FORMULA \[ t = \frac{107n\sqrt{e}}{\sqrt{s}} \] MINUTES

WHERE \( t \) = TIME OF TRAVEL OVER SURFACE IN MINUTES
\( n \) = HORTON'S VALUES FOR THE SURFACE
\( e \) = LENGTH OF FLOW IN METRES
\( s \) = SLOPE OF SURFACE IN %

EXAMPLE

LENGTH OF OVERLAND FLOW = 120m
AVERAGE SLOPE OF SURFACE = 2%
POORLY GRASSED SURFACE
\[ \therefore \text{TIME OF TRAVEL} = 16.3 \text{ MINUTES} \]

DATA ATTRIBUTED TO U.S. DEPT OF AGRICULTURE 1942.
NOMOGRAPH PUBLISHED IN "MUNICIPAL UTILITIES" SEPTEMBER 1951.

FORMULA AND VALUES OF "n" ADDED BY J.A. FRIEND 19TH NOVEMBER 1954.
RAINFALL INTENSITY CURVES
REVISED JULY 2008, BASED ON HIGH INTENSITY RAINFALL ANALYSIS FOR NELSON URBAN AREA
(NIWA PROJECT ELF09211)
FIGURES INCLUDE 16% INCREASE TO ALLOW FOR CLIMATE CHANGE TO 2100.

<table>
<thead>
<tr>
<th>CURVE</th>
<th>%</th>
<th>Yr FREQUENCY STORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1%</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>2%</td>
<td>50</td>
</tr>
<tr>
<td>C</td>
<td>5%</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>6.67%</td>
<td>15</td>
</tr>
<tr>
<td>E</td>
<td>10%</td>
<td>10</td>
</tr>
<tr>
<td>F</td>
<td>50%</td>
<td>2</td>
</tr>
</tbody>
</table>

PROBABILITY OF OCCURRING ANNUALLY

INTENSITY-mm / Hr

MINUTES
SD 504

NELSON CITY COUNCIL

INFRASTRUCTURAL ASSETS

APPROVED

SENIOR EXECUTIVE INFRASTRUCTURE DATE

3m WIDE x 150mm COMPACTED BASECOURSE FORMED ACCESS ON ONE SIDE

REINFORCED CONCRETE STRUCTURE

REMOVABLE 1m HIGH HANDRAIL WITH NETTING 50mm MAX MESH

DEBRIS GRILL

WINGWALL

GRILL REFER SD 505

REMOVABLE HANDRAIL IN SECTIONS

OPENINGS

SOCKET END PIPE MUST BE CAST INTO HEADWALL

1200mm dia RC pipe trap

ALTERNATIVE LOCATION

SOCKET END PIPE MUST BE CAST INTO HEADWALL

1m CLEARANCE

DEBRIS GRILL REFER SD 506

200mm DIA DRILLED HOLES

DEBRIS GRILL

1050mm dia RC pipe secondary intake

STANDARD INLET STRUCTURE

REINFORCED CONCRETE STRUCTURE REQUIRING SPECIFIC DESIGN.

RAILWAY IRON TRASH RACK 300mm CRS

(FLANGES UPSTREAM TO PREVENT BLOCKAGE)

CATCHPIT VOLUME TO SUIT SPECIFIC SITE CONDITIONS

NOTES
1. TYPES A,B,C AS SHOWN ARE GENERAL EXAMPLES - EACH CASE WILL REQUIRE DESIGN TO SUIT THE SITE WITH REGARD TO PEAK FLOWS AND ANTICIPATED DEBRIS. FINAL DETAILS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

SEE SD 503 FOR ALTERNATIVE

TYPE A DEEP TRAP SUMP

TYPE B RAILWAY IRON TRASH RACK & CATCHPIT

TYPE C SECONDARY INTAKE

STORMWATER INTAKE STRUCTURES WITH DEBRIS TRAPS

NELSON CITY COUNCIL

INFRASTRUCTURAL ASSETS

APPROVED

SENIOR EXECUTIVE INFRASTRUCTURE DATE

SD 504

29/07/2010
DEBRIS TRAP GRILL

PLAN

50 x 10 AT 100 CENTRES
(50 CENTRES WHEN IN PEDESTRIAN AREAS)

SECTION

50 x 10 HOOP

1200mm DIA FLUSH JOINT R.C PIPE

NELSON CITY COUNCIL

DEBRIS TRAP GRILL

INFRASSTRUCTURAL ASSETS

APPROVED

29/07/2010

SD 505

SENIOR EXECUTIVE INFRASTRUCTURE

DATE
SECONDARY INTAKE DEBRIS GRILL

NELSON CITY COUNCIL

INFRASTRUCTURAL ASSETS

APPROVED 29/07/2010 SD506

SENIOR EXECUTIVE INFRASTRUCTURE DATE
NOTES
1. FOR PIPES OVER 1050 DIA, MANHOLES ARE TO BE A SPECIFIC DESIGN.

2. TABLE OF DIMENSIONS

<table>
<thead>
<tr>
<th>M.H (DIA)</th>
<th>L (MIN)</th>
<th>T (MIN)</th>
<th>D (MAX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>500</td>
<td>200</td>
<td>1050</td>
</tr>
<tr>
<td>1350</td>
<td>400</td>
<td>200</td>
<td>750</td>
</tr>
<tr>
<td>1050</td>
<td>350</td>
<td>150</td>
<td>450</td>
</tr>
</tbody>
</table>

3. PRECAST CONCRETE MANHOLE RISERS SHALL COMPLY WITH THE REQUIREMENTS FOR CLASS 2 PRECAST CONCRETE PIPES TO AS/NZS 4958.

4. FOR MANHOLE FINISHING OFF DETAILS E.G. HAUNCHING, MAX. DEPTH OF LID, etc. SEE SD 602

TYPICAL SECTION A-A
- 200 x 100 x 150 CONC BLOCKS OR PRECAST CONC. BASE
- 200 x 100 x 150 CONC BLOCKS
- CONC BENCHING
- SLOPED 1 IN B MAX. 1 IN 12 MIN.
- BENCHING LEVEL = 2/3 DIA OF MAIN PIPE

TYPICAL SECTION B-B
- 200 x 100 x 150 CONC BLOCKS
- CONC BENCHING TO RADIUS CURVE
- FLOW 45' MAX

TYPICAL JUNCTION MANHOLE
- STD PRECAST COVER SLAB WITH OFFSET OPENING TO BE SET DIRECTLY OVER THE OFFSET OPENING IN THE LOWER PRECAST COVER SLAB
- MIN 75 AND MAXIMUM 100mm CONC UNDER CAST IRON FRAME
- CAST IRON COVER
- CONC BENCHING
- SLOPED 1 IN B MAX. 1 IN 12 MIN.
- BENCHING LEVEL = 2/3 DIA OF MAIN PIPE

STANDARD STORMWATER MANHOLE
Nelson City Council

INFRASTRUCTURAL ASSETS

TOOTHEDED CONNECTOR

SD 508

29/07/2010

SENIOR EXECUTIVE INFRASTRUCTURE DATE
SPECIAL SHALLOW SECTION OF TOOTHED CONNECTOR

PLAIN END PIPES 225Ø
R12 STIRRUPS AT 225 C/C

525
75

STANDARD INTAKE SECTION OF TOOTHED CONNECTOR

WELDED REINFORCEMENT BASKET OF R12 STIRRUPS AT 225 C/C, AND R12 BARS 2140 LONG

NOTE
REINFORCING STEEL TO BE USED WHEN REQUIRED BY THE ENGINEER
NOTES
1. SEE SHEETS 21/207 SHEET 3 FOR DETAILS OF STD. GRATING AND FRAME
2. INSITU CONCRETE TO BE 20 MPa AFTER 28 DAYS
3. NO REINFORCING REQUIRED FOR CAST INSITU BACK ENTRY UNIT
4. WHERE SUMP IS CONCRETE TO INTERCEPT K & C AT DISTINCT GRADE THE ENTRY UNIT SHALL BE INCLINED ON THE INSITU PAD EXTENDED OVER THE SUMP WALL WIDTH

SECTION

ELEVATION
GRATE AND FRAME NOT SHOWN

BACK ENTRY SUMP IN STANDARD KERB & CHANNEL

NELSON CITY COUNCIL

INRASTRUCTURAL ASSETS

APPROVED
29/07/2010
SENIOR EXECUTIVE INFRASTRUCTURE DATE

SD 510
NOTES
1 SEE SHEETS 21/207 SHEET 3 FOR DETAILS OF STD GRATING AND FRAME
2 INSITU CONCRETE TO BE 20 MPa AFTER 28 DAYS
3 NO REINFORCING REQUIRED FOR CAST INSITU BACK ENTRY UNIT
4 WHERE SUMP IS CONSTRUCTED TO INTERCEPT K & C AT DISTINCT GRADE THE ENTRY UNIT SHALL BE INCLINED ON THE INSITU PAD EXTENDED OVER THE SUMP WALL WIDTH

BACK ENTRY SUMP IN
STANDARD MOUNTABLE KERB &
CHANNEL

NELSON
CITY
COUNCIL

INFRASTRUCTURAL ASSETS

APPROVED 29/07/2010

SD 511

SENIOR EXECUTIVE INFRASTRUCTURE DATE
STANDARD SUMP - FRAME

TACK WELD ALL JOINTS

STANDARD SUMP - GRATING

NOTE: FRAME AND GRILL TO BE MILD STEEL

NELSON CITY COUNCIL

STANDARD SUMP FRAME & GRILL

INFRASTRUCTURAL ASSETS

APPROVED

SD 512

29/07/2010

SENIOR EXECUTIVE INFRASTRUCTURE DATE
FINS TO ASSIST IN FIXING AND ALIGNING MOULD WITH EXISTING KERB LINE

NOTE
DIMENSIONS ARE FOR BACK FACE.

SD 513
NELSON CITY COUNCIL

SUMP TOP MOULD FOR STANDARD KERB & CHANNEL

INFRASTRUCTURAL ASSETS

APPROVED
29/07/2010
SD 513

SENIOR EXECUTIVE INFRASTRUCTURE
DATE
NOTE
DIMENSIONS ARE FOR BACK FACE.

NELSON CITY COUNCIL

SUMP TOP MOULD FOR STANDARD MOUNTABLE KERB

INFRASTRUCTURAL ASSETS

APPROVED
29/07/2010
SENIOR EXECUTIVE INFRASTRUCTURE DATE

SD 514
**ALTERNATIVELY FOR VEHICLE LOADING 150mm THICK REINFORCED CONCRETE COVER SLAB WITH A PICTON TOP CAST IN MAY BE USED. THE REINFORCEMENT SHALL BE TO A SPECIFIC DESIGN.**

**NOTE**

USE 2400x1200x6mm CHEQUER PLATE SHEET
CUT 4 SHEETS 535x1200
CUT 30 RAGGED ENDS 100x40 EACH

10x25 STIFFENERS TACK WELDED

**PLAN OF 6mm CHEQUER PLATE**

**SECTION A-A**

**PLAN OF SUMP**

**ELEVATION**

**ISOMETRIC VIEW**

**SECTION B-B**

ENTRANCE SHAPED BY HAND IN SITU. TOOTHING REQUIRED ON HILLSIDE KERBS ONLY.

CONSTRUCTION JOINT

**ISOMETRIC VIEW**
TYPICAL PLAN SECTION

NOTE
PRIME ALL STEELWORK SURFACES
WITH CORROLESS RUST STABILISER "S2"
USE RESCUE STEEL ON ALL BOLTS

FLOATAGE CAGE FORMS A "K"
WITH EQUAL SPACINGS OF
90°

TYPICAL ELEVATION SECTION

FLOATAGE CAGE DETAIL

NELSON CITY COUNCIL
INFRASTRUCTURAL ASSETS
APPROVED
SD 516

SUMP WITH NON—RETURN
CHAMBER

TYPICAL ELEVATION SECTION
NOTE
WHERE PIPE DEPTH REQUIRES SUMP DEPTH IN EXCESS OF 900mm A STANDARD
940 x 460 mm SUMP SHALL BE PROVIDED.
CYCLE FRIENDLY SUMP – GRATING

NOTES:

1) LOCATION OF CYCLE FRIENDLY SUMP GRILL IS AT THE COUNCILS DISCRETION

2) GRILL TO BE MILD STEEL

3) DRAWING NOT TO SCALE
TACK WELDED JOINTS EACH END

AS PER STANDARD SUMP

8 - 10Ø BARS

50 x 12 PLATE

100

440

GRIND MAX 10mm DEEP INTO LONGITUDINAL PLATES, TOP OF LATERAL BARS TO BE FLUSH WITH TOP OF LONGITUDINAL PLATES

CYCLE FRIENDLY SUMP – GRATING

NOTES:

1) LOCATION OF CYCLE FRIENDLY SUMP GRILL AT COUNCIL’S DISCRETION

2) THE SUMP GRATE IS A STANDARD SUMP GRATE AS PER DRAWING 21/207 SHEET 3 WITH THE ADDITION OF 8 LATERAL BARS

3) FRAME AND GRILL TO BE MILD STEEL

4) DRAWING NOT TO SCALE

NELSON CITY COUNCIL

CYCLE FRIENDLY SUMP GRATE
Modification of Standard Sump Grate

INFRASTRUCTURAL ASSETS

APPROVED

29/07/2010

SD 519

SENIOR EXECUTIVE INFRASTRUCTURE

DATE
1. The standard silt & oil trap is designed to serve small installations such as truck depots etc. Major installations will require specific design.
2. Silt & oil trap is made up of four standard precast sump units.
3. Lids to be precast reinforced concrete lid mass approximately 226kg.
4. Oil capacity 390 litres, silt volume 0.1m³
5. Drain pipe work min 100mm dia PVC.
6. Vent pipe work min 40mm dia PVC, above ground vents may be galvanised steel if in an exposed position.
7. A continuous mortar pad minimum thickness 10mm, shall be laid round the top of each sump unit to allow for shaping to the required finished ground level.
8. A compressible sealant strip of Compriband or similar approved shall be laid on each mortar pad.
9. Where a steam cleaning operation or detergents or degreaser are used:
   * An application form to discharge trade waste from a silt & oil trap to the sewerage system shall be submitted to the engineering manager for his/her approval.
   * Stormwater shall not be allowed to discharge to the sewerage system.
10. Bunded areas around fuel storage areas should discharge to the stormwater via a suitably designed oil interceptor with an appropriate shut-off valve in situ.
11. Bund to be 200mm high around site.
THIS DETAIL SHALL BE USED WHERE ONE SOAKPIT IS PROPOSED PER LOT

NOTE:

1. SOAK PITS SHALL BE SITED AWAY FROM SERVICES BY 2m AND AWAY FROM BUILDING FOUNDATIONS BY 45° TO PIT BASE AS MINIMUM.

2. SILT TRAPS SHALL BE CONSTRUCTED WITH EVERY SOAKPIT WHERE DRAINING SURFACE WATER. (SEE NCC 21/207 SHT 1)

3. SOAKPITS MAY ONLY BE ALLOWED:
   A) ON FLAT LAND IN THE WOOD AREA, BROOK VALLEY AND STOKE.
   B) WHERE REASONABLE GROUND SOAKAGE CAN BE PROVEN BY TESTING TO THE ENGINEERS SATISFACTION IE. FOR RESIDENTIAL BUILDINGS 4500L IN 20 MINUTES.
      GARAGE OR ACCESSORY BLGS. 200L IN 4 MINUTES.
   C) ON EXISTING RESIDENTIAL LOTS FOR NEW BUILDINGS OR EXTENSIONS OVER 10m².
   D) IN NEW SUBDIVISIONS WHERE ONLY ONE NEW LOT IS BEING CREATED.

4. WHERE POSSIBLE AND PRACTICAL AN OVERFLOW CONNECTION IS REQUIRED FROM A SOAKPIT TO AN APPROVED OUTFALL.

5. SOAK PIT WILL EVENTUALLY SILT UP AND WILL REQUIRE ONGOING MAINTENANCE. OWNERS SHOULD BE MADE AWARE OF THIS.
**SECTION A**

Nominal 100 mm inlet

Concrete base

**300 ID CONCRETE PIPE OR PIT. STANDARD 800MM DEEP. CAN BE CUT TO SUIT SITE.**

**SUMP PLAN**

Cast iron swing grate in cast iron frame, round or square

**SITE PLAN**

HOUSE

FOOTPATH

GRASS BERM

ROADWAY

ALTERNATIVE LOCATION

60° Min. Angle of pipe to kerb

1.0 CLEAR

K and C

PREFERRED LOCATION OF SUMP IN VEHICLE CUTDOWN

**LONGITUDINAL SECTION**

GUTTER

DOWNPIPE SEALED SYSTEM

GL (DRIVEWAY)

BOUNDARY

ROADWAY

FLOW

STORMWATER PIPE

1 in 120 min

450 Min

500

800mm x 300 ID CONCRETE CHAMBER FOR 100Ø OUTLET

SEE NOTE 2 ABOVE

NOTES:

1. FINISHED FLOOR LEVEL MUST NOT BE LESS THAN 150mm HIGHER THAN LID LEVEL OF SUMP

2. SUMP IN ROADWAY MAY BE PERMITTED WHERE NOT POSSIBLE TO POSITION IN DRIVEWAY OR BERM

**NELSON CITY COUNCIL**

INFILL BUBBLE–UP SUMP LOCATION

**INFRASTRUCTURE DIVISION**

APPROVED

29/07/2010

SD 522

SENIOR EXECUTIVE INFRASTRUCTURAL ASSETS DATE
D/6 OR 150 WHICHEVER IS THE GREATER

COMPACTED TRENCH BACKFILL

AP20 OR as per AS/NZS 3725:2007

COMPACTED PIPE OVERLAY

COMPACTED HAUNCH & SIDE SUPPORT BEDDING

x = 100mm if D <= 1500
x = 150mm if D > 1500

NELSON CITY COUNCIL

PIECE BEDDING for CONCRETE PIPES

INFRASSTRUCTURAL ASSETS

APPROVED 29/07/2010

SD 523
CUT-IN HOLE FOR CONNECTION TO BE BETWEEN 30' OF TOP AND BOTTOM OF MAIN PIPE

STD. RCRR SOCKET SHORT
150 ALL ROUND, BUT NOT TO EXTEND ABOVE/BELOW, TOP/BOTTOM OF MAIN PIPE

TRIM PIPE

PVC MANHOLE STARTER OR SIMILAR TRIMMED TO SUIT

BEND MAIN PIPE STEEL (MIN 100mm LENGTH) INTO CONCRETE SURROUND AND TIE TO D10 STIRRUP

CONCRETE SURROUND

EPOXY MORTAR

NOTES:

1) SPECIAL DESIGN REQUIRED FOR: MAIN PIPES OTHER THAN REINFORCED CONCRETE, MORE THAN ONE CONNECTION PER MAIN.

2) DIRECT CONNECTIONS OF THIS TYPE ARE NOT PERMITTED ON PLASTIC MAINS.

3) OUTSIDE EDGE OF MAIN PIPE CUT-IN HOLE SHALL BE NOT LESS THAN 300mm FROM COLLAR OR END OF PIPE.

4) MAXIMUM DIAMETER OF CUT-IN HOLE SHALL BE LESS THAN TWO THIRDS OF THE INTERNAL DIAMETER OF MAIN PIPE.

5) EPOXY MORTAR SHALL BE APPLIED STRICTLY ACCORDING TO THE MANUFACTURER'S RECOMMENDATION AND SHALL BE FULLY CURED BEFORE THE SURROUND IS Poured AND THE SIDELINE LAID.

6) MAIN PIPE SURFACE SHALL BE ROUGHENED AND GROUT COATED BEFORE CONCRETE SURROUND IS Poured.

7) DIRECT CONNECTIONS MUST BE APPROVED BY THE ENGINEER, AND NORMALLY SHALL ONLY BE USED WHERE THE SIDE LINE IS LESS THAN 10m LONG, AND ACCESS FOR CLEANING THE SIDE LINE IS EASILY OBTAINABLE AT THE UPSTREAM END. THAT IS THE SIDE LINE SHALL TERMINATE WITH A MANHOLE, LHCE OR SUMP.

8) DIAMETER OF SIDE LINE PIPE SHALL BE LESS THAN HALF THE INTERNAL DIAMETER OF THE MAIN PIPE.

SQUARE RADIAL DIRECT CONNECTIONS:

<table>
<thead>
<tr>
<th>NOMINAL SIDE LINE DIAMETER</th>
<th>MINIMUM MAIN PIPE DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>225</td>
</tr>
<tr>
<td>150</td>
<td>375</td>
</tr>
<tr>
<td>200</td>
<td>450</td>
</tr>
<tr>
<td>225/250</td>
<td>525</td>
</tr>
<tr>
<td>300</td>
<td>675</td>
</tr>
<tr>
<td>375</td>
<td>825</td>
</tr>
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<td>450</td>
<td>975</td>
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<td>525</td>
<td>1050</td>
</tr>
<tr>
<td>600/675</td>
<td>1350</td>
</tr>
<tr>
<td>750</td>
<td>1600</td>
</tr>
<tr>
<td>825/900</td>
<td>1800</td>
</tr>
<tr>
<td>975</td>
<td>1950</td>
</tr>
<tr>
<td>1050</td>
<td>2100</td>
</tr>
</tbody>
</table>
GENTLY SLOPING BANKS WILL BECOME INUNDATED DURING FLOOD FLOWS, ENABLING THE DISSIPATION OF FLOW ENERGY THAT WOULD OTHERWISE CONTRIBUTE TO CHANNEL DAMAGE. ENSURE FLOOD WATERWAY CAPACITY IS MAINTAINED WHERE THERE IS HEAVY VEGETATION.
**Retention / Rain Water Harvesting Tanks**

- **Non Potable Reuse**
  - Not connected to NCC supply

- **Inlet**
  - Designed to stop sediment disturbance in tank

- **Overflow Pipe**

- **Retention Volume**
  - Impervious Area = 1 x 26 (see table below)

- **Water Harvest Volume**
  - Roof Area = 40 litres

- **Max Ground Water in Winter**

- **Native Plants**
  - Preferred

- **Rain Garden**
  - M² (see table below, no floatables, bark, etc.)
  - Size up to 20 m² = 100 # Pipe
  - Size 20 m² & Over = 150 # Pipe

- **Infiltration Rate**
  - Free draining, no compaction

- **Filter Layer**
  - Sand / Drainage Material

- **Pipe to Reticulation System**

- **Property Boundary**

- **Landscaped & Planted**
  - Grass Swales, Maximum slope 1 in 20

- **Footpath**

- **Subsoil Drain**

- **Pipe A**

- **Lincoln Filter Material**

- **Filter / Drainage Material**

- **Proprietary Storm Filter Treatment Device** (IVortex/Cartilage) for removal of 75% total suspended solids (TS3)

- **Fabric Wrapped Infiltration Detention Cells / Conduit** (Traffic Loaded) outlet to piped system

---

**Impervious Area = Roof + Paved Area**

<table>
<thead>
<tr>
<th>Impervious Area</th>
<th>Volume Needed for Stormwater Retention</th>
<th>Rain Garden (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150m²</td>
<td>4200 Litres</td>
<td>12m²</td>
</tr>
<tr>
<td>200m²</td>
<td>5600 Litres</td>
<td>16m²</td>
</tr>
<tr>
<td>250m²</td>
<td>7000 Litres</td>
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<tr>
<td>300m²</td>
<td>8400 Litres</td>
<td>25m²</td>
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<tr>
<td>350m²</td>
<td>9800 Litres</td>
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</tr>
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<td>400m²</td>
<td>11200 Litres</td>
<td>35m²</td>
</tr>
<tr>
<td>500m²</td>
<td>14000 Litres</td>
<td>40m²</td>
</tr>
</tbody>
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**Nelson City Council**

**Low Impact Design Concepts**

**(Specific Design Required)**

**Infrastructural Assets**

**Approved**

29/07/2010

**Senior Executive Infrastructure**

**Date**

**SD 526**