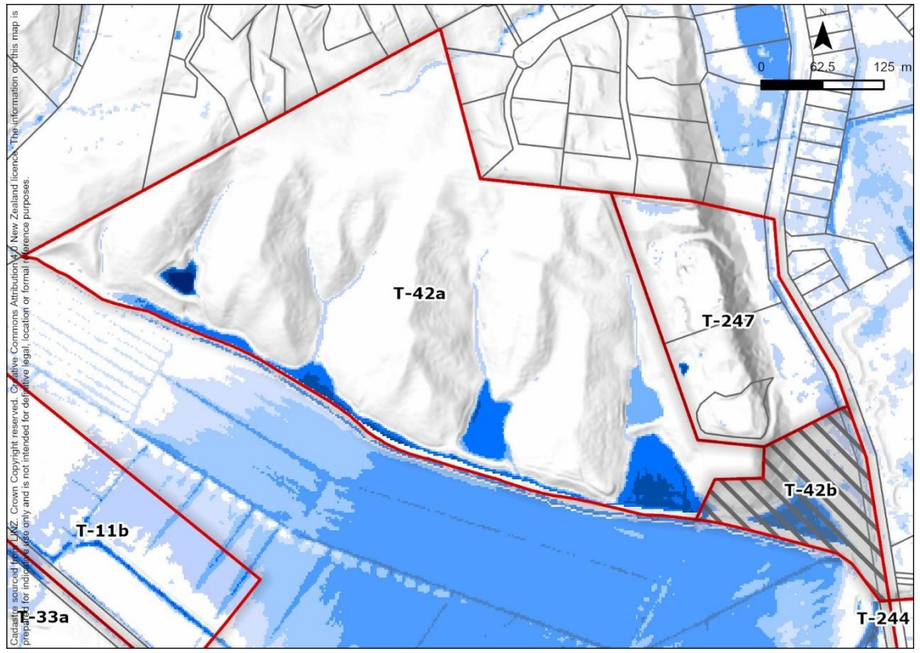
Site T-42a is undulating and contains a number of small, ephemeral tributary streams, of which some have been dammed to form small ponds. The southern boundary of the site is broadly aligned with the base of the hill slopes. The adjacent land to the south comprises the Seaton Valley stream flood plain with the stream channel currently aligned along the base of the hill slopes right at the edge of the flood plain. Parts of the channel are within the site and parts lie adjacent to it. Site T-42a is intended to include the hillslopes adjacent to the flood plain and not extend onto the flood plain. It is anticipated that development of the site will adopt a pragmatic approach to this boundary and development earthworks will ensure any flood hazards and impacts to the stream channel are avoided. Therefore, apart from the ephemeral stream channels and the constructed ponds, the site is not considered to be subject to flood hazards in a 1%AEP rainfall. The valleys on site T42a are within the yellow tsunami evacuation zones.

The bulk of site T-42b is located on the landward edge of the Mapua coastal plain close to the mouth of Seaton Valley, with a relatively small area extending to the northwest up onto the adjacent hill slopes. The coast is approximately 350 metres northeast of the site. On the coastal plain the site is low lying with ground levels of approximately 2.0 to 3.5 meters elevation (NZVD 2016). Mean High Water Springs (MHWS) is currently 1.71 meters elevation (NZVD 2016). Current relative sea-level rise projections for 100 years are approximately 2m (based on climate change scenario SSP5-8.5 H+) and as such this part of the site will be progressively impacted by coastal hazards.

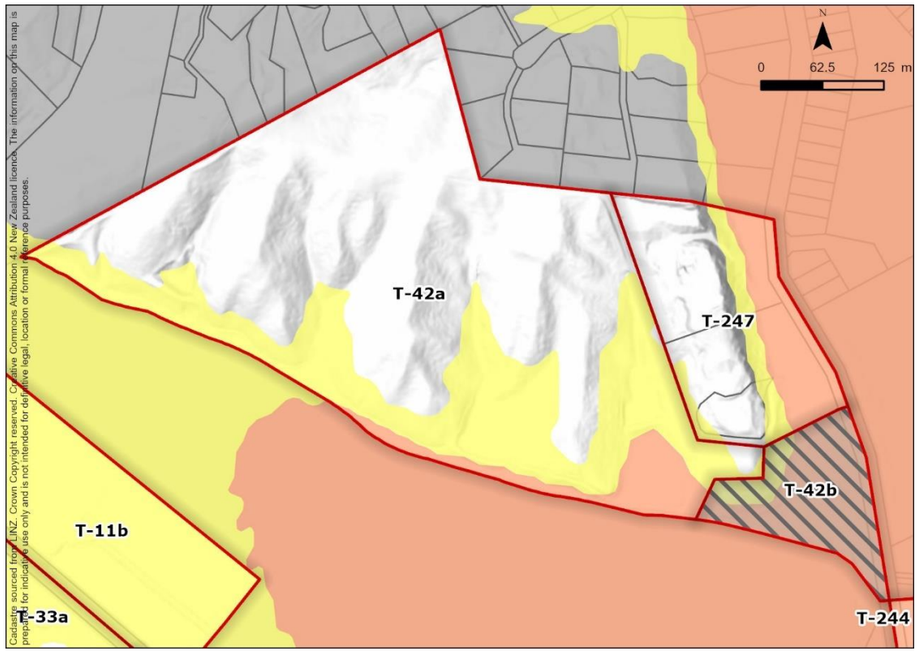
Site and Natural hazard maps for Māpua T-42a and T-42b (Part 49 Stafford Drive)

Site location map

Modelled flood depths (1% AEP, present day)



Tsunami evacuation zones



Natural hazards risk assessment table for Māpua T-42a (Part 49 Stafford Drive)

Hazard and Site Location Number	Likelihood (NPS Table 1)	Existing mitigation	Consequence (NPS Table 2) assessment based on existing mitigations		Risk level (NPS matrix)	Potential mitigation measures (plan-level assumptions)	Cost rating of potential mitigation measures	Consequence (NPS Table 2) assessment based on existing and potential mitigations		Risk level (NPS matrix)	Residual risk comment	Is the cost of potential mitigations proportionate to the level of risk	Notes
			Damage to property	Potential for injury or fatalities				Damage to property	Potential for injury or fatalities				
Flooding (river/surface) T-42a	1% AEP Possible	None	Minor	Minor	Medium	Sensible layout Provision for watercourses and stormwater reticulation	Medium	Negligible	Negligible	Low	With well engineered flow paths and stormwater reticulation residual risk is low	Yes, depending on mitigation measures for residential density	Model assumptions Updated 2021
Tsunami T-42a	Very Rare	Education Evacuation planning to preserve life via CDEM	Major	Major	Medium	No additional measures	Low	Major	Major	Medium	Residual risk from tsunami remains to buildings and life.	Yes, reliant on evacuation, recognising that not everyone will evacuate. There is no further potential mitigation and hazard event is rare to very rare.	
Natural hazard risk level assessment summary: **Site T42a is undulating with ephemeral streams within the valleys. Part of this site is located within the yellow tsunami evacuation zones. The risk level for flooding is assessed as low with mitigation measures, and the residual risk remains low. The tsunami risk level is assessed as medium and the residual risk remains medium.**													