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REPORT

Tonkin+Taylor

Hawkins Hill Right of Way

Design Report

Prepared for
Wellington City Council
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1 Introduction

Wellington City Council (WCC) engaged Tonkin & Taylor Ltd. (T+T) to undertake detailed design and cost estimations for improvement measures along the Hawkins Hill Right of Way (the RoW) in Brooklyn, Wellington.

This design phase has been undertaken following issue of the Service Levels and Maintenance Review Study[1] carried out by T+T in 2018. The purpose of this previous study was to review the existing Council owned right of way asset and make recommendations in relation to reactive maintenance, safety, walking and cycling improvements and on-going management and maintenance for each section on the RoW.

This study divided the RoW into five sections (A to E) and recommended a range of treatment options for the RoW categorised as 'do minimum', 'minor improvements' and 'major improvements'. The report recommended that minor improvements be undertaken on all five sections and included very preliminary high level cost forecasts of the treatment options and on-going maintenance requirements.

Subsequent to the issue of that report, the WCC City Strategy Committee approved a resolution on 22nd November 2018 to finalise detailed design and cost estimates for 'minor improvement' upgrades on sections A and B and 'do minimum' upgrades on sections C, D and E[2].

This report summarises the following in relation to the design phase:

- A review of the status of the tasks outlined in Section 8 – Next Steps from the Hawkins Hill Right of Way, Service Levels and Maintenance Review report;
- Data Collected;
- A summary of the detailed site investigations and pavement condition assessment;
- Design Philosophy, outlining the technical design assumptions and issues;
- Updated preliminary Engineer's Estimates of construction costs;
- Qualitative risk assessment; and
- Recommendations and next steps

This report has been produced in accordance with the scope outlined in our Offer of Service dated 14 June 2019.

[1] Hawkins Hill Right of Way, Service Levels and Maintenance Review (August 2018)
[2] Offer of Service, Hawkins Hill Right of Way, Detailed Design and Cost Estimate Package (June 2019)

2 Review of Next Steps from Service Levels and Maintenance Report

This section outlines the progress on the next steps identified in the previous Service Levels and Maintenance report. The next steps for further investigation were:

- **Asset Condition Assessment**
  - Formal assessment of pavement condition;
  - Review of pavement structural integrity;
  - Survey of drainage;
  - Assessment of slope stability.
- **Safety Assessment**
  - Confirm sight distances;
  - Road user safety assessment/safety audit of existing.
- **Access and Use Review**
  - Confirm consent conditions with respect to access and use;
  - Review of regulatory changes (if any);
  - Warrant for speed limit (if required);
  - Confirm changes to access conditions (if any);
  - Consultation with residents and stakeholders;
  - Draft access and use policy for RoW.
- **Option Confirmation and Development**
  - Confirm preferred option, legal requirements, and funding requirements;
  - Further develop scope and timing of options and refine costs and programme.

The asset condition assessment involved a formal assessment of pavement, drainage and slope stability. This was carried out in July 2019 by T+T Engineers. The summary of these assessments are detailed in Section 4 and 5 of this report.

A sight distance of 30m has been confirmed in accordance with Table 2 of Part C of the WCC Code of Practice for Land Development (WCC CoP) for a design speed of 30 km/h. This design parameter was agreed with WCC under the assumption that a 30km/h speed limit would be approved and implemented on the RoW by WCC. Should this not eventuate, the impact on the cut slopes proposed for visibility improvements, which are linked to operating speed, will need to be reviewed and will have cost and property implications.

WCC have advised that a Road Safety Audit will be procured separately, should one be required, by WCC in line with their internal processes.

The "Access and Use Review" and "Option Confirmation and Development" have been excluded from T+T's scope of works under this Offer of Service. WCC are progressing the access and use review and consultation with residents and stakeholders. It is recommended, based on the findings of this design and cost estimation exercise, that T+T work with WCC to further develop the scope of the remedial works designed and refine the cost estimates through a value engineering process to better align the scheme to WCC and public operational and budgetary expectations

3 Data Collected

Data collection related primarily to the utilisation of freely available datasets but also involved the procurement of a topographical survey. The following datasets were obtained:

- LIDAR data (1m intervals) as retrieved from Land Information New Zealand (LINZ);
- Edge of seal data (GIS shapefile) as retrieved from WCC Open Data Portal; and
- Utilities data (beforeUdig)

A 3D topographical survey was carried out by Spencer Holmes Ltd. in September 2019 at discrete sites along the RoW. This data was used to supplement available LIDAR data for accurate 3D modelling of cut-face surfaces where sight line improvements are proposed.

4 Pavement Condition Assessment

The previous Service Levels and Maintenance Report outlined the pavement condition from a visual inspection in May 2018. At this time it was noted maintenance work was being undertaken, and was also planned for sections of the RoW. The report recommended a formal assessment of the pavement condition was undertaken at a later stage, prior to detailed design to ensure the project took into account more recent pavement rehabilitation works.

The findings from the detailed pavement condition investigation are outlined for sections A to E below. These findings and the subsequent recommendations are the result of a site walkover undertaken on the 16th July 2019. It is noted that the outcomes from this detailed assessment have changed the assumptions and conclusions, as well as capital cost estimates from the previous report.

4.1 Section A

There is evidence of edge-break to both sides of the existing pavement as a result of uncontrolled stormwater flow along much of Section A, this is particularly severe closer to the commencement of the right of way (RoW) at Ashton Fitchett Drive. Edge break reinstatement will consist of saw-cutting the carriageway 500mm from the edge of the seal, cutting this material to waste and re-instating the pavement to the extent of the existing edge of seal. To assist in channelling stormwater away from these areas of edge break it is also proposed to re-profile the verge in these locations so stormwater sheds away from the carriageway down the cut-side slope.

An existing section of asphalt concrete (AC) repair is noted as having failed and is subject to crocodile cracking. Full width, full depth reconstruction is recommended in this location and is identified on the drawing 1006626.2000-1202 in Appendix A. This area of failed AC is shown in Figure 4-1 below.

Figure 4-1: Area of failed AC with crocodile cracking evident

Crocodile cracking and stripping of chipseal is evident on two bends near the end of Section A, approaching the wind turbine. It is recommended that the area of failed pavement at these locations be excavated and reinstated in accordance with the construction detail shown on drawing 1006626.2000-7101. A pavement subsoil drain may be required in these locations to control groundwater levels, this should be confirmed on site during the works upon inspection by the Engineer.

Layout drawings 1006626.2000-1202 to 1006626.2000-1204 in Appendix A show the location of all proposed pavement and stormwater improvement measures for Section A.

4.2 Section B

Edge-break and crocodile cracking are apparent in a number of locations in Section B where uncontrolled stormwater flow has scoured and damaged the edges of the existing pavement. An example of this is shown in Figure 4-2 below. The areas have been identified on the Drawings and will be reinstated in accordance with detail drawing 1006626.2000-7102.

Figure 4-2: Typical example of edge break seen in Section B

Potholes are also evident in a number of locations in Section B (Figure 4-3), some of which have been patch repaired in the past, others have established more recently. These will need to be excavated and repaired in accordance with detail drawing 1006626.2000-7102.

Figure 4-3: Typical example of potholing in Section B

On some sections there is evidence of previous patch repairs to the pavement which are failing and have contributed to the edge break.

Recent repairs to two sections of the RoW with an AC surface course appear to be performing well with no visual signs of damage or deterioration. These are close to either end of Section B, one is close to the wind turbine access gate and the other is approaching the Southernthread Road intersection. These are shown in Figure 4-4 and Figure 4-5 respectively.

Figure 4-4: Recent AC pavement repair on Section B (Near wind turbine)

Figure 4-5: Recent AC pavement repair on Section B (Near Southernthread Road)

Layout drawings 1006626.2000-2202 to 1006626.2000-2203 in Appendix A show the location of proposed pavement and stormwater improvement measures for Section B.

4.3 Section C

The pavement in Section C appears to be generally performing well. Some edge-break is evident, a typical view of which is shown in Figure 4-6 below, which should be repaired in accordance with detail drawing 1006626.2000-7102. Some verge re-shaping on the outside of the curve should also be carried out in accordance with the detail shown on 1006626.2000-7201 to control stormwater flow.

Figure 4-6: Typical view of edge-break in Section C

Layout drawings 1006626.2000-3202 to 1006626.2000-3203 in Appendix A show the location of proposed pavement and stormwater improvement measures for Section C.

4.4 Section D

There is a large pothole (Figure 4-7) approximately 100m beyond the start of Section D (Woofingtons) which will need to be repaired in accordance with detail drawing 1006626.2000-7102. Otherwise, the pavement in this section is fit for purpose with no obvious visual signs of deterioration. Minor areas of pothole repair and edge break reinstatement are also indicated for this section.

Figure 4-7: Large pothole requiring repair in Section D

Layout drawing 1006626.2000-4201 Appendix A shows the location of proposed pavement improvement measures for Section D.

4.5 Section E

The pavement in Section E appears to be performing well and is generally fit for purpose. It is considered that no intervention is required here.

5 Geotechnical Findings

5.1 General Findings

A site visit was undertaken by an engineering geologist to assess the existing cut slopes which are proposed to be cut back to provide the 30m sight distance as required for a 30km/h design speed.

In general, the rock encountered on the site is weathered greywacke consisting of approximately 60% sandstone and 40% siltstone. The strength of the observed materials varies from very weak to strong and generally tends to increase in strength from north to south (Section A to Section D). Material in Section A generally appears to be very weak to moderately strong whilst material in Section E tends to be moderately strong to strong.

Rock outcrops generally become more competent as you travel from north to south i.e. from Section A towards Section E. Rock outcrops in the southern area are less weathered and considered less rippable, more difficult to mechanically excavate, than rock outcrops in the northern area.

Existing slope angles generally vary between 50 and 80 degrees. The proposed rock slope angles for the new cut slopes should be a maximum of 65 degrees to ensure stability following completion of the works. In areas where soil is observed (ie above the rock) are proposed to have slope s angles cut at less than 35 degrees. Benching of the new cut slopes is proposed in areas where slopes are greater than 10m in height.

The size of the excavator used to carry out the proposed works will be key as the strength of the rock will tend to increase as existing rock is excavated and pushed back. From a constructability perspective, it is recommended that slope faces greater than 3m in height are excavated from the top down to road level.

Full site notes can be found in Appendix B. It is recommended that these site notes are provided to Contractors who may respond to a request for pricing by WCC for the physical works to ensure they are well informed of the site conditions when pricing for the works. The excavation of the cut slopes represents the most significant cost item of the physical works estimate and therefore the highest risk or opportunity of capital cost fluctuation.

6 Design Philosophy

6.1 General

The Hawkins Hill RoW scheme has been designed to include reactive maintenance and promotion of pedestrian and cyclist users to an appropriate level proportionate to the forecast traffic on the road and the level of service required. The design is based primarily around improving the existing deficiencies in the pavement condition and stormwater control. It is also aimed at increasing priority for walking and cycling whilst maintaining access for the private residential dwellings and various commercial operations along the RoW as outlined by the policy direction in the Wellington Outer Green Belt Management Plan.

These safety and access improvements have been undertaken with reference to the following documents;

- Wellington City Council Code of Practice for Land Development 2012 (WCC CoP)
- NZTA Cycling network guidance;
- NZTA Pedestrian Planning and Design Guide, October 2009;
- NZTA Sharrow Markings; best practice guidance note, December 2016;
- Manual of Traffic Signs and Markings (MOTSAM), August 2010;
- Austroads Guide to Traffic Management Part 8: Local Area Traffic Management, May 2016; and
- Wellington Outer Green Belt Management Plan, May 2004.

6.2 Design Assumptions and Issues

6.2.1 Earthworks

The main aspect of the design, from a construction capital expenditure perspective, is earthworks associated with excavation of existing cut slopes to provide improved sightlines of 30m for a 30km/h design speed. These parameters are based on the requirements of section C.1.16 of the WCC CoP.

Section B.11 of the WCC CoP requires the top of a cut face batter to be at least 2 metres from a boundary or building. To achieve the required 30m sight distance for the design speed, the top of some proposed cut face batters will be less than 2m from the nearest property boundary. One of these adjacent properties is WCC owned, the others are not. These sites, and their registered owners, are scheduled in Table 6.1 below.

Table 6.1: Cut faces top of which are less than 2m from adjacent property boundary

Drawing Reference	Area of adjacent property required to provide required 2m separation from top of cut slope batter face	Registered owners of adjacent property	Top of proposed cut slope encroaches onto adjacent property
1006626.2000-1401	105 m2	Wellington City Council	Yes
1006626.2000-1402	3.5 m2		No
1006626.2000-3401	3 m2		No
1006626.2000-3402	0.5 m2		No
1006626.2000-3403	320 m2	Airways Corporation of New Zealand Limited	Yes

These issues have been recorded in the qualitative risk register which can be found in Appendix C.

It is recommended that WCC review land requirements and decide on how discussions to acquire land might be approached. In areas where the top of the proposed cut slope batter faces do not encroach onto adjacent properties but is less than the required 2m separation under the WCC CoP, it should be established if there is a formal process for obtaining a relaxation, or departure, from the WCC CoP to allow these works to be carried out without affecting adjacent properties.

6.2.2 Safety and accessibility improvements

The Service Levels and Maintenance Review report recommended investigating the feasibility of a 1.5m wide unsealed shoulder to provide for pedestrians and cyclists along the full length of Section B. Due to the lack of a consistent reserve width along this section between the toe of the cut slope on the northern side of the RoW and the top of the embankment slope on the south side of the RoW, widening of this section of the RoW would be prohibitively expensive. This potential level of investment is not considered proportionate in light of the 'minor improvements' resolved by the WCC City Strategy Committee.

A shared space is generally used to refer to streetscape design which minimise separation between pedestrians and vehicles, typically in an urban environment. This type of arrangement has been considered for the RoW which would "eliminate the segregation of road users"[3]. In shared zones, traffic speeds tend to be self-enforcing through the interaction of motorists and other road users with environments created where traffic speed are passively managed. It has been identified that an operating speed of no more than 32km/hr is a requirement for successful operation of a shared zone with speeds, ideally, 24km/hr or below[4]. Given the historical recorded average speed for Section B of the RoW is 48km/h it is unlikely this ideal operating speed of 24km/h would be achievable through passive management. It is considered that pedestrian volumes should be relatively high in shared space zones to encourage lower traffic speeds. Low traffic volumes may encourage higher traffic

[3] https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/designing-a-cycle-facility/between-intersections/shared-zones/

[4] Shared Space in Urban Environments; Guidance Note; July 2012, Flow Transportation Specialists

speeds and it is desirable to have a low proportion of through traffic utilising shared zones as this traffic tends to travel faster. These factors, combined with the fact that shared zones are usually applied over distances shorter than the 1.3km length of Section B, and in urban situations, render this solution inappropriate.

Based on the site constraints and objectives, the recommended design solution has pedestrians and cyclists utilising the carriageway with motorised traffic, similar to a shared zone, but will actively manage traffic speeds through the installation of speed humps and warning signage. The presence of pedestrians and cyclists will be highlighted to motorists through warning signage and 'sharrow' road markings. Although not yet contained in the MOTSAM, sharrow markings will be placed at a maximum of 70m centres in each direction of travel in accordance with best practice guidance[5].

Access along the RoW will be controlled through the re-implementation of the access control gates which will restrict motorised access along Sections B, to E of the RoW to authorised persons only. This will further improve safety of pedestrians and cyclists using the RoW by reducing the volume of motorised traffic.

It is considered that this design approach will increase user safety and awareness along Section B for motorists and pedestrians and cyclists and is more appropriate in terms of the level of intervention called for in the Service Levels and Maintenance Review Study.

7 Preliminary Engineer's Estimate

7.1 General

The following preliminary Engineer's Estimates have been prepared for RoW sections A to E. The preliminary Engineer's Estimates for each section can be found in Appendix C.

The rates used in the preliminary cost estimates have been sourced from contractor rates tendered on recent construction projects in the Wellington area. Due to recently observed volatility in market rates we have allowed for a range of estimates. The lower band cost estimate has allowed for a 15% contingency whilst the upper band has allowed for a 30% contingency. These estimates are exclusive of GST.

These estimates do not allow for year on year cost escalation. Cost escalation is conservatively estimated to be 3% per annum using the process outlined in Appendix A of NZS:3910. Construction cost indices for both labour cost and producers price are published by Stats NZ[6] and have been reviewed for the five year period between December 2014 and December 2019. By averaging the year on year cost escalation during this period and allowing for a weighting of 60% to producers price index and 40% to labour cost index. An average cost escalation of 2.25% per annum is arrived at. In the interest of conservatism it is suggested a 3% rate should be used.

All other assumptions made in relation to the estimates are outlined in section 7.2 below.

Pavements and earthworks are considered to be the highest risk items associated with the reactive maintenance works, specifically rock excavation associated with sightline improvements. We have sought advice from our geotechnical engineering colleagues in relation to current representative rates for rock excavation.

[5] SHARROW MARKINGS; Best practice guidance note; 2016, NZTA
[6] https://www.stats.govt.nz/

7.2 Preliminary Engineer's Estimates

A comparison of the preliminary Engineer's Estimates with the high-level costs outlined in the service levels and maintenance report are outlined in Table 7.1 below.

Table 7.1: Reactive Maintenance Cost Comparison

	Section A	Section B	Section C	Section D	Section E	Total
Stage 1: Service levels and maintenance review	$400,790	$257,309	$197,210	$156,390	$87,259	$1,098,958
Stage 2: Preliminary Engineer's Estimate (lower estimate)	$409,000	$320,000	$232,000	$127,000	$8,000	$1,096,000
Stage 2: Preliminary Engineer's Estimate (upper estimate)	$463,000	$362,000	$262,000	$143,000	$10,000	$1,240,000

A breakdown of these preliminary Engineer's Estimates can be found in Appendix D.

7.3 Assumptions and exclusions

The following assumptions and exclusions are associated with the completion of the preliminary Engineer's Estimates:

- The following construction durations are estimated for each section of the works and have been included in the schedule of prices and preliminary engineer's estimate.

Table 7.2: Estimated Construction Durations

Section	Duration
Section A	5 weeks
Section B	5 weeks
Section C	3 weeks
Section D	4 weeks
Section E	1 week

- These durations have estimated based on experience of other civil schemes in the Wellington area with a broadly similar scope of works,
- At some locations, the profile of the existing cut slope had to be interpolated between the between the top of the surveyed bank and the profile and the point where the proposed cut slope intersects with the lidar data.
- The costs outlined above are the estimated total capital cost associated with the reactive maintenance works and do not include for future professional fees or land acquisition (if required) associated with the cut slope improvements outlined in Section 6.

- Preliminary and general cost items are generally difficult to estimate and as such are estimated as a proportion of the overall physical works cost. This estimation is usually taken to be 15%.
- Routine maintenance costs have not been considered in the above cost estimates.

8 Risk

The current known risks and opportunities associated with the project have been assessed using best practice risk management procedures detailed in the WCC Qualitative Risk Assessment guideline. It is intended that this risk register remains as a live document, to be updated as the project progresses with risks regularly reviewed and updated as information becomes available. The qualitative risk register is attached in Appendix C. The five highest rating risks and opportunities to the project are considered to be:

1 Cost certainty of reactive maintenance works allowing for construction cost escalations and budgeting adequately for this.

2 Expectations of scope of works by local stakeholders are not in line with WCC's requirements for the safety and accessibility improvements and, by extension, there is a lack of buy-in for the improvement measures.

3 Top of cut slope batter faces intersect, or otherwise are less than 2m from, adjacent property boundaries and therefore not in accordance in the WCC CoP for Land Development.

4 Ensuring 30km/hr speed limits are legally enforceable.

5 Appropriateness of 30km/hr speed limit on sections C, D and E due to lack of formal traffic management exacerbated by improved sightlines through tight corner radii.

Conversely, there are a number of opportunities which we see with the proposed measures, there include:

1 Reduction (or deferral) in scope of the proposed safety and accessibility measures may be possible by identification of measures which have been addressed through on-going maintenance carried out since the issue of the Service levels and maintenance review report.

2 Potential reduction in future on-going maintenance burden as a result of reduced traffic volumes on the RoW through the re-implementation of access control gates.

3 An opportunity exists for WCC to reduce tendering costs and better understand potential construction costs. WCC should explore the possibility of appointing a contractor through the WCC maintenance contract rather than procuring a contractor through a more traditional model where additional costs will be encountered and may be more exposed to greater variability in the construction rates.

9 Recommendations and next steps

9.1 Meeting with WCC project team

A meeting was held between the WCC and T+T project teams on the 20th February 2020. At that meeting Council asked T+T to complete the estimates for provision of a seprete 1.5 wide pedestrian and cyclist shoulder along Section B.

9.2 Recommendations and next steps

The following recommendations are made in relation to mitigating the risks outlined above insofar as possible.

We recommend that a risk/value workshop is held by WCC to discuss the various risks around the extent of the works, funding and programming of the scheme. We recommend the following items in particular are discussed:

- Budget expectations and ability to fund these reactive maintenance costs.
- Engage a quantity surveyor to provide greater cost certainty and provide advice to WCC on future construction cost escalation.
- Staging and prioritisation of works or potential deferral of aspects of the works to a later stage to align scale of works with budget expectations.
- Review recent routine maintenance works carried out on the RoW in the interim potentially negating some of the works called for in these safety and accessibility improvements and reducing the scope and cost of this package of works.
- Process for formalising the implementation of the 30 km/hr speed limit.