

Walkability Research Tools - Summary report

Research Report 356

Walkability Research Tools – Summary Report

**Abley Transportation Engineers,
Christchurch, New Zealand**

Contents

1.	Introduction	5
1.1	Background.....	5
1.2	Report Structure.....	5
2.	Research Outputs	6
2.1	Data Collected.....	6
2.2	Online database.....	7
2.3	Issued reports.....	8
3.	Discussion	10
3.1	Background.....	10
3.2	Data Analysis.....	10
3.3	Data Collection.....	11
4.	Summary and Recommendations	12

Tables

Table 2.1	Community street review locations, Wellington.....	6
Table 2.2	Community street review summary.....	6
Table 2.3	Physical and operational data summary.....	7
Table 2.4	Matrix of user types and tasks.....	8

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NZ Transport Agency. 2008. Walkability Research Tools – Summary Report. NZ Transport Agency Research Report 356. 12 pp.

An important note for the reader

The NZ Transport Agency is a Crown entity established under the Land Transport Management Amendment Act 2008. The objective of the NZ Transport Agency is to undertake its functions in a way that contributes to an affordable, integrated, safe, responsive, and sustainable land transport system. Each year, the NZ Transport Agency invests a portion of its funds on research that contributes to this objective.

This report is the final stage of a project commissioned by Land Transport New Zealand before 31 July 2008 and is published by the NZ Transport Agency.

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The material contained in this report is the output of research and should not be construed in any way as policy adopted by the NZ Transport Agency but may be used in the formulation of future policy.

ADDITIONAL NOTE

The NZ Transport Agency (NZTA) was formally established on 1 August 2008, combining the functions and expertise of Land Transport NZ and Transit New Zealand.

The new organisation will provide an integrated approach to transport planning, funding and delivery.

This research report was prepared prior to the establishment of the NZTA and may refer to Land Transport NZ and Transit.

1. Introduction

1.1 Background

Land Transport New Zealand (LTNZ) commissioned *Abley Transportation Engineers Limited* (ATEL) to:

- facilitate the collection of Community Street Review (CSR) data, and
- develop a methodology for the collection of physical and operational variables related to CSR routes, and
- collect physical and operational data on the CSR routes.

The purpose of the research is to link physical and operational variables in the walking environment to perception surveys undertaken using the CSR methodology. These tasks were undertaken as part of the Walkability Tools Research project.

CSRs were developed as part of a separate commission between Living Streets Aotearoa Inc. and ATEL for the Heath Sponsorship Council. The Health Sponsorship Council has since handed over responsibility for the ongoing success of CSR to LTNZ.

The Walkability Tools Research project involved defining appropriate physical and operational variables related to walkability and developing a methodology for the collection of these variables. The next stage involved collecting data, refining the methodology and ensuring it was entered and securely stored in an electronic database.

The survey data will be used by LTNZ for the development of a later mathematical model whereby walkability perceptions can be inferred by physical and operational measurements. The database is currently stored and accessed via www.levelofservice.com.

This report provides a summary of the data collected to date, the reports issued for this project and recommendations for data enhancement and analysis.

1.2 Report Structure

This report summarises the research that was undertaken and includes the following:

- Research Outputs
- Discussion
- Summary and Recommendations

Quotations taken from other references are noted in the text and are '*italicised*'. Important or especially relevant sections of quotations are **bold**.

2. Research Outputs

2.1 Data Collected

ATEL commissioned six CSRs that were undertaken in Wellington during July and August 2006. Three locations were identified and the CSRs were arranged by two local survey organisations using two user groups. Both organisations completed at least one survey at each location. The survey locations are listed in Table 2.1.

Table 2.1 Community street review locations, Wellington.

Street	Suburb	Type
Queens Drive	Kilbirnie	Residential
Rongotai Road	Kilbirnie	Suburban Shopping
Cable Street	City Centre	Commercial Retail

The CSR, including the organisation that arranged the survey and the survey location are listed in date order in Table 2.2. The table also includes the report volume number for the collected data so the original survey forms can be obtained from LTNZ if required.

Table 2.2 Community street review summary.

Date	Organisation	Location	User Group	Report
27 July 2006	Living Streets Aotearoa	Rongotai Road	Vision impaired	Volume 4 Appendix A
31 July 2006	Duffill Watts & Tse Ltd	Queens Drive	No impairments	Volume 3 Appendix A
31 July 2006	Duffill Watts & Tse Ltd	Rongotai Road	No impairments	Volume 4 Appendix B
31 July 2006	Duffill Watts & Tse Ltd	Cable Street	No impairments	Volume 2 Appendix A
4 August 2006	Living Streets Aotearoa	Queens Drive	Vision impaired and/or mobility impaired	Volume 3 Appendix B
10 August 2006	Living Streets Aotearoa	Cable Street	Vision impaired and/or mobility impaired	Volume 2 Appendix B

ATEL collected physical and operational variable data at the same locations that CSR data was collected. The collection of this data was undertaken in two parts.

1. Operational variables measure aspects of the environment that experience fluctuations such as traffic volume or the weather. Operational variable data must be collected when the CSRs are in progress to accurately record the condition of the walking environment at the time it is being reviewed.
2. Physical variables measure aspects of the environment that generally do not vary such as footpath width or cross fall. Physical variable data can be collected at any time, either shortly before or after the CSR is completed.

The physical and operational data collected for the project are listed in Table 2.3. The table includes the data collection date, the organisation that collected the data, the survey location and also the report volume number. The report volume number is included so the original

survey forms can be obtained from LTNZ if required.

Table 2.3 Physical and operational data summary.

Variable Type	Organisation	Location/Date	Report
Operational	A TEL	Rongotai Road 31 July 2006	Volume 5 Appendix A
Operational	A TEL	Rongotai Road 10 August 2006	Volume 5 Appendix B
Physical	A TEL	Rongotai Road	Volume 5 Appendix C
Operational	A TEL	Queens Drive 31 July 2006	Volume 6 Appendix A
Operational	A TEL	Queens Drive 4 August 2006	Volume 6 Appendix B
Physical	A TEL	Queens Drive	Volume 6 Appendix C
Operational	A TEL	Cable Street 27 July 2006	Volume 7 Appendix A
Operational	A TEL	Cable Street 31 July 2006	Volume 7 Appendix B
Physical	A TEL	Cable Street	Volume 7 Appendix C

Each survey organisation entered the data they collected into an electronic database. Access to the electronic database was made available via the internet and data input was completed using a web based graphical user interface. The database is currently stored and accessed via www.levelofservice.com.

2.2 Online database

The website www.levelofservice.com has been created to facilitate the CSR data management process. The website runs on php scripting language and the data is stored in a MySQL database. Users are allocated a user level based on their role in the CSR process, which allows access to tasks relevant only to their role. All users are given a unique username and password to access the database.

Users enter the CSR data and physical and operational variables into the database via 'lookalike' forms. The site also has the ability to execute analysis and produce automated reports. Users are also able to extract information from the database as downloadable Microsoft Excel spreadsheets to perform more complex statistical analysis. A matrix of the tasks and the users able to execute these tasks is shown in Table 2.4. A separate report titled *Database User Guide* has been produced to assist navigating and operating the database.

The website also contains a public area where users without a username and password can input CSR data and have the website undertake the Level of Service calculations. This enables users unfamiliar with CSR to trial the system for possible full use later. The data is stored within the database and accessible to the public user at any time. At the completion of the data input and automated analysis, the user is provided with a unique URL to copy and save in order to return to the analysis at a later date.

Table 2.4 Matrix of user types and tasks.

	Database Administrator	Database Analyst	CSR Survey Manager	CSR Survey Associate	P&O Survey Manager	P&O Survey Associate
View database status	x					
Change user password	x	x	x	x	x	x
View / update user details	x	x	x	x	x	x
View surveys	x	x				
Validate surveys	x					
Export surveys	x	x				
Run validation query	x					
View survey routes	x		x			
Create new data analyst	x					
Manage data analysts	x					
CSR reporting	x	x	x			
Create new CSR survey organisation	x					
Manage CSR survey organisations	x					
Manage CSR survey managers	x					
Create new P&O survey organisation	x					
Manage P&O survey organisations	x					
Manage P&O survey managers	x					
Assign routes to P&O survey associates	x				x	
Create CSR survey associate			x			
View CSR survey associate			x			
Edit CSR survey associate			x			
Create new survey route			x			
Delete survey route			x			
View survey participants			x	x		
Query to view CSR data			x	x		
Edit CSR data			x	x		
Enter CSR survey data				x		
Enter new survey participants				x		
Edit survey participants				x		
Create P&O survey associates					x	
View P&O survey associates					x	
View P&O data					x	
Enter P&O survey data						x
Edit P&O survey data						x

Accessing the database via a website allows users to login from any location and be confident that they are always using the same standardised system where all CSR data is held. The development of the website and database has been designed and tested in alignment with the development and testing of the CSR process to ensure it is comprehensive and easy to use. Regular backups of the database and source code are taken to ensure that data is always recoverable.

2.3 Issued reports

Several reports related to the Walkability Tools Research project have been prepared and issued to LTNZ in addition to this summary report. A list of all the reports associated with this research is provided below.

- Variables Collection Methodology. Issued July 2006. This report lists the requirements, techniques and any special equipment required for the collection of physical and operational variables. The report also contains the physical and operational survey forms to be used when collecting this data. This report is also

available in pdf format at www.levelofservice.com.

- Database User Guide. Issued April 2007. This report provides information on how to enter, manipulate and export data. The report, like the website, is based on user types and each user type has a set of pre-defined tasks. The report also documents how to use the public CSR Level of Service calculator.
- Database Output Specification. Issued April 2007. This report was prepared for use by Data Analyst users. The report lists all exportable fields from the online database; it provides a description of the various fields and lists the possible values of each field.
- Data Collected – Summary. Issued April 2007. This report contains information concerning the CSR and physical and operational data. The report discusses data input error rates and also provides route maps for each CSR.
- Data Collected – Volume 1. Issued May 2007. This report contains all the exportable data as at the date of issue.
- Data Collected – Volumes 2-4. Issued May 2007. These reports contain the data for the CSR. A summary of the data contained in these volumes is shown in Table 2.2.
- Data Collected – Volumes 5-7. Issued May 2007. These reports contain the physical and operational data. A summary of the data contained in these volumes is shown in Table 2.3.
- Summary Report. Issued November 2007. This report summarises the project including CSRs, operational and physical variable methodology and data input. It also provides a discussion and commentary regarding recommendations.

3. Discussion

3.1 Background

The purpose of the Walkability Tools Research project is to link physical and operational variables to perception surveys for the development of a later mathematical model. The mathematical model will allow walkability perceptions to be inferred from the physical and operational measurements of a walking environment. This will aid practitioners to quickly identify walking level of service for the transport network in a similar manner that is currently available for identifying level of service for vehicles. As far as ATEL is aware, the measurement of the road environment specifically for walking has never been undertaken and this project is a world first.

3.2 Data Analysis

The exported data can contain hundreds of fields of data that could quickly become difficult to manage and analyse. The database currently exports to a *tab separated values* (CSV) text file that is given the extension '.xls'. This allows a Microsoft Windows operating system in standard configuration to open the file with Microsoft Excel.

The data analysis is a later stage for this project; even so our familiarity with the data means we are able to provide some guidance on the possible data analysis methodology. One enhancement that would enable the spreadsheet data to be more manageable for later analysis is to organise the data before exporting. Currently the Microsoft Excel sheet contains all exported data, whereas multiple sheets could be created for one file. Each sheet would then contain the data for the specific section types, one for path length and one for road crossing.

Using a 'top down' approach to data analysis is a method of managing the high volume of data. A top down approach allows the data analyst to group similar data sets in an attempt to make inferences and correlation using a higher level of aggregated data. The results from this initial analysis may identify early trends that could identify areas requiring more detailed analysis. Disaggregating data into more specific groups may reveal significant information. This method can be repeated a number of times, deepening the level of data analysis at each step.

Similarly, data can be grouped based on participant type such as vision impaired users or mobility impaired users, to identify key differences between the target group and other respondent types. This method helps identify key variables that would create a higher level of walkability within a given environment. The database currently enables data to be grouped using the 'participant variables' exported with the CSR data.

3.3 Data Collection

The collection of physical and operational data is required, at least initially, to be carried out by trained practitioners. This will enable consistency in data collection and it is preferable that the same practitioner undertakes all measurements for a specific CSR route. Identifying collection agency variances through data analysis should also be considered, as well as providing standardised measuring equipment to ensure data collection bias is minimised.

The methodology for the collection of physical and operational variables has been tested and refined over the duration of this project. The number of variables is large and it is expected that a detailed data analysis may allow for the removal of some less significant variables. The data analysis may also identify inconsistencies in the data collection methodology that may suggest more instruction is needed or the methodology amended when collecting a particular variable.

4. Summary and Recommendations

The main benefit of this research is to improve walking access, safety, usability and friendliness for all members of the community. This will assist New Zealand to meet its sustainable transport objectives.

The project has reached a stage where methods now exist for data to be collected in earnest. Collecting more data will provide more valid results as well as more information to be extracted from CSR data and conclusions drawn about walking environments.

Automated information produced by the database at www.levelofservice.com provides initial results for a single CSR, however the volume and complexity of data analysis beyond Level of Service calculations and simple reporting will require an experienced statistics professional. The knowledge and information produced from the detailed analysis must be documented and made available to practitioners so walkability perceptions can be inferred from physical and operational variables.

The use of trained practitioners for physical and operational data is preferable at least in the short term, as the methodology for the collection of data develops. In the longer term, collection methodology improvements should be further documented, expanded and potentially based on the significance of specific variables to walkability perceptions. Less significant variables should be removed from the methodology.

The web interface and data collection forms should be reviewed for user friendliness and applicability. This process will require ongoing feedback from CSR practitioners. A management group could be considered for the ongoing improvement and promotion of CSRs and physical and operational variable collection.

It is the recommendation of Abley Transportation Engineers Limited that:

- More data is collected including both CSR and physical and operational variable data.
- A management or steering group is formed to oversee improvement in the CSR and physical and operational methodology.
- A statistical analysis is undertaken on the data by a suitable professional and the results made available to interested parties.
- The CSR and physical and operational variable methodology should be promoted to practitioners and the wider community to enable data to be collected in earnest.
- At least initially, only trained professionals and standardised equipment should be used to collect physical and operational data.