3 Engineering Design Criteria

In order to provide an adequate cross section for commuters and recreational users we consulted the current standards, liaised with colleagues and gained understanding of New Zealand best practice. We believe a 3m wide sealed path, with a channel on one side and sumps at regular intervals, will be the most suitable construction for this route. The following standards and guidelines have been considered in our design:

- *Austroads Part 13: Pedestrians;*
- *Austroads Part 14: Cyclist* (read in conjunction with TNZ's supplement);
- *Austroads AP- R287/06 Pedestrian – Cyclist Conflict Minimisation on Shared Paths and Footpaths;*
- *NZS4121 Design for Access and Mobility;*
- *Greater Wellington Regional Cycling Strategy*;
- *The Design of the Pedestrian Network* by Land Transport NZ;
- *TNZ Planning Policy Manual Version 1. Appendix 3. Walking and Cycling Policy Matrix;*
- *Getting there – on foot, by cycle. Strategic Implementation Plan 2006- 2009*. Ministry of Transport;
- *Nelson/ Tasman Cycle Forum Nov 2003* presentation by CAN (Cycling Advocates Network).

3.1 Cross Section, Gradient and Surfacing

Cross Sections

Based on the standards above, we studied the advantages and disadvantages of using a 2, 2.5 and 3m path. We believe that the community would benefit from a 3m path wherever possible. When there are site constraints, we recommend reducing the width of the path rather than extensive engineering works. 2 metres should be the minimum width considered

The table below explains the advantages/disadvantages of the selected widths for each option.

Table 3.1.1 – Cross Sections

Width	Advantages	Disadvantages
2m	• Lower impact on the environment than wider paths. • Lower costs than 2.5m and 3m paths. • Suitable for constricted areas.	• It allows for only 1 pedestrian and 1 cyclist at a time with no clearance area. • Not suitable for full range of recreational users. • It does not promote higher usage. • Maximum Speed limited to 20km/h. Doesn't allow fast commuting.
2.5m	• Lower impact on the environment than wider paths. • Lower costs than 3m path.	• It provides no clearance area for 2 pedestrians and 1 cyclist to pass, or 0.5m clearance for 1 cyclist and 1 pedestrian at a time (0.3m clearance only for a wheel chair user). Some vulnerable users (ie. young children, disabled or the elderly) might feel threatened by cyclists due to the small clearances. • Maximum Speed limited to 20km/h. Doesn't allow fast commuting.
3m	• Suitable for commuters and recreational users. • 30km/h permitted. Allows commuters to get faster to and from work. • Promotes a higher usage of the route. • 1m clearance/passing space between 1 cyclist and 1 pedestrian or 0.5m clearance between 1 cyclist and a couple walking at a time (very common in recreational paths)	• Higher impact on the area. • Higher costs than other options above.

Gradients

Based on the current design standards, we have considered the following gradients in our design. We have aimed to provide access to all users but understand the need to reduce accessibility in some areas to meet cost constraints.

Table 3.1.2 – Gradients

Gradient	Advantages	Disadvantages
1 in 20	• Suitable for all users.	• In some locations this gradient will increase the amount of earthworks considerably.
1 in 12	• Will reduce the earthworks costs.	• Not suitable for disabled users unless treated as a ramp with landings and handrails in both sides. • Would increase costs significantly if considered as an accessible ramp.

Recommendations

We recommend a 3m path as the most suitable for this route. This width of path will promote high usage among commuters and provide reasonable clearance between cyclists and pedestrians (See table 3.1.1).

Where the site constraints do not permit this width, we propose further site investigation to study the options to reduce the path width to 2-2.5m.

The maximum crossfall recommended is 2%. Wherever possible we recommend that the crossfall is kept within 1%. This permits the water to drain, as well as creating a suitable track surface for all users.

For most of the length of the route, we propose a design that makes the cyclepath/footpath accessible for all users, with a maximum gradient of 1 in 20. However there are areas where these standards have been relaxed, in order to decrease the amount of earthworks required. A maximum gradient of approximately 1 in 12 has been applied along the route at Willow Bank Reserve.

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Tawa's Community Steering Group feedback

During our workshop with Tawa's Community Steering Group, a 3m path was seen as a suitable option and the Group favoured the shallow gradients (1 in 20). However, it was agreed that in some sections accessibility might need to be compromised (due to cost constraints) and a narrower path might need to be constructed (due to the site constraints).

3.2 Drainage

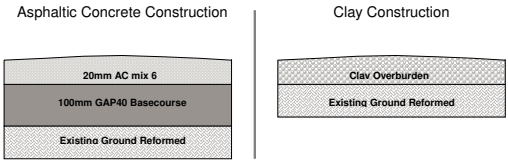
We have analysed various drainage options detailed below:

Table 3.2.1– Drainage Options

Drainage	Advantages	Disadvantages
No drainage	• No drainage costs.	• Uncontrolled water discharge. • Not recommended for sealed surfaces as water won't be able to run off adequately. • Path might become unusable as a result of puddles, floods and erosion. • Possible ponding on the lower side of the path.
Formed channel + Sumps	• Lower construction costs than sealed channel option. • Will help keep path usable as water will run off quickly • Storm water will discharge into the stream/existing drainage system is controlled. • Offers some level of protection to the footpath construction.	• Higher maintenance costs than sealed channel option.
Concrete channel + Sumps	• Low maintenance costs. • Will help keep path usable as water will run off quickly. • Storm water will discharge into stream/existing drainage system is controlled. • Offers some level of protection to the footpath construction.	• Higher construction costs.

3.3 Outline Construction Detail

We have analysed various options for the walkway surfacing: unsealed, chip sealed, clay overburden and asphaltic concrete construction. We have discarded the unsealed and chip sealed options due to higher maintenance costs and unsuitability for some of the users (wheelchairs, pushchairs, etc). Our preferred options are:



There will be 'cut and fill' earthworks to some extent along most of the length of the route in order to accommodate the path. At this stage, we have assumed that the excavated material will be re-used on site, thereby reducing costs of removing excavated material to landfill. We have included some allowance for this in our costs table below.

During the detailed design we would be able to assess the exact quantities of earthworks and identify if there are excavated materials that need to be disposed of off-site.

Important note with regards the requirement for stronger construction:

In the path sections that run along the stream, the path construction would need to support maintenance vehicles so that they can access the stream banks. The criteria for maintenance vehicles loadings have been included in our current design. We propose that further investigation is carried out on site (Scala Penetrometer Tests) to determine the CBR (California Bearing Ratio) and the type of soil.

We believe that in those areas of the stream that are prone to flooding there is a high risk that the path construction will be damaged by floodwater. At such sections the design of the footpath pavement will be adjusted such that it can withstand flooding

Tawa's Community Steering Group feedback

During our workshop, Tawa's Community Steering Group confirmed they would prefer a sealed path along the route so that it is accessible to all users. They were concerned that an unsealed path might discourage future users if not well maintained.

Fig.3.3.1 Clay Overburden track surface – Tawatawa Reserve

3.4 Fencing Requirements

ONTRACK require a 5m clearance from the centre of the nearest railway track to any area accessible to the public. It also recommends fencing when footpaths are located next to the railway corridor, in order to offer a safer environment for pedestrians and other route users. In accordance with ONTRACK's regulations, we recommend that 1.5m pool fencing is installed to separate the railway corridor from the path.

Fencing will also be required in those sections where the path is adjacent to private properties, in order to provide a safer environment for the residents. However, this fencing might also restrict their access onto the route.

3.5 Lighting

We have assessed the use of street lighting columns along the route and note the advantages and disadvantages in the table below:

Table 3.5.1 – Lighting

Advantages	Disadvantages
• Provides a safer environment with improved visibility after dark. • Provides an enhanced perception of security and helps discourage people's fear of crime. • Promotes the route usage to all users as they will consider the route as a safe alternative option. • Lighting design can be considered with other street furniture to provide an integrated design solution	• Significant increase in costs. • Possible disturbance to residents due to the increase in light pollution. • Requires maintenance. • Might be prone to vandalism. Possible to provide lanterns with vandalism protection.

We recommend that street lighting is provided to the footpath. We have allowed a spacing of 70m between lighting columns to provide homogenous lighting along the path. However, this would require further investigation by our lighting engineer. We propose the installation of solar powered LED lamps as they would promote the council objectives for Sustainable Design Further investigation will be required to determine spacing and confirm costs.

3.6 Summary

The table below shows a summary of the costs per metre for the different construction elements of the footpath. We have included a rate for earthworks in the Walkway Construction element. The costs below do not include any provision for consents, land costs or other Management Surveillance and Quality Assurance of Physical Works.

Table 3.6.1 – Linear Costs

Cost Element		Cost per metre
Walkway Construction*	**Option 1: Asphaltic Seal** 20mm mix 6 Asphaltic Concrete Construction with 100mm Gap40 basecourse, 3m wide (incl. minimal earthworks allowance to accommodate the path)	$59/m
	Option 2: Clay Seal Clay Overburden Construction, 3m wide (incl. minimal earthworks allowance to accommodate the path)	$120/m
Drainage	Concrete channel + sumps	$140/m
	Formed channel + sumps	$105/m
Fencing		$100/m
Lighting		$86/m

*Note: We have assumed a cost of $5 per metre for earthworks along the path. This cost is expected to vary at different sections of the route.