APPENDIX F Environmental Social Responsibility Screens (ESRs)

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

NZ TRANSPORT AGENCY WAKA KOTAHI

Use to assess options in the Indicative Business Case

Use this screen to identify opportunities and risks and assess options for state highway projects. Complete the screen for each option to distinguish them from one another or bundle options where appropriate. Screen results will signal where technical assessments are required and provide a written record to support the alternatives assessment required for statutory applications. For further assistance contact the EUD Team.

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Decide how many times screen should be filled out (Group Options) ▶ Answer screen questions using project information and suggested information sources ▶ Refer to screen questions explanation, particularly if you answered yes to any of the questions ▶ Complete page 2 of screen ▶ Incorporate page 2 text in IBC assessment of options table (Background and MCA)

PROJECT LOCATION:	PROJECT PURPOSE:	DATE:	OPTION DESCRIPTION:
Waipapa State Highway 10	Intersection Upgrade	25/05/2017	Right Turn Bay Option

CATEGORY		QUESTION	ANSWER				USEFUL INFORMATION SOURCES
GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural ☐	Commercial ◉			District/Unitary Plan Zoning Maps
			Industrial ◉	Residential ☐			
			High density residential ☐	Parks/open space ☐			
	G2	Does the option disturb previously undisturbed land?	Y ☐	N ○			
	G3	What is the construction timeframe?	>18 months ☐	<18 months ○			
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y ☐	N ○			NZTA MapHub Environmental and Social Risk Map- Natural Environment
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y ☐	N ○			Regional Plan Maps and Schedules
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y ☐	N ○			District Plan Maps and Schedules
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y ☐	N ○			Department of Conservation
	NE5	Will more than 0.5 hectares of vegetation be removed?	Y ☐	N ○			
		What type?					
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y ☐	N ○			Iwi NZTA MapHub Environmental and Social Risk Map- Culture and Heritage Heritage New Zealand List NZ Archaeological Association District Plan Maps and Schedules Regional Plan Maps and Schedules IPENZ Heritage List NZTA GIS predictive models
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y ☐	N ○			
	CH3	Are any scheduled, listed or other important heritage buildings/ structures within 200m of the area of interest?	Y ☐	N ○			
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y ☐	N ○			
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y ☐	N ○			
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National ☐	Regional ◉			NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes: - Designated airsheds (including one network classification) - Highly sensitive receivers Regional Council Contaminated sites Team
			Arterial ☐	Collector ☐			
	HH2	Is the area of interest designated as a non-compliant airshed?	Y ☐	N ○			
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y ☐	N ○			
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination? OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y ☐	N ○			
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y ☐	N ○			NZTA MapHub Project Team District Plan Maps Council and Community Strategy Documents
			Which?				
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y ☐	N ○			
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y ☐	N ○			NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes) Regional Land Transport Plan Project Team Strategies and District Plan
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y ☐	N ○			
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y ☐	N ○			
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y ☐	N ○			

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	Works footprint is pre-disturbed, contains no significant ecological/flora/fauna values. SH10 and Maritime Road both cross a stream. Any crossings of the stream must not worsen upstream flooding up to 100 year ARI, and must not worsen fish passage up to 1 year ARI.
CULTURAL AND HISTORIC HERITAGE:	Works footprint is pre-disturbed, contains no significant archaeology/heritage values.
HUMAN HEALTH:	Portion of land needs to be taken from electrical substation on corner of Maritime Rd and Loop Road, likely a HAIL activity. Potential for contaminated land.
SOCIAL:	Business/properties on eastern side of Loop road likely to be impacted at least during works period. Appears businesses utilise road reserve for car parking. Option has benefit that no change to northern connection Loop Road/SH10 will occur - no major change.

The responses above will be used in the IBC assessment of options summary table: MCA of the Option.

URBAN AND LANDSCAPE DESIGN:	Some opportunity to provide landscaping improvement on corner of Maritime Road and Loop Road - portion of road designation on northern side of intersection will remain unutilised.

Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Ensure businesses on eastern side of loop road are not heavily impacted during works. Major vehicle entry/exit point from business here + business utilises road reserve for parking

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

Potential flooding risks/fish passage risks from SH 10 and Martime Road Creek Crossings need to be addressed. Also considered important to address contaminated land (stage 2 inv)

Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	**Yes** ☐	**No** ○

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

NZ TRANSPORT AGENCY WAKA KOTAHI

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GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural ☐		Commercial ✔		District/Unitary Plan Zoning Maps
			Industrial ✔		Residential ☐		
			High density residential ☐		Parks/open space ☐		
	G2	Does the option disturb previously undisturbed land?	Y ○		N ○		
	G3	What is the construction timeframe?	>18 months ○		<18 months ○		
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y ○		N ○		NZTA MapHub Environmental and Social Risk Map- Natural Environment Regional Plan Maps and Schedules District Plan Maps and Schedules Department of Conservation
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y ○		N ○		
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y ○		N ○		
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y ○		N ○		
	NE5	Will more than 0.5 hectares of vegetation be removed?	Y ○		N ○		
		What type?					
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y ○		N ○		Iwi NZTA MapHub Environmental and Social Risk Map- Culture and Heritage Heritage New Zealand List NZ Archaeological Association District Plan Maps and Schedules Regional Plan Maps and Schedules IPENZ Heritage List NZTA GIS predictive models
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y ○		N ○		
	CH3	Are any scheduled, listed or other important heritage buildings/ structures within 200m of the area of interest?	Y ○		N ○		
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y ○		N ○		
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y ○		N ○		
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National ☐		Regional ✔		NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes: - Designated airsheds (including one network classification) - Highly sensitive receivers Regional Council Contaminated sites Team
			Arterial ☐		Collector ☐		
	HH2	Is the area of interest designated as a non-compliant airshed?	Y ○		N ○		
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y ○		N ○		
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination? OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y ○		N ○		
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y ○		N ○		NZTA MapHub Project Team District Plan Maps Council and Community Strategy Documents
			Which?				
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y ○		N ○		
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y ○		N ○		NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes) Regional Land Transport Plan Project Team Strategies and District Plan
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y ○		N ○		
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y ○		N ○		
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y ○		N ○		

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	Works footprint is pre-disturbed, contains no significant ecological/flora/fauna values. SH10 and Maritime Road both cross a stream. Any crossings of the stream must not worsen upstream flooding up to 100 year ARI, and must not worsen fish passage up to 1 year ARI.
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Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	**Yes** ○	**No** ○

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NZ TRANSPORT AGENCY WAKA KOTAHI

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			Industrial ✔		Residential ☐		
			High density residential ☐		Parks/open space ☐		
	G2	Does the option disturb previously undisturbed land?	Y ○		N ○		
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Reviewed by NZTA Project Manager		
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Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Ensure businesses on eastern side of loop road are not heavily impacted during works. Major vehicle entry/exit point from business here + business utilises road reserve for parking

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

Potential flooding risks/fish passage risks from SH 10 and Martime Road Creek Crossings need to be addressed. Also considered important to address contaminated land (stage 2 inv)

Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	**Yes** ○	**No** ○

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

NZ TRANSPORT AGENCY WAKA KOTAHI

Use to assess options in the Indicative Business Case

Use this screen to identify opportunities and risks and assess options for state highway projects. Complete the screen for each option to distinguish them from one another or bundle options where appropriate. Screen results will signal where technical assessments are required and provide a written record to support the alternatives assessment required for statutory applications. For further assistance contact the EUD Team.

Additional instructions and content, including information sources, to help complete the screen can be found on the Highways Information Portal Screen pages here

Decide how many times screen should be filled out (Group Options) ▶ Answer screen questions using project information and suggested information sources ▶ Refer to screen questions explanation, particularly if you answered yes to any of the questions ▶ Complete page 2 of screen ▶ Incorporate page 2 text in IBC assessment of options table (Background and MCA)

PROJECT LOCATION:	PROJECT PURPOSE:	DATE:	OPTION DESCRIPTION:
Waipapa State Highway 10	Intersection Upgrade	25/05/2017	Right Turn Bay Option

CATEGORY		QUESTION	ANSWER				USEFUL INFORMATION SOURCES
GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural ☐		Commercial ✔		District/Unitary Plan Zoning Maps
			Industrial ✔		Residential ☐		
			High density residential ☐		Parks/open space ☐		
	G2	Does the option disturb previously undisturbed land?	Y ○		N ○		
	G3	What is the construction timeframe?	>18 months ○		<18 months ○		
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y ○		N ○		NZTA MapHub Environmental and Social Risk Map- Natural Environment Regional Plan Maps and Schedules District Plan Maps and Schedules Department of Conservation
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y ○		N ○		
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y ○		N ○		
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y ○		N ○		
	NE5	Will more than 0.5 hectares of vegetation be removed?	Y ○		N ○		
		What type?					
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y ○		N ○		Iwi NZTA MapHub Environmental and Social Risk Map- Culture and Heritage Heritage New Zealand List NZ Archaeological Association District Plan Maps and Schedules Regional Plan Maps and Schedules IPENZ Heritage List NZTA GIS predictive models
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y ○		N ○		
	CH3	Are any scheduled, listed or other important heritage buildings/ structures within 200m of the area of interest?	Y ○		N ○		
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y ○		N ○		
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y ○		N ○		
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National ☐		Regional ✔		NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes: - Designated airsheds (including one network classification) - Highly sensitive receivers Regional Council Contaminated sites Team
			Arterial ☐		Collector ☐		
	HH2	Is the area of interest designated as a non-compliant airshed?	Y ○		N ○		
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y ○		N ○		
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination? OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y ○		N ○		
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y ○		N ○		NZTA MapHub Project Team District Plan Maps Council and Community Strategy Documents
			Which?				
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y ○		N ○		
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y ○		N ○		NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes) Regional Land Transport Plan Project Team Strategies and District Plan
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y ○		N ○		
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y ○		N ○		
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y ○		N ○		

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	Works footprint is pre-disturbed, contains no significant ecological/flora/fauna values. SH10 and Maritime Road both cross a stream. Any crossings of the stream must not worsen upstream flooding up to 100 year ARI, and must not worsen fish passage up to 1 year ARI.
CULTURAL AND HISTORIC HERITAGE:	Works footprint is pre-disturbed, contains no significant archaeology/heritage values.
HUMAN HEALTH:	Portion of land needs to be taken from electrical substation on corner of Maritime Rd and Loop Road, likely a HAIL activity. Potential for contaminated land.
SOCIAL:	Business/properties on eastern side of Loop road likely to be impacted at least during works period. Appears businesses utilise road reserve for car parking. Option has benefit that no change to northern connection Loop Road/SH10 will occur - no major change.

The responses above will be used in the IBC assessment of options summary table: MCA of the Option.

URBAN AND LANDSCAPE DESIGN:	Some opportunity to provide landscaping improvement on corner of Maritime Road and Loop Road - portion of road designation on northern side of intersection will remain unutilised.

Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Ensure businesses on eastern side of loop road are not heavily impacted during works. Major vehicle entry/exit point from business here + business utilises road reserve for parking

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

Potential flooding risks/fish passage risks from SH 10 and Martime Road Creek Crossings need to be addressed. Also considered important to address contaminated land (stage 2 inv)

Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	**Yes** ○	**No** ○

APPENDIX G
Final Multi Criteria Analysis

ASSESSMENT SUMMARY TABLE – DO MINIMUM: KLINAC LANE EXTENSION

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		

Option description

Description: The Klinac Lane Extension will be installed to the north following the intersection at SH10, Waipapa Road and Waipapa Loop Road. This extension is practically essential for any outcome that tries to properly balance traffic on the local road approaches to the main intersection.

Dependencies: None

Estimated total public sector funding requirement		Lower	Upper
	Capital cost ($m):	$361,031	$400,194
	Net property cost ($m):	-	-
	Opex ($m/30yr):		
	Maintenance ($m/30yr):		
	Present value of cost to govt. ($m):		
Estimated BCR range			
Timing of need:	***Optimal programme**:*	***Likely**:*	
IAF profile	***Strategic fit*** H/M/L	***Effectiveness*** H/M/L	***Efficiency*** H/M/L

ASSESSMENT SUMMARY TABLE – DO MINIMUM: KLINAC LANE EXTENSION

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	*0*	This option scored neutral for the first objective of *Economic Growth* as it is likely to make no effect to the economics of the area in terms of either aiding or restricting it.
Objective 2: Improve network efficiency	--	This option increases traffic at the intersection of SH10, Waipapa Road and Waipapa Loop Road. This traffic increase will saturate the intersection and adversely affect the SH10 traffic.
Objective 3: Improve safety by reducing crossing/turning crashes	--	This option increases the traffic at the intersection of SH10, Waipapa Road and Waipapa Loop Road, thereby increasing the risk of crossing/turning crashes.
Objective 4: Facilitate growth of multi-modal travel	*0*	This option has scored neutral for facilitating multi-modal travel as it is likely to make no effect to facilitate multi-modal travel in the area in terms of either aiding or restricting it.
Feasibility	*0*	As this option has already been decided to go ahead by FNDC, it is considered feasible and scored neutral in comparison to the other options.
Affordability	*0*	This option scored neutral for affordability as this project is most likely to go ahead regardless of the Waipapa Road Intersection Improvements and will be funded in part by FNDC.
Public/Stake-holders	---	As the public/stakeholders consider the intersection at SH10, Waipapa Road and Waipapa Loop Road to be a bad and unsafe intersection. '*Do Nothing*' will not be an acceptable option at this site.
Environmental and social	0	Although this option will not fix the issues with the intersection at SH10, Waipapa Road and Waipapa Loop Road; it will however, aid in dealing with the traffic in its proximity and offering better solutions to the businesses in and around it.
Safety	--	This option increases the traffic at the intersection of SH10, Waipapa Road and Waipapa Loop Road, thereby increasing the risk of crossing/turning crashes. This option does not address the needs of pedestrians and cyclists.
Economy	0	This option scored neutral for economy as this option as it is likely to make no effect to the economics of the area in terms of either aiding or restricting it.
Environmental opportunities	There is some opportunity to improve the stormwater capacity on Klinac Lane, which will improve the overflow during flood events.	
Social opportunities	There may be some social opportunities based on the needs of the local businesses.	
Rationale for selection or rejection of alternative	This option ranked 6th of those assessed. It was believed that a Do-Minimum approach will not be met favourably by the public and stakeholders as they have been expecting improvements to the intersection. This option would also not be beneficial in terms of improvements to safety and efficiency, which will degrade further with increase in traffic over time.	

ASSESSMENT SUMMARY TABLE – RIGHT TURN BAY

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		

Option description

Description: This option will involve providing a Right Turn Bay (RTB) for which there is room due to the existing width of the road. This will allow the through traffic to continue unimpeded, and provide right turning traffic with a safe place to wait.

The dis-benefit of this option will be that the speed of through traffic will likely increase and add to the difficulty of exiting the side roads.

Dependencies: None

Estimated total public sector funding requirement

	Lower	Upper
Capital cost ($m):	$5,030,208	$5,722,276
Net property cost ($m):	$274,750	$329,700
Opex ($m/30yr):		
Maintenance ($m/30yr):		
Present value of cost to govt. ($m):		
Estimated BCR range		

Timing of need:	**Optimal programme**:		**Likely**:			
IAF profile	Strategic fit	L	Effectiveness	L	Efficiency	M

ASSESSMENT SUMMARY TABLE – RIGHT TURN BAY

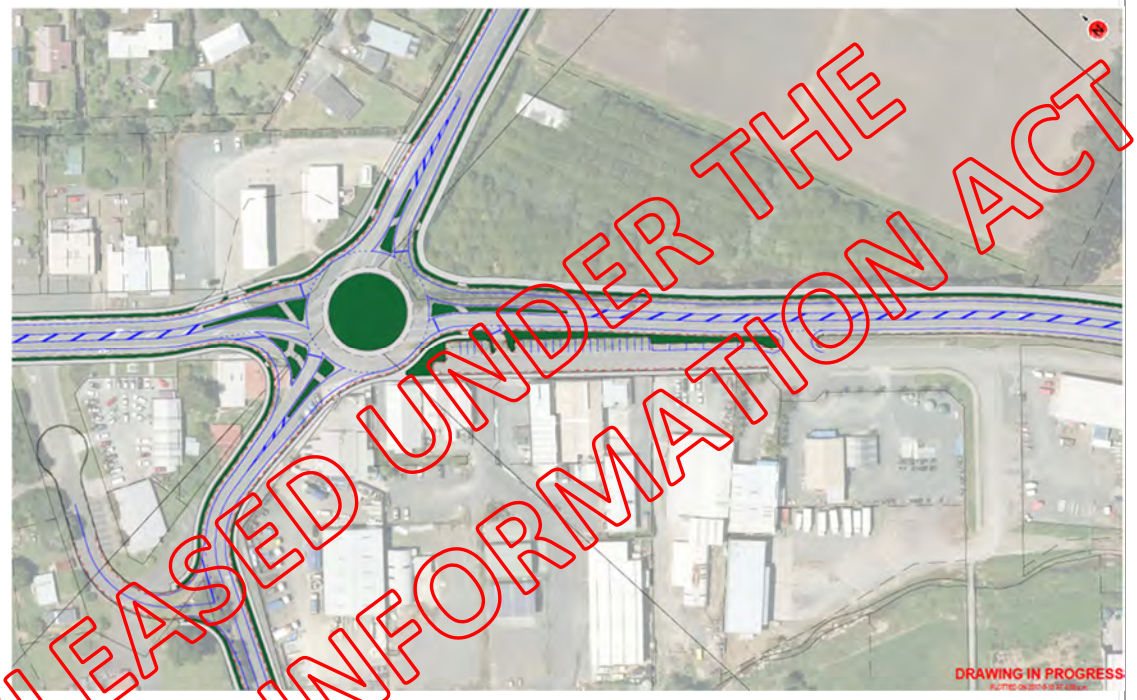
Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	+	This option provides a slightly better situation than *Do Minimum* in terms of improved local business access. However, this option still poses some level of impediment to local traffic from Waipapa Road crossing the SH10.
Objective 2: Improve network efficiency	*0*	The benefit to SH10 through-traffic from separating the *right* turning traffic is offset by the longer and less straight-forward route for the cross-traffic. Therefore, the net effect remains neutral.
Objective 3: Improve safety by reducing crossing/turning crashes	--	Whilst some safety benefit is delivered to right turners exiting Waipapa Road, the northbound through-traffic may travel at faster speeds, no longer impeded by traffic turning right from SH10. Additionally, the increased traffic movements at Waipapa Loop Road North will create more conflict with SH10 traffic and the shops opposite.
Objective 4: Facilitate growth of multimodal travel	++	This option will mean that pedestrian movements are well provided for, with uncontrolled crossing points as this option offers some of the shortest walking routes across the intersection. Cycling is also reasonably well catered for in this option.
Feasibility	-	N.E. and S.W. corners will remain unaffected and with least impact on the S.E. corner. On the N.W. corner major land take is required. Some property access in industrial area will be slightly affected by change to one way in Skippers lane. In terms of consenting, this option is neutral relative to the other options, as at this early stage, it is considered that the each of the options is equally consentable. For this option the whole of life/maintenance costs will be minimal.
Affordability	*0*	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	--	Whilst the public may recognise some benefit, any non-roundabout option is likely to be seen as nett dis-benefit as such. This is due to the fact that the other options really do not address the full extent of the problems in the area of the intersection at SH10, Waipapa Road and Waipapa Loop Road.
Environmental and social	++	Good pedestrian connectivity to all amenities. Slight dis-benefit for motorists as straight through movement from Waipapa Loop Road is no longer possible. Full access to existing walking and cycling facilities. Least land take.
Safety	--	Whilst some safety benefit is delivered to right turners exiting Waipapa Road, the northbound through-traffic may travel at faster speeds, no longer impeded by traffic turning right from SH10. Additionally, the increased traffic movements at Waipapa Loop Road North will create more conflict.
Economy	+	Refer to the Traffic Modelling Report, Opus June 2017 which details that this option will make slight benefits when compared to the other options including *Do Nothing*.
Environmental opportunities	There are no identified environmental opportunities connected with this option.	
Social opportunities	There are no identified social opportunities connected with this option.	
Rationale for selection or rejection of alternative	Ranked **2nd** of those assessed as it does not meet the safety, environmental and/or social benefits as some of the other options.	

ASSESSMENT SUMMARY TABLE – ROUNDABOUT

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		

Option description

Description: This option consist of having a roundabout at the intersection of SH10, Waipapa Road and Waipapa Loop Road. It is understood that urban roundabouts typically have a 55% effectiveness in crash reduction (Austroads Road Safety Engineering Toolkit). However, facilities for pedestrians and cyclists would have to be incorporated into the design.



Dependencies: None

Estimated total public sector funding requirement		Lower	Upper
	Capital cost ($m):	$6,186,236	$7,069,265
	Net property cost ($m):	$998,750	$1,198,500
	Opex ($m/30yr):		
	Maintenance ($m/30yr):		
	Present value of cost to govt. ($m):		
Estimated BCR range			

Timing of need:	***Optimal programme**:*		***Likely**:*			
IAF profile	*Strategic fit*	M	*Effectiveness*	H	*Efficiency*	M

ASSESSMENT SUMMARY TABLE – ROUNDABOUT

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	+++	This option provides a significantly better situation than *Do Minimum* in terms of ease of movement in all directions and provides a gateway treatment to the Waipapa area. It also provides the optimum economic growth and integrated land-use solutions in terms of tourism, i.e. for Twin Coast Discovery Highway movements.
Objective 2: Improve network efficiency	++	This option provides the best overall efficiency benefits but the pedestrian crossing points are necessarily some distance from the desire lines for crossing. It also provides the optimum solutions for network efficiency in terms of tourism, i.e. for Twin Coast Discovery Highway movements.
Objective 3: Improve safety by reducing crossing/turning crashes	++	This option will significantly reduce the number of conflict points and, for most users, will represent a safe and easy option. Even though roundabouts can have a higher number of crashes, compared to other intersection treatments, but these tend to be of a lesser severity due to lower speeds. It is assumed cycling provision can be carefully designed for.
Objective 4: Facilitate growth of multimodal travel	+	This option can provide well thought out pedestrian movements, with uncontrolled crossing points. But some of the walking routes across the intersection are at some distance from the desire lines. Cycling provision can be carefully designed for but less confident cyclists may find roundabouts less desirable.
Feasibility	--	This option will require land in-take from all four corners, and will have the largest overall footprint of all the considered options. Access within industrial area will largely remain unaffected. In terms of consenting, this option is neutral relative to the other options, as at this early stage, it is considered that the each of the options is equally consentable. In terms of whole of life operation/maintenance this option will pose greater stress on seal, so will require higher maintenance and/or earlier reseal. Landscaping maintenance also a factor for this option.
Affordability	*0*	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	++	The community are all very much expecting the solution to be a roundabout, based on various prior forms of awareness of a potential project at this intersection. The community is also expecting this option to be selected due to the success of the nearby SH10 / Kerikeri Rd Roundabout. In the eyes of the community, this option will be the best solution.
Environmental and social	+	The pedestrian connectivity to all amenities will have to be considered carefully but is achievable as it will be potentially affected by free-flowing traffic. This option will provide easier access for motorists for all movements. Full access to existing walking and cycling facilities can also be accommodated. This option will require the largest amount of land in-take, with a significant effect on the dairy.
Safety	++	This option will significantly reduce the number of conflict points and, for most users, will represent a safe and easy option. Even though roundabouts can have a higher number of crashes, compared to other intersection treatments, but these tend to be of a lesser severity due to lower speeds. It is assumed cycling provision can be carefully designed for.
Economy	++	A Traffic Modelling Study was conducted and found that that this option is preferred between all the options considered.
Environmental opportunities	There is some opportunity to clean up any potential contamination from the land in-take from the orchard. Also, for some landscaping on the actual roundabout.	
Social opportunities	There are no social opportunities associated with this option.	
Rationale for selection or rejection of alternative	This option ranked **1st** of the options considered as it provides the best safety benefits with good efficiency and economic benefits. The dis-benefit being that this option is the most expensive of the options considered.	

ASSESSMENT SUMMARY TABLE – TRAFFIC SIGNALS

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		

Option description

Description: This option involves traffic signals at the intersection of SH10, Waipapa Road and Waipapa Loop Road. It is understood that installing traffic signals will remove the conflict for turning vehicles, making it easier for all right turning movements, pedestrians and off-road cyclists. Traffic Signals typically have a 30-35% effectiveness in crash reduction (Austroads Road Safety Engineering Toolkit), depending on whether or not the right turn phases are fully controlled.

Disbenefits of this option include significant delays to through traffic, particularly during the inter-peak periods, and potential issues related to this then being the only set of traffic signals north of Whangarei, which would generate problems not common to most signals elsewhere.

Dependencies: None

Estimated total public sector funding requirement		Lower	Upper
	Capital cost ($m):	$5,809,633	$6,597,650
	Net property cost ($m):	$410,750	$429,900
	Opex ($m/30yr):		
	Maintenance ($m/30yr):		
	Present value of cost to govt. ($m):		
Estimated BCR range			

Timing of need:	***Optimal programme**:*		***Likely**:*			
IAF profile	*Strategic fit*	L	*Effectiveness*	L	*Efficiency*	L

ASSESSMENT SUMMARY TABLE – TRAFFIC SIGNALS

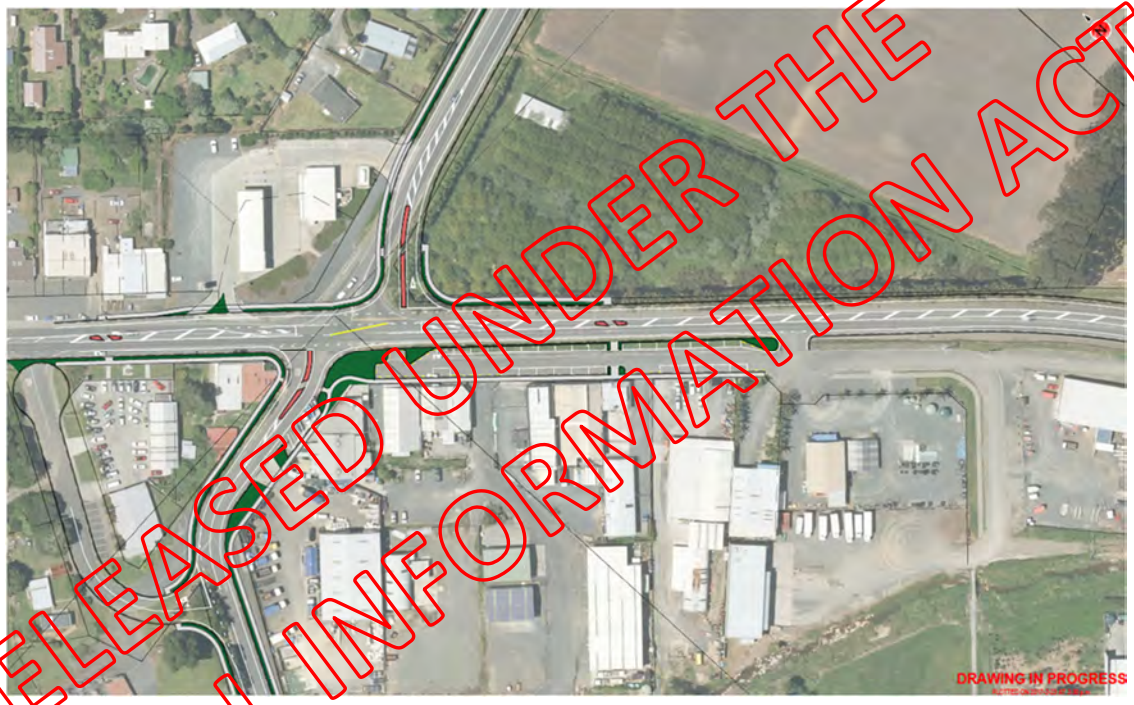
Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	+++	This option will provide a significantly better situation than *Do Minimum* in terms of ease of movement in all directions and provides a gateway treatment to the Waipapa area. It will also provide the optimum economic growth and integrated land-use solutions in terms of tourism, i.e. for Twin Coast Discovery Highway movements.
Objective 2: Improve network efficiency	--	This option will provide a detrimental effect on journey times for all movements particularly during off-peak periods. It is noted that this option is optimum for pedestrians. It also provides the optimum economic growth and integrated land-use solutions in terms of tourism, i.e. for Twin Coast Discovery Highway movements.
Objective 3: Improve safety by reducing crossing/turning crashes	---	SH traffic will not expect traffic signals this far north and so the instances of red light running are likely to be high. This could result in high-speed high-severity crashes (for example "T-boning").
Objective 4: Facilitate growth of multimodal travel	++	Pedestrians will have controlled crossing points close to the desire lines. These can also be used by less confident cyclists.
Feasibility	---	N.E. and S.W. corners will be unaffected. This option's greatest impact will be on the S.E. On N.W. corner, the land in-take will be minimal but building modification may be required. Access within industrial area will be largely unaffected. At this stage of project, all options are considered generally neutral relative to each other in terms of planning. Traffic signals represent the greatest ongoing care obligation and operational cost scenario i.e. signals infrastructure, heightened seal maintenance, etc.
Affordability	0	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	---	The Far North might be regarded as 'proud' of the fact that there are no traffic signals in the region, so signals would be strongly disliked. Neither would they be considered the best solution because of the inevitable waiting times.
Environmental and social	+	Pedestrian connectivity to all amenities will be available and controlled by signals. There will be easier access for motorists for all movements, but with some inherent delays. Full access to existing walking and cycling facilities can be provided in this option. This option will require a Medium level of land take overall.
Safety	---	SH traffic will not expect traffic signals this far north and so the instances of red light running are likely to be high. This could result in high-speed, high-severity crashes (for example "T-boning").
Economy	+	Refer to the Traffic Modelling Report, Opus June 2017 which details that this option will make slight benefits when compared to the other options including *Do Nothing*.
Environmental opportunities	There are no direct environmental opportunities associated with this option.	
Social opportunities	There are no social opportunities associated with this option.	
Rationale for selection or rejection of alternative	This option ranked 4th of the options considered as it provides significant benefits in economic growth with additional benefits in multi-modal travel but is also vastly worse off in terms of safety, feasibility and public expectations.	

ASSESSMENT SUMMARY TABLE – HEAD TO HEAD RIGHT TURN BAYS

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		

Option description

Description: This option would involve shifting the intersection of SH10, Waipapa Road, and Waipapa Loop Road further south on the State Highway, away from Waipapa Loop Road, in order to create a staggered pair of T-intersections. Separating these two local roads is likely to remove some of the uncertainty associated with vehicles turning right from the opposite side road.



Dependencies: None

Estimated total public sector funding requirement		Lower	Upper
	Capital cost ($m):	$5,395,801	$6,141,090
	Net property cost ($m):	$426,750	$512,100
	Opex ($m/30yr):		
	Maintenance ($m/30yr):		
	Present value of cost to govt. ($m):		
Estimated BCR range			
Timing of need:	***Optimal programme**:*	***Likely**:*	
IAF profile	*Strategic fit* L	*Effectiveness* L	*Efficiency* L

ASSESSMENT SUMMARY TABLE – HEAD TO HEAD RIGHT TURN BAYS

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	+	This option will provide a slightly better situation than Do Minimum in terms of improved local business access. However, it will still pose some level of impediment to local traffic from Waipapa Road crossing the State Highway.
Objective 2: Improve network efficiency	+	This option will provide a small benefit to SH through-traffic from separating the Right turning traffic. There will also be a slight benefit from vehicles turning right out of Waipapa Road due to the increased separation from Waipapa Loop Road.
Objective 3: Improve safety by reducing crossing/turning crashes	--	Whilst some safety benefit is delivered to right turning traffic exiting Waipapa Road, the northbound through-traffic may travel faster (speed) as they are no longer impeded by traffic turning right from the SH. Traffic turning right out of Waipapa Loop Road South will still have conflicts to manage.
Objective 4: Facilitate growth of multimodal travel	+	Pedestrian movements will be well provided for by this option, with uncontrolled crossing points, but some of the walking routes across the intersection will be at some distance from the desire lines. Cycling will also be reasonably well-catered for.
Feasibility	-	N.E. and S.W. corners will be unaffected. This option will have some impact the S.E. corner. On the N.W. corner, the land in-take will be minimal but modification may be required. Access within Skippers Lane will be slightly restricted. At this stage of the project, all options considered are generally neutral relative to each other in terms of planning. This option will have minimal effect on whole of life/maintenance.
Affordability	0	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	--	Whilst the public may recognise some benefit, any non-roundabout option is likely to be seen as nett dis-benefit.
Environmental and social	+	Pedestrian connectivity overall will be improved, but there will be some separation of crossing points from desire lines in places. No improvement for motorists via this option. Full access to existing walking and cycling facilities will also be provided, but not optimal.
Safety	--	Whilst some safety benefit is delivered to right turning traffic exiting Waipapa Road, the northbound through-traffic may travel faster (speed) as they are no longer impeded by traffic turning right from the SH. Traffic turning right out of Waipapa Loop Road South will still have conflicts to manage.
Economy	+	Refer to the Traffic Modelling Report, Opus June 2017 which details that this option will make slight benefits when compared to the other options including *Do Nothing*.
Environmental opportunities	There are no direct environmental opportunities associated with this option.	
Social opportunities	There are no social opportunities associated with this option.	
Rationale for selection or rejection of alternative	This option ranked 3rd in all the options considered as it only provides minimal benefits in economic growth, efficiency and multi-modal travel but will be worse off in terms of safety.	

ASSESSMENT SUMMARY TABLE – CLOSE WAIPAPA LOOP ROAD SOUTH

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region:	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		

Option description

Description: This option would completely close the intersection at Waipapa Loop Road South and divert all traffic to Waipapa Loop Road North. This intersection would need additional safety improvements incorporated into the design.

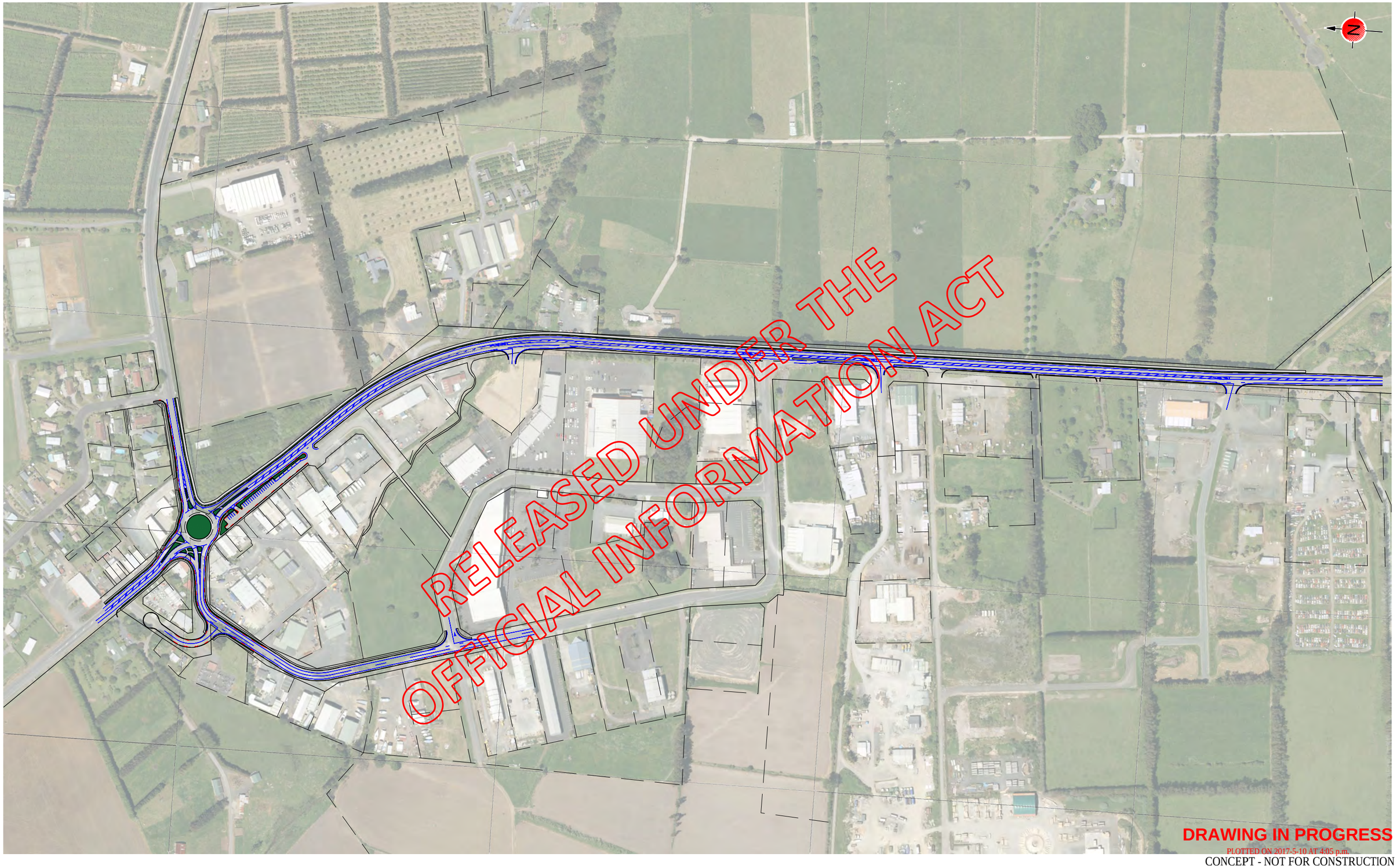
Dependencies: None

Estimated total public sector funding requirement		Lower	Upper
	Capital cost ($m):	$4,982,356	$5,042,174
	Net property cost ($m):	$93,750	$112,500
	Opex ($m/30yr):		
	Maintenance ($m/30yr):		
	Present value of cost to govt. ($m):		
Estimated BCR range			
Timing of need:	***Optimal programme**:*	***Likely**:*	
IAF profile	*Strategic fit* L	*Effectiveness* L	*Efficiency* L

ASSESSMENT SUMMARY TABLE – CLOSE WAIPAPA LOOP ROAD – SOUTH

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	-	This option is considered a net dis-benefit overall due to access to the business park being less straight-forward.
Objective 2: Improve network efficiency	-	This option is less beneficial as local road users will have to travel slightly further due to the closing of the Waipapa Loop Road South. Those movements are less intuitive and are likely to result in motorists using alternative access further to the South.
Objective 3: Improve safety by reducing crossing/turning crashes	--	Whilst some safety benefit will be delivered to right turning traffic exiting Waipapa Road, the northbound through-traffic may travel faster (speed) as they are no longer impeded by traffic turning right from the SH. Traffic turning right out of Waipapa Loop Road North will still have conflicts to manage.
Objective 4: Facilitate growth of multimodal travel	+	Pedestrian movements will be well provided for, with uncontrolled crossing points, but some of the walking routes across the intersection will be at some distance from the desire lines. Cycling will also be reasonably well-catered for.
Feasibility	-	Land in-take will be essentially focussed on the S.E. corner. No direct access will be provided from Skippers Lane into the main intersection. At this stage of the project, all options considered are generally neutral relative to each other in terms of planning. This option will have minimal costs for Whole of Life Operation / Maintenance.
Affordability	*0*	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	--	Whilst the public may recognise some benefit, any non-roundabout option is likely to be seen as nett dis-benefit, and as such options felt to be not really addressing the full extent of problems in the area of the intersection.
Environmental and social	+	Pedestrian connectivity overall will be improved, but there will be some separation of crossing points from desire lines in places. There will be no improvement for motorists. Full access will be provided to the existing walking and cycling facilities, but not optimal. Some land take will be required.
Safety	--	Whilst some safety benefit is delivered to right turners exiting Waipapa Road, the northbound through-traffic may travel faster (speed) as they are no longer impeded by traffic turning right from the SH. Traffic turning right out of Waipapa Loop Road North still has conflicts to manage.
Economy	-	Refer to the Traffic Modelling Report, Opus June 2017 which details that this option will make slight benefits when compared to the other options including *Do Nothing*.
Environmental opportunities	There are no direct environmental opportunities associated with this option.	
Social opportunities	There are no social opportunities associated with this option.	
Rationale for selection or rejection of alternative	This option ranked **5th** out of the options considered as it provides no real benefits apart from slightly better connectivity for pedestrians and cyclists. In all other aspects considered, it will only provide dis-benefits.	

APPENDIX H Recommended Option – Area Drawings



DRAWING IN PROGRESS

PLOTTED ON 2017-5-10 AT 4:05 p.m.

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-04-12
B	ROUNDABOUT SHAPE CHANGED		2017-05-10

NZ TRANSPORT AGENCY WAKA KOTAHI

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:2000 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
GENERAL ARRANGEMENT (OPTION 2 SHOWN)
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X01	B

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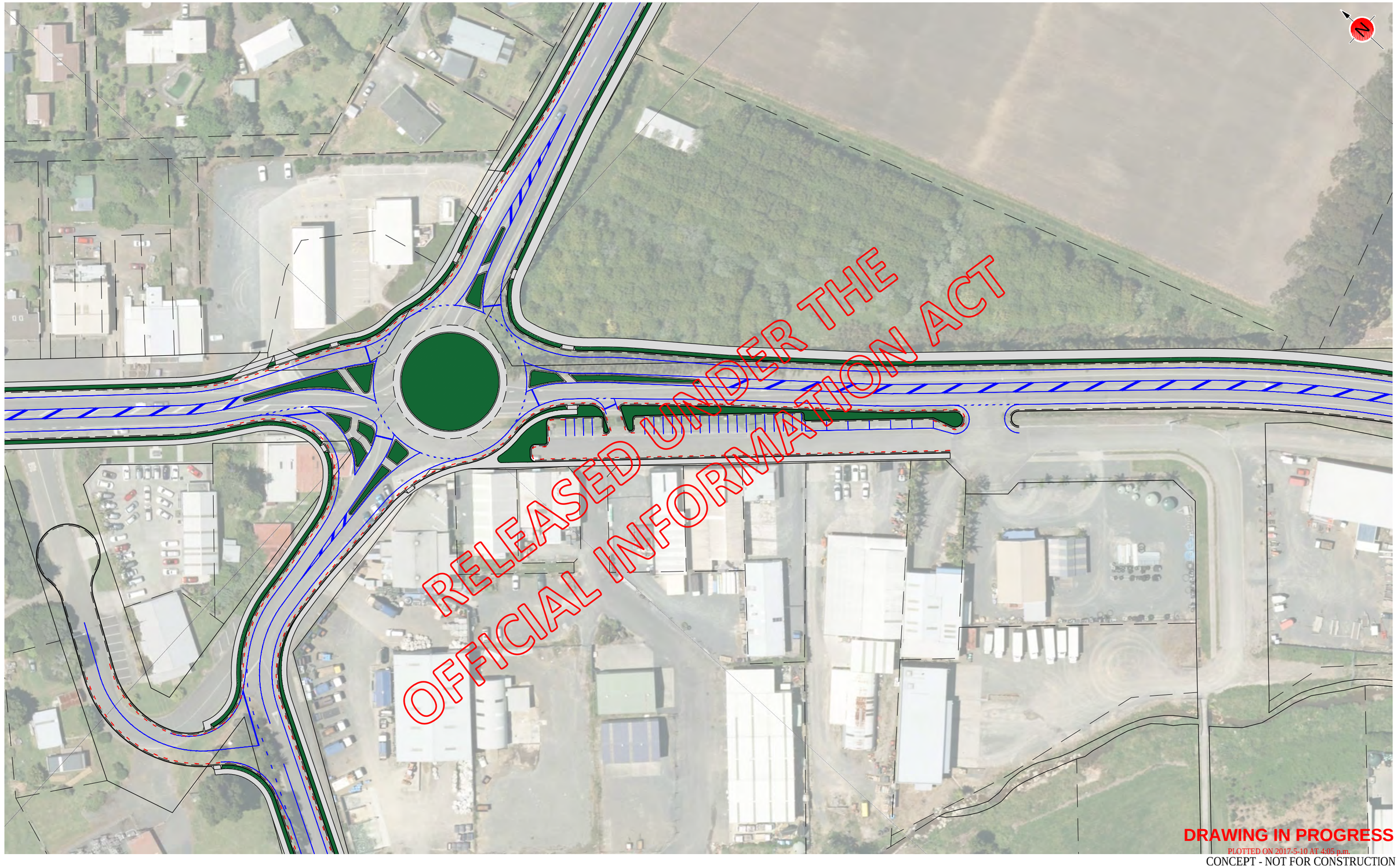

DRAWING IN PROGRESS

PLOTTED ON 2017-5-10 AT 4:05 p.m.

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-08
B	CONCEPT IMPROVED		2017-02-11
C	ROUNDABOUT ELLONGATED AND MOVED		2017-02-15
D	AMENDMENTS TO CONCEPT		2017-04-12
E	ROUNDABOUT SHAPE CHANGED		2017-05-10

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
OPTION 2: ROUNDABOUT
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X03	E

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1:1000@ A3
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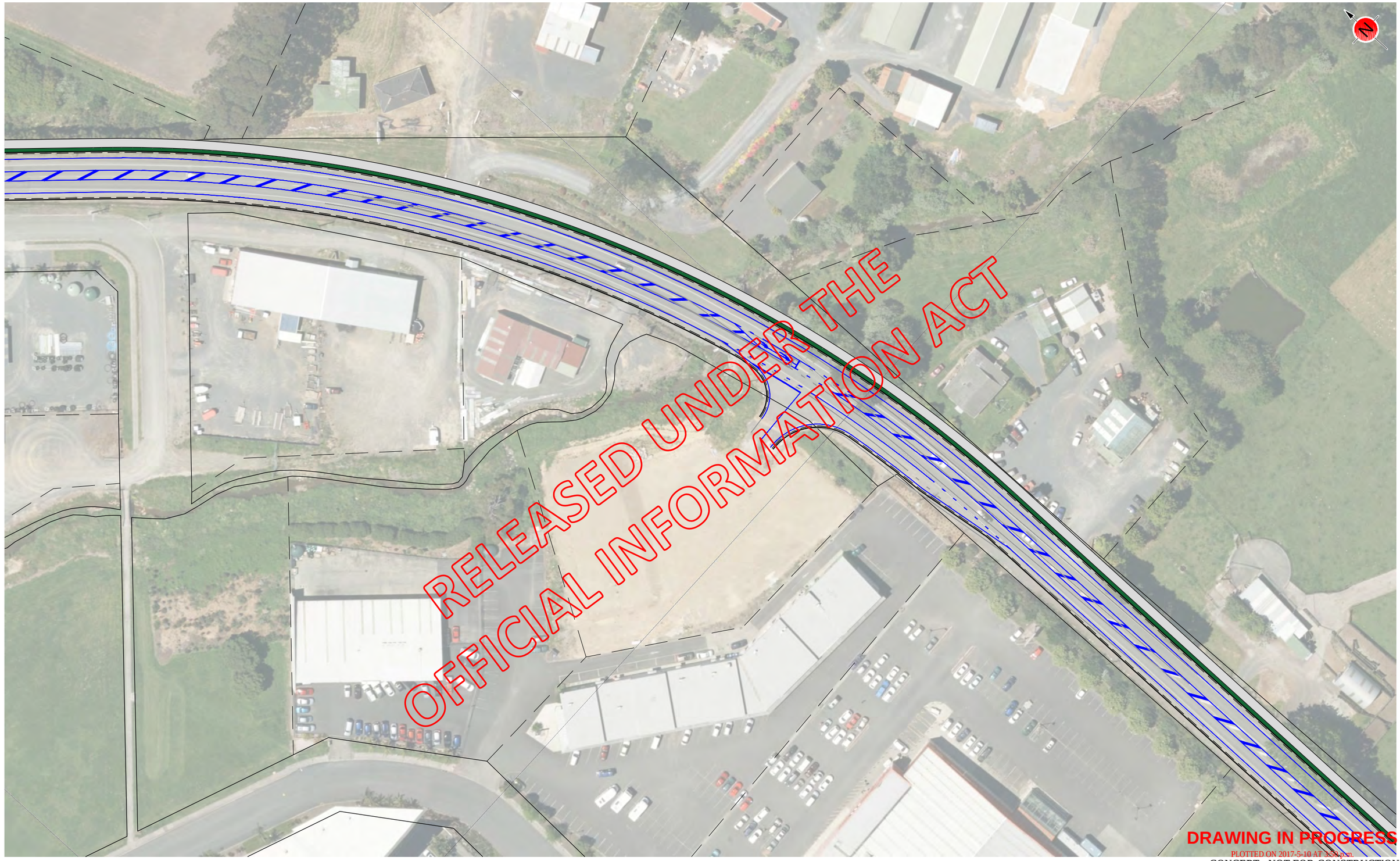

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PLOTTED ON 2017-5-10 AT 3:50 p.m.

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-22
B	ISSUED FOR INFORMATION		2017-03-13
C	AMENDMENTS TO CONCEPT		2017-04-12

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
WAIPAPA CORRIDOR TREATMENT
PLAN (SHEET 1 OF 2)

Project No.	Sheet. No.	Revision
1-11751.00	X20	C

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CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-22
B	ISSUED FOR INFORMATION		2017-03-13
C	AMENDMENTS TO CONCEPT		2017-04-12

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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
WAIPAPA CORRIDOR TREATMENT PLAN (SHEET 2 OF 2)

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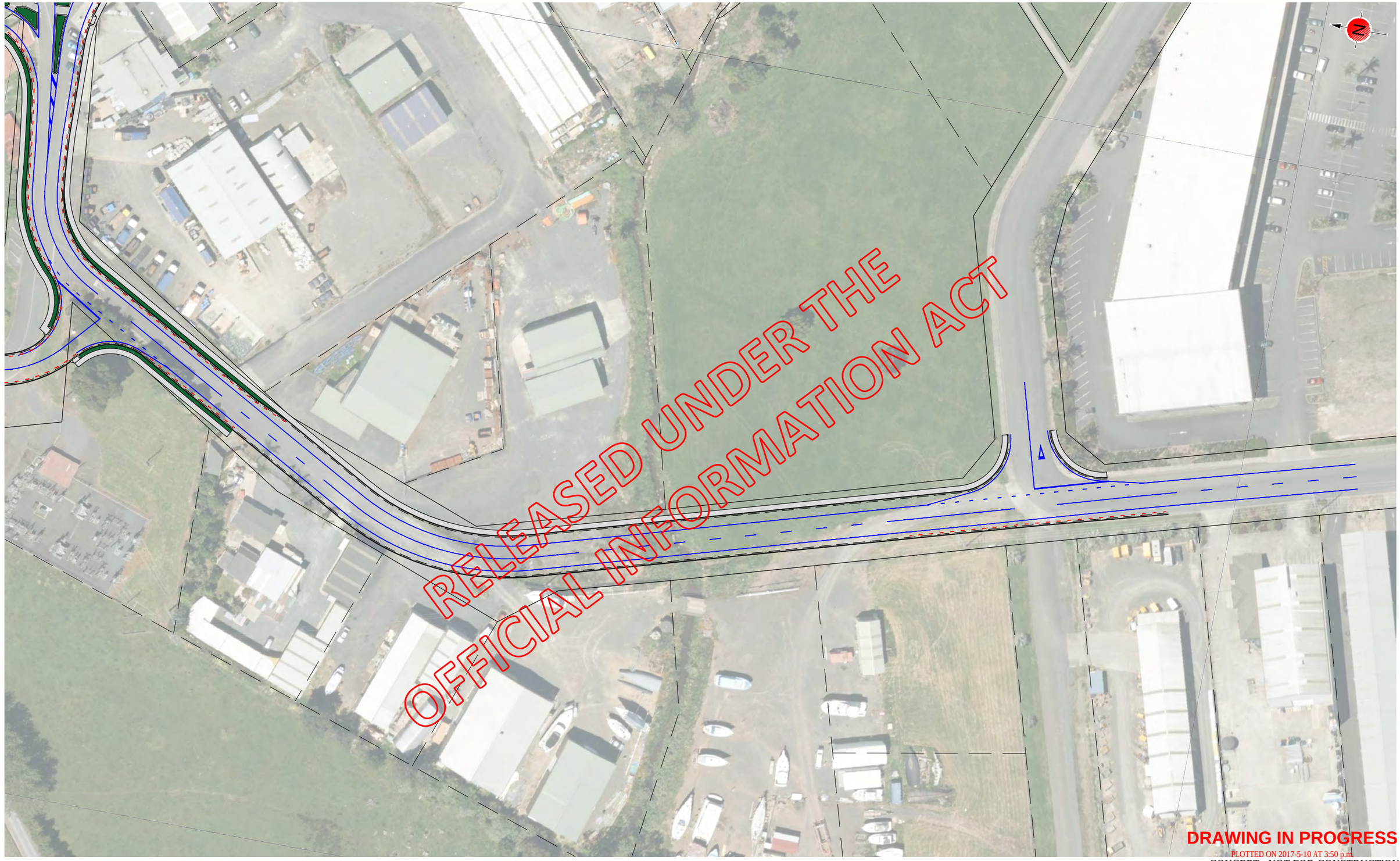

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CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-22
B	ISSUED FOR INFORMATION		2017-03-13
C	AMENDMENTS TO CONCEPT		2017-04-12

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
KLINAC LANE LINK
PLAN

Project No.	Sheet. No.	Revision
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APPENDIX I
Traffic Modelling

Waipapa Road/SH10 Intersection
Economic Analysis Inputs - using SIDRA model outputs

Assumptions and input data	Worksheets A2.1 to A2.8

Evaluation carried out in accordance with

Manual:	NZTA's EEM (volume 1)
Revision:	First Edition, Amendment 0
Date:	Effective from 1 July 2013

Project Timing:

Date of Evaluation:	31-Mar-17			
Base date is 1 July	2016			
Time Zero is 1 July	2017			
Discount Factor	6.00%			
Earliest Start of Construction is	1-Oct-18		ie at Time =	1.25
Construction Period is	6.0	months		
Construction Period ends	1-Apr-19		ie at Time =	1.75
				2016
Analysis period extends to 40 years after the start of construction, to Time=				41.25
				2041

Construction Cost of Options (+MSQA)

Expected Construction Costs - 1 July	1st period
Time Period	
Discount period - midpoint	1.50
Do Min	
Option 1 (Right Turn Bay))	$4,926,802
Option 2 (4 Leg Roundabout)	$5,362,676
Option 3 (Signals)	$5,575,956
Option 4 (Head to Head Right turn Bays)	$5,142,295
Option 5 (Close Waipapa Loop)	$5,058,386

Total Expected Estimate
$5,722,276
$7,069,265
$6,597,650
$6,141,090
$5,652,450

Expected Land Cost of Options	1st period
Time Period	Oct-18
Discount period	1.25
Do Min	$0.0
Option 1 (Right Turn Bay))	$329,700.0
Option 2 (4 Leg Roundabout)	$1,198,500.0
Option 3 (Signals)	$492,900.0
Option 4 (Head to Head Right turn Bays)	$512,100.0
Option 5 (Close Waipapa Loop)	$112,500.0

Expected Fees -	1st period	2nd period
Time Period	I/R	Specimen Design And Project Documentation
Discount period - midpoint	0.25	0.75
Do Min		
Option 1 (Right Turn Bay))	$232,887.0	$232,887.0
Option 2 (4 Leg Roundabout)	$254,044.5	$254,044.5
Option 3 (Signals)	$264,397.0	$264,397.0
Option 4 (Head to Head Right turn Bays)	$243,347.5	$243,347.5
Option 5 (Close Waipapa Loop)	$239,408.0	$242,156.0

Accident Savings are based on:

			Action			
Step 1	More than 1500vpd	Yes	Five year accident data	AADT	3,857	source: NZTA Count Site Data - Station 17 at Kerikeri
Step 2	Crash history adequate	Yes	Go to step 3	Traffic growth rate	2.20%	source: Based on 5 year count site data - annualised compound growth of SH10 between 2011-2015
Step 3	Significant change in last three years	No	Go to step 4	Growth rate ajustment for use in crash cost =	-2.00%	
Step 4	Minimum of crashes ≥ 5 injury or ≥ 2 serious and fatal	No	Go to step 5	Accident growth rate = 0.20%		
Step 5	Are Crash Prediction Models or crash rates available for the do minimum and project option(s)?	Yes	Go to Step 7			
Step 7	Fundamental Change	Yes	Method C for do min and Method B for Project Option			
	Fundamental Change	No	Method C for do minimum and project Option	Accident Trend Adjustment	0.965	Table A6.1(a)
Conclusion	Do Min	Method C				
	Option 1 (Right Turn Bay))	Method B				
	Option 2 (4 Leg Roundabout)	Method B				
	Option 3 (Signals)	Method B				
	Option 4 (Head to Head Right turn Bays)	Method B				
	Option 5 (Close Waipapa Loop)	Method B				

Traffic Volume Inputs & Model Assumptions

SIDRA 7.0.5.6563 software used to determine the annual operating costs

Project Operating Costs

Operating costs are based on SIDRA outputs

Vehicle Operating costs are determined from fuel usage outputs

Travel time costs are based on average sidra delays

CO2 is calculated from Sidra CO2 outputs

Benefits begin after construction (all benefits prior to construction are assumed to be equal)

Annualisation Factors

TIME PERIOD DATA				
PERIOD	**DESCRIPTION**	**hr/day**	**days/year**	***hrs/year***
1	AM Peak (1hr)	1	245	*245*
2	PM Peak (1hr)	2	245	*490*
3	IP Peak (1hr)	8	245	*1960*
4	Saturday (1hr)	6	52	*312*
5 Sunday	Sunday (1hr)	6	68	*408*
5 off peak	Off peak			*5345*

8760.00 8760.00

TT and VOC Cost Values used in economics

TT & CRV COST/HR	**Tab A4.3**	**RS**
Period	**TT**	**CRV**
1	15.13	3.88
2	14.96	3.79
3	17.95	3.60
4	14.09	4.26
5	14.09	4.26

VOC based on total fuel used and an equivalent resource cost
other VOC components considered to be the same

VOC costs (BASED ON $1.49/LITRE	
*** 1 (factor to get total VOC))**	
Period	$/litre
all periods	1.49

UPDATE FACTORS 2002 TO	2016
OPERATING COSTS	
TT	1.45
VOC	0.98
ACC	1.03
CONSTRUCTION COSTS	
Estimate at year	2017
Base date =	2016
Factor for base date =	0.96

YEARLY OPERATING COST WORKSHEET

1 hour modelled period

Roundabout (Option 2)

				Travel Time Cost			VOC		CO2			Yearly Cost		
Year	Time Period	Total Travel Time	Number of Vehicles (veh/hr)	Travel Time Cost	V/C	CRV Additional Congestion Cost	Fuel use litres/period	Cost/litre	CO2 Tonnes	Cost/Tonne	Periods/Yr	TT	VOC	CO2
2016	AM Peak (1hr)	3.23	1435.00	$49	0.54	$0	187.4	1.49	0.448	40	245	$11,968	$68,410	$4,391
	PM Peak (1hr)	3.09	1339.00	$46	0.41	$0	175	1.49	0.418	40	490	$22,630	$127,768	$8,201
	IP Peak (1hr)	2.25	1054.00	$40	0.31	$0	134.2	1.49	0.321	40	1960	$79,314	$391,918	$25,159
	Saturday (1hr)	2.25	1054.00	$32	0.31	$0	134.2	1.49	0.321	40	312	$9,910	$62,387	$4,005
	Sunday	1.77	860.00	$25	0.25	$0	108.9	1.49	0.2604	40	408	$10,162	$66,202	$4,250
	Night											$6,223	$11,690	
											TOTAL	$140,208	$728,375	$46,005
2026	AM Peak (1hr)	5.07	1,845	$77	0.73	$2	245.7	1.49	0.587	40	245	$19,354	$89,693	$5,756
	PM Peak (1hr)	4.99	1,780	$75	0.58	$0	236.9	1.49	0.566	40	490	$36,607	$172,961	$11,099
	IP Peak (1hr)	3.34	1,415	$60	0.43	$0	182.7	1.49	0.437	40	1960	$117,542	$533,557	$34,253
	Saturday (1hr)	3.34	1415.00	$47	0.43	$0	182.7	1.49	0.437	40	312	$14,687	$84,934	$5,453
	Sunday	2.57	1155.00	$36	0.34	$0	147.9	1.49	0.3536	40	408	$14,755	$89,911	$5,771
	Night											$7,592	$14,262	
											TOTAL	$210,538	$985,317	$62,331
2036	AM Peak (1hr)	18.81	2,335	$285	1.00	$72	342	1.49	0.817	40	245	$87,307	$124,847	$8,007
	PM Peak (1hr)	12.02	2,289	$180	0.87	$26	320.2	1.49	0.765	40	490	$101,035	$233,778	$14,998
	IP Peak (1hr)	5.23	1,829	$94	0.59	$0	240.8	1.49	0.576	40	1960	$184,106	$703,232	$45,143
	Saturday (1hr)	5.23	1829.00	$74	0.59	$0	240.8	1.49	0.576	40	312	$23,005	$111,943	$7,186
	Sunday	3.61	1492.00	$51	0.46	$0	193.6	1.49	0.463	40	408	$20,728	$117,693	$7,556
	Night											$8,961	$16,833	
											TOTAL	$425,142	$1,308,327	$82,889
2056	AM Peak (1hr)	41.84	2,517	$633	1.00	$162	414.7	1.49	0.990	40	245	$194,858	$151,386	$9,701
	PM Peak (1hr)	26.87	2,474	$402	1.00	$102	372.9	1.49	0.890	40	490	$246,872	$272,254	$17,452
	IP Peak (1hr)	6.33	1,964	$114	0.65	$0	261.4	1.49	0.625	40	1960	$222,647	$763,393	$49,000
	Saturday (1hr)	6.33	1964.00	$89	0.65	$0	261.4	1.49	0.625	40	312	$27,820	$121,520	$7,800
	Sunday	4.01	1602.00	$56	0.50	$0	209	1.49	0.4997	40	408	$23,024	$127,055	$8,155
	Night											$8,961	$16,833	
											TOTAL	$724,182	$1,452,441	$92,108

YEARLY OPERATING COST WORKSHEET

1 hour modelled period

Traffic signals (Option 3)

Year	Time Period	Total Travel Time	Number of Vehicles (veh/hr)	Travel Time Cost			VOC		CO2		Periods/Yr	Yearly Cost		
				Travel Time Cost	V/C	CRV Additional Congestion Cost	Fuel use litres/period	Cost/litre	CO2 Tonnes	Cost/Tonne		TT	VOC	CO2
2016	AM Peak (1hr)	12.28	1435.00	$186	0.79	$14	193.4	1.49	0.462	40	245	$48,972	$70,601	$4,531
	PM Peak (1hr)	11.34	1339.00	$170	0.86	$23	186.7	1.49	0.446	40	490	$94,254	$136,310	$8,744
	IP Peak (1hr)	7.79	1054.00	$140	0.68	$0	141.7	1.49	0.339	40	1960	$273,994	$413,821	$26,554
	Saturday (1hr)	7.79	1054.00	$110	0.68	$0	141.7	1.49	0.339	40	312	$34,236	$65,873	$4,227
	Sunday	6.12	860.00	$86	0.75	$4	115.80	1.49	0.28	40	408	$36,964	$70,397	$4,519
											TOTAL	$488,419	$757,002	$48,574
2026	AM Peak (1hr)	22.31	1846.00	$337	0.88	$52	257.3	1.49	0.616	40	245	$95,477	$93,927	$6,026
	PM Peak (1hr)	20.17	1,780	$302	0.92	$55	255.4	1.49	0.610	40	490	$174,853	$186,468	$11,958
	IP Peak (1hr)	11.79	1,415	$212	0.79	$13	193.5	1.49	0.463	40	1960	$439,815	$565,097	$36,268
	Saturday (1hr)	11.79	1415.00	$166	0.79	$15	193.5	1.49	0.463	40	312	$56,539	$89,954	$5,773
	Sunday	8.66	1155.00	$122	0.72	$3	156.1	1.49	0.373	40	408	$51,003	$94,896	$6,091
											TOTAL	$817,687	$1,030,343	$66,116
2036	AM Peak (1hr)	75.11	2,335	$1,136	1.00	$291	403.5	1.49	0.963	40	245	$349,817	$147,298	$9,437
	PM Peak (1hr)	53.86	2,289	$806	1.00	$204	371.6	1.49	0.887	40	490	$494,794	$271,305	$17,387
	IP Peak (1hr)	23.27	1,829	$418	0.94	$68	263	1.49	0.628	40	1960	$951,091	$768,065	$49,259
	Saturday (1hr)	23.27	1829.00	$328	0.94	$80	263	1.49	0.628	40	312	$127,240	$122,263	$7,841
	Sunday	12.60	1492.00	$178	0.89	$33	206.1	1.49	0.493	40	408	$86,079	$125,292	$8,038
											TOTAL	$2,009,021	$1,434,224	$91,962
2056	AM Peak (1hr)	116.34	2,517	$1,760	1.00	$451	487.9	1.49	1.164	40	245	$541,854	$178,108	$11,403
	PM Peak (1hr)	95.46	2,474	$1,428	1.00	$362	454.8	1.49	1.085	40	490	$876,994	$332,049	$21,266
	IP Peak (1hr)	52.32	1,964	$939	1.00	$188	319.4	1.49	0.763	40	1960	$2,209,841	$932,776	$59,788
	Saturday (1hr)	52.32	1964.00	$737	1.00	$223	319.4	1.49	0.763	40	312	$299,535	$148,483	$9,517
	Sunday	15.66	1602.00	$221	0.87	$38	223	1.49	0.533	40	408	$105,476	$135,566	$8,697
											TOTAL	$4,033,700	$1,726,982	$110,671

YEARLY OPERATING COST WORKSHEET

1 hour modelled period

Option 5 Staggered T

Year	Time Period	Total Travel Time	Number of Vehicles (veh/hr)	Travel Time Cost			VOC		CO2		Periods/Yr	Yearly Cost		
				Travel Time Cost	V/C	CRV Additional Congestion Cost	Fuel use litres/period	Cost/litre	CO2 Tonnes	Cost/Tonne		TT	VOC	CO2
2016	AM Peak (1hr)	2.43	1,521	$37	0.43	$0	159.2	1.49	0.382	40	245	$8,991	$58,116	$3,741
	PM Peak (1hr)	2.85	1,449	$43	0.60	$0	161.1	1.49	0.386	40	490	$20,885	$117,619	$7,556
	IP Peak (1hr)	1.96	1,203	$35	0.27	$0	133.3	1.49	0.319	40	1960	$69,096	$389,289	$25,025
	Saturday (1hr)	1.96	1203.00	$28	0.27	$0	133.3	1.49	0.319	40	312	$8,634	$61,969	$3,984
	Sunday	1.51	981	$21	0.19	$0	108.6	1.49	0.260	40	408	$8,700	$66,020	$4,243
											TOTAL	$116,306	$693,013	$44,549
2026	AM Peak (1hr)	5.03	1,965	$76	0.87	$11	208.8	1.49	0.500	40	245	$21,322	$76,222	$4,902
	PM Peak (1hr)	9.65	1,942	$144	1.00	$37	260.3	1.49	0.623	40	490	$88,675	$190,045	$12,215
	IP Peak (1hr)	2.99	1,620	$54	0.44	$0	179.9	1.49	0.430	40	1960	$105,318	$525,380	$33,743
	Saturday (1hr)	2.99	1620.00	$42	0.44	$0	179.9	1.49	0.430	40	312	$13,160	$83,632	$5,371
	Sunday	2.21	1,322	$31	0.30	$0	146.3	1.49	0.350	40	408	$12,683	$88,939	$5,715
											TOTAL	$241,158	$964,218	$61,947
2036	AM Peak (1hr)	24.27	2,488	$367	1.00	$94	349.9	1.49	0.836	40	245	$113,018	$127,731	$8,196
	PM Peak (1hr)	48.06	2,504	$719	1.00	$182	579.9	1.49	1.382	40	490	$441,573	$423,385	$27,083
Sunday+102:105	IP Peak (1hr)	5.14	2,088	$92	0.77	$4	233.4	1.49	0.559	40	1960	$189,524	$681,621	$43,794
	Saturday (1hr)	5.14	2088.00	$72	0.77	$5	233.4	1.49	0.559	40	312	$24,233	$108,503	$6,971
	Sunday	3.26	1,703	$46	0.49	$0	188.8	1.49	0.520	40	408	$18,713	$114,775	$8,490
											TOTAL	$787,062	$1,456,016	$94,534
2056	AM Peak (1hr)	28.07	2,700	$425	1.00	$109	476.9	1.49	1.137	40	245	$130,749	$173,946	$11,145
	PM Peak (1hr)	66.92	2,700	$1,001	1.00	$254	810.7	1.49	2.025	40	490	$614,872	$621,096	$39,686
Sunday+102:105	IP Peak (1hr)	8.69	2,238	$156	0.98	$29	254.9	1.49	0.610	40	1960	$363,226	$744,410	$47,840
	Saturday (1hr)	8.69	2238.00	$122	0.98	$35	254.9	1.49	0.610	40	312	$49,040	$118,498	$7,615
	Sunday	3.76	1,826	$53	0.59	$0	202.6	1.49	0.560	40	408	$21,591	$123,165	$9,141
											TOTAL	$1,179,478	$1,781,115	$115,426

YEARLY OPERATING COST WORKSHEET

1 hour modelled period

DO MINIMUM

Year	Time Period	Total Travel Time	Number of Vehicles (veh/hr)	Travel Time Cost			VOC		CO2		Periods/Yr	Yearly Cost		
				Travel Time Cost	V/C	CRV Additional Congestion Cost	Fuel use litres/period	Cost/litre	CO2 Tonnes	Cost/Tonne		TT	VOC	CO2
2016	AM Peak (1hr)	3.55	1435	$54	0.72	$1	160.10	1.49	0.38	40	245	$13,364	$58,445	$3,757
	PM Peak (1hr)	5.73	1339	$86	0.94	$17	157.80	1.49	0.38	40	490	$50,463	$115,210	$7,401
	IP Peak (1hr)	2.23	1054	$40	0.41	$0	120.30	1.49	0.29	40	1960	$78,284	$351,324	$22,571
	Saturday (1hr)	2.23	1054	$31	0.41	$0	120.3	1.49	0.288	40	312	$9,782	$55,925	$3,593
	Sunday	1.62	860	$23	0.27	$0	97.6	1.49	0.2336	40	408	$9,338	$59,333	$3,812
											TOTAL	$161,231	$640,236	$41,135
2026	AM Peak (1hr)	19.17	1846	$290	1.00	$74	258.9	1.49	0.619	40	245	$89,285	$94,511	$6,065
	PM Peak (1hr)	32.88	1780	$492	1.00	$125	334.6	1.49	0.798	40	490	$302,065	$244,291	$15,641
	IP Peak (1hr)	4.36	1415	$78	0.79	$5	164.3	1.49	0.393	40	1960	$162,937	$479,822	$30,827
	Saturday (1hr)	4.36	1415	$61	0.79	$6	164.3	1.49	0.393	40	312	$20,958	$76,380	$4,907
	Sunday	2.60	1155	$37	0.48	$0	132	1.49	0.3161	40	408	$14,939	$80,245	$5,159
											TOTAL	$590,184	$975,250	$62,599
2036	AM Peak (1hr)	29.05	2335	$440	1.00	$113	621.6	1.49	1.481	40	245	$135,298	$226,915	$14,509
	PM Peak (1hr)	43.94	2289	$657	1.00	$167	889	1.49	2.115	40	490	$403,680	$649,059	$41,450
	IP Peak (1hr)	25.34	1829	$455	1.00	$91	278.5	1.49	0.665	40	1960	$1,070,283	$813,331	$52,144
	Saturday (1hr)	25.34	1829	$357	1.00	$108	278.5	1.49	0.665	40	312	$145,073	$129,469	$8,300
	Sunday	5.80	1492	$82	0.91	$17	175	1.49	0.4188	40	408	$40,314	$106,386	$6,835
											TOTAL	$1,794,648	$1,925,160	$123,238
2036	AM Peak (1hr)	34.06	2517	$515	1.00	$132	959.4	1.49	2.282	40	245	$158,617	$350,229	$22,368
	PM Peak (1hr)	52.17	2474	$781	1.00	$198	1341.2	1.49	3.188	40	490	$479,355	$979,210	$62,485
	IP Peak (1hr)	28.64	1964	$514	1.00	$103	353.8	1.49	0.845	40	1960	$1,209,627	$1,033,238	$66,217
	Saturday (1hr)	28.64	1964	$404	1.00	$122	353.8	1.49	0.845	40	312	$163,960	$164,475	$10,541
	Sunday	14.82	1602	$209	1.00	$63	200.5	1.49	0.4796	40	408	$110,943	$121,888	$7,827
											TOTAL	$2,122,503	$2,649,039	$169,437

ACCIDENT BY ACCIDENT ANALYSIS - DO MINIMUM

WORKSHEET A6.2

Project Name:	Waipapa Road/SH10 Intersection	**Posted Speed Limit:**	70	km/h
Vehicle Involvement:	All	**Mean Speed:**	100	km/h
		Road Category:	70	
		Traffic growth rate	2.20%	%

Crash Type	Crash Cost (per Year)
Lost Control off Road	2,303
Head On	5,613
Crossing, Direct	0
Crossing Turning	9,211
Rear End, Crossing	8,635
	25,762

Lost Control off Road	Injury Severity				
	Fatal	**Serious**	**Minor**	**Non-Injury**	**Total Cost**
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	1	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.2	0.8			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	1	
5.Accidents per year **(4)/(1)**	0	0	0	0.2	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.206	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	1.439	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	5,000,000	505,000	27,000	1,800	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	4,600,000	505,000	28,000	1,600	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	4,600,000	505,000	28,000	1,600	
14. Total Accident Cost per Year **(9) x (13)**	0	0	0	2,303	**2,303**

Head On	Injury Severity				
	Fatal	**Serious**	**Minor**	**Non-Injury**	**Total Cost**
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	1	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.12	0.88			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	1	
5.Accidents per year **(4)/(1)**	0	0	0	0.2	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.206	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7.0	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	1.439	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	4,550,000	585,000	32,000	3,200	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	5,400,000	610,000	36,000	3,900	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	5,400,000	610,000	36,000	3,900	
14. Total Accident Cost per Year **(9) x (13)**	0	0	0	5,613	**5,613**

Crossing, Direct	Injury Severity				
	Fatal	**Serious**	**Minor**	**Non-Injury**	**Total Cost**
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	0	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.21	0.79			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	0	
5.Accidents per year **(4)/(1)**	0	0	0	0	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.000	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7.0	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	0.000	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	4,600,000	490,000	31,000	2,800	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	4,650,000	525,000	35,000	3,200	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	4,650,000	525,000	35,000	3,200	
14. Total Accident Cost per Year **(9) x (13)**	0	0	0	0	**0**

ACCIDENT BY ACCIDENT ANALYSIS - DO MINIMUM **WORKSHEET A6.2**

Project Name:	Waipapa Road/SH10 Intersection	**Posted Speed Limit:**	70	km/h
Vehicle Involvement:	All	**Mean Speed:**	100	km/h
		Road Category:	70	
		Traffic growth rate	2.20%	%

Crossing Turning	**Injury Severity**				
	Fatal	**Serious**	**Minor**	**Non-Injury**	**Total Cost**
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	2	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.09	0.91			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	2	
5.Accidents per year **(4)/(1)**	0	0	0	0.4	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.411	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7.0	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	2.878	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	4,500,000	475,000	31,000	2,900	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	4,650,000	525,000	35,000	3,200	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	4,650,000	525,000	35,000	3,200	
14. Total Accident Cost per Year **(9) x (13)**		0	0	9,211	**9,211**

Rear End, Crossing	**Injury Severity**				
	Fatal	**Serious**	**Minor**	**Non-Injury**	**Total Cost**
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	2	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.16	0.84			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	2	
5.Accidents per year **(4)/(1)**	0	0	0	0.4	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.411	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7.0	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	2.878	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	4,600,000	450,000	30,000	2,900	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	4,250,000	525,000	34,000	3,000	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	4,250,000	525,000	34,000	3,000	
14. Total Accident Cost per Year **(9) x (13)**		0	0	8,635	**8,635**

Worksheets A6: Accident cost savings

Weighted accident procedure – do minimum **Worksheet A6.5**

Project option	Do minimum		
Posted speed limit	70	Traffic growth rate	2.20%
Road category	RS	Time zero	2017

#	Site specific accident rate	
1	Number of years of accident records	5
2	Number of reported injury accidents over period	0
3	Number of accidents per year **(2)/(1)**	0
4	Trend adjustment factor (table A6.1(a))	1.028
5	Site-specific accident rate (accidents per year), A_S **(3)** x **(4)**	0
#	**Accident prediction model**	
6	Table used	6.1
7	Parameter b_0	0.00108
8	Parameter b_1	0.51
9	Parameter b_2	0.21
10	Lowest or sideroad AADT, Q_{minor}	6050
11	Highest or primary AADT, Q_{major}	9581
12	Typical accident rate (accidents per year), $A_{T,dm}$ (formula from appendix A6.5)	0.681862355

Go to step 13

#	Exposure based accident prediction equation	
6a	Table used	
7a	Coefficient b_0 (/10^8 veh-km or /10^8 vehicles)	
8a	Cross-section adjustment factor from table A6.13 (1.0 for no adjustment)	
9a	Adjusted coefficient **(7a)** x **(8a)**	
10a	Exposure at time zero (10^8 veh-km or 10^8 vehicles)	
12	Typical accident rate (accidents per year), $A_{T,dm}$ **(9a)** x **(10a)**	0.681862355
13	Accident trend factor for adjusting typical accident rate, f_t (appendix A6.4 method B).	-0.02
14	Adjustment factor for accident trend (1 + **(8)** x (time zero year - 2006) (appendix A6.4 method B).	0.98
15	Typical accident rate per year adjusted for accident trends, $A_{T,dm}$ **(12)** x **(14)***	0.668225108
#	**Weighting factor**	
16	k value (appendix A6.5)	2.3
17	Reliability of accident history, $_{\chi}$ (default is 1.0)	1
18	Reliability of accident prediction model or equation, $_{M}$ (default is 1.0)	1
19	Weighting factor, w, **(17)**^{2} x **(16)** / (**(17)**^{2} x **(16)** + **(18)**^{2} x **(15)**))	0.771330037
20	Do minimum weighted accident rate, $A_{W,dm}$ [**(19)** x **(15)**] + [**(1)** – **(19)**] x **(5)**	0.515422097
21	Cost per reported injury accident (table A6.22)	295000
22	Total do minimum accident cost per year **(20)** x **(21)**	**152050**

** For all mid-block analyses, the typical accident rate **(15)** must be divided by the mid-block length (in km).*

Project:	Waipapa Road/SH10 Intersection		
Project Option :			
Option Posted Speed Limit :	70	**Traffic Growth :**	2.20%
Road Category:	RS	**Time Zero :**	2017

ACCIDENT PREDICTION MODEL			
1	Model used	Accident prediction model 7	
2	Qmajor	8581	
3	Qminor	6050	
4	bo	2.81E-03	
5	b1	0.14	
6	b2	0.46	
7	Typical Accident Rate (Accidents per Year), At (formula from Section A6.5)	0.548	
		Proceed to Step 8	
EXPOSURE BASED ACCIDENT PREDICTION EQUATION			
1a	Method / Table Used:		
2a	Coefficient b0 (/10^8 veh-kms or /10^8 vehicles)		
3a	Cross-section adjustment factor from table A6.13 (1.0 no adjustment)		
4a	Adjusted coefficient **(2a)** x **(3a)**		
5a	Exposure at Time Zero (10^8 veh-kms or 10^8 vehicles)		
7	Typical Accident Rate (Accidents per Year), Atdm **(4a)** x **(5a)**		
8	Accident trend factor for adjusting Typical Accident rate, ft (appendix A6.4 method B)	1.02	
9	Adjustment factor (1 + **(8)** x (time zero year - 2006)) (appendix A6.4 method B)	0.980	
10	Typical Accident Rate per year adjusted for accident trends At **(7)** x **(9)****	0.537	No cost for signal in 70 and 100km area so Priority T costs has been used
		70	
ACCIDENT COSTS			
11	Cost per Reported Injury Accident (Table A6.22)	$ 280,000.00	$ 280,000
12	Total Accident Cost per Year **(10)** x **(11)**	$ 150,450	
	No years	0	
	MID POINTYear	2017	
	Traffic Growth at year Zero With adjustment	0.20%	
	Total Accident Cost/Year	**$ 150,450**	
	Growth		

(14)** For midblock analysis, the typical acc rate **(15)** must be divided by the length in km

Traffic Flows obatined from Tubecounts that have both directions

ACCIDENT RATE ANALYSIS - Option **WORKSHEET A6.5**

Project:	Waipapa Road/SH10 Intersection		
Project Option :			
Option Posted Speed Limit :	70	**Traffic Growth :**	2.20%
Road Category:	RS	**Time Zero :**	2017

ACCIDENT PREDICTION MODEL				
1	Model used			
2	Qmajor	8581	8581	
3	Qminor	6050	4093	
4	bo	5.65E-05	5.65E-05	
5	b1	0.2	0.2	
6	b2	0.76	0.76	
7	Typical Accident Rate (Accidents per Year), At (formula from Section A6.5)	0.259	0.192	
		Proceed to Step 8		
EXPOSURE BASED ACCIDENT PREDICTION EQUATION				
1a	Method / Table Used:			
2a	Coefficient b0 (/10^8 veh-kms or /10^8 vehicles)			
3a	Cross-section adjustment factor from table A6.13 (1.0 no adjustment)			
4a	Adjusted coefficient **(2a)** x **(3a)**			
5a	Exposure at Time Zero (10^8 veh-kms or 10^8 vehicles)			
7	Typical Accident Rate (Accidents per Year), Atdm **(4a)** x **(5a)**			
8	Accident trend factor for adjusting Typical Accident rate, ft (appendix A6.4 method B)	-0.02		
9	Adjustment factor (1 + **(8)** x (time zero year - 2006)) (appendix A6.4 method B)	0.980		
10	Typical Accident Rate per year adjusted for accident trends At **(7)** x **(9)****	0.442	No cost for signal in 70 and 100km area so Priority T costs has been used	
ACCIDENT COSTS			70	
11	Cost per Reported Injury Accident (Table A6.22)	$ 295,000.00	$ 295,000	
12	Total Accident Cost per Year **(10)** x **(11)**	$ 130,391		
	No years	0		
	MID POINTYear	2017		
	Traffic Growth at year Zero With adjustment	0.20%		
	Total Accident Cost/Year	**$ 130,391**		
	Growth			

(14)** For midblock analysis, the typical ax rate **(15)** must be divided by the length in km

Traffic Flows obatined from Tubecounts that have both directions

2016			2026			2036		
	SH10 Northbound	SH10 Southbound		SH10 Northbound	SH10 Southbound		SH10 Northbound	SH10 Southbound
0700-1900	3821	3679	0700-1900	3821	3679	0700-1900		
0000-0000	4237	4055	0000-0000	4237	4055	0000-0000		
Difference	416	376	Difference	416	376	Growth	507.52	458.72
Geomeric delay (s)	5.5	5.5	Curve Speed	20	20	Geomeric	5.5	5.5
Total TT	2288	2068	Initial Speed	70	70	Total TT	2791.36	2522.96
Additional TT Cost	3268.566889	2954.281611	Additional V	4.1	4.1	Additional	3987.652	3604.224
Total TT	**6222.8485**		Total VOC	6140.16	5549.76	Total TT	**7591.875**	
			Total VOC	**11689.92**				
Growth	2.20%							

2026			2036		
	SH10 Northbound	SH10 Southbound		SH10 Northbound	SH10 Southbound
0700-1900			0700-1900		
0000-0000			0000-0000		
Difference	507.52	458.72	Difference	599.04	541.44
Curve Spe	20	20	Geomeric	5.5	5.5
Initial Spee	70	70	Total TT	3294.72	2977.92
Additional	4.1	4.1	Additional	4706.736	4254.166
Total VOC	7490.995	6770.707	Total TT	**8960.902**	
Total VOC	**14261.7**				

2036		
	SH10 Northbound	SH10 Southbound
0700-1900		
0000-0000		
Difference	599.04	541.44
Curve Spe	20	20
Initial Spee	70	70
Additional	4.1	4.1
Total VOC	8841.83	7991.654
Total VOC	**16833.48**	

EEM Table A5.41 Additional VOC due to Speed Change Cycle (cents/Speed cycle)

Initial speed(km/h)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
5	0.1																							
10	0.2	0.1																						
15	0.3	0.2	0.1																					
20	0.5	0.4	0.2	0.1																				
25	0.7	0.6	0.5	0.3	0.2																			
30	1	0.9	0.7	0.6	0.4	0.2																		
35	1.3	1.2	1.1	0.9	0.7	0.4	0.2																	
40	1.7	1.6	1.4	1.2	1	0.7	0.5	0.2																
45	2.1	2	1.8	1.6	1.4	1.1	0.8	0.5	0.3															
50	2.5	2.4	2.3	2.1	1.8	1.5	1.2	0.9	0.6	0.3														
55	3	2.9	2.8	2.6	2.3	2	1.7	1.3	1	0.6	0.3													
60	3.6	3.5	3.3	3.1	2.9	2.5	2.2	1.8	1.4	1	0.7	0.3												
65	4.2	4.1	3.9	3.7	3.5	3.1	2.8	2.4	2	1.6	1.1	0.7	0.3											
70	4.9	4.7	4.6	4.4	4.1	3.8	3.4	3	2.6	2.1	1.7	1.2	0.7	0.3										
75	5.6	5.4	5.3	5	4.8	4.4	4.1	3.7	3.2	2.8	2.3	1.8	1.3	0.8	0.4									
80	6.3	6.2	6	5.8	5.5	5.1	4.8	4.4	3.9	3.5	3	2.5	1.9	1.4	0.8	0.4								
85	7.1	7	6.8	6.5	6.3	5.9	5.5	5.1	4.7	4.2	3.7	3.2	2.6	2.1	1.5	0.9	0.4							
90	8	7.8	7.6	7.4	7.1	6.7	6.3	5.9	5.4	5	4.5	3.9	3.4	2.8	2.2	1.6	0.9	0.4						
95	8.9	8.7	8.5	8.2	7.9	7.5	7.1	6.7	6.3	5.8	5.3	4.7	4.2	3.6	2.9	2.3	1.7	1	0.4					
100	9.8	9.6	9.4	9.1	8.8	8.4	8	7.6	7.1	6.6	6.1	5.6	5	4.4	3.8	3.1	2.4	1.7	1	0.4				
105	10.8	10.6	10.4	10.1	9.8	9.4	8.9	8.5	8	7.5	7	6.4	5.8	5.2	4.6	3.9	3.3	2.5	1.8	1.1	0.4			
110	11.9	11.6	11.4	11.1	10.8	10.3	9.9	9.4	9	8.4	7.9	7.3	6.7	6.1	5.5	4.8	4.1	3.4	2.7	1.9	1.1	0.4		
115	13	12.7	12.5	12.2	11.8	11.4	10.9	10.4	9.9	9.4	8.9	8.3	7.7	7.1	6.4	5.7	5	4.3	3.5	2.8	2	1.2	0.5	
120	14.1	13.9	13.6	13.2	12.9	12.4	11.9	11.5	10.9	10.4	9.8	9.3	8.6	8	7.4	6.7	6	5.2	4.5	3.7	2.9	2	1.2	0.5

Hourly Count Export

Site Ref: 01000015 (1km south of Waimate Nth Rd)
Start Date (dd-mon-yyyy): 01-Jan-2015
End Date (dd-mon-yyyy): 31-Dec-2015
Direction: Both
Data Type: ALL Vehicles

Day		00:00 - 01	01:00 - 02	02:00 - 03	03:00 - 04	04:00 - 05	05:00 - 06	06:00 - 07	07:00 - 08	08:00 - 09	09:00 - 10	10:00 - 11	11:00 - 12	12:00 - 13	13:00 - 14	14:00 - 15	15:00 - 16	16:00 - 17	17:00 - 18	18:00 - 19	19:00 - 20	20:00 - 21	21:00 - 22	22:00 - 23	23:00 - 00	Total
27-Feb	FRI	13	11	7	15	26	67	158	381	529	490	493	446	516	488	563	636	676	526	378	204	149	94	57	37	6960
6-Mar	FRI	16	13	10	16	28	85	132	379	545	458	495	550	508	507	577	624	645	539	339	240	162	106	78	37	7089
29-May	FRI	12	15	12	9	26	73	133	395	508	460	416	500	507	538	577	688	632	575	279	208	168	97	118	46	6992
7-Aug	FRI	11	7	11	12	23	61	155	365	484	445	431	436	470	440	481	561	605	471	259	149	98	75	60	35	6145
30-Oct	FRI	10	6	11	16	15	65	157	440	548	457	483	502	528	452	558	652	589	562	293	172	126	83	61	33	6819
6-Nov	FRI	19	14	16	11	19	67	150	395	549	474	480	518	529	507	554	667	607	584	337	208	140	116	90	27	7078
2-Mar	MON	15	16	9	24	27	70	176	456	536	435	423	509	455	398	419	570	566	503	251	164	77	60	35	31	6225
9-Mar	MON	15	8	12	18	37	67	149	406	509	419	421	432	414	387	479	477	530	546	249	122	88	53	18	20	5876
25-May	MON	7	9	7	16	31	77	162	388	519	421	396	423	430	426	438	522	528	498	172	116	54	40	40	11	5731
10-Aug	MON	12	7	14	16	25	62	142	397	468	373	338	394	422	384	468	455	535	420	196	117	67	45	27	12	5396
2-Nov	MON	15	13	10	13	26	90	165	448	537	452	458	427	475	463	480	547	591	532	294	149	78	48	41	16	6368
9-Nov	MON	14	9	14	19	25	71	185	426	577	441	453	495	484	438	493	545	591	550	289	156	114	59	36	15	6494
28-Feb	SAT	21	12	11	12	28	43	94	194	287	456	503	581	507	465	440	543	358	308	228	160	116	92	67	50	5376
7-Mar	SAT	26	13	12	10	13	40	88	171	271	416	533	560	527	496	464	379	316	304	212	139	94	99	66	31	5280
23-May	SAT	17	9	7	11	14	35	54	118	186	284	430	449	422	367	316	273	281	238	173	81	61	60	45	23	3954
8-Aug	SAT	17	10	9	8	26	30	54	144	250	410	512	521	499	397	377	343	271	242	180	106	87	61	44	24	4622
31-Oct	SAT	18	12	12	13	20	23	91	196	311	453	523	570	550	460	438	408	431	306	231	195	136	92	59	27	5575
7-Nov	SAT	17	12	11	7	16	40	86	193	332	475	571	549	504	424	399	354	363	314	354	315	232	290	195	30	6083
1-Mar	SUN	29	12	16	4	10	25	46	105	145	322	426	489	410	374	416	431	341	301	223	165	115	53	34	17	4509
8-Mar	SUN	17	14	9	5	10	18	48	81	148	286	425	468	420	405	409	374	354	335	228	158	120	60	30	18	4440
24-May	SUN	28	24	20	4	12	23	35	86	129	272	340	394	349	370	288	336	286	232	166	104	50	34	12	8	3602
9-Aug	SUN	22	11	6	4	9	14	34	71	126	226	311	369	391	320	346	289	284	248	156	104	69	44	20	13	3421
1-Nov	SUN	17	12	8	12	43	16	42	117	177	313	389	354	402	368	377	392	370	279	183	151	126	72	26	18	4264
8-Nov	SUN	19	14	7	6	11	20	55	129	202	305	422	433	414	352	347	448	321	313	230	151	117	55	25	22	4418
5-Mar	THU	12	8	9	19	15	72	141	393	592	469	484	479	481	510	530	594	590	579	325	193	126	87	46	35	6789
12-Mar	THU	7	3	13	21	24	77	149	397	551	439	460	502	469	481	478	540	596	590	313	187	136	91	55	30	6609
28-May	THU	9	9	15	13	18	77	172	394	553	484	426	474	472	444	504	582	604	552	248	146	101	62	59	21	6439
6-Aug	THU	19	8	13	8	20	50	139	384	499	442	459	404	425	439	494	515	530	487	217	120	88	61	46	22	5889
29-Oct	THU	7	8	15	14	21	69	158	402	547	469	493	482	512	457	489	572	562	563	255	167	84	68	37	24	6475
5-Nov	THU	8	7	12	9	24	77	160	421	536	544	478	581	549	503	556	566	604	614	294	196	118	87	57	22	6973
3-Mar	TUE	12	15	12	14	23	68	143	395	548	431	428	454	475	461	521	545	581	541	248	150	112	78	36	17	6302
10-Mar	TUE	4	7	11	13	25	55	143	384	538	470	456	435	486	445	447	546	581	524	260	175	107	74	36	20	6236
26-May	TUE	16	6	15	10	18	69	161	412	522	450	410	425	466	447	470	566	529	520	228	108	66	63	33	33	6049
11-Aug	TUE	12	6	7	13	18	49	152	369	473	429	417	482	455	384	412	487	563	471	205	104	60	49	22	18	5611
3-Nov	TUE	7	10	17	8	14	59	174	446	550	474	524	536	503	466	505	546	588	506	283	147	114	67	43	21	6608
10-Nov	TUE	9	9	14	15	25	83	187	396	605	481	475	437	491	459	540	589	574	518	303	179	110	73	50	16	6638
4-Mar	WED	7	7	14	14	19	81	139	422	536	449	464	528	480	405	471	563	572	601	293	176	103	82	42	19	6497
11-Mar	WED	8	17	9	13	22	63	161	419	554	465	489	523	478	484	460	545	580	568	286	169	118	78	40	20	6572
27-May	WED	10	11	11	11	23	66	175	402	515	401	422	440	467	416	474	529	539	504	233	127	80	87	28	17	6044
5-Aug	WED	8	9	7	14	13	60	142	364	482	398	407	423	432	454	460	525	528	422	198	108	74	73	35	17	5653
4-Nov	WED	10	11	11	16	16	77	159	387	538	500	489	494	547	467	534	536	585	562	302	173	103	87	44	20	6668
11-Nov	WED	10	5	10	10	29	74	173	441	523	517	461	484	537	494	505	549	600	603	311	200	124	108	53	30	6900
		00:00 - 01	01:00 - 02	02:00 - 03	03:00 - 04	04:00 - 05	05:00 - 06	06:00 - 07	07:00 - 08	08:00 - 09	09:00 - 10	10:00 - 11	11:00 - 12	12:00 - 13	13:00 - 14	14:00 - 15	15:00 - 16	16:00 - 17	17:00 - 18	18:00 - 19	19:00 - 20	20:00 - 21	21:00 - 22	22:00 - 23	23:00 - 00	Total
Weekday		11	9	12	14	23	69	156	404	534	457	451	471	482	455	498	561	580	534	271	161	105	75	47	24	
Sat		19	11	10	10	20	35	78	169	273	416	512	538	502	435	406	350	337	285	230	166	121	116	79	31	
Sun		22	15	11	6	16	19	43	98	155	287	386	408	398	365	363	378	326	285	198	139	100	53	25	16	

	PERIOD	Days/Yr	hrs/day	Hrs/Year	flow/hr			
weekday night		240	13	3120	75			
week day AM		240	1	240	534			
week day PM		240	2	480	571			
week day IP		240	8	1920	469	Same as Saturday pe	Counte	
Saturday		52	6	312	468	Count was 11-12	Sidra Volmes reduced by	0.87
Sunday		68	6	408	383	82% of IP	Sidra Volmes reduced by	0.71
Weekend offpeak/night		120	18	2160	115			

APPENDIX J
ECONOMICS

COST-BENEFIT ANALYSIS OF THE OPTIONS

WORKSHEET 4

Const Starts 1-Oct-18

Const Ends 1-Apr-19

Project : Waipapa Road/SH10 Intersection

Calculated by : Kristoffer Hansson

Reviewed by:

Time Zero:	1-Jul	2017
Base Date:	1-Jul	2016

OPTION		Option 2 (Roundabout)	Option 4 (Head to Head Right Turn Bays)	Option 5 (Close Waipapa Loop South)	Option 3 (Traffic Signals)	Option 1 (Right Turn Bay)	Do Min	Option 2 (Roundabout)	Option 4 (Head to Head Right Turn Bays)	Option 5 (Close Waipapa Loop South)	Option 3 (Traffic Signals)	Option 1 (Right Turn Bay)
TANGIBLE BENEFITS CALCULATION:										NET BENEFITS OF THE OPTIONS		
1. Travel Time		$6,465,175	$9,838,281	$10,203,623	$29,877,354	$9,838,281	$21,037,803	$14,572,628	$11,199,523	$10,834,181	($8,839,551)	$11,199,523
2. Vehicle Oper.		$14,838,274	$15,743,905	$16,027,995	$16,098,854	$15,743,905	$18,924,446	$4,086,173	$3,180,541	$2,896,451	$2,825,592	$3,180,541
3. Accidents		$1,794,968	$1,927,424	$1,927,424	$2,223,937	$1,927,424	$2,247,576	$452,608	$320,152	$320,152	$23,639	$320,152
4.Carbon dixiode ($40/tonne)		$939,343	$1,017,102	$1,031,307	$1,032,524	$1,017,102	$1,212,531	$273,188	$195,429	$181,224	$180,007	$195,429
6. TOTAL (1+2+3+4)		$24,037,760	$28,526,712	$29,190,348	$49,232,670	$28,526,712	$43,422,356	$19,384,597	$14,895,645	$14,232,008	($5,810,313)	$14,895,645
COSTS CALCULATION:										NET COSTS OF THE PROJECT OPTIONS		
1. Fees		$473,810	$453,859	$449,037	$493,118	$434,350	$0	$473,810	$453,859	$449,037	$493,118	$434,350
2. Property		$1,069,609	$457,027	$100,401	$439,892	$294,243	$0	$1,069,609	$457,027	$100,401	$439,892	$294,243
3. Construction		$4,716,741	$4,522,905	$4,449,102	$4,904,331	$4,333,368	$0	$4,716,741	$4,522,905	$4,449,102	$4,904,331	$4,333,368
4. Maintenance							$0					
5. TOTAL (1+2+3+4)		$6,260,159	$5,433,791	$4,998,541	$5,837,341	$5,061,960	$0	$6,260,159	$5,433,791	$4,998,541	$5,837,341	$5,061,960
TANGIBLE BENEFIT TO COST RATIO								**3.1**	**2.7**	**2.8**	**N/A**	**2.9**

Ranking B/C Ratio

Intangible Benefits

INCREMENTAL COST-BENEFIT ANALYSIS OF PROJECT OPTIONS

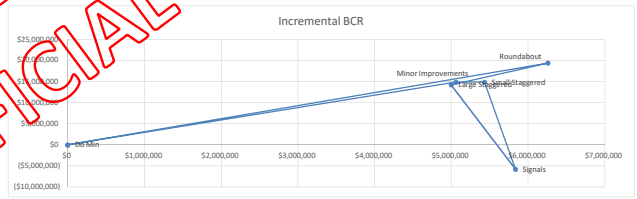
WORKSHEET 5

Incremental BCR in order of increasing cost:

Target BCR 3.0

Ranked by increasing cost

Option	Net Costs	Net Benefits
Do Min	$0	$0
Minor Improvements	$5,061,960	$14,895,645
Small Staggered	$5,433,791	$14,895,645
Signals	$5,837,341	($5,810,313)
Large Staggered	$4,998,541	$14,232,008
Roundabout	$6,260,159	$19,384,597
PW Roundabout	#REF!	#REF!



Step	Option A: Option	Costs	Benefits	Option B: Option	Costs	Benefits	Incremental Costs	Incremental Benefits	Incremental BCR
1	Option 1 (Right Turn Bay)	$5,061,960	$14,895,645	Option 4 (Head to Head Right Turn Bays)	$5,433,791	$14,895,645	$371,830	$0	N/A
2	Option 1 (Right Turn Bay)	$5,061,960	$14,895,645	Option 3 (Traffic Signals)	$5,837,341	($5,810,313)	$775,380	($20,705,958)	N/A
3	Option 1 (Right Turn Bay)	$5,061,960	$14,895,645	Option 5 (Close Waipapa Loop South)	$4,998,541	$14,232,008	($63,419)	($663,636)	N/A
4	Option 1 (Right Turn Bay)	$5,061,960	$14,895,645	Roundabout	6260159.312	19384596.87	$1,198,199	$4,488,952	**3.7**
5	Roundabout	$6,260,159	$19,384,597	#REF!	#REF!	#REF!	#REF!	#REF!	**#REF!**

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	**TYPE**	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION Do Min

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0					2017	0.96		0.916	0.000	0.000
Fees	F	0.3	0.3	0.0					2017	0.96		0.986	0.000	0.000
Fees	F	0.8	0.8	0.0					2017	0.96		0.957	0.000	0.000
Property	L	1.3	1.3	0.0					2017	0.96		0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	161,231	26.60%	236,986	18.15%	2002	1.45	$3,422,510	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			590,184	20.41%	2002	1.45	$6,960,151	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			1,794,648	0.91%	2002	1.45	$10,655,142	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	640,236	5.23%	698,933	4.79%	2008	0.98	$4,786,972	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			975,250	9.74%	2008	0.98	$5,824,205	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,925,160	1.88%	2008	0.98	$8,313,270	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	41,135	5.22%	44,896	4.78%	2008	0.98	$307,366	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			62,599	9.69%	2008	0.98	$373,217	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			123,238	1.87%	2008	0.98	$531,948	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	152,050	0.20%	152,582	0.20%	2006	1.03	$2,247,576	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$161,231		$640,236		$41,135		152050	304
2026	$590,184	$42,895	$975,250	$33,501	$62,599	$2,146		
2036	$1,794,648	$120,446	$1,925,160	$94,991	$123,238	$6,064		
2056	$ 2,122,503	$ 16,393	$ 2,649,059	$ 36,194	$ 159,437	$ 2,310		
						crash GROWTH adjustment =		0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	**TYPE**	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING — OPTION: Option 3 (Traffic Signals) — WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	5,575,956		5,575,956		2017	0.96	$4,904,331	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	264,397		264,397		2017	0.96	$250,150	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	264,397		264,397		2017	0.96	$242,968	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	492,900		492,900		2017	0.96	$439,892	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	488,419	6.74%	546,109	6.03%	2002	1.45	$5,753,744	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			817,687	14.57%	2002	1.45	$8,319,783	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			2,009,021	5.04%	2002	1.45	$15,803,827	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	757,002	3.51%	804,893	3.40%	2008	0.98	$5,265,374	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			1,030,343	3.92%	2008	0.98	$5,029,763	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,434,224	1.02%	2008	0.98	$5,803,718	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	48,574	3.61%	51,648	3.40%	2008	0.98	$337,868	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			66,116	3.91%	2008	0.98	$322,622	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			91,062	1.02%	2008	0.98	$372,034	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	150,450	0.20%	150,978	0.20%	2006	1.03	$2,223,937	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	CO2	growth/yr	crashes	growth/yr
2016	$488,419		$757,002		$48,574		150450	301
2026	$817,687	$32,927	$1,030,343	$27,334	$66,116	$1,754		
2036	$2,009,021	$119,133	$1,434,224	$40,388	$91,963	$2,585		
2056	4,033,700	$101,234	1,726,982	$14,638	110,671	$935		
						crash GROWTH adjustment =		0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	**TYPE**	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION Option 1 (Right Turn Bay)

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	4,926,802		4,926,802		2017	0.96	$4,333,368	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	232,887		232,887		2017	0.96	$220,338	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	232,887		232,887		2017	0.96	$214,011	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	329,700		329,700		2017	0.96	$294,243	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	116,306	10.73%	139,181	9.04%	2002	1.45	$1,591,017	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			241,158	26.64%	2002	1.45	$2,992,990	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			787,062	2.49%	2002	1.45	$5,254,274	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	693,013	3.91%	740,530	3.66%	2008	0.98	$4,887,700	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			964,218	5.10%	2008	0.98	$4,920,226	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,456,016	1.12%	2008	0.98	$5,935,979	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	44,549	3.91%	47,597	3.66%	2008	0.98	$314,079	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			61,947	5.26%	2008	0.98	$317,960	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			94,534	1.11%	2008	0.98	$385,063	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	130,391	0.20%	130,848	0.20%	2006	1.03	$1,927,424	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	CO2	growth/yr	crashes	growth/yr
2016	$116,306		$693,013		$44,549		130391	261
2026	$241,158	$12,485	$964,218	$17,121	$61,947	$1,740		
2036	$787,062	$54,590	$1,456,016	$19,180	$94,534	$3,259		
2056	1,179,478	$19,621	1,791,115	$16,255	115,426	$1,045		
						crash GROWTH adjustment =		0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	**TYPE**	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION **Option 2 (Roundabout)**

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	5,362,676		5,362,676		2017	0.96	$4,716,741	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	254,045		254,045		2017	0.96	$240,356	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	254,045		254,045		2017	0.96	$233,454	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	1,198,500		1,198,500		2017	0.96	$1,069,609	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	140,208	5.02%	153,530	4.61%	2002	1.45	$1,536,643	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			210,538	10.13%	2002	1.45	$1,886,777	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			425,142	3.52%	2002	1.45	$3,041,755	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	728,375	1.53%	773,393	2.32%	2008	0.98	$5,046,772	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			985,317	3.28%	2008	0.98	$4,691,525	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,308,327	0.55%	2008	0.98	$5,099,976	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	45,005	3.55%	48,866	3.34%	2008	0.98	$319,074	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			62,331	3.30%	2008	0.98	$297,019	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			82,889	0.56%	2008	0.98	$323,250	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	121,420	0.20%	121,856	0.20%	2006	1.03	$1,794,968	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$140,208		$728,375		$46,005		$ 121,430.41	243
2026	$210,538	$7,033	$985,317	$25,694	$62,331	$1,633		
2036	$425,142	$21,460	$1,308,327	$32,301	$82,889	$2,056		
2056	724,182	$14,952	1,452,441	$7,206	92,109	$461		
						crash GROWTH adjustment =		0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	**TYPE**	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION **Option 4 (Head to Head Right Turn Bays)**

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	5,142,295		5,142,295		2017	0.96	$4,522,905	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	243,348		243,348		2017	0.96	$230,235	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	243,348		243,348		2017	0.96	$223,624	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	512,100		512,100		2017	0.96	$457,027	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	116,306	10.73%	139,181	9.04%	2002	1.45	$1,591,017	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			241,158	26.64%	2002	1.45	$2,992,990	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			787,062	2.49%	2002	1.45	$5,254,274	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	693,013	3.91%	740,530	2.66%	2008	0.98	$4,887,700	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			964,218	5.10%	2008	0.98	$4,920,226	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,456,016	1.12%	2008	0.98	$5,935,979	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	44,549	3.91%	47,697	3.66%	2008	0.98	$314,079	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			61,947	5.26%	2008	0.98	$317,960	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			94,534	1.11%	2008	0.98	$385,063	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	130,391	0.20%	180,848	0.20%	2006	1.03	$1,927,424	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$116,306		$693,013		$44,549		130391	261
2026	$241,158	$12,485	$964,218	$27121	$61,947	$1,740		
2036	$787,062	$54,590	$1,456,016	$49,180	$94,534	$3,259		
2056	1,179,478	$19,621	1,761,115	$16,255	115,426	$1,045		
						crash GROWTH adjustment =		0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	**TYPE**	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING **OPTION** **Option 5 (Close Waipapa Loop South)** **WORKSHEET A1.1 and A1.2**

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	5,058,386		5,058,386		2017	0.96	$4,449,102	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	239,408		239,408		2017	0.96	$226,508	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	242,156		242,156		2017	0.96	$222,529	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	112,500		112,500		2017	0.96	$100,401	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	116,306	10.73%	128,181	9.04%	2002	1.45	$1,591,017	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			241,158	22.64%	2002	1.45	$2,992,990	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			787,062	2.49%	2002	1.45	$5,254,274	0.312	12.187	103.433
Additional Travel Time 2016-2026	T	1.8	10.0	8.2	12,275	3.90%	13,113	3.65%	2002	1.45	$128,012	0.903	6.549	24.852
Additional Travel Time 2026-2036	T	10.0	20.0	10.0			17,062	2.73%	2002	1.45	$117,623	0.558	7.579	34.234
Additional Travel Time 2036-2056	T	20.0	41.3	21.3			21,725	0.00%	2002	1.45	$119,707	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	693,013	3.91%	749,596	3.66%	2008	0.98	$4,887,700	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			964,818	5.10%	2008	0.98	$4,920,226	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,456,016	1.12%	2008	0.98	$5,935,979	0.312	12.187	103.433
Additional VOC 2016-2026	v	1.8	10.0	8.2	14,313	3.83%	15,159	3.59%	2002	0.98	$99,866	0.903	6.549	24.852
Additional VOC 2026-2036	v	10.0	20.0	10.0			19,659	2.68%	2002	0.98	$91,398	0.558	7.579	34.234
Additional VOC 2036-2056	v	20.0	41.3	21.3			24,926	0.00%	2002	0.98	$92,825	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	44,549	3.91%	47,597	3.66%	2008	0.98	$314,079	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			61,947	5.26%	2008	0.98	$317,960	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			94,534	1.11%	2008	0.98	$385,063	0.312	12.187	103.433
Additional CO2 2016-2026	CO2	1.8	10.0	8.2	71	3.83%	758	3.59%	2002	0.98	$4,993	0.903	6.549	24.852
Additional Co2 2026-2036	CO2	10.0	20.0	10.0			983	2.68%	2002	0.98	$4,570	0.558	7.579	34.234
Additional CO2 2036-2056	CO2	20.0	41.3	21.3			1,246	0.00%	2002	0.98	$4,641	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	130,391	0.20%	130,848	0.20%	2006	1.03	$1,927,424	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	CO2	growth/yr	crashes	growth/yr
2016	$116,306		$693,013		$44,549		130391	261
2026	$241,158	$12,485	$964,218	$27,121	$61,947	$1,740		
2036	$787,062	$54,590	$1,456,016	$49,190	$94,534	$3,259		
2056	1,179,478	$19,621	1,781,115	$16,255	115,426	$1,045		
						crash GROWTH adjustment =		0.20%

APPENDIX K
Cost Estimates and Risk Register

Project Estimate - Form C

DBE

PN4234 SH10 Waipapa Road Intersection Improvements

Detailed Business Case Estimate
Right Turn Bay

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	**Nett Project Property Cost**	274,750	54,950	27,475
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	**Total Project Development**	**Nil**	**Nil**	**Nil**
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	**Total Pre-implementation**	423,431	42,343	42,343
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	325,716	65,143	
	Physical Works			
1	Environmental Compliance	50,000	5,000	
2	Earthworks	22,918	2,292	
3	Ground Improvements	0	0	
4	Drainage	634,384	63,438	
5	Pavement and Surfacing	462,499	46,250	
6	Bridges	0	0	
7	Retaining Walls	62,550	6,255	
8	Traffic Services	216,500	21,650	
9	Service Relocations	1,290,000	258,000	
10	Landscaping	143,312	14,331	
11	Traffic Management and Temporary Works	375,000	37,500	
12	Preliminary and General	260,573	26,057	
13	Extraordinary Construction Costs	488,574	48,857	
	Sub Total Base Physical works	4,006,311	529,631	
D	**Total for Implementation Phase**	4,332,027	594,774	950,000
E	**Project Base Estimate** (A+C+D)	5,030,208		
F	**Contingency** (Assessed/Analysed)	(A+C+D)	692,067	
G	**Project Expected Estimate**	(E+F)	5,722,276	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	**Funding Risk Contingency** (Assessed/Analysed)		(A+C+D)	1,019,818
I	**95th percentile Project Estimate**		(G+H)	6,742,094
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate 29/09/17	**Cost Index (Qtr/Year)**
Estimate prepared by	**Signed** N Todd Jones
Estimate internal peer review by	**Signed**
Estimate external peer review by	**Signed**
Estimate accepted by NZTA	**Signed**

Note: (1) These estimates are exclusive of escalation and GST.
(2) Project Development Phase Estimates are set to Nil as these are now sunk costs.

Project Estimate - Form C

PN4234 SH10 Waipapa Road Intersection Improvements

DBE

Detailed Business Case Estimate
Roundabout

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	Nett Project Property Cost	998,750	199,750	99,875
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	Total Project Development	Nil	Nil	Nil
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	Total Pre-implementation	461,899	46,190	46,190
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	355,307	71,061	
	Physical Works			
1	Environmental Compliance	50,000	5,000	
2	Earthworks	28,256	2,826	
3	Ground Improvements	0	0	
4	Drainage	667,241	66,724	
5	Pavement and Surfacing	579,306	57,931	
6	Bridges	0	0	
7	Retaining Walls	62,550	6,255	
8	Traffic Services	226,550	22,655	
9	Service Relocations	1,290,000	258,000	
10	Landscaping	274,170	27,417	
11	Traffic Management and Temporary Works	375,000	37,500	
12	Preliminary and General	284,246	28,425	
13	Extraordinary Construction Costs	532,961	53,296	
	Sub Total Base Physical works	4,370,279	566,028	
D	Total for Implementation Phase	4,725,587	637,089	1,512,500
E	Project Base Estimate (A+C+D)	6,186,236		
F	Contingency (Assessed/Analysed)	(A+C+D)	883,029	
G	Project Expected Estimate	(E+F)	7,069,265	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	Funding Risk Contingency (Assessed/Analysed)		(A+C+D)	1,658,565
I	95th percentile Project Estimate		(G+H)	8,727,830
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate 29/09/17	Cost Index (Qtr/Year)
Estimate prepared by	Signed
Estimate internal peer review by	Signed
Estimate external peer review by	Signed
Estimate accepted by NZTA	Signed

Note: (1) These estimates are exclusive of escalation and GST.
(2) Project Development Phase Estimates are set to Nil as these are now sun

Project Estimate - Form C

PN4234 SH10 Waipapa Road Intersection Improvements

DBE

Detailed Business Case Estimate
Traffic Signals

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	Nett Project Property Cost	410,750	82,150	41,075
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	Total Project Development	Nil	Nil	Nil
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	Total Pre-implementation	480,722	48,072	48,072
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	369,786	73,957	
	Physical Works			
1	Environmental Compliance	50,000	5,000	
2	Earthworks	12,872	1,287	
3	Ground Improvements	0	0	
4	Drainage	659,124	65,912	
5	Pavement and Surfacing	603,062	60,306	
6	Bridges	0	0	
7	Retaining Walls	56,250	5,625	
8	Traffic Services	515,500	51,550	
9	Service Relocations	1,290,000	258,000	
10	Landscaping	136,057	13,606	
11	Traffic Management and Temporary Works	375,000	37,500	
12	Preliminary and General	295,829	29,583	
13	Extraordinary Construction Costs	554,680	55,468	
	Sub Total Base Physical works	4,548,374	583,837	
D	Total for Implementation Phase	4,918,160	657,795	1,265,000
E	Project Base Estimate (A+C+D)	5,809,633		
F	Contingency (Assessed/Analysed)	(A+C+D)	788,017	
G	Project Expected Estimate	(E+F)	6,597,650	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	Funding Risk Contingency (Assessed/Analysed)		(A+C+D)	1,354,147
I	95th percentile Project Estimate		(G+H)	7,951,797
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate 29/9/17	Cost Index (Qtr/Year)
Estimate prepared by	Signed N Todd Jones
Estimate internal peer review by	Signed
Estimate external peer review by	Signed
Estimate accepted by NZTA	Signed

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Project Estimate - Form C

PN4234 SH10 Waipapa Road Intersection Improvements

DBE

Detailed Business Case Estimate
Head to Head RTB

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	Nett Project Property Cost	426,750	85,350	42,675
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	Total Project Development	Nil	Nil	Nil
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	Total Pre-implementation	442,450	44,245	44,245
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	340,346	68,069	
	Physical Works			
1	Environmental Compliance	50,000	5,000	
2	Earthworks	12,872	1,287	
3	Ground Improvements	0	0	
4	Drainage	651,124	65,112	
5	Pavement and Surfacing	589,772	58,977	
6	Bridges	0	0	
7	Retaining Walls	62,550	6,255	
8	Traffic Services	223,000	22,300	
9	Service Relocations	1,290,000	258,000	
10	Landscaping	149,742	14,974	
11	Traffic Management and Temporary Works	375,000	37,500	
12	Preliminary and General	272,277	27,228	
13	Extraordinary Construction Costs	510,519	51,052	
	Sub Total Base Physical works	4,186,255	547,625	
D	Total for Implementation Phase	4,526,601	615,695	1,277,500
E	Project Base Estimate (A+C+D)	5,395,801		
F	Contingency (Assessed/Analysed)	(A+C+D)	745,290	
G	Project Expected Estimate	(E+F)	6,141,090	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	Funding Risk Contingency (Assessed/Analysed)	(A+C+D)		1,364,420
I	95th percentile Project Estimate	(G+H)		7,505,510
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate 29/09/17	Cost Index (Qtr/Year)
Estimate prepared by	Signed N Todd Jones
Estimate internal peer review by	Signed
Estimate external peer review by	Signed
Estimate accepted by NZTA	Signed

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Project Estimate - Form C

PN4234 SH10 Waipapa Road Intersection Improvements

DBE

Detailed Business Case Estimate
Close Waipapa Loop Road

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	Nett Project Property Cost	93,750	18,750	9,375
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	Total Project Development	Nil	Nil	Nil
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	Total Pre-implementation	435,287	43,529	43,529
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	334,836	66,967	
	Physical Works			
1	Environmental Compliance	50,000	5,000	
2	Earthworks	12,872	1,287	
3	Ground Improvements	0	0	
4	Drainage	643,272	64,327	
5	Pavement and Surfacing	534,476	53,448	
6	Bridges	0	0	
7	Retaining Walls	62,550	6,255	
8	Traffic Services	220,500	22,050	
9	Service Relocations	1,290,000	258,000	
10	Landscaping	159,690	15,969	
11	Traffic Management and Temporary Works	375,000	37,500	
12	Preliminary and General	267,869	26,787	
13	Extraordinary Construction Costs	502,254	50,225	
	Sub Total Base Physical works	4,118,483	540,848	
D	Total for Implementation Phase	4,453,319	607,816	922,500
E	Project Base Estimate (A+C+D)	4,982,356		
F	Contingency (Assessed/Analysed)	(A+C+D)	670,094	
G	Project Expected Estimate	(E+F)	5,652,450	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	Funding Risk Contingency (Assessed/Analysed)		(A+C+D)	975,404
I	95th percentile Project Estimate		(G+H)	6,627,854
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate 29/09/17	Cost Index (Qtr/Year)
Estimate prepared by	Signed
Estimate internal peer review by	Signed
Estimate external peer review by	Signed
Estimate accepted by NZTA	Signed

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Project Estimate - Form C

PN4234 SH10 Waipapa Road Intersection Improvements

DBE

Detailed Business Case Estimate
DO MINIMUM: Klinac Lane Extension

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	Nett Project Property Cost	0	0	0
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	Total Project Development	Nil	Nil	Nil
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	Total Pre-implementation	39,775	3,977	3,977
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	30,596	6,119	
	Physical Works			
1	Environmental Compliance	0	0	
2	Earthworks	0	0	
3	Ground Improvements	0	0	
4	Drainage	0	0	
5	Pavement and Surfacing	0	0	
6	Bridges	0	0	
7	Retaining Walls	0	0	
8	Traffic Services	0	0	
9	Service Relocations	0	0	
10	Landscaping	0	0	
11	Traffic Management and Temporary Works	0	0	
12	Preliminary and General	0	0	
13	Extraordinary Construction Costs	0	0	
	Sub Total Base Physical works	376,329	37,633	
D	Total for Implementation Phase	406,925	43,752	387,500
E	Project Base Estimate (A+C+D)	446,700		
F	Contingency (Assessed/Analysed)	(A+C+D)	47,730	
G	Project Expected Estimate	(E+F)	494,429	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	Funding Risk Contingency (Assessed/Analysed)		(A+C+D)	391,477
I	95th percentile Project Estimate		(G+H)	885,907
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate 29/09/17	Cost Index (Qtr/Year)
Estimate prepared by	Signed
Estimate internal peer review by	Signed
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Estimate accepted by NZTA	Signed

Note: (1) These estimates are exclusive of escalation and GST.
(2) Project Development Phase Estimates are set to Nil as these are now sun

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Right Turn Bay		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
C	**Pre-implementation Phase Fees**			**$ 423,431.20**
D1	**Implementation Phase fees**			**$ 325,716.31**
D2	**Physical Works**			**$ 4,006,310.61**
1.00	**Environmental Compliance**			**$ 50,000.00**
2.00	**Earthworks**			**$ 22,918.35**
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ 10,046.40	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Right Turn Bay		
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
3.00	**Ground Improvements**			**$ -**
4.00	**Drainage**			**$ 634,384.05**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 139,894.29	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 21,600.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 60,869.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 15,806.75	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit	ea.	$ 8,093.19	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 462,498.70**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 38,193.07	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 6,368.00	
5.11	Base course	m3	$ 41,861.49	
5.12	Surfacing (chip seal)	m2	$ 9,544.00	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 121,200.00	
5.14	Surfacing (second coat)	m2	$ 46,475.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Right Turn Bay		
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
7.00	**Retaining Walls and Access Works**			**$ 62,550.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 34,650.00	
8.00	**Traffic Services**			**$ 216,500.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 8,000.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 3,000.00	
8.06	Traffic signals		$ -	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**	Estimated		**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 143,312.00**
10.01	Landscaping (aesthetic and environmental)		$ -	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 3,200.00	
10.04	Architecture		$ -	
10.05	Fencing		$ -	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 63,000.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 43,500.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 24,000.00	
10.12	Traffic islands - pedestrian	m2	$ 3,400.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Right Turn Bay		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
11.00	Traffic Management and Temporary Works			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	Preliminary and General			$ 260,573.05
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 97,714.89	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$	
13	Extraordinary Construction Costs			$ 488,574.46

Base Estimate	$ 4,755,458.12

Date of Estimate	29/09/2017
Estimate prepared by	N Todd/Aroyo
Estimate internal peer review by	
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation and GST.

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Roundabout		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
C	**Pre-implementation Phase Fees**			**$ 461,899.44**
D1	**Implementation Phase fees**			**$ 355,307.26**
D2	**Physical Works**			**$ 4,370,279.34**
1.00	**Environmental Compliance**			**$ 50,000.00**
2.00	**Earthworks**			**$ 28,255.50**
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ 15,383.55	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Roundabout		
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
3.00	**Ground Improvements**			**$ -**
4.00	**Drainage**			**$ 667,241.31**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 135,231.14	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 40,000.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 90,860.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 28,452.60	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit		$ 14,367.73	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 579,305.93**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 58,483.13	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 9,751.00	
5.11	Base course	m3	$ 64,100.40	
5.12	Surfacing (chip seal)	m2	$ 14,614.25	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 195,000.00	
5.14	Surfacing (second coat)	m2	$ 38,500.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Roundabout		
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
7.00	**Retaining Walls and Access Works**			**$ 62,550.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 34,650.00	
8.00	**Traffic Services**			**$ 226,550.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 15,550.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 5,500.00	
8.06	Traffic signals		$ -	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$ -	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**			**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 274,169.90**
10.01	Landscaping (aesthetic and environmental)	m2	$ 34,000.00	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 4,320.00	
10.04	Architecture		$ -	
10.05	Fencing		$ 2,187.90	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 81,000.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 39,000.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 48,000.00	
10.12	Traffic islands - pedestrian	m2	$ 3,400.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron	m2	$ 56,050.00	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Roundabout		
Item	Description	Unit	Sub-Element Totals	Element Totals
11.00	**Traffic Management and Temporary Works**			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	**Preliminary and General**			$ 284,245.81
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 532,960.90	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$ -	
13	**Extraordinary Construction Costs**			$ 532,960.90

Base Estimate	$ 5,187,486.04

Date of Estimate	29/09/2017
Estimate prepared by	N Taylor
Estimate internal peer review by	
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation and

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Traffic Signals		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
C	**Pre-implementation Phase Fees**			**$ 480,722.44**
D1	**Implementation Phase fees**			**$ 369,786.50**
D2	**Physical Works**			**$ 4,548,373.92**
1.00	**Environmental Compliance**			**$ 50,000.00**
2.00	**Earthworks**			**$ 12,871.95**
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ -	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures: temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements			Traffic Signals	
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
3.00	**Ground Improvements**		$ -	**$ -**
4.00	**Drainage**			**$ 659,124.01**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 139,894.29	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 32,000.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 60,869.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 35,290.80	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit	ea.	$ 12,949.10	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 603,062.11**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 79,966.73	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m3	$ 13,333.00	
5.11	Base course	m2	$ 87,647.49	
5.12	Surfacing (chip seal)	m2	$ 19,982.75	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 159,000.00	
5.14	Surfacing (second coat)	m2	$ 44,275.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Traffic Signals		
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
7.00	**Retaining Walls and Access Works**			**$ 56,250.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 28,350.00	
8.00	**Traffic Services**			**$ 515,500.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 12,000.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 3,000.00	
8.06	Traffic signals	LS	$ 295,000.00	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**			**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 136,056.90**
10.01	Landscaping (aesthetic and environmental)		$ -	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 1,440.00	
10.04	Architecture		$ -	
10.05	Fencing	m2	$ 504.90	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 63,000.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 43,500.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 18,000.00	
10.12	Traffic islands - pedestrian	m2	$ 3,400.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Traffic Signals		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
11.00	**Traffic Management and Temporary Works**			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	**Preliminary and General**			$ 295,829.20
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 110,935.95	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$ -	
13	**Extraordinary Construction Costs**			$ 554,679.75

Base Estimate	$ 5,398,882.86

Date of Estimate	29/09/2017
Estimate prepared by	NJ Todd
Estimate internal peer review by	
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation and

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements			Head to Head RTB	
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
C	**Pre-implementation Phase Fees**			**$ 442,449.70**
D1	**Implementation Phase fees**			**$ 340,345.93**
D2	**Physical Works**			**$ 4,186,254.92**
1.00	**Environmental Compliance**			**$ 50,000.00**
2.00	**Earthworks**			**$ 12,871.95**
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ -	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Head to Head RTB		
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
3.00	**Ground Improvements**			**$ -**
4.00	**Drainage**			**$ 651,124.01**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 139,894.29	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 24,000.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 90,860.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 25,290.80	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit	ea.	$ 12,949.10	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 589,171.52**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 69,224.93	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m3	$ 11,542.00	
5.11	Base course	m2	$ 75,873.94	
5.12	Surfacing (chip seal)	m2	$ 17,298.50	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 177,600.00	
5.14	Surfacing (second coat)	m2	$ 38,775.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Head to Head RTB		
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
7.00	**Retaining Walls and Access Works**			**$ 62,550.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 34,650.00	
8.00	**Traffic Services**			**$ 223,000.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 12,000.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 5,500.00	
8.06	Traffic signals		$ -	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$ -	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**			**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 149,741.80**
10.01	Landscaping (aesthetic and environmental)	m2	$ 12,800.00	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 1,920.00	
10.04	Architecture		$ -	
10.05	Fencing	m	$ 1,009.80	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 68,400.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 42,000.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 7,200.00	
10.12	Traffic islands - pedestrian	m2	$ 10,200.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Head to Head RTB		
Item	Description	Unit	Sub-Element Totals	Element Totals
11.00	**Traffic Management and Temporary Works**			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	**Preliminary and General**			$ 272,276.74
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 102,103.78	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$	
13	**Extraordinary Construction Costs**			$ 510,518.89

Base Estimate	$ 4,969,050.55

Date of Estimate	29/09/2017
Estimate prepared by	N Todd
Estimate internal peer review by	
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation and

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Close Waipapa Loop Road		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
C	**Pre-implementation Phase Fees**			**$ 435,286.82**
D1	**Implementation Phase fees**			**$ 334,836.02**
D2	**Physical Works**			**$ 4,118,483.02**
1.00	**Environmental Compliance**			**$ 50,000.00**
2.00	**Earthworks**			**$ 12,871.95**
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ -	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Close Waipapa Loop Road		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
3.00	**Ground Improvements**			$ -
4.00	**Drainage**			**$ 643,272.43**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 146,422.69	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 14,400.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,751.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 60,860.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 22,129.45	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$	
4.28	Single Sump Catchpit	ea.	$ 11,330.46	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 534,475.70**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 64,450.80	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m3	$ 10,746.00	
5.11	Base course	m2	$ 70,641.26	
5.12	Surfacing (chip seal)	m2	$ 16,105.50	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 130,500.00	
5.14	Surfacing (second coat)	m2	$ 43,175.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			$ -

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements Elemental Breakdown for Physical Works		Close Waipapa Loop Road		
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
7.00	**Retaining Walls and Access Works**			**$ 62,550.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 34,650.00	
8.00	**Traffic Services**			**$ 220,500.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 12,000.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 3,000.00	
8.06	Traffic signals		$ -	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$ -	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**			**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 159,690.10**
10.01	Landscaping (aesthetic and environmental)		$ -	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 1,600.00	
10.04	Architecture		$ -	
10.05	Fencing	m	$ 1,178.10	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 63,000.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 43,500.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 40,800.00	
10.12	Traffic islands - pedestrian	m2	$ 3,400.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Close Waipapa Loop Road		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
11.00	**Traffic Management and Temporary Works**			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	**Preliminary and General**			$ 267,868.81
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 100,450.81	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$ -	
13	**Extraordinary Construction Costs**			$ 502,254.03

Base Estimate	$ 4,888,605.86

Date of Estimate	29/09/2017
Estimate prepared by	N Todd (for)
Estimate internal peer review by	
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation and

PN4234 SH10 Waipapa Road Intersection Improvements

Nett Property Costs

Property Acquisition Reference	Property Requirements	Purchased	Property Purchase Costs (A)	(Less) Disposal Value (B)	Nett Property Purchase Costs (A-B=C)					Property Compensation Costs (D)	Property owner Accommodation Works (E)	Nett Project Property Cost (C+D+E=F)
					Right Turn Bay	Round-about	Signals	Head to Head RTB	Cloase Waipapa Loop Road			
	Lot 2 DP 22952		0	0	12,000	12,000	12,000	12,000	12,000	0	0	0
	Lot 2 DP 72659		1,000,000	0	200,000	650,000	200,000	200,000	0	0	0	0
	Lot 1 DP 153739		0	0	16,000	40,000	40,000	30,000	39,000	0	0	0
	Lot 1 DP 95010		0	0	0	50,000	14,000	0	0	0	0	0
	Lot 2 DP 153648		0	0	0	200,000	95,000	135,000	0	0	0	0
	Lot 1 DP 164804		0	0	0	0	3,000	3,000	0	0	0	0
	Waipapa Corridor Treatment: Lot 1 DP 153739, Lot 4 DP 98489, Lot 3 DP 98489, Lot 4 DP 102236, Lot 5 DP 102236, Lot 3 DP 99619		0	0	46,750	46,750	46,750	46,750	46,750	0	0	0
			0	0						0	0	0
			0	0						0	0	0
			0	0						0	0	0
			0	0						0	0	0
Fees	**Property Acquisition Agents Fees**	-	-	-	-					-	-	0
Base Estimate			**0**	**0**	**274,750**	**998,750**	**410,750**	**426,750**	**93,750**	**0**	**0**	**0**

Contingency	0
Expected Estimate	**0**

Funding Risk Contingency	0
95th Percentile Estimate	**0**

Date of Estimate	**Cost Index**
Estimate prepared by	**Signed**
Estimate internal peer review by	**Signed**
Estimate external peer review by	**Signed**
Estimate accepted by NZTA project manager	**Signed**

Note: These estimates are exclusive of escalation and GST.

Ian Rich – HNO Risk Advisor (Tel: 04 894 6287)
Ian.Rich@nzta.govt.nz
April 2015

Risk Register

Project/Contract:	SH10 Waipapa Road Intersection
Project/Contract ID:	PN4234
NZTA Office:	Northland
NZTA Lead:	Sebastian Reed

Document Date:	21 June 2017	
Supplier Lead:	Chris Parker	Opus
RM Specialist:	Naushaba Todd-Jones	Opus
Risk Tolerance Threshold:	**Moderate**	

									Current Exposure				**Residual (Target) Exposure**			
									Semi-Quantitative			**Treatment Strategy**	**Semi-Quantitative**			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
5	1	Property acquisition required to widen the carriageway lanes and add the intersections	**Description:** There is a threat that compulsory acquisition will be required. **Cause:** The cause of the threat is that due to the design (carriageway widths and shared pathways) land in-take will be required and uncooperative owners may require statutory timeframes (18 months). **Consequence:** The consequence of the threat is that this will lead to delays in the project programme until compulsory acquisition has been completed.	Sebastian Reed / Stu Graham	NZTA	21/03/2017	Draft	Pre Implementation	Begin property acquisition liaison as early as possible in the project.	Very High	Low	20		High	Very Low	8	
1	2	Property disposal	**Description:** There is an opportunity to sell a portion of the Loop Road (north end) by moving the turnaround (closed end) treatment further into Loop Road. **Cause:** The cause of the opportunity is that Loop Road is to be closed off with a turnaround treatment in the current design. **Consequence:** The consequence of the opportunity is that the north end of Loop Road can be separated as a section and sold possibly to the neighbouring property as a store frontage.	Sebastian Reed / Stu Graham	NZTA	21/03/2017	Draft	Pre Implementation	This opportunity to be explored and implemented at the Detailed Design Stage.	High	High	21		Very High	Very High	25	
5	3	Treatment of Loop Road	**Description:** There is a threat that there may be public objections to the closing of the Loop Road, currently proposed in the Roundabout Option. **Cause:** The cause of the threat is that closing a road requires public notification, which may lead to objections and hearings. **Consequence:** The consequence of the threat is that Loop Road may have to be left open to the SH, which is not desirable for safety reasons.	Sebastian Reed / Keith Kent / Chris Parker	NZTA / FNDC / Opus	21/03/2017	Draft	Pre Implementation	Manage expectation early - prepare the arguments for closing Loop Road and demonstrate the benefits to the Public and Key Stakeholders on Open Days, meetings, etc. Include FNDC in presenting these arguments.	Very High	Low	20		Very High	Very Low	13	
1	4	Treatment of Loop Road	**Description:** There is a threat that for the Roundabout Option, the power poles on the top end (N) of Loop Road and the western end of Skippers lane will require relocating. **Cause:** The cause of the threat is the design requirement (closure of Loop Road, becoming a cul-de-sac and additional area requirement for the roundabout treatment at the intersection). **Consequence:** The consequence of the threat is that this involves major works and will affect both the cost and the programme of the project.	Sebastian Reed / Chris Parker	NZTA / Opus	21/03/2017	Draft	Pre Implementation	Establish from the design whether this relocation will be required and plan ahead, taking in account the cost and time requirements early in the project.	Very High	Medium	23		High	Low	16	

Ian Rich – HNO Risk Advisor (Tel: 04 894 6287)
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April 2015

Risk Register

Project/Contract:	SH10 Waipapa Road Intersection
Project/Contract ID:	PN4234
NZTA Office:	Northland
NZTA Lead:	Sebastian Reed

Document Date:	21 June 2017	
Supplier Lead:	Chris Parker	Opus
RM Specialist:	Naushaba Todd-Jones	Opus
Risk Tolerance Threshold:	**Moderate**	

									Current Exposure				**Residual (Target) Exposure**			
									Semi-Quantitative			**Treatment Strategy**	**Semi-Quantitative**			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
1	5	Treatment of Klinac Lane	**Description:** There is a threat that there is lack of clarity as to the funding of the Klinac Lane Treatment. **Cause:** The cause of the threat is that the funding for the project from FNDC is as yet uncommitted. **Consequence:** The consequence of the threat is that the without the Klinac Lane treatment, the Waipapa Intersection treatment will have reduced economic benefits, and affect the viability of the project.	Sebastian Reed / Keith Kent	NZTA / FNDC	21/03/2017	Draft	Implementation	FNDC to commit their funding for this project at the Business Case stage so that NZTA can account for the 60% subsidy requirement for this part of the project in their funding request.	Very High	Medium	23		High	Low	16	
10	6	Services Relocation	**Description:** There is a threat that the project programme may be extended. **Cause:** The cause of the threat is the requirement for the services relocations to accommodate the new intersection & associated geometrics design, and the difficulty in the accurate planning and estimating of the services relocations based on conceptual design. **Consequence:** The consequence of the threat is adverse impact on the project programme.	Sebastian Reed	NZTA	21/03/2017	Draft	Implementation	The services relocation plan (including programming) to be revised at Detailed Design stage with the asset owners.	Medium	High	17		Low	Medium	10	
11	7	Services Relocation	**Description:** There is a threat that project costs may escalate from services relocation. **Cause:** The cause of the threat is the requirement for the services relocations to accommodate the new intersection & associated geometrics design, and the difficulty in the accurate planning and estimating of the services relocations based on conceptual design. **Consequence:** The consequence of the threat is that the cost of services relocation is much higher than anticipated and will have a major impact on the project costs.	Sebastian Reed	NZTA	21/03/2017	Draft	Implementation	The services relocation plan (including cost) to be revised at Detailed Design stage with the asset owners.	Medium	Medium	15		Low	Low	6	
1	8	Consents (NZTA)	**Description:** There is a threat that NRC may require treatment of the road to a 100year ARI through the consenting process. **Cause:** The cause of the threat is that the project site is on a floodplain / flood overland flowpath. **Consequence:** The consequence of the threat is that the design will have to incorporate 100year ARI (which is not economically feasible for the site) but may otherwise not be consented.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Project Manager to engage NRC early on in the project to discuss the design requirements and criteria including the economic feasibility.	Very High	Medium	23		High	Very Low	8	

Ian Rich – HNO Risk Advisor (Tel: 04 894 6287)
Ian.Rich@nzta.govt.nz
April 2015

Risk Register

Project/Contract:	SH10 Waipapa Road Intersection
Project/Contract ID:	PN4234
NZTA Office:	Northland
NZTA Lead:	Sebastian Reed

Document Date:	21 June 2017	
Supplier Lead:	Chris Parker	Opus
RM Specialist:	Naushaba Todd-Jones	Opus
Risk Tolerance Threshold:	**Moderate**	

									Current Exposure				**Residual (Target) Exposure**			
									Semi-Quantitative			**Treatment Strategy**	**Semi-Quantitative**			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
5	9	Consents (FNDC)	**Description:** There is a threat that Klinac Lane upgrade project may not go ahead. **Cause:** The cause of the threat is that the project site is on a floodplain / flood overland flowpath. **Consequence:** The consequence of the threat is that the design will have to incorporate 100year ARI (which is not economically feasible for the site) and may not be consented.	Keith Kent	FNDC	21/03/2017	Draft	Pre Implementation	To assess the viability of the proposed options for Klinac Lane early in the Design process and incorporate flood solutions that are technically viable and economically feasible.	Very High	Low	20		Very High	Very Low	13	
4	10	Contaminated Land - Former Orchard	**Description:** There is a threat that the land intake from the former orchard will be contaminated. **Cause:** The cause of the threat is that additional land is required to be taken to the SE of the intersection to allow for the upgrade (roundabout or head to head right turn bays). **Consequence:** The consequence of the threat is that the land may require remediation and therefore impact on the project costs and programme.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Conduct a Preliminary Site Investigation early in the project (Pre-Implementation).	High	High	21		Medium	Medium	15	
8	11	Contaminated Land - PFS	**Description:** There is a threat that the land intake from the Petrol Filling Station (PFS) will be contaminated. **Cause:** The cause of the threat is that additional land is required to be taken to the NE of the intersection to allow for the upgrade (roundabout). **Consequence:** The consequence of the threat is that the land may require remediation and therefore impact on the project costs and programme.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Conduct a Preliminary Site Investigation early in the project (Pre-Implementation).	High	Medium	19		Medium	Low	11	
14	12	Geotechnical Issues	**Description:** There is a threat that there may be some geotechnical issues identified during the construction phase. **Cause:** The cause of the threat is that no geotechnical investigation (desktop and / or site investigation) has been conducted for the site. **Consequence:** The consequence of the threat is that if any geotechnical issues are identified they will have an impact on the cost and programme of the project.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Conduct a Preliminary Geotechnical Investigation early in the project (Pre-Implementation).	Medium	Low	11		Low	Very Low	2	

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April 2015

Risk Register

Project/Contract:	SH10 Waipapa Road Intersection
Project/Contract ID:	PN4234
NZTA Office:	Northland
NZTA Lead:	Sebastian Reed

Document Date:	21 June 2017	
Supplier Lead:	Chris Parker	Opus
RM Specialist:	Naushaba Todd-Jones	Opus
Risk Tolerance Threshold:	**Moderate**	

									Current Exposure				**Residual (Target) Exposure**			
									Semi-Quantitative			**Treatment Strategy**	**Semi-Quantitative**			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
14	13	Archaeological Issues	**Description:** There is a threat that there may be some archaeological issues identified during the construction phase. **Cause:** The cause of the threat is that only a very high level archaeological assessment has been conducted as part of the Planning and Environment Desktop Study. **Consequence:** The consequence of the threat is that if any archaeological issues are identified they will have an impact on the cost and programme of the project.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Conduct a 'Preliminary Archaeological Investigation early in the project (Pre-Implementation).	Medium	Low	11		Low	Very Low	2	
14	14	Accommodating 24 hour Businesses during Construction	**Description:** There is a threat that the 24hour businesses on the project site may be uncooperative during the construction phase. **Cause:** The cause of the threat is the Waipapa intersection has a 24 hour Petrol Filling Station (PFS). **Consequence:** The consequence of the threat is this will impact the project programme in the form of extensions.	Sebastian Reed / Contractor	NZTA / TBC	21/03/2017	Draft	Operation	The Contractor to liaise with the business owners and other stakeholders early on in the programme and keep them abreast with the timeline of the construction phases. The Contractor to also find the business owners' requirements and, accommodate & account for these within their management plans.	Medium	Low	11		Medium	Very Low	4	
11	15	Parking Changes	**Description:** There is a threat that the local businesses may object to the design. **Cause:** The cause of the threat is the change in the intersection treatment that will change the parking situation (arrangement, number, etc.) **Consequence:** The consequence of the threat is that the design may have to be changed or additional intake of land may be required to provide additional parking.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Involve the key stakeholders (business owners, residents, etc.) in the process early through Open days, etc. to get their buy-in into the design.	Medium	Medium	15		Medium	Low	11	
11	16	Water / Stormwater Culverts	**Description:** There is a threat that there may be previously unknown / unaccountable SW / mains water culverts in the project site. **Cause:** The cause of the threat is that there are water services of suppliers who have not been able to be contacted and there are no services plans available for these services. **Consequence:** The consequence of the threat is that it will have an adverse impact on the cost and time of the project.	Sebastian Reed / Chris Parker	NZTA / Opus	22/03/2017	Draft	Pre Implementation	To liaise with the service providers and asset owners in the locality of the project to assess impact and associated costs, etc. early on but also throughout the design development.	Medium	Medium	15		Medium	Low	11	

Ian Rich – HNO Risk Advisor (Tel: 04 894 6287)
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April 2015

Risk Register

Project/Contract:	SH10 Waipapa Road Intersection
Project/Contract ID:	PN4234
NZTA Office:	Northland
NZTA Lead:	Sebastian Reed

Document Date:	21 June 2017	
Supplier Lead:	Chris Parker	Opus
RM Specialist:	Naushaba Todd-Jones	Opus
Risk Tolerance Threshold:	**Moderate**	

										Current Exposure				Residual (Target) Exposure			
										Semi-Quantitative			Treatment Strategy	Semi-Quantitative			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
8	17	Shared Footpath / Cycleway	**Description:** There is a threat that the Agency has not decided whether they would like to have the shared footpath / cycleway and consequently not agreed on its dimensions (meet/depart from the requirements?) **Cause:** The cause of the threat is the early stage of the design phase. **Consequence:** The consequence of the threat is that as this project is going through a Single Stage Business Case process, the design may change following the project funding having been approved.	Sebastian Reed / Chris Parker	NZTA / Opus	22/03/2017	Draft	Pre Implementation	Key design aspects to be decided upon as soon as possible.	High	Medium	19		Medium	Very Low	4	

Risk Status	
Draft	17
Live - Treat	0
Live - Parked	0
Impacted	0
Closed	0
Rejected	0
Blank	8
TOTAL	**25**

Current Risk Score	
Extreme	5
High	9
Moderate	3
Low	0
Zero	8
TOTAL	**25**

Residual Risk Score	
Extreme	1
High	5
Moderate	7
Low	4
Zero	8
TOTAL	**25**

APPENDIX L
Land Requirement Plans

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	167m²
B	LOT 2 DP 72659	NA28C/1053	19m²
C	LOT 1 DP 153739	NA91C/871	88m²
D	LOT 1 DP 153739	NA91C/871	71m²
TOTAL AREA			345m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

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1:1000 @ A3
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Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

NZ TRANSPORT AGENCY WAKA KOTAHI

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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales	Project No.	Sheet. No.	Revision
C. NIXON	1:500 AT A1	1-11751.00	V01	A

Project: NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet: RIGHT TURN BAY OPTION
LAND REQUIREMENT PLAN

Original Sheet Size A1 [841x594] Plot Date 2017-03-20 at 12:05:33 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(V) Survey\+AutoCAD\1-11751.00_V01-05,20.dwg - V01

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	167m²
B	LOT 1 DP 95010	NA50C/862	15m²
C	LOT 2 DP 153648	NA91C/965	332m²
D	LOT 1 DP 153739	NA91C/871	990m²
TOTAL AREA			1504m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

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Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

NZ TRANSPORT AGENCY WAKA KOTAHI

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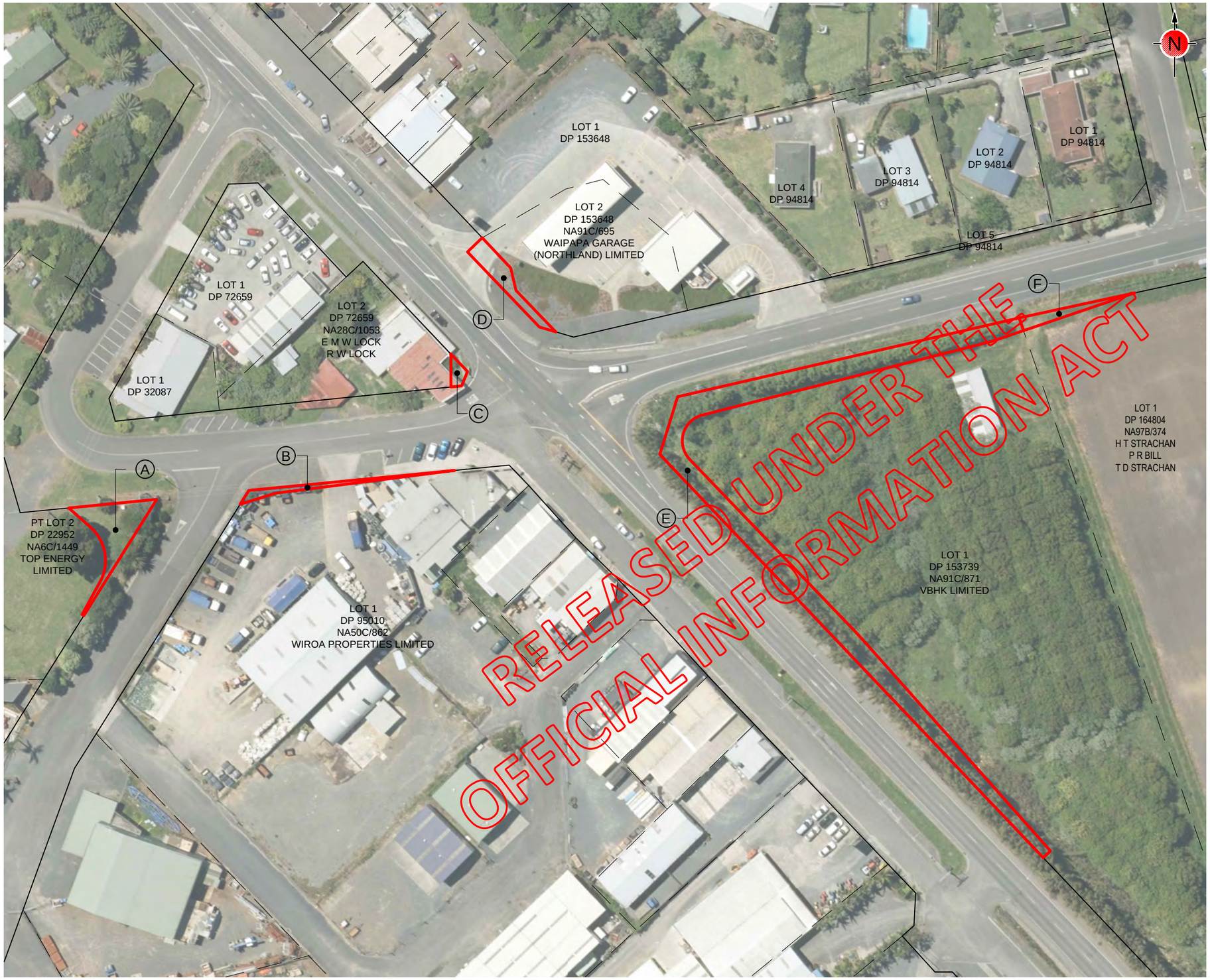
Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales	Project No.	Sheet. No.	Revision
C. NIXON	1:500 AT A1	1-11751.00	V02	A

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
ROUNDABOUT OPTION
LAND REQUIREMENT PLAN



LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	161m²
B	LOT 1 DP 95010	NA50C/862	45m²
C	LOT 2 DP 72659	NA28C/1053	21m²
D	LOT 2 DP 153648	NA91C/695	94m²
E	LOT 1 DP 153739	NA91C/871	1024m²
F	LOT 1 DP 164804	NA97B/374	48m²
TOTAL AREA			1393m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
SIGNALS OPTION
LAND REQUIREMENT PLAN

Project No.	Sheet. No.	Revision
1-11751.00	V03	A

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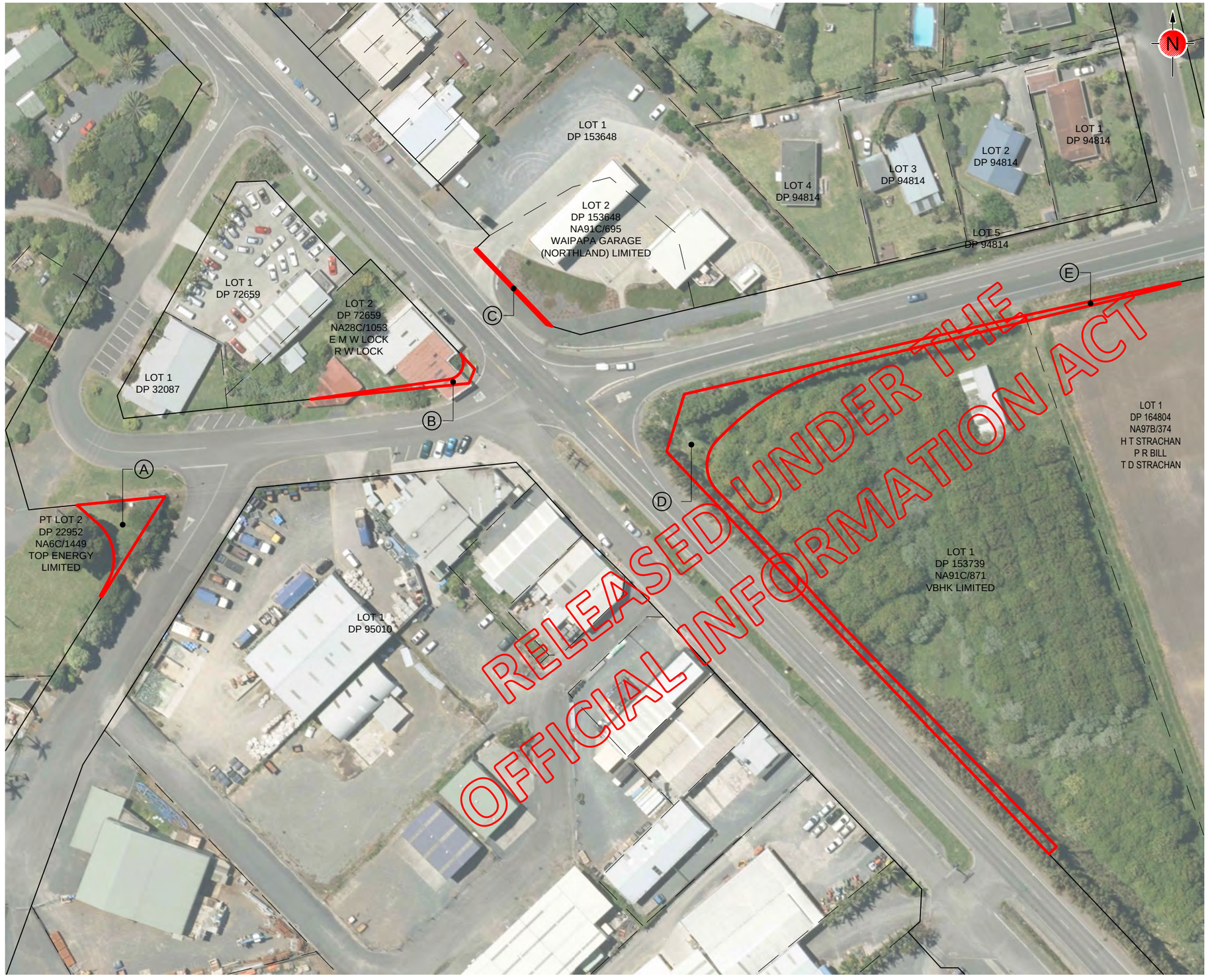

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	167m²
B	LOT 2 DP 72659	NA28C/1053	45m²
C	LOT 2 DP 153648	NA91C/695	17m²
D	LOT 1 DP 153739	NA91C/871	734m²
E	LOT 1 DP 164804	NA97B/374	37m²

TOTAL AREA 1000m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

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NZ TRANSPORT AGENCY WAKA KOTAHI

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
HEAD TO HEAD RIGHT TURN BAY OPTION
LAND REQUIREMENT PLAN

Project No.	Sheet. No.	Revision
1-11751.00	V04	A

Original Sheet Size A1 [841x594] Plot Date 2017-03-20 at 12:05:39 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(V) Survey\+AutoCAD\1-11751.00_V01-05,20.dwg - V04

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	187m²
B	LOT 1 DP 153739	NA91C/871	785m²
TOTAL AREA			972m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

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125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
CLOSE WAIPAPA LOOP ROAD NORTH OPTION
LAND REQUIREMENT PLAN

Project No.	Sheet. No.	Revision
1-11751.00	V05	A

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	LOT 1 DP 153739	NA91C/871	177m²
B	LOT 4 DP 98489		4m²
C	LOT 3 DP 98489		49m²
D	LOT 4 DP 102236		64m²
E	LOT 5 DP 102236		42m²
F	LOT 3 DP 99619		155m²
TOTAL AREA			491m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales	Project No.	Sheet. No.	Revision
C. NIXON	1:1500 AT A1	1-11751.00	V20	A

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
WAIPAPA CORRIDOR TREATMENT
LAND REQUIREMENT PLAN

Original Sheet Size A1 [841x594] Plot Date 2017-03-20 at 12:05:44 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(V) Survey\+AutoCAD\1-11751.00_V01-05,20.dwg - V20

APPENDIX M
Preliminary Planning and Environmental Assessment

NZ Transport Agency

Waipapa Intersection Upgrade

Planning and Environment Desktop Review

March 2017

NZ Transport Agency

Waipapa Intersection Upgrade

Planning and Environment Desktop Review

March 2017

Prepared By
Jessica Moser
Graduate Environmental Consultant

Reviewed By
Mark Farrey
Team Leader Planning

Approved for Release By
Chris Parker
Roading Team Leader

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Telephone: +64 9 430 1700
Facsimile:

Date: 07/03/2017
Reference: 1-11751.00
Status: Draft 1

Contents

1 Introduction

The New Zealand Transport Agency (NZTA) have an interest in upgrading the intersection between State Highway 10 and Waipapa Road. Opus has been requested to undertake an upgrade options assessment which is of sufficient detail to support the NZTA business case.

Possible upgrades for the intersection being considered include:

- A roundabout
- Traffic signals
- Head to head right turn bays
- Close Waipapa Loop Road South
- Add a right turn bay

The effectiveness and feasibility of each option can be impacted by planning and environment constraints. Accordingly, it is vital to identify such constraints and account for these up front during the concept design options assessment.

1.1 Scope and Objectives

The scope of this report is limited to a desktop planning assessment. The desktop assessment will aim to identify planning constraints that may be encountered during:

1. The engineering investigation stage- i.e. potential for disturbance and consents during the geotechnical investigation.

2. The design phase- i.e. the potential for different designs to have different effects on the environment and trigger different consents.

3. The construction phase- a rough forward estimate of differing construction methods (required for different designs) will be made. Different construction methods may again cause different impacts on the environment and trigger different consents.

The objective of this desktop assessment will be to identify where constraints can be avoided and how impact can be minimised. This work will identify the most favourable options (in terms of planning and environmental constraints).

1.2 Methodology

Opus Planners have assessed all proposed alignments, designs and potential investigation or construction methods against relevant District and Regional Planning Provisions and National Environmental Standards. These have included:

- Far North District Council, District Plan;
- Northland Regional Council, Regional Plans;
  - Regional Water and Soil Plan
  - Regional Air Quality Plan
  - Regional Policy Statement
- National Environmental Standards for Air Quality; and

- National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health.

The planning assessment is also supported by a desktop archaeological investigation, attached in **Appendix A**.

2 Engineering Investigations, Designs and Construction Requirements

2.1 Engineering Investigations

Before certain designs can be considered, a geotechnical investigation of the site needs to be undertaken. Geotechnical investigation typically involves a number of tests:

- Pavement Testing. A small section of road and underlying gravel is extracted and tested for integrity
- SCALA Testing. A solid small diameter probe (approximately 10mm diameter) is pushed into the ground to a depth of 4-5m. This probe is then hit with a weight to measure the amount of resistance the soil has. No extraction of soil is required
- Cone Penetration Testing. This is similar to SCALA testing, except to a deeper level of approximately 12m. No extraction of soil is required
- Hand Auger Testing. An auger (typically <100mm diameter) is hand driven down a few meters. The soil core is extracted and sent to a laboratory for testing.

2.2 Design and Alignment

The designs may vary during detailed design, however the likely options are as follows:

- Option 1A: Replace the existing intersection with a roundabout.
- Option 1B: Add traffic signals to the existing intersection.
- Option 1C: Remove the existing head to head turn bays by realigning Waipapa Road so that the eastern approach to State Highway 10 is moved further south.
- Option 1D: Close Waipapa Loop Road South.
- Option 1E: Add a right turn bay on State Highway 10 for traffic turning right onto Waipapa Road.

2.3 Possible Construction Requirements

The construction works with consenting significance could include:

- A small amount of vegetation clearance (for the road realignment required for Option 1C and Option 1D).
- Works associated with upgrades to intersection approaches – possible need for extension/upgrade of water course crossing to the south.
- Stormwater diversion and discharge
- Some excavation in potential HAIL sites.

3 Environmental, Heritage Constraints

3.1 Environmental Constraints

3.1.1 Ecosystems

Terrestrial Environment

The site is heavily disturbed, with the majority of the works envelope being previously cleared and disturbed during the development of the industrial area and the existing road. The only vegetation remaining acts as a buffer screen on the boundary of the Orchard Lot (on the South East of the intersection) **Figure 1**. The lot boundary on the State Highway contains a tall row of bamboo, the lot boundary on Waipapa Road consists of a tall row of what looks to be a mix of native/non-native species. Neither row of vegetation is considered sufficient enough to offer ecological or habitat values.

As the site does not provide any significant terrestrial habitat, there will be limited ecological constraints associated with the construction works and operation of the upgraded intersection. However the vegetation on the boundaries of the Orchard do have visual screening value, therefore it is ideal to avoid disturbing this vegetation, or replace the vegetation if it needs to be cleared.

Aquatic Environment

The only aquatic ecological values identified, exist to the south of the site where a tributary of the Kerikeri River is situated (Whiriwhiritoa Stream) (**Figure 2)**. This tributary has been subjected to a significant amount of urban encroachment and disturbance, however it would still provide passage for aquatic species such as fish. Accordingly any work on the culvert over this tributary must account for fish passage. Overall when catering for fish passage the following principles are considered:

- Maintaining fish passage during low/base flow events.
- Maintaining fish passage during high flow events (at least up to the 1 year ARI event). This is measured by:
  - No increase in flow velocity on the stream edges compared to existing; OR
  - No increase in flow velocity on the stream edges above 0.3m/s.

In order to comply with the above guiding principles the following measures are recommended:

- Ensure culvert array spans the full width of the stream – this avoids narrowing flows.
- Avoid the use of base slabs on culverts – this maintains the natural “low flow” channel which fish can utilise for passage during base flow scenarios.
- If a base slab is required, bury it below the stream bed, otherwise:
  - Ensure invert is installed on upstream/downstream gradient no steeper than natural existing gradient.
  - Ensure invert meets apron and any upstream or downstream scour protection at the same height (no hydraulic jumps or “lips”) (**Figure 3**)
  - Provide for low flow provision (usually achieved by installing the centre culvert cell slightly lower than the outside cells) (**Figure 4**)

Figure 1: Vegetation within Project Site

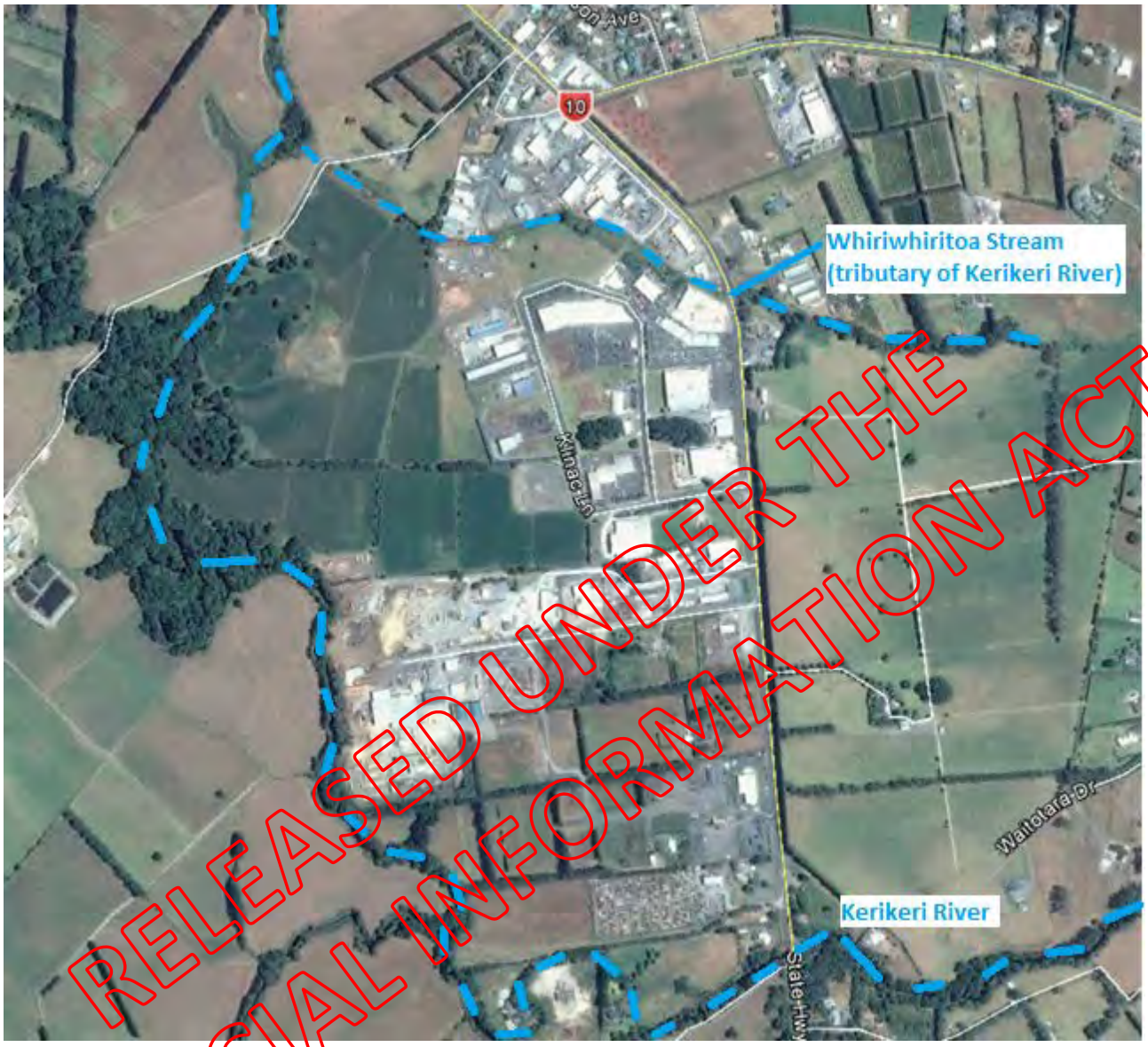

Figure 2: Local Drainage

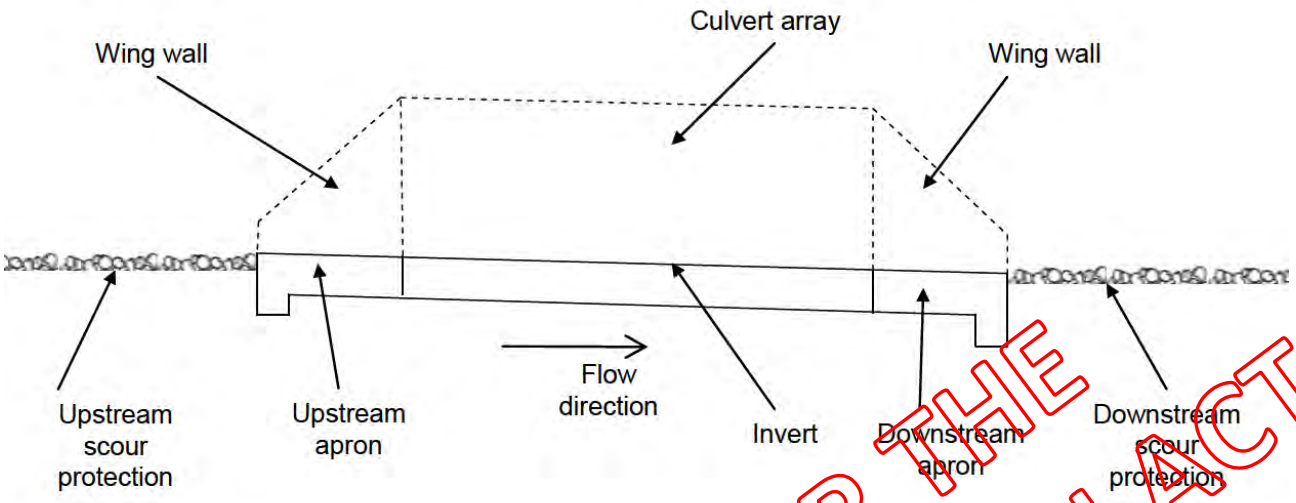

Figure 3: Connection of culvert inverts, aprons and scour protection

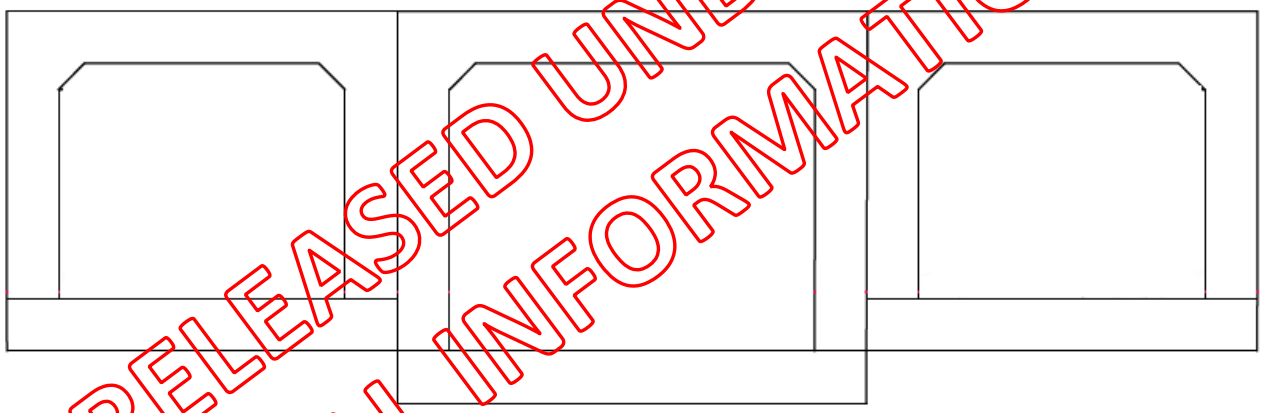

Figure 4: Lowering of a culvert cell for low flow fish passage provision

3.1.2 Geology and Soil

The *Department of Lands and Survey Soils Map Whangaroa – Kaikohe* provides the following soils information:

- Northern side of intersection: Okaihau gravelly friable clay
- Southern side of intersection: Waipapa Clay

The *Department of Lands and Survey Rock Types Map Whangaroa – Kaikohe* provides the following geological information:

- Northern side of intersection: Basalt flows and cones of very fine to medium grained crystalline basalt, dense and moderately fractured; hard to very hard. Weathered to soft red brown or dark grey brown clay to depths of 20m with many rounded corestones:
  - A Bauxite outcrop is noted on land a few lots to the East on Waipapa Road

- South side of intersection: Alluvium; mud sand and gravel with minor peat, forming river bed and flood plain deposits up to 10m above stream. In places forming a thin (1-3m) veneer over rugged surfaces of lave flows; unconsolidated to very soft. Un-weathered.

Overall it can be seen that the geology/soils support a lot of clay, therefore the site is dominated by very fine sediment. Fine sediment must be managed carefully during construction as it is prone to erosion and is difficult to capture in sediment control devices.

Bauxite is an aluminium ore which can often be mixed with iron and titanium oxides, therefore it may be natural to encounter elevated concentrations of aluminium, iron and titanium in the soil at this site.

There are a number of listed HAIL sites and potential HAIL sites in the vicinity of the intersection (**Figure 5**):

- The BP Service Station directly north of the intersection which stores large quantities of fuel underground. There is potential for mismanagement of fuels and leaking of underground tanks at this site. If this has occurred, the typical contaminants released can include petroleum hydrocarbons, mono aromatic hydrocarbons and metals such as lead (previously used in leaded petrol).
- Two corners on the intersection cater for a range of industrial land uses which may undertake activities which could be considered potentially contaminating.
- There is also an orchard directly east of the intersection which may have been subject to chemicals in the form of fertilizers and pesticides. Therefore, the site has a risk of containing contaminated soil/groundwater and is therefore classified under the Ministry for the Environment, Hazardous Activities and Industries List (HAIL).

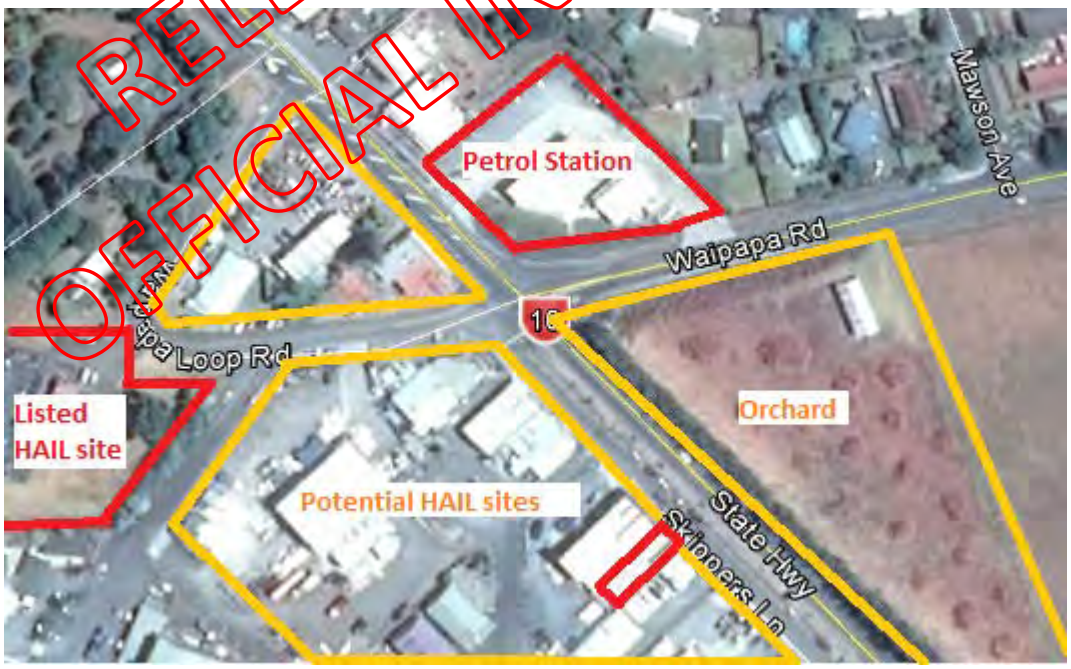

Figure 5: HAIL Sites Adjacent to the Existing Intersection

3.1.3 Topography and Drainage

The project site has an elevation of approximately 80 m above sea level. The land from the intersection to the south is flat in nature, it is considered an alluvial plan (as per the geology describes) associated with the Kerkikeri River 1.4km to the south of the intersection. To the north of the intersection the geology changes, and there is a gentle incline upwards.

All water from the site would eventually drain southwards towards the Kerikeri River tributary (Whiriwhiritoa Stream) which is situated ~400 m south of the intersection (**Figure 2)** This tributary will be sensitive to any erosion and sediment runoff from site works. However, one advantageous feature of the site, is its flat nature, this makes erosion prevention much less complex than a hilly site.

3.2 Heritage Constraints

The Archaeological Assessment in **Appendix A** identifies that the site has low archaeological value. A search of the Heritage New Zealand Pouhere Taonga register found that there are no known heritage sites in the vicinity of the project. In addition, the site has already been subject to significant disturbance associated with the existing intersection and surrounding industrial area. Therefore, it is unlikely that any undiscovered archaeology remains.

4 Planning Constraints

4.1 Far North District Council

The relevant District Council planning maps have been reproduced below. It can be seen in **Figure 6** that the current intersection is designated as road reserve. The adjoining land is made up of commercial, industrial and rural production zones.

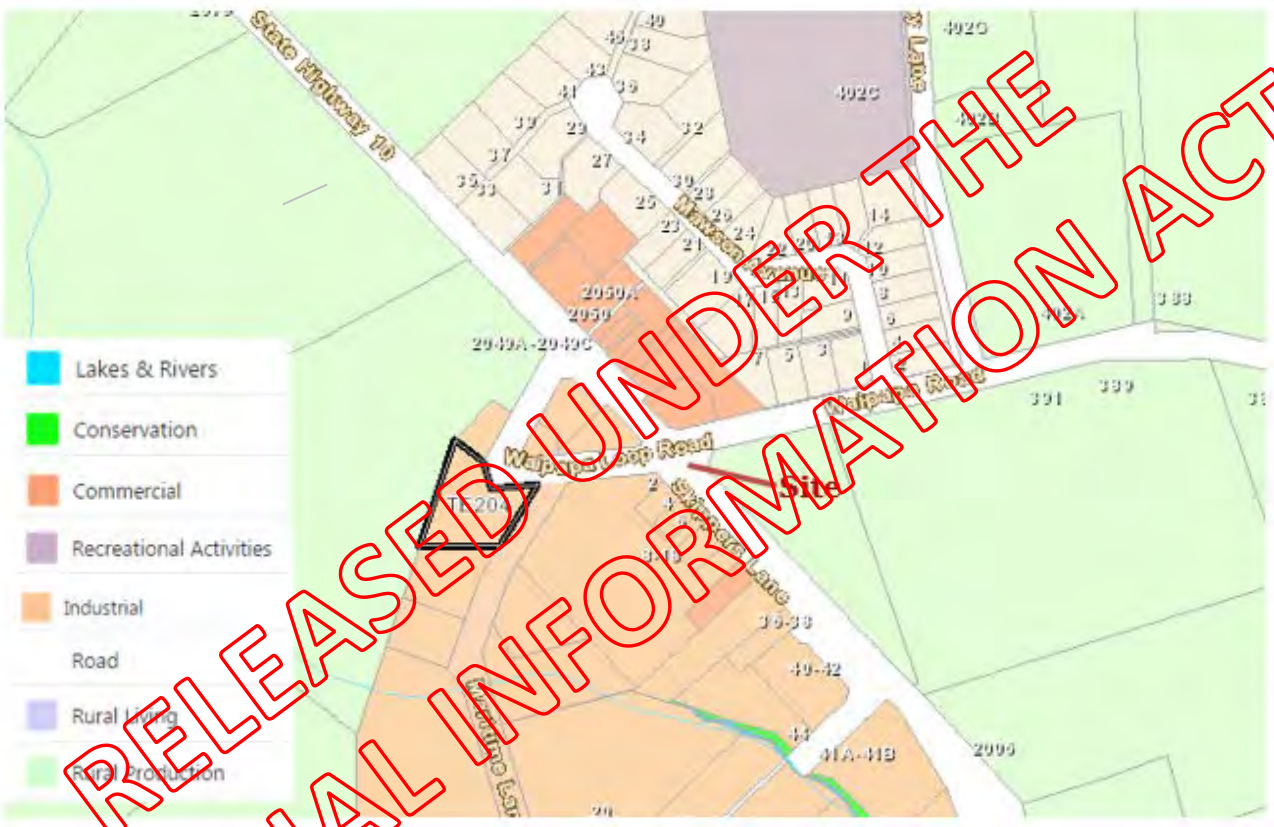

Figure 6: FNDC Zoning Maps for Waipapa

The resource map for Waipapa (**Figure 7**) shows that there are no outstanding landscapes, features or sites of cultural significance and therefore no constraints are relevant to this site in regards to resources.

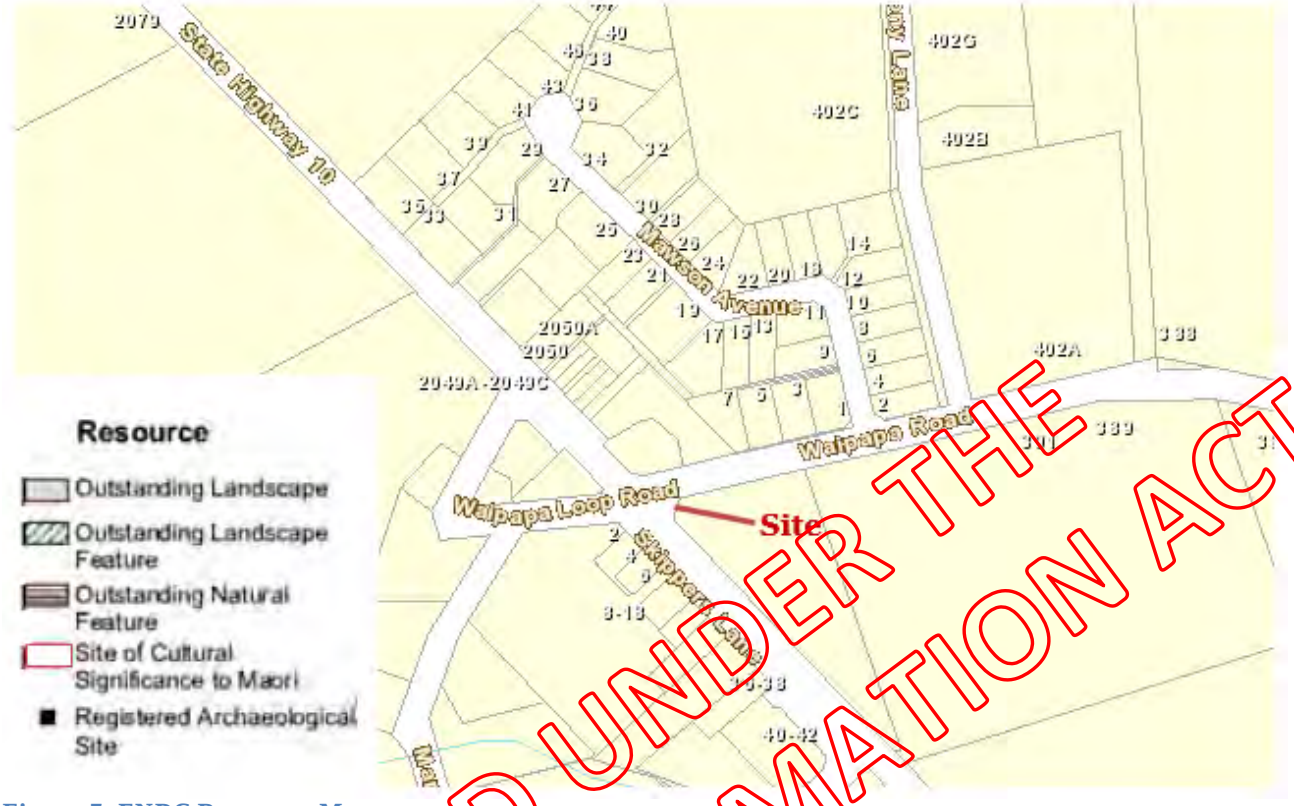

Figure 7: FNDC Resource Map

4.2 Northland Regional Council

The relevant Regional Council information maps have been reproduced below.

4.2.1 Flooding

Figure 8 shows the flood hazards for the 10 year and 100 year flood extent. The 100 year flood level is close to the site, therefore the impact on the overland flow paths will be taken into consideration in the design.

The intersection itself is not heavily constrained by flooding, the map simply shows that some backing up through the current stormwater system can occur in a 100 year event which isn't a major concern. However, flooding is a significant constraint towards the south of the intersection around the tributary of Kerikeri River (Whiriwhiritoa Stream). Any works over this tributary may have potential to alter the flooding regime.

- Any changes to the state highway culvert crossing, or adjacent council roads over this tributary will need to allow for the unimpeded passage of the 1 in 100 year event (i.e. not worsen the upstream flood level).

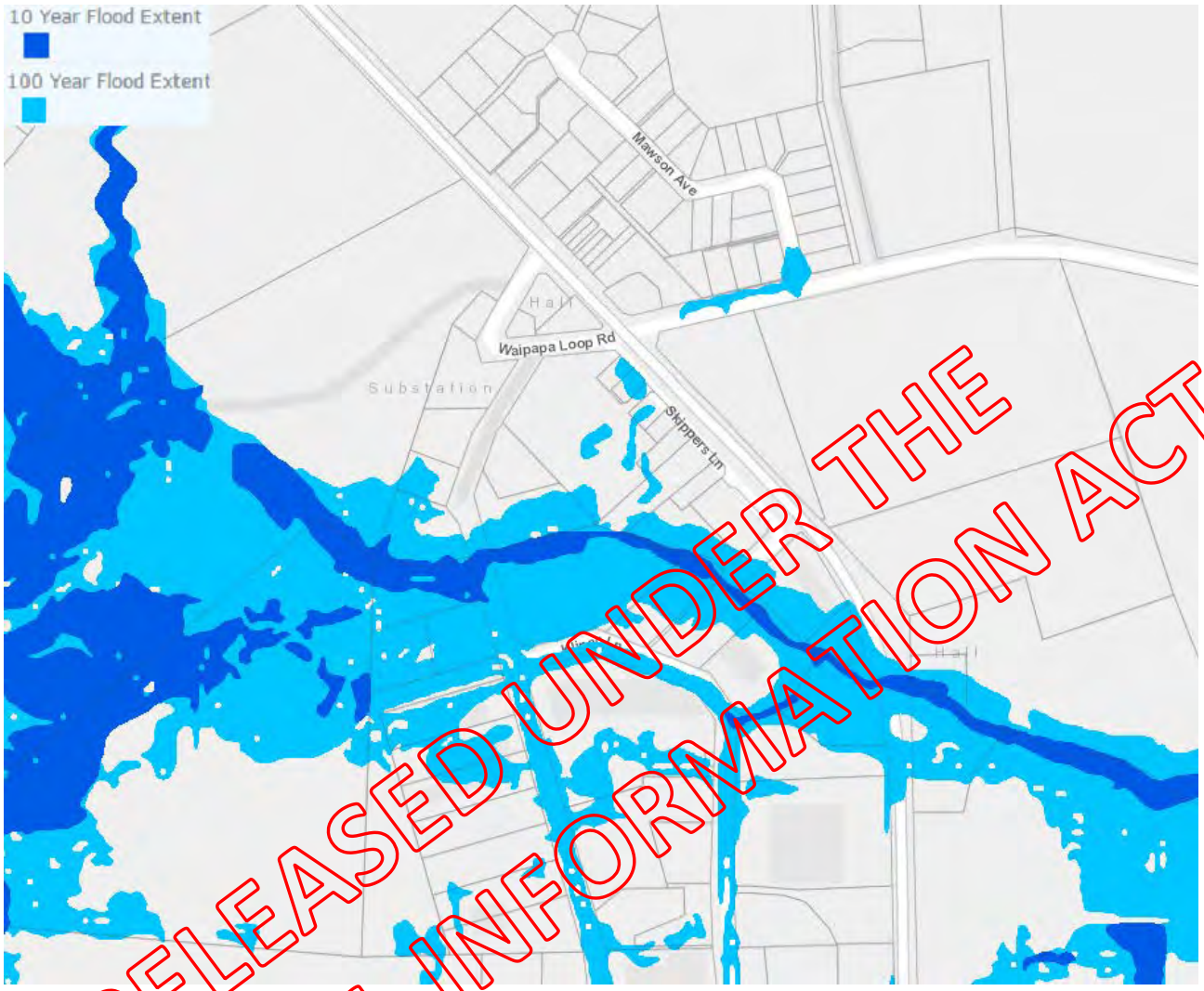

Figure 8: NRC Flood Hazards

4.2.2 Groundwater

It can be seen that the current intersection and surrounding area has low groundwater allocation (**Figure 9**) by catchment. **Figure 10** shows that the area is one of Northlands main aquifers and includes one active bore log directly south east of the intersection and several active and inactive bore logs further north. Together, these two images indicate that there is low groundwater allocation, however there are a number of bores in the local vicinity. Low groundwater allocation means that less than 25% of the groundwater table is assigned to a certain use.

Although the use of groundwater in the area is not high, there are still some local users. Therefore the project must ensure that the quality/quantity of groundwater for local users is not adversely impacted. This can primarily be ensured by appropriate management of any contamination at the site.

Figure 9: NRC Indicative Groundwater Allocation

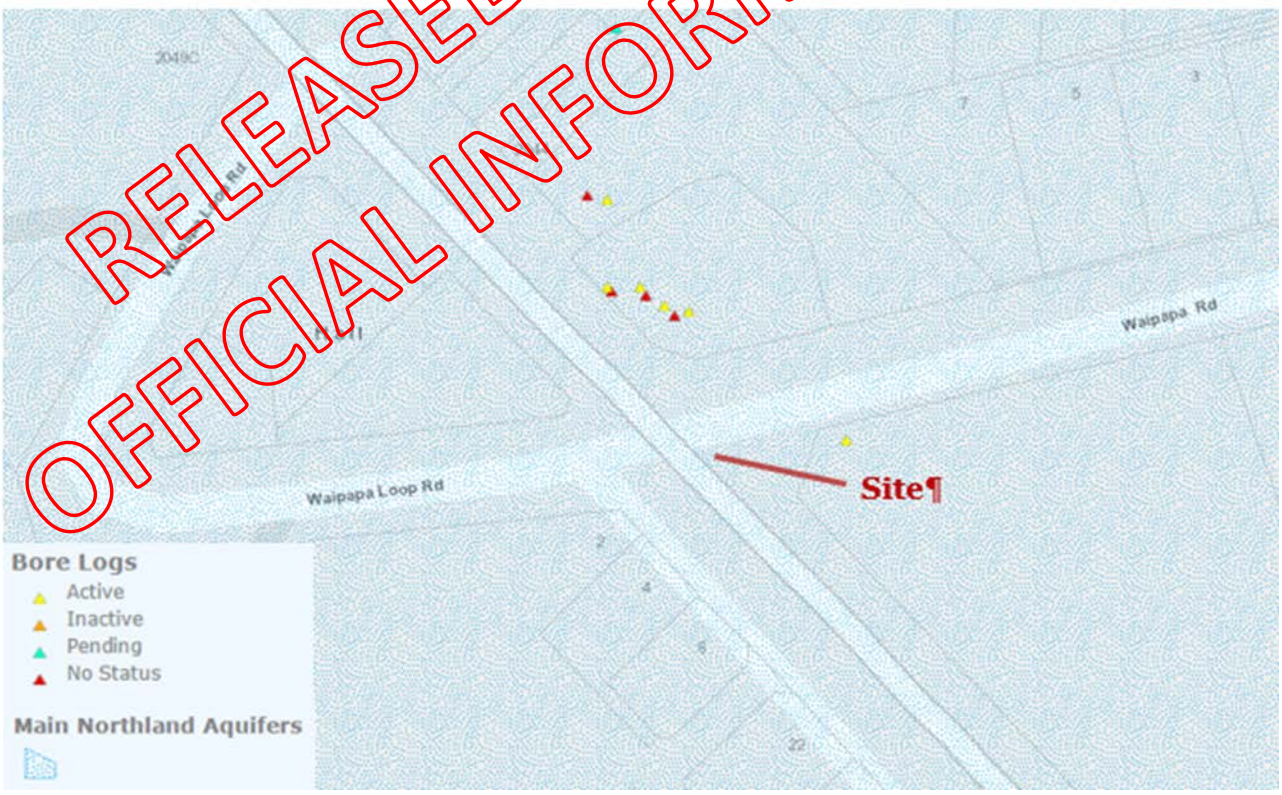

Figure 10: NRC Water Resources

4.2.3 Surface Water

It can be seen that the current intersection and surrounding area has fully allocated surface water (**Figure 11**) by catchment. This means that a high number of people are reliant on extracting water from the river and its tributaries. As a result, it is of up most importance that the quality of the surface water near the project site is not negatively impacted by sediment runoff or other contaminants.

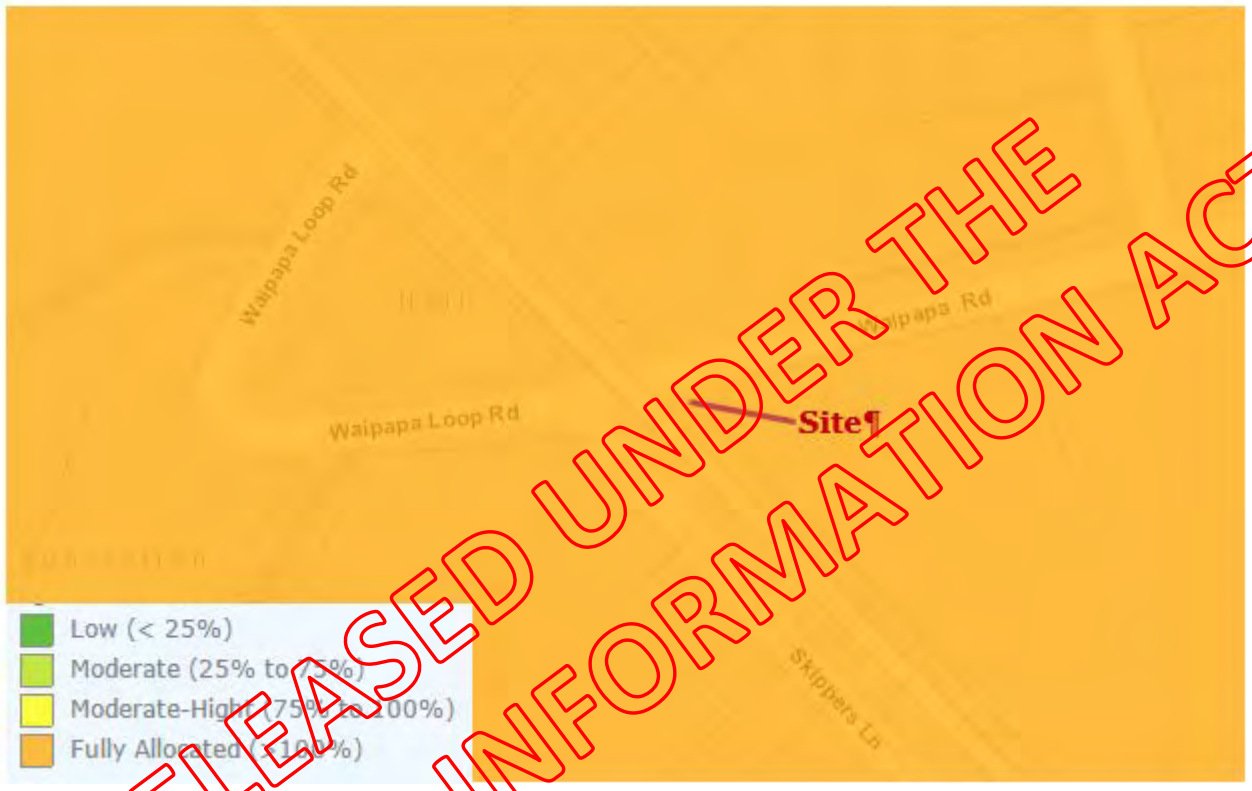

Figure 11: NRC Indicative Surface Water Allocation

4.2.4 Selected Land Use Sites

Figure 12 shows that there are two selected land use (SLU) sites in close proximity to the works envelope. These are HAIL sites which have been recorded by NRC. The SLU directly north of the intersection is a verified HAIL site due to the service station. The other SLU on State Highway 10 is further south from the site, it is a verified HAIL site due to a motor vehicle workshop and paint manufacturer or formulation.

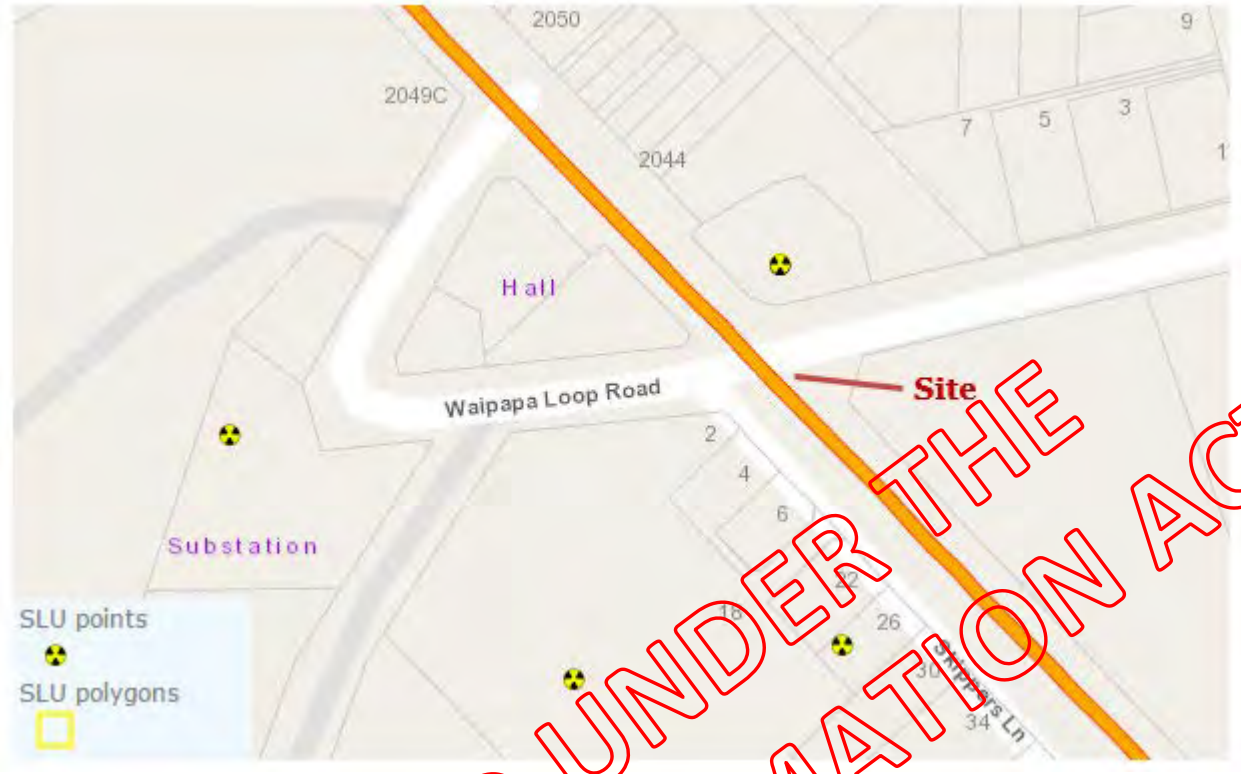

Figure 12: NRC Selected Landuse Sites

5 Consenting Considerations

5.1 Investigative Works

As described above in Section 2.1, some drilling and soil extraction will be required.

5.1.1 Terrestrial Investigations

Non HAIL Sites

Consent for geotechnical investigation will not be required. It is highly unlikely that 5000 m3 needs to be disturbed in a period of 12 months. Accordingly it is a **permitted activity**.

HAIL Sites

Consent for geotechnical investigation will not be required for:

- Soil sampling
- Small – scale and temporary disturbance of soil (< 25 m^3 per 500 m^2, in < 2 months)

It is therefore likely that geotechnical investigation in HAIL sites can proceed as a **permitted activity**.

5.1.2 Riparian Zone

Provided that:

- The area of exposed soil is <200m^2 and <50m^3; AND
- The disturbed area is reinstated and revegetated a.s.a.p.

Then the geotechnical investigation can proceed as a **permitted activity**.

5.2 Design and Alignment

5.2.1 Far North District Council

Alteration to Designation

Provided that the works remain within the road designation, the NZTA avoids the requirements for a land use consent under the District Plan. Therefore, the most efficient and timely way to progress with a development is to utilise the existing designation as much as possible without encroaching on other land.

- The traffic signals is the most favourable option in this respect, as the designation will not need to be altered.
- The roundabout is the next most favourable option as the designation will only need to be extended a small amount; towards the corner of the petrol station and the orchard.
- The head to head right turn bays and loop road options are the least favourable equally. Both these options require alteration to the designation towards the orchard and from the industrial land on the west side of the state highway.

Outline Plan of Works

An outline plan is not always necessary for works within a designation. Under s176A(2) an outline plan is not necessary if:

- The proposed public work, project, or work has been otherwise approved under the RMA, or
- The details of the proposed public work, project or work, are already incorporated into the designation,
- The territorial authority waives the requirement for an outline plan. This is usually because adequate details sufficient to supply 176A (3) have already been provided in designation.

176A(3) of the RMA requires that an outline plan must show:

a. The height, shape, and bulk of the public work, project or work; and
b. The location on the site of the public work, project or work; and
c. The likely finished contour of the site; and
d. The vehicular access, circulation, and the provision for parking; and
e. The landscaping proposed; and
f. Any other matters to avoid, remedy, or mitigate any adverse effects on the environment.

In this case, sufficient detail of all of the above can likely be provided with the alteration to designation. Discussions will be required with Far North District Council Consents Manager to agree on this approach.

5.2.2 National Environmental Standard for Assessing and Managing Contaminants in Soil (NESCS)

As described above in **Section 3.1.2**, the petrol station is considered basically all land surrounding the intersection is either a formally listed HAIL site or potentially considered a HAIL site.

With the exception of the traffic signals, all options will require some encroachment on HAIL sites. Given that there is no doubt these sites are HAIL sites, the most efficient course of action would be to:

- Proceed with a Stage 2 investigation (sample the soil to determine if contamination is actually present)
- If contamination is present, produce a management plan which will identify how contamination will be managed during works to ensure it is not spread or worsened.
    - » Remediation is unlikely to be necessary as the exposure risk to the end user will not raise (i.e. the land will continue to be used as a road, the land will not be used for residential purposes, childcare, food growing etc).

5.2.3 Northland Regional Council

The alignment is primarily on terrestrial land and therefore the design is not heavily constrained by regional rules. However, there is a tributary Tributary of the Kerikeri River (Whiriwhiritoa Stream) approximately 400 m to the south of the intersection.

The Regional Council requires **consent for any culvert longer than 25m**. And any works on the culvert need to consider Fish Passage provisions (as outlined in Section 3.1.1 of this report) and Flooding Provisions (as outlined in 4.2.1 of this report). The Environmental Standards for structures under the plan also apply.

- Environmental Standards are outlined in Section 29.1.11 of the Regional Water and Soil Plan:

1. The structure does not prevent fish passage under any flow conditions.
2. Any placement of a new structure from 27 October 2001 shall not take place within any indigenous wetland; and
3. The repair, alteration, use or removal of an existing structure shall not take place within any indigenous wetland; and
4. No activity or structure shall adversely affect any area of significant indigenous vegetation or significant habitats of indigenous fauna.
5. The structure does not cause the diversion, damming or blockage of any river or stream.
6. The short term visual clarity of any permanently flowing river or wetland shall not be reduced by more than 40% after reasonable mixing, due to sediment or sediment laden discharge originating from the site of the land disturbance activity.
7. There is no damage to, or restriction of the use of, any existing river or lake protection works, or any other lawfully established structure as a result of this activity.
8. There is no significant erosion of the bed of the river or lake as a result of the activity.
9. Any associated embankments are maintained to prevent sediment entering the river or lake.
10. No contaminants (including but not limited to oil, petrol, diesel, paint or solvent) are released into the water or to the bed of the river or lake from equipment being used for the activity, and no refuelling of equipment takes place on any area of the river or lake bed.
11. All demolition debris from the river or lake bed structure is removed from the site.
12. Existing lawful public access rights to and along rivers and lakes are not restricted.
13. The activity shall not interfere with or destroy any waahi tapu, as defined in the definitions, urupa or any other sites known to the local iwi that are of spiritual or cultural significance to Maori which have been identified to the Council. Should archaeological remains or features be uncovered the activity shall cease and the Regional Council notified as soon as practicable. Also as soon as practicable the Regional Council will then notify the appropriate tangata whenua entity. The activity shall not be recommenced without the authority of the New Zealand Historic Places Trust.

At this stage **sufficient information is not yet available to determine likelihood of meeting the above criteria**.

5.3 Possible Construction Requirements

Construction methods can only be assumed at this stage, however construction activities with consenting relevance have been assumed in the following sections.

5.3.1 Far North District Council

The district plan is considered by the regional council for noise/vibration limits set in the district plan.

Provided that the construction noise meets the limits specified in NZS 6803:1999 (**Table 1**) and the vibration meets the limits in ISO 4866 (**Table 2**), the activity is permitted.

The noise limits in the industrial and commercial areas are quite lenient as general activities at these locations are not highly noise sensitive (i.e. workers do not need silence to sleep). Therefore it is quite likely that these limits can be met.

Table 1: Recommended Upper Limits for Construction Noise Received in Industrial or Commercial Areas for all Days in the Year

Time Period	Duration of Work		
	Typical Duration L_{eq} (dBA)	Short-Term Duration L_{eq} (dBA)	Long-Term Duration L_{eq} (dBA)
0730 – 1800	75	80	70
1800 - 0730	80	85	75

The vibration limits associated with occupied dwellings do not apply as the site is surrounded by commercial/industrial activities. Therefore the lowest guideline limit applicable is 2 mm/s PPV which is not a complex target to achieve particularly in clay soils. It is likely this limit can be met, however it is standard practice to ensure pre and post work condition surveys are undertaken on adjacent structures and buildings.

Table 2: ISO 4866: 2010 Vibration Guidelines

Receiver	Details	Category A (Peak particle Velocity, PPV)	Category B (Peak particle Velocity, PPV)
Occupied dwellings	Night time (8pm to 6am)	0.3 mm/s PPV	1 mm/s PPV
	Daytime (6am to 8pm)	1 mm/s PPV	5 mm/s PPV
Other occupied buildings	Daytime 0630h - 2000h	2 mm/s PPV	10 mm/s PPV
All other buildings	Vibration - transient	5 mm/s PPV	BS 5228-2* Table B2
	Vibration - continuous		BS 5228-2*

			50% of table B2 values
Underground Services	Vibration – transient	20 mm/s PPV	30 mm/s PPV
	Vibration - continuous	10 mm/s PPV	15 mm/s PPV

5.3.2 Northland Regional Council

The following construction activities are subjected to rules under the Northland Regional Air Quality Plan and the Regional Water and Soil Plan:

- Generation of dust.
  - » Rule 9.1.4.2: The discharge of dust into air arising from road construction and maintenance is a **permitted activity** provided that the discharge shall not result in any offensive or objectionable dust deposition, or any noxious or dangerous levels of airborne particulate matter, beyond the boundary of the subject property. Provided dust management measures are in place, these criteria can be complied with.
- A small amount of vegetation clearance (limited vegetation remaining within the envelope).
  - » Rule 33.1.1: Any vegetation clearance that is not on erosion prone land, and is not in a Riparian Management Zone, is a **permitted activity**, provided that:
    a) The Environmental Standards in Section 32 are complied with; and
    b) Vegetation clearance by burning does not take place on peat soils, nor on any contiguous area in excess of 5 hectares on other soils.

    It is likely these criteria can be complied with, therefore permitted activity.
- Road construction/widening including excavation and filling.
  - » Rule 33.1.3: Any earthworks that are not in a Riparian Management Zone, are a permitted activity, provided that:
    a) The volume moved or disturbed in less than 5,000 m^3 in any 12 month period where the activity is not undertaken on erosion prone land;
    b) The volume moved or distributed is less than 1,000 m^3 in any 12 month period and the surface area of the soil exposed is less than 1,000 m^2 where the activity is undertaken on erosion prone land;
    c) There are no more than minor adverse effects on soil conservation beyond the property boundary; and
    d) The Environmental Standards in Section 32 are complied with.

    It is likely that earthworks will exceed these limits, therefore a **resource consent may be required**.
- Taking, use, damming or diverting of surface water may be required during works:

» Rule 24.3.3: The taking, use, damming or diverting of surface water which does not meet the requirements of the permitted activity rules, or is not covered by the non-complying activity rules, and is not otherwise covered by a rule in any other section of this Plan, is a discretionary activity. It is likely **resource consent may be required for this activity**.

» Rule 34.1.2: Vegetation clearance within the Riparian Management Zone is a permitted activity, provided that:

a) The Environmental Standards in Section 32 are complied with; and
b) The vegetation;
   i. Impedes or is likely to impede flood flows; or
   ii. Causes or is likely to cause stream bank erosion; or
   iii. Is a plantation forest planted prior to this Plan becoming operative; or
   iv. Is a plantation forest planted after this Plan became operative and the clearance is outside a setback of 5 m from a water body; or
c) The vegetation clearance;
   i. Is the minimum necessary to give effect to the permitted activity rules in this Plan; and
   ii. Does not exceed 200 m^2 in total; or
   iii. It is the minimum necessary for track and road maintenance.

This activity it likely to meet criteria c, and therefore is likely to be **permitted activity**.

» Rule 34.1.3: Earthworks in the Riparian Management Zone are a permitted activity, provided that:

a) The Environmental Standards in Section 32 are complied with;
b) The earthworks are the minimum necessary;
   i. To give effect to the permitted activity rules in this Plan; and
   ii. The area of exposed soil is less than 200 m^2 and the volume of earth disturbed is less than 50 m^3; or
   iii. For track or road maintenance;
c) Following the completion of any earthworks those parts of the Riparian Management Zone that are not required for the permitted activity are reinstated to a stable contour and revegetated as soon as practicable; and
d) As a result of the earthworks in the Riparian Management Zone there are no adverse flooding or drainage effect on any property owned or occupied by another person.

- Alteration to stormwater; stormwater discharge points may be required.

» Rule 21.1.1: The diversion and discharge of stormwater by way of an open constructed stormwater collection system or piped stormwater collection system into water or onto or into land where it may enter water, where the stormwater collection system is connected to, or part of, a stormwater system for which a resource consent exists is a permitted activity.

5.3.3 National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health

As described in **Section 4.2.4** the construction has the potential to take place within two HAIL sites and therefor the following constraints from the National Environmental Standards apply.

Rule 8.3: Disturbing the soil of the piece of land is a permitted activity while the following requirements are met:

a) Controls to minimise the exposure of humans to mobilised contaminants must:

   i. Be in place when the activity begins;

   ii. Be effective while the activity is done;

   iii. Be effective until the soil is reinstated to an erosion-resistant state;

b) The soil must be reinstated to an erosion-resistant state within 1 month after the end of the course of sampling for which the activity was done;

c) The volume of the disturbance of the soil of the piece of land must be no more than 25 m^3 per 500 m^2;

d) Soil must not be taken away in the course of the activity, except that:

   i. For the purpose of laboratory analysis, any amount of soil may be taken away as samples;

   ii. For all other purposes combined, a maximum of 5 m^3 per 500 m^2 of soil may be taken away per year;

e) Soil taken away in the course of the activity must be disposed of at a facility authorised to receive soil of that kind;

f) The duration of the activity must be no longer than 2 months;

g) The integrity of the structure designed to contain contaminated soil or other contaminated materials must not be compromised.

It is unlikely that the requirements for volume and timeframe will be met and therefore, the project will require investigation and consent for these activities.

5.4 Affected Parties

In respect to the natural environment, overall it is considered that the existing site is already significantly disturbed, design/construction, provided it occurs in accordance with all recommendations in this report, can likely occur with no more than minor effect on the environment.

- It is of course recommended that consultation occurs with the local tangata whenua

In respect to the built environment, the traffic detours/delays during works can have the potential to negatively impact on the businesses operating adjacent to the site.

- The adjacent business owners should be consulted with and informed of the potential for disruption to their customer base, and how this can be avoided and mitigated.

6 Summary Recommendations

The following key recommendations can be concluded from the above investigation:

6.1 Geotechnical Investigation

- Geotechnical Investigation Activities (provided they roughly align with the assumptions provided in Section 2.1) can proceed as a permitted activity.

6.2 Design and Alignment

- Given that there is no doubt the sites surrounding the intersection are HAIL sites, the most efficient course of action would be to:
  - » Proceed with a Stage 2 investigation (sample the soil to determine if contamination is actually present)
  - » If contamination is present, produce a management plan which will identify how contamination will be managed during works to ensure it is not spread or worsened.
    - Remediation is unlikely to be necessary as the exposure risk to the end user will not raise (i.e. the land will continue to be used as a road, the land will not be used for residential purposes).
- Pursue an option which requires the least amount of encroachment/disruption on land outside of the existing road designation. The signals or the roundabout option seem to require the least amount of land requirement.
  - » This can also be favourable when dealing with HAIL sites, as the less disturbance required in these sites, the less complications arise.
- Works on/adjacent to the Kerikeri River Tributary (Whiriwhiritoa Stream) will need to consider fish passage impacts (recommendations have been provided in Section 3.1.1), and flooding impacts (recommendations have been provided in Section 4.2.1)
- Given that the site consists of fine clay soils focus should be placed on preventing erosion as sediment capture devices are almost ineffective against fine soil. Design and works should avoid large cuttings, steep slopes or steep/long drainage paths.
- Tangata Whenua should be consulted and involved in design, particularly regarding any works within watercourses.

6.3 Construction

- Given that the site is a state highway and is surrounded by commercial/industrial uses, noise/vibration management requirements will not be highly restrictive. The works would be likely to meet permitted criteria, however pre and post work condition surveys on surrounding buildings/structures are still recommended.

- The risk of encountering archaeology on this site is considered low, therefore works can proceed under an Accidental Discovery Protocol.

- The adjacent business owners should be consulted with and informed of the potential for disruption to their customer base, and how this can be avoided and mitigated.

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