Chapter 3: *Transportation*

3.1. Introduction

3.1.1. Scope

This Chapter sets out the requirements for the design and construction of roads and infrastructure (including accessways) associated with land development, subdivision and road improvements/upgrades within the District.

The requirements shall apply to all such infrastructure whether to be vested in WDC or retained in private ownership and whether initiated and undertaken by a Developer or by WDC.

3.1.2. Objectives

The objectives of the Transport Network are to:

a. Provide and maintain a safe, efficient, accessible and sustainable transport network capable of ensuring the movement of people, vehicles and goods with operating speeds appropriate to the surrounding environment and with minimal effects on the environment and adjoining land uses.

b. Integrate land use and transport planning to ensure that land use activities, development and subdivision enhance and maintain the safety and efficiency of the transport network.

c. Provide suitable and sufficient vehicle crossings, access, parking, loading and manoeuvring areas that contribute to, and do not detract from, the safe and efficient functioning of the transport network.

d. Ensure that transport network infrastructure (including other utility services) is designed and located in a manner which contributes to quality design outcomes.

e. Ensure future growth can be supported by the provision of appropriate transportation infrastructure.

3.1.3. Performance Standards

The Transport Network shall be designed to achieve the following:

a. The construction and maintenance of the network in accordance with the ES including the asset design lives.

b. The design and location of intersections and accessways to ensure that:

   i. Safety is provided.

   ii. Vehicle manoeuvres are accommodated.

   iii. They are sufficiently separated so as not to adversely affect the free flow of traffic.

iv. Intersections operate at Safe System Speeds (see Austroads Safe System Assessment Framework (2016 – AP-R509-16))

c. The design and location of vehicle crossings and associated access to protect amenity and ensure safe and efficient movement to and from sites for vehicles, pedestrians and cyclists by managing:

   i. Separation distances between vehicle crossings.

   ii. Separation distances from intersections.

   iii. Vehicle crossing sight distances.

   iv. The number of vehicle crossings per site.

d. The promotion and facilitation of walkability by requiring unused vehicle crossings to be reinstated to match the existing footpath and kerbing.

e. The promotion of walkability by ensuring the safe and efficient movement to and from sites for pedestrians and cyclists through the design and implementation of road and outdoor lighting to conform to align with National Guidelines for Crime Prevention through Environmental Design in New Zealand principles including:

   i. Maximising movement safety (especially after dark).

   ii. Considering lighting as being integral to the overall design philosophy.

   iii. Eliminating concealment spots or securing them by incorporating visibility aids as necessary.

   iv. Ensuring good visibility, sightlines and casual surveillance are provided.

f. The design and location of parking and loading areas and associated access to ensure safe movement within the site as well as safe ingress and egress of vehicles, pedestrians and cyclists by managing:

   i. Parking and loading space dimensions.

   ii. The location and identification of car parking and loading spaces.

   iii. Manoeuvring space within the site.

   iv. Gradient.

   v. The construction standards of parking areas.

g. The improvement of pedestrian safety and walkability in proximity to commercial areas, schools and other community facilities by enhancing the standard of pedestrian networks.

h. The facilitation of cycle and pedestrian connectivity within new subdivisions and developments, and where appropriate, to existing developments.

i. Incorporate the Safe System Approach (see Austroads Safe System Assessment Framework (2016 – AP-R509-16)) ensuring roadway design encourages appropriate road use behaviour and safe speeds.

3.1.4. Functions and Hierarchy of a Transport Corridor

The Transport Network should be designed to achieve:

a. Shorter travel distances,

b. An increased number of alternative routes for all types of users,

c. Increased opportunity for interaction, and

d. Improved access to public transport, cycling and walking networks, and to destinations such as schools and public amenities.

Transport Corridors serve the following functions:

a. Movement (linking places with transportation infrastructure that provides for a range of transport modes and user groups to move people and goods),

b. Place Context (creating public spaces for people to interact, exercise and enjoy where appropriate), and

c. Utility Corridor (providing corridors that Network Utility Operators and others can utilise to service the area e.g. telecommunications, electricity, three waters and gas networks: street lighting and design elements within the berm including landscaping and street furniture).

The Transport Network hierarchy is defined in the District Plan.

3.1.5. Reference Documents

Details of documents referenced in this Section are as follows:

Note it is the responsibility of the Developer to ensure the most up to date referenced document is sourced.

3.1.5.1 New Zealand Standards

AS 1141.32:2019 - Methods for sampling and testing aggregates, Method 32: Weak particles (including clay lumps, soft and friable particles) in coarse aggregates

AS/NZS 1906.1:2017 - Retroreflective materials and devices for road traffic control purposes - Part 1: Retroreflective Sheeting

AS/NZS 2890.1:2004 - Parking Facilities Part 1: Off-street car parking

AS 2890.2:2018 - Parking facilities, Part 2: Off-street commercial vehicle facilities

AS/NZS 3845.1:2015 - Road Safety Barrier Systems and Devices

NZS 3109:1997 - Concrete Construction

NZS 3116:2002 - Concrete Segmental and Flagstone Paving

NZS 4121:2001 - Design for access and mobility - Buildings and associated facilities

NZS 4402:1986 - Test 2.8.1 - Standard method by wet sieving

NZS 4402:1986 - Test 2.8.2 - Subsidiary method by dry sieving

NZS 4402:1986 – Test 4.1.1 – NZ standard compaction test

NZS 4402:1986 - Test 4.1.3 - NZ vibrating hammer compaction test

NZS 4404:2010 - Land development and subdivision infrastructure

NZS 4407:2015 - Methods of sampling and testing road aggregates

3.1.5.2 Waka Kotahi Standards and Guidelines

Land Transport Rule – Traffic Control Devices 2004

Waka Kotahi - Code of Practice for Temporary Traffic Management

Waka Kotahi – Cycling Network Guidance

Waka Kotahi - Bridge Manual SP/M/022 Third edition, Amendment 3, 2018

Waka Kotahi - Manual of Traffic Signs and Markings (MOTSAM) - Part 1: Traffic Signs, 2010

Waka Kotahi – New Zealand Guide to Pavement Structural Design (2017)

Waka Kotahi - One Network Road Classification (ONRC)

Waka Kotahi – Pedestrian Network Guidance

Waka Kotahi - Pedestrian Planning and Design Guide (2009)

Waka Kotahi – Planning Policy Manual - Accessway Standards and Guidelines Appendix 5B (2007)

Waka Kotahi – Public Transport Design Guidance

Waka Kotahi Research Report 453 Trips & Parking Related to Land Use (November 2011)

Waka Kotahi - Road Safety Audit Procedures for Projects Guideline (2013)

Waka Kotahi – RTS 13 Guidelines for Service Stations (1996)

Waka Kotahi - RTS 14 Guidelines for Facilities for Blind and Vision Impaired Pedestrians (2015)

Waka Kotahi - RTS 18 NZ On Road Tracking Curves for Heavy Vehicles (2007)

Waka Kotahi – Speed Management Guide (2016)

Waka Kotahi – Speed Management Guide - Volume 2: Toolbox – how to implement treatments and activities (2016)

Waka Kotahi - Stormwater Treatment Standard for State Highway Infrastructure (2010)

Waka Kotahi – Technical Advice Note for Tactile Installation TAN #20-20 (2020)

Waka Kotahi – Traffic Control Devices Manual (TCD Manual) (2008)

Waka Kotahi – Traffic Note 37 Revision 2 (2011)

Waka Kotahi - Traffic Note 56 Revision 1 (2011)

3.1.5.3 Waka Kotahi Specifications

Waka Kotahi - B/2 Construction of Unbound Granular Pavement Layers (2005)

Waka Kotahi - B/5 In-situ Stabilisation of Modified Pavement Layers (2008)

Waka Kotahi – F/1 Earthworks Construction (1997)

Waka Kotahi – F/2 Pipe Subsoil Drain Construction (2013)

Waka Kotahi – F/5 Corrugated Plastic Pipe Subsoil Drain Construction (2000)

Waka Kotahi – M/1 Bitumen for Pavements (2020)

Waka Kotahi – M/4 Basecourse Aggregate (2006)

Waka Kotahi – M/6 Sealing Chip (2019)

Waka Kotahi – M/7 Roadmarking Paints (2009)

Waka Kotahi - M/10 Dense Graded Asphalt (2020)

Waka Kotahi – M/13 Adhesion Agents (1989)

Waka Kotahi – M/14 Edge Marker Posts (2011)

Waka Kotahi – M/17 W-section Bridge Guardrail (1989)

Waka Kotahi - M/23 Road Safety Barrier Systems (2009)

Waka Kotahi M/23 Appendix A: Permanent Road Safety Hardware (2021)

Waka Kotahi - P/3 First Coat Sealing (1995)

Waka Kotahi – P/4 Resealing (1995)

Waka Kotahi - P/12 Pavement Marking (2000)

Waka Kotahi - P/43 Specification for Traffic Signals (2020)

Waka Kotahi - T/1 Benkelman Beam Deflection Measurements (1977)

Waka Kotahi - T/10 Skid Resistance Investigation and Treatment Selection (2013)

3.1.5.4 Austroad Guides

Effectiveness and Implementation of Raised Safety Platforms (2020 - AP-R642-20)

Guide to Road Design - Part 3: Geometric Design (2021 - AGRD03-16)

Guide to Road Design - Part 4: Intersections and Crossings - General (2021 - AGRD04-17)

Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections (2021 - AGRD04A-17)

Guide to Road Design - Part 4B: Roundabouts (2021 - AGRD04B-15)

Guide to Road Design - Part 4C: Interchanges (2015 - AGRD04C-15)

Guide to Road Design - Part 6A: Paths for Walking and Cycling (2021 - AGRD06A-17)

Guide to Pavement Technology - Part 2: Pavement Structural Design (2019 - AGTP02-17)

Guide to Pavement Technology – Part 5: Pavement Evaluation and Treatment Design (2019 -AGPT05-19)

Guide to Pavement Technology - Part 6: Unsealed Pavements (2009 – AGPT06-09)

Guide to Traffic Management - Part 8: Local Street Management (2020 - AGTM08-20)

Guide to Traffic Management - Part 10: Transport Control – Types of Devices (2020 - AGTM10-20)

Safe System Assessment Framework (2016 – AP-R509-16)

3.1.5.5 Other Documents

Auckland Council GD01 – Stormwater Management Devices in the Auckland Region (2017)

Building Act 2004

ENZ Producer Statement – PS1 Design

ENZ Producer Statement – PS4 Construction Review

Local Government Acts 2002 and 1974

Ministry for the Environment's National Guidelines for Crime Prevention Through Environmental Design in New Zealand (2005)

Northland Transportation Alliance Design Manual - Street Lighting Version 1 *(To be provided by WDC on request)*

NZ Building Code

NZ Utilities Advisory Group: National Code of Practice for Utility Operators' Access to Transport Corridors - Updated Version 2, July 2019Operative District Plan

Road Safety Audit Standard for the Whangārei District *(To be provided by WDC on request)*

WDC District Plan Maps

WDC Policy #0064 - Road Naming

WDC Policy #0129 - Land Development Stabilisation 2018 and Land Development Stabilisation – Technical Design Requirements 2018

WDC Urban Design Guidelines

Wellington Water – Water Sensitive Design for Stormwater: Treatment Device Guideline, December 2019

Note: These are not exclusive and other standards, guidelines, and design responses may be used where appropriate, provided they meet the performance requirements of this Chapter.

3.2. Design

3.2.1. General

Roads and accessways shall be designed to the requirements and standards set out in Table 3-2 (Urban), Table 3-3 (Rural) and Table 3-4 (Rural). The standards shall apply equally to new works and to upgrading works.

Traffic management/calming facilities may be required in the road design to ensure that the design speed is achieved/controlled.

3.2.2. Engineering Design Approval

3.2.2.1 Competency

All investigations, design, supervision and certification of the works covered by this Chapter shall be carried out by or under the control of a SQEP working within their area of competence.

The SQEP shall certify that the works through all stages until completion are in accordance with the requirements of Section 1.5.1.3 Risk Based Assessment Framework.

3.2.2.2 Design and Access Statements

For all roadways that will vest with WDC, a design and access statement shall be submitted with the application for EDA. For all roads which will be publicly vested, a Road Safety Audit (See Section 3.2.3 Safety Audit) or an approved exemption will be required.

Design shall be accompanied by a PS1 Design signed by a SQEP, which outlines how the applicable design standards have been applied. The PS1 Design shall cover all relevant aspects of Section 3.2 Design and specifically address the following:

a. Road dimensions and layout,

b. Link and place functions,

c. Connectivity and how it will be achieved for all road user types,

d. How safe and appropriate speeds will be achieved and managed through design (in accordance with the Waka Kotahi Speed Management Guide) and the design speed environment,

e. How any 'serious and critical' issues identified in the Road Safety Audit have been addressed,

f. Parking, passing and loading provisions,

g. Criteria used in determining visibility distances and splays,

h. Safety barrier requirements and considerations that have been made for alternative treatments,

i. Impact on existing street features, including but not limited to street furniture, pedestrian refuge facilities, bus stops & shelters, for visual consistency and also potential increase in usage, and

j. Any new parking restrictions that will be required in order for the proposed design to operate safely (e.g. no stopping).

3.2.2.3 Content of Design Submission

All design documentation to be submitted for EDA shall include site investigations, supporting information and calculations sufficient to demonstrate compliance with the design standards. In addition to the general requirements of Section 1.5.3 Engineering Design Approval the information submitted for EDA shall include, but not be limited to:

a. Testing of the pavement subgrade (roads and accessways),

b. Assessment of traffic volumes and vehicle operating speeds,

c. Plan showing the hierarchy of the proposed roading network including adjacent roads taking into account projected growth predictions and predicted AADT's,

d. Pavement design – structural and surfacing,

e. Geometric design,

f. Drainage design,

g. Streetlighting,

h. Road marking and signage,

i. Speed management devices,

j. Utility service locations,

k. Vehicle crossing design,

l. Landscaping,

m. Delineation between public and private assets, and

n. Design and access statements.

In addition, design drawings complying with the requirements of Appendix F Drawing Standards shall be submitted for approval together with specifications as necessary.

Any departures from the ES shall be noted and fully justified. Such assessment shall be carried out by a SQEP who is working within their competencies in accordance with the requirements of Section 1.5.1.3 Risk Based Assessment Framework. The SQEP shall identify the design standards used and certify that the design complies with the referenced standards.

3.2.3. Safety Audit

A Road Safety Audit, or exemption, is required for any improvement or renewal activity that involves vehicular traffic and/or walking and/or cycling as per the Road Safety Audit Standard for the Whangarei District. The audit should generally take place at project milestones including, but not limited to:

- Concept Stage (for large, complex projects) and/or,
- Scheme or preliminary design stage (part or pre-implementation) and/or,
- Detailed design stage (pre-implementation or implementation) and,
- Pre-opening or post-construction stage (implementation or post-implementation).

The auditors shall be independent of the design team and shall use the procedures detailed in Waka Kotahi Road Safety Audit Procedures for Projects – Guidelines.

The objectives of the audit will be to identify potential safety problems for all road users affected by the proposed development, including the needs of pedestrians, cyclists and elderly/disabled users and to ensure that measures to eliminate or reduce the problems are fully considered.

Recommendations from the audit report shall be addressed and incorporated into the design as considered appropriate by the SQEP, safety auditor and WDC prior to final WDC approval.

3.2.4. Design Life

The minimum design life of roading assets shall be:

a. Pavements – 30 years,

b. Surface and ground water drainage systems - 100 years,

c. Stormwater treatment systems within a public road – 100 years and in accordance with Section 4.3.7 Design Life,

d. Bridges, major culverts and earth retaining structures on public roads - 100 years, and

e. Structures (including bridges) on private roads and accessways – in accordance with the Building Act 2004/ NZ Building Code requirements.

3.2.5. Road Classifications and Design Criteria

3.2.5.1 Road Classifications

Roads have been classified in terms of the Waka Kotahi's One Network Road Classification (ONRC). The following table lists the classifications and what broadly defines them. The District Plan Maps identify each roading network classification.

Table 3-1: Road Classifications

Classification	Average Daily Traffic (ADT)		Brief Descriptive
	Urban	Rural	
Access (Low Volume)	<200	<50	Access (Low Volume) are all other roads classed as low volume.
Access	<1,000	<200	Access includes all other roads. Significant numbers of pedestrians and cyclists. Low volume roads within this category will fall into the low volume subset above.
Secondary Collector	>1,000	>200	Roads that provide a secondary distributor/collector function, linking local areas of population and economic sites and may be the only route available to some places within the local area. Significant numbers of pedestrians and cyclists in urban areas.
Primary Collector	>3,000	>1,000	Roads that are locally important that provide a primary distributor/collector function, linking significant local economic areas or areas of population. In urban areas they may have moderate passenger transport movements and numbers of cyclists and pedestrians using the road.
Arterial	>5,000	>3,000	Roads that link regionally significant places, industries, ports or airports and may be the only route available to some places within the region. In urban areas they may have significant passenger transport movements

Classification	Average Daily Traffic (ADT)		Brief Descriptive
	Urban	Rural	
			and numbers of cyclists and pedestrians using the road.
Regional	>15,000	>10,000	Roads that connect regionally significant places, industries, ports or airports. They are also major connectors between regions.
National and National (High Volume)	>25,000 >35,000	>15,000 >20,000	Roads that connect major population centres, major ports or international airports and have high volumes of heavy commercial vehicles or general traffic.

3.2.5.2 Design Criteria

Roads shall be designed in accordance with the general requirements of Table 3-2, Table 3-3, Table 3-4 and the standard drawings. For the purpose of applying the criteria of Table 3-2, Table 3-3, and Table 3-4 the “urban” and “rural” definitions shall be as follows:

“Urban” shall include the following environments:

a. Living 1 – 3 Environments

b. Business 1 – 4 Environments

c. Town Basin Environment

d. Marsden Point Port Environment

e. Airport Environment

f. Port Nikau Environment

g. Marsden Primary Centre

h. Urban Transition Environment

i. Kamo Walkability Environment

j. Ruakaka Equine Environment

k. Open Space Environment adjacent to another Urban zone

l. Rural Village Environment

m. Rural (Urban Expansion) Environment allotments under 2000 m^2

n. Strategic Rural Industry Environment

o. City Core Environment*

p. City Fringe Environment *

q. General Business Environment*

r. Trade Retail Environment*

s. Heavy Industry Environment*

t. Local Centre Environment*

u. Shopping Centre Environment*

v. Waterfront Environment*

w. Urban Residential Environment*

x. Large Lot Residential Environment*

y. Passive Recreation Environment adjacent to another Urban zone*

z. Active Recreation Environment adjacent to another Urban zone*

aa. Natural Environment adjacent to another Urban zone*

"Rural" shall include the following environments:

a. Countryside Environment

b. Coastal Countryside Environment

c. Open Space Environment not adjacent to any Urban zone

d. Rural Countryside Environment

e. Rural Living Environment

f. Rural (Urban Expansion) Environment allotments over 2000 m^2. Special considerations for lots between 2000 m^2 and 4000 m^2 can be found in Section 3.2.5.3 Rural (Urban Expansion) Zone Lots 2000-4000 m2.

g. Passive Recreation Environment not adjacent to any Urban zone *

h. Active Recreation Environment not adjacent to any Urban zone *

i. Natural Environment not adjacent to any Urban zone *

*Note: * denotes a proposed environment/zone*

Likewise, where "urban" and "rural" references are made throughout this Chapter, the above definitions shall apply.

3.2.5.3 Rural (Urban Expansion) Zone Lots 2000-4000 m^2

The Rural (Urban Expansion) Zone provides for a density of rural residential development that lies between the densities of the Rural Living and Residential Zones. The zoning provides capacity for the future urban expansion of the City and accordingly must be managed for this purpose. Section 3.2.5.2 Design Criteria provides that lots over 2000 m^2 shall be classified as rural. For the purposes of the road corridor, special design consideration may be given to lot sizes between 2000 m^2 and 4000 m^2 to provide safe and

appropriate facilities for all users. Table 3-5 shall be used as a guide in development of Low Volume Access and Access Roads in this environment.

Table 3-2: Urban Road Design Criteria

Classifications	Average Daily Traffic (ADT) [1]	Minimum Legal Road Width[2]	Carriageway Requirements				Berm[5] Requirements	
			Overall Width[3]	Movement Lane Width[4]	On Street parking	Cyclists	Pedestrians	Utility Service Corridor
Low Volume Access	< 200	18.0	8.0	2 x 3.0	1 x 2.25	cycling shared in movement lane on road	2 x 1.8 m wide footpath, both sides.	1.5 m both sides
Access	200 - 1,000	20.0	10.5	2 x 3.0	2 x 2.25	cycling shared in movement lane on road	2 x 1.8 m wide footpath, both sides	1.5 m both sides
Secondary Collector	1,001 - 3,000	24.0	15.0	2 x 3.5 marked	2 x 2.0	2 x 1.5 m wide marked cycle lane, both sides on road	2 x 1.8 m wide footpath, both sides	1.5 m both sides
Primary Collector	3,001 - 5,000	25.0	16.0	2 x 3.5 marked	2 x 2.0	2 x 1.8 m wide marked cycle lane, both sides on road	2 x 1.8 m wide footpath, both sides	2.0 m both sides
Industrial	N/A	22.0	13.0	2 x 3.5 marked	2 x 3.0	See Note 6 below	2 x 1.8 m wide footpath, both sides	2.0 m both sides
Arterial	5,001 – 15,000	Specific Design						
Regional	15,001 – 25,000	Specific Design						
National	> 25,000	Specific Design						

1. ADT as defined in Research Report 453 Trips & Parking Related to Land Use November 2011
2. Full transport corridor width. May be increased to accommodate cycleways, drainage facilities, landscaping etc. Shall allow for future development
3. Measured between kerb faces
4. Excludes shoulders and parking
5. Measured from the property boundary to the face of the kerb
6. Cycling shared in movement lane unless ADT > 3,000 in which case cycling provisions to be agreed with WDC

Table 3-3: Rural Road Design Criteria – Sealed Roads

Classifications	Average Daily Traffic (ADT)[7]	Minimum Legal Road Width[8]	Carriageway Requirements					Berm Requirements
			Overall Width[9]	Movement Lane Width[10]	Unsealed Shoulder	Sealed Shoulder	Cyclists	Pedestrians[11]
Low Volume Access	<50	20.0	7.0	2 x 2.5	2 x 0.5	2 x 0.5	shared in movement lane	shared on shoulder & berm
Access	50 - 200	20.0	7.0	2 x 2.5	2 x 0.5	2 x 0.5	shared in movement lane	shared on shoulder & berm
Secondary Collector	201 – 1,000	20.0	8.0	2 x 3.0	2 x 0.5	2 x 0.5	shared in movement lane	shared on shoulder & berm
Primary Collector	1,001 - 3,000	20.0	11.0	2 x 3.5	2 x 0.5	2 x 1.5	on sealed shoulder where it is a defined cycle route	shared on shoulder & berm

Classifications	Average Daily Traffic (ADT)[7]	Minimum Legal Road Width[8]	Carriageway Requirements					Berm Requirements
			Overall Width[9]	Movement Lane Width[10]	Unsealed Shoulder	Sealed Shoulder	Cyclists	Pedestrians[11]
Arterial	3,001 – 10,000	20.0	12.0	2 x 3.5	2 x 0.5	2 x 1.8	on sealed shoulder where it is a defined cycle route	shared on shoulder & berm
Regional	10,001 - 15,000	Specific Design						
National	> 15,000	Specific Design						

7. ADT as defined in Research Report 453 Trips & Parking Related to Land Use November 2011
8. Full transport corridor width. May need to be increased to accommodate cycleways, drainage facilities, earthworks and the like. Shall allow for future development
9. Measured between the outer extremities of the shoulders. May need to be increased to allow additional widening on horizontal curves and/or the provision of passing bays
10. Excludes shoulders
11. Dedicated (separate) pedestrian access generally not provided unless in built environment

Table 3-4 Rural Road Design Criteria – Unsealed Roads

Classification	Characteristics[12]	Minimum Legal Road Width[8]	Carriageway Requirements			
			Minimum Width	Maximum Width	Pavement Depth (mm)	Wearing Course (mm) nominal
Primary Collector	Band 3	20.0	6.0	8.0	250.0	100.0
Secondary Collector	Band 3	20.0	6.0	8.0	250.0	100.0
Access	Band 3	20.0	6.0	8.0	250.0	100.0
Low Volume	Band 3	20.0	6.0	8.0	250.0	100.0
Primary Collector	Band 2 Forestry	20.0	4.0	5.0	250.0	100.0
Secondary Collector	Band 2 Forestry	20.0	4.0	5.0	250.0	100.0
Access	Band 2 Forestry	20.0	4.0	5.0	250.0	100.0
Low Volume	Band 2 Forestry	20.0	4.0	5.0	250.0	100.0
Primary Collector	Band 2 Private Use	20.0	4.0	5.0	100.0	100.0
Secondary Collector	Band 2 Private Use	20.0	4.0	5.0	100.0	100.0
Access	Band 2 Private Use	20.0	4.0	5.0	100.0	100.0
Low Volume	Band 2 Private Use	20.0	3.0	4.0	100.0	100.0
Primary Collector	Band 1	20.0	3.0	4.0	100.0	No Wearing Course
Secondary Collector	Band 1	20.0	3.0	4.0	100.0	No Wearing Course

Classification	Characteristics[12]	Minimum Legal Road Width[8]	Carriageway Requirements			
			Minimum Width	Maximum Width	Pavement Depth (mm)	Wearing Course (mm) nominal
Access	Band 1	20.0	3.0	4.0	100.0	No Wearing Course
Low Volume	Band 1	20.0	3.0	4.0	100.0	No Wearing Course
Arterial		Specific Design				
Regional		Specific Design				
National		Specific Design				

12. Determination of the ONRC Band Number will be made in consultation with the WDC

Table 3-5 Low Volume Access and Access Roads for Rural Zone Lots 2000-4000 m²

Classifications	Average Daily Traffic (ADT) [1]	Minimum Legal Road Width[2]	Carriageway Requirements				Berm[5] Requirements	
			Overall Width[3]	Movement Lane Width[4]	On Street parking	Cyclists	Pedestrians	Utility Service Corridor
Low Volume Access	<50	18.0	8.0	2 x 3.0	NA	cycling shared in movement lane on road	2 x 1.8 m wide footpath, both sides.	1.5 m both sides

Classifications	Average Daily Traffic (ADT) [1]	Minimum Legal Road Width[2]	Carriageway Requirements				Berm[5] Requirements	
			Overall Width[3]	Movement Lane Width[4]	On Street parking	Cyclists	Pedestrians	Utility Service Corridor
Access	50 - 200	20.0	8.0	2 x 3.0	NA	cycling shared in movement lane on road	2 x 1.8 m wide footpath, both sides	1.5 m both sides

3.2.6. Geometric Design

3.2.6.1 General

Roads shall be designed to satisfy the requirements of Table 3-6 and the sub-sections following.

Table 3-6: Road Classification Designs

Classification	Design Speed (km/h)	Gradient[13] (%)	Maximum Superelevation (%)	Minimum Curve Radius (m)
Private accessway	-	up to 22.2[14]	-	8
Urban				
Low Volume Access	50	0.4 – 12.5	6	60
Access	50	0.4 – 12.5	6	60
Secondary Collector	50	0.4 – 10.0	6	80
Primary Collector	50	0.4 – 10.0	6	80
Arterial	Design speed to match intended posted speed	Specific Design[15]		
Regional		Specific Design[15]		
National		Specific Design[15]		
Industrial/Commercial Service Lane	-	0.4 – 10.0	-	To suit 18 m semi-trailer unit
Rural				
Low Volume Access	Design speed to match intended posted speed	0.4 – 12.5	Specific Design[15]	
Access		0.4 – 12.5		
Secondary Collector		0.4 – 10.0		
Primary Collector		0.4 – 10.0		
Arterial		Specific Design[15]		
Regional				
National				

13. Where the gradient of a public road is steeper than 12.5% a resolution of WDC is required (refer to Section 329 of the Local Government Act 1974/2002)

14. Refer to Sections 3.2.27.2 Urban Private Accessways and Section 3.2.27.3 Rural Private Accessways for specific gradient details.

15. Specific Design shall be to Austroads Guide to Road Design – Part 3: Geometric Design.

3.2.6.2 Design Speed

The design speed of a road is the maximum speed that a vehicle can safely travel at on that road under perfect conditions. A Safe System Approach encourages appropriate road use behaviour and safe speeds. Many factors shall be considered and the Austroads Guide to Road Design - Part 3: Geometric Design provides suitable guidance for designing to a design speed. (NB: This Guide replaces that which was previously provided in the (separate) Austroads Urban and Rural Road Design Guides). Austroads Guide to Traffic Management – Part 8: Local Street Management and the Waka Kotahi Speed Management Guide also provides suitable guidance.

Traffic management facilities shall be included in the road design as necessary to ensure that the design speed environment is achieved.

3.2.6.3 Horizontal and Vertical Alignment

Horizontal and vertical alignment (including horizontal and vertical curves) shall be based on terrain and the design speed applicable to the road function.

The design speed of the vertical alignment shall not be less than that of the horizontal alignment. The design should provide for a consistent standard of alignment with no curve less than 10 km/hr lower than the 85th percentile operating speed at the site.

Reverse curves shall be separated by an adequate length of straight in metres being 0.7 times the posted speed limit.

Tracking curves (or demonstration of tracking by use of digital tracking software) may be required to show that vehicles can negotiate curves that are narrow in lane width or have a small radius. The vehicles chosen shall be appropriate to the type of vehicle that will use the road. Refer to RTS18 – NZ On-road Tracking Curves for Heavy Vehicles.

3.2.6.4 Curve Radius

The minimum centreline radius for roads shall be in accordance with Table 3-6.

3.2.6.5 Crossfall and Superelevation

The normal (minimum) crossfall for all sealed roads shall be 3%. Where existing features mean that this cannot be achieved the crossfall may vary between 2% and 4%. Single crossfall roads will be considered on urban access and low volume access roads where normal crossfall is unobtainable and shall have particular regard for stormwater management.

The crossfall for unsealed roads shall be 4%, with a range of 3-6% as it will hold water resulting in rutting and potholes if crossfall is< 3%.

Minor adjustments to kerb levels to provide an evenly sweeping kerb line are acceptable.

The maximum urban superelevation shall be 6%.

3.2.6.6 Widening on Curves

In some instances, (e.g. low horizontal curve radius where the passage of vehicles has the potential to reduce safety), movement lanes shall be assessed to determine the need for localized additional width. For a two-lane road, curve widening should be omitted when the total widening is less than 0.5 m.

The Austroads Guide to Road Design - Part 3: Geometric Design has useful guidance on this. Table 3-7 (adapted from Austroads) provides acceptable data for use in design.

Table 3-7: Curve Widening per Lane for Design Vehicle

Curve Radius (m)	Widening per lane (m)	
	11.5m large rigid truck	18m semi-trailer
60	0.7	0.8
80	0.5	0.6
100	0.4	0.5
140	0.3	0.3
200	0.2	0.2
>400	-	-

3.2.6.7 Sight Distance

All roads shall be designed with sight distances that match the posted speed. Refer to **Sheet 4**.

Visibility splays and envelopes may require the road boundary to be set back, in which case trees shall not be planted in the visibility splay. Sightlines outside the Transport Corridor will only be approved where the land between the sightline and the road reserve boundary, plus an additional 0.5 m beyond the sightline, is appropriately protected such that no development is permitted within the affected area and WDC has the legal right to trim or remove vegetation within that area. Easements or covenants are acceptable land protection instruments in this regard.

3.2.7. Cut / Fill Batters

3.2.7.1 Urban Roads

Cut and fill batters for roads shall be constructed within the Transport Corridor and comply with the following criteria:

a. Maximum grade of 20% (1:5) starting at the road boundary. Where circumstances dictate a steeper grade is necessary, a geotechnical

assessment of the slope shall be provided together with specific access design,

b. Any retaining wall designed to support the road or footpath shall be constructed within the Transport Corridor and will likely require a building consent, and

c. Where WDC considers that the stability of any planned embankment is in doubt, a stability analysis of the slope under saturated conditions may be required.

3.2.7.2 Rural Roads

Rural batters for cuttings and embankments shall usually be constructed inside the Transport Corridor and comply with the following criteria:

a. Batters less than 750 mm high shall be cut at 1V:4H and shall be top soiled and grassed,

b. Batters greater than 750 mm high shall be cut at 1V:2H and shall be protected from face erosion by hydro-seeding or similar, and

c. Batters 4.5 m high and above shall be assessed by a Geo-Professional. In undertaking this check and determining the appropriate erosion protection the Geo-Professional shall take into account:

   i. The type of soils present in the cutting, and

   ii. The degree of practicable erosion and its effect on long term stability, the safety of road users, and adjacent property owners.

3.2.8. Intersections

3.2.8.1 General

Subject to the following provisions and the provisions of Section 3.2.8.2 Design Considerations, all intersections shall be designed in accordance with Austroads Guide to Road Design Part 4: Intersections and Crossings and Part 4A: Unsignalised and Signalised Intersections. All intersection designs shall take into consideration the Safe System Approach (see Austroads Safe System Assessment Framework (2016 – AP-R509-16)), including minimizing and modifying conflict points, reducing speed of vehicles, improving visibility and providing space and protection for pedestrians and bicyclists.

Generally, roads should intersect only with roads in the same class or those immediately above or below in classification. T-junctions are preferred to cross intersections particularly for access roads. The angle of intersection should be 90°, although a minimum angle of 70° can be used when justified by other constraints. Carriageway alignment may be offset within the road reserve to improve the intersection angle.

Intersections on curves, particularly on the inside of curves, other than large radius curves, shall be avoided. Multi-leg intersections may require control by roundabouts.

3.2.8.2 Design Considerations

The location and design of intersections shall take into account the minimum sight distances shown in **Sheet 4**.

The minimum permitted spacing between adjacent intersections on different categories of road is set out in Table 3-8. All distances are measured along the centreline of the major road between the centrelines of the intersecting roads.

Table 3-8: Minimum Intersection Spacing

	Access (including low volume)	Secondary Collector	Primary Collector	Arterial
Urban	30 m	50 m	100 m	100 m
Rural	75 m	100 m	150 m	150 m

The minimum kerb radius at urban intersections shall be:

a. 8 m with corner splays of 4 m to 6 m for residential roads of collector class and below. A reduced kerb radius may be considered to enhance pedestrian facility in low speed environments subject to the approval of the WDC.

b. 13.5 m with corner splays of 6 m for arterial roads and in commercial/industrial areas.

c. Corner splays in higher than 50 km/hr speed environments shall be subject to Specific Design to ensure safe visibility at intersections.

Major industrial intersections shall be specifically designed for 18 m semi-trailer units, and all urban intersections (access roads and above) designed for a minimum 11.5 m large rigid truck, as defined by the 'RTS18' tracking curves referenced in Section 3.2.6.3 Horizontal and Vertical Alignment.

Gradients within 30 m of urban intersections shall be:

a. For access roads - less than 1 in 33 where practicable and not greater than 1 in 10, or

b. For collector and arterial roads - less than 1 in 50.

3.2.8.3 Arterial Road Intersections

For intersections with arterial roads, the engineering drawings shall show the sight distance provided at each intersection, plus the following information:

a. Design Speed,

b. Design Vehicle,

c. Distance from limit lines to viewpoint (LV),

d. Approach Sight Distance (ASD),

e. Safe Intersection Sight Distance (SISD), and

f. All radii.

The SISD shall be determined with an object of height 0.6 m.

Reference can also be made to Austroads Guides to Road Design Parts 4, 4A, and 4C.

3.2.9. Roundabouts

Roundabouts may be required at multi-leg intersections, intersections where Stop or Give Way controls do not provide adequate capacity or Level of Service, or to provide traffic calming.

Roundabouts shall be subject to specific approval by WDC and shall be designed in accordance with Austroads Guide to Road Design Part 4B: Roundabouts. The size of a roundabout has a significant role in the performance for capacity, traffic safety and turning movements of vehicles and shall take into account the following key considerations:

a. Classification of intersecting roads,

b. Pedestrian and cyclist safety and accessibility,

c. Anticipated vehicle types,

d. Distribution of turning traffic,

e. Heavy vehicle access requirements, and

f. Landscaping.

Visibility is an important factor to ensure safety standards are met, Austroads Guide to Road Design Part 4B: Roundabouts, Criteria 1 and 2 for sight distance are both mandatory requirements. Achievement of Criteria 3 is desirable.

3.2.10. Traffic Signals

Traffic signal installations shall be subject to Specific Design, safety auditing and approval processes to the satisfaction and final approval of WDC. Developers are advised to consult with WDC at an early stage to ascertain current requirements. (Note: the current standard is Waka Kotahi P/43 Specification for Traffic Signals– modified by current Whangārei District Council Regional Special Conditions).

3.2.11. Pavement Structural Design

3.2.11.1 General

Pavements shall be provided to all roads such that vehicle loads may be carried out without distress, in all weathers, for at least the design life with only normal routine maintenance and periodic re-surfacing.

Pavements (including carparks) shall be flexible granular pavements with thin surfacing layers. Where this is not sufficient or a more innovative solution can be implemented, the proposal shall be considered an Alternative Design (See Section 1.5.1.2 Alternative Designs) and will require specific approval from WDC.

Pavements shall be designed for the specified design life, based on the subgrade strength, traffic loading and traffic growth. Design loads shall be determined from the known and/or predicted heavy vehicle usage of the road, with adequate justification provided.

3.2.11.2 Design

A sealed pavement design may be carried out by one of two methods:

3.2.11.2.1. Sealed Pavement – Specific Design

This method shall be used for all industrial roads and all arterial and collector classifications (both urban and rural). It may also be used for roads of lower classifications.

The design shall be in accordance with the Austroads Guide to Pavement Technology – Part 2: Pavement Structural Design and the Waka Kotahi – New Zealand Guide to Pavement Structural Design together with relevant Waka Kotahi pavement material standards. All roads with a design number of Equivalent Standard Axles (DESA) greater than 10,000[7] shall have a pavement design completed by a Chartered Professional Engineer (CPEng).

Factors to be included in the design are:

a. Design Life,

b. Trips generated per household per day – 10,

c. Annual Heavy Commercial Vehicle (HCV) growth factor - 3 % minimum unless otherwise specified by the WDC,

d. Load factor - the **Presumptive ESA/HCV of 1.44** shall be used for design purposes unless otherwise specified by the WDC, and

e. % HCV - 5% urban access and collector roads; 7% urban arterial roads; 10% industrial and commercial; 9% all rural classifications.

Note: The above factors are the minimum values to be used for design purposes and WDC may require site-specific increased values where peer reviews indicate the need or where WDC believe that circumstances exist where they can be justified.

The design report shall include the following information as a minimum:

a. Results of soils investigations,

b. Design assumptions and figures,

c. Material specifications,

d. Engineering drawings, and

e. QA measures for construction.

3.2.11.2.2. Sealed Pavement – Default Design

This method may only be used for urban and rural access (including low volume) classifications. Using this design does not exempt the construction from any tests or compliance with any targets and does not provide any guarantee that the resulting pavement will comply with all testing requirements. Pavements shall comply with the depth and aggregate specified in Table 3-9.

Table 3-9: Pavement Layer Thickness for Urban and Rural Classifications

Road Classification	Sub-base	Basecourse	Notes
Low Volume Urban Access (< 200 vpd)	200	110	max 5% HCV
Urban Access (200 – 1,000 vpd)	250	130	max 5% HCV
Rural Access & Low Volume Access (< 200 vpd)	220	120	max 9% HCV

These typical designs are based on an in-situ subgrade having a soaked CBR of 5 for a minimum depth of 0.6 m. If the in-situ subgrade does not achieve this strength, then subgrade improvements may be undertaken in order to achieve the required design subgrade CBR value. Refer to Section 3.2.11.2.1 Subgrade Testing for method of determining the design CBR.

If a subgrade of 0.6 m depth and a CBR of 5 is not practicable, a Specific Design will be required as per Section 3.2.11.2.1 Sealed Pavement – Specific Design.

3.2.11.2.3. Unsealed Pavement

SQEP shall engage with WDC's asset engineers before developing and submitting a design for consideration in order to determine the classification of road. This ensures the design can follow the Centre of Excellence for unsealed roads process when determining the importance of the road and how the road is constructed, maintained and renewed. This process allows for an unsealed road to be easily adopted to the vested and maintained roads.

Subgrade shall be investigated and tested before a pavement design is developed using pavement investigation methodologies in Austroads Guide to Pavement Technology Part 5, (DCP investigation through test pit methodology).

Where a subgrade CBR is less than 7:

a. A layer will be constructed using a sub100 aggregate at a minimum of 2.5 times the nominal aggregate size (250 mm), laid over the subgrade and a GAP65 layer at a minimum 2.5 times nominal aggregate size (162.5 mm) over the sub100, or

b. To a sufficient thickness determined from the Austroads Guide to Pavement Technology Part 6 design guide chart for cover over formation to overcome the CBR deficiency.

Where a subgrade CBR is less than 3:

a. A subgrade should be designed as equal to a CBR of 3 but with the initial subgrade (formation) layer stabilised to a depth of 100-150 mm, and

b. Stabilisation requirements are to be determined by following Austroads methodology for determining Lime or cement content or a blend of both through appropriate laboratory investigation.

If subbase layers are required, and once these have been constructed, unsealed granular pavements shall comprise a minimum compacted thickness as per Table 3-4 of GAP 40 material with a minimum soaked CBR of 20. Wearing Course, where required from Table 3-4, shall be page green compliant, and of AP30 material, 100 mm thick and shall be placed and compacted to complete the carriageway formation.

Crossfall is to be between 6-8% on straights and 8-12 % superelevation in corners. Transitions and geometry of crossfall and geometric design of the road are to follow Austroads Design Guidelines. The crown of the road will not be flat or graded flat under any circumstances.

3.2.11.3 Subgrade Testing

The support provided by the subgrade is one of the most important factors to be considered in determining pavement design thickness, composition and performance. The level of support as characterised by the subgrade strength is dependent on the soil type, density and moisture conditions at construction and during service.

Subgrades are inherently variable in nature and reflect the changes in topography, soil type, and drainage conditions that occur along an existing or proposed road alignment. Hence the selection of a subgrade design value requires adequate consideration of the degree of variability within a particular development section, and the quantity and quality of data on subgrade properties. Therefore, the frequency of testing is critical to gaining a good understanding of the true nature of the subgrade. As a minimum, testing should be at intervals of ‘length + 50 m / 100” or 5 whichever is greater in visually similar subgrade materials.

Where the extent of cut or fill is too great to make subgrade CBR testing feasible at the design stage, such testing shall be done on completion of earthworks and the pavement design amended accordingly and submitted to WDC for re-approval.

Soaked CBR (laboratory test) values of the pavement subgrade shall be used, and the pavement designed for the estimated number of ESA loadings over the design life.

Unsoaked, or in-situ subgrade CBR tests in non-granular materials will be approved for private accessways serving no more than eight household units using a scala penetrometer testing from 0 to 1.0 m below design subgrade level. **Sheet 5** shows the correlation between scala penetration and CBR values. Taking the average value of the inferred CBR from the scala test results is not appropriate. Determine the design CBR as follows:

a. For subgrade strengths that are constant or improve with depth, the design CBR shall be the 10th percentile of the results obtained over the – i.e. the value below which 10% of the test results fall (or the value exceeded by 90% of the test results).

b. For any weak layers encountered up to 1.0 m below the design subgrade level and/or when subgrade improvements are required, the design CBR shall be determined using the nomograph on **Sheet 5a**.

3.2.11.4 Peer Review

All specific pavement designs shall be peer reviewed (see Peer Review) at the Developer's cost. The peer review shall be submitted with the design documentation together with an explanation as to how the findings of the peer review have been addressed.

3.2.12. Road Surfacing

3.2.12.1 General

All new urban carriageways shall be surfaced with either a chip seal or asphaltic concrete. The use of concrete will require specific approval from WDC.

All new rural carriageways shall be surfaced with a chip seal unless specifically approved otherwise by WDC through resource consent conditions.

All urban and rural private accessways shall be surfaced in accordance with the requirements of **Sheet 7**, **Sheet 8**, **Sheet 9** and **Sheet 10**.

Asphaltic concrete (type to be approved by WDC) applied over a waterproofing chip seal shall be used on industrial roads, roundabouts, all cul-de-sac turning heads, off street carparking areas and any other site subject to high turning movements as determined by WDC. On cul-de-sac heads, asphalt shall be applied until the carriageway becomes a constant width.

3.2.12.2 Chip Seal Surfacing

The first coat shall be a two-coat grade 3/5 chip seal. A second coat of chip seal shall be applied between 12 and 18 months later as part of the development cost. Other chip seal designs may be considered and approved by the WDC. For further details and requirements see Section 3.3.5.3 First Coat Chip Seal and 3.3.5.4 Second Coat Chip Seal and Resealing.

3.2.12.3 Asphaltic Concrete Surfacing

Asphaltic concrete may be used as an alternative surfacing to chip seal, however there are stricter requirements for pavement stiffness. Selection of an appropriate mix for industrial sites shall be agreed with the WDC. For further details and requirements see Section 3.3.5.2 Asphaltic Concrete (AC).

3.2.12.4 Permeable Paving

Generally permeable pavement (other than on unsealed road) will not be approved for public roads. This type of pavement may only be used for low traffic roads, pedestrian areas, carparks, private roads or similar; and require specific approval under Section 1.5.1.2 Alternative Designs.

3.2.13. Road Drainage

3.2.13.1 General

The new roads and new drainage on the existing road shall be designed on a basis of the following:

a. All roads shall be provided with facilities for the collection and disposal of both surface stormwater and ground water suitable to cater for a 1% AEP flood event,

b. Enabling groundwater recharge through soakage systems,

c. Providing for stormwater treatment for Roads where ADT is >3000, industrial, arterial, (or otherwise where required by District Plan and Stormwater Network Discharge Consent) for improved quality of stormwater discharges into receiving environments.

d. Complying with requirements of the NRC,

e. Where practicable, OLFP for new roads constructed in Urban and Industrial areas should be constructed at a lower level than adjoining land. The rural roads should be constructed at a higher level than surrounding land but should not obstruct OLFP,

f. Water discharged from adjoining land,

g. Public safety,

h. Minimising of future maintenance requirements,

i. Capacity of any existing piped network,

j. Cyclists,

k. Reduction of peak discharge rate, and

l. Compliance with Chapter 4: Stormwater and Drainage, including stormwater runoff design.

In urban areas stormwater runoff should be controlled by kerb and channel. (Section 4.2.4 Discharge to the Road Kerb details the limitations of kerb stormwater outlets). Alternative options may be considered and will require specific approval under Section 1.5.1.2 Alternative Designs

Note: Channels constructed from clay or concrete pavers will not be considered for approval.

The urban road drainage system shall include first flush treatment to meet or exceed Auckland Council GD01 – refer to Section 3.2.13.6 Catch-Pits for catch-pit design requirements. Where proprietary treatment devices are proposed, the type of device shall be pre-approved by WDC.

Design criteria for components of the drainage system are as follows:

3.2.13.2 Subsurface Drainage

Subsurface drains shall be provided on both sides of all urban roads for pavement drainage purposes except where it can be demonstrated to the satisfaction of WDC that it is not necessary - e.g. low water table and natural ground with high permeability – refer to WDC Policy #0129 - Land Development Stabilisation 2018 and Land Development Stabilisation – Technical Design Requirements 2018. Rural roads in cut will require subsurface drainage, see **Sheet 14**.

Subsurface drains shall discharge to a suitable component of the stormwater system.

Where natural groundwater levels are known to be high, an effective means of de-watering shall be submitted for approval at the design stage. Such means to identify whether the measures shall be temporary, or form part of the permanent subsurface drainage system.

3.2.13.3 Side Drains, Water Tables

Stormwater from rural roads shall be directed to the side drains network, comprising of side channels /inlet & outlets, pipes and inspections chambers. The side drains network shall be sized to cater for a 10% AEP rainfall event, without causing flood hazard. The side drains network shall be capable of keeping groundwater levels below the road subgrade and be located within the Transport Corridor. Scour protection such as concrete, rock riprap, check dams, a combination thereof shall be provided for side drains, where flow velocities exceed specified values in Section 4.3.12.3 Open Channel Flow Calculations. All outlets shall include protection from scouring, and not create adverse impact on slope stability.

The stormwater discharges from the road shall not cause damage to the adjacent property. The discharge of concentrated stormwater shall be subject to the approval of the affected property owner(s).

Where physical constraints preclude the construction of side drains and/or the land is steep, unstable or prone to erosion, kerb & channel or similar shall be considered.

3.2.13.4 Swales

The use of swales for stormwater treatment will require the pre-approval from WDC before proceeding with design details. Where such approval is granted, swales, and similar stormwater devices that rely on infiltration may be used to reduce peak discharge flows, and to provide stormwater treatment.

Swales should be located within the road corridor at one or both sides. Swales in the centre of the road may be installed with pre-approval from WDC. Swales shall be designed with the following principles:

a. Have sufficient width to accommodate other related infrastructure, including stormwater devices, utility services (if needed), plants and be accessible for maintenance,

b. Accommodate for safe crossings for vehicles and pedestrians, and

c. Comply with the requirements of Section 4.3.21 Soakage Devices and Section 4.3.22 Stormwater Treatment and Detention Devices.

Where swales are used in urban areas the road edge shall have a flush concrete edge or kerb openings. Safety in Design principles shall be applied to prevent vehicles driving through them (e.g. barriers and bollards). The road edge shall be installed with 30 MPa concrete, 300 mm wide and 200 mm deep with the top surface matching the crossfall of the carriageway. See **Sheet 13**. Refer to Section 3.2.26 Vehicle Entrances for the requirements for vehicle crossings over swales.

Refer also to **Sheet 15** and **Sheet 16** for typical details that may be used in swale design and to the Waka Kotahi Stormwater Treatment Standard for State Highway Infrastructure, Auckland Council GD01, Wellington Water - Water Sensitive Design for Stormwater: Treatment Device Guideline and WDC Urban Design Guidelines for further guidance.

3.2.13.5 Kerb and Channel

Subject to the provisions of Section 3.2.13.4 Swales, kerb and channel at a minimum gradient of 0.4% shall be provided on both sides of the carriageway for all urban carriageways. See **Sheet 13**.

Heavy duty kerb & channel shall be used in all industrial roads and service lanes. See **Sheet 13**.

Mountable kerb and channel shall be used on traffic islands and may be used on service lanes. In all other cases, mountable kerb and channel may only be used with the specific approval of WDC.

Kerb and channel shall be provided on the uphill side of all urban roads with single crossfall to collect the stormwater runoff from footpaths and berms.

For rural roads, kerb and channel shall be required where necessary to control stormwater runoff such as adjoining cut and fill batters to control potential scouring of channels and embankments.

3.2.13.6 Catch-Pits

Catch-pits shall be installed alongside including kerb and channels and shall be designed and constructed in accordance with the provisions of Section 4.3.19 Catch-Pits.

The location of catchpits shall be designed in a manner not to cause a nuisance flooding at the road, road intersections and pram and vehicle crossings.

Catch-pit grates shall be safe and pedestrian and cycle friendly. The grates shall either transverse to the channel direction or gaps to be in a wavy pattern in a direction of traffic Proprietary devices including ‘super catch-pits’ or back entry inlet catch-pits, shall be pre-approved by WDC, and designed and installed in accordance with the manufacturer’s

specifications. All catch-pits shall be designed with allowance for partial blockage of the gratings. See **Sheet 34** for standard catch-pit details.

3.2.13.7 Secondary Stormwater Network Provisions

At all points where there is a risk of primary network blockage and/ or overflow into private property, provision shall be made for secondary flow paths, which need to be in public ownership or protected by an easement.

For more information on overland flow path requirements and design refer to Section 4.3.9.3 Secondary Stormwater Network Design Requirements .

3.2.14. Parking and Manoeuvring

3.2.14.1 On Road Parking

The Transport Corridor shall be designed to accommodate the parking requirements contained in Table 3-2.

Parking bay pavement shall be constructed to the same standard as the road unless agreed otherwise by WDC. Crossfall requirements are the same as for the carriageway.

3.2.14.2 Off Road Parking

Where dedicated off-road carparking is required, the quantity and location shall be provided in accordance with the District Plan. The following requirements shall be met:

a. The layout dimensions shall conform to the details shown in AS/NZS 2890.1:2004. Mobility parking spaces shall be designed in accordance with NZS 4121:2001. Loading bay spaces shall comply with AS 2890.2:2018. Refer also to District Plan for layout dimensions.

b. Adequate provision shall be made for access between the road and parking area and for manoeuvring within the site so that vehicles do not reverse out onto the road.

c. On-site manoeuvring for cars and heavy goods vehicles shall comply with the vehicle tracking curves shown on **Sheet 26**, **Sheet 27** and **Sheet 28** as applicable. Manoeuvring in and out of a parking/loading bay shall not require more than one reverse manoeuvre.

d. The gradient for off-street parking spaces, loading bays and associated manoeuvring areas for all non-residential activities shall not be steeper than:

   i. 1 in 16 for surfaces at 90° to the angle of parking, or

   ii. 1 in 20 for surfaces parallel to the angle of parking.

e. Structural design shall comply with the requirements of Section 3.2.11 Pavement Structural Design, and construction (including testing) shall comply with the requirements of Section 3.3.3 Pavement Construction and Section 3.3.4 Pavement Testing - the same as for roads. Unless approved

otherwise through the resource consent conditions, surfacing shall comply with the requirements of Section 3.3.5 Pavement Surfacing.

3.2.15. No Exit Roads and Cul-de-sac Heads

3.2.15.1 No Exit Roads

'No-exit' roads shall not be provided (especially in commercial and industrial areas) where through roads and connected networks can be designed. Where no-exit urban roads cannot be avoided, they should ensure connectivity for pedestrians and cyclists and have no-exit signage.

No-exit roads shall provide for road turning at the end of the road for an appropriate vehicle but in any event not less than an 11 m rigid truck.

3.2.15.2 Cul-de-sac Head Design

The design of cul-de-sac turning areas shall be in accordance with **Sheet 11**, noting that in commercial and industrial areas the minimum radius shall be 15 m to accommodate the turning movements of service vehicles.

Off-set turning heads shall be designed by offsetting the road carriageway crown to create symmetrical conditions, with the channel being designed accordingly.

If a central area is proposed for parking or planting, the layout shall be checked for access by heavy vehicles (11.5 m rigid truck) using tracking curves. The minimum trafficable width shall be 5.5 m.

Hammerhead or 'T' cul-de-sacs may be provided in urban areas only where a standard circular head is not practicable. The layout shall be subject to Specific Design with particular consideration of vehicle entry/exits. Compliance with Figure 3.4 in NZS 4404:2010 is an acceptable solution in residential areas.

The minimum channel gradient around turning heads shall be 0.5%. The maximum long or cross section slope in turning heads shall be 6%. Appropriate drainage shall be provided with a double catch-pit required at the low point.

3.2.16. Road Lighting

3.2.16.1 General

WDC recognises that the correct level of road lighting is important for the safety and well-being of the community and this section provides the guidelines to achieve the following elements of good lighting design:

a. Enable safe and convenient movement of vehicles, pedestrian and cyclists,

b. Minimise glare, spill lighting and sky glow,

c. Reduce likelihood of criminal activity at night using National Guidelines for Crime Prevention through Environmental Design in New Zealand principles,

d. Reduce energy consumption, and

e. Reduce maintenance cost.

All materials, design and installation of road and public space lighting shall comply with the requirements of the Northland Transportation Alliance Design Manual - Street Lighting Version 1.

3.2.17. Traffic Signs and Line Markings

Road design shall incorporate signage, road-marking and the provision of traffic control devices (such as flush or raised medians, pedestrian refuges) appropriate to the place and link context. Access roads shall be designed to minimise the need for traffic signs and marking. Signs include Stop and Give-Way, directional arrows on islands, warning signs, delineation devices (edge marker posts) etc. Road-marking includes marking of intersections, centrelines, parking areas etc.

Road marking and traffic signs shall comply with the Land Transport Rule: Traffic Control Devices 2004 and associated Waka Kotahi Traffic Control Devices Manual.

Urban and rural roads shall be marked in accordance with Table 3-10 and Table 3-11.

Table 3-10: Road Marking - Urban

Type	Criteria	Delineation Posts	Centre line	Edge Line	RRPM's	Intersection Control
Low Volume Access	0 – 200 ADT	X	X	X	X	✓
Access	200 –1,000 ADT	X	✓	X	X	✓
Primary Collector	1,001 – 3,000 ADT	X	✓	May Be required	May Be required	✓
Secondary Collector	3,001 – 5,000 ADT	X	✓	May Be required	May Be required	✓
Arterial	5,001- 15,000 ADT	X	✓	✓	✓	✓
Regional	15,001- 25,000 ADT	X	✓	✓	✓	✓
National	>25,001 ADT	X	✓	✓	✓	✓
Service Lane		X	May Be required	X	X	✓

Table 3-11: Road Marking – Rural (Sealed)

Type	Criteria	Delineation Posts	Centre line	Edge Line	RRPM's	Intersection Control
Low Volume Access	0 – 50 ADT	X	X	Inside Curves	X	✓
Access	51 – 200 ADT	X	✓	Inside Curves	X	✓
Primary Collector	201 – 1500 ADT	✓	✓	✓	May be required	✓
Secondary Collector	1000 – 3000 ADT	✓	✓	✓	✓	✓
Arterial	3000 – 10,000 ADT	✓	✓	✓	✓	✓
Regional	10,001 – 15,000 ADT	✓	✓	✓	✓	✓
National	>15,001 ADT	✓	✓	✓	✓	✓

All signs on public roads shall have VIP standard or equivalent sheeting in accordance with AS/NZS 1906.1:2017. All other signs shall have Class 2 sheeting. The sign sheetings shall be designed to adhere fully to the backing for at least 10 years.

Sign supports on traffic islands shall be a recoverable or breakaway type.

3.2.18. Speed Management

Speed management is about achieving safe and appropriate speeds that reflect road function, design, safety and use. We need people and goods to move efficiently around our transport network; however, aligned to the Safe System approach (See Austroads Safe System Assessment Framework (2016 – AP-R509-16)) , we also need to see a reduction in deaths and serious injuries. The Speed Management Framework (see Waka Kotahi Speed Management Guide) provides a single assessment method for determining safe and appropriate speeds by aligning travelling speeds with road function.

Effective speed management treatments are likely to be a result of a combination of measures which include engineering and infrastructure improvements and may include traffic calming through a combination of the following methods:

a. Vertical features,

b. Horizontal features,

c. Traffic management and control,

d. Traffic signs and road markings, and/or

e. Zonal treatments.

In order to achieve the desired design speed environment, traffic calming devices may be required within the transport corridor. The Waka Kotahi Speed Management Guide, Austroads Guide to Traffic Management and the Waka Kotahi Traffic Control Devices Manual should be used to guide development of these devices.

Traffic calming measures shall be designed so not to create adverse stormwater impacts on the road and adjacent properties.

3.2.18.2 Targeted Safe & Appropriate Design Speed

Table 3-12 indicates the targeted design speed by roadway classification. The appropriate design speed should be determined prior to commencement of engineering measures to achieve that design speed.

Table 3-12 Targeted Design Speed

	Classification	Appropriate Design Speed
Urban	Low Volume Access, Access, Industrial	30 km/h operating speed (safe and appropriate)
	School Zones (within 500 m of a school active frontage)	30 km/h
	Primary & Secondary Collector	40 km/h
	Arterial, Regional	50 km/h
UTE & Future Urban (Semi-rural)	Low Volume Access, Access Primary & Secondary Collector	40 km/h
	School Zones (within 500 m of a school active frontage)	30 km/h
	Arterial, Regional	60 km/h
Rural	Low Volume Access, Access	40 km/h
	School Zones (within 500 m of a school active frontage)	60 km/h or lower
	Primary & Secondary Collector	60 km/h
	Arterial, Regional	80 km/h

3.2.18.3 Device Selection

The Waka Kotahi Speed Management Guide, Volume 2: Toolbox identifies possible treatments based on speed and the One Network Road Classification. The selection of speed management treatments shall be discussed with WDC at an early stage in the design. Safety audits (refer to Section 3.2.3 Safety Audit) and public consultation may be necessary depending on the proposed treatment. Ultimately the use of any speed management measure shall be subject to the specific approval of WDC.

3.2.18.4 Electronic Variable Speed Limits

WDC operates a network of electronic variable speed messaging signs which are used at schools to improve safety for school children at the start and end of a school day. These devices are Intelligent Transportation System (ITS) devices and, because they operate a legally enforceable speed limit, they require Specific Design to ensure that the layout complies in all respects to be enforceable. It is very important that any works that impact an existing electronic variable speed limit sign is advised to WDC at an early stage.

Developers need to be aware of the following:

a. The Developer is responsible for upgrading any existing variable speed limit sign impacted by their works.

b. Any upgrading or alterations must comply with the relevant provisions of the Waka Kotahi Traffic Note 37 Revision 2 (40 km/h variable speed limit in school zones) or Traffic Note 56 Revision 1 (Active school warning signs).

c. Specific Design is required to demonstrate compliance.

d. Safety audits (refer to Section 3.2.3 Safety Audit) may be required to ensure no hazards are introduced as a result of the works.

3.2.19. Bridges, Culverts and Other Structures

The Developer shall obtain all necessary resource consents (including NRC) and/or building consents required for bridges, culverts, underpasses (pedestrian or stock) and retaining structures.

For any development where a bridge is proposed, the bridge concept plan shall be discussed and agreed with WDC before detailed design commences.

All bridges, major culverts, underpasses and retaining structures shall be designed in accordance with the Waka Kotahi Bridge Manual (SP/M/022) and the design shall be carried out by SQEP.

Note: Culverts, including multiple culverts, with a total watercourse area greater than 3.4 m^2 are regarded as 'major culverts' under the Waka Kotahi Bridge Manual. Some culverts may be considered dams, for Further details refer to Section 4.3.14.1 General Requirements for Culverts.

Appendix D of the Waka Kotahi Bridge Manual (SP/M/022) shall not be used for bridges on public roads, except with the specific approval of the WDC.

3.2.19.1 Bridge and Culvert Design

Particular features that shall be considered/covered in the design include, but are not limited to:

a. All bridges and culverts shall be designed with a width to accommodate movement lanes, cycle, and pedestrian needs of the road, in accordance with the road classification given in Table 3-2 and Table 3-3.

b. The design of the structure shall provide for the installation and fixing of all suitable barriers to cater for the needs of pedestrians, cyclists and vehicles, including the interaction between the various modes.

c. All culverts shall have anti-scour structures to protect batter slopes, berms, and carriageways.

d. Where passing above traffic lanes, bridges shall have a full clearance height of 5.2 m to allow over-dimension vehicles to operate without a permit.

e. All bridges and culverts shall be founded to resist settlement or scour. Abutments shall be designed to ensure bank stability and provide erosion or scour protection as applicable.

f. The use of the structure as a service corridor shall be included in the design. This shall include consultation with utility providers to ascertain their current and future needs.

g. The design shall include provision of any necessary access facilities to and within the structure in order to undertake inspection and maintenance activities.

3.2.19.2 Bridge and Culvert Hydraulic Design

Hydraulic design shall be carried out by SQEP in accordance with Chapter 4: Stormwater and Drainage.

The bridge or culvert shall be designed to achieve:

a. No adverse impact on existing upstream water levels during a 20% AEP (adjusted for climate change) flood event,

b. Able to pass a 1% (adjusted for climate change) AEP flood without damage to the road and watercourse structures, and

c. Obstructions and risk of blockage of the flows are minimised.

In terms of traffic serviceability, the bridge or culvert shall also achieve:

a. On roads carrying > 3000 vpd, no interruption to traffic during a 1% (adjusted for climate change) AEP flood event, or

b. For roads carrying between 250 and 3000 vpd, no interruption to traffic during a 2% (adjusted for climate change) AEP flood event, or

c. For roads carrying < 250 vpd, no interruption to traffic during a 10% (adjusted for climate change) AEP flood event.

3.2.19.3 Bridges on Private Accessways

For bridges on private accessways serving up to eight household units, the design requirements of Appendix D of the Waka Kotahi Bridge Manual (SP/M/022) set minimum requirements and may be used, subject to the following conditions:

a. The accessway will not become a through route,

b. The accessway has a speed limit to 70 km/hr,

c. Use by logging trucks or similar is unlikely, and

d. No significant overloads are expected to occur, or the bridge can be bypassed.

Note that Appendix D of the Waka Kotahi Bridge Manual (SP/M/022) allows the replacement of the HN design load with 0.85 HN. The HO load need not be considered.

The level of side protection shall be appropriate to the situation. The minimum acceptable shall be the provision of kerbs and marking posts where the height above the watercourse is no more than 1.0 m.

3.2.20. Footpaths and Pedestrian Accessways

Pedestrians shall be provided for in accordance with Table 3-2 and Table 3-3.

3.2.20.1 Urban Footpaths and Accessible Crossings

Footpaths shall follow the guidelines outlined in the Waka Kotahi Pedestrian Network Guidance and conform with the following:

a. Footpaths shall be set back a minimum 1.2 m from the kerb unless physical constraints dictate otherwise and/or located in a cul-de-sac. See **Sheet 29**.

b. The minimum width shall be 1.8 m (not including kerb width where adjacent to kerb) and noting that in areas with high concentrations of pedestrians such as shopping areas, community facilities, schools etc. and where angled parking is provided adjacent to the footpath, Specific Design shall apply in consultation with WDC.

c. Footpaths shall have the minimum clear width of 1.5 m between or around obstructions such as power poles, lighting columns, transformers and the like.

d. Crossfall shall typically be 2% sloping towards the kerb and channel. Localised crossfall in the range of 1-3% may be approved where levels

make the typical crossfall impracticable. Crossfall in high pedestrian use areas such as shopping centres shall be 1% wherever practicable.

e. Longitudinal gradient shall conform to that of the road and shall not exceed 12.5%.

f. New footpaths shall be constructed in concrete unless specifically approved otherwise by WDC.

Accessible (pram and wheelchair) crossings shall be provided at all kerbed intersections and pedestrian crossings. Catch-pits shall not be located within the accessible crossing. The crossing entrance shall be connected to the footpaths and have a maximum gradient of 8.3% and shall not create break over angles that are unsafe for, or not traversable by mobility devices.

Construction details for footpaths and pram crossings are described further in Section 3.3.7 Footpaths, Cycleways and Vehicle Crossings and shown on **Sheet 12** and **Sheet 17** respectively.

All new footpath crossings shall consider the Safe System approach (see Austroads Safe System Assessment Framework (2016 – AP-R509-16)) and be designed to shorten crossing distances, reduce conflicts between pedestrians and motorists, increase visibility and encourage safe speeds.

3.2.20.2 Rural Footpaths

Footpaths shall be provided and constructed in the rural environments where required by resource consent conditions. These may be located adjacent to lot boundaries, separated from the carriageway by a water table. They shall be constructed to the same standard as urban footpaths.

Where not specifically required by resource consent conditions, the berm shall be formed and grassed so that it is suitable for pedestrian use.

In any rural environment the provision of safety footpaths may be required because of the scale or type of development, and/or hazards from traffic.

3.2.20.3 Pedestrian Accessways

Pedestrian accessways may be provided to link one urban road to another (especially no-exit roads) in order to improve connectivity and/or where they would offer a significantly shorter walking route from a road to a reserve or shopping centre etc.

Such accessways shall be designed for user safety and comply with the following:

a. They shall be created as either an easement in gross in favour of WDC or a separate lot and should be visible from end to end and preferably no greater than 2 properties long,

b. The minimum formed width shall be 5.0 m if also acting as a cycleway and constructed to a standard not less than that for footpaths. The minimum legal width shall be 1.0 m wider than the formed width,

c. Provision shall be made for stormwater services,

d. Where barriers are provided to prevent vehicular access, provision shall be made for mobility scooter and wheelchair access, and

e. Lighting conforming to accepted National Guidelines for Crime Prevention through Environmental Design in New Zealand principles shall be provided and shall ensure that glare does not encroach into adjacent residential properties but still effectively illuminates the accessway.

3.2.21. Facilities for Vision Impaired Pedestrians

Facilities for visually-impaired pedestrians (i.e. TGSI - tactile pavers) shall be installed in accordance with the Waka Kotahi RTS14: Guidelines for Facilities for Blind and Vision Impaired Pedestrians at:

a. Crossing points at arterial or collector roads, including pedestrian throat islands, refuge islands and median islands,

b. Signalised intersections and signalized pedestrian crossings,

c. Zebra crossings,

d. Bus stops, and

e. Other areas of high pedestrian activity such as shared zones, pedestrian malls, shopping centres.

Further installation guidance can be found in Waka Kotahi Technical Advice Note for Tactile Installation TAN #20-20.

3.2.22. Cycle Facilities

Cyclists are generally expected to share the movement lanes on roads. Where a shared off-road cycleway/footpath or a dedicated cycleway is required or where good design requires separation from the carriageway, the facilities shall be designed in accordance with the Austroads Guide to Road Design - Part 6A: Paths for Walking and Cycling and the Waka Kotahi Cycling Network Guidance.

Off-road facilities designed for use by cyclists and shared with pedestrians shall have a minimum width of 3.0 m unless specified otherwise by resource consent conditions. Off road cycle ways and/or shared paths shall have a maximum gradient of 12.5%, a minimum lateral clearance of 700 mm and a minimum overhead clearance of 2.5 m from any fixed object (including trees) and shall be surfaced with either concrete or asphaltic concrete.

On road cycle lanes shall be surfaced with either chip seal or asphaltic concrete and marked to the Waka Kotahi's Traffic Control Devices Manual requirements.

3.2.23. Berms

3.2.23.1 General

Berms shall be provided between the edge of the formed carriageway and the road legal boundary to accommodate footpaths, road signs, road lighting, underground services, landscaping and grass areas.

Berms shall be of adequate width to:

a. Achieve safe clearances between the carriageway edge and any obstacle (minimum 600 mm urban and 1500 mm rural),

b. Allow running of utility services and placing of street lighting poles within the berm,

c. Provide adequate space between the road reserve boundary and the carriageway edge to enable residents to safely enter the road traffic,

d. Allow for efficient road edge and edge drain maintenance,

e. Allow for accessibility and effective operation and maintenance of stormwater assets,

f. Allow for adequate growth of plants/trees and ease of their ongoing maintenance, and

g. Allow for use of a lawnmower for general maintenance - narrow grass strips less than 0.60 m wide shall be avoided.

3.2.23.2 Urban Berms

Berm crossfall shall typically be 4%, however localised grass berm cross falls may range between 2% and 10% but shall be easily maintainable. Engineering design shall demonstrate that a standard vehicle crossing can be installed as shown on **Sheet 26** and in accordance with **Sheet 23** (breakover angles).

The berm crossfall shall slope towards the road.

Stormwater runoff from berms shall not concentrate, cause ponding, flooding or a nuisance to adjacent properties or adversely affect footpaths and compromise a safe usage.

Berms shall have compacted base with layer of topsoil from 100 mm to 300 mm deep and be grassed. See Section 3.3.8 Berms for construction details.

3.2.23.3 Rural Berms

Where practicable, rural berms should be constructed to the same standard as urban berms. Provision shall be made for footpaths in accordance with Section 3.2.11.2 Design Footpaths.

3.2.24. Trees and Landscaping

Landscaping including structures and street trees shall not compromise sight lines, underground services, or the safety of road users, cyclists and pedestrians.

Trees shall not be planted within 10 m of power poles, vehicle crossings, bus stops and pedestrian crossings. Clearances from lighting columns shall be in accordance with Northland Transportation Alliance Design Manual - Street Lighting Version 1.

The mature size of any tree or garden planting shall be assessed for each planting location and shall be in scale with the surrounding street environment. Street trees shall be suitably located and meet the requirements of Section 7.2.8 Street Tree Planting Design Considerations.

All proposed berm planting and landscaping structures shall be shown on the engineering drawings submitted for approval and the design shall be in accordance with Chapter 7: Public Spaces and Landscape Works. The approval of WDC will be required for all such plantings and structures. The Developer is encouraged to discuss landscape concepts with WDC prior to applying for resource consents, to ensure the suitability of the proposal and consistency with the ES.

Street trees and other planting are considered to be assets for the purposes of as-built information.

3.2.25. Road Names and Signs

Names for new roads (including private roads and accessways serving more than five lots), will be determined by WDC in accordance with the WDC Policy #0064 - Road Naming. The Developer shall submit three names to WDC for approval in order of preference well in advance of the vesting of the road (or the creation of the title or easement for private accessways).

Road name signs shall be in accordance with Table 3-13 and comply with the details in **Sheet 24** and **Sheet 25**. The following requirements for road name signs shall also be met, where applicable:

a. ‘No exit’ supplementary blades shall be erected on all cul-de-sac and dead-end road signage.

b. ‘Private access’ supplementary blades shall be erected on all private road and accessway signage.

c. The WDC logo shall only be placed on public road signage.

d. All signage shall be erected at intersections.

Table 3-13: Road Name Signage

Parameter	Urban and Rural Arterial Roads	All Other Public Roads	Private Roads and Accessways
Blade Size	200 mm	150 mm	150 mm

Parameter	Urban and Rural Arterial Roads	All Other Public Roads	Private Roads and Accessways
Background Colour	Blue	Blue	White
Letter Colour	White	White	Blue
Letter Height	150 m	100 mm	100 mm
Letter Type	Transport	Transport	Transport

3.2.26. Vehicle Entrances

3.2.26.1 General

Where a site has frontage to more than one road, the vehicle entrance shall be onto the road that has the lower class in the roading hierarchy.

The number of vehicle crossings per allotment shall not exceed those shown in Table 3-14.

Table 3-14: Maximum Number of Vehicle Crossings per Allotment

Frontage (m)	Low Volume Access	Access	Secondary Collector	Primary Collector	Arterial	Regional	National
0 - 16	1	1	1	1	1	Specific Approval	
17 - 60	2	2	1	1	1		
61 - 100	3	3	2	1	1		
>100	3	3	3	2	1		

Notes:

1. *The frontage measurement will only apply to the road front approved for gaining entrance.*
2. *Paddock entrances in rural Environments, with less than 10 vehicle movements per month, are exempt from the provisions of this Table.*
3. *This Table does not apply to service stations where they comply with the Waka Kotahi's Guidelines for Service Stations.*

The minimum distance of a vehicle entrance from an intersection is shown in Table 3-15. Distances are measured along the centreline of the frontage road from the centreline of the vehicle entrance to the edge of the carriageway of the intersecting road.

Table 3-15: Minimum Distance of Vehicle Crossing from Intersections

Intersecting Road Classification (distance in metres)					
Frontage Road	**National**	**Regional**	**Arterial**	**Primary and Secondary Collector**	**Access and Low Volume Access**
Speed Limit up to 50 km/hr					
National	Specific Design				
Regional					
Arterial	70	70	70	55	35
Primary and Secondary Collector	40	40	40	40	20
Access and Low Volume Access	25	25	25	25	10
Speed Limit over 50 km/hr					
National	Specific Design				
Regional					
Arterial	180	180	180	180	90
Primary and Secondary Collector	75	75	75	60	60
Access and Low Volume Access	75	75	75	60	60

The angle of vehicle entrances should be 90°, although a minimum angle of 70° can be used when justified by other constraints (as approved by WDC). Vehicle crossings may not be situated within the curve radius at intersections.

Where access points are not clearly identifiable at the development stage, crossings shall be constructed at the building consent stage.

Entrance crossings shall be designed and constructed in such a manner that will control stormwater runoff entering or exiting a property from the road, and prevent stormwater and detritus, including gravel, dirt and other materials, migrating in flow direction. Vehicle crossings shall be designed for use by a standard design vehicle without grounding and shall comply with the breakover and departure angles specified on **Sheet 23**.

All crossings shall demonstrate that vehicles exiting them are able to do so without crossing the road centreline and/or tracking outside the crossing flares. This is particularly applicable to commercial crossings.

Crossing locations shall comply with the minimum sight distance requirements of **Sheet 4**. Sight lines shall be contained within the road reserve.

Construction of a vehicle crossing over water meters, fire hydrants, valve boxes, cess pit grates, or other stormwater assets shall be avoided, unless specifically approved by WDC.

Specific Design shall be provided for the crossing of swales and/or infiltration devices used for stormwater management. The design shall demonstrate that maintenance access is available to ensure the operation of the swale and/or infiltration device will not be compromised in any way. An acceptable design option is shown on **Sheet 16**. Consent notices may be required to be registered on affected property titles where such crossings are not constructed at the time of subdivision.

Vehicle entrances on State Highways shall comply with the requirements of the Waka Kotahi and obtain their prior approval.

Note: Maintenance of a vehicle crossing is the ongoing responsibility of the property owner(s) served by it.

3.2.26.2 Urban Crossings

A vehicle crossing shall be provided at the development stage between the kerb line and the road boundary at the entrance to all private accessways and service lanes, and at any other place where the location of the future driveway to a lot can be determined with reasonable certainty (e.g. panhandle shaped lots, corner lots).

Vehicle crossings in urban areas shall be constructed in concrete with surface finish to match the surfacing of the adjacent footpath.

Private accessways and driveways sloping up from the road shall have a stormwater system installed at the boundary as detailed on **Sheet 18**.

Vehicle crossings for individual lots and private accessways shall comply with the details on **Sheets 18** and **Sheet 19**.

3.2.26.3 Commercial and Industrial Crossings

All lots in areas zoned for commercial or industrial activity and all developments in other zones for commercial or industrial activities shall have an industrial standard crossing. Dimensions and construction details are provided in **Sheets 19** and **Sheet 22**.

3.2.26.4 Rural Crossings

A vehicle crossing shall be provided at the development stage at the entrance to all private accessways and at any other place where the location of the future driveway to a lot can be determined with reasonable certainty (e.g. panhandle lots).

On sealed roads, vehicle crossings shall be sealed to the road boundary or for a minimum distance of 10 m from the edge of the carriageway (whichever is the greater) and to a standard not less than that of the adjoining road surface. Asphaltic concrete or concrete may be used as alternative to chip seal. Where the access slopes up from a sealed road the crossing shall be sealed a minimum distance of 10 m from the edge of the carriageway and designed to ensure debris does not get flushed onto the road creating a danger to cyclists and motorcyclists (e.g. initial negative gradient away from the road).

If the access slopes away from the road, an area not less than 3 m long shall be provided from the edge of the carriageway at a gradient not exceeding 3%.

The crossing shall not obstruct any drainage facilities within the berm. Where the drain is shallow and only carries low rain flow, the crossing may pass through the drain. Where the drain is of an unsuitable shape or carries significant rain flow the drain shall be piped under the crossing. Pipes and end treatments shall be sized appropriately for the catchment intercepted but shall be a minimum 300 mm diameter. Traversable culvert safety ends complying with Waka Kotahi Specification M/23 shall be constructed to minimize safety risk and eliminate culvert end snagging hazards.

Rural crossings shall be designed to accommodate the largest vehicle that is likely to access the site.

Vehicle crossings for individual lots and private accessways shall comply with the following:

Type 1A	A basic entrance with flares but no local widening as shown on **Sheet 21**.
Type 1B	Shall be used for dairy tanker entrances and the like as shown on **Sheet 21**.
Type 2	A basic entrance with some local widening as shown on **Sheet 21**.
Type 3	The same as the Waka Kotahi 's 'Diagram D' standard (as described and shown in Appendix 5B of the Waka Kotahi Planning Policy Manual) except that 3 of the 4 tapers shall be 1:20 rather than 1:10 – those tapers being both tapers on the opposite road from the crossing and the taper for a vehicle decelerating to turn left into the entrance.
Type 4	A right turn bay and/or full left turn lane marked out in accordance with the Waka Kotahi Manual of Traffic Signs and Markings for the operating speeds of non-turning vehicles as they approach the entrance.

Criteria for the entrance crossing types are given in Figure 3-1 and Figure 3-2. Note that these Figures **do not** apply to rural intersections. They relate only to private rural entrances including private accessways.

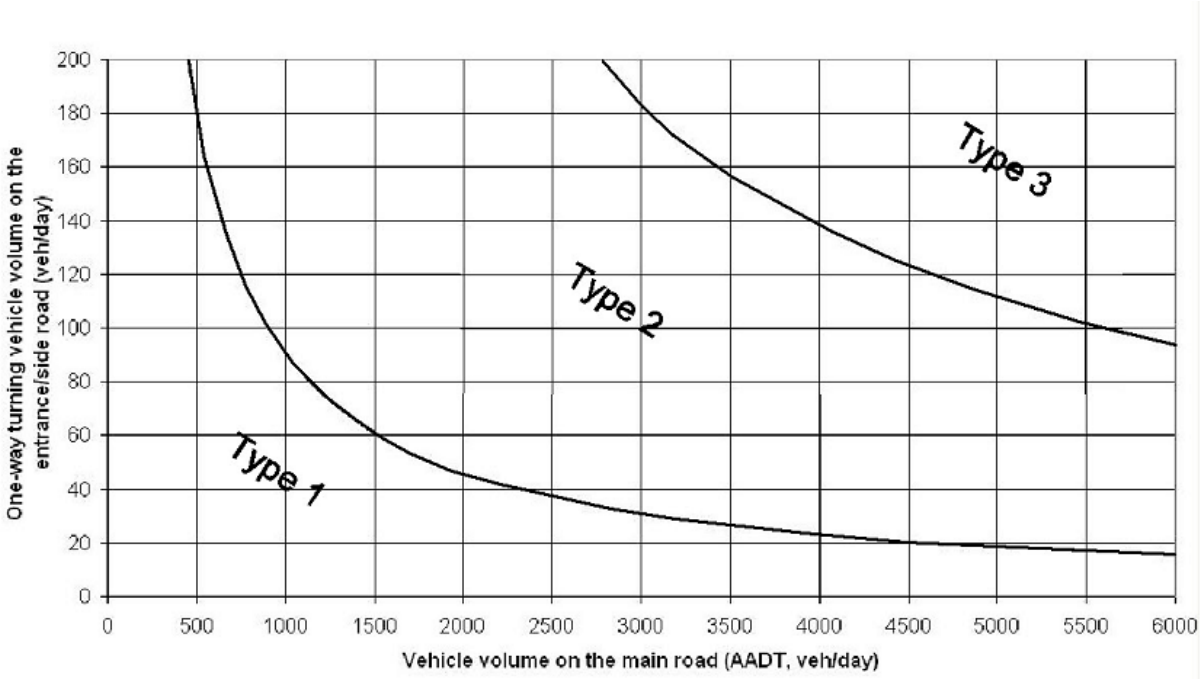

Figure 3-1: Criteria for Vehicle Entrance Types (Rural)

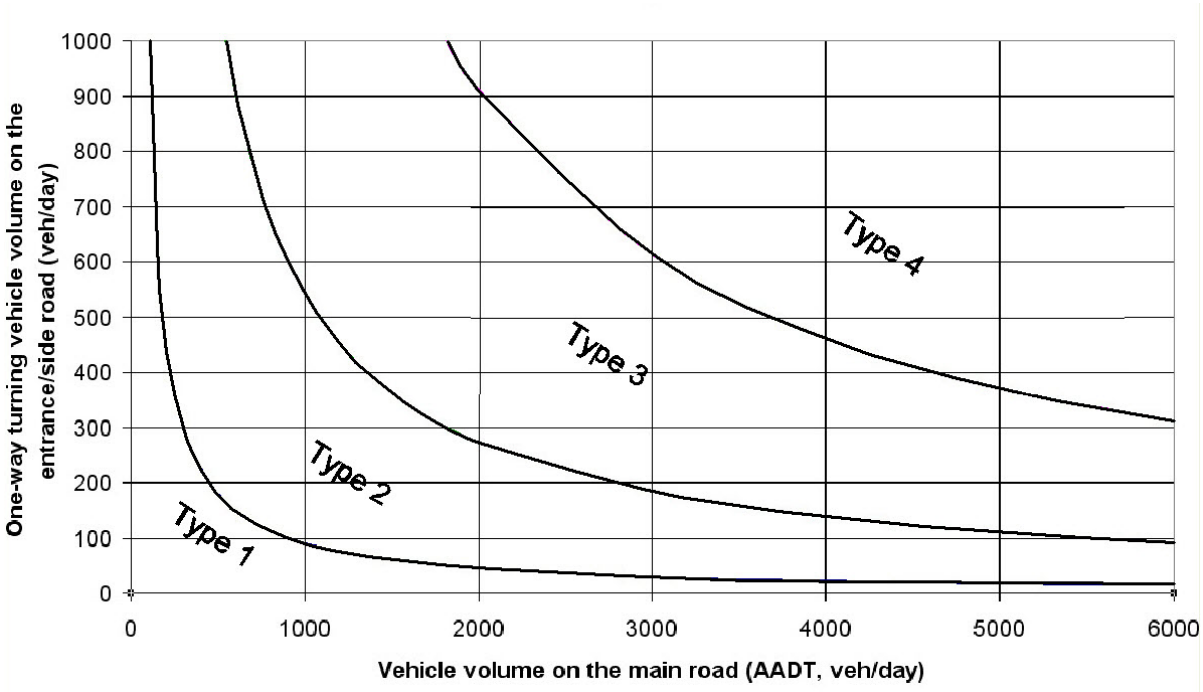

Figure 3-2: Criteria for Vehicle Entrance Types (Rural) - Extended

For Types 2 & 3 the criteria shall be applied separately to each direction of turn into the entrance crossing. It is acceptable for entrances to have different treatment types on each side of the main road provided the expected volumes of each turn have been assessed by a traffic engineering SQEP. With Types 2 & 3 treatments the left turn component applies to the widening on the same side of the main road and the right turn component applies to the widening on the opposite side of the main road.

3.2.27. Private Accessways

3.2.27.1 General

Vehicular accesses that serve eight or less lots or Household Units shall be private accessways, except where WDC agrees that they become public road through resource consent conditions.

Unless approved otherwise through the resource consent conditions, private accessways serving more than eight lots or Household Units shall be formed to the requirements of the relevant road standard. Minimum legal and carriageway widths shall conform to Table 3-16.

Table 3-16: Minimum Width Requirements – Private Accessways

Category	Criteria (Household Units)	Minimum Legal Width (m)	Minimum Carriageway Width (m)			Footpath Width (m)	Minimum Surfacing Requirement
			Unsealed Shoulder	Surfacing Width[17]	Total		
Urban							
A	2 - 4	4.0	-	1 x 3.0	3.0	-	Seal or Concrete
A(Alt) [16]	2 - 4	5.0	-	1 x 4.0	4.0	-	Seal or Concrete
B	5 - 8	6.0	-	1 x 4.5	4.5	1 x 0.95	Seal or Concrete
Rural							
C	2	4.0	2 x 0.25	1 x 3.0	3.5	-	Aggregate[18]
C(Alt) [16]	2	5.0	2 x 0.25	1 x 4.0	4.5	-	Aggregate[18]
D	3 - 5	6.0	2 x 0.25	1 x 4.0	4.5	-	Aggregate[18]
E	6 - 8	10.0	2 x 0.25	2 x 2.75	6.0	-	Seal

16. If a fire appliance has to use the private accessway, then the **alt** option will apply to the design of the private accessway. This decision will be made by WDC after examining the available reticulation etc (Refer to NZ Building Code C/AS1 Part 6: Fire Fighting – July 2014)

17. Private accessways in industrial/commercial developments shall be formed to service lane standards. See **Sheet 2**.

18. Refer to Section 3.2.26 Vehicle Entrances for instances where sealing is required for rural private accessways.

Where a private accessway serving more than eight household equivalents is gated, the gates shall be located far enough from the carriageway and provided with turning facilities to enable a standard design vehicle to enter the accessway and turn around, without passing the gates or affecting through traffic on the public road.

Where a public sewer pump station or fire hydrant is located within, or accessed via a private accessway, an adequate turning and parking area for service vehicles and fire appliances in the vicinity of the pump station or hydrant shall be provided and the access designed to take heavy vehicles. Refer to 5.2.10.4 Layout and Access and 6.2.9.2 Hydrant Locations for further details. The minimum carriageway width shall be 4.0 m. See NZ Building Code C/AS1 Part 6.

Where a private accessway contains public water and/or sewer reticulation, the legal width shall be increased to accommodate the minimum clearances required by **Sheet 30**.

Easements in gross in favour of WDC may be required to be created over accessways containing public utility services.

Provided the subgrade CBR (in-situ test) is not less than 7, the construction may be in accordance with **Sheet 7**, **Sheet 8**, **Sheet 9** and **Sheet 10**. Where the subgrade CBR is less than 7, the pavement shall be specifically designed by a SQEP.

3.2.27.2 Urban Private Accessways

The maximum gradient shall be:

a. 12.5% for the first 5 m from the road reserve boundary, and

b. 22.2% for the remainder.

The crossfall shall be 3%.

On accessways in excess of 100 m long and less than 4.5 m carriageway width, passing bays shall be provided at points of intervisibility (at approximate 50 m intervals). For such passing bays the carriageway width should be increased to 5.5 m over a 15 m length including 5 m tapers at each end.

Surface water from the accessway shall be collected in a catchpit and/or directed to a stormwater conveyance system with an approved outfall. Generally, kerb discharge or any discharge that may reach a road carriageway directly or indirectly will not be permitted. Where an accessway falls away from the road, stormwater control shall be provided to ensure that stormwater from the road via accessways does not concentrate onto a private property. See also Section 3.2.26 Vehicle Entrances. Stormwater attenuation and treatment shall comply with the requirements of Chapter 4: Stormwater and Drainage.

Private accessways shall comply with the construction requirements of Section 3.3.9 Private Accessways and the details on **Sheet 7** and **Sheet 8**.

3.2.27.3 Rural Private Accessways

The maximum gradient shall be:

a. 12.5% for the first 5 m from the road reserve boundary, and

b. 22.2% for the remainder.

The crossfall shall be 3% (sealed) or 6% (unsealed)

All accessways in the Rural Living, Rural (Urban Expansion) and Rural Village environments shall be sealed. In other rural environments all accessways serving six household units or more shall be sealed and/or where the gradient exceeds 12.5%.

On accessways in excess of 200 m long and less than 4.5 m carriageway width, passing bays shall be provided at points of intervisibility (at approximate 100 m intervals). For such passing bays the carriageway width should be increased to 5.5 m over a 15 m length including 5 m tapers at each end.

Where an unsealed accessway joins a sealed road, the accessway shall be sealed from the edge of the seal to at least the property boundary to prevent metal migrating onto the road. In addition, the provisions of Section 3.2.26 Vehicle Entrances shall apply for the crossings.

Surface water from the accessway shall not be permitted to concentrate onto any property which could be at risk of instability or erosion and shall comply with the requirements of Chapter 4: Stormwater and Drainage.

Similarly, surface water from the road reserve shall be prevented from flowing onto a private accessway in an uncontrolled manner.

On all side drains, where the gradient is steeper than 6.7%, scour protection such as concrete, rock riprap, check dams, a combination thereof or similar shall be provided. All outlets shall likewise be protected from scour and located to minimise the risk of slope instability.

Private accessways shall comply with the construction requirements of Section 3.3.9 Private Accessways and the details on **Sheet 9** and **Sheet 10**.

3.3. Construction

3.3.1. General

Road construction shall be carried out to the requirements and standards of WDC approved drawings and specifications so as to achieve the intended design life. Where there is conflict between the approved documents and the ES, the ES shall take preference.

Road construction includes all associated construction within the Transport Corridor, together with private road and accessway construction, and applies equally to new works and to upgrading works.

3.3.2. Pavement Materials

These requirements apply to flexible pavements for public and private roads and for private accessways. For rigid pavements such as concrete refer to Austroads guides.

The design may utilise high strength materials (e.g. Waka Kotahi M/4 basecourse), or lower strength modified materials (e.g. lime or cement stabilised GAP 40 basecourse). The designer shall specify the material standards required by the design.

The Developer shall provide test data to confirm compliance with the specified material standards required for the design.

3.3.2.1 Granular Rock Fill Material (when used as a Subgrade Improvement Layer)

This material is a non-specific quarry aggregate suitable for use as a subgrade improvement layer. Lime rock is not acceptable as a granular fill.

This sub-base material shall have minimum soaked CBR of 20 and a nominal maximum size.

The material shall be suitably graded, moderate to highly weathered quarry rock with sufficient fines to aid compaction. A minimum of 10% by dry mass shall be unweathered (blue) material to ensure a level of durability.

The source of supply of all materials shall be nominated and the material shall be tested to ensure the CBR requirement can be achieved, and test results shall be provided. The material shall have the following properties:

a. A crushing resistance not less than 80 kN,

b. Well graded with grading such that 100% of the material is less than 75 mm maximum size with no more than 65% passing a 19.0 mm sieve and 3% - 18% passing a 1.18 mm sieve, and

c. A sand equivalent equal to or greater than a value of 20.

Evidence of these properties will be required for approval by WDC.

3.3.2.2 Aggregate Pavement Layers

GAP aggregates shall comprise crushed aggregate and shall be free of all non-mineral matter. GAP 65 is a commonly used suitable sub-base material and lime stabilised GAP 40 a commonly used suitable basecourse material. Use of other complying materials is not precluded – e.g. Waka Kotahi M/4.

3.3.2.2.1. GAP Aggregates

GAP aggregates shall meet the material standards specified in Table 3-17 when tested in accordance with the specified test, the grading limits defined in Table 3-18 and the shape control of Table 3-19. The grading limits defined in Table 3-18 shall be tested in accordance with NZS 4402:1986 Test 2.8.2 ‘Subsidiary Method by Dry Sieving’ or NZS 4402:1986 Test 2.8.1 ‘Standard Method by Wet Sieving’ where aggregates contain clay or other fine material causing aggregation of the particles.

Table 3-17: Materials Standards for GAP Aggregates

	Test	Standard
Crushing Resistance (kN)	NZS 4407:2015 Test 3.10	>110kN
Weathering Quality Index	NZS 4407:2015 Test 3.11	AA, AB, AC, BA, BB,CA or CB
Clay Index	NZS 4407:2015 Test 3.5	>3.5, <8.0
California Bearing Ratio	Compacted to NZS 4402:1988/1986 Test 4.1.3, Tested to NZS 4407:2015 Test 3.15	Not less than 40 %
Sand Equivalent	NZS 4407:2015 Test 3.6	Not less than 25 Not less than 40 when modified
Lime Reactivity (where applicable)	Tested by the Soaked CBR Test 3.15 of NZS 4407:2015 for 0% & 3% of lime (calcium oxide) by weight with NZ vibrating hammer compaction.	The soaked CBR of the 3% lime sample shall: Exceed the soaked CBR value of the 0% lime sample by more than 150% and Have a CBR value greater than 170%

Table 3-18: GAP Aggregate Grading Limits (Dry Sieving)

Test Sieve Aperture	Percentage Passing			
	Waka Kotahi M/4 (AP 40)	GAP 65	GAP 40	GAP 20
63.0 mm	-	100	-	-
37.5 mm	100	70-85	100	-
19.0 mm	66-81	46-68	63-81	100
9.5 mm	43-57	31-54	41-57	52-75
4.75 mm	28-43	20-41	26-43	31-55
2.36 mm	19-33	13-32	18-33	21-42
1.18 mm	12-25	9-23	11-25	13-31
600 micron	7-19	6-16	6-19	7-23
300 micron	3-14	3-12	3-14	5-16
150 micron	10 max	10 max	10 max	12 max

Test Sieve Aperture	Percentage Passing			
	Waka Kotahi M/4 (AP 40)	GAP 65	GAP 40	GAP 20
75 micron	7 max	6 max	7 max	8 max

Table 3-19: Aggregate Grading Shape Control

Fractions	Percentage of Material in Fraction			
	Waka Kotahi M/4 (AP 40)	GAP 65	GAP 40	PAP 20
37.5 – 9.5 mm	-	24-46	-	-
19.0 – 4.75 mm	28-48	15-37	27-49	-
9.5 – 2.36 mm	14-34	10-31	13-34	19-47
4.75 – 1.18 mm	7-27	7-25	7-28	8-35
2.36 mm – 600	6-22	6-19	6-22	6-27
1.18 mm – 300	5-19	5-16	5-19	3-21
600 – 150 micron	2-14	2-12	2-14	2-17

3.3.2.2.2. Equivalent Waka Kotahi M/4 AP40 Quality Basecourse Material

"Equivalent Waka Kotahi M/4 AP40 quality basecourse" must comply with all parts of the Waka Kotahi M/4 Specification except those requirements which are directly reduced by the allowance of the use of GAP 40 material as specified. These are as follows:

a. Crushing resistance can be as low as 120 kN instead of 130 kN.

b. Weathering quality index "CB" acceptable in addition to normal Waka Kotahi M/4 range.

c. Sand equivalent of GAP 40 aggregate prior to modification can be as low as 28 (modified must comply with Waka Kotahi M/4 requirement of 40).

d. Aggregate Grading Envelope & Shape Control prior to modification to comply with GAP 40 requirements specified in Table 3-18. The equivalent Waka Kotahi M/4 AP40 Quality Basecourse need not comply with Waka Kotahi M/4 grading requirements, however, after stabilisation the maximum particle size shall not be less than 26.5 mm.

Alternatively, material fully complying with the Waka Kotahi M/4 Specification may be used.

3.3.2.2.3. GAP 20 Running Course

The running course of an unsealed pavement shall consist of GAP 20 aggregate with the following properties:

a. A crushing resistance of 110kN to 230kN when tested in accordance with NZS 4407:2015 Test 3.10,

b. A clay index greater than 3.5 and less than 10.0 when tested in accordance with NZS 4407:2015 Test 3.5,

c. Meet the grading limits of Table 3-18, and

a. Aggregate sources that produce stones that are hard, elongated and with sharp cutting edges capable of puncturing car tyres shall not be used.

3.3.3. Pavement Construction

3.3.3.1 Subgrade Layer

The subgrade may be fill or undisturbed material and shall be free of organic matter and other harmful material. It shall be constructed to meet the requirements of the pavement design and Waka Kotahi's Specification F/1 - Earthworks Construction. Wherever practicable, the natural in-situ material shall be used in construction of the subgrade by implementing compaction or other methods of modification to meet the required subgrade strength. Such methods of modification may include:

a. Lime or cement stabilization,

b. Use of geotextile fabrics and/or grids,

c. Drying and re-compaction of material,

d. Subgrade drainage improvements, or

e. A combination of the above.

Where the in-situ material is unsuitable to be used as subgrade, it shall be replaced by imported subgrade material fit for purpose and shall be subject to approval by WDC before use – see Section 3.3.2.1 Granular Rock Fill Material (when used as a Subgrade Improvement Layer).

The subgrade material, whether in-situ or imported, shall be compacted to a depth of not less than 600 mm. It shall be placed in layers not exceeding 150 mm (compacted thickness) and as close as practicable to optimum moisture content. The material shall be compacted to the specified CBR value. Measurement of CBR value shall be by CBR in-situ tests or, in the case of non-cohesive material, by a suitable calibrated Scala Penetrometer test.

For cohesive soils, the Scala Penetrometer test may be used as a measure of uniformity. Irrespective of the CBR and Benkelman Beam results, the standard of compaction shall not be less than 95% of the optimum dry density of the material as specified in NZS 4402:1988/1986 Test 4.1.1 or Test 4.1.3.

Compaction shall cease if the material shows signs of excessive weaving or heaving and shall not recommence until the problem has been resolved.

The entire surface of the compacted subgrade shall be made smooth, firm and uniform, by blading, grading and rolling, approximating the crossfall required on the final surface noting that:

a. The reduced level of any point shall be within the limits 0 mm above to 20 mm below the design level, as established by stringing.

b. The surface shall be finished so that all points are within 15 mm below a 3 m straight edge laid at any point on the surface.

See Section 3.3.4 Pavement Testing for testing requirements.

3.3.3.2 Recovered Material

Recovered material may be specified for use as the sub-base layer for the construction of a new pavement, subject to prior approval by WDC.

Where recovered material shall be used and there is a shortfall, the recovered material shall be placed first, with the imported aggregate to make up the shortfall placed on top, subject to suitable depths of each being achievable for effective compaction.

Recovered road pavement for reuse shall have a grading curve within or close to (+/- 3% at any sieve size) the grading of the specified sub-base aggregate and meet the material standards of Table 3-17.

Recovered material with obvious clay intrusions shall not be used in the sub-base.

3.3.3.3 Sub-base Layer

The sub-base layer shall be spread, graded and compacted in accordance with Waka Kotahi Specification B/2 - Construction of Unbound Granular Pavement Layers to achieve a mean of 95% of maximum dry density and a minimum of 92% of MDD, noting that:

a. No sub-base layer material shall be placed until the subgrade has been satisfactorily completed and approved by the WDC,

b. The reduced level of any point on the surface of the sub-base layer shall be within the limits 10 mm above to 0 mm below the design level as established by stringing,

c. The surface shall be finished so that all points are within 15 mm below a 3 m straight edge laid at any point on the surface, and

d. Compaction of the sub-base shall be tested for acceptance as detailed in Section 3.3.4 Pavement Testing.

3.3.3.4 Basecourse Layer

The basecourse layer shall be spread, graded and compacted in accordance with Waka Kotahi Specification B/2 - Construction of Unbound Granular Pavement Layers to achieve a mean of 98% of maximum dry density and a minimum of 95% of MDD noting that:

a. No basecourse layer material shall be placed until all previous pavement layers have been satisfactorily completed and approved by the WDC,

b. The reduced level of any point on the surface of the basecourse layer shall be within the limits 5 mm above to 5 mm below the designed or nominated level as established by stringing,

c. The surface shall be finished so that all points are within 10 mm below a 3 m straight edge laid at any point on the surface,

d. Compaction of the basecourse shall be tested for acceptance as detailed Section 3.3.4 Pavement Testing, and

e. The basecourse shall have a tight stone mosaic surface after sweeping and prior to sealing.

Cement or lime stabilized basecourse shall be placed and compacted in accordance with Waka Kotahi Specification B/5 – In situ Stabilisation of Modified Pavement Layers.

3.3.4. Pavement Testing

The pavement layers shall be tested with all test results to be provided to WDC, whose approval is required before construction of subsequent layers begins. Testing requirements are as follows:

3.3.4.1 Test Spacing

Compaction and material strength tests should be conducted at the locations and spacings shown in Table 3-20.

Table 3-20: Test Locations and Spacing

Carriageway Width	Location	Spacing
Less than or equal to 8.5 m	At the kerbside wheel tracks	Alternating sides, 10 m between tests. (20 m repetition of testing rows)
Greater than 8.5 m	At centreline and kerbside wheel tracks	Staggered across the road, 10 m between tests. (30 m repetition of testing rows)

The kerbside wheel tracks are assumed to be 0.5 m from the edge of the channel or carriageway.

On small sites, there shall be a minimum of 10 tests carried out

3.3.4.2 Subgrade

Prior to sub-base construction, testing of the subgrade shall take place to confirm the design CBR (see Section 3.2.11.3 Subgrade Testing). If subgrade improvement measures have been carried out (such as replacement with pit sand, granular rock fill material or use of a stabilization agent), the materials shall be tested by Scala Penetrometer, where a significant portion of the particles pass a 9.5 mm sieve or by clegg hammer where granular rock is used.

The shape of the subgrade shall be measured by stringing.

3.3.4.3 Sub-base

The compaction of the sub-base shall be tested by nuclear densometer.

The thickness and shape shall be measured by stringing

3.3.4.4 Basecourse

The compaction of the basecourse shall be tested by nuclear densometer.

The thickness and shape shall be measured by stringing

Prior to sealing, clegg hammer and Benkelman testing shall be carried out in the presence of a WDC representative. (Note that Benkelman Beam testing is not mandatory on private accessways).

Such pavements shall not be sealed until all testing has been completed and test results submitted to and approved by WDC. The pavement shall be sealed as soon as practicable after acceptance by WDC, subject to suitable weather conditions.

Private roads and accessways may be sealed under instruction from the SQEP supervising the construction and will require a PS4 Construction Review to be provided to WDC on completion.

3.3.4.5 Testing Methods and Parameters

For Scala Penetrometer testing, the CBR vs Penetration graph is shown on **Sheet 5**. The Scala Penetrometer should only be used when a significant portion of the particle size is less than 9.5 mm.

Subgrade, sub-base and basecourse samples shall be tested by an IANZ accredited laboratory for their soaked CBR values.

Sub-base and basecourse compaction testing should be done using a calibrated nuclear densometer, measuring the compaction as a percentage of the maximum dry density of the material. Compliance values shall be as specified in Section 3.3.3.3 Sub-base Layer and Section 3.3.3.4 Basecourse Layer.

Clegg hammer testing shall be carried out on a surface that has no loose material, at testing intervals as specified in Table 3-20 and the minimum clegg impact value (CIV) shall be in accordance with Table 3-21.

Table 3-21: Minimum Clegg Impact Values

Accessway Type	Basecourse Clegg Values
For all roads to be sealed (public and private)	no value < 45
For all rural roads and vehicle crossings to remain unsealed (public and private, e.g. Dairy farms, forestry).	no value < 30

Accessway Type	Basecourse Clegg Values
For private right of way relating to pavement formation from the road front boundary of a property inwards, requires a consistent pavement strength and compaction result.	no value < 45
For all commercial accessways to be sealed (*Shared ROW).*	no value < 45
For all private accessways to be sealed (*ROW & Joint Access Lot).*	no value < 45
For all private accessways to remain unsealed.	no value < 25
For all commercial vehicle crossings to be concreted & built.	no value < 30
For all residential vehicle crossings to be concreted & built.	no value < 15

Disclaimer: Roading Engineer / Inspector can make exceptions during winter months due to ground conditions, if all other inspection criteria is satisfactory.

Benkelman beam deflections shall be carried out by an IANZ accredited organization and conform to the target deflections in Table 3-22.

No more than 10% of the test results shall exceed the 90th percentile and no single result shall exceed the maximum.

Readings shall be taken at the intervals specified in Table 3-20.

Table 3-22: Benkelman Beam Standards

Road Classification (Urban & Rural)	90th Percentile (mm)	Maximum (mm)
Access roads	1.6	2.0
Collector roads and commercial roads	1.4	1.8
Arterial roads and all industrial roads and lanes	1.2	1.6

3.3.5. Pavement Surfacing

3.3.5.1 General

Acceptable surfacing options are as follows. For the mandatory use of asphaltic concrete refer to Section 3.2.12 Road Surfacing.

a. Hot laid asphaltic concrete laid over a waterproofing sealcoat

b. Chip seal

Other surfacing options include:

c. Concrete block pavers

d. Concrete

Limitations concerning their use are described in Section 3.3.5.3 Concrete Block Pavers, Section 3.3.5.7 Concrete and Section 3.3.5.8 Permeable Pavers.

If special sealing measures are required at an intersection, the special measures shall extend to a distance of 20 m beyond the tangent points of the intersecting roads or accesses.

3.3.5.2 Asphaltic Concrete (AC)

Hot laid asphaltic concrete shall comply with and be constructed in accordance with Waka Kotahi M/10.

Prior to surfacing with AC, a waterproofing sealcoat shall be laid. Where design traffic volumes in residential areas are less than 800 vpd, a single coat grade 5 membrane seal shall be used with a residual bitumen application rate of 1.0 l/m^2. Where traffic volumes are higher and/or there are greater stresses, a waterproofing chip seal shall be applied to the prepared basecourse surface in accordance with Section 3.3.5.3 First Coat Chip Seal. The AC shall be placed no sooner than 14 days after the application of the waterproofing chip seal.

AC paving shall consist of the spraying of a tack coat with a quick breaking bituminous emulsion at an application rate of 0.3 l/m^2 and the spreading and rolling of the AC mix. The finished level shall be between 0 mm and 5 mm proud of the edge of the channel.

For urban access (including low volume) roads and no additional turning stresses, the default mix is Waka Kotahi M/10 DG10 with a minimum thickness of 30 mm.

For urban secondary collector roads, low stress intersections, cul-de-sac turning heads and public carparks, the default mix is Waka Kotahi M/10 AC20 with a minimum thickness of 35 mm.

For road classifications primary collector and above and for all commercial and industrial roads a specific mix design shall be submitted to and approved by WDC.

3.3.5.3 First Coat Chip Seal

A two-coat chip seal shall be applied to the prepared basecourse surface but only when the ground temperature is not less than 10^0C.

The first layer shall consist of the spraying of 180/200 penetration grade bitumen. The bitumen shall be cut back to suit, include one part per hundred adhesion agent and be spread at a rate of 1.2 l/m^2 residual (measured at 15^0C).

The first layer chip shall comprise the spreading and rolling of a grade 3 chip at a spread rate of 75 m^2/m^3. It is essential that the spreading of the first chip layer is carefully controlled such that the chips are evenly spread and are no more than one layer thick over the entire surface.

The second layer shall consist of the spraying of 180/200 penetration grade bitumen. The bitumen shall be cut back to suit, include one part per hundred adhesion agent and be spread at a rate of 0.8 l/m^2 residual (measured at 15^0C).

The second layer chip shall comprise the spreading and rolling of a grade 5 chip at a spread rate of 150 m^2/m^3.

For private accessways, the sealed surface may be a grade 4 chip with a grade 6 dry locking chip rolled in within 5 hours of the application of the grade 4 chip.

Seal binder, chip and adhesion agents shall be in accordance with Waka Kotahi Specifications M/1, M/6 and M/13 respectively and applied in accordance with Waka Kotahi P/3.

For both first and second coat chip seal, the bitumen application shall extend over the lip of the kerb and channel, but not by more than 25 mm. All catchpits, manhole lids, hydrant and valve boxes and the like shall be protected by paper prior to the spraying of bitumen.

Likewise, for both first and second coat chip seal where the new seal adjoins an existing sealed surface, the bitumen application shall extend 300 mm over the existing sealed surface.

3.3.5.4 Second Coat Chip Seal and Resealing

This treatment shall be applied on carriageways to produce a uniform texture on surfaces that have an existing seal coat.

Prior to resealing, all surface and pavement defects shall be repaired. The resealing shall not be applied until 28 days after asphalt patching or levelling of the surface has been completed, or any necessary basecourse repairs have been two coats sealed.

The second coat chip seal carried out between 12 and 18 months after the waterproofing first coat shall consist of the spraying of 180/200 penetration grade bitumen. The bitumen shall be cut back to suit, include one part per hundred adhesion agent and be spread at a rate of 1.3 l/m^2 residual (measured at 15^0C). The chip layer shall comprise the spreading and rolling of a grade 5 chip. If specified, a dry locking coat of grade 5 or 6 chip shall then be applied at a spread rate of 300 m^2/m^3.

3.3.5.5 Second Coat Seal Bond Removal of Surplus Chip

Sealed roads and private accessways shall be swept, and all surplus chip removed from grass berms, footpaths, channels and catch-pits prior to final acceptance by WDC.

3.3.5.6 Concrete Block Pavers

Design and material standards shall comply with NZS 3116:2002 and with the manufacturer's instructions. The pavers shall be readily available standard units and receive the prior approval of WDC. The design of the road shall be carried out by a SQEP. Edges of the paved areas shall be adequately confined by concrete nibs.

Bedding course shall be in accordance with NZS 3116:2002.

When used in roads the basecourse surface shall be given a waterproof sealcoat in accordance with Section 3.3.5.2 Asphaltic Concrete (AC) before the bedding course and pavers are laid.

Pavers shall be laid to 5 mm above the edges of channels.

3.3.5.7 Concrete

Concrete shall be sourced from a special grade plant as defined in NZS 3109:1997**.**

The minimum concrete strength at 28 days shall be not less than:

a. 30 MPa for private ways, service lanes, parking bays, vehicle crossings, mountable kerb & channel and dished channels, or

b. 20 MPa for footpaths and standard kerb & channel.

3.3.5.8 Permeable Pavers

Permeable pavers will not be approved as a running surface for public roads. For any other application within the transport corridor refer to Section 3.2.12.4 Permeable Paving.

3.3.5.9 Surface Tolerances and Finishing

The finished surface of all roads and accessways shall have no abrupt or abnormal deviations, and no areas shall pond water.

The surface shall be of uniform texture and satisfy density standards appropriate to the surfacing.

3.3.6. Kerb & Channel

Kerb and channel shall be placed on a well compacted layer (CBR > 15) of basecourse metal, the surface of which shall be smooth and uniform.

Kerb and channel may be either cast-in-situ or extruded and conform to the profiles of **Sheet 13**. The extrusion machine shall be operated to produce a well compacted mass of concrete which will maintain its shape without support after extrusion and be free from surface pitting and trapped air. A mortar layer nominally 6 mm in thickness should be applied in conjunction with the laying of the kerb and channel and the top and face of the kerb and the channel surface floated over with a steel tool before the mortar has finally set.

Concrete used shall be ready mixed concrete from a certified plant and shall be not less than 20 MPa 28-day strength for standard kerb and channel and 30 MPa for mountable kerb and channel.

Contraction/expansion joints shall be formed at a maximum spacing of 3.0 m to a minimum depth of 40 mm. All cold joints shall be likewise sawcut. Should cracking occur adjacent to a saw cut, a minimum 1.5 m section of kerb and channel shall be removed and recast.

Channels shall not pond water (minimum gradient 1:200) and flow shall be maintained past all vehicle and accessible (pram) crossings.

Kerb blocks with cast-in-situ channels shall be the subject of Specific Design and requires prior approval from WDC.

3.3.7. Footpaths, Cycleways and Vehicle Crossings

This section outlines the work required to construct, reinstate or repair footpaths, off road shared cycle paths and vehicle crossings.

3.3.7.1 Subgrade Preparation

The exposed subgrade shall be tested by using a Scala Penetrometer for compliance with a CBR value of not less than 10.

If the material fails this test then:

a. The existing subgrade shall be further compacted, to improve the CBR value, or

b. The unsuitable material shall be excavated, removed from site, replaced with suitable material, compacted up to subgrade level and re-tested.

The subgrade area, either existing or modified, shall be trimmed, shaped and compacted to provide uniform support for the basecourse.

3.3.7.2 Basecourse Layer

The basecourse layer shall be constructed of bedding sand and/or GAP metal depending on the surfacing and shall form a compacted pavement depth conforming to the relevant drawing Sheets.

For asphaltic concrete footpaths and cycle paths, the final basecourse surface shall have a tight stone mosaic surface, with no loose aggregate, suitable for the application of a tack coat and an asphalt layer.

3.3.7.3 Concrete Surfacing

Formwork shall comply with the requirements of NZS 3109:1997.

Concrete used shall be ready mixed concrete from a certified plant and shall not be less than 20 MPa 28 day strength for footpaths and cycle paths and 30 MPa for vehicle crossings. The concrete shall be placed so that the coarse aggregate does not separate from the fines, and it shall be thoroughly worked and consolidated into all parts of the formwork, so that no voids or cavities are left.

Strict attention shall be paid to adequate curing. Immediately after placement, concrete shall be protected from premature drying, excessively high or low temperatures and mechanical damage and shall be maintained with minimal moisture loss for the necessary curing period and hardening of the concrete. In hot dry weather this will involve the use of sprinklers. In cold or wet weather, concrete shall be protected from the elements during the curing period by covering with sheets of PVC or alternative approved material.

Footpaths and cycle paths shall be a minimum of 100 mm thickness and formed over not less than 50 mm compacted depth of fine granular material and shall be laid with construction joints at not more than 3.0 m intervals. See **Sheet 12**.

All final path and vehicle crossing surfaces shall be true to the lines and levels specified and 'broom' finished. Surfacing shall comply with D1/AS1 Table 2 of the NZ Building Code for acceptable wet slip resistance for sloping walking surfaces. The final surface shall not vary by more than 5 mm when checked with a 3 m straight edge. No finished surface shall hold water.

The use of coloured concrete exposed aggregate or patterned surfaces will require the specific approval of WDC.

3.3.7.4 Asphaltic Concrete Surfacing

AC footpaths and cycle paths shall be subject to the specific approval of WDC.

Footpaths, cycle paths and vehicle crossings shall be laid to the compacted basecourse and AC depths shown on the relevant Drawing Sheets.

They shall be edged with either concrete, kerb blocks, brick pavers or timber edging. See **Sheet 12**.

The prepared basecourse surface shall be swept to remove all loose metal and debris prior to the application of a tack coat. The tack coat shall be applied to all surfaces where the asphalt material will be placed and at an application rate of 0.25 litres/m². The final surface shall be flush with the top of the edging and graded uniformly between. Depressions or irregularities that may cause water to pond will not be accepted in the finished surface.

All asphaltic concrete shall be laid in accordance with Waka Kotahi M/10, except that plant appropriate to the size of the area being surfaced shall be used.

3.3.7.5 Concrete Paver Surfacing

Concrete paver footpaths shall be subject to the specific approval of WDC.

They shall be laid to 5 mm above the tops of channels and shall be edged with concrete.

3.3.8. Berms

On completion of all other works, the berms shall be prepared and spread with good quality topsoil to a lightly compacted depth of not less than 100 mm and not more than 300 mm. The topsoil shall be free of weeds, stones and other foreign matter and graded to kerb top and footpath edges, and shall be finished 15 mm high to allow for settlement except on the low side of the footpath where the topsoil shall be finished flush to prevent water ponding.

Berms will typically be grassed but may be landscaped if it is impracticable to maintain as grass. Any landscape planting design and implementation shall be in accordance with Chapter 7: Public Spaces and Landscape Works.

The berms shall be sown with a grass seed mixture the generic characteristics of which are such that the grass cover is low growing, with a robust and deep rooting system well suited to the soil conditions. An 80% grass strike shall be achieved within one month of sowing and the grassed areas shall be maintained free of excessive weed growth and

shall be kept mown throughout the maintenance period and immediately before being taken over by WDC.

All poles, signposts, light standards, marker posts, electricity transformers, cast iron boxes, etc. set in grass berms shall be finished off with a concrete mowing strip 150 mm wide and 75 mm thick surrounding the base, flush with the finished ground level.

No grassed berms less than 300 mm in width shall be approved. Where mowing strips are required within 300 mm of hard stand areas (footpaths etc.) the gap shall be concreted and not grassed.

3.3.9. Private Accessways

Refer to Section 3.2.27 Private Accessways for the design requirements for private accessways, Section 3.3.5 Pavement Surfacing for surfacing requirements, and to **Sheet 7**, **Sheet 8**, **Sheet 9** and **Sheet 10** for construction details.

The subgrade CBR shall be tested for both the concrete and sealed options of **Sheet 7**, **Sheet 8**, **Sheet 9** and **Sheet 10,** clegg testing shall be carried out in accordance with Section 3.3.4.5 Testing Methods and Parameters.

The associated vehicle crossings shall comply with the requirements of Section 3.2.26 Vehicle Entrances and Section 3.3.7 Footpaths, Cycleways and Vehicle Crossings.

3.3.10. Reinstatement and Contractor Damage

Superfluous vehicle entrance crossings and the like along the road frontage of any development shall be removed and the ground reinstated to match existing features. Likewise, any damage caused to any feature or service within the Transport Corridor as a consequence of the contractor's/Developer's actions shall be repaired at the contractor's/Developer's expense.

A photographic record of the existing road frontage should be taken before works commence to establish the existing condition of all such features. Refer to Section 1.6.5.8 Protection and Remediation of Existing Trees, Services, and Roads.

3.4. Completion of Works

3.4.1. General

Following completion of the work, a producer statement (construction) PS4 Construction Review (or similar and approved), along with all testing, measuring etc. shall be supplied to WDC for approval.

3.4.2. As-Built Information and RAMM Data

As-built drawings, a schedule of asset information and Operation and Maintenance Manuals, and RAMM Data shall be submitted in accordance with Section 1.7.2 As-Built Plans, Asset Information Schedules, Operation and Maintenance Manuals.

3.4.3. Second Coat Seal Bond

The second coat chip seal required as a consequence of Section 1.6.5.8 Second Coat Chip Seal and Resealing shall require a bond in terms of Section 1.6.5.8 Bonds. The bond shall be released upon satisfactory completion of the works as determined by the WDC.

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