



W A L K A B I L I T Y  
T O O L S R E S E A R C H



V a r i a b l e s  
C o l l e c t i o n  
M e t h o d o l o g y  
J u l y 2 0 0 6

# W A L K A B I L I T Y T O O L S R E S E A R C H



## V a r i a b l e s C o l l e c t i o n M e t h o d o l o g y J u l y 2 0 0 6

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# Contents

<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
	Background	1
	Report Structure	1
<b>2</b>	<b>METHODOLOGY</b>	<b>2</b>
	Introduction	2
	Variable Categories	2
	Special Equipment	2
	Undertaking the Surveys	3

## Figures

Table 2.1	Special Equipment for Collecting Variable Data	2
Table 2.1	Special Equipment for Collecting Variable Data (cont)	3

## Appendices

<b>Appendix A</b>	Variables Collection Methodology
<b>Appendix B</b>	Path Length Operational Survey Form
<b>Appendix C</b>	Path Length Physical Survey Form
<b>Appendix D</b>	Road Crossing Operational Survey Form
<b>Appendix E</b>	Road Crossing Physical Survey Form
<b>Appendix F</b>	Transit New Zealand Vehicle Classification Scheme (TNZ 1999).

# 1 INTRODUCTION

## Background

- 1.1 Land Transport New Zealand (LTNZ) commissioned Steve Abley – Chartered Transportation Engineering (Steve Abley) to develop a methodology for collecting physical and operational variables. This is being undertaken as part of the Walkability Tools Research project (LTNZ Ref: 16/06). The purpose of the research is to link physical and operational variables to perception surveys undertaken using the Community Street Review methodology.
- 1.2 Community Street Reviews were developed as part of a separate commission between Living Streets Aotearoa Inc. and Steve Abley for the Heath Sponsorship Council. The Health Sponsorship Council has since handed over responsibility for the ongoing success of Community Street Reviews to LTNZ.
- 1.3 The collection of New Zealand survey data is intended to be stored centrally by LTNZ for development of a mathematical model whereby walkability perceptions can be inferred by physical and operational measurements. The location of the central database is *www.levelofservice.com*.
- 1.4 This report details the methodology for collecting physical and operational variables and lists the equipment required for data collection.

## Report Structure

- 1.5 This report is divided into sections to aid understanding of the methodology:
  - Methodology
    - Explains how the variables are classified and describes the survey forms.
  - Appendices
    - Includes the detailed variables collection methodology and various survey forms.
- 1.6 Quotations taken from other references are noted in the text and are “*italicised*”. Important or especially relevant sections of quotations are **bold**.

## 2 METHODOLOGY

### Introduction

2.1 Physical and operational variables are collected on the same sites used for Community Street Reviews. The physical and operational variables are collected specific to either a path length or a road crossing to match the Community Street Review methodology.

### Variable Categories

2.2 Physical and operational variables are organised in four categories, these are:

1. Path Length Operational
2. Path Length Physical
3. Road Crossing Operational
4. Road Crossing Physical

2.3 Operational variables are collected while the Community Street Review Participants are completing their assessment of each section of the site. The data collected relates to aspects of the environment that fluctuate such as traffic volume, weather and temporary walking hazards.

2.4 Physical variables can be collected at any time, either before or after the Community Street Review is completed. The data collected relates to items in the environment that generally do not change such as footpath width, permanent obstacles and cross fall.

2.5 Descriptions of each variable and how they are measured are included in Variables Collection Methodology in **Appendix A**.

### Special Equipment

2.6 The data collection requires some special equipment to record things such as gradients, footpath and road crossing widths and weather. The special equipment is listed in **Table 2.1**.

**Table 2.1 Special Equipment for Collecting Variable Data**



Counter



GPS

Table 2.1 Special Equipment for Collecting Variable Data (cont)



Humidity Meter



Light Meter (night time only)



Measuring Wheel



Sound Meter



Smart Level



Stop Watch



Tape Measure



Thermometer

### Undertaking the Surveys

- 2.7 Four survey forms have been developed to aid collection of the operational and physical variables. The forms match the four variable categories and are attached as **Appendices B-E**.

- 2.8 It is recommended that two technicians collect the operational and physical variable data. This is due to the amount of equipment required to measure the variables. It is easier if one technician measures while the other records. Undertaking both tasks at once is difficult.
- 2.9 Operational variables are collected at the same time as the Community Street Review Participants are completing their survey of each section. It is not possible to collect physical variables at the same time as operational variables as technicians must maintain pace with the Community Street Review Participants.
- 2.10 A separate form is used for each section for both physical and operational variables. Information is collected at the top of each form to link the survey with the surveyor, the site and the date. A number of fields are common across the four surveys, these are:
- Surveyor: *The name of the surveyor completing the form.*
- Organisation: *The name of the organisation commissioned to complete the survey.*
- Site: *The site name. This should match the Community Street Review site name.*
- Section: *The section name. This should match the Community Street Review section name.*
- Date: *The date the survey is undertaken.*
- 2.11 The operational survey forms have a field for time. The time of day that each section is completed on, should be recorded in this field.
- 2.12 The physical survey forms have two fields to record the GPS positions, one at the start and one at the end of each section. To speed up data collection it is recommended that waypoints are taken and the corresponding waypoint number is recorded in the GPS field. Later the waypoint location can be extracted and entered on the form. GPS locations are based on World Geodetic System 1984 (WGS84).
- 2.13 When the surveys are complete they can be entered into the central database located at [www.levelofservice.com](http://www.levelofservice.com).

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M e t h o d o l o g y  
A P P E N D I X A

# Contents

## **PATH LENGTH (OPERATIONAL)**

PL1	Moveable Non-Regular Obstacles	1
PL2	Hiding Places	1
PL3	Use of Access Ways	2
PL4	People Flow	2
PL5	Number of Wheeled Users	3
PL6	Density of People	3
PL7	Vehicle Speed	3
PL8	Adjacent Traffic Flow	4
PL9	Number of Heavy Vehicles	4
PL10	Use of On Street Parking	4
PL11	Deviation around Obstacles	5
PL12	Source of Smells	5
PL13	Litter	5
PL14	Detritus	6
PL15	Vandalism	6
PL16	Temporary Hazards	7
PL17	Weather	8
PL18	Humidity	8
PL19	Temperature	8
PL20	Noise	9
PL21	Light	9

## **PATH LENGTH (PHYSICAL)**

PL22	Land Use Classification	11
PL23	Effective Width	11
PL24	Regular Obstacles	12
PL25	Permanent Non-Regular Obstacles	13
PL26	Deviation from Desire Line	14
PL27	Road Width	15
PL28	Posted Speed Limit	15
PL29	Street Activity	15
PL30	Height of Adjacent Buildings	16
PL31	Building Veranda	16
PL32	Height of Opposite Buildings	16
PL33	Surface Type	17
PL34	Footpath Condition	17
PL35	Area Adjacent Footpath	18
PL36	Cross Fall	18
PL37	Longitudinal Gradient	19
PL38	Stumbling Hazards	20
PL39	Trip Hazard	20
PL40	Provision of Tactile Aids	21
PL41	Provision for On Street Parking	21
PL42	Distance from Moving Vehicles	22
PL43	Vehicle Access Ways	22
PL44	Visibility to Vehicle Access Ways	23
PL45	Shared Path	24
PL46	Directional Information	25
PL47	Quantity of Greenery	25
PL48	Provision of Utility Features	26
PL49	Provision of Comfort Features	26

PL50	Designed Steps	27
PL51	Protection from Hazards	27
PL52	Design Effort	28

#### **ROAD CROSSING (OPERATIONAL)**

RC1	Moveable Non-Regular Obstacles	29
RC2	People flow	29
RC3	Number of Wheeled Users	29
RC4	Density of People	30
RC5	Vehicle Speed	30
RC6	Deviation Around Obstacles	30
RC7	Source of Smells	30
RC8	Litter	30
RC9	Detritus	31
RC10	Vandalism	31
RC11	Temporary Hazards	31
RC12	Weather	31
RC13	Humidity	31
RC14	Temperature	32
RC15	Noise	32
RC16	Light	32

#### **ROAD CROSSING (PHYSICAL)**

RC17	Land Use Classification	33
RC18	Effective Width	33
RC19	Possible Crossing Width	34
RC20	Crossing Control Type	34
RC21	Type of Refuge Island	35
RC22	Footpath Condition	35
RC23	Road Condition	35
RC24	Number of Crossing Lanes	36
RC25	Crossing Length	36
RC26	Deviation from Desire Line	36
RC27	Posted Speed Limit	36
RC28	Permanent Non-Regular Obstacles	37
RC29	Refuge Island Surface Type	37
RC30	Road Surface Type	37
RC31	Cross Fall	37
RC32	Footpath and Road Intersecting Gradient	38
RC33	Stumbling Hazards	39
RC34	Trip Hazards	39
RC35	Provision of Tactile Aids	40
RC36	Odd Vehicle Approach Direction	40
RC37	Visibility of Approaching Traffic	41
RC38	Provision of Comfort Features	41
RC39	Designed Steps	41
RC40	Protection from Permanent Hazards	41
RC41	Design Effort	42

## Figures

Figure PL1.1 Examples of Moveable Non-Regular Obstacles	1
Figure PL3.1 Example of a Vehicle Using an Access Way	2
Figure PL4.1 People Flow	3
Figure PL10.1 Example of Use of On Street Parking	4
Figure PL13.1 Examples of Path Length with Litter	6
Figure PL15.1 Examples of Vandalism	7
Figure PL16.1 Examples of Temporary Hazards	7
Figure PL18.1 Measuring Percentage Humidity Using a Multimeter	8
Figure PL19.1 Measuring Temperature Using a Multimeter	9
Figure PL20.1 Measuring Noise Using a Multimeter	9
Figure PL23.1 How to Measure Footpath Effective Width	12
Figure PL24.1 Examples of Regular Obstacles	13
Figure PL25.1 Examples of Permanent Non-Regular Obstacles	14
Figure PL26.1 Example of Deviation from Desire Line	15
Figure PL33.1 Footpath Materials	17
Figure PL36.1 Example of Measuring Cross Fall	19
Figure PL37.1 Measuring Longitudinal Gradient	19
Figure PL38.1 Diagram for Measuring Stumbling Hazards	20
Figure PL38.2 Example of How to Measure Stumbling Hazards	20
Figure PL40.1 Example of Tactile Paving on a Path Length	21
Figure PL41.1 Example of Provided On Street Parking	22
Figure PL42.1 Measuring Distance to Nearest Traffic Lane	22
Figure PL43.1 Vehicle Access Way	23
Figure PL44.1 Access Way Visibility Diagram	23
Figure PL44.2 Example of Access Way Visibility	24
Figure PL45.1 Examples of Shared Paths	24
Figure PL46.1 Example of Directional Information	25
Figure PL48.1 Provision of Utility Features	26
Figure PL49.1 Provision of Comfort Features	27
Figure PL50.1 Example of Designed Steps	27
Figure PL51.1 Example of Protection from Hazards	28
Figure PL52.1 Example of Very High Design Effort	28
Figure RC1.1 Example of a Moveable Non-Regular Obstacle	29
Figure RC18.1 Multiple Dropped Crossing Points	34
Figure RC19.1 Possible Crossing Width	34
Figure RC21.1 Refuge Island Types	35
Figure RC25.1 Measuring Crossing Length	36
Figure RC31.1 Measuring Road Crossing Cross Fall	38
Figure RC32.1 Measuring Footpath and Road Intersecting Gradient	38
Figure RC32.2 Footpath and Road Intersecting Gradient Diagram	39
Figure RC35.1 Examples of Road Crossing Tactile Paving	40

## PATH LENGTH (OPERATIONAL)

### PL1 Moveable Non-Regular Obstacles

<i>Measurement:</i>	1. Effective Width (m) 2. Location Option – kerb, centre, rear. 3. Cane Detectable Option – Yes, no
<i>Frequency:</i>	For each moveable non-regular obstacle, 10 Max.
<i>Special equipment:</i>	Tape measure or measuring wheel

PL1.1 Moveable non-regular obstacles restrict the Path Length typical effective width and can be anywhere up to 2.1m above the ground. They do not need to be grounded within the footpath and may protrude over the footpath.

PL1.2 Moveable non-regular obstacles are items that appear irregularly and are not fixed permanently to the footpath. This can include shop signs, shop furniture, cycles and any other items temporarily placed on the footpath as shown in **Figure PL 1.1**. Moveable non-regular obstacles on different sides of the path length are counted separately and moveable non-regular obstacles within 3m of each other on one side of the Path Length are counted as one.

**Figure PL1.1 Examples of Moveable Non-Regular Obstacles**



PL1.3 When measuring moveable non-regular obstacles that are located in the centre of the footpath measure the footpath width on either side of the obstacle. Add the two measurements together and record the total width.

PL1.4 Determine whether the moveable non-regular obstacle is cane detectable. Obstacles are cane detectable if a solid element of the item is within 150mm of the ground for its entire width or length.

### PL2 Hiding Places

<i>Measurement:</i>	Number (#)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL2.1 Places that a person could potentially use to hide or hover are considered security issues. This can include trees, bushes, buildings, bus stops or telephone boxes that a potential attacker could hide in without detection. Count the number of places in each Path Length that could be used as a hiding place.

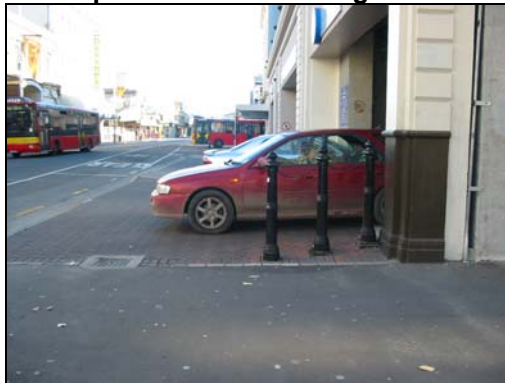
## PL3 Use of Access Ways

<i>Measurement:</i>	Rating select – Not Applicable, None, Low, Medium, High, Very high.
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL3.1 Record the use of the vehicle access ways, as shown in **Figure PL3.1** for each Path Length using the 6 point scale based on the following descriptions:

- Not Applicable There were no access ways in the Path Length
- None No vehicles observed using any of the access ways.
- Low 1 vehicle observed using any of the access ways
- Medium 2-3 vehicles observed using any of the access ways
- High 4 vehicles observed using any of the access ways
- Very High More than 5 vehicles observed using any of the access ways

**Figure PL3.1 Example of a Vehicle Using an Access Way**



## PL4 People Flow

<i>Measurement:</i>	1. Number (#) 2. Time (seconds)
<i>Frequency:</i>	Once at start of Path Length
<i>Special equipment:</i>	Counter and stop watch

PL4.1 People Flow records how many other users are on the Path Length while the Community Street Review participants are assessing the section, as shown in **Figure PL4.1**. At the start of each Path Length identify one of the Community Street Review participants and count the number of people that cross a screen line that moves with the chosen participant. Record the number of people that crossed the screen line and the time taken for the participant to travel the section. Do not include other Community Street Review participants; do include people walking and wheeled users.

**Figure PL4.1 People Flow**



## **PL5 Number of Wheeled Users**

<i>Measurement:</i>	Number (#)
<i>Frequency:</i>	Once at start of Path Length
<i>Special equipment:</i>	Counter

PL5.1 At the start of each Path Length and while counting People Flow (PL4) record the number of wheeled users including wheel chairs, people pushing prams and if on a shared path, cycles and small scooters that crossed the screen line.

## **PL6 Density of People**

<i>Measurement:</i>	Number (#)
<i>Frequency:</i>	Once at end of Path Length
<i>Special equipment:</i>	Counter

PL6.1 At the end of each Section count the number of people in the Section, excluding the Community Street Review participants.

## **PL7 Vehicle Speed**

<i>Measurement:</i>	Option – Not Applicable, Below, Same, Above,
<i>Frequency:</i>	Once
<i>Special equipment:</i>	From observation

PL7.1 Select an option that determines whether the actual vehicle speeds are generally, the same, above or below the posted speed limit. Select 'Not Applicable' if the Section does not have traffic lanes adjacent; e.g. pedestrian mall or if there were no vehicles on the road while the Community Street Review participants moved along the Section.

## PL8 Adjacent Traffic Flow

<i>Measurement:</i>	Number (#) Not Applicable
<i>Frequency:</i>	Once at start of Path Length
<i>Special equipment:</i>	Counter

PL8.1 Adjacent traffic flow includes only the traffic in the lane or lanes directly adjacent the Path Length. Count the number of vehicles, including heavy vehicles and motorbikes that cross the same moving screen line used for People Flow (PL4). Do not include lanes separated by a centre line, painted or solid median. Select 'Not Applicable' if the Section does not have traffic lanes adjacent; e.g. pedestrian mall.

## PL9 Number of Heavy Vehicles

<i>Measurement:</i>	Number (#) Not Applicable
<i>Frequency:</i>	Once at start of Path Length
<i>Special equipment:</i>	Counter

PL9.1 Count the number of heavy vehicles that cross the moving screen line while counting Adjacent Traffic Flow (PL8). Select 'Not Applicable' if the section does not have traffic lanes adjacent; e.g. pedestrian mall.

PL9.2 Vehicle classifications are detailed in the *Transit New Zealand Vehicle Classification Scheme (TNZ 1999)* included in **Appendix E**. Classes 1 and 2 define light vehicles and classes 3 to 13 define heavy vehicles.

## PL10 Use of On Street Parking

<i>Measurement:</i>	Rating select – not available, 0-25%, 25-50%, 50-75%, 75-100%, >100%
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL10.1 Determine the proportion of parked vehicles to total parking spaces as shown in **Figure PL10.1**. If parking is not possible select 'not available'.

**Figure PL10.1 Example of Use of On Street Parking**



## PL11 Deviation around Obstacles

<i>Measurement:</i>	Rating select – Not Applicable, None, Low, Medium, High, Very High
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL11.1 Sometimes obstacles can be located so as to create minimal deviation or alternatively they can be located whereby significant weaving or deviation is required. Record the general deviation from a straight line to the footpath where the deviation occurs.

Not Applicable	There were no obstacles
Very Low	Some obstacle deviation was required but it was minimal and almost insignificant.
Low	Obstacle deviation is between very low and medium
Medium	Obstacle Deviation was required that necessitated regular adjustment to journey.
High	Obstacle deviation is between medium and very high
Very High	Obstacle deviation was required that was awkward and required significant manoeuvrings.

## PL12 Source of Smells

<i>Measurement:</i>	Option Select – Factories, Vehicle Fumes, Food smells, Garden, Stagnant or Rotting, Neutral, Other (specify).
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL12.1 Smells or fumes can be caused by various sources such as traffic, factories and gardens. Select the general smell for each Path Length using the options listed.

## PL13 Litter

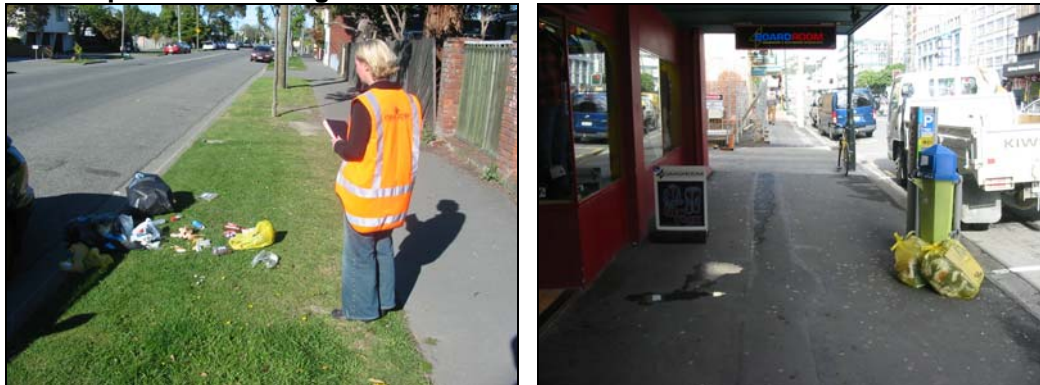
<i>Measurement:</i>	Rating Select – Very Low, Low, Moderate, High, Very High.
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL13.1 Record the amount of litter in each Path Length, as shown in **Figure PL13.1**, using the following scale and descriptions:

Very Low	No evidence of litter anywhere along the Path Length.
Low	The Path Length was between very low and moderate.
Moderate	There was the occasional item of litter along the Path Length.

- High The footpath was between moderate and very high.
- Very High There was often litter along the Path Length, this included large items such as abandoned cars. People had to manoeuvre around litter.

**Figure PL13.1 Examples of Path Length with Litter**



## PL14 Detritus

<i>Measurement:</i>	Rating Select – Very Low, Low, Moderate, High, Very High
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL14.1 Record the amount of detritus organic waste such as leaves, gravel, bark chips, for each Path Length using the following scale and descriptions:

- Very low The Path Length was completely clear of detritus.
- Low The Path Length had between very low and moderate detritus.
- Moderate There was some detritus on the Path Length although this was limited to small areas.
- High The Path Length had between moderate and very high detritus
- Very high There was a lot of detritus on the Path Length that covered large areas.

## PL15 Vandalism

<i>Measurement:</i>	Rating Select – Very Low, Low, Moderate, High, Very High
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL15.1 Vandalism can include items such as tagging and broken glass as shown in **Figure PL15.1**. Record the general level of vandalism in the Path Length using the following scale and descriptions:

- Very Low There was no vandalism, tagging or broken items along the Path Length.
- Low There was between very low and moderate vandalism.
- Moderate There was some vandalism, the occasional surface was tagged or

some items were broken along the Path Length

High There was between moderate and very high vandalism

Very High There was a lot of vandalism, many of the surfaces were tagged or items were broken along the Path Length.

**Figure PL15.1 Examples of Vandalism**



## PL16 Temporary Hazards

<i>Measurement:</i>	Option Select – None, Physically obstructive, Not physical but unpleasant, People congestion
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL16.1 Temporary obstructive hazards include utility or roading work, as shown in **Figure PL16.1**, dogs barking, cars parked over the footpath and any other items that would not usually be on the footpath. Select 'Physically obstructive' if the temporary hazard required deviation or 'Not physical but unpleasant' if say, the hazard didn't require deviation but the hazard was unpleasant such as a dog barking behind a fence.

**Figure PL16.1 Examples of Temporary Hazards**



## PL17 Weather

<i>Measurement:</i>	1. Raining? Option – Yes, no 2. Cloudy? Option – Yes, no 3. Windy? Option – Yes, no
<i>Frequency:</i>	Once at end of Path Length
<i>Special equipment:</i>	None

PL17.1 Observe the general weather conditions and select the appropriate options that best represent the conditions while the Path Length is being assessed by the Community Street Review participants.

## PL18 Humidity

<i>Measurement:</i>	Percentage (%)
<i>Frequency:</i>	Once at end of Path Length
<i>Special equipment:</i>	Humidity Meter

PL18.1 Humidity is measured as a percentage of Relative Humidity. A measurement is taken at the end of the Path Length as shown in **Figure PL18.1**.

**Figure PL18.1 Measuring Percentage Humidity Using a Multimeter**



## PL19 Temperature

<i>Measurement:</i>	Degrees Celsius (Deg C)
<i>Frequency:</i>	Once at end of Path Length
<i>Special equipment:</i>	Thermometer

PL19.1 Temperature is measured in degree Celsius using a thermometer at the end of the Path Length as shown in **Figure PL19.1**.

**Figure PL19.1 Measuring Temperature Using a Multimeter**



## PL20 Noise

<i>Measurement:</i>	1. Decibel (A) 2. Option: Music, vehicles, machinery (building site etc), people, other – please state
<i>Frequency:</i>	Once at end of Path Length
<i>Special equipment:</i>	Sound meter and stopwatch

PL20.1 Noise is measured in decibels using a sound meter. A measurement is taken at the end of each Path Length. Observe the sound meter for 10 seconds and record a typical decibel reading as shown in **Figure PL20.1**.

PL20.2 Select an option that best describes the source of noise along the path length.

**Figure PL20.1 Measuring Noise Using a Multimeter**



## PL21 Light

<i>Measurement:</i>	Lux (Lx)
<i>Frequency:</i>	Night time or in Underpass only. Once at end of Path Length
<i>Special equipment:</i>	Light meter

PL21.1 Light is measured in lux using a light meter as shown in **Figure PL21.1**. A spot measurement should be taken at the end of each Path Length, only if it is night time or if the section is in an underpass. Observe the light meter for 10 seconds and record a typical reading.



## PATH LENGTH (PHYSICAL)

### PL22 Land Use Classification

<i>Measurement:</i>	Option Select - Residential, Suburban shopping, Commercial retail, Commercial industrial, Industrial, Parklands, Rural, Other (specify).
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL22.1 Select the land use category that best describes the Path Length using the following descriptions:

Residential	The majority of land has residential houses, flats or apartments
Suburban shopping	The majority of land has non branded shopping and supports a residential community
Commercial retail	The majority of land has branded or large format retail stores or is a mall.
Commercial industrial	There is a mixture of large format retail stores and non-retail business activity.
Industrial	The majority of land has non-retail business activity
Parklands/rural	The majority of land is park or farmland
Other	The majority of the land does not fit the above categorisations – a notation field allows further commentary.

### PL23 Effective Width

<i>Measurement:</i>	Distance (m)
<i>Frequency:</i>	Start, as required (max 10)
<i>Special equipment:</i>	Tape measure or measuring wheel

PL23.1 Effective Width is the area of the footpath where walking normally takes place and is the area clear of obstacles and encroachments. Effective Width does not include areas that contain items such as trees, grass berms, seating, shop furniture, signs or any other items that intrude on the footpath through route. Always ignore any Moveable Non-Regular Obstacles (PL1), Regular Obstacles (PL24) or Permanent Non-Regular Obstacles (PL25) when measuring Effective Width as these will be measured when collecting other variable information.

PL23.2 A 'shy distance' should be added to buildings, signs, curbs and any other items adjacent or on the footpath. Shy distances reflect the space required around an object to effect negotiation and decrease effective width. Typical shy distances are:

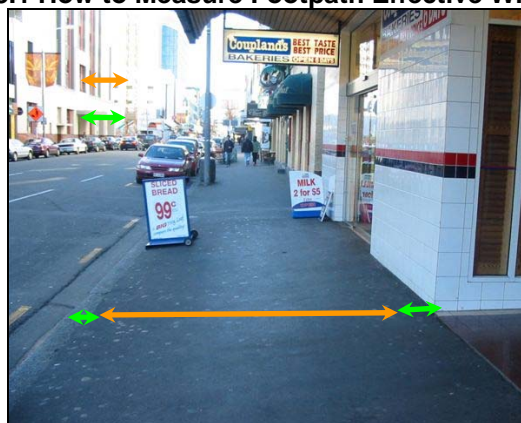
Sign Posts:	0.10m
Buildings	0.15m
Low Kerb ( $\leq 125\text{mm}$ )	0.05m
High Kerb ( $\geq 125\text{mm}$ )	0.15m

Tree Trunk	0.15m
Soft Foliage	0.05m
Grass verge	0.00m

PL23.3 Effective Width is measured at the start of the Path Length. Further measurements are taken at points along the section where the Effective Width has changed and only when the change has not been caused by an obstacle. Effective Width is measured at the same points as Cross Fall (PL36) and Longitudinal Gradient (PL37). When there is a change in one of these variables they are all measured at the same point in the Section, up to a maximum of 10 points. An estimate of the percentage of the Section that these measurements relate to is recorded.

PL23.4 An example of how to measure Effective Width is shown in **Figure PL23.1**. The orange line represents Effective Width and the green lines on either side illustrate 'shy distance'. Note that the shy distance adjacent the building is larger than the shy distance adjacent the kerb.

**Figure PL23.1 How to Measure Footpath Effective Width**



## PL24 Regular Obstacles

<i>Measurement:</i>	<ol style="list-style-type: none"> <li>1. Regular obstacle Option – parking meter, lamp column, veranda posts or other (specify)</li> <li>2. Number (#)</li> <li>3. Distance (m)</li> <li>4. Location Option – kerbside, centre, rear</li> <li>5. Cane detectable Option - yes/no</li> </ol>
<i>Frequency:</i>	For each regular obstacle, 5 Max.
<i>Special equipment:</i>	Tape measure or measuring wheel

PL24.1 Regular Obstacles restrict the Path Length typical Effective Width and can be anywhere up to 2.1m above the ground. They do not need to be grounded within the footpath and may protrude over the footpath.

PL24.2 Regular Obstacles are permanent items that occur at a regular frequency and are located in the same general area of the footpath, as shown in **Figure 24.1**, such as parking meters, lamp columns or street signs.

- PL24.3 Select the type of Regular Obstacle from the options; parking meter, lamp column, veranda post or other (state item). Record the number of obstacles in the Path Length, their typical location i.e. kerb, centre or rear of footpath and measure the typical Path Length effective width at the regular obstacle position.
- PL24.4 Determine whether the Regular Obstacle is cane detectable. Obstacles are cane detectable if an element of the item is within 150mm of the ground for its entire width or length.

**Figure PL24.1 Examples of Regular Obstacles**



## PL25 Permanent Non-Regular Obstacles

<i>Measurement:</i>	<ol style="list-style-type: none"> <li>1. Distance (m)</li> <li>2. Location Option – kerb, centre, rear, (select all that apply).</li> <li>3. Cane Detectable Option – Yes, no</li> </ol>
<i>Frequency:</i>	For each non regular obstacle, 10 Max.
<i>Special equipment:</i>	Tape measure or measuring wheel

- PL25.1 Permanent Non-Regular Obstacles restrict the Path Length typical Effective Width and can be anywhere up to 2.1m above the ground. They do not need to be grounded within the footpath and may protrude over the footpath.
- PL25.2 Permanent Non-Regular Obstacles are items that appear irregularly and are fixed permanently to the footpath, wall or post. This can include seats, rubbish bins, bus stops, post boxes and any other items that can not be moved.
- PL25.3 Measure the Effective Width at each Permanent Non-Regular Obstacles. Two Permanent Non-Regular Obstacles directly opposite on the footpath are included as one measurement and the options 'kerb' and 'rear' are selected, as shown in **Figure PL25.1**. In this case, the Effective Width measurement is the footpath distance between the two obstacles. Permanent Non-Regular Obstacles within 3m of each other on one side of the Path Length are counted as one obstacle.
- PL25.4 When Permanent Non-Regular Obstacles are located in the middle of the footpath, measure the distance on either side of the obstacle and add these measurements together to determine the Effective Width. A Permanent Non-Regular Obstacle is not considered to be in the middle of the footpath if the Effective Width on one side of the obstacle is <1.2m.

PL25.5 Determine whether the Permanent Non-Regular Obstacle is cane detectable. Obstacles are cane detectable if an element of the item is within 150mm of the ground for its entire width or length.

**Figure PL25.1 Examples of Permanent Non-Regular Obstacles**



Both obstacles are within 3m of each other and are counted as one obstacle



Both obstacles are within 3m of each other and are counted as one obstacle



The obstacle is located on both the kerb and rear of the footpath and is counted as one obstacle

## PL26 Deviation from Desire Line

<i>Measurement:</i>	Distance (m)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL26.1 Sometimes the Path Length will not follow the natural walking desire line. Measure the lateral displacement from a point at the start and end of the desire lines to the deviated Path Length as shown in **Figure PL26.1**.

**Figure PL26.1 Example of Deviation from Desire Line**



## PL27 Road Width

<i>Measurement:</i>	Distance (m)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	From records

PL27.1 Extract the Road Width for the Path Length from aerial photographs or cadastral information.

## PL28 Posted Speed Limit

<i>Measurement:</i>	Speed Limit (km/hr)
<i>Frequency:</i>	Once at start of Path Length
<i>Special equipment:</i>	From records

PL28.1 Record the posted speed limit for each Section.

## PL29 Street Activity

<i>Measurement:</i>	Rating select – Very low, Low, Medium, High, Very high.
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL29.1 The level of street activity is typically dependent on the adjacent land use. Street activity does not include the activity of people moving through the Path Length at the time of observation; it refers to the potential activity of the street based on adjacent land use. Rate the street activity relevant to the adjacent land use for each Path Length using the scale and descriptions below.

- Very Low Land use includes blank walls, car parks, residential housing and few people mingling or participating in the Path Length
- Low Street activity is between very low and medium
- Medium Activities that are interesting but that do not promote much people activity such as office buildings
- High Street activity is between medium and very high

Very High Shop frontages, outdoor dining areas, street theatre and a large number of people potentially mingling or participating in the Path Length.

## PL30 Height of Adjacent Buildings

<i>Measurement:</i>	1. Building Height Number (#) 2. Building Setback from footpath (m)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL30.1 Record the typical number of storeys for the buildings adjacent the footpath for each Path Length. Estimate the distance the buildings are setback from the nearest footpath edge.

## PL31 Building Veranda

<i>Measurement:</i>	1. Type Option – Continuous, Broken, Absent 2. Visibility Option – Solid, Transparent
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL31.1 Record whether the buildings adjacent the footpath generally have a veranda and select from the options below:

Continuous The veranda is continuous if all buildings along the Section have a veranda and it is broken only between buildings.

Broken The veranda is broken if some buildings along the Section have a veranda.

Absent The veranda is absent if no buildings along the Section have a veranda.

PL31.2 Select whether the veranda is transparent, generally clear and can be seen through, or is solid for the section.

## PL32 Height of Opposite Buildings

<i>Measurement:</i>	1. Building Height Number (#) 2. Distance (m)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL32.1 Record the typical number of storeys for the buildings on the opposite side of the road for each Path Length. Estimate the distance the buildings are setback from the footpath edge.

## PL33 Surface Type

<i>Measurement:</i>	Option – Concrete, Asphalt, Natural stone, Cobbles, Masonry, Artificial Stone Paving (ASP), Exposed aggregate, Track, Chip Seal, Other
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL33.1 A variety of surface materials can be used to construct footpaths. Select the appropriate surface materials for each Path Length from the list as shown in **Figure PL33.1**. Often a section will include a variety of materials, select all material types that are used in the section and include approximate percentage coverage for each material. For example a section may be 50% asphalt, 10% cobbles and 40% artificial stone paving.

**Figure PL33.1 Footpath Materials**



## PL34 Footpath Condition

<i>Measurement:</i>	Rating Select – Very bad, Bad, Moderate, Good, Very good.
<i>Frequency:</i>	Once
<i>Special Equipment:</i>	None

PL34.1 The overall condition of the footpath relates to whether it is in need of repair or maintenance. Record the general footpath condition for the section using the 5 point scale based on the following descriptions:

**Very Bad** A large number of bumps, cracks, holes, weeds or overgrown vegetation e.g. tree roots protruding through surface or creating bumps, the 'rocking' of pavers, significant weeds and or significant potholes.

**Bad** A footpath that displays characteristics between very bad and moderate

Moderate	Some bumps, cracks, holes weeds or overgrown vegetation e.g. some elements of a bad footpath but not many.
Good	A footpath between moderate and very good.
Very Good	Very few bumps, cracks, holes, weeds or overgrown vegetation e.g. generally smooth, no broken pavers, no potholes.

## PL35 Area Adjacent Footpath

<i>Measurement:</i>	1. Walkable Option – Yes, No 2. Footpath Side Option: Kerb, Rear, Both
<i>Frequency:</i>	Start, as required(10 max)
<i>Special equipment:</i>	None

PL35.1 Footpaths are bordered by a variety of uses including grass berms, buildings, fences, gardens, roadways, parks and water ways. Determine whether the area adjacent the footpath is walkable. A walkable surface should be at the same height as the footpath, flat and firm and at least 3 metres long.

PL35.2 Area Adjacent Footpath is recorded at the start of the Path Length and at each point when Effective Width (PL23), Cross Fall (PL36) and Longitudinal Gradient (PL37) are measured. Select 'yes' if the area adjacent the footpath is walkable and record whether this is on the kerb, rear or both sides of the footpath.

## PL36 Cross Fall

<i>Measurement:</i>	Gradient (%)
<i>Frequency:</i>	Start, as required (10 max)
<i>Special equipment:</i>	smart level or calibrated wedge

PL36.1 Footpath Cross Fall is the slope of the footpath at right angles to the direction of travel. Some Cross Fall is required for drainage, but excessive Cross Fall requires people to use extra energy to resist the perpendicular forces.

PL36.2 Cross Fall is measured at the start of the Path Length and at any point during where there is a significant change in Cross Fall. It is also measured at the same points as Effective Width (PL23) and Longitudinal Gradient (PL37). When there is a change in one of these variables they are all measured at the same point in the section, up to a maximum of 10 points. An estimate of the percentage of the section that these measurements relate to is recorded.

PL36.3 Cross fall is measured using a smart level or calibrated wedge as shown in **Figure PL36.1**. The instrument is aligned perpendicular to the direction of travel. Readings are taken from the building towards the kerb i.e. a downwards slope from the building to the kerb is recorded as a negative percentage, an upwards slope is recorded as a positive percentage.

Figure PL36.1 Example of Measuring Cross Fall



## PL37 Longitudinal Gradient

<i>Measurement:</i>	Gradient (%)
<i>Frequency:</i>	Start, as required (10 max)
<i>Special equipment:</i>	Smart level or calibrated wedge

- PL37.1 Longitudinal Gradient is the slope parallel to the direction of travel. The slope can be in an uphill or downhill direction. Longitudinal Gradient is measured at the start of the Path Length and at any point during where there is a significant change in Longitudinal Gradient. It is measured at the same points as Effective Width (PL23) and Cross Fall (PL36). When there is a change in one of these variables they are all measured at the same point in the section, up to a maximum of 10 points. An estimate of the percentage of the section that these measurements relate to is recorded.
- PL37.2 A section should not include positive and negative gradients, rather only one or the other. Longitudinal Gradient is measured using a smart level or calibrated wedge. The instrument is placed in the centre of the Effective Width parallel with the direction of travel as shown in **Figure PL37.1**.
- PL37.3 Readings are taken from north to south and east to west i.e. a downwards slope from north to south is recorded as a negative percentage, an upwards slope is recorded as a positive percentage and similarly for measurements from east to west.

Figure PL37.1 Measuring Longitudinal Gradient



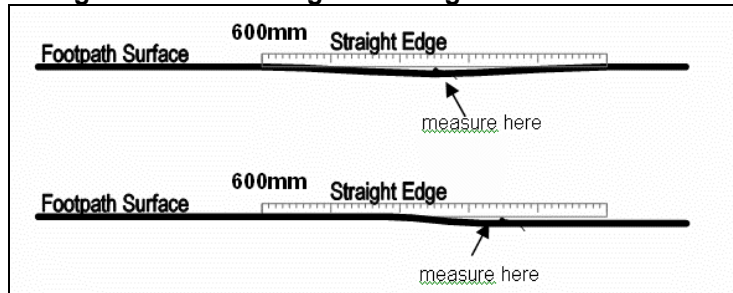
## PL38 Stumbling Hazards

<i>Measurement:</i>	Distance per 600mm (mm)
<i>Frequency:</i>	Start, as required (10 max)
<i>Special equipment:</i>	Smart level and small ruler

PL38.1 All surfaces on which pedestrians walk should be firm, stable and slip resistant even when wet.

PL38.2 Using a 600mm level as the straight edge, place it parallel to the direction of travel in the centre of the Effective Width (PL23) as shown in **Figure PL38.1**. Stumbling Hazard is measured at the start of the Path Length and at each point along the footpath where the surface could cause a stumbling hazard, up to a maximum of 10 measurements for each Path Length. Use the small ruler to measure any difference in the footpath surface level along the length of the straight edge as shown in **Figure PL38.2**. Record any measurements greater than 6mm.

**Figure PL38.1 Diagram for Measuring Stumbling Hazards**



**Figure PL38.2 Example of How to Measure Stumbling Hazards**



## PL39 Trip Hazard

<i>Measurement:</i>	Height (mm)
<i>Frequency:</i>	At each Trip Hazard (Max 10 worst)
<i>Special equipment:</i>	Small ruler

PL39.1 A Trip Hazard is a sudden change in the footpath surface that has the potential to cause pedestrians to fall or trip. A Trip Hazard is defined as a vertical change in the surface that is either sunken or protruding from the footpath. Record all Trip Hazards for each Section and measure the height of each hazard if greater than 6mm.

## PL40 Provision of Tactile Aids

<i>Measurement:</i>	1. Does the Section have tactile paving or Visual Aids? Option – Yes, No 2. Do they warn of stepping into a hazard? Option – Yes, No 3. Do they give directional cues by pointing people in the correct direction to cross the road? Option – Yes, No 4. Do they direct towards a crossing point by having a long 'tail' of paving that helps people find the crossing? Option – Yes, No 5. Are they correctly installed? Option – Yes, No
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL40.1 Visually impaired people often use texture as a way-finding cue, including tactile paving as shown in **Figure PL40.1**. Tactile paving is an area of texture that can be easily felt under foot such as corduroy or blister paving. It is typically found at intersections to alert the visually impaired they are approaching a crossing and is also installed to warn of other hazards or information.

PL40.2 Record the options to each question that best describes the Provision of Tactile Aids along the Path Length.

**Figure PL40.1 Example of Tactile Paving on a Path Length**



## PL41 Provision for On Street Parking

<i>Measurement:</i>	Option – Yes, No
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL41.1 On Street Parking includes marked and unmarked parking areas and parallel or angle parking. An example of on-street angle parking is shown in **Figure PL41.1**. Record whether there is Provision for On-Street Parking along the Path Length.

**Figure PL41.1 Example of Provided On Street Parking**



## PL42 Distance from Moving Vehicles

<i>Measurement:</i>	Distance (m)
<i>Frequency:</i>	Once at centre of Path Length
<i>Special equipment:</i>	Tape measure/measuring wheel

PL42.1 Measure the distance from the edge of the footpath to the edge of the nearest traffic lane as shown in **Figure PL42.1**. If the road has provision for on street parking include the parking area in the measurement. The measurement will go either to edge of the marked parking or if unmarked, to where you would expect the traffic lane to start. For parallel parking typically allow 3 metres from the curb to the start of the traffic lane and for angle parking typically allow 5 metres. Record the measurement once in the centre of the Section.

**Figure PL42.1 Measuring Distance to Nearest Traffic Lane**



## PL43 Vehicle Access Ways

<i>Measurement:</i>	Number (#)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL43.1 Count the number of vehicle access ways for each Path Length. Access ways include residential driveways, commercial entrances and access to delivery and parking areas, an example is shown in **Figure PL43.1**. Record the number of access ways for the Path Length.

Figure PL43.1 Vehicle Access Way



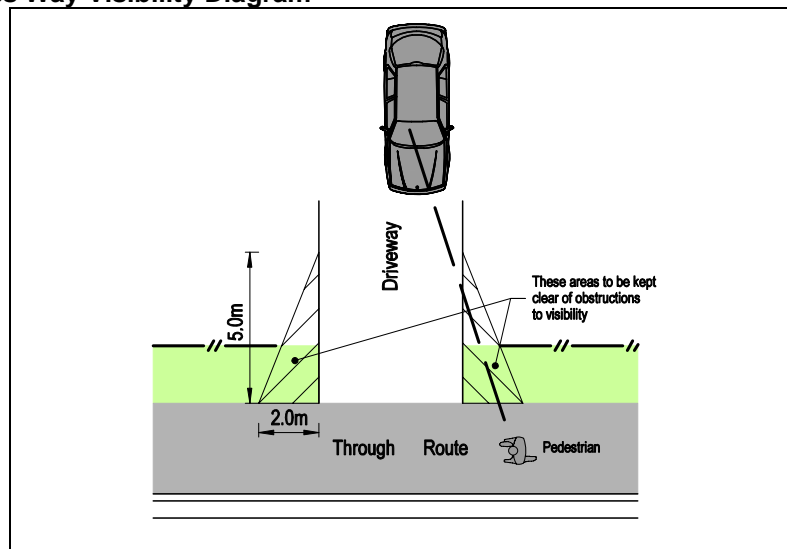
## PL44 Visibility to Vehicle Access Ways

<i>Measurement:</i>	Rating – Not Applicable, Very bad, Bad, Average, Good, Very Good
<i>Frequency:</i>	Once
<i>Special equipment:</i>	Tape measure or measuring wheel

PL44.1 Vehicle access ways have varying levels of intervisibility between motorists and walkers. The diagram in **Figure PL44.1** details the required ‘clear zone’ required on either side of a Vehicle Access Way to allow clear visibility for both driver and pedestrian. An example of very bad visibility to a Vehicle Access Way is shown in **Figure PL44.2**. Using the ‘clear zone’ measurements select the general Access Way Visibility for the Path Length using the following scale and descriptions:

- N/A There are no vehicle access ways for the section.
- Very Bad None of the access ways exhibit a clear zone.
- Bad The vehicle access ways are between very bad and poor
- Average Some of the access ways exhibit a clear zone.
- Good The vehicle access ways are between average and very good
- Very Good All of the access ways exhibit a clear zone.

Figure PL44.1 Access Way Visibility Diagram



**Figure PL44.2 Example of Access Way Visibility**



## PL45 Shared Path

<i>Measurement:</i>	1. Shared Path Option – Yes, No 2. Transport Mode Option – Cycle, Tram/Bus, Other (specify)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL45.1 A shared path can be used by a range of transport modes including pedestrians, cyclists and small wheeled vehicle users, buses or trams, examples are shown in **Figure PL45.1**. The paths can be either marked with a centre line, logos and other pavement markings or unmarked and identified simply by a sign. Record whether each Path Length is a shared path and indicate the other transport modes that can use the path.

**Figure PL45.1 Examples of Shared Paths**



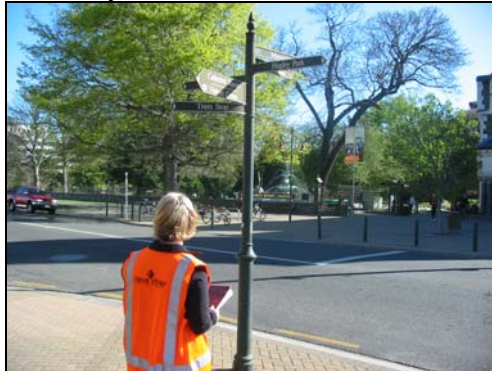
## PL46 Directional Information

<i>Measurement:</i>	Signage Rating – Nil, Very poor, Poor, Good, Very Good
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL46.1 Directional Information can vary in quality, an example of Directional Information is shown in **Figure PL46.1**. Record the quality of directional information for each Path Length using the following scale and descriptions:

Nil	There was no directional information provided.
Very Poor	The signs were pointing in the wrong direction and were not legible
Poor	The signs only included street names or were vague and not specific.
Good	The signs included directions to community services and areas of interest.
Very Good	The signs provided a detailed map of where I was in relation to other community services and areas of interest areas including travel times.

**Figure PL46.1 Example of Directional Information**



## PL47 Quantity of Greenery

<i>Measurement:</i>	Greenery Rating – Nil, Small, Medium, Large, Very Large
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL47.1 Record the Quantity of Greenery for each Path Length using the following scale and descriptions:

Nil	No greenery or planting.
Small	Limited gardens such as hanging pots, small planter box or trees planted without surrounding grassed areas.
Medium	Includes grass verges adjacent the footpath and large planter boxes.

- Large Small reserves, residential front lawns (without fences) or large landscaped garden areas included within the streetscape design.
- Very large Large recreational or leisure park.

## PL48 Provision of Utility Features

<i>Measurement:</i>	1. Facilities Available Option – Yes, No 2. Number (#)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL48.1 Utility features include items such as bus stops, telephone booths, rubbish bins and bank ATM machines. Some examples are shown in **Figure PL48.1**. Record whether each Path Length has utility features and the number of utility features supplied.

**Figure PL48.1 Provision of Utility Features**



## PL49 Provision of Comfort Features

<i>Measurement:</i>	1. Facilities Available Option – Yes, No 2. Number (#)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL49.1 Comfort features include items such as seating, as shown in **Figure 49.1**, drinking fountains and shelter such as shade sails or verandas. Record whether each Path Length has comfort features and the number of comfort features supplied.

PL49.2

**Figure PL49.1 Provision of Comfort Features**



## PL50 Designed Steps

<i>Measurement:</i>	1. Number (#) 2. Height (mm)
<i>Frequency:</i>	As required (3 max)
<i>Special equipment:</i>	Small ruler

PL50.1 Steps are identified by a sudden vertical change, up or down, and are distinguishable from a Trip Hazard as they are designed and included as part of the walking environment as shown in **Figure PL50.1**. Record the number of steps and their average height for each set of steps up to a maximum of 3 for each Path Length

**Figure PL50.1 Example of Designed Steps**



## PL51 Protection from Hazards

<i>Measurement:</i>	Hazard Protection Option – Yes, No
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL51.1 Hazard protection includes physical barriers to potential hazards such as handrails and fencing, as shown in **Figure PL51.1**. For each Path Length record whether there are any hazard protection features.

**Figure PL51.1 Example of Protection from Hazards**



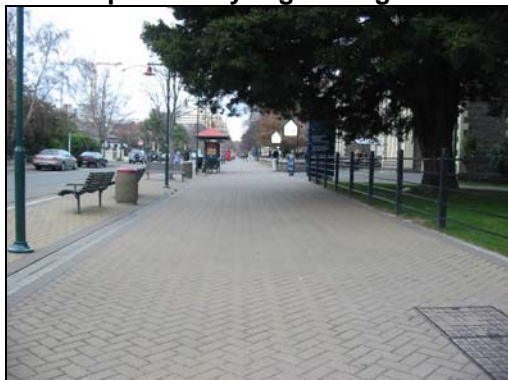
## PL52 Design Effort

<i>Measurement:</i>	Rating – Not designed, very low, low, medium, high, very high
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

PL52.1 Design Effort relates to physical items that make the streetscape look nice and are more than just functional, as shown in **Figure PL52.1**. This includes landscaping and art that makes the environment more pleasant to interact. Record the design effort of the streetscape for each Path Length using the following scale and descriptions:

Not designed	The footpath length has not been specifically designed as a footpath.
Very Low	No landscape or urban design elements have been applied to the streetscape, the area is purely functional
Low	The design effort is between very low and medium
Medium	Landscape architecture elements have been applied to some of the streetscape. This can include gardens, cobblestones and seating but is unlikely to include art.
High	The design effort is between medium and very high
Very High	Landscape architecture elements have been applied to the entire streetscape. This can include gardens, cobblestones, seating, art, water features and other items

**Figure PL52.1 Example of Very High Design Effort**



## ROAD CROSSING (OPERATIONAL)

### RC1 Moveable Non-Regular Obstacles

<i>Measurement:</i>	1. Effective Width(m) 2. Location Option –Centre or edge. 3. Cane Detectable Option – Yes, no
<i>Frequency:</i>	For each obstacle, 10 Max.
<i>Special equipment:</i>	Tape measure or measuring wheel

RC1.1 Measured similar to Path Length Moveable Non-Regular Obstacles (PL1). An example of a Road Crossing Moveable Non-Regular Obstacle is shown in **Figure RC1.1**.

**Figure RC1.1 Example of a Moveable Non-Regular Obstacle**



### RC2 People flow

<i>Measurement:</i>	1. Number (#) 2. Time (seconds)
<i>Frequency:</i>	Once at start of Road Crossing
<i>Special equipment:</i>	Counter and stop watch

RC2.1 Measured similar to Path Length People Flow (PL4).

### RC3 Number of Wheeled Users

<i>Measurement:</i>	Number (#)
<i>Frequency:</i>	Once at start of Road Crossing
<i>Special equipment:</i>	Counter

RC3.1 Measured similar to Path Length Number of Wheeled Users (PL5).

## RC4 Density of People

<i>Measurement:</i>	Number (#)
<i>Frequency:</i>	Once at end of Road Crossing
<i>Special equipment:</i>	None

RC4.1 Measured similar to Path Length Density of People (PL6).

## RC5 Vehicle Speed

<i>Measurement:</i>	1. Generally Option – Not Applicable, Above, Same, Below
<i>Frequency:</i>	Once at start of Road Crossing
<i>Special equipment:</i>	From observation

RC5.1 Measured similar to Path Length Vehicle Speed (PL7).

## RC6 Deviation Around Obstacles

<i>Measurement:</i>	Rating select – not available, None, Low, Medium, High, Very High
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC6.1 Measured similar to Path Length Deviation around Obstacles (PL11).

## RC7 Source of Smells

<i>Measurement:</i>	Option Select – Factories, Vehicle Fumes, Food smells, Garden, Stagnant or Rotting, Neutral, Other (specify).
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC7.1 Measured similar to Path Length Smells (PL12).

## RC8 Litter

<i>Measurement:</i>	Rating Select – Very Low, Low, Moderate, High, Very High.
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC8.1 Measured similar to Path Length Litter (PL13).

## RC9 Detritus

<i>Measurement:</i>	Rating Select – Very Low, Low, Moderate, High, Very High.
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC9.1 Measured similar to Path Length Detritus (PL14).

## RC10 Vandalism

<i>Measurement:</i>	Rating Select – Very Low, Low, Moderate, High, Very High
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC10.1 Measured similar to Path Length Vandalism (PL15).

## RC11 Temporary Hazards

<i>Measurement:</i>	Option Select – None, Physically obstructive, Not physical but unpleasant, People congestion
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC11.1 Measured similar to Path Length Temporary Hazards (PL16).

## RC12 Weather

<i>Measurement:</i>	1. Raining? Option – Yes, no 2. Cloudy? Option – Yes, no 3. Windy? Option – Yes, no
<i>Frequency:</i>	Once at end of Road Crossing
<i>Special equipment:</i>	None

RC12.1 Measured similar to Path Length Weather (PL17).

## RC13 Humidity

<i>Measurement:</i>	Percentage (%)
<i>Frequency:</i>	Once at end of Road Crossing
<i>Special equipment:</i>	Humidity Meter

RC13.1 Measured similar to Path Length Humidity (PL18).

## RC14 Temperature

<i>Measurement:</i>	Degrees Celsius (Deg C)
<i>Frequency:</i>	Once at end of Road Crossing
<i>Special equipment:</i>	Thermometer

RC14.1 Measured similar to Path Length Temperature (PL19).

## RC15 Noise

<i>Measurement:</i>	Decibel DB(A) Option: Music, vehicles, machinery (building site etc), people, other – please state
<i>Frequency:</i>	Once at end of Road Crossing
<i>Special equipment:</i>	Sound meter and stopwatch

RC15.1 Measured similar to Path Length Noise (PL20).

## RC16 Light

<i>Measurement:</i>	Lux (Lx)
<i>Frequency:</i>	Night time or in Underpass only. Once at end of Path Length
<i>Special equipment:</i>	Light meter

RC16.1 Measured similar to Path Length Light (PL21).

## ROAD CROSSING (PHYSICAL)

### RC17 Land Use Classification

<i>Measurement:</i>	Land Use Type Option - Residential, Suburban shopping, Commercial retail, Commercial Industrial, Industrial, Parklands, Rural, Other (specify).
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC17.1 Select the land use category that best describes the land surrounding each Road Crossing using the following descriptions:

Residential	The majority of land has residential houses, flats or apartments
Suburban shopping	The majority of land has non branded shopping and supports a residential community
Commercial retail	The majority of land has branded or large format retail stores or is a mall.  There is a mixture of large format retail stores and non-retail business activity.
Industrial	The majority of land has non-retail business activity
Parklands/rural	The majority of land is park or farmland
Other	The majority of the land does not fit the above categorisations – a notation field allows further commentary.

### RC18 Effective Width

<i>Measurement:</i>	Distance (m)
<i>Frequency:</i>	Kerb, Island start, Middle, Island finish, Kerb
<i>Special equipment:</i>	Tape measure or measuring wheel

RC18.1 Measured similar to Path Length Effective Width (PL23).

RC18.2 Each road crossing will have up to five effective width measurements, once at the start of the crossing, secondly at the start of any central island, thirdly in the centre of the island, fourth at the exit of the centre island and finally at the other side of the road crossing. The second, third and fourth measurements will only be recorded if the road crossing has a central island.

RC18.3 At some crossings there may be more than one dropped crossing point as shown in **Figure RC18.1**. In this case collect the data for the best example from the dropped crossings available.

Figure RC18.1 Multiple Dropped Crossing Points



RC18.4 Effective Width for a road crossing will typically be less than the dropped crossing distance because effective width is measured perpendicular to the direction of travel and dropped crossings often extend around the radii of a corner crossing.

## RC19 Possible Crossing Width

<i>Measurement:</i>	Distance (m)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	Tape measure or measuring wheel

RC19.1 Often the Possible Crossing Width when travelling on the road is different to the crossing Effective Width (RC18) as measured at the kerb or island. Measure the Possible Crossing Width once that is reflective of the actual width available when crossing the road. This could be defined by crossing lines painted on the road or could be restricted by vehicle stopping points as shown in **Figure RC19.1**.

Figure RC19.1 Possible Crossing Width



## RC20 Crossing Control Type

<i>Measurement:</i>	Option Traffic lights, Zebra crossing, uncontrolled
<i>Frequency:</i>	Once
<i>Special Equipment:</i>	None

RC20.1 Record the type of road crossing control used for each Road Crossing.

## RC21 Type of Refuge Island

<i>Measurement:</i>	Option Sheep Pen, Angular, Straight, None
<i>Frequency:</i>	Once
<i>Special Equipment:</i>	None

**RC21.1** Record the type of Refuge Island for each road crossing from the list shown in **Figure RC21.1**.

**Figure RC21.1 Refuge Island Types**



Sheep Pen



Angular



Straight



None

## RC22 Footpath Condition

<i>Measurement:</i>	Rating Select – Very bad, Bad, Moderate, Good, Very good.
<i>Frequency:</i>	Once
<i>Special Equipment:</i>	None

**RC22.1** Measured similar to Path Length Footpath Condition (PL34). Consider the Road Crossing entry and exit footpath and refuge island only. Do not include the road surface condition.

## RC23 Road Condition

<i>Measurement:</i>	Rating Select – Very bad, Bad, Moderate, Good, Very good.
<i>Frequency:</i>	Once
<i>Special Equipment:</i>	None

**RC23.1** Measured similar to Path Length Footpath Condition (PL34). Consider the road surface only. Do not include any refuge island or footpath area.

## RC24 Number of Crossing Lanes

<i>Measurement:</i>	1. Number of vehicle lanes(#) 2. Number of cycle lanes(#)
<i>Frequency:</i>	Once
<i>Special Equipment:</i>	None

RC24.1 Record the number of vehicle lanes including bus or tram lanes and cycle lanes crossed for each Road Crossing.

## RC25 Crossing Length

<i>Measurement:</i>	Distance (m)
<i>Frequency:</i>	Once
<i>Special Equipment:</i>	Measuring wheel

RC25.1 Using the measuring wheel measure the road crossing length from kerb to kerb. When measuring sheep pen style crossings include the refuge island distance in the measurement as shown in **Figure RC25.1**.

**Figure RC25.1 Measuring Crossing Length**



## RC26 Deviation from Desire Line

<i>Measurement:</i>	Distance (m)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC26.1 Measured similar to Path Length Deviation from Desire Line (PL26).

## RC27 Posted Speed Limit

<i>Measurement:</i>	Speed Limit (km/hr)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	From records and observation

RC27.1 Measured similar to Path Length Posted Speed Limit (PL28).

## RC28 Permanent Non-Regular Obstacles

<i>Measurement:</i>	1. Effective Width (m) 2. Centre, Edge 3. Cane Detectable Option – Yes, no
<i>Frequency:</i>	For each obstacle, 10 Max.
<i>Special equipment:</i>	Tape measure or measuring wheel

RC28.1 Measured similar to Path Length Permanent Non-Regular Obstacles (PL25).

## RC29 Refuge Island Surface Type

<i>Measurement:</i>	1. Refuge Island Option - Yes, No 2. If Yes Option – Concrete, Asphalt, Natural stone, Cobbles, Masonry, Artificial Stone Paving (ASP), Exposed aggregate, Track, Chip Seal, Other
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC29.1 Measured similar to Path Length Surface Type (PL33) but for refuge island if available.

## RC30 Road Surface Type

<i>Measurement:</i>	Option – Concrete, Asphalt, Natural stone, Cobbles, Masonry, Artificial Stone Paving (ASP), Exposed aggregate, Track, Chip Seal, Other
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC30.1 Measured similar to Path Length Surface Type (PL33) but for road surface.

## RC31 Cross Fall

<i>Measurement:</i>	Gradient (%)
<i>Frequency:</i>	Kerb, Island start, Middle, Island finish, Kerb
<i>Special Equipment:</i>	Smart level or calibrated wedge

RC31.1 Road Crossing Cross Fall is the slope of the Road Crossing or roadway at right angles to the direction of travel and is measured similar to Path Length Cross Fall (PL36). Cross Fall is measured at the same time as the Road Crossing Effective Width (RC18) although if there is no central island a separate measurement is taken in the middle of the Road Crossing as shown in **Figure RC31.1**.

**Figure RC31.1 Measuring Road Crossing Cross Fall**



## RC32 Footpath and Road Intersecting Gradient

<i>Measurement:</i>	<ol style="list-style-type: none"> <li>1. Dropped Crossing? Option Yes, No</li> <li>2. Height (mm)</li> <li>3. Gradient (%)</li> <li>4. Gradient (%)</li> </ol>
<i>Frequency:</i>	Entry Kerb, Exit Kerb
<i>Special equipment:</i>	Smart level or calibrated wedge

RC32.1 The footpath and road intersecting gradient is the worst footpath and worst road angle measured parallel to the direction of travel as shown in **Figure RC32.1**. The gradients can be in an uphill or downhill direction and are measured at the same locations as Effective Width (RC18). The length that the slope must exist for should be greater than 100mm when measured horizontally from the centre of a 320mm diameter wheel (the same size as a large Trumeter measuring wheel) as illustrated in the diagram in **Figure RC32.2**.

RC32.2 Readings are taken from the footpath towards the road i.e. a downwards slope from the footpath to the road is recorded as a negative percentage, an upwards slope is recorded as a positive percentage. A maximum of four readings are taken, 2 for each section of the Road Crossing at the best available crossing point.

**Figure RC32.1 Measuring Footpath and Road Intersecting Gradient**

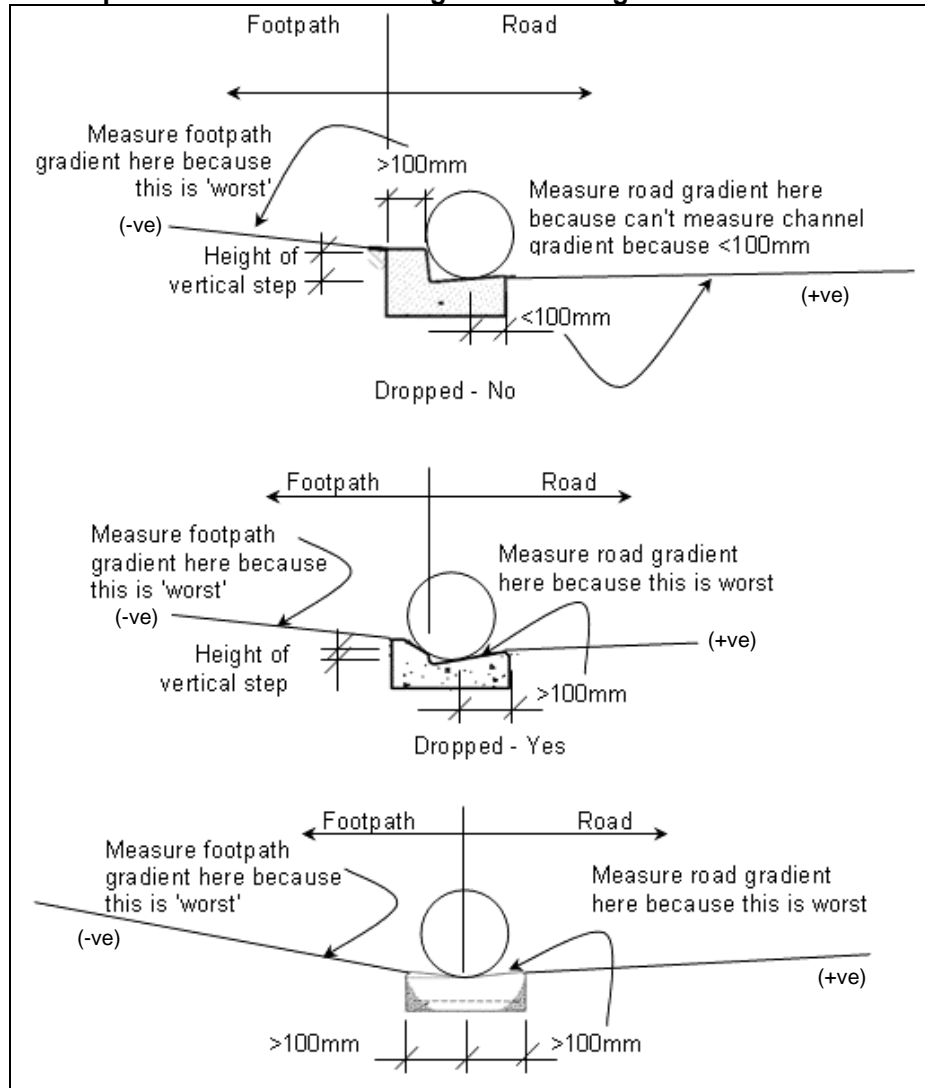


Measuring footpath gradient



Measuring road gradient

**Figure RC32.2 Footpath and Road Intersecting Gradient Diagram**



## RC33 Stumbling Hazards

<i>Measurement:</i>	Distance per 600mm (mm)
<i>Frequency:</i>	At each Hazard (Max 10 worst)
<i>Special equipment:</i>	Smart level and small ruler

RC33.1 Measured similar to Path Length Stumbling Hazard (PL38). Measure Stumbling Hazards on the Road Crossing footpath or refuge island only. Do not measure Stumbling Hazards in the roadway.

## RC34 Trip Hazards

<i>Measurement:</i>	Height (mm)
<i>Frequency:</i>	At each Trip Hazard (Max 10 worst)
<i>Special equipment:</i>	Small ruler

RC34.1 Measured similar to Path Length Trip Hazard (PL39). Measure Trip Hazards on the Road Crossing footpath or refuge island only. Do not measure Trip Hazards in the roadway.

## RC35 Provision of Tactile Aids

<i>Measurement:</i>	1. Does the Section have Tactile Paving or Visual Aids? Option – Yes, No 2. Do they warn of stepping into a hazard? Option – Yes, No 3. Do they give directional cues by pointing people in the correct direction to cross the road? Option – Yes, No 4. Do they direct towards a crossing point by having a long 'tail' of paving that helps people find the crossing? Option – Yes, No 5. Are they correctly installed? Option – Yes, No
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC35.1 Measured similar to Path Length Provision of Tactile Aids (PL40). Examples of Road Crossing Tactile Paving are shown in **Figure RC35.1**.

**Figure RC35.1 Examples of Road Crossing Tactile Paving**



## RC36 Odd Vehicle Approach Direction

<i>Measurement:</i>	Odd Direction? Option – Yes, No
<i>Frequency:</i>	Once
<i>Special Equipment:</i>	None

RC36.1 When crossing a road it is natural for people to expect traffic in the lane closest to them to be approaching from the right. In some situations traffic will approach from a different direction such as one-way streets. Record whether traffic is approaching the road crossing in a different direction than anticipated or at an odd angle.

## RC37 Visibility of Approaching Traffic

<i>Measurement:</i>	Visibility Rating – Very bad, Bad, Average, Good, Very good
<i>Frequency:</i>	Once for each crossing direction (max 2)
<i>Special Equipment:</i>	None

RC37.1 The visibility to approaching vehicles is important when considering the safety of the Road Crossing. Record the Visibility of Approaching Traffic for each Road Crossing using the rating descriptions below:

- Very Bad The Road Crossing provides limited visibility.
- Bad The visibility is between very bad and average
- Average The Road Crossing provides for the minimum visibility.
- Good The visibility is between average and very good.
- Very Good The Road Crossing provides excellent visibility.

## RC38 Provision of Comfort Features

<i>Measurement:</i>	1. Facilities Available? Option – Yes, No 2. Number (#)
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC38.1 Measured similar to Path Length Provision of Comfort Features (PL49).

## RC39 Designed Steps

<i>Measurement:</i>	1. Number (#) 2. Height (mm)
<i>Frequency:</i>	As required (3 max)
<i>Special equipment:</i>	Small ruler

RC39.1 Measured similar to Path Length Designed Steps (PL50).

## RC40 Protection from Permanent Hazards

<i>Measurement:</i>	Hazard Protection? Option – Yes, No
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC40.1 Measured similar to Path Length Protection from Permanent Hazards (PL50).

## RC41 Design Effort

<i>Measurement:</i>	Rating – not designed, very low, low, medium, high, very high
<i>Frequency:</i>	Once
<i>Special equipment:</i>	None

RC41.1 Measured similar to Path Length Design Effort (PL52).

W A L K A B I L I T Y  
T O O L S R E S E A R C H



M e t h o d o l o g y  
A P P E N D I X B

### Walkability Tools Research - Path Length Operational Survey Form

Surveyor:		Site:		Date:	
Organisation:		Section:		End time:	

<b>PL4. People Flow</b>		<i>Once at Start</i>
Counter	# of people:	
Stop watch	Time taken:	

<b>PL5. Number of Wheeled users</b>		<i>Once at start</i>
Counter	# of users	

<b>PL8. Adjacent Traffic Flow</b> (includes heavy & light vehicles, not cycles)		<i>Once at Start</i>
Not Applicable	# of vehicles:	

<b>PL9. Number of Heavy Vehicles</b>		<i>Once at Start</i>
Not Applicable	# of heavy vehicles:	

<b>PL1 Moveable Non-Regular Obstacles</b>	<i>For each (max 10)</i>							Tape measure/ measuring wheel		
	1	2	3	4	5	6	7	8	9	10
Effective width (m)										
Kerbside/centre/rear										
Cane detectable Y/N										

Select rating for each listed variable once for this section (circle)	Rating					
	Lowest			Highest		
<b>PL3. Use of Access Ways</b>	Not Applicable	Not used	1 vehicle	2-3 vehicles	4 vehicles	5 or more vehicles
<b>PL10. Use of on-street parking</b>	Not Applicable	0-25%	25-50%	50-75%	75-100%	>100%
<b>PL11. Deviation around obstacles</b>	Not Applicable	Minimal	In between	Regular adjustment	In between	Significant manoeuvring
<b>PL13. Litter</b>		None	In between	Occasional item	In between	A lot
<b>PL14. Detritus</b>		None	In between	Occasional item	In between	A lot
<b>PL15. Vandalism</b>		None	In between	Some	In between	A lot

<b>PL2. Hiding Places (#)</b>	<i>Once</i>
# of hiding places:	

<b>PL7. Vehicle Speed</b>		<i>Once</i>	
N/A	Below	Same	Above

<b>PL16. Temporary Hazards</b>		<i>Once</i>
None	Physically Obstructive	
Not physical but unpleasant dogs barking, abusive people	People congestion	

<b>PL12. Source of Smells</b>		<i>Once</i>
Factories	Vehicle	Food
Garden	Rotting	Neutral
Other (please specify)		

<b>PL6. Density of People</b>	<i>Once at End</i>
Counter	# of people:

<b>PL17. Weather</b>		<i>Once at End</i>	
Raining?	Yes	No	
Cloudy?	Yes	No	
Windy?	Yes	No	

<b>PL18. Humidity (%)</b>		<i>Once at End</i>
Humidity meter	Percentage:	

<b>PL19. Temperature (Deg C)</b>		<i>Once at End</i>
Thermometer	Degrees Celsius	

<b>PL20. Noise DB(A)</b>		<i>Once at End</i>
Sound meter/ stop watch	Decibel:	
Music	Vehicles	Machinery
People	Other (specify):	

<b>PL21. Light (Lx)</b> (measured only at night or underpass)		<i>Once at End</i>
Light meter	Lux:	

WALKABILITY  
TOOLS RESEARCH



Methodology  
APPENDIX C

### Walkability Tools Research - Path Length Physical Survey Form

Surveyor:		Site:		Date:	
Organisation:		Section:		GPS start	
				GPS end	

Complete table for all variables at each point			<i>Start, each time any variable changes</i>		Tape measure/ measuring wheel	
Point	PL23. Effective Width (m)	PL35. Area Adjacent Footpath		PL36. Cross Fall (%)	PL37. Longitudinal Gradient (%)	Percentage of length
		Walkable Y/N	If yes, Kerb/rear/both			
Start						
2						
3						
4						
5						
6						
7						
8						
9						
10						

**Sum**

<b>PL38. Stumbling Hazards (mm)</b>				<i>At each stumbling hazard (max 10 worst)</i>				Smart level & ruler	
1	2	3	4	5	6	7	8	9	10

<b>PL39. Trip Hazard (mm)</b>				<i>At each trip hazard (max 10 worst)</i>				ruler	
1	2	3	4	5	6	7	8	9	10

<b>PL24. Regular Obstacles</b>		<i>For each regular obstacle (max 5)</i>			Tape measure/ measuring wheel	
Measurement		Obstacle 1	Obstacle 2	Obstacle 3	Obstacle 4	Obstacle 5
Type: parking meter/lamp column/veranda post/other						
Number (#)						
Effective width (m)						
Location: kerb/centre/rear						
Cane detectable: yes/no						

<b>PL25 Permanent Non-Regular Obstacles</b>			<i>For each (max 10)</i>					Tape measure/ measuring wheel		
	1	2	3	4	5	6	7	8	9	10
Effective width (m)										
Kerb/centre/rear										
Cane detectable Y/N										

<b>PL50. Designed Steps</b>		<i>As required (3 max)</i>		Small ruler	
		1	2	3	
Number of steps (#)					
Average step height (mm)					

<b>PL30. Height of Adjacent Buildings</b>	<i>Once</i>
Number of storeys (#):	
Building setback from footpath (m):	

<b>PL32. Height of Opposite Buildings</b>	<i>Once</i>
Number of storeys (#):	
Building setback from footpath (m):	

<b>PL22. Land Use Classification</b>	<i>Once</i>	
Residential	Suburban Shopping	Commercial retail
Commercial Industrial	Industrial	Parklands
Rural	Other (specify):	

<b>PL33. Surface Type (%)</b>	<i>Once</i>	
Concrete	Asphalt	Natural Stone
Cobbles	Masonry	ASP
Exposed Aggregate	Track	Chip Seal
	Other (specify):	

<b>PL41. Provision for On Street Parking</b>	<i>Once</i>
On street parking available?	Yes   No

<b>PL45. Shared Path</b>	<i>Once</i>
Shared?	Yes   No
If yes:   Cycle   Tram   Bus	Other:

<b>PL51. Protection from Hazards</b>	<i>Once</i>
Select for this section:	Yes   No

<b>PL26. Deviation from Desire Line</b>	<i>Once</i>
Distance (m)	

<b>PL31. Building Veranda</b>	<i>Once</i>	
None	Broken	Continuous
If there:	Solid	Transparent

<b>PL42. Distance from moving vehicles</b>	<i>Once at middle</i>
Distance (m):	

<b>PL27. Road Width</b>	<i>Once</i>
From records (m):	

<b>PL28. Posted Speed Limit</b>	<i>Once</i>
Speed Limit (km/hr):	

<b>PL40. Provision of Tactile Aids</b>	<i>Once</i>
Tactile paving or visual aids?	Yes   No
Do they warn of a hazard?	Yes   No
Give directional cues by pointing people across road?	Yes   No
Direct towards crossing point with use of 'tail' of paving?	Yes   No
Are they correctly installed?	Yes   No

<b>PL43. Vehicle Access Ways</b>	<i>Once</i>
Number (#)	

<b>PL48. Utility Features</b>	<i>Once</i>
Are there Utility features:	Yes   No
How many? (#)	

<b>PL49. Comfort Features</b>	<i>Once</i>
Are there comfort features?	Yes   No
How many? (#)	

Select rating for each listed variable once for this section (circle)	Rating				
	Lowest			Highest	
<b>PL29. Street Activity</b>	Very Low blank walls	Low In between	Medium office buildings	High In between	Very High Shops, dining
<b>PL34. Footpath Condition</b>	Very bad	Bad	Moderate	Good	Very Good
<b>PL44. Visibility to Vehicle Access Ways</b>	Very bad no clear zone	Bad In between	Average some clear zones	Good In between	Very Good All clear zones
<b>PL46. Directional Information</b>	Nil	Very Poor wrong directions	Poor vague, st names	Good includes directions	Very Good maps
<b>PL47. Quantity of Greenery</b>	Nil	Small pots, trees alone	Medium grass verges	Large reserves, front lawns	Very Large parks
<b>PL52. Design Effort</b>	Very Low purely functional	Low In between	Medium some landscape	High In between	Very High Everything landscape
	Not applicable				
	Not designed				

W A L K A B I L I T Y  
T O O L S R E S E A R C H



M e t h o d o l o g y  
A P P E N D I X D

## Walkability Tools Research – Road Crossing Operational Survey Form

Surveyor:		Site:	
Organisation:		Section:	

<b>RC2. People Flow</b>		<i>Once at Start</i>
Counter	# of people:	
Stop watch	Time taken:	

<b>RC3. Number of Wheeled users</b>		<i>Once at start</i>
Counter	# of users	

<b>RC1 Moveable Non-Regular Obstacles</b>	<i>For each (max 10)</i>							Tape measure/ measuring wheel			
		1	2	3	4	5	6	7	8	9	10
Effective width (m)											
Kerbside/centre/rear											
Cane detectable Y/N											

Select rating for each listed variable once for this section (circle)	Rating					
	Lowest		Highest			
<b>RC6. Deviation around obstacles</b>	Not Applicable	Minimal	In between	Regular adjustment	In between	Significant manoeuvring
<b>RC8. Litter</b>		None	In between	Occasional item	In between	A lot
<b>RC9. Detritus</b>		None	In between	Occasional item	In between	A lot
<b>RC10. Vandalism</b>		None	In between	Some	In between	A lot

<b>RC11. Temporary Hazards</b>		<i>Once</i>
None	Physically Obstructive	
Not physical but unpleasant dogs barking, abusive people	People congestion	

<b>RC7. Source of Smells</b>		<i>Once</i>
Factories	Vehicles	Food
Garden	Rotting	Neutral
Other (please specify)		

<b>RC4. Density of People</b>	<i>Once at End</i>
Number of people (#)	

<b>RC12. Weather</b>	<i>Once at End</i>	
Raining?	Yes	No
Cloudy?	Yes	No
Windy	Yes	No

<b>RC13. Humidity (%)</b>	<i>Once at End</i>
Humidity meter	Percentage

<b>RC14. Temperature (Deg C)</b>	<i>Once at End</i>
Thermometer	Degrees Celsius

<b>RC15. Noise DB(A)</b>		<i>Once at End</i>
Sound meter/ stop watch	Decibel	
Music	Vehicles	Machinery
People	Other (specify):	

<b>RC16. Light (Lx)</b>		<i>Once at End</i>
<small>(measured only at night or underpass)</small>		
Light meter	Lux:	

<b>RC5. Vehicle Speed</b>			<i>Once</i>
N/A	Below	Same	Above

W A L K A B I L I T Y  
T O O L S R E S E A R C H



M e t h o d o l o g y  
A P P E N D I X E

### Walkability Tools Research – Road Crossing Physical Survey Form

Surveyor:		Site:		Date:	
Organisation:		Section:		GPS start	
				GPS end	

<b>RC32. Footpath &amp; Road Intersecting Gradient</b>	Entry Kerb, Central Island, Exit Kerb	Smart level or calibrated wedge
	Dropped? Y/N	Height (mm)
Entry Kerb		
Central Island Entry		
Central Island Exit		
Exit Kerb		
	Footpath gradient	Road gradient

Complete table for all variables at the road crossing	Kerb, Island, Kerb	Measuring wheel or tape
	<b>RC18. Effective Width (m)</b>	<b>RC31. Cross Fall</b>
Kerb		
Island Start		
Island Middle		
Island Finish		
Kerb		

<b>RC33. Stumbling Hazards (mm)</b>	<i>At each hazard (max 10 worst)</i>								ruler	
1	2	3	4	5	6	7	8	9	10	

<b>RC34. Trip Hazard (mm)</b>	<i>At each trip hazard (max 10 worst)</i>								ruler	
1	2	3	4	5	6	7	8	9	10	

<b>RC39. Designed Steps</b>	<i>As required (3 max)</i>						Small ruler		
	1		2		3				
Number of steps (#)									
Average step height (mm)									

<b>RC28 Permanent Obstacles</b>	<i>For each (max 10)</i>							Tape measure/ measuring wheel		
	1	2	3	4	5	6	7	8	9	10
Effective Width(m)										
Centre/Edge										
Cane detectable Y/N										

<b>RC17. Land Use Classification</b>	<i>Once</i>	
Residential	Suburban Shopping	Commercial retail
Commercial industrial	Industrial	Parklands
Rural	Other (specify):	

<b>RC20. Crossing Control Type</b>	<i>Once</i>	
Traffic lights	Zebra crossing	Uncontrolled

<b>RC22 Type of Refuge Island</b>	<i>Once</i>	
Sheep Pen	Angular	
Straight	None	

<b>RC25. Crossing Length</b>	<i>Once</i>
Distance (m)	

<b>RC24. # of Crossing Lanes</b>	<i>Once</i>	
Traffic Lanes (#)		
Cycle Lanes (#)		

<b>RC19. Possible Crossing Width</b>	<i>Once</i>
Distance (m)	

<b>RC29. Refuge Island Surface Type</b>		<i>Once</i>	
Refuge Island?		Yes	No
Concrete	Asphalt	Natural Stone	
Cobbles	Masonry/	ASP	
Exposed Aggregate	Track	Chip Seal	
	Other:		

<b>RC36. Odd Vehicle Approach</b>		<i>Once</i>	
Odd Direction?		Yes	No

<b>RC38. Comfort Features</b>		<i>Once</i>	
Are there comfort features?		Yes	No
How many? (#)			

<b>RC40. Protection from Hazards?</b>		<i>Once</i>	
Hazard Protection?		Yes	No

<b>RC26. Deviation from Desire Line</b>		<i>Once</i>	
Distance (m)			

<b>RC27. Posted Speed Limit</b>		<i>Once</i>	
Speed Limit (km/hr):			

<b>RC30 Road Surface Type (%)</b>		<i>Once</i>	
Concrete	Asphalt	Natural Stone	
Cobbles	Masonry	ASP	
Exposed Aggregate	Track	Chip Seal	
	Other:		

<b>RC35. Tactile Aids</b>		<i>Once</i>	
Tactile paving or visual aids?		Yes	No
Do they warn of a hazard?		Yes	No
Give directional cues to cross?		Yes	No
Direct towards crossing point?		Yes	No
Are they correctly installed?		Yes	No

Select rating for each listed variable once for this section (circle)		Rating				
		Lowest				Highest
<b>RC22. Footpath Condition</b>		Very Bad	Bad	Moderate	Good	Very Good
<b>RC23. Road Condition</b>		Very Bad	Bad	Moderate	Good	Very Good
<b>RC37. Visibility of Approaching Traffic</b>		Very Bad limited visibility	Bad in between	Average minimum visibility	Good in between	Very Good excellent visibility
<b>RC41. Design Effort</b>		Very Low purely functional	Low in between	Medium some landscape	High in between	Very High Everything landscape
		Not designed				

W A L K A B I L I T Y  
T O O L S R E S E A R C H



M e t h o d o l o g y  
A P P E N D I X F

## TRANSIT NEW ZEALAND VEHICLE CLASSIFICATION SCHEME (TNZ 1999)

Class	Axles	Identification algorithm	Vehicle types in class	% of total HMV	Length Range (WIM data)	RUC Class	TNZ Length Class	DKW Class	Aust-roads Class	Light or Heavy	Axle Groups (Pave. Des.)	PEM Class
1	2	No. of axles & wb < 3.2m	o-o (short vehicle)				S		1	Light		Car & LCV
2	3	No. of axles & sp ax1-ax2 < 3.2m	o-o-o (short veh. towing)				S/M		2	Light		Car & LCV
	4	No. of axles & (sp ax1-ax2 < 3.2 & > 2.2) & sp ax3 - ax4 <= 1.0m	o-o-oo (short veh. towing)				S/M		2	Light		Car & LCV
3	2	No. of axles & wb >= 3.2m	o-o (long vehicle)	28	4m-11m	2	M	3,4	3	Heavy	1s,1d	MCV
4	3	No. of axles & sp ax1-ax2 >= 3.2m & sp ax2-ax3 <= 2.2m	o--oo	11	7m-12m	6	M/L	5	4	Heavy	1s,2	HCV1
5	3	No. of axles & sp ax1-ax2 >= 3.2m & sp ax2 - ax3 > 2.2m	o-o--o	3	6m-15m	2,24	M/L	7	6	Heavy	1s,1d,1d	HCV1
6	4	No. of axles & sp ax1-ax2 <= 2.2m	oo--oo	4	8m-11m	14	M	6	5	Heavy	1s,1d,1d,1d	HCV1
7	4	No. of axles & sp ax1-ax2 > 2.2m & sp ax3-ax4 > 1.0m	o--o-o--o	2	8m-19m	2,30	M/L	8	7	Heavy	1s,1d,1d,1d	HCV1
			o-o--oo	2	10m-17m	2,29	M/L	8	7		1s,1d,2	
8	5	No. of axles	o--oo-o--o	1	16m-19m	6,30	L/VL	9	8	Heavy	1s,2,1d,1d	HCV2
			o--oo--oo	3	11m-17m	6,29	L	9	8		1s,2,2	
9	6	No. of axles & sp ax1-ax2 > 2.2m & sp ax4-ax5 <= 1.4m	o-oo--ooo	14	15m-18m	6,33	L/VL	10	9	Heavy	1s,2,3	HCV2
10	6	No. of axles & sp ax1-ax2 > 2.2m & sp ax4-ax5 > 1.4m	o-oo-o--oo	2	16m-20m	6,37	L/VL	11	9	Heavy	1s,2,1d,2	HCV2
11	7	No. of axles & sp ax1-ax2 > 2.2m	o-oo--oo--oo (B-train)	4	18m-21m	6,29,29	VL	12	10	Heavy	1s,2,2,2	HCV2
			o--oo-oo--oo (T & T)	4	18m-21m	6,43	VL	13	10		1s,2,2,2	
			o-oo--oo-o--o (A-train)		18m-21m	6,29,30	VL	14	10		1s,2,2,1d,1d	
12	6,7,8	No. of axles, (6,7 or 8) & sp ax1-ax2 <= 2.2m	oo--oo-o--o	9	15m-20m	14,30	L/VL	13	9	Heavy	1s,1s,2,1d,1d	HCV2
			oo--oo-o--oo		17m-21m	14,37	VL	13	10		1s,1s,2,1d,2	
13	8,9	No. of axles & sp ax1-ax2 > 2.2m	oo-oo--oo--oo (B-train)	8	19m-21m	6,33,29	VL	15	10	Heavy	1s,2,3,2	HCV2
			o-oo-ooo-o--o (A-train)		19m-21m	6,33,30	VL	15	10		1s,2,3,1d,1d	
			oo-oo-oo-o--oo (A-train)		19m-21m	6,29,37	VL	15	10		1s,2,2,1d,2	
			ooo (B-train)		19m-21m	6,33,33	VL	15	10		1s,2,3,3	
14			everything else									
							S 0-5.5m M 5.5-11m L 11-17m VL >17m		Class 11 & 12 not rel. in NZ		1s = SAST 1d = SADT 2 = TADT 3 = TRDT	