PROTECTING VULNERABLE ROAD USERS IN TEMPORARY TRAFFIC MANAGEMENT (TTM) ENVIRONMENTS

Practice Note

v1.0 | December 2023

CIVIL CONTRACTORS NEW ZEALAND

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Protecting Vulnerable Road Users in Temporary Traffic Management environments

Practice Note

The production and publication of this practice note was sponsored by Downer New Zealand Limited and McConnell Dowell Constructors Limited as part of respective Enforceable Undertakings agreed with WorkSafe New Zealand under Section 123 of the Health and Safety at Work Act 2015.

The Enforceable Undertakings[84; 85] that led to this Practice Note arose from a tragic event involving the loss of a cyclist's life in October 2019 at a construction site in Christchurch, New Zealand. This practice note seeks to contribute to the prevention of such incidents in the future.

This practice note is intended to fit within the TTM Library outlined within Waka Kotahi's New Zealand Guide to Temporary Traffic Management (NZGTTM) (version 1.0) as an *operational practice note* [77]

Version 1.0

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Document Information

Document details

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This document is intended to provide guidance on the treatment of vulnerable road users in Temporary Traffic Management in New Zealand and is based on research and practices as understood at the time of publication. While the content may be cited and referred to, it should not be misused or misrepresented for purposes other than those for which it is intended. The document remains the intellectual property of WorkSafe New Zealand, and any changes to its content should be approved by the appropriate parties.		

Revision table

Version *Date*	Author(s) *Reviewer(s)*	Details of Revision
Version 1.0 *15 Dec 2023*	Dave Tilton, Parallaxx *Dr Glen Koorey, ViaStrada* *Dr Bridget Doran, MRCagney* *Dr Dan Sullivan, Solutions in Transport* *(Part D review only)*	Initial publication

Practice Note Structure

Part A: Primary Guidance (for all audiences)

This is for all audiences who have a role in keeping vulnerable road users safe in temporary traffic management environments.

Pages A1 - A3

Part B: For Clients and Road Controlling Authorities

For use by Clients or Road Controlling Authorities (RCAs) responsible for commissioning work or managing road networks with TTM involved.

Pages B1 - B5

Part C: For Contractors and Subcontractors

For PCBUs undertaking activities that impact Vulnerable Road Users in the road environment, including TTM Subcontractors.

Pages C1 - C6

Part D: For TTM Designers

For those designing TTM environments that affect Vulnerable Road Users.

Pages D1 - D62

Part E: For Field Staff

This is for use by field staff who implement and maintain temporary traffic management, such as site traffic management supervisors (STMSs).

Pages E1 - E9

Part F: Physical TTM Control Measures

Detailed information on physical control measures for use to enhance the safety and accessibility of people in TTM environments

Pages F1 - F27

Glossary, References, and Appendices

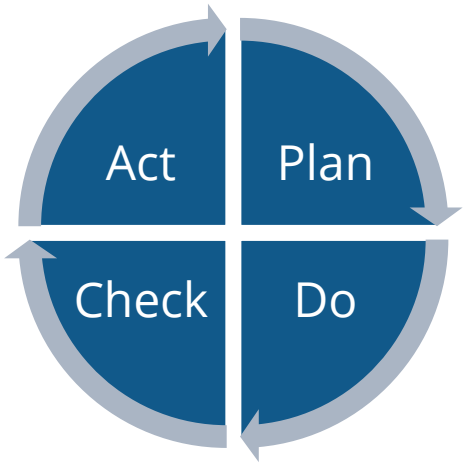
Includes a complete glossary of terms and all references used within this Practice Note. Also holds appendices (forms, checklists) that are provided as part of this guidance.

Pages GRA1 – GRA40

How to use the parts of this Practice Note

If you represent a Contracting PCBU (a principal/client)	Read and use **Part A** (applicable for all roles and organisations)	Read and use **Part B**	**The following may also be helpful:** - Glossary, references & appendices section: o Glossary o Appendix A (Procurement assessment)
If you represent a Road Controlling Authority (RCA)			**The following may also be helpful:** - Glossary, references & appendices section: o Glossary o Appendix B (VRU Safety Assessment)
If you represent a Contractor or Sub contractor (you engage with TTM as part of your work)		Read and use **Part C**	**The following may also be helpful:** - Part F (control measures) - Glossary, references & appendices section: o Glossary o Appendix C (Contractor/Subcontractor review for TTM)
If you represent a TTM specialist contractor (or division)		Read and use **Parts C & F**	**The following may also be helpful:** - Glossary, references & appendices section: o Glossary o Appendix D (planning process) o Appendix E (configuraiton selection) o Appendix F (dimensional guidance) o Appendix G (peer/risk review)
If you are a TTM Designer (sometimes referred to as a TTM Planner)		Read and use **Parts D & F**	**The following may also be useful:** - Glossary, references & appendices section: o Glossary & References o Appendix D (planning process) o Appendix E (configuration selection) o Appendix F (dimensional guidance) o Appendix G (peer/risk review)
If you are a Site Traffic Management Supervisor (STMS) or other field worker.		Read and use **Part E**	**The following may also be helpful:** - Part F (control measures) - Glossary, references & appendices section: o Glossary o Appendix F (dimensional guidance) o Appendix H (pedestrian on-site risk tool) o Appendix I (cyclist on-site risk tool)

Keeping up with Good Practice



Any good practice system relies on being up-to-date – and capturing improvements as frequently as possible.

The **Plan-Do-Check-Act cycle** is a well-known continuous improvement process that applies to this document. A process of checking and acting to continue improving this practice note will be necessary for the safety of people in TTM environments in New Zealand.

Figure 1 - Plan-Do-Check-Act Cycle[12]

With a few exceptions, most international TTM guidance gets refreshed approximately every eight years[66] – this is far too long to stay current.

To remain current, this practice note will be updated as often as possible when new good practice emerges. This will happen in three ways:

1. Engagement with the **NZ Temporary Traffic Management Industry Steering Group (NZ TTM ISG)** to promote discussion of technological and regulatory updates.
2. Biennial formal reviews, regular scanning to update the practice note with the latest research findings, and revisions post-significant incidents for continuous learning and improvement.
3. A broad open feedback mechanism from diverse sectors.

What can you do to help with good practice?

Keep a record of your good practices. When something works and keeps working, record it.

Feed back what works up the chain. If you are an STMS, tell your organisation when something is working well and might be good practice.

Email CCNZ (info@civilcontractors.co.nz) or the TTM ISG (info@ttm-isg.org) with any learnings. The more you share what you learn, the more people can be safe.

Part A: Primary Guidance

This part is for use by all audiences who have any role in keeping Vulnerable Road Users safe in Temporary Traffic Management (TTM) environments.

This part includes instructions for using all other parts, definitions, and principles.

This part includes the following guidance:

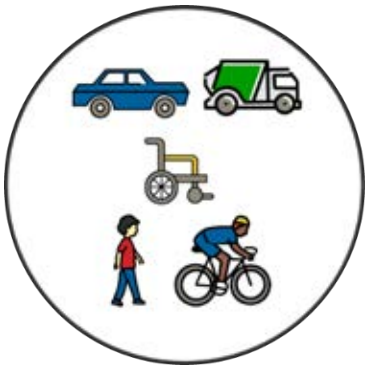
Part A: Primary Guidance

Why guidance is needed for Vulnerable Road Users in TTM

Between 2001 and 2021...[76]

One thing you will notice about this guidance is a significant **focus on disabled people.**
This is deliberate.
These people are among the most vulnerable on the road and can have the highest needs. **If you make it safe for disabled people, you make it safe for everybody.**

Vulnerable Road Users are the most at-risk group, yet they generally receive the **least attention** in temporary traffic management planning[57; 64]



We have a history of focussing our temporary traffic management effort on cars and treating people walking and cycling last[38; 57].
This practice note challenges you to do the opposite.
Design for the vulnerable road users first.

Everyone in temporary traffic management needs to understand **why we must protect vulnerable road users.** Without the why, solutions and control measures are superficial and less effective[37].

People who work in the road environment (including TTM) also walk and cycle, just like their families. **Making TTM sites safer for everyone** helps them, too[63].

How to read and implement this practice note

What is a practice note, and what is good practice?

A Practice Note is a **how-to guide** for doing your job better – in this case, **keeping vulnerable road users safe in temporary traffic management environments.**

It gives **advice** based on what experts and research say **works**[9].

It is not a bunch of theories but **practical tips** and **steps** to **make things safe**[33].

Everything in a practice note should be based on **evidence**. Things that are **tried and tested**.

What is good practice?

In TTM, we often hear about "best practices," but the aim here is "good practice."

The difference is that "best" can make it sound like there is only one perfect way to do something, which is not always true[15].

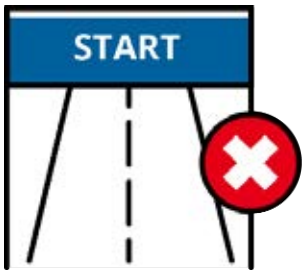
"Good practice" is about finding smart, effective ways to get the job done backed by real evidence.

Conditions of good practice		
Good practice means a method or technique **aligned with a** specific objective **that is:**		
	Condition	Explanation
	**Validated by solid evidence**[15; 33]	This means that good practice is not just a neat idea someone has; it is a method that has been tested and proven to work effectively.
	**Consistently yields better results compared to other approaches**[58]	This means that good practice is not just about doing something well once, but it is a way of doing things that usually turns out better than other ways you could do it.
	**Designed to be iterative, adapting and improving over time**[18]	Good practice is not set in stone; it evolves and changes to get better results as we learn more.
	**It is reliably used and can adjusted to fit different settings**[58]	This means that good practice is what most reasonable people or organisations do when they want to do things well. It is a trusted method that can work well even if you change a few things.

What does this practice note cover, what it does not, and some details about how it is written

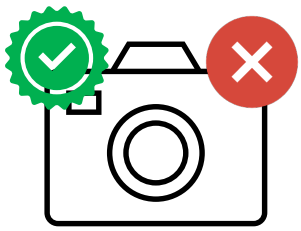
Examples are given as much as possible to help understand the guidance[21]. These examples are not meant to be templates or recipes for direct copying.

Lists are used in some places – these lists are not to be treated as complete, and they may list some but not all possible examples.



This practice note is primarily aimed at the construction sector, not special events or filming operations. While the guidance may be applicable in those contexts, the language and examples are tailored for construction activities. Such events guidance would be developed separately.

This practice note is not intended for emergencies that require highly dynamic and immediate traffic management. While some principles may be applicable, the focus is on planned construction works.



This practice note uses photos in many places to provide examples (including from other countries). Where these photos are negative (examples that should not be copied or replicated), these are marked with a red “x”. Where they show a positive example, they are marked with a green tick.

The Language of this Practice Note

The language of disability

In this practice note, the social model of disability is adopted, which views disability as a result of societal barriers rather than an individual's issue[54]. The term 'disabled people' is used to emphasise the impact of inaccessible transport. This language choice aligns with the principles outlined by the Ministry of Social Development[39] at the time of writing, highlighting the importance of inclusive communication. Our approach aims to promote understanding and inclusivity in discussing disability-related topics.

Other important language

Vulnerable Road Users. In this practice note, we use the term vulnerable road users as it is widely recognised within the TTM industry and aligns with existing other guidance. While there is a valid call to evolve beyond this term for inclusivity, this guidance aims to provide practical information digestible by its audience, maintaining familiar language. It acknowledges that future iterations may explore alternative terminology, but for now, it builds on established industry terminology to communicate its insights effectively.

Motor Vehicles and Traffic.

In this practice note, we use the term 'motor vehicles' to refer to powered vehicles like cars and trucks, distinguishing them from non-motorized "vehicles" like bicycles.

Also, by minimising the use of 'traffic,' we shift the focus to the individuals operating these motor vehicles, emphasising the human factor in decision-making and actions. This approach highlights that safety and responsibility ultimately lie with people, not just vehicles, aligning with our goal of promoting safer and more responsible road use.

'Must', 'Should', and 'Could'

The following table is used at the start of each section to highlight what different parties MUST and SHOULD do concerning vulnerable road users in TTM environments.

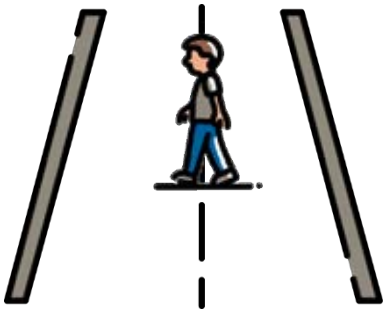
	**A legal requirement that has to be complied with.** These directives are legally obligatory due to their critical role in ensuring safety.
	**A recommended practice or approach.** These are preferred methods for enhancing safety, but alternative approaches may also be valid if they achieve the same safety outcomes. Words such as **shall** and **could** may also be used for the same purpose.

Who are Vulnerable Road Users?

People who are at heightened risk in Temporary Traffic Management (TTM) settings

People outside of motor vehicles **behave differently from those driving motor vehicles.**
They travel at different speeds, in a manner different to traffic, and manoeuvre differently.

Vulnerable road users can **move in various directions** without being confined to designated lanes, leading to unpredictable paths within the road corridor.



Vulnerable road users have **limited protective measures compared to users of registered motor vehicles.**
They are not in an enclosed motor vehicle cab, most do not have horns or indicators, and most cannot react quickly to avoid collision.

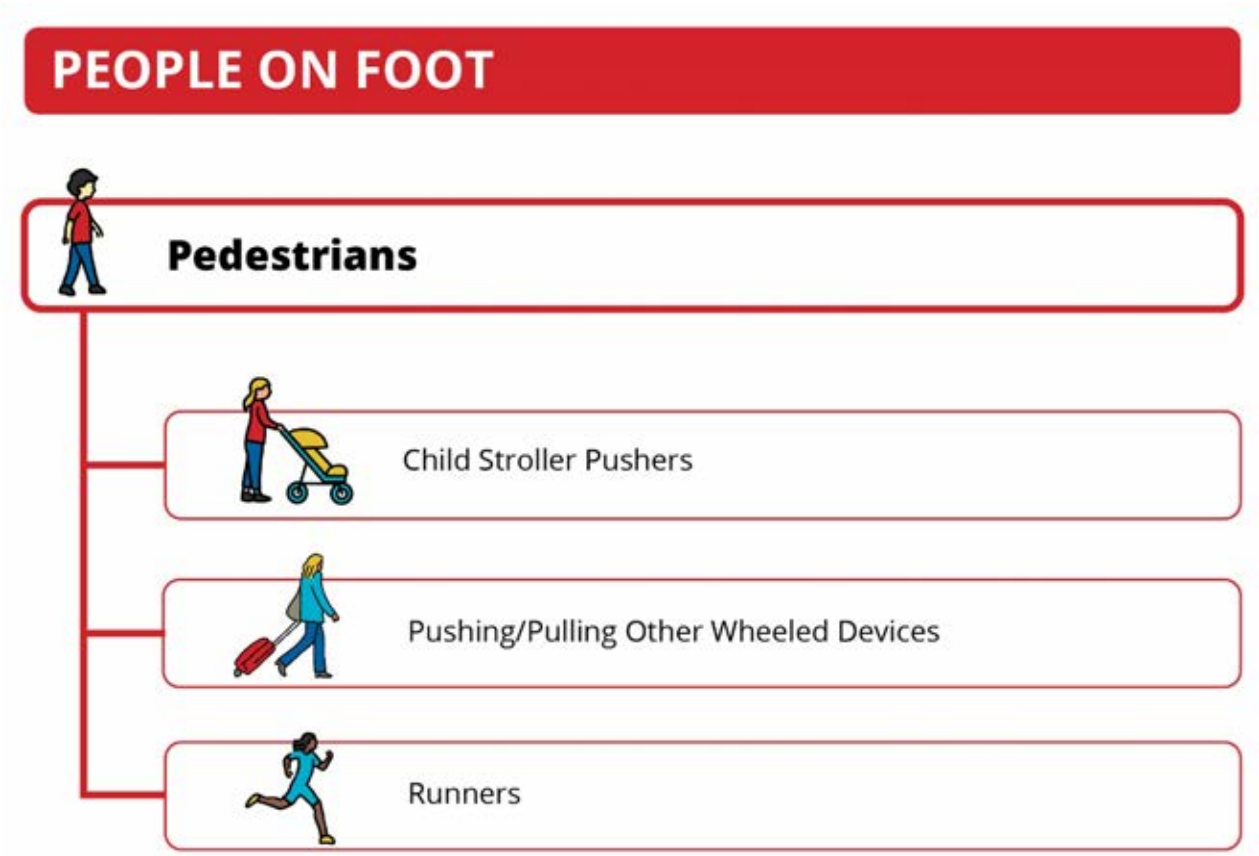
Who is vulnerable but not covered by this practice note?

Motorcyclists are not covered by this practice note because, despite their vulnerability, they operate registered motor vehicles that travel in designated lanes at speeds similar to other motor vehicles, requiring different TTM measures.

This practice note does not cover workers because the safety measures designed to protect them in TTM settings are distinct from those aimed at the general public.

Types of Vulnerable Road Users

Here is a list of the different types of vulnerable road users. We have divided them into two main categories: **those on foot** and **those on wheels**. Each category lists sub-groups alphabetically to help you understand who we are talking about.

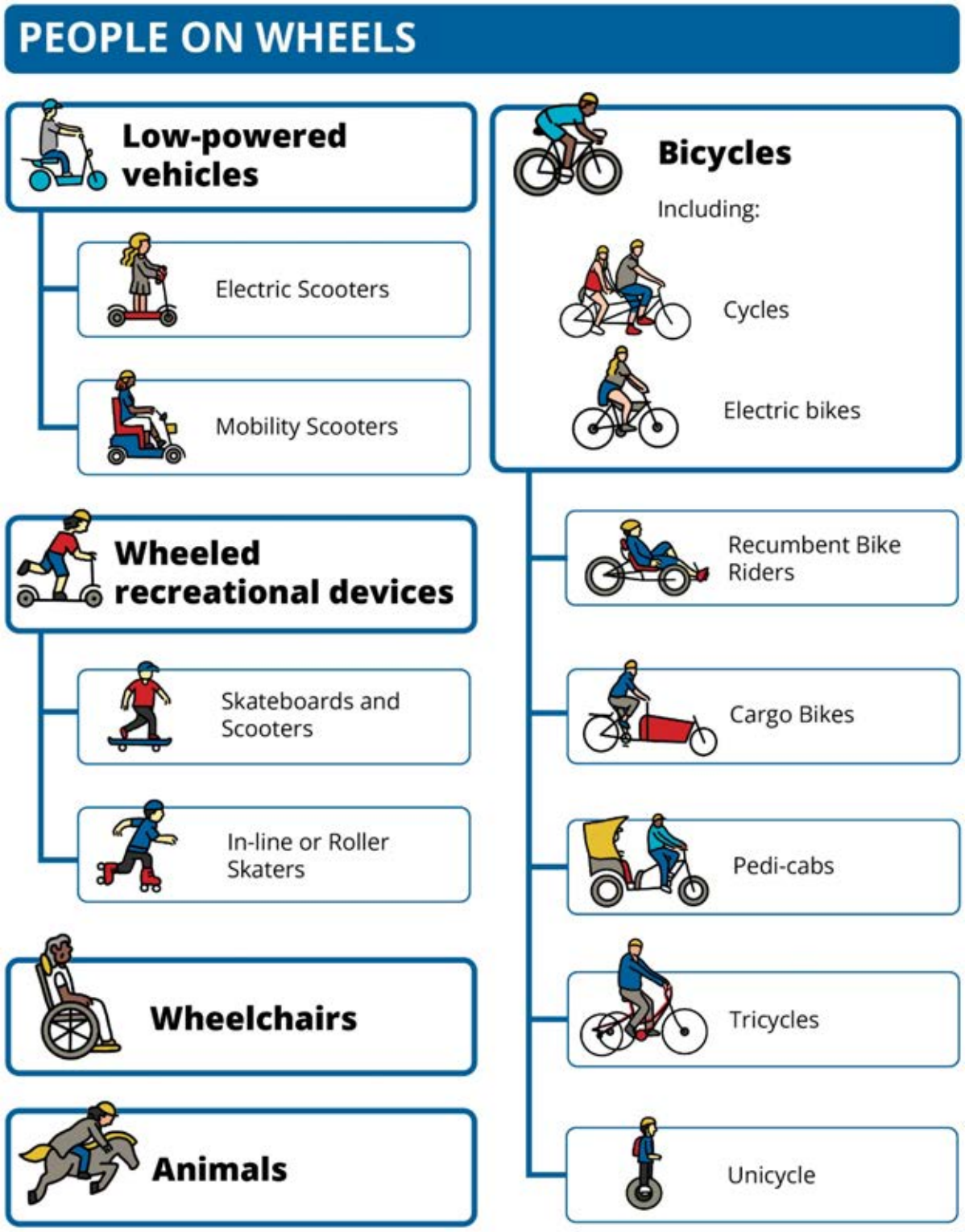


Pedestrians encompass a broad spectrum of individuals, from children to older adults, each with unique needs and abilities.

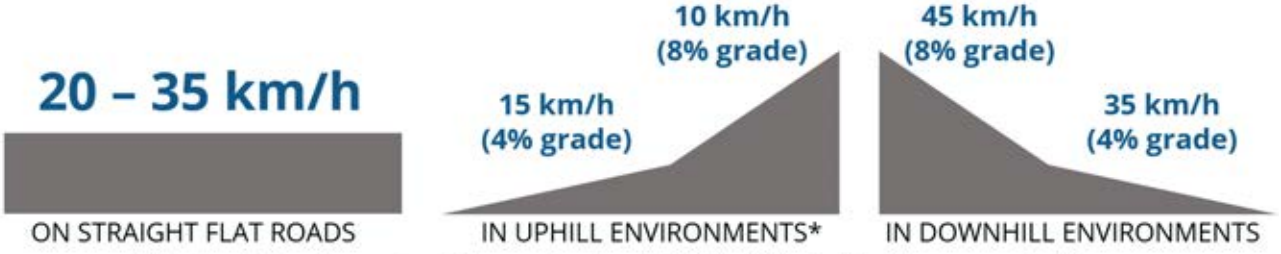
Diversity among pedestrians includes factors like age, physical capabilities, and mobility aids, such as walkers or strollers.

Recognising this diversity is essential in TTM design to ensure safe and accessible pathways for all pedestrians.

To create inclusive and safe environments, TTM measures must consider factors like crossing times for children or accommodating people who have low vision.



Did you know cyclists average travel speeds are approximately[71]:



*Note: in uphill environments, e-bikes can travel up to 10-15 km/h faster than these approximations

Where Vulnerable Road Users travel

Here, we look at where different types of vulnerable road users are **legally allowed to travel.** Whether there are footpaths, cycle lanes, or shared paths, knowing where these users should and should not go is essential for designing for their safety.

However, it is essential to note that people often choose the **path of least resistance**, even if it is not strictly legal. Research indicates that cyclists and pedestrians may use different parts of the road if they believe it is safer or more convenient[40; 57; 87].

Pedestrians, low-powered devices, and mobility devices may use footpaths

Only people riding bikes may use on-road cycle lanes

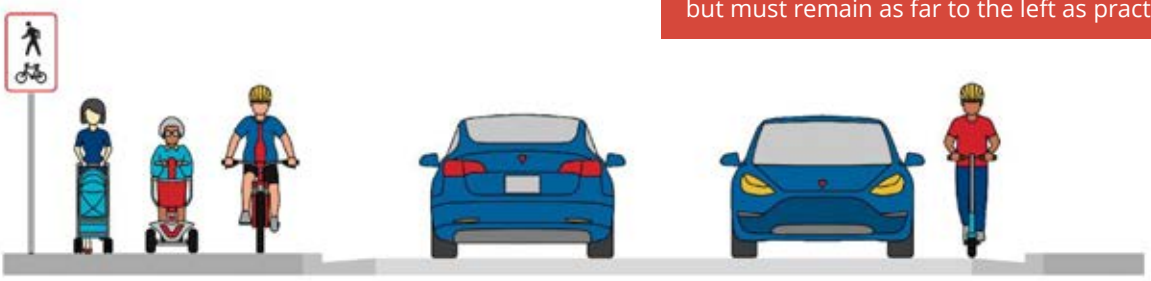
Wheeled recreational devices may also use footpaths

Cyclists must ride as far to the left as practical (whether there is a cycle lane or not).
In some cases this may not be practical or safe, and cyclists may 'take the lane'.

Pedestrians must use the footpath if there is one, and if not, they must remain as close to the edge of the roadway as practical

Pedestrians, cyclists, wheeled recreational devices, mobility devices, or low powered devices may all used a shared path

Low powered devices may use the roadway but must remain as far to the left as practical



Disabled People

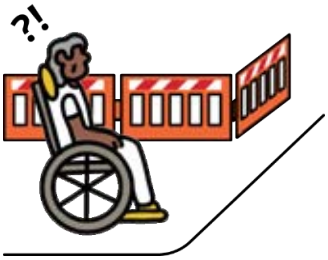
People are disabled by environments that are not accessible for them. The environment is disabling when some people can use it safely and comfortably, but others cannot. Poor planning can worsen these limitations in the TTM context, discouraging disabled people from using the road network[14]. **Walking and cycling are often the only options for transport disabled people have.** In TTM, we must understand people's challenges on our sites.

Disabilities are not necessarily permanent; the environments we create can make it harder for people with temporary medical conditions, for example.

Physical Abilities

Some people face mobility challenges navigating inaccessible road environments. Examples include rough surfaces, steps, or long detours[49]. Examples include people using wheelchairs or those using mobility aids like crutches.

Someones physical ability can result in:



Difficulty in moving through narrowed or very angled routes

Difficulty with uneven surfaces and changes in levels or slopes

Inability to cross safely or cover long detours

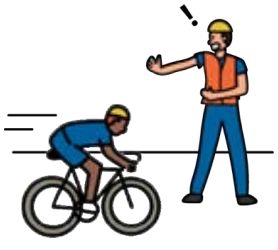
Cognition

These **affect a person's mental processes**, such as memory, attention, reasoning, problem-solving, communication, or learning[43].
Examples include dementia, which can cause confusion and disorientation in unfamiliar environments, or autism spectrum disorder, which can make it difficult to cope with sensory overload and changes in routine.

Awareness of normal human variation in cognitive abilities means knowing that:

Some signs can be confusing for some people

Flashing lights or noises that could make some people anxious or uncomfortable

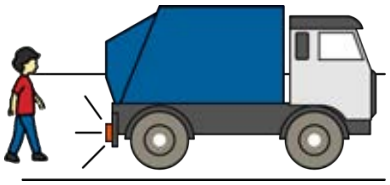


Some people need more time than others to react to sudden movements

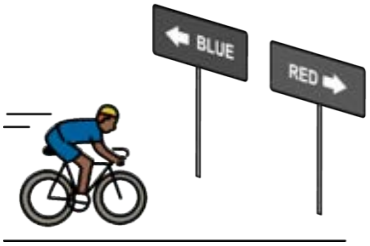
Senses

Environments that do not adequately accommodate human sensory variation can introduce danger. Safe environments cater to everyone, including people who have little or no vision, who have colour blindness, who have little hearing or who are Deaf.[1].

People with canes may struggle with visual directional signs not accompanied by tactile cues at the right height for their cane.



Those with hearing impairments may not respond to auditory cues like nearby traffic or a truck's reversing beeper.



Individuals with colour vision deficiencies might not recognise the significance of coloured safety markings.

Intersectionality

Intersectionality refers to the overlapping of physical, cognitive, and sensory disabilities, along with other variables like age or language, that can compound challenges for vulnerable road users in TTM settings[14] (see **Error! Reference source not found.**).

For example, an older person who has trouble seeing (visual impairment) and who has trouble walking and keeping their balance has multiple disabilities intersecting - which makes their experience of TTM even more challenging.

TTM provisions should ensure environments are safe for everybody.

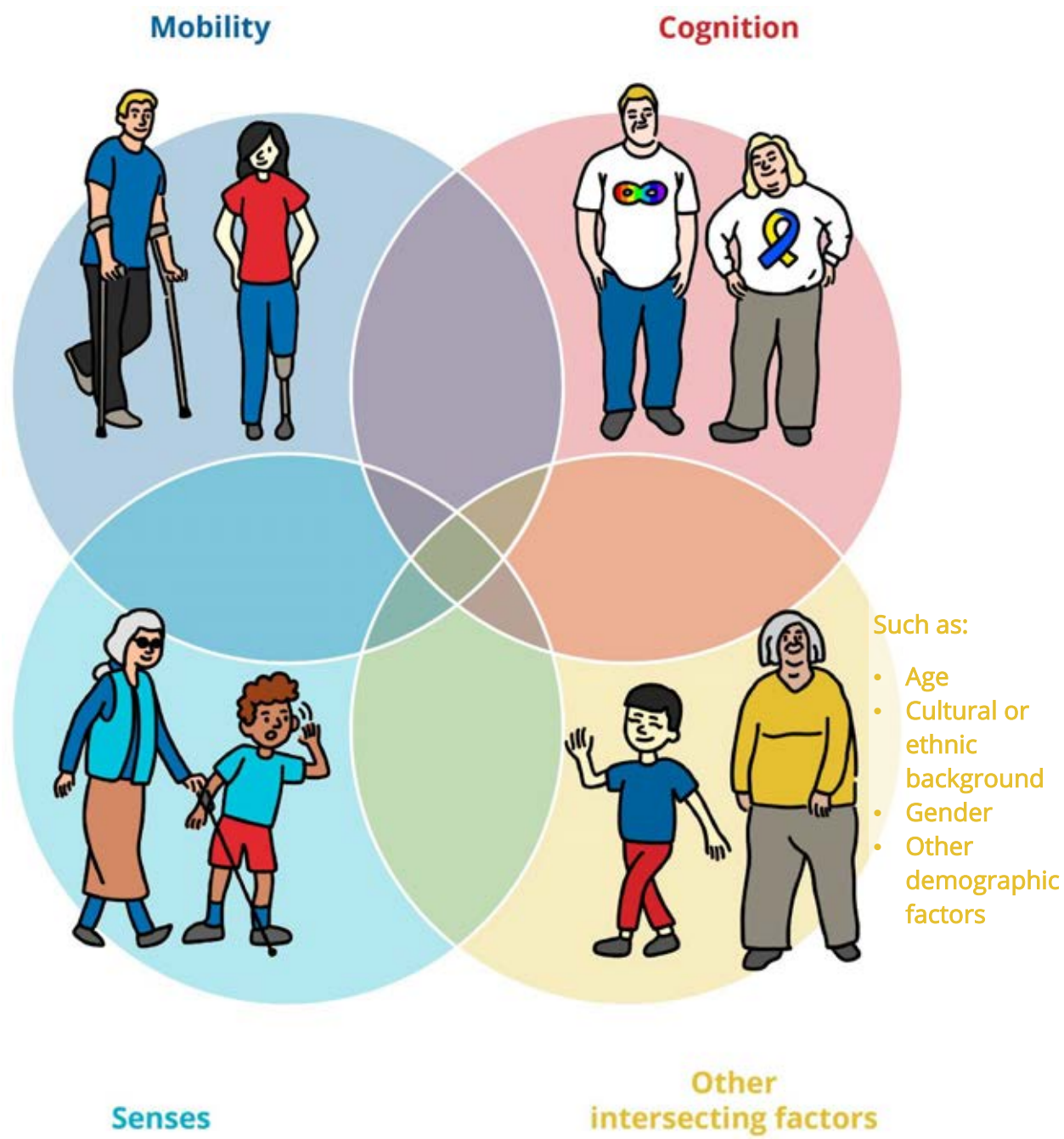


Figure 2 - The intersectionality of human characteristics

Why focus on Disabilities?

The people who need the most care and addition in TTM environments to be safe are **disabled people.**

The great news is that **if they are safe, everyone else will be too.**

Disabled people are challenged by even simple TTM shortfalls, like a missing fence panel or a sign that is sticking out slightly too far.

If you make it safe for those disabled people, you make it safe for everybody.

Psychological factors

Understanding the psychology of vulnerable road users is crucial for effective TTM.

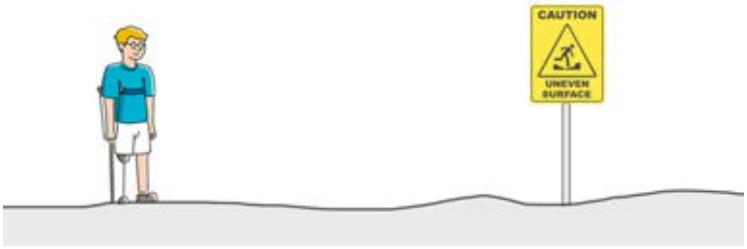
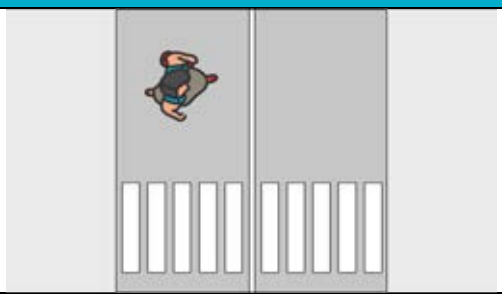
How **people think and feel** directly influences their actions on the road, which can either enhance or compromise safety measures.

Psychological factors include preferred routes, confidence levels, and how easily they get distracted. These factors **introduce unpredictability** that TTM sites must account for.

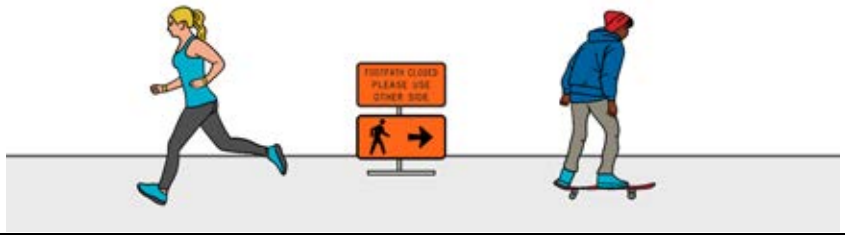
While engineering solutions like fencing aim to minimise the need for decision-making, the reality is that **human behaviour is a variable that cannot be entirely controlled.**

Therefore, TTM measures should be designed to direct and resonate with road users' psychology, **encouraging safer and more predictable behaviours.**

The following examples of psychological factors are just some considerations to account for in how vulnerable road users behave around TTM.

<table>
<tr><th colspan="2">Vulnerable road users like to follow familiar and comfortable routes. This is sometimes referred to as 'the path of least resistance and most comfort'[40; 57]</th></tr>
<tr><td> 
</td><td>  </td></tr>
<tr><td>If you present an unrealistic path for people to follow, with lots of bumps, it is unlikely to get used. This means your control measure is not working, and you need to do something different as your current approach creates more risk.</td><td>Pedestrian crossings far from usual crossing points may be ignored, leading to risky behaviours.</td></tr>
<tr><th colspan="2">Highly mobile and confident people are likely to take shortcuts, while less mobile individuals find detours challenging[28; 41]</th></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>A cyclist may ride on the footpath to bypass a worksite, posing a risk to pedestrians.</td><td>A person using a wheelchair may avoid a detour altogether if it appears too complicated or has an unsuitable surface and decides to cross the road in an unsafe area instead.</td></tr>
</table>

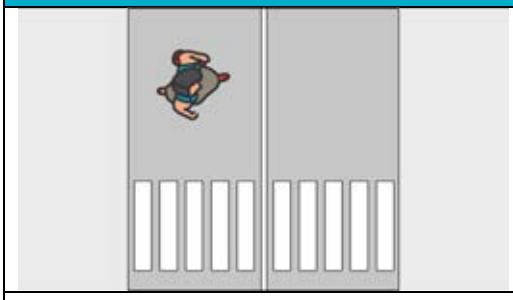
Different people have different perceptions of risk[28]



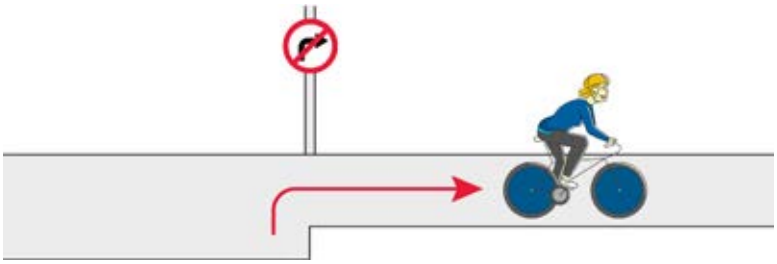
Because so many of our control measures in TTM rely on people *choosing* to follow them – we can expect a wide range of behaviours. The more you can get a consistent, predictable response from vulnerable road users (by giving them a clear and obvious path to follow – the safer their choices will be.

Cyclists will have different speeds depending on how confident they are. Just because some are going slow does not mean all will be.

People outside motor vehicles make trade-offs for their safety and comfort when environments are not well designed.[50; 56]



Individuals confident in their ability to judge traffic speed and distance may jaywalk[1] instead of using designated crossings.



Confident cyclists may continue riding through stop signs or stop paddles or ignore restricted movements if the route is faster and they think it is safe to take the risk.

Lots of pedestrian-related collisions are due to distraction and unawareness[34]

What does this mean for TTM?

People listening to music or using cell phones will likely miss audio cues or instructions from signs. Having multiple control measures helps ensure distracted people have multiple ways to get important information about what to do.

The more complex you make the environment, the more likely people will make mistakes. Keep it simple and repeat the exact instructions over and over.

[1] Jaywalking refers to crossing the road outside of designated crossings or against traffic signals. This is not illegal in New Zealand, unless it is within 20m of a designated crossing or set of traffic signals[23].

Case Studies

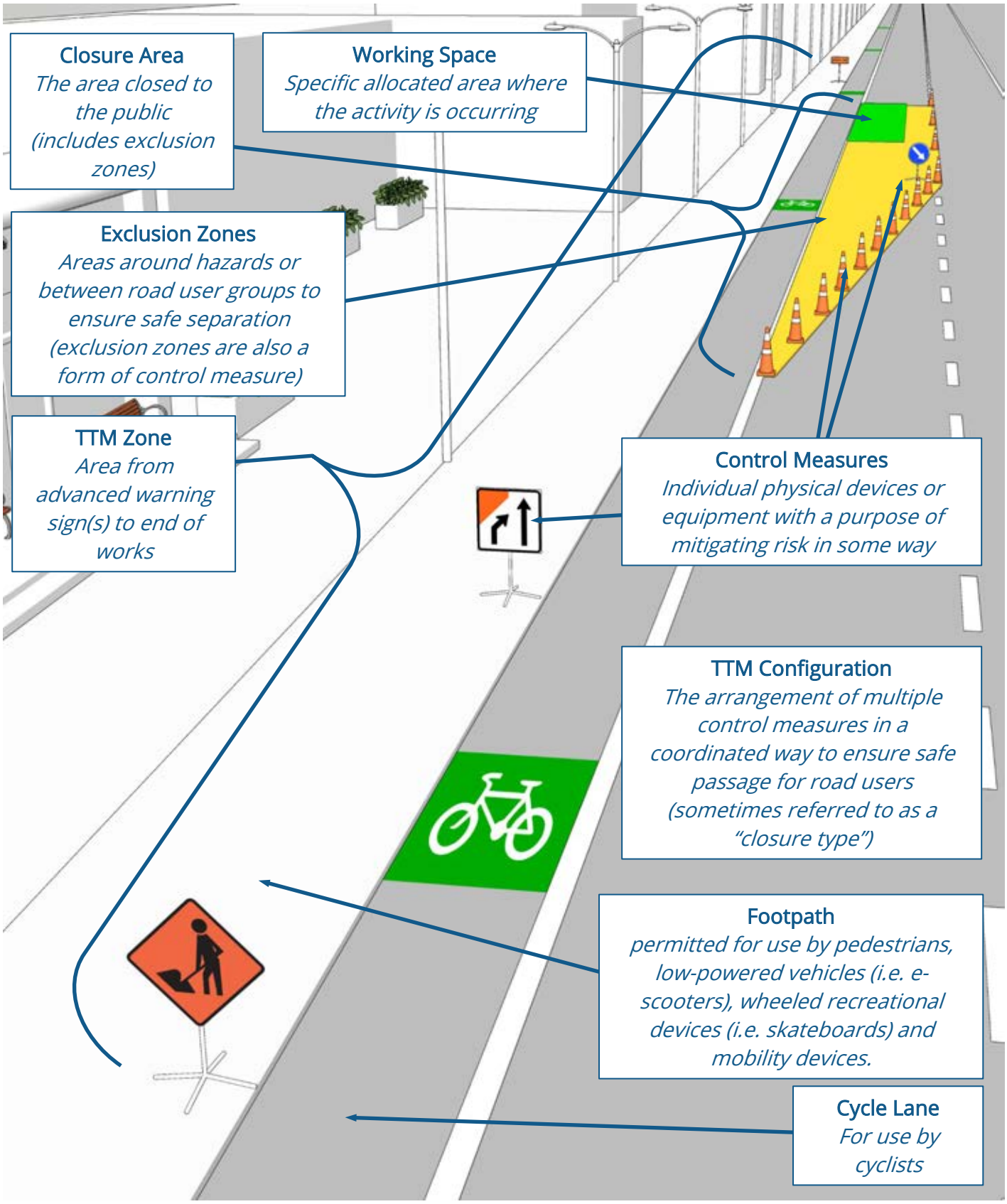
Case studies are **real-world examples** that help you practically apply this guidance. Like this one, you will find case studies in light blue boxes throughout this document.

They show you **lessons learned by others**—both what to do and what to avoid.

Whether it is a **warning example** with significant consequences or a **success story** worth replicating - these **case studies offer valuable insights** for your TTM situations involving vulnerable road users.

List of Case Studies

Key Terms



Glossary

A complete glossary of terms, including **acronyms** and **definitions**, can be found on Page GRA1 in this practice note's **Glossary, References and Appendices** section.

References

An important aspect of anything to do with *good practice* (like this practice note) is that it is **evidence-based.**

That means the guidelines and information are based on real-world examples and trusted studies.

When we have used information from other places, you will see a number right next to it, like what is shown below:

If you want to know more about where that information comes from, you can find that number in the **references section** at the end of this practice note.

This way, you know our advice is solid and reliable, and you can also go and find more details if you want to.

Appendices

Appendices are included at the end of this practice note to give you easy access to forms or checklists that you might use more than once.

List of appendices

Overall principles to maximise the safety of Vulnerable Road Users in TTM

Having some easy-to-understand principles for managing vulnerable road users in TTM means we can hold each other accountable simply.

You will find these principles used across this practice note at every level.

These principles should become foundational to how we manage the safety of vulnerable people in TTM environments.

We should all be able to remember them by heart.

These principles are very similar to the permanent design principles for pedestrians published by Waka Kotahi in 2023[78][2] – they have also been adapted to be relevant for cyclists. This means we should all be following the same approach to keeping vulnerable road users safe on our roads – regardless of whether it is permanent or temporary.

[2] 'Step-free' (from the Waka Kotahi Pedestrian Network Guidance) has been replaced by 'Smooth and Stable'.

Safe

The **Safe** principle ensures everyone stays out of harm's way in TTM setups, especially vulnerable road users like people walking and cycling.

First, have a solid plan to tackle risks - a **comprehensive risk assessment and management plan.**

This means looking at **risks from** the **environment**, the **activity**, and the risks that come with the **control measures** you put in place.

Keep an eye on things to ensure your plans work as they should.

Image Credit i: Parallaxx

Image Credit ii: New York DOT[45]

Next, always seek the lowest total risk[77].

Sometimes, a solution to one problem might cause another. For instance, moving pedestrians away from a dangerous worksite is good, but maybe not if it means they have to cross a busy road instead.

Every safety measure should be checked to ensure it **does not lead to other risks.**

Lastly, when designing your TTM setup, think about **safety first.**

So often, when TTM gets planned and delivered, priorities like cost, traffic disruption, or convenience get pushed to the top. **Safety must be the priority.** It is the primary reason we have TTM.

Obvious

The **Obvious** principle emphasises making Temporary Traffic Management (TTM) setups easy to understand at a glance for all road users, regardless of their abilities.

Firstly, TTM setups should be **clear and easily understood**.

The layout should be straightforward so everyone knows where to go without confusion.

Image Credit iii: Betty Mitrova

Image Credit iv: Parallaxx

Next, focus on **signage and markings**. They should be **legible and straightforward** to navigate, reducing the chance of unsafe decisions that could lead to accidents.

They should remain clear even in bad weather or low light.

Lastly, ensure **accessibility for all users**, including disabled people.

TTM setups should allow easy movement for everyone, regardless of their physical capabilities. This means keeping pathways wide, flat, and free of obstacles and providing ramps where necessary.

The goal is to ensure that no one feels excluded or at risk due to the TTM setup.

Image Credit v: Jeanette Ward

Image Credit vi: Parallaxx

Smooth and Stable

The Smooth and Stable principle advocates for creating step-free environments that will not cause harm if used by vulnerable road users.

Firstly, it is essential to ensure that environments are accessible and free of hazards. This means removing any obstacles that could cause harm or impede movement.

It is about keeping the ground clear and ensuring it is stable and easy to move on, whether on foot or on wheels.

Image Credit vii: Parallaxx

Image Credit viii: Traffic Management and Control

Secondly, focus on **direct routes.**

It is essential to prioritise the **shortest and most straightforward routes for VRUs.**

One way to do this is by making the shortest and straightest path for these vulnerable users, as shown in Figure 3.

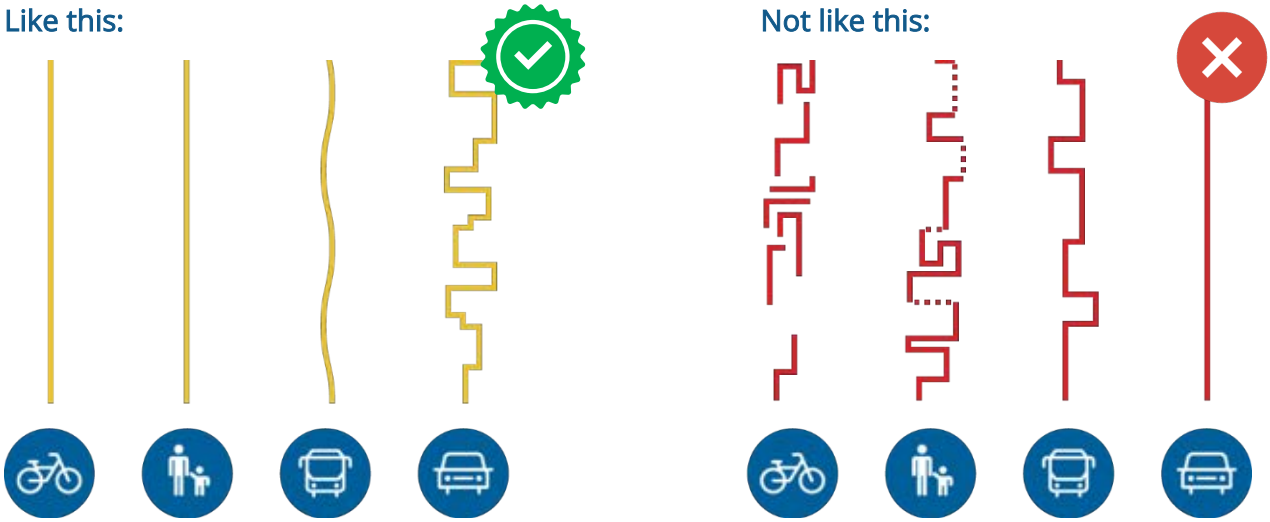


Figure 3 - Applying the principle of 'safe' to vulnerable road users in TTM[53]

Longer paths can tire them out and lead to them breaking the rules, making things riskier. So, when deciding on routes and spaces, **consider vulnerable road users before motor vehicles.**

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Part B: For Clients and Road Controlling Authorities

This part is for use by Clients (also called *Contracting PCBUs*) who commission work that involves TTM affecting Vulnerable Road Users (including but not limited to Road Controlling Authorities (RCAs), utility asset owners, or property developers).

This part is also for use by Road Controlling Authorities (RCAs) responsible for road networks where TTM is performed that affects Vulnerable Road Users.

This part includes the following guidance:

The following appendices are relevant to this part:

Part B: For Clients and Road Controlling Authorities

Contracting PCBUs, also referred to as Clients or Principals, are those who engage other entities to perform work and need to ensure that work is done without harm to people.

Road Controlling Authorities (RCAs) oversee the road networks, ensuring safe and efficient network operation. In some cases, RCAs are the Contracting PCBUs and have multiple responsibilities under different legislation.

Contracting PCBUs MUST:

- Ensure that, so far as reasonably practicable, the health and safety of people are not put at risk by the work they are involved in[25, Section 36].
- Consult, cooperate, and coordinate activities with all other PCBUs sharing overlapping duties as far as is reasonably practicable[25, Section 34].
- Not contract out health and safety duties or push risks onto others in a contracting chain[25, Section 28].

Contracting PCBUs SHOULD:

- Prioritise health and safety by engaging in thorough planning and procurement, considering contractors' safety records, and ensuring clear monitoring and reporting procedures are in place.
- Establish a framework for worker engagement and participation, ensuring their training and competency are up to standard.
- During planning, engage with designers, contractors, and subcontractors to identify and eliminate possible risks.

Road Controlling Authorities MUST:

- Take all necessary precautions for the public's safety, traffic, and workers on or near any road, especially during construction or repairs, and require other parties involved in such work to adopt similar safety measures[35, Section 353].
- Approve Traffic Control Devices on their roads before use[32, Section 3.2(2)].
- Approve using any **TSLs** on their roads via a **TMP**[31].
- Maintain their roads in good condition and use devices to control speeds where necessary. Public safety and traffic precautions are mandatory during road construction and repair[22].
- Temporarily prohibit traffic from using a road[35, Schedule 10, Section 11].

Road Controlling Authorities SHOULD:

- Maintain open communication with all PCBUs for collaborative risk management.
- Ensure a streamlined process for TMP approval and network access coordination.
- Contribute to a shared health and safety assurance system with other PCBUs.
- Engage with the community and workers for feedback on safety measures.

Responsibilities and Duty of Care – Contracting PCBUs

Initiation and procurement

Clients or Principals initiate projects through procurement, establishing the ethos for a safety-conscious environment in TTM. Procurement practices should prioritise health and safety and review or evaluate contractors' safety records[86], particularly concerning Vulnerable Road Users (VRUs) safety.

Risk management at the design and planning stage

There is a significant opportunity for risks to VRUs to be identified and eliminated or mitigated at the design and planning stages [57]. Contracting PCBUs also significantly influences the designations of works, which can incorporate the needs of VRUs for the construction phase[56].

Leadership in health and safety practices

Contracting PCBUs are expected to promote robust health and safety practices throughout the contracting chain. This leadership ensures TTM measures prioritise vulnerable road users' safety, aligning with WorkSafe guidance[86] and HSWA 2015[25].

Continuous monitoring, review and adaption

Effective monitoring and review mechanisms ensure compliance with health and safety duties and adapt to changing circumstances. This includes reassessing resources and adopting new technology for continued safety in TTM setups, as mandated by HSWA 2015, to review the effectiveness of control measures.

Engagement with workers, community, and stakeholders

Utilise your position as a Contracting PCBU to understand and convey the needs of VRUs, especially those with disabilities, by connecting with local communities and advocacy groups. Share these insights with your contracting chain to foster safer, more inclusive TTM setups, building trust within the community and ensuring heightened safety for the most vulnerable.

Responsibilities and Duty of Care – RCAs

Given their unique statutory position, RCAs are instrumental in **bolstering** the Contracting PCBUs and Contractors **towards effective risk management.**

While Contractors often serve as the primary PCBUs managing and controlling the workplace (as per HSWA Section 37), executing effective risk control measures hinges on the **supportive framework extended by RCAs** through specific legislative mechanisms exclusive to them.

In aligning with the duty of care under Section 34 of HSWA, RCAs have a distinct role where they can **harmonise their additional legislative functions** under the Land Transport Act, Land Transport Management Act, Local Government Act, and Transport Act, with the overarching HSWA responsibilities.

This harmonisation, carried out in a **consultative, cooperative, and coordinated manner with other PCBUs**, aims to ensure that the most reasonably practicable risk solutions are actioned.

By leveraging the provisions within these other legislative frameworks, **RCAs can contribute to optimising safety outcomes**, thereby augmenting the collective effort to uphold the intent of HSWA in **managing risks proficiently.**

RCAs can support the effective management of risk for Vulnerable Road Users by:

Establishing **communication channels** with contracting PCBUs and contractors for **timely exchange of safety-related information** and **coordinated risk management efforts.**

Utilise the exclusive legislative provisions under various transport and local government acts to **facilitate optimal risk management in TTM environments.**

Provide accessible platforms for TMP submissions and approvals, ensuring a streamlined process that **promotes timely application of safety measures.**

Promote community engagement to gather insights on Vulnerable Road User needs and ensure this information is shared with contracting PCBUs and contractors for informed risk management.

Support the adoption of innovative safety technologies and practices[3] among contracting PCBUs and contractors, leveraging the legislative frameworks to encourage continuous improvement in risk management.

[3] Where such technologies or practices relate to Traffic Control Devices – the RCA plays a central role in the authorisation of such innovation through the Land Transport Act 1998.

Procuring and verifying safe TTM for Vulnerable Road Users

Refer to **Appendix A** for a Procurement Assessment for Contracting PCBUs on VRU Safety

Refer to **Appendix B** for a Vulnerable Road User Safety Assessment Tool

Consider Centralised Equipment Procurement: Leverage the purchasing power of the Contracting PCBU to acquire advanced or specialised TTM equipment like pedestrian bridges or high-quality fencing, which may be cost-prohibitive for individual contractors for more minor works[56].

Contract Clauses: Traditionally, TTM has been primarily oriented towards motor vehicles and able-person safety[20; 55]. Contracting PCBUs must pioneer a shift towards a more inclusive safety paradigm from the procurement stage. Integrate specific contract clauses that mandate a nuanced approach to safety, extending beyond general standards to address the unique needs of Vulnerable Road Users and people with disabilities.

Quality Assurance and Auditing: Establish verification systems to assure that the risk solutions for VRUs in TTM are not merely rule-compliant but genuinely effective in minimising risk to as low as reasonably practicable, especially for those with disabilities. This verification process should evaluate the real-world impact of TTM measures on VRUs, ensuring they move beyond theoretical compliance to practical safety outcomes.

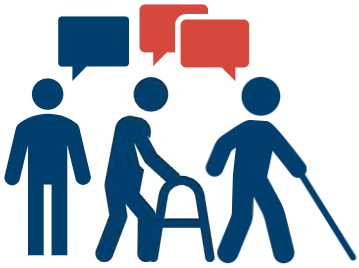
Training and Competency: Recognise that publicly available or centralised training systems may lack a substantial focus on VRUs. Encourage evidence of training and competency in addressing VRU needs within the contracting chain, highlighting that managing VRU safety requires tailored competencies.

Feedback Loops: Acknowledge that current cross-contract and cross-project learning mechanisms for safety may be inadequate. Contracting PCBUs and RCAs can lead in developing collaborative forums or platforms to share good safety practices across contractors without compromising commercial sensitivity. Enhancing the feedback process reinforces the 'Check' and 'Act' stages of the PDCA cycle.

Engaging with stakeholders regarding TTM impacts

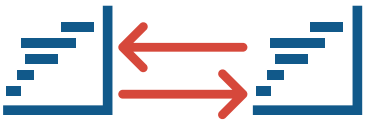
Collaborate with Disability Advisors: Foster relationships with internal disability advisors. Rather than overwhelming not-for-profit disability organisations with extensive consultation, prioritise open communication channels with in-house experts who can provide valuable insights on creating a safe environment for all.

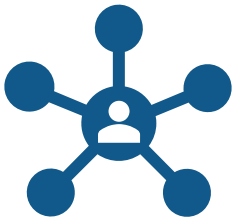
Establish Safety Liaison Channels: Create effective liaison channels between contractors, local stakeholders, and other PCBUs involved in the project. Ensure a seamless flow of safety-related information to address concerns and maintain a shared commitment to VRU safety across the project.



Conduct VRU Impact Assessments: Engage in systematically evaluating the potential impacts of TTM plans on VRUs by conducting assessments that gauge how different aspects of the TTM plans affect VRUs' safety and mobility. Integrate the findings with other PCBUs into project planning, stakeholder engagement processes, and continuous improvement mechanisms to optimise VRU safety.

Engage in Cross-Project Learning: Establish mechanisms for sharing VRU safety lessons and best practices across different projects and with other PCBUs (including other Contracting PCBUs). Encourage a culture of learning and continuous improvement by promoting the sharing of successful VRU safety strategies and the challenges encountered in different TTM setups.





Promote Public Education on TTM and VRU Safety: Engage in public education campaigns to promote awareness and understanding of TTM plans and their implications for people's safety. Utilise various mediums to share information on the TTM measures in place and how they cater to safety, fostering a culture of shared responsibility.

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Part C: For Contractors and Subcontractors

This part is for use by Persons Conducting a Business or Undertaking (PCBUs) who undertake activities that impact Vulnerable Road Users in the road environment. This may include but is not limited to roading contractors, civil contractors, utility service providers, upright and construction companies.

This part is also for Subcontractors, including specialist Temporary Traffic Management Subcontractors.

This part includes information on responsibilities and the need to integrate TTM planning into work planning as soon as possible.

This part includes the following guidance:

The following appendices are relevant to this part:

Part C: For Contractors and Subcontractors

Contractors are responsible for **carrying out the work agreed upon with the client, ensuring it is done safely and to the correct standard.**

Contractors hire subcontractors to do **specific tasks or provide services** within that work, often bringing special skills to the project.

In some cases, subcontractors are specialists in TTM and provide that expertise to contractors, including TTM design, equipment, site supervision, and field staff.

Contractors (and Subcontractors) MUST:

- Ensure the health and safety of everyone affected by the work, doing what is reasonably practicable to manage risks[25, Section 36].
- Work with all involved parties to manage safety and other overlapping duties[25, Section 34].
- Managing risks following the **Hierarchy of Controls**[24, Section 6].
- Engage with workers on health and safety matters [25, Section 58].
- Provide adequate training, instruction, and supervision to workers so that health and safety risks can be managed[25, Section 36(3)(f)].
- Ensure the ongoing effectiveness of any control measures put in place to manage risk[24, Sections 7 & 8].
- Not discriminate against any person due to their age or the presence of any disability[26].
- Not compromise the effectiveness of any measures at rail crossings[51].
- Seek approval from the Road Controlling Authority (RCA) before installing any traffic control device in the road environment[32, Section 3.2(2)].

Contractors (and Subcontractors) SHOULD:

- Engage in proactive steps to enhance health and safety at the worksite.
- Utilise a centralized prequalification system for easier vetting of potential sub-contractors.
- Ensure regular site inductions and safety briefings, like toolbox talks, are conducted.
- Foster a culture of continuous improvement in health and safety outcomes.
- Work closely with sub-contractors to develop and maintain a health and safety plan.
- Participate in a project's initial risk management planning wherever reasonably practicable.
- Maintain open communication with other contractors, sharing contact details and critical information.
- Alert the contractor or the contracting PCBU when control measures need adjustment or resources need reallocation to uphold health and safety standards.

Responsibilities and Duty of Care

Robust VRU-Specific Risk Assessment Process: Embed detailed risk assessment for vulnerable road users as part of the overall TTM and job/project-wide risk assessments. This way, the approach to finding and reducing risks for VRUs is tied to the overall project safety goals.

Checking Control Measure Effectiveness: Set up a well-documented process to check how well the control measures for VRU safety are working. This should include regular checks and collecting data to see if the measures are doing their job or need to be changed to reduce risks more.

Worker Engagement: Talk with workers when choosing control measures to handle risks, especially for VRUs. By getting ideas from those on the ground, a better and more shared approach to handling overlapping duties can be reached.

Talking and Planning with Other PCBUs: Create straightforward ways for talking, planning, and working with other PCBUs involved in the project. This includes making sure subcontractors are part of the planning and decision-making on how risks will be handled.

Talking to the Community and Other Stakeholders: Set up a structured way to talk with the community and other external stakeholders to understand the needs and concerns of VRUs. Use this feedback to help decide how to manage risks, ensuring VRU safety within TTM setups is better and more inclusive.

Planning work with TTM and Vulnerable Road Users in mind

Refer to **Appendix C** for a tool for aligning activity planning, TTM planning, and VRU safety

Good planning is vital to ensuring vulnerable road users stay safe while work is done on roads.

Often, contractors plan how to do their job first and think about temporary traffic management later[56].

This can lead to **missed chances to make things safer** and more accessible for people on foot, bikes, or disabled people.

For example, if a contractor plans to block a bike lane for a long time, they might not consider allocating space for a **temporary bike lane nearby** if they plan traffic management too late.

Also, **understanding the specific people that use the space you are working in** is essential. For instance, if a school is close to the worksite, there will be many young pedestrians, which means extra safety steps are needed.

Contractors and subcontractors can maximise the safety of VRUs during planning by:

Plan Together: Start planning traffic management at the same time as planning the work tasks. This way, you can make sure both plans work well together to keep VRUs safe.

Know the Local VRUs: Talk to local groups or authorities to learn about the VRUs in the area and how they move around. Make sure your methodology can meet their needs.

Check VRU Risks Early: Look for risks to VRUs early in the planning. Identify dangers and come up with ways to manage them that fit well with the work plan.

Be Flexible in Work Plans: Work plans that can change to meet traffic management requirements. For example, doing work during quieter times can reduce disruptions for VRUs.

Keep Talking to VRUs: Set up ways to get feedback from VRUs and others to learn how well traffic management works. Use this feedback to adjust your plans if needed.

Apply the Hierarchy of Controls: Utilise the Hierarchy of Controls to systematically address VRU safety during planning. Aim first to eliminate risks, then implement engineering, then administrative measures, ensuring a thorough yet simplified approach to enhancing VRU safety.

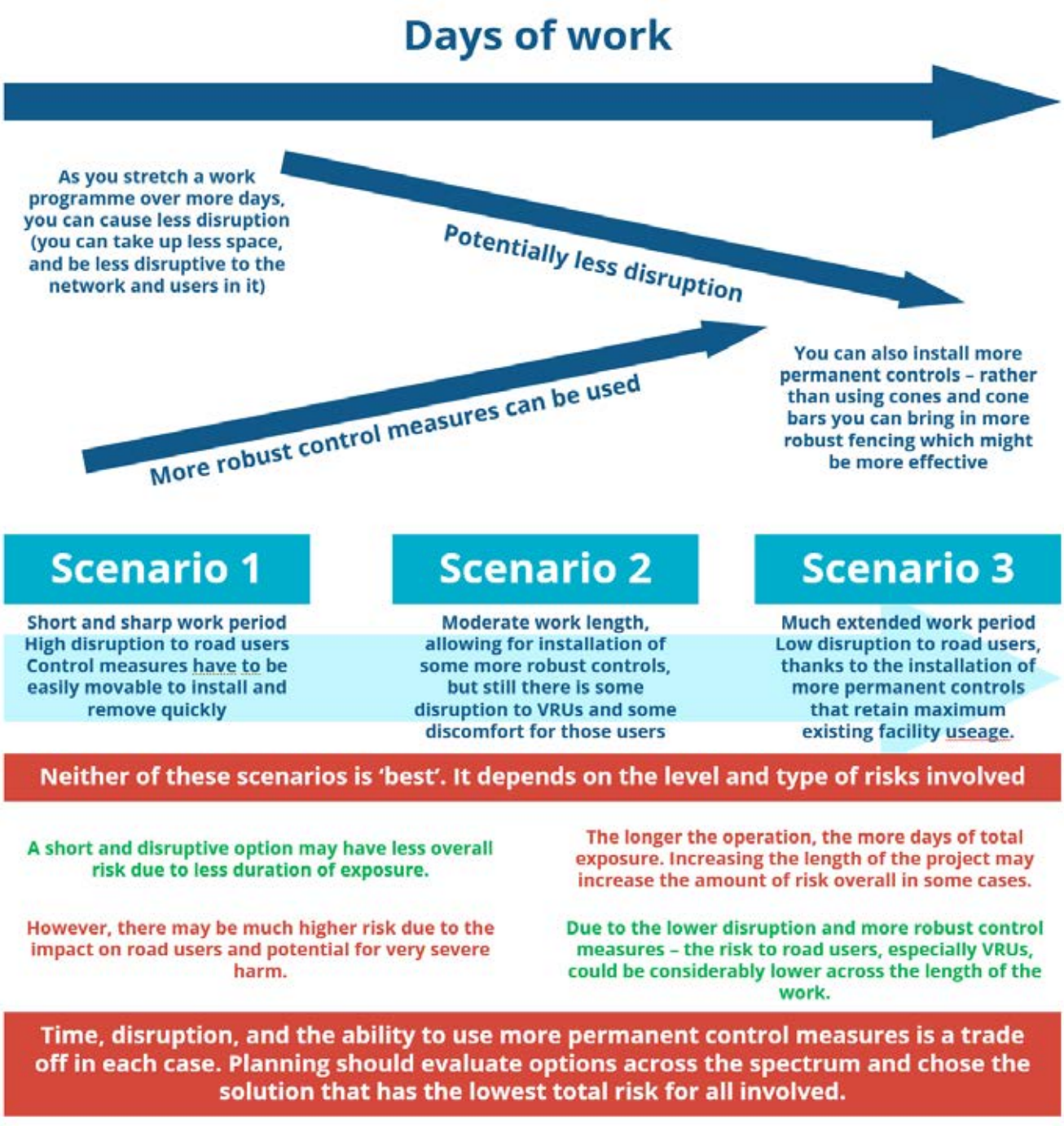
Balancing Time and Disruption: A Closer Look at Control Measures

Planning activities in the road environment and the associated traffic management requires a careful balance between the **time hazards are present** and the **disruption to road users**, especially people on foot or using wheeled devices.

The longer a hazard exists, the more chance for incidents.

However, reducing hazard duration might lead to more disruption, like detours or closed lanes, which can also be risky.

This page delves into the relationship between **time**, **disruption**, and the **effectiveness of control measures** for safeguarding vulnerable road users.



Training and Competency

The Health and Safety at Work Act (HSWA) requires the right information, training, instruction, and supervision to be provided to ensure everyone's safety[25, Section 36(3)(f)].

This means that staff involved in TTM need **specific, detailed training about VRUs** (where they are at risk), how they interact with TTM setups, and the risks involved.

Current training, like NZQA unit standards associated with TTM roles and the Waka Kotahi training and competency model[74], **do not cover VRU safety in detail.**

This leaves a gap that Contractors and Subcontractors should fill by creating and providing **specialised training on VRU safety.**

If your workers are simply qualified as a TTM Worker, Traffic Management Operative (TMO), or STMS and have had no other specialised training – **you are not doing enough to ensure they are adequately trained** to manage risk in TTM environments – especially those associated with vulnerable road users.

If workers have not had VRU-specific training, they should be **supervised closely.**

It is up to Contractors and Subcontractors (the PCBU who employs those workers) to ensure this **training or supervision is provided, recorded, and aimed at reducing risks to VRUs.**

Employers can use the curriculum guidance on the next page to explore whether staff involved in assessing and managing risk relating to vulnerable road users are **suitably trained and competent.**

It is crucial to understand that this list is not exhaustive but outlines core areas of knowledge and skills indispensable for those tasked with VRU safety in TTM design or on-site management.

Not all curriculum items will be relevant to every worker. The applicability of these training components varies based on the roles and tasks each worker undertakes within the TTM systems.

Foundational Curriculum for Keeping Vulnerable Road Users safe in TTM environments

Understanding Vulnerable Road Users (VRUs):

- Who are VRUs? (pedestrians, cyclists, motorcyclists, and people with disabilities).
- What unique needs and challenges do VRUs have in traffic?

VRU Interaction with Temporary Traffic Management (TTM):

- How do VRUs move through TTM setups?
- What risks and hazards might VRUs face in TTM zones?

Legislative Framework:

- What does HSWA say about VRU safety?
- Other local and national laws impacting VRU safety in TTM.

Risk Assessment and Management for VRUs:

- How to identify and assess risks for VRUs in TTM.
- How to create and use control measures to lessen VRU-related risks.

Designing VRU-friendly TTM Setups:

- How to plan TTM setups that consider the safety and mobility of VRUs.
- Best practices in creating VRU-friendly TTM setups.

Engagement and Communication:

- How to engage with local communities and VRU groups effectively.
- How to communicate safety measures and disruptions to VRUs and the community.

Monitoring, Review, and Continuous Improvement:

- How to check if VRU safety measures are working.
- How to collect, review, and use feedback from VRUs and others.

Emergency Response and Incident Management:

- How to prepare for and respond to incidents involving VRUs.
- How to report and investigate VRU-related incidents to avoid them in the future.

Supervisory Skills for VRU Safety:

- Training for supervisors on overseeing VRU safety measures.
- Building a culture of safety and responsibility among the team.

Ongoing Training and Competency Verification

Maintaining Competency: Ensure a system for regular competency checks, like refresher courses or on-the-job assessments, to keep VRU safety skills sharp over time.

Continuous Learning: Stay updated with evolving TTM methodologies, technological advancements, and legislative changes to keep training relevant and effective.

Feedback Loop: Foster a culture where field experiences, especially near misses or incidents, are shared and used to refine training programs, enhancing VRU safety in future TTM setups.

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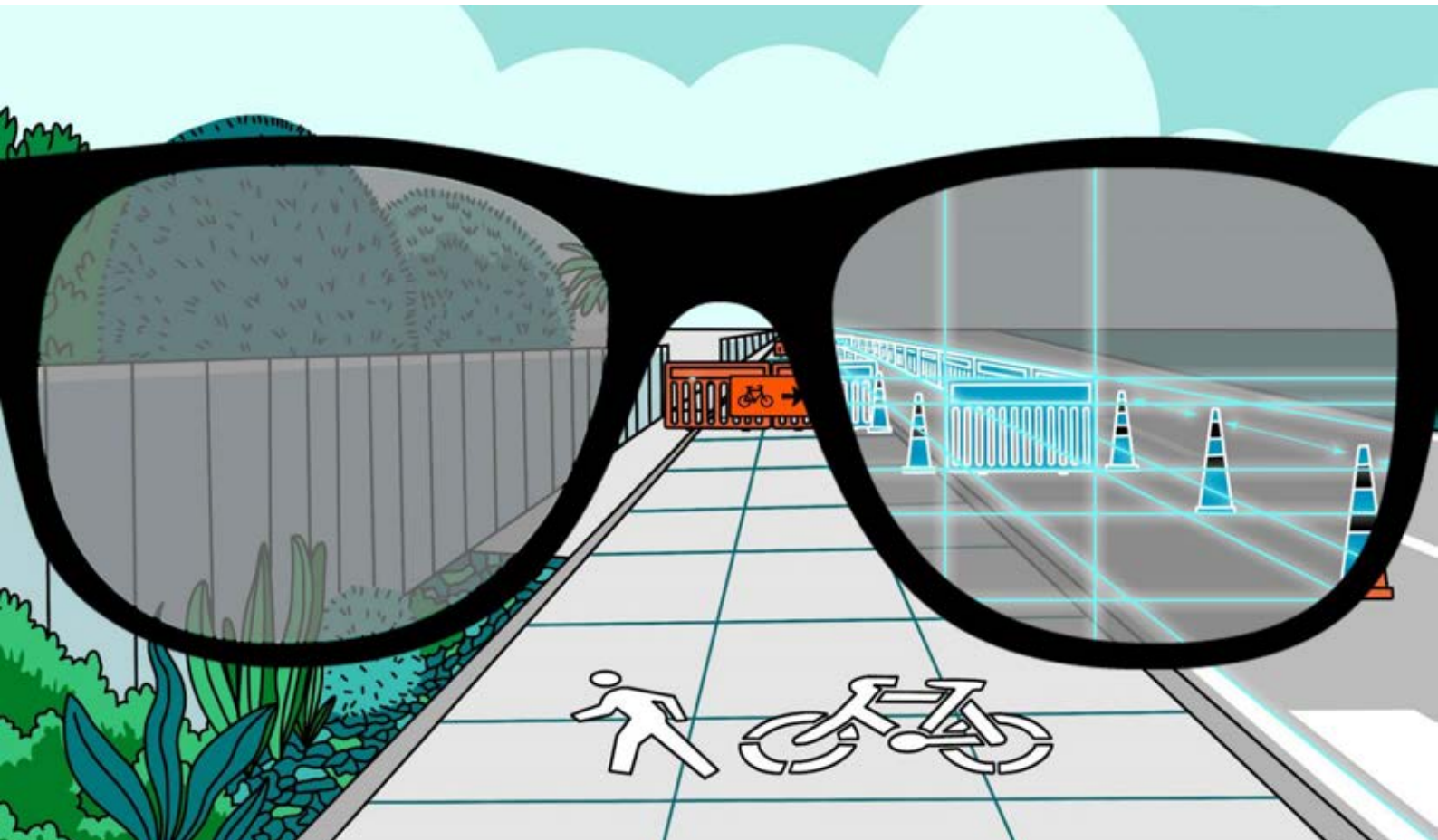
Part D: For TTM Designers

This part is for those designing TTM environments that affect Vulnerable Road Users.

This part includes processes for designing TMPs involving Vulnerable Road Users and a catalogue of how they can be safely managed through different arrangements of TTM equipment and the safe selection of that equipment.

This part includes the following guidance:

The following appendices are relevant to this part:



Part D: For TTM Designers

TTM Designers MUST:

- Conduct thorough risk assessments considering all risks associated with all those who are affected by the activity[25, Section 44(4)(d)(e)].
- Apply control measures that result in risks being managed as low as reasonably practicable[24, Section 6].
- Utilise the **hierarchy of controls** in designing traffic management plans to mitigate risks to VRUs effectively[24, Section 6].
- Ensure TTM designs comply with other legislative measures such as the TCD Rule, Setting of Speed Limits Rule, and Road User Rule.

TTM Designers SHOULD:

- Strive for continuous improvement by staying updated on new industry standards, technologies, and best practices in TTM design.
- Encourage a peer review process of your TMPs to ensure a well-rounded and effective solution for managing risk[86].
- Engage with communities and groups of vulnerable road users to better understand their needs and incorporate their feedback into TMPs.
- Establish a feedback loop with STMS staff to monitor the effectiveness of your TMPs so you can make future ones even better.

A risk assessment and treatment process for Vulnerable Road Users in TTM

Appendix D A3 poster of the planning process used in this practice note.

The primary task for TTM designers is to assess and manage risk **as low as reasonably practicable** in TTM environments and produce a TTM design that reflects this.

A structured approach is needed to assess and treat risk with the best solutions.

This part of the guidance outlines a process for TTM designers to follow that encourages thinking deeply about the needs of vulnerable road users in TTM environments.

Appendix D provides an A3 poster to help designers practice this planning process and become familiar with the steps.

This planning process does not just work for Vulnerable Road User safety – it can be used for all TTM.

Figure 4 summarises the planning process provided as part of this guidance. Each step is explained individually – with thorough explorations of what that step means and how it works.

Remember – this process is a guide only. There is more than one 'right answer', and no recipe can be applied to all situations. **Each situation should be evaluated site-specifically.**

A planning process to help protect our most vulnerable road users

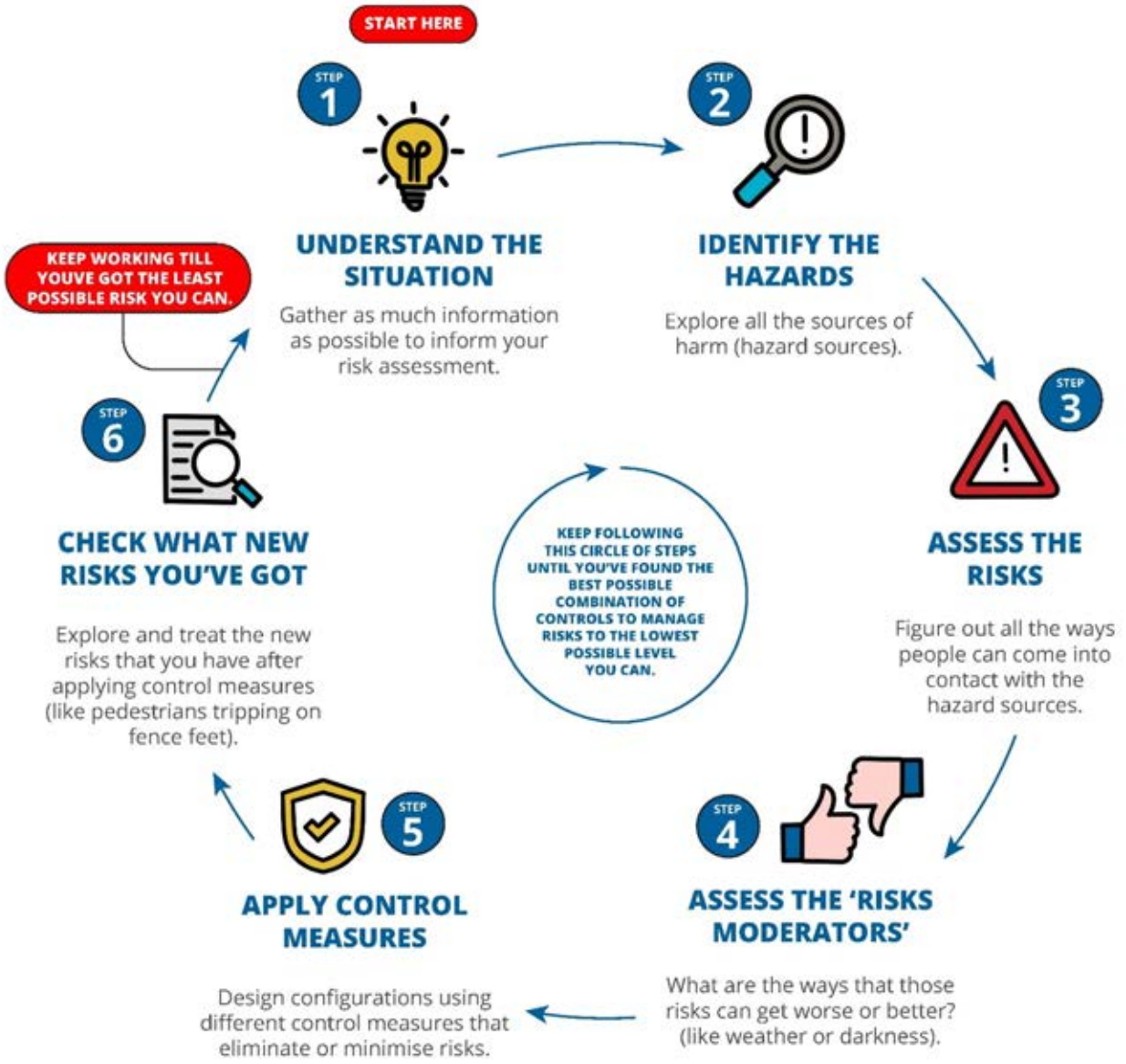


Figure 4 - Planning Process for protecting vulnerable road users in TTM

This guidance lays out a **6-step planning process** to help you shape your Traffic Management (TTM) designs to make the roads safe for everyone.

This process is not a one-time task **but a cycle that you will go through repeatedly**, refining your designs each time as every change brings new factors into play.

These steps are **grounded in well-established risk management practices** and have been tried and tested in other fields, ensuring a reliable framework for making informed decisions in traffic management planning.

It is designed to help you **think through and tackle all the factors that come into play** in making our roads safer, ensuring your TTM designs are well-rounded and well-thought-out.

This guidance explores each of the six steps in its own heading.

Step 1: Understand the situation

This step helps you know what you are working with so you can make **smart decisions** to create traffic management plans that **fit well with the site's needs and challenges**. It is about **collecting detailed information** on the site and the activity you will be doing there.

Do TTM planning alongside activity planning. Begin your traffic management planning alongside the construction planning phase, not after it. This coordination ensures that the methodologies adopted are safe and efficient from the start and that there are no missed opportunities to optimise the activity.

Thorough site reconnaissance. Conduct a thorough examination of the site. Check where people walk or cycle and note anything that might be affected by the work, like footpaths, cycle lanes, or nearby shops and schools. Do not just gather information related to **when you visited** – gather information about **all the conditions** that will be present for the entire activity. Remember, conditions are different at different times of the day and week. Also, **liaise with the RCA** for information that may be relevant.

Capture everything that is there. Thoroughly document existing infrastructure. This sets a baseline to understand how your activity might interact with the existing setup. Also, explore the surrounding area to identify common pedestrian origins and destinations like homes, stores, parks, and schools, along with alternate routes and established “short-cut” routes or 'desire lines' chosen by people walking and cycling to better anticipate movement patterns around the work zone.

Thoroughly Understand the Activity. Delve deeply into the specifics of the work activity that will be happening. This includes understanding the stages, machinery, delivery schedules, worker movement, and other aspects affecting traffic or pedestrian flow. Also, get a clear picture of the timelines involved - when will work start each day, when will it end, and will there be weekend or night-time activity?

Consider whether community engagement is necessary and worthwhile. Consider engagement with residents, business owners, and local stakeholders to gather insights. Their feedback can provide invaluable information about how the area functions daily and how your work might impact them. They might also provide suggestions or highlight concerns that you had not considered.

Detailed assessment of specific areas. For example, in areas with high pedestrian traffic, ensure that detours are wide enough to allow for several people walking or riding, including overtaking and travelling in both directions. Also, look for areas that might have informal use for VRUs, like worn grass pathways.

Do not stop there. The process of understanding the site should not stop after the initial assessment. Keep going throughout the planning process so that you are always looking to learn more and use that new learning and information to feed better TTM design.

Step 2: Identify the hazards

In this step, designers need to identify hazards, which are things that could cause harm.

These hazards can come from:

- The activity that makes the TTM necessary, in the first place, is construction work or road repairs.
- They can also come from the road environment, such as a sharp curve or a busy intersection.

It is important to note that the TTM measures you put in place, like signs or barriers, can also introduce new hazards. However, these will be evaluated later in the process.

The goal here is to spot these potential sources of harm so you can plan how to manage them.

Hazards can also be divided into static (stationary) and dynamic (moving) hazards.

	Static (not moving)	Dynamic (moving)
Environment Hazards	Hazards that are part of the **environment** (present before you even get there) that are **not moving** – like furniture, trees, surfaces, parked vehicles, etc.	Hazards that are part of the **environment** (present before you even get there) are **moving** – like motor vehicles, other vulnerable road users, public transport, etc.
Activity Hazards	Hazards introduced by the **activity** (not the TTM, that comes later) that **are not moving**- like materials, static equipment, excavations, etc.	Hazards introduced by the **activity** (not the TTM, that comes later) that are **moving** – like workers, moving plant or equipment, falling objects, etc.

Figure 5 (next page) provides a simple approach for identifying hazard sources that might cause harm to vulnerable road users.

This is not a complete list – there are always other sources of harm, as **each situation is different.**

Ensure you explore further than the list in Figure 5 (but use it as a guide).

Each hazard source in Figure 5 is explored briefly in further headings.

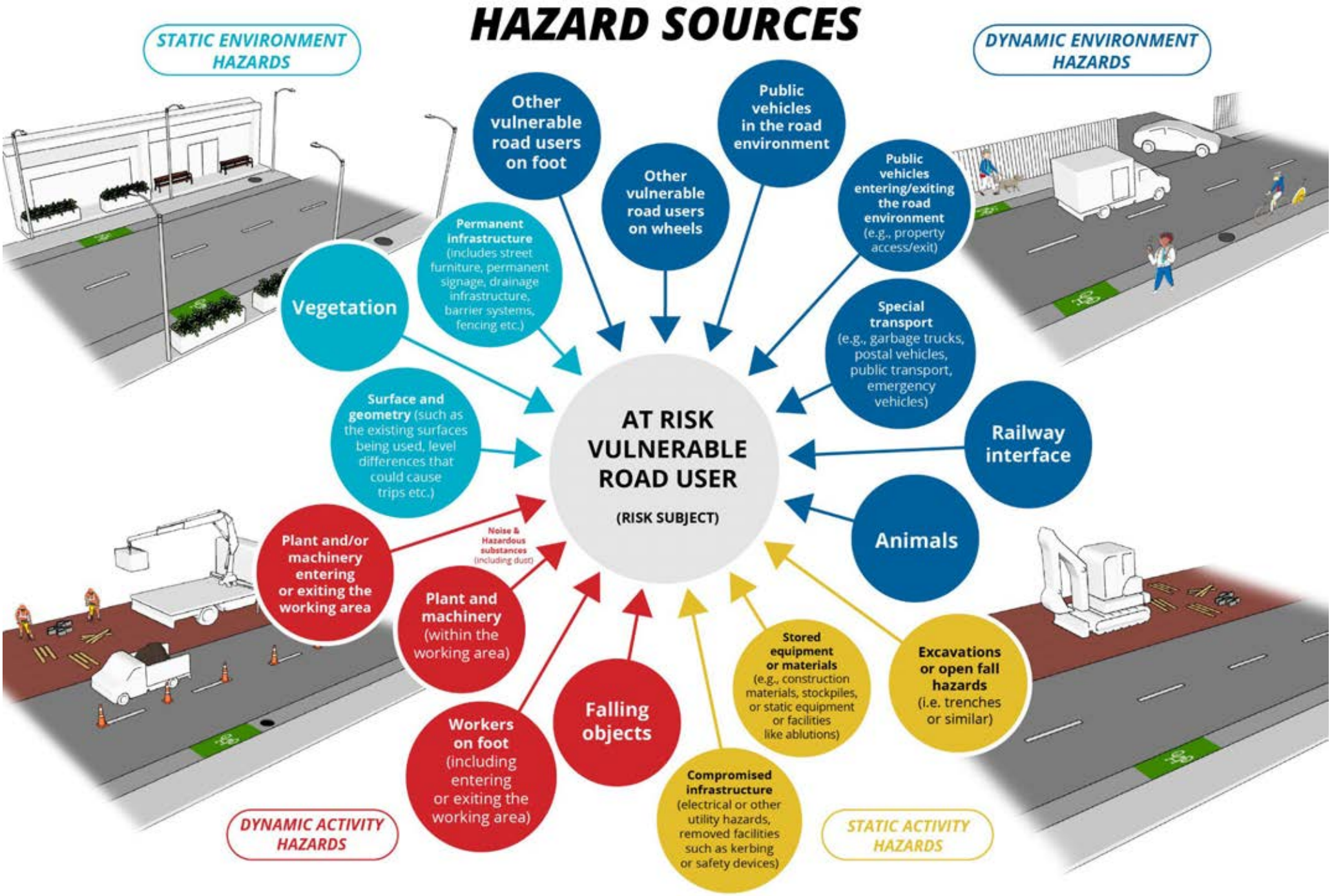


Figure 5 - Hazard sources for Vulnerable Road Users in TTM environments

Static Environment Hazards

They are **stationary (not moving) and could cause harm** to vulnerable road users, such as trees, bus stop shelters, or even a trip hazard in an uneven footpath.

Remember, these hazard sources are not all there is. Look further than these examples for additional things in the environment that could cause harm to vulnerable road users.

Hazard Source	Explanation	Example
Permanent Infrastructure *Includes street furniture, permanent signage, drainage infrastructure, barrier systems, etc.*	Features like street furniture, permanent signs, and barriers that can obstruct or confuse vulnerable road users, for example, a bench on a footpath or a street light pole. What you should be asking here: ***What are all the permanent infrastructure features in this environment that could harm vulnerable road users?***	 *Image Credit ix: Waka Kotahi*
Vegetation	Trees, bushes, or other plant life can obscure vision or create tripping risks; for instance, an overgrown hedge blocking the view of an upcoming pedestrian crossing or an overhanging tree into a cycle lane. You should be asking: What are all the vulnerable road users in this environment? ***Where are they going, and how are they moving?***	 *Image Credit x: Waipa District Council*
Surface and Geometry	The physical characteristics of the road, including its material and shape, such as a steep incline that makes it difficult for wheelchair users to navigate safely, a sunken footpath with a trip hazard, or even just the kerb itself. What you should be asking here: ***What are the conditions of the environment, like surface and geometry, that can impact vulnerable road users?***	 *Image Credit xi: Wikimedia Commons*

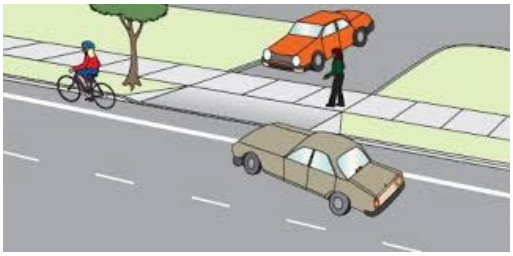
Dynamic Environment Hazards

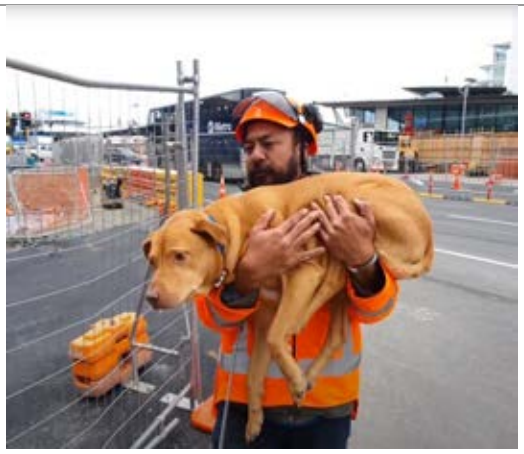
They are **dynamic (moving) and could cause harm** to vulnerable road users such as motor vehicles or trains, public transport, other vulnerable road users, vehicles entering or exiting, and even animals.

Remember, these hazard sources are not all there is. Look further than these examples for additional things moving around in the environment that could cause harm to Vulnerable Road Users.

That does not mean checking once – different hazards are present at different times. Make sure you evaluate the site at different times to get the best picture of the moving hazards that might be there during the activity you are planning.

Hazard Source	Explanation	Example
Public Vehicles in the Road Environment	Moving motor vehicles that use the road can pose a risk to vulnerable road users; for example, vehicles in the main traffic lanes of the road or vehicles turning into or out of side roads. What you should be asking here: ***What public motor vehicles are present in the environment, how many, and where are they going from and to?***	 *Image Credit xii: Parallaxx*
Other Vulnerable Road Users on Foot	Pedestrians who move or stop create hazards, such as a child running into a bike lane or someone with a child stroller using a narrow footpath with other pedestrians. What you should be asking here: ***What are all the potentially vulnerable road users on foot in this environment? Where are they going, and how are they moving?***	 *Image Credit xiii: Parallaxx*

Hazard Source	Explanation	Example
Other Vulnerable Road Users on Wheels	Cyclists, skateboarders, or scooter users who share the path and whose movements can be unpredictable; for instance, a skateboarder swerving into the path of a pedestrian. You should be asking: What are all the potentially vulnerable road users on wheels in this environment? W***here are they going, and how are they moving?***	 *Image Credit xiv: Mellissa Ramsay*
Public Vehicles Entering or Exiting the Road Environment *Such as properties or driveways*	Vehicles turning into or out of driveways or other entrances pose a risk to those on footpaths or in cycle lanes; for example, a car exiting a driveway without noticing a passing pedestrian. What you should be asking here: ***What are all the entry and exit points to the road for motor vehicles, how often and in what way are they used?***	 *Image Credit xv: Pedbiksafe.org*
Special Transport *Such as rubbish collection vehicles, postal vehicles, public transport, and emergency services.*	Vehicles with unique movement patterns or stops, such as rubbish trucks or emergency vehicles; for instance, a postal vehicle that stops frequently, requiring cyclists to overtake. What you should be asking here: ***What are all the special vehicles that do or might use the environment, in what way, at what times, and where?***	 *Image Credit xvi: Transport for London*

Hazard Source	Explanation	Example
Railway Interface	Points where the road crosses a railway pose unique risks, such as a cyclist getting a tire stuck in the railway tracks. What you should be asking here: ***If there are any railway interfaces in the environment, what are the vulnerable road user interactions with those railways? (crossings, walkways, etc.)***	 *Image Credit xvii: Kiwirail / Waka Kotahi*
Animals	Domestic or wild animals can enter the road and create unpredictable hazards; for example, a dog running into the street, causing cyclists to swerve. What you should be asking here: ***Where might there be animals in the environment, where might they come into contact with vulnerable road users, and in what ways?***	 *Image Credit xviii: Parallaxx*

Remember – do not stop there!

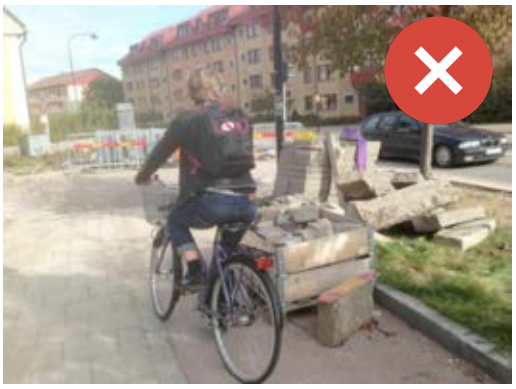
Keep looking for more moving hazards in the environment.

Look at different times and on different days – ask, ***"What else could be different if I were to come back tomorrow?"***

Static Activity Hazards

They are things that are stationary (not moving) and are being introduced by the work that is going to be done that could cause harm to Vulnerable Road Users, such as excavations, stored materials, or cables running across a footpath.

Remember, these hazard sources are not all there is. Keep asking questions of those who will do the work, like *"Does the pipe you are installing also need to be onsite at the start?"* or *"Will you have more than one hole open at a time?"*

Hazard Source	Explanation	Example
Excavations or open fall hazards *Such as trenches or pits or even water catchments that the depth is unknown*	Features like trenches, pits, or unknown-depth water catchments that pose a risk of falling, for example, a trench near a pedestrian pathway. What you should be asking here: ***What hazards could vulnerable road users fall into, when, how, and where?***	 *Excavations present hazards to vulnerable road users. Image Credit xix: Golden Valley Construction*
Stored equipment or materials *Such as construction materials, stockpiles, static machines or even site toilet facilities*	Items like construction materials, stockpiles, or static machines that can obstruct or pose risks, such as a pile of bricks left unsecured near a bike lane. What you should be asking here: ***Where are materials or plant going to be stored during this activity, where, for how long, and how would vulnerable road users be harmed?***	 *Materials sitting in the path of vulnerable road users. Image Credit xx: Niska & Eriksson (Sweden)*
Compromised infrastructure *Such as electrical or other utility hazards, removed kerbs or safety devices.*	Hazards arise from altered or damaged utilities, kerbs, or safety devices; for instance, a removed kerb that makes the boundary between pedestrian and vehicular traffic unclear. What you should be asking here: ***Where are changes to permanent infrastructure that could harm vulnerable road users?***	 *Long-term worksite showing reduced road surface standard and removed pathways and cycleway/traffic lane separation. Image Credit xxi: Chris Harmer.*

Dynamic Activity Hazards

They are things that are dynamic (moving) and are being introduced by the work that is going to be done that could cause harm to Vulnerable Road Users, such as moving plant or people, entering and existing work vehicles, or even falling objects.

Remember, these hazard sources are not all there is. Ask questions about those who will do the work, like ***"Will these vehicles be present the whole time, or will they come and go?"*** or ***"Does that excavator need to load a truck, or will it only move material within the working space?"***

Look further than these examples for additional things that the activity will introduce that are moving around and could cause harm to Vulnerable Road Users.

That does not mean checking once – different hazards are present at different times. Ensure you explore the entire work lifecycle from the first task to the last one. For example – chip sealing a road has multiple phases to line marking the road at the end. Each phase has different dynamic activity hazards. This might require **multiple TTM configurations** (including multiple ones within the same day).

Hazard Source	Explanation	Example
Plant or machinery *Within the working space*	Heavy machinery operating within the work zone can pose immediate threats to vulnerable road users, for example, a crane swinging its load close to a pedestrian pathway. What you should be asking here: ***Where is there moving plant and machinery involved in this activity that could harm vulnerable road users?***	 *Truck outrigger in footpath.* *Image Credit xxii: Kouchy & Partners (Sweden)*
Plant or machinery *Entering and exiting the working area*	Machinery moving in and out of the work zone can create hazards, such as an entering truck crossing a bike lane. What you should ask here: ***How will plant and machinery enter and exit the activity area, which could interact with and harm vulnerable road users?***	 *Activity vehicles entering and exiting often have to cross the path of vulnerable road users. Image Credit xxiii: Parallaxx.*

Hazard Source	Explanation	Example
Workers on Foot *Including entering or exiting the activity area*	Workers walking within or into the work zone can interact with vulnerable road users; for instance, a worker stepping into a cyclist's path. What you should be asking here: ***How are workers moving around the worksite (including entry and exit) where they could interact with vulnerable road users?***	 *Workers moving around, with or without equipment, present a hazard to road users (as road users also present a hazard to workers). Image Credit xxiv: Mellissa Ramsay*
Falling Objects	Objects falling from height within the work zone can pose a direct risk, for example, a tool falling off scaffolding and onto a pedestrian walkway. What you should be asking here: ***Where are hazards above (or close to above) that could fall on vulnerable road users?***	 *Falling objects (either from slung loads or work above) present risks to those below. Image Credit xxv: RCS Safety (California)*
Noise and Hazardous Substances *Including dust and biological hazards*	Loud noises can disorient vulnerable road users, and hazardous substances like dust can impair vision; for example, construction dust obscures pedestrians' and drivers' view of a footpath. What you should be asking: ***What could produce noise or hazardous substances (including dust) from the activity that could harm, impact or impede vulnerable road users?***	 *Noise and dust from worksites present hazards to road users, especially on foot or wheels, as they have no protection. Image Credit xxvi: NBM Media*

What if the working area is not in one spot (i.e. a mobile work task)?

Your TTM will move with the work, and the hazards will change significantly.

If this is the case – the following considerations are essential:

Consideration	Explanation	Example
Static Environment hazards will change.	As the work area moves, the static elements like permanent infrastructure and vegetation that pose a hazard in one location may not be a concern in another. For example, a street lamp that was an obstruction at the first site may not be present at the next. New hazards may arrive, like a curve in the road restricting the visibility of approaching cyclists.	 *Doing mobile TTM along this road would present different static environment hazards as the operation progressed. Image Credit xxvii: Greater Auckland.*
Dynamic Environment hazards will change.	The flow of traffic and pedestrian activity will vary as the work area moves, affecting the types of dynamic environmental hazards present. For instance, an intersection will have different hazards to vulnerable road users compared to a mid-block section without side roads.	 *Dynamic hazards, including cyclists, pedestrians, or intersection movements, will come and go as operations move along the road. Image Credit xxviii: Kaipara City Council.*
Dynamic activity hazards will change.	The nature of the work activity itself may change as the work area moves, altering the types of machinery or plant in use. For example, a mower will, in certain places, have to work closer or further away from the edge of the lane (which gets closer or further away from cyclists on the edge of the road)	 *As operations move along the road, their hazards change as well – the activity requires different tasks at different times, adding to the dynamic nature of a mobile operation. Image Credit xxix: Transport British Columbia.*

Especially with moving operations, control measures MUST be reviewed to ensure they are effective and working.[24, Section 8]

Step 3: Assess the Risks

Now, you have a complete list of all the things that can cause harm to vulnerable road users.

You now need to figure out **how that harm might happen.** This means exploring how these Vulnerable Road Users might be **exposed** to those hazards.

Exposure happens when those Vulnerable Road Users are in the same place and time as a hazard and have **conflict**.

What we are doing here is identifying and assessing risks. To simplify it, we will call these risk **methods of conflict**.

Can I just use a risk matrix?

A risk matrix is a standard method to assess risk in TTM and is used by many organisations.

This is where a table is used to assign how **likely** and how **serious** a risk might be, and it usually results in a list of risks that are deemed 'low' or 'medium' or 'high' (or some other classification system).

Risk matrices can sometimes result in a lack of depth of risk assessment and are often just a **tick-box exercise** for some people[10].

Risk assessment is critical when dealing with vulnerable road users and must be done thoroughly. This means we need a better approach than a risk matrix.

Workers MUST comply with reasonable instructions from their employer (the PCBU) about Health and Safety[25, Section 45]. That includes policies or specific procedures (such as risk matrices) if they are related to compliance with the Health and Safety at Work Act 2015.
Before using the risk assessment process in this guide, ensure it does not conflict with an organisation's (PCBU) instructions related to Health and Safety.

What is another method to assess risks?

Failure Modes Effects Analysis (FMEA) is a tool used to spot possible ways things can go wrong (failure modes) in a process, product, or system and then to understand the impact of these failures[59]. By doing this, you can figure out how to **prevent these failures or reduce their effects.**

In our approach – we will call these failures **Methods of Conflict.** This is a simple way to understand that when two things (a **risk subject** (someone whom you want to protect from harm) and a **hazard come together – conflict (harm) can occur**. This is a **system failure** – and our design needs to **remove these potential failures (conflicts) from happening.**

Conflict, in this case, means places where **different road users or activities could interfere with each other** in a way that could cause harm. This could be, for example, where a new pedestrian route crosses a busy driveway.

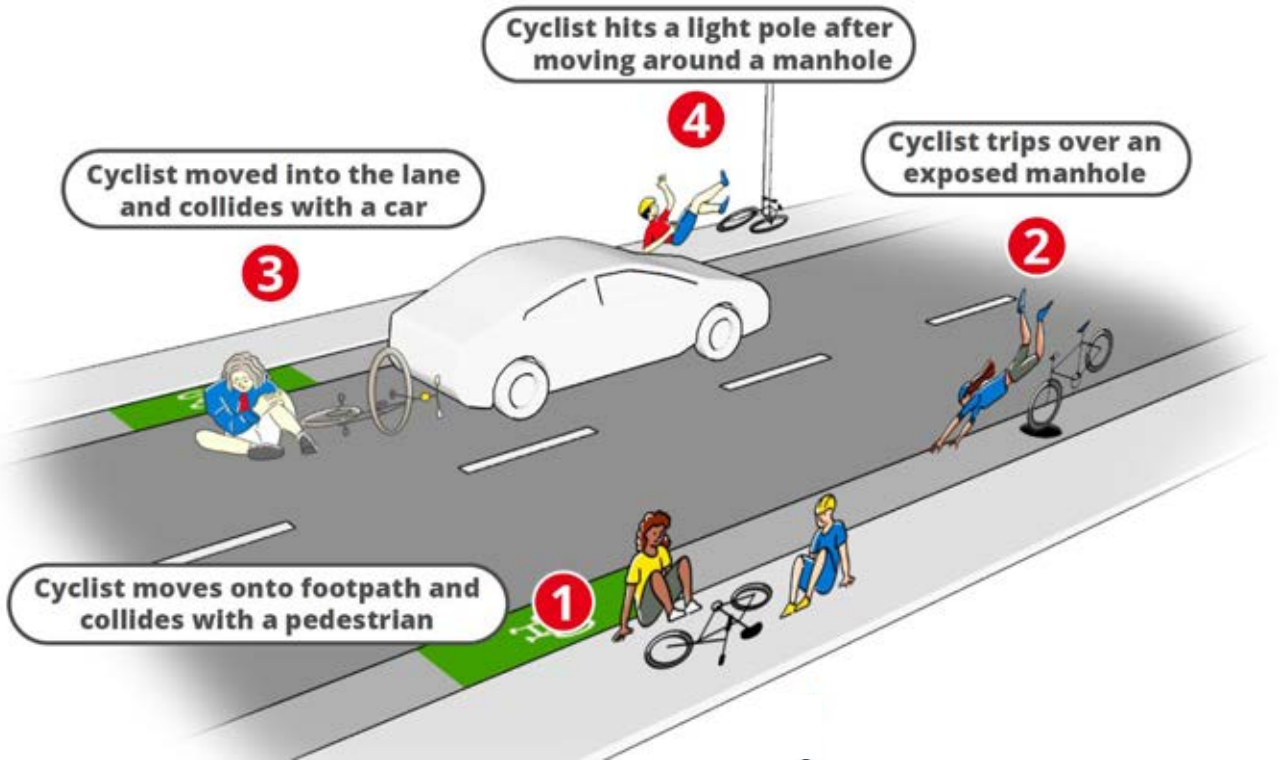


Figure 6 - Explaining Methods of Conflict for Vulnerable Road Users in TTM environments

These methods are important because they help to prevent problems before they happen. They let you plan your TTM in a way that avoids trouble, keeps people safe, and allows traffic, both motor vehicles and people walking, to flow smoothly. By looking at Figure 6, you can see examples of how methods of conflict are used to plan better TTM setups.

What is the outcome of exploring the Methods of Conflict?

You should now have a list, a diagram, or multiples of both, of all the methods of conflict in your situation.

If you have listed them – they might be something like *"a person on foot walks under a suspended load from a crane, and the load falls, harming the pedestrian"* or *"a person on a bicycle approaches from the side street and strikes a person on foot"*.

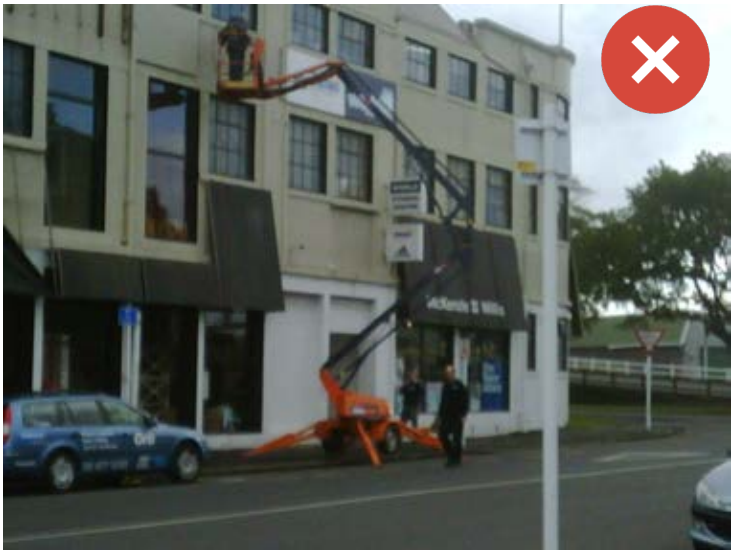
If you have used a diagram, you might have sketches and notes showing all the conflict areas and where they are. Using diagrams and sketches is a great way to get lots of detail and make it easier for others you are working with to understand.

Remember – we **have not applied any control measures** yet – so these methods of conflict just represent a **picture of what you are dealing with** and what **needs to be treated** (with control measures).

Case Study A: Distinguishing between hazards, risk events[60]

When setting up temporary traffic management around construction sites, keeping pedestrians safe is vital.

This means listing potential dangers and **fully understanding them to create effective safety measures.**



The person working on the elevated work platform has tools and materials that may fall onto the walkway below. The EWP is blocking the footpath. Image Credit xxx: Peter Graham.

Situation

A person is working on an elevated work platform (EWP) with tools, materials, and materials above a footpath. It is obvious there is a risk, but what exactly could happen?

Hazard Identified

Work with equipment and materials is occurring over the walkway.

Potential Risks

1. A pedestrian might walk beneath just as some equipment or material falls, causing injury.
2. Someone might tire of waiting and recklessly cross the road, risking collision with a vehicle.
3. The activity might distract someone, and they collide with street furniture, the EWP, or other people.

We must apply control measures addressing the immediate danger and possible human reactions to prevent these risks from becoming a reality.

The detailed steps required

1. **Identify the Hazard:** Recognise and describe the potential source of harm clearly.
2. **Define Risk Events:** Envision different scenarios that could result from the hazard.
3. **Evaluate Likelihood:** How likely is it that these events will occur?
4. **Assess Consequence:** What could be the outcome if these events happen?

Applying Control Measures

Now, treat the risks (apply control measures). Control measures typically apply to one of the four areas above:

Can you eliminate or minimise the hazard itself?	Can you eliminate or minimise the risk event from occurring? (this can also be exposure to the hazard)	Can you eliminate or minimise the likelihood of the risk event?	Can you eliminate or minimise the consequence (if it were to occur)?

Assessing risk moderators

A risk moderator can **increase or decrease the impact or likelihood of a risk**, even though it is not a risk by itself.

For example, while rainy weather is not a risk on its own, it can amplify the risk of slipping on a wet road.

Step 4: Assess the risk moderators

In this step, we look at how risk moderators change the risks or conflict methods we found in Step 3.

Risk moderators are not risks themselves but can make a risk bigger or smaller when they are present.

We have picked some risk moderators for this guidance, but many others are out there. The ones we picked are a good starting point, but always watch for more as you work on your design.

Figure 7 shows the risk moderators we will discuss in this guidance. You can make better and safer traffic management plans by understanding these moderators.

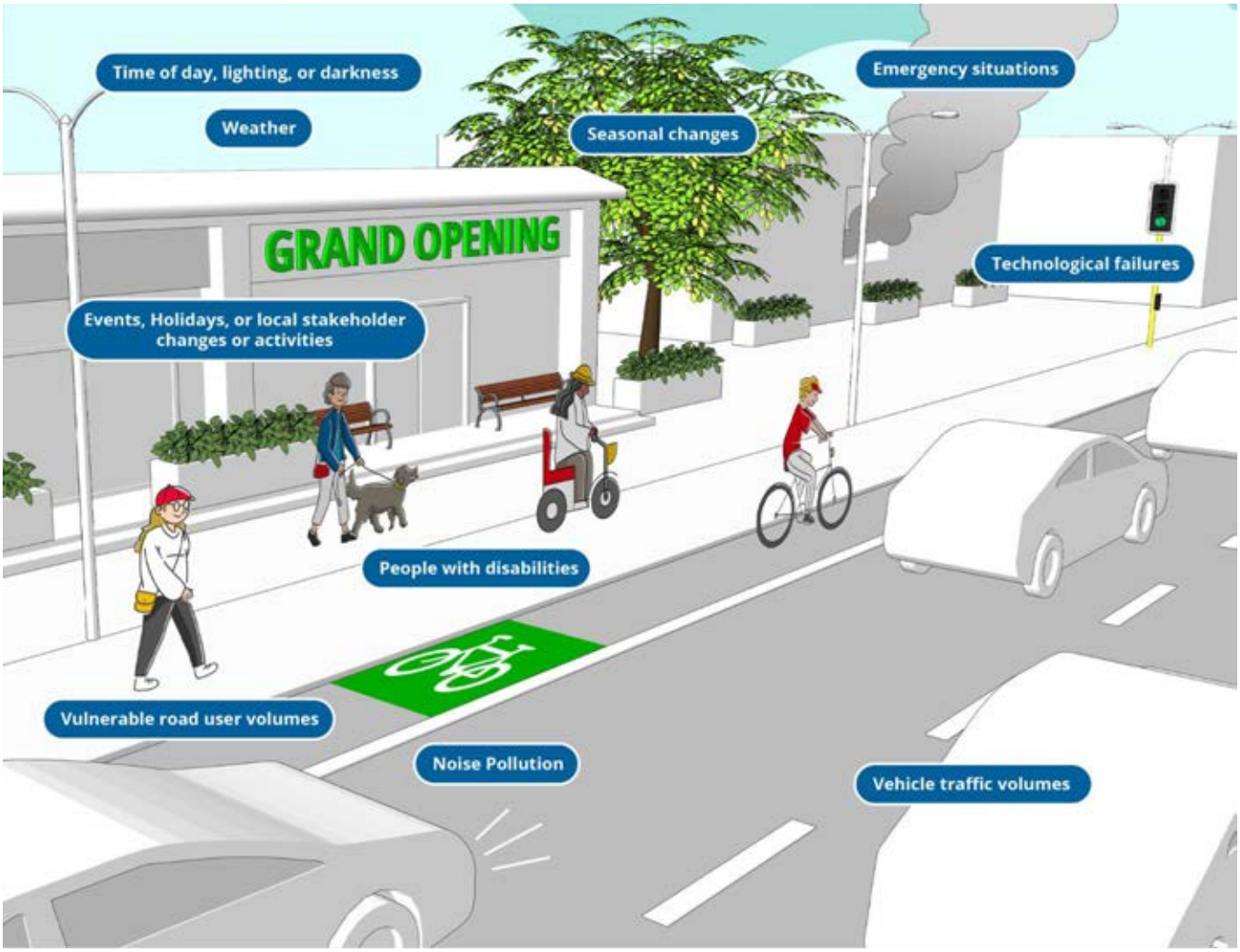


Figure 7 - Example risk moderators that might impact Vulnerable Road Users in TTM environments

Risk Moderator	Explanation
Weather	Adverse weather conditions such as rain, snow, or strong winds can alter the physical environment of a TTM zone. Rain can create slippery surfaces, reducing traction for motor vehicles and people walking. Snow and ice can obscure road markings and signage, making it difficult for all road users to navigate safely. On the other hand, dry and calm weather conditions can enhance the effectiveness of TTM measures, providing clear visibility and stable conditions. Sun glare can also cause visibility challenges at sunset and sunrise.  *Image Credit xxxi: Betty Mitrova*
Time of Day, Lighting, or Darkness	The risks within a TTM zone can vary considerably depending on the time of day and the lighting conditions. For instance, darkness or poor lighting can drastically reduce visibility for drivers and vulnerable road users, making it difficult to see and respond to TTM controls and other road users. Headlights often used by cyclists are not sufficiently powerful enough to illuminate signs to the same degree that vehicle headlights can, possibly reducing the effectiveness of TTM signs for these users[44]. During daylight hours, the clarity and visibility of TTM measures are enhanced, potentially reducing the likelihood of incidents.  *Image Credit xxxii: Parallaxx*

Risk Moderator	Explanation
Vehicle Traffic Volumes and Types	Higher motor vehicle traffic volumes (or different vehicle types, such as heavy vehicles) can increase the complexity and risk of managing a TTM zone. The more vehicles there are, the higher the likelihood of conflicts between vehicles and VRUs (although sufficient congestion can lead to slower traffic speeds that reduce the likely severity of any incidents). High traffic volumes may also reduce the effectiveness of TTM measures due to the increased complexity of managing multiple road users. Conversely, lower traffic volumes can reduce the likelihood of conflict between hazards and the level of exposure – reducing risk.  *Image Credit xxxiii: Parallaxx*

Case Study B: Vulnerable road user safety and freight vehicles: A case study in North Carolina and Tennessee[80]

As online shopping has become more popular, the number of trucks delivering goods in cities has grown rapidly.

This increase in urban freight traffic is important for TTM zones because trucks, cars, bicycles, and pedestrians often share these areas.

A case study from North Carolina and Tennessee shows that the more trucks there are, the higher the chance of accidents happening, especially those involving people not in cars, like pedestrians and cyclists.

Image Credit xxxiv: Transport and Environment (Europe)

Between 2009 and 2015, there was a notable rise in the number of injuries and deaths from crashes involving freight vehicles in urban areas.

These accidents tend to happen on local roads rather than highways, which is concerning because local roads are where people often walk or cycle.

This study also found that these accidents usually involve older people and happen more often at night or when drivers have been drinking alcohol.

Trucks with trailers are hazardous, as they are big and challenging to manoeuvre.

Another key point is that accidents involving trucks and VRUs are more likely to cause serious harm.

This is because trucks have blind spots and are heavy, which makes crashes more dangerous.

Lastly, the study shows that accidents often occur when trucks are reversing or parking, especially in busy urban areas where parking is scarce.

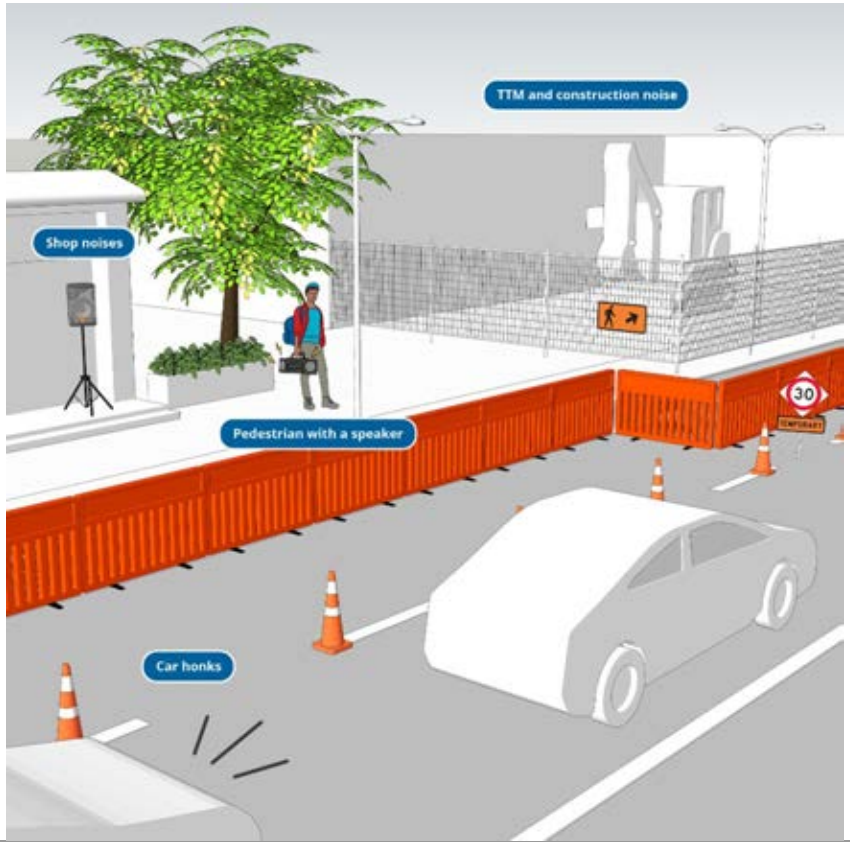
This is a big challenge for safety because trucks have many blind spots that make it difficult to see people or other vehicles when moving backward or parking.

The findings from this study can help us understand the risks that freight traffic brings to TTM zones. They suggest that TTM plans should account for the type and amount of freight traffic, especially in urban areas.

Planners might need to think about creating specific loading zones or using technology to help truck drivers see better around their vehicles to make these areas safer for everyone.

Risk Moderator	Explanation
Vulnerable Road User Volumes	The volume of VRUs may differ significantly from motor vehicle traffic peaks. Recognising and planning for these varying VRU volumes is crucial in TTM to ensure safe and effective traffic management for all road users. Also consider major public transport transit areas which can result in a high volume of people on foot or cycling.  *Image Credit xxxv: Ben Gracewood*
Seasonal Changes	Different seasons bring about varying weather conditions and daylight hours, affecting the risks within a TTM zone. For instance, autumn may bring wet leaves onto pathways, creating slip hazards. During summer, longer daylight hours can enhance the visibility of TTM measures, potentially reducing the risk of incidents.  *Image Credit xxxvi: Highway Traffic Control (New Jersey)*

Events, Holidays, or Local stakeholder changes or activities	Local events, holidays, or changes in local stakeholder activities can lead to sudden or significant changes in traffic and VRU volumes. For example, a local market might drastically increase pedestrian traffic, altering the risk profile of the TTM zone. Conversely, during holiday periods, reduced traffic and VRU volumes may simplify the risks present.  *Image Credit xxxvii: Parallaxx*
Emergency Situations	Emergencies such as accidents, fires, or medical incidents can significantly disrupt the planned TTM arrangements. They require quick and unobstructed access for emergency responders, which TTM measures might hinder. Moreover, emergency vehicles can further complicate traffic and TTM management, increasing the risk of collisions or other incidents. **For more information on managing emergencies – refer to the contingency plans section.**  *Image Credit xxxviii: Monterey County Fire Training Officers Association*

Technological Failures	Technological systems like traffic lights, electronic signage, or communication devices are crucial in managing TTM zones. A failure in any of these systems can lead to confusion, miscommunication, or loss of control over the TTM control measures. For instance, a malfunctioning traffic light could lead to confusion and potential collisions.  *Image Credit xxxix: Queensland Police*
Noise Pollution	High levels of noise pollution can create a distracting or disorienting environment within a TTM zone. Excessive noise might prevent VRUs and workers from hearing crucial auditory cues like horns, warning shouts, or emergency sirens. Conversely, quieter conditions can enhance the ability of individuals to communicate and perceive auditory warnings, potentially reducing the risk of incidents. 

Methods for mitigating risks to Vulnerable Road Users in TTM environments

Step 5: Apply Control Measures

Applying control measures is about putting the **right actions in place to handle the risks we have found.**

These measures **eliminate** or **minimise** risk, keeping **everyone in the TTM zone safe.**

We look at this in two parts. First, we see how different **controls work together** to make a safe system (Step 5A).

Then, we look at **each control itself (Step 5B)**. We explore the purpose and value of the more common individual controls in **Part F of this guidance** so designers can understand each of them.

Hierarchy of Controls

The hierarchy of controls is a system that **prioritises the complete removal of risks** as the most effective means of protection.

It guides using less effective controls only when higher strategies are not reasonably practicable.

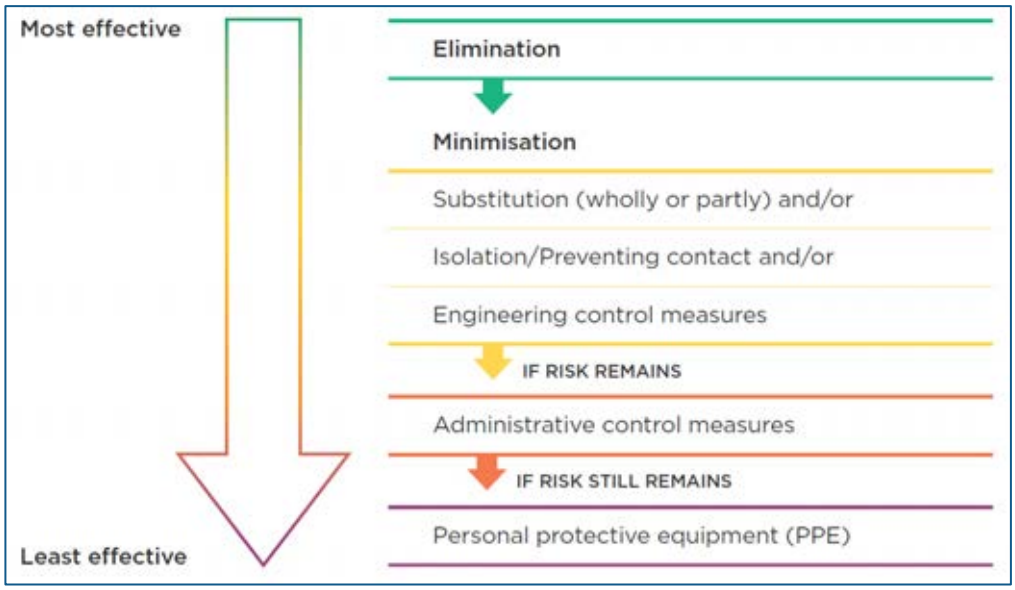


Figure 8 - Hierarchy of Controls diagram published by WorkSafe New Zealand [82]

You MUST follow the hierarchy of controls when selecting control measures to apply to risks[24].
You MUST select the best possible control and only move to a lesser control if the better one is not reasonably practicable[24].

List every possible control measure to keep people safe before picking the best ones. This ensures you think of new ideas and do not just go with what you always do.

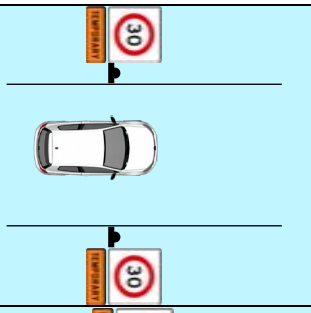
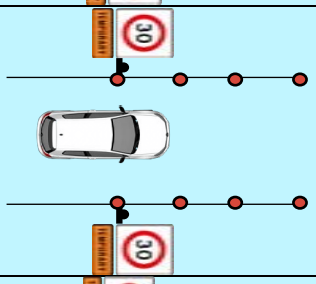
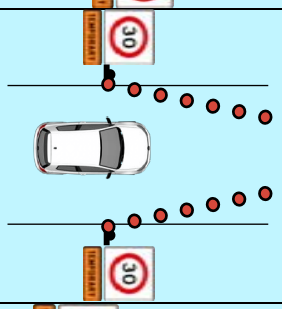
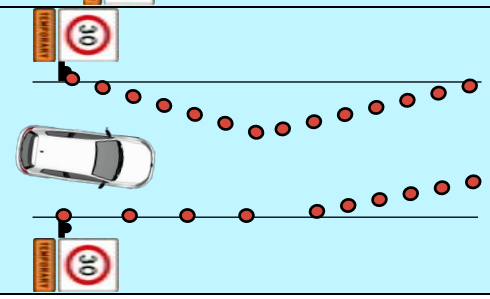
Explaining the Hierarchy of Controls

Preference	Explanation	Example
Must be considered first **ELIMINATION**	This control completely removes the hazard, thus nullifying the risk. For example, an unattended excavator on a footpath represents a significant risk that can be eliminated by removing the excavator entirely.	
Must be considered next **SUBSTITUTION**	This involves replacing a hazard with something less risky. Continuing from the previous example, replacing the excavator with a manual hand excavation reduces the risk by substituting the heavy plant with a less hazardous operation.	
ENGINEERING	These are physical modifications to reduce risk. Creating an exclusion zone for the excavator, meaning any incursions had room to be absorbed, would be an engineering control (if combined with fencing).	
ISOLATION	This involves creating a barrier between the hazard and people. Erecting a fence around the excavator isolates the risk, preventing pedestrian access. The effectiveness varies: fences provide a more substantial barrier than cones or cone bars, which are more easily moved.	
Must be considered next **ADMINISTRATION**	These rely on human actions and decisions, like obeying signage or speed limits. Their effectiveness depends on compliance and can be bolstered by physical measures to encourage or enforce adherence.	
Must be considered last **PERSONAL PROTECTIVE EQUIPMENT (PPE)**	The least effective control in the hierarchy. In TTM, reliance on PPE, such as high-visibility clothing or helmets, is insufficient for significant risk mitigation, particularly concerning VRUs. PPE should be a last resort after all other controls have been considered.	

Case Study C: Engineering, Isolation, and Administrative Controls as a system

In TTM, the distinction between administrative and engineering controls is not a clear boundary but a **range that blends the two.** Administrative controls, such as Temporary Speed Limits (TSLs), are at one end of this range, relying on drivers' choices for effectiveness. On the other end are engineering controls that physically alter driving conditions to force compliance.

The following 4-step sequence explains how more 'engineering' can be introduced to a TSL to take it from a simple administrative control – towards a more engineered one. The hierarchy of controls requires you to seek engineering first – so methods that do not simply rely on a road user's decision (in this case, to follow a TSL) must be considered first.

Starting with a TSL sign, its effectiveness depends on individual adherence, placing it firmly within the administrative domain. This is a regulatory measure.	
Adding cones along the roadside introduces a physical measure that encourages drivers to slow down, not through direct enforcement but through psychological influence, nudging the control slightly towards the engineering side of the range.	
Narrowing these cones and decreasing their spacing compresses travel lanes, which compels drivers to reduce speed more significantly. This further amplifies the physical measures to control motor vehicle speeds.	
The installation of a chicane is an even more 'engineered' control. It forces drivers to reduce speed due to the physical changes in the roadway, positioning this control towards the engineering end of the range.	

This progression illustrates how the nature of controls can evolve from relying on driver decision-making to dictating driver behaviour through design, enhancing the overall effectiveness of the risk management strategy.

While the TSL is an administrative control, it can be enhanced through other 'more engineered' measures to generate more effective risk management. This highlights that the combination of controls often generates effectiveness – not each control by itself.

Step 5A: Selecting Temporary Traffic Management Methods

A 'Temporary Traffic Management Method' is a planned setup using various items like cones, signs, and fencing arranged in a particular way to **safely guide people through or around an activity in the road reserve.**

For example, a **footpath diversion** is a specific arrangement of these items to create a new path for pedestrians.

It is important to **figure out the general TTM method** before selecting individual controls – as all the individual controls should work together as part of a system.

It is good practice to design your control measures for vulnerable road users before you design for motor vehicle traffic.

Decide what the system will look like first (looking at space, time, activity, geometry, etc.) – then the individual control measures needed to achieve that will be clearer later.

Control measures have to work together. They can easily be ineffective in isolation (like the photo example shown).

You should ensure the individual control measures you choose **work together – to create a safety system.**

The next part of the guidance lays out **12 different TTM methods for managing VRUs safely using TTM.**

The 12 options are sequenced (generally) **in order of preference**, but in some cases, the order (of preference) may change depending on the site and activity conditions and your risk assessment.

Signs have been used to close this crossing however there are no other supporting control measures, the tactile paving is still in place which means visually impaired users are likely to still be at risk. Image Credit xl: Betty Mitrova.

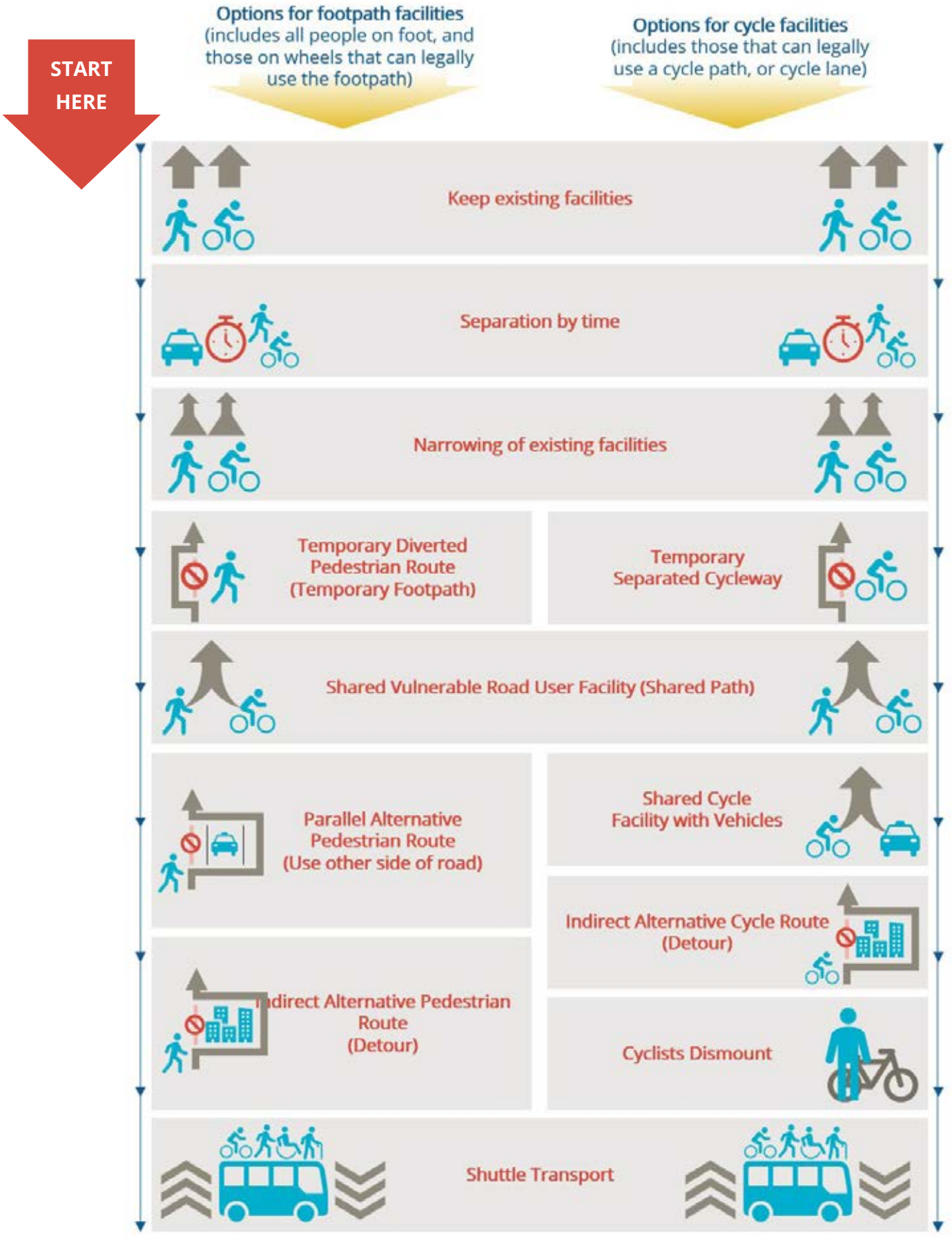
This order of preference is important – it gives a clear sequence of choices, and **you should not move on to the next choice until you have verified if a more preferred option is possible.** This supports the required approach to managing risk – by choosing the option that is the safest (and still reasonably practicable) first.

Some methods apply to **those on foot**, some apply to **those on wheels,** and some apply to both. **With all methods, do not forget that speed management is an effective way to generate safe environments for people walking and cycling.**

Each of the 12 explored methods is not isolated – they can be combined. Many sites may use multiple methods – as the risks at different places or times call for a different approach depending on the situation.

Refer to Appendix E for a Vulnerable Road User TTM Methodology selection tool.

Exploring 12 different Temporary Traffic Management Methods for managing vulnerable road users safely



Keep existing facilities

Maintain the usability of existing facilities like footpaths, cycle lanes, and crossings while designing the activity methodology.

Considerations

Activity Methodology: Assess how the work activity is planned and executed to ensure safe entry and exit to the work area. Determine if temporary stoppage of VRU paths (see separation by time method) is necessary for safe entry and exit to the work area.

Work Duration: Evaluate if constraining to a tight space could prolong the activity, extending the overall exposure to risk for different people and outweighing the benefits of utilising existing facilities.

Safety of Work Activity: Determine if the tight space compromises the safety of the work activity itself. Evaluate if the constrained space could lead to hazardous situations for workers and vulnerable road users. A method of segregating (i.e. fencing) space between the activity and vulnerable road users is still likely to be required.

Existing pedestrian crossing maintained with full width and enhanced by some adjacent cones for clarity. Image Credit xli: Betty Mitrova.

Impact on vulnerable road users: Assess the impact on VRU flow and whether the existing facilities can accommodate the VRUs safely alongside the work activity. Evaluate if there are any specific times during the day when VRU flow is higher and if adjustments in the work schedule could alleviate risks.

Quality of Existing Facilities: Assess the quality and condition of existing facilities to ensure they are up to standard for safe use by vulnerable road users. Evaluate if any temporary enhancements or repairs are necessary to uphold safety standards.

Communication: Ensure clear communication with vulnerable road users about the activity – sometimes, just the presence of work activity (even if there is little impact) can make people stay at home or take alternative, less safe routes.

Separation by time

This is about timing our work so it does not clash with the movement of vulnerable road users. Sometimes, we can pause the activity, letting people pass safely before we continue. Other times, we might need to control traffic, stopping it briefly to let people cross or move through.

Example of a stop/go operation having a specific phase for cyclists – separating their safe travel in a single lane environment by time (from vehicles). Image Credit xlii: Betty Mitrova.

Considerations

Vulnerable road user flow: Analyse the volume of VRUs during different times of the day to identify appropriate work stoppage intervals and times.

Work Stoppage Impact: Assess the feasibility of halting and restarting work, considering the nature of the activity and the impact on the overall project timeline. Evaluating whether elongated work duration due to frequent stoppages could escalate the total risk.

Noise Pollution: Recognise the challenge of communicating effectively with workers and the public during noisy work. Considering noise-reducing measures or alternative communication methods to ensure clear instructions.

Holding Time Tolerance: Recognising the patience threshold of vulnerable road users, particularly in holding areas, and understanding that prolonged waiting could deter compliance or prompt unsafe behaviour. Acknowledge that cyclists may have a lower tolerance for waiting and planning for shorter holding durations.

Visibility of Approaching Vulnerable Road Users: Ensure a clear line of sight or employ monitoring systems to detect approaching users in time to halt work or guide them to safe holding areas.

Possible Control Measures

Traffic Management Workers: Employing traffic/footpath controllers to manage the movement and coordination of different users.

Signs: Implementing signs (like Figure 9) to guide vulnerable road users and inform them of procedures. Such signs alone will be insufficient to manage risk as visually impaired users cannot rely on signs for safety.

Figure 9: Such a sign (with custom wording) would be permitted under the Land Transport Rule: Traffic Control Devices 2004 Section 4.4(1), and corresponding sign W7-8 under Schedule 1 provided it is approved by the Road Controlling Authority prior to use (Section 3.2(2)).

Communication Systems: Establish communication between traffic controllers and work crews to signal approaching vulnerable road users and coordinate work stoppages. Consider using alert systems, like bells or lights, to notify workers of approaching users.

Designated Holding Areas: Creating safe and marked holding areas for vulnerable road users to wait during work activity, ensuring they are protected from other hazards.

Narrowing of existing facilities

Narrowing Existing Facilities means that while we keep footpaths, cycle lanes, or crossings open for use, we make them narrower to accommodate our work area. It is like squeezing the space a bit but ensuring people can still pass through safely while we undertake the work activity.

This example shows a narrowed existing path with a method to prevent access to the hazard area and directional signage. One improvement would be ensuring the method preventing access is particularly clear at the entry points (closest to the camera) to make sure pedestrians can't get through, especially at the point of the change in their direction. Image Credit xliii: Traffic Management Hawkes Bay.

Considerations

Pedestrian Congestion: When we narrow down spaces, it can get more crowded, especially during busy hours. This can tempt people to step onto the road or take a different, less-safe route.

Sight Lines: With a narrower space, seeing what is coming for workers and VRUs might be more challenging.

Narrowed Length: Shorter, narrow lengths may require limited other controls, while longer lengths may need other controls.

Existing Obstructions: Things like benches or lamp posts could become bigger hurdles with less room to manoeuvre around them.

Width Requirements: Even if it is narrower, the space **should still be wide enough for everyone, including people with wheelchairs and allow for people to pass each other.**

Narrowed cycle path separated by delineation. Image Credit xliv: Downer NZ.

Straight Path: Keeping the path as straight as possible helps everyone know where to go and makes the journey smoother, sticking to the **smooth and stable** principle.

Possible Control Measures

A mechanism for preventing access: Something solid and clear to show where people should not go, keeping them away from hazards.

Directional Information: Signs or other control measures showing which way to go can help keep things orderly and clear.

Passing Bays: In spots where it gets tight, a wider section at regular intervals can let people pass each other safely whilst still resulting in the least possible disruption to users.

Visible Markings: Clear markings on the ground can help guide the way, ensuring everyone knows where to go, even if it is narrower than usual.

Monitoring: A staff member keeping an eye on things, especially during busy times, can help manage the flow and spot any issues before they become problems.

Temporary Diverted Pedestrian Route (Temporary Footpath)

This is both a methodology and explored as a control measure (outlined in Part F). This method directs pedestrians to a different nearby path when their usual footpath is not usable due to our work. This change in route is only for a short time and is nearby, without making them cross other roads or go far out of their way.

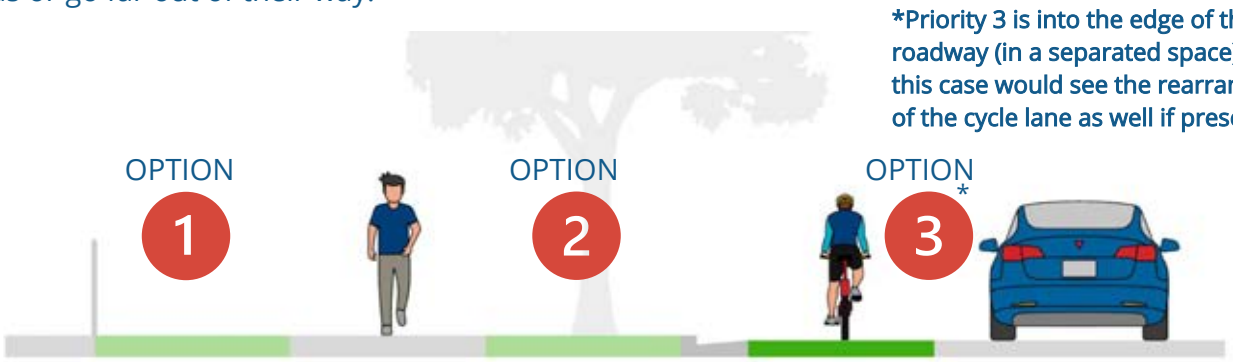


Figure 10 - Cross section of order of preference for pedestrian diversion options

Considerations

The first important consideration is where to divert pedestrians. The cross-section above (Figure 10) shows the **preferred order**. Any selection of an option that is lower in the preferred order should be evidenced by **why a higher option cannot be done** (use a risk assessment process; do not just jump to a lesser option without documenting why more preferred options will not work).

Refer to Figure 11 for a range of considerations for this footpath methodology (when diverted into the edge of the carriageway. Many of the same considerations apply to other diversion locations as well.

An example of a temporary diverted pedestrian route into a closed road space. One improvement is a few trip hazards that are visible. Image Credit xlv: Parallaxx.

Possible Control Measures

Possible control measures are also provided in Figure 11 (next page). Additional potential control measures include:

- temporary lighting (if the visibility of the path or transition points is compromised),
- passing bays (if the width does not allow continuous two-way space)
- audible messaging (to enhance directional information for the hearing impaired)
- temporary marking (to provide supporting directional information as well as signs)

For Dimensional information refer to Appendix F

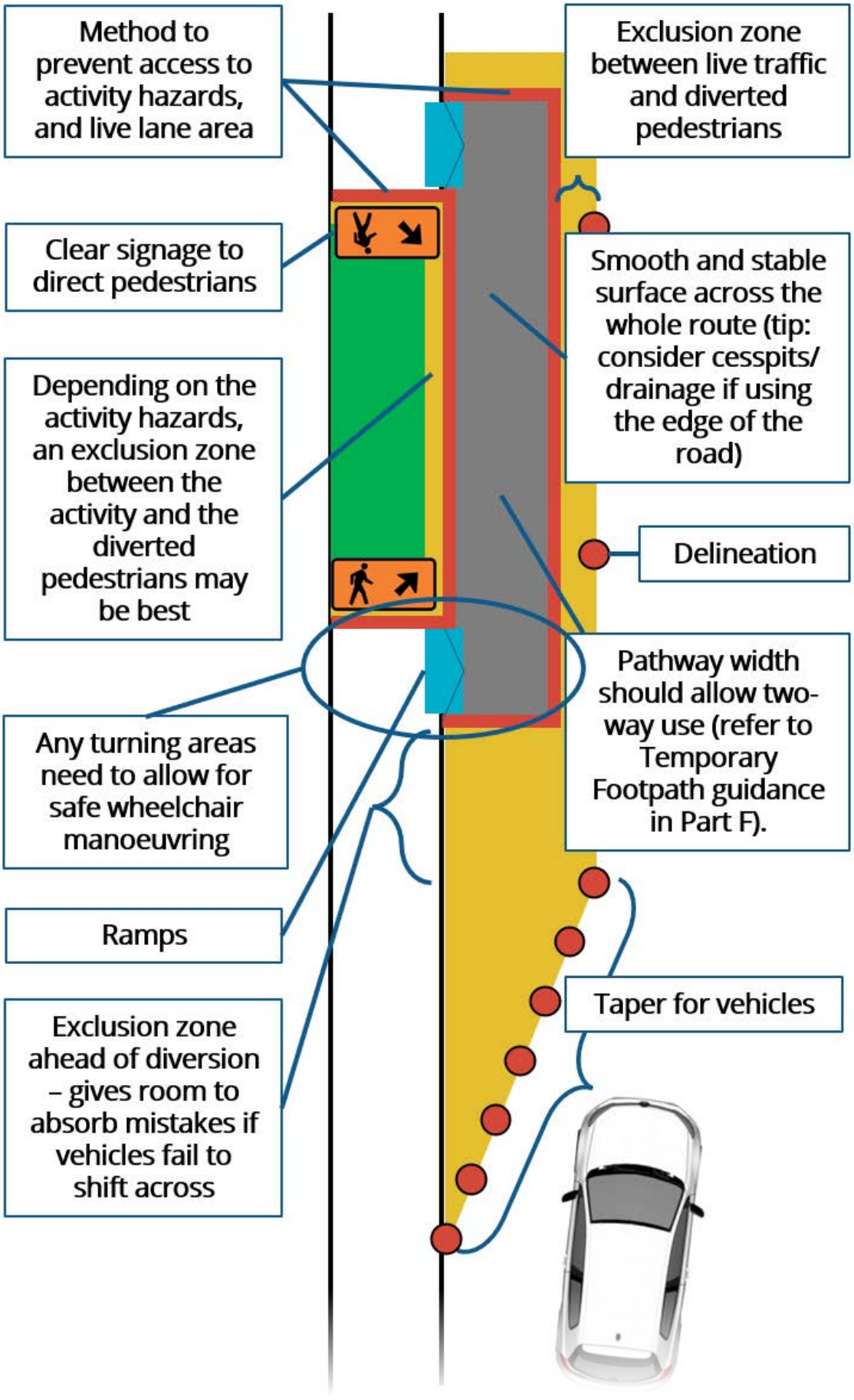


Figure 11 - Considerations for the temporary diversion of pedestrians towards or into the carriageway

Temporary Separated Cycleway

This is both a methodology and explored as a control measure (outlined in Part F). A temporarily separated cycle lane is established when work activities impede the existing cycle lane. Cyclists are redirected to a nearby or adjacent route designated temporarily.

This method maintains a **separated** cycle lane that is not merged with motor vehicles (for that method, see **Shared Cyclist Facility with Vehicles).**

This example shows a clear and well aligned temporary cycle lane diversion. One improvement would be adding a method to prevent cyclists riding through the cones (especially at the diversion location). Image Credit xlvi: Whites Traffic Management.

Considerations

MUST

Cyclists MUST not be directed to ride on footpaths or grass berms[29, Section 11.11(1)]4.

Refer to Figure 12 for a range of considerations for this cycle lane methodology (when diverted into the carriageway. Additional considerations include:

- Whether the impacted cycle lane carries one-way or two-way cycle traffic will impact the width and design of the transition areas (refer to **Temporary Cycleways in Part F**).
- aim to keep the route as direct as possible (straight).
- Visibility for cyclists around obstacles or activity hazards, especially at transition areas.
- Any level differences between existing and temporary cycleway locations.
- temporary marking (to provide supporting directional information as well as signs)
- adjacent speed of motor vehicles. This will impact the width of the exclusion zones provided as well.

Possible Control Measures

Possible control measures are also provided in Figure 12 (next page). Additional potential control measures include:

- Temporary lighting (if the visibility of the path or transition points is compromised),
- Cyclist chicane arrangements to ensure appropriate speeds of cyclists using the diversion.
- Deliberate selection of control measures to prevent access. Cones will not prevent access, cone bars can be effective but deteriorate quickly, and fencing (particularly if used for channelling in a taper) can cause harm to cyclists if they strike it.
- Temporary marking (to provide supporting directional information as well as signs)

[4] It may be appropriate to convert a short section of footpath to be a shared path, however appropriate regulatory signage must be used to do this (i.e. R4-11 sign)

For Dimensional information refer to Appendix F

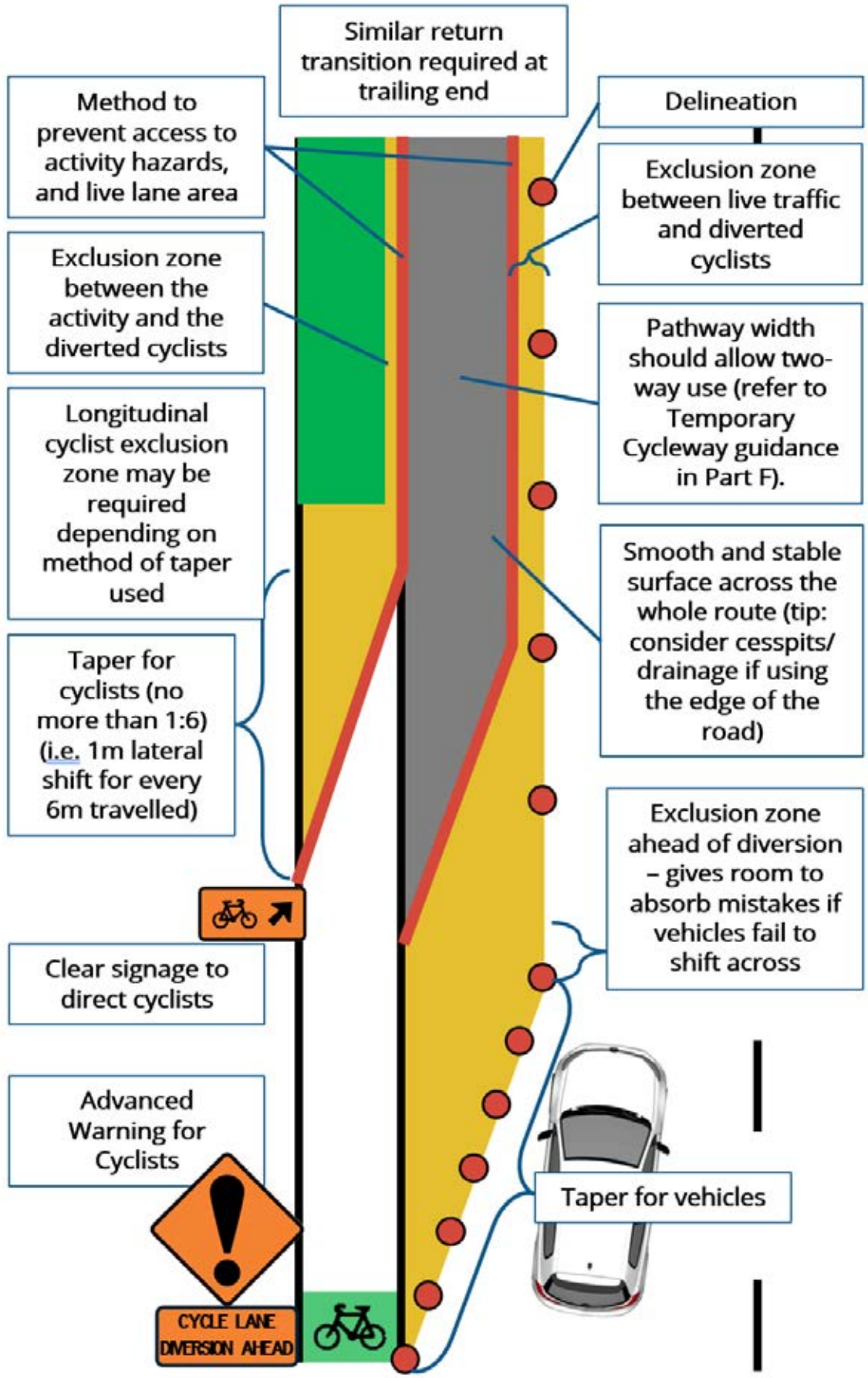


Figure 12 - Considerations for the temporary diversion of cyclists into the carriageway. The custom advanced warning sign text is permitted in accordance with the Land Transport Rule: Traffic Control Devices 2004 Section 4.4(1), and corresponding sign W7-8 under Schedule 1 provided it is approved by the Road Controlling Authority prior to use (Section 3.2(2)).

Shared Vulnerable Road User Facility (Those on Foot and on Wheels together)

A Shared Vulnerable Road User Facility, often referred to as a **shared path**, is a designated route meant for use by pedestrians and cyclists, mobility devices, and wheeled recreational devices[70].

This facility aims to provide a safe space for different user groups to travel alongside each other. **Remember, it is still best to separate people riding bicycles from pedestrians wherever possible.**

An example of a permanent shared path using pavement marking to provide directional guidance (keep left). Image Credit xlvii: Waka Kotahi[70]

Considerations

Path Width: It is crucial to ensure the path is wide enough to accommodate different users safely; **refer to Appendix F for dimensional guidance.**

User Volumes: High user volumes may necessitate a more structured approach to separation or segregation to prevent conflicts.

Surface Quality: The surface should be smooth and well-maintained to cater to the different needs of users.

Visibility: Adequate visibility is crucial for all users, particularly at intersections and crossings.

Directional Signs and Markings: These help guide users, promote predictable behaviour, and are especially effective in shared path environments[57].

Possible Control Measures

Signage and Markings: Shared paths occupy a unique legal category[5] and require specific signage as ordinarily, cyclists and pedestrians do not occupy the same facilities.

Figure 13 - R4-11 sign used to mark the start of a shared path.

Signs (like the one shown in Figure 13) are **required** at the start of the shared path[32, Section 11.4(1)(a)(i)]. This specific sign is not mandatory; any sign that appropriately indicates it is a shared environment would be acceptable – provided it complies with the Traffic Control Devices Rule 2004.

Directional Separation: Employ centrelines for directional separation when the path width permits.

[5] Land Transport Rule: Traffic Control Devices 2004, Section 11.4.

Shared Cyclist Facility with Vehicles

concept entails a part of the road where motor vehicles and cyclists coexist. This arrangement is typically seen where separate cycle lanes are not provided or a cycle facility needs to be closed for activity.

The lane width majorly influences the dynamics between people who cycle and motor vehicles.

A sufficient lane width allows a **lateral coexistence between people and motor vehicles** (the lane is ≥4.25m wide), enabling them to move side by side.

People who cycle and motor vehicles SHOULD NOT be asked to coexist where the shared lane between cyclists and motor vehicles is between 3.25m and 4.25m. Vehicles may be confident to pass – however, there is not enough space to do so safely.

In the case of a narrower lane (≤3.25m), a "take the lane" approach is advocated for, where cyclists occupy the middle of the lane, and motor vehicles follow. Figure 14 shows these lane width considerations.

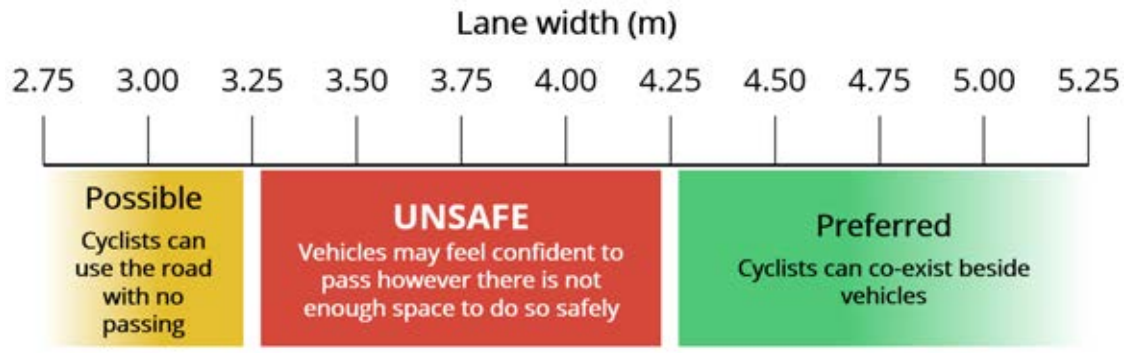


Figure 14 - Lane width guidance for cyclists sharing the carriageway. Adapted from Transport for London[63]

Considerations

Considerations and control measures for lateral coexistence (preferred):

Lane Width: An adequate lane width of 4.25m or more is important for lateral coexistence.

Signage and Markings: Clear signage and possibly road markings are important for road users and cyclists to warn of the upcoming shared environment (and the transition to and from that environment of cyclists are to join the carriageway from a separate space temporarily). Refer to Figure 19 for additional concepts.

Speed: Temporary speed limits should help make a safer environment for people who cycle and motor vehicles to coexist. Lower speed limits are preferred, especially in urban settings, to minimise the risk of accidents. Traffic calming measures could also be deployed to encourage speed limits.

Parking Management: Managing on-street parking is crucial to prevent obstruction and maintain the lane width for shared use. This might include no-parking zones.

Considerations and control measures for the "Take the Lane" approach:

Lane Width: In situations where the lane width is narrowed to 3.25 metres or less, the "take the lane" approach is **possible**. A concept layout of this approach is shown in Figure 20.

This necessitates a single-file approach, emphasising the importance of speed parity between people who cycle and motor vehicles to prevent unsafe overtaking attempts.

Speed Management: A speed limit of 30 km/h is recommended to maintain speed parity, making it safe for cyclists to take the lane without impeding traffic flow significantly and reducing the chance of more severe consequences if something goes wrong.

Lane width is the most effective way to manage safe speeds for sharing the road. Be careful to consider uphill and downhill impacts on people cycling as well.

Signs and Markings: Few temporary measures are aligned closely with the "take the lane" cycling approach; however, some permanent measures such as sharrows (road marking) (Figure 15) are possible, as well as the use of signs approved within the Traffic Control Devices Rule 2004 (examples below):

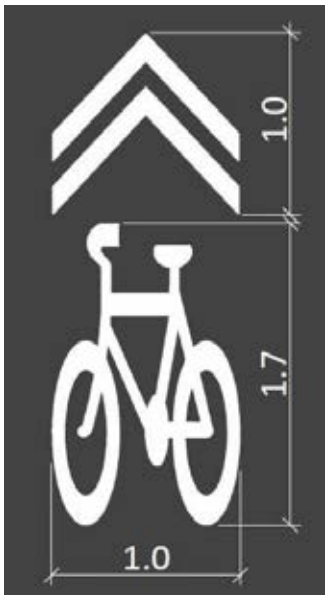


Figure 15 - Sharrow marking indicate a shared lane for both cyclists and motorists, helping position cyclists safely on the road while reminding all road users to share the space responsibly.[57]

Figure 16 - A43-7 Sign

Figure 17 - W5-8.13 Sign

Figure 18 - A43-1 Sign

Considerations and control measures for closing a cycle lane and diverting cyclists into the lane:

Where there is an existing cycle lane, and it is required to be closed, with cyclists needing to be redirected to merge with traffic, the following considerations are important:

- Exclusion zones at the transition area ensure that mistakes by people who cycle or motor vehicle drivers do not have catastrophic consequences.
- A clear warning to people who cycle and motor vehicles that the merging operation is ahead.
- Reduction of motor vehicle speed to allow safer coexistence with cyclists.
- Straight alignment of cyclists and vehicles at the merge point (i.e. they are both pointing in the same direction).

For Dimensional information refer to Appendix F

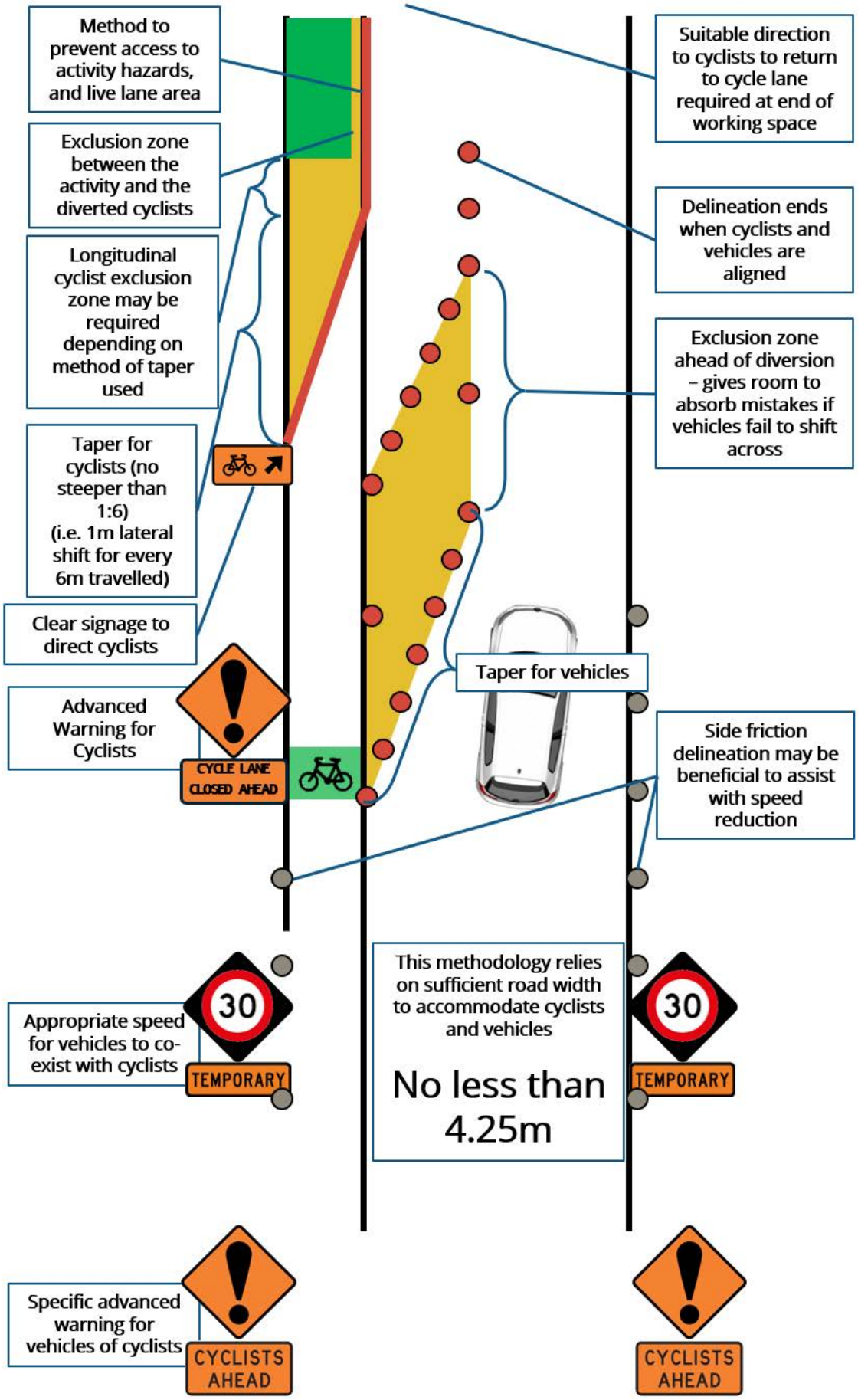


*Figure 19 - Considerations for the temporary diversion of cyclists into the carriageway to share the road with vehicles where there is **sufficient lane width for passing.***

For Dimensional information refer to Appendix F

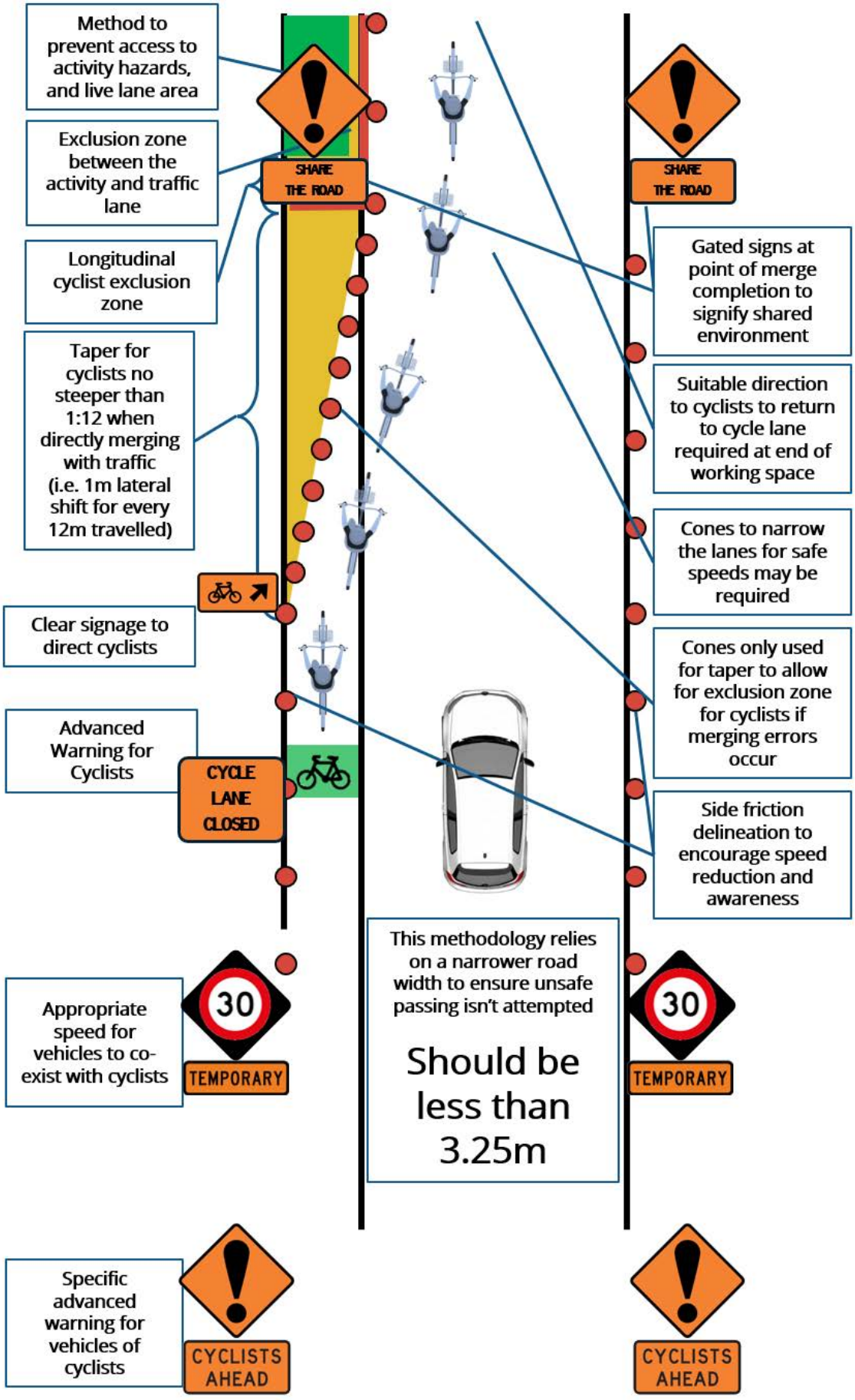


Figure 20 - Considerations for the temporary diversion of cyclists into the carriageway to share the road with vehicles where there is ***insufficient lane width for passing.***

Parallel Alternative Pedestrian Route (Use the other side of the road)

This method refers to redirecting pedestrians to use the **footpath on the opposite side of the road** when the usual footpath is unavailable. This requires crossing the road and possibly re-crossing it further along to resume the original path.

SHOULD

Diverting pedestrians to a footpath on the other side of the road should only be considered after all other preferred options have been ruled out. Compliance with this method is proven to be low[3; 42; 47; 64], resulting in ineffective risk management.

Considerations

Route Deviation: Significant deviations from existing paths can lead to misunderstanding and unsafe pedestrian movements as individuals may attempt to enter the carriageway to bypass the site.

Footpath closure at signalised crossing to allow safe controlled crossing of the road for footpath users. Image Credit xlviii: Danny Wood.

Controlled Crossing Facilities: Providing controlled temporary crossing facilities can ensure safe crossing to the alternative footpath, especially on roads with high traffic volumes. Existing controlled crossing points may be utilised if they do not divert pedestrians excessively or unintuitively.

Alternate route quality: The path quality where people are being diverted should be of equal or better standard.

Sight Distance: The sight distance at crossing points needs to be sufficient to allow for safe crossing (Refer to Appendix F). This is crucial for pedestrians and oncoming traffic to have adequate visibility to react to each other.

Access to Properties: If there are properties within closed sections of footpath, this could create confusion and result in unsafe pedestrian movements. Arrangements should be clear and well-communicated for continued access.

Possible Control Measures

Temporary Tactile Pavers: Utilise temporary tactile pavers to assist visually impaired individuals in identifying the crossing points.

Example of footpath closure (suing other side) utilising an existing pedestrian refuge. Image Credit xlix: Danny Wood.

Pedestrian Refuge: In cases where the road is wider than 10 metres and may be challenging to cross in one go[68], a temporary pedestrian refuge in the middle of the road can provide a safe waiting area for a multi-stage crossing (**refer to this detail in Appendix F).**

Dedicated Site Personnel: Positioning dedicated site personnel at closure or crossing points to assist and guide pedestrians, especially those requiring assistance or reassurance.

Detours for People who are walking

This refers to guiding pedestrians along a different path when their typical route is temporarily inaccessible.

Such detours can be longer and may deviate significantly from the original or desired route.

While detours are **typically the last resort** due to their potential to cause confusion or non-compliance, they might be the only viable option to maintain pedestrian safety and accommodate necessary work activities in certain exceptional circumstances.

Example of a pedestrian detour plan. The length of the detour may be a challenge for those with disabilities and could encourage unsafe behaviour. Control measures should be considered if non-compliance is a risk. Image Credit l: Parallaxx.

Considerations

Understanding and Compliance: Detours that oppose usual routes or desired lines are often misunderstood, leading to unsafe pedestrian movements. The further a detour deviates from the original path, the lower the likelihood of compliance, especially if it significantly increases the travel distance[67]. It is essential to ensure that the use of the original (closed) route is prevented through engineering controls if it is unsafe.

Vulnerable Pedestrians: People who are blind or with low vision or other disabilities are more likely to face challenges with detours, especially those with multiple crossing points or unclear directions.

Early Planning: The planning for detours should be integrated into the initial stages of construction planning to ensure they maximise opportunities for extensive public communication and optimal use of routes (which might include private property).

Route Quality: Detours should aim to maintain or even improve the quality of the original route in terms of surface material, facility width, and signalised crossings.

Possible Control Measures

Dedicated TTM workers: Positioning dedicated TTM workers throughout the detour route to mitigate the risk of misunderstandings regarding the change of direction and to ensure that vulnerable pedestrians can be fully escorted through the route.

Clear and Concise Signage: Utilising clear and concise signage to guide pedestrians effectively along the detour route, indicating the direction and any crossing points.

Utilisation of Signalised Crossings: Incorporating signalised crossing points with longer crossing phases to facilitate safe crossings, especially at busy intersections or high-traffic areas.

Detours for people who cycle

This refers to redirecting cyclists from their usual path to an alternative route due to temporary obstructions. Unlike pedestrians, cyclists cover distances faster and may be more willing to take detours if well-planned and clearly marked. The aim is to provide a safe, clear, and reasonably direct alternative to the usual cycle route.

Cyclist detour with no clear safe arrangement with the nearest traffic lane at the point of detour. Image Credit li: Washington State Department of Transportation.

Considerations

Route Directness: Cyclists prefer direct routes to minimise travel time[44; 57]. Detours that significantly lengthen the trip may lead to non-compliance, with cyclists potentially finding alternative routes that might be unsafe or choosing to dismount and become pedestrians.

Surface Quality: The surface quality of the detour route is crucial, as uneven or rough surfaces can be hazardous for cyclists. The surface of any detour should be checked thoroughly for cyclist safety before use and checked regularly for any deterioration.

Signage and Markings: Clear signage and markings are vital to guide cyclists along the detour route, indicating the direction, potential hazards, and the distance to the destination.

Crossing Points: Safe crossing points are essential, especially at busy intersections or high-traffic areas. Signalised crossings or designated cycle crossings are preferred.

Width and Capacity: The width of the detour route should be sufficient to accommodate cyclists safely, allowing for overtaking where necessary. Refer to Appendix F.

Possible Control Measures

Advanced Warning Signs: Positioning advanced warning signs to inform cyclists of the upcoming detour well in advance, allowing them to make informed decisions.

Temporary Cycle Lanes: Establishing temporary cycle lanes on the detour route can provide a designated space for cyclists, enhancing their safety, especially on roads with mixed traffic.

Lighting and Visibility: To prevent accidents, ensure good lighting and visibility along the detour route, especially at night or during adverse weather conditions.

Route Monitoring: Monitoring the detour route to promptly identify and address any issues, ensuring it remains safe and clear of obstructions.

Public Communication: Publicising the detour through various channels, including online platforms, to inform cyclists in advance and allow them to plan their routes accordingly.

Case Study D: Cyclist detour compliance in Sweden

The longer cycle detours are, the more deviation from the original path, the less compliant cyclists will follow the detour.

This means that cyclists are still likely to try and use the existing route (which is now unsafe) or may try and ride with motor vehicle traffic, which is unsafe without appropriate controls.

The following cyclist detour was set up in Gothenburg, Sweden. Observations showed that 12 out of 15 cyclists (80%) ignored the detour and cycled on the traffic lanes instead[23].

Rerouting of cycle traffic when the cycle path is closed (yellow cross) due to roadworks. The solid red line shows the route the cyclists are directed to, while the dotted lines show their chosen route. Image Credit lii: www.eniro.se

This case study highlights that deploying TTM methods to manage the safety of vulnerable road users must account for the level of compliance with the chosen controls. If the method is ineffective, then adjustments or alternatives must be actioned.

Cyclists Dismount

This method is deployed in scenarios deemed hazardous or impractical for cyclists to continue riding.

This typically occurs in Very constrained activity areas, heavily congested areas, or where roadway widths are notably restricted.

The directive compels cyclists to dismount and proceed on foot, essentially transitioning them temporarily into pedestrians.

However, this measure is often seen as disruptive and less favourable among cyclists due to the inconvenience it imposes, and thus, it **is recommended to be a last resort.**

Figure 21 - This sign combination uses a W5-8.12 cyclist directional sign, with a custom sign under W8-8 from the Traffic Control Devices Rule 2004.

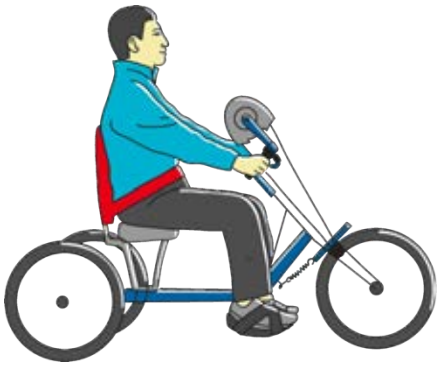
Considerations

Make it clear why they are dismounting: The reason must be immediately apparent to cyclists. Compliance rates will likely plummet without a clear and visible rationale [17].

Short Distance: The directive should span a short distance, ideally not exceeding 50 metres[7]. This minimises inconvenience and increases the likelihood of compliance.

Alternative Routes: Before resorting to a "Cyclists Dismount" directive, all alternative routes and configurations should be explored to retain space for cycling. This directive should be employed only in extreme circumstances where alternative routes are impractical or unsafe.

Impact on Disabled Cyclists: Not all cyclists can easily dismount and proceed on foot, especially those using cycles as mobility aids. The process could potentially cause accidental injury and significant inconvenience to these individuals.



Possible Control Measures

Signage Clarity: Ensure the signage is clear, visible, and placed well in advance to provide ample reaction time for cyclists.

Marshals: In situations where dismounting is unavoidable, having marshals on site to assist cyclists, particularly disabled people, could enhance compliance and safety. These marshals should ideally receive specific training to assist disabled cyclists better.

Public Communication: Broadcasting the "Cyclists Dismount" directive and its reasons on various platforms, including online and local signage, can help inform cyclists in advance and possibly lead to better compliance.

Shuttle Transport

Shuttle transport emerges as a contingency measure when accommodating vulnerable road users within or around a work zone becomes unfeasible. This mechanism is triggered in scenarios where the construction of temporary walkways or bike paths is impracticable, often during substantial infrastructural overhauls like bridge replacements or complete closures such as a railway crossing upgrade. The primary goal is to ensure safe and accessible passage for pedestrians and cyclists around the construction site, albeit in motorised transport, deviating from the typical self-propelled travel mode.

This method may also be suitable in rural areas where an extended length of the road is reduced to a single lane with alternating flow. It may be undesirable for people cycling to travel with the motor vehicle traffic due to the time taken to negotiate the single-lane section.

Considerations

Only used if you have to: It is advised that shuttle services be considered less preferred than other measures with less disruption to users. It may not be a 'last resort' – as the activity and site conditions may mean shuttle transport is the only realistic option.

Image Credit liii: Bike Ventures (Bulgaria)

Capacity and Accessibility: Ensuring the shuttle service is accessible to all, including individuals with disabilities, is paramount. A standard capacity should include space for at least two disabled passengers in powered chairs alongside a maximum of ten non-disabled individuals[1].

Volume-Based Service: The frequency and operation of the shuttle service could be determined based on the pedestrian and cyclist volumes. High volumes may necessitate on-site shuttles, while on-call services could serve low volumes.

Cost-Effectiveness and Practicality: Exploring partnerships with local public transit systems might present a cost-effective and practical solution, especially in urban settings with robust systems.

Possible Control Measures

Clear Signage, Information, and Communication: Display clear signage and provide information on the shuttle service's availability, location, and schedule well before the construction site. Communicate the availability and operational details of the shuttle service through various channels, including online platforms, to ensure maximum awareness among the affected VRUs.

Collaboration with Local Transit Operators: Engage with local public transit authorities to explore the possibility of bolstering existing transit services to accommodate the detour needs of VRUs.

Appropriate parking and waiting areas: Ensure safe locations for vulnerable road users to wait and safe pick-up and drop-off areas clear of the road.

Contingency Plans

The primary aim of a contingency plan is to ensure the continuous safety and accessibility of traffic spaces for vulnerable road users, even in the face of unforeseen circumstances.

Preparing for various scenarios enhances the robustness and flexibility of the TMP, making it resilient to change and uncertainties. **The value of effective contingency planning is in:**

Proactive Risk Management: Anticipating problems before they occur is at the heart of risk management. Contingency plans provide a structured response to potential issues, minimising the possibility of less effective ad-hoc decisions when things change.

Enhanced Safety: The dynamic nature of traffic and construction environments necessitates a buffer against potential hazards. Contingency plans offer this buffer, ensuring that safety standards are maintained even when the primary traffic management methodology faces challenges.

Operational Efficiency: With well-structured contingency plans, field staff can quickly adapt to changing conditions without requiring extensive re-design or delay, thus maintaining the operational flow.

Every contingency plan should:

Be scenario-specific: Each contingency plan should be tailored to address a specific event or scenario. This narrows the focus and ensures the response is precise and effective.

Have defined trigger points: Establish clear, measurable trigger points that signal the activation of a contingency plan. These trigger points should be identified far enough in advance to provide adequate time to implement the contingency measures.

Be feasible and resourced: Ensure each contingency plan is feasible with the available or easily accessible resources. This includes human resources, equipment, and other logistical arrangements necessary to enact the plan.

Be communicated: Develop clear communication channels to promptly relay the activation of contingency plans to all relevant stakeholders. This includes field staff, other road users, and the VRUs affected by the change.

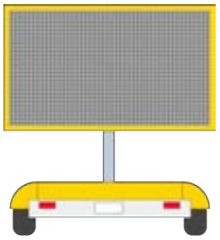
Have associated training: Field staff should be adequately trained and familiarised with the contingency plans to ensure swift and correct implementation when needed.

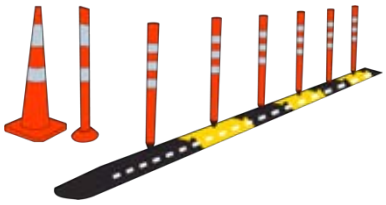
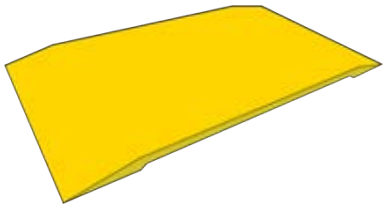
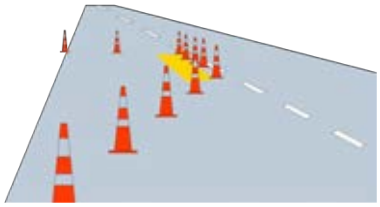
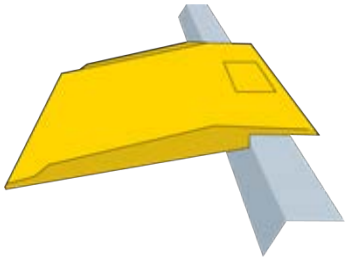
Control Measures that are used for Vulnerable Road Users

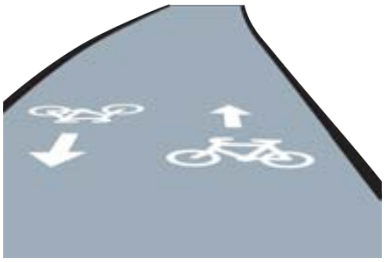
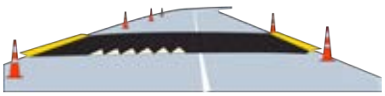
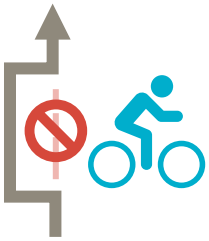
Step 5B: Select Individual Control Measures

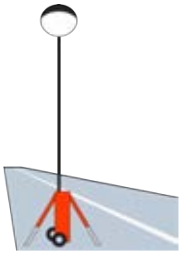
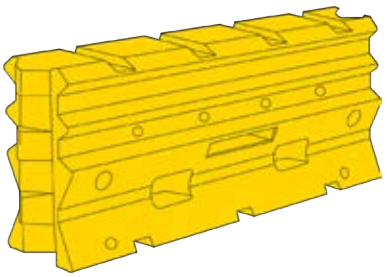
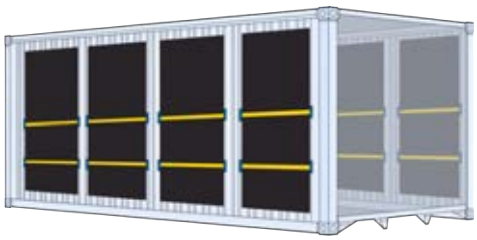
The individual control measures should be selected to achieve the overall traffic management method in Step 5A. This requires a deep and thorough understanding of the individual controls used in TTM for the safety of vulnerable road users and how they work.

Individual control measures are provided alphabetically and summarised in the following table. Refer to Part F of this guidance for a full exploration of each control measure (in the same order as this table).

Control measure	Explanation	Graphic
Advanced Technologies *Page F2*	Uses modern technology like sensors to detect and protect vulnerable road users. For example, a sensor could alert approaching cyclists of a motor vehicle in a blind spot.	
Advanced Warning *Page F3*	Gives early warning about upcoming hazards (for either vulnerable road users or drivers), such as warning of a narrow path for cyclists.	
Audible Messaging *Page F3*	Uses sound to guide or warn vulnerable road users. For example, a beep to indicate a safe time to cross the road or a speaker sharing safe directions (particularly for visually impaired road users).	
Communications with the Public *Page F4*	Keeps people informed about what is happening and why. For example, a community notice about roadwork dates or a variable message sign (VMS).	
Cone Bars *Page F6*	Used to create quick, visible separation between areas. For example, separating a pedestrian path from a work zone.	

Control measure	Explanation	Graphic
Delineation *Cones* *Tubular Delineators* *Flexible Traffic Separators* *Page F7*	Marks out boundaries between areas and provides channelling for road users. For example, cones are set up to channel road users away from a road shoulder to give room for cyclists.	
Escorting Vulnerable Road Users *Footpath Controllers* *Page F8*	Guiding vulnerable users safely through the work zone. For example, a worker helps an older person cross the road.	
Excavation Covers *Trench Covers* *Page F9*	Covers up holes or trenches to make them safe to walk or ride over. For example, a sturdy cover over a dug-up part of a sidewalk.	
Exclusion Zones *Safety Zones* *Page F10*	Areas that provide buffer zones between hazards and those that can be harmed (providing space to absorb errors or mistakes). For example, a space between a fence and an excavation so the fence does not fall in the hole if struck.	
Fencing *Page F11*	Physical devices that prevent access to an area and channel road users. For example, a fence guiding pedestrians towards a safe crossing point.	
Kerb Ramps *Page F12*	Creates step-free access between levels. For example, a ramp at a crossing for wheelchair users.	

Control measure	Explanation	Graphic
Markings *Temporary Marking* *Road Marking* *Page F14*	Paint or tape on the ground to guide or warn. For example, LOOK LEFT is painted on the ground at a crossing point for pedestrians.	
Signs *Directional Signs* *Regulatory Signs* *Page F15*	Provides information or instructions. For example, a sign indicating a direction for cyclists to travel in.	
Temporary Bus Stops *Page F16*	A short-term bus stop when the usual one is unavailable. For example, a sign and marked area a few metres away from a closed bus stop.	
Temporary Crossings *Page F17*	Short-term safe places to cross the road. For example, a signposted safe crossing using temporary traffic signals.	
Temporary Cycleways *Page F18*	A designated, temporary route for cyclists to ensure their safe passage through or adjacent to a work zone.	
Temporary Footpaths *Page F20*	A designated, temporary route for footpath users to ensure their safe passage through or adjacent to a work zone.	

Control measure	Explanation	Graphic
Temporary Lighting *Page F20*	Extra lights for safety and visibility. For example, floodlights illuminate a temporary footpath that is still required at night.	
Temporary Road Safety Barrier System (TRSBS) *Page F23*	Barriers to redirect or capture motor vehicles that leave the road so motor vehicle occupants do not get hurt may also provide valuable protection for vulnerable road users in certain situations.	
Temporary Speed Limits *Page F23*	Reduced speed zones near work areas. For example, a 30km/h limit where people who cycle and motor vehicles use the same road space.	
Temporary Walkway Bridges *Page F25*	Paths over obstacles or hazards. For example, a footbridge over a dug-up section of road.	
Vehicle fitted with a Truck Mounted Attenuator (TMA) *Page F25*	A vehicle equipped with an impact-absorbing device to reduce the severity of collisions. For example, a truck with an attenuator positioned at the start of a pedestrian diversion to protect people walking who are being diverted close to vehicles.	
Walkway Covering *Page F26*	Covers to protect or guide pedestrians. For example, a covered walkway shields people from falling objects.	

Check what new risks you have introduced

Implementing control measures to manage risks can occasionally introduce new hazards or escalate existing ones.

Step 6: Check what new risks you have got

Some potential introduced risks are summarised alphabetically in the following table. This list is not exhaustive. You should always look for new risks from using other control measures.

Control measure	Explanation
Control measure deterioration, variability, or redundancy *Page D53*	Over time, controls like fencing or signs might no longer serve their intended purpose, thus becoming obstacles that could be hit or block pathways. A continuous evaluation of control measures to ensure they are still needed and effective is required.
Loss or impact to access for properties *Page D55*	Implementing control measures might alter people's movement patterns in the vicinity, negatively affecting access to businesses or residences. Such changes could spawn new hazards or challenges, like altered parking, delivery, or emergency service access.
Sign Placement *Page D56*	While signs need to be prominently placed to ensure visibility, their placement can encroach upon spaces needed by vulnerable road users or their safe use of those spaces.
Site Access or Exit *Page D57*	Work activity vehicles' entry and exit points may shift as the site progresses, possibly intersecting with paths vulnerable road users use unexpectedly. These changing patterns can lead to unfamiliar crossover points, increasing the risk of accidents.
Surface Condition *Page D58*	Temporary relocation of pedestrian or cyclist paths can result in inferior surface conditions. Using these temporary environments may present new risks like uneven or slippery surfaces, which did not exist before.
Visibility *Page D60*	Altering pedestrian or cycle routes changes sight lines, while introducing plant, machinery, and materials to the environment may obstruct previously clear visibility. These changes can heighten the risk of collisions or other accidents.
Water pooling or drainage *Page D61*	Changes brought about by control measures, like the placement of devices, alterations to permanent infrastructure like kerbs, or the placement of kerb ramps, can affect water movement and drainage. These changes can cause water to pool in areas where the environment's geometry is not equipped to handle it, creating unsafe surfaces or areas where water depth is difficult to ascertain.

Control measure deterioration, variability, or redundancy

Any temporary sign MUST be removed as soon as the need for it has ended[32, Section 4.2(7)].

Description:

Over time, or due to changing site conditions, control measures like delineation or ground surfaces may degrade, lose effectiveness, or no longer serve their intended purpose. They become hazardous or obstacles that could hit or block pathways, endangering the safety of vulnerable road users.

For instance, a ramp initially placed to aid pedestrian access might become worn and uneven, posing a tripping hazard. Similarly, faded paint or line marking can lead to unclear path demarcation, creating confusion for VRUs.

When the access gate is open on this site, the pedestrian signage directs users to walk into the site entry point. Image Credit liv: Parallaxx.

How would this risk arise?

These risks can come from a lack of meticulous attention during the planning stages, where control measures remain unchanged across different phases of the job despite the evolving nature of site risks.

The risk becomes more likely when insufficient checking and correction has occurred on-site, allowing for degraded or misaligned control measures to remain unaddressed.

Additionally, when the primary focus is on managing motor vehicle-based risks, the effect of control measures may be overlooked, making some controls redundant or hazardous for those who are vulnerable.

The use of paper taped to a cone has meant the sign has deteriorated and hardly visible. The cone makes the ramp narrower which is particularly problematic for people using a wheelchair. Image Credit lv: Betty Mitrova.

Fences to prevent access to hazards but have fallen over, creating risk for vulnerable road users. Image Credit lvi: Sweden National Road and Transport Research Institute[44].

For instance, a row of cones moved by the public and left in disarray could obstruct pedestrian pathways and become tripping hazards.

Redundant or degraded controls mean the risk is going unmanaged (as those control measures were deployed for a reason and are no longer working/adding value). This means that someone has more risk than they should. Given that vulnerable road users have the highest risk of harm in most cases – ineffective controls have a greater impact on their safety than anyone else.

Mitigation strategies:

A well-structured plan that adapts to the changing risks on site is the cornerstone of mitigating these risks.

Such plans should delineate the evolution of control measures in tandem with the site's changing risk profile, enabling field staff to make necessary adjustments promptly.

A thorough onsite checking process is also crucial. This entails verifying the existing control measures and critically evaluating their relevance and effectiveness in the current site scenario.

For instance, asking, **"In what ways is this not currently working?"** can prompt a more detailed review.

Where longevity of control measures is concerned, utilizing more durable options like tubular delineators could significantly reduce maintenance requirements, thereby minimizing the risk of deterioration. However, weighing this against the increased time and risk involved in their installation and removal is essential, ensuring a balanced and well-assessed approach to risk management.

Equipment left in or adjacent to pedestrian routes that is unused only serves to add obstacles or hazards to users. Image Credit lvii: Betty Mitrova.

Loss or impact to access for properties

Description:

The risk of losing or affecting property access happens when traffic controls change how people usually move around, making it hard for them to get to certain places. This risk can **affect** customer visits to businesses, deliveries, emergency services, and the places' daily workings.

How would this risk arise?

This risk comes up when we put controls like fences, change traffic routes, or close paths to manage traffic or keep places safe during work. For instance, putting up a fence for a construction site might make people take a longer route, cross more driveways or change how they enter homes and businesses. Likewise, changing traffic routes may block regular entrances, affecting cars and people trying to access properties.

Mitigation strategies:

Engagement

Talk to property owners, business operators, and the community to understand their needs and concerns. Knowing what they require helps in planning and setting up controls properly.

Customised Planning

Plan traffic controls in a way that balances between managing traffic and keeping access to properties.

Consider the local setting, the type of properties affected, and what people expect.

Clear Signage and Communication

Put up clear signs to show any changes in routes or access points. Also, inform affected people about the changes, why they are happening, and how long they will last.

Information signage to inform pedestrians of local businesses being open. Image Credit lviii: Parallaxx.

Iterative Assessment

Regularly check the controls set up and be ready to make changes based on what is happening on the ground or feedback from the community.

Alternative Access Arrangements

Create temporary access points or paths to ensure people can still get to properties. This could include setting up delivery zones, temporary parking areas, or shuttle services for longer distances.

Coordination with Emergency Services

Work with local emergency responders to ensure they can still access properties in case of emergencies. Plan for emergency vehicle routes to keep the access clear. See contingency plans.

Sign Placement

Description:

The risk involves placing signs where vulnerable road users need safe movement. Misplaced signs could obstruct pathways or sightlines, introducing risks that outweigh the sign's benefit.

Image Credit lix: Parallaxx

Image Credit lx: Betty Mitrova

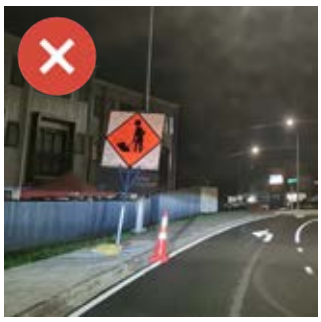


Image Credit lxi: Betty Mitrova

Image Credit lxii: Betty Mitrova

How would this risk arise?

This risk arises when signs are placed without considering the needs of all road users. For instance, a sign placed on a footpath may force pedestrians, especially those with mobility aids, onto the road.

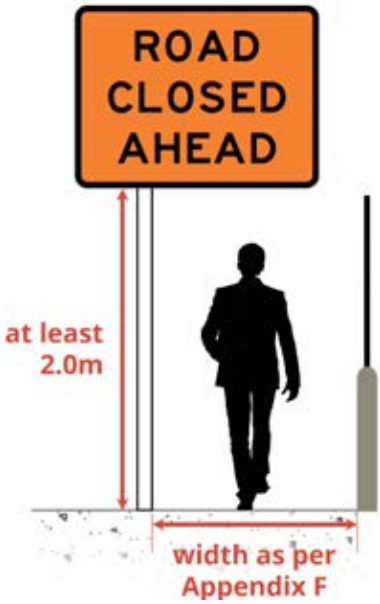


Figure 23 – Pedestrian or cycling box dimension requirements

Mitigation strategies:

Pedestrian or Cycling Box

For footpaths or cycle lanes, there should be no encroachment of signs into the full useable width of the space (as per widths outlined in Appendix F).

Therefore, any signs needing to be placed into walking or cycling space should be above 2.0m. This results in the pedestrian or cycling box concept (Figure 22 and Figure 23).

Figure 22: Depiction of the 'pedestrian box' concept[2]

Standard Sign Placement

When placing all standard signs (at normal height) – full footpath or cycle lane widths (as per Appendix F) should remain. Where any trip hazards (such as sign feet) are close to the travelled path of users – delineation should be placed (Figure 24).

Delineation placement adjacent to trip hazards is an important control for the visually impaired, who use canes to detect hazards or objects in their path.

Figure 24 - Sign placement adjacent to vulnerable road user paths.

Site Access or Exit

Description:

This introduced risk involves the potential hazards associated with entry and exit points of a construction or work site. Inadequate management of these points can lead to confusion, congestion, or accidents, particularly for vulnerable road users unfamiliar with temporary changes.

Site access and exit in this location would be very challenging. Pedestrians itneracting in the same place as entering vehicles and a blind corner of hoarding close to a live traffic lane. This location would require a number of control measures to ensure the safety of site entry and exit activity. Image Credit lxiii: Parallaxx.

How would this risk arise?

Site access or exit risks emerge when construction activities disrupt traffic flow and pedestrian or cyclist movement. This could occur if entry and exit points are poorly marked, insufficient space for motor vehicles and VRUs to navigate safely, or temporary changes are not communicated effectively to the public. There may also be risks associated with the visibility of gates or entering/exiting vehicles based on obstructions where there is limited space between the obstructions and where people travel.

Mitigation strategies:

Clear Demarcation

Ensure that entry and exit points are demarcated with appropriate signage visible from a distance to all road users, including pedestrians and cyclists.

Use TTM Workers or other Personnel

Employ personnel at key points to manage the flow of motor vehicles and VRUs, particularly during peak hours or when large vehicles enter or exit the site. This control can be added or removed as required – as the movement of vehicles into and out of a site is often infrequent.

Safe Crossing Points

Establish safe crossing points for VRUs with signage, markings, and fencing where necessary to guide them away from risks. Removing VRUs from the conflict points for entering/exiting vehicles can be the best way to eliminate the risk.

Regular Review

Conduct regular reviews of the access and exit arrangements, particularly in response to feedback from VRUs and changes in site activity, to ensure ongoing safety and efficiency.

Emergency Access

Maintain clear routes for emergency vehicles at all times, ensuring that any changes to access points are communicated to emergency services immediately.

Surface Condition

Description:

This risk relates to the safety concerns for pedestrians and cyclists when redirected onto alternate surfaces due to traffic management activities. These alternative pathways may have uneven, slippery, or unstable surfaces that could lead to trips, slips, or falls, especially for those with mobility impairments or when using assistive devices.

Slippery and uneven surfaces are not navigable for all people. One consequence of poor TTM is that some people give up trying to travel. We must ensure everyone can use walking and cycling facilities safely and comfortably.

How would this risk arise?

This risk materialises when temporary pathways are not adequately assessed for surface integrity and when changes in surface conditions are not addressed or communicated. For instance, pedestrians diverted onto gravel or lawns could encounter unstable footing, while cyclists redirected onto cobblestone areas might find the surface unsafe, particularly in wet conditions.

Whilst this grass area might be stable in good weather and with light use – that will quickly change after some use or rain, creating an unsafe surface for many users – especially those with mobility challenges. Image Credit lxiv: Betty Mitrova.

In this instance, high-contrast temporary non-slip covers have been used. These are helpful for people with visual impairments, but there is still a small trip hazard to watch out for. Image Credit lxv: Carina Duke.

Mitigation strategies:

Surface Assessment

Before redirecting traffic, thoroughly assess the alternate surface to ensure it is stable, even, and free of hazards.

Improvement Works

Carry out any necessary work to improve the surface condition, such as compacting loose gravel or covering uneven areas with temporary but stable platforms.

Signage and Warnings

Install clear signage to warn VRUs of the surface change, especially when transitioning from one type of surface to another.

Lighting

Ensure adequate lighting is provided where surface conditions may be less visible, such as during darkness hours or in shaded areas.

Accessibility Compliance

Make sure that any temporary surfaces comply with accessibility standards, providing a smooth transition for those with wheelchairs or other mobility aids.

Routine Inspections

Implement a schedule for regular inspections of the temporary surfaces to identify and rectify any emerging issues promptly.

Case Study E: Damaged footpath led to man's death[88]

Maintaining good surface conditions for footpaths is crucial for ensuring the safety and mobility of all pedestrians, especially disabled people.

Image Credit lxvi: Simon Maude

This case study revolves around the tragic incident where a 77-year-old man lost his life due to a fall from his mobility scooter, which was caused by a damaged section of the footpath.

This incident highlights the necessity of maintaining footpath integrity and showcases the legal and financial repercussions for failing to do so.

Some people depend on mobility aids with small wheels, and a footpath's condition directly impacts their ability to navigate the urban landscape safely.

In this case, the accident demonstrates the fatal consequences of neglecting this responsibility.

From a legal standpoint, the Health and Safety at Work Act 2015 imposes a duty on businesses to ensure their operations do not compromise the safety of others.

The failure of YSB Group Ltd to meet this requirement led to their conviction and subsequent fines totalling $200,000 for their role in the incident.

The legal records outline a series of shortcomings by YSB Group Ltd, from the lack of a proper risk assessment to inadequate pedestrian provisions and traffic management.

These failings exemplify a disregard for standard industry practices and the safety of vulnerable road users.

This case serves as a powerful reminder of the responsibilities of PCBUs to prioritise the safety of footpaths. This death was a preventable tragedy that has had lasting consequences for the victim's family and the companies involved.

This stark example highlights the importance of maintaining good surface conditions on footpaths, not only for compliance with safety regulations but also for safeguarding human life, particularly for disabled people who rely on these pathways for independence and well-being.

Visibility

Description:

These risk concerns arise when permanent sightlines are obstructed by traffic management setups, reducing the ability of road users to see each other or potential hazards. This can increase the likelihood of conflicts or collisions, as the ability to anticipate and react to others' movements is compromised.

How would this risk arise?

This issue can emerge when temporary fencing, signage, or construction equipment layout inadvertently blocks views, particularly at crossings, bends, or intersections. An example would be a site office that prevents drivers and pedestrians from seeing each other at a crossing point, increasing the risk of an accident.

Mitigation strategies:

Sightline Audits

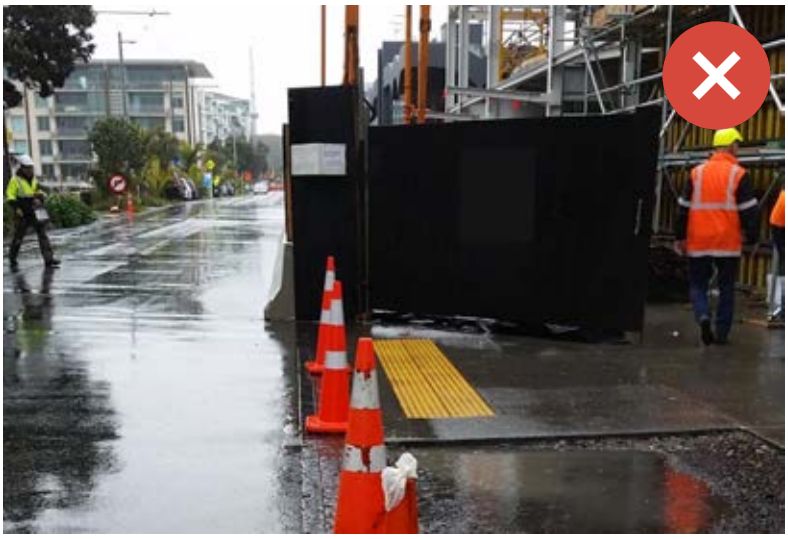
Perform regular checks to ensure all temporary structures do not interfere with sightlines for any users. Refer to Appendix F for dimensional guidance.

Strategic Placement

Place all necessary temporary structures carefully to maintain clear visibility across the site, especially around high-risk areas like intersections, crossings, or changes in direction.

Height Considerations

Ensure that the height of fencing and signage is appropriate so that they do not block eye-level visibility for users, including those in vehicles and on foot.



This crossing point is significantly compromised by the site hoarding, meaning anyone crossing from right to left (as viewed) would have no visibility of oncoming traffic. Image Credit lxvii: Parallaxx.

Mirrors and Supplementary Signage

Convex mirrors at strategic points can improve sightlines. Furthermore, warn of blind spots and use additional signage to alert users to potential visibility issues.

Lighting Enhancements

Increase lighting around areas where visibility is crucial, such as crossings and entry/exit points, to help illuminate potential hazards.

Water pooling or drainage

Description:

The risk of water pooling and drainage issues arises when modifications to road and footpath surfaces lead to inadequate drainage, causing water to accumulate. This can create hazards for all road users, especially vulnerable ones, making surfaces slippery and obscuring potential obstacles.

How would this risk arise?

Altering the surface levels for traffic management or installing barriers disrupting normal water flow can lead to water pooling. For example, a new temporary footpath might lack proper camber for drainage, resulting in standing water after rain.

Mitigation strategies:

Surface Assessment

Before implementing control measures, assess the existing drainage and predict how changes might affect water flow.

Proper Cambering

Ensure that temporary pathways have an adequate camber to facilitate water runoff and prevent pooling.

Drainage Plans

Incorporate additional drainage solutions into the TMP, such as temporary channels or strategically placed drainage mats.

Water can pool in various places, especially in construction environments where the topography has changed. This photo is an extreme version, but even a blocked drain due to construction debris can have an impact on the safety of vulnerable road users in a worksite. Image Credit lxviii: Campbell River Mirror.

Regular Monitoring

After rain or during wet conditions, inspect the site for water pooling and take immediate action to rectify any issues.

Non-slip Surfaces

Where water pooling cannot be avoided, use non-slip materials to reduce the risk of slips and falls.

Clear Markings

Mark areas prone to water pooling clearly so VRUs are aware and can navigate safely.

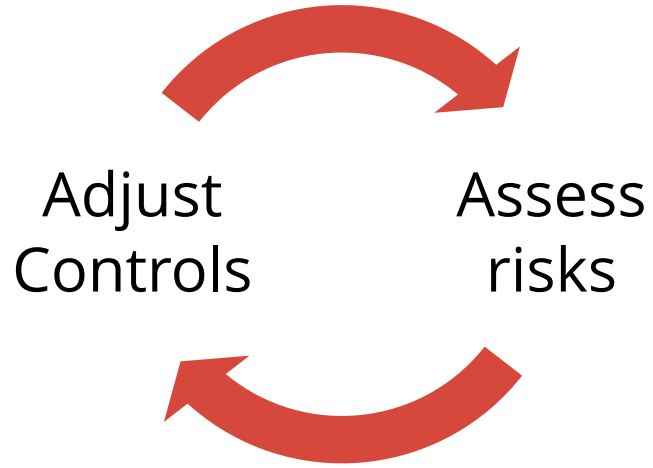
Responsive Maintenance

Set up a schedule to quickly address water pooling, promptly clearing blockages or other drainage issues.

Treat the new risks and look for new hazards

As you address identified risks within your TMP, remain vigilant for the **emergence of new hazards.**

This dynamic process requires a responsive and continual **cycle of evaluation, action, and re-evaluation** to ensure all risks are managed optimally.



This diagram to the right is simple, but it highlights that the risks change as soon as you adjust new controls, and you need to re-evaluate.

It is important to note that this diagram says 'adjust controls', not 'add controls'.

Sometimes, the risk change has come from the control you just added before, and the additional risk is because you have more than you started with.

This is the challenge with treating health and safety risks – sometimes your treatments make it worse, and you must keep revising until you have the risk as low as possible.

This becomes a process of **ever-decreasing risk** until you reach the **lowest possible risk level for the site.**

Peer Review / Risk Review

Peer review is essential in traffic management planning, offering an **independent check that strengthens safety measures.**

A peer reviewer spots oversights, bolstering the plan's thoroughness and safety.

This step is not about ticking boxes but fostering a **collaborative effort towards the best possible risk management**, ensuring the traffic management plan stands up to scrutiny and aligns with best practices.

In selecting a peer reviewer, prioritise expertise and impartiality[16]. The right reviewer engages as a partner, not just an approver, providing insightful feedback to refine the plan.

Their role is **to enhance**, not just endorse, driving the designer towards the **safest and most practical outcomes for all road users.**

Refer to Appendix G for a TTM Design peer/risk review tool.

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Part E: For Field Staff

This part is for use by field staff who set up and look after temporary traffic management, such as Site Traffic Management Supervisors (STMSs).

Here, you will find easy steps to help make sure your sites are safe for people walking, cycling, and using other ways of getting around that are not in cars (like scooters and wheelchairs).

This part includes the following guidance:

The following appendices are relevant to this part:

Part E: For Field Staff

You MUST (these are legally required, not a choice):

- Take care of your health and safety.
- Make sure nothing you do (or fail to do) causes harm to someone else.
- Keep looking for ways to make things safer for other people on site and choose the best solutions, not just the easy or quick ones.
- Follow instructions from your company and your client
- Follow the policies and procedures of your company and client.

You SHOULD (follow these unless you have something better):

- Talk with your team about how to make things safe and listen to their ideas.
- Keep an eye out for new problems and help fix them to keep everyone safe.
- Learn from any mistakes or incidents to help stop them from happening again.
- Ask questions and talk to others if you are not sure how to do something safely. It is better to be sure than to guess and risk someone's safety.

What do you need to do?

Make it SAFE

S	A	F	E
Set it up right	**Always look around**	**Fine-tune and fix**	**Explain and Engage**
Install the TMP accurately as designed.	Keep scanning for hazards and ways to improve safety.	Keep making improvements and fix anything you find that could be better.	Discuss with your team and client what you have changed and record it.

How to safely install TTM when there are vulnerable road users around

What is a vulnerable road user?

Someone walking, on a bike, in a wheelchair, on a scooter, or on a mobility scooter.

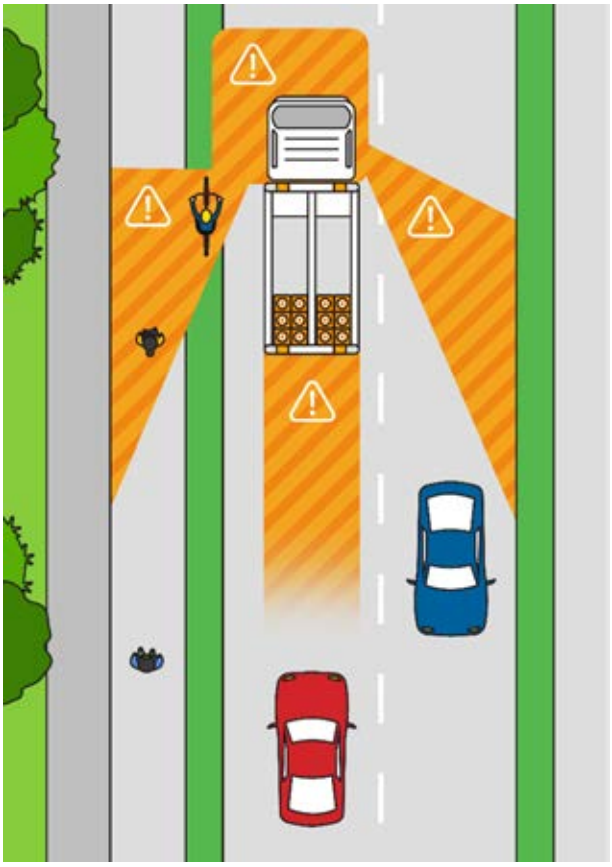
Anyone not in a motor vehicle, that's not part of the work or TTM crew.

These people get hurt the easiest on site. You need to focus on keeping them safe.

These next topics show a few big dangers for vulnerable road users while you are setting up. But there are more risks out there.

Always check the TMP, use what you learned in training, and talk to your boss and client so you have all the dangers covered.

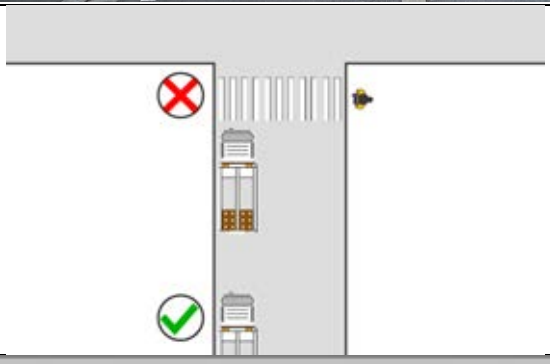
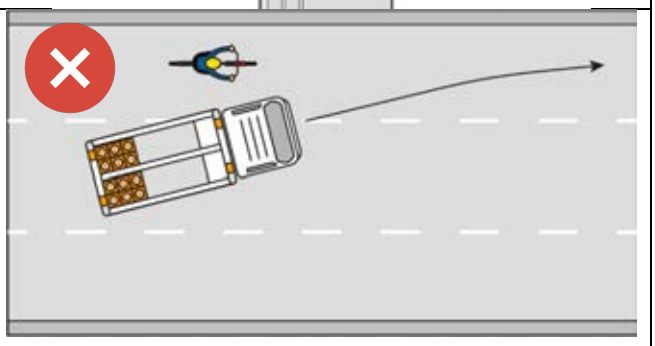
Driving around to set up



Blind Spots: Know where your blind spots are. Vulnerable road users, especially cyclists, can sneak up quickly and catch you unaware. Constantly check your blind spots for people who could be there that you did not see (especially your blind spots).

Safe Speed: Drive super slowly, especially near crossings, cycle lanes, and busy footpaths, so you have time to spot and react to vulnerable road users like pedestrians, cyclists, or people on scooters who might come out unexpectedly.

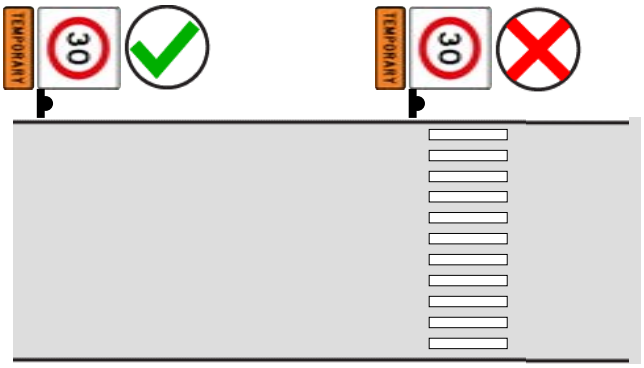
Stopping and parking

Do not block sight lines for people: Make sure you park so people can still see oncoming cars and bikes. If they cannot see, they might walk or ride into danger.	
Watch your distance from crossings and intersections: Do not park too close to where people cross the road or where roads meet. Give space so cars, bikes, and walkers can see each other.	
Be visible, and no unexpected movements: Park where people can see you easily. Do not suddenly move your truck without checking for people walking or cycling nearby.	
Do not block access to bus stops or walkways: Make sure you do not park in front of places where people catch buses or walk through. This makes it hard to see for safety and buses to enter and exit the stop safely.	
Watch your doors: Always check for people on bikes or walking before you open your door. Open slowly so you and others have time to react if someone is coming too close.	

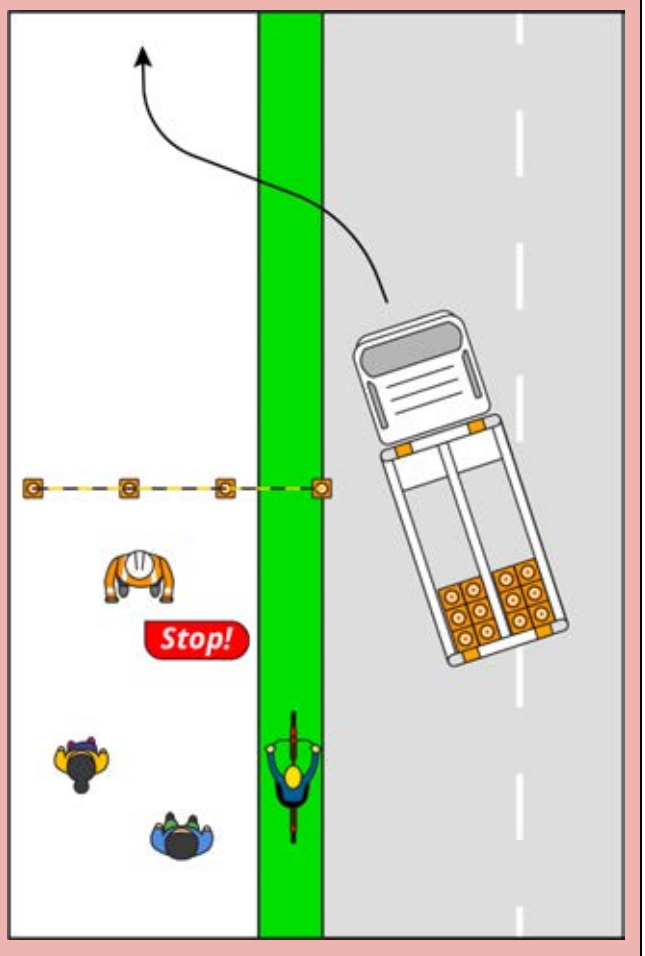
But how do I get my signs out?

Park safe – and use the footpath to walk it out.

Putting signs out

Plan your site: As you drive through the site before setting it up, pay extra attention to finding the best spots for placing signs that will not obstruct or endanger anyone. Remember, you can increase the distance between signs to pick a safer spot.	
Safety space and trip hazards: Make sure there is enough space around your signs so people can still use all pathways fully. Keep the area clear of anything that could cause a trip.	 *Image Credit Ixix: Parallaxx*
Use a spotter: While you are busy placing signs or moving equipment, a spotter can watch out for people coming and going, warning you and them to prevent incidents.	
Check your work: Be critical of your work. After setting up a sign, step back and look. Is it clear? Can people see it easily? Does it hide other signs? Taking extra time to check now can save you trouble and extra work later. Make sure what you have done is safe and works well.	

Letting the client/contractor in and out

Pre-arrival communication: Tell your clients about the TTM set-up before they arrive. Let them know where to enter, park, and areas to stay away from.	
Control the process: Make sure you know when entry and exit movements are taking place. Make sure it does not happen without your knowledge, and you instruct exactly how it has to happen, including using spotters or TTM workers where needed.	
Clear information for vulnerable road users: Make sure you have a system for letting people know about vehicles entering and exiting. Vulnerable road users will often continue on their path unless they know something is going on - place spotters, signs, or even better, cones and cone bars to stop and hold pedestrians if there is a risk of traffic crossing their path to enter or exit a site. People have been killed by trucks entering and exiting worksites - this is a highly risky task, and you need to be hyper-aware of these movements on site. They might happen multiple times daily, so focus on your site entry and exit procedures and prioritise them for safety.	

Checking the level of safety for vulnerable road users on-site

Are all the routes for pedestrians and cyclists safe, obvious, smooth, and stable?

1. Check the Control Measures: Are the safety measures actually working? Watch how people move and behave around the site. Do they seem unsure or have close calls? Look for spots where people get confused or where accidents might happen.

2. **If you make it safe for people with disabilities, you make it safe for everybody**

3. Use this Guidance: Check Appendices H and I. These are your guides to make sure things are safe for footpath users (Appendix H) and cyclists (Appendix I).

4. Ask Them: Want to know if it is safe? Just ask the people using the site. Talk with as many as you can, find out how they feel, and what could be better.

5. Watch for Changes: Keep an eye out for anything new or different on site. New risks often come from changes.

6. Act Quickly: If you see a risk, do not wait. Fix it right away.

7. Teamwork: Your crew can help spot safety issues, too. Remind them to keep an eye out and tell you about risks straight away. It shows you are a leader who cares about safety. Create a safety-focused culture with your team.

How to offer help to people navigating your site

If you suspect someone might need help, ask them, "Would you like some help?".
They will indicate whether and what form of help they might need. If a blind person asks to be guided, offer them your arm to hold as you walk through the site.

Dealing with changes, incidents, or emergencies on-site

Make Safe Changes

Most changes you will need to make onsite will not be because of emergencies – they will be small things that make things safer.

You are allowed to make changes on-site; if you see something that should be safer, and you are in charge of it, you must try to make it safer.

Any change you make onsite must result in it being safer than it was before.

Have a look on the next page for how to document changes.

Always be ready for the unexpected.

This means having your radio within reach, your vehicles being parked where they are safe but accessible, and your crew being briefed fully on emergency procedures.

A site that is prepared for an emergency is safe.

Vulnerable road users can come from anywhere at any time. Image Credit lxx: Mellissa Ramsay.

For example, what if a visually impaired person crossed here? Image Credit lxxi: Waka Kotahi

Anticipate 'What If'

Do not wait for an issue to figure things out. Regularly walk through potential scenarios and discuss them with your team. Ask yourself, 'What if this barrier fails?' or 'What if traffic suddenly increases?' By thinking ahead, you can have a plan of action that prevents panic and ensures a swift, safe response.

Maintain Clear Communication

Talk is not just talk; it is a safety tool. Keep everyone on the same page with clear, direct communication. Whether it is a change in traffic patterns or a new risk spotted, let your team know immediately. Regular safety talks can turn a good team into a great one.

Image Credit lxxii: Parallaxx

Documentation and reporting

Why do we have paperwork?

There are three primary reasons why STMSs have paperwork in TTM

Process Tools	Legal Requirements	Recording of Activity
Some documents serve as your roadmap to doing things right. They are checklists and guides, like Appendix H & I in our guidance, designed to help you make good decisions. Some examples are: • Hazard ID form • The 2-hourly checklist in the on-site record • Equipment checklist	Certain records are legally required. They prove that things are legally correct, like temporary speed limits. Some examples are: • TSL requirements in the on-site record form. • Incident report.	Recording what happens on-site—the wins and the challenges—is about learning and improving. It helps us understand what works and what does not. This knowledge is invaluable for making all our future sites safer. Some examples are: • When you record what is changed on the TMP. • STMS diary of activity.

Make sure you know what the purpose of each of your documents is. This will help make sure you record the right things and do not waste time.

You MUST (this is legally required, not a choice):

- Install temporary speed limits following the approved Traffic Management Plan (you cannot modify from the approval).
- Record the location from where the temporary speed limit has been installed and where it finishes. This includes if you are using different TSLs (each has a start and a finish that must be recorded).
- Record the time that all the temporary speed limit signs were finished being installed (this is when the TSL is 'active' from), and the time that the first TSL sign was removed (this is when the TSL is no longer active from).

When things go wrong

Reporting	Urgent Reporting protocol
If something does not go to plan, report it. Record what happened, whether a close call or an actual incident. Ask yourself: - What went wrong? - When and where did it happen? - Who was involved or saw it? - Was anything damaged, and how? - How did we fix it?	You should have an agreed list of "critical notifications" that, if they happen onsite, you are required to notify your supervisor/manager immediately. This makes sure you and your company agree on what will be considered a critical event. This could include: - Any injury to anyone - A vehicle breaching the site - Equipment failure - Traffic disruption is above a certain level.

Keeping track of your solutions

The value of recording what you have done is that others can learn from it, including other STMS and the TTM Designers who prepare the TMPs you use.

More than Words

Your phone's camera is a powerful tool. Snap a photo or shoot a quick video to capture what is happening.

If you are making a video, talk through what you see. It is easier and often tells more than a written report.

Videos can be gold. Walk through your site, record, and narrate what is going on.

It can be as simple as saying, *"Here is where we put the new signs, and that is how we are making sure everyone can walk through safely."*

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Part F: Physical TTM Control Measures

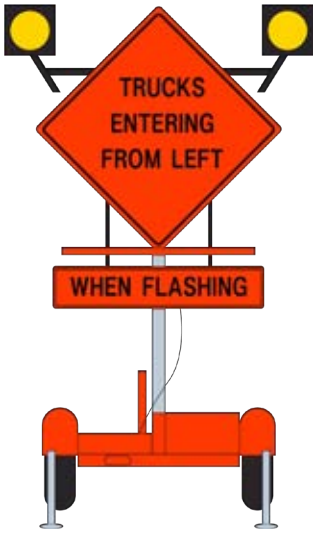
Detailed information on physical control measures to enhance the safety and accessibility of vulnerable road users in temporary traffic management.

Part F: Physical TTM Control Measures

There are **many other possible control measures** that can help keep vulnerable road users safe in temporary traffic management environments.

This selection is the common or emerging **physical controls** with evidence in New Zealand or overseas. This list can always be added to, so if you think a control measure would be valuable to include in this practice note, email info@civilcontractors.co.nz.

Advanced Technologies



Advanced Technologies in TTM leverage digital tools to enhance VRU safety by providing timely and context-specific warnings and guidance.

These tools include Bluetooth-triggered alerts on users' devices, electronic signage that changes based on traffic flow or pedestrian density, and sensors that activate warnings when VRUs approach hazards.

Technological solutions can be tailored to meet diverse needs, such as auditory alerts for the visually impaired and vibration signals for the hearing impaired.

Specific Requirements

- Technologies must be compatible with various devices and accessible to all VRUs.
- Systems should have failsafe mechanisms in place to prevent misinformation.

Control Measure Variations

Variations may range from simple app-based alerts to complex sensor networks that adapt to real-time conditions.

Advantages

- Provides dynamic and interactive safety measures.
- Can be updated instantaneously to reflect current TTM changes.
- Personalised warnings increase user attention and compliance.

Disadvantages

- May exclude those without access to the necessary technology.
- Dependence on power and connectivity can lead to failure points.

Installation and Removal Considerations

Setup involves software configuration and possible physical installation of sensors. Setup can be time-consuming and involved, meaning this control measure may be more suitable for longer-term work sites.

Risks that this control may introduce

- Over-reliance on technology could reduce vigilance.
- Technical malfunctions may lead to a lack of warnings.
- Privacy concerns if personal data is collected.

Maintenance Requirements

- Regular software updates and hardware checks to ensure optimal operation.
- Continuous monitoring for system integrity and data protection measures.

Electronic responsive signage can enhance the safety of VRUs. There are temporary options available for use in TTM environments. Image Credit lxxiii: HMI Technologies New Zealand.

Advanced Warning

Advanced warning can help inform drivers and VRUs about upcoming hazards. Make sure not to place signs where they become a hazard themselves. Image Credit lxxiv: Christchurch City Council.

Advanced warning alerts road users to upcoming changes in road conditions, guiding them to adapt their behaviour accordingly to ensure safety. Advanced warning also improves reaction time as users are more prepared for changes up ahead.

Advanced warning is used on approach to hazards for motor vehicle drivers, pedestrians, or cyclists to inform them of the changing conditions ahead.

Advanced warning signs provide only one method of sharing information (visually). Important information should be shared in multiple ways, i.e., having a worker look out for visually impaired pedestrians to give verbal information or using an audible messaging device.

Specific Requirements

Signs are a traffic control device – and must be designed and installed following the Land Transport Rule: Traffic Control Devices 2004.

Signs must allow for sufficient reaction time. Refer to **Appendix F.**

Control Measure Variations

Usually, static, fixed signs are used; however, electronic signs are also valuable where variable messages are needed.

Advantages

- Increases situational awareness.
- Reduces speed ahead of worksites.
- Can be updated for real-time information (electronic variants).

Disadvantages

- Fixed signs may be less effective over time due to familiarity.
- Due to not giving specific instructions (usually), signs can become lost and have a limited impact on behaviours.

Dimension Requirements

All signs must comply with the Land Transport Rule: Traffic Control Devices 2004. Further information can also be found in Waka Kotahi's M23 Appendix F.

Installation and Removal Considerations

Installation and removal should consider the safety of users at the time (i.e. be considerate of crossing paths or walkways).

Risks that this control may introduce

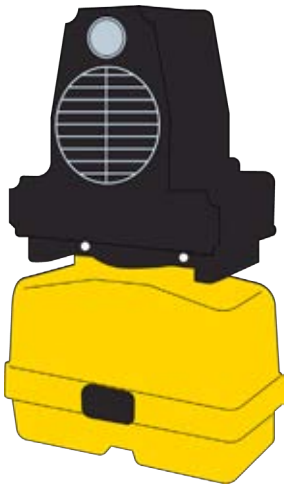
If poorly placed, they can obstruct views or be a trip hazard. If signs are no longer relevant (no longer apply), they can confuse road users.

Maintenance Requirements

Regular checks to ensure signs are undamaged, clean, and not presenting risk to passing users.

When not installed properly, all signs can be hazardous for the public. If signs are in place for some time, consider a detectible edge for cane users safety. Image Credit lxxv: Minnesota Department of Transportation.

Audible Messaging



Audible messaging devices can convey critical TTM information and instructions to VRUs through sound, enhancing situational awareness and safety, especially for the visually impaired.

This control is used to provide oral instructions for navigating TTM environments. Devices are activated manually or by sensors to broadcast messages about detours, worksite dangers, or crossing points.

It offers an essential navigational aid for visually impaired VRUs, ensuring equitable access to safety information.

Specific Requirements

- Messages must be concise, clear, and broadcast at a volume audible over background noise but not disruptive.
- Devices should be positioned to prevent obstruction or entanglement with pedestrians.

Control Measure Variations

- Push-button-activated messages.
- Motion sensor-triggered broadcasts.
- Continuous loop messages for high-traffic areas.

Advantages

- Direct communication method for vital safety information
- Enhances compliance of users through clear audio cues
- Beneficial in noisy environments where visual cues may be missed.

Disadvantages

- Can be ignored or misunderstood if not clear or loud enough.
- Potential noise pollution in quiet areas.
- Requires regular maintenance to ensure clarity and functionality.

Dimension Requirements

Devices should be installed at a height accessible to all users, including wheelchair users, without causing an obstruction.

Installation and Removal Considerations

Installation may require technical expertise to ensure correct audio levels and sensor range.

Risks that this control may introduce

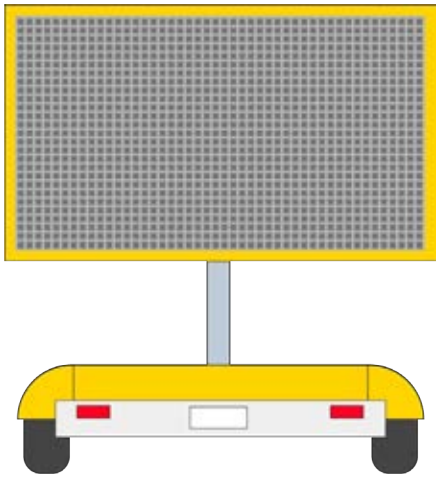
- Over-reliance on audio cues may reduce attention to visual signs.
- Inaccurate messaging could mislead VRUs and confuse them.

Maintenance Requirements

- Regular testing for audio clarity and volume.
- Ensuring messages are up-to-date with current TTM changes and layout.

In deploying audible messaging, it is vital to balance disseminating essential information with minimising additional noise and disruption in the TTM environment.

Communications with the Public



Public communication aims to ensure that all road users, including VRUs, are well-informed, engaged, and guided effectively to ensure compliance with TTM controls for their safety and the smooth progression of the works.
This control involves informing the public about TTM activities through notifications, visual aids, and engagement forums. It ensures that road users understand changes and can navigate safely and confidently.
Materials should be accessible to all, including formats for those with disabilities, such as braille, large print, and audible messages, to ensure equal access to information.

Specific Requirements

- Information must be clear, concise, and presented in a non-technical language.
- Engagement methods should be tailored to diverse community needs, including language and cultural considerations.

Control Measure Variations

- Traditional methods: letter drops, public meetings.
- Digital platforms: social media updates, real-time traffic websites.
- Ongoing engagement: feedback forms and focus groups throughout the project duration.

Advantages

- Encourages public cooperation and understanding.
- Reduces frustration and confusion for road users.
- Facilitates safer navigation through worksites.

Disadvantages

- Misinformation can spread if messages are unclear or inaccurate.
- May require significant resources to manage effectively.
- Public engagement can be time-consuming and may delay project timelines.

Risks that this control may introduce

- Insufficient communication can lead to non-compliance and increased risk of incidents.
- Overloaded information may result in public disengagement.

Maintenance Requirements

- Regular updates and accuracy checks on all communication channels.
- Monitor feedback mechanisms to ensure they remain effective and responsive.

Effective communication with the public is foundational to the success of TTM operations, directly impacting the safety of VRUs and the overall efficiency of TTM.

Cone Bars

Cone bars are a temporary access deterrent, providing a visual barrier to direct pedestrian flow and deter entry into hazardous or restricted areas.

In simple terms, cone bars span between traffic cones to create a quick and easily adjustable boundary. They are commonly used to guide pedestrians and demarcate safe zones within TTM environments.

Cone bars lack a detectable lower edge, making them less suitable for visually impaired individuals who use canes, as they may not be detected at cane height.

Cone Bars do not stop users and provide little security that access to hazards is prevented. In this instance its clear a user can bypass the control measures into the hazard. Image Credit lxxvi: Parallaxx.

Specific Requirements

Cone bars should span between standard cones and be visible.

They must not be used as a permanent fence or left unattended, as they do not offer structural rigidity.

- Cone Bars should not be left unattended. They should only be used when personnel are present onsite to monitor the continuous effectiveness of these devices.
- Cone Bars should not be used where visually impaired users are present.

Advantages

- Quick to deploy and reposition.
- Lightweight and portable.
- Enhances visual demarcation of safe areas.

Disadvantages

- Not a robust physical barrier.
- Prone to theft due to their portability.
- Inadequate for containing animals or unsupervised children.

Dimension Requirements

- Diameter: 35mm minimum, 100mm maximum.
- Weight: No more than 7kg for ease of handling.
- Retro-reflectivity: Must comply with AS1906.1:2017 for visibility.

This image from the U.S. shows the concept of a detectible edge – illustrating a limitation of using cone bars in TTM. Image Credit lxxvii: Dan Burden.

Risks that this control may introduce

- Can be easily bypassed, offering a false sense of security.
- May create a trip hazard if not properly secured or if they sag due to insufficient tension.

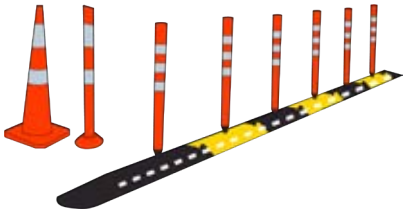
Maintenance Requirements

- Regular checks to ensure high visibility and structural integrity.
- Immediate replacement if damaged to maintain effective delineation.

Given their limitations, cone bars should be used cautiously and always in conjunction with other control measures. Their usage must be continuously monitored and should never be relied upon as a preventive measure against entry into hazardous areas.

A shortfall of cone bars is they have no detectible edge for cane users. Image Credit lxxviii: Waka Kotahi.

Delineation (Cones, Tubular Delineators, Flexible Traffic Separators)



- Delineation in TTM is essential for guiding and informing road users, delineating the path they should follow, and indicating the presence of potential hazards.
- Delineation devices such as cones, tubular delineators, and flexible traffic separators visually guide drivers and pedestrians, creating clear demarcations between safe zones and areas under construction or repair.
- While these devices are primarily visual, their placement and the tactile nature of some delineators can aid individuals with visual impairments, especially if combined with other sensory warning devices.

Specific Requirements

- Be fluorescent orange with specified chromaticity coordinates.
- Feature white or silver retro-reflective bands.
- Have markings indicating compliance date.
- Remain stable and visible even if knocked over.

For more detailed specifications for delineation devices, refer to Waka Kotahi's M23 Appendix F.

Delineation serves to channel differe types of road users with a primary purpose of being visible. Image Credit lxxix: Parallaxx.

Control Measure Variations

- Cones have two retro-reflective bands and a standard height of 900mm.
- Tubular delineators follow similar specifications but can vary in shape.
- Flexible traffic separators are larger and used for more pronounced channelisation.

Advantages

- High visibility in various lighting conditions.
- Quick to deploy and versatile in application.
- Essential for channelling traffic flow and enhancing road user safety.

Disadvantages

- Can be displaced by wind or impact if not secured.
- May be ignored by road users if overused or placed without a clear purpose.
- May not deter through access for VRUs.

Dimension Requirements

- Height for standard cones and tubular delineators: 900mm (+20mm, -0mm).
- Weight: No more than 7kg.
- Retro-reflective bands must meet Class 300 photometric performance.

When placing delineation next to traffic lanes – don't put it right up to the lane line/edgeline. Leave space for a small 'shoulder space' for safe cycling (at least 0.5m). Image Credit lxxx: Glen Koorey.

Risks that this control may introduce

- Improper placement can confuse road users and create hazards.
- Displacement can lead to ineffective delineation and increased risk of accidents.

In practice, delineation is a dynamic control measure that needs constant assessment to remain effective. Its success is dependent on correct, consistent application and maintenance.

Escorting Vulnerable Road Users (Footpath Controllers)

- The primary purpose of escorting vulnerable road users (VRUs) through TTM environments is to provide targeted assistance, ensuring their safe navigation around or through temporary hazards.
- Footpath controllers, or escorts, are positioned in TTM zones to guide pedestrians, including those with disabilities, around active work areas, especially when usual paths are obstructed or present variable hazards.
- This measure significantly benefits individuals with disabilities by offering human assistance for navigation, thereby reducing the risk of confusion or accidents in TTM zones.

Specific Requirements

- Footpath controllers should have clear protocols for operation, be appropriately trained, and wear high-visibility clothing. Their deployment should align with periods of heightened risk or activity.

Advantages

- Provides tailored assistance to VRUs.
- Enhances the safety of individuals with specific needs.
- Adaptable to varying risk levels and work zone activities.

Disadvantages

- Resource-intensive, requiring dedicated personnel.
- Not practical for long-term, unattended sites.
- Introduces additional personnel into the hazard zone.

Risks that this control may introduce

- Potential for footpath controllers to be at risk from work zone hazards.
- If not managed properly, can create additional points of conflict between VRUs and work zone activities.

Maintenance Requirements

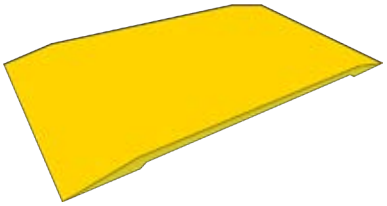
- Ongoing training and monitoring of footpath controllers to ensure effective and safe operation.
- Regularly review work zone conditions to assess the need for escort presence.

Footpath controllers are a dynamic and responsive safety measure that can effectively mitigate risks during peak hazard periods. However, their use requires careful planning, considering the availability of resources and the specific needs of the TTM environment. For example, during tree pruning operations, pausing work to allow pedestrians to pass minimises disruption and eliminates the hazard temporarily. Clear communication protocols must be established to ensure footpath controllers can effectively manage the movement of VRUs and interact with work zone personnel to minimise risk exposure.

Having staff on hand to escort and assist those with disabilities is a very effective way to ensure sites are able to be navigated safely by even the most disadvantaged of users. Image Credit lxxxi: Parallaxx.

Visually impaired users especially benefit from being escorted through road works due to the highly challenging nature of TTM and the number of hazards. Image Credit lxxxii: Carina Duke.

Excavation Covers (Trench Covers)



- Excavation covers are used to cover open excavations securely to prevent falls and injuries to pedestrians and ensure safe passage over or around construction zones.
- These covers are deployed to bridge over trenches or holes during construction or maintenance work, allowing pedestrians and light vehicles to traverse safely.
- When designed in compliance with standards like AS 1428.1, these covers support accessibility by providing a stable and non-slip surface for individuals with mobility aids.

Some excavation covers are rated for vehicle and VRU use. Image Credit lxxxiii: Transport for London.

Specific Requirements

Covers must be anchored securely to prevent movement, have a non-slip surface, and sit flush with the pavement to avoid trip hazards. Specific requirements can be found in Waka Kotahi's M23 Appendix F.

Control Measure Variations

Variants may include different materials like steel-framed fibreglass and differing weight ratings, dimensions, and colours for visibility, with some designed to cover larger excavations and others for pedestrian-only access.

Advantages

- Provide a stable surface over hazards.
- Enhance pedestrian safety.
- Support continued access to businesses and residences during work.

Disadvantages

- Heavy and may require machinery or multiple people to install.
- Can be costly, especially if custom sizes are needed.
- Require monitoring to ensure they remain secure.

Dimension Requirements

Dimensions vary based on the excavation but must support distributed weight and point load requirements, such as a 2.0-tonne distributed weight rating and a 500kg point load.

Installation and Removal Considerations

Installation and removal may require machinery for heavy covers.

Some excavation covers can be heavy, therefore installation and removal using mechanical means is preferred. Image Credit lxxxiv: Oxford Plastics

Risks that this control may introduce

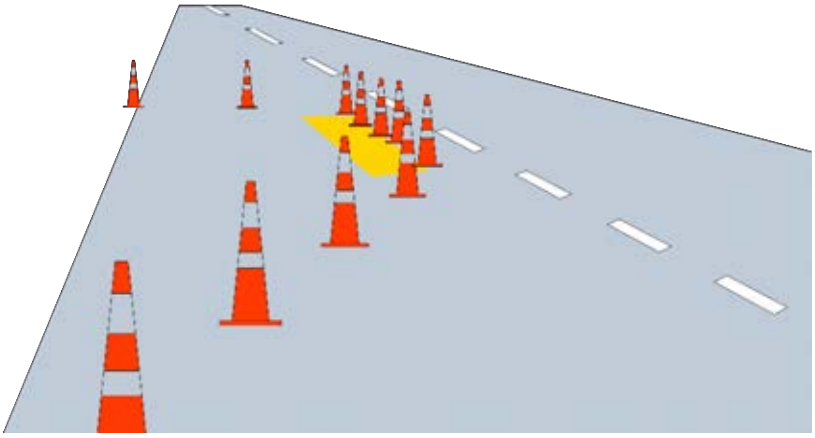
Improper installation can result in trip hazards or covers that shift under load, while inadequate maintenance can lead to reduced slip resistance over time.

Covers placed on footpaths should be bright and flanked by devices that show clearly the safe path for VRUs. Image Credit lxxxv: Carina Duke.

Maintenance Requirements

Regular inspections ensure slip resistance is maintained, especially in wet conditions, and the covers remain securely anchored without creating trip hazards.

Exclusion Zones (Safety Zones)



- Exclusion zones serve as a safeguarding buffer, creating a physical space that separates road users and vulnerable road users (VRUs) from potential hazards (or each other), thus mitigating the risk of incidents.
- These zones are typically allocated around hazards or work areas to prevent unauthorised access, ensuring a safe distance between the public and potential dangers.

Specific Requirements

Exclusion zones should be based on the hazard type and adjacent traffic speed. Exclusion zones alone are insufficient to mitigate risk; they must be accompanied by other controls (such as fencing, barriers, or delineation) that prevent access to those areas for them to be effective.

Advantages

- Provide clear boundaries to enhance safety.
- Reduce the likelihood of accidental incursions into hazardous areas.
- Serve as a preventative measure for worksite accidents.

Disadvantages

- Can reduce the available space for road users and VRUs. As shown in the image above, it is vital to maintain a safe space for cycling – if the cones were up to the lane line, this would force cyclists into the other lane with motor vehicles, creating potentially unsafe interactions.

Dimension Requirements

Dimensions are context-specific, often determined by the potential hazard's nature and the environment.

Risks that this control may introduce

Poorly placed or arranged exclusion zones can encourage using those spaces for walking or cycling (defeating their purpose). Exclusion zones can inflame other hazards, with users being more cramped and more prone to incidents or constraining working room, resulting in amplified risk of working space incidents.

Maintenance Requirements

Regular checks to ensure exclusion zones remain clear, empty and visible, with prompt adjustments as needed to maintain the integrity and effectiveness of the exclusion zone.

Fencing

Fencing in TTM is implemented to delineate work zones, guiding and protecting both VRUs and workers by deterring unauthorised access to hazardous areas.

Fences are employed around construction sites, excavation areas, or any place where interaction with the public occurs. They are critical for channelling pedestrians safely around or through a TTM setup and ensuring that work zones are marked and secured.

For disabled individuals, fences must include detectable guidance features like bottom and top rails and be constructed to prevent tripping or impeding mobility aids.

Fencing is particularly important on longer-term worksites, and where heavy machinery is used. Image Credit lxxxvi: Wikimedia Commons.

Specific Requirements

Fencing must be continuous, securely linked, and have supportive top and bottom rails to form a barrier around hazards. The bottom rail should not exceed 100mm above the ground level to prevent tripping, and the top rail must be at a minimum height of 1.2m to prevent climbing, roll-over, and ensure visibility.

Control Measure Variations

Variations in fencing include different materials like polyethylene or metal, heights, and additional safety features like reflective surfaces or warning lamps for night use.

Advantages

- Clearly demarcates hazardous areas.
- Offers visual and physical guidance for VRUs.
- Prevents unauthorized access.

Disadvantages

- Requires maintenance to ensure integrity.
- Can be cumbersome to install and remove for shorter activities.
- Could obstruct views if not designed with visibility in mind.
- Is less flexible with more dynamic worksites.

Dimension Requirements

Fencing should be at least 1.2m high and have detectible bottom edging at 100mm from the ground.

Fencing should be selected based on having the least amount of introduced risk. This example shows non-trip feet. Image Credit lxxxvii: Oxford Plastics LLC.

Installation and Removal Considerations

Installation and removal of fencing can be challenging and a phase of the work itself –transporting, placing, and installing the fencing. This should be accounted for in the TTM and activity planning. Installation can also be intrusive to the environment by carrying fencing across pathways and parking unloading vehicles close by; these hazards introduce a new layer of risk to VRUs.

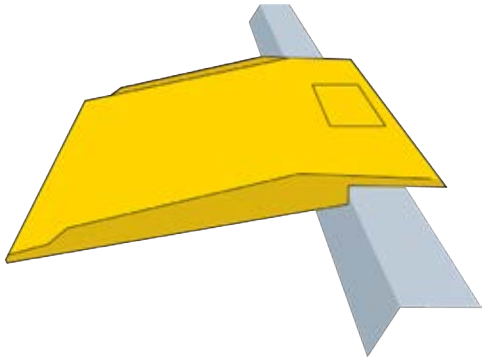
Risks that this control may introduce

If not installed correctly, fencing could create tripping hazards, obstruct visibility, or become a projectile in strong winds. If not installed correctly, fencing could create tripping hazards, obstruct visibility, or become a projectile in strong winds.

Maintenance Requirements

Regular inspection ensures fences remain in good condition, appropriately anchored, and visible.

Kerb Ramps



- When regular footpath levels are altered, Kerb ramps are integral in maintaining pedestrian access and safety.
- They aim to bridge vertical gaps between the footpath and the road, thus enabling continuous, unimpeded pedestrian flow.
- These ramps are strategically placed where pedestrians need to ascend or descend from the footpath level. For example, when a footpath is closed for work, a kerb ramp will allow pedestrians to safely detour onto the road (into a separated space) and then back onto the footpath beyond the obstruction.
- Kerb ramps are vital for inclusivity, allowing wheelchair users, the visually impaired, or those with pushchairs to navigate elevation changes that would otherwise be inaccessible. They remove the barrier that a kerb presents.

Specific Requirements

Kerb ramps should have a gentle incline, no steeper than a 1:12 gradient, which is manageable for wheelchair users without assistance. They must be constructed of durable, non-slip materials with sufficient weight capacity to handle heavy pedestrian traffic and mobility aids.

Refer to the Kerb ramps section in Appendix F of this guidance and Waka Kotahi's M23 Appendix F for more detail.

Control Measure Variations

Variations can include portable, lightweight ramps for short-term use and more robust installations for longer-term projects. Some ramps may incorporate tactile ground surface indicators to aid visually impaired users.

Kerb ramps should be secure and avoid edges that users can fall off (as shown in this example). Use cones or other methods to make the path clear for how to safely use the ramp. Image Credit lxxxviii: Betty Mitrova.

Advantages

- Provides access across kerbs and elevation changes.
- Supports compliance with accessibility requirements.
- Generally quick to deploy and adaptable to various environments.

Disadvantages

- May become obstructive if not positioned correctly.
- Temporary solutions require regular maintenance.

Dimension Requirements

Ramps should have a minimum clear width—1.2 metres—to accommodate a wide range of users, including those with service animals or wide mobility devices. Further dimension requirements are explored in the kerb ramp section of Appendix F of this guidance.

Installation and Removal Considerations

Installation should factor in the ramp's stability and its capacity to withstand pedestrian traffic without shifting.

Image Credit lxxxix: Asphalt Kerb ramps are also possible, however effective drainage is a consideration, as well as visibility of the ramp for visually impaired users.

Risks that this control may introduce

If not properly designed or maintained, ramps can introduce risks such as slipping, tripping, or the ramp becoming a navigational hazard.

Maintenance Requirements

Regular inspections are necessary to ensure that kerb ramps maintain their structural integrity, surface traction, and that any temporary fixings remain secure. Any wear or damage should be promptly addressed to prevent accidents.

Kerb ramps can be useful for changes in elevation in other places, not just kerbs. Image Credit xc: Steve Murphy.

When selecting a kerb ramp, prioritise one with a high-traction surface and bevelled edges to reduce trip hazards.

Ensure that the ramp placement does not inadvertently create new hazards, such as creating a pinch point with street furniture or impeding drainage, which could lead to water pooling and increased slip risk.

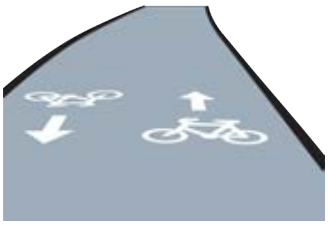
It is also essential to consider the end-users; for instance, ramps with high-contrast colours can assist people who are blind or with low vision identify the ramp's location and boundaries.

Additionally, during installation, ensure ramps are securely anchored to prevent movement or displacement and check that the transition between the ramp and the existing footpath is smooth to prevent tripping.

Proper signage should also be installed to guide pedestrians to and from the ramp, ensuring visibility and that users know the alternate route.

Pedestrian kerb ramps come in many forms, including more robustly constructed types such as this one. Kerb ramps that are fit for purpose based on the situation, duration, and risk for the site should be selected. Image Credit xci: Oregon Department of Transportation.

Markings (Temporary Marking, Road Marking)



- The primary purpose of road markings is to guide vulnerable road users (VRUs) safely through or around temporary traffic management (TTM) areas, delineating safe paths and alerting them to hazards.
- In practice, markings are used to create temporary crosswalks, segregate cyclist lanes, or outline safe zones for pedestrians, offering visual cues to guide VRUs along designated safe paths.
- High-contrast and coloured markings can enhance visibility for those with visual impairments but may not provide utility for long-cane users who rely on tactile feedback.

Specific Requirements

Markings should be applied to meet -visibility standards following Waka Kotahi's Manual of Traffic Signs and Markings (MOTSAM) Part 2, using colours and contrasts that stand out from the surrounding pavement.

Control Measure Variations

Variants include different colours, materials (paint, tape, thermoplastics), and reflective properties adapted to various lighting conditions and road surfaces.

Markings can be used to help give clear guidance of separation of users. Using colours is also valuable for those with visual impairments. Image Credit xcii: Bike Portland.

Advantages

- Increases visibility of pathways for VRUs.
- Can be quickly applied and adapted to changing TTM scenarios.

Disadvantages

- Temporary markings may wear off more quickly than permanent ones.
- May not be effective for all users, particularly those who are visually impaired.
- Do not provide physical controls to direct behaviour
- May be challenging to remove and confuse if left in place when no longer applicable.

Dimension Requirements

Dimensions should mimic standard road markings, maintaining consistent widths and patterns to avoid confusing VRUs.

Installation and Removal Considerations

The application should consider the surface condition and weather for adherence. Installation (and removal) of road marking requires activity- and environment-specific TTM considerations on their own.

Risks that this control may introduce

Inadequately applied markings may lead to misinterpretation of safe paths, potentially guiding VRUs into hazardous areas.

Maintenance Requirements

Markings require regular inspection to remain visible and intact; faded or damaged markings should be restored promptly.

In many cases, VRUs look down – so marking can be a valuable way to provide guidance that supports signs and places informaiton exactly where they are looking. Image Credit xciii: Parallaxx.

Signs (Directional Signs, Regulatory Signs)

Signs can be informative, to help with naivigation or even local businesses. Image Credit xciv: Parallaxx.

Signage in temporary traffic management informs and directs all road users, including VRUs, ensuring their safe navigation through or around worksites and other alterations to the usual traffic environment.

Signs are utilised to communicate various messages, from directional instructions and regulatory requirements to warnings about upcoming conditions, enabling road users to make informed decisions and take appropriate actions.

Signage design must consider visibility for all users, including those with visual impairments. Reflectivity standards and sign placement are critical to ensure that VRUs, such as cyclists who may not have powerful lights, can see the signs clearly.

Image Credit xcv: Parallaxx

Specific Requirements

Signs must comply with the Land Transport Rule Traffic Control Devices 2004 and NZTA M25 specifications, ensuring retro-reflectivity and adherence to prescribed dimensions and materials.

Control Measure Variations

Variations in signage include differences in size, colour, and reflectivity, depending on the road level and expected traffic volume. Temporary signs may have custom wording approved by the road controlling authority to address specific scenarios[32].

Advantages

- Provides clear instructions, reducing confusion.
- Supports good decision-making from VRUs

Disadvantages

- Poorly designed or placed signs may lead to misinterpretation.
- An overabundance of signs can cause confusion or ignorance.

Dimension Requirements

The dimensions for signs vary based on road classification, with specific minimum sizes required for visibility and comprehension from appropriate distances. Refer to Waka Kotahi's M23 Appendix F and Land Transport Rule Traffic Control Devices 2004.

Sign placement is a key consideration. Signs can increase risk when they block or obstruct VRU paths. Image Credit xcvi: UltimeciaNZ via Twitter.

Installation and Removal Considerations

Installation should ensure signs are secure and visible in all conditions and not presenting any trip hazards for users.

Risks that this control may introduce

Any signs introduced into the environment carry risks as they take up space and add a hazard. All signs must add value and contribute to overall risk management onsite.

Any signs that are no longer serving this purpose should be removed.

Also, signs may become obscured if not maintained or correctly positioned, leading to miscommunication and potential hazards for VRUs.

Maintenance Requirements

Signs require regular checks to ensure they serve a purpose, are visible and clean and do not impede users.

Temporary Bus Stops

- The primary purpose of temporary bus stops is to maintain public transport service continuity when regular bus stops are impacted by temporary traffic management activities such as roadworks or events.
- Temporary bus stops ensure that passengers can continue to access bus services when their usual stops are unusable. They provide interim solutions to facilitate public transport during disruptions, providing an alternative location for boarding and alighting from buses.
- The establishment of temporary bus stops can have significant impacts on individuals with disabilities. Ensuring these stops are accessible is crucial, involving step-free access, clear signage, and proximity to safe road crossings.

Specific Requirements

Temporary bus stops need to be within a certain proximity to the original stop, provide safe access, and meet legal requirements such as clear visibility and no obstruction from driveways or 'no stopping' zones. Waka Kotahi's guidance on Temporary Bus Stops in TTM environments contains further considerations.

Control Measure Variations

Variations of temporary bus stops may include those with or without shelters, varying lengths to accommodate different bus sizes, and differing proximity to the original bus stop, depending on site-specific conditions.

Advantages

- Ensures continuity of bus services
- Provides flexibility in public transport management
- Can be tailored to meet specific site requirements

Disadvantages

- Potential confusion for passengers
- May not offer all the amenities of a permanent stop

Dimension Requirements

Key dimensions for temporary bus stops include adequate space for bus manoeuvres (entry and exit), vertical and horizontal clearance for the bus, and safe pedestrian access. Some basic dimension requirements can be found in **Appendix F of this guidance.**

Installation and Removal Considerations

Installation should consider the timing of works, the need for consultation with authorities, and the provision of clear communication to the public.

In some cases, temporary bus stops will require temporary shelters as well. Image Credit xcvii: photobucket.com.

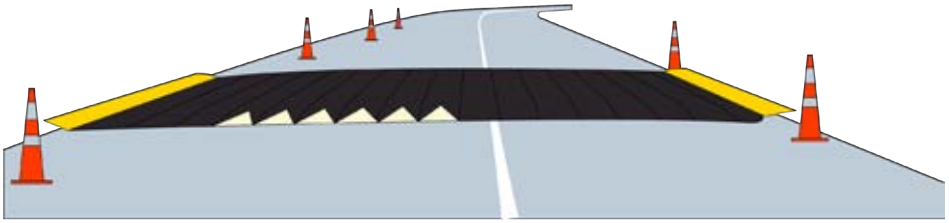
Risks that this control may introduce

Temporary bus stops can introduce risks such as decreased visibility of the stop, confusion leading to unsafe pedestrian behaviours, and potential impacts on traffic flow.

Maintenance Requirements

Maintenance of temporary bus stops includes ensuring signage is clear, the stop remains accessible, and any temporary materials are kept in good condition. Regular inspections should be conducted to address any emerging issues.

Temporary Crossings



Temporary crossings facilitate safe pedestrian passage across roadways when usual routes are inaccessible or unsafe.

A temporary crossing is implemented when there is a disruption to the standard pedestrian network, providing a clearly defined path for individuals to cross from one side of a street to the other.

The design of temporary crossings has a profound impact on accessibility. Features like tactile pavers are crucial; they guide visually impaired pedestrians and should be included in temporary setups wherever feasible.

When selecting crossing points, using existing permanent infrastructure (including median refuges) is preferred. Image Credit xcviii: Danny Wood.

Specific Requirements

Temporary crossings must be designed with user safety as the priority. This includes continuous fencing to guide pedestrians and using pedestrian refuges for crossings exceeding 10 metres across, providing a safe mid-point standing area. Tactile pavers should meet Waka Kotahi's RTS14 guidelines.

Control Measure Variations

Different scenarios may call for various temporary crossings, ranging from informal signposted crossings to those with tactile ground surface indicators to signalised crossings with audible cues and adjusted timings for slower walking speeds.

Dimension Requirements

Temporary crossing widths should be at least 1.8m, with specific visibility requirements explored in the **Temporary Crossings portion of Appendix F**. The height and arrangement of any installed push buttons should meet the specifications of NZS 4121:2001.

Risks that this control may introduce

Introducing a directive for pedestrians to cross live traffic lanes generates significant additional risk and must mitigate more risk that is introduced.

Maintenance Requirements

Ongoing maintenance is critical to ensure temporary crossings remain navigable and hazard-free. This includes monitoring the integrity of tactile guiding systems if used, ensuring signage visibility, and maintaining the functionality of push-button signals if the crossing is signalised.

Tactile ground surface indicators can be installed easily and quickly. Image Credit xcix: Parallaxx

Tactile Ground Surface Indicators are an important measure for the safety of pedestrians, even at temporary crossing points. They should be considered in accordance with best local practice. Image Credit c: UW-TOPS Lab.

Temporary Cycleways

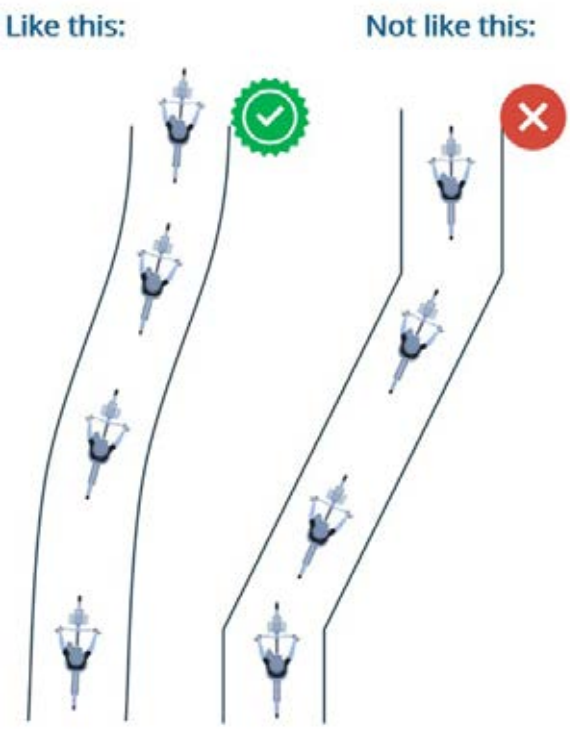
- Temporary cycleways are a control measure to safely redirect cyclists around construction zones or roadworks without significantly altering their route. These pathways are designed to maintain connectivity and safety for cyclists during temporary changes in their usual environment.
- When usual cycle routes are obstructed, temporary cycleways provide an alternative that minimises disruption to cyclists' journeys. They guide cyclists along a secure and defined path, ensuring continuity in their travel while keeping them segregated from vehicular traffic and pedestrian walkways.
- As a control measure, temporary cycleways should be accessible to all cyclists, including those with disabilities. The physical attributes of the path, such as surface smoothness and width, play a crucial role in its usability by cyclists of varying abilities.

Delineation between cycle paths and live traffic is vital for ensuring safe separation. Image Credit ci: Bike Auckland.

Specific Requirements

Fencing, when used to delineate the cycleway, must be continuous and linked to prevent cyclists from entering vehicular traffic and to guide them along the intended path. Signage should be clear, informing cyclists of the temporary cycleway and its direction.

When altering the route of cyclists – do not use sharp movements. Like motor vehicles, people who cycle need to change their direction over distance. **Use smooth curves with cyclists.**



Control Measure Variations

Temporary cycleways can vary from simple demarcated lanes to fully separated paths with physical barriers. The chosen variant typically depends on the expected cycle traffic volume, the complexity of the surrounding roadworks, and the work duration.

Advantages

- Maintains cyclist route continuity during disruptions.
- Enhances safety by segregating cyclists from other traffic.
- Encourages ongoing cycling, supporting sustainable transport.

Disadvantages

- Requires significant space and resources to implement.
- May confuse if markedly different from regular routes.
- Possibility of introducing new hazards if not well-managed.

Dimension Requirements

Further extensive dimensional details for temporary cycleways can be found in **Appendix F of this guidance.**

Even when there are no formed or marked cycle paths, cyclists are often present. Providing sufficient space for them to safely move through a TTM site is important as space can often be constrained and given to vehicles as a priority first. Do the opposite – give space first to cyclists, then vehicles. Image Credit cii: Chris Harmer.

Installation and Removal Considerations

- Before installing the temporary cycleway, ensure a safe diversion of motor vehicle traffic away from the installation area. This may require phased traffic control measures to shift traffic patterns gradually.
- Cyclist Transition: Sequence the shift of cyclists onto their temporary path carefully. This should be done in stages to minimize disruption and confusion, ensuring clear signage and communication.
- Work Vehicle Coordination: Plan the entry and exit of work vehicles to minimize crossings with the cyclist path. This may involve scheduling work vehicle movements during lower cycle traffic periods or using designated crossing points with clear visibility and signage.

If pushing cyclists close to the edge of the road, consider the safety of drainage infrastructure. Image Credit ciii: seattlepi.com/local/transportation/article/Cyclists-want-action-on-dangerous-storm-drains-1261495.

Risks that this control may introduce

Improperly installed or maintained cycleways can lead to risks such as collisions if cyclists are forced into close proximity with pedestrians or vehicles. Additionally, temporary paths may introduce hazards if they are not clear of obstructions or lead cyclists through high-risk areas.

Maintenance Requirements

Maintaining a temporary cycleway involves regular checks to ensure visible signage, surfaces are intact, and fencing and delineation remain effective.

Providing good signage aligning with temporary cycle paths ensure that users navigate the space safely and don't take less safe routes through the site. Image Credit civ: Glen Koorey.

Temporary Footpaths

- Temporary walkways serve to maintain safe, accessible pedestrian routes when standard pathways are obstructed or unavailable.
- Temporary walkways are alternate footpaths provided when usual walking routes are disrupted, for instance, due to construction or maintenance work. They ensure pedestrians can continue their journey safely.
- Temporary walkways must consider those with disabilities. This includes ensuring surfaces are firm, stable, and slip-resistant and that gradients (cross-slopes) **do not exceed 2%**. Regular passing spaces if the walkway width is less than 1.8m are essential for accommodating mobility aids.

A well-formed temporary walkway is well marked, straight and clear, and separated from other hazards like work activity and live traffic. Image Credit cv: Parallaxx.

Specific Requirements

These walkways should maintain a continuous fence (or similar) to prevent access to live traffic, the worksite hazards, and directional clarity. The quality of the walking surface is paramount, and it should be kept free from hazards such as debris or uneven surfaces.

Control Measure Variations

Variations in temporary walkways can include differences in surface materials, widths, and barrier types. A diverted walkway varies based on the chosen route, with a move away from traffic being preferred, followed by moving towards traffic, and lastly, into the roadway (into a separate space) if there is no other option.

Any footpath (temporary or not) has risk of trips where there are level differences in the surface. Any step thicker than a pencil is a potential trip hazard and should be addressed by fixing the path (preferred), and if not reasonably practicable, delineating and marking the hazard so it is clearly visible. Image Credit cvi: Wikimedia Commons.

Advantages

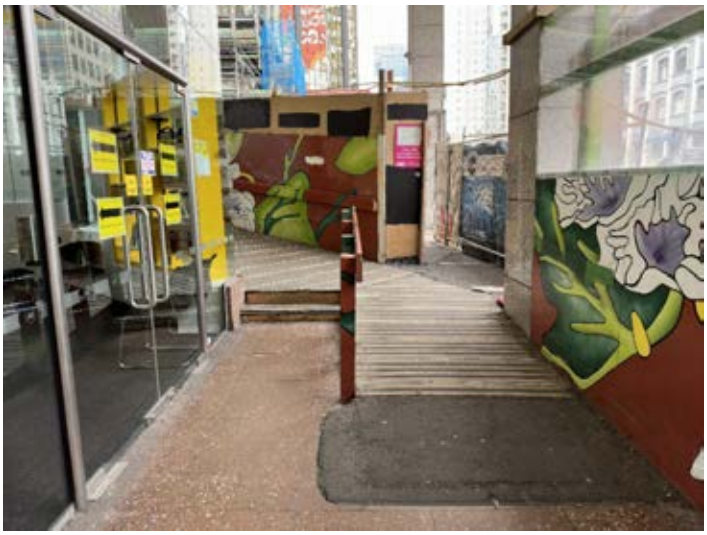
- Ensures pedestrian safety and continuity of access during disruptions.
- Accommodates a diverse range of users, including those with disabilities.

Disadvantages

- Can occupy significant space, impacting other road users.
- Requires resources for installation, maintenance, and eventual removal.
- Can disrupt property or business access.

Dimension Requirements

The desired width for temporary walkways is 1.8 metres, accommodating comfortable passage for pedestrians, including those with disabilities. Further detailed dimensional guidance is available in the **temporary walkways section of Appendix F.**



Temporary walkways should always provide accessible routes for those with mobility impairments. In this case, while there are steps – there is a clear and well-formed safe ramp available. Image Credit cvii: Parallaxx.

Installation and Removal Considerations

- Carefully plan the installation to cause minimal disruption to existing pedestrian flow.
- Clearly signpost alternative routes and provide adequate lighting, especially in areas with high foot traffic or complex navigation.
- Prioritize safety and accessibility during installation, ensuring no new hazards are introduced.
- During removal, progressively reintegrate pedestrians back to their original pathways, ensuring any temporary signage or fencing is entirely removed promptly and not left as hazards anywhere onsite.

Risks that this control may introduce

Risks include potential tripping hazards, insufficient space for mobility aids, or inadequate separation from vehicular traffic, which could lead to accidents.

Maintenance Requirements

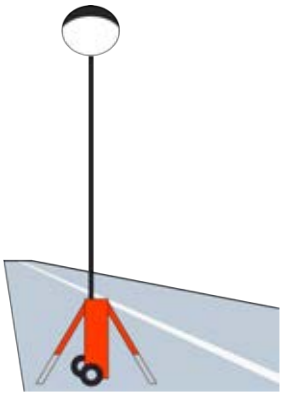
Regular inspection and maintenance ensure the walkway remains safe and navigable.

This includes monitoring surface conditions, fencing integrity, and signage clarity.

Temporary walkways should be safe, obvious, and smooth and stable. In this case the path narrows considerably, the sign is obscured, there is an unsafe kerb drop off, and many trip hazards. Image Credit cviii: Parallaxx.

Temporary Lighting

A key risk of temporary lighting is the glare for road users from their installation. Lighting should be selected to minimise glare (i.e. balloon lighting) and be directed away and down from approaching users. Image Credit cix: IRF Webinar - Pedestrian Safety in Work Zones.



- Temporary lighting in (TTM enhances safety and navigation for VRUs through well-lit, visible environments, particularly during low-light conditions or at night.
- Temporary lighting is deployed in areas where regular lighting is insufficient or absent, such as construction zones, detours, or areas with heavy machinery. It helps VRUs and drivers navigate safely by providing clear visibility.
- Good lighting can significantly aid those with visual impairments, ensuring safer navigation through TTM areas. However, improperly placed or overly bright lights can cause glare, posing challenges for all road users, especially those with certain visual disabilities.

Specific Requirements

Temporary lighting should provide ample lighting without glare or distraction. Road lighting design requirements can be found in Waka Kotahi's M30 specification.

Control Measure Variations

Standard temporary lighting includes portable light towers, often used in work zones. Balloon lighting is increasingly popular for its diffuse, glare-free illumination, suitable for complex or sensitive areas. Solar-powered lighting can provide reliable light without electrical connections. LED lighting is a common choice due to its energy efficiency and long lifespan.

Installation and Removal Considerations

- Lighting should be strategically placed to illuminate paths, crossings, and work zones effectively.
- Careful planning is required to ensure that lighting does not create new hazards, like glare or shadows.
- Installation timing should account for minimal disruption to traffic and VRU flow.
- Removal should be coordinated to ensure areas are not left without adequate lighting, potentially increasing risk.

Temporary lighting for VRU paths can be placed low, to reduce glare for drivers but serve the purpose of lighting the path. Image Credit cx: Wikimedia Commons.

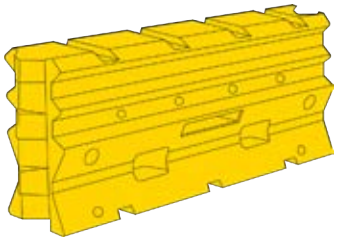
Risks that this control may introduce

- Glare from poorly positioned or overly bright lights can lead to visibility issues for VRUs and drivers.
- Inadequately secured lighting equipment could pose tripping hazards or become dislodged, causing accidents.
- Electrical hazards associated with temporary lighting installation, particularly in wet conditions.

Maintenance Requirements

Regular checks to ensure all lights are functioning correctly, securely fastened, and orientated correctly.

Temporary Road Safety Barrier Systems (TRSBS)



- Temporary Road Safety Barrier Systems (TRSBS) are engineered to redirect or absorb the impact of errant motor vehicles, thereby reducing the severity of crashes and protecting road users, including pedestrians, cyclists, and workers in TTM zones.
- TRSBS are deployed in areas with a risk of motor vehicles deviating from their path, particularly near work zones or traffic diversions. They act as a physical barrier, safeguarding VRUs and workers by preventing motor vehicles from entering pedestrian or work areas.

Specific Requirements

- TRSBS must be installed with an adequate deflection zone behind the barrier, as specified by the manufacturer or relevant standards.
- The barrier system should be continuous, without gaps that could permit motor vehicle intrusion.
- Proper anchoring and end treatments are crucial for the effective functioning of TRSBS.

Pedestrians should not be put into the deflection zone of a barrier system. Image Credit cxi: Parallaxx.

Control Measure Variations

- Concrete barriers are durable and offer high-level crash protection but are less flexible for quick repositioning.
- Water-filled barriers are more versatile for quick deployment and adjustments.
- Steel barriers provide substantial protection and can be adapted to various road configurations.

Advantages

- Provides a robust physical barrier between motor vehicles and VRUs.
- Helps to absorb and redirect crash energy, enhancing safety in TTM zones.

Disadvantages

- Can occupy significant space, potentially impacting traffic flow and pedestrian movement.
- Requires careful planning and installation to ensure effectiveness and safety.

Dimension Requirements

Adequate deflection space must be maintained behind the barrier per the manufacturer's system specifications.

Installation and Removal Considerations

TRSBS require significant installation coordination and a specifically dedicated planned operation for installation and removal.

Risks that this control may introduce

If not correctly installed, barriers can become hazards, especially if they intrude into pedestrian or motor vehicle pathways.

Inadequate deflection space can lead to barrier failure in the event of a motor vehicle impact.

Temporary Road Safety Barriers can serve as channelisation devices too – giving clear path for where cyclists should travel. Neither cyclists nor pedestrians should be permitted to travel in the deflection zone of the barrier. Image Credit cxii: New York Department of Transport.

Maintenance Requirements

Regular inspections to ensure the TRSBS remains installed as per manufacturers' requirements.

Temporary Speed Limits

- Temporary Speed Limits (TSLs) are a **critical control measure in TTM environments aimed at reducing motor vehicle speeds to ensure the safety of all road users, especially VRUs in proximity to vehicular traffic.**
- TSLs are implemented in areas where road conditions, such as construction work or road layout changes, necessitate a slower vehicular speed to maintain safety. By legally mandating lower speeds, TSLs help in reducing the risk of accidents and the severity of any potential incidents, particularly in zones where VRUs and motor vehicles are nearby or sharing space.

Specific Requirements

- TSLs must comply with the Land Transport Rule: Setting of Speed Limits 2022.
- Speed limits should be indicated through signage and, where applicable, supported by additional traffic control measures.

Control Measure Variations

Whilst the construct of temporary speed limits themselves are fixed through legislative requirements, the deployment and use of a TSL can be varied by using additional traffic calming measures to illicit a more prominent speed reduction from road users. Refer to **Case Study C**, which explores this subject.

Advantages

- Can reduce the likelihood and severity of accidents in TTM environments.
- Enhances safety for VRUs by slowing down vehicular traffic.

Disadvantages

- May cause traffic delays and increased travel time.
- Effectiveness depends on driver compliance and enforcement.

Installation and Removal Considerations

Signs must be installed following the approved TMP and the Land Transport Rule: Setting of Speed Limits 2022.

Risks that this control may introduce

- Inadequate enforcement or non-compliance can lead to ineffective speed control.
- Overly restrictive speed limits may lead to driver frustration and non-compliance.

Maintenance Requirements

- Regularly inspect and maintain speed limit signs and any additional traffic calming measures to ensure visibility and effectiveness.
- Monitor and review TSLs to ensure they meet the TTM environment's safety requirements, which is still necessary, especially in dynamic work zones.

Temporary Walkway Bridges

- Temporary walkway bridges provide a safe, continuous path for pedestrians and cyclists over obstacles like trenches, excavated areas, or other hazardous work zones, ensuring minimal disruption to their travel routes.
- These bridges are deployed when the direct pedestrian path is obstructed, offering a safe alternative to ground-level detours. They are especially useful in high-traffic areas or where detours would significantly extend travel time or reduce compliance with alternative routes.
- It is essential to include wheelchair-accessible ramps at entrances and exits.
- Bridges should also accommodate various mobility aids.

Specific Requirements

- Need to be robust and stable, free from structural defects such as cracks or holes.
- Should adhere to minimum width requirements for safe passage of pedestrians and cyclists (**refer to Appendix F**).

Control Measure Variations

- Widths vary based on pedestrian volume: standard widths range from 1.20m to 1.50m, with up to 2.50m for high-traffic areas.
- Material and design may vary, with some bridges designed for lightweight portability and others for heavier traffic.

Dimension Requirements

- Refer to the Temporary Walkway Bridges section within Appendix F of this guidance.

Purpose build bridges can be useful where the geometry and arrangement of pathways is unique and bespoke. Image Credit cxiii: Parallaxx.

Installation and Removal Considerations

- Planning must account for the space required for ramps and the bridge itself.
- Coordination with other TTM elements is crucial to ensure safe and efficient installation and removal.

Risks that this control may introduce

- Potential tripping hazards at entry and exit points if ramps are not appropriately designed.
- Risk of structural instability if not properly installed or maintained.

Maintenance Requirements

- Regular inspections for structural integrity, especially under high-usage

Temporary bridges should be stable and embedded into the pathways either side so there are no trip hazards for users at either end. Image Credit cxiv: Oregon Department of Transport.

Advantages

- Maintains direct pedestrian routes, avoiding lengthy detours.
- Ensures safety over hazardous or uneven surfaces.

Disadvantages

- Can be costly and time-consuming to install.
- Requires significant space for installation and ramps.

Vehicle fitted with a Truck Mounted Attenuator (TMA)

- A truck-mounted attenuator (TMA) vehicle serves dual purposes in TTM. Firstly, the vehicle acts as a protective barrier for people on foot, such as when footpaths are diverted into the carriageway. Secondly, the TMA minimises the impact severity if a road user collides with the protective vehicle.
- The vehicle is strategically placed to shield pedestrians from traffic, particularly in areas where footpaths merge with or are close to vehicular lanes. The TMA, attached to the vehicle's rear, absorbs collision energy, reducing injury risk to the errant driver and protecting workers and VRUs nearby.
- The vehicle placement should not impede visual or physical accessibility features of the walkway.

Specific Requirements

- The vehicle should be of the required weight to be fitted with the TMA.
- The TMA must be approved for use on New Zealand's roads through Waka Kotahi's M23 Appendix C.

Control Measure Variations

- Variations in TMA designs, based on impact rating and size.
- Different vehicle types, depending on the required level of protection and site-specific conditions.

Advantages

- Provides physical barrier protection for pedestrians.
- Reduces impact severity in case of vehicular collision.

Disadvantages

- Requires significant road space.
- Potential visual obstruction for drivers and pedestrians.

Installation and Removal Considerations

- Strategic positioning is crucial to maximise protection without causing undue road or pedestrian obstruction.
- Coordination with other TTM elements, ensuring the vehicle does not impede traffic flow or pedestrian movement.
- Consider quick and safe removal in case of emergency or completion of work.

TMA vehicles, when positioned to protect something, need to ensure there is sufficient space in front of them to accommodate room to roll ahead if struck. Image Credit cxv: Parallaxx.

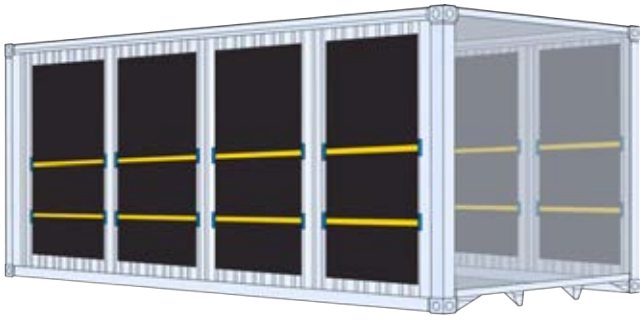
Risks that this control may introduce

Potential for creating blind spots for both drivers and pedestrians.

Risk of pedestrian or vehicle collision if improperly positioned.

Sufficient **roll-ahead distance** must be accommodated to ensure there is room for the vehicle to move forward if struck.

Walkway Covering



- Walkway covering protects pedestrians and cyclists from hazards such as falling objects, particularly in areas where overhead work is being conducted.
- These coverings are installed over existing or temporary walkways and bikeways, ensuring a safe passage for VRUs underneath construction or maintenance areas. They are particularly useful in urban environments where rerouting pedestrian traffic is impractical or unsafe.
- Must be designed to accommodate wheelchairs and other mobility aids.
- Requires clear signage and, where appropriate, tactile ground surface indicators for visually impaired users.

Specific Requirements

- Must meet minimum height and width standards to ensure safe and comfortable passage (refer to the relevant section in Appendix F of this guidance).
- Materials used should be durable, weather-resistant, and capable of withstanding anticipated loads.

Control Measure Variations

- Variations in materials (e.g., solid materials, transparent panels for natural light).
- Different designs for integration with surrounding urban aesthetics.

Advantages

- Protects pedestrians and cyclists from overhead hazards.
- Enables continuous access along existing routes, minimising disruption.

Disadvantages

- Can be costly and time-consuming to install and maintain.
- May create visual and physical barriers in the streetscape.

Dimension Requirements

Minimum width of 1.8m (2.5m or more in CBD environments) and minimum height clearance of 2.5m.

Installation and Removal Considerations

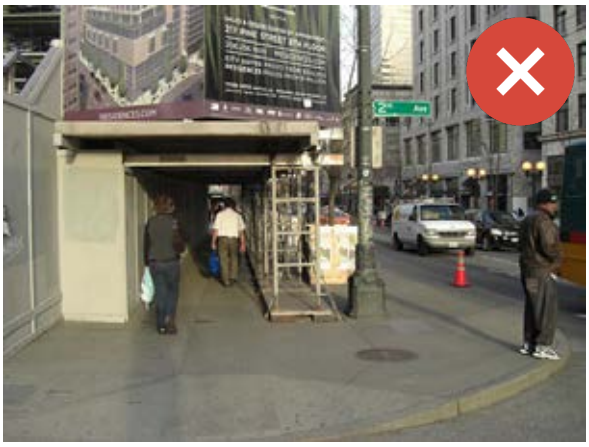
- Installation should minimise disruption to pedestrian and vehicle traffic.
- Structural stability and secure anchoring are crucial.

Risks that this control may introduce

- Potential tripping hazards if not installed correctly.
- Reduced visibility for pedestrians and cyclists, especially at corners and intersections.

Maintenance Requirements

- Regular inspection for structural integrity and damage.
- Cleaning and clearing of debris to ensure visibility and safety.



A key risk of covered walkways is darkness and constrained space. A suitable height to the covered walkway allows for the installation of temporary lighting and a reduced feeling of claustrophobia by users. Image Credit cxvi: City of Seattle.

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Glossary, References and Appendices

This part contains all terms (glossary) and references indicated within all parts of the Practice Note.

This part also includes all Appendices (forms, checklists) referenced within all other parts of the Practice Note.

This part includes the following components:

Glossary

Where terms have additional italicised terms underneath them (such as control measure) – these are variants of the term that may be used in some cases and can be assumed to have the same meaning.

Term	Definition
AADT	Annual Average Daily Traffic *The total volume of traffic passing a roadside observation point over the period of a calendar year, divided by the number of days in that year (365 or 366 days). Measured in vehicles per day (VPD).* [72]
Activity	*A planned event or operation done within the road reserve or affecting the normal use of the road reserve. An activity can be:* - *vertical and horizontal construction projects* - *vertical and horizontal maintenance activities* - *inspections and data collection – survey, asset investigation, traffic counting* - *on-road events and races – cycling, triathlon, running, motorsport* - *adjacent events – horse races, concerts, air shows* - *emergency services operations – FENZ, police, tow truck, civil defence* - *planed legal enforcement – police, MPI, Covid cordons* - *• agricultural and forestry - stock crossing, stock droving and logging activities* [77]
ADA (1990)	The Americans with Disabilities Act of 1990 (U.S)
AGTTM	Austroads Guide to Temporary Traffic Management (Australia) [5]
ALARP	As Low As Reasonably Practicable *A risk management principle that calls for the reduction of risk to the lowest level that is feasible, given existing technical, financial, and temporal constraints. It represents a balance between the effort and cost of further risk mitigation against the degree of safety achieved.* [6] *This means you must do everything reasonably practicable to eliminate or minimise health and safety risks arising from your work.* [83]
Audible Message Device (AMD)	*A specialised form of traffic control equipment designed to disseminate pre-recorded or live voice messages to inform, guide, or warn road users. These devices are intended for temporary use in or near work zones, special events, or other scenarios where typical visual traffic control devices may not be fully effective for all road users, including the visually impaired.* [19]
Barrier	Refer to Temporary Road Safety Barrier System (TRSBS)

Term	Definition
Bicycle	Refer to Cycle
Bow-Tie method[13] *[of risk assessment]*	*The Bow-Tie Risk Assessment method is a visual tool used to analyse and communicate how major incidents can occur and what measures are in place to prevent or mitigate such incidents.* *The method is depicted by a bow-tie diagram, which outlines the causes of an event on the left-hand side, the event itself in the middle, and the potential consequences on the right-hand side. Preventive measures (barriers) are identified to stop the event from occurring, and mitigative measures are identified to lessen the impact if the event does occur.*
CAS	Crash Analysis System *New Zealand's centralised crash analysis database administered by Waka Kotahi (NZ Transport Agency) [76]*
CBD	Central Business District
Client	Refer to Contracting PCBU
Closure [area]	*The physical area from which the road users are to be excluded. This includes, but is not limited to, shoulder closures, lane closures, and road closures.*[86]
CNG	Cycling Network Guidance[79] *Published by Waka Kotahi (NZ Transport Agency)*
Competent Person	*Someone who has the appropriate skills, training, knowledge, and experience to perform the task or role.* [86]
Contracting PCBU	*The initiator of a contract for work or services.* [86]
Contractor	*A PCBU has been awarded a contract by the contracting PCBU (for example, an RCA or utility/service provider) or a PCBU that has been awarded a contract to work near or on a private road.* [86]
Consult, Cooperate, and Coordinate *Overlapping Duties* *The 3C's*	*Sometimes referred to as 'the 3 C's' – this phrasing is directly from the Health and Safety at Work Act 2015 (Section 34) and requires that where PCBUs have the same duty, "each PCBU with the duty must, so far as is reasonably practicable, consult, co-operate with, and co-ordinate activities with all other PCBUs who have a duty in relation to the same matter".* *These overlapping duties emerge when multiple businesses share health and safety responsibilities within a shared workspace or a contracting chain. Through consultation, cooperation, and coordination, businesses can delineate clear roles, responsibilities, and effective communication channels, thereby averting potential gaps in risk management.*

Term	Definition
Control measure *Risk controls* *Control*	*A way of eliminating or minimising risks to health and safety.*[86]
CoPTTM	The Code of Practice for Temporary Traffic Management (New Zealand)
Cycle	*A vehicle having at least two wheels designed primarily to be propelled by the muscular energy of the rider and includes a power-assisted cycle.* [72] *Not permitted to use the footpath.*
Cycle Lane	*A longitudinal strip within a roadway reserved by a marking or sign designed for the passage of cycles.* [72]
Cycle Path	*Part of the road that is physically separated from the roadway that is intended for the use of cyclists, but which may be used also by pedestrians and includes a cycle track formed under section 332 of the Local Government Act 1974.* [72]
Delineation	*A treatment that enhances the selection of the appropriate path and speed or position to allow a movement to be carried out safely and efficiently. It could include line marking, raised pavement markers, traffic cones, post-mounted reflectors, chevron signs, etc.* [72]
Disabled Person *Person with Disability*	*Someone who experiences impairments in mobility, vision, hearing, or cognitive function, limiting their ability to navigate and interact safely within the road environment.* [48] *Alternative definition: Any person who suffers from physical or mental disablement to such a degree that they are seriously limited in the extent to which they can engage in the activities, pursuits and processes of everyday life.* [72]
DSI	Death and Serious Injury [Crashes] *Crashes are vehicular accidents resulting in either fatality or serious injuries that necessitate immediate and specialised medical treatment and may lead to long-term physical, cognitive, or psychological impairment.* [61]
EED	Engineering Exception Decision *A mechanism utilised within the Code of Practice for TTM (CoPTTM) framework.* *"A written decision made following consideration of all factors, including the safety of all concerned, to vary a code of practice(s), standard(s) or guideline(s), to suit a particular situation."*[73]
Emergency	*An uncontrolled event that has caused, or is risking to cause, loss of life, injury or serious property damage. It can include declarations of civil defence emergencies, traffic crashes or other significant incidents. It does not include delays unless these are the result of one of the above situations.* [72]

Term	Definition
Event	Refer to Special Event
Exclusion Zone	*An area where activity, workers, materials, plant or public is prohibited to preserve the separation between hazards and road users or different road user groups.* *This area is usually marked in yellow on a Traffic Management Diagram.*
Failure Modes Effects Analysis (FMEA)	*A systematic approach for evaluating the potential failure modes in a system. It identifies and assesses potential failure modes, their causes, and their effects on the system's functionality. The methodology is beneficial for preemptively identifying and addressing how a device or process might fail, thereby facilitating risk mitigation.* [59]
FENZ	Fire and Emergency New Zealand
Footpath	*A path or way principally designed for and used by pedestrians and includes a footbridge.* *Users of mobility and wheeled recreational devices are permitted (unless specifically prohibited by the road controlling authority) to use a footpath.* [72]
Fundamental Temporary Traffic Management (TTM) Controls	Refer to TTM Methods *Around the site, through the site, past the site, in the gaps in this order. These controls are the temporary traffic management (TTM) description substitutes for the Health and Safety at Work Act 2015 hierarchy of controls.* [77]
Good Practice	*A method or technique that has consistently shown superior results compared to others and can serve as a benchmark. It is replicable, adaptable to different contexts, and emerges from comparative evaluations. It can yield desired outcomes consistently and evolve through iterative solutions in response to changing contexts.*
GPG	Good Practice Guide
Hazard	*A potential source of harm. It could include an object, situation, or behaviour.* [86]
H&S	Health and Safety
HSWA (2015)	Health and Safety at Work Act 2015
ISO	International Standards Organisation
Level Crossing *Rail Crossing* *Railway Crossing*	*means any place where—* *(i) a railway line crosses a road on the same level; or* *(ii) the public is permitted to cross a railway line on the same level; and* *includes a bridge used for both rail vehicles and road traffic on the same level; but does not include a railway line on a road that is intended solely for the use of light rail vehicle.* [51]

Term	Definition
LGA (1974, 2002)	Local Government Act (1974, 2022) *The Local Government Act 2002 supersedes the 1974 Act. However, numerous provisions of the 1974 Act remain in place and were not retracted, including provisions that have implications for local authorities' oversight of Temporary Traffic Management. Both Acts (1974 and 2022) are referenced within this text together – or, where appropriate, where the specific provision is from one of the versions of the Act that is specifically referenced.*
Live Lane	*A traffic lane available for use by road users.* [86]
Low Powered Vehicle (LPV)	*A Low Powered Vehicle (LPV) is a category of electrically assisted personal mobility devices designed for individual use. These devices typically feature a footboard or platform, two or three wheels, a long steering handle, and an electric auxiliary propulsion motor. LPVs encompass a variety of wheeled recreational devices, including but not limited to electric scooters, electric bicycles (e-bikes), electric skateboards, self-balancing devices, and similar electrically powered individual transportation modes.* *To legally qualify as an LPV, these devices should meet specific criteria, including:* • *Wheel Size: The wheels on an LPV must not exceed 355mm in diameter.* • *Motor Power: LPVs are equipped with an electric motor that assists in propulsion. The maximum power output of this motor must not exceed 300W.* [72]
Lowest Total Risk	*A principle aimed at minimising the overall risk across all involved parties rather than just transferring risk from one group to another.* *This concept acknowledges that a solution for reducing risk to one group might inadvertently escalate the risk for another group. The objective is to identify solutions that bring down the total risk for everyone involved rather than merely shifting the risk around.*[77] *The term Lowest Total Risk originated from the NZ Guide to TTM. However, the principle is similar to 'Global at Least Equivalent' (GALE), used in aviation safety.*
LTMA (2003)	Land Transport Management Act 2003
Manual Traffic Control (MTC) *Manual Traffic Controller*	*Traffic is controlled using stop/go paddles by hand.* *A Manual traffic controller is the person who operates the stop/go paddle.*
Marking	*A line, symbol, pattern, message, numeral, pavement marker or other device set in the roadway or applied or attached to the road surface.* [72]

Term	Definition
Method of Conflict	*A potential interaction between a risk subject, such as a vulnerable road user, and a hazard source causing harm within a given environment.* *This concept is an operational tool for designers and field staff, facilitating an easier understanding of how risk materialises in real-world scenarios.*
Mobile TTM Operation	*Mobile operations are those activities or operations not contained within a fixed site where vehicles are progressively travelling in the same direction as, but at a speed less than or in a manner different from, normal traffic. Mobile operations may involve stopping for short periods.* [73]
Mobility Device	*A vehicle that:* - *is designed and constructed (not merely adapted) for use by persons who require mobility assistance due to physical or neurological impairment and* - *is powered solely by a motor that has a maximum power output not exceeding 1500 W; or* *A vehicle that the Director of Land Transport has decided under section 168A(1) of the Land Transport Act 1998 to be a mobility device.* [72] *Is permitted to use a footpath.*
NZGTTM	The New Zealand Guide to Temporary Traffic Management
NZQA	New Zealand Qualifications Authority
NZTA	Refer to Waka Kotahi (NZ Transport Agency) *The formal name Waka Kotahi (NZ Transport Agency) is used primarily in recent documentation – the acronym NZTA is present in documentation dates prior to 2022. Further older documentation may refer to Transit New Zealand.*
Operating Speed	*Operating speed is the speed at which users are observed to travel over a given stretch of road under favourable conditions and in the absence of speed limits or other traffic control devices. It reflects the speed most users perceive as safe and comfortable for that particular road segment. In plain language, it is the speed that most drivers naturally choose to drive at when nothing is telling them to go slower or faster, and the road conditions are good* [8]*.*
OHS	Occupational Health and Safety
Overlapping Duties	*When a PCBU shares duties with other PCBUs. When two or more PCBUs are working together at the same location or through a contracting chain, they must work together to fulfil their duties of care and manage risks. Where those duties overlap, the PCBUs must consult, cooperate, and coordinate with each other to meet their health and safety responsibilities to workers and others.* [86]

Term	Definition
Pavement Marking	Refer to Marking
PDCA	Plan-Do-Check-Act [cycle][12] *The PDCA cycle is a four-step method for continuously improving processes and products. It stands for Plan, Do, Check, and Act:* 1. ***Plan**: Identify an issue and plan how to tackle it. Create a plan outlining the changes needed.* 2. ***Do**: Implement the changes according to your plan.* 3. ***Check**: Analyse the results to see if the changes positively impacted or solved the issue.* 4. ***Act**: If the changes were successful, apply them on a broader scale. If not, go back to the planning stage and devise a new plan.* *It is like a loop because once you have acted, you go back to planning the next improvement, and the cycle repeats. This way, there is a continuous effort towards improving processes and outcomes.*
Pedestrian	*A person on foot on a road and includes a person in or on any contrivance equipped with wheels or revolving runners that is not a vehicle and permitted to use a footpath.* *In New Zealand law, a pedestrian does not include a person on a mobility or wheeled recreational device. However, both of these classes of users may use a footpath.* [72]
Pedestrian Channelising Device (PCD)	*Primarily a term used in the United States and Canada for corraling pedestrians using physical devices that direct their movement.*
Person Conducting a Business or Undertaking (PCBU)	*In most cases, a PCBU will be a business entity, such as a company. However, an individual carrying out business as a sole trader or self-employed person is also a PCBU. A PCBU does not include workers or officers of a PCBU, volunteer associations with no employees, or home occupiers that employ or engage a tradesperson to carry out residential work.* [86]
PNG	Pedestrian Network Guidance[79] *Published by Waka Kotahi (NZ Transport Agency)*
Power Assisted Cycle	*A cycle to which is attached one or more auxiliary propulsion motors that have a combined maximum power output not exceeding 300 W*[72]*. Such a device is still considered a cycle.*
Primary Duty of Care	*A PCBUs legal obligation to ensure, so far as is reasonably practicable, the health and safety of workers and that other persons are not put at risk by its work. This is called the 'primary duty of care'.* [86]

Term	Definition
Principal	Refer to Contracting PCBU
Rail Crossing *Railway Crossing*	Refer to Level Crossing
Reasonably Practicable	*What is, or was, reasonably able to be done to ensure health and safety, taking into account and weighing up relevant matters, including:* - *The likelihood of the risk concerned occurring or workers being exposed to the hazard* - *The degree of harm that might result* - *What the person concerned knows, or ought reasonably to know, about:* o *the hazard or risk* o *ways of eliminating or minimising the risk* - *The availability and suitability of ways to eliminate or minimise the risk* - *After assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.* [86] *For more information, see WorkSafe New Zealand's fact sheet.*
Risk	*The effect of uncertainty on objectives.* [27] *Risk can become a difficult concept to understand and practically work with. It can have multiple meanings and interpretations. This results in confusion and ineffective treatment of risk in physical settings.* *For this reason, this practice note has adopted the term methods of conflict as a way for designers and field staff to understand what risk looks like in practical environments more easily. 'Conflict' refers to the exposure of a risk subject to a hazard that can cause harm.*
Road Controlling Authority (RCA)	*As defined in the Land Transport Management Act 2003 – "in relation to a road, means the Minister, Department of State, Crown entity, State enterprise, or territorial authority that controls the road. In relation to a road within Auckland that is controlled by Auckland Transport, means Auckland Transport".* [30] *Referred to in some New Zealand legislation as a public road controlling authority*
Road *Road Reserve* *Roadway*	*The area of land between the legal boundaries, usually fence line to fence line and including any safety run-off areas, which is dedicated to allow the passage of road users. The road reserve also includes an air space of six metres directly above the road surface.*[72] *Roadway or carriageway refers to the sealed area between kerbs (or the edges of the seal if no kerbs are present.*

Term	Definition
Road Marking	Refer to Marking
Safety Zone ***Safety Zones***	Refer to Exclusion Zone
Shared Path	*A path intended to be used by pedestrians, cyclists, mobility devices and wheeled recreational devices.* [72]
Shoulder	*The portion of the formed road beyond the traffic lanes that is contiguous and flush with the pavement's surface and, on a sealed road, includes any unsealed part of the road and any sealed part of the road outside an edge line on the road.* [72]
Side Friction	*The retarding effect on the free flow of traffic caused by interference of any sort at either edge of a carriageway or traffic lane, other than at an intersection. Concerning road works, it is a form of positive traffic management that uses delineation devices placed close to a live lane to give road users the impression that they are travelling in a more restrictive width than they are.* [72]
Special Event	*An event requiring Temporary Traffic Management is a planned, non-construction activity that significantly impacts the normal flow of traffic or the safety of road users. This encompasses public gatherings, sporting events, concerts, and filming, necessitating special traffic arrangements to manage increased or altered vehicular and pedestrian movement.* [73]
Subcontractor	*A PCBU hired by a contractor to carry out temporary, paid work under contract.* [86]
STMS	Site Traffic Management Supervisor *A qualified person who has specific responsibility for documentation and management of temporary traffic management (TTM). The STMS is the system installer, the person that installs a system designed by a designer.* [77]
Tactile Pavers	Refer to Tactile Ground Surface Indicators (TGSI)
Taper	*A straight or smoothly curved row of delineation devices used to shift traffic laterally, for example, from a lane to the shoulder.* [77]
TCD	Traffic Control Device *A device used on a road for the purpose of traffic control; and includes a sign, signal or notice; or traffic calming device; or marking or road surface treatment.*[32]
TCP	Traffic Control Person *Primarily a term used in the United States and Canada. Equivalent to a Traffic Controller, TTM Worker, or Traffic Management Operative (TMO) in New Zealand.*
TA (or TLA)	Territorial Authority *Sometimes referred to as a Territorial Land Authority* *A city council or district council under the Local Government Act 2002* [36]

Term	Definition
TAO	Transport Authority Organisation *This term is not referred to in legislation; however, it is defined in the New Zealand Guide to Temporary Traffic Management (NZGTTM) as a "Road Controlling Authority (RCA), Rail Access Authority (RAA), Public Transport Authority (PTA) or other authority"* [77]
Temporary Traffic Management Industry Steering Group (TTM ISG)	*New Zealand's Temporary Traffic Management Industry Steering Group (NZ TTM ISG) was formed in April 2023 to connect and represent the TTM industry to provide guidance and enable aligned decision-making to ultimately meet the requirements of the Health and Safety at Work Act (2015).* *The group comprises representatives across various TTM industry stakeholders like Tier 1 Contractors, CCNZ, ACE NZ, Waka Kotahi, RCAs, and others.*
Temporary Traffic Management (TTM) Method *TTM Methodology [for vulnerable road user treatment]*	*Groupings and arrangements of TTM control measures create a complete fit-for-purpose TTM environment that manages risk to road users and workers as low as reasonably practicable.* *Refer to the section Selecting a Temporary Traffic Management Method.* *The New Zealand Guide to TTM (NZGTTM) uses the term "Fundamental TTM Controls"* [77]*; however, this term has not been adopted in this guidance so as not to confuse the use of the term controls (refer to control measures).* *TTM Configurations*
Temporary Road Safety Barrier System (TRSBS)	*An engineered assembly of components designed and installed to redirect, absorb, or contain kinetic energy from errant vehicles to minimise injury to vehicle occupants and other road users during a specific time-limited period or activity.*
TGSI	Tactile Ground Surface Indicators *Sometimes referred to colloquially as tactile pavers.* *Design standards can be found in AS/NZS 1428.4:2002*
TMA	Truck Mounted Attenuator *A safety device fitted to the rear of a vehicle that collapses when impacted by another vehicle.* [72]
TMD	Traffic Management Diagram *The TMD is a traffic management diagram within the traffic management plan (TMP). A TMP may have more than one TMD included as part of it.* [77]

Term	Definition
TMP	Traffic Management Plan *A document describing the design, implementation, maintenance, and removal of temporary traffic management (TTM) while the associated activity is being carried out within the road reserve or adjacent to it and affecting the road reserve.* [86] *This term has a range of alternative forms across international territories, such as transportation management plan, traffic control plan, and traffic guidance scheme.*
TPAR	Temporary Pedestrian Access Routes *Primarily a term used in the United States*
TSL	Temporary Speed Limit *A speed limit that is in force for a period of less than 12 months and is set under the Land Transport Rule: Setting of Speed Limits 2022 by the Road Controlling Authority (RCA).* [77]
TTM	Temporary Traffic Management *Temporary measures applied to preserve the safety of road workers and users while an activity impacting the normal operation of the road reserve is undertaken.* *Alternate terminology is used in other territories, such as Temporary Traffic Control or Work Zone Traffic Control.*
TTM Zone	*The section of road defined at each end by advance warning and end of works signs, or between vehicles in a mobile operation, including the vehicles themselves.* [77]
Unicycle	*A vehicle with one wheel that is designed to be propelled by the muscular energy of the rider. With only one wheel, a unicycle is, by definition, not a cycle (which has two or more wheels). Therefore, a unicycle must be considered a wheeled recreational device.* [72]
VKT	Vehicle Kilometres Travelled
VPD	Vehicles Per Day *The total volume of traffic passing a roadside observation point over 24 hours.*
VRU	Vulnerable Road User(s) *Defined in the context of this practice note as - "Road users not using registered motor vehicles or motorcycles".*
VTU	Vulnerable Transport User(s) *May also be referred to as Vulnerable Non-Motorised Transport Users.* *See Vulnerable Road User(s) (VRU)*

Term	Definition
Waka Kotahi (NZ Transport Agency)	*New Zealand's transport regulator, a New Zealand Crown entity tasked with promoting safe and functional transport by land, including the responsibility for driver and vehicle licensing and administering the New Zealand state highway network.*
Wheeled Recreational Device	*A vehicle that is a wheeled conveyance (other than a cycle that has a wheel diameter exceeding 355 mm) and that is propelled by human power or gravity. Includes a conveyance to which are attached one or more auxiliary propulsion motors that have a combined maximum power output not exceeding 300 W.* [72] *Is permitted to use a footpath.*
Working Space	*The physical area within which the activity in the road reserve is being undertaken, not including the exclusion zones or TTM areas.*
Worksite *Worksite Area*	Refer to TTM Zone *This term is historically utilised to describe the full extent of the area between 'advanced warning' and 'works end' signs – and is now referred to as the TTM Zone.*
Work Zone	Refer to TTM Zone *This term is used in many international territories to describe the TTM Zone.*

References

[1] Americans with Disabilities Act 1990 (U.S), Pub. L. No. 101-336 § 2, 328. https://www.govinfo.gov/content/pkg/statute-104/pdf/statute-104-Pg327.pdf

[2] Ashe, J. (2019). *ADA in the Work Zone: A Legal Perspective*. Federal Highway Administration (FHWA), Retrieved from http://www.dot.state.mn.us/trafficeng/workzone/ADA/ADA%20in%20the%20Work%20Zone%20-%20A%20Legal%20Perspective.rtf

[3] ATSSA. (2021). *Pedestrian Considerations: Updated Checklist for Temporary Traffic Control Zones*. American Traffic Safety Services Association

[4] Austroads. (2021). Guide to Road Design Part 6A: Paths for Walking and Cycling. In (Vol. AGRD06A-17): Austroads.

[5] Austroads. (2021). *Guide to Temporary Traffic Management*. Austroads Retrieved from https://austroads.com.au/network-operations/temporary-traffic-management/guide

[6] Aven, T. (2016). Risk assessment and risk management: Review of recent advances on their foundation. *European Journal of Operational Research*, *253*(1), 1-13. https://doi.org/10.1016/j.ejor.2015.12.023

[7] British Columbia Ministry of Transportation and Infrastructure. (2020). *Traffic Management Manual for Work on Roadways*. British Columbia Ministry of Transportation and Infrastructure Retrieved from https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/engineering-standards-and-guidelines/traffic-engineering-and-safety/traffic-engineering/traffic-management-and-traffic-control/2020-traffic-control-manual/2020-traffic-management-manual-for-work-on-roadways.pdf

[8] Caltrans. (2023). Highway Design Manual. In: California Department of Transportation.

[9] Clarke, S. (2019). Types of safety cultures and best practice suggestions. In *Increasing Occupational Health and Safety in Workplaces: Individual, Work and Organizational Factors* (pp. 294-313). Edward Elgar Publishing Ltd. https://doi.org/10.4337/9781788118095.00025

[10] Cox, L. A., Jr. (2008). What's wrong with risk matrices? *Risk Analysis*, *28*(2), 497-512. https://doi.org/10.1111/j.1539-6924.2008.01030.x

[11] CROW. (2020). *Werk in Uitvoering 2020 - Serie (Work in Progress 2020 - Series)*. CROW Retrieved from https://www.crow.nl/publicaties/werk-in-uitvoering

[12] Deming, W. E. (1950). *Elementary Principles of the Statistical Control of Quality*.

[13] Dianous, V. d., & Fievez, C. (2006). ARAMIS project : a more explicit demonstration of risk control through the use of bow-tie diagrams and the evaluation of safety barrier performance. *Journal of hazardous materials*, *130*(3), 220-233. https://doi.org/10.1016/j.jhazmat.2005.07.010

[14] Doran, B., Crossland, K., Brown, P., & Stafford, L. (2022). *Transport experiences of disabled people in Aotearoa New Zealand*. Waka Kotahi (New Zealand Transport Agency). https://www.nzta.govt.nz/assets/resources/research/reports/690/690-Transport-experiences-of-disabled-people-in-Aotearoa-New-Zealand.pdf

[15] Druery, J., McCormack, N., & Murphy, S. (2013). Are Best Practices Really Best? A Review of the Best Practices Literature in Library and Information Studies. *Evidence Based Library and Information Practice*, *8*(4), 110-128. https://doi.org/10.18438/b8rc9s

[16] Engineering New Zealand. (2018). Practice Note 2: Peer review. In (pp. 16): The Institution of Professional Engineers New Zealand Inc.,.

[17] Essa, M., Hussein, M., & Sayed, T. (2018). Road users' behavior and safety analysis of pedestrian–bike shared space: case study of Robson Street in Vancouver. *Canadian Journal of Civil Engineering*, *45*(12), 1053-1064. https://doi.org/10.1139/cjce-2017-0683

[18] FAO. (2013). *Good practices at FAO: Experience capitalization for continuous learning*. Food and Agriculture Organization of the United Nations. https://www.fao.org/3/ap784e/ap784e.pdf

[19] FHWA. (2023). *Manual on Uniform Traffic Control Devices*. Federal Highway Administration - U.S. Department of Transportation Retrieved from https://mutcd.fhwa.dot.gov/

[20] Gambatese, J., & Johnson, M. (2014). Impact of Design and Construction on Quality, Consistency, and Safety of Traffic Control Plans. *Transportation Research Record: Journal of the Transportation Research Board*, *2458*(1), 47-55. https://doi.org/10.3141/2458-06
[21] Garcia-Retamero, R., & Galesic, M. (2010). Who profits from visual aids: overcoming challenges in people's understanding of risks. *Social Science and Medicine*, *70*(7), 1019-1025. https://doi.org/10.1016/j.socscimed.2009.11.031
[22] Government Roading Powers Act 1989.
[23] Hasselgren, F. (2011). *Unprotected road users in road work accidents* Chalmers University of Technology]. Gothenburg.
[24] Health and Safety at Work (General Risk and Workplace Management) Regulations, § s.6 (2016). https://www.legislation.govt.nz/regulation/public/2016/0013/latest/DLM6727382.html
[25] Health and Safety at Work Act 2015.
[26] Human Rights Act 1993.
[27] ISO. (2009). Risk management: Principles and guidelines. In (Vol. AS/NZS ISO 31000:2009): International Standards Organisation,.
[28] Koorey, G., Bosher, S., Smith, M., & Fowler, M. (2017). *Design Guidance for Pedestrian & Cycle Rail Crossings*. Waka Kotahi (NZ Transport Agency); Kiwirail, Retrieved from https://www.nzta.govt.nz/assets/resources/design-guidance-for-pedestrian-and-cycle-rail-crossings/Design-guidance-for-pedestrian-and-cycle-rail-crossings.pdf
[29] Land Transport (Road User) Rule 2004.
[30] Land Transport Management Act 2003.
[31] Land Transport Rule: Setting of Speed Limits 2022.
[32] Land Transport Rule: Traffic Control Devices 2004.
[33] Lawrence, A., Houghton, J., Thomas, J., & Weldon, P. (2014). Where Is the Evidence? Realising the Value of Grey Literature for Public Policy & Practice, A Discussion Paper.
[34] Lee, M., Lee, H., Hwang, S., & Choi, M. (2021). Understanding the impact of the walking environment on pedestrian perception and comprehension of the situation. *Journal of Transport & Health*, *23*. https://doi.org/10.1016/j.jth.2021.101267
[35] Local Government Act 1974.
[36] Local Government Act 2002.
[37] Mazumder, A., Sahi, W., Black, D., & Attanayake, U. (2017). Enhancing Non-motorized Mobility within Construction Zones. In W. M. University (Ed.). Michigan, U.S.: Transportation Research Center for Livable Communities.
[38] Ministry of Highways. (2023). *Traffic Control Devices Manual for Work Zones*. Ministry of Highways, Saskatchewan Retrieved from https://publications.saskatchewan.ca/api/v1/products/109898/formats/123412/download
[39] Ministry of Social Development. (2019, July). *Disability language - words matter*. Retrieved December 12 from https://www.msd.govt.nz/about-msd-and-our-work/work-programmes/accessibility/quick-reference-guides/disability-language-words-matter.html
[40] Misra, A., & Watkins, K. (2018). Modeling Cyclist Route Choice using Revealed Preference Data: An Age and Gender Perspective. *Transportation Research Record*, *2672*(3), 145-154. https://doi.org/10.1177/0361198118798968
[41] MNDOT. (2021). *Pedestrian Accommodations through Work Zones Design Guidance*. Minnesota Department of Transportation Retrieved from http://www.dot.state.mn.us/trafficeng/workzone/apr-tpar/ped-accommodations-through-wz-design-guidance.pdf
[42] Morelli, C. J., Brogan, J. D., & Hall, J. W. (2005, November 15). *Accommodating Pedestrians in Work Zones* TRB 2006 Annual Meeting, Washington D.C. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=a4c4664a9b6fc47015e1c52da5510b8421d964c8
[43] National Institute of Neurological Disorders and Stroke. (2022, 19 October 2019). *NINDS common data elements*. Retrieved October 25 from https://www.commondataelements.ninds.nih.gov/
[44] Niska, A., & Eriksson, J. (2014). *Road works on cycle paths: knowledge compilation and problem description*. Swedish National Road and Transport Research Institute Retrieved from http://trafikverket.diva-portal.org/smash/get/diva2:1738195/FULLTEXT01.pdf
[45] NYDOT. (2023). *Work Zone Traffic Control*. New York Department of Transportation Retrieved from https://www.dot.ny.gov/divisions/engineering/design/dqab/hdm/hdm-repository/chapt_16.pdf

[46] ODOT. (2018). *Temporary Pedestrian Accessible Routes (TPAR)*. Oregon Department of Transportation Retrieved from https://www.oregon.gov/ODOT/Engineering/Docs_TrafficEng/TPAR-Overview.pdf
[47] Papadimitriou, E., Theofilatos, A., & Yannis, G. (2013). Patterns of pedestrian attitudes, perceptions and behaviour in Europe. *Safety Science*, *53*, 114-122. https://doi.org/10.1016/j.ssci.2012.09.008
[48] Peden, M., Scurfield, R., Sleet, D., Mohan, D., Hyder, A. A., Jarawan, E., & Mathers, C. (2004). *World report on road traffic injury prevention*. World Health Organisation.
[49] Piotr, C. (2017). Physically Disabled Pedestrians—Road Users in Terms of Road Accidents. https://doi.org/10.1007/978-3-319-43985-3_14
[50] Puchades, V. M., Fassina, F., Fraboni, F., De Angelis, M., Prati, G., de Waard, D., & Pietrantoni, L. (2018). The role of perceived competence and risk perception in cycling near misses. *Safety Science*, *105*, 167-177. https://doi.org/10.1016/j.ssci.2018.02.013
[51] Railways Act 2005.
[52] Road Safety Canada Consulting. (2011). *Road Safety in Canada*. https://tc.canada.ca/sites/default/files/migrated/tp15145e.pdf
[53] SALAR. (2019). *Gatuarbete I Tätort: Handbok Till Stöd För Planering Och Genomförande (Street Work in Urban Areas: Hanbook to Support Planning and Implementation)*. Swedish Association of Local Authorities and Regions, Retrieved from https://skr.se/download/18.5627773817e39e979ef38da8/1642168556280/7585-788-6.pdf
[54] Shakespeare, T. (2006). The social model of disability. In L. J. Davis (Ed.), *The disability studies reader* (pp. 197-204). Routledge. http://thedigitalcommons.org/docs/shakespeare_social-model-of-disability.pdf
[55] Shaw, J., Chitturi, M., Han, Y., Bremer, W., & Noyce, D. A. (2016). Bicyclist and Pedestrian Safety in Work Zones: Recent Advances and Future Directions. Transportation Research Board 95th Annual Meeting, Washington DC, United States.
[56] Shaw, J., & Oneyear, N. (2021). *Pedestrian Accommodations in Work Zones: Systematic Literature Review and Research Needs* (Smart Work Zone Deployment Initiative, Issue. Federal Highway Administration. https://intrans.iastate.edu/app/uploads/2021/11/pedestrian_accommodations_in_work_zones_w_cvr.pdf
[57] Shaw, J. W., Bremer, W., Chitturi, M. V., Bill, A., & Noyce, D. A. (2023). *Guidelines for Work Zone Designers: Pedestrian and Bicycle Accomodation*. University of Wisconsin-Madison Retrieved from https://workzonesafety.org/files/documents/training/fhwa_wz_grant/uw_wz_designer_guidelines_pedestrian_bicycle_accommodation-508.pdf
[58] Sorensen, G., Sparer, E., Williams, J. A. R., Gundersen, D., Boden, L. I., Dennerlein, J. T., Hashimoto, D., Katz, J. N., McLellan, D. L., Okechukwu, C. A., Pronk, N. P., Revette, A., & Wagner, G. R. (2018). Measuring Best Practices for Workplace Safety, Health, and Well-Being: The Workplace Integrated Safety and Health Assessment. *Journal of Occupational Environmental Medicine*, *60*(5), 430-439. https://doi.org/10.1097/JOM.0000000000001286
[59] Stamatis, D. H. (2003). *Failure Mode and Effect Analysis: FMEA from Theory to Execution*. ASQ Quality Press.
[60] Sullivan, D. (2023, December 6). *Distinguishing between hazards and risk events* [Interview].
[61] Te Manatu Waka (Ministry of Transport). (2021, June). *Te Anga Whakatakoto Hua mō ngā Waka: Transport Outcomes Framework*. Retrieved August 27 from https://www.transport.govt.nz/area-of-interest/strategy-and-direction/transport-outcomes-framework/
[62] Te Tari Mo Nga Take Hauatanga: Office for Disability Issues. (2023, 12 February 2023). *Key facts about disability in New Zealand*. New Zealand Government,. Retrieved October 25 from https://www.odi.govt.nz/home/about-disability/key-facts-about-disability-in-new-zealand/
[63] TfL. (2018). *Temporary Traffic Management handbook: Keeping people safe at roadworks*. Transport for London, Retrieved from https://content.tfl.gov.uk/temporary-traffic-management-handbook.pdf
[64] TfL. (2019). *Safer Provisions for Pedestrians at Roadworks: A Risk Prioritisation Framework*. Transport for London, Retrieved from https://content.tfl.gov.uk/safer-provisions-for-pedestrians-at-roadworks-a-risk-prioritisation-framework-final.pdf

[65] Theiss, L., & Bligh, R. P. (2013). *Worker safety during operations with mobile attenuators*. Texas Department of Transportation. https://static.tti.tamu.edu/tti.tamu.edu/documents/0-6707-1.pdf
[66] Tilton, D. (2023). *Toward a New Zealand-centric good practice guide for vulnerable road users in temporary traffic management (TTM) environments: An integrative review*.
[67] Ullman, B. R., & Trout, N. D. (2009). Accommodating Pedestrians with Visual Impairments in and around Work Zones. *Transportation Research Record*, *2140*, 102 - 196.
[68] Waka Kotahi. (2009). *Pedestrian planning and design guide*. Waka Kotahi (NZ Transport Agency), Retrieved from https://www.nzta.govt.nz/assets/resources/pedestrian-planning-guide/docs/chapter-15.pdf
[69] Waka Kotahi. (2014). *Guidelines for public transport infrastructure and facilities: Interim consultation draft*. Waka Kotahi (NZ Transport Agency), Retrieved from https://www.nzta.govt.nz/assets/consultation/guidelines-for-public-transport-infrastructure/docs/guidelines-pt-infrastructure-draft.pdf
[70] Waka Kotahi. (2014). *Safer Journeys for People who Cycle*. Waka Kotahi (NZ Transport Agency), Retrieved from https://www.nzta.govt.nz/assets/Walking-Cycling-and-Public-Transport/docs/Cycling-safety-panel-final-report.pdf
[71] Waka Kotahi. (2016). *Sharrow Markings: Best Practice Guidance Note*. (R1E160203). Waka Kotahi (NZ Transport Agency), Retrieved from https://www.nzta.govt.nz/assets/resources/sharrow-markings-best-practice-guidance-note/Sharrow-markings-best-practice-guidance-note.pdf
[72] Waka Kotahi. (2018, December 18). *Traffic control devices manual - Definitions*. Waka Kotahi (NZ Transport Agency),. Retrieved October 22 from https://www.nzta.govt.nz/resources/traffic-control-devices-manual/definitions/#annual-average-daily-traffic
[73] Waka Kotahi. (2019). *Code of practice for temporary traffic management (CoPTTM)*. (978-0-478-40773-0). Waka Kotahi (NZ Transport Agency), Retrieved from https://www.nzta.govt.nz/assets/resources/code-temp-traffic-management/docs/2018/sections-a-to-h-combined-copttm-4th-ed-nov2018.pdf
[74] Waka Kotahi. (2019). *Training and Competency Model v5.3*. Waka Kotahi (NZ Transport Agency) Retrieved from https://www.nzta.govt.nz/assets/resources/code-temp-traffic-management/docs/2019/Training-and-Competency-Model-v5.3.pdf
[75] Waka Kotahi. (2023). *Bus Stops Impacted by Temporary Traffic Management: Public Transport Design Guidance*. (978-1-99-106819-4). Waka Kotahi (NZ Transport Agency), Retrieved from https://www.nzta.govt.nz/assets/resources/bus-stops-impacted-by-temporary-traffic-management/guidance-for-bus-stops-impacted-by-temporary-traffic-management.pdf
[76] Waka Kotahi. (2023). *Crash Analysis System* https://cas.nzta.govt.nz/
[77] Waka Kotahi. (2023). *New Zealand guide to temporary traffic management (NZGTTM)*. Waka Kotahi (NZ Transport Agency) Retrieved from https://www.nzta.govt.nz/roads-and-rail/new-zealand-guide-to-temporary-traffic-management/
[78] Waka Kotahi. (2023). *Principles of Safe, Obvious and Step-free (SOS)*. Waka Kotahi (NZ Transport Agency). Retrieved August 19 from https://www.nzta.govt.nz/walking-cycling-and-public-transport/walking/walking-standards-and-guidelines/pedestrian-network-guidance/planning/pedestrian-planning-principles/principles-of-safe-obvious-and-step-free-sos/
[79] Waka Kotahi. (2023). *A Safe System for walking*. Waka Kotahi (NZ Transport Agency). Retrieved August 19 from https://www.nzta.govt.nz/walking-cycling-and-public-transport/walking/walking-standards-and-guidelines/pedestrian-network-guidance/walking-in-new-zealand/a-safe-system-for-walking/#relationship-to-speed-and-speed-environment
[80] Wang, J., Parajuli, S., Cherry, C. R., McDonald, N. C., & Lyons, T. (2022). Vulnerable road user safety and freight vehicles: A case study in North Carolina and Tennessee. *Transportation Research Interdisciplinary Perspectives*, *15*, 100650. https://doi.org/https://doi.org/10.1016/j.trip.2022.100650
[81] WisDOT. (2019). *Facilities Development Manual - Design - Traffic Control*. Wisconsin Department of Transportation Retrieved from https://wisconsindot.gov/rdwy/fdm/fd-11-50.pdf#fd11-50-31

[82] WorkSafe NZ. (2017, September 25). *Risk management*. WorkSafe New Zealand. Retrieved November 6 from https://www.worksafe.govt.nz/topic-and-industry/hazardous-substances/managing/risk-management/
[83] WorkSafe NZ. (2019). *Introduction to the Health and Safety at Work Act 2015 – special guide*. Retrieved August 4 from https://www.worksafe.govt.nz/managing-health-and-safety/getting-started/introduction-hswa-special-guide/
[84] WorkSafe NZ. (2022). Accepted enforceable undertakings: Downer New Zealand Limited. Retrieved 31 March 2023, from https://www.worksafe.govt.nz/laws-and-regulations/enforceable-undertakings/accepted-enforceable-undertakings/downer-new-zealand-limited-2/
[85] WorkSafe NZ. (2022). Accepted enforceable undertakings: McConnell Dowell Constructors Limited. Retrieved 31 March 2023, from https://www.worksafe.govt.nz/laws-and-regulations/enforceable-undertakings/accepted-enforceable-undertakings/mcconnell-dowell-constructors-limited-2/
[86] WorkSafe NZ. (2022). *Keeping healthy and safe while working on the road or roadside*. https://www.worksafe.govt.nz/topic-and-industry/road-and-roadside/keeping-healthy-safe-working-road-or-roadside/
[87] Yang, H., Ozbay, K., Ozturk, O., & Xie, K. (2015). Work zone safety analysis and modeling: a state-of-the-art review. *Traffic Injury Prevention*, *16*(4), 387-396. https://doi.org/10.1080/15389588.2014.948615
[88] YSB Group Limited v Worksafe New Zealand, (High Court of New Zealand 2019).

Appendices

Appendix A: Procurement Assessment for Contracting PCBUs on VRU Safety

The following assessment tool can be utilized by Contracting PCBUs to evaluate and enhance VRU safety in TTM during procurement. It is adaptable and can be recreated or modified electronically to integrate within existing procurement systems or approaches.

Risk Identification and Understanding	
Is there evidence of the safety of Vulnerable Road Users being foundational to the risk management approach taken to TTM by the Contractor?	
What further information could be provided to deliver clearer evidence of risk understanding and mitigation strategies for vulnerable road users? *For example, the contractor's risk assessment including specific elements involving pedestrians, cyclists, and people with disabilities.*	

Track Record	
Is there evidence of the contractor's competency and experience in ensuring VRU safety in previous projects?	
What further information could be provided to establish a contractor's capability in managing VRU safety? *For example, specific case studies of safety initiatives or methodologies from previous work.*	

Legal and Regulatory Compliance	
Is there evidence of compliance with all legal and regulatory requirements related to VRU safety?	
What further information could be provided to demonstrate a clear link between the proposed methodology and legal and regulatory compliance related to VRUs in TTM environments? *For example, specific VRU-focussed legislative provisions and how they will be complied with.*	

Inclusivity and Accessibility	
Is there evidence of inclusivity and accessibility considerations in the procurement process for all VRUs, including those with disabilities?	
What further information could be provided to demonstrate an understanding of the diverse needs of VRUs in the specific contract area and how they will be met? *For example, evidence of research into the VRUs present and using the road corridor in the contract area*	

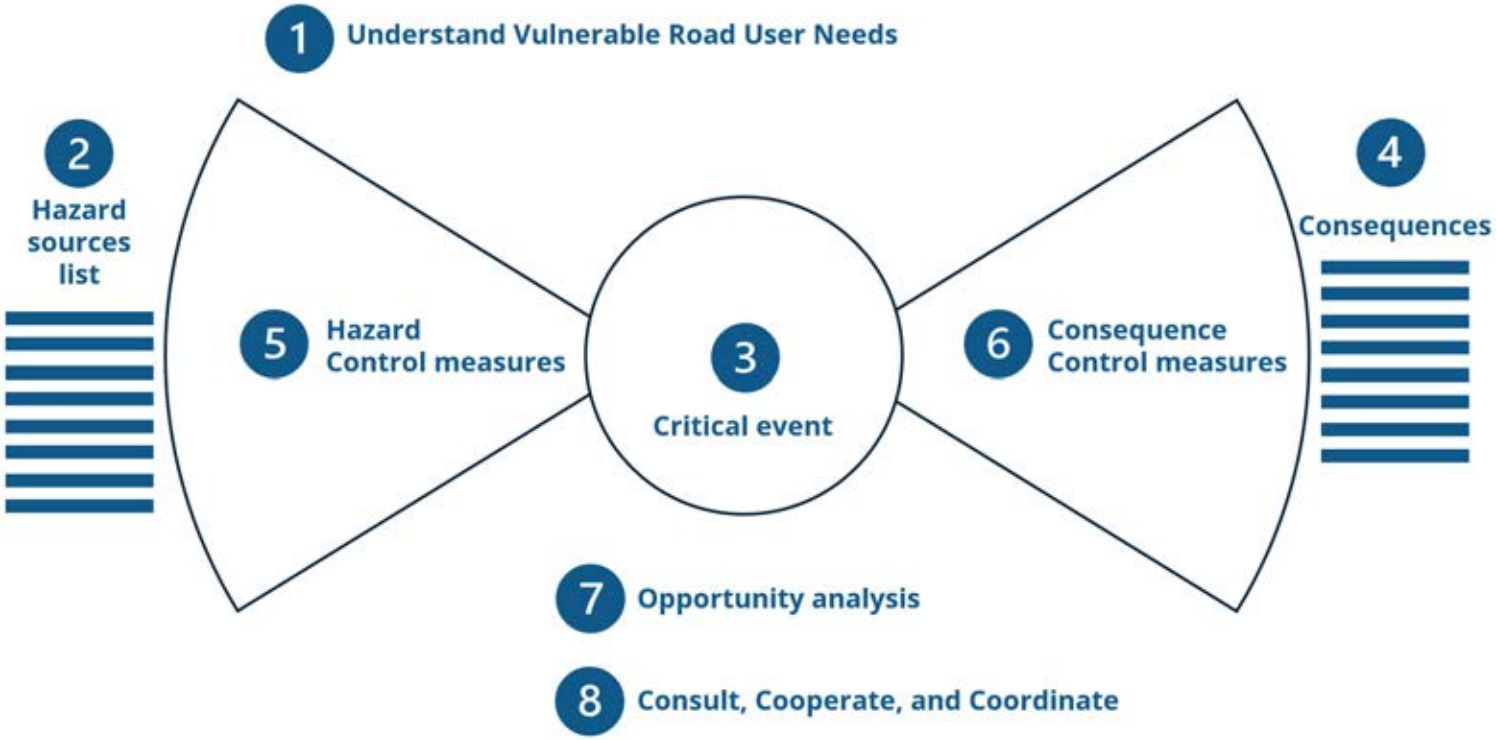
Appendix B: RCA Vulnerable Road User Safety Assessment (VRUSA)

This tool is to aid Road Controlling Authorities (or other parties who wish to use it) in evaluating the level of safety for Vulnerable Road Users in TTM environments and providing practical contributions on how to enhance the level of safety.

This is an enhancement-focused tool, not a compliance-focused one, reflecting the role of the RCA to consult, cooperate, and coordinate with fellow PCBUs**. This tool will generate potential enhancements to risk management for VRUs in TTM to share with other PCBUs.**

This tool is founded on the bow-tie model (for risk assessment), a practical tool used across many industries to explore the origins of a potential incident and its potential consequences[13]. **Follow the steps in order and record the results as you go.**

This tool is adaptable to other use cases outside vulnerable road user safety.



1	**Understand Vulnerable Road Users Needs** • Identification of VRU types (pedestrians, cyclists, people with disabilities, etc.) • Understanding their specific needs and challenges in the given environment through engagement with local community groups, surveys, traffic studies, and observation.
2	**Hazard Source Identification (left edge of the bowtie)** • List and describe all potential hazards that could adversely affect VRUs. • For assistance, a list of potential hazard sources can be found on **Page D5 (in Part D).**

3	**Critical Event (centre knot of the bowtie)** • Define the crucial event as a VRU-involved incident (e.g., collision or near-miss) that the assessment aims to prevent. • This event acts as the focal point around which the assessment revolves. • Note that this explores one critical event. The safety assessment can either be used multiple times with a different critical event each time) – or assess multiple critical events simultaneously and link hazards and those events together more systematically.
4	**Consequence Analysis (right edge of the bowtie)** • For each hazard, outline the potential consequences should the hazard lead to a VRU-involved incident. • Assess the severity (e.g., minor injury, major injury, fatality) of the consequence to generate an understanding of the significance of the risk. • Document the findings in a manner that allows for easy visualisation and understanding of the potential consequences.
5	**Hazard Control Measures (left wing of the bowtie)** • Existing Controls: Detail the current control measures in place to prevent or mitigate the identified hazards, such as signs, fencing, temporary crossings, etc. • Additional Controls: Identify and describe additional control measures that could be employed to reduce the risks further. • Evaluate the feasibility and effectiveness of implementing additional control measures.
6	**Consequence Control Measures (right wing of the bowtie)** • Existing Controls: Detail the current control measures in place to prevent or mitigate the identified consequences. • Additional Controls: Identify and describe additional control measures that could be employed to reduce the risks further. • Evaluate the feasibility and effectiveness of implementing additional control measures.
7	**Opportunity Analysis** • Explore available but unutilised mechanisms/methods to better manage the identified hazards or consequences for VRUs (the main 'additional controls' findings from steps 5 and 6). • Evaluate why these opportunities may not have been utilised, what barriers exist to their implementation, and what steps can be taken to overcome them and implement the opportunities. Consult with other PCBUs if required for information. • Document the findings as recommendations.
8	**Consult, cooperate, coordinate** • Disseminate the assessment findings and recommendations to other PCBUs, obtaining their input and understanding their perspectives on the feasibility and effectiveness of proposed safety measures. • Formulate a joint action plan with other PCBUs to implement prioritised recommendations.

Appendix C: Contractor/Subcontractor review for TTM

The Contractor Risk Review Tool is designed to **align TTM with the work activity.**

This tool is a straightforward way to **check that TTM plans fit well with on-site work.**

It helps ensure that everything about TTM is **right for the specific job**. Use the questions in the tool to write notes to the TTM designer on what needs to be adjusted or what you need to know more about (to confirm everything will work correctly and safely).

Step	Ask
1	**Verify Plant and Material Accommodation** • Is the allocated space for plant and materials clearly marked within the TTM plan? • Are the designated zones sufficient for the quantity and size of materials and equipment? • Are there provisions for additional space if the project scope changes?
2	**Assess Activity Vehicle Flow (in, through, out)** • Can the TTM layout support the frequency and size of vehicles without causing congestion? • Are entry and exit points for construction vehicles safe and accessible and without conflict with other road users? • Is there a contingency plan for different types, times or vehicle entry/exit needs?
3	**Confirm Operational Timing Compatibility** • Are the TTM arrangements designed to accommodate the busiest and most complex work activity planned? • Does the TMP clearly show how the TTM will change as the activity risks change over time?
4	**Check Alignment with Activity Phases** • Does the TTM plan adapt to different activity phases? • Are there clear triggers for when TTM arrangements change as per activity transitions? • Is there a communication strategy to inform stakeholders of phase-related TTM changes?
5	**Evaluate Space for Activity Maneuvering** • Is there enough maneuvering space allocated for the safe operation of plant or machines? • Are VRU pathways and activity maneuvering areas separated? • How will the space for maneuvering be managed in case of unexpected obstructions?
6	**Review Provision for Materials Storage** • Are storage areas for materials placed to minimise manual handling risks? • Do the storage locations comply with the TTM pathways and do not block sightlines? • Is there a process for updating the TTM plan as material storage needs evolve?
7	**Inspect Vehicle and Plant Interaction with VRUs** • Are there dedicated crossing points for VRUs that are monitored during vehicle movements? • Is there physical separation and signage to warn VRUs and operators of interaction points? • Are vehicle and plant operating zones clearly defined and separate from VRU areas?

A PLANNING PROCESS TO HELP PROTECT OUR MOST VULNERABLE ROAD USERS

This isn't just useful for planning TTM for vulnerable people, you can use this process for planning all TTM.

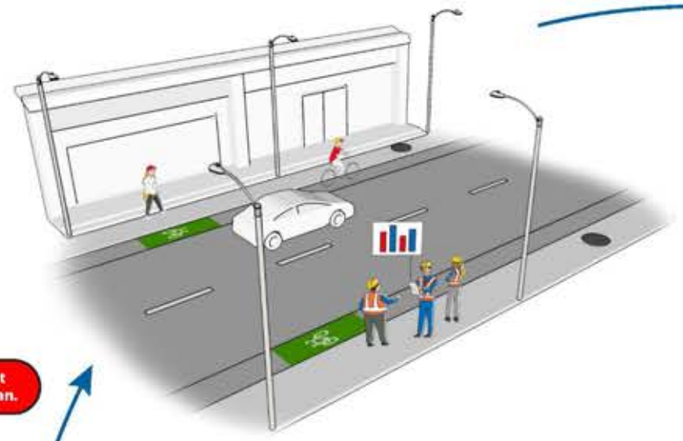
Civil CONTRACTORS New Zealand

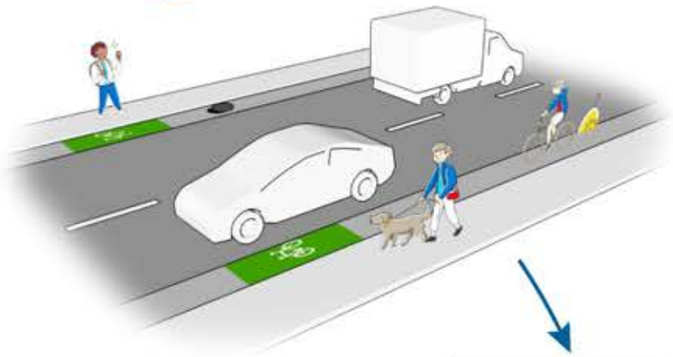
STEP 1

START HERE

UNDERSTAND THE SITUATION

- Gather information about the work being done, and the environment it will be done in.
- The more information the better. Do this with other people involved so you get the best possible information.
- Get really clear on all the people that are moving through the space you will be working in.
- Pay specific attention to disabled people, or people that would struggle more than normal with TTM environments.





STEP 2

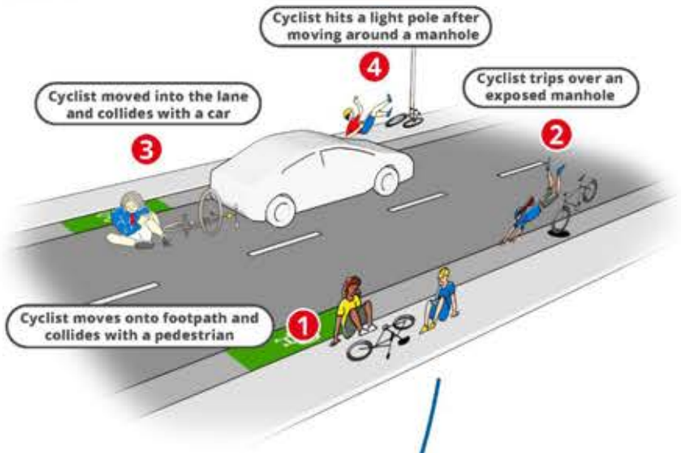
IDENTIFY THE HAZARDS

- Find all the ways that people can be harmed.
- This can be done by listing all the ways that people or objects can come together causing people to get hurt.
- For example pedestrian vs. vehicle entering a property, or mobility scooter vs. work vehicle entering the worksite.
- We call these ***'methods of conflict'*** and they are a useful way to get clear on all the hazards.

STEP 3

ASSESS THE RISKS

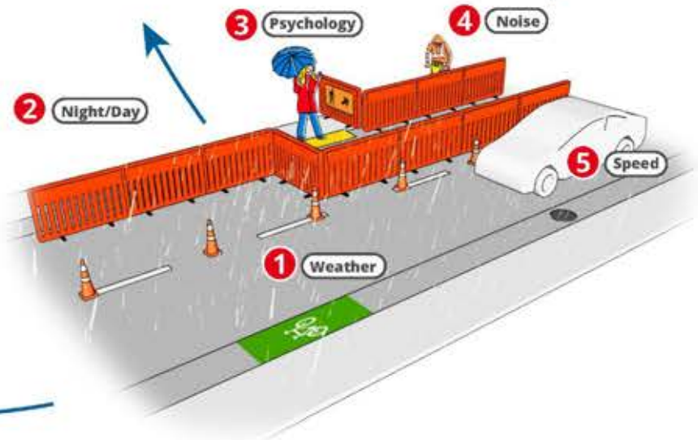
- Now look at how all these ***'methods of conflict'*** might actually come true. How would a pedestrian get exposed to and collide with a pedestrian? Where are they both in relation to each other?
- This allows you to find all the risks that need to be removed or minimised.
- It can help to play out a number of different scenarios of things that could happen (do as many as you can!) – this is a good way to make sure all the different possibilities are covered by your plan.
- Be careful, people might have many risks, and they might show up lots of different ways. Try to list as many risks as you can.



STEP 4

ASSESS THE 'RISK MODERATORS'

- What are all the things that could make the risks you've found worse, or better?
- Things like weather, darkness, or even just the compliance of the road users themselves – all these things might make your risks different.
- For example, if it rains – what will the surfaces that cyclists are using be like? Will they change their path because water pools somewhere?
- List all the risk moderators that could impact your environment – and explore them thoroughly. Ask 'what if?'.

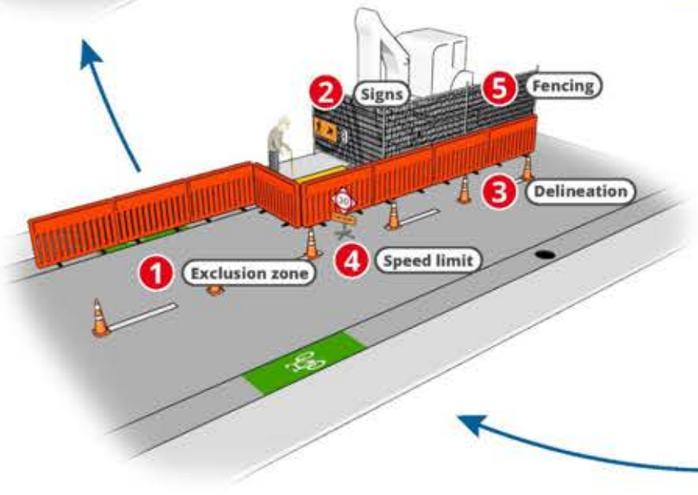


STEP 5

APPLY CONTROL MEASURES

- Controls are all the things we use to reduce risk.
- First see if there are any risks you can completely remove – if you remove the hazard (source of harm), or exposure to it – you can eliminate the risk. Do that first as many ways as you can.
- If you cant, then you can minimise it by controlling exposure (engineer or isolate the risk) like using fencing, or using non-slip surfaces, or using a exclusion zone.
- You have to use the best possible control you can – so be sure to select the best option, and only use a less effective one if the best one is not ***[1] reasonably practicable .***
- You'll have a bunch of controls you've chosen (the list of options is very long!) so take time to make sure you've chosen the best option – AND – make sure they all work together too (for example make sure your fencing allows for how you're managing site access to happen safely).
- Put all these controls into your plan. Your risk solution is now taking shape.

[2] For more information on what 'reasonably practicable' means, refer to that section.



STEP 6

CHECK WHAT NEW RISKS YOU'VE GOT

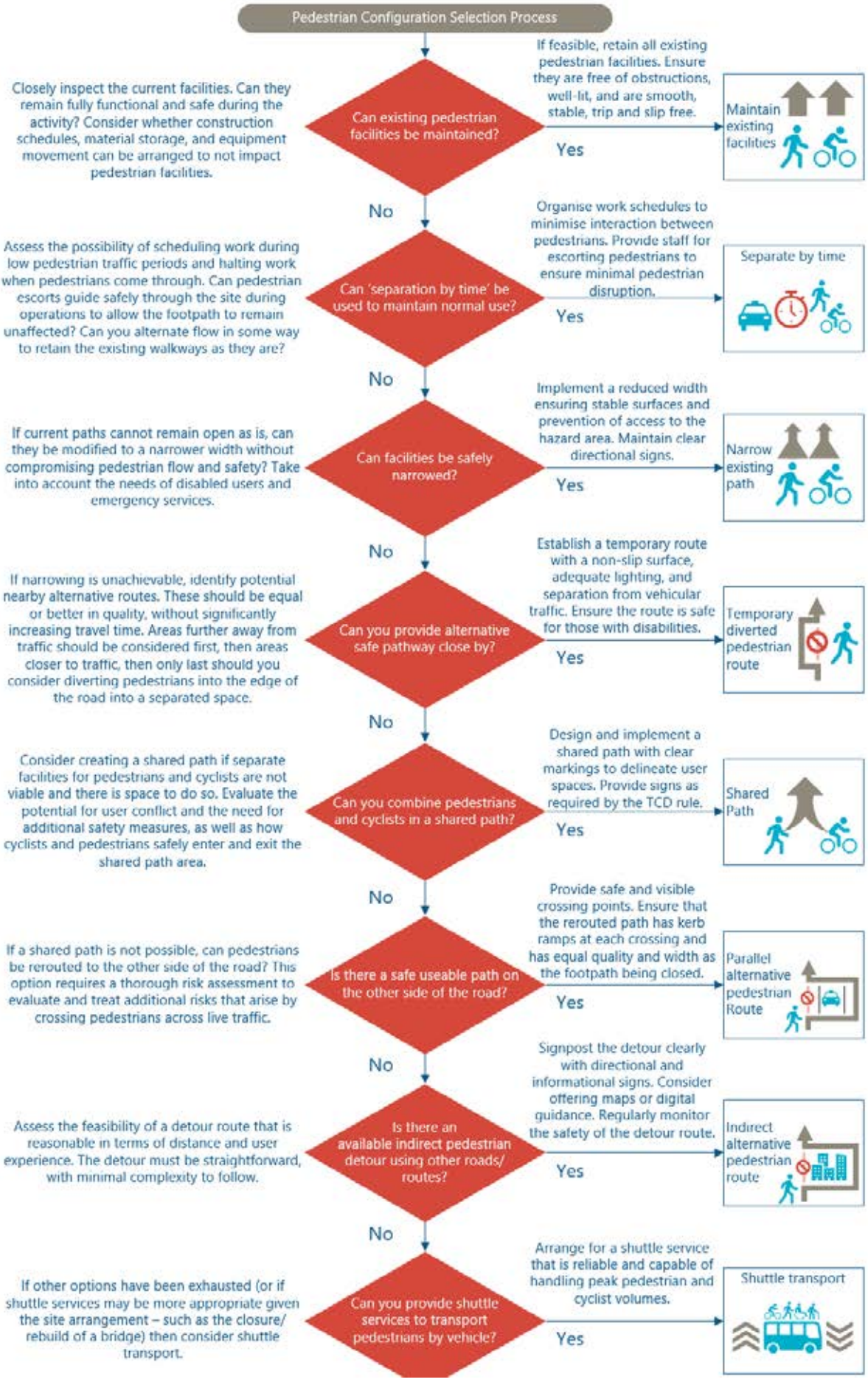
- In a lot of cases – using controls introduces new risks – like putting a fence down means you have an obstacles that people can hit, or they might trip over the feet of the fence.
- Go back to steps 2 and 3 of this process and add these new risks in.
- Go through the process again until you've found the best combination of controls that has the lowest total risk.
- That means, select controls that reduce the risks onsite, and don't have any controls that either have no purpose, or increase risk more than what you had to start with.
- Repeat this process (steps 2, 3, 4, 5, 6) over and over until you've got the best solution you can.

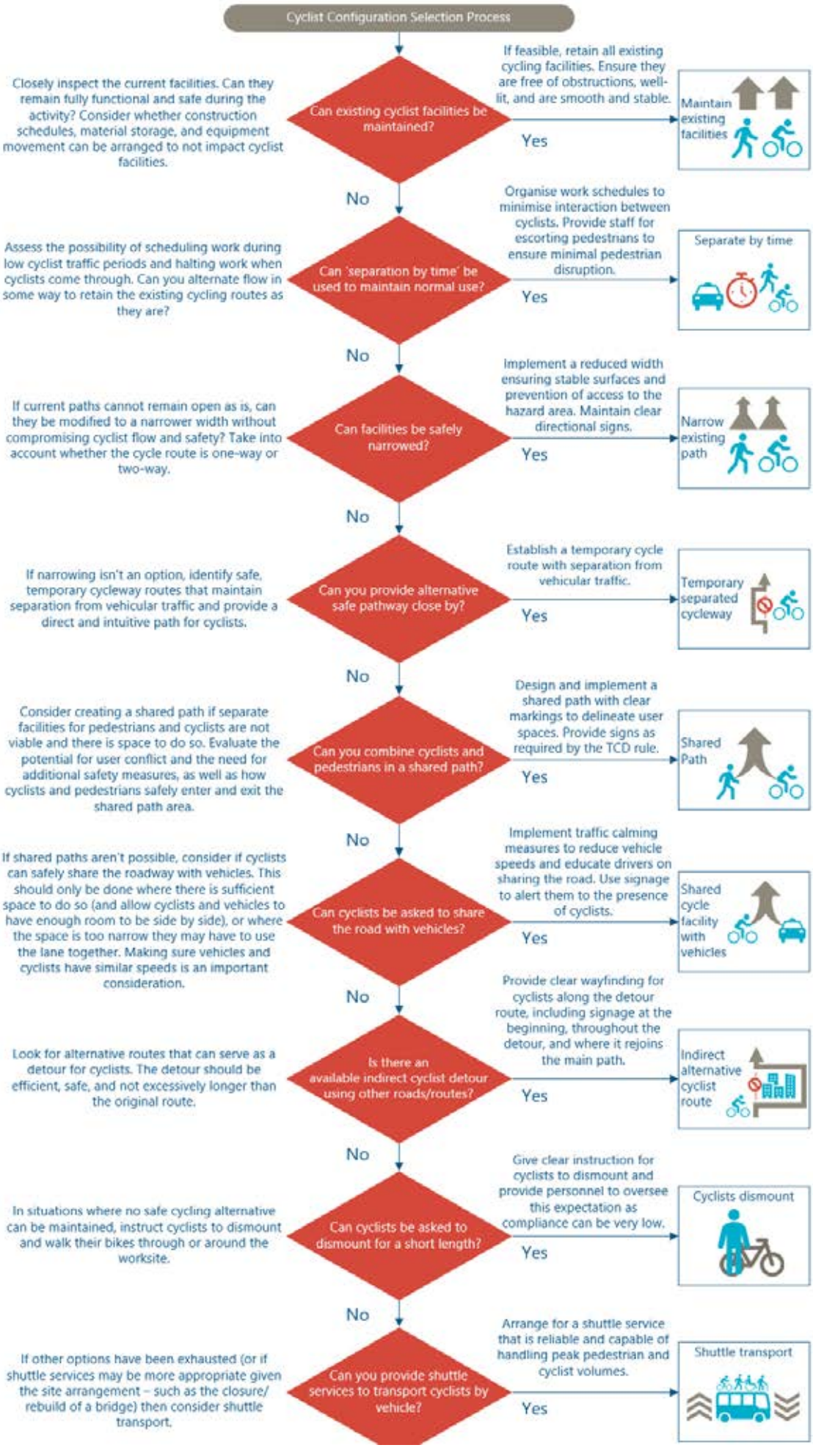
Keep working till youve got the least possible risk you can.

KEEP FOLLOWING THIS CIRCLE OF STEPS UNTIL YOU'VE FOUND THE BEST POSSIBLE COMBINATION OF CONTROLS TO MANAGE RISKS TO THE LOWEST POSSIBLE LEVEL YOU CAN.

ACROSS ALL STEPS – MAKE SURE YOU INCLUDE AS MANY PEOPLE AS YOU CAN THAT CAN HELP YOU DO A GOOD JOB. THE BEST TTM SOLUTIONS COME WHEN ALL THE PEOPLE THAT HAVE A PART TO PLAY ARE INVOLVED ALONG THE WAY.

Appendix E: VRU TTM Configuration selection tools



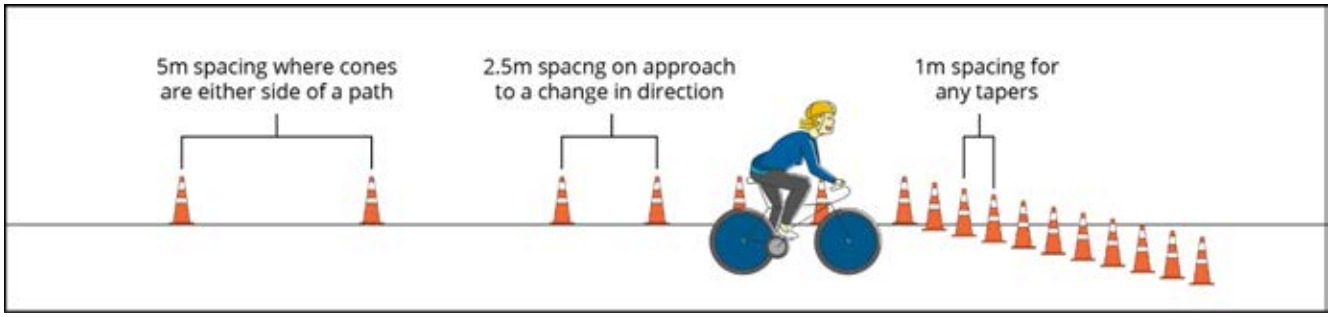

Cyclist Configuration Selection Process
Closely inspect the current facilities. Can they remain fully functional and safe during the activity? Consider whether construction schedules, material storage, and equipment movement can be arranged to not impact cyclist facilities.
Can existing cyclist facilities be maintained?
If feasible, retain all existing cycling facilities. Ensure they are free of obstructions, well-lit, and are smooth and stable.
Yes
Maintain existing facilities
No
Assess the possibility of scheduling work during low cyclist traffic periods and halting work when cyclists come through. Can you alternate flow in some way to retain the existing cycling routes as they are?
Can 'separation by time' be used to maintain normal use?
Organise work schedules to minimise interaction between cyclists. Provide staff for escorting pedestrians to ensure minimal pedestrian disruption.
Yes
Separate by time
No
If current paths cannot remain open as is, can they be modified to a narrower width without compromising cyclist flow and safety? Take into account whether the cycle route is one-way or two-way.
Can facilities be safely narrowed?
Implement a reduced width ensuring stable surfaces and prevention of access to the hazard area. Maintain clear directional signs.
Yes
Narrow existing path
No
If narrowing isn't an option, identify safe, temporary cycleway routes that maintain separation from vehicular traffic and provide a direct and intuitive path for cyclists.
Can you provide alternative safe pathway close by?
Establish a temporary cycle route with separation from vehicular traffic.
Yes
Temporary separated cycleway
No
Consider creating a shared path if separate facilities for pedestrians and cyclists are not viable and there is space to do so. Evaluate the potential for user conflict and the need for additional safety measures, as well as how cyclists and pedestrians safely enter and exit the shared path area.
Can you combine cyclists and pedestrians in a shared path?
Design and implement a shared path with clear markings to delineate user spaces. Provide signs as required by the TCD rule.
Yes
Shared Path
No
If shared paths aren't possible, consider if cyclists can safely share the roadway with vehicles. This should only be done where there is sufficient space to do so (and allow cyclists and vehicles to have enough room to be side by side), or where the space is too narrow they may have to use the lane together. Making sure vehicles and cyclists have similar speeds is an important consideration.
Can cyclists be asked to share the road with vehicles?
Implement traffic calming measures to reduce vehicle speeds and educate drivers on sharing the road. Use signage to alert them to the presence of cyclists.
Yes
Shared cycle facility with vehicles
No
Look for alternative routes that can serve as a detour for cyclists. The detour should be efficient, safe, and not excessively longer than the original route.
Is there an available indirect cyclist detour using other roads/routes?
Provide clear wayfinding for cyclists along the detour route, including signage at the beginning, throughout the detour, and where it rejoins the main path.
Yes
Indirect alternative cyclist route
No
In situations where no safe cycling alternative can be maintained, instruct cyclists to dismount and walk their bikes through or around the worksite.
Can cyclists be asked to dismount for a short length?
Give clear instruction for cyclists to dismount and provide personnel to oversee this expectation as compliance can be very low.
Yes
Cyclists dismount
No
If other options have been exhausted (or if shuttle services may be more appropriate given the site arrangement – such as the closure/ rebuild of a bridge) then consider shuttle transport.
Can you provide shuttle services to transport cyclists by vehicle?
Arrange for a shuttle service that is reliable and capable of handling peak pedestrian and cyclist volumes.
Yes
Shuttle transport

Appendix F: VRU Facilities: Distances, Dimensions and Geometric Guidance

The following dimensional, distance and geometric guidance is provided in alphabetical order:

Cone Spacing

Cone spacing can be used as an effective way to shape movement from vulnerable road users, especially cyclists.

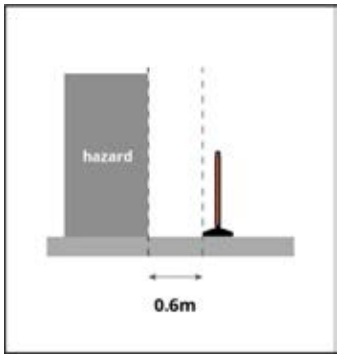


Cones spaced beside the path of travel (but not preventing access to any hazards) can be spaced at 5m centres. When approaching changes in alignment, 2.5 spacing can be used (this also helps slow cyclists down). For all tapers for cyclists, 1m spacing should be used.

Exclusion Zones

When cyclists or pedestrians are placed close to a hazard – utilise an exclusion zone (0.6m) to give room for error[11].

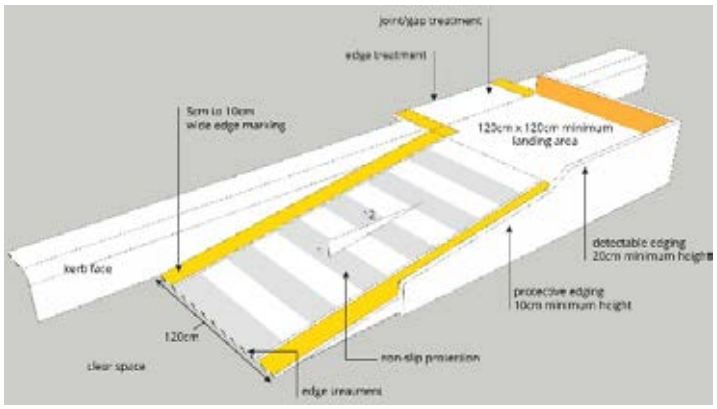
Fencing should not be placed directly next to a hazard, as if struck, fencing will deflect.

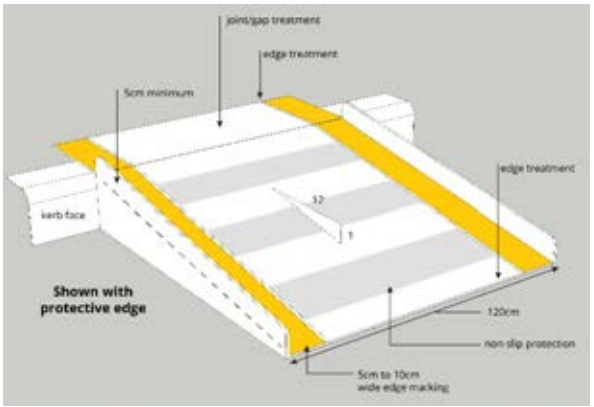


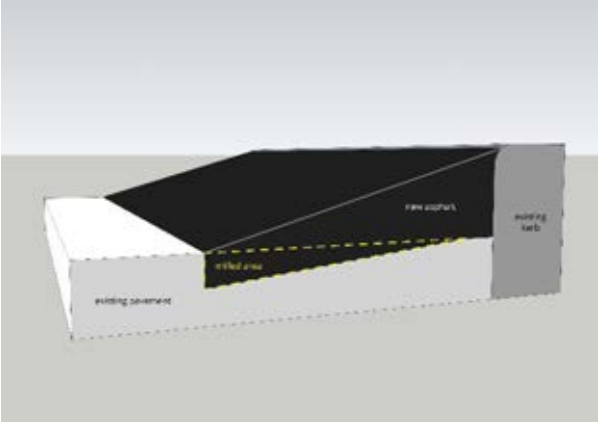
Kerb Ramps

When using kerb ramps – ensure they are wide enough and not too steep to cause challenges for people with mobility issues or those in wheelchairs.

Ramps should have a grade of 1:12. A grade of 1:8 could be used where it is monitored and has very non-slip surfacing[41].

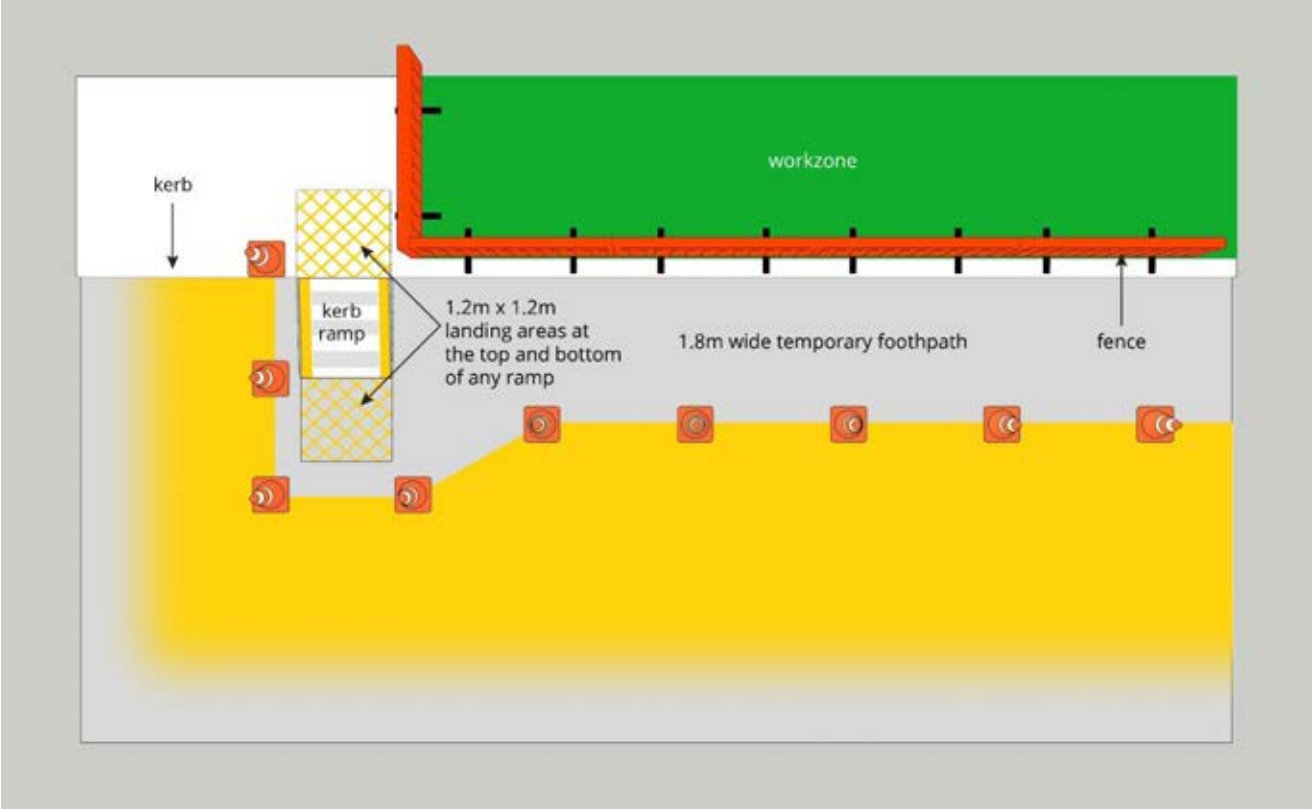






Where an asphalt ramp is used, this should be keyed to avoid edge degradation over time[81].

Regardless of the materials used, all kerb ramps should be no less than 1.2m wide[41].



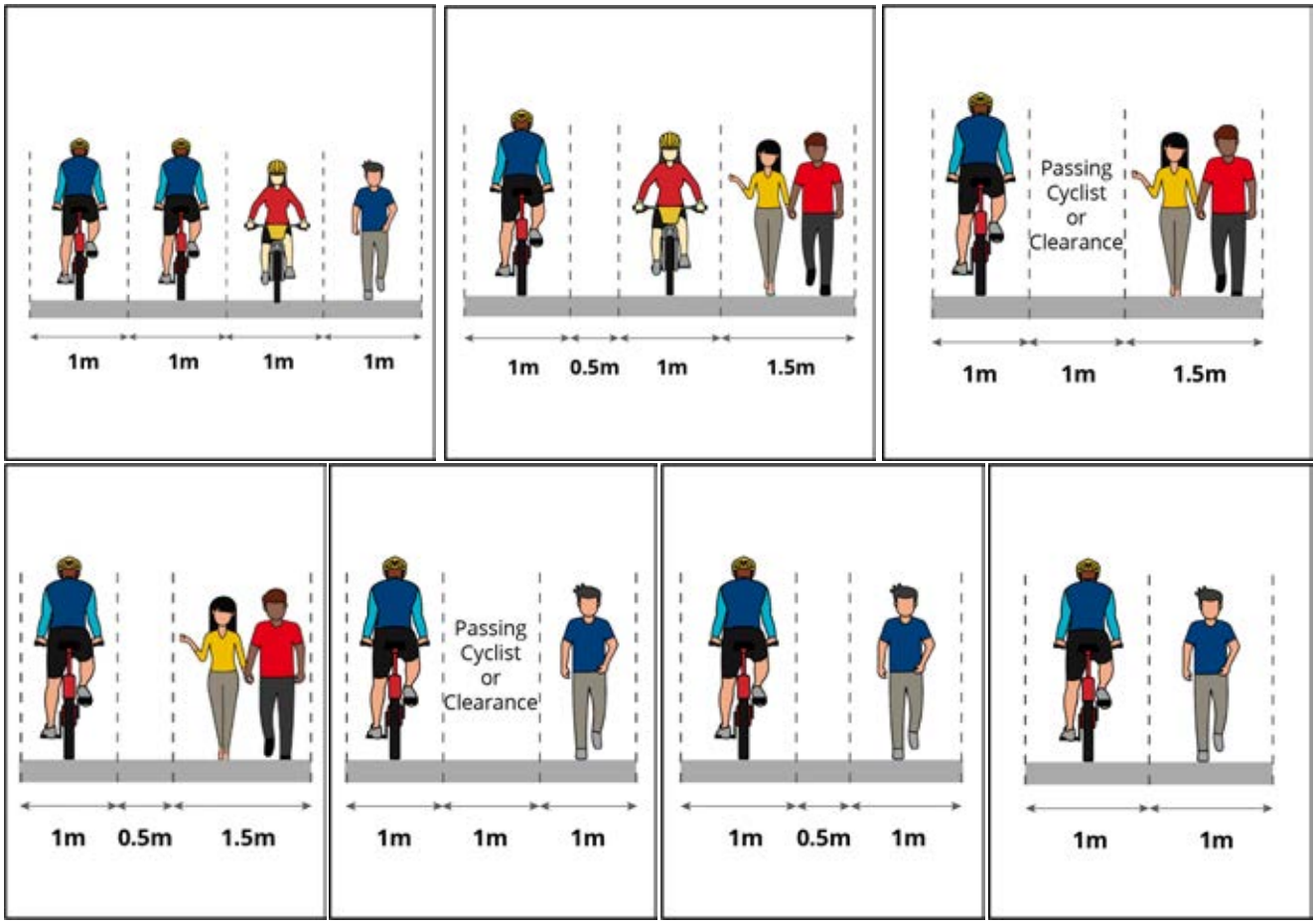
Where kerb ramps are adjacent to narrow spaces – a turning/landing area at the top and bottom of the ramp area is required to allow safe maneuvering by those in wheelchairs or on mobility scooters. **The area at each end of the ramp should be 1200mm x 1200mm.**

Shared Path

When providing a shared path in a TTM environment, maintain the permanent facility dimensions.

If that is not possible, utilise the below dimensional guidance[4].

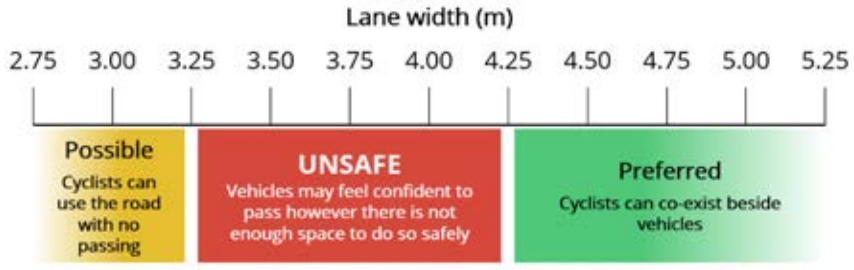
To choose an appropriate width for your TMP, evaluate the volume and type off traffic using the shared path currently and its existing width, and select an appropriate width from the provided options above.



Shared Traffic Lane

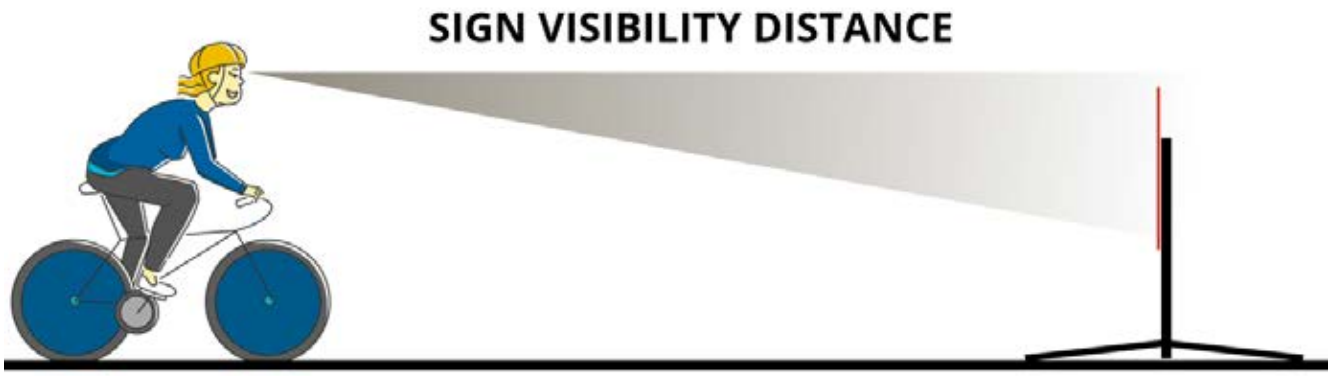
When traffic and cyclists are asked to share the road, sufficient lane width is required to ensure this can happen safely (where they travel side by side).

If the available lane width is **below 4.25m**, cyclists are not advised to travel side by side with vehicles. In this case, the lane width should be reduced further (using side friction) to have cyclists and vehicles use the lane together (not side by side)[63].



Sign Visibility Distance – For Cyclists

The distance that signs should be visible for approaching cyclists should be based on their approach speed.



This distance would primarily apply to cyclists as generally the fastest moving road users relevant to this practice note.

Operating Speed	30	40	50	60	70
Sign Visibility Distance	**20m**	**25m**	**32m**	**50m**	**60m**

Stopping Sight Distance (SSD) – for Vulnerable Road Users

All road users need a certain amount of clear visibility of their route to ensure safe decision-making – particularly as they approach intersections or blind spots.

Users of the footpath travel at different speeds, and depending on the different users present in the environment, the distances below can be used as guidance to ensure that sufficient clear visibility is available ahead for these users at all times.

A pedestrian requires at least 2m of clear forward visibility at all times. This would be particularly relevant in covered walkways or sharp turns adjacent to fencing.

Taper for Cyclists

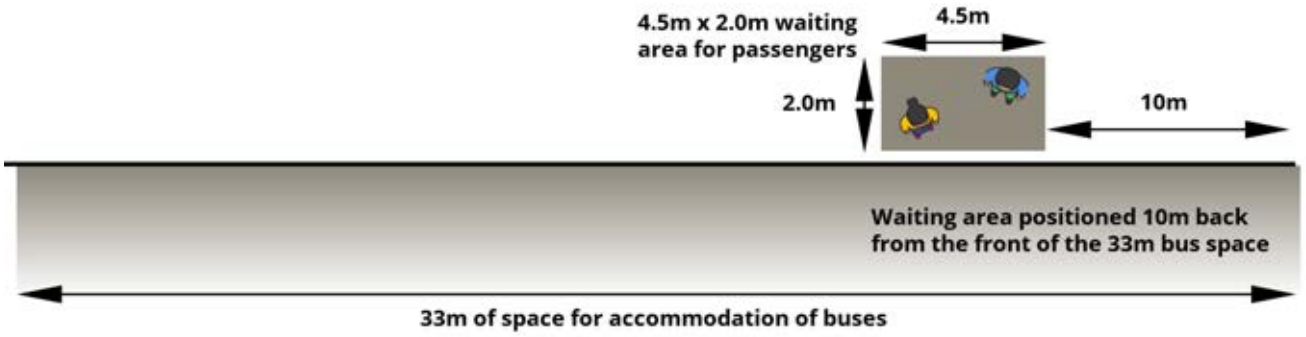
At times, cyclists need to be shifted from their path. Like vehicles, they need space to do so – therefore, tapers are also necessary for cyclists.

The length of a cyclist's taper depends on how far they are being shifted laterally. The taper rate for cyclists should not be steeper than 1:6. When merging with vehicles, the rate should be 1:8.

Temporary Bus Stop Dimensions

When relocated temporarily, bus stops still need enough space for passengers to wait safely and not get in the way of other footpath users.

The following dimensions should be used when arranging a temporary bus stop location[69].



Bus drivers and passengers need appropriate signs to inform them of the relocation[75].

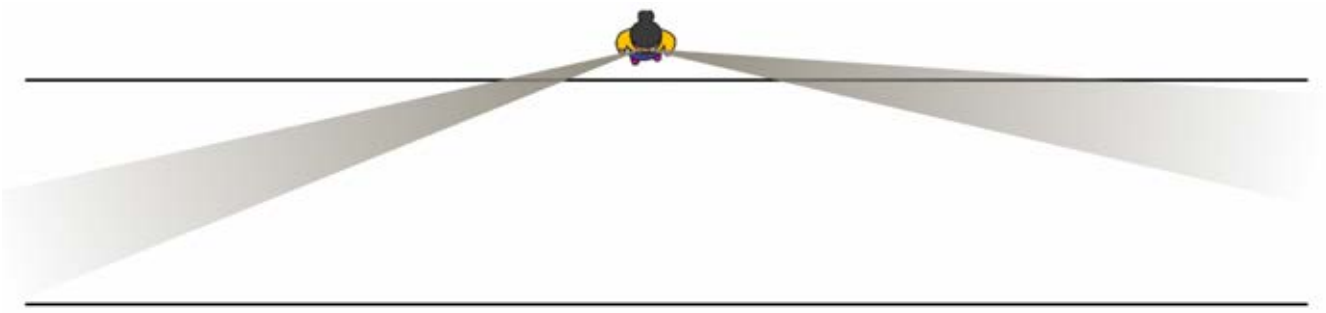
Further extensive guidance regarding temporary bus stop relocations in TTM environments has been published by Waka Kotahi.

Temporary Crossings

Temporary crossings might be implemented where transferring pedestrians across the road is necessary.

Temporary crossings must cater to all users, including those with mobility aids. A crossing width of 1.8 metres allows for unobstructed passage for pedestrians and those in wheelchairs.

A critical consideration of temporary crossings is visibility. Stopping sight distance ensures clear approach visibility (and the ability to stop) for approaching vehicles. The required SSD values (in all approach directions) are provided below.



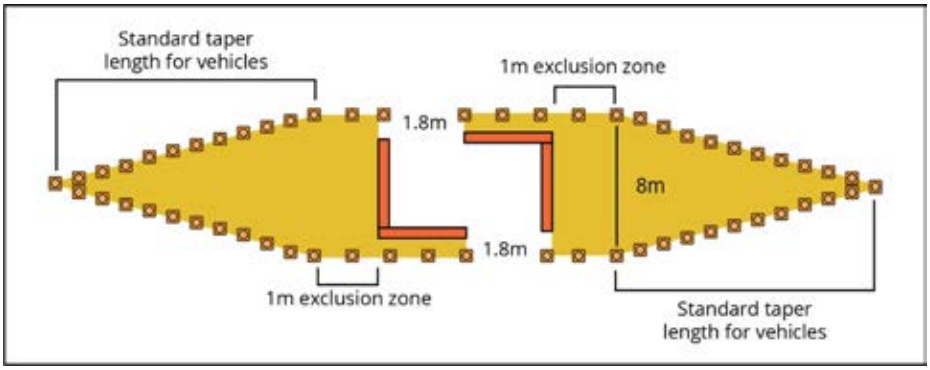
Operating Speed[6]	30	40	50	60	70	80	90	100	110
Stopping Sight Distance (SSD)	**40m**	**55m**	**75m**	**95m**	**115m**	**140m**	**165m**	**195m**	**240m**

These values are based on wet roads and a reaction time of 2.5 seconds[8].

The maximum length for a crossing without a refuge should be 10 metres. If a crossing spans wider than this, a pedestrian refuge is preferred to provide a safe waiting space for crossing the remaining distance.

Temporary Pedestrian Refuge

Utilising temporary crossings on wide (>10m) roads is not advised. Other temporary pedestrian solutions should be explored first.



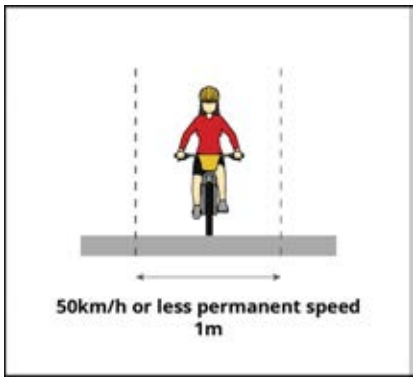
If a crossing over a wider road is necessary (other safer options have been explored and deemed not reasonably practicable), then a pedestrian refuge is advised to allow pedestrians to do the crossing in two stages. The following detail provides a dimensional arrangement for a pedestrian refuge in these instances.

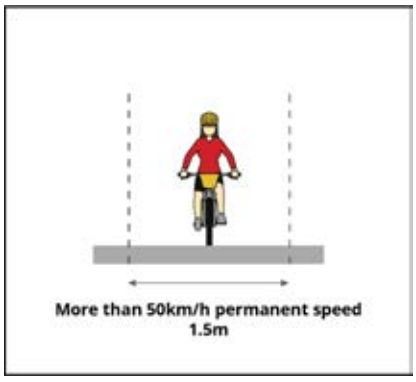
[6] Where possible, attempts should be made to reduce operating speeds to no more than 70km/h near active modes

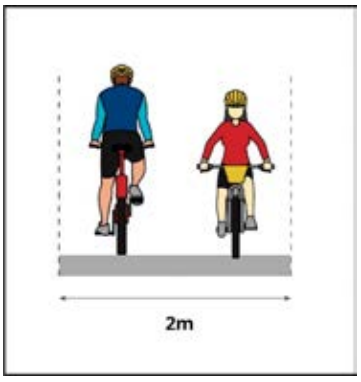
Temporary Cycleways

When providing a temporary cycleway in a TTM environment, maintain the permanent facility dimensions.

If that is not possible, utilise the below dimensional guidance.







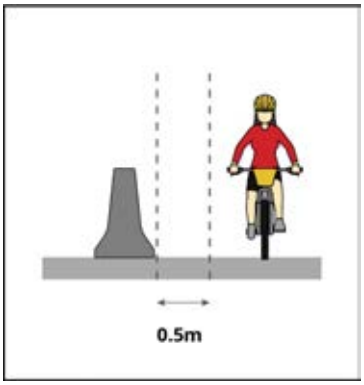
A temporary cycleway in a 50km/h (or less) permanent speed area should be 1m. This increases to 1.5m over 50km/h and 2m when it is a two-way cyclway[73].

To choose an appropriate width for your TMP, evaluate the current arrangement of cyclists, the road's permanent speed, and their existing width, and select an appropriate configuration from the options above.

Lateral Clearance

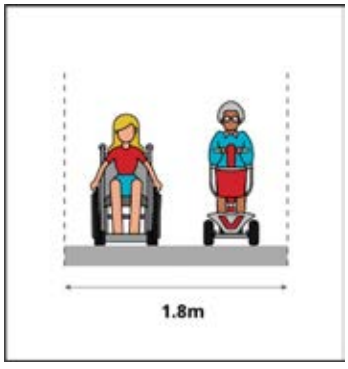
Of important consideration for cyclists is their clearance from obstacles or barriers close to the edge of their travelled path.

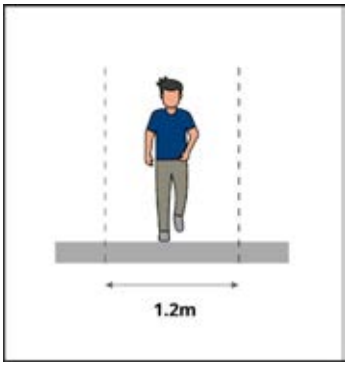
0.5m offset should be provided beside cyclist paths so they can fully use their space[11].



Temporary Footpaths

When providing a temporary footpath in a TTM environment, maintain the permanent facility dimensions. If that is not possible, utilise the below dimensional guidance.





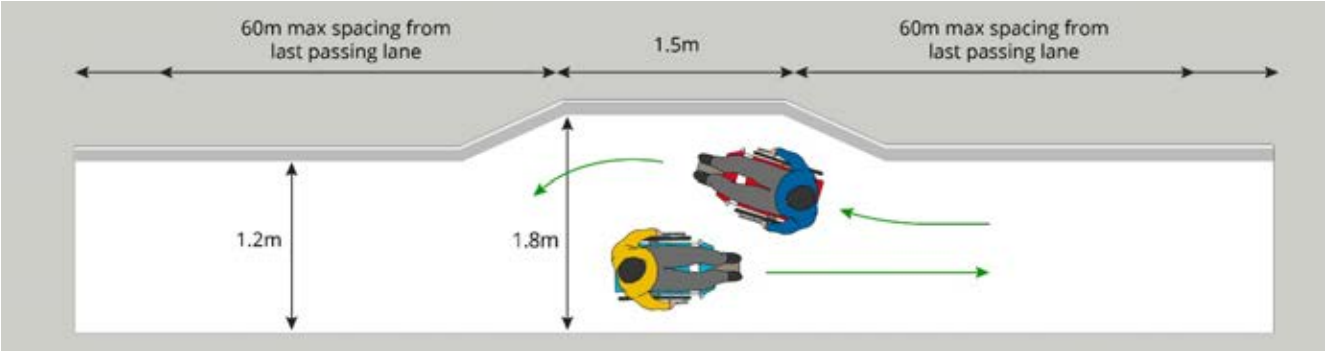
The preferred width is **1.8m for all temporary pedestrian facilities.**

In some cases, this may not be possible, and this **can be reduced to 1.2m** but should only be done for the shortest length possible.

If the length of the reduced-width footpath is greater than 60m – then passing bays should be incorporated.

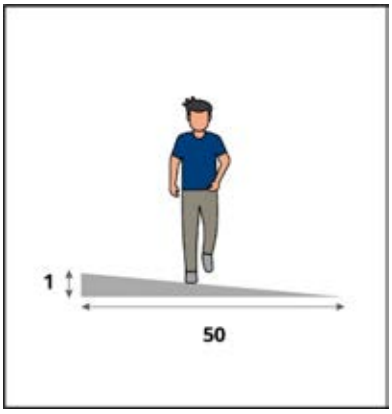
Passing Bays

Passing bays are incorporated when a longer than 60m stretch of footpath of less than 1.8m is used.



The passing bay should be no less than 1.5m long and widen to 1.8m to allow two wheelchairs or mobility scooters to pass safely. They should be spaced no further than every 60m.

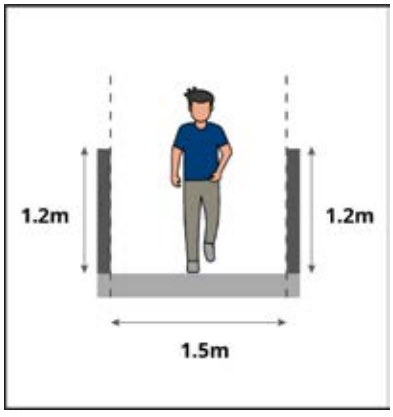
Footpath Gradient



The gradient (lateral crossfall) of the temporary footpath should be adequate to ensure water runoff but not so steep as to cause difficulty for pedestrians, particularly those with mobility impairments.

The lateral gradient of the temporary footpath should be no steeper than 1:50 (2.00%)[57].

Temporary Walkway Bridges



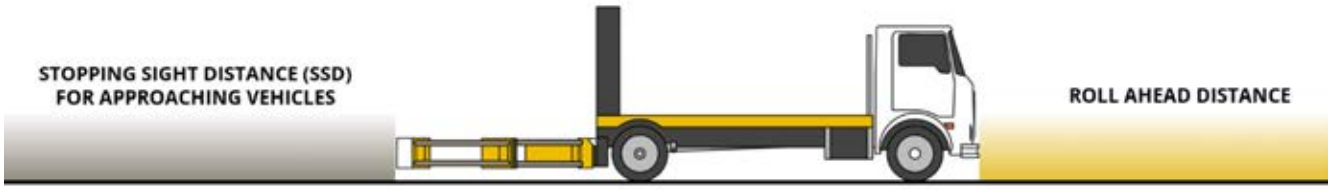
Temporary walkway bridges are sometimes used across hazards to allow continued footpath access.

Temporary walkway bridges should be **no less than 1.5m wide[46]**; however, they may need to be wider depending on the volume of expected use.

Handrails are required on both sides across temporary walkway bridges **to a height of 1.2m[46].**

Vehicle fitted with a Truck Mounted Attenuator

When using a vehicle fitted with a truck-mounted attenuator as a control measure, two important distances are required to be accounted for: stopping sight distance (behind the vehicle) and roll-ahead distance (in front of the vehicle).



Stopping Sight Distance (SSD)

This relates to approaching vehicles – ensuring they have enough room to see, react, and stop without hitting the TMA.

Operating Speed[7]	30	40	50	60	70	80	90	100	110
Stopping Sight Distance (SSD)	**40m**	**55m**	**75m**	**95m**	**115m**	**140m**	**165m**	**195m**	**240m**

These values are based on wet roads and a reaction time of 2.5 seconds[8].

Roll ahead distance

This relates to how far the vehicle may shunt forward when struck from behind. If the vehicle is used as a protective device, this roll-ahead distance becomes an exclusion zone (if something is placed in this roll-ahead zone, then the vehicle is not serving its purpose of protection).

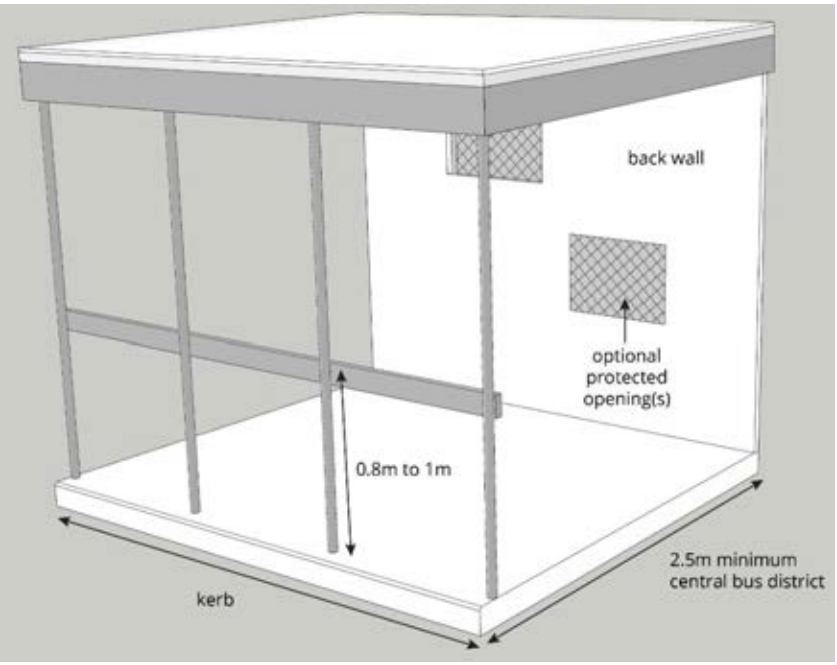
The roll-ahead distance is affected by the size of the vehicle and the size and speed of the vehicle that might strike it.

Operating Speed of impacting vehicle	30	40	50	60	70	80	90	100	110
Roll Ahead Distance (SSD)	**3m**	**5m**	**8m**	**12m**	**16m**	**21m**	**27m**	**33m**	**40m**

These values are based on vehicle weights of 4500kg (GVM) (both the truck being hit and the vehicle striking the truck) and the parking brake being on[65]. The weights of these vehicles heavily influence these distances. The original calculation should be referred to if using vehicle weights different from the above.

[7] Where possible, attempts should be made to reduce operating speeds to no more than 70km/h near active modes

Walkway Covering



Covered walkways are common where there are risks of falling objects, and the walkway remains open.

For city centres, provide a **minimum clear width of 2.5m** for covered walkways to allow for busy foot traffic. In other areas, a width of 1.8 metres is sufficient.

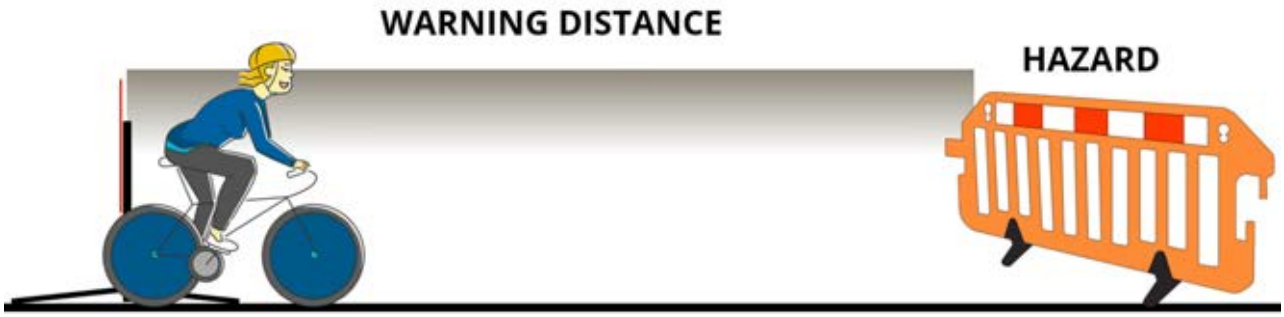
Ensure covered walkways have a **minimum height clearance of 2.5 metres**. This prevents obstructions for taller individuals and allows clearance for any temporary signs or lights.

If the walkway covering is open on one side, install handrails for safety. These should stand between **0.85m and 1.0m from the walkway surface** to accommodate various users.

Fit all covered walkways with **adequate lighting** to ensure visibility at all times. This is crucial for safety day and night, especially in construction areas.

Warning Distance – For Cyclists

Due to the speed at which cyclists travel, a suitable distance is needed from when they are warned of a hazard to when they happen upon it.



The following distances should be used between warning signs and hazards for cyclists.

Operating Speed	30	40	50	60	70
Warning Distance	**15m**	**20m**	**25m**	**30m**	**35m**

For simplicity, the distances are rounded to be half the operating speed in each case.

Appendix G: TTM Design peer/risk review tool

This tool provides a structured approach for conducting a risk review on a traffic management plan – specifically around the needs of vulnerable road users.

This risk review is focused on **finding opportunities to manage risk better** – not as a tool to determine if something is 'safe enough'. This tool should be used to enhance TMPs by **identifying opportunities to improve their safety.**

This tool encourages **'staged reviews'** within the traffic management planning process. Progressively identify and resolve potential issues by evaluating risks at 50%, 85%, and 100% design completion milestones.

1	**Step 1:Establish the stage of the TMP design to define the review's purpose** 50% review purpose: Focus on integrating traffic management with the overall construction methodology, ensuring no opportunities to eliminate risks have been missed. Verify that the emerging TTM configuration is the highest in the preferred list possible. 85% review purpose: Confirm that comprehensive risk assessment and mitigation strategies are documented. Review the proposed traffic management controls to ensure they do not inadvertently introduce new risks elsewhere. 100% review purpose: Evaluate the complete risk landscape to validate that the chosen controls in the TMP are indeed the best available options in strict adherence to the hierarchy of controls. Ensure any new risks introduced by controls have been effectively managed.
2	**Step 2: Understand the context of the Traffic Management Plan** Objective: Get all the details about the traffic management plan and why certain safety measures were chosen. Action: Take note of things like how busy the roads are, any previous accidents, how many cars and people are around, and where bikes and walkers go. Make sure you know why each safety step was picked and how they all work together. This ensures you know the ins and outs of the traffic situation to help evaluate the plan later.
3	**Step 3: Evaluate the TTM Configuration against the preferred list in this guidance** Objective: Evaluate whether the chosen methodology for vulnerable road users aligns with the order of preferences. Action: Review the TTM plan to confirm that the configuration follows the sequence of preferred configurations (i.e. keeping existing facilities first, followed by separation by time, etc.) Begin by defining the proposed method(s), then assess whether the chosen configurations are the best available given the conditions. Output of this step: Identify opportunities to use a more preferred configuration to manage the safety of VRUs.

4	**Step 4: Visualising Conflict Points on the Traffic Management Plan** **Objective:** Identify and mark potential conflict points for VRUs on the TMP. **Action:** Review the TMP layout and physically mark with red X's all possible conflict areas where VRUs might encounter hazards such as moving vehicles, construction activity, obstacles, driveways, plant, materials, or any other hazard. Be comprehensive. **Output of this step:** An annotated copy of the TMP with clearly marked conflict points. This visual tool will highlight areas requiring safety measures and will be instrumental in checking strategies that are used to mitigate identified risks.
5	**Step 5: Clarify Existing Control Measures for VRU Safety** **Objective:** Document and assess existing control measures aimed at mitigating VRU conflicts. **Action:** Work through one-by-one all current controls on the TMP designed to prevent the marked conflicts. Interrogate each control measure's function and how it operates to safeguard VRUs. **Output of this step:** A detailed evaluation of the utilised control measures forming a comprehensive picture of the TMP's safety mechanisms for VRUs.
6	**Step 6: Assess Control Measures Against the Hierarchy of Controls** **Objective:** Do current control measures represent the best possible option under the hierarchy of controls. **Action:** Critically review the utilised control measures against the hierarchy prescribed in legislation to determine if some more effective options or combinations have not been considered. **Output of this step:** A catalogue of areas where control measures can be improved or optimised, with suggestions for enhancements to use controls that are at a higher level in the hierarchy.
7	**Step 7: Investigate Potential Control Measure Failures** **Objective:** Anticipate how and why existing control measures might fail to prevent conflicts. **Action:** For each control measure, identify potential failure points and scenarios where they may not effectively prevent conflicts. **Output of this step:** A risk analysis highlighting weak spots in the current control strategies and recommendations for additional safeguards or redundancy measures.
8	**Step 8: Assess Risks Under Varying Conditions** **Objective:** Analyse how variable conditions could amplify risks to VRUs. **Action:** Simulate scenarios where changes in weather, light, traffic volumes, VRU volumes, events, or site conditions could affect the effectiveness of control measures (or create new risks). Evaluate the resilience of the TMP under these varying conditions. **Output of this step:** An assessment that outlines the TMP's vulnerabilities to changes in conditions and provides a basis for dynamic risk management.
9	**Step 9: Compile Review Findings and Recommendations** **Objective:** Summarise the opportunities for improvement identified throughout the review process. **Action:** Document all findings from the review stages, highlighting where TTM methods can be elevated in the preference list, where controls can be selected from higher up the hierarchy, how potential failures can be more explicitly prevented, and how variability in risk factors can be better accommodated. **Output of this step:** A review report, or annotated TMP, providing actionable recommendations for elevating the TMP's approach to managing VRU risks.

Appendix H: A Pedestrian on-site risk tool for TTM field staff

If your site is safe for those with disabilities, it is safe for everybody

An **elderly** person in a **wheelchair** who is **visually impaired** is approaching your site (this is one example of a possible user. Try other people, too)

Your Name:	**Site ID / TMP ID:**
Date:	**Site Location:**

*Go through the site **yourself**, and use every **pedestrian route** possible. Answer these questions:*

Is it safe?	Is it obvious?	Is it smooth and stable?
Are there places this person would **come close to moving plant, machinery, or traffic?**	If you were in a wheelchair and could not see well, would you know where to go in the current setup?	Are the **surfaces smooth** and **free** of **potholes, gravel**, or **soft ground** that could make it unsafe for wheelchairs?
If yes, could they get **harmed in those places?** **How would it happen** if they did?	Can a wheelchair user easily **move** through the site **without** making **complex** or **unsafe decisions**? If you were them, where would you ***choose*** **to go?**	Are there **trip hazards (any edge thicker than a pencil width)** from equipment, hoses, pipes, signs, or pavement level differences (permanent or temporary) that could be dangerous?
Are there **objects close to their path** that they could hit or be struck by?	Are the signs easy to see and understand? Are there other things in place to help people follow the signs?	Are there **edges or drops** that a wheelchair could easily get caught on or fall off and get hurt?

*Based on your site review - on a **scale of 1 – 10** – how **safe** will this site be for this person?*

1 2 3 4 5 6 7 8 9 10

Most unsafe site ever — Safest site ever

Now, give at least 3 things you can do to improve your chosen number. **What would make it a 10?**	
1.	**Completed:**
2.	**Completed:**
3.	**Completed:**

Appendix I: A Cyclist on-site risk tool for TTM field staff

If your site is safe for those with disabilities, it is safe for everybody

A **child** on a **bicycle** who has **headphones on** is approaching your site.

Your Name:	Site ID / TMP ID:
Date:	Site Location:

*Go through the site **yourself** and use every **route users could use on wheels (cyclists, electric scooters, etc.)**. Answer these questions:*

Is it safe?	Is it obvious?	Is it smooth and stable?
Are there places this person would **come close to moving plant, machinery, or traffic?**	If you were a child cycling, would the current setup indicate where you should go?	Are the **surfaces smooth** and **free** of **potholes, gravel**, or **soft ground** that could make it unsafe for a child on a bicycle?
If yes, could they get **harmed in those places?** **How would it happen** if they did?	Can a child on a bicycle easily **move** through the site **without** making **complex** or **unsafe decisions**? If you were them, where would you ***choose*** **to go?**	Are there **trip hazards (any edge thicker than a pencil width)** from equipment, hoses, pipes, signs, or pavement level differences (permanent or temporary) that could be dangerous?
Are there **objects close to their path** that they could hit or be struck by?	Are the signs easy to see and understand? Are there other things in place to help people follow the signs?	Are there any **narrow passages** or **bottlenecks** that could make it difficult for cyclists to maintain stability?

*Based on your site review - on a **scale of 1 – 10** – how **safe** will this site be for this person?*

1 2 3 4 5 6 7 8 9 10

Most unsafe site ever — Safest site ever

Now, give at least 3 things you can do to improve your chosen number. **What would make it a 10?**	
1.	**Completed:**
2.	**Completed:**
3.	**Completed:**

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