WHANGAREI DISTRICT COUNCIL

Environmental Engineering Standards

Issue 1

Operative from 1 July 2010

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We acknowledge the following councils for allowing us to use parts of their Standards/Codes of Practice in compiling this document:

Christchurch City Council

Waimakariri District Council

Whangarei District Council welcomes users of this document to copy parts of it for their own use, providing that appropriate acknowledgement of the source is made.

Enquiries regarding the document may be directed to the group manager Infrastructure and Services or the senior environmental engineering officer.

Amendments

No.	Date	Description
1.	20/7/2010	Correct 4.11.1: 2% to 5%: correct hyperlinks in 1.4.1.3
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12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

Table of Contents

Section 1 Referenced Documents, Glossary and Abbreviations

1.1 Referenced Documents

Where conflict exists between any referenced document and the WDC Environmental Engineering Standards (EES), the WDC EES shall take preference, except where there is conflict between the Whangarei District Plan and the EES, in this case the District Plan shall take preference.

Note The most up-to-date of any publication/standard shall supersede any conflicting requirements of older documents

- Auckland Regional Council
  - Erosion and Sediment Control Guidelines for Land Disturbing Activities (TP 90). http://www.arc.govt.nz/plans/technical-publications/technical-publications/technical-publications-51-100.cfm
- Building Act 2004 and amendments
- Building Industry Authority (BIA) New Zealand Building Code www.dbh.govt.nz/bcl-get-a-copy-of-building-code
- Coastal Management Plan for Northland
- Coastal Management Strategy
- Electricity Act 1992 and amendments
- Fencing Act (1978)
- Guide for Safety with Underground Services – Occupational Health and Safety
- Health and Safety in Employment Act 1992 and amendments
- Health and Safety in Employment (Pipelines) Regulations 1999 (SR 1999/350) (as at 3 September 2007)
- Land Transfer Act 1952 and amendments
- Local Government Act 1974 and amendments
- Long Term Council Community Plan (LTCCP)
- NZ Coastal Policy Statement
- Plumbers, Gasfitters and Drainlayers Act 1976 and amendments
- Public Works Act 1981 and amendments
- Regional Coastal Plan for Northland
- Regional Water and Soil Plan for Northland
- Resource Management Act 1991 and amendments
- Telecommunications Act 2001 and amendments
- Water Supplies Protection Regulations 1961 and amendments
- Whangarei District Plan.

NZS, AS, AS/NZS, SNZ Standards

• SNZ/PAS 4509: 2008	New Zealand Fire Service Fire Fighting Water Supplies Code of Practice (Fire Service Code of Practice)
• NZS/BS 750: 1984	Specification for underground fire hydrants and surface box frames and covers
• NZS 3604: 1999	Timber framed buildings
• NZS 3910: 2003	Conditions of contract for building and civil engineering construction
• NZS 4121: 2001	Design for Access and Mobility: Buildings and Associated Facilities
• NZS 4229: 1999	Concrete masonry buildings not requiring specific engineering design

- NZS 4275: 1995 Methods of Test for underground Marking Tape – series
- NZS 4404: 2004 Land development and subdivision engineering
- NZS 4431: 1989 Code of practice for earthfill for residential purposes
- NZS 4442: 1988 Welded steel pipes and fittings for water, sewage and medium pressure gas
- NZS 4501: 1972 Code of practice for marking of fire hydrants
- NZS 5828: 2004 Playground equipment and surfacing
- NZS 6701: 1983 Code of practice for road lighting
- NZS 7643: 1979 Code of practice for the installation of unplasticized PVC pipe systems
- AS/NZS 1100: Technical drawing – series
- AS/NZS 1158: Lighting for roads and public spaces – series
- AS/NZS 1546.1: 1998 On-site domestic wastewater treatment units – Septic tanks
- AS/NZS 1547: 2000 On-site domestic wastewater management
- AS/NZS 2280: 2004 Ductile iron and fittings
- AS/NZS 2566.1: 1998 Buried flexible pipelines structural design (including supplement 1)
- AS/NZS 2845.1: 1998 Water supply – Backflow prevention devices
- AS/NZS 2865: 2001 Safe working in a confined space
- AS/NZS 2890.1: 2004 Parking Facilities, Part 1: Off-street Car parking
- AS/NZS 4020: 2002 Testing of products for use in contact with drinking water
- AS/NZS 4130: 2003 Polyethylene (PE) pipes for pressure applications
- AS/NZS 4158: 2003 Thermal-bonded polymeric coatings on valves and fittings for water industry purposes
- AS/NZS 60598.1: 2003 Luminaries – General requirements and tests
- NZS/AS 1657: 1992 Fixed platforms, walkways, stairways and ladders. Design, construction and installation
- AS/NZS ISO 9000: 2000 Quality management systems
- AS/NZS ISO 9001: 2000 Quality management systems – requirements
- AS 1831: 2007 Ductile cast iron
- AS 2638.2: 2006 Gate valves for waterworks purposes- resilient seated
- AS 4087: 2004 Metallic flanges for waterworks purposes
- AS 3996: 2006 Access covers and grates
- SNZ HB 44: 2001 Subdivision for People and the Environment
- SNZ HB 8630: 2004 Tracks and outdoor visitor structures.

Site Suitability and Earthworks See Section 2

- WDC Coastal Structure Plan – Slope Instability Potential and Effluent Disposal Potential, Oakura to Langs Beach
- Stormwater Catchment Management Plans
- Coastal Hazard and Erosion Studies (WDC/Jeremy Gibbs).

Roads and Access See Section 3

- Austroads www.austroads.com.au
  - Austroads Rural Road Design
  - Austroads Urban Road Design
  - Austroads Pavement Design, including NZ Supplement
  - Austroads Pavement Design for Light Traffic (supplement to Austroads Pavement Design Guide)

  - Austroads Waterway Design
  - Austroads Guide to Traffic Engineering Practice (series)
- Guides to Traffic Engineering Practice and the New Zealand Supplements
- LTSA Guidelines (RTS series) and Manuals, including TRS18 – NZ On-road Tracking Curves 2007
- NZ Institute of Highway Technology approved Pavement Design Techniques
- NZ Transport Strategy
- NZTA Stormwater Treatment Standard for State Highway Infrastructure
- Pavement Design Manual
- Rural Road Design - Guide to the Geometric Design of Rural Roads
- TNZ/Transfund Specifications and Notes for Road Construction, Maintenance and Material Standards
- TNZ/LTSA – Manual of Traffic Signs and Markings (MOTSAM)
- Transit New Zealand[1] Act 1989 and amendments
- Transit New Zealand (TNZ) or the New Zealand Transport Authority (NZTA)
  - All TNZ/NZTA Manuals and Standards including Criteria and Guidelines
  - TNZ New Zealand Supplement to Austroads Guide Part 14: Bicycles
- Transport Management Act 2003 and amendments
- Urban Road Design - Guide to the Geometric Design of Major Urban Roads
- WDC Working Within Road Reserves Policy and Specification. Refer Procedures Manual
- WDC Road Opening Notice. Refer Procedures Manual
- WDC Road Naming Policy April 2009. Refer Procedures Manual
- WDC RAMM data forms. Refer Procedures Manual
- TNZ Manuals and Technical Documents.

Stormwater See Section 4

- Auckland Regional Council
  - Stormwater Treatment Devices - Design Guideline Manual (TP 10) *www.arc.govt.nz/plans/technical-publications/technical-publications-1-50.cfm*
- WDC Stormwater By-law
- Stormwater Catchment Management Plans
- NRCS TR-55 Urban Hydrology for Small Watersheds *http://www.cpesc.org/reference/tr55.pdf*

Waste See Section 5

- Auckland Regional Council
  - On-Site Wastewater Systems (TP 58), but only where AS/NZS 1547:2000 does not provide sufficient information

    http://www.arc.govt.nz/plans/technical-publications/technical-publications/technical-publications-51-100.cfm
- WDC Wastewater By-law
- NZWWA – New Zealand Pipe Inspection Manual 2006
- WDC Coastal Structure Plan – Slope instability Potential and Effluent Disposal Potential, Oakura to Langs Beach
- WDC Wastewater Asset Management Plan
- WDC Standard for Wastewater Pumping Station Electrical Engineering Systems
- WSA 02-2002 V2.3 – Sewerage Code of Australia
- WSA 04-2005 V2.1 – Sewage Pumping Code of Australia

[1] From 1/1/08 TNZ and LTNZ have amalgamated to become the NZ Transport Agency (NZTA). Hence any reference to TNZ Guidelines, Standards and Manuals shall be considered accordingly

- WSA 07-2007 V1.1 – Pressure Sewerage Code of Australia.

Water Supply See Section 6

- Ministry of Health Drinking Water Standards for New Zealand 2005
- WDC Water Supply By-law 2005
- WDC Specification for the Installation of Water Mains
- WDC Water Services Approved Materials List (including supplementary)
- WDC Water Services Hygiene Code of Practice
- WDC Specification for the Installation of Water Service Connections
- WDC Backflow Prevention and Cross Connection Control Policy
- WDC Water Services Asset Management Plan
- WDC Water Pumping Station Electrical Engineering Systems (when developed)
- WDC Specification for Registered and Licensed contractors for Water Supply.

1.2 Glossary – Definitions. See Whangarei District Plan Definitions

Annual Exceedance Probability (AEP)	The probability of exceedance of an event (generally a rainfall storm) within a period of one year. (1% AEP is equivalent to 1 in 100 year storm)
Approved	Whangarei District Council approval in writing
Arterial Road	Major roads with high traffic volumes or a significant component of through traffic. These include major roads into and through the District, and roads serving significant areas of development. Existing arterial roads are shown on District Plan maps
Assessment	(See Design/Technical review)
Attenuate/Attenuation	To lessen the intensity/severity/effects of an activity to a defined reduction, generally no more than pre-development levels
Average Return Interval (ARI)	The average, or expected, value of the periods between exceedances of a given rainfall total accumulated over a given duration. Refer to AEP
Catchment/Catchment Area	The area over which surface water run-off will tend to flow under gravity towards a common outlet point
Carriageway width	The road width normally traversed or occupied by vehicles. See Sheet 2
Collector Road	Roads that collect traffic from specific areas, or link important roads or major traffic generators. Existing collector roads are shown on District Plan maps
Commercial and Industrial Area	For the purposes of this standard, this is generally land contained within Business 1, Business 2, Business 3, Business 4 (including Oil Refinery and Kauri Dairy Factory), Marsden Point Port and Airport Environments. However, other areas may be added by changes to the District Plan. (Council should be consulted beforehand to determine the standard that will be applied to a particular area if there is any doubt)
Community Sewerage System	A wastewater reticulation, treatment and disposal system, that serves two or more properties. This applies irrespective of whether or not it is maintained by Council
Consent Holder	See developer
Council	Whangarei District Council

Curve Number (CN)	Is an empirical parameter used in hydrology for predicting direct run-off or infiltration from rainfall excess. The run-off curve number is based on the area's hydrologic soil group, land use, surface treatment, gradient and hydrologic condition
Cycleway	The part of a road that is laid-out or constructed primarily for cyclists. It may include the associated edging, kerb and channel
Defects Liability Period	The period required by Council, after the completion of the works, for which the applicant is responsible for repairing defects that may arise during this period, due to faulty materials and/or workmanship. Council will normally require a bond to cover any necessary works. See Section 1.11.1.5
Design/Technical Review (or Assessment)	An assessment of a specific part of an overall design or report by a suitably qualified and experienced professional. Refer to document ISSN 1176-0907 on the IPENZ website. The assessment can be done internally or externally. *http://www.ipenz.co.nz/ipenz/practicesupport/Practice_Notes.cfm* . Also see Peer Review
Developer	In relation to resource consent applications, is the owner, Trust, Company, person(s), or organisation or legal entity who have been granted Council consent to undertake the activities applied for, and has the financial responsibility for the development
Developer's Representative	See section 1.4.1.3
District Plan	The operative and proposed plans for the Whangarei District and any combination of them applicable to resource consent applications
Drain	A pipe or channel that conveys sewage or stormwater flow. Drainage has a corresponding meaning
Dwelling Unit (Du)	A single self-contained household unit, used principally for residential activities, whether by one or more persons, including accessory buildings. Where more than one kitchen facility is provided on the site, there shall be deemed to be more than one dwelling unit. A building or group of buildings or part thereof principally used for residential purposes by a single household. (See WDC Developments Contributions Policy)
Earthworks	Any modification to the shape of the land surface, removal of soil, excavation, infilling, re-contouring, including construction of any road, track, landing or drainage canal
Footpath	The part of a road that is laid out or constructed primarily for pedestrians. It may include the associated edging and kerb

Geotechnical Engineer/Geo-Professional	A chartered professional engineer (CPEng) or an engineering geologist, with recognised qualifications and experience in geotechnical engineering, and experience related to land development
Good Ground	Is defined under **NZS3604:1999** (as amended), and in **NZS4229:1999** as 'any rock or soil capable of withstanding an ultimate bearing capacity of 300kPa (i.e. an allowable bearing pressure of 100kPa using a factor of safety of 3), but excludes: a Potentially compressible ground such as topsoil, soft soils such as clay which can be moulded easily in the fingers, and uncompacted loose gravel which contains obvious voids b Expansive soils being those that have a liquid limit of more than 50% when tested in accordance with **NZS4402 test 2.2** and a linear shrinkage of more than 15% when tested from the liquid limit in accordance with NZS4402 test 2.6, and c Any ground which could foreseeably experience movement of 25mm or greater for any reason including one or combination of: Land instability, ground creep, subsidence, seasonal shrinking and swelling, frost heave, changing ground water level, erosion, dissolution of soil in water, and effects of tree roots
Gradient	The slope of a surface or object off horizontal generally described either as a percentage or as a ratio i.e. 1:4 is equivalent to 25% or 250mm/m
Ground	The surface of the earth and below, whether soil or rock
Heavy Vehicle	Any vehicle exceeding 3500kg gross laden weight
Household Unit (hu)	A single self-contained household unit, used principally for residential activities, whether by one or more persons, including accessory buildings. Where more than one kitchen facility is provided on the site, there shall be deemed to be more than one residential unit
Household Unit Equivalent (HUE)	The volume of effluent discharged from an average household in a 24 hour period (i.e. 4 persons/household @ 200litres/person/day = 800litre/day). This is used to determine equivalent flows from various commercial activities
Hydraulic	The static and dynamic behaviour of fluids
Hydrology	The study of the movement, distribution, and quality of water throughout Earth

Independently Qualified Person (IQP)	A specialist, approved under Council's Resource Consent IQP process (not under the Building Act), having the appropriate skills and qualifications to carry out specific procedures, and who has no financial interest in the proposal/project. See Section 1.5 & Table 1.1 of these standards and the approved list of IQPs on Council's website
Invert	The bottom of a pipe or channel or cesspit
Legal Width for Roads	For public roads, this is the width of the strip of land that has been declared road in accordance with Section 114 of the Public Works Act, 1981
	For private roads, privateways or easements (rights-of-way), it is the width of the strip of land over which the public, shared owners or landowners with dominant tenement are legally entitled to pass without the specific approval of any one landowner. The term 'legal road' is interchangeable with the term 'road reserve'
Licensed Contractor	A specialist contractor who has been Licensed by WDC to perform a particular type of work on Council assets, that only licensed contractors are permitted to perform (e.g. live connections to existing water reticulation). Normally only a limited number of contractors will be licensed at any one time. See Council's website for a list of Licenced contractors. (see also Registered Contractor)
Local Road	Roads not classified as arterial or collector, whose major function is to provide access to properties rather than provide routes for other traffic. See Table 3.1
Manhole	A chamber which provides access from the surface to an underground service
Means of Compliance	A method by which the requirements of the standard may be complied with
Modified Rational Method	This method provides a way to calculate the hydrograph from a catchment based on rational method C values and the peak intensity. There is no 'loss method' associated with the modified rational method. The underlying assumption is that the peak intensity is maintained for a long enough duration to reach peak flow at the outlet of the catchment
Network Utility Operator	Has the same meaning as given to it by Section 166 of the Resource Management Act 1991
Outlet	The discharge point of a gravity or pumped fluid system
Overland Flow Path	Refers to the path taken by run-off. This may be either primary or secondary flows

Owner	Includes an owner of land, whether beneficially or as trustee, and their agent or attorney, and a mortgagee acting in exercise of power of sale. It also includes the Crown, the Public Trustee, and any person, local authority, board or other body or authority however designated, constituted or appointed, having power to dispose of the land or interest therein by way of sale
Pavement	The layer(s) of a road or access structure above the subgrade, incorporating sub-base and/or basecourse crushed granular material whether chemically stabilised or not, or rigid material (such as concrete), but excluding any seal coat. See Sheet 2 & Sheet 3
Peak Flow (Q)	Is determined from the formula Q = CIA, where Q = discharge, C = run-off coefficient, I = rainfall intensity, A = drainage area
Peer Review	An overall review of a design by a suitably qualified and experienced professional. Refer to *http://www.ipenz.co.nz/ipenz/practicesupport/Practice_Notes.cfm* .Also see Design/Technical Review
Primary Design Flow	The estimated stormwater run-off selected to provide a reasonable degree of protection to surrounding land and buildings. This flow will generally be piped or contained within narrow confines, and may be under public control by reserve or easement
Principal Water Mains	All water reticulation 100mm inside diameter or greater, including associated valves
Private Road	Any roadway, place, or arcade laid out within the District on private land intended for the use of the public generally
Private Way/Private Accessway	A road or passage over private land that is not open or intended to be open to general public use. Also see District Plan definitions
Registered Contractor	A contractor who has obtained approval from Council to construct or modify assets owned or to be taken over by Council, and is included in Council's official list of Registered contractors. Registration is restricted to the type of work for which approval has been given. (The Registered Contractor's duties differ to that of the Licenced Contractor).
Regulatory Assessment	This checks assumptions, design method, arithmetical accuracy and conclusions drawn by the designer
Rider Main	Water reticulation less than 100mm inside diameter, including associated valves, that serves more than one property
Rising Main	Pressure reticulation between a pumping station and a non pressurised junction or termination, including another pumping station, manhole, reservoir or treatment system

Road or Street	**Road** means, subject to sections 43(1), 51(1), 54(1) & 55 of the **Government Roading Powers Act 1989 No 75**, any road as defined in section 315(1) of the Local Government Act 1974, and **roading** has a corresponding meaning
Run-off Coefficient (C)	Used to estimate the amount of rainfall run-off that will occur off any given surface. See Table 4.1
Rural Area	For the purposes of this standard, this is generally land contained within Countryside, Coastal Countryside or Living 3 Environments (for access and servicing purposes). However, other areas may be added by changes to the District Plan. Where Resource Consent allows reduced lot sizes within these Environments, Council may require certain or all 'Urban' standards to be applied. (Council should be consulted beforehand to determine the standard that will be applied to a particular area if there is any doubt)
Secondary or Overland Flow Path	Refers to the path taken by run-off in excess of the primary design flow, which has the purpose of preventing inundation of surrounding building sites. When calculating secondary or overland flow path dimensions, blockage or failure of the primary system is to be considered
	Freeboard above the secondary flow level is required to cater for inaccuracies in flow estimation and possible blockage/failure of the primary system
	Secondary or overland flow path may be under public control by reserve or easement
Senior Environmental Engineering Officer	A senior engineer within the Environmental Engineering Division of Council
Service Lane	Has the meaning given in Section 315 of the Local Government Act 1974
Sewer	An enclosed pipe not less than 100mm inside diameter used for conveying sewage by gravity
Specific Design	A design that requires calculation, either using a method referenced in these standards, or outside of the scope of methods used in these standards
	Specific designs shall be prepared by a person suitably qualified with adequate expertise and experience in accordance with sound and accepted engineering practice and principles and that meets the objectives set out in these standards and/or the District Plan. The design shall comply with New Zealand Standard specifications and/or other nationally recognised procedures and systems

Standard Design Vehicle	See Sheet 26 for details
Stable Ground	Land that in the opinion of a suitably qualified and experienced geotechnical engineer, is in a state which is unlikely to settle, slip, erode or otherwise move, allowing for a suitable factor of safety to the detriment of superimposed buildings, services, roads or property generally
Stormwater	Rain water that flows via overland flow, channels or pipes
Stormwater Attenuation/ Treatment Pond	A permanent pond, wetland or dry detention basin, designed to attenuate peak stormwater flows and provide water quality treatment
Subbase	The material between the subgrade and basecourse aggregate
Subgrade	The top 1m layer of the road formation below the pavement. It includes any stabilisation, granular or non-granular material of a lower standard than quarry run aggregate
Surcharge	A pipe running in excess of its gravity flow condition, above full and under a degree of pressure
Survey Plan	As described in Section 2 of the Resource Management Act. See *http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html*
Swale Drain	A grassed surfaced channel for conveying stormwater (as opposed to 'open drain') generally at low, non-eroding velocities
Urban Area	For the purposes of this standard, this is generally land contained within the Living 1 and Living 2 Environments and all Business/Commercial/Industrial Environments. However, other areas may be added by changes to the District Plan. (Council should be consulted beforehand to determine the standard that will be applied to a particular area if there is any doubt)

1.3 Abbreviations

AAD	Annual average daily traffic
ADWF	Average Dry Weather Flow (l/s)
AEP	Annual Exceedance Probability
BIA	Building Industry Authority
CDP	Catchment Drainage Plan
CMP	Catchment Management Plan
DN	Nominal Diameter
HIRDS	High Intensity Rainfall Design System in the form of software produced by NIWA
ISO	International Standards Organisation
LTSA	Land Transport Safety Authority (Now NZTA – New Zealand Transport Agency)
MoT	Ministry of Transport
NAASRA	National Association of Australian State Road Authorities (now Austroads)
NRC	Northland Regional Council
NZBC	New Zealand Building Code
NZDWS	New Zealand Drinking Water Standard
NZS	New Zealand Standard, as published by the Standards Association of New Zealand (SANZ)
NZTA	New Zealand Transport Agency (Previously LTSA and LTNZ)
OD	Outside diameter
PDWF	Peak Dry Weather Flow (l/s)
PE 80B	Polyethylene type 80B
PE 100	Polyethylene type 100
PN	Pressure nominal
PPM	Parts per Million
RMA	Resource Management Act
RON	Road Opening Notice
RTS	Road and Traffic Standards (Published by the LTSA)
SCADA	Supervisory, Control and Data Acquisition
SEEO	Senior Environmental Engineering Officer
SN	Stiffness number
TMP	Traffic Management Plan
TNZ	Transit New Zealand (Now NZTA – New Zealand Transport Agency)
TSS	Total Suspended Solids
vpd	Vehicles per day
WDC	Whangarei District Council

1.4 General Requirements and Procedures

1.4.1 General Requirements

1.4.1.1 General

This document sets out the processes and standards that are expected to be followed and met whenever any development project is undertaken in accordance with WDC's District Plan.

It recognises that Council and other network operators will become the owners of roading and other infrastructure that are created in the land development process. Council and other network operators will assume responsibility for ongoing maintenance of these systems, and associated costs. To that end it is important that there is confidence that the systems are designed and constructed in a manner which ensures that they are fit for purpose at the time of transfer of ownership and can be expected to last well into the future.

In many cases, land development involves the creation of infrastructure that will not transfer to Council or other network operators. These systems will be retained in private ownership, either individually or as a shared responsibility. While Council has no role in maintaining these systems, it is still important that they are suitably designed and constructed so that future landowners in the District buying into any such assets through the purchase of land can have confidence in the systems.

In all, this document strives towards 'Creating the Ultimate Living Environment' for all concerned.

This document (WDC Environmental Engineering Standards) should be read in conjunction with relevant New Zealand Standards (in particular, **NZS 4404**) and other referenced documents in these standards. See Section 1.1. Where requirements differ, the Environmental Engineering Standards shall take precedence.

Acceptance of an alternative means of compliance for meeting the objectives of the Environmental Engineering Standards will be at the discretion of Council's group manager Infrastructure and Services, and will not confer approval in general to any design criteria, construction technique, or material forming part of the design. Any approval is based on an examination of the information provided and shall not relieve the developer of the responsibility for compliance with Council standards, established principles, and carrying out the work in accordance with sound engineering practice.

Note Where the typeset in this document is normal, this indicates an acceptable design. However, where the typeset ***is red italics,*** it indicates that the design will need specific approval before it will be accepted by Council (may need resource consent, plan approval by SEEO etc)

1.4.1.2 Statutory Requirements

The developer is responsible for obtaining all necessary consents, compliance with all statutes, regulations, by-laws, requirements, and obligations, and subsequent revisions and updates, and providing for the protection of other property from damage resulting from the development, including:

- Building Act 2004 and amendments
- Electricity Act 1992 and amendments
- Health and Safety in Employment Act 1992 and amendments
- Land Transfer Act 1952 and amendments
- Land Transport Management Act 2003 and amendments
- Local Government Act 1974 and amendments
- Plumbers, Gasfitters and Drainlayers Act 1976 and amendments
- Public Works Act 1981 and amendments
- Resource Management Act 1991 and amendments
- Telecommunications Act 2001 and amendments
- Transit New Zealand Act 1989 and amendments

- Transport Management Act 2003 and amendments
- Water Supplies Protection Regulations 1961 and amendments
- Regional Water and Soil Plan for Northland
- Coastal Management Plan for Northland
- Coastal Management Strategy
- NZ Coastal Policy Statement
- Whangarei District Plan.

1.4.1.3 Developer's Representative

The developer should nominate a specialist representative to liaise with Council, who would generally be a suitably experienced licensed cadastral surveyor, resource management/planning consultant, or chartered professional engineer, but may be a suitably qualified person in a related field, experienced in **all** phases of resource consent, and be available for site visits within 24 hours of being so requested by Council.

Council will generally **not** allow the applicant to act in this position unless they can provide proof that they have the necessary qualifications/experience to do so.

Should this appointed representative change during the various phases of the work, Council is to be notified in writing of the change, and provided with the contact details of the new representative.

The representative shall provide, or arrange for suitably qualified and experienced persons to provide the following:

- Compliance with Section 1.2.2 (Statutory requirements)
- All correspondence, investigations, calculations, design, construction work and supervision, certification of completed works, and provision of as built plans of the approved works
- Hold appropriate qualifications, and be able to provide evidence of such qualifications and professional indemnity insurance to the value of at least $1,000,000. See sections 1.4.1.6 & 1.5.1
- Ensure that the developer's contractors hold adequate insurance cover for their activities, **and provide evidence of such insurance cover *prior*** to commencement of work on the development, and maintain this cover throughout the works. See Section 1.4.1.6.

All Council correspondence relating to the conditions of consent shall be with the developer's appointed representative(s).

At Council's discretion, developers/owners may be copied into any correspondence sent to the developers appointed representative(s).

1.4.1.4 Fees and Charges

The developer shall pay all fees and charges relating to the assessment of the application, review and approval of plans and documents, inspections carried out, legal fees, drainage easements, bonds, and similar, and such other fees and charges where applicable.

1.4.1.5 Cost of the Work and Council Contributions

The developer is responsible for all costs associated with the application and all construction work required, unless otherwise agreed in writing with Council. This includes provision and relocation of services, connections to existing services, and all other permanent or temporary work required for the development. It may also involve upgrading existing infrastructure required because of the effects of the development, including adjoining properties.

The developer shall pay all development contributions and other charges set by Council.

The developer's representative should liaise with appropriate network utility operators prior to submitting any resource consent application to confirm any requirements and costs.

In special circumstances, Council may contribute towards the cost of work in terms of an applicable policy, or as negotiated, with the basis and timing of payment of such agreements confirmed in writing by Council prior to commencing work. Generally such contributions would cover the provision of services greater than required for the immediate proposal.

1.4.1.6 Insurance

Where work is carried out on a public road or reserve, or on a Council asset, or land not owned by the developer, the developer shall ensure that the following insurance is in place prior to commencing work:

- **Public Liability Insurance** in the name of the developer for an amount of not less than **$2,000,000.** For developments where the value of work on public land or Council asset is low, Council may reduce the required value of the **Public Liability Insurance** to relate to the risk, but not less than 200% of the value of this work. The policy shall cover all insurable risks normally applicable to land development work until the end of the maintenance period. Such risks may need to include flooding due to burst water mains, property damage due to land slips, or contamination of natural water due to overflowing sewerage reticulation, and similar
- The developer's representative and IQP(s) shall separately hold suitable current **Professional Indemnity Insurance** with minimum cover of **S1,000,000**.

This **Professional Indemnity Insurance** shall cover all aspects of the works for which the professional is responsible for. See sections 1.4.1.3 & 1.5.1.

As **Professional Indemnity Insurance** is for a fixed amount for the insured period, proof that there is sufficient/suitable cover available at the time the particular project is undertaken, and that the cover is suitable for the works being undertaken, will be required in writing from the Insurer.

- Council may require specific **Public Liability** and **Professional Indemnity Insurance** for large developments and/or developments that require specialist design/works that fall outside of the norms
- The developer shall ensure that its contractors also hold insurance cover adequate to cover their activities and these requirements, **and provide evidence of suitable insurance cover** prior to the commencement of the work, and ensure that this insurance cover is maintained for the duration of the works.

1.5 General Investigation, Design, Certification and Role of the IQP

1.5.1 Investigation

All investigation, calculations, design, supervision and certification of the works outlined in these standards shall be carried out by or under the control of person(s) who:

- Have been certified by WDC's Resource Consent IQP[2] assessment process
- Are working within their assessed competencies
- Have appropriate professional indemnity insurance. See sections 1.4.1.3 & 1.4.1.6
- Have no financial interest in the proposed project/works.

Specialist aspects of the design will require investigation, calculations, design, supervision and certification by an IQP. See Table 1.1. This list is not exhaustive, and Council may require design by an IQP of further parts of the project where it considers that the scale or complexity of the project warrants it.

Specialist reports shall include definite conclusions and recommendations for site development, be endorsed with the author's signature, name printed, qualifications, date, have plan(s) where applicable, have a statement to the effect of 'I am suitable qualified and experienced to carry out the abovementioned designs etc', and be of benefit to Council as well as the client within the limitation clause.

The requirement for an IQP is deemed to be satisfied by:

- A chartered professional engineer working within his/her area of competence as assessed by IPENZ
- Other appropriately qualified technical specialists working within their area of competence and approved in writing by Council under the WDC IQP assessment process.

The only area of specific expertise that is limited in terms of IQP status is geotechnical engineering. Only chartered professional engineers or engineering geologists with proven geotechnical competency can hold IQP status in this field of engineering.

1.5.2 Design

Designs may either conform to these standards, *or be an alternative design appropriate to a specific situation.* See Section 1.2.1 for alternative design considerations.

Notes

- Designers are reminded of their responsibilities for providing access and facilities for disabled persons, particularly where the requirements of the Building Act/Code can often be more onerous than that required under this standard and the District Plan
- The submission of local circuit or site-specific coordinates and levels for public infrastructure will not be accepted unless prior approval has been obtained in writing from Council.

1.5.2.1 Design Life

The design life of assets shall be 100 years unless otherwise stated in this document or agreed to in writing by Council.[3]

1.5.3 Certification

Certification of proposed works is required at the design stage and at completion of construction. See EES-PS1 & EES-PS4 forms.

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[2] Note IQP status gained under the Building Act does not qualify the holder to be an IQP within the Resource Consents Division, and vice versa

[3] This is in line with DZ4404 and other Councils

1.5.3.1 Design Stage

All works requiring design by an IQP will require certification in the form of a producer statement (design). WDC form EES-PS1 may be used for this purpose, or other form approved by WDC.

1.5.3.2 Post Construction

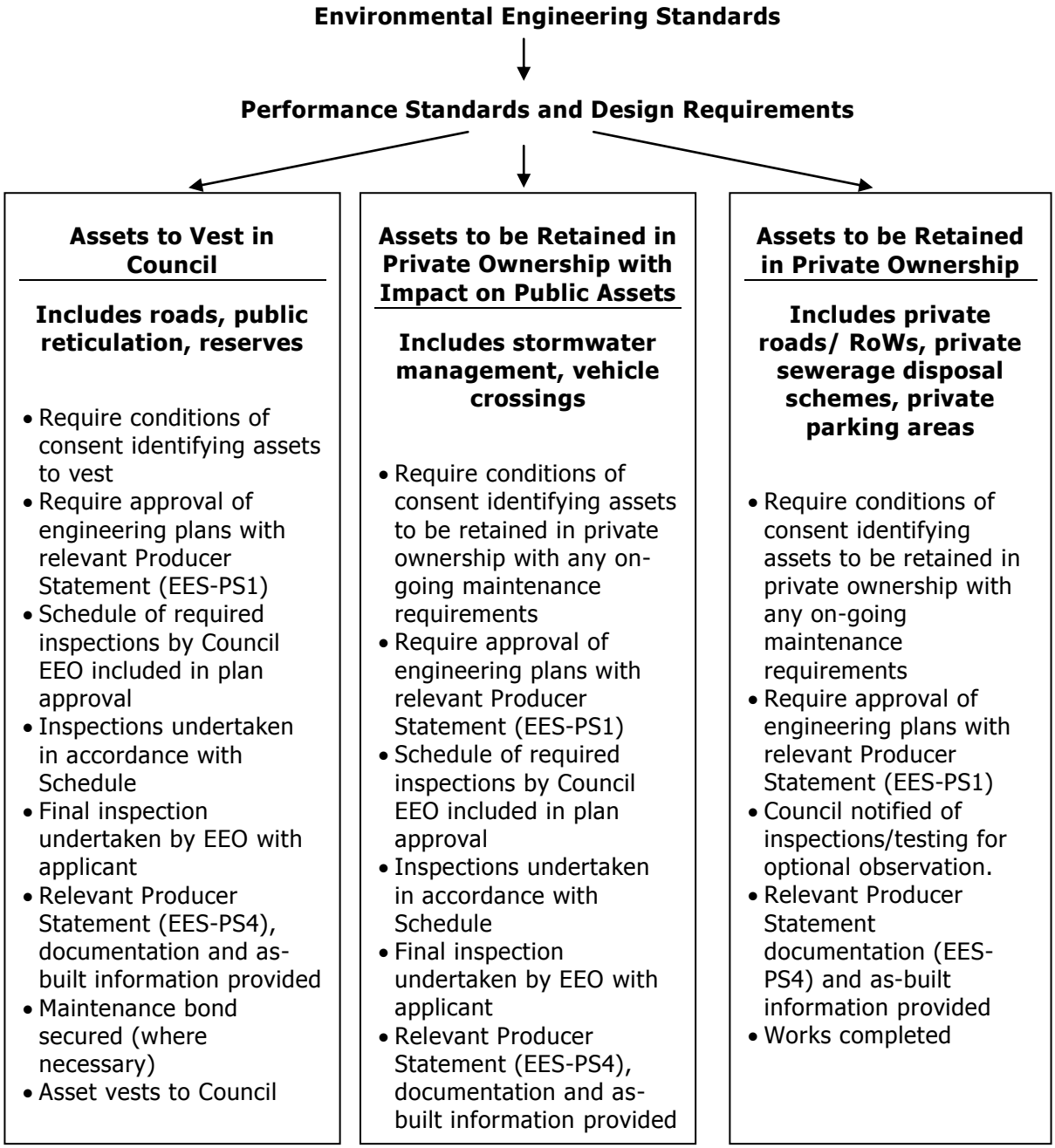
After construction is completed, producer statements (construction) for all completed works, for which an EES-PS1 has been provided, will be required. WDC form EES-PS4 may be used for this purpose, or other form approved by WDC.

Associated test results, inspections etc are to accompany the producer statement (construction).

1.5.4 The Role of the IQP

The following diagram sets out the manner in which the EES document will be used when considering engineering works associated with resource consents. A key point is that more reliance will be placed on IQPs to design, supervise and certify works that are to remain within private ownership.

The following diagram outlines Council and IQP involvement in various aspects of development.



Note If there is any doubt as to the required/permitted level of IQP involvement in any consent application, please contact the resource consents manager or the SEEO for clarification.

See Procedures Manual on Council's website identifying approved IQPs.

Table 1.1 Specialist Aspects that Require an Independent Qualified Person (IQP) for Investigation, Calculations, Design, Supervision and Certification

Site Suitability	Geotechnical Assessment Report for land with Moderate or High Risk of instability – Geo-professional only Report on other hazards, e.g. Coastal Erosion and Instability, Mine Zones, Flood Zones etc Earthworks/Compaction design.
Roads and Access	Complete design of collector roads and arterial roads, including pavement structural design, geometric design and surfacing design Pavement structural design for roads/accessways where the subgrade CBR is less than 7 Geometric design for all roads with a design speed of greater than 50 km/hr Intersections with collector or arterial roads, and roundabouts Lighting design Bridges (will require building consent) and major culverts, including waterway design Retaining walls (these may require building consent) Peer Reviews and Safety Audits.
Stormwater	Catchment Analysis Overland flow paths (levels, extent) to 1% AEP Stormwater treatment devices, attenuation structures/devices etc.
Wastewater	Gravity reticulation requiring pipework larger than 150mm ID Sewer pump stations and rising mains Suitability report for on-site disposal (using form EES-SEW1) Community wastewater treatment systems Pipe bridges and other structures.
Water	Water booster pump stations Reservoirs Pipe bridges and other structures Hydraulic design of reticulation All design outside the scope of simplified methods in this standard.

Work requiring IQP design is to be accompanied by full calculations and a producer statement (design) on form EES-PS1 (or similar and approved) and submitted to Council for approval.

On completion of the work, a producer statement (construction) on form EES-PS4 (or similar and approved), along with all testing, measuring etc is to be supplied to Council for approval.

1.6 Resource Consent Applications

1.6.1 Initial Application Stage (Subdivisions and Land Use Consents)

The following **minimum** level of engineering information is expected to be provided at this stage, (where applicable):

- A suitable site plan detailing the overall proposed development and showing existing contours in areas proposed for development (e.g. building site, access, effluent disposal area) and any overland flowpaths, rivers, wetlands, water bores etc which exist pre-development either in the subject property or in adjoining properties (where applicable)
- Each proposed lot is to detail a building site, access route to the building site and an effluent disposal site (where applicable)
- Visual assessment by a person experienced in Geotechnical assessment for site(s) that lie within the **low instability hazard zone**. This assessment is to determine whether or not further geotechnical investigation is necessary i.e. local ground conditions do/do not qualify for a low instability rating. A professional statement will be required from this experienced person containing his/her recommendations and the fact that they are suitably experienced and qualified to make this assessment
- Geotechnical assessment where the site lies within the **medium and high instability zones** on the WDC GIS hazard mapping. This assessment is to cover the areas proposed for development within the larger site (e.g. building site, accessway, effluent disposal site etc). See Section 2
- Geotechnical assessment where the site lies **outside of the WDC hazard mapping zones**. The content of the assessment will depend on whether the geo-professional considers the site(s) to be of low, medium or high instability. See Section 2
- Assessment of any other hazards affecting the site (flooding, coastal hazards, mine zones etc). In case of flooding and overland flowpaths, an assessment of the extent and depth of the 1% AEP event is to be clearly shown on the plans. Development within the Coastal Hazard zones will normally require an assessment by a chartered professional engineer with competency in Coastal Marine Engineering and approval from NRC to carry out the activity
- Traffic assessment. This may only be an assessment of entrance sight lines, but may involve a full report from an IQP (traffic) depending on the proposal
- In reticulated areas, an assessment that shows that the existing infrastructure has sufficient capacity to support the development (sewer, water, stormwater)
- For sites outside of the area of benefit of reticulated sewer, a completed on-site effluent assessment on form EES-SEW1 to prove the ability of the site to effectively support disposal within the NRC Water and Soil Plan rules
- An assessment of fire-fighting capability to provide compliance with **SNZ PAS 4509:2008** in reticulated areas. Should the proposed house site be positioned sufficiently far away from a hydrant or other suitable water supply such that a fire fighting appliance has to use the access route, then this route shall be capable of:
  - Conveying a 20 tonne vehicle (max access gradients for fire appliance need to be considered)
  - Of supporting a 20 tonne vehicle
  - Be formed to a minimum width as specified in Table 3.7 for 2-4 lots

  Unless *an alternative is agreed to in writing by the fire region manager.*

  In non-reticulated areas, a water supply and access complying with the requirements of **SNZ PAS 4509:2008**, (and more particularly **Appendix B**) shall be provided for, *unless an alternative is agreed to in writing by the fire region manager.*
- Existing services (private and public) on the land in question have been located and plotted

- Any roads, accessways, entrances comply with the minimum requirements of the EES. (existing and proposed)
- Parking and manoeuvring, accessible parking etc demonstrated as achievable
- Proof that any consents necessary from NRC have been applied for/obtained.

Depending on the complexity of any consent application, it may be necessary to produce full engineering construction drawings, calculations etc for certain/all aspects of the proposal prior to subdivision consent approval being obtained. This would particularly apply in terrain which is unstable/steep/flood prone etc, and where design outside of the scope of this standard is proposed. Each application will be assessed and a decision made as to the degree of design required. It is suggested that the applicant/IQP have a pre-lodgement meeting with Council to determine the probable level if information/design necessary. See Section 1.7.4 for detail requirements.

The SEEO will assess the application for compliance with the Environmental Engineering Standards. If any part of the works falls outside the expertise level of SEEO/I & S staff, external consultants with the necessary expertise will be employed to carry out the assessment. The applicant will not be approached for permission in this case. This will be as per the regulatory assessment described by IPENZ.

1.6.2 Post Consent Approval Stage (Subdivisions)

1.6.2.1 Engineering Plan Approvals for Construction

The following **minimum** level of engineering information is expected to be provided at this stage, (where applicable):

- Full engineering plans with all calculations, tests etc, as required by the conditions of the approved resource consent, drawn in accordance with NZS1100 and WDC EES drafting standards. See Section 1.7.3 & Section 1.7.4 of this document.

It is recommended that complex and/or specialist designs are peer reviewed before submission, as it is highly likely that WDC will require this to be done. If there is doubt, contact the SEEO.

It is suggested that a pre-lodgement meeting be held beforehand to determine the necessary detail for engineering plans. The SEEO should be contacted to arrange such a meeting.

1.6.2.2 Approval by Council

Three sets of engineering construction plans and one set of specifications (where deemed appropriate), calculations and other relevant supporting information shall be supplied to Council when engineering plans are requested as conditions of consent. If the documentation is not acceptable, Council will return one set of plans with Council comments. If preferred, Council will examine and comment on one set of documents and then receive the additional copies of the plans for endorsement.

Note Once plans are approved, Council reserves the right to require alterations where unforeseen circumstances necessitate such alterations

Plans submitted for approval as part of resource consent shall include Council's resource consent and property numbers, the applicant's name and reference numbers, and specific reference to parts of these standards that the contractor needs to be familiar with for construction purposes.

Endorsement of plans is subject to the payment of plan inspection fees. The developer shall hold an endorsed copy of plans on site at all times during construction of the works.

Council will endeavour to process plans within 10 working days.

The following are the minimum requirements for any construction plans submitted for approval.

1.6.2.3 Supporting Information and Calculations

Supporting information shall be provided for the following:

- Site Suitability and Earthworks

- Roading and Site Access
- Stormwater Drainage, including attenuation (where required), overland flow paths, and water quality measures
- Wastewater Reticulation and Disposal
- Water Supply
- Landscaping and Reserves
- Network Utility Services
- Supporting information shall include:
- Names and details of independent qualified persons (IQPs) that carried out investigations and design
- Design reports and calculations
- Plans
- Specifications (where deemed appropriate by Council)
- Other reports required to comply with these standards
- Design certificates for each part of the works. Producer statements (design) on Form EES-PS1.

1.6.2.4 Assessments/Reviews of Reports and/or Designs

Council undertakes assessments of information provided with consent applications. Those assessments may take the form of one or more of the following assessments/reviews:

- **Regulatory** Assessment/Review
- **Design** Assessment/Review or **Technical** Assessment/Review
- **Peer** Review.

The **Regulatory** Assessment/Review assesses the design for compliance with pertinent regulations, consent requirements and laws.

External regulatory reviews will take place as part of the approval process where Council staff do not have the necessary skills to process a particular design. This review will be considered part of the normal approval process, and the permission of the applicant will not be sought.

Design Assessment/Review checks assumptions, design method, arithmetical accuracy and conclusions drawn by the designer.

External Technical/design reviews will be undertaken if, in the opinion of Council's assessor, particular parts of the overall design would appear not to be up to the standard requirements.

Peer Review involves a complete assessment of the overall proposal and design.

A full peer review will only take place if, in the opinion of Council's assessor, the whole proposal and design is severely deficient, or is outside of recognised design methods etc.

Regulatory, Technical/Design and Peer Reviews/Assessments will be undertaken under the rules as described by IPENZ, and the reviewer may be required to work with the applicant's designer as outlined in the **IPENZ Practice Note 02**.

This practice note may be found at *http://www.ipenz.co.nz/ipenz/practicesupport/Practice_Notes.cfm*.

All reviews will be undertaken by an independent specialist approved by Council, and at the developer's cost.

1.7 Drafting Standards

1.7.1 General

Design and as-built plans shall comply with the following standards. Where the plans do not comply or are not clear in their presentation, Council may require revised plans to be presented. Drafting standards shall comply with **NZS/AS 1100** and this standard.

Coloured lines may only be used in **design/construction** plans for services [sewer (red), water (blue) and stormwater (green)] but standard line type and thickness is still to be used alongside the colour. All as-built plans are to be strictly black and white with complying line types/thicknesses.

Standard symbols and line styles as detailed in Sheet 1 shall be used to ensure uniformity.

Existing services shall be shown in faint lines and proposed services in heavy bold lines, in accordance with the specified line type for the particular service. The extent of existing and new work and infrastructure that will be modified or removed shall be clearly identified.

Plans shall clearly define the work on public assets as distinct to assets that will remain in private ownership.

Existing and proposed property boundaries shall be shown and clearly marked on all plans.

Service plans shall clearly show the location of each service. This may require separate sheets for each of the services for clarity.

Design plans shall be provided in hard copy format. For larger developments plans shall also be provided in DWG disk format (or other format agreed to by WDC in writing).

As-built plans shall be provided in both electronic and hard copy formats, except that hard copy plans only may be accepted for minor infill developments at the discretion of Council.

1.7.2 Survey Co-ordinates and Levels

1.7.2.1 Asset Data/Levels

As a minimum requirement where any development creates reticulated and/or other assets to vest in Council, all as-built information shall comply with the following:

- Levels or elevations shall be Reduced Levels to the LINZ/DOSLI datum. (One Tree Point 1964 Datum).
- All data will be in NZTM coordinate projection NZGD2000.

Note *Submission of local circuit or site-specific coordinates and levels for any assets to vest in Council will not be accepted, unless previously discussed with WDC and approval obtained in writing*

1.7.2.2 Subdivision Survey Parcel Boundary Elements

All subdivision survey parcel boundary elements shall be in terms of NZGD2000 where the work falls within the distances defined in the Rules for Cadastral Survey 2010 (effective 24 May 2010). They are to be orientated to NZGD2000 and fully connected, bearings and coordinates, to the NZGD2000 survey control such that the subdivision survey will be submitted to LINZ as a NZGD2000 survey.

1.7.3 Plan General

- Plans should generally be oriented with north to the top of the sheet
- All plans shall have a North point
- Plans shall have a horizontal and vertical scale bar to confirm printed scale
- Plans and long sections shall commence with the lowest distance/lowest invert on the left hand side of the sheet
- Road cross sections shall commence at the bottom left hand corner, and proceed upwards.

1.7.4 Title Blocks

The title block must include the following information:

- A project title, including street address
- A unique number or identifier, preferably the consent or project number
- Designer's name, signature and contact details
- Draughtsperson's name
- Drawing checker's name
- Design reviewer's name and signature
- Stage of work e.g. for acceptance, accepted engineering drawings, construction, as-built
- Date of preparation and of acceptance
- Scale or scales used
- Graphic vertical and horizontal scale
- Datum and origin
- Original sheet size
- Drawing title e.g. Long section
- Sheet numbers, including the number in the set
- An amendment box, including brief description of amendment and sign off by designer.

1.7.5 Scales

Table 1.2 gives preferred scales for plans. Plans using other scales will generally not be accepted. Items listed within the table refer to the **minimum** scales that will be accepted on **A3** sheets. If plans are produced on A1 sheets, a reduced plan on A3 must meet these minimum scales. **All text and symbols must be clearly legible at A3 size.**

Table 1.2 Preferred Scales

Preferred drawing scales	Items listed show minimum preferred scale at A3 sheet size (This is to ensure clarity)
1:50	
1:100	
1:200	Road cross-section horizontal
1:250	
1:500	Long section horizontal. Site plan view showing details of services etc
1:750	
1:1000	
1:1250	
1:1500	

All scales are to be clearly depicted, along with the plan size they relate to.

Long section details shall have a scale ratio of 1 horizontal to 5 vertical.

Plans are to have both a horizontal and vertical graphical scale bar for confirmation of print size/scale.

1.7.6 Hard Copy Format

All plans shall be prepared on standard ISO A1, A2 or A3 plan sheets, with a clean background. Where A1 or A2 sheets are used, reduced A3 copies to scale shall also be provided.

Plans must be suitable for photo reduction and microfilming. Lines shall not be finer than 0.25mm on A2 sheets and 0.35mm on A1 sheets. Printing should be spaced sufficiently to retain clarity when reduced. Capital letters shall be not less than 2.5mm in height before reduction from A1 size. Where a mixture of capital and lower-case letters are used, the height of capital letters shall be not less than 3.5mm on A1 sheets.

1.7.7 Electronic Formats

Plan formats shall be:

- AutoCAD **.dwg** files, including all referenced files required. As-built plans to be a full set of all plans, updated to include as-built information, easements etc
- **.pdf** copies of plans, endorsed/certified as as-built plans. These .pdf copies are to be high resolution, suitable for producing quality prints
- ***.dxf*** *files/other formats may be accepted (subject to compatibility with WDC system). Permission to submit in an alternative format must be obtained from WDC in writing* ***prior*** *to submission.*

Particular requirements for AutoCad plans include:

- Layouts shall be set up so they may be printed as they are required to be printed, i.e. with all necessary layers turned on and irrelevant information frozen. Layers that are required for the design but are not required to be printed shall have the '**Do not Print'** symbol selected in the layer control area
- All x-refs, pen assignments, images and special fonts used shall be included with the plan file
- Layouts shall be named to represent the content of each sheet (normally the sheet title)
- Different elements of the plan shall be drawn on its own appropriately named layer, e.g. sewer manholes on a 'SWMH' layer
- As-built layouts shall have 'As-built' incorporated in the title
- Layouts should have line-type scale setting inset into them to ensure correct printing.

1.8 Content of Plans

Plans shall include:

- A locality plan of the site including major street names and other major features. The locality plan shall include a north point
- Legal descriptions of the site, and adjacent properties
- The overall extent of the works, including the relationship with works or services adjacent to the site. This includes clearly identifying existing works that will be modified, removed or abandoned
- Proposed house site, access route to the house site, and effluent disposal site (if applicable).

1.8.1 Geotechnical See Section 2

- Site plan showing positions of borehole/test pit/penetrometer etc, areas of concern e.g. slip scarps, unstable ground etc. Plan is to include any adjoining land/river/ocean details which might affect the stability etc of the subject land
- Plan of any works proposed to mitigate the effects of issues determined by the geotechnical investigation.

1.8.2 Earthworks See Section 2

- Earthworks plans showing existing and proposed contours, areas of cut and fill, batter slopes, drainage details, silt control measures etc

1.8.3 Roads and Access See Section 3

- Design of roads, including plans, long and cross sections showing vertical and horizontal road geometry
- Pavement details
- Kerbing and side drains, berms, footpaths, cycleways, etc
- Road marking, signs and signals and all road furniture. Details of information signs shall include the full layout, including sign text and colours (all road markings and signs to comply with MOTSAM)
- Proposed planting of berms
- An electronic file of coordinates for road centrelines and edge of seal/kerb lines
- Details of accesses including berm crossings and drainage.

1.8.4 General Services

- Location of services in berms and accessways in relation to other services and site boundaries.

1.8.5 Stormwater See Section 4

- A contour plan of the development site prior to any works commencing showing the location of existing flow paths, and a contour plan of the developed site showing the proposed stormwater works and flow paths
- The 1% AEP(+20%) flood extent within overland flow paths and easement extents to convey these flows
- Plans and long sections of reticulation, showing the location of all sumps, manholes etc, pipe lengths, sizes, materials, cover, levels and grades of stormwater drains. Location and depth of services that cross existing or proposed drains/pipes
- Plans, long sections and cross sections of all open drains and watercourses
- Details of inlet/outlet structures including protective screens

- Details of stormwater treatment/attenuation devices
- Floodplain/Secondary Flow Path levels and boundaries, and easement requirements.

1.8.6 Wastewater See Section 5

1.8.6.1 Reticulated Systems

- Plans and long sections showing the depth and location of all pipelines (proposed and existing) including lengths, sizes, materials, class of pipes, cover, levels and grades, location, depth, and separation distance of services that cross existing or proposed reticulation
- Depth, location, details (and condition, where applicable) of all access structures, service connections etc
- Details of connection into the existing reticulation and other special connections
- Special details, including pump stations, rising mains, air valves, odour control facilities etc
- The make and model of all pumps, valves and other equipment
- Pipeline details including thrust blocks, special connections, pipeline bridges etc.

1.8.6.2 On-site Systems

- Disposal area (including reserve area) proposed
- Positions of any overland flows, streams, drains, water bores (including any in adjoining properties) with separation distances to each
- Positions of test bores etc.

1.8.7 Water Supply See Section 6

- The depth and location of all pipelines, including lengths, pressure class, sizes, materials and cover. Location, depth, and separation distances of services that cross existing or proposed reticulation
- Depth and location of service connections, valves, hydrants, bends, tees, meters, meter boxes, backflow devices etc
- Details of connection into existing reticulation and other special connections
- Special details, including pump stations, reservoirs
- Pipeline details including thrust blocks, pipeline bridges etc
- The make and model of all pumps, valves and other equipment
- Nominal static pressure at the connection point and at the lowest point in the works, design pressure and maximum design pressure.

1.8.8 Fire Fighting See Section 6

1.8.8.1 Reticulated Areas

- Position of nearest hydrant (existing or proposed) and distance to the existing or proposed dwelling site following a route along which a fire hose could be laid. **Note** Hydrants must be able to service all of the available buildable area shown in Living 1 & 2 and Business environments. Compliance with **SNZ PAS 4509:2008** is required
- Flow/pressure available from hydrants compliant with standards and Section 6.7.8.

1.8.8.2 Non-reticulated Areas

- Proposed method of providing fire-fighting water supply (tanks/dam/river etc). Refer to **SNZ PAS 4509** for requirements.

1.8.9 Reserves and Landscaping See Section 7

- Details of proposed earthworks, landscaping, planting etc of reserve areas, including stormwater and recreational reserves.

1.8.10 Electricity, Telecommunications and Gas See Section 8

- The depth and location of existing and proposed electricity and telecommunications, (including gas services where applicable).

1.8.11 Lighting

- Details and positions of proposed/existing street and security lighting.

1.9 Construction Management Plan

The developer shall submit a construction management plan, where required by the resource consent conditions, and receive written Council approval prior to commencing work on site. The plan shall include the following, (where applicable):

- Details of when and how proposed works will be carried out
- All notifiable works
- Submission of a project plan, as applicable
- Principal contractor, sub contractors, and staff to be used
- Equipment to be used and available for use
- Names and telephone numbers of contact and supervisory staff
- Starting date, working days, hours of work, and estimated completion date
- Temporary Traffic Management Plan (TTMP), as necessary
- Health and Safety procedures and safety officer(s)
- Dust and sedimentation control, as applicable
- Confirmation of all insurances
- Contingency and Emergency procedures.

1.10 Construction Works – Site Inspections and Approvals

1.10.1 Health and Safety

All work carried out on Council assets or public land shall strictly comply with WDC 'Health and Safety Policy and Procedure'. See Procedures Manual on Council's website.

Where Council is not the Principal (e.g. work is carried out by a developer), all contractors working on public land and/or on Council assets are required to complete/comply with the following requirements of the Policy:

- Forms **H&S002**, **H&S004** and **H&S006**
- Provide a copy of their Occupational Safety Policy or the current Council Approved Health and Safety Approved contractors Certificate
- Comply with **H&S005**, including providing a traffic management plan in a format that is consistent with TNZ Code of Practice for Temporary Traffic Management in New Zealand (Current Edition) where work will be carried out within a road
- Complete and comply with **H&S006.**

No work on Council assets or on any public land shall proceed before the above has been complied with, and approved by Council. Council reserves the right to refuse to allow a contractor that in its opinion may not comply with all Health and Safety requirements, to carry out work on Council Assets, or on public land.

In the case of work being carried out on private land that requires work in Council road reserve (e.g. vehicle crossing, water connection etc), the applicant/contractor is required to apply for a Road Opening Notice and submit a traffic management plan for approval **before** any work may take place in the public area.

1.10.2 Commencement of Work

No work associated with a resource consent shall commence until:

- Council has granted consent, and all other statutory provisions have been met. (e.g. permit to disturb archaeological sites, necessary building consents, road opening notices obtained, and similar)
- The requirements of the consent, including sections 1.4.1.3, 1.4.1.6, & 1.5, 1.6 and 1.7 have been satisfied
- Any Council contribution toward the cost of work has been approved in writing. See Section 1.4.1.5
- The developer's representative shall give Council 24 hours notice of the intention to commence construction work, and advise Council in writing, the name, address, and contact details of all contractors who will be carrying out work on the development. See Section 1.4.1.6 (Insurances).

Note Any works undertaken prior to the final approval of engineering plans will be at the developer's risk. Council reserves the right to reject such work, or request that the works be exposed and/or tested for compliance/suitability

1.10.3 Noise and Hours of Work

Noise resulting from any activity shall comply with the noise rules of the Whangarei District Plan.

Unless otherwise stated in the Whangarei District Plan, construction work shall be restricted to the hours of 7.00am to 7.00pm Monday to Friday and 7.30am to 6.00pm on Saturdays and exclude Sundays and public holidays, except that ***unless otherwise approved*** all work shall be undertaken during daylight. (For the purpose of this section daylight is defined as the period commencing at the official time of sunrise and ending at the official time of sunset).

Operating hours for emergency work and necessary maintenance work shall be at the discretion of Council.

1.10.4 Registered contractors and Licensed contractors

For some infrastructure services, Council maintains a list of contractors that are permitted to construct or work on Council Assets, or assets that will be transferred to Council ownership. Contractors on such a list may be either registered or licensed contractors. (See Procedures Manual on Council website).

Registered contractors are contractors who demonstrate to Council that they have the resources and competence to carry out the type of work, that they have acceptable health and safety and management systems, and that they comply with all other requirements of Council including insurances. See Section 1.4.1.6 and similar.

Licensed contractors are a limited number of specialist contractors that Council has approved to perform particular types of work (e.g. live connections to water reticulation).

1.10.5 Site Inspections

Where assets are to vest, the developer's representative shall notify Council 24 hours prior to requiring site inspections required by these standards and necessary at the following stages of the work:

- Completed earthworks and prepared subgrade
- Verification of construction to approved plans on-site prior to backfilling piped services, and similar
- Finished basecourse prior to the commencement of sealing
- Prior to pouring any concrete
- On completion of any service connections/disconnections prior to backfilling
- At completion of all works when as-built plans have been submitted and the site left neat and tidy.

Council will confirm the minimum required inspections at engineering plan approval stage, but the list above specifies the critical points for which inspections will always be required.

Note Council reserves the right for monitoring staff to inspect any incomplete Council approved project during daylight hours

As described in Section 1.5, works that are to remain in private ownership, and which have no impact on the public systems/land, may be inspected/tested by a suitably certified and competent Council IQP. However, Council is still to be informed as to when such inspections/tests are to take place so that a Council officer may observe if so desired.

All works that are to be vested in Council, or will have an impact on public assets, will require Council staff to be present when inspections/testing take place. A list of required inspections for which Council officers are to be present will be provided with plans approved for construction works. Council will not undertake such inspections/testing unless the contractor responsible for the works is present.

A full schedule of tests, measurements, results of inspections is to be provided to Council, along with a producer statement (construction). See Form EES-PS4, on completion of the works. Producer statements without the test results etc will not be accepted. It is also recommended that photographs be provided to further back up the documentation. These can be provided in hard copy or on disc.

1.10.6 Testing

Inspection/Testing shall include as necessary:

- Material testing
- Fill compaction testing
- CBR testing of road subgrade

- Nuclear Densometer testing of compaction of road construction layerworks
- Clegg Hammer testing of Pavement
- Confirmation of pavement depth (using lift pegs, string lines etc)
- Pressure testing of pipelines
- PE Pipe welding testing, including: Calibration Certificate/Welders Registration, Joint tensile testing
- Welding data-log records
- Video inspection of all wastewater and stormwater pipelines to be vested in Council, inspection to be in accordance with **NZWWA Pipe Inspection Manual** (May 2006)
- Disinfection testing of water mains
- Hydrant flow testing
- Tracer Cable/Detection Tape testing
- Testing of manholes and other pipeline components
- Other testing as directed by Council, including Benkelman Beam tests.

The developer shall pre-test all works that are to be vested or will have an impact on public systems/land and prove it satisfactory before requesting an inspection by Council. Work shall not proceed until Council's representative has inspected and approved the work (in conjunction with the contractor, See Section 1.10.5, and given written approval to proceed.

1.10.7 Colour of Pipes and Ducts

Pipelines and ducts installed shall comply with the requirements of the network utility operator. In order to identify in-ground services, pipes with the external colours in Table 1.3 shall be used where possible for the relevant services. Other services shall not use pipes with these colours (including the colour of stripes on pipes, and particular requirements for detection tapes identifying Council services).

The internal colour of wastewater and stormwater pipes shall be suitable for video inspection (black will not normally be approved).

Any pipes laid not complying with these colours will need prior approval from Council (in writing), and will need to be clearly marked with a detection tape that identifies the service.

Table 1.3 Pipe Colours

Pipe Use	**Colour**
Sewer	White
Stormwater	Grey
Potable Water	Blue
Non-Potable Water	Lilac
Gas	Yellow
Power	Orange
Telecommunications	Green

1.10.8 Connection to Existing Services

Upon successful testing of the reticulation, and written approval to connect to Council owned services (using the 'Public Utility Service Connection' form on Council's website), the developer shall arrange for the connection to be made. The connection shall only be made by a licensed contractor. See Procedures Manual on Council's website.

An authorised Council officer/agent shall inspect connections prior to backfilling. Where a connection is to be made within private property not owned by the developer, it is the developer's responsibility

to obtain approval and make all necessary arrangements with the property owner concerned. Written evidence of that owner's approval will be required by Council.

1.10.9 Protection of Existing Trees, Services, and Roads

The developer and/or contractor shall take every care to protect existing public trees, services, and private property from damage as a result of its operations. To this end:

- Excavations, filling, accessways, and retaining structures, should be outside effected tree root and drip line areas, *where practicable* [4]
- Flat steel tracked machines shall only be permitted to run on sealed road carriageways with prior Council approval if appropriate protection is provided
- Ribbed steel-tracked machines shall only be permitted to run on sealed road carriageways if appropriate protection, such as rubber mats, is provided. Otherwise, rubber tyre or flat tracked machines are required
- The contractor shall consult all network utility operators as to the location of buried services and take appropriate action to protect those services.

Damage caused by the works shall be the liability of the developer, and if not repaired by the contractor, shall be repaired on the written instruction of Council or affected network utility operator. If remedial work is not commenced within 48 hours of the written instruction (or sooner if the circumstances warrant it) and completed as soon as practicable, Council may carry out the work at the developer's cost. This provision includes the removal of mud and debris from existing roads and drains, which may be required daily in the interest of traffic and pedestrian safety. See Section1.8.11.

Developer(s) and contractor(s) shall hold appropriate insurance to cover themselves in the event of their operations damaging existing property and services, and shall indemnify Council against any claims associated with the works, whether during or after construction. See Section 1.4.1.6.

1.10.10 Soil Disturbance and Dust Control

The developer is responsible for compliance with Northland Regional Council requirements and consents. See Section 2.5

1.10.11 Emergency Procedure

If during the course of construction, a situation arises which may endanger the security of public or private property or the operation of a public facility, Council may instruct the developer or contractor to undertake such remedial measures as considered necessary to abate the danger.

Where Council has to carry out emergency work on behalf of the developer, the cost of the work will be recovered from the developer.

1.10.12 Variations to Approved Engineering Documentation

Where changes to the approved engineering documentation are required, the developer shall not proceed until Council grants written approval to the variation.

Normally, approval will only be given once plans and/or calculations/details are submitted to Council. However, in some instances, with written approval from the SEEO, work may be allowed to continue while the information/plans are assessed.

The developer/contractor must be aware that, should this procedure *not* be followed, any works constructed without approvals will *not* be accepted by Council.

[4] Specific approval will be required to build inside the drip line area

1.11 Post-Construction – s224(c)

1.11.1 As-Built Plans, RAMM Data and other Information

1.11.1.1 General

On completion of the works, the developer shall provide the following (where applicable):

- Post-construction geotechnical reports and associated plans, including locations of filling, and limitations on development of the properties e.g. form EES-P01
- Post-construction survey of attenuation and water quality ponds to demonstrate design volumes have been achieved
- As-built plans. See Section 1.11.1.3
- Results of all testing, video inspection records of all wastewater and stormwater reticulation, PE pipeline welding data logging results
- Evidence that all infrastructure work has been completed to the requirements of the network utility operator, including all requirements for final completion. See Section 1.11.1.2
- Certified design and completion certificates from Council approved IQPs. Forms EES-PS1 & EES-PS4
- Operation and maintenance manuals required by Council. See 1.11.1.2 & 1.11.2.2
- Asset information schedule. See Section 1.11.2.3
- RAMM information for public roading assets. See Section 1.11.1.4
- Any bonds in terms of Sections 1.11.1.6, 1.11.1.7 & 1.11.1.8 are in place.

1.11.1.2 As-Built Plans, Asset Information Schedules, Operation and Maintenance Manuals

As-built plans, Asset Information Schedules, and Operation and Maintenance Manuals shall be provided on completion of construction work in compliance with Section 1.11 of this standard, particularly Section 1.11.1.2, and as described below.

The requirements for As-Built plans, Asset Information and Operation and Maintenance Manuals apply to the installation or modification of all Council assets, irrespective of whether they are works associated with resource consent or otherwise.

For Resource Consents

A Section s224(c) certificate or release of a performance bond for a development will not be issued until as-built plans, Asset Information Schedules, and Operation and Maintenance Manuals have been provided and approved.

For Whangarei District Council Contracts

The Defects Liability Certificate will not be issued until as-built plans, schedules of Asset Information and Operation and Maintenance Manuals have been provided and approved.

It is desirable to provide this information as soon as the contract is finished.

1.11.1.3 As-Built Plans

As-built plans shall be provided in hard copy and electronic formats, to the following requirements:

- Drafting standards shall be as detailed in Section 1.7 of these standards. Plans shall also be provided without aerial photographs
- A full set of approved construction plans updated to include As-Built information shall be supplied. This shall include sheets that have and have not been amended since the application, such as Index Sheets, Locality Plans, Earthworks, Long Sections, Cross Sections, Coordinate Sheets, Details etc

- As-built plans shall include non-physical details such as the extent of overland flow paths
- All 'Asset Information Schedule Requirements' as included in the 'Procedures Manual' on Council website. See Section 1.11.1.2
- Specific requirements in the particular sections of these standards, and all plans required by the statutory consent authorities in the consent approval(s).

As-built plans shall be adequately labelled and dated and show what has actually been constructed, including all approved changes and items removed or decommissioned during construction. The developer's representative/IQP shall certify the accuracy of the plans, label roads with WDC approved road names, and parcels with legal descriptions and house numbers (where available). Plans shall also accurately locate the position and depth of all existing services exposed during construction works.

For any service, including service connection(s), either not being provided although shown on the As-built plans, or not in the position shown, the developer's representative/IQP shall provide or locate the service or, in the event that the service doesn't comply with these standards or the approved plans, rectify the incorrect components. Council shall then be provided with revised As-built plans as necessary.

Location and level data for both plans and asset schedules shall be to the co-ordinates and level requirements of Section 1.7.2, to the following accuracy:

- Levels accurate to 10mm
- Locations accurate to 100mm.

1.11.1.4 RAMM Data Requirements

RAMM (Road Assessment and Maintenance Management) data is required as set out below for all roads or other assets such as car parks constructed or altered by applicants which are to be maintained by Council. RAMM data requirements are as set out in WDC RAMM data forms. (See Procedures Manual on Council website).

1.11.1.4a Resource Consents

Council will use its RAMM Consultant(s) to assess RAMM data capture for Council maintained road(s) and parking assets on behalf of Council.

Developers are required to assist Council's consultant by providing all information required for this work, which includes:

- All pavement details, including aggregate types, depths and sources of aggregate
- Typical sections and plan views
- Top surface and sealing data
- Dates that each pavement layer, surfacing etc are constructed
- Details of all road signs
- Footpath construction details
- Crossings, features and minor structures
- Details of subsurface drainage, geotextile layers, and all other buried features
- Information on all structures, including bridges, retaining structures etc (Note that culverts with a waterway area greater than 3.4m^2 are regarded as bridges in terms of the Transit NZ bridge manual)
- For roads, accessways and access lots serving 5 or more lots or dwelling units, which are intended to be named but not maintained by Council, the applicant shall supply the carriageway length, width, road name and street name blade, pole and fixing/mounting data only.

This information shall be available with the as-built data below.

1.11.1.4b Whangarei District Council Contracts

Requirements for obtaining RAMM data shall be as set out in the particular Contract Conditions.

In general the Professional Services Consultant will be responsible for providing the RAMM data, with the contractor assisting the consultant with data capture.

RAMM data shall be presented using WDC Standard Forms for:

- All pavement details, including aggregate types, depths and sources of aggregate
- Typical sections and plan views
- Top surface and sealing data
- Dates that each pavement layer, surfacing etc are constructed
- Details of all road signs
- Footpath construction details
- Crossings, features and minor structures
- Details of subsurface drainage, geotextile layers, and all other buried features
- Information on all structures, including bridges, retaining structures etc (Note that culverts with a waterway area greater than $3.4m^2$ are regarded as bridges in terms of the Transit NZ bridge manual).

RAMM data shall be provided to the requirements of Council preferably prior to the issue of the Practical Completion Certificate.

1.11.1.5 Defects Liability Period

The developer shall be responsible for the performance of all works provided by the developer that will become Council assets, for a **minimum** defects liability period of 12 months for all assets.[5]

1.11.1.6 Bonds

The relevant Council policies shall be consulted to establish the full conditions:

- The bond shall be an agreed cash deposit (preferable), or a bank bond from a New Zealand based Trading Bank (sound reasons for not providing a cash bond will have to be provided)
- No interest will be paid on bond monies
- The bond amount shall be a **minimum** of 150% of the estimated value of the intended bonded engineering work, including GST, or as otherwise approved by Council
- For defects/maintenance bonds, the amount shall be a **minimum** of 5% of the estimated value of the intended bonded engineering work including GST, or as otherwise approved by Council. A defect/maintenance bond will only cover works for which there are no known pre-existing defects at the time of bonding. Any works with known defects will be assessed at full replacement value with the bond set at a **minimum** of 150% of the full estimated value of the works
- The developer is responsible for providing all necessary documentation, and shall pay all processing fees, legal costs and disbursements relating to the bond
- Council may require the bond to be registered against the title(s) of the property
- The bond for outstanding or defect/maintenance work is refundable upon confirmation of final inspection and acceptance by Council following completion of the works, payment of all associated fees
- Bond refunds shall include GST when included in the bond value approved by Council
- Council's decision as to whether the bond will be issued is final.

[5] In exceptional circumstances (e.g. road construction has not been properly supervised/ inadequate testing done etc), this period may be extended at the discretion of the roading manager

1.11.1.7 Uncompleted Works Bond

Uncompleted works bonds may be implemented to enable short-term deferral of certain physical works under the Resource Management Act. Such bonds shall only be entered into if the application complies with the specific requirements of the applicable Resource Consent Operational Policy.

- Bonds are for engineering works required by conditions of an approved resource consent
- Generally only minor uncompleted works and, where approved, carriageway sealing may be bonded. Critical infrastructure (e.g. road formation, water, wastewater, stormwater, power supply etc) will not normally be bonded
- As-built plan requirements for completed works will not be bonded
- Delayed implementation shall not result in adverse effects outside the boundary, prevent vehicular access to each lot from a road, inhibit occupation of lots for their proposed land use, or result in, or leave a hazard to public safety
- The term of the bond shall not exceed 12 months
- Where compliance with the conditions of resource consent is issued under bond, the balance of the construction work outstanding shall be completed within the term of the bond.

Council's decision as to whether the bond will be issued is final.

1.11.1.8 Defects/Maintenance Bonds

Defects/Maintenance Bonds will be required to ensure the performance, completion and/or maintenance/repair of certain works carried out under the Resource Management Act, and be a condition of consent in accordance with the applicable Resource Consent Operational Policy. Defects/Maintenance Bonds will be applied if:

- Non-completion has the potential to result in adverse effects outside of the subject site boundary or expose Council to possible financial and/or litigation claims
- Work is to be undertaken on Council owned/administered land
- The maintenance period for the work shall commence at the completion of the whole of the work, except as otherwise permitted
- A defects/maintenance period is required on assets to be vested to Council
- It is unreasonable to delay the issuing of s224(c) certificate due to conditions of consent relating to planting/control
- It is unreasonable to delay the issuing of s224(c) certificate due to conditions of consent that cannot reasonably be completed by this stage, and which may result in adverse effects outside of the subject sites boundary
- The term of the bond shall be appropriate to the extent and scope of the consent condition, and in accordance with Council policy.

1.11.2 Requirements for Final Completion

Prior to final acceptance at completion of the maintenance period, the developer shall satisfy the following requirements:

- Berm grass to be mown
- Carriageways and footpaths swept, and surplus seal chip removed
- All sumps and piped disposal systems cleaned out
- Planted areas to be left in a state suitable for ongoing maintenance – including:
    - All plants healthy, depths of mulch as specified in plans, grass established, removal of all weeds and noxious vegetation from berms, reserves etc, any outstanding maintenance items completed
    - All utility services to be complete and functioning correctly

- Written approval from other network utility operators as necessary.

1.11.2.1 Vesting and Easements

Roads, stormwater pipelines, land for overland flow paths, retention/attenuation ponds and water and wastewater infrastructure, shall be vested or protected by easements in favour of Council **as specified in the conditions of resource consent**, or as otherwise approved, at the developer's expense.

Easements in favour of Council are required for all public reticulation located in private property regardless of sizing, except where the reticulation is contained within the side boundary restrictions, specified in the District Plan or as otherwise directed by resource consent conditions. Easements may be required for access to maintenance structures.

1.11.2.2 Operation and Maintenance Manuals

Operation and Maintenance Manuals shall be provided in PDF format, plus 2 hard copies, for all mechanical equipment and installations, including sewer pump stations, water supply booster pumps, actuated valves, air valves, odour control and treatment facilities, water quality treatment devices, attenuation structures and outlet controls, and similar, including:

- As-built plans
- Equipment List, with make, model and serial numbers
- Equipment supplier details
- Pump curves, with design flow/head identified
- Electrical layout
- Control logic
- As-built levels of control switches
- Maintenance schedules
- Technical Specifications.

1.11.2.3 Asset Information Schedule

'Asset Information Schedule Requirements' shall be provided as included in the Procedures Manual on Council website**.** It shall consist of a full inventory list of all Council assets that have been provided ***and*** all assets that have been removed, or sealed off. The asset schedule shall be cross-referenced with the plans using a simple sequential numbering system. Cross-reference numbers on as-built plans shall be underlined to distinguish them from other numbers. The Asset Information Schedule shall include:

Component Type/Description

- Unit Type
- Installation Date
- Expected Life
- Location X,Y,Z Co-ordinates & inverts – for 'point data'. – For lines, pipes and mains, coordinates at the start, end, 20 m centres, change of material/size etc shall be shown on plans
- Material and class
- Size
- Quantity
- Serial Number
- Ground Surface description
- Manufacturer.

Section 2 Site Suitability (Geotechnical, Hazards etc) and Earthworks

2.1 General Requirements

2.1.1 General

This Section covers requirements for the following:

- Assessment of land stability and suitability for the proposed use
- Design and control of earthworks
- Assessment of ground suitability for the construction of roads, buildings etc
- Assessment of other hazards that may affect the development. This may include hazards identified in the District Plan or in Council or other engineering reports, or hazards identified as part of the site investigation.

2.1.2 Referenced Documents

Details of referenced documents will be found in Section 1.1.

Council has copies of investigations carried out to support development proposals across the District. Reports on adjacent sites may be available, subject to limitations on their use.

2.2 Technical Requirements

2.2.1 Preliminary Site Evaluation

The developer shall obtain information available from Council and other sources on hazards and development limitations that may affect the development, including:

- Coastal Erosion and Instability
- Earth movements
- Mine zones
- Flood zones
- Contaminated sites.

Information on these hazards is available via the District Plan, the WDC GIS, NRC records, or specific investigations/reports.

The developer shall engage a geotechnical engineer/geo-professional to carry out a preliminary site evaluation and prepare a geotechnical assessment report, except where the developer can otherwise demonstrate that the site is stable and suitable for the proposed use, and the proposed earthworks on the site are minor in scale. An IQP shall carry out an evaluation as required on other hazards. Refer to Section 1.6.1 for requirements.

2.2.2 Coastal Areas

Minimum site levels in coastal areas shall take into account storm surge, wave run-up, tsunami hazards, erosion potential, climate change and sea level rise.

Specific investigation and design shall be carried out for all coastal sites, and particularly where potential development lies within coastal hazard notations.

2.2.3 Geotechnical Assessment Report

The geological/geomorphological assessment should entail most or all of the following steps, and a brief report should specifically address the expected effects of the subdivisional and/or building development on the land.

The following risk levels are identified in Council reports on slope stability. Where the site is outside of an area covered by such reports, an assessment shall be made by a geotechnical engineer/geo-professional as to which level is appropriate.

2.2.3.1 Low Stability Hazard

On this land erosion or land slippage is not apparent. However, sloping areas may be sufficiently sensitive to erosion or slippage that could occur due to inappropriate cutting, filling, and/or site disposal of stormwater and/or effluent waste water, and natural events (e.g. cyclonic short term high intensity rainfall events). These slopes could also be subject to soil creep.

Accordingly, applications for development of this land should be accompanied by a brief geotechnical report which summarises the results of a walk-over survey and a geological/geomorphological assessment (which describes how the particular landform has been formed, what it is made up of and what slope processes are, or are likely to be occurring) and provides an informed opinion on the suitability of the land for the intended purpose.

The geological/geomorphological assessment should entail most or all of the following steps, and the brief report should specifically address the expected effects of the subdivisional and/or building development on the land.

The geotechnical assessment of low risk land would be expected to include most or all of the following steps:

a Walk-over inspection of the site and the surrounding land

b Inspection of aerial photographs taken at various times to provide insight into the local geomorphology and evidence of any previous instability

c Review of geological data (maps, bulletins)

d Enquiry after local information about stability/instability of the ground

e Seek existing data about the soil and rock profile (look for nearby exposures) or perform some simple subsurface investigation

f Examination of the soil profile to confirm that if the soil is in-situ and not colluvium (slide debris)

g Examination of the existing survey records for evidence of movement (slippage or erosion)

h An opinion stated by a geotechnical specialist as to the stability of the land for development (including an assessment of the effects of development such as excavation, filling, removal of vegetation, disposal of stormwater or effluent wastewater into or over the area)

i Provide definite conclusions and recommendations on any development restrictions. See Section 2.2.5.

2.2.3.2 Moderate Stability Hazard

This land does not exhibit any evidence of any recent instability but does display 'relic' landslide geomorphology, or is sufficiently sloping to be potentially subject to instability due to either natural events (e.g. high intensity rainfall events or earthquake), or as a result of inappropriate cutting, filling, and/or site disposal of stormwater and/or effluent waste water.

Accordingly, applications for subdivision, building or other development (such as excavation, filling, removal of vegetation, disposal of stormwater or domestic wastewater into or over the area) may be allowed to proceed subject to consent conditions. These would include a requirement for a supporting geotechnical report which includes a stability assessment demonstrating that the proposed development will not accelerate, worsen or result in the land being subject to, or likely to be subject to, erosion or slippage, to the satisfaction of Council.

A geotechnical assessment on moderate risk land would be expected to include:

a Topographic survey (if not already available) or slope profiles

b A description of the geology and geomorphology of the area, including comment on the areas surrounding the development site

c Definition of the nature and continuity of the strata over the whole area of land which is proposed to be developed (buildings, access and services) and to a depth below which slipping is most unlikely, by means of test pit and/or drilling and/or augering (unless existing exposures are adequate)

d Assessment of the relative strength and the sensitivity of the soil in each stratum in which, or interface on which, sliding is possible

e Assessment of likely groundwater levels and piezometric pressures in the strata during extreme infiltration conditions

f An opinion stated by a geotechnical engineer/ geo-professional as to the stability and suitability of the land for development. The stability of the whole slope (upon which the site may only form a part of) and the effects of the development (such as excavation, filling, removal of vegetation, disposal of stormwater or effluent waste water into or over the area) on this should be given

g Provide definite conclusions and recommendations on any development restrictions. See Section 2.2.5.

2.2.3.3 High Stability Hazard

This land exhibits evidence of recent or present slippage or erosion and/or is subject to processes such that slippage or erosion is considered likely to occur within the next 100 years. Accordingly, development of this land presents an identifiable hazard to property and could also, in some circumstances, threaten life.

On, above and especially below this land, no subdivision, building or other development including excavation, filling, removal of vegetation, disposal of stormwater or domestic wastewater into or over the area should be permitted unless a geotechnical report including an appropriate and adequately detailed stability analysis is produced to the satisfaction of Council.

The geotechnical report must demonstrate that the proposed development area will not be subject to erosion, or slippage, or inundation by debris from upslope. It should also show the proposed development, through preventative works or other measures, will ensure that any structure will not become damaged by erosion or slippage arising on or off the site, and that development will not accelerate, or worsen, erosion or slippage.

A geotechnical report on high landslip hazard areas land would be expected to include:

a Topographic Survey (if not already available)

b A description of the geology and geomorphology of the area and immediate surrounding areas

c Definition of the nature and continuity of the strata over the whole area of land involved, and to a depth below which slipping is most likely, by means of test pits and/or continuous recovery core drilling (unless existing exposures are adequate)

d Determination of the peak and residual shear strength parameters (either from laboratory tests or back analysis of relevant slope failures) and the sensitivity of the soil in each stratum in which, or interface on which, sliding is possible

e Assessment of groundwater levels and piezometric pressures in the strata during extreme infiltration conditions

f Analysis of possible failure mechanisms, relevant to the specific geology and geomorphology of the site using effective stresses

g An opinion stated by a geotechnical engineer/geo-professional as to the stability of the ground and the preventative (or remedial) measures to be incorporated in the development

h The stability of the whole slope (upon which the development site may form only part of) and the effects of the development (such as excavation, filling, removal of vegetation, disposal of stormwater or effluent waste water into or over the area) on this should be given

i Provide definite conclusions and recommendations on any development restrictions, specifically addressing section 106 of the RMA. Ssee Section 2.2.5.

Even with a thorough geotechnical report, which includes a stability analysis, complete avoidance of all risk may not be possible and no guarantee of absolute safety should be expected. Site development works in particular need to be carefully planned to ensure development does not result in slippage or erosion.

Works which can be undertaken to protect or restore the land include earthworks (to reduce slope angles or place buttress fills), drainage works (trench drains, buttress or counterfort drains aligned down the true slope angle are particularly effective), retaining structures, erosion protection structures, and planting.

2.2.4 Stabilisation Works

Provide clear details of any necessary works required to protect or restore the land. This may include earthworks (to reduce slope angles or place buttress fills), drainage works (trench drains, buttress or counterfort drains aligned down the true slope angle), retaining structures, erosion protection structures, and planting.

Where a site requires works to ensure stability of a landform, such works shall be confirmed and recommended in the application report(s) and/or be carried out and certified by a Council approved IQP or geotechnical engineer/geo-professional as part of the subdivision or development.

2.2.5 Restrictions on Development

Any restrictions on development contained in a site suitability report must be presented in tabular form with a plan defining areas suitable for use/define areas to be avoided as the basis of a Consent Notice registered against the title of the land affected. See Section 2.2.3 & WDC Form EES-PO1.

2.2.6 Specific Building site(s) and Effluent Disposal site(s)

All subdivision applications shall identify a specific building site, a route to gain access to the building site and, where applicable, a specific effluent disposal site. These areas are to be examined and any restrictions associated with the development of the site(s) reported on, along with recommendations as to how these restrictions may be mitigated. (These reports will be carried over to the building division via a consent notice/notice on title, for use at the time of building consent application).

2.3 Landform

The developed landform shall preserve natural features as much as practicable, including the retention of natural watercourses.

2.4 Compaction of Fill Material

Compaction of fill material shall be as set out in **NZS 4431**, or as specified by the geotechnical engineer/geo-professional where **NZS 4431** is not applicable.

All documentation on the testing of the compacted soils shall be submitted with completion report.

2.5 Erosion, Sediment, Dust, and Odour Control

The developer is responsible for compliance with Northland Regional Council requirements and consents (See Regional Water and Soil Plan) and shall employ the best practical means to ensure that windblown dust or soil nuisance, or water born erosion and siltation, or odour problems, are minimised and systems maintained during the course of construction works.

This may require detention ponds, silt fences, and similar. The use of flocculants may be required in surface water sediment control ponds depending on the sensitivity of the location and receiving environment.

Incomplete cut and fill areas shall be kept to a minimum and re-topsoiled, grassed or vegetated, and fertilised, as soon as possible to suit seasonal conditions.

2.6 Topsoil

Topsoiled surfaces shall be between 150mm – 300mm consolidated depth, and shall consist of the outermost layer of natural soil with the highest concentration of organic matter and microorganisms, and generally be free of vegetation, large clumps, excessive and large stones, and be suitable for easy spreading in an even layer.

2.7 Report on Completion of Construction

Where excavation or filling has been carried out, a plan (with before/after contours not exceeding 1m intervals) and a report identifying the extent/depth of the work, inspections and test results shall be submitted on completion of construction and prior to the final inspection of the development. This shall be accompanied by a statement of professional opinion as to the compliance of the filled/cut ground to the specification and the suitability of the land for Building Construction. See WDC Form EES-PO1.

This report must identify any specific design requirements that necessitate the building/foundation design to deviate from **NZS 3604** and **NZS 4229** and design parameters for detailed design of the foundations (such as bearing capacity, suitable founding depth etc).

Section 3 Roads and Access

3.1 Scope

This section covers the minimum requirements for the design and construction of roads associated with land development and road improvements.

3.2 General

3.2.1 Objective

The objective is to provide road corridors capable of ensuring the safe and efficient movement of people, vehicles and goods with operating speeds appropriate to the surrounding environment carrying all utility services underground and creating an aesthetically acceptable environment.

3.2.2 Referenced Documents

For details of referenced documents refer to Section 1.1.

3.2.3 Road Design

Road design shall provide for the various components of a road. These include, among others, - for specific details require, refer to Section 3.4

- Road carriageway, including bridges, culverts etc
- Pedestrian and cycle facilities
- Street lighting
- Road marking and signs
- Berm and amenity provisions including landscaping and street furniture
- Vehicle Crossings
- Vehicle parking and manoeuvring areas
- Utility services
- Stormwater control, including stormwater treatment and 'low-impact' design structures and use of carriageway as a secondary flow path.

Road design shall include provision for full future development outside of the property boundary to the extent defined in the District Plan together with its impact on the existing surrounding road network.

3.3 Design Process

3.3.1 Designer Responsibilities

Refer to Section 1.5 for the qualifications and experience specified for the person undertaking investigations, design, supervision and certification of the proposed works. Note in particular that certain specialist aspects Table 1.1 require an IQP to undertake the design work.

For all works, when submitting plans the designer shall provide a Producer Statement – Design identifying the design standards used, and certifying that the design complies with these standards. See Form EES-PS1.

For significant projects, the above information, together with all other infrastructural design details, shall be submitted in the form of a comprehensive bound engineering design report.

Designers must liaise with Northpower and Telecom and any other approved utility provider (including Council) to determine their requirements. All existing utilities must be located and plotted on design plans.

3.3.2 Information to be Submitted

The information shall include site investigations, supporting information and calculations sufficient to demonstrate compliance with the design requirements. This shall include:

- Testing of the pavement subgrade
- Assessment of traffic volumes (contact the roading manager for relevant data on existing roads)
- Pavement design
- Surfacing design
- Drainage design
- Roadmarking and signage
- Utility service locations
- Private accessways.

Design drawings complying with the requirements of Sections 1.7 & 1.8 shall be provided for approval.

3.3.3 Design Approval

The drawings and supporting information will be reviewed by the roading manager or his/her delegated representative. Following any necessary amendments, the drawings will be stamped and signed by the roading manager or his/her delegated representative. Only the stamped drawings shall be deemed approved drawings. Unless specifically stated otherwise, the approval of drawings does not supersede the requirements or obligations of these Standards.

3.3.4 Safety Audit

The roading manager may require the designer to provide at any time prior to engineering plan approval, an independent safety audit of the design. The auditors shall be independent of the design team and shall use the procedures detailed in Road Safety Audit – Procedures for Projects – Manual Number TFM9.

The objectives of the audit will be to identify potential safety problems for road users and others affected by the proposed project and to ensure that measures to eliminate or reduce the problems are fully considered.

3.4 Design Requirements

3.4.1 Design Life

The design life of roads shall be as follows:

- Pavements – not less than 25 years based on Equivalent Standard Axle (ESA) or an equivalent design method
- Surface and ground water drainage systems - not less than 100 years
- Stormwater treatment systems within the legal road – not less than 25 years to first significant maintenance[6]
- Bridges and major culverts on public roads - not less than 100 years
- Bridges on private roads and privateways – not less than 100 years
- Other structures on private roads and accessways – in accordance with Building Act/Code requirements.

[6] Replacement of the filtration media etc would be considered to be significant maintenance.

3.4.2 Road Width Requirements

Unless approved otherwise through the resource consent process, minimum road widths shall comply with Table 3.1 (urban) & Table 3.2 (rural).

Unless consented otherwise, the requirements shall apply equally to roads that are to remain in private ownership.

Table 3.1 Minimum Width Requirements – Living 1 & 2 and all Business Environments

Class	Type	Criteria	Minimum Road Reserve Width (m) (refer *notes below)	Minimum Carriageway Width (m)				Foot path Width (m)
				Parking	Traffic	Cycles	Total	
	Local							
A	Residential cul-de-sac	Up to 150m	14.0	-	7.5	-	7.5	1 x 1.4
B	Minor Residential	Up to 500m	18.0	1 x 2.5	2 x 3.0	-	8.5	2 x 1.4
C	Residential	Over 500m	21.0	2 x 2.5	2 x 3.0	-	11.0	2 x 1.4
	Collector							
D	Residential/ Industrial/ Commercial	1000 – 3000 vpd	23.0	2 x 2.5	2 x 3.5	2 x 1.0	14.0	2 x 1.4
	Arterial							
E	Residential/ Industrial/ Commercial	3000 – 7000 vpd	24.0	2 x 2.2	2 x 3.5	2 x 1.8	15.0	2 x 1.4
		>7000 vpd	Specific Design					
	Service Lane							
F	Industrial/Commercial note 1	-	9.0	-	2 x 3.0	-	6.0	1x1.35

Note 1 Privateways in Industrial/Commercial zones shall be formed to service lane standard. Refer to Section 3.4.11.1 & sheet 2

Table 3.2 Minimum Width Requirements – Rural Roads (Living 3, Countryside and Coastal Countryside Environments)

Class	Type	Annual Average Daily Traffic (aadt)	Min. Road Reserve Width (m)	Minimum Carriageway Width (m)			
				Unsealed Shoulder	Sealed Shoulder	Traffic	Total
	Local						
A	Minor	1 - 300	20.0	2 x 0.5	2 x 0.5	2 x 2.5	7.0
B	Sub collector	301 - 700	20.0	2 x 0.5	2 x 0.5	2 x 3.0	8.0
C	**Collector**	701 – 2500	20.0	2 x 0.5	2 x 0.5	2 x3.5	9.0
D	**Arterial**	>2500	20.0	2 x 0.5	2 x 1.0	2 x 3.5	10.0

***Notes**

Road reserve widths **may** need to be increased from Table 3.1 & Table 3.2 to provide for:

- Services (including sewage pump stations and associated storage, electricity transformers etc)
- Berms
- Batters (see note following)
- Landscaping
- Stormwater channels, swales, bio filtration strips or other stormwater mitigation measures. Refer Section 3.4.15, Sheet 15 & Sheet 16
- Recessed parking
- Future development (i.e. where further development of a site or adjoining land is possible, consideration shall be given for the need or desirability of increasing the legal width of a road to permit such development in the future).

***Notes** In addition

- The legal road reserve shall extend at least 0.5m beyond the top of the batter in cuts and the toe of the batter in fills where such cut height and fill depth exceeds 1.5m unless the batter slope is 1V:5H (20%) or less
- The roading manager may require a higher class of road than that required for the particular development (including future stages of the development) to allow for development both within and outside of the subject property. In such cases Council will fund the difference in width being that which the developer is required to provide and that which Council requires. The cost to Council and timing of any Council contribution shall be agreed with the roading manager prior to work commencing on site
- *Where particular constraints exist that make the required widths impracticable or undesirable, or where low-impact design is proposed as part of the **total** development concept, the developer may apply for dispensation to these standards through the resource consent process. The application should include the reasons for requiring the dispensation, and any measures proposed to mitigate the effects of the reduced standard and demonstrate that this will not compromise good engineering practice*
- Where comprehensive developments are proposed, cycle lanes shall be provided on all urban and industrial/commercial collector and arterial roads. They will also be required where the road forms a strategic link with other cycle routes. Cycle provisions shall comply with 'Austroads Guide to Traffic Engineering Practice – Part 14 Bicycles,' and the NZ Supplement
- The roading manager may require provision for public transport facilities.

3.4.3 Geometric Design Requirements

3.4.3.1 Design Parameters

Design parameters for speed, gradient, super-elevation and curve radius are set out in Table 3.3. Refer also to Sheets 2, 3, 7, 8, 9 & 10.

Table 3.3 Geometric Design Requirements

Type	Design Speed (km/h)	Gradient (%)	Super-elevation (%)		Min. Curve Radius (m)
			Permitted	*Maximum***	
Privateway	-	0.4–12.5–22.2*	-	-	8
Cul-de-sac	-	0.4 – 12.5	6	*8*	15
Local Residential Roads	30	0.4 – 12.5	6	*8*	45
Residential Collector & Arterial	50	0.4 – 10.0	8	*10*	80
Industrial/Commercial Collector	50	0.4 – 10.0	6	*10*	80
Industrial/Commercial Service Lane	-	0.4 – 10.0	N/A		To suit 18m semi trailer unit
Rural Local & Sub-Collector	70	0.4 – 12.5	*To Specific Design*		
Rural Minor Collector (700 – 1000 vpd)	70 – 100	0.4 – 10.0			
Rural Major Collector and Arterial (> 1000 vpd)	100	0.4 – 10.0			

* Refer to Section 3.4.11.2 & Section 3.4.11.3 for specific gradient details.

*** Requires specific pre-approval in writing from the roading manager before submission.*

Notes

- Major **urban** collector and arterial roads shall be designed to 'Austroads Guide to the Geometric Design of Major Urban Roads', incorporating horizontal transition curves

  Other urban roads and privateways may use circular curves with bend widening as required. Tables 3.3 to 3.6 in NZS 4404:2004 may be used for the horizontal and vertical design of urban roads without horizontal transition curves.

- **Rural** roads shall be designed to **TNZ State Highway Geometric Design Manual** or **'Austroads Guide to the Geometric Design of Rural Roads'** except as modified by Tables 3.2, 3.3 & 3.4

  With appropriate signage as necessary, low speed rural roads and privateways may use circular curves without transition curves.

- Roads may be longitudinally 'flat' where permeable edge collector strips or swales are used for stormwater treatment/collection.

Table 3.4 Recommended Widening on Curves for Rural Roads

Curve Radius (m)	Widening (m) where normal width of 2 traffic lanes is:			
	6.0	6.5	7.0	7.5
30 - 50	2.0	1.5	1.5	1.0
50 - 100	1.5	1.0	1.0	-
100 - 250	1.0	1.0	-	-
250 - 750	1.0	0.5	-	-
>750	0.5	-	-	-

3.4.3.2 Horizontal Alignment

Tracking curves (or demonstration of tracking by use of digital tracking software) will be required to show that vehicles can negotiate curves that are narrow 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 Vehicle 2007' and note that tracking curves can be accessed at *http://www.landtransport.govt.nz/roads/rts/rts-18/index.htmail*.

Plans with tracking curves shall be submitted at their natural scale.

The design should provide for a consistent standard of alignment with no curve less than 15 km/hr lower than the 85th percentile operating speed at the site.

3.4.3.3 Vertical Alignment

Crest vertical curves and sag vertical curves shall be designed in accordance with **Austroads Road Engineering Guides 2009**, (or the **Draft State Highway Geometric Design Manual** available off the NZTA website), which gives appropriate K values.

3.4.3.4 Superelevation and Crossfall

Superelevation shall be applied in accordance with Austroads Guidelines unless otherwise required by the roading manager. The rate of superelevation rotation shall be 0.035 radians per second for design speeds up to 70 km/hr and 0.025 radians per second for design speeds of 80 km/hr or higher.

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

Crossfall of 3% is required on all sealed roads.

Where existing features mean that this cannot be achieved the crossfall may vary between 2% and 4%. *Single crossfall roads will be subject to the specific approval of the roading manager and must have particular regard for stormwater management.*

3.4.3.5 Sight Distances

Sight distances for stopping, intersections, overtaking, curves and obstructions shall comply with Sheet 4, **Austroads Guide to Traffic Engineering Practice - Part 5: Intersections**, and **Part 6: Roundabouts**. Where there is conflict, Sheet 4 shall prevail.

The vehicle speeds applicable to sight distance measurement shall be the 85 percentile upper bound operating speed at the limit of visibility in the applicable direction – i.e. point 'O' in respect of sightlines 1, 2 and 3,and point 'E' in respect of sightline 4 on Sheet 4.

Speeds shall be measured using either a floating car survey, calibrated speed gun or by timing the delay as a vehicle crosses marks a set distance apart on the road surface using a digital stopwatch that is accurate to 0.1 seconds. The speeds of a minimum 10 vehicles shall be measured in each case. The approach speeds of vehicles need not be measured for sightline vectors with available sight distance greater than that required for the speed limit of the road.

Should the above method not be used, then the prevalent speed limit shall be used to determine sight distances.

Sightlines outside the road reserve will only be permitted provided the land between the sightline and the road reserve boundary, plus an additional 0.5m beyond the sightline, is appropriately protected such that no development is permitted within the affected area and Council or its contractors have the legal right to trim or remove vegetation within that area. Easements or covenants are acceptable land protection instruments in this regard.

3.4.4 Existing Roads

Where a proposed development fronts an existing road which is not formed to the required standard, and where the effects of the development will, in the opinion of the roading manager, have an adverse effect on the road or surrounding road network, the developer will be required to upgrade the road to comply with this standard. This may include intersection construction or modification, the provision of kerb & channel, footpaths and the upgrading of drainage along the development frontage.

The extent to which upgrading is required will generally be defined through the resource consent process.

3.4.5 Pavement Structural Design

3.4.5.1 General

The design shall be in accordance with the **Austroads Guide to Pavement Technology – Part 2: Pavement Structural Design** (including its New Zealand supplement) and relevant Transit New Zealand pavement materials standards. Pavement design for local roads may use **Austroads 'Pavement Design for Light Traffic'** supplement to the Austroads Pavement Design Guide. The design shall include adequate testing of the subgrade.

Calculations and investigations supporting the design, including testing of the subgrade shall be submitted to Council with the engineering drawings. Laboratory testing shall be undertaken by an IANZ (or equivalent) accredited laboratory. 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 pavement thicknesses adjusted accordingly.

The designer shall provide a Producer Statement–Design on Form EES-PS1.

3.4.5.2 Design & Subgrade Testing

Generally, flexible pavements shall be used for public roads and carparks.

Other types must receive the prior approval of the roading manager.

Pavements shall be designed for the specified design life, based on the subgrade strength, traffic loading and traffic growth. (In general, traffic growth is taken as 2%, however, each case needs to be specifically considered. The roading manager reserves the right to specify a growth figure).

The frequency of testing shall generally be in accordance with good engineering practice and determined by the IQP responsible for the design. However, Council reserves the right to state testing regimes.

Soaked CBR (laboratory test) values of the pavement subgrade shall be used, and the pavement designed for the estimated number of ESA loadings over a 25-year design life. The minimum design traffic for urban cul-de-sacs shall be 5,000 ESAs per lane. In other environments, and for other classes of road, design loads shall be determined from the known and/or predicted heavy vehicle usage of the road, with adequate justification provided.

Unsoaked, or in-situ subgrade CBR tests in non-granular materials will be accepted for privateways and local roads using a scala penetrometer. Sheet 5 shows the correlation between scala penetration and CBR values. The CBR for each uniform pavement design shall be the 10th percentile CBR value – i.e. the value below which 10% of the test results fall (or the value exceeded by 90% of the test results.

For privateways, provided the subgrade CBR (in-situ test) is greater than 7, the construction may be in accordance with Sheet 7 & Sheet 8. Where the subgrade CBR is less than 7, the pavement shall be specifically designed by an IQP.

Subgrade improvements may be undertaken as a means of reducing the metal pavement thickness. Such improvements may include:

- *Lime or cement stabilisation*
- *Use of geotextile fabrics and/or grids*
- *Undercutting of unsuitable material and replacement with a well graded material with a soaked CBR>7*
- *Drying and recompaction of material*
- *Subgrade drainage improvements.*

3.4.6 Intersection Design

3.4.6.1 General

Intersections on curves, particularly on the inside of curves shall be avoided. The location of the intersections shall take into account the minimum sight distances. See Sheet 4.

For major intersections with more than 3,000 vehicles per day, an independent safety audit of the design shall be submitted to Council with evidence that recommendations of the safety auditor have been implemented.

Roundabouts and traffic signals shall be subject to specific approval by the roading manager and shall comply with the TNZ Manual of Traffic Signs and Markings; **'Austroads Guide to Traffic Engineering Practice Part 6: Roundabouts'** and **Part 7: Traffic Signals** as amended for NZ conditions. Refer Section 3.4.12.

Carriageway alignment may be offset within the road reserve to improve the intersection angle. Tee intersections are preferred to cross intersections particularly for minor roads. Acute-angle and multi-leg intersections are to be avoided. See Section 3.4.6.2 following.

3.4.6.2 Design Criteria

The preferred angle of intersection is 90^0.

The angle of intersection may be reduced to 70^0 for intersecting local roads.

Centre to centre distances between any two roads shall be not less than:

- 40m when intersecting a local road
- 150m when intersecting a collector class road or higher (all environments).

Acceleration and deceleration facilities shall be provided as necessary. For rural intersections, reference should be made to the Procedures Manual and a report entitled '**Entrance Treatments and Sight Distances**' for local widening and turning bay requirements, and in particular to Figure 1. See Section 3.4.10.3.

The minimum kerb radius at intersections shall be:

- 8m for residential roads of collector class and below
- 13.5m for residential roads above Class D, and in commercial/industrial areas.

Major industrial intersections shall be specifically designed for 18m semi-trailer units, and all urban intersections (Class C roads and above) designed for a minimum 11.5m large rigid truck, as defined by the 'RTS18' tracking curves referenced in Section 3.4.3.2.

Lot corners shall be splayed a minimum of 6m along both boundaries unless relevant tracking curves demonstrate otherwise.

Wherever practicable the gradient within 30m of intersections on local roads should not exceed 1 in 8 (12.5%) and should preferably be less than 1 in 33 (3%).

3.4.7 Cul-de-sac Heads

The geometric layout shall comply with Sheet 11.

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

Hammerhead or 'T' cul-de-sacs may be provided with the prior approval of the roading manager where a standard circular head is unsuitable. The layout is subject to specific design with particular consideration of vehicle entry/exits. Compliance with Figure 3.5 in NZS 4404:2004 is an acceptable solution in residential areas.

If a central area is proposed for parking or planting, the layout shall be checked for access by heavy vehicles using tracking curves. The minimum trafficable width shall be 6m.

No exit roads should be avoided if at all possible in commercial/industrial areas.

Where a road is formed, and it is possible that the road will be extended in the future, provision for turning within the carriageway at the end of the road shall be specifically provided for. The design shall be subject to specific approval by the roading manager.

3.4.8 Footpaths, Accessways and Cycleways

3.4.8.1 Urban Footpaths

Footpaths shall be set back a minimum 1200mm from the kerb ***unless physical constraints dictate otherwise***[7] and unless located in a cul-de-sac. See Sheet 29.

Footpaths shall comply with the following:

- The minimum width shall be 1.4m (not including kerb width where adjacent to kerb).

In areas of high pedestrian use such as shopping centres, community facilities, schools etc and where angled parking is provided local widening will be required – specific design shall apply.

- Crossfall shall be 2%
- Longitudinal gradient should generally conform to that of the road and shall not exceed 12.5%
- Accessible (pram and wheelchair) crossings shall be provided at all kerbed intersections and pedestrian crossings. ***Where possible, sumps should be sited on the upstream side of the crossing***[8]. The crossing entrance shall be connected to the footpaths and have a maximum gradient of 1 in 12 (8.3%).

Construction details for footpaths and pram crossings are described further in Section 3.5.4 and shown on Sheet 12 & Sheet 17.

3.4.8.2 Rural Footpaths

Footpaths shall be provided and constructed in the Living 3 environment where required by resource consent. These may be located adjacent to lot boundaries, separated from the carriageway by a watertable. They shall be constructed to the same standard as urban footpaths.

With cluster development in Countryside and Coastal Countryside environments, 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.

3.4.8.3 Pedestrian Accessways and Cycleways

A pedestrian accessway will generally be required where it would offer a significantly shorter walking route between roads or from a road to a reserve, shopping centre or community facility etc

Accessways and cycleways shall comply with the following:

- They shall be created as either an easement in gross in favour of Council or a separate lot and should be visible from end to end
- The minimum width shall be 2.5m if also acting as a cycleway. They shall be paved full width to a standard not less than that for footpaths
- Provision shall be made for stormwater disposal
- Where barriers are provided to prevent vehicular access, provision shall be made for mobility scooter access
- Fencing See Sheet 54, lighting and handrails shall be provided for pedestrian accessways to enhance the surrounding properties. Lighting shall be such that it does not glare into adjacent residential properties but still effectively illuminates the accessway
- Dedicated cycleways shall be provided where good design requires separation from the carriageway or where required by the roading manager.

[7] Discretionary. Proof required that constraints cannot be overcome by design change

[8] Discretionary if sumps not placed upstream of accessible crossing. Proof required to justify

3.4.9 Berms and Landscaping

3.4.9.1 Urban Berms

The shape, slope and vegetation of berms shall be satisfactory for stormwater run-off, maintenance, location of services, landscaping and vehicle crossings to properties. To achieve satisfactory drainage, the crossfall of berms should be at least 3% but may be varied between 3% and 17%. Where berms are specifically provided for as water quality treatment filter strips, the composite gradient should be 2% – 5%.

For berm crossfalls greater than 8%, the designer shall produce cross sections to demonstrate crossings can be satisfactorily negotiated by a standard design vehicle as shown on Sheet 26 *and in accordance with* Sheet 23 *(breakover angles).*

The berm crossfall shall normally slope towards the road.

Where this is not possible, a positive drainage system shall be provided that directs flow to a controlled stormwater system. This may require the use of dished channels and sumps.

Stormwater run-off from berms shall not be concentrated so as to pond, flood or cause a nuisance on any adjacent lot or adversely affect pedestrian use of footpaths.

Berms shall be topsoiled to a compacted depth of not less than 150mm or greater than 300mm and grassed. The whole of the berm area shall be suitable for mowing. See Section 3.5.5 for construction details.

3.4.9.2 Rural Berms

In general, rural berms shall be constructed to the same standard as urban berms. The width of the berm shall not be less than 2m between the roadside channel and road reserve boundary. Provision shall be made for footpaths in the Living 3 Environment, and level berms suitable for pedestrian use in the vicinity of cluster developments in the Countryside and Coastal Countryside Environments. See Section 3.4.8.2.

Where existing or proposed road culverts are discharging onto adjoining properties the culverts shall be extended to the road reserve boundary to enable continuous unrestricted pedestrian access.

Batter slopes shall be topsoiled and grassed or if necessary, hydroseeded.

3.4.9.3 Landscaping

Landscaping (including structures) must not compromise sight lines, underground services, or the safety of road users, cyclists and pedestrians.

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 Section 7 of this standard. The approval of both the roading manager and the parks manager will be required for all such plantings and structures.

3.4.10 Vehicle Entrances

3.4.10.1 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, ***except*** *where access to the road with higher class is shown to be more appropriate, and with the approval of the roading manager.*

The number of vehicle entrances per proposed allotment shall not exceed those shown in Table 3.5.

Table 3.5 Maximum Number of Vehicle Crossings per Proposed Allotment

Note The frontage measurement will only apply to the road front/s approved for gaining entrance

Frontage (m)	Local	Collector	Arterial
0-16	1	1	1
17-60	2	1	1
61-100	3	2	1
>100	3	3	2

Notes

- Paddock entrances in Countryside Environments, with less than 10 vehicle movements per month, are exempt from the provisions of this table
- This table does not apply to service stations, where they comply with the Land Transport Safety Authority Guidelines for Service Stations.

The minimum distance of a vehicle entrance from an intersection is shown in Table 3.6. Distances are measured parallel to the centreline of the frontage road from the centreline of the vehicle entrance to the edge of the carriageway of the intersecting road.

Table 3.6 Minimum Distance of Vehicle Crossing from Intersections

	Intersecting Road Type (distance in metres)		
Speed Limit 50 km per hour			
Frontage Road	**Arterial**	**Collector**	**Local**
Arterial	70	55	35
Collector	40	40	20
Local	25	25	10
Speed Limit over 50 km per hour			
Arterial	180	180	90
Collector	75	60	60
Local	75	60	60

Note Vehicle crossings may not be situated within the curve radius at intersections

Entrance crossings are to be designed and constructed in such a manner that will control stormwater run-off entering a property from the road, and that will likewise prevent stormwater and detritus, including gravel, dirt and other materials, migrating onto the road reserve from a property. Urban accessways and private driveways sloping up from the road shall have a stormwater collection and disposal system at the boundary as detailed on Sheet 18.

Site specific design shall be provided for the crossing of grass swales and/or bio filtration strips where such systems are used for control and management of stormwater from the carriageway. Such design must ensure all weather access is available to the property whilst ensuring the operation of the swale and/or bio filtration strip is not 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 crossings shall be designed for use by a standard design vehicle without grounding. See Sheet 23 for details.

Crossing locations are to comply with the minimum sight distance requirements of Sheet 4.

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

A Road Opening Notice shall be obtained prior to the construction of any crossing. This shall include the provision of an associated traffic management plan.

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

3.4.10.2 Urban Crossings

A vehicle crossing shall be provided between the kerb line and the road boundary at the entrance to all privateways 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).

Vehicle crossings in urban areas shall normally be constructed in concrete with surface finish to match adjacent footpaths.

Specific approval may be given for interlocking pavers or asphaltic concrete.

Vehicle crossings for individual lots and privateways shall comply with the details on Sheet 18 & Sheet 19.

3.4.10.3 Rural Crossings

A vehicle crossing shall be provided at the entrance to all privateways 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 chip seal, asphaltic concrete or concrete. Where concrete is used, the start of the concrete shall be not less than 0.5m from the edge of the existing seal, or 0.5m outside of the carriageway width required by this standard, whichever is the further. The area between the concrete crossing and edge of seal shall be sealed.

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

Vehicle crossings for individual lots and privateways 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. See Sheet 21

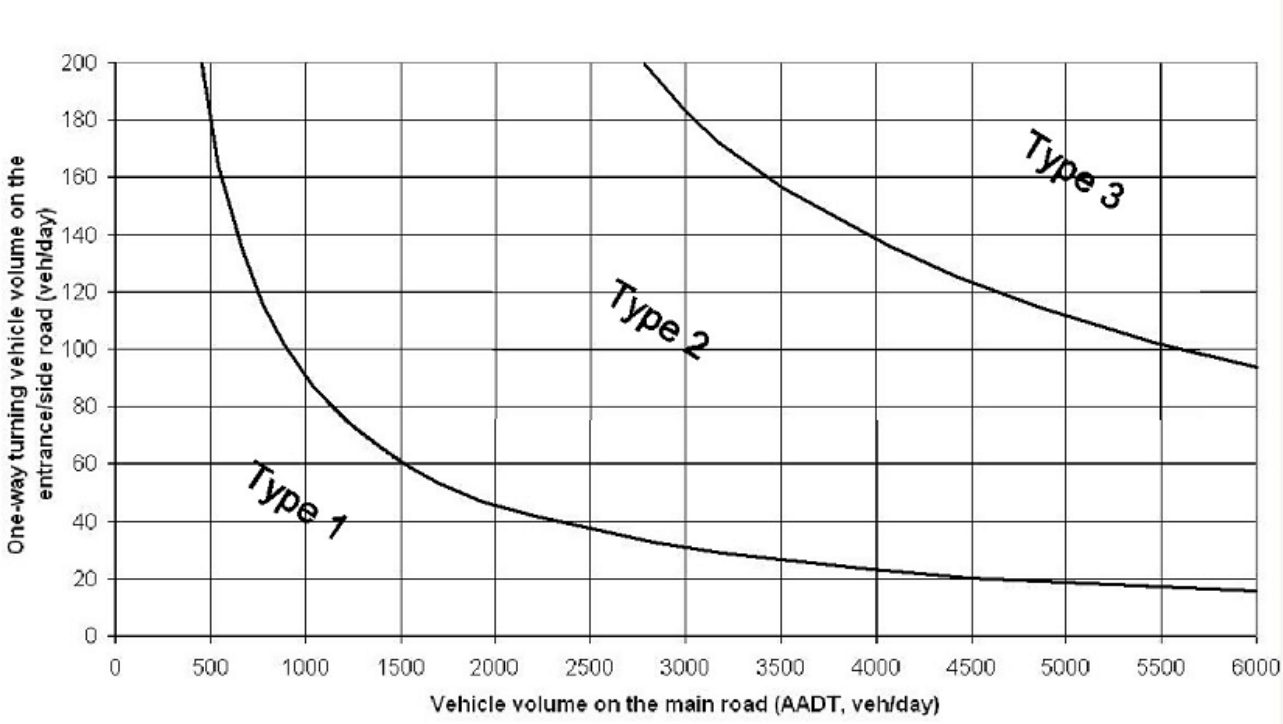
Type 2 A basic entrance with some local widening as shown on Sheet 21

Type 3 The same as the NZTA's 'Diagram D' standard (as described and shown in Appendix 5B of its *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 *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 1. Note that the use of the formula which is the basis for Figure 1 may be required where interpolation of Figure 1 is uncertain. Reference should be made to the Procedures Manual for the formula and to an extended Figure where turning volumes exceed 200 vehicles per day. See Section 3.4.6.2.

Figure 1 Criteria for Vehicle Entrance Types (Rural)



For Types 2 & 3 the criteria is to 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 IQP. 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.

3.4.10.4 Commercial Crossings onto Sealed Roads

Where a commercial crossing is constructed onto a sealed road, a (minimum) 2m strip of minimum 30mm thick hot laid AC shall be laid immediately in front of the crossing for the width of the mouth of the crossing. Refer Sheet 19 & Sheet 22 for details.

3.4.11 Private Accessways

3.4.11.1 General

Vehicular accesses that serve **eight or less** separate lots or dwelling units shall be private accessways, ***except*** *where Council agrees that they become public road.*

Unless approved otherwise through the resource consent process[9], private accessways serving more than eight lots or dwelling units shall be formed to the requirements of the relevant road standard. Minimum legal and carriageway widths shall conform to Table 3.7 below.

[9] Discretionary. Substantial reasons required for deviation – approval is not guaranteed.

Table 3.7 Minimum Width Requirements – Private Accessways

See also Sheet 9 & Sheet 7

Category	Environment	Criteria (No of lots or dwelling units, whichever is the greater)	Minimum Private way width (m)	Minimum Carriageway width (m)			Footpath width (m)	Minimum Surfacing requirements
				Unsealed shoulder	Surfacing width	Total		
	Urban							
A	Living 1 & 2	2 - 4	4.0	-	1 x 3.0	3.0	-	Seal or concrete
A(alt)*	Living 1 & 2	2 - 4	5.0	-	1 x 4.0	4.0		Seal or concrete
B	Living 1 & 2	5 - 8	6.0	-	1 x 4.5	4.5	0.95	Seal
	Rural							
C	Living 3	2	4.0	2 x 0.25	1 x 3.0	3.5	-	Seal or concrete
C(alt)*	Living 3	2	5.0	2 x 0.25	1 x 4.0	4.5	-	Seal or concrete
D	Living 3	3 - 5	6.0	2 x 0.25	1 x 4.0	4.5	-	Seal or concrete
E	Countryside & Coastal countryside	2	4.0	2 x 0.25	1 x 3.0	3.5	-	Aggregate
E(alt)*	Countryside & Coastal countryside	2	5.0	2 x 0.25	1 x 4.0	4.5		Aggregate
F	Countryside & Coastal countryside	3 - 5	6.0	2 x 0.25	1 x 4.0	4.5	-	Aggregate
G	All environs	6 - 8	10.0	2 x 0.25	2 x 2.75	6.0	-	Seal

Note* *If a fire appliance has to use the privateway, then the **(alt) option will apply to the design of the privateway. This decision will be made by the SEEO after examining the available reticulation etc (Refer to **New Zealand Building Code C/AS1 Part 8 – Fire Fighting**)*

Note Privateways in industrial/commercial developments shall be formed to service lane standards. See Sheet 2

Where a private accessway serving more than 8 lots or residential units 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 maintenance vehicles and fire appliances in the vicinity of the pump station or hydrant shall be provided and the access designed to take heavy vehicles. The minimum carriageway width shall be 4.0m. See **NZ Building Code C/AS1 Part 8**.

Where a private accessway contains public water and/or sewer reticulation the legal width may need to be increased to accommodate the minimum clearances required by Table 6.4.

Easements in gross in favour of Council may be required to be created over the accessway[10].

If the CBR of the subgrade is <7 and/or the number of residential units served exceeds 8, specific design of the accessway by a CPEng/IQP is required.

3.4.11.2 Urban Private Accessways

The **maximum** gradient shall be:

- 12.5% for the first 5m from the road reserve boundary
- 22.2% for the remainder.

The minimum crossfall shall be 3% and the maximum crossfall 6%.

On privateways in excess of 100m long and less than 4.5m carriageway width, passing bays shall be provided at points of intervisibility (at approximately no more than 50m intervals), or as approved. For such passing bays the carriageway width should be increased to 5.5m over a 15m length including 5m tapers at each end.

Surface water from an urban accessway shall be collected in a sump and/or directed to a stormwater control or reticulation system with an approved outfall location (generally, no discharge will be permitted directly to the kerb). It shall not discharge over a footpath or directly onto a road carriageway. Where accesses fall away from the road, stormwater control shall be provided as necessary to ensure that stormwater from the access does not concentrate onto any lot. See also, Section 3.4.10 - vehicle entrances. Stormwater attenuation and treatment shall comply with the requirements of Section 4.

Private accessways shall comply with the construction requirements of Section 3.5 and the details on Sheet 7. Note that where private accessways are proposed for industrial developments they shall be formed to the service lane standard of Sheet 2 *unless agreed otherwise through the resource consent process[11].*

3.4.11.3 Rural Private Accessways

Refer to Sheet 9 & Sheet 10

The maximum gradient shall be:

- 12.5% for the first 5m from the road reserve boundary
- 22.2% for the remainder.

The minimum crossfall shall be 3% (sealed) or 4% (unsealed) and the maximum crossfall 6%.

All accessways in the Living 3 environment shall be sealed. In other rural environments all accessways serving 6 lots/dwelling units or more shall be sealed and/or where the gradient exceeds 18.2%.

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.

On privateways in excess of 200m long and less than 4.5m carriageway width, passing bays shall be provided at points of intervisibility (at approximately no more than 100m intervals) or as approved. For such passing bays the carriageway width should be increased to 5.5m over a 15m length including 5m tapers at each end.

Surface water from a rural accessway shall not be permitted to concentrate onto any lot which could be at risk of instability or erosion and shall comply with the requirements of Section 4.

Surface water is to be prevented from entering the public road reserve area in an uncontrolled manner, an approved method of attenuation and treatment at/near the boundary is to be submitted for approval.

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[10] Discretionary. Council will decide if an easement in gross is necessary

[11] Discretionary. Substantial reasons for deviation required, approval not guaranteed

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

Private accessways shall comply with the construction requirements of Section 3.5 and the details on Sheet 9 & Sheet 21 - vehicle crossings.

3.4.12 Traffic Control, Signage & Roadmarking, Traffic Calming

Road design shall incorporate signage, roadmarking and the provision of traffic control devices as appropriate. Traffic control devices include medians (flush or raised), pedestrian refuges and the like. Signs include Stop and Give-Way, directional arrows on islands, warning signs etc. Roadmarking includes marking of intersections, centrelines, parking areas etc

Road marking and traffic signs shall comply with the **TNZ Manual of Traffic Signs and Markings** (MOTSAM) and **NZS 5414: Specification for Construction of Traffic Signs**.

Urban and rural roads shall be marked with in accordance with Table 3.8 & Table 3.9.

Table 3.8 Road Marking - Residential and Commercial/Industrial Roads (Living 1 & 2 and all Business Environments)

Type	Criteria	Delineation Posts	Centre Line	Edge Line	RRPM	Intersection Controls
Urban Local Roads						
Cul-de-sac	Up to 150m	X	X	X	X	May be required
Minor Residential	Up to 500m	X	May be required	X	X	May be required
Residential Road	Over 500m	X	✓	✓	May be required	✓
Service Lanes		X	May be required	X	X	May be required
Collector Road						
Urban and Industrial/ Commercial	1000 – 3000 vpd	X	✓	✓	May be required	May be required
Arterial Roads						
Urban and Industrial/ Commercial	3000 – 7000 vpd	X	✓	✓	✓	May be required
	>7000 vpd	X	✓	✓	✓	May be required

Table 3.9 Road Marking: Rural Roads (Living 3 Countryside and Coastal Countryside Environments)

Type	Criteria	Delineation Posts	Centre Line	Edge Line	RRPM	Intersection Controls
Local Roads						
Minor	0 – 300 vpd	May be required	May be required	Inside Curves	X	May be required
Sub Collector	300 – 700 vpd	✓	✓	Inside Curves	X	May be required
Collector Road						
Minor & Major Collector	700 – 2500 vpd	✓	✓	✓	May be required	May be required
Arterial Roads						
Arterial	>2500 vpd	✓	✓	✓	✓	May be required

All signs on urban State Highways, arterial, collector and local roads shall have VIP standard or equivalent sheeting in accordance with **AS/NZS 1906.1**. 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.

In residential streets, traffic calming measures may be used to enhance amenity values and safety, by limiting speeds and discouraging through traffic from minor roads. Traffic calming measures include providing horizontal bends of significant deviation (45^0 or more), provision of speed humps, traffic islands, raised pedestrian crossings, lane deflections, narrowing etc

The provision of traffic calming measures should be discussed with the roading manager at an early stage in the design. The use of any such measure shall be subject to the specific approval of the roading manager.

3.4.13 Road Names and Signs

The provisions of WDC Road Naming Policy – April 2009 shall be followed.

For each new public road, service lane or public accessway, and for each new private road and privateway (including access lot, right of way etc) serving 5 or more lots or dwellings, the applicant shall submit three names in order of preference for Council approval. In accordance with the policy, the names are to be specified in order of preference, with justification for each name as it relates to historical, geographical or cultural significance. The information is to be submitted to the Subdivision Officer for presentation to Council for their consideration. Council's decision will be notified to the applicant so that provision of road name signage, etc can be made by the developer.

Name signs for roads, service lanes, privateways, walkways and cycleways shall be erected at all intersections. Name signs shall comply with the details in Sheet 24 & Sheet 25. No exit signs are to be erected on all cul-de-sacs or dead-end roads. Private Access supplementary blades are to be erected on all private roads and accessways.

3.4.14 Street Lighting

Street lighting shall be provided in all urban streets, walkways and cycleways, and areas set aside for frequent public use. It shall also be provided at major rural intersections. This is for traffic safety, pedestrian safety, security and convenience.

Walkways shall have pedestrian safety lighting designed and located to minimise the effects of intrusion of light into neighbouring dwellings.

Street lighting shall be designed by a suitably qualified and experienced person, using proprietary software, for the functional classification of the road to the illumination criteria of **AS/NZS 1158**. Plans indicating illumination patterns and intensities are to be supplied with the design for approval.

The installation shall be designed for the economic use of energy applying the following criteria:

- Electronic control gear shall be used unless the particular rating (wattage) is not manufactured at the time of design. In this situation low loss ferro-magnetic ballasts can be used
- High power factor (>=0.95 lagging <1.0)
- High efficiency lamps.

Lighting columns shall normally be galvanised hollow steel[12]. Dissimilar metals shall not be used in contact with each other. Lamps shall be down facing on outreach arms. Shielded fixtures shall be used where light spill may affect adjacent properties. Frangible bases shall be required where the legal speed limit is greater than 50 km/hr. Frangible bases may be required (at Council's discretion) where the road being constructed intersects with a main road.

The style of lighting standard and fitting to be used shall be subject to the prior approval of the roading manager.

As-built plans including full technical data and schematic lighting drawings shall be supplied on completion as per the requirements of Section 1.11.1 of this standard.

[12] *If not proposing to use galvanised hollow steel, pre-approval for an alternative is to be obtained before submitting plans*

3.4.15 Road Drainage

3.4.15.1 General

In general, urban roads shall be built lower than the adjacent ground levels and rural roads shall be built higher than the adjacent flood levels, but shall not obstruct natural overland flows.

Control of stormwater run-off from the road reserve area including any adjoining contributing catchment areas shall be incorporated in the design of the road. Refer to Section 4 - Stormwater Drainage- for additional design criteria.

In urban areas this will generally be by kerb and channel, or *by a specifically approved low-impact alternative means. Alternative controls shall be designed to fit with the urban environment, and minimise maintenance requirements.*

The urban drainage system shall include first flush treatment to meet or exceed **Auckland Regional Council TP 10** standards.

Where 'active' or proprietary treatment devices are proposed, the type of device shall be approved by the roading manager and/or the wastes and drainage manager in order that maintenance requirements for such devices may be rationalised across the District.

Where there are particular requirements affecting adjoining properties - e.g. vehicle crossing locations in relation to sumps or kerb connections - these shall be included in consent notices on the relevant property titles.

In Living 3 Environments and other rural areas, side (open) drains shall be provided for stormwater, and to keep groundwater below the road subgrade. Side drains shall be located within the road reserve or privateway as applicable.

Where physical constraints preclude the construction of side drains and/or the land is steep, unstable or prone to erosion, kerb & channel or similar may be required to be provided[13]*.*

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

3.4.15.2 Subsurface Drainage

Subsurface drains shall be provided on both sides of all urban roads *except where it can be demonstrated to the satisfaction of the roading manager that it is not necessary - e.g. low water table and ground with high permeability*[14]. Rural roads in cut will also normally require subsurface drainage. See Sheet 14.

Subsurface drains shall have adequate flushing locations, and 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 are to be temporary, or form part of the permanent subsurface drainage system.

3.4.15.3 Surface Drainage

Treatment standards shall comply with the requirements of Section 4 and in particular Section 4.10. Treatment provided in compliance with NZTA Stormwater Treatment Standard for State Highway Infrastructure (draft) is also acceptable.

3.4.15.4 Side Drains, Water Tables

Stormwater from rural roads shall be directed to side drains/water tables or other approved system, sized to suit the flows discharging to them but in any event not less than a 10% AEP rainfall event. On all such drains where the gradient is steeper than 1:15 (6.7%) scour protection such as concrete, rock riprap, Gobi blocks, 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.

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[13] Discretionary. Details to be submitted for consideration prior to final plans being submitted

[14] Discretionary. Details to be submitted for consideration prior to final plans being submitted

Where any new outlets are directed onto private property they shall be subject to the approval of the affected property owner(s) and be shown to be neither diverting catchments nor significantly changing peak flows or flow patterns[15].

3.4.15.5 Kerb and Channel

Subject to the provisions of Section 3.4.15.7 kerb and channel at a **minimum** gradient of 1:200 shall be provided for all urban carriageways. See Sheet 13.

Unless the specific approval of the roading manager has been obtained, mountable kerbs may only be used on service lanes and traffic islands.

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

3.4.15.6 Sumps

Sumps shall be provided to accept the design flow, including kerb outlets and overland flow intercepted by the road from adjacent land, based on the sump capacity (approximately 28 l/s for a single back entry sump).

The design capacity of non-standard sumps (e.g. double sumps, super sumps and recessed sumps) shall be established and used for design purposes making allowance for partial blockage of the gratings. See Sheet 34 for sump details.

The maximum spacing of sumps shall be 90m *unless subject to low impact specific design[16].* Double sumps shall be provided at low points and on gradients exceeding 8%. Sumps are also required where there is potential for ponding, where flow could leave the channel (tangent points at intersections), and upstream of accessible (pram) crossing locations.

Unless specifically designed[17], sump leads shall be at least 300mm. NB for single sumps and 375mm NB for double sumps at a minimum grade of 1%. Sump gratings shall be suitable for crossing by bicycles.

Where no other overall treatment mechanisms are possible stormwater treatment shall be incorporated into sumps using sump silt screens approved by Council[18].

Treatment of the 'first flush' of stormwater shall meet or exceed ARC TP 10 standards. This will need to be considered in relation to overall treatment requirements. Refer to Section 4.

3.4.15.7 Swales and Bio Filtration Devices

Swales, bio filtration strips or other appropriate stormwater mitigation measures may be provided for treatment of stormwater from the roads. Refer to Sheet 15 and ***NZTA Stormwater Treatment Standard for State Highway Infrastructure (draft)*** *for typical designs.*

Where swales are used in Living 1 and 2 and/or Business environments the road edge shall have a flush concrete edge. The edge shall be 30MPa concrete, 300mm wide and 200mm deep with the top surface matching the crossfall of the carriageway. See Sheet 13. Refer to Section 3.4.10 for the requirements for vehicle crossings over swales.

Council may require a defect/maintenance bond for such systems while they prove their effectiveness. Refer Section 1.11.1.8.

3.4.16 Bridges, Culverts and Retaining Walls

3.4.16.1 General

The developer shall obtain all necessary resource consents and/or building consents required for bridges, culverts and retaining walls.

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[15] It is to be demonstrated that there are no other options for discharge. Easements will normally be required

[16] Specific approval required

[17] Specific approval required

[18] Specific approval required

It is noted that public use of any structure requiring a building consent is not permitted until a Certificate for Public Use or Code Compliance Certificate is obtained.

3.4.16.2 Waterway Design

Waterway design shall be carried out by an IQP in accordance with Section 4 of this standard.

The total waterway shall be designed to achieve:

- No exacerbation of existing upstream water levels during a 5 year (plus climate change) ARI flood event
- Able to pass a 100 year (plus climate change) ARI flood without significant damage to the road and waterway structures
- Obstructions and risk of blockage in the waterway area are minimised.

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

- On arterial roads (> 3000 vpd), no interruption to traffic during a 100 year (plus climate change) ARI flood event
- For roads between 250 and 3000 vpd, no interruption to traffic during a 50 year (plus climate change) ARI flood event
- For minor roads (< 250 vpd), no interruption to traffic during a 10 year (plus climate change) ARI flood event.

3.4.16.3 Bridges on Public Roads

The design shall be carried out by an IQP, in accordance with the **Transit New Zealand Bridge Manual**. The design load shall be HN HO 72. Note that culverts with a waterway area greater than 3.4m^2 are regarded as bridges under the TNZ Bridge Manual.

Appendix D of the Bridge Manual (Lightly Trafficked Rural Bridges) shall not be used for bridges on public roads, except with the specific consent of the roading manager.

The width shall accommodate the full carriageway width (two-way traffic) appropriate to the class of road including cycle lanes and footpaths as required. Provision shall be made in the design for cables, pipelines etc.

Side barriers, including barriers to approaches as appropriate shall be provided. These may be W section steel guardrail or concrete barriers. *The design standards and details shall be confirmed with the roading manager at an early stage*[19]*.* Pedestrian barriers shall be provided at footpaths. Wing walls, and scour protection shall be provided to protect batter slopes. Foundations shall be protected against settlement and scour. In order to mitigate against blockages due to debris build-up during flood events, bridges and culverts shall be designed to minimise or eliminate obstructions including piers/supports etc within the 1:100 year (plus climate change) ARI water level.

3.4.16.4 Bridges on Private Accessways

For bridges on private accessways serving up to 8 lots or dwelling units, the design requirements of ***Appendix D of the TNZ Bridge Manual*** *are minimum requirements and may be used, subject to the following conditions:*

- *The access will not become a through route*
- *The alignment has a speed value below 70 km/h*
- *Use by logging trucks or similar is unlikely*
- *No significant overloads are expected to occur, or the bridge can be bypassed.*

Appendix D of the TNZ Bridge Manual *allows the replacement of the HN design load with 0.85 HN. The HO load need not be considered.*

[19] Specific approval required before final plans are submitted

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 1.0m.

3.4.16.5 Retaining Walls

Retaining walls alongside roads/accessways carrying surcharge loads will require engineering design and building consent.

3.4.17 State Highways & Railways

Properties that front a State Highway or access a side road intersecting with a State Highway will need to comply with the requirements of the NZTA. The NZTA shall be consulted before undertaking any planning associated with the site layout or access provisions.

Likewise properties that require access over a rail corridor will need to comply with the requirements of Ontrack. Ontrack shall be consulted before undertaking any planning associated with the site layout or access provisions.

Note Consent applications will **not** be accepted unless NZTA/Ontrack (where applicable) has been consulted and agreements reached (in writing)

3.4.18 Car parking & Manoeuvring

Where carparking (either within the road reserve or dedicated off-road carparking) is required, the layout dimensions shall conform to the details shown in **AS/NZS 2890.1** Section 2.4.

On-site manoeuvring for cars and heavy goods vehicles shall comply with the vehicle tracking curves shown on Sheets 26, 27 & 28. Manoeuvring in and out of a parking/loading bay is not to require more than 1 reverse manoeuvre.

Structural design shall comply with the requirements of Section 3.4.5, and construction (including testing) shall comply with the requirements of Section 3.5.1 - the same as for roads. *Unless approved otherwise through the consent process,* surfacing shall comply with the requirements of Section 3.5.2.2.

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, and/or

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

3.4.19 Queuing Space Lengths

Queuing space length shall be measured from the road boundary and extend along the accessway into the site to a point where conflict with vehicles on the site may arise (e.g. manoeuvring from a parking space), or to the nearest vehicle control point in the site (e.g. the ordering position with regards to drivethrough facilities). Refer Table 3.10 for minimum queuing lengths.

Table 3.10 Queue space Lengths

Number of Parking Spaces	Minimum Queuing Length (m) at each Entrance
1-2	0.0
3-20	5.5
21-50	10.5
51-100	15.5
101-150	20.5
151 and over	25.5
Drive-through facilities with access from an arterial road	50

3.5 Construction

3.5.1 Pavement

3.5.1.1 General

These requirements apply to flexible pavements. For rigid pavements such as concrete refer to Austroads requirements.

The pavement structural design shall conform to the requirements of Section 3.4.5 of this standard.

The design may utilise high strength materials (e.g. **TNZ 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 applicant shall provide test data to confirm compliance with the material standards required for the design.

Where fill is required to achieve the design subgrade levels, the IQP shall provide an adequate level of inspection and testing to enable certification by the IQP on completion that the fill material complies with the specification. If stabilised subgrades are used, care shall be taken to allow appropriate curing before spreading the pavement aggregate.

3.5.1.2 Subgrade

Following formation earthworks to subgrade level, the subgrade shall be tested and the design CBR confirmed. The subgrade shall be free of organic matter or other harmful material. Any modifications to the pavement design required as a result of such tests shall receive the prior approval of the roading manager.

Tests should be conducted at 10m intervals (staggered) in both lanes, or as otherwise instructed in writing by the IQP/Council.

Wet areas shall be drained using subsoil drainage with an outlet to a sump or other appropriate component of the stormwater system. Outlets to an open channel shall be protected by a concrete or grouted rock surround.

The subgrade shall be maintained true to grade and cross-section prior to the placement of the metal aggregate layers.

3.5.1.3 Sub-base Material

Sub-base material shall:

- Meet the standards specified in Table 3.11 (for lime stabilised pavements)
- Be compacted to not less than 95% of maximum dry density as per TNZ B/2
- Ensure the largest aggregate size is not larger than 40% of the depth of the layer or 65mm.

GAP65 is suitable sub-base material and must comply with the grading limits specified in Table 3.12.

3.5.1.4 Basecourse Material

Basecourse material shall:

- Meet **TNZ M/4** standards (all passing 40mm – AP40) or approved equivalent such as lime stabilised GAP40 to the standards specified in Table 3.11 (lime stabilised) & Table 3.12 (grading)
- Not be less than 100mm thickness when used with other metal aggregate layers
- Be compacted to not less than 98% of maximum dry density as per **TNZ B/2**
- Have a tight stone mosaic surface after sweeping.

Table 3.11 Material Standards (Suitable for Lime Stabilised Pavements)

	Test	**Standard**
Crushing Resistance (kN)	TNZ M4 NZS4407 test 3.10	>120kN
Quality Index	NZS 4407 : 1991 Test 3.11	AA, AB, AC, BA, BB or CA
Clay Index	NZS 4407 Test 3.5	>3.5, <8.0
California Bearing Ratio	Compacted to NZS 4402 : 1986 Test 4.1.3, Tested to NZS 4407 Test 3.15	Not less than 40 %
Proportion of Broken Rock		For each aggregate fraction, not less than 50% by weight shall have 2 or more broken faces
Lime Reactivity	Quick Response Test in accordance with RRU Technical Recommendation No 2	Lime Reactive

Table 3.12 Grading Limits (when delivered or following compaction)

Running Course	**GAP 40 (Basecourse)**	**GAP 65 (Sub base)**
Hardness, 120kN	Hardness, 120kN	Hardness, 120kN
100% of the material less than 19mm maximum size	100% of material less than 37.5mm maximum size	100% of material less than 75mm maximum size
60% maximum passing 4.75mm sieve	Between 63-81% passing a 19mm sieve	At least 45% passing a 19mm sieve
31% maximum passing 0.6mm sieve	12 – 25% passing a 1.18mm sieve	12-25% passing a 1.18mm sieve

3.5.1.5 Testing Prior to Sealing

Maximum dry density tests shall be carried out on the aggregate layers (sub-base and basecourse) in conformity with Table 3.13.

Benkelman Beam and Clegg Hammer tests shall be carried out on the prepared surface prior to sealing. Such tests should be carried out in the presence of a Council representative. Tests shall conform to the requirements and tolerances of Table 3.13 & Table 3.14. Benkelman Beam tests are not mandatory for private accessways, but will be required if the accessway serves more than 8 lots/dwelling units.

Public roads shall not be sealed until all testing has been completed and test results submitted to and accepted by Council. The road shall be sealed as soon as possible after acceptance by Council, subject to suitable weather conditions.

Private roads may be sealed under instruction from the IQP in charge of the project, and will require a producer statement (construction) (e.g. EES-PS4) be provided to Council on completion, unless consent conditions dictate otherwise. Refer Section 1.5.4.

Table 3.13 Pavement Test Requirements

Test	Standard	Requirement	Criteria
Aggregate Layer Density (Nuclear Densometer)	NZS 4407 Test 4.2.2	All roads that will become public roads	Sub- base 95% maximum dry density, Basecourse 98% maximum dry density
Clegg Hammer		All roads and private ways. At 20m centres at the edges and centre of pavements on completion of the pavement surface preparation	Roads:– no value < 45 Privateways:– 40 for not less than 90% of the surface tested and no value less than 35
Benkelman Beam		All public roads. At 10m centres (staggered) in the wheel track in both lanes	95% comply with Table 3.14, with no value exceeding the standard by more than 25%

Table 3.14 Benkelman Beam Standards

Road Type	Maximum allowable Deflection (mm)
Cul-de-sac	2.0
Residential and rural local roads	1.5
Collector, Arterial roads and service lanes	1.0

3.5.2 Surfacing

3.5.2.1 Unsealed Roads/Privateways

Council may, by specific approval, allow rural roads to be unsealed. Approval will not normally be given where the road will service properties that are predominantly urban, lifestyle, horticultural or similar, or that extend or join a sealed road. Approval for unsealed roads shall be confirmed in writing at the time of resource consent application.

Where unsealed roads have been agreed to, the surface finish shall include an upper layer of well graded - conforming to Table 3.12 - running course aggregate of maximum particle size 20mm, minimum thickness 50mm and containing sufficient fine material to bind the layer and confine large particles in the underlying structural pavement layer. The crossfall shall be 4% minimum, 6% maximum with particular care required on the top side of superelevated curves and on the transitions between superelevated curves to avoid flat spots.

Where approved new unsealed roads intersect with sealed roads, at least 20m of the new road shall be sealed from the intersection.

Such unsealed roads/privateways will require specific design. Council must approve the design and testing regime before construction may begin.

3.5.2.2 Sealed Roads, Carparks and Privateways

3.5.2.2.1 General

All surfaces must meet site-specific traffic loading requirements, including skid resistance requirements as outlined in TNZ T/10 Skid Resistance Investigation and Treatment Section.

Acceptable surfacing options are as follows. Limitations concerning their use are described in the section following.

- Hot laid asphaltic concrete laid over a waterproofing sealcoat. See Section 3.5.2.2.3
- Chip seal. See Section 3.5.2.2.4
- Concrete block pavers. See Section 3.5.2.2.5
- Concrete. See Section 3.5.2.2.6
- Permeable Pavers. See Section 3.5.2.2.7.

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

3.5.2.2.2 Application & Limitations

Asphaltic Concrete	- **must** be used for all industrial roads
	- **must** be used for cul-de-sac turning heads
	- **must** be used for intersections with high heavy vehicle usage
	- *may be used in all locations*
	- *may be used for all urban collector and arterial roads*
	- *may be used for all off street car parking areas*
	- *may be required on steep gradients and tight corners*
Chip Seal	- *may be used in all locations other than where asphaltic concrete is mandatory as above*
	- may **not** be used for privateways steeper than 22.2% *unless otherwise approved*
Concrete Block Pavers	- *may be used for residential cul-de-sacs and privateways*
	- *may be used for recessed parking bays*
	- *shall be subject to specific approval anywhere else*
Concrete	- *may be used for privateways and service lanes*
	- *may be used for recessed parking bays*
	- *shall be subject to specific approval anywhere else*
Permeable Pavers	- will **not** be permitted as a running surface in public roads
	- *may be used for all off street car parking areas, private accessways.*
	- ***shall be subject to specific approval in all cases.***

3.5.2.2.3 Asphaltic Concrete (AC)

Hot laid asphaltic concrete shall comply with TNZ M/10 and be constructed in accordance with TNZ P/9. The finished level shall be between 3mm and 7mm proud of the edge of the channel.

The compacted thickness shall not be less than 30mm of Mix 10 AC except for low stress intersections, industrial roads, cul-de-sac turning heads and public carparks where the compacted thickness shall not be less than 35mm of Mix 15 AC. For high stress intersections and roundabouts the compacted thickness shall not be less than 50mm of Mix 20 AC.

Prior to surfacing with AC a waterproofing sealcoat shall be laid. This may be either a hot bitumen spray or a cold bitumen emulsion with a grade 5 chip for Mix 10 AC and grade 3 chip for Mix 15 AC. The seal coat shall comprise a minimum of 1.0 l/m^2 of residual penetration grade bitumen

All sumps, manhole lids, hydrant and valve boxes and the like must be protected by paper prior to the spraying of bitumen.

3.5.2.2.4 Chip Seal

Seal binder can be applied as a cut back or emulsion and shall be in accordance with TNZ specification M/1. Determination of the suitability of a binder for use with adhesion agents, for the manufacture of emulsions and compatibility with polymers and other binders shall be the responsibility of the supplier. The binder application rates shall be designed to suit the conditions.

Seal chip and adhesion agents shall be in accordance with TNZ specifications M/6 and M/13. Chip seals shall be applied in accordance with TNZ P/3 (initial seals).

Chip seal shall comprise a first coat grade 3 chip with a second wet lock coat grade 5 chip constructed in a single operation with asphaltic cutback to TNZ specifications (above).

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.

All sumps, manhole lids, hydrant and valve boxes and the like must be protected by paper prior to the spraying of bitumen.

Sealed roads and privateways shall be swept, and all sumps shall be cleaned out prior to final acceptance by Council.

3.5.2.2.5 Concrete Block Pavers

Design and material standards shall comply with **NZS 3116** and with the manufacturer's instructions. *The pavers shall be readily available standard units*[20]*.* The design of the road shall be carried out by a suitably qualified person. Edges of the paved areas shall be adequately confined, normally by concrete nibs.

Bedding sand shall be in accordance with **NZS 3116**.

When used in roads the basecourse surface shall be given a waterproof sealcoat before the sand and pavers are laid.

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

3.5.2.2.6 Concrete

Concrete for roads and privateways shall be sourced from a special grade plant as defined in **NZS 3109.**

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

- 30 MPa for roads, privateways, vehicle crossings, kerb & channel and dished channels
- 20 MPa for footpaths.

3.5.2.2.7 Permeable Pavers

All permeable paving shall be subject to specific design and approval.

Some minimum standards are as follows:

- Design, material and construction standards shall comply with NZS 3116 unless otherwise specified
- Pavers shall be readily available standard units
- The minimum basecourse depth will be subject to the subgrade strength but shall not be less than 200mm
- Permeable pavers should not be used where the CBR ≤ 3
- The slope of the pavers should not exceed 5%
- Permeable paving should not be used in areas with unstable ground
- Pavers shall be a minimum of 80mm thick
- Pavers shall have a 25 year design life.

3.5.2.3 Surface Tolerances and Finishing

The finished surface of the road 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. Skid resistance and surface texture of roads of collector class or higher, with a design speed exceeding 70 km/h shall satisfy TNZ T10.

[20] The specific approval of the roading manager must be obtained for the use of any type of paver prior to laying

3.5.3 Kerb and Channel

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 free from surface pitting and true to profile.

Kerb blocks with cast-in-situ channels shall be the subject of specific design and approval.

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

3.5.4 Footpaths and Cycleways

3.5.4.1 Concrete Footpaths

Footpaths shall be concrete, with a broomed finish. Surfacing shall comply with **D1/AS1 Table 2 of the New Zealand Building Code** for acceptable wet slip resistance for sloping walking surfaces. (See *http://www.dbh.govt.nz/UserFiles/File/Publications/Building/Compliance-documents/clause-d1.pdf)*.

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

Footpaths shall be formed over not less than 50mm compacted depth of fine granular material and shall be laid with construction joints at not more than 3.5m intervals. See Sheet 12.

3.5.4.2 Asphaltic Concrete Footpaths

AC footpaths shall be subject to the specific approval of the roading manager.

They shall comprise 25mm M10 asphaltic concrete on 150mm compacted GAP 40 basecourse with a waterproofing sealcoat. They shall not puddle water and shall be edged with either concrete, kerb blocks or brick pavers. See Sheet 12.

3.5.4.3 Concrete Paver Footpaths

Refer Section 3.5.2.2.7 Permeable Pavers, and

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

3.5.5 Berms and Landscaping

On completion of all other works, the berms shall be spread with good quality topsoil to a lightly compacted depth of not less than 150mm and not more than 300mm. The topsoil shall be free of weeds, stones and other foreign matter and graded to kerb top and footpath edges, and may be finished 15mm high to allow for settlement except on the low side of the footpath where the topsoil shall be finished flush to prevent water ponding.

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 must be achieved and the grassed areas shall be maintained free of excessive weed growth and shall be kept mown throughout the maintenance period.

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

3.5.6 General

Superfluous vehicle entrance crossings and similar along the road frontage of any development shall be removed and any broken footpaths or other non-complying facilities or services repaired, removed or sealed off as necessary at the developer's expense.

It is recommended that pre-development photographs of the existing road frontage be taken to prove any pre-existing damage. If no proof is provided, it will be assumed that the damage occurred during development, and repairs will then be required to be undertaken at the developer's cost.

3.5.7 Road Opening Notice and Traffic Management Plan

All works proposed to be undertaken in the road reserve will require a Road Opening Notice (RON) to be submitted and approved prior to works commencing. The application (including the associated traffic management plan) should be made to the roading manager. A copy of the approved RON and TMP must be held on site at all times.

3.6 As-Built Information

3.6.1 As-Built Drawings and Schedule of Asset Information

A set of drawings and schedule of asset information shall be submitted as per Section 1.7 & Section 1.11.1 of this standard. These shall clearly and accurately show the as-built locations and details of all infrastructure provided as part of the work, including any modifications made to the existing system and including the identification of any assets that have been removed or decommissioned.

For this work the developer/contractor shall employ a competent surveyor to carry out detailed surveys of the completed works and services

A certificate of completion for the works (including an RMA s224(c) Certificate) will not be issued by Council until acceptable as-built drawings have been produced.

3.6.2 RAMM Data

RAMM data shall be provided as required by Section 1.11.1.4.

3.7 Defects Liability Period

A defects liability period of 12 months is required for road construction works. During this period, Council will carry out normal maintenance work on the public roads. A Defect/Maintenance Bond shall be required for the works in terms of Section 1.11.1.8.

At the end of the defect liability period, Benkelman Beam tests may be required at the developer's expense where there is reason for the roading manager to doubt the integrity of the road.

3.8 Standard Drawings

Refer to Section 9 - Drawings.

Section 4 Stormwater Drainage

4.1 Introduction

This section covers the requirements for Stormwater Related Drainage Works.

Stormwater drainage systems are required to collect and convey surface water run-off, in order to minimise adverse effects including flooding, erosion, sedimentation and water quality effects. Ground water control may be part of this requirement.

The system shall consist of, but not be limited to:

- A primary system of pipes and/or open waterways to cater for more frequent rainfall events
- A secondary system consisting of open channels, flood plains and overland flow paths to cater for higher magnitude events, and blockages in the primary system.

4.2 Referenced Documents

Details of referenced documents will be found in Section 1.1.

4.2.1 Definitions

Definitions for this section are contained in Section 1.2.

4.3 Content of Technical Submission

The submission for engineering approval in respect of stormwater shall be accompanied by documents as listed below.

4.3.1 Supporting Information

The application shall include supporting information and calculations that demonstrate that:

- The design is consistent with the general requirements for the whole of the catchment
- Stormwater quality and quantity requirements are satisfied
- Pipeline design provides the required level of service
- Secondary flow paths are available, and adequate for the design volumes. Flood heights shall be assessed and restrictions and/or easements required shall be identified
- Overland flow paths including flood levels, flow path boundaries and easement requirements shall be clearly identified in consent and as-built drawings.

The design shall identify off-site effects, including changes to:

- Flow peaks (where permitted) and frequency patterns
- Flood water levels
- Contamination levels and erosion
- Discharge of stormwater on downstream properties.

Measures to mitigate any detrimental effects shall be identified.

Operational and maintenance requirements for any water quantity and/or quality control structures shall be provided. Refer Section 1.11.2.2.

Any design outside of the provided standard solutions shall be carried out by an IQP, experienced in catchment analysis who shall provide a design certificate EES-PS1 identifying the design standards used, and certifying that the design complies with these standards. On completion of the works, the IQP shall certify that the completed works achieve the required design criteria EES-PS4.

4.3.2 Design Drawings and Specifications

Design drawings complying with the requirements of Section 1.7 & Section 1.8 shall be provided for approval.

4.3.3 Approval of Design

The drawings and calculations will be reviewed by the waste and drainage services manager or his/her representative**.** The drawings showing any required amendments or comments shall be returned to the applicant's representative. If adjustments to the design are required a new set of amended drawings shall be submitted to Council prior to approval being granted. Only drawings stamped and signed by the waste and drainage services manager or his/her representative shall be deemed approved drawings.

4.4 General Requirements and Policy

The stormwater system for a development, including any upgrading of existing downstream systems where required, shall provide:

- Formalised conveyance systems and/or storage or an alternative low impact system in or leading through urban areas
- Retention and enhancement of existing natural waterways through open space areas, including parks and reserves
- Allowance for climate change effect.

For all land development works (including projects involving changes in land use or coverage) the design of the stormwater disposal system shall include the evaluation of stormwater run-off changes on upstream and downstream properties.

Upstream flood levels shall not be increased by any downstream development.

Downstream impacts from a development to be investigated shall include (but are not limited to) changes in flow peaks and patterns, flood water levels, contamination levels and erosion or silting effects, as well as effects on the existing stormwater drainage system.

Where such impacts are considered detrimental by WDC, mitigation measures (e.g. peak flow attenuation, velocity control, contamination reduction facilities) on or around the development site, or the upgrading of downstream stormwater disposal systems will be required at the developer's expense. The downstream effects need not be considered in detail if suitable mitigation measures as identified in this standard are implemented in the design of the development.

4.4.1 Capacity and Future System Expansion

The design of primary and secondary stormwater systems within a development shall allow for the conveyance of flows from the whole of the upstream catchment routed to the site. The developer shall extend reticulation (where appropriate) and secondary flow paths to a location on the upstream boundary of the development most suited to serving the upstream area at its natural discharge location.

As a minimum, the system shall be designed to receive both primary and secondary design flows from the upstream catchment in its current status, for the design storms required by Section 4.13.1.2. In addition, Council may require the developer to take account of increased flow from the potential development of the upstream catchment.

Council will provide information that it has available on the capacity of downstream reticulation. The developer shall review the capacity to determine its adequacy. If there is inadequate capacity, Council will advise what upgrading is necessary.

*The piping of existing watercourses or open drains will **not** generally be permitted.*

*The building over of existing or new council vested pipes will **not** generally be permitted.*

In rural areas, a discharge to an existing drainage channel may be approved, subject to appropriate conditions.

In general, stormwater systems should be designed so that the full development will not result in any increase in peak discharge rates or reduced quality, compared to the pre-development situation for the threshold storm probability. This may require on-site detention and/or disposal systems.

The design shall specifically cover the provision of sumps, culvert inlets etc to ensure that the design surface flow can enter the system. Particular attention shall be paid to inlet assessment when looking at flow conditions for pipes (i.e. providing adequate head to achieve design flows).

4.4.2 Changes to Existing Development

Where any changes to existing development, i.e. building extension, additional buildings/dwellings, increased pavement or changes to pavement etc, influence the site run-off characteristics, such changes need to be considered in line with the standard set out in this document.

4.4.3 Compliance

Compliance with the WDC District Plan, WDC Stormwater By-law, WDC approved Catchment Management Plans and the various rules of the Northland Regional Council is required for all consents.

4.4.4 Regional Plans

Any design for new development and alteration to existing development shall as a minimum comply with the Regional Water and Soil Plan and Coastal Plan where no other standards are applicable.

4.4.5 Stability

The provision of soakaways or attenuation in the form of ponds or other porous structures will not be permitted in areas designated as medium or high stability hazard on WDC's hazard maps, unless specifically designed by a geo-professional and approved by Council. Any attenuation provision must be provided in a sealed format (e.g. tanks, concrete chambers, etc) to prevent stormwater ingress to the soils leading to an increased stability hazard.

Attenuation and treatment devices shall also not be located within low stability hazard land directly adjacent to an area denoted as a medium or high hazard without a specific engineering assessment of the impact of such a provision on the stability of the high hazard land.

4.5 Catchment Management Plans

Where a Catchment Management Plan (CMP) exists for the area of the proposed development, it shall be adhered to, and any conditions set out in the referenced CMP, where applicable, shall be met.

The developer must take into account catchment wide issues at the concept design stage. The potential implications of future development upstream of the site and the cumulative effects of land development on water quality, flooding downstream and erosion are important considerations. The larger the scale of the development, the more significant the catchment management issues are likely to be. The developer must show how these issues are to be addressed and the effects dealt with. Where the discharge is to be into Council's system and/or is to be incorporated into Council's existing or future discharge consent, then the developer must demonstrate that consent conditions, including quality requirements, will be met.

Consent Requirement:

- Developments within catchments with operative, consented Catchment Drainage or Management Plans (CDP or CMP) that comply with the requirements of the Plan, will not require separate resource consents for stormwater diversion and discharge from Northland Regional Council. It should be noted that CDP/CMPs in the Whangarei District do not cover all urban areas. In view of the age of some CMP's, WDC may apply additional conditions on stormwater disposal
- Where an operative consented CDP/CMP is not in place or the proposal is not consistent with an operative consented CDP/CMP, the applicant shall obtain all necessary resource consents from Northland Regional Council required for the work. Where a consent is for a facility that will be taken over by Council, the application shall be in the name of Whangarei District Council. Council shall be consulted about stormwater management at an early stage, before detailed design commences and be a consulted party on any Resource Consent conditions
- In all circumstances, the relevant requirements of the Stormwater By-law shall be complied with.

Council will advise whether the area of a development is covered by a CDP or CMP, and conditions associated with it. WDC reserves the right to apply surface water conditions/discharge constraints in

addition to those imposed by NRC to safeguard elements of the WDC controlled downstream networks.

4.5.1 Hikurangi Swamp Major Scheme

Development within the Hikurangi Swamp Major Scheme catchment shall have pre development flows limited to a run-off rate equivalent to 23.7mm per 24 hrs on the site footprint, until such time that the rating system of the scheme is amended to accommodate non-agricultural land use or the pumping capacity is upgraded to facilitate drainage of a greater run-off depth.

This limitation shall not apply for land discharging directly to the rivers passing through the scheme, but shall apply to land discharging to the pockets of storage which utilise the pumps to pump to the river.

These requirements shall be in addition to the requirements of this standard and/or any applicable consented catchment management plan.

4.6 Hydrology

4.6.1 Rainfall Input

Any new development will need to be assessed against the appropriate rainfall data to determine site and catchment specific estimated surface run-off.

There are within the Whangarei District a number of sources for rainfall data readily available to the designer. They are:

- Rainfall intensity duration charts as set out in section E1 of the NZBC. Note that the charts are limited to 10min duration only
- Intensity Duration Curves as per Appendix G
- Rainfall depth data from HIRDS (NIWA) (latest version at time of application).

In addition where appropriate other acceptable alternatives include analysis of a specific site based on information provided by verified research studies of particular soil or site conditions.

The hydrology applied to the design shall take into account the following:

- Estimation of Surface Run-off
- Critical storm duration in relation to storage provisions where applicable
- Rainfall Intensity and Time of Concentration.

4.6.2 Storm Analysis

The intent of the analysis for rainfall intensity and duration of the pre-development is to protect the downstream network against additional peak load from changes caused by the development.

For analysis of the rainfall events either the Modified Rational Method (variable duration, uniform profile), or a NRCS TR55 type 1A storm profile (fixed duration, variable profile) are acceptable for determining peak flow and run-off volumes, subject to the criteria set out below.

The use of the ARC TP 108 profile for estimation of pre-development peak run-off in Whangarei District is not considered appropriate.

(Refer to Section 4.13 Hydraulic Design for determining time of concentration in relation with Modified Rational Method run-off calculations).

For analysis related to treatment volumes an ARC TP 108 type storm shall be used. The total rainfall run-off volume calculated with the **TP 108** storm profile gives similar results to the Type 1A storm method as the principal considerations of initial abstraction, time of concentration and CN values are the same. The TP 108 methodology is a restatement of the NRCS TR55 method.

4.6.3 Climate Change

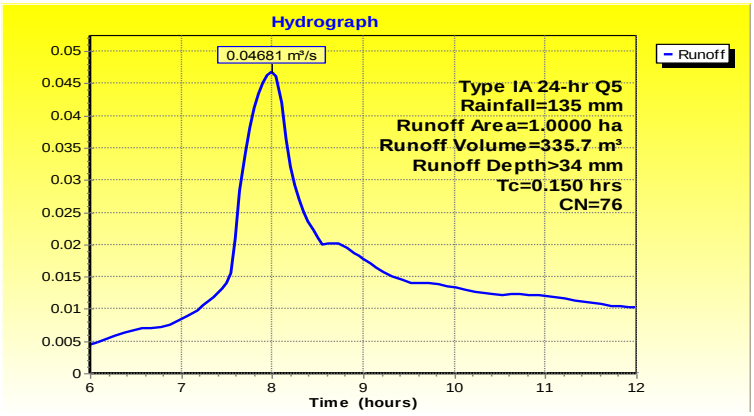
Allowance must be made for climate change for all post developed flows in line with the recommendations of the Ministry for the Environment which indicates a figure of 20% by 2090 as its upper limit for Whangarei. Pre-development flows shall be based on rainfall data in their original form to represent a true assessment of the future impact of the proposed development on the environment.

4.6.4 Site Considerations

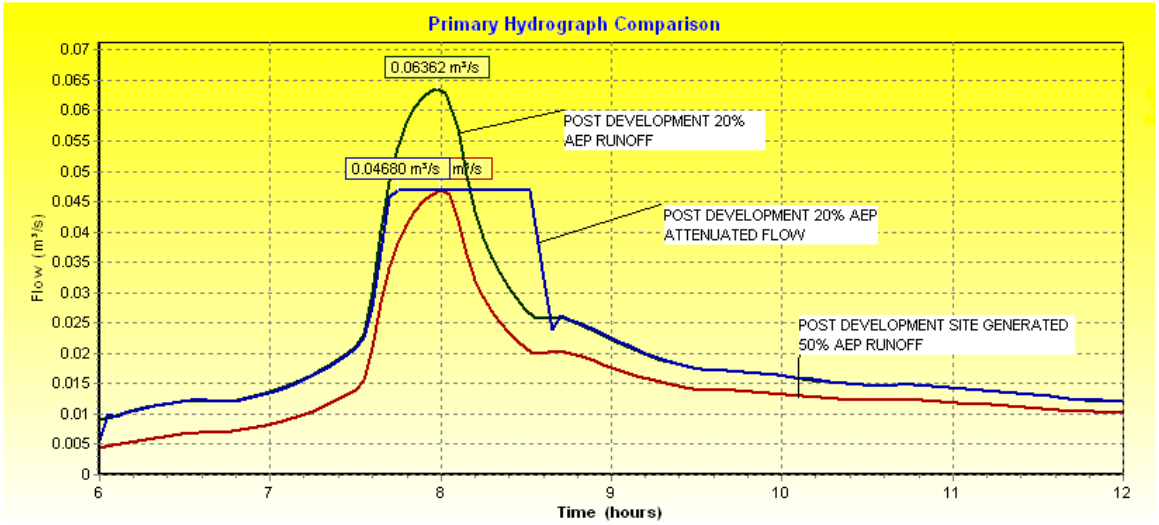
4.6.4.1 Frequency Effect

The frequency effect is the ability of a developed site to generate the peak run-off of the pre-developed site for an increased probability rainfall event irrespective of the provision of attenuation. That means what was previously the run-off from a 10% AEP event might now be achieved from a 20% or even 50% AEP event for the post-developed site. It will appear as if the downstream system is stressed more frequently from similar rainfall events than in the pre-developed situation. To counter this effect Council will require the attenuation of the developed peak flow from the developed portion of the site to be limited to 80% of the pre developed flow for the design events.

The graph below represents the run-off from a typical 1 ha site as pre development for a 20% AEP.



The graph below shows the run-off curves for different aspects of the development on the same site and has the 50% AEP curve embedded to show the peak flow aspect.



The variability of soils within the Whangarei District and wider Northland, are borne out by changes in run-off characteristics in addition to that caused by vegetation cover. The four hydrologic soil groups are:

- D Very low permeability such as clay (e.g. Northland Allochthon/Onerahi Chaos)
- C Low permeability such as loam (e.g. Maunu and Glenbervie volcanics)

- B Medium permeability, coastal wind blown sands (e.g. Ruakaka and Waipu coastal sands)
- A High permeability such as fractured rock and deeply bedded scoria deposits.

Soil type A is not usually encountered at surface levels and typically is only used for discharge to ground solutions by deep infiltration. Soil type A should not be used for the calculation of surface run-off.

Note ARC TP 108 soil classification table contains an error in that the soil class A descriptor is missing, and the table relates to soil classes B, C and D

4.6.4.3 CN Numbers/Run-off Coefficients

Rainfall run-off curves are used to describe rainfall losses. The curves used in ARC TP 108 and other methods were developed by the US National Resource Conservation Service, previously known as Soil Conservation Service (SCS). Curve numbers (CN) were determined based on the hydrological soil group, cover type, soil treatment, hydrological condition and antecedent ground condition.

Values from the summary sheets in TR55 and ARC TP 108 have been adopted for typical Northland soils encountered in the Whangarei District. Table 4.1 below sets out the typical values to be applied. For more detailed information refer to the original tables in TR55 or Table 2-2 of ARC TP 108.

Run-off Coefficients C represents the proportion of rainfall resulting in physical run-off for calculation of flow. The values given in E1 of the NZBC are considered low for Northland conditions during significant rainfall events and WDC has adopted figures developed from the formula C= CN/ (200-CN) from TR55 ARC TP 108. These values are listed side by side in Table 4.1 below.

Table 4.1 Curve Numbers and C Values

Curve Numbers and C values for typical Whangarei District conditions (CN - C)				
Land Use	**% impervious**	**Type B soils**	**Type C soils**	**Type D soils**
Open space (lawns, parks etc)				
Fair condition (grass cover 50-75%)		69 - 0.53	79 - 0.65	84 - 0.72
Good condition (grass cover >75%)		61 - 0.44	74 - 0.59	80 - 0.67
Impervious areas				
Paved parking lots, roofs, driveways, curbs, channels etc (excluding right-of-way)		98 - 0.96	98 - 0.96	98 - 0.96
Roads and streets				
Paved; open ditches (incl right-of-way)		89 - 0.80	92 - 0.85	93 - 0.87
Unsealed/Gravel (incl right-of-way, accessway & parking areas)		85 - 0.74	89 - 0.80	91 - 0.83
Urban development:				
Commercial and business	85	92 - 0.85	94 - 0.89	95 - 0.90
Industrial	72	88 - 0.79	91 - 0.83	93 - 0.87
Landscaped	0	70	75	80
Residential by average lot size				
500m² or less	65	85 - 0.74	90 - 0.82	92 - 0.85
1000m²	40	75 - 0.60	83 - 0.71	87 - 0.77
2000m²	25	70 - 0.54	80 - 0.67	85 - 0.74
4000m²	20	68 - 0.52	79 - 0.65	84 - 0.72
10,000m² (1 ha)	10	65 - 0.48	77 - 0.63	82 - 0.69
Rural development				
Pasture, grassland (m²)		61 - 0.44	74 - 0.59	80 - 0.67
Grass and bush		48 - 0.32	65 - 0.48	73 - 0.57
Trees and grass combination (orchards)		58 - 0.41	72 - 0.56	79 - 0.65
Forest		55 - 0.38	70 - 0.54	77 - 0.63

4.7 Collection

4.7.1 Low Impact Design

The use of low impact design, including the use of grassed swales, open channels, ponds, wetlands, rain gardens, in-ground stormwater detention structures etc is promoted by Council to reduce the impacts of stormwater discharge by improving quality and/or reducing quantity of the discharge. Such concepts need to be considered early in the design process.

Low impact design and/or stormwater treatment will be required as follows:

- By conditions of a resource consent (including conditions and recommendations in Catchment Drainage Plans or Catchment Management Plans). **Note** Council may impose additional conditions to those required by a catchment management plan to resolve or prevent exacerbation of known problems within the catchment. To meet water quality requirements of the Regional Water and Soil Plan for Northland and/or WDC held resource consent conditions for SW discharge
- To comply with requirements of a relevant by-law
- To restrict impacts on downstream properties from a change in use of land, or change in the nature of the land
- As required by the waste and drainage department manager.

Well-designed and maintained alternative systems can enhance local amenity and ecological values.

Early consultation with Council is recommended to identify the impact and suitability of the design, including maintenance requirements. *Consultation is also required regarding the selection of proprietary stormwater treatment devices, so that Council can standardise types across the District.*

Reference should be made to:

- Auckland Regional Council (ARC) TP 124, Low Impact Design Manual for the Auckland Region
- ARC TP 10, Design Guideline Manual, Stormwater Treatment Devices
- SNZ HB 44.2001 Subdivision for People and the Environment.

4.7.2 Subsoil Drains

Subsoil drains shall be provided where required to control groundwater levels. They will normally be required under kerbs, and in locations where an open drain is filled. They may also be required for pipelines with cut-off walls.

Other design aspects of the development may also warrant subsoil drains, including stability hazard control and significant earth retaining structures. The design of these elements is not covered by this section and may be subject to specific engineering design.

4.8 Conveyance (Primary Systems)

4.8.1 Reticulation (Layout)

4.8.1.1 Pipes

4.8.1.1.1 Gravity Pipelines

Where possible, reticulation is to be located in the road reserve or within other public land. Reticulation should not be located below the crown of the carriageway, and manholes within the carriageway should be avoided

In private property and other areas where development or building may occur, pipes shall be located clear of potential building sites and existing or proposed engineering features. Pipes within private lots shall generally run parallel to boundaries with an offset from the boundary between 1.0m and 1.5m.

Pipes shall be sited outside of the zone of influence of the foundations of existing structures. Where this is not possible, the pipe and structure shall be protected to details approved by Council. The design shall include protection of the pipeline and structure, and maintenance access for the pipeline.

No structure shall be erected over any buried public sewer or stormwater system without prior written approval of Council's waste and drainage manager.

4.8.1.1.2 Curved Pipelines

Pipelines should be constructed in straight horizontal and vertical alignment between maintenance structures.

Subject to specific design, close control of installation to maintain grades and alignment, and accurate as-built plans, curved pipelines may be approved in exceptional circumstances.

4.8.1.1.3 Joints

All pipes shall have an approved joint to connect pipe to pipe or pipe to other components. Refer Section 4.8.2.4.2 for details.

4.8.1.1.4 Pipeline Connections

Connections will normally be made into manholes. However direct connection of a minor pipeline into a major pipeline is permitted provided:

- Connection is via a suitable junction or saddle where the minor pipe diameter is not greater than half the major pipe diameter
- The distance between the pipeline connection and the closest inspection point is not greater than 25m.

Saddling of sump leads (300 Ø) into primary lines is permitted provided that the connection is made at 45º or less to the direction of primary flow. Saddling of double sumps is not permitted.

Connections shall be sealed with removable caps until required. The caps are to be painted green and have 'SW' painted/fixed onto the end cap. Their location shall be accurately measured and shown on as-built plans with dimensions to readily identifiable reference points and with depth to invert from finished ground level or absolute spur invert level. The position is also to be marked with a wooden stake (min 2'x4') painted green with 'SW' painted/fixed onto the stake, and extending from the invert of the connection to 600mm above ground level.

4.8.1.1.5 Maintenance Structures

All manhole and other maintenance structures shall be kept clear of boundaries, and where practicable, outside of carriageways and footpaths.

4.8.1.1.6 Minimum Pipe Sizes

Minimum pipe sizes unless otherwise specified shall be:

- Sump Outlets - 300mm ID
- Stormwater mains - 300mm I.

Exception for property only connections where no sumps are connected where the min pipe size may be 225mm ID.

4.8.1.1.7 Separation from other Services

Minimum clearances to other services are given in Table 6.4 & Sheet 30. These shall apply except with written agreement of the affected service owners.

4.8.1.1.8 Stormwater near Trees and Existing Reticulation

Reference shall be made to Section 7.1.2.4 of this standard for requirements regarding the location of trees close to reticulation. Root ingress protection to pipe joints shall be provided where joints occur within 5m of a tree trunk >0.50m of girth measured 1.00m above ground. Pipelines in proximity to willows and poplars shall be avoided.

Where any pipes or cables are laid alongside existing reticulation then a gap of at least 1m should be maintained where practicable so as not to disturb the existing trench.

4.8.1.1.9 Pipe Cover

All reticulation located in areas not subject to traffic loading shall have a minimum of 600mm of cover between the crown of the pipe and finished ground level. Under carriageways the minimum depth to crown shall be 1200mm unless specifically designed concrete capping is provided. See Sheet 31, Sheet 32 & Sheet 33.

Note socket cover is reduced by an amount dependent on class and type of pipe.

Where the above minimum depths cannot be met, special protection of the pipe shall be provided, subject to specific engineering design and approvals.

Where the reticulation lines are located in the front yard of lots, the invert level shall be deep enough so as not to interfere with any future driveway construction.

4.8.1.1.10 Bulkheads on Pipes (Anti Seepage Collar)

Bulkheads shall be provided on pipelines with steep grades, and where separation of formations is required. Bulkhead details shall be included in the drawings. See Sheet 19 for example. Spacing shall be as follows:

Table 4.2 Bulkhead Spacing

Bulkhead Spacing		
Grade %	Requirement	Spacing (S) (m)
15 - 35	Concrete Bulkhead	S = 100 / Grade (%)
> 35	Special Design	3.0

4.8.1.2 Manholes

4.8.1.2.1 General

Access chambers or manholes shall be provided at all changes of direction, gradient and pipe size, generally at branching lines and terminations.

4.8.1.2.2 Spacing

The maximum spacing shall be generally 120m. *Approval may be given for greater spacing for pipes larger than 1050mm.*

4.8.1.2.3 Details

Manholes shall be constructed in accordance with Sheet 37.

4.8.1.3 Sumps

Sumps shall be provided as required to prevent the primary design flow from discharging over adjoining properties, or over footpaths. This includes surface drainage from vehicular and pedestrian accessways.

Sumps and high flow inlets shall be fitted with grates to prevent accidental access. These grates shall be removable for maintenance access. See Sheet 34.

4.8.1.4 Inlet and Outlet Structures

All culvert and pipeline inlets and outlets shall be provided with adequate wingwalls, headwalls, aprons and scour protection for, erosion control, fill retention around the pipeline and pipeline support. With larger diameter pipes where there is a danger from access to the pipes, wingwalls with approved safety grates shall be provided. Open-ended manholes to serve as high flow inlets shall have grates or scruffy domes installed. See Sheet 35.

The appearance of inlets and outlets in relation to the riparian landscape, and effects on in-stream values shall be considered. Naturally bedded discharge pipes are preferred where discharge is to an existing stream or water body.

4.8.1.5 Lot Connections

Connections shall be provided to all new urban lots, and to rural lots where a stormwater system with adequate capacity has been provided, subject to the principles set out above.

Where stormwater reticulation is available, connections shall be made directly to stormwater mains. *Where this is not available, connections may discharge to an alternative path which may include roadside open drains, waterways, or to ground, subject to the provisions of this standard and the approval of Council.*

Kerb discharges will generally only be permitted in exceptional circumstances, and will be subject to ***specific*** *approval from Council.*

Connections shall be sited clear of obstructions, known development proposals and be accessible for maintenance.

4.8.2 System Components (Specification)

4.8.2.1 Design Life

The asset life of stormwater drainage systems shall not be less than 50 years for private systems in accordance with the NZBC. It shall not be less than 100 years for public systems or private systems to be vested in Council in the immediate or near future. The asset life of components in the system which by their nature are shorter than the minimum set out above shall indicate the replacement requirement in the application.

A maintenance schedule as shown on the sample in the procedures manual shall form part of the application.

4.8.2.2 Private System Components

Whilst private stormwater systems are generally not bound by the minimum standard for public systems as set out in this document, where the public system becomes reliant on the private system, such as in treatment and attenuation, the private system shall have a performance standard similar to the public system.

Notwithstanding this, private systems shall meet other legal requirements such as described in the **New Zealand Building Code**.

4.8.2.3 Private Sumps

Sumps on private access ways shall be capable of accepting the flow from the catchment area. The minimum grate size shall be 300 x 300mm. Where an access way is steep, or stormwater connections discharge onto the access way, standard single or double sumps as required for roads, and detailed on Sheet 34 shall be used. Sump leads shall be adequate for the catchment area, but not less than 150mm.

4.8.2.4 Public System Components

4.8.2.4.1 Pipes

4.8.2.4.1a Materials and Class

Standard approved pipe materials are given in Table 4.3. *Other materials shall only be used with the written approval of the waste and drainage department manager.*

Table 4.3 Pipe Material and Class

Pipe Material and Class for Stormwater Drainage			
Material	**Standard**	**Class (min)**	**Notes**
Concrete RRJ	AS/NZS 4058	2	Class for shallow pipes or particular loading to be by specific design
uPVC	AS/NZS 2566	SN 8	*Concrete protection/capping required for road crossings with cover less than 1.2m (Council approval required to lay pipes with cover less than 1.2m under roads)*
PE	AS/NZS 4130	SDR 17, SN 16	Black Outer, White or Brown Inner lining. Internal bead formed by welding shall be removed Where the pipeline is installed by directional drilling or pipe bursting methods, the pipe class should be SDR 11
PP (e.g. 'StormBoss' twin wall pipe)	AS/NZS 5065	SN 16	*Subject to specific approval. Shall be shown to be capable of withstanding a jetting resistance to 4000psi (280 bar) without damage* *Concrete protection/capping required for road crossings with cover less than 1.2m (Council approval required to lay pipes with cover less than 1.2m under roads)*
Vitrified Clay (Extra Strength)	BS EN 291 1991		*Subject to specific approval, for use where required for aggressive ground conditions*

4.8.2.4.1b Structural Strength of Pipes and Bedding

The pipe bedding shall be selected to meet the requirements of the class of pipe to be used and the design loading conditions. The design loading shall include any construction loading which may occur during the process of construction development such as temporary fill stockpiles, passage of construction machinery.

The combination of bedding class and pipe class for concrete pipes shall conform to the requirements of **AS/NZS 3725**. The bedding class used shall be H2 *unless specifically approved prior to construction by the waste and drainage department manager.* The type of bedding and class of pipes adopted shall be in accordance with the pipe laying tables and bedding diagrams in **AS/NZS 3725**.

The requirements for PVC shall be as set out in **AS/NZS 2032** and **AS/NZS 2566**. The depth of bedding and surround materials are to be as shown in Sheet 31.

Where the gradient of the pipeline exceeds 10% or where ground conditions, in the opinion of Council, merit the need, sufficient cement shall be added to the granular bedding material to provide a weak concrete with a strength of not less than 7 MPa. The depth of bedding shall be as specified in **AS/NZS 3725** for concrete pipelines and as described in **AS/NZS 2566** for plastic pipelines.

4.8.2.4.1c Soft Ground Conditions

Where a pipeline is to be laid in soft ground (i.e. ground that is likely to settle, deflect and/or subside etc) Council may require a geotechnical analysis of the site to determine the most appropriate bedding design and backfill material and process. Any such requirements shall be strictly adhered to and the developer's representative shall be required to confirm this in writing to WDC.

Note *Pipes laid to minimum grades will NOT normally be accepted in ground liable to settlement.*

4.8.2.4.1d Pipeline Construction

The construction of concrete pipelines shall be carried out in accordance with the requirements of **AS/NZS 3725**.

Construction of uPVC pipelines shall be in accordance with **AS/NZS 2566** parts 1 & 2.

Construction of Polyethylene pipelines shall be carried out in accordance with AS/NZS 2033 and AS/NZS 2566. The use of polyethylene is confined to trenchless construction methods and above ground pipelines, which are subject to specific approval by Council.

Trenchless methods of construction may be used subject to prior application to WDC specifying the methodology, pipe material and jointing system to be employed. Council shall not unreasonably withhold approval provided that the materials are covered by the relevant specification for an equivalent trenched application.

The two types of pipe approved for this form of construction are polyethylene and reinforced concrete. In the latter case these shall be specially manufactured for jacking operations*. Pipe classes for each type are subject to specific design. The joints for each are subject to specific approval by Council.* The methodology used shall be such that the design gradients are met along with hydraulic efficiency of the pipeline. Micro-tunnelling is recommended where gradients are less than 1%.

Where the trenchless method involves drilling a pipeline under the drip line of a tree with a girth of >0.5m at 1.0m above ground, an arborist report on the minimum cover from ground level to invert level may be required to ensure no damage is caused to the tree.

All testing required under these sections shall be charged to the developer.

Where trenchless methods of construction are used the resulting pipeline shall not be accepted if it contains sags or crest in the vertical which will retain flow and consequently lead to siltation in the pipeline. Horizontal deviation from alignment is acceptable without loss of vertical alignment provided that the maximum deviation is not more than 1.5D for pipes up to 300mm nominal diameter, 1.0D for pipes greater than 300mm nominal diameter. Compliance measured by CCTV survey following construction of the line.

For trenched construction the trench width at the top must be kept to minimum *and where specified not exceeded without prior approval of WDC.* Particular care must be taken that the pipe is correctly aligned and not disturbed by the backfilling operation. Collar and pipe bedding thickness specified shall be met. The materials and backfill compaction shall comply with **AS/NZS 3725** or specific design specifications.

4.8.2.4.2 Joints

All pipes shall have an approved flexible sealed joint with the exception of polyethylene pipes or pipes used for pipe jacking. *Reinforced concrete flush butt-jointed pipes will generally not be allowed.* Solvent glue joints shall not be used. Concrete pipes used in jacking operations shall have stainless steel covers to the joints.

Polyethylene pipes shall be laid with a watertight joint at the connection into manholes. Pipe to pipe joints shall be capable of accommodating a minimum of 50mm expansion and contraction and shall be detailed on the engineering plans and be subject to approval by Council.

Where polyethylene pipes are butt welded, welding to be carried out by certified welder (i.e. one who has attended an approved welding course recognised by the NZWWA) and the testing procedure to be as per Counci's 'Specification for Polyethylene Weld'.

4.8.2.4.3 Culverts

Approved pipe materials may be used for culverts. In addition, reinforced box culverts designed for the imposed loads, and with suitable connection between units may be used.

Other materials may only be used for road culverts where the design life of the culvert is shown to be not less than 100 years, and with the written permission of Council.

4.8.2.4.4 Manholes

Normally manholes will be constructed in reinforced concrete, except where aggressive site conditions make them unsuitable.

Shallow manholes with a maximum depth of 1.2m and maximum pipe size of 300mm may use a 600mm diameter chamber.

Generally, standard manholes shall have a minimum internal diameter of 1050mm (specific approval required for other sizes). The size and layout shall be designed to ensure hydraulic efficiency. With larger pipes (generally larger than 600mm), or multiple connections/branches, the size of the manhole will need to be increased to accommodate the reticulation.

For pipelines with internal diameter of 1.2m or greater, access may be approved using offset 1050mm risers factory joined to the pipeline. These may be used in conjunction with factory made mitre joints in the pipeline for direction changes.

Connections up to 300mm diameter may have an open cascade of up to 2.0m deep into a manhole.

Where the pipe size changes at a manhole, generally the soffit of inlet pipes shall be no lower than the soffit of outlet pipes. *In exceptional circumstances such as when the pipes are used for attenuation purposes, connections at invert to invert may be permitted subject to a comprehensive demonstration of network capacity.*

Inlet pipes shall be cut back to the inside face of the manhole and plastered to a smooth finish. The base is to be benched and haunched with concrete to a plaster finish to accommodate the inlet and outlet pipes and appropriately direct the flow of branch pipes.

All chambers shall be made watertight.

Manhole covers and rings shall be of ductile iron (cast steel) construction to **AS 3996** class D. Manhole covers shall be hinged such that they cannot be dislodged during pipe surcharge conditions (Saint Gobain Korum or equivalent).

The throats of all stormwater manholes shall be painted green with a suitable paving paint. The covers may remain unpainted.

4.8.2.4.5 Connections

The minimum connection size shall be:

- 100mm for each residential allotment
- 150mm for a commercial/industrial lot. The connection shall be designed to suit the potential site coverage, and where known, the intended use of the property. **The minimum connection size will only be suitable for small lots**.

Where discharge rate controls are applied, Council may approve alternative connection sizes.

Connections shall be sited clear of obstructions and known developments and accessible for maintenance.

Direct connection of minor pipelines to major pipelines is acceptable, provided:

- Connection is via a suitable junction or saddle
- The distance between the connection and the closest inspection point is not greater than 25m.

Connections shall be sealed with removable caps until required. Their location shall be accurately measured and shown on as-built plans.

4.8.2.4.6 Sumps

Sumps on public roads shall comply with Section 3.4.15.6 of this standard.

4.8.2.4.7 Inlet/Outlet Structures

Inlets to reticulated systems shall have removable debris traps and/or pits. The effects of blockage shall be considered.

The design of debris traps on inlets to large pipes (>750mm) shall be to the approval of Council. As a minimum they shall have a raked face and an access area above to permit screen clearing at times of high flows. Consideration should be given in the design of such screens to health and safety risks during maintenance operations.

4.8.2.4.8 Subsoil Drains

Subsoil drains under public roadways shall be perforated or slotted, with smooth internal surfaces. Private subsoil drains alongside accessways may use corrugated pipe (draincoil). Inspection points shall be provided at regular intervals. Subsoil drains shall discharge to a sump, manhole or watercourse. Outlets to a watercourse shall have a formed concrete or grouted rock outlet.

Free draining backfill shall be provided around subsoil drains.

4.8.2.5 Inspection and Testing

4.8.2.5.1 Pipeline Pressure Test

A pipeline pressure test will not normally be required. However Council reserves the right to require a low-pressure air test of the reticulation.

4.8.2.5.2 CCTV Inspection

The whole of the reticulation to be vested in Council shall be inspected and recorded by CCTV. Inspection records shall comply with NZWWA '**New Zealand Pipe Inspection Manual'**. Reticulation will not be accepted by Council until CCTV is completed and reports including video is provided to Council. Refer Section 1.10.6.

4.8.2.5.3 Manholes

All manholes shall be visually inspected to ensure the standard of construction and finishing is acceptable.

4.8.2.5.4 Marking of Connections

All connections shall be marked as described in Section 4.8.1.1.4.

4.9 Overland Flow - Secondary Systems

4.9.1 Waterways

All waterways that are to be maintained by Council shall be protected by easement or located in land in public ownership.

4.9.1.1 Constructed Waterways

Where waterways are constructed, they shall be designed to be stable, not prone to scour and able to be maintained, with adequate access for maintenance machinery. ***Generally concrete lined waterways will not be permitted***. Designs shall be suitable to support and facilitate the movement of aquatic life. Planting adjacent to the waterways must be suitable to stabilise the banks without causing a maintenance liability in the future by their presence.

4.9.1.2 Natural Waterways

Existing natural waterways should be retained, and piping avoided. Reserves should be created around significant natural waterways in accordance with the requirements of the District Plan. Where waterways have been modified, they should be restored and enhanced. *In catchments where comprehensive resource consent is held for stormwater and the waterway is not regarded as significant in drainage or ecology terms the diversion of waterways is at the discretion of WDC and NRC.*

Culverting or piping of existing waterways will require specific approval of the wastes and drainage manager. This will generally not be given unless special requirements merit consideration. The layout of lots is not considered sufficient justification.

Existing vegetation to waterway banks should be maintained and protected to prevent bank scour. Removal of vegetation and replacement with engineered banks to prevent scour will not generally be acceptable. Retention of existing trees and bush cover adjacent to waterways is encouraged.

4.9.2 Flooding Related Issues

4.9.2.1 Freeboard

The minimum freeboard above the calculated flood protection level shall be 0.5m for habitable building floors, and 0.3m for commercial and industrial buildings, *unless specific assessment*

demonstrates that a different freeboard is appropriate. Generally minimum floor levels above flood levels calculated to occur during the 1% AEP storm shall be identified for all lots where appropriate.

Specific consideration shall be given to access requirements to properties. Normally these should be above the flood protection level. Where this is not possible (e.g. the road/access forms the secondary flow path), the height and velocity of flow shall be such that carriageways are passable. This information shall be indicated on the drawings.

4.9.2.2 Secondary Overland Flow Paths

The design shall include a full analysis of overland flow paths. This shall include preparation of plans, long sections and cross sections showing design water levels for a 1% AEP (+20%) storm. Where the secondary flow path is in private property, limitations on development shall be noted on the title, and an easement over the flowpath will normally be required.

Lots shall generally fall towards roadways, which may be used as secondary flow paths. Where secondary flow paths cannot be kept within roads, they should be kept on public land, such as access ways, parks and reserves, or designated by legal easements over private land. The location of easements shall be clearly shown on plans to be held by the asset owner. Where stormwater attenuation systems are provided within a development, they shall be designed to receive the maximum design flows from the secondary flow path.

Where roads are used as secondary flow paths, the design shall ensure that such flow will not overflow onto adjacent properties, particularly where the properties are below the level of the road. This may require specific design of the berm to contain the flow, while ensuring that vehicles can cross the berm at driveway/access way locations. Consideration must be given at the design stage to ensure that natural flowpaths shall be the basis for the overland flow path and that unnatural restrictions such as sharp turns are not included in the design.

The design of secondary flow paths shall include measures required to protect against instability and erosion. Scour of natural channels needs to be prevented by reducing velocities and or armouring with suitable material. Ponding or secondary flow on roads shall be limited in height and velocity to ensure that carriage ways are passable during high magnitude events.

Where a secondary system of overland flow paths is not available, the primary system shall be designed to provide a level of protection required of secondary systems. This shall include an analysis of the effects of blockages of pipes and culverts. This is particularly important with smaller culvert sizes, or where there are grates on culvert inlets, and/or the culvert is in a location where it is likely to receive silt, vegetation or rubbish.

4.9.2.3 Tidal Areas

Minimum floor levels in tidal areas shall be set taking into account storm surge, tsunami hazards, climate change and sea level rise. Vehicle access along normal routes will also be required during flood conditions.

The minimum floor level as permitted activity under the Operative District Plan May 2007 for Coastal Areas is RL 2.5m (One Tree Point datum 1964). However, specific investigations shall be carried out for **all sites** to determine an actual floor level dependant on local conditions. Wave run-up is also to be provided for in coastal areas.

4.10 Treatment

4.10.1 Stormwater Quality Control

All new subdivision developments or re-developments, and all other new stormwater systems, shall comply with the requirements of the NRC Regional Water and Soil Plan in relation to stormwater quality control.

It is emphasised that applicants shall consider the NRC Regional Water and Soil Plan and CDPs/CMPs before commencing the design of a new system. It is expected that all discharges should be treated meeting or exceeding the requirements of the ARC TP 10 standard. (75% TSS removal).

It is noted that, in 2001, Council commenced a monitoring programme of the waterways in its urban drainage areas. Information from that monitoring will be made available to applicants to assist them in the design of the on-site measures if required.

4.10.2 Treatment Ponds and Wetlands

The treatment of stormwater in ponds or wetlands is permitted on the following principle:

- That ponds and wetlands shall comply with the requirements of the NRC Regional Water and Soil Plan
- That ponds and wetlands generally shall be designed to the TP 10 standard *with the proviso that where requirements of TP 10 are not practical, application may be made to Council to vary these requirements.*

A complete set of drawings and design calculations shall be submitted for approval. A geotechnical report addressing general ground stability of the pond under all operational conditions, slope and necessity for lining to prevent piping may be required by the stormwater asset manager.

In addition ponds shall comply with the following:

- Maximum permanent water depth is 1.5m
- External slopes shall be 1 vertical to 4 horizontal
- Internal slopes shall be 1 vertical to 4 horizontal
- The maximum water level resulting from the operation of the pond shall be contained within the footprint of the drainage reserve area and or within the site legal boundary
- Reverse benches around the full perimeter with slope 1:10 min 2.0m wide at 300mm above the permanent pool water level where ponds are not fenced.

Note Refer to Section 5.4.3 & Section 5.9 of ARC TP 10 for aspects of safety applying to detention ponds removing the need to fence ponds

4.10.3 Proprietary Treatment Systems

The treatment of stormwater where required using proprietary systems is permitted when:

- The proprietary system meets or exceeds the minimum treatment requirements of TP 10
- *Is from a WDC accepted supplier/manufacturer (for the purposes of standardisation) and complies with the supplier's specifications or recommendations.*[21]

Generally the use of proprietary systems to be vested in Council, which require frequent replacement of treatment media, will not be accepted.

4.11 Attenuation

The requirement for stormwater detention and the design parameters shall be established as part of the stormwater analysis. Where attenuation is required the following shall apply:

4.11.1 Residential

All stormwater run-off arising from new residential development within the Whangarei District shall be attenuated so that peak flow discharge from the post developed site(s) is limited to 80% of the pre-development levels for both primary and secondary flows unless:

- The development has individual lot sizes larger than 10,000m² (1 ha) with a proposed created impervious area such as roofs, hardstanding and driveways not exceeding 5% of the total site
- *The development lies adjacent to marine and or coastal areas with tidal influence and has direct discharge to these receiving environments*
- *There is sufficient capacity for direct discharge to ground subject to suitable soil conditions and specific design.*

[21] The Designer is to ensure that the system proposed has WDC written approval.

Note It will need to be demonstrated that the discharge across boundaries (both below and above ground) does not exceed pre-development flows, particularly with regard to the concentration of flows

4.11.2 Non Residential

All non residential development related discharge of stormwater within the Whangarei District shall be attenuated, so that peak flow discharge form the post developed site(s) is limited to 80% of the pre-development levels for both primary and secondary flows unless the development:

- Has individual lot sizes larger than 10,000m² (1 ha) with a proposed created impervious area not exceeding 2% of the total site
- Lies adjacent to marine and or coastal areas with tidal influence and has direct discharge to these receiving environments.

Examples of accepted solutions for attenuation devices by Council are, but not limited to:

- In ground solutions using lined gravel pits, pipes, manholes and/or proprietary systems
- Above ground systems such as ponds, water tanks, swales and the porous sub-base portion of permeable paving solutions.

Note Attenuation storage within permeable paving is only accepted for private systems and subject to the requirements of the WDC Stormwater By-law and specific design

4.11.3 Stormwater Detention Areas

Stormwater detention areas shall be contained within legal boundaries of a drainage reserve. They shall not be included in local purpose reserves without specific prior approval of Council's Infrastructure and Services Division.

All weather, legal access to the area from a road shall be provided for maintenance for Council vested systems. Vehicle/machinery access into the fore-bay of wet ponds, or the main bay of dry ponds, shall have a min width of 2.5m and a max gradient of 35% (1/3). Perimeter access and access to inlet and outlet structures for maintenance should be considered in the design. Hazards from the area shall be identified and mitigated. Access for maintenance vehicles shall be provided within the fence surrounding the pond when installed.

Notes

- The requirement for fencing complying with the Fencing of Swimming Pools Act 1987 shall be established, and provided where necessary
- Refer to Section 5.4.3 & Section 5.9 of ARC TP 10 for aspects of safety applying to detention ponds removing the need to fence ponds.

4.12 Disposal

Controlled discharges required for the disposal options mentioned under Section 4.12.2, 4.12.4, 4.12.5 & 4.12.6 are subject to the provisions within this document.

4.12.1 Discharge to Ground (Soakaway)

Soak pits or trenches may be approved where a geotechnical investigation demonstrates that soils are suitable for soakage.

Refer to worksheet in Appendix I to determine the soakage rate from simplified site tests.

The soakaway may be designed using the simplified design method set out in the worksheet in Appendix I.

Design solutions beyond this method will require specific design by an IQP.

Soak pits shall not be used in areas subject to medium or high instability hazard.

Soak pits shall also be designed for 1% (+20%) AEP flows from impervious areas.

All soak pits/trenches shall be designed so as to be serviceable. Some acceptable designs can be found in the Procedures Manual.

Infiltration ponds offer an acceptable solution where soakage rates indicate reasonable results. The ponds must comply with the same general criteria as outlined in Section 4.10.2 for attenuation ponds.

Permeable pavement and associated porous sub-base can offer an acceptable solution where suitable ground conditions exist, subject to specific design.

4.12.2 Discharge to Land

Subject to the requirements of this document and the NRC Regional Water and Soil Plan, discharge of stormwater to land is permitted on the following principles that:

- Flooding of low lying areas shall not be increased in such a way that it reduces the freeboard for existing buildings and or accessways. Outlets to low lying areas must be provided or existing outlets retained
- Dispersal of concentrated flow from the development shall occur as soon as practicable and before any overland discharge to a neighbouring property occurs.

An acceptable rate of dispersed discharge from collected flow at the boundary is <2 litres/sec/m of run of discharge (i.e. from a flow dispersal swale). For example for a 12 litre/sec discharge from attenuation or peak run-off provide a 6m linear length of dispersal swale.

4.12.3 Re-Use

The re-use of stormwater is encouraged as a means of attenuating the increased flow associated with new development or changes to existing development.

For domestic solutions it is recognised that roofwater tanks can provide a significant contribution to stormwater attenuation when they are provided solely as a water supply for a dwelling.

Table 4.4 sets out the percentage reduction of the required attenuation volume attributable to the house roof. The table is based on a water consumption of 250 litre/person/day.

Note Reduction figures relate **only** to the roof portion of the attenuation and do not include other impervious surfaces

Table 4.4 Percentage Reduction of Required Attenuation Volume

Roof area	% Reduction of Required Attenuation Volume					
	Roof Tank Size (litres)					
	200	1000	3000	4500	9000	25 000
150	20	35	45	45	50	50
200	20	25	35	35	35	40
250	10	20	30	30	35	35
300	10	15	20	20	25	25
500	5	10	10	10	15	20

Note Where the roof water tank attenuation is to be used to offset direct discharges from external impervious areas, it should be noted that, once paved areas exceed 50-60% of the roof area, the incremental increase in roof run-off attenuation storage volume effectiveness becomes limited. Therefore where the 'other' impervious areas exceed 120m², a suitable, combined attenuation system should also be provided.

For commercial and/or body corporate installations, the re-use volume and its derived percentage of attenuation needs to be guaranteed. This can be done by means of a specific notation on the title or as land use consent condition.

When the attenuation is no longer provided through re-use it must be incorporated in the other attenuation system originally provided as part of the development that the reuse was tied in with.

Proof of the effectiveness of the revised attenuation system must be provided. This will be subject to the WDC Stormwater by-law.

4.12.4 Discharge to Water Body

Discharge to a natural or man-made water body is permitted subject to the requirements of this document. Suitable measures shall be put in place at the point of discharge to prevent scour, erosion or significant change to the receiving waterbody at the point of discharge.

The discharge shall also comply with the receiving water criteria of the NRC Regional Water and Soil Plan and or the conditions of the WDC CMP where applicable.

4.12.5 Discharge to Natural Stream and River

The discharge to natural streams and or waterways is permitted subject to:

- A specific resource consent for the discharge of SW
- Compliance with a CMP for the catchment
- Compliance with the NRC Regional Water and Soil Plan
- Any specific resource consent conditions.

4.12.6 Discharge to Marine Environment

The following principles shall apply where discharges of stormwater onto a beach or a Council owned coastal reserve is the only alternative:

- A specific resource consent for the discharge of SW
- Compliance with a CMP for the catchment
- Compliance with the NRC Regional Water and Soil Plan
- Any specific resource consent conditions.

In addition

- The foreshore yard of private property shall form well vegetated buffer areas
- Where landowners have retaining or erosion control walls on the coastal edge, the landward side of the wall shall be used for wide dispersal of stormwater
- Where discharge through an outfall is the only alternative, the outfall shall be specifically designed to minimise beach erosion and adverse effects on beach amenity subject to specific approval of the Parks and stormwater asset managers.

Any new outfall or physical changes to existing outfalls to Coastal Marine Areas will require Resource Consent from the NRC.

4.12.7 Erosion Protection

Erosion protection of conveyance channels and overland flow paths is required to prevent sediment loss.

The downstream environment in way of open channels, water ways, streams and rivers needs to be considered to prevent scouring caused by, or increased because of, the development.

The use of natural materials used to prevent erosion, or reduce erosion causes such as high velocities, is encouraged.

The landscape needs to be considered when applying erosion protective measures.

4.13 Hydraulic Design

4.13.1 Council Design Input

Notwithstanding the outcome of specific design for reticulated networks, Council shall have the right to specify the diameters and classes of pipes to be used for all reticulation within the subdivision or

development, and to specify connection points and reticulation alignment. It will provide on request details of the existing reticulation for design purposes.

Council may also limit discharge rates and volumes from the development. This may involve limiting flows from a partially developed site proposed for subdivision to the lesser of the existing run-off from the site at its present level of development, or the calculated run-off for a rural condition, prior to any development on the site. It may also be required to limit flows based on the capacity of the immediate downstream network.

4.13.1.1 Design Methods

The design of a stormwater system by way of attenuation not covered by the non specific generic method as set out on the worksheet 'simplified design method' Appendix J *will require specific design. The design shall be carried out by an IQP experienced in catchment design. This standard does not cover the detailed methodology to be followed in the design beyond the simplified method. Worksheet in* Appendix J. *This worksheet does not cover the design of the piped network.*

For **NZS 4404:2004 Section 4.3.12**, in conjunction with Verification Method E1/VM1 of the Approved Documents for New Zealand Building Code is an approved means of compliance.

Other methods, e.g. the Procedure for Hydrological Design for Urban Stormwater Systems by the New Zealand Institution of Engineers, or a proprietary computer model may also be approved. If a computer network model is used, it can be any suitable proprietary software. Council may require demonstration of the suitability either directly or through a process of peer review.

For large catchments with significant storage elements, specific design using network flow modelling shall be used.

Appendix G gives Intensity Duration Curves to be used in the design, *unless acceptable alternative data is provided.* Acceptable alternatives include analyses of a specific site based on information provided by NIWA, and/or verified research studies of particular soil or site conditions.

The design shall take into account the following:

- Estimation of Surface Run-off
- Critical storm duration in relation to storage provisions where applicable
- Rainfall Intensity and Time of Concentration
- Sizing of the stormwater drainage components based on hydraulic capacity, including analysis of full pipe and part pipe flows
- Analysis of energy loss through structures (Manholes, bends, inlets etc)
- Determination of water surface profiles in a stormwater drainage system
- Outfall water levels.

4.13.1.2 Design Storms

Minimum return periods shall be as follows:

1 For primary design flows (all environments)	**% AEP**	**ARI (years)**
a Piped network no surcharge	50	1:2
b Piped network allowing discharge within 0.3m of the lid level	20	1:5
2 For secondary systems (all environments)		
c Overland flowpaths	1	1:100
3 For flood protection (all environments)		
d All areas	1	1:100

Note Climate change allowance - add 20% to rainfall data

4.13.1.3 Duration

The minimum duration of the design storm for the pre-developed flow consideration using modified rational method shall be:

- All environments: 60 minutes.

The post-developed design shall be tested for critical duration taking into account the effects of attenuation and detention on the discharge.

Note This critical duration is unlikely to be the same as that used for the pre-development assessment.

4.13.2 Outlet and Backflow Effect

Outlet design and tail water level conditions shall be taken into account in the design of discharges to stormwater systems and waterways.

Where stormwater discharges to tidal waters, the design shall assume a tide level of Mean High Water Spring (MHWS) plus a storm surge of 0.35m. (0.15m barometric adjustment and 0.2m of surge).

4.13.3 Piped Networks

Piped systems shall be designed to cater for the peak design flow based on a 'Colebrook-White' roughness coefficient of 0.06 for both Reinforced Concrete and uPVC pipes. Equally a Manning's number 'n' of min 0.011 should be used for design. There shall be no surcharge occurring for the 50% AEP in any part of the network. Surcharge in part or for the whole may occur for the 20% AEP but shall be limited to within 0.3m of any structure lid. It is assumed that the lid is at or near finished ground level.

4.13.3.1 Gradients and Acceptable Flow Velocities

Pipes shall be kept as steep as possible in flat areas to control silt deposition. The velocity should be at least 0.75m/s at a flow of 50% of a 2-year return period storm. A suitable reduction of velocity or part full pipes shall be considered in demonstration of the requirement.

4.13.4 Hydraulic Flow in Manholes

In addition to the normal pipeline gradient all manholes shall have a minimum drop of 20mm +5mm per 10 degree of angle change. Where the pipe size increases this drop can form part of the increase and is not cumulative.

Erosion of concrete pipes should be considered where the pipe gradient is steeper than 1 in 3, especially at gradient transition.

4.13.5 Open Channel Flows

Open channel flow calculation as set out in E1 using the appropriate Manning's 'n' value is acceptable to show that the design can accommodate the flows from the specified min return period. Allowance needs to be added for the vegetation of the overbanks and the lining of steep sections with armour. Council's accepted values for 'n' are set out in Table 4.5.

Table 4.5 Manning's Values

Description	Manning's value 'n'
Open stream with straight uniform channel in earth & gravel in good condition	0.0225
Unlined channel in earth and gravel with some bends & in fair condition	0.025
Channel with rough stony bed or with weeds on earth bank & natural streams with clean straight banks	0.030
Winding natural streams with generally clean bed but with some pools & shoals	0.035
Winding natural streams with irregular cross sections & some obstruction with vegetation and debris	0.045
Irregular natural stream with obstruction from vegetation & debris	0.060
Very weedy irregular winding stream obstructed with significant overgrown vegetation & debris	0.100

Maximum velocities for open channels (including overland flow paths) shall be as set out in Table 4.6.

Table 4.6 Max Flows in Channels

Description	Max flow ms^{-1}
Earth channels – no bed vegetation	0.6
Fully vegetated channels (e.g. swales)	1.0
Rock spall lined channels	2.0

4.13.6 Culverts

The design of culverts shall consider the effects of inlet and tailwater controls. An acceptable method of assessing flows with inlet and outlet control is given in the *Approved Documents for New Zealand Building Code, Verification Method E1/VM1*.

Refer to Section 3.4.16 for culvert design requirements in respect of roading and accessways.

4.13.7 Outlet Structures

Outlet structures shall be designed so as not to provide any restriction to the flows in the watercourse. Where the discharges represent more that 10% of the watercourse flow rate for an equivalent event, adequate energy dissipation shall be applied.

Section 5 Wastewater

5.1 General Requirements

This section covers the design and construction requirements for wastewater systems. Wastewater systems are required to collect and convey wastewater for subsequent treatment and disposal. Such systems shall consist of but not be limited to a gravity reticulation system including associated pump stations and rising mains, a treatment system and a system to dispose of the treated effluent.

Where a public wastewater system with sufficient spare capacity is available, connection to it will be required. Where a connection is not available to the public system or where a public system does not exist, an alternative system must be provided. This will normally consist of on-site treatment and disposal, either individual or communal in nature. Such systems will generally be subject to separate resource consent approvals.

This section is generally limited to the standards required for conventional reticulation systems. Alternative systems such as EDS or suction systems shall be subject to specific approval and agreement on design standards.

5.2 Referenced Documents

Details of referenced documents will be found in Section 1.1.

5.3 Submission of Application

5.3.1 Supporting Information and Calculations

The application shall include supporting information and calculations that demonstrate that the:

- Existing wastewater reticulation and treatment system that the development will connect to is adequate to serve the proposed development
- Proposed reticulation is adequate to serve the proposed development and the potential upstream catchment.

The design shall include:

- Pipe sizes, material, and layout of the reticulation, (including the existing reticulation)
- Hydraulic design, including providing adequate capacity and self-cleaning velocity
- Service connection locations to serve the buildable area with a gravity connection
- Engineering design of pump stations and rising mains (including all calculations).

Refer to Table 1.1 for details of designs to be undertaken by an IQP.

5.3.2 Design Drawings and Specifications

Design drawings complying with the requirements of Section 1.7 & Section 1.8 of this standard and relevant waste and drainage standard operation procedures shall be provided for approval.

5.3.3 Approval of Design

The drawings and calculations will be will be reviewed by the waste and drainage manager or his/her representative. The completed form and the drawings showing any alterations shall be returned to the applicant's representative. If adjustments to the design are required a new set of amended drawings shall be submitted prior to approval being granted. Only drawings stamped and signed by the waste and drainage manager or his/her representative shall be deemed approved drawings. Unless specifically stated otherwise, the approval of drawings does not supersede the requirements or obligations of these Standards.

5.3.4 Consents

The applicant shall be responsible for obtaining all necessary resource consents and building consents for the wastewater system including consents for stream crossings, pump stations, discharges etc. It is to be noted that any modification to an existing private system will require a building consent.

5.4 Connections and Disconnections

5.4.1 Connection to Existing Wastewater Scheme

All lots within the 'Area of Benefit' of a sewerage scheme shall be provided with a gravity connection to Council system unless Council confirms in writing that a connection is unwarranted, unavailable or unsuitable. Where properties are adjacent to an area of benefit, Council may approve a connection, or require that a connection to the system be provided. Refer to Section 5.10.1 for connection details.

5.4.2 Disconnections

Council approval and inspection is required for disconnections from the wastewater network to ensure work is carried out appropriately and in such a manner that will prevent contamination, leakage or infiltration. Such work is subject to separate application and is required to be undertaken by a licensed contractor.

5.5 Wastewater Treatment and Disposal

Where a public system is not available or where the use of conventional gravity reticulation is impossible or impractical an alternative system must be provided. Depending on the scale and nature of the system, Council may agree to take over future responsibility for the ownership, management and operation of the system whether in whole or in part. This will be determined at the consenting phase of the application *and will require full prior consultation with Council* and will generally not apply to systems serving **less than 16 lots**. Certain areas may be designated by Council in which the use of specified alternative systems is mandatory.

All such systems whether or not to vest in Council shall obtain any necessary NRC consents and ensure that adequate provisions for the ongoing maintenance and operation of the system are in place.

5.5.1 Individual On-Site Treatment and Disposal

Where the nett lot size ≥2000m^2 for on-site disposal of wastewater, and there are no factors that may preclude or limit its use, on-site disposal will normally be approved. However, approval will be based on an on-site assessment that demonstrates that the environment is capable of receiving the effluent without adverse effects, in a complying manner. This assessment is to be submitted with the resource consent application.

This will require an investigation carried out by an IQP, using Form EES-SEW1 referencing the Site-and-Soil Evaluation Procedures of **AS/NZS 1547:2000** and demonstrating compliance with the performance requirements of the NRC Regional Plans. It will need to be demonstrated for each lot that:

- The site is suitable for the disposal system proposed
- Adequate area including reserve area is available.

Reference is to be made to the WDC Hazard Plans (e.g. Coastal Structure Plan – Slope instability Potential and Effluent Disposal Potential, Oakura to Langs Beach (Tonkin and Taylor 2005)).

Reference is also to be made to Council's GIS system when submitting designs for on-site effluent systems. In particular, the following GIS layers are to be referenced in the investigation:

- Land Resources Aquifers at risk
- Land resources Streams
- Hazards Effluent on slope stability
- Hazards Effluent suitability.

5.5.2. Communal On-Site Treatment and Disposal

Where site size, ground conditions, topography etc limit the ability for individual on-site effluent treatment and disposal, communal systems should be considered. These systems may be conventional gravity systems discharging to a central treatment area or low pressure pumped systems where each lot has an individual on-site tank which then pumps via a small bore pipe to a central treatment area.

The following are to be considered when a communal system is proposed:

- Resource consent from Northland Regional Council may be required
- Whether to apply to have the system made public. WDC will consider all applications, but may require a system be made public even if application is not made
- If the system is kept private, the following (among others) will be necessary:
  - A formal legal agreement between **all** land owners in which each is individually and severally responsible for the maintenance and performance of the system. This agreement must require each landowner to be a member and also ensure that obligation is transferred to a new owner(s) if the property is on-sold
  - A contract with an approved company is entered into on an ongoing basis to attend to the specified maintenance and any equipment failure
  - A comprehensive management plan is supplied and approved by the consent authority.

All the above agreements/contracts/plans etc will require approval from Council before the system is finally approved for use.

- If it is proposed to have the system become a public asset, it is imperative that the applicant engage with Council at an early stage in order for Council to consider each proposal on its merits, and, should a decision be made to accept the system as a public asset, that agreement be reached as to the specific requirements. This is to take place before the application is submitted for final approval.

5.5.3 Pressure Wastewater Collection (PWC)

PWC comprises two main options:

1 Pump the liquid from a septic tank to the public reticulation or to a central treatment area. The system shall consist of:

- Multi-chambered tank designed for maximum retention of solid matter and equipped with an outlet filter
- An emergency overflow effluent disposal field or emergency storage tank capable of receiving a minimum of 24 hours design flow in the event of a pump/power failure
- A control panel and audible alarm system
- An approved boundary kit.

2 Pump raw sewage via a grinder pump to the public reticulation or to a central treatment area. The system shall consist of:

- A specifically designed tank with grinder pump. Tank is to be sized to receive a minimum of 8 hours normal flow in the event of a pump/power failure
- A control panel and alarm system
- An approved boundary kit.

The design requirements of a PWC system shall include:

- Design to be done by an IQP/CPEng who has demonstrated competency in the design of PWC systems
- Design is to be done in accordance with the Pressure Sewerage Code of Australia WSA07:2007 of the Wastewater Services Association of Australia Inc
- All lines in a PWC system shall be a minimum ID of 50mm
- All pressure pipework is to be polyethylene
- Only black polyethylene pipes with an off-white stripe may be used. Refer to WSA07:2007
- All joints are to be done using electro fusion techniques
- Flushing points are to be provided in convenient locations

- The time in mains is to be generally limited to 6-8 hours.

Note Where the effluent is proposed to be pumped to a Council system, written approval must be obtained from Council **before** the consent application is submitted

5.5.4 Recycled Water

The provision of any recycled water (treated wastewater) system whether public or private shall be subject to specific approval. Should such a system be contemplated, early consultation with Council will be required to determine its acceptance and any associated conditions. The reticulation of any such water will require consideration of backflow prevention issues, metering and pipe materials and colours.

5.6 Level of Service

5.6.1 Design Life

The asset life of wastewater systems to be vested in Council shall not be less than 100 years. The asset life of components of the systems, which by their nature are shorter than 100 years (e.g. pumps, valves etc), shall indicate the replacement requirement in the application.

5.6.2 Capacity and Future System Expansion

All development shall be reticulated with a piped system adequate to transport the design flow without surcharging. Wastewater reticulation shall be constructed to the upstream boundaries of the development at the applicant's expense and shall be capable of serving the entire subdivision or development together with any undeveloped land beyond, when that land is developed to its ultimate development intensity.

5.6.3 Infiltration Minimisation

The reticulation shall be designed, detailed, constructed and tested to ensure that there is zero pipeline infiltration at commissioning and a low level of infiltration/ex-filtration over the life of the system. Testing shall include all components of the system, including manholes.

The use of sealed maintenance and inspection structures as an alternative to manholes will require specific approval by Council.

5.6.4 Council Design Input

Council shall have the right to specify the diameters and classes of pipes to be used for all reticulation within the subdivision or development, and to specify connection points and reticulation alignment. It will provide on request details of the existing reticulation for design purposes and where necessary, investigate the capacity of the downstream wastewater reticulation and treatment facilities to determine their adequacy, at the applicant's expense.

5.7 Pipe Selection

5.7.1 Pipe Materials and Class

Standard approved pipe materials for gravity sewers are detailed in Table 5.1. Other materials may only be used with the written approval of the waste and drainage manager.

Pressure pipelines (Rising Mains) shall meet the design criteria as laid out in Section 5.11. Only PE or ductile iron may be used for pressure sewer pipelines. For PE pressure pipes, the internal bead formed by welding shall be removed. Where coils/rolls of PE pipe are used for pressure mains, only electrofusion couplings may be used (no internal beads formed).

Blue pipes or black pipes with a blue stripe shall not be used for sewer pipelines.

Table 5.1 Pipe Material and Class for Gravity Reticulation

Material	Standard	Class (min)	Notes
uPVC	AS/NZS 1260	SN 8	*Refer note below
	AS/NZS 1477	PN 9	*Refer note below
mPVC	AS/NZS 4765	As for uPVC	
PE (min gradient 1%)	AS/NZS 4130	SDR 17, SN 16	*Subject to specific approval* *Black outer, white or brown inner lining* *Internal bead formed by welding shall be removed.* *Where coils/rolls of PE pipe is used, only electrofusion couplings may be used. (no internal beads formed).* *Where the pipeline is installed by directional drilling or pipe bursting methods, the pipe class should be SDR11*
Vitrified clay	AS 1741		*Requires specific approval, for use where required for aggressive wastes only*
Ductile Iron	AS 2280	K9	Cement lined, externally coated appropriate to the environment (min 2-coat epoxy and wrapped in Denso tape). Approved for above ground installation
Steel	NZS 4442	4.2mm wall thickness	*Requires specific approval* *Concrete lined, external coated appropriate to the environment (min 2-coat epoxy and wrapped in Denso tape).* *Only approved for above ground installation*
Concrete RRJ	NZS 7649		*Requires specific approval. Only permitted in special circumstances. May require internal lining or other protection.* *Roller compacted concrete pipes may be required to be individually tested*
PP (e.g. Sewerboss twin wall pipe)	AS/NZS 5065	SN 8	*Shall be shown to be capable of withstanding a jetting resistance to 4000 psi (280 bar) without damage.* *Refer note below

**Note* *All pipes laid under a public road having a cover less than 1.2m shall be subject to specific design and approval*

Minimum pipe sizes are given in Table 5.2 below.

Table 5.2 Minimum Pipe Sizes for Gravity Wastewater Reticulation and Property Connections

Pipe	Minimum Size ID *(mm)*
• Connection serving 1 dwelling unit • *Connection to in-fill development, serving up to 3 dwelling units, via an inspection chamber (subject to Council approval)*	DN 100
• Connection serving more than 1 dwelling unit • Connection serving commercial and industrial lots	DN 150
• Reticulation serving residential lots	

5.8 Design Parameters

The design shall provide for domestic wastewater, industrial wastewater, infiltration and direct inflow of stormwater as follows:

Note This is only for reticulated sewers – for onsite systems design flows are to be based on AS/NZS 1547

5.8.1 Residential flows

Table 5.3 shows the minimum inflows to be provided for (depending on the source of the water supply) for various uses related to people based activities. The flows are average daily dry weather flows (ADWF)

Table 5.3 Design Inflows for Residential Type Activities – for reticulated sewers only. For on-site waste water systems refer to AS/NZS 1547 for flows

Source		Wastewater flow allowances (litres/person/day)	
		Tank supply	Reticulated/bore supply
Household		140	200
Hotels/motels	Guests and resident staff	140	200
	Other non-resident	30	40
Community halls	Banqueting	20	30
	Meetings	10	15
Marae	Day only	40	40
	Day/sleep over	140	140
Restaurant/Bar/Café	Dinner	30	30
	Lunch	25	25
	Bar patron	20	20
Schools	Pupils plus staff	30	40
Camping grounds	Fully serviced	100	130
	Recreation areas	50	65
Retirement home	Residents	200	220
	Day staff	40	50
Hospital/rest home		220	250

Where particular activities are not known or being specifically designed for as in Table 5.3, a default flow of 200 litres/person/day shall be used together with the following factors:

- Dry weather peak daily flow = 2.5 x ADWF
- Peak wet weather flow (PWWF) = 5 x ADWF
- Number of people per dwelling unit = 4.0
- Number of dwelling units per gross hectare = 15.

Where a particular activity is known (such as development in a holiday area), figures specific to the activity are to be used.

In practical terms, unless the catchment is likely to exceed 250 dwelling units, and where no industrial or commercial flow, or flow from a pumping station is involved, 150mm diameter pipes laid within the limits of Table 5.6 will be adequate without specific hydraulic design.

Where a catchment is outside of the above limitations, a specific hydraulic design shall be carried out.

5.8.2 Industrial/commercial Flows

- For individual industries, specific assessment shall be carried out of the wastewater flows
- When assessing the ultimate development flows from a wider area, the flow rates in Table 5.4 may be used as a design basis. The sensitivity of the pipe sizes and capacity of reticulation components

shall be determined to ensure sufficient capacity is available in the event of heavier than-expected flows.

Table 5.4 Design dry Weather Wastewater Flow Rates for Industrial/ Commercial flows (includes Business 1-4, Marsden Point Port and Airport Environments)

Minimum Design Flows	Flow Rates *(litres/sec/ha)*
Light water usage	0.4
Medium water usage	0.7
Heavy water usage	1.3

The above flows include both sanitary wastewater and trade wastes, and include peaking factors. Allowance needs to be made for inflow/infiltration in wet weather.

5.8.3 Hydraulic design

The hydraulic design shall be based on either the Colebrook-White formula or the Manning formula. Material coefficients for pipes up to DN 300 are given in Table 5.5. These values take into account joints, slime, debris etc.

Table 5.5 Coefficients for Gravity Lines

Material	Colebrook-White K *(mm)*	Manning
VC	1.5	0.013
PVC	0.6	0.011
PE	0.6	0.011
Cement lining (DI & steel, concrete)	1.5	0.012

5.8.4 Limitation on Pipe Size Reduction

Pipe size shall not be reduced on any downstream section.

5.8.5 Minimum Grades for Self-cleaning

Self-cleaning shall be achieved by providing the minimum grades specified in Table 5.6. In any case, the minimum allowable cleansing velocity is to be 0.75ms^{-1}.

Table 5.6 Minimum Grades for Wastewater Pipes

Pipe Size	Location	Minimum Grade	
Connections and Permanent Ends of Reticulation		**(%)**	**(Ratio)**
DN 100	Property Connection	1.65	1:60
DN 150	Property Connection	1.20	1:83
DN 150, 225 & 300	Permanent upstream ends of reticulation with 10 or less residential lots connected	1.00	1:100
Wastewater Pipes – Reticulation with more than 10 residential lots *(except PE pipelines and pipes installed by trenchless methods)*			
DN 150	Recommended minimum grade	0.67	1:150
	Absolute minimum grade	0.55	1:180
DN 225		0.33	1:300
DN 300		0.25	1:400
PE Pipes and Pipes Installed by Trenchless Methods			
All sizes	To suit installation method, but not less than	1.00	1:60

5.8.6 Maximum Velocity

The preferred maximum velocity for peak wet weather flow is 3.0 m/s. *Where a steep grade that will cause a velocity greater than 3.0 m/s is unavoidable see WSA 02 for precautions and design procedures.*

5.9 Reticulation Layout and Location

5.9.1 Gravity Pipelines

Wherever possible, gravity reticulation is to be located in the road berms but may be located in public reserves and private property. Crossings of roads, railway lines, waterways and underground services shall be at right angles as far as possible.

Where practicable and economic, pipelines should be constructed in straight horizontal and vertical alignment between maintenance structures. *Subject to specific design, close control of installation to maintain grades and alignment, and accurate as-built plans, curved pipelines may be approved. Approval will normally be given only where pipelines follow curved street alignments, or where there will be savings in life-cycle costs.*

In private property and other areas where development or building may occur, pipes shall be located clear of potential building sites and where practicable parallel to boundaries with an offset from the boundary between 1.0m and 1.5m. Pipes shall be sited outside of the zone of influence of the foundations of existing or potential structures, or a minimum of 1.5m either side of the pipe diameter, whichever is the greater. *Where this is not possible, the pipe and structure shall be constructed to details approved by Council including maintenance access, and will normally be subject to an easement.*

No structure shall be erected over any buried public sewer or stormwater system without prior written approval of Council's waste and drainage manager.

Where new structures are proposed adjacent to existing sewers, they shall maintain a clearance of a ***minimum of 1.5m***[22] *from the edge of the pipe to any part of the building (including footings and eaves) for sewer maintenance purposes, unless prior approval from Council's waste and drainage manager is obtained in writing.*

Should the relocation of a Council main be approved as part of Resource Consent or Building Consent application, a comprehensive management plan is to be submitted to the waste and drainage manager for approval ***before*** *any works may begin. This management plan is, among others, to cover the methodology, assess risks and provide contingency plans for the proposed works.*

5.9.2 Maintenance Structures

All manhole and other maintenance structures shall be kept clear of boundaries, and where practicable, outside of carriageways and footpaths.

They shall be located as far as possible:

- Where long term, safe access is available
- Clear of floodways, stormwater detention areas, stormwater secondary flow paths and inter-tidal regions.

5.9.3 Pump Stations

Public pump stations, including associated vehicular access, shall be sited on a separate lot vested in Council. The site for a temporary pumping station may be an easement registered in favour of Council, rather than a separate lot. *Council may permit pump stations to be sited in roads or public reserves, subject to specific approval.*

Pump stations, including associated service vehicle parking areas shall not be located where they will adversely affect pedestrian or vehicular traffic. In particular, valve and pump station lids shall be kept clear of carriageways, footpaths and driveway locations.

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[22] The waste and drainage manager will determine the minimum distance, this distance will be affected by, among others, depth of existing pipe, topography etc

5.9.4 Pressure Pipelines (Rising Mains)

Rising mains should be located in roads, public reserves and access lots. Where rising mains cross private property, including access lots, an easement in favour of Council over the pipeline alignment will be required.

Short rising mains with consistent flow where retention times in the main are low, may discharge to gravity reticulation via a manhole. In all other situations, rising mains should discharge to a downstream pump station or treatment plant, to minimise the potential for odours in gravity reticulation.

5.9.5 Separation from other Services

Minimum clearances to other services shall be in accordance with requirements of relevant utility providers or as presented in Table 5.7, whichever is the greatest.

Alternatives may be used with written agreement of the wastes and drainage manager, and other affected service owners.

All wastewater mains shall be laid at a lower level than water mains to avoid cross contamination.

Table 5.7 Minimum Separation Distances to other Services

Utility (Existing Service)	Minimum Horizontal Clearance (mm) New Main Size ≤ DN 300	Minimum Vertical Clearance (mm) see note 1
Gas mains	300 see note 2	150
Telecommunications conduits & cables	300 see note 2	150
Electricity conduits & cables	500	225
Stormwater drains	300 see note 2	150
Water mains	1000/600 see note 3	500/750 see note 3

Notes

- Vertical clearance applies when wastewater mains cross another utility service, except in the case of water mains when a vertical clearance shall always be maintained, even when the water and wastewater pipes are parallel. The water main should always be located above the wastewater pipe to minimize the possibility of backflow contamination in the event of a main break
- Clearance can be reduced further to 150mm for distances of up to 2m when passing installations such as poles, pits and small structures, providing the structure is not destabilized in the process
- When a wastewater pipe is at the minimum vertical clearance below the water main (500mm), maintain a minimum horizontal clearance of 1000mm. This minimum horizontal clearance can be progressively reduced to 600mm as the vertical clearance is increased to 750mm
- Where a wastewater main crosses other services, it shall cross at an angle as near as possible to 90^{o}
- Clearance shall be measured from the outside of each pipe or duct.

5.9.6 Wastewater Mains near Trees

Refer to Section 1.10.9.

5.9.7 Easements

Easements in favour of Council are required for all public gravity reticulation greater than 150mm diameter and all rising mains located in private property. Easements may also be required for access to maintenance structures.

5.10 Reticulation Components

5.10.1 Connections

A 100mm diameter service connection shall be provided for each allotment able to be serviced. The size of a connection for a commercial/industrial lot shall be designed to suit the intended use. Connections shall be sited clear of obstructions and known developments and be accessible for maintenance. Connection locations and details shall be as per Sheet 36.

Connections shall be positioned at sufficient depth to enable the entire buildable area of the property to be served by a gravity pipeline, allowing for allowable minimum grades and cover provisions. The depth of the connection should not be less than 600mm and generally not exceed 1500mm. *Exemptions or variations will require specific Council approval.*

A connection shall not cross more than one lot boundary. To achieve this, a 150mm (min) branch sewer with a TMS may be used. *This condition may be relaxed at the discretion of Council for minor 'infill' development to take account of the layout of existing reticulation.*

Where an existing or proposed sewer is more than 4.5m deep, connections shall be made to a shallower branch sewer laid from a manhole on the deep sewer.

Connections shall be sealed with removable caps until required. The caps are to be painted red and have 'SS' painted/fixed onto the end cap. Their location shall be accurately measured and shown on as-built plans with dimensions to readily identifiable reference points and with depth to invert from finished ground level or absolute spur invert level. The position is also to be marked with a wooden stake (min 2'x4') painted red with 'SS' painted/fixed onto the stake, and extending from the invert of the connection to 600mm above ground level.

5.10.2 Pipe Bridges and Bridge Crossings

Pipe bridges shall be specifically designed for the particular environment. Piles may be concrete or timber. The developer is responsible for obtaining all building consents and resource consents. Timber piles shall be H6 treated. No cutting, notching or boring after treatment is permitted in areas in contact with soil or water. Cut or bored areas shall be resealed using a suitable preservative treatment.

The underside of the pipe bridge structure is to be a minimum of 300mm above the Q100(+20%) flows. *A lesser standard is acceptable subject to specific approval.*

Pipelines across bridges (normally rising mains) will normally use Ductile Iron or coated concrete lined steel pipes. Where these existing bridges are not above the Q100 flows, the pipe is to be located on the downstream side of the bridge. *Specific written approval is required to attach pipes to bridges.*

5.10.3 Maintenance Structures

5.10.3.1 General

Maintenance structures shall be provided for access and maintenance of the reticulation including water jetting and video inspections. Preference will be given to structures that will minimise the potential for infiltration. Types of maintenance structures are:

- Manhole (MH)
- Maintenance Shaft (MS)
- Terminal Maintenance Shaft (TMS).

Maintenance Structures shall be provided in accordance with the provisions of Table 5.8.

Table 5.8 Maintenance Structure Requirements

Maintenance Structure Locations	Acceptable Option		
	MH	MS	TMS
Intersection of reticulation mains (excludes property connections)	Yes	No	No
Change of pipe grade (level invert)	Yes	With DN 150 pipe only using a vertical bend	No
Change of pipe grade at different invert level	Yes	No	No
Changes in pipe size	Yes	No	No
Changes in horizontal direction (except using curved pipes)	Yes	Use prefabricated units or horizontal bends, max 33° deflection	Yes for DN 150 pipe only
Change of pipe material	Yes	No	No
Upstream ends of reticulation	Yes	Yes	Yes
Location of discharge of a pressure main into a gravity pipe	Yes – must include a vent	No	No

Note
- Manholes are the only option where personnel entry is required
- DN 100 connections may be made to any maintenance structure, or at any point along a main using a proprietary junction
- London Junctions or Rodding Eyes may not be used instead of a maintenance structure at the end of the main

5.10.3.2 Spacing and Marking

Maximum spacing shall be as follows:

The maximum distance between any two consecutive maintenance structures shall be 120m

- At the permanent end of a wastewater main the distance from the end maintenance structure to the nearest downstream MH shall not exceed 240m
- Where a combination of MHs and MSs is used on the same pipe, the maximum spacing between consecutive MHs shall not exceed 400m irrespective of the number of MSs between the two MHs.

The throats of all sewer maintenance structures shall be painted red with a suitable paving paint. The covers may remain unpainted, but, if painted, shall be painted red with a 50mm white strip through the diameter.

5.10.3.3 Manholes (MH)

5.10.3.3.1 Manhole Design

The maximum deflection through a MH for pipe sizes 150 – 300mm DN shall be:

- 120^0 for a standard MH with internal fall along MH channel complying with Table 5.9
- 150^0 with a drop MH.

Channels in the MH base shall have a minimum internal radius (in plan) of 300mm.

The minimum internal fall through a MH joining pipes of the same diameter shall comply with Table 5.9.

Table 5.9 Fall Through Manholes

Deflection Angle at MH	Minimum Internal Fall (mm)
0 - 30	30
>30 - 60	50
>60 - 120	80

Where the internal fall across the base of the MH is not achievable due to a large difference between the invert levels of the incoming and outgoing pipes, an external drop shall be provided unless the diameter of the manhole exceeds 1050mm, then an internal drop may be provided.

Effect of steep grades on manholes

- Where practicable, steep grades > 7% shall be 'graded out' at the design phase.
- *Where this is not possible, the following precautions should be taken:*
  - *The steep grade of an inlet pipe is to be continuous through the MH*
  - *The minimum depth to invert of the MH shall be 1.5m for DN 150 and 225 pipes*
  - *The minimum depth to invert of the MH shall be 2.0m for DN 300 pipes*
  - *Vertical change of direction at the MH not to exceed 45°*
  - *No drop junctions or verticals are to be incorporated in the MH*
  - *Inside radius of channel in the MH is to be greater than 6 times the pipe diameter*
  - *Benching is to be taken to 150mm above the top of the inlet pipe.*

For further guidance on handling steep grades, see **WSA 02.**

5.10.3.3.2 Manhole Construction

Manholes shall be constructed in accordance with Sheet 37 and have precast bases where practicable. In addition:

- Covers shall be ductile iron (complying with AS 3996:2006), watertight, with a clear opening of not less than 600mm diameter. Stepped rungs **shall not** be installed. Standing areas with a minimum working space of 750mm clear of obstructions at the base shall be provided
- Drop manholes with an ID of 1050 or smaller shall have an **external drop**
- The height of the bottom riser shall be the maximum available to suit the manhole depth and there should be no riser joints in manholes less than 2.5m deep. Openings created in manholes for pipeline entry shall be drilled to the minimum size practicable
- Where pipe sizes change at the manhole, the soffit of the inlet pipe should be at least as high as the soffit of the outlet pipe
- Where manholes are constructed in soft or unsuitable ground, the area under the manhole shall be undercut and backfilled with suitable hardfill to the satisfaction of Council in order to provide an adequate foundation for the manhole base. Any excavation to a depth greater than necessary shall be made good with weak mix concrete
- The lids of manholes and maintenance structures shall be flush with paved surfaces and raised at least 50mm above the surrounding ground surface. In areas subject to flooding lids shall be 300mm above the 1 in 100 year flood level. Where this is not practicable, watertight, bolt-down covers shall be used and all manhole components tied together
- In all trafficked areas, WDC approved heavy duty lids and frames shall be used.

5.10.3.4 Maintenance Shafts (MS)

Maintenance shafts suitable for pipeline rodding and jetting shall comply with AS/NZS 4999, and be constructed in accordance with Sheet 38 & Sheet 39.

Maintenance shafts shall only be used on DN 150 and DN 225 pipes where personnel access below ground will not be required, and subject to the limitations in Table 5.8.

The maximum depth of a MS shall not exceed the allowable depth of the pipeline, the manufacturer's stated allowable depth limit, and in any event shall not exceed 3.6m with the deviation of the riser shaft from vertical not exceeding 300mm measured at the surface.

At changes in grade, the MS should be located on the pipe with flatter gradient. Directional and gradient changes may be made as follows:

- Using close-coupled bends immediately adjacent to the MS. The maximum horizontal deviation shall be 330
- Using specially manufactured MS units to suit design requirements. The maximum horizontal deviation shall be 900.

Maintenance shafts shall not be located in carriageways or heavily trafficked areas. They shall have sealed, removable access covers, with a separate cast iron manhole cover and frame set in a concrete surround at ground level.

5.10.3.5 Terminal Maintenance Shafts (TMS)

Terminal Maintenance Shafts suitable for pipeline rodding may be used as terminating structures on DN 150 and DN 225 pipes where personnel access below ground will not be required, and subject to the limitations in Table 5.8.

The maximum depth and vertical deviation of a TMS shall be as for a MS.

Up to two property connections may discharge directly to the riser shaft. Where a property connection is directly upstream of the terminal maintenance structure, a MS may be used instead of a TMS, with a reducer immediately upstream of the MS to accept the DN 100 connection.

Terminal Maintenance Shafts shall not be located in carriageways or heavily trafficked areas. Maintenance shafts shall have sealed, removable access covers, with a separate cast iron manhole cover and frame set in a concrete surround at ground level.

5.10.4 Pipelines

5.10.4.1 Construction

Pipelines shall be constructed in accordance with the manufacturer's specifications, the relevant NZ Standard and Sheet 31 & Sheet 32.

5.10.4.2 Cover

All reticulation located in areas not subject to traffic loading shall have a minimum of 600mm of cover between the top of the pipe and finished ground level. Protection will be required where this minimum cannot be achieved. (Normally by unreinforced concrete slab and/or higher pipe class). Refer to Sheet 32.

Under roadways the minimum depth shall be 1200mm. Where this cannot be achieved, specific design and approval will be required. (Normally by reinforced concrete slab protection and/or higher pipe class). Refer to Sheet 32.

Where reticulation lines are located in the front yard of lots, the invert level shall be deep enough so as not to interfere with any future driveway construction.

5.10.4.3 Marking

A detection tape shall be laid directly above all rising mains and above new sewers. The tape shall have 'sewerage' written on it in white and be located at a depth of between 200 and 250mm above the pipe crest. Where the pipe is not laid in a straight line between manholes the tape shall contain sufficient metal to be detectable from the surface by a standard metal detector.

5.10.4.4 Building Over/Near Pipelines

No building shall be built over a public rising main or closer than 1.5m from the centre of any rising main. Subject to WDC approval, a building developer may divert the public rising main (including any valves and fittings) in accordance with Council standards, and at their own expense. Refer to 5.9.1 for clearances.

Council prefers not to have public gravity wastewater mains under buildings because of the potential difficulties with maintenance, replacement and repairs. In some situations it is permitted to construct buildings over the wastewater mains, however, this will be considered on a case-by-case basis. The approval of Infrastructure & Services' waste and drainage manager must be in writing for each case.

Approval may be given provided:

- There is no reasonable alternative for the property owner
- The existing sewer is not greater than 225mm diameter
- The length under the building is minimised
- That the sewer main has a CCTV inspection before and after any work is done
- Council is advised and approves each individual proposal, in writing, prior to obtaining a building consent
- One of the following solutions is used:
  - The length of pipe under the building is replaced with an equivalent diameter PVC main laid inside a carrier pipe of the next appropriate larger size or as specified to facilitate future renewal or upsizing. Manholes are to be placed on each side of the building, with enough clear space to be accessible by a truck-mounted water blaster. No lateral connections permitted along the length of pipe between these manholes. The foundations of any building must be designed and constructed so that no additional load is placed on the sewer. All backfill must be thoroughly compacted and certified by an appropriately competent person, or
  - There is still access for repairs or replacement without disturbing the building, e.g. high open foundations on poles or cantilevered with a minimum of 2.0m vertical clearance from ground level and 1.5m horizontal clearance from the centreline of the sewer main.

Where the pipeline is covered by an easement, the property owner shall:

- Where there is no subdivision planned, request a waiver letter from the WDC seeking permission to encroach upon the easement
- Where a subdivision is planned, adjust the easement document to record the encroachment and pay associated costs.

5.10.5 Pump Stations

5.10.5.1 General Requirements

[23]*Where practicable, pumping stations shall be avoided in favour of gravity systems.*

Pump stations serving less than six household equivalents will not generally be taken over by Council.

Sewage Pumping Stations and rising mains shall be designed by an IQP *and be subject to specific approval.*

Except where site conditions or specific design requirements preclude their use, Modular Package Pump Stations constructed of GRP or PE, complying with these Standards shall be used.

Flygt 'TOPS' pump station bases shall be used in pump stations.

Electrical and control systems shall strictly comply with the 'WDC Wastewater Pumping Stations Electrical Engineering Systems' Standard. Refer Procedures Manual.

Pump Stations shall be provided with all-weather vehicle access and provision for parking and manoeuvring of maintenance vehicles.

Pump Stations shall meet the following general requirements. Refer to Sheet 42.

1 The pump station shall consist of an underground pump well, a separate valve chamber that can drain into the pump chamber, emergency storage, a water supply and electrical control cabinet.

The station shall be designed for all imposed loads, including floatation.

2 Pump stations are to be designed and constructed to ensure that no stormwater enters, either through the wall or the roof and lid. The lids and the electrical control cabinet are to be a minimum of 100mm above the general ground level, with the surrounding ground graded away from the station. In areas subject to flooding the top surface shall be 300mm above the 1 in 100 year flood level.

[23] It will be necessary to prove that a pumpstation is the most practicable option

3 Pump and Valve chambers shall have sealed, lockable lids that can be readily opened by one person. Lid details shall comply with 'Manukau City Council' details (Refer Manukau Engineering Quality Standards) unless otherwise approved. Openings shall be a minimum of 600x600. Pump chamber lids shall be provided with stainless steel safety grids with a grid size of 100 x 100mm. Where a pump station is within 50m of the boundary of a residential dwelling or accommodation unit, lids shall be insulated.

4 All lifting chains, guide rails, fittings, connections, nuts, bolts etc in the pump station shall be 316 stainless steel.

5 Pump chamber pipework shall be Ductile Iron with a two-coat epoxy coating. For small diameter pipework where DI is not available, stainless steel pipework shall be used.

6 Concrete in pump stations shall be suitable for sewer pump stations, and shall be lined with an epoxy or similar lining. The concrete strength, admixtures and lining specification shall be supplied.

7 Pumps shall be 'Flygt' 3 phase submersible type design, located on guide rails. Specific approval by the waste and drainage manager will be required for alternative pump types.

8 The preferred impellor type where the rising main size is 90mm PE or greater is an Open Self cleaning channel impeller i.e. Flygt 'N' Pump or equivalent. Shrouded single or multi-channel impellers e.g. Flygt 'C' pumps, shall be capable of passing a 75mm diameter solid. For a rising main size of less than 90mm PE pipe, grinder cutter pumps e.g. Flygt 'M' pumps shall be used.

9 There shall be a minimum of two pumps (duty and standby) in all pump stations, with automatic changeover of the pumps if the duty pump blocks or breaks down.

Council reserves the right to require the standardisation of pumps with a power rating exceeding 35kW.

10 Access to pump stations shall be suitable for vehicles with a lifting gantry to install or remove pumps and equipment. Where this is not possible, the wet well shall be provided with a suitable lifting arm or gantry for servicing the pumps.

11 Float cables and lifting chains shall have hook plates.

12 Non-return and isolating valves for each pump shall be located in the valve chamber. The isolating valve shall be a resilient seated gate valve complying with AS/NZS 2638.2 (anticlockwise closing) installed downstream of the non-return valve. Non-return valves shall be ball-valves with full-bore opening or swing check valves with external handles.

13 The capacity of the wet-well between start and stop levels shall be such as to limit pump starts to no more than fifteen per hour.

14 Pump chambers shall have a single inlet pipe, from an upstream 'satellite' manhole.

15 Pump Stations shall have emergency storage in case of mechanical or electrical failure or blockage of the pumps or rising main. The storage must be located at such a level as to prevent overflow from any manholes, gully traps, pump station lids or any other outlet from the system. Storage tanks shall be provided with a lockable, hinged, water tight lid with a minimum opening of 600x600, and able to be opened by one person by hand.

16 Variable speed drive is required for pumps over 5kW.

17 All pump stations shall be reviewed for the potential for odours, and the effects of odours on adjacent dwellings. Odour mitigation shall be provided appropriate to the risk. If required wet wells shall be fan-forced ventilated to provide a minimum of four air changes per hour, with a vent stack.

18 The electrical supply shall be underground.

19 Lighting shall be provided to illuminate the control cabinet. A 10A single phase power socket is to be provided in the cabinet with RCD protection.

20 Suitable low maintenance landscaping may be required on the pump station site around the wet well area.

21 Fencing may be required where the pumpstation is exposed to traffic etc.

22 Pump stations and storage chambers shall be provided with an automatic cleaning system.

23 An Operating and Maintenance Manual shall be provided that covers all aspects of the design and operation of the stations including:

- Design calculations, including pipe and fitting head-loss assumptions and pump curves
- A plan of the design catchment
- As Built drawings including circuit diagrams and switch locations
- Pump details, pump duty information, float switch levels
- Contingency measures for emergency overflows
- Operation and maintenance procedures
- Other relevant data and information.

24 Pump stations shall be tested and commissioned in the presence of a Council representative strictly in accordance with the 'WDC Wastewater Pumping Stations Electrical Engineering Systems' Standard.

5.10.5.2 Compliance with the NRC Regional Water and Soil Plan for Northland

Pump stations shall comply with the requirements for a controlled activity in the Rules for Sewage Discharges in the Regional Water and Soil Plan, and any necessary resource consents for its installation and use shall first be obtained by the developer. R*efer (http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Regional-plans/Regional-Water-and-Soil-Plan/*

Note that where particular constraints exist – e.g. a sensitive receiving environment such as a bathing area or marine farm, the consent conditions may require a greater storage capacity.

5.10.5.3 Hydraulic Design

Pump stations shall provide pumping velocities in the rising main in the range 0.75 to 2.5m per second.

Pump stations and rising mains shall be designed to provide for the peak wet weather flow from the ultimate catchment development, without utilising the required emergency storage capacity.

Material coefficients shall use the values given in Section 5.8.3 (old pipes). The design shall be checked for coefficients appropriate for new pipes.

Where possible, the rising main should be sized, and the pump controlled, such that the volume of the rising main is pumped at least once each day, preferably each pump cycle. If there is insufficient inflow into the pump station to achieve this, then measures shall be incorporated into the design to control odours at the outlet of the rising main. These may include:

1 Regular flushing of the main with clean water, to clear the full volume of the main. Appropriate controls will be necessary to ensure that water is only introduced when the sewage inflow is inadequate.

2 Design of the outlet chamber to minimise effects from the discharge. This may include separation from dwellings, ventilation, and/or the use of odour control devices.

Where the pump station discharges into a common pressurised main that is used by other pump stations, variation in head conditions caused by the operation of the other stations shall be taken into account. Supporting information shall be provided to demonstrate satisfactory operation of the network for all pumping scenarios.

5.10.5.4 Flow Monitoring

Pump stations with an ultimate design flow of 10 l/sec or greater shall be provided with Mag-Flow meters on the rising main, connected to Council's telemetry system. The system shall record instantaneous flow and totalised flows.

5.10.5.5 Electrical and Control

The developer shall arrange for the power supply to a pump station. The power supply for public pump stations shall be transferred to Council following successful testing and commissioning of the pump station.

The electrical switch box shall be located in a safe position as close as practicable to the pump chamber. It shall be fabricated Aluminium or Stainless Steel, or Aluminium Montrose type. In accordance with WDC

Planning requirements, the maximum height of the electrical/control box shall be 1.5m, with coverage of not more than 3.0m^2. Vents etc should be incorporated in telemetry masts.

The electrical and control system shall strictly comply with the 'WDC Wastewater Pumping Stations Electrical Engineering Systems' Standard. Refer Procedures Manual.

5.10.5.6 Telemetry

All pump stations and treatment facilities shall be connected to Council's telemetry system. Council shall confirm whether satisfactory radio network communications are available at the site. If not, an alternative communication system (e.g. telephone land-line with autodialer, or cell phone) shall be provided.

5.10.5.7 Water Supply

Fresh water shall be supplied from a standard 25mm. ID connection at a minimum static pressure of 300kPa. A standard hose connection is to be fitted.

If the water supply is taken from Council's drinking water network, backflow prevention shall be provided in accordance with the NZ Building Code Approved Documents for a high-hazard installation (RPZD) and Sheet 44.

The backflow preventer is to be positioned next to the electrical control cabinet and the water connection outlet shall terminate in the pumpchamber.

The developer shall apply to Council's Water Services for the connection (including the meter and backflow preventer), pay all costs and provide as-built details including all requirements of Section 6.14.

5.10.5.8 Private Pump Stations

Private pump stations are permitted where it is not practical or economic to provide a gravity connection to a public sewer. Normally, proprietary pump stations will be used, with grinder pumps. Pump stations serving less than the equivalent of six residential lots will generally not be taken over by Council.

5.10.5.9 Odour Control

Odour control systems shall be provided at all pump stations, manholes, vents and air valves that are likely to cause odour problems.

Unless otherwise approved, pump stations wet wells shall be force-ventilated to provide at least 4 air changes per hour. The vent discharge shall be a minimum of 3.6m high. The standard system uses a column with an inline fan with explosion proof motor.

5.11 Rising Main Design

Rising mains shall be designed to fully account for the characteristics of the system in question including pump characteristics, surge, flow regimes and fatigue. The design shall minimise the time wastewater spends in a rising main, to avoid septicity and odour problems, and maintain self-cleansing velocities. Both these objectives can be achieved by minimising the length and diameter of the pipe. The pipeline will also need to withstand normal operating pressures, including short duration surge pressures from normal cycling and special events (such as power failure).

The general requirements of Part 6 – Water Supply and Reticulation regarding water supply pressure mains shall also apply to wastewater rising mains.

5.11.1 Maximum Operating Pressure

Design the components of a pressure pipeline to withstand a maximum operating pressure that is greater than all of the following:

- 400kPa (note that this is not the minimum pipeline pressure class)
- 1.5 x (static head + friction head)
- Pump shut off head
- Positive or negative surge pressures.

Ensure that external loads on the pipeline are included in all load cases, especially when pressure testing large diameter pipes. Provide a factor of safety of at least 2 against buckling under negative or external pressures. All fittings shall have a pressure rating equal to or greater than the pressure rating of the associated pipeline, or PN12, whichever is the greater.

For plastic pipes, fatigue effects may require a higher nominal pressure rating, which must be the greatest of the following:

- The maximum calculated operating pressure
- The minimum pressure rating in the table below
- The equivalent operating pressure based on a surge & fatigue analysis.

To calculate the equivalent operating pressure (P_{eo}) use the methodology described in Appendix A – Designing for Surge and Fatigue.

5.11.2 Pressure Surges

Pressure surges can arise from a number of different operations, e.g. the sudden starting or stopping of a pump or closure of a non-return valve. Surges can be critical in pumping systems, especially in large diameter mains and high static head systems.

The designer shall submit the design for rising mains, including levels and layout, with the engineering drawings. Submit a detailed hydraulic surge and fatigue analysis report, including all assumptions and all calculations.

When choosing the pipe class for rising mains, ensure that the effect of surge and fatigue from the projected number of cycles over a 100-year lifecycle is taken into account. For details on surge and fatigue see Appendix A.

Consider soft closing, non-return valves for installations in high head situations as well as variable speed controls.

Allow for issues such as operation and maintenance and consider failure of any mechanical surge protection measures and protection from damage during these situations.

5.11.3 Minimum Pipe Sizes

Pressure pipelines maintained by Council must have a minimum nominal diameter of 50mm for treated effluent and 100mm for raw or macerated sewage. Pipe diameters shall be limited to the following standard sizes: 50mm, 100mm, 150mm, 200mm, and 300mm nominal bore (internal diameter). Any larger pipe sizes shall be subject to specific approval.

5.11.4 Velocity

Pressure mains shall have a preferred velocity of 0.8-1.2ms^{-1}, with an absolute minimum velocity of 0.75ms^{1}, and a maximum velocity of 2.5ms^{-1}. The velocity shall be confirmed in the Design Report.

5.11.5 Gradients

The profile of rising mains shall be designed to minimise the number of high and low points, which require the installation of air and sluice valves respectively. However, the final profile will be a balance between the minimum depth of main and number of valves.

Where possible, rising mains shall be graded continually upwards from the pumping station to termination. Design to keep the pipe full and prevent sudden discharges of foul air at pump start.

Avoid creating summits since they trap air, reducing capacity, and allow the build up of sulphides, which convert to droplets of sulphuric acid and may cause pipe corrosion.

If a summit is unavoidable, provide automatic air release valves. Design the air valves specifically for wastewater operation. Mount air valves vertically above the pipeline to which the air valve is connected. Fit an isolating gate valve between the air valve and the vented pipeline and mount the valves in a concrete valve chamber. The chamber must be large enough to allow easy access for maintenance staff to operate the isolating valves or remove all valves from the chamber.

At low points, provide drain valves and chambers such that the contents of the entire main can flow into the chamber and the contents be collected by a sucker truck. Alternatively, it may be possible to drain directly to a nearby sewer (subject to specific Council approval).

5.11.6 Cover over Pipes

The minimum cover over the top of the pipe to finished ground level shall be:

- 600mm in berm, footpath or behind carriageway or kerb & channel
- 750mm under carriageways or areas where Council proposes carriageways.

Where the minimum required cover is not available, specific design is required.

5.11.7 Joints

Joints between fittings and pipes on rising mains shall be made using the following methods (where appropriate):

- Socket & spigot (except for PE pipes) only where the socket is designed specifically for the spigot outside dimension)
- Gibault (except for PE pipes/tension systems) where the gibault is either of the multi-fit type or specifically designed for the outside diameters of the items to be joined. Gibaults may not be used where the step difference exceeds 10mm
- Flange-socket or flange-gibault adaptors (except for PE pipes)
- *Butt-fusion welding (PE pipes DN160 and larger only) by a specialist contractor only*
- Mechanical couplers (full restraint type – PE pipes only)
- Welding (concrete lined steel only)
- Threaded connections to BSP (generally only for pressure tappings or similar).

Electrofusion and solvent-cement joints are not permitted without specific approval by Council.

5.11.8 Flanges

All valves and fittings shall be flanged to either AS2129 Table D/E or AS4087 Class 16. It is the developer's responsibility to ensure that all mating flanges are compatible. Note that this also applies to items such as flow meters and check valves, and that alternative flange standards (such as ANSI or DIN) will not be accepted. If higher pressure ratings are required, these will be subject to specific Council approval.

5.11.9 Sluice Valves

Attach sluice valves to flanged fittings rather than plain-ended fittings. The force required to open or shut a manually operated valve, using a standard valve key, with pressure on one side of the valve only, must not exceed 15 kg on the extremity of the key.

Specify geared operation, motorised valves or a valve bypass arrangement, to reduce pressure across the valve, if the allowable force cannot be met.

5.11.10 Scour Valves

Scours are required on the low point of all rising mains. Generally, valves should be the same size as the main, but no greater than 150mm in size. Install scour valves at the lowest point between isolating valves, and discharge to an approved chamber.

5.11.11 Air Valves

Air can accumulate at high points when it is drawn into the system.

It is preferred to have no high points in wastewater rising mains wherever possible, and thus little or no requirement for air valves. If this cannot be avoided, mains should be laid evenly to grade between peaks to ensure all possible locations of potential air pockets are well known.

Investigate the need for air valves at all high points, particularly those more than 2m higher than the lower end of the section of main, or if the main has a steep downward slope on the downstream side.

Air may also come out of solution in the wastewater due to a reduction in pressure, such as when wastewater is pumped uphill. Air valves may be required to allow continuous air removal at these locations.

Air valves shall be sized for peak flow rates and located as required for management of water hammer.

5.12 Contractor Qualifications

Reference should be made to Section 1.8.4 regarding Registered and Licensed contractors. Only contractors, Registered with WDC shall install or work on wastewater assets that will become part of the public system. The scope of work that a Registered contractor is permitted to perform shall be in terms of their Approval.

5.13 Inspection and Testing

5.13.1 Gravity Reticulation

All sewer pipes, including connections, shall be pre-tested (pressure) by the contractor during construction. On substantial completion of all other associated engineering work there shall be a final pressure test carried out. Where the reticulation is to be vested in Council, this test is to be carried out in the presence of the SEEO or his delegated representative. If the reticulation is to remain private, this test is to be carried out in the presence of an IQP who shall certify the test and forward the results to the SEEO.

In addition the whole of the reticulation that is to be vested in Council shall be inspected by CCTV. The timing of the CCTV inspection shall be determined by the Waste and Drainage Manger. Inspection records shall comply with **NZWWA 'New Zealand Pipe Inspection Manua**l' and shall be submitted to Council for review.

The pipeline pressure test procedure for PVC pipes is as follows:

a The pipeline under test shall be effectively plugged and air introduced by suitable means until a pressure of 300mm of water is indicated by a suitable manometer (such as a U-tube) connected to the system

b After the air has attained a uniform temperature, as indicated by the pressure becoming steady, the source of air supply shall be physically disconnected and the pressure drop shall not exceed 20mm after a period of five minutes

c The wetting of pipelines before test, where applicable and practicable, is recommended.

In wet conditions, should the low pressure air test pass and there be signs of infiltration, this shall not exceed 600ml/hr/25mm pipe diameter/1000m length of pipe.

Should any leaks be discovered, these shall be made good and another test undertaken.

For PE pipes the type of test will depend on the length and diameter of pipe to be tested. The contractor shall confirm with Council which test is required in accordance with the manufacturer's requirements.

New sewer reticulation must be completely and permanently isolated from Council's 'live' sewer reticulation until such time as all the foregoing tests are passed, and written authority from Council to connect to the live sewer is obtained. Connection shall only be carried out by a Registered contractor, and the connection is to be inspected by the SEEO (or delegated representative) before the connection is backfilled.

5.13.2 Rising Mains

Rising mains shall be tested using the test prescribed for water pipes, with the test pressure being 1.5 times the maximum working pressure or the maximum pressure rating of the pipe, whichever is less. See Section 6.18.

5.13.3 Manholes

All manholes shall be watertight and tested by plugging and filling the manhole with water (including time allowed for absorption). During the test, the level of water in the manhole shall not drop more than 5mm in 10 minutes.

5.13.4 CCTV Inspection

Where required, CCTV inspection of pipelines is to be undertaken by a professional operator using a pan and tilt camera, in accordance with the technical specification of the ***New Zealand Pipe Inspection Manual***. The operator shall pan around every joint and check every lateral connection and defect.

The video footage in VHS or DVD format, and the accompanying CCTV log sheets for each sewer length (*as per the template in the* ***NZ Pipe Inspection Manual***), showing the features and condition of all inspected manhole lengths, shall be provided to Council. Video footage supplied without log sheets will not be accepted.

5.14 Completion

5.14.1 As-Built Drawings and Schedule of Asset Information

A set of drawings and a schedule of asset information shall be submitted as per Section 1.11.1 of this standard. These shall clearly and accurately show the as-built locations and details of all wastewater infrastructure provided as part of the work, including any modifications made to the existing system. As-built drawings may be checked on site for accuracy on completion of the subdivision or development. The drawings shall identify assets that have been removed or decommissioned.

5.14.2 Operation and Maintenance Manuals

Operation and maintenance manuals shall follow the format described in the WDC document 'Waste and Drainage – Operation and Maintenance Manuals- Standard Format'. (TRIM 10/960).

Copies are available from the waste and drainage manager upon request. (It is advisable to regularly check for updates of this manual).

5.15 Defects Liability

A Defects/Maintenance Bond will be required for the works in terms of Section 1.11.1.8 of this standard.

5.16 Drawings

Refer to Section 9 for drawings.

Section 6 Water Supply and Reticulation

6.1 General Requirements

This section covers the requirements for connection to Council's water reticulation system. In general, a connection to Council system shall be provided to all lots within Living and Business Environments unless Council confirms in writing that a connection is unwarranted, unavailable or unsuitable.

Connections in other environments will be subject to the availability of a water supply. Council may however, require that a water supply be provided to a development, regardless of the Environment, if in the opinion of the water services manager the connection would be a logical extension of an existing supply.

6.2 Referenced Documents

Details of referenced documents will be found in Section 1.1.

6.3 Submission of Application

6.3.1 Supporting Information and Calculations

The application shall include supporting information and calculations for the following:

- An analysis of the water demand for consumption and fire fighting. Fire fighting flows for industrial land shall be obtained from NZS PAS 4509:2008, based on type and size of industry
- Establish that the existing water supply reticulation is adequate to serve the proposed development
- Where the proposal would use more than 10% of the capacity of the existing water source and/or treatment facilities, it must be established that the existing water source and/or treatment facilities are adequate to serve the proposed development
- The existing and proposed water reticulation is adequate to serve the proposed development
- The proposal has no more than minor effects on the environment and other water users
- Potential water hammer effects are considered and appropriate measures included
- Required pressures and flows can be met from all hydrants and service connections.

For industrial uses, the type and size of industry used to establish water use and the Water Supply Classification for fire fighting supply shall be identified. This information will be put on the relevant property files.

Refer to Appendix A for details of Designing for Surge and Fatigue.

6.3.2 Design Drawings and Specifications

Design drawings complying with the requirements of Section 1.7 & Section 1.8 shall be provided for approval.

6.3.3 Approval of Design

The drawings and calculations will be will be reviewed by the water services manager or his/her delegated representative. Following any necessary amendments, the drawings will be stamped and signed by the water services manager or his/her delegated representative.

Only drawings stamped and signed by the water services manager or authorised representative shall be deemed approved drawings. Unless specifically stated otherwise, the approval of drawings does not supersede the requirements or obligations of these standards.

6.3.4 Disconnections

Council approval is required for disconnections from the water supply network to ensure that the disconnection is carried out appropriately and the old connection blanked off in a way that prevents any possibility of contaminated water entering the network and/or leaks occurring from the redundant

fittings and pipework. **Such work is required to be undertaken by a Council licensed contractor**.

The necessary form (Application for Public Utility Service Connection/Disconnection) can be obtained from Council's website or from Council offices. This needs to be filled in and approved **before** any work may be undertaken.

A Council inspecting officer shall inspect all disconnections before back-filling takes place.

6.4 Level of Service

6.4.1 Design Life

The asset life of water supply systems to be vested in Council shall not be less than 100 years. The asset life of components of the systems which by their nature are shorter than 100 years, (e.g. pumps, valves etc) shall be noted in the application.

6.4.2 Design Tolerance

The location and levels of water mains and fittings shall be specified in metres to one decimal place for horizontal alignment and two decimal places for vertical alignment.

6.4.3 Service Requirements

Where a water supply is available, or where a supply and reticulation system is to be provided as part of a subdivision or development, it shall be adequate for fire fighting purposes and for estimated domestic, commercial and industrial consumption. The design shall conform to the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice SNZ PAS 4509:2008.

For large industrial sites, the requirements of SNZ PAS 4509:2008 may not be able to be met from existing Water Services infrastructure. In such cases, the developer may need to provide a supplementary supply. The developer shall establish requirements and obtain approval for such a supply from the Fire Service, and provide evidence of this approval with the consent application.

6.4.4 Capacity and Future System Expansion

Developments shall comply with all relevant structure plan requirements and pipe sizes set by the water services manager in order to provide an integrated approach to development.

The effect on existing and potential future development in an area shall be taken into account when determining whether there is capacity to serve a subdivision. The water services manager has the discretion to make a final decision on water availability.

The water supply system shall be constructed to a connection point approved by Council. Where development beyond the property boundaries is possible, the reticulation shall be extended to the boundaries of the approved development at the developer's expense. The supply shall be capable of serving the entire subdivision or development and any undeveloped land beyond, when that land is developed to the ultimate development intensity. Where applicable, the developer shall provide a blanked off connection to serve future development.

6.4.5 Private Water Supply Systems

At Council's discretion, small isolated subdivisions or developments outside existing reticulated areas may be served by private water supply systems. These systems will only be approved as potable water supplies if they are able to comply with the New Zealand Drinking Water Standards 2005 (NZDWS), (see http://www.moh.govt.nz/moh.nsf/0/12F2D7FFADC900A4CC256FAF0007E8A0) and operation and monitoring systems are put in place to ensure compliance with the NZDWS.

The applicant is advised to consult with the water services manager, New Zealand Fire Service, Northland Health and the Northland Regional Council regarding any necessary approvals.

6.4.6 Council Design Input

Council shall have the right to specify the diameters and classes of pipes to be used for all reticulation within the subdivision or development, and to specify connection points and reticulation alignment. It will provide on request details of the working pressure or pressures at the point or points of connection to the existing reticulation for design purposes, and where available, the capacity of existing water supply facilities.

Where further information is required for the design, the developer shall consult with the water services manager regarding payment of costs associated with such investigations. Such investigations may involve data logging at a hydrant over peak periods.

6.5 Scope of Design

The scope of design shall include:

- Pipe sizes, material, and layout of the reticulation
- Hydraulic design
- Service connection locations
- Types and locations of valves, hydrants etc
- Thrust blocks and anchors
- Preparation of plans and specifications. Except for small (up to 4 lots) infill developments, water reticulation shall be on a separate plan from other services, presented in a clear and legible manner.

The hydraulic design of reticulation, outside the scope of simplified methods in this standard, shall be carried out by an IQP - Refer Section 1.5 - experienced in the design of water reticulation systems, who shall provide a Producer Statement (Design) – Form EES-PS1 identifying the design standards used, and certifying that the design complies with these standards.

Where the existing reticulation or a proposed extension cannot comply with the minimum flow or operating pressure requirements, the applicant may be required to provide and install elevated storage and/or booster pumping systems to the approval of Council. Where pressures are likely to exceed recommended levels Council may require that a pressure-reducing device be installed to ensure acceptable working pressures.

6.6 Pipe Selection

6.6.1 Sizing of Mains

The development shall be reticulated with a piped water system adequate to supply all domestic, commercial and industrial consumption for the economic life of the development, and for fire fighting purposes for that class of development.

The water demands for commercial and industrial areas, and for irrigation shall be analysed and specifically allowed for in the design.

For design purposes a static pressure of either 40m or the actual static pressure in the existing main, whichever is the lesser, shall be used.

6.6.2 Standard Pipe Sizes

Pipelines shall be standardized as DN 50, 100, 150, 200, 250, 300, 375, 450, 525 and 575mm nominal internal diameter only. Where required, the water services manager shall specify the diameter of larger pipes.

Reference to the diameters of pipes shall specify whether the inside (ID) or outside (OD) diameters are being referred to.

6.6.3 Minimum Pipe Sizes

Minimum pipe sizes shall be as set out in Table 6.1.

Table 6.1 Minimum Water Supply Pipe Sizes

Reticulation Hierarchy	Minimum ID (mm)
Industrial Area Main (Business 4)	150
Industrial Rider mains	100
Principal Main (other environments)	100
Residential Rider main	50
Residential Service Connection	20

6.6.4 Pipe Class

Standard approved pipe classes are given in Table 6.2. Other classes shall not be used, except with the written approval of the water services manager.

Table 6.2 Pipe Classes

Class of Pipe and Fittings	Maximum Working Pressure	
	Head (m)	kPa
Class 12 (PN12.5)	120	1200
Class 16 (PN16)	160	1600

6.6.5 Pipe Materials

The following pipe materials are approved for use:

- PE80/PE100 to AS/NZS 4130: 2009
- Ductile Iron to AS/NZS 2280: 2004
- Steel to NZS 4442: 1988.

All water mains shall be constructed using PE80 *unless otherwise approved by the water services manager.*

PE pipes shall conform to the following requirements:

- Rider mains and service connections of 50mm ID and under shall use solid blue PE 80 pipe
- PE 80 water mains with a nominal ID of 100mm or greater shall be black internally with a blue outer skin. The blue outer skin shall be co-extruded with the internal material, and have a thickness equivalent to 10% of the pipe wall thickness unless otherwise approved by the water services manager. The developer shall provide evidence of the blue outer skin thickness
- PE 100 may be permitted for pipe sizes greater than 200mm ID. It shall also be blue skinned to a thickness of 10% of the pipe wall thickness unless otherwise approved by the water services manager.

Steel or ductile iron will normally only be approved where the use of PE is not appropriate, e.g. in above ground applications. The use of steel or ductile iron is subject to specific approval and tight quality control of fabrication and construction. Steel and ductile iron pipes shall have a spun concrete lining not less than 6mm thick, and an external coating of extruded blue HDPE. Care shall be taken not to damage the coating during handling and installation. No welding is permitted after the protective coatings have been installed on the pipes.

Notes

- PVC is not an acceptable pipe material
- Blue, or black with blue stripe pipes or ducts **may not be used for any application other than potable water supply** within the WDC area.

6.6.6 Pipe Bridges and Bridge Crossings

Pipe bridges and pipes attached to bridges shall be specifically designed by an IQP for the particular environment.

Pipe bridges shall be designed for a life of 100 years. Normally piles will be concrete. *Approval for timber piles will be at the discretion of the water services manager.* Where approved, timber piles shall be H6 treated. No cutting, notching or boring after treatment is permitted in areas in contact with soil or water. Cut or bored areas shall be resealed using a suitable preservative treatment.

Where pipelines are fixed to vehicle bridges, they shall be installed on the downstream face of the bridge and shall be located above the 1 in 100 year flood level. Such pipes will normally be ductile iron or coated steel and shall be provided with an appropriate Denso wrapping. The wrapping specification will depend on a number of factors and will be determined by the water services manager.

The developer shall be responsible for obtaining all necessary building consents and resource consents.

6.7 Flow Capacity

6.7.1 Domestic Demand

The design shall provide for annual, seasonal and peak demand. A minimum domestic demand of 300 litres/ head/day shall be designed for.

6.7.2 Peak Flows

Peak flows shall be calculated as follows:

Peak Day Demand (over a 12 month period) = Average Day Demand x PF, and where:

a For populations below 2,000 PF = 2

b For populations above 2,000 consult WDC Water Services Division for a PF

Peak Hourly Demand = Average Hourly Demand (on peak day) x PF (over a 24 hour period) and where:

a For populations below 2,000 PF = 5

b For populations above 2,000 consult WDC Water Services Division for a PF.

6.7.3 Minimum Flows

The minimum flow for an individual 20mm ID residential connection shall be 25 litres per minute at the meter location.

6.7.4 Pressure Fluctuations

The design shall ensure that large pressure fluctuations due to variations in usage are avoided. Unless dispensation is given by the water services manager, head losses in existing and new mains at peak flow shall be limited to:

- DN less than or equal to 150mm - 5m per 1000m of pipeline
- DN greater than or equal to 200mm - 3m per 1000m of pipeline.

6.7.5 Flow Velocities

Pipe lines shall normally be designed for flow velocities within the range of 0.5 – 2.0m/s.

6.7.6 Operating Pressures

The minimum service water pressure, in other than fire fighting conditions, shall be 250kPa at ground level within the building envelope of each lot.

Where this pressure cannot be met at the house site, a booster pumping system may be required. Where the fire fighting capabilities are sufficient, private pumps, serving up to 5 lots, jointly maintained by the owners may be provided. The requirement for joint maintenance responsibilities shall be registered on the affected property titles.

The maximum static water pressure shall be 600kPa except where approved otherwise by the water services manager. In cases where the static pressure exceeds 600kPa, a pressure reducing value may be required.

The preferred operating pressure in the reticulation system is 400kPa. Council may require that a PRV be installed to reduce the pressure in any development to 400kPa or below.

6.7.7 Fire Risk Classification

A normal single residential property will have a classification W3. Other buildings with a sprinkler system fitted to an approved standard may also have a classification of W3.

All other buildings are classified according to **Table 1, SNZ PAS 4509:2008** (pages 12 & 13).

6.7.8 Fire Fighting Water Requirements

The minimum standard of water supply for fire fighting shall be as set out in Table 6.3. The required flow is to be obtained from the maximum number of fire hydrants as scheduled within an accessible distance of 270m of any fire risk. The accessible distance is via a route from the fire hydrant to the property, following roads, driveways or rights of way. For maximum hydrant spacing refer to Section 6.11.3.

The water supply requirements for fire protection systems must be considered in addition to fire fighting water supplies. All fire fighting water requirements should be considered additional to the expected daily demand.

The minimum fire fighting residual running water pressure shall be 100kPa at any fire hydrant. For industrial subdivisions, the water supply classification to which the system has been designed shall be stated. Following approval, this classification shall be registered against all property titles as a consent notice, with a rider that the design does not necessarily account for future consumption from other large users.

Where a development is of such a nature that the required flows cannot be achieved, even with the installation of pumps, without serious negative effects on the system, the developer shall install sprinklers or provide an alternative means of fire fighting to the satisfaction of the NZ Fire Service.

For non-reticulated fire fighting water requirements refer to **SNZ PAS 4509:2008**.

Table 6.3 Simplified Method for Determining Fire Fighting Supplies

Water Supply Classification	Water flow within an accessible distance of 135m (l/s)	Additional water flow required within an accessible distance of 270m (l/s)	Water storage time (min)	Water storage volume (m^3)	Maximum number of fire hydrants to provide flow
W1	12.5		15	11	1
W2	12.5		30	23	1
W3	12.5	12.5	30	45	2
W4	25.0	25.0	60	180	3
W5	50.0	50.0	90	540	4
W6	75.0	75.0	120	1080	6
W7	100.0	100.0	180	2160	8
W8	As calculated				

Refer to **Table 1 SNZ/PAS 4509:2008** for Water Supply Classification.

6.7.9 Dedicated Sprinkler and Fire Fighting Water Mains

Approval for dedicated sprinkler and fire fighting water mains will be given at the discretion of the water services manager. When designing sprinkler systems it must first be established that the minimum operating pressure of 250kPa is available.

All dedicated watermains for sprinkler systems must have a Council approved testable double check (or RPZ) detector backflow prevention device together with isolation valves for testing, located within, but as close as possible to the property boundary. The owner shall be responsible for the ongoing maintenance of the sprinkler system.

All dedicated fire fighting watermains with hydrants connected to them shall have an RPZ backflow prevention device together with isolation valves for testing located within, but as close as possible to the property boundary together with an electromagnetic water meter, or NZ Insurance Council approved meter. The backflow prevention device must be mounted above ground level and protected by a cage to avoid damage. The hydrants shall not be used for any purpose other than fire fighting.

6.7.10 Domestic

Domestic sprinkler systems should be designed to run at a pressure of no more than 25m (250kPa) head which is the target minimum operating pressure at customer meters. If the sprinkler system is a dead end system and not linked to the internal plumbing then a backflow preventer is required. All sprinkler systems are required to be metered.

6.7.11 Empirical Guide for Sizing of Mains

The empirical guides provided in NZS 4404 may be used to confirm the adequacy of pipe size calculations. Note that pipeline sizes shall allow for future growth, both infill and extension.

6.8 Layout of Reticulation

6.8.1 General

Mains and ridermains shall follow public roads where possible. A principal main fitted with fire hydrants shall be laid on one side of all through streets and on one side of every cul-de-sac. Principal mains shall be laid on both sides of State Highways. Council may also require principal mains on both sides of arterial and dual carriageway streets, and industrial subdivisions.

A ridermain shall be laid along the road frontage of all lots not fronted by a principal main including the circular head of cul-de-sacs. Rider mains shall be designed as ring mains, with a connection to a principal main at both ends as shown in Sheet 45.

Mains and ridermains will not normally be permitted to be laid across private property or down rights of way. However where appropriate and with the prior approval of the water services manager, a privateway or private road may be reticulated with a Council maintained reticulation system.

The criteria for granting such approval will be based on the number and length of connections required, or to provide fire cover to meet the requirements of the Fire Fighting Code of Practice.

Reference should be made to Section 6.11.3 for fire cover criteria. In such cases, an easement in favour of Council over the privateway or private road will be required and the main may be required to be laid in a duct. Details on points of supply are given in the WDC Water Supply By-law.

Where a private access will contain a Council maintained watermain, the minimum clearances required by Table 6.4.shall be provided, to allow maintenance access clear of other services.

Note This may require the legal width of the access to be greater than the minimum specified in Section 3.4.11 of this standard

Valves and surface boxes should be located in berms, clear of carriageways where possible.

6.8.2 Separation from other Services

All watermains shall be laid at a higher level than sewers to avoid cross contamination. Where practicable, water mains should have a spacing of at least 500mm or three times their diameter, whichever is the greater, between their outside edge and any other service, or as shown on Sheet29 where applicable as agreed with the water services manager.

Table 6.4 Minimum Separation Distances to Other Services

Utility (Existing Service)	Minimum Horizontal Clearance (mm) New Main Size		Minimum Vertical Clearance [note 1] (mm)
	DN ≤ 200	DN > 200	
Water mains > DN 375	600	600	500
Water mains of ≤ DN 375	300 [note 2]	600	150
Gas mains	300 [note 2]	600	150
Telecommunications conduits & cables	300 [note 2]	600	150
Electricity conduits & cables	500	1000	225
Stormwater mains	300 [note 2]	600	150 [note 3]
Wastewater pipes	1000/600 [note 4]	1000/600 [note 4]	500/750 [note 3]
Kerbs	150	600 [note 5]	150 (where possible)

Notes

1. Vertical clearance applies when water mains cross another utility service, except in the case of wastewater when a vertical clearance shall always be maintained, even when the main and wastewater pipe are parallel. The main should always be located above the wastewater pipe to minimize the possibility of backflow contamination in the event of a main break.
2. Clearance can be reduced further to 150mm for distances of up to 2m when passing installations such as pole, pits and small structures, providing the structure is not destabilized in the process.
3. Water mains should always cross over wastewater and stormwater drains.
4. When a wastewater pipe is at the minimum vertical clearance below the water main (500mm), maintain a minimum horizontal clearance of 1000mm. This minimum horizontal clearance can be progressively reduced to 600mm as the vertical clearance is increased to 750mm.
5. Clearance from the kerb and channel shall be measured from the nearest edge of the concrete. For water mains DN 375 and less, clearances can be progressively reduced until the minimum of 150mm is reached for mains of DN 200 and less.
6. Where a main crosses other services, it shall cross at an angle as near as possible to 90°.
7. Clearance shall be measured from the outside of each pipe or duct.

6.8.3 Separation from Structures

Pipes adjacent to existing buildings and structures shall be located clear of the 'zone of influence' of the building foundations. If this is not possible, a specific design shall be undertaken to cover the following:

- Protection of the pipeline
- Long term maintenance access for the pipeline
- Protection of the existing building or structure.

Sufficient clearance for laying and access for maintenance is also required. Table 6.5 may be used as a guide for minimum clearances for mains laid in public streets.

Table 6.5 Clearances from Structures

Pipe Diameter (DN)	Minimum Clearance to wall or building (mm)
<100	600
100 to 150	1000
200 to 300	1500
375	2000

Note These clearances should be increased for mains in private property (even with easements) as access is often more difficult and damage risk greater

6.8.4 Water Mains near Trees and Existing Reticulation

Reference shall be made to Section 7 of this standard for requirements regarding the location of trees close to water reticulation. Where any pipes or cables are laid alongside existing water reticulation then a gap of at least 1m is to be maintained where practicable so as not to disturb the existing trench.

6.8.5 Pipe Cover

All reticulation located in areas not subject to traffic loading shall have a minimum of 600mm of cover between the top of the pipe and finished ground level. Under carriageways this distance shall be increased to 900mm. In all other circumstances not meeting the minimum requirements stated then special protection of the pipe is to be provided, subject to Council approval. Details of pipe protection are shown on Sheet 32. Council may specify a greater depth if required. Where excavations for entrances to developments encounter existing water supply lines, those lines shall be relocated to comply with the depth requirements of this document.

The sections of pipe adjacent to a carriageway crossing shall be gradually deepened either side of the carriageway, to allow the required cover to be achieved under the carriageway without provision of vertical bends. Air valves may be required on the resulting crests in the pipe.

All pipes with less than 500mm cover under carriageways shall be laid in a larger protective duct. Service connections shall not have less than 600mm cover under footpaths and berms terminating at a meter manifold as per Sheet 46.

6.8.6 Work on Existing Water Mains

Where work is required on or over existing water mains, the developer may be required to lower, move or protect the main to ensure cover and separation distances are met. Only Licensed contractors will be permitted to work on existing live water mains. The developer shall pay the full cost of this work.

6.8.7 Thrust and Anchor Blocks

On all mains exceeding 50mm diameter where no end restraint is available, concrete anchor blocks shall be provided at all valves, bends, tees, reducers and dead ends. Generally anchor/thrust blocks are not required on PE mains, except where a connection is made to an unrestrained pipe or fitting.

The size of the bearing surfaces shall be specifically designed. Sheet 50 gives guidelines for shape and size for a soil with a bearing pressure of 100kPa and a design pressure of 1500kPa. These are to be confirmed by an IQP at the time of design.

The concrete shall be ordinary grade concrete supplied from a graded plant, and have a minimum compressive strength of 17.5Mpa at 28 days, unless otherwise approved by the water services manager. All anchor blocks must be poured using adequate formwork, with the bearing surface poured against an undisturbed soil surface. A protective wrapping shall be provided between the pipe and concrete. Reference should be made to drawings **WS-003, 004 & 005** in **NZS 4404:2004** for typical thrust block locations when used with pipes without end restraint.

If reticulation is being extended from the end of an existing pipe with a blank cap and thrust block, the thrust block shall be removed and the new pipe continued in the same alignment as the original pipe.

6.9 Valves and Fittings

6.9.1 General

All valves and fittings shall be in accordance with WDC's Approved Materials List, the main points of which are summarised below.

Pipe fittings above ground, or in non-aggressive ground conditions, shall be ductile iron to **AS 1831:2007**, powder coated with Rilsan 11 or approved equivalent to **AS/NZS 4158:2003** Where applicable they shall comply with **AS/NZS 2280:2004**.

Flanges shall be to **AS 4087:2004** PN16. Fittings laid adjacent to other fittings shall have flanged joints. Where fittings are located in on-line positions, flexible (gibault) joints may be permitted subject to approval of Council (Note that gibault joints may not be used on PE pipe).

All bolts and nuts shall have washers and be 316 stainless (see specifications for mains), plus protective wrapping. This shall be 'Denso' primer paste covered with 'Denso' tape wrap, followed by 'Denso' MP/HD tape or 'Greensleeve' over wrap, or approved alternatives complying with the same standards.

6.9.2 Sluice Valves and Peet Valves

6.9.2.1 Type

Sluice valves used on principal mains shall be ductile iron Resilient Seated valves to **AS 2638.2:2003** and fully nylon coated to **AS/NZS 4158:2006**. They shall be bi-directional, anti-clockwise closing, have raised flange faces to **AS 4087:2004** and shall be provided with cast iron spindle caps. The depth to the top of the spindle shall be where practicable between 75mm and 250mm and the spindle shall be truly vertical. Where depth to the spindle exceeds 500mm a spindle extension shall be used to bring the top of the spindle between 75mm and 250mm of the surface.

Peet Valves used on rider mains shall be ductile iron Resilient Seated valves to **AS 2638.2:2006** and fully nylon coated to **AS/NZS 4158:2003**. They shall be clockwise closing with a ductile iron handwheel. They shall have a threaded end connections to which a 63mm PE compression coupling can be screwed.

Butterfly valves shall only be used with the specific approval of the water services manager. They shall be anti-clockwise closing, and fitted with travel stops, and shall be fitted with a special type of spindle or cap dolly, which differs from those for sluice valves.

6.9.2.2 Location

The location of valves shall be so arranged that a shutdown of any section of water main will affect as small an area as practicable, generally in accordance with Table 6.7. Valves located at intersections shall be fixed on all legs of a tee or cross installation and shall where possible be located in berm areas free of the carriageway. A peet valve is required on rider mains at the connection to the principal main. Where there are more than 15 connections on the rider main, an isolating peet valve should be provided in the middle of the rider main.

The valve layout on the principal and rider mains should enable the rider main to be flushed through the nearest hydrant. Where this is not possible a scour valve may be required. Air release valves may also be required at high points.

Where the rider main is a continuation from the end of the principle main in the same direction, the end of the principle main shall be provided with a peet valve immediately after the reducer.

The maximum spacing of valves shall be in accordance with Table 6.7.

Table 6.7 Valve Spacing

Water Main Size DN	No of Property Service Connections (nominal)	Maximum Spacing of Valves (m)
≤ 150	40	300*
200 - 300	100	750
≥ 375	150	1000
* In rural areas, the maximum spacing may be increased to 500m		

6.9.3 Air Release and Scour Valves

Air Release and Scour Valves shall be located as required by the water services manager. Air release valves shall be ductile iron and of the combination type as per the Approved Materials List.

They shall be installed in a fully draining box as per Sheet 51. A connection to a suitable drainage system shall be provided for all scour points where practicable.

6.9.4 Pressure Reducing Valves

Pressure reducing valves may be required by the water services manager where water pressure is greater than 600kPa, and a significant number of properties are affected or potentially affected (typically over a distance of 500m, and affecting more than 40 lots).

Pressure Reducing Valves shall be installed as per Sheet 52. Pressure gauges are required upstream and downstream of the valve. Only Cla-Val valves shall be used as specified by Water Services.

The valve shall be installed in an approved chamber with isolating valves to allow removal.

6.10 Valve Marking

The position of all valves on water mains shall be indicated by a white plastic or reinforced concrete indicator post to Council's approval bearing the inscribed letters 'SV', 'AV', 'BV' or 'PV' in black to indicate either sluice valves, air valves, butterfly valves or peet valves, respectively. A concrete mowing strip 150mm wide shall surround the post when it is set in the grassed berm. The asset ID of the valve shall also be stencilled on the top of the marker post in adhesive black lettering along with the size of the main on which it is situated and the distance of the post from the main. The asset ID shall be allocated by the water services manager.

There shall also be a rectangle painted on the kerb in a direct line between the valve and the marker post. This rectangle shall be white unless the valve is to be normally closed in which case it shall be red. In all cases the colour of the valve box lid shall match the rectangle.

6.11 Hydrants

6.11.1 General

All mains of 100mm diameter or greater shall be provided with hydrants.

6.11.2 Type

Hydrants shall be ductile iron, clockwise closing, screw down type generally in accordance with **NZS/BS 750:1984**, and shall be tall pattern. Hydrants and hydrant risers are to be fully coated inside and out with blue nylon to **AS/NZS 4158:2003**. The hydrant stopper shall be resilient seated and encapsulated in nitrile or EPDM rubber. Spindles shall be non rising stainless steel or DR brass, stem seals shall be nitrile rubber 'O' rings (gland packing is not acceptable). Hydrant tees shall be ductile iron and coated in Rilsan 11 or approved alternative complying with **AS/NZS 4158:2003.** The sealing cup washer shall be of nitrite rubber and the gland seal shall be either braided PTFE yarn or a minimum of two captive 'O' sealing rings. Hydrants shall not be self-draining.

6.11.3 Position

Hydrants shall generally be fixed opposite the common boundaries of lots and spaced at intervals not exceeding 135m within residential areas and 90m within commercial and industrial areas. For

developments requiring pipelines greater than or equal to 100mm ID on both sides of the road, hydrants shall be fitted on the larger pipe as above, and on the smaller pipe at intervals not exceeding 270m. The terminal hydrant shall be within 135m of the furthermost portion of any building site along a route that is fully accessible[24]. In cul-de sacs or other terminal streets the last hydrant shall be as per Sheet 45 and not be more than 65m from the end of the street. Where a private way is more than 65m long a hydrant shall be provided at the street end of the private way or on the other side of the street immediately opposite the entrance. Council may require a 100mm diameter principal main with hydrant to be constructed within a private way or private road to ensure fire coverage. In this instance an adequate turning and parking area for fire appliances in the vicinity of the hydrant shall be provided and the access designed to take heavy vehicles.

Where an isolated risk is identified such as a school or large industrial complex, a private fire main may be constructed onto that lot. No other reticulation shall be taken off this line. Meter and backflow requirements shall be as specified in Section 6.7.9.

Hydrants must be readily accessible[1] for fire appliances and should generally be positioned near street and private way intersections and at least 6m from any building. Hydrant risers shall be used where necessary to ensure that the top of the spindle is not less than 75mm nor greater than 250mm below finished surface level. Hydrants are required at all dead ends, high points for the purpose of air release, and low points to enable mains flushing if a normal washout cannot be fitted. Refer also to Air Release and Scour Valves Section 6.9.3.

6.11.4 Marking

The location marking of fire hydrants shall be to **NZS 4501:1972**. Markings in carriageways and footpaths shall use yellow Thermoplastic Hydrant Markers, and blue 'Cats-Eye' markers shall be located on the hydrant side of the road centreline. Yellow plastic or reinforced concrete marker posts to Council's approval shall be fixed 225mm from the street boundary at the closest point to and facing the hydrant, with the top of the post 600mm above finished ground level. A concrete mowing strip 150mm wide shall surround the post when it is set in the grassed berm. The hydrant asset ID (top number), correct main size in millimetres (middle number) and the distance between marker and hydrant in metres (bottom number) shall be attached to the post using black adhesive lettering near the top of the post. The hydrant asset ID shall be allocated by the water services manager.

6.12 Surface Boxes

All valves and hydrants shall be accessible via surface boxes, details of which are shown on Sheet 49 & Sheet 45. All boxes shall be cast iron or ductile iron and be directly above the valve or hydrant. The longer side of the boxes shall run parallel to the water main. The box shall be supported on concrete risers sized to provide unobstructed access to the valve or hydrant. In the case of hydrants, this shall include easy access for standpipes and installation of data logging equipment. Care shall be taken to ensure loading from traffic is not transmitted via the box and surrounds to the pipe or fittings. Where a valve is particularly deep, a length 200mm diameter PN9 PVC pipe shall be used to direct the valve key to the spindle. This does not remove the requirement for concrete surrounds. All surface boxes shall be heavy duty. Hydrant boxes in road carriageways shall be manufactured to **NZS/BS 750**. Hydrant boxes in arterial roads and State Highways shall be Motorway Grade.

All surface boxes shall be correctly coloured using thermoplastic in carriageways and footpaths, and paint in berms.

6.13 Bulk Water Meters

The water services manager may require the provision of a bulk water meter at the connection point of the reticulation. This will normally only be required where there are more than 20 industrial connections, 40 commercial or 150 residential connections. The meter shall be a full bore magnetic flow meter in accordance with the Water Services Approved Materials List complete with data logger.

[24] The definition of accessible is a route from the fire hydrant to the building or building site following roads, driveways or right of ways.

6.14 Service Connections

6.14.1 General

A service connection shall be provided for each single lot or residential unit with individual street frontage. The connection shall be perpendicular to the main or ridermain and terminate 100mm from the boundary with a Water Services approved manifold (Acuflo) including diaphragm isolation valve and dual check valve and blue meter box with base. The manifold shall be blanked off with a brass plug and 5mm hole drilled in the cap of the manifold. Refer to Sheet 46.

For private ways, a single connection, with size determined as for a rider main, is to be provided within the legal road not exceeding 500mm from the road boundary. A peet valve is to be installed at the junction to the main. At the road boundary a multiple meter box shall be provided in accordance with Sheet 46. Separate connections shall then be provided to each lot from the box. The lot number of each connection shall be clearly marked within the box. Where lots are situated up a private way or similar, connections shall be split either side where practicable to avoid passing under the roadway and shall terminate within each lot.

Where a Council maintained water main is provided along a private access or road, connections may be provided from this main to each property. Backflow prevention shall be provided at all metered connections in accordance with Section 6.14.4.

6.14.2 Meters

Meters are not to be installed during subdivision or development but are to be applied for separately for each lot at the appropriate time using a Public Utility Service Connection Form.

The only exceptions to this are for water supplies for public assets that will be maintained by Council in future (e.g. a sewer pumping station or irrigation system for a reserve). In these instances an application shall be made to Water Services for the connection, including written confirmation from the relevant Council Division that will be paying for the water. The correct utility as-built form shall still be submitted to the Water Services Division as per the specification for service connections. However, the meters and backflow preventers shall be installed at the time of connection. Note the developer shall apply for these connections, and pay all costs, including any Development Contributions for the connections.

For connection sizes up to 20mm diameter, meters shall be Class C manifold type meters. For connections larger than 20mm diameter, the advice of the water services manager shall be sought as to the type of meter and backflow preventer.

6.14.3 Connection to Water Main

Service connection to a principal main or rider main shall be with an electro-fusion tapping saddle. Tapping saddles on PE80/PE100 pipes shall be with ball valves or self-tapping ferrules at the point of connection, installed strictly in accordance with the manufacturer's instructions. Connection between the tapping saddle and the service connection shall be made using an approved compression fitting.

Note As an alternative LG2 gun metal tapping bands may be used but only with the prior approval of the water services manager.

All materials and fittings must be approved by the water services manager and installed strictly in accordance with the manufacturer's recommendations.

The tapping saddle for each service connection shall be sited at the central point of the front boundary or house site, and clear of any driveways or access ways. The position shall be marked on the kerb with a 125mm square of blue paint; in addition a notch 12mm wide and 12mm deep shall be cut in the top of the kerb before painting.

Service connections laid across roads or driveways shall be laid in a larger duct.

Service connections shall be PE80 PN12 pipe of 20mm internal diameter unless otherwise approved by the water services manager.

All fittings used shall be mechanical and comply with **WIS 4/2401** and are to be as per the Water Services Approved Materials List.

6.14.4 Backflow Prevention

All connections shall be provided with a dual check valve Backflow Preventer, as a minimum. These shall be installed in the manifold. Where the hazard requires a greater level of protection, they shall be installed appropriate to the level of contamination risk.

For sewer pumping stations a reduced pressure zone backflow preventer shall be installed, above ground, in a protective cage. See Sheet 44.

All backflow preventers must be installed between isolating valves and be fully testable.

More details of where backflow preventers are required can be found in the **WDC Backflow Prevention and Cross Connection Control Policy** and the **WDC Water Supply By-law**.

6.14.5 Existing Connections

Where a connection (metered or otherwise) exists to a property that is being subdivided or re-developed, the as-built plans shall clearly provide the details of the connection as it relates to the subdivided property including meter details.

6.15 Pump Stations and Reservoirs

A pump station may need to be provided where an increase in pressure is required. Where possible the pump station should be linked to an appropriate sized reservoir. Where no reservoir site is available a pressure sustaining system may be used.

Pump Stations shall be designed in accordance with Sheet 53 and other WDC Water Supply Pump Station documents.

The design of these components must be approved by the water services manager or authorised representative. Pumps shall be capable of maintaining the pressures and flows required, with reserve capacity. A standby pump must be provided.

Reservoirs shall be of concrete construction. They shall be sized to provide:

- A fire fighting supply as specified in the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice **SNZ PAS 4509:2008**, with a minimum of one hour's supply
- Sufficient storage for two days supply at peak daily demand, plus additional future demand as assessed by Council.

A Council approved telemetry link will need to be provided for control of pumps and reservoir levels. The reservoir and pump station site shall be vested in Council. An access and water supply easement will also be required where the supply line runs over private property.

6.16 Contractor Qualifications

Reference should be made to Section 1.10.4 regarding registered and licensed contractors. Only contractors registered with WDC shall install or work on water assets that will become part of the public system. The scope of work that a registered contractor is permitted to perform shall be in terms of their approval.

Registered contractors shall comply with the following:

- Be familiar with this standard and relevant related documents, and be suitably experienced and qualified to work with the relevant pipe materials
- Have staff that have successfully completed an approved welding course recognised by the NZWWA to undertake jointing procedures on polyethylene pipes (PE80/PE100) of greater than 63mm OD
- Have staff that have completed the relevant unit standards in water reticulation as required by WDC Specification for Registered and Licensed contractors for Water Supply
- Be a WDC Certified Health and Safety approved contractor
- They must strictly follow the provisions of WDC's Hygiene Code

- They must hold insurance as required by Section 1.4.1.6.

Connections to live water pipelines shall only be undertaken by licensed contractors to WDC's Water Services Division, who have been approved to work on live reticulation.

For work on live water mains, licensed contractors must have passed the National Certificate in Water Reticulation (or relevant sections) and be in possession of their Blue Card at all times.

Contractors who produce workmanship of a substandard quality or fail to comply with these standards will have their approved status revoked.

6.17 Pipeline Construction

6.17.1 Jointing

Pipe laying and jointing shall be as recommended by the manufacturer, and as required by the applicable standard for the type and class of pipe.

Joints in PE pipes of greater than 50mm ID shall be welded joints unless the water services manager approves the use of mechanical fittings.

100mm ID pipes (125mm OD), may be supplied in coils, and joined using electrofusion couplers. Where pipe is supplied in 6m or 12m lengths, and the pipeline length is greater than 50m, joints shall be butt welded.

Only pipes of the same Melt Flow Index shall be welded together. Pipes from different suppliers or different batches shall not be welded.

Welding (butt or electrofusion) of PE pipes shall be undertaken by a suitably qualified contractor using calibrated and data logged welding machines. Only persons who have successfully completed a NZWWA approved welding course and are registered to weld polyethylene pipe shall be allowed to do so. Prior to commencing work, the following shall be provided:

- Copy of current calibration certificate (not more than 12 months old)
- Registration number of welder, and current certification (not more than 24 months old).

All welding of PE pipe must be data logged. Welding must take place in a covered environment to avoid contamination of weld faces and prepared pipe.

For all electrofusion welds, a mechanical scraper with winding mechanism shall be used to ensure even finishing. Hand scraping of pipe ends is not acceptable.

Electrofusion welds shall be undertaken using clamps where practicable and the equipment correctly calibrated.

For welded pipelines, one or more welded joints shall be removed for tensile testing. The test sample(s) shall be sent to an approved laboratory for testing at the contractor's expense. If a test weld fails, two additional welds shall be tested. If one of the additional welds also fails the pipe must be removed and condemned and a new line laid.

The jointing of flanged fittings to PE pipe shall be with stub flanges and backing rings. Backing rings shall be mild steel and plastic coated with Rilsan 11 or approved alternative, and be to the **AS/NZS 4158:2003** standard. The thickness of the backing rings shall be as shown in Table 6.8.

Table 6.8 Thickness of Backing Rings on PE Water Pipe Joints

Pipe Outside Diameter (mm)	Backing Ring Thickness (mm)
125	16
180	16
250	16
315	20

For pipes greater than 180mm OD, slim flanges with reinforced faces shall be used. Gaskets must be used for all flanged connections. All bolted flanges shall be tightened in accordance with the manufacturer's specification using a torque wrench.

During transportation and on site storage temporary capping of all pipes as per Whangarei District Council's Hygiene Code is required. The pipes shall be inspected externally immediately prior to laying to check for damage in accordance with the manufacturers specifications. An internal inspection should also be carried out and adequate protection against the ingress of debris shall be made as laying proceeds. Temporary caps shall be placed over all open ends during construction.

6.17.2 Water Main Installation

Pipe bedding and backfill requirements are detailed on Sheet 31.

All pipes shall be laid so that the identification code is uppermost where practical, and shall be evenly supported along their length. All mains and rider mains installed by trenching shall be thoroughly bedded and protected by a well hand-compacted granular material. The particle size range of this material shall be as shown on Sheet 31 and shall meet the requirements of the compaction test given in Appendix B of **NZS 7643:1979** regardless of pipe material. The bedding material shall be placed in layers of less than 100mm and shall surround the pipe by at least 100mm in all directions.

Reinstatement of trenches in existing carriageways shall comply with the requirements of the WDC Working within Road Reserves Policy and Specification

6.17.3 Detection Tape

A metallic detection tape and tracer cable shall be laid directly above all new non-metallic water mains including rider mains.

Detection tape shall have 'water' written on it in blue, be located at a depth of between 200 and 250mm below the finished surface level and contain sufficient metal to be detectable from the surface by a standard metal detector.

Tracer cable shall also be attached to all principal mains and rider mains. This wire shall take the form of a continuous 2.5mm^2 multi strand (polythene sleeved) cable, strapped to the pipe wall by means of a minimum of two complete wraps of heavy duty adhesive tape, at a maximum of 3.0m intervals. The tracer cable shall be connected to all surface boxes, and electrically tested for continuity by a Registered Electrician following installation and backfilling. Records of the electrical continuity test shall be provided by the contractor.

6.17.4 Special Measures in Aggressive Ground Conditions

Where aggressive soil conditions are likely to be encountered, only approved water services materials are to be used. For metal components, the approved materials are Grade 316 stainless steel complying with **AS/NZS 4673:2001**, Ductile Iron coated to **NZS 4158:2003,** or aluminium-bronze.

Additionally, all metal shall have a molybond coating corrosion protected with 'Denso' primer paste covered with 'Denso' tape wrap' followed by 'Denso' MP/HD tape or 'Greensleeve' over wrap, or approved alternative complying with the same standards.

The water services manager shall be the sole judge as to what constitutes 'aggressive' ground conditions.

6.18 Disinfection and Testing

6.18.1 Pressure Testing

On completion of the pipe laying and jointing, sufficient backfill materials shall be placed over the pipes to prevent movement during pressure testing, leaving joints, fittings and anchor blocks visible. No connections of a permanent nature between existing mains and the new work will be allowed at this stage. PE 80 rider mains shall not to be connected to the mains before testing, but shall be tested separately. Service connections shall be included within the test.

To complete the preliminary test the new reticulation system shall be swabbed and any air eliminated using a temporary supply. All valves on the new main shall be fully opened and all hydrants, stop taps and valves on the consumer end of the service pipes shall be shut. Water for tests may be obtained from the existing system provided prior water services division approval is obtained and a metered standpipe with a check valve is used. Standpipes are available from the water services division.

A visual inspection of the line including joints and fittings shall be made and any apparent flaws and leaks shall be remedied. The pipe shall be left full overnight before pressure testing.

Pressure tests shall be carried out using an approved pressure pump at a steady rate without shock loading. Pressure gauges used shall be accurate and read to a minimum of 10kPa intervals.

Note Gauges shall be calibrated on an annual basis, with test certificates available for all equipment on request

The contractor shall give the water services manager at least 24 hours notice before carrying out testing. The test shall be carried out in the presence of a Council representative and a data logger shall be used to verify the results.

The test pressure shall be 1.25 x the rated pressure of the pipe (1500kPa for PN 12 and 2000kPa for PN 16). Test sections shall generally not exceed 500m in length. The specified test pressure is the pressure to be applied at the lowest point in the section.

If the pressure gauge is not located at the lowest point a correction shall be made for the difference in levels. Pressure testing against valves will not be permitted.

For PE 80 or PE 100 pipe the type of test will depend on the length and diameter of pipe to be tested. The 'small diameter' pipeline test shall be limited to 50mm ID pipes and to 100mm ID pipes where the length to be tested does not exceed 300m.

The contractor shall supply a graph or data logger printout of the pressure test and show calculations n_1 and n_2 where applicable.

Note *New test procedures are proposed in DZ 4404/V1.0 (Appendix B 3). Council reserves the right to implement and/or require the use of these procedures at the discretion of the water services manager.*

The applicant, its representatives and contractors are reminded of their obligations under the Resource Management Act in terms of the discharge of testing water into natural water courses. It will only be acceptable to discharge the water into a Council-managed stormwater system if it is of a quality that would comply with the requirements of the relevant catchment drainage plan or the rules in the NRC Water and Soil Plan. Testing water shall not be discharged into a Council-managed sewerage system.

6.18.2 Disinfection

After backfilling and before being put into service, all pipes, valves, house connections and other fittings shall be disinfected. All disinfection testing will be at the developer's cost.

Disinfection testing shall be carried out by persons who have successfully completed **NZQA Unit Standard 19209 - Water Reticulation.** Demonstrate knowledge of water reticulation system cleaning and disinfection.

The main shall firstly be swabbed with a suitable swab if not already done prior to pressure testing. The main shall then be drained and slowly filled with potable water to which sufficient free chlorine is added to produce a concentration of 50 parts per million (ppm) in the main. It is recommended this be done via a water tanker of known volume.

The point of water application shall be at the beginning of the section of main to be sterilised. The main shall be left full of the chlorinated water for 24 hours, during which time all valves, hydrants and other fittings on the section shall be operated.

The residual chloride concentration must not be less than 20 ppm after 24 hours.

The main shall then be flushed out until the chlorine concentration of the issuing water is between 2 & 0.2 ppm.

If the chlorination is found to be unsatisfactory, the contractor shall repeat the procedure until the water is of acceptable quality.

The testing of the chlorine concentration is to be carried out on site by WDC's Wastewater laboratory or other approved laboratory. It is the contractor's responsibility to organise the laboratory representative to be on site. At least 24 hours notice is required for the initial chlorine application.

The representative shall return 24 hours later for the second residual chlorine test and will stay on site while the line is flushed until the chlorine concentration is between 2 & 0.2 ppm.

The laboratory will then issue Council with a written report confirming the tests.

Chlorine may be added to the pipe in one of the following ways:

a Chloride of lime solution

b Calcium hypochlorite solution

c Sodium hypochlorite solution

d HTH dry chlorine granules dissolved in water before put into the main.

Note The chlorine solution must not be discharged into the stormwater system

Following approval by Council of the tests and provided all other aspects of the pipework are satisfactory, Form EES-W1 will be completed by the Senior Environmental Engineering Officer (or his delegated representative).

Upon completion of Form EES-W1 the applicant shall keep the new reticulation continuously charged with water under pressure and obtain Council approval to connect to the existing reticulation. This is requested by notifying Water Services in writing and providing a copy of Form EES-W1, the test results and a sketch of the connection detail. The Licensed contractor who will undertake the work must be identified and Council file and property identification numbers shown. The connection shall only be made by the (Council approved) contractor shown in the application. Upon connection the new reticulation is to be flushed to the satisfaction of Council, and left operational.

If the main to be connected is deemed by the water services manager to be critical, then only the WDC Reticulation Maintenance contractor may undertake the connection.

All costs associated with connection to the existing system shall be met by the developer.

6.18.3 Hydrant Flow Test

Following completion of the pipe test and connection to the main, the developer shall be required to provide certification from the fire service or other approved independent certifier, of the static pressure, the maximum flow and the residual pressure at maximum flow for each hydrant.

6.19 Completion

6.19.1 As-Built Drawings and Schedule of Asset Information

A set of as-built drawings and a schedule of asset information shall be submitted as per Section 1.11.1 of this standard. These shall clearly and accurately show the as built locations and details of all water infrastructure provided as part of the work, including any modifications made to the existing system. Weld data logging information for all welds shall be submitted with As-Built drawings.

Additional information required for all hydrants, valves and meter box locations is as follows:

i Position - from LH, RH and front boundary of adjacent lot

ii Location - xyz co-ordinates

iii Item - hydrant, sluice valve, peet valve, pressure reducing valve

iv Make, model - depth to spindle/handle

v Date installed

vi For Hydrants - static pressure

- residual pressure

- maximum flow rate

Vii For valves - Number of turns to fully open.

As-built drawings may be checked on site for accuracy on completion of the subdivision or development. A certificate of completion for the works will not be issued until acceptable as-built

drawings have been produced and a schedule of asset information provided to the satisfaction of Council's water services manager.

6.19.2 Operation and Maintenance Manuals

Full details of all mechanical plant, including pump stations and treatment facilities shall be provided, including complete O & M Manuals in PDF format, plus 3 hard copies. The O&M Manuals shall include:

- As-built drawings
- Equipment list, with make, model and serial numbers
- Equipment supplier details
- Pump curves, with design flow/head identified
- Electrical layout
- Control logic
- Maintenance schedules.

6.20 Defects Liability

A Defects/Maintenance Bond will be required for the works in terms of Section 1.11.1.8 of this standard.

6.21 Drawings

Refer to Section 9 for drawings.

Section 7 Parks

7.1 General Requirements

This section covers the requirements for the design of landscaping within parks, recreation and other reserves in the District. It should be read in conjunction with Parts 7 & 8 of NZS4404: 2004.

The section follows the subdivision process in terms of:

7.1.1 Reserve Provision

7.1.2 Design

7.1.3 Construction and maintenance

7.1.1 Reserve Provision

Council gives priority to the equitable distribution of reserves throughout the District and within each area of urban expansion. The Whangarei District Reserves Strategy sets out Council's intentions for the provision of reserves and levels of service within those reserves. Each application should best match the purpose of the reserve with the location proposed.

The developer is encouraged to discuss reserve concepts with Council's parks & recreation manager to ensure all proposals shall be consistent with this document. It is preferable for this process to begin at a pre-application meeting prior to applying for resource consent.

Each reserve shall be classified in accordance with its primary purpose e.g. recreation or local purpose (utility) under the Reserves Act 1977, and this must be recorded on the subdivision consent layout plan.

Definitions of reserve types are contained within Reserves Strategy and a guide is provided below.

Reserve Type	Purpose	Size (ha)
Central Community Reserve	A central reserve providing for a community hall and other buildings, playground, garden/picnic area, possibly intensive small scale recreation facilities such as tennis, bowls, etc Generally flat contours	1 - 2
Coastal Reserve	The coastal townships will typically have one or more coastal margin reserves. The size and purpose of these will be determined by geographical and ecological factors. Future reserve provision as a result of coastal subdivisional development will be guided by the provisions outlined in section 3.4	1 - 10
Sports Reserve	To provide for field sports such as rugby and cricket – space for at least 2 winter fields plus buildings and car parking. May be combined with Central Community reserve. Generally flat contours	3 - 5
Neighbourhood Reserve	Small reserves to provide local residents with easy access to a play area, usually within 500 meters of urban dwellings. Dependent on the size and design of the town and/or the location of the community reserve /playground, they may or may not be required. Generally flat or gently sloping contours	0.3 – 2
Green Space Reserve	Small areas used to enhance the general amenity and landscape of the town or for walkway linkages, and to connect new reserves to existing or future reserves etc that may take advantage of established trees or scenic areas e.g. riverside	0.5 – 2.0
Natural Area*	Ecologically significant land usually of a large size, or land bounding existing natural areas. May be forested, natural wetland, coastal or isolated tracts of significant remnant forest	3 - 300
Range	**Excludes Natural areas**	**5.8 - 20**

***Natural areas as conservation covenants**

Natural areas shall be vested in Council as reserves. Alternatively, they may be vested with the Queen Elizabeth II Trust as Open Space Covenant, or as WDC Conservation Covenants.

Development Contributions

Reserve development contributions shall be in accordance with Council's Development Contribution Policy.

Gifting of Land

Where land is given which is excess of the reserves contribution requirement then this land (in excess) will be recognized as a gift and not as reserves contribution. This must be agreed to in writing.

Recreation Reserves

Recreation reserves to be vested in WDC shall comply with Part 8 of NZS4044: 2004.

7.1.2 Design

Each reserve shall require an approved design, which will form a reserve management plan under the Reserves Act 1977. The plan shall provide objectives and policies for the reserve consistent with the Reserve Act 1977.

The design for all proposed reserves and street gardens shall (where applicable) be consistent with the following documents.

- NZS 4404: 2004 Land Development and Subdivision Engineering
- SNZ HB 8630: 2004 Tracks and Outdoor Visitor Structure Standard
- New Zealand Urban Design Protocol (MfE, 2005)
- SNZHB 44: 2001 Subdivision for People and the Environment
- LTNZ: Pedestrian Planning and Design Guide
- National Guidelines for Crime Prevention Through Environmental Design in New Zealand
- Low Impact Urban Design and Development (LIUDD) research programme publications 2003-2009 (Landcare Research; Auckland University)
- LTNZ RTS 14: Guidelines for facilities for blind and vision-impaired pedestrians
- Cancer Society Guidelines for Shade Planning and Design : Under Cover
- Clean Streams – A Guide to Riparian Management In Northland (NRC)
- Pest Management Strategy. Northland Regional Council 2007
- TP 10 Auckland Regional Council 2003.

And including the following Council documents where available:

- WDC Reserves Strategy:
- Significant landforms and earthworks policies (to be completed)
- Landform strategy (to be completed)
- Guidelines for Ecological Enhancement Plans (to be completed)
- Eco-sourcing policy (to be completed)
- Guidelines for coastal structures – design, permitting, ownership and management (to be completed)
- WDC Energy Design Guide (to be completed)
- Water, Stormwater, Wastewater alternatives (to be completed).

7.1.2.1 Design Drawings and Specifications

The application shall include plans showing the following (where applicable):

- Existing natural (topographical, geological, hydrological and ecological), including all existing trees and areas of vegetation within the site, and any proposed modifications or changes to these areas:

- Paths/paving
- Fencing
- Access signs
- Access structures (such as styles, gates, boardwalks, platforms)
- Location of trees
- Areas of planting, plant locations and spacing
- Plant species and grade
- Mulch
- Areas of grass
- Areas of ecological enhancement
- Mitigation devices or works such as revetment, retaining walls, stop banks, beach replenishment, scour control mats, riffles, etc
- Location and design of rain gardens or other stormwater interception or treatment features
- Services reticulation (as appropriate to the zoning environment - utilities, water, waste water, electricity) to boundary
- Alignment of footpaths
- Location of park furniture and facilities such as seating, tables, play equipment, and lighting
- Landscape features such as mounding, stormwater ponds (to be vested as drainage reserves (local purpose)) unless dealing with stormwater from the reserves only, access signage, access structures
- Irrigation or other services
- Fencing
- A maintenance/management plan for all planted areas structures and facilities
- A supporting statement accompanying the design drawings detailing how the proposal is consistent with the documents referenced above.

Design drawings shall comply with the requirements of Section 1.7 & Section 1.8 of this standard.

7.1.2.2 Compatibility with Engineering Design

Landscape design shall be considered in the early stages of a development to ensure that any landscape conditions and objectives are compatible with subsequent engineering design and works. Landscape design shall enhance the character and environment of a development, to strengthen existing neighbourhood character and unify those areas into an integrated district.

7.1.2.3 Long-term Public Benefit

Any landscaping shall provide maximum long-term public benefit with minimum ongoing maintenance costs, while giving due regard to the safe use of public assets.

7.1.2.4 Location in Relation to Piped Services

Trees, street gardens and reserve plantings shall be located so as not to compromise the integrity and efficient operation of infrastructural services. As such if particular landscape conditions or objectives are required for a subdivision or development then these will need to be taken into account prior to undertaking detailed engineering design.

Of particular importance is the effect of tree roots on the operation and maintenance of piped services. Trees shall not be planted where piped services will be within the drip line, unless specific consideration by an arborist confirms that the root system is unlikely to affect the services, and that excavation to maintain the service will not affect the tree.

7.1.2.5 Sight Lines

The minimum separation and sight distances detailed in Figures 7.1 & 7.2 of NZS 4404:2004 shall be adhered to for tree and shrub planting.

7.1.2.6 Stormwater Treatment or Detention Ponds

Stormwater treatment or detention ponds contained within recreation reserves shall only be permitted where they are designed for >2% AEP flood event. The design of any pond shall reflect the use of the reserve as a recreational area and shall be integrated into the reserve such that the feature enhances rather than detracts from the reserve (low impact design).

7.1.2.7 Linkages

The design of reserves must seek to maximize linkages and access opportunities to the surrounding street and reserve network, including esplanade reserves.

7.1.2.8 Services and Structures within Reserves

The alignment of services through reserves shall only be permitted with the written consent of the parks manager, unless the services are for the benefit of a facility within the reserve, or unless provided for within a reserve management plan.

Private access through the reserve shall only be permitted with the written consent of the parks manager, or unless provided for within a reserve management plan.

7.1.2.9 Fencing

All fencing shall be consistent with the WDC guidelines and permitted standards for fencing and boundary treatments. Refer to Sheet 54 of this standard and **Figure 8.1 NZS 4404:2004.**

All fencing within and on the boundaries of reserves shall be subject to a fencing covenant. The covenant shall exempt Council from liabilities relating to fences and shall require fencing to be agreed by the parks and recreation manager in line with the fencing guidelines.

7.1.2.10 Species Selection

Species are to be selected with regard to overall composition, low maintenance and longevity.

The number of species used should ensure a unified result and species choice in street gardens to complement street planting, environment, and scale of surroundings. The following matters are to be considered for correct species selection:

- Suitability to environmental conditions e.g. ground moisture, wind, etc
- Tolerance to amenity situation
- Pest and disease resistance
- Non-suckering habit
- Longevity
- Shading consistent with location
- Minimum maintenance requirements
- Toxicity of leaves, flowers, seeds and bark in areas likely to be used by young children.

Native plantings shall be consistent with Council's Eco-sourcing guidelines.

7.1.2.11 Quality Control

All plants shall be sound, healthy, vigorous and free of any defects which may be detrimental to plant growth and development. In addition plants should have vigorous root and branch systems and plants supplied in pots must not be root bound. Defects may include but are not limited to the following:

Pests	Denuded bark	Weed and parasites
Diseases	Multi leaders	Excess dead leaf material
Sun scalds	Dead wood	Plants not hardened off
Abrasions	Girdling roots	Frost damage
Cankers	Breakages	Form not consistent with species
Cracks	Spent flowerheads	Tree proportion (i.e trunk calliper/tree size)

Generally only species adapted to the site conditions shall be planted.

7.1.2.12 Tree/Plant Size

The mature size of any tree or garden planting is to be assessed for each planting location and is to be in scale with the surrounding street environment. Plants should not exceed 450mm in height in the sight triangle of intersections, or other traffic or vehicle/pedestrian conflict areas, unless tree planting provides for eventual clear trunking to a high canopy, or planting does not interfere with sight lines.

The minimum planting size of a landscape tree is 1.5m tall at the time of planting unless the local conditions of a site require consideration of alternatives, e.g. an exposed site may require small, well-hardened trees.

Note Proposed planting within road reserve areas will require the prior approval of both the roading manager and the parks manager **before** plans are submitted as part of the resource consent application

7.1.2.13 Landscaping Structures

Landscaping structures include (but are not limited to) sculptures, walls, fences, screens, bollards, entranceways, posts, etc, and could be made from materials such as concrete, brick, stone, rock and timber. The design of the landscape must be considered as an integral part of the development and surroundings to fulfil both functional and aesthetic requirements.

Durability and maintenance requirements must be considered.

Landscape structures must comply with the requirements of SNZ HB 8630: 2004 – Tracks and Outdoor Visitor Structure Standard.

Structures must be located so that they do not obstruct the sight lines for intersections, pedestrian crossings and signs. The separation distances must be considered together with trees and other landscaping features.

Entranceway wall structures must be located fully on private land. Any other immovable landscape structure (e.g. boulders) is not to be located so as to prevent access to underground services.

Structures must be designed to safely withstand appropriate loadings and must not be a hazard to traffic. The developer is responsible for gaining any necessary building consents in respect of proposed structures, including retaining walls. All retaining walls including those not requiring a building consent shall be constructed to resist lateral earth pressures and those from any surcharge loading that may be present.

7.1.2.14 Irrigation Provision

Council may require provision for permanent irrigation of street and reserve gardens or turf.

Provision for irrigation during the establishment of plants is acceptable for gardens that are not otherwise irrigated.

All connections shall be provided with a water meter. The developer shall apply for, and pay all costs associated with the water connection, including development contributions.

7.1.2.15 Natural Areas

Natural areas contained within reserves shall be weed free, and a management plan prepared detailing the ongoing management of the area.

7.1.2.16 Variations to Part 8 NZS 4404:2004

Council has adopted Part 8 of NZS 4404:2004 (its updates and amendments) Parks and Reserves along with the following variations:

Section 8.3.6 - Pedestrian Accessways

Replace the existing paragraph with the following:

1 Pedestrian accessways (Local Purpose (Accessway) Reserves) providing access to Esplanade and Conservation Covenant Reserves shall generally have a minimum legal width of 6m (also to

allow for maintenance vehicle access) with a central permanently surfaced (permeable pavers, turf block pavers, or porous concrete) shared path 2.20m in width.

They shall be aligned in such a way as to provide clear views of entry and exit points. The length of the pedestrian accessway must be no more than five times the width, at the narrowest point.

The developer is responsible for signage of the shared paths conforming to WDC Parks Signage Design Styles or otherwise WDC Roading street sign standard. Refer to Sheet 24 & Sheet 25.

Identity signage shall be provided at each access point.

The design shall include fencing that does not exceed 1.2m in height.

Removable barriers shall be installed to control vehicle access and allow maintenance. These barriers shall be to the approval of the parks manager.

2 Pedestrian linkages in urban areas are to be provided to facilitate safe pedestrian and cycle movement through neighbourhoods, and to create a more permeable, open space environment. Linkages may be provided that either:

i Provide a short, direct route between streets (Local Purpose (Accessway) Reserves). Such pedestrian accessways are to be provided in accordance with Section 3.4.8.1 **except** that they are to be a minimum of 6.0m in width with a central permanently surfaced (permeable pavers, turf block pavers, or porous concrete) shared path of 2.20m in width. The length of the pedestrian accessway must be no more than five times the width, at the narrowest point.

The developer is responsible for signage of the shared paths, conforming to WDC Parks Signage Design Styles, or otherwise WDC Roading street sign standard. Refer to Sheet 24 & Sheet 25.

Identity signage shall be provided at each access point.

Boundary fencing shall be in accordance with Sheet 54 of this standard and **Figure 8.1 NZS 4404:2004**. Removable barriers shall be installed to control vehicle access and allow maintenance. Gradients of footpaths and ramps are to be no greater than 1 in 8

or

ii Facilitate pedestrian access and cycle movement and create a continuous, permeable, open space environment. Such linkage reserves are to be provided as Local Purpose (Amenity) Reserves and are able to be no less than 12.00m in width with a permanently surfaced (concrete, pavers, asphalt) shared path at a minimum of 2.20m width.

Such reserves may contain landscaping at a suitable safe distance from paths and boundaries.

Paths should be no closer than 2.0m to boundaries. The developer is responsible for signage of the shared paths conforming to WDC Parks Signage Design Styles or otherwise WDC Roading street sign standard. Refer to Sheet 24 and Sheet 25.

Identity signage shall be provided at each access point.

Fencing shall be in accordance with Sheet 54 of this standard and **Figure 8.1 NZS 4404:2004**.

Gradients of footpaths and ramps are to be no greater than 1 in 8.

3 Pedestrian accessway routes within Esplanade, Natural area and Conservation Covenant Reserves shall be continuous with adjacent lots and access points; and generally have a minimum shared path width of 2.20m with a continuous paved permeable surfaced, constructed according to the referenced NZ standards.

Public access points to be provided at 300m intervals.

Public crossing points to be provided at 500m intervals where water bodies are 10.00m or less in width.

The developer is responsible for signage of the shared paths conforming to WDC Parks Signage Design Styles, or otherwise WDC Roading street sign standard. Refer to Sheet 24 & Sheet 25.

Identity signage shall be provided at each access point.

All Fencing shall be in accordance with Sheet 54 of this standard and **Figure 8.1 NZS 4404:2004**.

Gradients of footpaths and ramps to be no greater than 1 in 8.

Decking/boardwalk access structures within Local Purpose (accessway) Reserves are not permitted;

i Where water bodies are greater than 10.00m width, public crossing point construction is discretionary

ii Jetties, landings, fishing pontoons and the like, are discretionary.

7.1.2.17 Approval of Design

The parks manager or his/her representative will review the drawings and return them to the applicant's representative, detailing any alterations that are required. If adjustments to the design are required, a new set of amended drawings shall be submitted to Council prior to approval being granted.

Only drawings stamped and signed by the parks manager or authorised representative shall be deemed approved drawings.

Unless specifically stated otherwise, the approval of drawings does not supersede the requirements or obligations of these standards.

7.1.3 Construction

The requirements detailed in NZS 4404:2004, Section 7.4 Construction and Part 8: Reserves apply to the implementation of landscape works within parks, recreation, stormwater drainage, road and other reserves.

Council may vary the length of time required for maintenance of landscaped areas by the developer/ applicant from that detailed in NZS 4404:2004.

7.1.3.1 Earthworks

All earthworks within reserve areas require the approval of Council prior to commencement. All earthworks shall comply with the Environmental Standards for Land Disturbance Activities contained within the Operative Regional Water and Soil Plan for Northland (NRC).

The requirements regarding finished gradients and profiles as detailed in **NZS 4404:2004** (Section 8.3.2) apply.

7.1.3.2 Stormwater Drainage

Section 4 of this standard applies to all stormwater ponds and other devices.

Where reserves adjoin or incorporate stormwater retention ponds, wetlands, or other such stormwater systems, these shall be identified, and impacts and maintenance requirements detailed.

Reserves that are provided for stormwater control, including stormwater retention ponds shall be created as drainage reserves, with separate titles.

7.2 Completion

7.2.1 As-Built Drawings and Schedule of Asset Information

A set of drawings and a schedule of asset information shall be submitted as per Section 1.11.1 of this standard. These shall clearly and accurately show the as-built locations and details of all reserves infrastructure provided as part of the work, including any modifications made to existing systems.

As-built drawings may be checked on site for accuracy on completion of the subdivision or development.

A certificate of completion for the works will not be issued until acceptable as-built drawings have been produced.

The drawings shall identify assets that have been removed or decommissioned.

7.2.2 Operation and Maintenance Manuals

Full details of any equipment, including complete O & M Manuals in PDF format, plus 3 hard copies, The O & M Manuals shall include:

- As-built drawings
- Equipment List, with make, model and serial numbers
- Equipment supplier details
- Maintenance schedules
- Conservation plans.

7.2.3 Defects liability

A defects/maintenance bond will be required for the works in terms of Section 1.11.1.8 of this standard.

7.3 Maintenance

The reserve shall be maintained for the specified period as set out in the reserve management plan submitted in terms of WDC requirements.

Section 8 Electricity, Telecommunications and Gas

8.1 General Requirements

The developer shall liaise with the appropriate network utility operator(s) and supply electricity, street lighting, and telecommunications, as necessary for the project, and in terms of the District Plan. The cost of this work, necessary legalisation and transferring of land, installation work, and amendments to existing services and facilities shall be the responsibility of the developer unless otherwise agreed in writing with the respective network utility operator(s) and/or Council.

- Reticulated electricity and telecommunications supply (preferably installed during road construction) shall be provided to the boundary of each lot, or at the discretion of the network **utility operator it shall be provided at a selected location within 10m of each lot.** Ducting for any fibre optic tele-communications may be laid at the discretion of the network utility operator. All plant shall be underground, where practicable, as specified in the Whangarei District Plan.
- Where it can be demonstrated that the intended land usage does not warrant electricity or telecommunications supply, (e.g. forestry, run off blocks), or where it is considered uneconomic to provide such services by the boundary, the council or controlling network utility operator(s) may approve the use of a 'no electricity supply encumbrance' or 'no telecommunications supply encumbrance' registered on the affected land title(s).
- Distribution pillars, and similar, shall not be located where they are likely to cause interference with access construction at the common boundary of access ways onto roads.
- It is the incoming owner's responsibility (not withstanding prior arrangements) to meet the costs of any internal electricity and telecommunications reticulation and/or any network upgrade that may be necessary to supply loads above and beyond that designed for.
- Easements - where applicable on public and private land, electricity and telecommunications cables, lines, and plant, will require easements registered over new and existing plant in favour of a recognised network utility operator to ensure the security of supply.
- Sites for transformers and/or other equipment and facilities shall be provided where required, and positioned and secured to minimise any hazard.

8.2 Design Drawings

Design and installation of utility services shall be complimentary to typical drawing standards shown within these standards, and engineering drawings of the development approved by Council. Installation of any street lighting, reticulation, and facilities within public roads, will require an approved 'road opening notice' from Council prior to any work on the road.

8.3 Electricity

Council reserves the right to require security lighting to be installed where public safety is at risk. Street lighting shall be installed for new streets and roads and public accessways within living 1, living 2, living 3, and all business environments as shown on the Whangarei District Plan, unless otherwise approved in writing.

8.4 Gas

Reticulated gas is not mandatory in terms of these standards. Developers wishing to install gas services shall satisfy the requirements of an approved gas network utility operator and in terms of NZS 5528 and these standards, including registering necessary easements and payment of all costs.

8.5 Service Location

Preferred service locations in berms are shown on Sheet 29.

8.6 As-Built Plans

The developer shall reach agreement with the respective network utility operator(s) prior to commencing work on-site, and upon completion accurately record 'as-built data' of electricity, telecommunications, and gas reticulation, installed for the development, which shall be kept as a permanent record by the network utility operator in a format suitable for use by others.