REPORT

Tonkin+Taylor

Upper Stebbings Valley Residential Zone

Transportation Assessment

Prepared for
Wellington City Council
Prepared by
Tonkin & Taylor Ltd
Date
October 2017
Job Number
1003121.v2

Exceptional thinking together
www.tonkintaylor.co.nz

Distribution:

Wellington City Council	PDF
Tonkin & Taylor Ltd (FILE)	PDF

Table of contents

1 Introduction

1.1 Background

The Northern Growth Management Framework (NGMF) outlined future residential areas for Wellington City's northern suburbs, and Wellington City Council (WCC) is investigating options for extending the residential zoning north of Churton Park, to the area known as Upper Stebbings Valley in line with this framework.

This area is the rural-zoned land between the existing Churton Park development and Tawa. Middleton Road borders the area to the East and Bests Ridge to the West. The terrain in this area is steep rugged farmland, second growth bush and some forestry.

The NGMF identified a strong need to connect this area to Tawa, however the local community did not support the use of Greyfriars Crescent as a part of that link. Informal discussions highlighted an opportunity to provide a link through the Corrections owned land (Arohata Prison), however no proposal has so far been formalised.

The Council has asked Tonkin & Taylor Ltd to undertake a high level review of potential transport impacts of development scenarios in the Upper Stebbings Valley as a part of the imminent structure planning exercise.

1.2 Purpose of Report

This report provides a summary of the traffic modelling inputs, assumptions made and limitations, as well as the ultimate outcomes of the modelling exercise with regards a range of issues from intersection performance to expected uptake in alternative modes of transportation.

The purpose of this information is to help inform the WCC structure planning process for growth in the area and identify, where appropriate, infrastructure improvements which could be made to help ease any problems which may arise during development of the area. This is to include impacts on:

- The local road network;
- The state highway network;
- The public transport network;
- Supportive facilities, such as park and ride facilities or improved access to public transport stops;
- The cycling network; and
- The walking network

Concept roading alignments for the key roads serving each development scenario, as well as rough order construction costs are provided in Section 6 and Appendix B of this report.

2 Current Environment

2.1 Population and Demographics

Population and demographic information was sourced from ".id," a company which processes and displays census information and forecasts in a web-based graphical interface for Wellington City (as well as other districts).

Information for Churton Park / Glenside, and Tawa / Grenada North was compared between the 2006 and 2013 census years (refer tables below) to obtain a rate of change.

Table 2.1: Churton Park / Glenside Population Statistics

Data	2006	2013	Change
Total Households (no.)	1,962	2,226	264
Total Population (no. people)	5,859	6,528	669

Table 2.2: Tawa / Grenada North Population Statistics

Data	2006	2013	Change
Total Households (no.)	4,689	4,908	219
Total Population (no. people)	13,761	14,172	411

As far as social demography is concerned, Tawa seems to have a larger mix of backgrounds living within it than Churton Park.

Generally, Churton Park appears to be populated by relatively high income households in the 35 to 55 year of age bracket with children, a low unemployment rate, and a low rate of people without qualifications. Whereas Tawa has a mix of all age groups, employment positions, education background and children in the household.

2.2 Existing Land Use

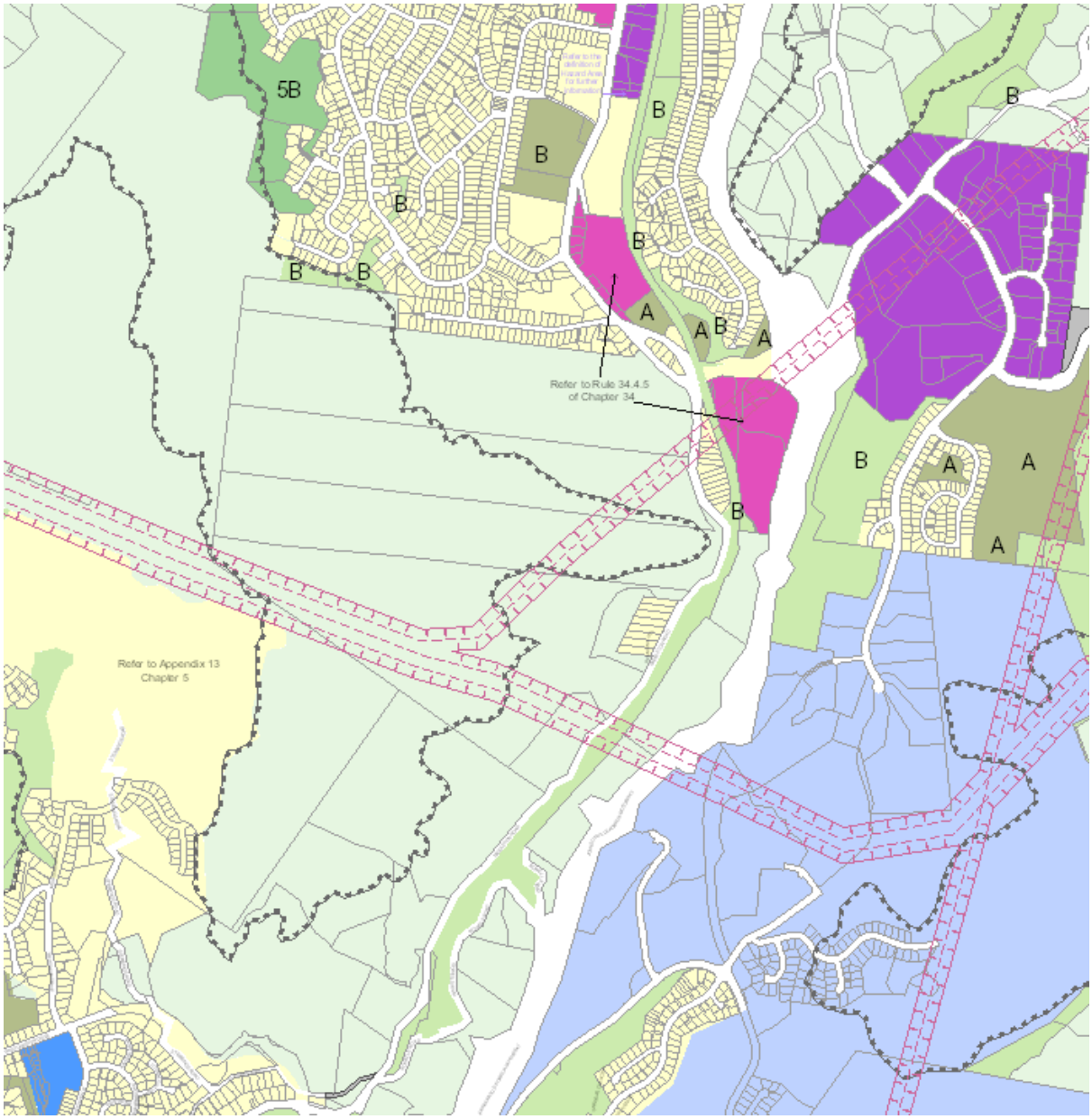


Figure 2.1: Upper Stebbings Growth Area (Light green for Rural zoning) (Wellington City Council)

The existing land in the Upper Stebbings Valley is zoned Rural, including the area which is currently occupied by the Arohata Prison.

Other land uses in this area are generally farming and some forestry, with an easement corridor for high capacity power transmission lines running to the south near Churton Park.

It is also important to note that a significant portion of the proposed development sites has the Ridgeline Hilltops overlay on it in the District Plan which restricts the development potential of the area. We have assumed the development range provided by WCC, for the various scenarios, have taken this issue into account where appropriate.

2.3 Transport Environment

2.3.1 Existing Road Hierarchy

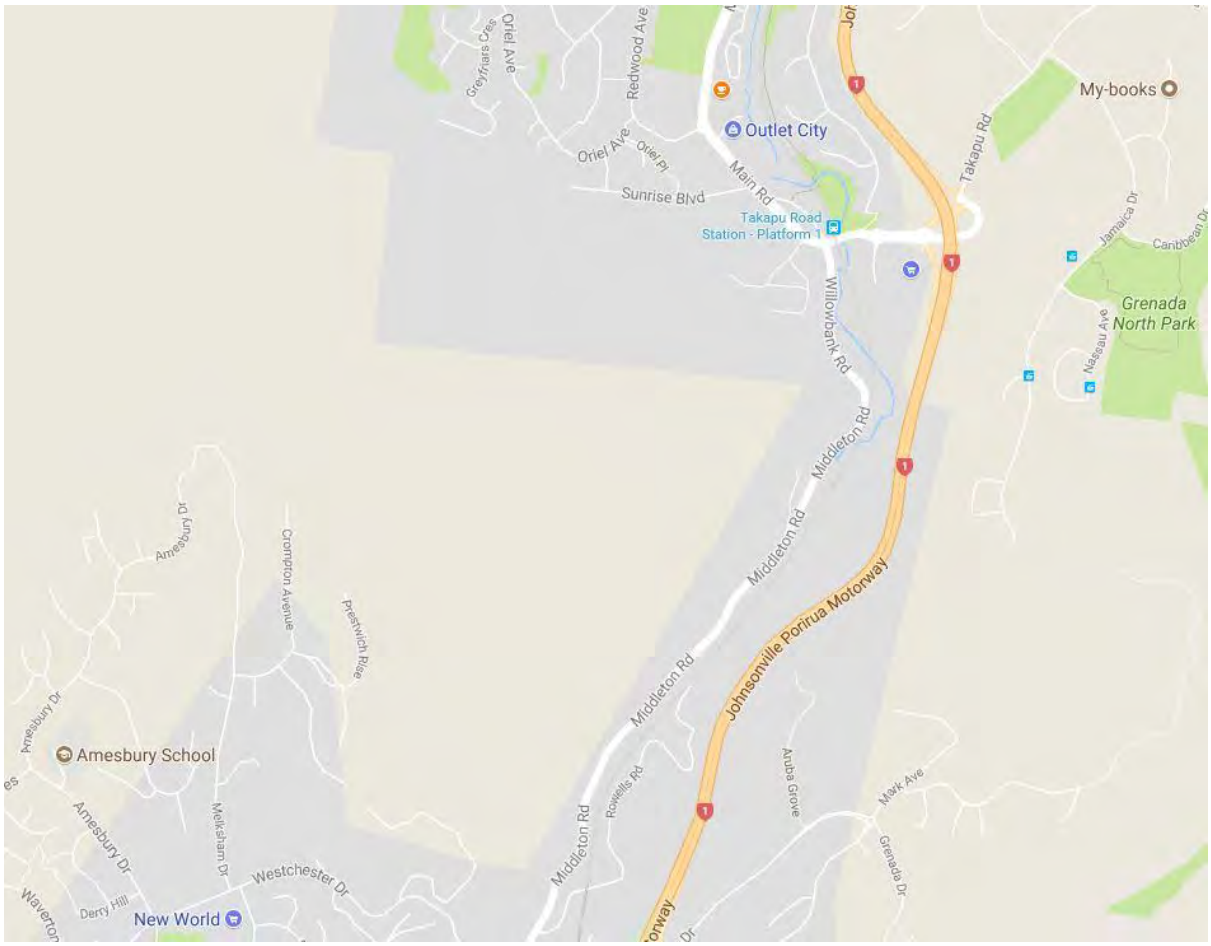


Figure 2.2: Road Network around Upper Stebbings Growth Area (Google)

The existing roads within the assessment area and their respective hierarchy from the District Plan, are listed in Table 2.3 below, any not listed are Local Roads only

Table 2.3: Existing Road Hierarchy

Hierarchy Level	Road Name
Motorway	State Highway 1
Principal	Main Road Willowbank Road Middleton Road Grenada Drive Westchester Drive East
Collector	Redwood Avenue Oriel Avenue Westchester Drive

2.3.2 Road Width Standards

The existing Collector and Principal roads within the study area do not strictly adhere to the WCC Code of Practice for Land Development minimum road and carriageway widths (Part C, Table 1). The departures from the Code of Practice include a lack of formal parking space, and often the absence of one of either the berm or footpath.

This is most notable in Tawa, and is assumed to be the result of local roads being upgraded in status over time due to increases in traffic volume and connectivity, whilst retaining the local road characteristics. It is also noted that several areas of Churton Park share a similar cross section (e.g.: Westchester Drive, which only has a path on one side and a berm on the other for much of its length).

Conversely, the local roads both new and older in each suburb appear to be largely compliant with the WCC Code of Practice.

2.3.3 Local Intersections

The intersections assessed as part of this study are predominantly roundabouts, of varying sizes, with one staggered crossroad and a T-intersection at Sunrise Boulevard.

The key intersections listed in table 2.4 below, were considered to be the most appropriate to demonstrate the effects of growth within the network immediately adjacent to the proposed development area. However, the impact of large volumes of additional traffic is anticipated to be more widespread and more sophisticated network modelling would enable better understanding of the widespread network effects.

Table 2.4: Assessed Intersections

Intersecting Roads	Intersection Type
Main Road / Redwood Avenue	Roundabout
Main Road / Sunrise Boulevard	T-intersection
Main Road / Takapu Road / Willowbank Road / Boscobel Lane	Roundabout
Westchester Drive / Melksham Drive / Lakewood Avenue	Staggered-Crossroads
Westchester Drive / Middleton Road / Westchester Drive East	Roundabout

2.3.4 Traffic Flows

Existing traffic flows were assessed, utilising traffic data supplied by WCC and Greater Wellington Regional Council (GWRC), supplemented by short duration survey data recorded at the key intersections, across both morning and evening peak times.

The results of the surveys were used to help calibrate the distribution of forecast traffic flows within the gravity model.

2.3.5 Road Safety

The recorded crash history for the assessed intersections was investigated using the NZ Transport Agency CAS (Crash Analysis System) database for a five year period between 2010 and 2016.

There were no recorded crashes that resulted in more than minor injuries. The crash incidence is low and, with one exception (detailed below), intersection crashes are not always from the same approaching direction.

Westchester Drive / Middleton Road Roundabout:

There have been five different crashes recorded on the eastern approach from Middleton Road to this roundabout in the last two years, the primary cause is failing to give way for various reasons, often environmental (causes include one crash due to sunstrike and two crashes in slippery conditions).

Table 2.5: Recent Crash History (entire intersection)

Year	Fatal	Serious	Minor	Non-	Total
2012	0	0	1	0	1
2013	0	0	0	1	1
2014	0	0	0	1	1
2015	0	0	2	3	5
2016	0	0	0	2	2
Total	**0**	**0**	**3**	**7**	**10**

2.3.6 Walking and Cycling Network

Census data suggests that people choosing to walk or cycle to work are increasing in both suburbs. Whilst this is a relatively small numerical increase, when compared with the rate of population growth, it suggests these modes are becoming more popular as a means of travel, and may reflect an increase in people working within close proximity to the home.

Table 2.6: Walking and Cycling Uptake

Suburb	Data	2006	2013	Change (no.)	Rate of Change (%/yr)
Churton Park / Glenside	Walking	42	69	27	9.18
	Cycling	33	39	6	2.60
	Population	5,859	6,528	669	1.63
Tawa / Grenada North	Walking	192	213	21	1.56
	Cycling	45	57	12	3.81
	Population	13,761	14,172	411	0.43

Footpaths are prevalent throughout Churton Park and Tawa, on at least one side of the road in both built up and (in some cases) more rural areas; there are some key places where they are currently absent, or simply end, such as at the entrance to Arohata Prison.

Although there is signage directing cyclists at key locations in this area, there is little evidence of formal cycling facilities in the form of dedicated lanes or paths; on narrow roads, such as the northern part of Middleton where there are limited or no other options for connectivity further south, this is likely to discourage many potential cyclists.

2.3.7 Public Transport Modes and Accessibility

Census data suggests that while patronage of public transport is growing in both suburbs, travel by train as a mode from those living in Churton Park / Glenside declined between 2006 and 2013. This is assumed to be due to the proximity of stations with the nearest ones in Johnsonville or Tawa, with the latter lacking in parking infrastructure or usable links via other modes (such as cycling or the bus network).

If this assumption holds true, there may be a latent demand within the Churton Park / Glenside area which could be unlocked via improvements in:

- Transportation link availability;
- The perception of road corridor safety, particularly for cyclists; and
- Parking facilities, specifically the number of park and ride spaces available at the Tawa and Johnsonville railway stations.

Conversely, Tawa has seen growth in uptake of both the train and bus services.

Table 2.7: Public Transport Uptake

Suburb	Data	2006	2013	Change (no.)	Rate of Change (%/yr)
Churton Park / Glenside	Bus	408	459	51	1.79
	Train	72	60	-12	-2.38
	Population	5,859	6,528	669	1.63
Tawa / Grenada North	Bus	48	87	39	11.61
	Train	1,419	1,512	93	0.94
	Population	13,761	14,172	411	0.43

3 Future Transport Environment

3.1 Population

Data for Churton Park / Glenside, and Tawa / Grenada North was compared between the 2013 census year and the forecast as at 2043 from Wellington City Council (refer tables 3.1 and 3.2 below) to obtain a rate of change.

Table 3.1: Churton Park / Glenside Population Statistics

Data	2013	2043	Change	%
Total Households (no.)	2,226	3,643	1,417	63.3
Total Population (no. people)	6,528	10,055	3,527	54.0

Table 3.2: Tawa / Grenada North Population Statistics

Data	2013	2043	Change	%
Total Households (no.)	4,908	7,323	2,415	49.2
Total Population (no. people)	14,172	18,632	4,460	31.5

3.2 Road Hierarchy

The road hierarchy for the existing infrastructure is assumed not to change from its current form, in that the primary linkages will remain. The suggested new routes (refer section 5.3) have been designed based on a WCC standard Collector cross-section. However, it is anticipated that the only road serving a true collector function will be the easiest through-route between the two suburbs and that all other roads will at least start as local roads.

3.3 Road Width Standards

The road widths have been assumed to be maintained for existing roads, although future traffic volumes may result in this being reviewed.

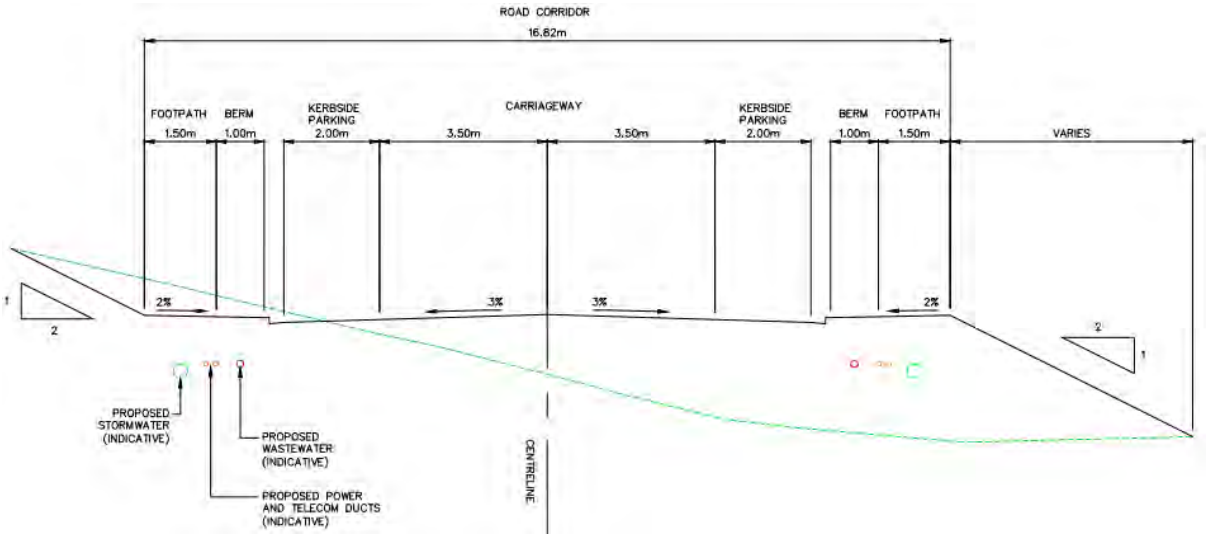


Figure 3.1: Indicative Road Profile (Sub-collector)

New roads are anticipated to be designed to the current Code of Practice for Land Development, an example given in the figure above and in more detail in Appendix B.

3.4 Local Intersections

All intersections are assumed to be maintained in their current configuration as a start point, future traffic conditions will indicate when and where changes should be implemented.

New connections will be required for the new Churton Park through-route at either end, and these are discussed under Section 5.3 Connectivity Options.

3.5 Traffic Flows

Trip distribution has been assumed to follow approximately the same percentages as existing, except where directly affected by an increase in demand on the network (i.e.: a new intersection or other development area connection).

3.6 Road Safety

No assessment has been made for safety upgrades to the existing road network. At this stage we have assumed that a "status quo" situation exists on the network with the only changes being required to accommodate the gradual increase of vehicles, and the additional demand on the network due to the new subdivision.

Any network improvement measures suggested in this report to improve the movement of vehicles and people should be considered as indicative and, as such, do not inherently include a specific safety assessment. Road safety audits, to assess the safety of planned network improvements when a preferred option is chosen and a preliminary design has been developed would be beneficial.

3.7 Walking and Cycling Network

Throughout this assessment we have assumed that the existing network(s) for pedestrians and cyclists remain in situ and do not erode in functionality or attractiveness.

3.8 Public Transport Modes and Accessibility

We have assumed that public transport in general will increase in popularity through a normal linear progression forecast, in line with population growth. Despite where a negative value was previously reported, it is considered appropriate that this would not continue a downward trend to zero over thirty years whilst the population of the area was increasing.

It is unclear from the census forecast whether the population growth estimation had accounted for the Upper Stebbings Growth Area. Given that the information within this report will go into planning additional services and significant growth is already looking likely, it was considered prudent to not risk over-estimating this far into the future as this may persuade WCC to put money aside for an unlikely scenario which could be better spent elsewhere, and so no further growth was considered.

4 Transmission Gully and Petone to Grenada

The influence these two projects have on the local roads between Churton Park and Tawa is expected to be minimal; the reasons for this view are:

- These two infrastructure projects are unlikely to be an additional attractor; people who were wanting to go north or south will still need to go to the same intersection to get on the State Highway network as they did before, their route may just change once they get to that decision point.
- Transmission Gully will have an intersection at State Highway 58, which will provide a route down into the Hutt Valley via Haywards Hill as an alternative to the Petone to Grenada and State Highway 1 and 2 routes. If this Petone to Grenada route does not get built, the Transmission Gully /SH58 route will still act as a relief route, somewhat reducing the congestion issues that occur on State Highway 1 near Tawa and Churton Park. This is considered in turn to reduce the likelihood of the local road route through Tawa and Churton Park being increasingly used as a "rat run" to avoid the current peak period SH1 congestion.
- It has been assumed that, other than a natural increase in the traffic figures which will capture some defections onto the local roads, the State Highway network in this area remains largely self-contained as the modelling method used cannot determine at what point the motorway system falls over. Further much more detailed analysis using the WTSM model would be necessary to reasonably predict the effects of these and any other infrastructure projects.
- In line with the above assumption, it has by implication also been assumed that should an issue be shown to occur within the WTSM then NZTA will enact works to ensure the continued functioning of the State Highway network to the minimal impact of the local road network.

5 Upper Stebbings Growth Area

5.1 Proposed Upper Stebbings Growth Area Description

This growth area consists of some 275 hectares of land between Churton Park and Tawa along the western side of the State Highway 1 corridor.

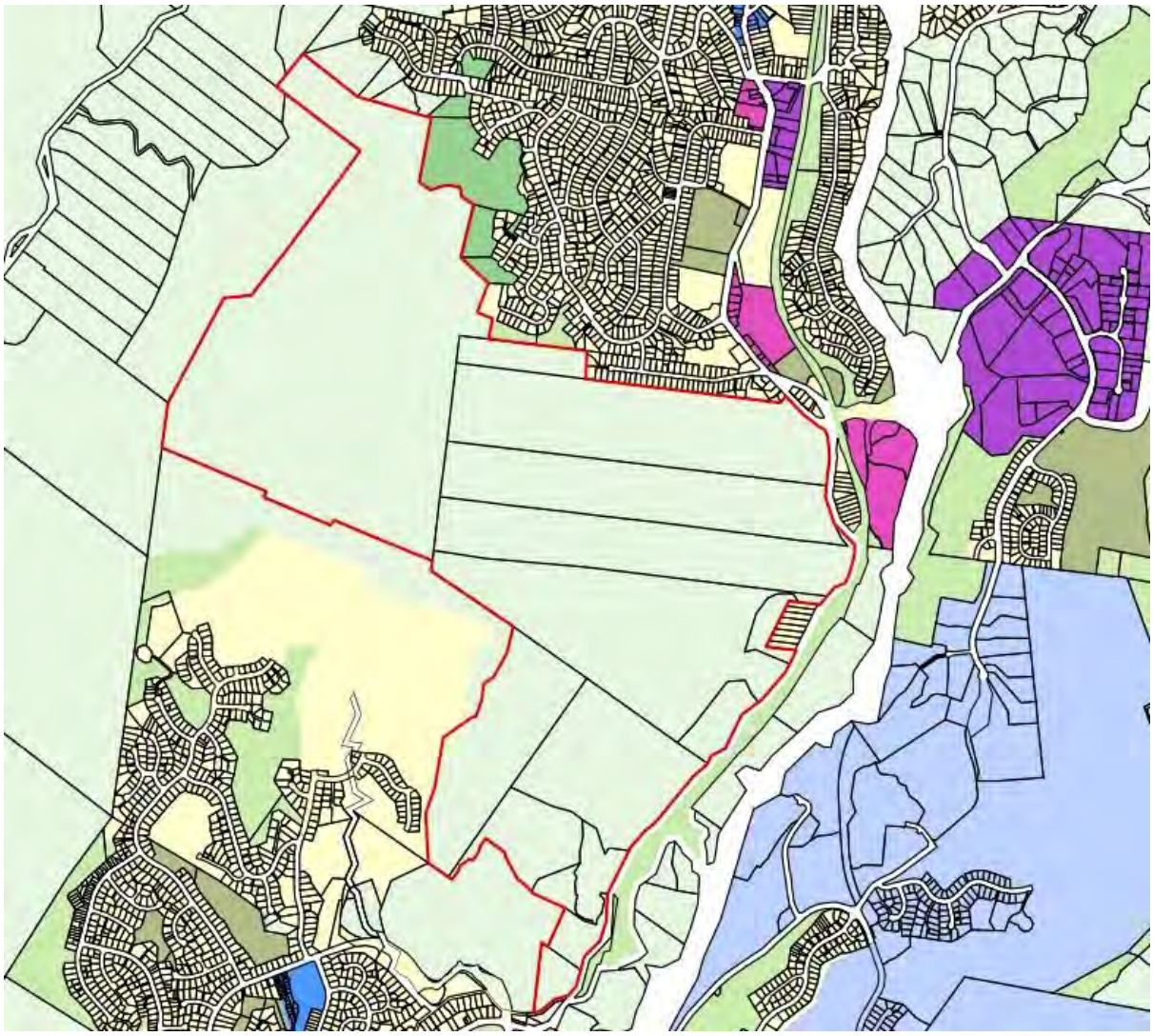


Figure 5.1: Stebbings Growth Area (Red border) (Wellington City Council)

Currently zoned Rural, this area is bordered on all but one side by residential zoning and is currently farming land and forestry, plus the Arohata Prison off Main Road in Tawa. Also through the area is a transmission corridor for high capacity national grid power lines.

The topography is very steep in places and prone to sudden changes in grade, making development of the area very challenging.

5.2 Development Scenarios for Zone

Wellington City Council have provided details of three scenarios of varying levels of development, and a range of dwellings expected for each scenario. These scenarios were then used to inform trip generation estimates, as well as likely primary road routes based on information such as topography, possible protected green areas, etc.

Scenario 1

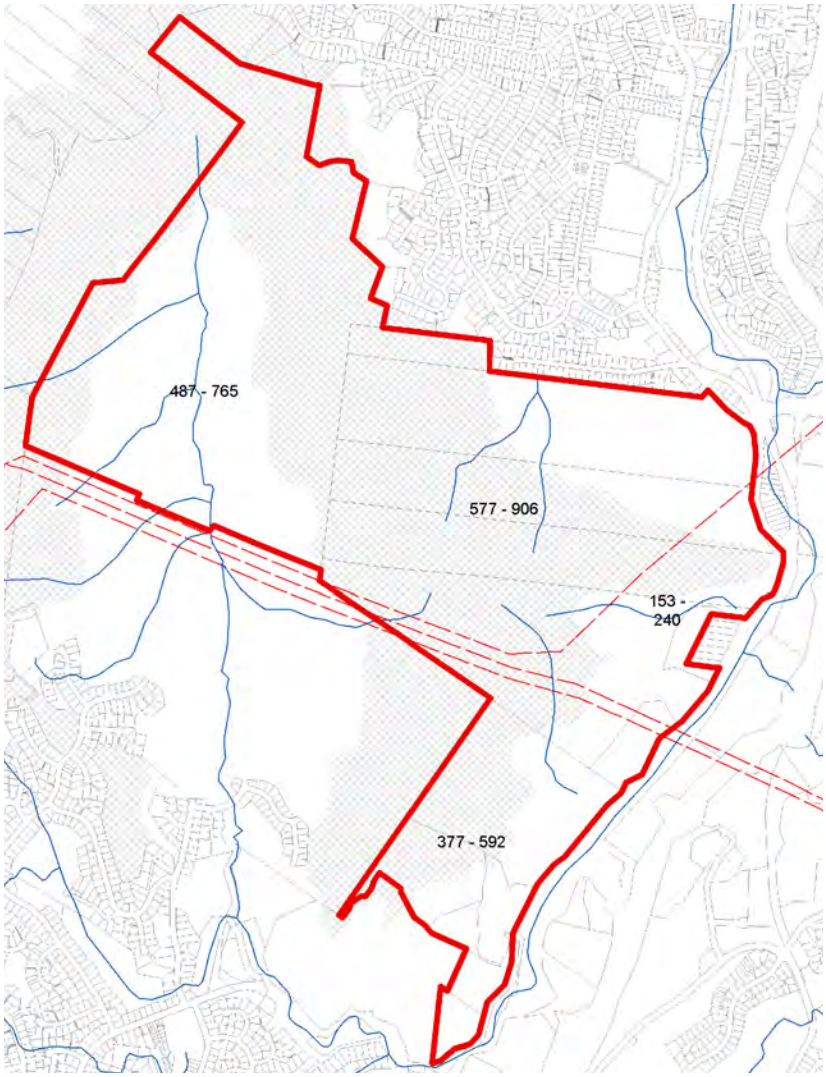


Figure 5.2: Scenario 1 Plan (Wellington City Council)

This option assumes the whole area is able to be utilised for subdivision, according to Wellington City Council this would allow dwelling numbers between 1,590 and 2,500.

For this option two connections essentially extending roads currently being built as part of the Churton Park developments have been envisioned, with a single final connection as a new T-intersection at Main Road on the Tawa side, coming down just in front of Arohata Prison.

Scenario 2

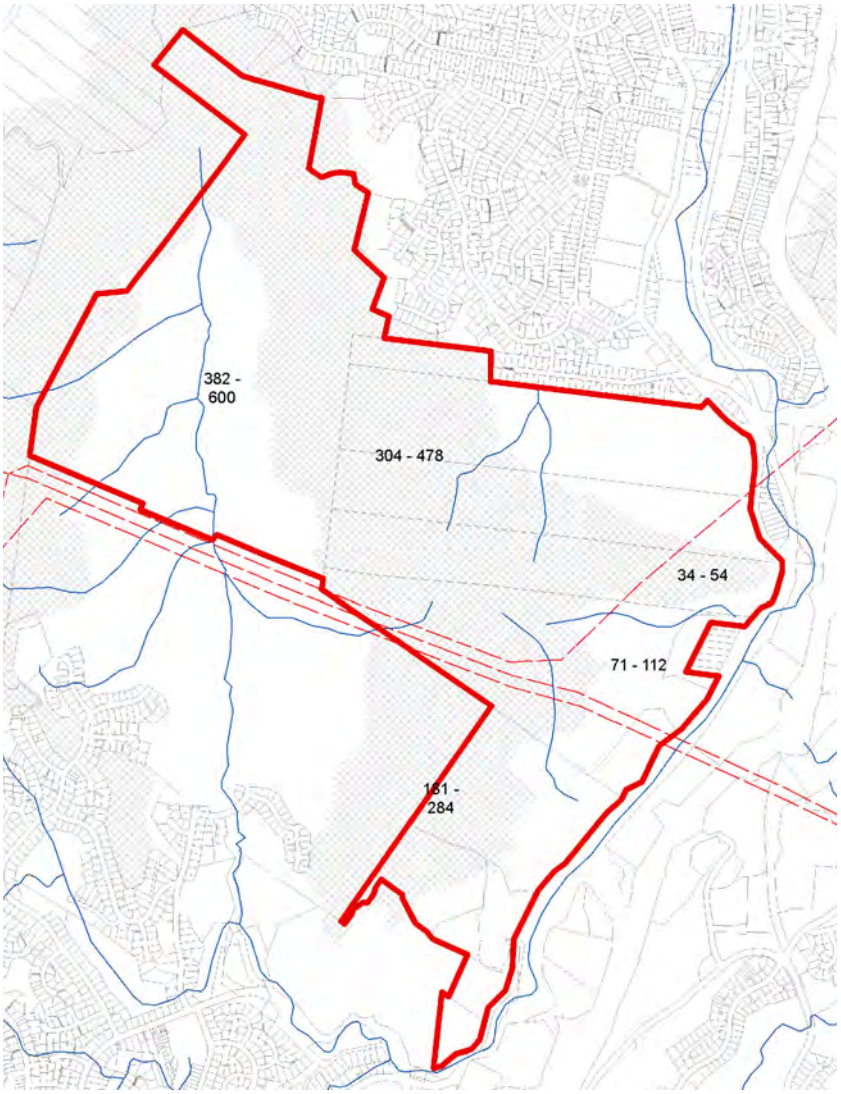


Figure 5.3: Scenario 2 Plan (Wellington City Council)

This option assumes a somewhat more limited development potential than scenario 1, restricting the available land and the dwelling range to between 970 and 1,530.

The road connections for this option are identical to that for scenario 1 because, although the land areas available are more restricted, they are also spread out in a similar general pattern meaning the road options would be just as effective at connecting the areas.

It is important to note that whilst restricted from scenario 1, the land areas appear to follow the ridgeline overlay from the district plan and any restrictions that may be imposed because of this.

Scenario 3

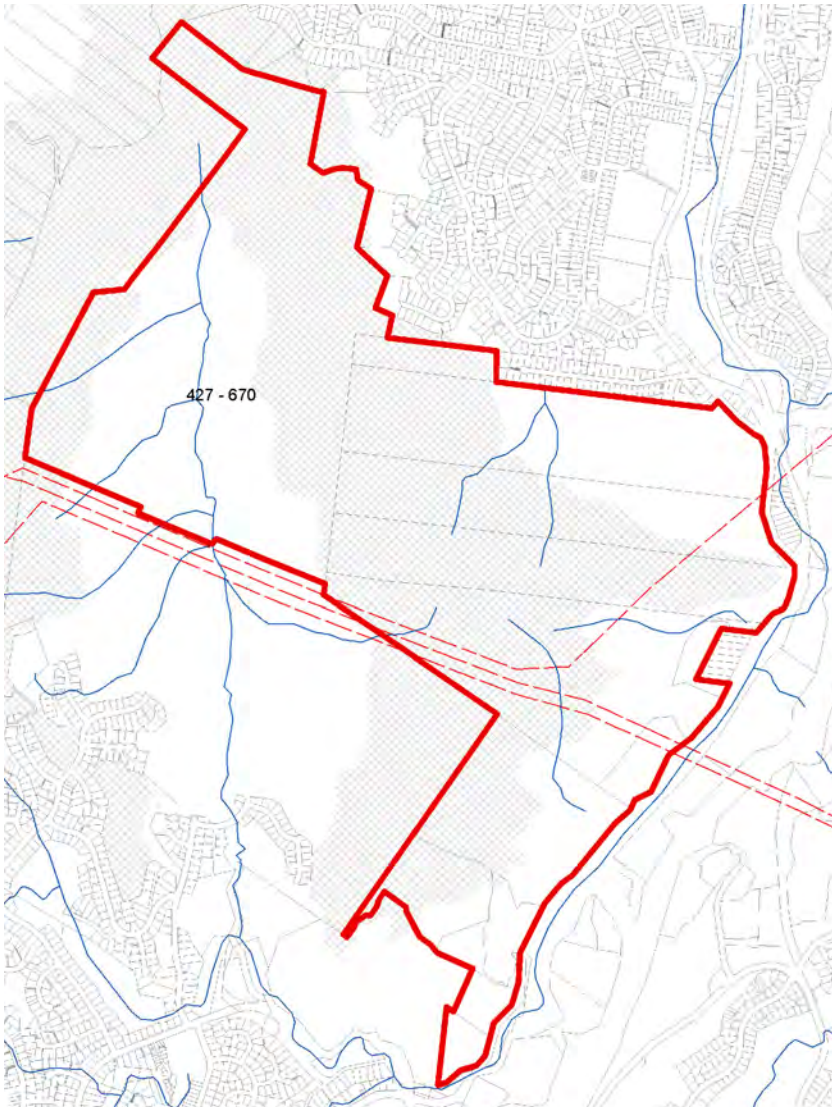


Figure 5.4: Scenario 3 Plan (Wellington City Council)

This scenario features the most heavily restricted land area for building, confined to an area to the North-West of the site mostly between (but still partially including) two ridgeline segments. WCC have indicated this would allow dwelling numbers in the range of 430 to 670.

For this option one of the road connections into Churton Park would not be required in favour of a single Collector running through and the T-intersection with Main Road in Tawa would be abandoned in favour of a connection to the top of Sunrise Boulevard, though to achieve this would require the purchase of property.

5.3 Connectivity Options

5.3.1 Plan Discussion

Plan SK01 (see Appendix B) shows three alignment options and one sub-option, for connecting roads through the proposed development area:

- Road 1 is the original concept, largely based on the MWH design from 2005, which connects the majority of the subdivision and provides a through-route from Churton Park to Tawa.
- Road 2 is an alternative or addition to Road 1, depending on WCC preference or development constraints, for the main route between the two existing suburbs.
- Road 3a is the first route option considered along the lower part of the growth area, but suffers from large earthworks batter slopes on the corners which eat into desired reserve areas.
- Road 3b was the second route option considered for this area, which manages to avoid the reserves with its cut batter slopes, but still provides a reasonable alignment and secondary connection into Churton Park.
- Road 3c was designed at the request of WCC to better serve the development areas down the steeper slopes towards the Middleton Road end of the Stebbings development area.
- Road 4 (not shown) is the potential road connection to Sunrise Boulevard from Road 1, instead of heading down to Main Road. This option is considered desirable from the point of view of limiting intersections on a Principal Road, however there may be local resident issues with pursuing this option, hence why it was not shown.

5.3.2 Design Standards

The alignments are derived from the typical Collector Road cross-section from Wellington City Council Code of Practice for Land Development of 7m of carriageway (2x 3.5m lanes) 4m of parking width (2x 2m wide bays) and 5m of off-road allowance (2x 1.5m footpaths, 2x 1m berms), giving a total width of 16m.

A maximum 12% longitudinal grade has been applied, with cut / fill batter slopes of 2:1 which is steeper than normally encountered in a residential area to minimise the volumes of cut and fill. This was considered to be a reasonable compromise as the design is indicative and based on available topographic data which has not been confirmed to anything below 1m accuracy.

5.3.3 Design Restrictions

Because of the design standards used, in particular the longitudinal grades, finding a feasible route to service the eastern side of the development area was challenging. The route shown offers a compromise between desirable minimum standards, and reducing the level of impact on reserve areas due to cut/fill batter slopes.

At this stage we considered that the eastern areas would be best serviced off the main spine roads via local cul-de-sacs and driveways down to building platforms rather than their own loop road.

6 Potential Effects on the Transport Network

6.1 Proposed Access Arrangements

6.1.1 Road Alignment

The road alignment options shown on plan SK01 in Appendix B are discussed in section 5.3 above. These are conceived as options for Collector roads, from which local roads and right of ways would branch off where appropriate as per the WCC standards in order to fully connect the development area internally.

At the Churton Park side three possible connection points with existing and proposed infrastructure were deemed viable:

- The extension of Melksham Drive North into the development area
- The extension of Prestwich Rise North into the development area; and
- The extension of the proposed Farnworth Terrace road within the Stebbings Farmland Ltd Reedy Block subdivision plans

All these options allow a good east-west coverage for road access to the development scenarios, and avoid land acquisition to provide intersections that were not considered during the original design of the Churton Park subdivision.

6.1.2 Rough Order of Costs

The rough order cost for these roads, split by alignment (Roads 1 to 3) is based on local construction knowledge, assumptions and scheduled rates with a contingency of around 30% applied (recommended amount for earthworks at the feasibility stage of projects, recommended by the New Zealand Transport Agency's Economic Evaluation Manual).

Note that only Road 3a of the two original Road 3 options has been quantified as we consider it to be the most conservative for the two alignments given in terms of work required to build.

Road 3c has also been quantified at the request of WCC as a link road to try and better serve the lower slopes towards Middleton Road.

Three cost scenarios are presented below, including for the roads that would support the three scenarios of varying levels of development. Total costs include a 30% contingency (excl GST).

Scenario 1 & 2 (with Road 3a)		**Scenario 1 & 2 (with Road 3c)**		**Scenario 3 (Road 1 only)**	
Road 1:	$ 41,100,000	Road 1:	$ 41,100,000	Road 1:	$ 41,100,000
Road 2:	$ 9,250,000	Road 2:	$ 9,250,000		
Road 3a:	$ 22,600,000	Road 3c:	$ 29,100,000		
Total:	**$ 73,000,000**	**Total:**	**$ 79,450,000**	**Total:**	**$ 41,100,000**

Further detailed rough order costs are attached in Appendix C, including a typical rough order cost per meter of road calculation.

The single largest cost element for any of these roads is the earthworks, which amounts to around half the cost of construction.

There could be some efficiencies gained from relaxing some of the road design standards to suit the environment (allow some steeper gradients, or narrower corridor width, for example). However no optimisation exercise has been entered into in this regard due to the high-level nature of this assessment; any efficiencies to be gained should be investigated during the Detailed Design phase.

6.2 Assessment of Road Network Performance

For the purposes of comparison a gravity traffic model of the road network was developed to test a variety of situations:

- 2013 Base Year: The last year for which census records are available as well as traffic counts for most roads within a reasonable timeframe of this date so the level of accuracy can be considered to be appropriate.
- 2043 No Development: Assessment of the network based on linear growth derived from the difference in forecast populations between 2013 and 2043, and assumed to represent a pro-rata growth in traffic volumes as a baseline for comparison with the development scenarios.
- 2043 Scenario 1: A look at the 2043 forecast figures with amendments to account for additional traffic generation from the Upper Stebbings Valley area in line with the development proposition for Scenario 1.
- 2043 Scenario 2: A look at the 2043 forecast figures with amendments to account for additional traffic generation from the Upper Stebbings Valley area in line with the development proposition for Scenario 2.
- 2043 Scenario 3: A look at the 2043 forecast figures with amendments to account for additional traffic generation from the Upper Stebbings Valley area in line with the development proposition for Scenario 3.

Each of the scenarios assumes the higher end of the development yield as a conservative assessment of effects.

High-level gravity style spreadsheet models were developed using these principles and, based on the traffic numbers in these scenarios, Sidra 7 models created for the key intersections.

For scenarios 1 and 2, where a new connection is required to Main Road in Tawa, a new intersection was also modelled.

6.2.1 Existing Intersection Overall Performance

Level of Service	Degree of Saturation (x) *SIDRA Method*			Degree of Saturation (x) *ICU Method*
	Signals	Roundabouts	Sign Control	All intersection types
A	x ≤ 0.60	x ≤ 0.60	x ≤ 0.60	x ≤ 0.60
B	0.60 < x ≤ 0.70	0.60 < x ≤ 0.70	0.60 < x ≤ 0.70	0.60 < x ≤ 0.70
C	0.70 < x ≤ 0.90	0.70 < x ≤ 0.85	0.70 < x ≤ 0.80	0.70 < x ≤ 0.80
D	0.90 < x ≤ **0.95**	0.85 < x ≤ **0.95**	0.80 < x ≤ **0.90**	0.80 < x ≤ **0.90**
E	**0.95** < x ≤ 1.00	**0.95** < x ≤ 1.00	**0.90** < x ≤ 1.00	**0.90** < x ≤ 1.00
F	1.00 < x	1.00 < x	1.00 < x	1.00 < x

Figure 6.1: Volume/Capacity Ratio Levels of Service (LOS) Table from SIDRA 7

The degree of saturation of an intersection is a measure of how much traffic demand the intersection is experiencing, relative to its total capacity to accommodate vehicles. A degree of saturation of 1.00 means that the demand is equal to the capacity and no further traffic is able to progress through the intersection. Values over 0.85 are typically regarded as experiencing traffic congestion, with queues of vehicles beginning to form.

Figure 6.2 and Figure 6.3 below show the morning and evening peak expected flows over time between the modelling base year of 2013, and the furthest projection year of 2043. For these figures it has been assumed that the relationships between the two points in time will be linear, given that currently there is way to know when these developments will begin, or how long it will take for them to become fully occupied.

Larger versions of these graphs are available in Appendix D.

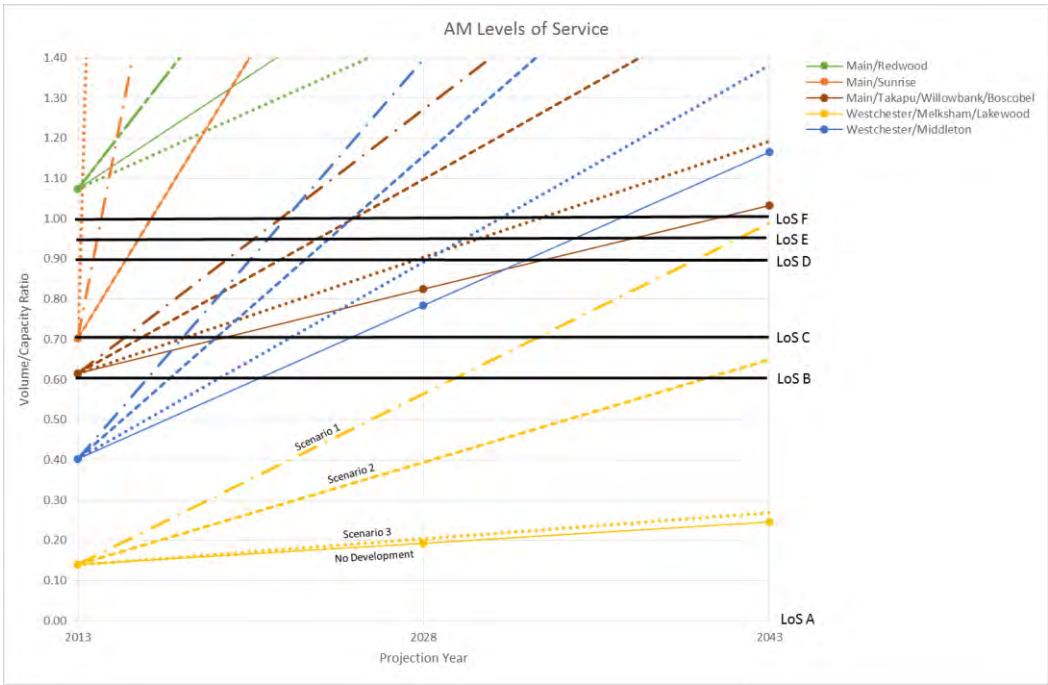


Figure 6.2: Morning Peak LOS Graph for all intersections, varying scenarios

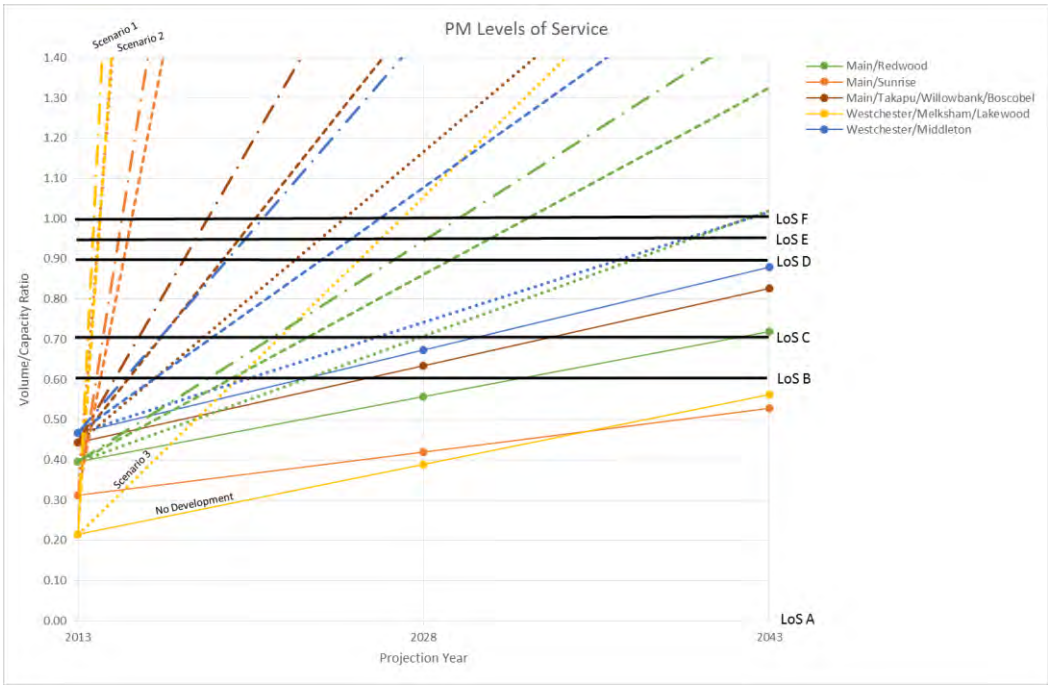


Figure 6.3: Afternoon Peak LOS Graph for all intersections, varying scenarios

These graphs indicate the intersections as a whole, under the assumptions already stated, would cross into a LOS of F (indicating an unacceptable delay) under the different development scenarios approximately as follows:

Table 6.1: Expected Earliest LOS 'F' Year

Intersection	No Development	Scenario 3 (Low Development)	Scenario 2 (Med Development)	Scenario 1 (High Development)
Main Road / Redwood Avenue	AM = Already at F PM = Not likely	AM = Already at F PM = 2042	AM = Already at F PM = 2031	AM = Already at F PM = 2029
Main Road / Sunrise Boulevard	AM = 2017 PM = Not likely	AM = 2014 PM = 2014	AM = 2015 PM = 2017	AM = 2017 PM = 2015
Main Road / Takapu Road / Willowbank Road / Boscobel Lane	AM = 2039 PM = Not likely	AM = 2033 PM =2025	AM = 2025 PM = 2020	AM = 2023 PM = 2018
Westchester Drive / Melksham Drive / Lakewood Avenue	AM = Not likely PM = Not likely	AM = Not likely PM = 2027	AM = Not likely PM = 2016	AM = 2043 PM = 2016
Westchester Drive / Middleton Road / Westchester Drive East	AM = 2036 PM = Not likely	AM = 2032 PM = 2043	AM = 2026 PM = 2026	AM = 2023 PM = 2019

It is important to note that, because of the way Level of Service is calculated for an intersection using the degree of saturation, in some instances at intersections under the right flow conditions it is possible to get improved Level of Service with increased traffic, as a result of vehicle arrival speeds reducing. Hence why some intersections (such as Main Road/Sunrise Boulevard) appear to reach LOS of F later despite higher development.

6.2.2 Existing Intersection Leg Performance

Table 6.2 to Table 6.11 inclusive show the points at which each approach to an intersection reduces to a LOS F: the point at which the traffic volume exceeds the lane capacity and significant delays occur.

The figures reported do not necessarily signify that the overall road capacity is exceeded, often LOS F will signify that right turning vehicles simply cannot find a suitable gap to join the main road flow.

Level of Service for v/c ≤ 1.0	Average delay per vehicle in seconds (d)			Level of Service for v/c > 1.0
	Signals	"SIDRA Roundabout LOS" method (1)	Sign Control (*Default for roundabouts*) (1)	All Intersection Types
A	d ≤ 10	d ≤ 10	d ≤ 10	F
B	10 < d ≤ 20	10 < d ≤ 20	10 < d ≤ 15	F
C	20 < d ≤ 35	20 < d ≤ 35	15 < d ≤ 25	F
D	35 < d ≤ **55**	35 < d ≤ **50**	25 < d ≤ **35**	F
E	**55** < d ≤ 80	**50** < d ≤ 70	**35** < d ≤ 50	F
F	80 < d	70 < d	50 < d	F

Figure 6.4: Time Delay Levels of Service (LOS) Table from SIDRA 7

In all cases an LOS A represents a less than 10 second delay on average, whereas an LOS F represents an average delay of over 50 seconds at a standard give-way or stop control, or over 70 seconds at a roundabout.

Note that in the tables below, Scenario 3 contained the lowest development density, increasing to the highest density of development within Scenario 1.

Main Road / Redwood Avenue Intersection

This intersection is currently a three-leg roundabout with give way controls at each leg.

Predominant existing traffic flows are along Main Road heading south in the morning peak, and north in the afternoon peak.

Figure 6.5: Main / Redwood Intersection (Google)

Table 6.2: AM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Main Road)	F	F	F	F	F
South (Main Road)	A	A	A	C	F
West (Redwood Avenue)	B	F	F	F	F

Table 6.3: PM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Main Road)	A	A	B	F	F
South (Main Road)	A	A	A	F	F
West (Redwood Avenue)	A	B	F	F	F

The model results suggest that the existing roundabout is already congested in the base year during the morning peak from the North along Main Road. The LOS gradually reduces on all legs in later years as development increases.

Main Road / Sunrise Boulevard Intersection

This intersection is currently a T-intersection with a give way control on Sunrise Boulevard, and a flush median on Main Road.

Predominant existing traffic flows are along Main Road heading south in the morning peak, and north in the afternoon peak.

Figure 6.6: Main / Sunrise Intersection (Google)

Table 6.4: AM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Main Road)	A	D	D	F	F
South (Main Road)	A	A	A	A	A
West (Sunrise Boulevard)	F	F	F	F	F

Table 6.5: PM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Main Road)	A	B	F	F	F
South (Main Road)	A	A	D	B	E
West (Sunrise Boulevard)	B	E	F	F	F

The model results suggest that there may be congestion on Sunrise Boulevard in the morning peak for the base year. This would primarily be due to right turners waiting for gaps in the main road traffic.

Main Road / Takapu Road / Willowbank Road / Boscobel Lane Intersection

This intersection is currently a 4-leg roundabout with give way controls at each leg.

Predominant existing traffic flows are from Main Road into Takapu Road in the morning peak, and appear to be split evenly in direction in the afternoon peak along the same route.

Figure 6.7: Main / Takapu / Willowbank / Boscobel Intersection (Google)

Table 6.6: AM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Boscobel Lane)	C	F	F	F	F
East (Takapu Road)	A	B	C	F	F
South (Willowbank Road)	A	D	D	C	B
West (Main Road)	A	D	F	F	F

Table 6.7: PM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Boscobel Lane)	A	B	C	F	F
East (Takapu Road)	A	B	F	F	F
South (Willowbank Road)	A	B	F	F	F
West (Main Road)	A	A	A	A	E

The model results suggest that the ability of vehicles to exit Boscobel Lane in the morning peak is poor, failing in the AM peak with a no development 2043 scenario, and the LOS for all legs reduce in future years.

The exception appears to be Willowbank Road where the AM peak LOS improves in future years with increasing development. This could be due to the relatively low opposing flow on the Takapu Road leg, allowing increased performance for Willowbank Road approach, at the expense of the Main Road approach.

Westchester Drive / Melksham Drive / Lakewood Avenue Intersection

This intersection is currently a staggered cross-roads arrangement with give way controls on Melksham Drive and Lakewood Avenue, and a narrow median with right-turn bays along the main route of Westchester Drive.

Predominant existing traffic flows are along Westchester Drive heading east in the morning, west in the afternoons.

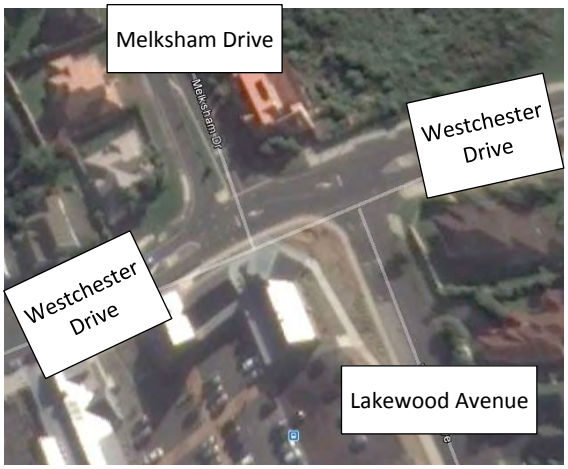


Figure 6.8: Westchester / Melksham / Lakewood Intersection (Google)

Table 6.8: AM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Melksham Drive)	B	C	C	C	E
East (Westchester Drive)	A	A	A	A	A
South (Lakewood Avenue)	B	C	C	E	F
West (Westchester Drive)	A	A	A	A	A

Table 6.9: PM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Melksham Drive)	B	C	E	F	F
East (Westchester Drive)	A	A	A	A	E
South (Lakewood Avenue)	B	D	F	F	F
West (Westchester Drive)	A	A	A	A	A

The model results suggest that the intersection generally operates acceptably, and should still be functional in a 2043 "no development" scenario, however, as soon as any development occurs Lakewood Avenue LOS reduces quickly in the afternoon peak.

Westchester Drive / Middleton Road / Westchester Drive East Intersection

This intersection is currently a 4-leg roundabout with give way controls on each leg.

Predominant existing traffic flows are along Westchester Drive heading east in the morning peak, contributed to mainly from both legs of Middleton Drive. The afternoon peak comes from Westchester Drive East heading west, however the split in flows changes to be predominantly Middleton Road heading north and then up Westchester Drive.

Figure 6. 9: Westchester/ Middleton Intersection (Google)

Table 6.10: AM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Westchester Drive)	A	F	F	F	F
East (Middleton Road)	A	C	C	C	C
South (Westchester Drive East)	A	A	A	A	A
West (Middleton Road)	A	A	A	A	A

Table 6.11: PM Peak Levels of Service

Approach Direction	2013 Base Year	2043 Scenarios			
		No Development	Scenario 3	Scenario 2	Scenario 1
North (Westchester Drive)	A	A	E	F	F
East (Middleton Road)	A	A	B	B	B
South (Westchester Drive East)	A	B	C	F	F
West (Middleton Road)	A	C	C	C	C

The model results suggest that, during the morning peak in 2043, the northern approach (Westchester Drive) irrespective of development shows a significant reduction in LOS. In the afternoon peak the southern approach (Westchester Drive East) also shows unfavourable conditions in scenarios 1 or 2.

6.2.3 Proposed Intersection Leg Performance

The proposed new intersection for the Road 1 Collector Road in scenarios 1 and 2 joins Main Road in Tawa, between the Arohata Prison entrance and existing properties just off Sunrise Boulevard. The option of relocating the prison entrance onto the new Road 1 to reduce the concentration of intersections along Main Road is a potential opportunity.

Modelling the Road 1 / Main Road intersection as a 'standard' tee intersection of a similar design to Sunrise Boulevard 100m to the north results in a level of service 'F' on every approach with traffic volumes as currently defined.

A series of conceptual options were assessed including;

- Roundabout (10m dia)
- Roundabout (50m dia)
- Traffic signals

Table 6.12: AM Peak Levels of Service

Approach Direction	2043 Scenario 1 Design Options		
	10m dia Roundabout	50m dia Roundabout	Traffic Signals
North (Main Road)	F	D	F
West (New Road 1 Connection)	F	F	F
South (Main Road)	A	A	D

Table 6.13: PM Peak Levels of Service

Approach Direction	2043 Scenario 1 Design Options		
	10m dia Roundabout	50m dia Roundabout	Traffic Signals
North (Main Road)	C	B	F
West (New Road 1 Connection)	B	B	F
South (Main Road)	C	C	C

The best performance was obtained from a roundabout configuration, requiring at least two lanes in each direction on both Main Road and the new collector. However, these options still resulted in poor levels of service at least once a day on at least one approach, usually the new collector due to the volume of traffic heading towards State Highway 1 using this new road.

6.2.4 Future Parking Demand

Future parking demand at the nearest railway stations (Redwood Station and Takapu Road Station) has been assessed based on the calculated increase in commuters from the Churton Park and Tawa suburbs:

A short duration parking survey was carried out at the same time as the intersection traffic counts to provide an understanding of car park usage, and the results were used to estimate the increase in spaces likely required by 2043, based on underlying growth irrespective of development within the Upper Stebbings Growth Area:

Table 6.14: Parking Demand 2043

Railway Station	Total Spaces	2017 Average Occupancy	2043 Increase Required	New Total
Redwood	151	140	92	243
Takapu Road	71	63	36	107

This increase includes allowance for additional parks where people are currently witnessed parking illegally, a practice which suggests the carparks are 100% full at key times during the day.

6.3 Assessment of Alternative Modes

6.3.1 Public Transport

6.3.1.1 Forecast Patronage

We have assessed future patronage using the average growth recorded between the 2006 and 2013 census years and projecting forwards to 2043 where data was available. Where negative growth was experienced (such as train patronage from Churton Park / Glenside) we have assumed this would not compound over an additional 30 years and instead increased the patronage in-line with the forecast growth of the area.

The results of the forecasting are **Error! Reference source not found.** below:

Table 6.15: Public Transport Forecast

Suburb	Data	2013	2043	Change (no.)	Rate of Change (%/yr)
Churton Park / Glenside	Bus	459	730	271	1.97
	Train	60	85	25	1.39
	Population	6,528	10,055	3,527	1.80
Tawa / Grenada North	Bus	87	832	745	28.54
	Train	1,512	2,556	1,044	2.30
	Population	14,172	18,632	4,460	1.05

We have not adjusted predicted traffic volumes as modal shift towards public transport partly as a conservative measure, but also because car trips are likely to still occur at least in the case of increased train use, as part of the trip chain to get people to the local station.

6.3.1.2 Routes and Frequency

6.3.1.2.1 Buses: Existing

Figure 6.10: Existing Network Map extract (Metlink)

Currently only the number 54 services Churton Park, operating at a frequency of every 10 to 15 minutes during peak times, and every 30 minutes during off-peak times.

Tawa is currently serviced by the following routes:

- 210 – operating every 30 minutes during peak times, and every hour during off-peak times
- 211 – operating every 20 minutes during peak times, and every hour during off-peak times, but only between the hours of 07:12 and 16:25
- 97N – This service is an infrequent service operating only during the Weltec Polytechnic terms

These three buses all stop at both the Outlet City approximately 350m from Takapu Road railway station, and Tawa Mall which is approximately 250m from Tawa railway station.

6.3.1.2.2 Buses: Proposed

Bus route number 1 is scheduled to go through as far as Churton Park as a high-frequency service by mid-2018, and the Greater Wellington Regional Council's (GWRC) route map suggests it is intended to go further north. This route is intended to operate on a 10 to 15 minute frequency.

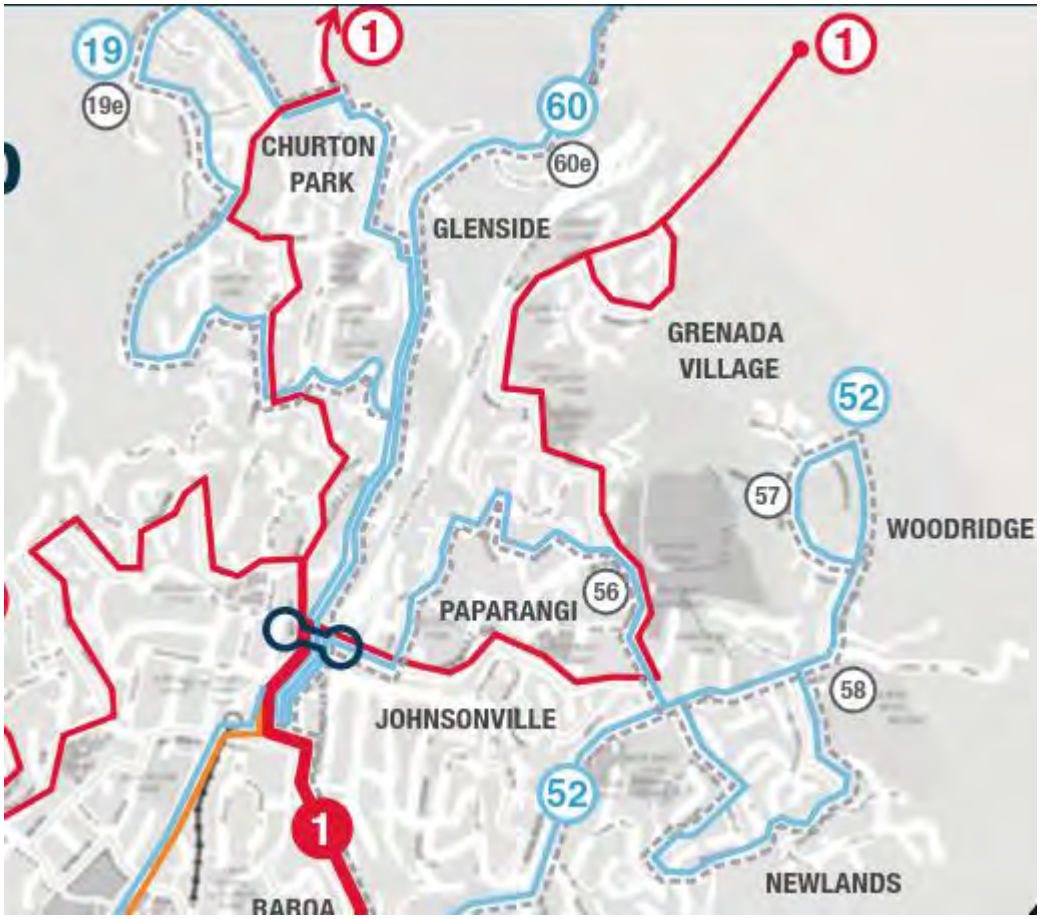


Figure 6.11: Bus Services Plan extract for mid-2018 (Metlink)

The local bus number 19 will terminate at Churton Park also, and number 60 will go to Tawa and further north. As these services are not scheduled to operate until mid-2018 the actual street by street routes have not yet been published, however we understand based on a route plan from Metlink that the number 60 may use State Highway 1 north of Johnsonville, and the frequency of these two bus services is anticipated to be every 30 minutes at peak times, and every 60 minutes at off-peak times.

Proposed Collector roads connecting Tawa to Churton Park could encourage the extension of the future number 19 bus service further north to Tawa as a natural extension of the current route, which could facilitate modal shift and, depending on the route, could offer a viable alternative to the train station at Tawa, reducing pressure on the small carpark, which may in turn increase train patronage.

6.3.1.2.3 Train Services

The train services operating through the various railway stations located along the edge of Tawa are reasonably frequent, although the exact frequency seems to vary quite significantly depending on their starting station and the time of day (ie: whether these stations are bypassed by the express service).

The train services are not thought to be due to change, however not allowing cyclists on the trains, whilst understandable, could lead to lower patronage without a secure facility to store them at the origin point(s).

6.3.1.3 Supportive Facilities

To encourage public transport usage, extension of at least one bus route through the development area, as mentioned above, would be highly advantageous and could also aid the link to Tawa railway station.

In tandem with this facility, Tawa railway station will require additional car parking as the current facility is space constrained and it is likely this area primarily acts as a drop-off area for most local patrons, or other means (such as walking or cycling) is used to get to the station from those living closer by.

6.3.2 Walking and Cycling

We have estimated increase directly proportional to population growth, as derived from the census data, this suggests a steady increase in walking and cycling in both areas as shown in **Error! Reference source not found.** below:

Table 6.16: Walking / Cycling Forecast

Suburb	Data	2013	2043	Change (no.)	Rate of Change (%/yr)
Churton Park / Glenside	Walking	69	279	210	10.14
	Cycling	39	73	34	2.87
	Population	6,528	10,055	3,527	1.80
Tawa / Grenada North	Walking	213	458	245	3.84
	Cycling	57	217	160	9.37
	Population	14,172	18,632	4,460	1.05

Walking and cycling as the sole means of transportation to work is likely reserved to those people who work close to their homes, and it is not thought likely people who walk / cycle to bus stops or train services are caught in this due to only being able to select one option in the census.

7 Issues Identified

7.1 Existing Issues Identified

The traffic modelling indicates issues that will need to be addressed regardless of future development as follows:

- Main Road and Redwood Avenue Roundabout: This intersection appears from the traffic modelling to be operating at a lower level of service on the northern approach (Main Road from Tawa) than we would expect for the existing situation. Further detailed survey and calibration of the intersection model would be beneficial in accurately assessing the base year performance, and for use in re-assessing the future year performance for the development scenarios.
- Main Road and Sunrise Boulevard T-intersection: This intersection appears from the traffic modelling to be operating at a lower level of service on the eastern approach (Sunrise Boulevard) than we would expect for the existing situation. Further detailed survey and calibration of the intersection model would be beneficial in accurately assessing the base year performance, and for use in re-assessing the future year performance for the development scenarios

Further detailed peak hour traffic surveys would be used to update the vehicle routing assumptions, obtained from the simple survey conducted, and to provide a baseline test for the growth and distribution assumptions within the WTSM model outputs used for future year scenario testing.

7.2 Future Issues Identified (2043 No Development)

The key issues highlighted by the traffic modelling at some point prior to 2043, without any development taken into account, are:

- Main Road and Redwood Avenue Roundabout: This intersection is estimated to currently operate at a level of service 'F' or worse on the northern approach (Main Road from Tawa). Further detailed traffic survey and modelling assessment would be beneficial in accurately assessing the base year performance, and for use in re-assessing the performance and upgrade options for the future year development scenarios.
- Main Road and Sunrise Boulevard T-intersection: This intersection appears to currently be at a level of service 'F' or worse on the eastern approach (Sunrise Boulevard). Further detailed traffic survey and modelling assessment would be beneficial in accurately assessing the base year performance, and for use in re-assessing the performance and upgrade options for the future year development scenarios.
- Main Road / Takapu Road / Willowbank Road / Boscobel Lane Intersection: The Boscobel Lane approach from the carpark will fall below LOS F without any development
- Westchester Drive / Middleton Road / Westchester Drive East Intersection: Westchester Drive approach from the north will fall below LOS F without any development

7.3 Future Issues Identified (2043 with Stebbings Development)

By 2043, all intersections modelled are anticipated to experience LOS F on at least one approach in either the morning or afternoon peak, or possibly both, in all development scenarios modelled.

If development goes ahead it is likely that capacity improvements and/or intersection upgrades to the Main Road corridor will be required to increase capacity between State Highway 1 and Tawa, as well as the Westchester Drive corridor from Melksham and Amesbury Drives to State Highway 1.

8 Conclusions

8.1 Conclusion

Based on the high-level gravity modelling undertaken in this assessment, even the lowest level of development within the Upper Stebbings Growth Area, is anticipated to result in significant capacity and intersection performance issues on the existing road network in the Churton Park and Tawa areas, with a particular focus on the already busy and relatively narrow Main Road corridor.

The table below shows whether a given intersection in the assessment is currently at level of service 'F', and if not when it is expected to reach that level, based on the volume/capacity ration for the intersection as a whole (refer section 6.2.1):

Table 8.1: Expected Earliest LOS 'F' Year

Intersection	No Development	Scenario 3	Scenario 2	Scenario 1
Main Road / Redwood Avenue	Now	Now	Now	Now
Main Road / Sunrise Boulevard	2017	Now	Now	Now
Main Road / Takapu Road / Willowbank Road / Boscobel Lane	2039	2025	2020	2018
Westchester Drive / Melksham Drive / Lakewood Avenue	Not Likely	2027	Now	Now
Westchester Drive / Middleton Road / Westchester Drive East	2036	2032	2026	2019

Adding to this pressure from the motoring public is the expected increase in demand for safe and effective pedestrian and cycling facilities which, in suburbs as topographically challenging as these, could pose further demands on the management of transport corridors, and walking and cycling infrastructure investment.

The patronage of public transport is also expected to increase over this period to 2043, likely increasing demand for additional train capacity, and pressure on the existing station services and park and ride facilities at stations in Tawa and Johnsonville.

8.2 Further work

The modelling has identified that capacity improvements and/or intersection upgrades to the Main Road corridor will be required to increase vehicle capacity between State Highway 1 and Tawa, as well as the Westchester Drive corridor from Melksham and Amesbury Drives to State Highway 1. Options for upgrades may include:

- Intersection improvements, in the form of additional lanes, changes in intersection form (i.e. from priority to roundabout) or control (traffic signals).
- Options to limit side road access to the Main Road and Westchester Drive corridors, either through rationalising intersections or limiting turning movements to increase through capacity.
- Provide network optimisation – potentially in the form of co-ordinated traffic signal controlled intersections along the corridor

The form of capacity upgrades require further detailed investigation:

- For those intersections which are currently estimated as having poor existing Levels of Service, undertake further detailed traffic survey and modelling assessment to accurately assess the base year performance, and re-assess the performance and test upgrade options for the future year development scenarios;
- Look at modelling the key intersections and corridors identified in this assessment in more detail, possibly as part of a wider network modelling exercise;
- If the Petone to Grenada project does not go ahead or is delayed, look at seeking more detailed information of the resulting impacts on the road network as a whole through the WTSM model, and undertake sensitivity tests on the above intersection upgrades;
- Based on the outcomes above, produce a programme of intersection upgrades where required.

Other intersections currently outside the scope of this report may need to be looked at further north into Tawa following the route of the possible congestion issue identified along Main Road.

In addition, the following options will reduce private vehicle travel in the peak periods and assist to address future transport growth and provide for current and future capacity improvements:

- Investigate increasing park and ride space at the nearby railway stations, especially Takapu Road, so that any negotiations required have plenty of time to take their course.
- Work with Greater Wellington Regional Council on long-term strategic plans for the public transport system in this area, with the view to:
  - Increasing rail capacity to meet anticipated future demand, and
  - Provide new bus routes and infrastructure through the new Upper Stebbings development area, routes which also link to the rail stations in the area.
- Incorporate walking and cycling facilities in the new development areas, and increase investment in existing areas to create a connected walking and cycling network, to encourage uptake of active mode travel.

9 Referenced Documents

- .ID NZ, (http://forecast.idnz.co.nz/wellington, July 2017)
- Auckland Motorway Alliance (AMA), Mobile Road (https://mobileroad.org/index.html, July 2017)
- Douglas, M & Ableу, S, Research Report 453 “Trips and Parking Related to Land Use” (New Zealand Transport Agency, 2011)
- Greater Wellington Regional Council, Wellington Transport Strategy Model (WTSM) (Sourced via contact Andrew Ford, July 2017)
- Google Maps (https://www.google.co.nz/maps/place/Amesbury+Dr,+Churton+Park,+Wellington+6037/@-41.188156,174.8191909,15.93z/data=!4m5!3m4!1s0x6d38ad0f3535ae8b:0xf9110efe5a3367b2!8m2!3d-41.1966929!4d174.8027482, July 2017)
- Metlink, Metlink 2018 Route Map (https://www.metlink.org.nz/greater-transport-greater-wellington/2018-a-new-bus-network-for-wellington-city/, July 2017)
- New Zealand Transport Agency, Crash Analysis System (CAS) (https://securecas.nzta.govt.nz/Citrix/AccessPlatform/auth/login.aspx, July 2017)
- New Zealand Transport Agency, State Highway Traffic Monitoring System (TMS) (https://tms.nzta.govt.nz/login.jsp, July 2017)
- Wellington City Council, Code of Practice for Land Development (Wellington City Council, 2012)
- Wellington City Council, Wellington City District Plan (Wellington City Council, March 2010)

10 Applicability

This report has been prepared for the exclusive use of our client Wellington City Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:

.....

Timothy Broadhead

Civil Engineer

Authorised for Tonkin & Taylor Ltd by:

.....

Chris Hillman

Project Director

.....

Ryan Dunn

Senior Transportation Engineer

RWD
t:\wellington\tt projects\1003121\workingmaterial\20171006.upper stebbings ta report final v1.docx

Appendix A: Traffic Modelling Report

10.1 A.1 Assessment Methodology

Collect all available data for the key roads and intersections in the area and analyse this data for known rates of change which could then inform the calculations for future rates of change on a pro-rata basis.

A Base Year gravity spreadsheet model was developed, using turning movement percentages obtained from short duration intersection surveys of morning and evening peak counts across the 4th to the 7th of July 2017 to determine trip distributions and balance the flows.

The 2043 "No Development" scenario, used the same proportions for turning, but with traffic volume increases based proportionally on the census growth predictions.

This model was used as the basis for assessment of the development scenarios, with point loads introduced into the system based on the development yield to estimate how the flows would affect the network.

10.1.1 A.1.1 Modelled Periods

Two years were modelled:

- 2013 as a base year where we still have a significant amount of collected data, and
- 2043 as the forecast year.

Within the forecast year several scenarios were modelled, as outlined below.

10.1.2 A.1.2 Data Collection

The data used was collected from a variety of sources, namely:

- .ID NZ, (http://forecast.idnz.co.nz/wellington, July 2017)
- Auckland Motorway Alliance (AMA), Mobile Road (https://mobileroad.org/index.html, July 2017)
- Douglas, M & Abley, S, Research Report 453 "Trips and Parking Related to Land Use" (New Zealand Transport Agency, 2011)
- Greater Wellington Regional Council, Wellington Transport Strategy Model (WTSM) (Sourced via contact Andrew Ford, July 2017)
- New Zealand Transport Agency, State Highway Traffic Monitoring System (TMS) (https://tms.nzta.govt.nz/login.jsp, July 2017)

Intersection surveys:

- Westchester Drive / Amesbury Drive (04 July 2017, 0800-0830 & 1630-1700)
- Westchester Drive / Melksham Drive (04 July 2017, 0835-0905 & 1705-1735)
- Westchester Drive / Middleton Road (05 July 2017, 1630-1700 & 06 July 2017, 0800-0830)
- Main Road / Takapu Road. Willowbank Road (05 July 2017, 1710-1740 & 06 July 2017, 0840-0910)
- Main Road / Redwood Avenue (06 July 2017, 1630-1700 & 07 July 2017, 0800-0830)
- Main Road / Sunrise Boulevard (06 July 2017, 1705-1735 & 07 July 2017, 0835-0905)

10.1.3 A.1.3 Modelled Scenarios

The scenarios modelled were as follows:

10.1.3.1 A.1.3.1 2013 Base Year:

10.1.3.2 The latest year for which census records are available as well as traffic counts for most roads within a reasonable timeframe of this date so the level of accuracy can be considered to be reasonable high.

10.1.3.3 A.1.3.2 2043 No Development:

10.1.3.4 Predicted linear growth based on the difference in forecast populations between 2013 and 2043, and similar growth in traffic volumes as a baseline for comparison with the development scenarios.

10.1.3.5 A.1.3.3 2043 Scenario 1:

10.1.3.6 2043 forecast figures with amendments to account for additional traffic generation from the Upper Stebbings Valley area in line with the development proposition for Scenario 1.

10.1.3.7 A.1.3.4 2043 Scenario 2:

10.1.3.8 2043 forecast figures with amendments to account for additional traffic generation from the Upper Stebbings Valley area in line with the development proposition for Scenario 2.

10.1.3.9 A.1.3.5 2043 Scenario 3:

2043 forecast figures with amendments to account for additional traffic generation from the Upper Stebbings Valley area in line with the development proposition for Scenario 3.

Each of the scenarios where further development occurs (1 to 3) were also assessed at each end of the expected dwelling yields, but only the higher end models were used for the purposes of the report as a conservative measure due to the high-level nature of the modelling.

The gravity model was adjusted using the traffic generation (as detailed below) and surveyed trip distribution. Based on the traffic volumes from these models, assessments were made of the key intersections using Sidra 7.

For scenarios 1 and 2, where a new connection is required to Main Road in Tawa, a proposed intersection was also assessed.

10.1.4 A.1.4 Traffic Generation

Traffic generation for all scenarios was developed in a series of steps. Initially all existing Annual Average Daily Traffic (AADT) counts were obtained from Wellington City Council where available, and from the Mobile Road application as ADT estimates where data was missing Mobile Road was also used to obtain State Highway data.

TMS was then used to obtain recent count data for another year for the State Highway network, and an average annual increase in traffic volumes was extrapolated from this data, which was used to estimate progression or regression, as appropriate, to develop the base year traffic volumes on the local road network.

For the no development scenario, the same method was used to calculate the expected 2043 demand using a pro-rata linear growth calculation at around 2.2% per year for all roads which corresponds with the recorded growth in the State Highway

For all development scenarios, additional traffic was then loaded to the system at key points based on the generation yield within the Stebbings Growth Area as follows:

Table A.1: Trip Generation Estimate by Dwelling Numbers

Scenario	Dwelling Numbers		Trips/day/dwelling	Resulting Predicted ADT	
	Low Estimate	High Estimate		Low	High
1	1,590	2,500	10	15,900	25,000
2	970	1,530	10	9,700	15,300
3	430	670	10	4,300	6,700

10.1.5 A.1.5 Trip Types

For new trips, the numbers calculated have been derived from on NZTA Research Report 453.

For other modes, a trips have been determined pro-rata to the predicted population rate of growth between 2013 and 2043, and then multiplied by the base rate for that mode, derived from journey to work data.

10.1.6 A.1.6 Traffic Distribution

We have assumed that the traffic in the peak hours is between 10% and 20% of the ADT, using the WTSM and previous local road counts as a gauge to refine this percentage

For the 2043 No Development scenario, we assumed vehicle turning proportions at any given intersection would remain unchanged from that observed in 2013, giving a proportional distribution to the traffic volumes at each decision point.

For the development-based scenarios this was maintained, however the system then had a load applied at the points where the additional trips were expected to enter the system. Where these points were was estimated based on:

- Connection point(s) of the new collector road(s) to the system, and
- The assumption that the State Highway was the main attractor and traffic would generally head in the general direction of the nearest interchange in a 70/30 split type pattern.
- This loading follows through the model for the morning peak, and again in the opposing direction during the evening peak

10.1.7 A.1.7 Intersection Modelling

Each of the key intersections was modelled in SIDRA 7 for each of the scenarios (detailed above), based on the traffic distribution derived from the gravity model

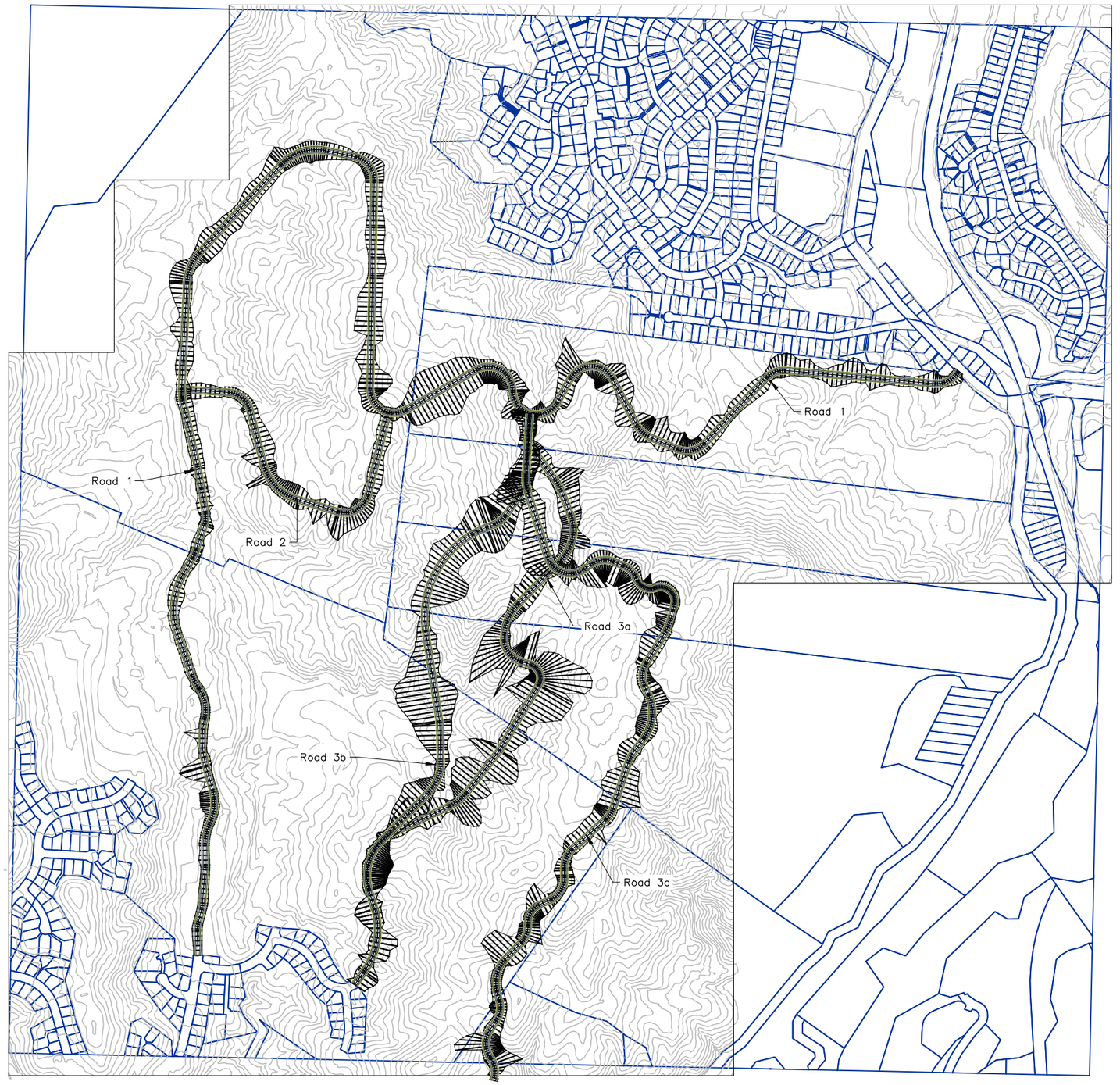
The main assumptions in this modelling process were:

- Approach and exit speeds were no greater than the posted speed limit, and were only less in very clear circumstances (eg: carpark exit).

- Heavy vehicles accounted for the percentage determined in their AADT count or estimate obtained from WCC or Mobile Road.
- Available road length on approach was either 500m or the distance to the next intersection, whichever was least.
- Where no designated right-turn bay was available, available medians (if any) were modelled as a right-turn bay.
- All non-measurable inputs were left as SIDRA defaults
- A minimum Level of Service (LoS) of 'D' must be achieved.

Appendix B: Indicative Roads Plan

- Drawings SK01 & SK02.



NOTES :
1. All dimensions are in millimetres unless noted otherwise.

1	Alignment 3C		
0	First Issue		
REVISION DESCRIPTION		BY	DATE
DESIGNED :		JGRE	Sep. 17
DRAWN :		JGRE	Sep. 17
DESIGN CHECKED :			
DRAFTING CHECKED :			

REFERENCE :

CADFILE : \\1003121-SK01.dwg

APPROVED :

NOT FOR CONSTRUCTION

This drawing is not to be used for construction purposes unless signed as approved

Tonkin+Taylor
Level 4, 2 Hunter St, Wellington
Tel. (04) 381 8560 Fax. (09) 307 0265
www.tonkintaylor.co.nz

WELLINGTON CITY COUNCIL

UPPER STEBBINGS TRANSPORT ASSESSMENT

TAWA/CHURTON PARK

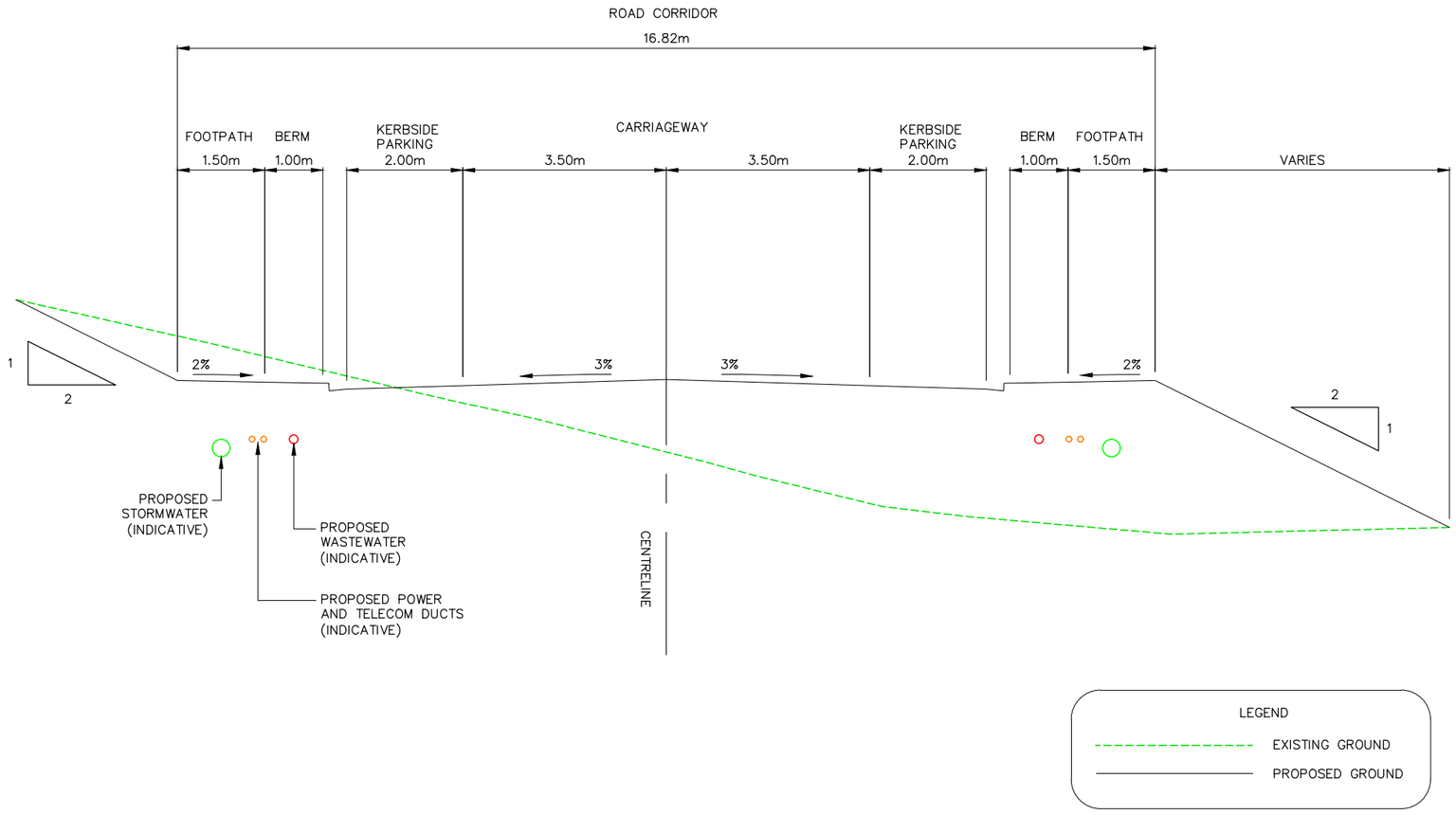
INDICATIVE ROAD ALIGNMENTS (PROPOSED)

SCALES (AT A3 SIZE)
1: 10,000

DWG. No. 1003121-SK01

REV. 1

DRAWING STATUS: PRELIMINARY DRAFT



SCALE 1: 100

0 1 2 3 4 5 (m)

NOTES :

1. All dimensions are in millimetres unless noted otherwise.

0	First Issue		
REVISION	DESCRIPTION	BY	DATE
DESIGNED :		JGRE	Sep. 17
DRAWN :		JGRE	Sep. 17
DESIGN CHECKED :			
DRAFTING CHECKED :			

REFERENCE :

CADFILE : \\1003121-SK02.dwg

APPROVED :

NOT FOR CONSTRUCTION

This drawing is not to be used for construction purposes unless signed as approved

Tonkin+Taylor

105 Carlton Gore Road, Newmarket, Auckland
Tel. (09) 355 6000 Fax. (09) 307 0265
www.tonkintaylor.co.nz

WELLINGTON CITY COUNCIL

UPPER STEBBINGS TRANSPORT ASSESSMENT

TAWA/CHURTON PARK

TYPICAL ROAD CROSS SECTION

DRAWING STATUS: PRELIMINARY DRAFT

SCALES (AT A3 SIZE)
1: 100

DWG. No. 1003121-SK02

REV. 0

Appendix C: Schedule of Rates

- Pricing Schedule included with all assumed rates and quantities

Wellington City Council

Schedule of Prices

Description of Works	Transport Network Development Works
Client	Wellington City Council

Job No.:	1003121	Prepared by:	JGRE
Date:	11 Oct 2017		

Schedule of Prices Summary		
Item	*Description*	*Value*
1	Preliminary and General	$ 5,133,294.43
2	Earthworks	$ 35,795,737.50
3	Drainage	$ 3,865,180.00
4	Fencing	$ 562,500.00
5	Granular Pavement Layers	$ 2,373,525.00
6	Sealing	$ 2,034,450.00
7	Footpaths	$ 1,572,075.00
8	Kerb and Channel	$ 1,356,300.00
9	Landscaping	$ 206,527.50
10	Telecommunication Works	$ 616,500.00
11	Electrical Works	$ 431,550.00
12	Lighting Works	$ 341,849.25
13	Potable Water Main	$ 739,800.00
14	Foul Sewer Main	$ 1,046,950.00
	Contingencies @ 30%	$ 16,822,871.60
Total Construction Price - Original option 3 (excl.GST)		$ 72,899,110.28

1	Road 1 Price	$ 31,611,899.78
2	Road 2 Price	$ 7,095,421.55
3	Road 3 Price	$ 17,368,917.34
	Construction Price less Road 2 (link Road)	$ 48,980,817.12
	Contingencies @ 30%	$ 14,694,245.14
Total Construction Price -Oringinal option 3, less Road 2 (link Road)		$ 63,675,062.26

1	Road 1 Price	$ 31,611,899.78
2	Road 2 Price	$ 7,095,421.55
3	Road 3C Price	$ 22,383,414.72
	Contingencies @ 30%	$ 18,327,220.82
Total Construction Price - Road 3C option incl Road 2 (excl.GST)		$ 79,417,956.87

Note, optimization of cut/fill may reduce costs

1.0 Preliminary & General					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
1.1	*Road 1*				
1.1.1	Preliminary and General	1	LS	$ 2,547,147.21	$ 2,547,147.21
1.1.2	Traffic Control/Temporary Works	1	LS	$ 10,000.00	$ 10,000.00
1.1.3	Topogrpahical Suveys (offset, protect and reinstate survey marks)	1	LS	$ 3,000.00	$ 3,000.00
1.2	*Road 2*				
1.2.1	Preliminary and General	1	LS	$ 1,273,573.61	$ 1,273,573.61
1.2.2	Traffic Control/Temporary Works	1	LS	$ 10,000.00	$ 10,000.00
1.2.3	Topogrpahical Suveys (offset, protect and reinstate survey marks)	1	LS	$ 3,000.00	$ 3,000.00
1.3	*Road 3*				
1.3.1	Preliminary and General	1	LS	$ 1,273,573.61	$ 1,273,573.61
1.3.2	Traffic Control/Temporary Works	1	LS	$ 10,000.00	$ 10,000.00
1.3.3	Topogrpahical Suveys (offset, protect and reinstate survey marks)	1	LS	$ 3,000.00	$ 3,000.00
1.3	*Road 3C*				
1.3.1	Preliminary and General	1	LS	$ 1,273,573.61	$ 1,273,573.61
1.3.2	Traffic Control/Temporary Works	1	LS	$ 10,000.00	$ 10,000.00
1.3.3	Topogrpahical Suveys (offset, protect and reinstate survey marks)	1	LS	$ 3,000.00	$ 3,000.00
				1.0 Subtotal	$ 5,133,294.43

2.0 Earthworks					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
2.1	*Road 1*				
2.1.1	Site Clearance	1	LS	$ 300,000.00	$ 300,000.00
2.1.2	Cut to fill	253000	m^3	$ 60.00	$ 15,180,000.00
2.1.3	Cut to waste	0	m^3	$ 65.00	$ -
2.1.4	Strip topsoil and stockpile	46860	m^3	$ 30.00	$ 1,405,800.00
2.1.5	Take from stockpile, spread and compact	26547	m^3	$ 40.00	$ 1,061,868.00
2.1.6	Strip topsoil and dispose to contractor's tip	20313	m^3	$ 65.00	$ 1,320,364.50
2.2	*Road 2*				
2.2.1	Site Clearance		LS	$ 150,000.00	$ -
2.2.2	Cut to Fill	54000	m^3	$ 60.00	$ 3,240,000.00
2.2.3	Cut to Waste	0	m^3	$ 65.00	$ -
2.2.4	Strip topsoil and stockpile	8400	m^3	$ 30.00	$ 252,000.00
2.2.5	Take from stockpile, spread and compact	995	m^3	$ 40.00	$ 39,792.00
2.2.6	Strip topsoil and dispose to contractor's tip	7405	m^3	$ 65.00	$ 481,338.00
2.3	*Road 3*				
2.3.1	Site Clearance		LS	$ 100,000.00	$ -
2.3.2	Cut to Fill	175000	m^3	$ 60.00	$ 10,500,000.00
2.3.3	Cut to Waste	0	m^3	$ 65.00	$ -
2.3.4	Strip topsoil and stockpile	27450	m^3	$ 30.00	$ 823,500.00
2.3.5	Take from stockpile, spread and compact	23727	m^3	$ 40.00	$ 949,080.00
2.3.6	Strip topsoil and dispose to contractor's tip	3723	m^3	$ 65.00	$ 241,995.00
2.3	*Road 3C*				
2.3.1	Site Clearance		LS	$ 100,000.00	$ -
2.3.2	Cut to Fill	180000	m^3	$ 60.00	$ 10,800,000.00
2.3.3	Cut to Waste	60000	m^3	$ 65.00	$ 3,900,000.00
2.3.4	Strip topsoil and stockpile	25650	m^3	$ 30.00	$ 769,500.00
2.3.5	Take from stockpile, spread and compact	16572	m^3	$ 40.00	$ 662,880.00
2.3.6	Strip topsoil and dispose to contractor's tip	9078	m^3	$ 65.00	$ 590,070.00
				2.0 Subtotal	$ 35,795,737.50

3.0 Drainage					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
3.1	*Road 1*				
3.1.1	Underground stormwater drainage 300 mm RCRRJ class 4 pipe	3983	m	$ 450.00	$ 1,792,350.00
3.1.2	Supply and install manhole 1050 mm dia	44	Ea	$ 4,500.00	$ 199,150.00
3.1.3	Supply and install 225 mm dia RCRRJ class 4 catchment leads	531	m	$ 350.00	$ 185,873.33
3.1.4	Supply and install standard single sump	89	Ea	$ 3,500.00	$ 309,788.89
3.1.5	Headwalls (Hynds WW0600)	12	Ea	$ 860.00	$ 10,320.00
3.2	*Road 2*				
3.2.1	Underground stormwater drainage 300 mm RCRRJ class 4 pipe	730	m	$ 450.00	$ 328,500.00
3.2.2	Supply and install manhole 1050 mm dia	8	Ea	$ 4,500.00	$ 36,500.00
3.2.3	Supply and install 225 mm dia RCRRJ class 4 catchment leads	97	m	$ 350.00	$ 34,066.67
3.2.4	Supply and install standard single sump	16	Ea	$ 3,500.00	$ 56,777.78
3.2.5	Headwalls (Hynds WW0600)	4	Ea	$ 860.00	$ 3,440.00
					$ -
3.3	*Road 3*				
3.3.1	Underground stormwater drainage 300 mm RCRRJ class 4 pipe	1452	m	$ 450.00	$ 653,400.00
3.3.2	Supply and install manhole 1050 mm dia	16	Ea	$ 4,500.00	$ 72,600.00
3.3.3	Supply and install 225 mm dia RCRRJ class 4 catchment leads	193.6	m	$ 350.00	$ 67,760.00
3.3.4	Supply and install standard single sump	32	Ea	$ 3,500.00	$ 112,933.33
3.3.5	Headwalls (Hynds WW0600)	2	Ea	$ 860.00	$ 1,720.00
3.3	*Road 3C*				
3.3.1	Underground stormwater drainage 300 mm RCRRJ class 4 pipe	1780	m	$ 450.00	$ 801,000.00
3.3.2	Supply and install manhole 1050 mm dia	20	Ea	$ 4,500.00	$ 89,000.00
3.3.3	Supply and install 225 mm dia RCRRJ class 4 catchment leads	237	m	$ 350.00	$ 83,066.67
3.3.4	Supply and install standard single sump	40	Ea	$ 3,500.00	$ 138,444.44
3.3.5	Headwalls (Hynds WW0600)	4	Ea	$ 860.00	$ 3,440.00
				3.0 Subtotal	$ 3,865,180.00

4.0 Fencing					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
4.1	*Road 1*				
4.1.1	Temporary (including gates)	8000	m	$ 20.00	$ 160,000.00
4.1.2	Permanent Post and Wire (including gates)	8000	m	$ 25.00	$ 200,000.00
4.2	*Road 2*				
4.2.1	Temporary (including gates)	1500	m	$ 20.00	$ 30,000.00
4.2.2	Permanent Post and Wire (including gates)	1500	m	$ 25.00	$ 37,500.00
4.3	*Road 3*				$ -
4.3.1	Temporary (including gates)	3000	m	$ 20.00	$ 60,000.00
4.3.2	Permanent Post and Wire (including gates)	3000	m	$ 25.00	$ 75,000.00
4.3	*Road 3C*				$ -
4.3.1	Temporary (including gates)	3600	m	$ 20.00	$ 72,000.00
4.3.2	Permanent Post and Wire (including gates)	3600	m	$ 25.00	$ 90,000.00
				4.0 Subtotal	$ 562,500.00

5.0 Granular Pavement Layers					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
5.1	*Road 1*				
5.1.1	TNZ M/4 AP40 Basecourse 150 mm thick (solid)	6572	m^3	$ 100.00	$ 657,195.00
5.1.2	AP65 Subbase 250 mm thick (solid)	10953	m^3	$ 80.00	$ 876,260.00
5.2	*Road 2*				
5.2.1	AP40 Basecourse 150 mm thick (solid)	1204.5	m^3	$ 100.00	$ 120,450.00
5.2.2	AP65 Subbase 250 mm thick (solid)	2007.5	m^3	80	$ 160,600.00
5.3	*Road 3*				
5.3.1	AP40 Basecourse 150 mm thick (solid)	2395.8	m^3	$ 100.00	$ 239,580.00
5.3.2	AP65 Subbase 250 mm thick (solid)	3993	m^3	80	$ 319,440.00
5.3	*Road 3C*				
5.3.1	AP40 Basecourse 150 mm thick (solid)	2937	m^3	$ 100.00	$ 293,700.00
5.3.2	AP65 Subbase 250 mm thick (solid)	4895	m^3	80	$ 391,600.00
				5.0 Subtotal	$ 2,373,525.00

6.0 Sealing					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
6.1	*Road 1*				
6.1.1	30 mm Mix 10 Asphaltic Concrete	43813	m^2	$ 30.00	$ 1,314,390.00
6.2	*Road 2*				
6.2.1	30 mm Mix 10 Asphaltic Concrete	8030	m^2	$ 30.00	$ 240,900.00
6.3	*Road 3*				
6.3.1	30 mm Mix 10 Asphaltic Concrete	15972	m^2	$ 30.00	$ 479,160.00
6.3	*Road 3C*				
6.3.1	30 mm Mix 10 Asphaltic Concrete	19580	m^2	$ 30.00	$ 587,400.00
				6.0 Subtotal	$ 2,034,450.00

7.0 Footpaths					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
7.1	*Road 1*				
7.1.1	Construct standard concrete path, 100 mm thick, 100 mm AP20 basecourse	11949	m^2	$ 85.00	$ 1,015,665.00
7.2	*Road 2*				
7.1.1	Construct standard concrete path, 100 mm thick, 100 mm AP20 basecourse	2190	m^2	$ 85.00	$ 186,150.00
7.3	*Road 3*				
7.1.1	Construct standard concrete path, 100 mm thick, 100 mm AP20 basecourse	4356	m^2	$ 85.00	$ 370,260.00
7.3	*Road 3C*				
7.1.1	Construct standard concrete path, 100 mm thick, 100 mm AP20 basecourse	5340	m^2	$ 85.00	$ 453,900.00
				7.0 Subtotal	$ 1,572,075.00

8.0 Kerb and Channel					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
8.1	*Road 1*				
8.1.1	Provide and install WCC standard kerb and channel. Include for excavation, disposal, 50 mm AP40 basecourse bedding and all works accociated with the installation of the kerb and channel. (Dropping kerb at driveways has not been assessed)	7966	m	$ 110.00	$ 876,260.00
8.2	*Road 2*				
8.2.1	Provide and install WCC standard kerb and channel. Include for excavation, disposal, 50 mm AP40 basecourse bedding and all works accociated with the installation of the kerb and channel. (Dropping kerb at driveways has not been assessed)	1460	m	$ 110.00	$ 160,600.00
8.3	*Road 3*				
8.3.1	Provide and install WCC standard kerb and channel. Include for excavation, disposal, 50 mm AP40 basecourse bedding and all works accociated with the installation of the kerb and channel. (Dropping kerb at driveways has not been assessed)	2904	m	$ 110.00	$ 319,440.00
8.3	*Road 3C*				
8.3.1	Provide and install WCC standard kerb and channel. Include for excavation, disposal, 50 mm AP40 basecourse bedding and all works accociated with the installation of the kerb and channel. (Dropping kerb at driveways has not been assessed)	3560	m	$ 110.00	$ 391,600.00
				8.0 Subtotal	$ 1,356,300.00
9.0 Landscaping					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
9.1	*Road 1*				
9.1.1	Tree planting	398	No.	$ 35.00	$ 13,940.50
9.1.2	Spread topsoil from stockpile and sow seed	7966	m^2	$ 15.00	$ 119,490.00
9.2	*Road 2*				
9.2.1	Tree planting	73	No.	$ 35.00	$ 2,555.00
9.2.2	Spread topsoil from stockpile and sow seed	1460	m^2	$ 15.00	$ 21,900.00
9.3	*Road 3*				
9.3.1	Tree planting	145	No.	$ 35.00	$ 5,082.00
9.3.2	Spread topsoil from stockpile and sow seed	2904	m^2	$ 15.00	$ 43,560.00
9.3	*Road 3C*				
9.3.1	Tree planting	178	No.	$ 35.00	$ 6,230.00
9.3.2	Spread topsoil from stockpile and sow seed	3560	m^2	$ 15.00	$ 53,400.00
				9.0 Subtotal	$ 206,527.50
10.0 Telecommunication Works					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
10.1	*Road 1*				
10.1.1	Installation of main telecommunication underground cabling (not including fibre optic cabling)	3983	m	$ 100.00	$ 398,300.00
10.2	*Road 2*				
10.2.1	Installation of main telecommunication underground cabling (not including fibre optic cabling)	730	m	$ 100.00	$ 73,000.00
10.3	*Road 3*				
10.3.1	Installation of main telecommunication underground cabling (not including fibre optic cabling)	1452	m	$ 100.00	$ 145,200.00
10.3	*Road 3C*				
10.3.1	Installation of main telecommunication underground cabling (not including fibre optic cabling)	1780	m	$ 100.00	$ 178,000.00
				10.0 Subtotal	$ 616,500.00
11.0 Electrical Works					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
11.1	*Road 1*				
11.1.1	Installation of main electricity underground cabling	3983	m	$ 70.00	$ 278,810.00
11.2	*Road 2*				
11.2.1	Installation of main electricity underground cabling	730	m	$ 70.00	$ 51,100.00
11.3	*Road 3*				
11.3.1	Installation of main electricity underground cabling	1452	m	$ 70.00	$ 101,640.00
11.3	*Road 3C*				
11.3.1	Installation of main electricity underground cabling	1780	m	$ 70.00	$ 124,600.00
				11.0 Subtotal	$ 431,550.00

12.0 Lighting Works					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
12.1	*Road 1*				
12.1.1	Provide and erect lighting pole and illuminaire and reconnect electrical supply. Include for all testing and meeting all of the requirement of the service provider which may require the works to be completed by the Service Provider's own contractor.	40	m	$ 5,545.00	$ 220,857.35
12.2	*Road 2*				
12.2.1	Provide and erect lighting pole and illuminaire and reconnect electrical supply. Include for all testing and meeting all of the requirement of the service provider which may require the works to be completed by the Service Provider's own contractor.	7	m	$ 5,545.00	$ 40,478.50
12.3	*Road 3*				
12.3.1	Provide and erect lighting pole and illuminaire and reconnect electrical supply. Include for all testing and meeting all of the requirement of the service provider which may require the works to be completed by the Service Provider's own contractor.	15	m	$ 5,545.00	$ 80,513.40
12.3	*Road 3C*				
12.3.1	Provide and erect lighting pole and illuminaire and reconnect electrical supply. Include for all testing and meeting all of the requirement of the service provider which may require the works to be completed by the Service Provider's own contractor.	18	m	$ 5,545.00	$ 99,810.00
				12.0 Subtotal	$ 341,849.25
13.0 Potable Water Main					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
13.1	*Road 1*				
13.1.1	Installation of main underground water main	3983	m	$ 120.00	$ 477,960.00
13.2	*Road 2*				
13.2.1	Installation of main underground water main	730	m	$ 120.00	$ 87,600.00
13.3	*Road 3*				
13.3.1	Installation of main underground water main	1452	m	$ 120.00	$ 174,240.00
13.3	*Road 3C*				
13.3.1	Installation of main underground water main	1780	m	$ 120.00	$ 213,600.00
				13.0 Subtotal	$ 739,800.00
14.0 Foul Sewer Main					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
14.1	*Road 1*				
14.1.1	Installation of underground foul sewer main excluding manholes and connection to existing system	3983	m	$ 120.00	$ 477,960.00
14.1.2	Supply and install manhole 1050 mm dia	44	Ea	$ 4,500.00	$ 199,150.00
14.2	*Road 2*				
14.2.1	Installation of underground foul sewer main excluding manholes and connection to existing system	730	m	$ 120.00	$ 87,600.00
14.2.2	Supply and install manhole 1050 mm dia	8	Ea	$ 4,500.00	$ 36,000.00
14.3	*Road 3*				
14.3.1	Installation of underground foul sewer main excluding manholes and connection to existing system	1452	m	$ 120.00	$ 174,240.00
14.3.2	Supply and install manhole 1050 mm dia	16	Ea	$ 4,500.00	$ 72,000.00
14.3	*Road 3C*				
14.3.1	Installation of underground foul sewer main excluding manholes and connection to existing system	1780	m	$ 120.00	$ 213,600.00
14.3.2	Supply and install manhole 1050 mm dia	20	Ea	$ 4,500.00	$ 90,000.00
				14.0 Subtotal	$ 1,046,950.00

Wellington City Council

Schedule of Prices

Description of Works	Transport Network Development Works
Client	Wellington City Council

Job No.:	1003121	Prepared by:	JGRE
Date:	11 Oct 2017		

Schedule of Prices Summary			
Item	*Description*	*Value*	
1	Preliminary and General	$	909.28
2	Earthworks	$	6,177.50
3	Drainage	$	936.38
4	Fencing	$	90.00
5	Granular Pavement Layers	$	385.00
6	Sealing	$	330.00
7	Footpaths	$	255.00
8	Kerb and Channel	$	220.00
9	Landscaping	$	33.50
10	Telecommunication Works	$	100.00
11	Electrical Works	$	70.00
12	Lighting Works	$	55.45
13	Potable Water Main	$	120.00
14	Foul Sewer Main	$	170.00
	Contingencies @ 30%	$	2,955.63
Price per meter (excl.GST)		$	12,807.74

1.0 Preliminary & General					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
1.1	*Road*				
1.1.1	Preliminary and General	1	LS	$ 894.28	$ 894.28
1.1.2	Traffic Control/Temporary Works	1	LS	$ 10.00	$ 10.00
1.1.3	Topogrpahical Suveys (offset, protect and reinstate survey marks)	1	LS	$ 5.00	$ 5.00
				1.0 Subtotal	$ 909.28

2.0 Earthworks					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
2.1	*Road*				
2.1.1	Site Clearance	1	LS	$ 100.00	$ 100.00
2.1.2	Cut to fill	60	m^3	$ 60.00	$ 3,600.00
2.1.3	Cut to waste	20	m^3	$ 65.00	$ 1,300.00
2.1.4	Strip topsoil and stockpile	15	m^3	$ 30.00	$ 450.00
2.1.5	Take from stockpile, spread and compact	10	m^3	$ 40.00	$ 396.00
2.1.6	Strip topsoil and dispose to contractor's tip	5	m^3	$ 65.00	$ 331.50
				2.0 Subtotal	$ 6,177.50

3.0 Drainage					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
3.1	*Road*				
3.1.1	Underground stormwater drainage 300 mm RCRRJ class 4 pipe	1	m	$ 450.00	$ 450.00
3.1.2	Supply and install manhole 1050 mm dia	0.01	Ea	$ 4,500.00	$ 50.00
3.1.3	Supply and install 225 mm dia RCRRJ class 4 catchment leads	1	m	$ 350.00	$ 350.00
3.1.4	Supply and install standard single sump	0.02	Ea	$ 3,500.00	$ 77.78
3.1.5	Headwalls (Hynds WW0600)	0.01	Ea	$ 860.00	$ 8.60
				3.0 Subtotal	$ 936.38

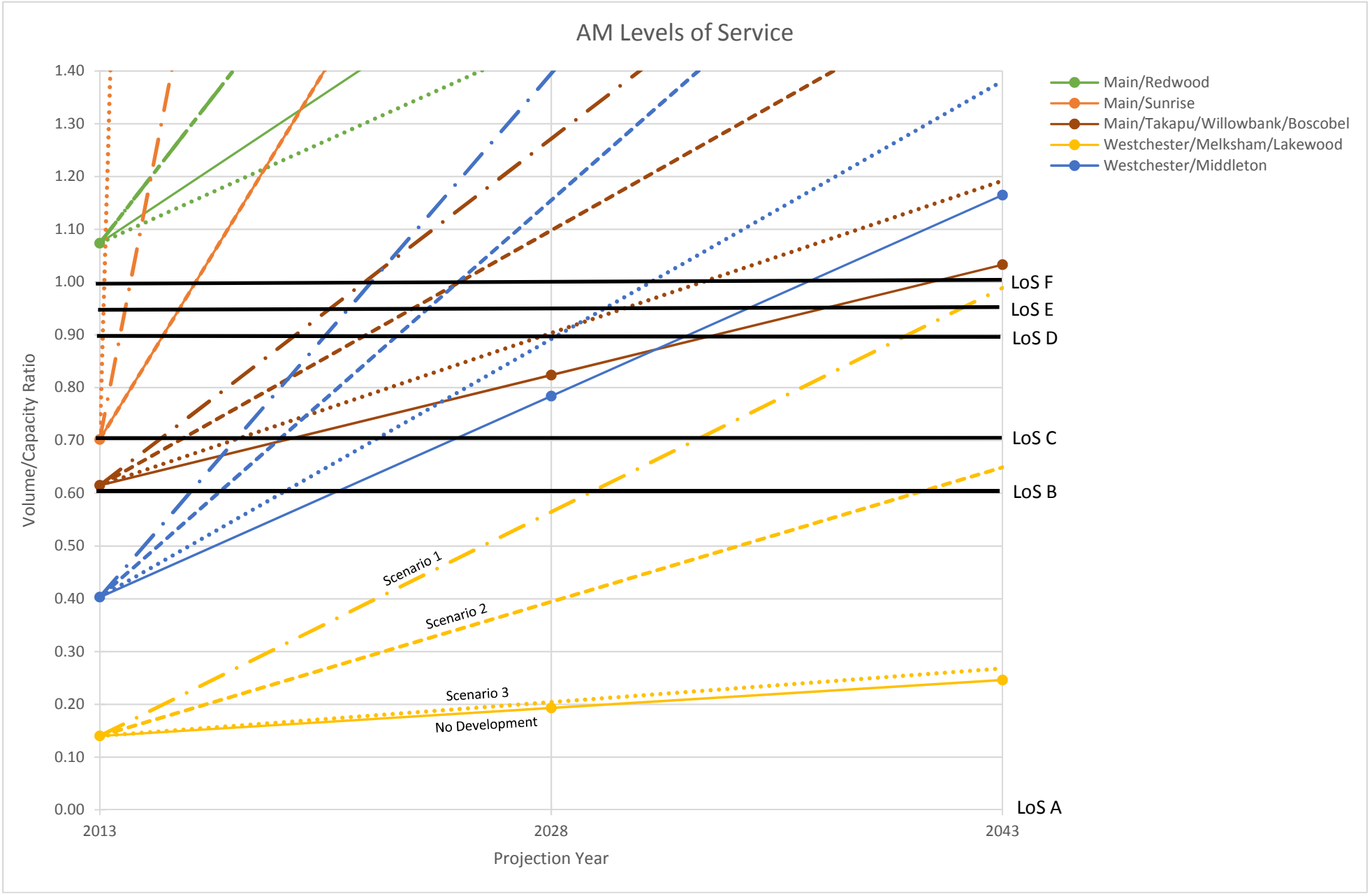
4.0 Fencing					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
4.1	*Road*				
4.1.1	Temporary (including gates)	2	m	$ 20.00	$ 40.00
4.1.2	Permanent Post and Wire (including gates)	2	m	$ 25.00	$ 50.00
				4.0 Subtotal	$ 90.00

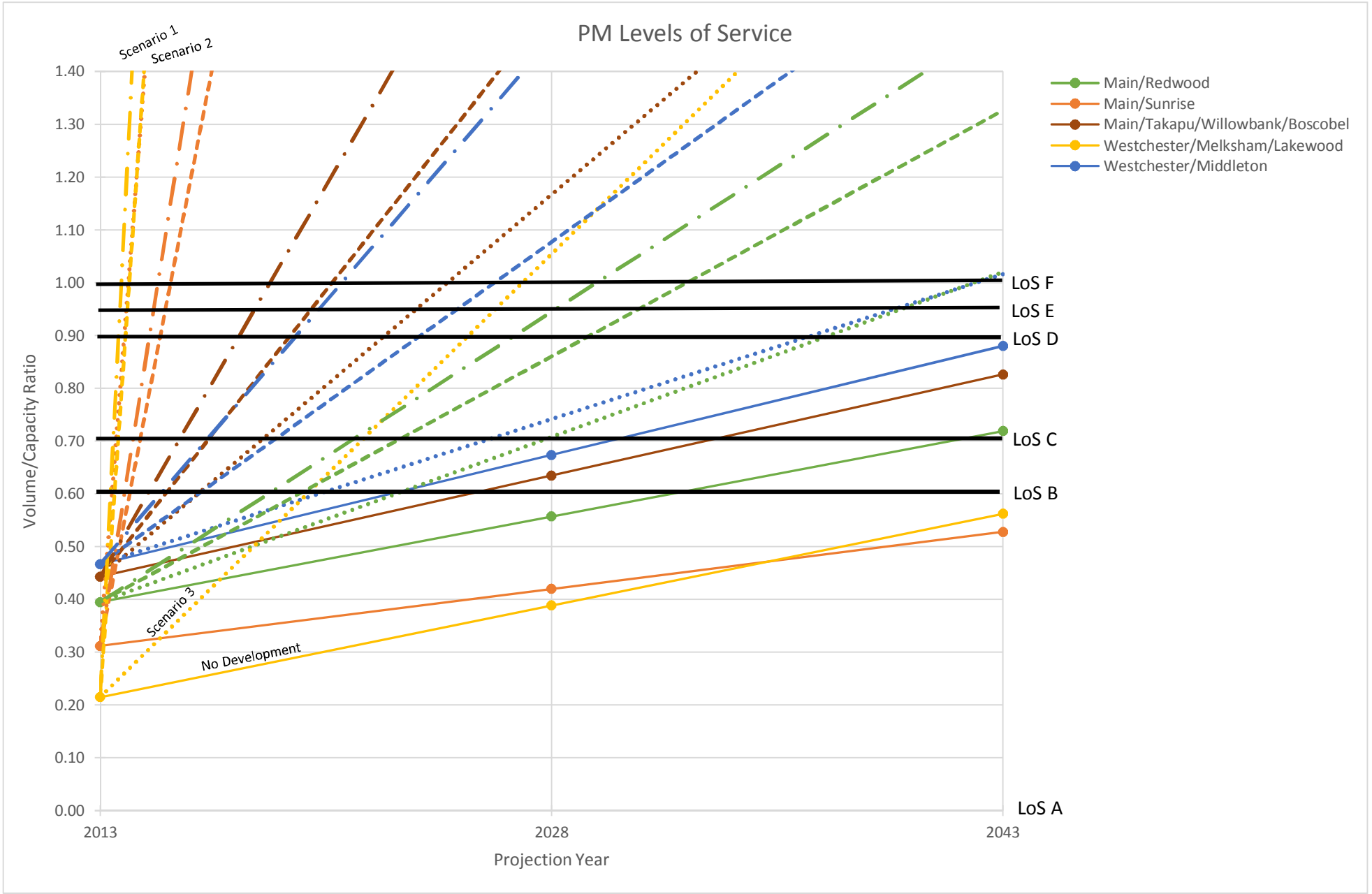
5.0 Granular Pavement Layers					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
5.1	*Road*				
5.1.1	TNZ M/4 AP40 Basecourse 150 mm thick (solid)	2	m^3	$ 100.00	$ 165.00
5.1.2	AP65 Subbase 250 mm thick (solid)	3	m^3	$ 80.00	$ 220.00
				5.0 Subtotal	$ 385.00
6.0 Sealing					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
6.1	*Road*				
6.1.1	30 mm Mix 10 Asphaltic Concrete	11	m^2	$ 30.00	$ 330.00
				6.0 Subtotal	$ 330.00
7.0 Footpaths					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
7.1	*Road*				
7.1.1	Construct standard concrete path, 100 mm thick, 100 mm AP20 basecourse	3	m^2	$ 85.00	$ 255.00
				7.0 Subtotal	$ 255.00
8.0 Kerb and Channel					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
8.1	*Road*				
8.1.1	Provide and install WCC standard kerb and channel. Include for excavation, disposal, 50 mm AP40 basecourse bedding and all works accociated with the installation of the kerb and channel. (Dropping kerb at driveways has not been assessed)	2	m	$ 110.00	$ 220.00
				8.0 Subtotal	$ 220.00
9.0 Landscaping					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
9.1	*Road*				
9.1.1	Tree planting	0.1	No.	$ 35.00	$ 3.50
9.1.2	Spread topsoil from stockpile and sow seed	2	m^2	$ 15.00	$ 30.00
				9.0 Subtotal	$ 33.50

10.0 Telecommunication Works					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
10.1	*Road*				
10.1.1	Installation of main telecommunication underground cabling (not including fibre optic cabling)	1	m	$ 100.00	$ 100.00
				10.0 Subtotal	$ 100.00
11.0 Electrical Works					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
11.1	*Road*				
11.1.1	Installation of main electricity underground cabling	1	m	$ 70.00	$ 70.00
				11.0 Subtotal	$ 70.00
12.0 Lighting Works					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
12.1	*Road*				
12.1.1	Provide and erect lighting pole and illuminaire and reconnect electrical supply. Include for all testing and meeting all of the requirement of the service provider which may require the works to be completed by the Service Provider's own contractor.	0	m	$ 5,545.00	$ 55.45
				12.0 Subtotal	$ 55.45
13.0 Potable Water Main					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
13.1	*Road*				
13.1.1	Installation of main underground water main	1	m	$ 120.00	$ 120.00
				13.0 Subtotal	$ 120.00
14.0 Foul Sewer Main					
Item	*Description*	*Quantity*	*Unit*	*Rate*	*Value*
14.1	*Road*				
14.1.1	Installation of underground foul sewer main excluding manholes and connection to existing system	1	m	$ 120.00	$ 120.00
14.1.2	Supply and install manhole 1050 mm dia	0	Ea	$ 4,500.00	$ 50.00
				14.0 Subtotal	$ 170.00
	Contingencies @ 30%				$ 2,955.63
				TOTAL CONSTRUCTION ESTIMATE	$ 12,807.74

Appendix D: LOS Graphs

- AM and PM Levels of Service (LoS) Graphs


AM Levels of Service
Volume/Capacity Ratio
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
2013
2028
2043
Projection Year
Main/Redwood
Main/Sunrise
Main/Takapu/Willowbank/Boscobel
Westchester/Melksham/Lakewood
Westchester/Middleton
LoS F
LoS E
LoS D
LoS C
LoS B
LoS A
Scenario 1
Scenario 2
Scenario 3
No Development


PM Levels of Service
Scenario 1
Scenario 2
Scenario 3
No Development
Main/Redwood
Main/Sunrise
Main/Takapu/Willowbank/Boscobel
Westchester/Melksham/Lakewood
Westchester/Middleton
LoS F
LoS E
LoS D
LoS C
LoS B
LoS A
Volume/Capacity Ratio
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
2013
2028
2043
Projection Year

www.tonkintaylor.co.nz