

Manly Dam Link Trail Upgrade King Street, Manly Vale

Traffic Safety Assessment

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1.2 Objectives

The purpose of this assessment is to:

- ❖ describe the site, existing roadway, condition and geometry
- ❖ describe the proposed design options
- ❖ assess the adequacy of the proposed options having regard to traffic, pedestrian and cyclists' safety
- ❖ assess the suitability of each option.

1.3 Provided Information

TTPA relied upon the following design documents and data when undertaking the assessment:

- ❖ TBLD project brief (V1) for provision of traffic engineering services for traffic safety audit for the manly dam link trail concept design (version V1/21)
- ❖ Option 1 (off-road bush boardwalk) concept design dated 09/04/2021
- ❖ Option 2 (edge of road boardwalk) concept design dated 16/04/2021
- ❖ Manly Dam traffic count data from July 2013 to February 2021 received on 21/05/2021

1.4 Checklists and Reference Material

The assessment has regard for the following technical publications:

- ❖ Austroads Guide to Road Safety Part 6: Implementing Road Safety Audits (Edition 1.2, February 2019)
- ❖ Austroads Guide to Road Design Guide Part 3: Geometric Design (Edition 3.4, February 2021)
- ❖ TfNSW Technical Direction TTD 2016/001 – Design and implementation of shared zones including provision for parking
- ❖ TfNSW Safer Speeds Policy & Guidelines (July 2012)

2.0 Existing Site Context

2.1 Inception

An inception meeting was held on-site on Friday 21 May 2021. The meeting was attended by:

- ❖ Mr. Andrew Zouroudis (TBLD)
- ❖ Mr. Scott van Trienen (Northern Beaches Council)
- ❖ Mr. Bernard Lo (TTPA)
- ❖ Mr. Sherlock You (TTPA)

2.2 Site and Field Assessment

TTPA's representatives inspected the Trail on Friday 21 May 2021 (rain) and Sunday 30 May 2021 (sunny).

2.3 Existing Site Context & Trail Conditions

The Trail is curvilinear, bitumen-sealed, carries two-way traffic (Figure 2), and has a narrow carriageway of varying widths between 3.8m and 5m.

Figure 2 Existing road condition



The Austroads Design Guide provides a minimum two-way road width of 5.5m to 6m. On this basis, the roadway is substandard for two-way traffic flow. Onsite, vehicles were observed to have a tendency to straddle on the road's centreline (Figure 3), presenting considerable traffic risk as the roadway was also seen to be frequently used by cyclists and pedestrians (including children, 'skateboarders', elderly persons, as well as mobility-impaired user groups). Figure 3 also provides an indication of their interaction with the roadway.

Figure 3 Vehicles driving on centre of road with other user groups



The roadway presents with numerous vertical and horizontal curves, and there were substandard sightlines noted in numerous locations along the Trail. Some of these are highlighted in Figure 4. When two cars in opposite directions met on the Trail, one of the cars must manoeuvre outside of the sealed road surface in order to pass one another. This is due to the substandard road width.

Figure 4 Substandard driver sightlines



2.4 Traffic Counts

Council provided TTPA with a record of the Trail's vehicular traffic counts. The data covers an extensive period from July 2013 to February 2021. However, it was subsequently revealed that most of the data were not usable. As a result, it is not possible to provide a consistent year-by-year comparison. Nevertheless, the usable data were extracted and summarised in this assessment to provide an indication of the Trail's vehicular traffic over the following periods (Table 1):

- ❖ January 2018, 2019 and 2020
- ❖ August 2017, 2019 and 2020
- ❖ December 2017, 2018 and 2019

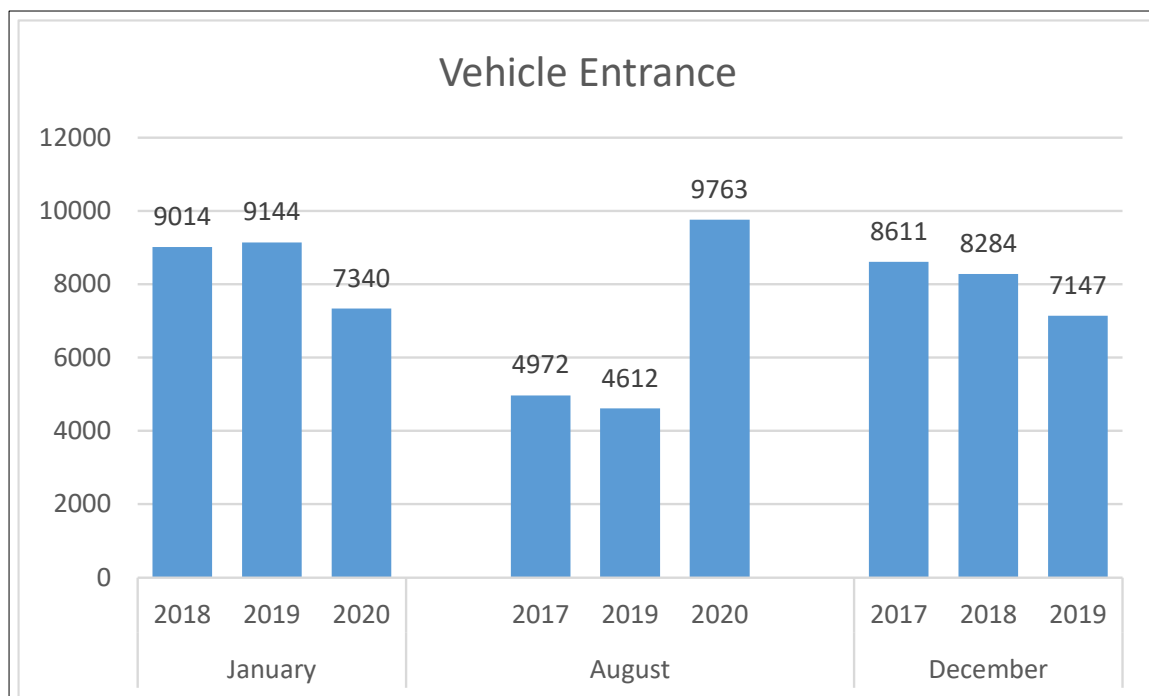
Table 1 Traffic Counts

	Vehicle Count by Month (vpm)
January	
2018	9,014
2019	9,144
2020	7,340
August	
2017	4,972
2019	4,612
2020	9,763
<i>Cont.</i>	

December	
2017	8,611
2018	8,284
2019	7,147

The above information which is expressed diagrammatically in Figures 6 below provides an indicative 'trend' of the Trail's utility over a three-year period.

Figure 6 Vehicular traffic



The recorded data indicates peak traffic movements in August (winter), consistent with typical park visitation pattern i.e., more pedestrian and cyclist activities in the summer months and vice versa. Relevantly, the level of vehicular traffic has increased significantly in August 2020 (following uplift of the State's lockdown). This is expected to be the forward trend as the pandemic effect 'pushes' towards outdoor activities.

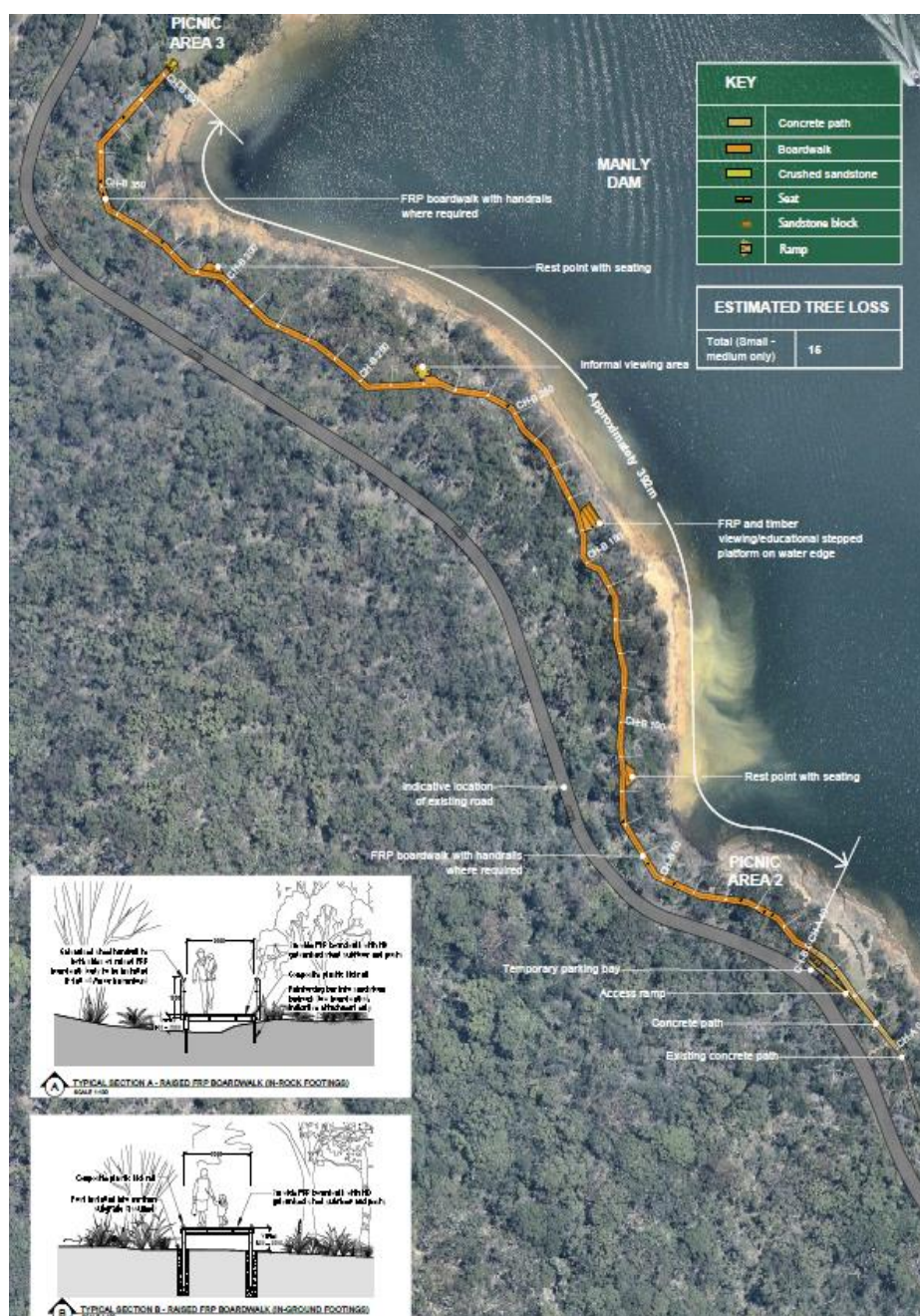
Having regard for the above, in conjunction with TBLD, Council has developed three design options which are aimed at improving the Trail's condition and accessibility. The relevant design options are provided in Appendix A and described in the following Section.

3.0 Proposed Upgrade

3.1 Option 1 – Off-Road Bush Boardwalk

Option 1 involves the provision of a new off-road track with a 2m wide 'boardwalk' bypassing the existing roadway between Picnic Area 2 and Area 3, as shown in Figure 7 below.

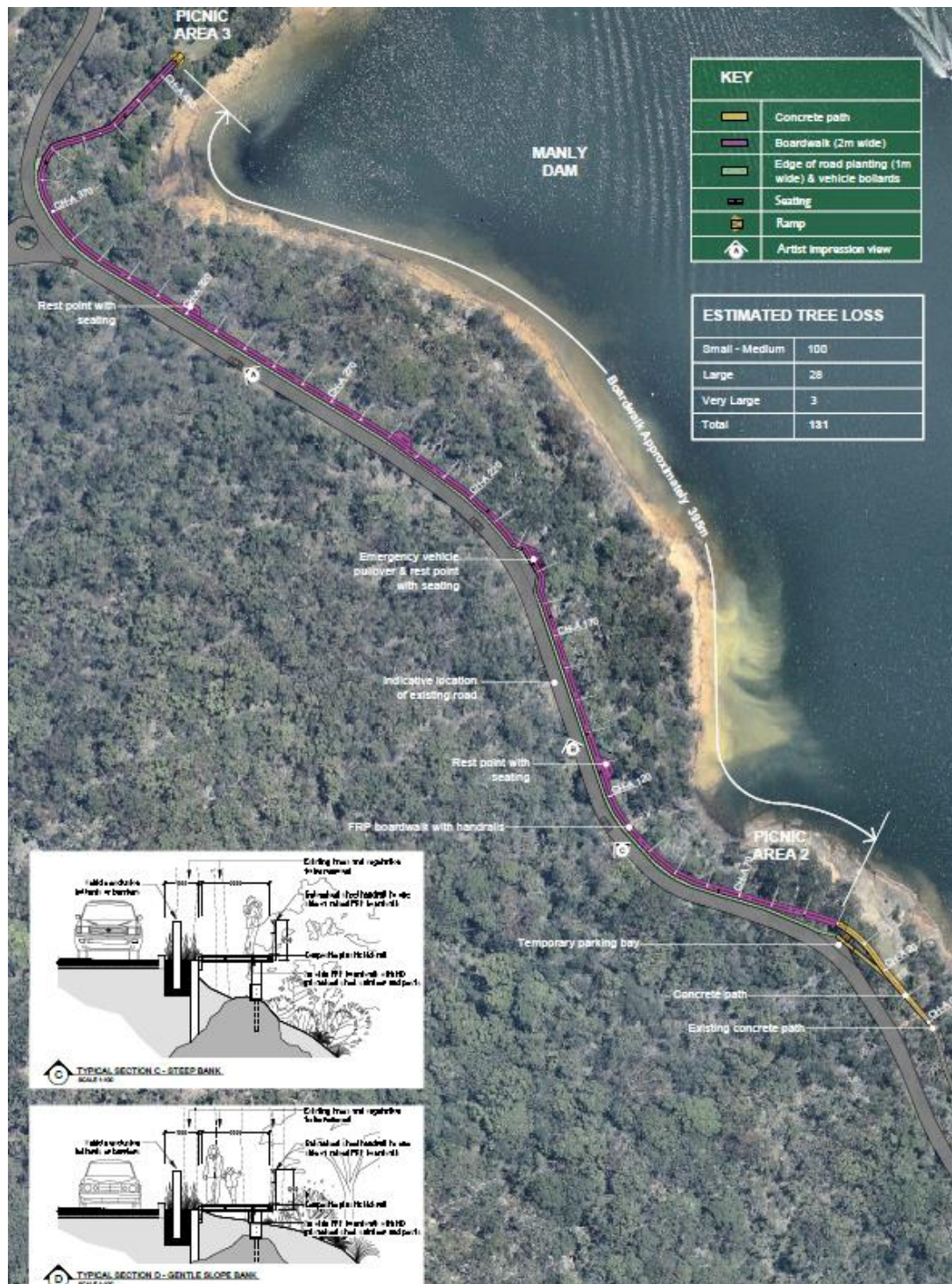
Figure 7 Option 1



3.2 Option 2 – Edge of Road Pathway

Option 2 involves the construction of a roadside footpath 2m wide with associated barrier and be generally aligned to follow the existing Trail, as shown in Figure 8.

Figure 8 Option 2



3.3 Option 3 – Shared Zone

Option 3 is not yet developed in detail at the time of this assessment.

However, it is in effect maintaining the Trail's 'status quo', in that all users will continue to use the Trail's roadway between Picnic Area 2 and Picnic Area 3. However, in prioritising the most vulnerable user group – pedestrians, the contemplated option proposes to formalise this section of the Trail as a Shared Zone. Under this arrangement, pedestrians and cyclists have right of way on the roadway and vehicles must give way as and when required.

4.0 Traffic Safety Assessment Findings

4.1 Summary

The traffic safety assessment categorises the associated risks using a standard risk matrix (Table 2) provided by Austroads.

Table 2 Risk Matrix

Likelihood	Improbable	Occasional	Highly Probable
Severity			
Minor	Low	Low	Medium
Moderate	Low	Medium	High
Major	Medium	High	High

And the risk levels are described as follows:

Likelihood:

- ❖ *Highly probable:* It is likely that more than one crash of this type could occur within a five-year period.
- ❖ *Occasional:* It is likely that less than one crash of this type could occur within a five-year period.
- ❖ *Improbable:* Less than one crash of this type could occur within a 10-year period.

Severity:


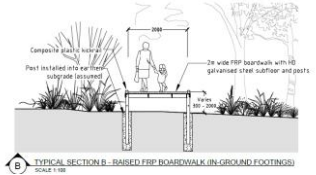

- ❖ *Major:* The crash is likely to result in fatality or serious injuries.
- ❖ *Moderate:* The crash is likely to result in minor injuries or large scale of property damage.
- ❖ *Minor:* The crash is likely to result in minor property damage or many near-miss crash events.



Priority:

- ❖ *High:* Very important and needs to be addressed urgently.
- ❖ *Medium:* Important and needs to be addressed as soon as possible.
- ❖ *Low:* Needs to be considered as part of regular maintenance/ planning program.

The safety assessments for each of the proposed options, which have regard for the criteria documented in Checklist 1: Feasibility Stage Audit from the Austroads Guide to Road Safety (Part 6), are tabulated in the following subsections.

4.2 Option 1 Assessment Findings



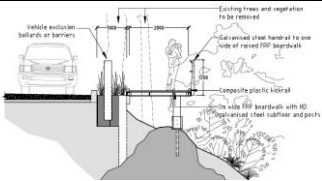
No.	Category	Description of Risk	Photo / Diagram	Likelihood	Severity	Risk Rating	Other Notes / Comments
1	Pedestrian	Specific shoes (i.e. with thin heels) might be trapped by the grates leading to foot injuries.		Improbable	Moderate	Low	
2	Pedestrian	Small items might fall into the small grate holes and result in personal property loss		Improbable	Minor	Low	
3	Pedestrian	Pedestrians might accidentally step outside the boardwalk without fence protection and result in injuries		Improbable	Moderate	Low	Recommend providing low height side barrier/protection/warning or a wider boardwalk as a buffer zone
4	Pedestrian	The paths' grades might be too steep at certain sections for wheelchair/pram access.		Highly probable	Moderate	High	DDA compliance will not be feasible with the Option 1 boardwalk design without significant cost and environmental impacts




5	Bicycle	There are cyclists (family recreational) currently identified in the study area. The cyclists' wellbeing/safety are not considered in the boardwalk option.		Highly probable	Major	High	Although it is understood that the scope of work is to improve pedestrians' walking experience, it is nonetheless desirable to provide an upgrade that complements other vulnerable user groups, particularly as there are existing risks associated with the narrow roadway (see item 6 below)
6	Vehicle	The two-lane two-way roadway is substandard, too narrow, and has limited sightlines. Vehicles often straddle in the centre of two lanes and there is very limited passing opportunity for cars, let alone for pedestrians and cyclists that were observed and recorded as regular users of the Trail.		Occasional	Major	High	Although it is understood that the scope of work is to improve pedestrians' walking experience, it is nonetheless desirable to provide an upgrade that complements other vulnerable user groups.

Further Comments

The assessment finds Option 1 to be highly advantageous as it removes the most vulnerable user group from the currently substandard roadway. It is acknowledged that cyclists will not be able to use the proposed boardwalk. While it is desirable for the boardwalk to also accommodate cyclists, it is recognised that there are geometrical constraints that will preclude this provision. Instead, Council may consider a partial upgrade of the existing roadway to provide a safer cycling environment (this is not a scope of this assessment).

4.3 Option 2 Assessment Findings

No.	Category	Description of Risk	Photo / Diagram	Likelihood	Severity	Risk Rating	Other Notes / Comments
1	Pedestrian	Specific shoes (i.e. with thin heels) might be trapped by the grates and leading to foot injuries.		Improbable	Moderate	Low	
2	Pedestrian	Small items might fall into the small grate holes and result in personal property loss		Improbable	Minor	Low	
3	Pedestrian	Due to the steep gradients of the existing roadway. The path, which will follow the roadway's terrain, could be too steep and unsuitable for wheelchair/pram access at certain sections.		Highly probable	Moderate	High	It may not be possible to achieve a DDA compliant side path due to the existing roadway slopes. It is recommended to investigate alternative alignment at steep road sections.
4	Pedestrian / Vehicle	The barrier specification is not identified in the design plan. If bollards are used, there is a risk of errant vehicles crashing over and run over pedestrians on the side path.		Occasional	Major	High	Recommend using Austroads/TfNSW compliant energy absorbing structures/bollards/barriers and ensure adequate crash buffer area provided between the roadway and side path is compliant with the relevant design criteria (product-dependent).

5	Bicycle	There are cyclists (family recreational) currently identified in the study area. The cyclists' wellbeing/safety are not considered in the boardwalk option.		Highly probable	Major	High	Although it is understood that the scope of work is to improve pedestrians' walking experience, it is nonetheless desirable to provide an upgrade that complements other vulnerable user groups, particularly as there are existing risks associated with the narrow roadway (see item 6 below)
6	Vehicle	The two-lane two-way roadway is substandard, too narrow, and has limited sightlines. Vehicles often straddle in the centre of two lanes and there is very limited passing opportunity for cars, let alone for pedestrians and cyclists that were observed and recorded as regular users of the Trail.	 	Occasional	Major	High	Although it is understood that the scope of work is to improve pedestrians' walking experience, it is nonetheless desirable to provide an upgrade that complements other vulnerable user groups.

Further Comments

Option 2 presents as a less desirable outcome for pedestrians when compared to Option 1. This is largely due to the footpath having to follow the roadway's alignment and terrain. As such, it will 'inherit' the already substandard sightlines and grades. As the Trail is frequently used by wheel-chair dependent user-groups, they will not be able to negotiate these grades easily, thus rendering the proposed option inadequate.

Because the footpath and an additional safety barrier will abut the roadway, the carriageway will need to be widened further to provide additional safety buffer zone (barrier-dependent) that is essential for pedestrian safety as well as for vehicle passage. The envisaged civil works will be quite significant and will be potentially cost-prohibitive in comparison to Option 1.

Furthermore, because of the required road widening, Option 2 (in its current form) will also necessitate the removal of 131 established trees along the Trail. Any further widening (as identified above) will potentially result in more tree loss.




4.3 Option 3 Assessment Findings

As the Shared Zone concept is not developed at the time of this assessment, it will instead review the roadway's physical conditions, utilisation, and considers its suitability as a Shared Zone.

Shared Zone is an official traffic control that must satisfy the criteria contained in the TfNSW Technical Direction 2016/001 (February 2016) and the requirements of TfNSW Safer Speeds Policy & Guidelines V1.0 (July 2012). There are a series of numerical warrants that the site must satisfy in order to be considered as a suitable 'candidate' for Shared Zone. There are detailed below.




Features	Shared Zone
Current traffic flows	≤ 100 vehicles per hour and ≤ 1000 vehicles per day
Current speed limit	≤ 50 km/h
Length of proposed Shared Zone	≤ 400 metres
Current speed limit of adjoining roads	≤ 50 km/h
Current carriageway width	minimum trafficable width of 2.8 metres
Route access	must not be located along bus routes or heavy vehicle routes except delivery or garbage trucks
Streets with narrow or no footpaths	where pedestrians are forced to use the road
Kerbs	kerbs must be removed unless excepted by the RMS (See Section 4)



In addition, a Shared Zone (the entire section of the Trail) must be complemented by a suite of regulatory signage as indicated below:

	<p>R4-4 SHARED ZONE</p> <ul style="list-style-type: none"> • Must be displayed at the start of a shared zone. • R4-4 may be repeated in combination with R2-10 at additional locations within a shared zone.
	<p>R4-5 END SHARED ZONE</p> <ul style="list-style-type: none"> • Must be displayed at the end of the shared zone.
	<p>R2-10 GIVE WAY TO PEDESTRIANS</p> <ul style="list-style-type: none"> • Must be displayed at the start of a shared zone and below the R4-4 sign. • R2-10 may be repeated in combination with R4-4 <p>R5-65 PARK IN BAYS ONLY</p> <ul style="list-style-type: none"> • Must be displayed at the start of a shared zone, below the R2-10 sign, when parking is provided. • May be repeated in isolation at additional locations within a shared zone.

Having regard for the above, an assessment of the Trail in relation to the Shared Zone design criteria is tabulated below.

No.	Category	Description of Risk	Photo / Diagram	Likelihood	Severity	Risk Rating	Other Notes / Comments
1	Authority Approval	Shared Zones on public roads must be approved by the TfNSW. The existing 20 km/h speed limit does not meet the requirement outlined in TfNSW Technical Guide TTD 2016/001	N/A	N/A	N/A	N/A	It will be essential to reduce the Trail's speed limit to 10 km/h for it to operate as a Shared Zone.
2	Authority Approval	<p>The site criteria for a shared zone are:</p> <ul style="list-style-type: none"> • Current traffic flows no more than 100 vehicles per hours and 1000 vehicles per day • Current speed limit is less than 50km/h • Length of proposed shared zone no more than 400m • Minimum trafficable width of 2.8m • Streets with narrow or no footpath where pedestrians are forced to use the road 	N/A	N/A	N/A	N/A	<p>Based on information and traffic counts provided by the Council:</p> <ul style="list-style-type: none"> • Current traffic flows are generally less than 1000 vehicles per day. The hourly traffic flows are not known however it has been observed to be less than 100 vehicles per hour. • Current speed limit is identified as 20km/h. • The distance between Picnic Area 2 and 3 is approximately 500m. This is in excess of the criteria's limit. • Existing road width within the study area varies between 3.9m to 4.9m with no footpath identified based on the site visits.

3	Pedestrian	Due to the steep gradients of the existing roadway. The shared path grade will be unsuitable for wheelchair/pram access. It will also present manoeuvring difficulty for drivers that must give way to pedestrians.		Highly probable	Moderate	High	Significant roadworks might be required to provide a DDA compliant Shared Zone, which may not be financially or environmentally viable
4	Pedestrian / Bicycle / Vehicle	The existing roadway presents with numerous blind corners. Due to the poor sightline, there are potential conflict risks between pedestrians, bicycles and vehicles. It will also present manoeuvring difficulty for drivers that are descending at a steep slope.		Highly probable	Major	High	Significant roadworks might be required to provide a DDA compliant Shared Zone, which may not be financially or environmentally viable
5	Pedestrian / Bicycle	Due to its extensive distance, it is likely additional traffic calming devices (i.e., speed humps) will be required along the roadway when implementing Shared Zones. The speed humps will in turn present as trip hazards for pedestrians and cyclists, and manoeuvring challenge for wheel-chair users.		Occasional	Moderate	Medium	It is not practical to 'treat' the roadway with further traffic calming devices due to the nature of user groups.

6	Bicycle	There are cyclists (family recreational) currently identified in the study area. They were found to travel at speeds well below 10 km/h and in some instances found to have 'stopped for a break'. It is not known whether a trailing driver, particularly in the busier weekends, would be able to patiently wait for these vulnerable user groups to negotiate the steep Trail.		Highly probable	Major	High	It is not practical to 'treat' the roadway with further traffic calming devices due to the nature of user groups.
7	Vehicle	The two-lane two-way roadway is substandard, too narrow, and has limited sightlines. Vehicles often straddle in the centre of two lanes and there is very limited passing opportunity for cars. This issue is worsened by regular pedestrians and cyclists at the Trail.		Occasional	Major	High	It is expected that a Shared Zone would not improve vehicles' circulation. It is not known whether a trailing driver, particularly in the busier weekends, would be able to patiently wait for these vulnerable user groups to negotiate the steep Trail.

9	Pedestrian/bicycle	<p>If drivers fail to give way to pedestrians, or if they try to manoeuvre around pedestrians/cyclists, pedestrians might be forced to walk on unpaved road areas and fall into the ditch / steep bank.</p> <p>It is also noted that the roadway pavement presents with numerous cracks/damages that are trip hazards for pedestrians and cyclists</p>		Occasional	Major	High	
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Further comments:

Option 3 Shared Zone is found to be unsuitable in the context of the Trail's terrain and traffic circumstance. Fundamentally, Shared Zones are intended to prioritise dominant pedestrian activity on otherwise typically vehicle-centred roadways. This is in direct contradiction with the Trail's operating circumstance. The traffic data recorded a significant vehicular volume on the existing roadway. Therefore, if a Shared Zone was implemented on the Trail, it would potentially force majority of the drivers to wait for other road users. This 'imbalance' is a catalyst for misbehaviours that lead to more traffic safety issues.

5.0 Conclusion

The assessment has concluded that:

Existing Site Conditions

- ❖ The existing road width along the Trail varies between 3.9m and 4.9m and is generally substandard (5.5m to 6m) for a two-lane two-way road as per Austroads Guides to Road Design.
- ❖ The existing roadway presents with multiple horizontal and vertical blind turns - significantly limiting drivers/pedestrians/cyclists' sightlines.
- ❖ The existing roadways present multiple manoeuvring difficulties for cars, which increase traffic safety risks for all users.
- ❖ A mix of vehicles, pedestrians, bicycles and skateboarding activities were observed onsite during the inspections.

Option 1

Pedestrians

Option 1 is found to be the most desirable provision for pedestrians as it separates them from general vehicular traffic entirely.

Cyclists

Option 1 does not affect cyclists.

Cars

Option 1 does not affect normal traffic.

It is recommended that Council considers further provision/upgrade on the roadway to accommodate cyclists.

Option 2

Pedestrians

Option 2 will also separate pedestrians from vehicular traffic movements on the roadway. However, it is not considered to be suitable as the path will retain the roadway's existing vertical and horizontal grades. These steep curves will present difficulty for children, elderly and wheelchair bound users.

Cyclists

Option 2 will not affect cyclists.

Cars

Unless the roadway is widened, Option 2 will introduce some further restriction to traffic movements. This is due to the construction of a physical barrier on areas that are currently relied upon by vehicles to 'pass' an opposing vehicle. It is also known that any further road widening for Option 2 will exacerbate the already significant environmental impact (i.e., 131 trees lost).

It is recommended that Council considers further provision/upgrade on the roadway to accommodate cyclists.

Option 3

Pedestrians

Option 3 is not a suitable proposal in the context of this site. The proportion of vehicular traffic to pedestrians contradicts with the principle of Shared Zone.

Cyclists

Option 3 is not a suitable proposal in the context of this site. The proportion of vehicle to cyclists also contradicts with the principle of a Shared Zone.

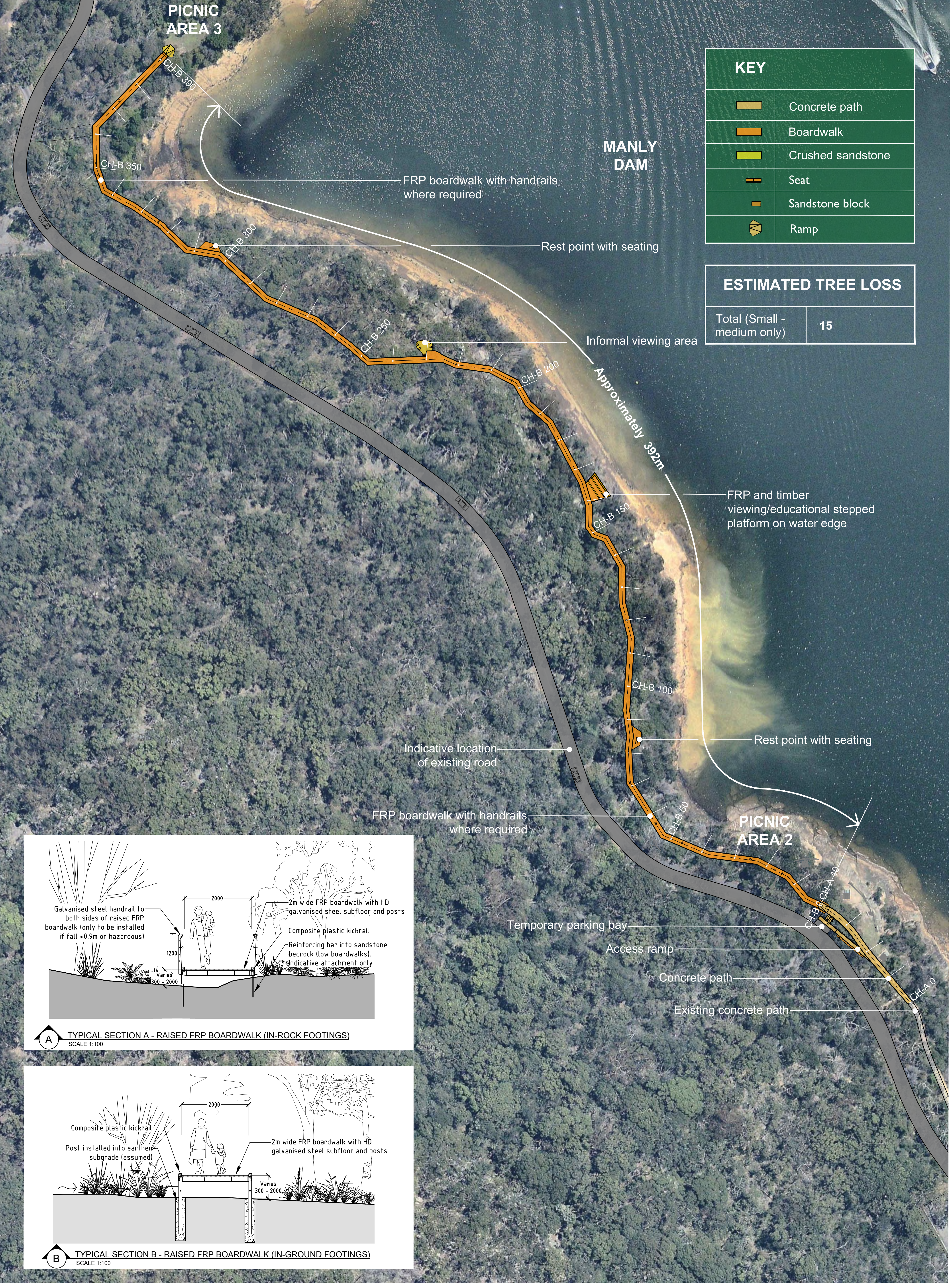
Cars

The Shared Zone will reduce the roadway's capacity because drivers will be delayed by pedestrians and cyclists who have right of way. During busy period, particularly in the weekends, these delays may cause drivers to take unnecessary risks resulting in a poorer traffic safety outcome.

Appendix A

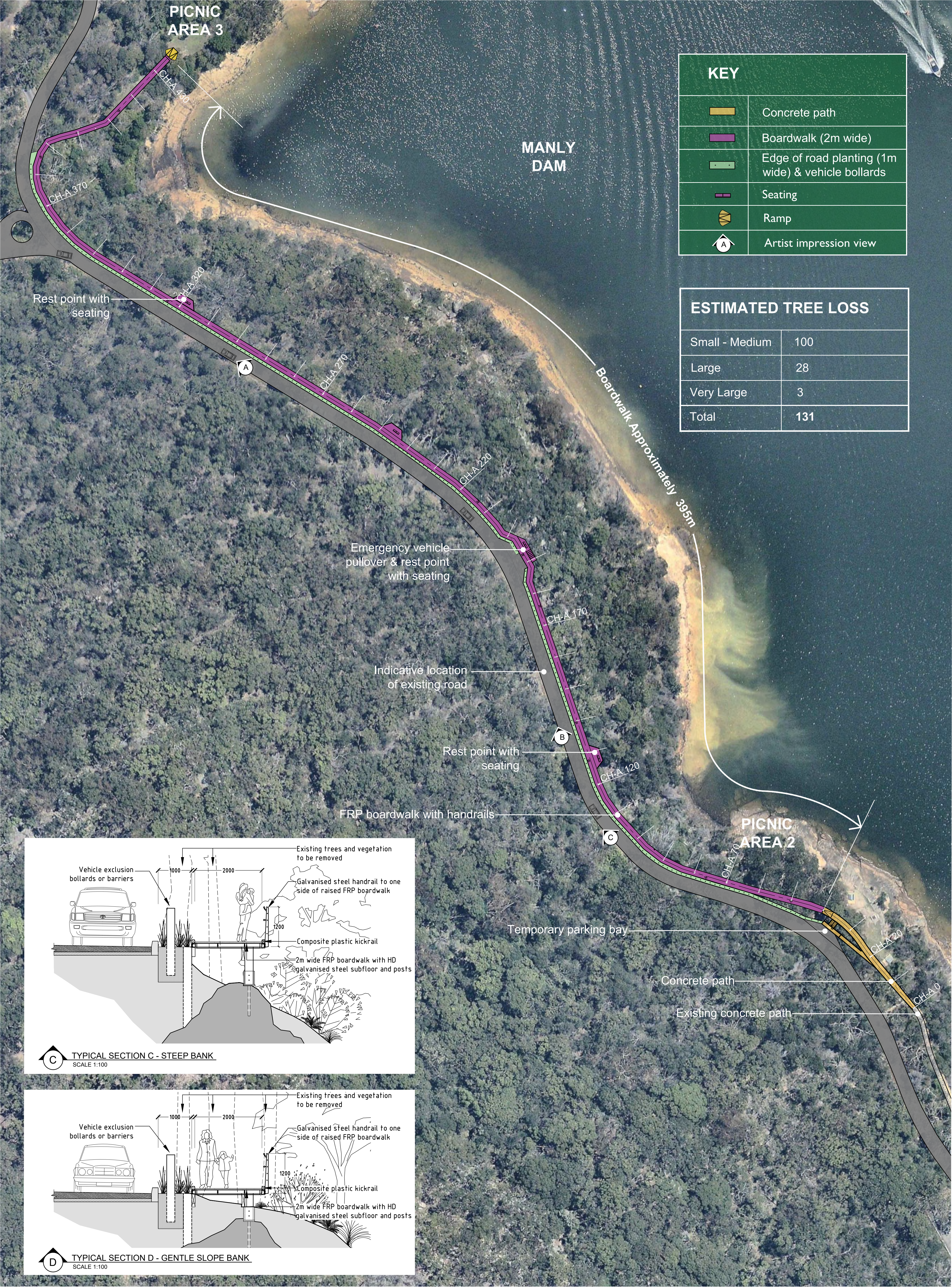
Concept Design Plans





KEY	
	Concrete path
	Boardwalk
	Crushed sandstone
	Seat
	Sandstone block
	Ramp

ESTIMATED TREE LOSS	
Total (Small - medium only)	15



KEY	
	Concrete path
	Boardwalk (2m wide)
	Edge of road planting (1m wide) & vehicle bollards
	Seating
	Ramp
	Artist impression view

ESTIMATED TREE LOSS	
Small - Medium	100
Large	28
Very Large	3
Total	131

