Looking at Transport: Movement and Liveability

- Define context of Transport and Liveability
- Brief Overview of the Department of Civil and Environmental (UoA) and University of Auckland
- Transportation Staff and areas of Research Interest
- Overview of Courses a student numbers
- Research Outputs
- Examples of Research Projects (past and current)

Looking at Transport: Movement and Liveability

What others think and say of Auckland

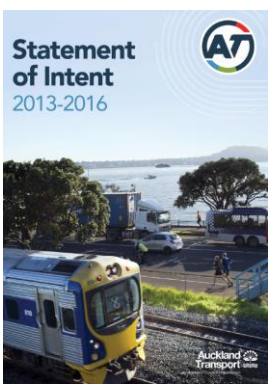
International opinion shows that Auckland is a very desirable place to live.

Auckland's Growth: Auckland will add a person to its population every 19 minutes. This compares to one person every two hours for Christchurch and one person every 2.5 hours for Wellington. With that rate of growth will come big challenges, especially on infrastructure, particularly tunnels, tarmac and bridges.

Transportblog: Auckland Council chief economist Geoff Cooper

Auckland's Transport and Growth

A high-quality transport system is essential to the performance of Auckland's economy and its residents' way of life. As Auckland grows, Auckland Transport must ensure that the transport system remains efficient and facilitates grow in an affordable way



Auckland Transport *Statement of Intent 2013-16*

My View

There are exciting challenges ahead in all aspects for Auckland to continue to build a world leading city.

Auckland's development must be balanced with both socioeconomic and environmental initiatives to provide us with a healthier, vibrant and liveable city.

Lonely Planets -Top 10 cities (2014)

Rank	City, Country
1	Paris, France
2	Trinidad, Cuba
3	Cape Town, South Africa
4	Riga, Latvia
5	Zurich, Switzerland
6	Shanghai, China
7	Vancouver, Canada
8	Chicago, USA
9	Adelaide, Australia
10	Auckland, New Zealand

Auckland's Ranking based on

Cuisine, culture and coastal scenery

The Economist Most Liveable Cities (2013)

Most Liveable	Most Unliveable
1. Melbourne, Australia	131. Tehran, Iran
2. Vienna, Austria	132. Douala, Cameroon
3. Vancouver, Canada	133. Tripoli, Libya
4. Toronto, Canada	134. Karachi, Pakistan
5. Calgary, Canada	134. Algiers, Algeria
6. Adelaide, Australia	136. Harare, Zimbabwe
7. Sydney, Australia	137. Lagos, Nigeria
8. Helsinki, Finland	137. Port Moresby, PNG
9. Perth, Australia	139. Dhaka, Bangladesh
10. Auckland, NZ	140. Damascus, Syria

Ranking Based on

Widespread availability of goods and services, low personal risk, and an effective infrastructure.

Mercer Quality of Living Survey (2012)

Rank	City	Country
1	Vienna	Austria
2	Zurich	Switzerland
3	Auckland	New Zealand
4	Munich	Germany
5	Vancouver	Canada
6	Düsseldorf	Germany
7	Frankfurt	Germany
8	Geneva	Switzerland
9	Copenhagen	Denmark
10	Bern	Switzerland
	Sydney	Australia

Ranking Based on

Criteria are safety, education, hygiene, health care, culture, environment, recreation, political-economic stability and public transportation.

Monocle's Most Liveable Cities Index (2013)

Rank	City	Country
1	Copenhagen	Denmark
2	Melbourne	Australia
3	Helsinki	Finland
4	Tokyo	Japan
5	Vienna	Austria
6	Zurich	Switzerland
7	Stockholm	Sweden
8	Munich	Germany
9	Sydney	Australia
10	Auckland	New Zealand

Ranking based on

Safety/crime, international connectivity, climate/sunshine, quality of architecture, public transportation, tolerance, environmental issues and access to nature, urban design, business conditions, pro-active policy developments and medical care

University of Auckland

QS World University Rankings

In 2012 The University of Auckland was the highest ranked New Zealand university at 83 out of 700

Civil and Structural ranked at 42=

In both cases Researching Rank = Very High

Faculty of Engineering (FoE)

More than 3,600 students:

- 2,700 at undergraduate level,
- 430 in taught postgraduate programmes and
- over 480 research postgraduate students.

Staff

- 187 Academic staff
- 141 Technical and Professional Staff

Our five departments FoE

Chemical and Materials Engineering
Civil and Environmental Engineering
Electrical and Computer Engineering
Engineering Science
Mechanical Engineering

FoE Nine (9) Specialisations

All accredited by the Institution of Professional Engineers New Zealand (IPENZ):

Biomedical	Computer Systems
Chemical and Materials	Electrical and Electronic
Civil (including Environmental)	Engineering Science
Software	Mechatronics
Mechanical (including Wood and Wood-fibre composites)	

Department of Civil and Environmental Engineering - (CEE)

<u>Students</u>

About 220 Undergraduate students
Approximately 70 PhD students
and 20 ME students.

<u>Staff</u>

The Department Consists of:
41 Academic Staff (some adjunct)
5 Technical and Support Staff

Primary Areas of Research

- Construction management
- Geotechnical engineering
- Fluvial processes
- Hydraulic engineering and environmental fluid mechanics
- Roads and transportation engineering
- Structural engineering

Research Laboratories

1. Geotechnical Engineering Laboratory
2. Environmental Engineering Laboratory
3. Fluid Mechanics Laboratory
4. Mobile Field Laboratory (MFL) for in-situ testing
5. Data Visualization Laboratory

Research Centres within the department:

Water and Environmental Research Centre

Roads and Transportation Research Centre

University of Auckland Centre for Earthquake Engineering Research (UACEER)

Research Projects Available to Students

<u>Research themes</u>

Energy, Technologies for Health, Infrastructure & Environment and Manufacturing & Materials:

- 66 Research Projects across all areas CEE
- Available to PhD, masters, summer scholarship or BE final year

Year 4 Projects

A total of the 88 projects will be presented in five parallel streams including:

- Construction management.
- Earthquake engineering.
- Environmental engineering.
- Geotechnical design.
- Structural design.
- Sustainability.
- Transportation systems and infrastructure.
- Water resources, hydrology, and fluid mechanics.

UoA Transportation Engineering Team

Data Visualisation Laboratory

The Transport Challenges – Unique and Common (Houghton et al, 2009)

- Increasing congestion on all modes of transport (somewhat)
- Customer safety
- Decaying transport infrastructure
- Reduction of availability and increased cost of raw materials
- Pressure on the City's economic competiveness
- Growing negative environmental impacts
- Where we'll live

Reducing the Environmental Impact

- Cites strive to be cleaner, less congested and have improved traffic flow
- 'Transport infrastructure' – the biggest infrastructure challenge
- Effective transport is central to the economic prosperity
- Congestion can be a major cost, as high as 1% -3% GDP
- Transport produces a large share of the GHG and other pollutants

Water Run-off – Toxic elements

Water Run-off – Treatment



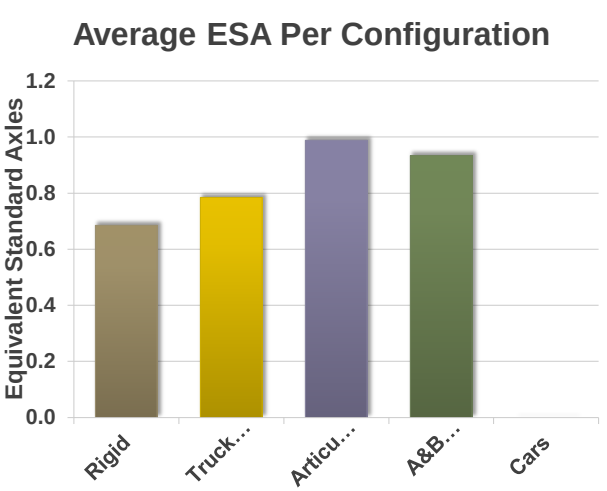
Emergency/Floods

Used Tyres

Environment and Freight Movement

- From a transport perspective Economic prosperity depends largely on efficient freight movements
- Major effort required to ensure the effects on the environment are managed

Infrastructure Decay - Pavement Failure



The Prediction of Pavement Surface Aggregate Wear and Microtextural Polishing (Oct 2011)

Objective:

To find an alternative method to Polished Stone Value (PSV) test and to standardise the Auckland Pavement Polishing Device (APPD)

Project outcome:

To have an alternative laboratory test methodology so that a more accurate prediction of road surface performances can be obtained.

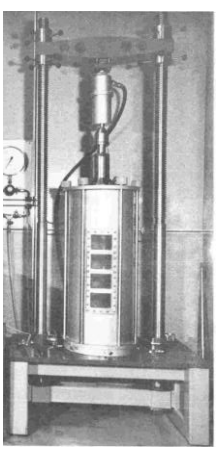
The Performance of Unbound Aggregates for the Purposes of Permeable Pavements (Mar 2012)

Objectives:

To determine the effects on engineering performance of simulated traffic loading on unbound granular basecourse materials under saturated conditions.

- Project outcome:

To determine the suitability of permeable pavements in the New Zealand road network.



The Development of a Multi-Faceted Evaluation Framework of Shared Spaces

Objectives:
To develop an evaluation framework for shared spaces / streets, taken into account quantitative and qualitative performance measures of pedestrians, cyclists and vehicles.

Project outcome:
The evaluation framwork and performance index that can be used to measure effectiveness of different shared space environments

Intersections A balance between safety and efficiency

Objectives:
To highlight to transport professionals the **quantitative** effect the two treatments have on intersection safety and performance.

Outcome:
Both left turn treatments resulted in increased clearance times for pedestrians and vehicles and increased cycle times.

Moisture Susceptibility of Unbound Granular Road Aggregates

Objectives:
To find the performance of unbound aggregates used in basecourse layer of the pavements in wet conditions and to verify how well we simulate their behaviour in laboratory

Project outcome:
Suitable gradation for wet conditions which can extend pavement life, A new permanent deformation statistical model including stress and number of loading cycles for RLT test data.

Repeated Load Triaxial Test Setu

Christchurch Accelerated Pavement Test Indoor Facility

The Performance of Improvement Techniques on Marginal Unbound Granular Aggregates Using a Large Scale Repeat Load Triaxial Test

Objectives:
To optimize the improvement techniques based on collating and analysing methods to improve local Auckland based marginal material and critiquing the practice of RLT test worldwide which is applied in unbound granular aggregates

Research outcome:
to find factors which influence the property of Auckland marginal materials using RLT test to get a technique to improve the performance of marginal unbound granular aggregates

Local aggregate

RLT test

Public-Transport Studies

Objectives:

To consider different bus sizes so as to have even-headway and even-passenger-load timetables, linked with optimal vehicle scheduling.

To determine the actual penalty value of transfers between and within public-transport modes, and the perception of passengers in making transfers.

Projects outcome:

To improve the design of public-transport timetabling and vehicle scheduling.

To provide a more precise value of public-transport transfer penalty for modelling and decisions.

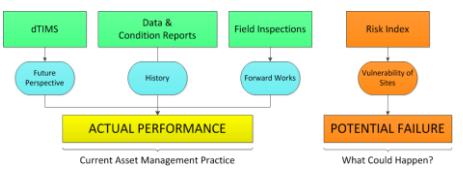
The Risks Associated with Road Pavement Failure in New Zealand

Objectives:

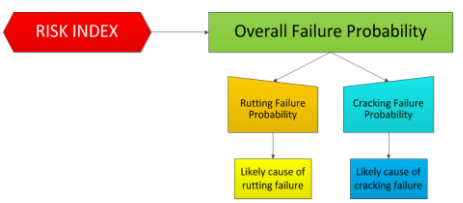
To develop a comprehensive understanding of pavement failure, and a failure risk index to quantify and assess the failure risk of road pavements

Project outcome:

A tool which can quantify the failure risk and diagnose the failure mode and cause(s) of failure. This can supplement the current asset management practice to minimise the variation in forecasted maintenance plans and identify symptomatic problems on road networks



Research Context



Risk Index

Modelling Flushing on Thin Flexible Surfaced Pavements in New Zealand

Objectives:
To develop a model to determine the initiation and progression of flushing on thin flexible surfaced pavements.

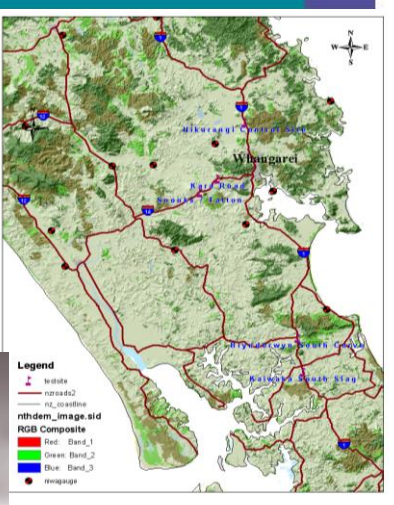
Project outcome:
Mechanistic understanding of the development of flushing and a data-based model that can forecast flushing occurrence on thin flexible surfacings.

Flushing on the wheel paths of a pavement

Wheel tracking machine used to apply loading to pavement samples

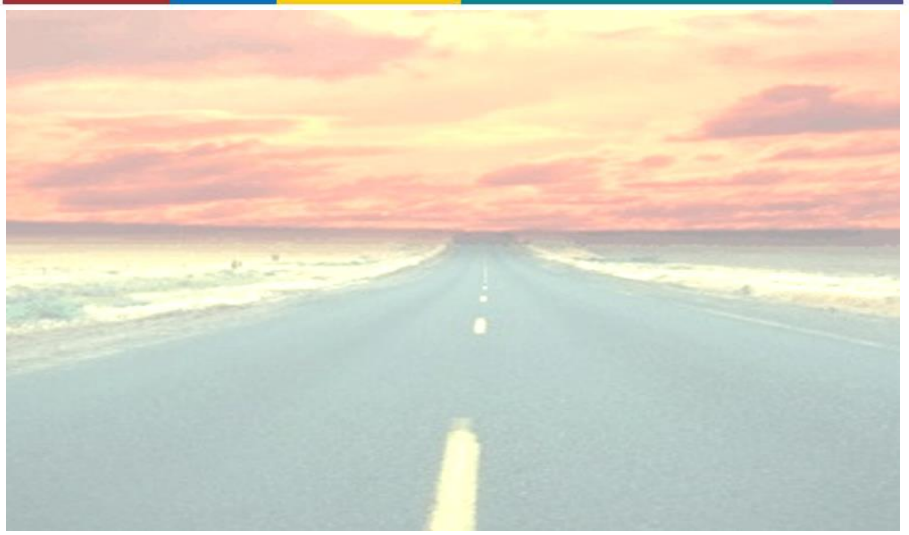
Skid Resistance and Road Safety –Seasonal variations in skid resistance

The GripTester



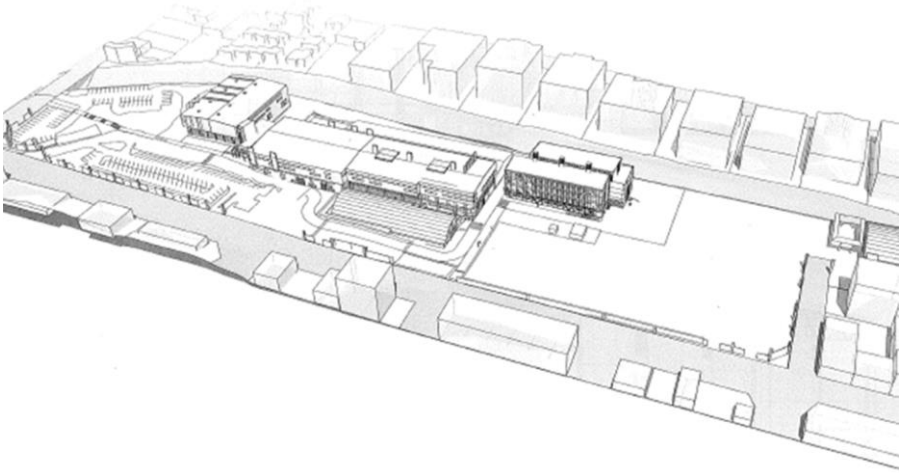
Northland Skid Testing Sites

The Research Road Ahead



Newmarket CEE Laboratories

Newmarket Laboratories



New CEE Structures Laboratory Building

Research Partners / Funders external to the University

Downer
Fulton Hogan Ltd
AT
ROADING NEW ZEALAND
WINSTONE AGGREGATES
STEVENSON
GREEN VISION RECYCLING
NZ TRANSPORT AGENCY WAKA KOTAHI
IDS Ltd
nzcid
RIMS ROAD INFRASTRUCTURE MANAGEMENT SUPPORT
Ministry of Business, Innovation & Employment
NATIONAL INFRASTRUCTURE UNIT
Ministry of Transport TE MANATŪ WAKA
GHD
Auckland Council

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