

Green Star – Design & As-Built and Interiors NZ v1.0

# Sustainable Transport Performance Path Calculator Guide

March 2021

*This guide has been adapted from the Green Building Council of Australia's guide. This guide is to be used for the Performance Pathway in the 'Sustainable Transport' credit in both Green Star – Design & As Built and Green Star – Interiors.*

## Document Information

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This document is updated as necessary: it can be found at <https://www.nzgbc.org.nz/>.

## Change Log

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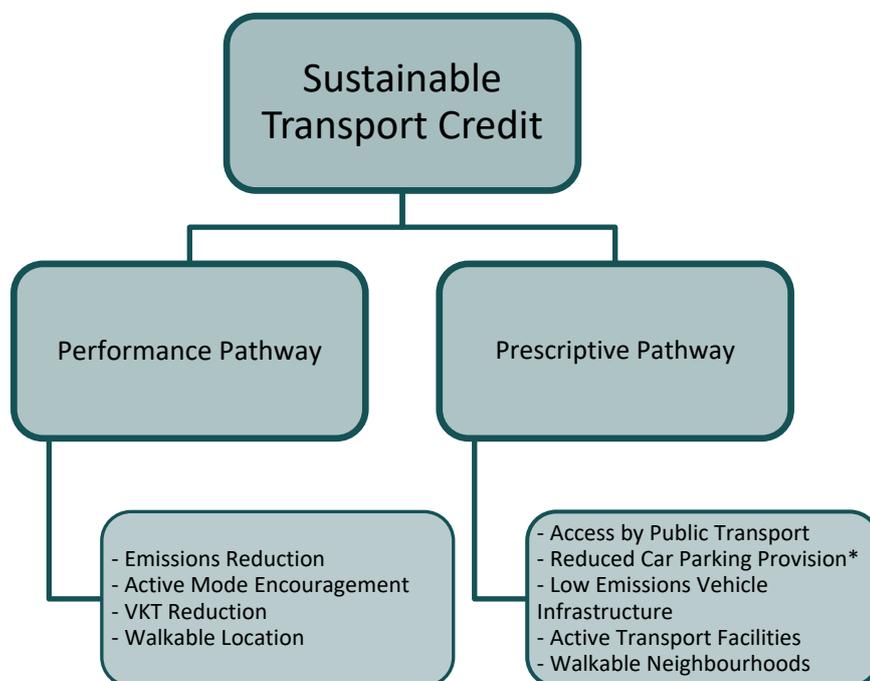
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# 1 Introduction

The New Zealand Green Building Council (NZGBC) and MRCagney NZ Ltd have developed a Sustainable Transport Calculator (the Calculator) that may be used to validate the Performance Pathway for the 'Sustainable Transport' credit in both *Green Star – Design & As Built NZv1.0 (Design & As Built)* and *Green Star – Interiors NZv1.0 (Interiors)*. This calculator is based upon work by the Green Building Council of Australia and AECOM, and adapted for the New Zealand context.

Points awarded in the 'Sustainable Transport' credit can be achieved using the Performance Pathway or a Prescriptive Pathway (see Figure 1-1). The Calculator determines the number of points awarded out of the available points under the Performance Pathway for the 'Sustainable Transport' credit. This Calculator Guide ('the Guide') should be used in conjunction with the Calculator.

The Calculator determines the number of points awarded based on the proposed travel plan for the building or fitout ('the project'). Points are awarded based on the proposed emissions reduction, active mode encouragement, vehicle kilometres travelled (VKT) reduction and walkable location.



**Figure 1: Sustainable Transport Credit Pathways**

\*The 'Reduced Car Parking Provision' criterion is only applicable for *Design & As Built*.

A Travel Plan (or equivalent sustainable transport strategy) must be developed to ensure that all aspects of transport for regular project occupants have been considered and addressed as part of the Performance Pathway. Points are then awarded, based on a holistic approach to reducing the impacts from transport, where the Proposed Project's performance is improved when compared to a Reference Project. Points are awarded by completing the Calculator with the predicted transport mode split as defined in the Travel Plan.

Compliance with the Performance Pathway requires project teams to demonstrate the carbon emissions from transport generated from the project's typical operations (the 'Proposed Project'). This value is then compared

to carbon emissions from transport for a comparable project of a similar type in a similar location (the 'Reference Project').

The Calculator provides carbon emissions reductions as a result of changes in mode share, or reduction in average trip length. These changes may occur due to transport design initiatives, such as removal of a car parking space, provision of cyclist facilities or carpooling initiatives. Points are rewarded based on carbon emissions reduction as well as active mode encouragement, vehicle kilometres travelled reduction, and walkable location. The Calculator determines the number of points awarded based on the inputs made from the Travel Plan.

## 2 Glossary of Terms

### Key terms

**Mode Share** – The proportion of commuting trips that take place by a given mode of transport (e.g. bus, car, bicycle).

**Project Population** – Refers to the population of regular building or fitout users within the project being rated. For example, in an education facility, the project population would include office staff or teachers and not visitor or student populations. This is on the basis that the 'Sustainable Transport' credit aims to capture the emissions attributed to the project being rated, and therefore, does not take into account visitor populations.

**Proposed Project** – The building or fitout to be rated by the Green Star rating tool, as designed by the project team.

**Reference Project** – A hypothetical building or fitout of a similar type in a similar location to the proposed project.

**Suitably Qualified Transport Professional** – The suitably qualified transport professional shall hold a relevant tertiary qualification (including, but not limited to, architecture, engineering, sustainability and planning) and have produced a sustainable Travel Plan for a previous project of similar scale.

**Walk Score®** – A measure of pedestrian accessibility to amenities (e.g. supermarkets, restaurants etc.) that is publicly available for every address in New Zealand from the following website: <http://www.walkscore.com>.

### Acronyms

**SA2** – Statistical Area Level 2, a Census geographical unit representing a population of 1,000 to 4,000 people generally.

**VKT** – Vehicle Kilometres Travelled.

## 3 Breakdown of criteria

Based on the rating tool being used for the project, there are a differing number of total points available. The Calculator assigns points as detailed in Table 1 and Table 2. The total number of points available are:

- **10 points** for *Design & As Built*; and
- **7 points** for *Interiors*.

The four criteria within the Calculator are described below:

### **Criterion 1. Emissions Reduction**

Criterion 1 relates to a reduction in transport emissions directly related to commuting trips to and from the site. Criterion 1 is calculated from commuting trips mode share, average trip length and the proportion of trips that may be avoided (e.g. by working from home). Criterion 1 considers reduction in greenhouse gas emissions which contribute to climate change.

### **Criterion 2. Active Mode Encouragement**

Criterion 2 relates to an increase in the mode share of walk and bicycle commuting trips, referred to collectively as “active modes”. Criterion 2 considers encouragement of transport modes that promote health and fitness to commuters as well as having financial benefits and reducing the societal cost of healthcare.

### **Criterion 3. Vehicle Kilometres Travelled Reduction**

Criterion 3 relates to a reduction in vehicle kilometres travelled (VKT) for commuting trips, which may be affected by either or both of a reduction in average trip length or a reduction in the mode share of car trips. Criterion 3 considers lessening car dependence which, in addition to reducing greenhouse gas emissions, local pollution, congestion, and vehicle crashes, improves social equality. Reduced VKT also has potential financial benefits to commuters.

### **Criterion 4. Walkable Location**

Criterion 4 relates to a site that is located in a “walkable” location. Criterion 4 is not related to commuting trips but instead considers that motorised trips may be avoided by allowing project users to accomplish errands on foot (e.g. meetings, lunch breaks, appointments).

**Table 3-1: Points breakdown for - Design & As Built**

Design & As Built	Points Available					
	0.5	1	2	3	4	5
1. Emissions Reduction	-	10-15%	15-25%	25-35%	35-45%	>45%
2. Active Mode Encouragement	>50%	100%	-	-	-	-
3. VKT Reduction	>10%	>20%	-	-	-	-
4. Walkable Location (Walk Score ®)	-	71-80	81-90	91-100	-	-
<b>Total</b>						<b>10 Points</b>

**Table 3-2: Points breakdown for Interiors**

Interiors	Points Available					
	0.5	1	1.5	2	2.5	3
1. Emissions Reduction	15-25%	25-30%	30-35%	35-40%	40-45%	>45%
2. Active Mode Encouragement	-	>50%	-	-	-	-
3. VKT Reduction	>5%	>10%	-	-	-	-
4. Walkable Location (Walk Score ®)	-	80-89	-	90-100	-	-
<b>Total</b>						<b>7 Points</b>

## 4 How the calculator works

The Calculator works by comparing the Proposed Project with a Reference Project against the criteria listed under Section 3.

The Reference Project characteristics are automatically calculated within the Calculator. Points are achieved by comparing the performance of the Proposed Project with the Reference Project. For information on how the Reference Project is generated refer to Section 7.

The 'Walkable Neighbourhoods' criterion considers the walkability score of the location of the project being rated. Points are achieved using outputs from the Walk Score® website.

## 5 Where to find the calculator and how to enter data

The Calculator may be found on the NZGBC website at the following web address:

[https://www.nzgbc.org.nz/Article?Action=View&Article\\_id=95](https://www.nzgbc.org.nz/Article?Action=View&Article_id=95)

To choose either *Design & As-Built* or *Interiors*, select the appropriate option from the dropdown on the Overview sheet of the Calculator (Figure 2).



**Figure 2: Selecting project type**

**Step 0:** Before beginning, ensure that Excel Macros are enabled. Click "Enable Content" when prompted, as shown in Figure 3 below.



**Figure 3: Enabling Macros**

**Step 1:** Enter the address of the building or fitout to be assessed. The address must be entered in the following format:

**<Street Number>, <Street Name>, <Street Type>, <Suburb>, <Postcode>**

**Step 2:** Enter the building or fitout type. There is a drop-down box with a list of possible types. These are listed below:

- Office, for example office buildings, administration centres.
- Education, for example primary schools, high schools, TAFEs, universities.
- Healthcare, for example hospitals, clinics.
- Industrial, for example warehouses, distribution centres.
- Retail Centre, for example shopping centres.
- Public Building, for example libraries, swimming pool complexes, community centres.
- Multi-unit Residential, for example apartment buildings, town-houses.
- Mixed-use Building, for example office buildings with retail spaces.

**Step 3:** Press the 'Find/Reset' button. This is used to populate the reference data for the address and building or fitout type entered and may also be used at any time to reset the assessment to its starting point.

The SA2 field is automatically determined from the address. If these are incorrectly calculated, please adjust the address until the SA2 correctly represents the project’s location (see Step 1 above).

Steps 1-3 are shown in Figure 4 (taken from the Design & As Built: Sustainable Transport Calculator).

Building Address

Building Type

SA2 Queen Street

**Figure 4: Steps 1 to 3 - Sustainability Calculator in use**

**Step 4:** The mode share percentages, avoided trips, average trip length and work weeks per annum are automatically populated based on the building or fitout type and location.

Adjust any of those values by manually entering the adjusted figure into the blue cells shown in Figure 5. The cells will change colour to indicate that a user change has been made. The other fields, including total emissions, total VKT and percentage of trips using active modes are automatically calculated, once the user clicks ‘Update Mode Shares’.

Refer to Section 8 for guidance on how to justify changes in mode share.

**Green Star - Design & As Built**

	Reference	Adjusted	Proposed	
Train	10.0%	10.0%	7.5%	
Bus	32.0%	32.0%	23.9%	
Ferry	4.0%	4.0%	3.0%	
Car Driver	41.0%	41.0%	30.6%	
Car Passenger	0.0%	0.0%	0.0%	
Bicycle	0.0%	10.0%	10.0%	
Walk	13.0%	25.0%	25.0%	
Total Mode Share	100.0%	122.0%	100.0%	<input type="button" value="Update Mode Shares"/>
Avoided trips	2.0%	2.0%	2.0%	%
Ave Trip Length	8.54	8.54	8.54	km
Work weeks	48	48	48	weeks / annum
trips per annum	470		470	trips / annum
Emissions per trip	1317		984	g CO <sub>2e</sub> / trip

**Figure 5: Step 4 – adjusting mode share percentages**

**Step 5:** The emissions intensity of each transport mode is automatically calculated.

The blue cells containing the emissions intensity of car drivers can be modified. Note that car emissions intensity is per VKT and is applied to the driver only, not to passengers. The interface is shown in Figure 6.

Refer to Section 8 for guidance on how to justify improvements in vehicle emissions intensities.

Emissions Intensity	Reference	Current	Unit
Train	14	14	g CO <sub>2-e</sub> / passenger km
Bus	136	136	g CO <sub>2-e</sub> / passenger km
Ferry	19	19	g CO <sub>2-e</sub> / passenger km
Car Driver	265	265	g CO <sub>2-e</sub> / vehicle km
Car Passenger	0	0	g CO <sub>2-e</sub> / passenger km
Bicycle	0	0	g CO <sub>2-e</sub> / passenger km
Walk	0	0	g CO <sub>2-e</sub> / passenger km
Total	33	33	g CO <sub>2-e</sub> / passenger km

**Figure 6: Step 5 – the emissions intensity of each mode is used to calculate transport emissions**

## 6 Travel plan

A Travel Plan (or equivalent alternative transport strategy) must be completed at a stage early enough in the design phase to ensure that the recommendations can be considered and implemented in the project.

The project team must report how the recommendations of the Travel Plan have been included in the project. The Travel Plan must be prepared by a suitably qualified Transport Professional (see Glossary section). The Travel Plan must include, as a minimum, the items listed below:

### 6.1 Site-specific Transport Assessment

The assessment must be carried out before the Development Approval and reviewed at the final design stage (prior to or during construction). The assessment must consider:

- The local environment for pedestrians and cyclists;
- Public transport links serving the site;
- Facilities for cyclists; and
- Car parking provisions (with a view to minimising the use of private cars).

### 6.2 Design Features for Alternative Transport

This section must be based on the site-specific transport assessment and, as a minimum, provide recommendations on the following issues:

- Provision of priority parking spaces for car share schemes;
- Provision of a dedicated path for pedestrians and cyclists from the site entrance to the major building entrance and bicycle parking facilities (where appropriate);
- Provision of dedicated cycle storage facilities and cycle lanes on-site, and adjoining lanes off-site where applicable;

- Improvements to bus services (where appropriate), e.g. altering bus routes or offering discounts;
- Restricting and/or charging (metering) for car parking; and
- Considerations in the location and design of all alternative transport design features to encourage maximum utilisation of these facilities.

## 6.2.1 Operational Opportunities for Alternative Transport

This section must include a plan of measures that encourage travel options with low environmental impact during building operation and, as a minimum, address the following:

- Reduction in single occupancy car journeys to and from the facility. e.g. car sharing;
- Promotion of walking;
- Promotion of cycling;
- Promotion of public transport;
- Deliveries and contractor vehicles;
- Visitors' transport; and
- Set targets for the mode share for project users transport to and from the building. The targets must be based on design and operational initiatives recommended by the Plan.

## 6.2.2 Building / Fitout Users' Information

This section must provide recommendations on how information about alternative transport facilities will be communicated to the project users e.g. walking, cycling and public transport.

## 7 Determining the reference project

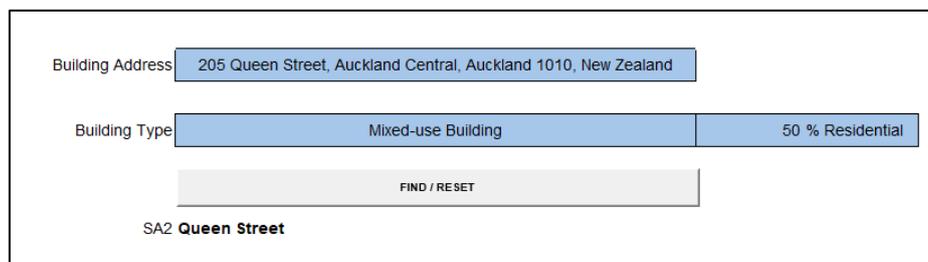
This Section describes how the Reference Project's emissions, VKT and active mode benchmarks are determined.

### 7.1 Mode Share

Mode share data is determined using SA2 level data from the NZ 2018 Census 'Main means of travel to work' and 'Main means of travel to education' data. The Reference Project is a building (or fitout within a building) which has the average mode share characteristics of places of employment within the SA2 area with its centroid closest to the location of the building being assessed.

There are three exceptions to the above:

- 1) When the user selects "multi-unit residential" as the primary building type, the mode share data has the average characteristics of residents leaving an SA2 zone to travel to a place of employment elsewhere.
- 2) When the user selected "education" as the primary building type, the mode share data has the average mode share characteristics of places of education within the SA2 area with its centroid closest to the location of the building being assessed.
- 3) When the user selects "mixed-use building" as the primary building type, the option to specify the percentage of the building that is residential will appear (e.g. 50%), as in Figure 7 below. The average mode share data for residents leaving that SA2 zone is combined with the mode share data for places of employment in that SA2 in that ratio (e.g. 50% of the residential mode share + 50% of the employment mode share). This could be used for hotels, or buildings that contain apartments.



The screenshot shows a form with the following fields and values:

- Building Address: 205 Queen Street, Auckland Central, Auckland 1010, New Zealand
- Building Type: Mixed-use Building (with a sub-field for 50 % Residential)
- Buttons: FIND / RESET
- SA2: Queen Street

**Figure 7: Mixed-use Building options**

### 7.2 Avoided Trips

Avoided trips refer to the propensity of employees to work from home or otherwise not take a commuting trip during a work week. Avoided trips are not differentiated by SA2 due to the large fluctuations and the difficulty of separating working from home data in the Census between employees who work from home occasionally compared to self-employed persons who work from home the majority of the time. The Calculator uses a standard value for avoided trips of 2% for all purposes except Education, which has an assumed 0% avoided trips.

## 7.3 Average Trip Length

Average trip length for the Reference Project is determined using the same data as described above. Using geospatial analysis combined with the number of employees who travel to a given SA2 from every other SA2, it is possible to estimate the average trip length for employees who commute to the SA2 of interest. This work was undertaken by MRCagney and applied to the Calculator.

## 7.4 Work Weeks

'Work weeks' refers to the number of normal working weeks per annum for employees of the Reference Project.

This is assumed to be 48 weeks (assuming 4 weeks of annual leave), except for Education workers who are assumed to work 40 weeks per annum. This is separate from avoided trips (see Section 7.2) which only refers to additional avoided trips.

## 7.5 Walk Score®

The publicly available Walk Score® website (<http://www.walkscore.com>) is used to determine the walkability of the building's location. Unlike other Performance Pathway criteria (1, 2 and 3), criterion 4 is not calculated by comparison with a Reference Project.

Walk Score® is available for every address in New Zealand and is automatically calculated within the spreadsheet tool. The Walk Score® is updated directly from the Walk Score® website and therefore always represents the most recently available data.

## 7.6 Emissions Intensity

Emissions intensity is estimated using 'Measuring Emissions: A Guide for Organisations – 2020 a Detailed Guide' prepared by the Ministry for the Environment<sup>12</sup>.

**Table 7-1: Emissions factors by transport mode**

Travel Mode	kg CO2-e/PKT	g CO2-e/PKT
Train	0.014	14
Bus	0.136	136
Ferry	0.019	19
Car Driver	0.265	265
Car Passenger	0	0
Bicycle	0	0

<sup>1</sup> Accessed from <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/Measuring%20Emissions%20Detailed%20Guide%202020.pdf>, 11th January 2020

<sup>2</sup> Accessed from <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>, 11<sup>th</sup> January 2020

## 8 Claiming improvements

This Section outlines the documentation required to claim improvements for the Proposed Project against the Reference Project.

The justifications must be included in a site-specific Travel Plan developed early in the design phase (i.e. Schematic Design phase). The Travel Plan must include a site-specific transport assessment, and the recommendations of the Plan should be included in the design, construction and operation of the project. Refer to Section 6 of this Guide for specific requirements of the Travel Plan.

### 8.1 Submission Requirements

#### 8.1.1 Mode Share Changes

Any changes to a mode share percentage in the "Adjusted" column are carried forward to the "Proposed" column. Any mode share percentages not modified by the user will make up the remaining proportion of travellers (up to 100%), so that each mode share is proportional to the "Reference" mode share.

For example, in Figure 8 the Adjusted mode shares total to 80%, and the remaining 20% of mode share must be comprised of modes which have not been adjusted by the user (i.e. Ferry and Car Driver). This 20% is allocated to these modes in proportion to their reference values (e.g. for Ferry:  $(4 \div 45) \times 20 = 1.8$ , so an additional 1.8% is added to the Ferry mode share in the Proposed column.

	Reference	Adjusted	Proposed
Train	10.0%	0.0%	0.0%
Bus	32.0%	0.0%	0.0%
Ferry	4.0%	4.0%	5.8%
Car Driver	41.0%	41.0%	59.2%
Car Passenger	0.0%	0.0%	0.0%
Bicycle	0.0%	10.0%	10.0%
Walk	13.0%	25.0%	25.0%
<b>Total Mode Share</b>	<b>100.0%</b>	<b>80.0%</b>	<b>100.0%</b>
Avoided trips	2.0%	2.0%	2.0%
Ave Trip Length	8.54	8.54	8.54
Work weeks	48	48	48

**Figure 8: Example of mode share changes**

The following justifications are to be considered when filling out the appropriate Submission Template for assessment:

**Walk:** Demonstrate that the claimed percentage of project users live (or in the case of a residential building, work) within walking distance of the building. The definition of walking distance depends on the project type. For example, students at a tertiary institution may have a higher tolerance for walking distance compared with office staff. Students at a primary school are likely to have the lowest tolerance for walking distance. It is the responsibility of the project team to justify the definition of walking distance appropriate to the project.

The project team must also justify the assumption that project users live nearby. For example, education or healthcare institutions with associated student or staff accommodation may be able to justify this. The project team is encouraged to submit a Technical Question to the NZGBC to provide justification of their assumptions.

**Cycle:** Demonstrate that cycle facilities are available for the claimed proportion of project users. Building / fitout initiatives should be in place to facilitate cycle use, including secure bicycle parking, weather protection, changing facilities with provision of showers and lockers etc. Secure bicycle parking is defined as that which is in accordance with AS 2890.3.

**Car (Driver, Passenger):** Demonstrate that car parking is only available for the claimed proportion of car drivers and parking is not freely and readily available near the site for occupants to use. An incentive scheme for carpooling or to give up a parking space may also be claimed with documentation of how the scheme works and a justification for the proportion of reduced car trips claimed.

**Public Transport (Train, Bus, and Ferry):** Demonstrate that a scheme has been developed for incentivising public transport use. The claimed increase must be proportional to the incentive scheme.

## 8.1.2 Trip Length Changes

Evidence must be produced that the workforce for this project commutes shorter distances than the Reference Project. For example, education or healthcare institutions with associated student or staff accommodation may be able to justify this. This could also apply to a primary or secondary school with a zoning policy for enrolments. The project team is encouraged to submit a Technical Question to the NZGBC to provide justification of their assumptions. Route distances should be calculated via the route that is taken, rather than in a straight line ('as the crow flies').

## 8.1.3 Avoided Trips Changes

An incentive scheme must be demonstrated or evidence of past rates of working from home must be produced to justifying increasing the avoided trips percentage for the company or workers/residents in the project. This does not apply to populations such as students, who would not typically receive incentives for working from home.

## 8.1.4 Work Weeks Changes

Evidence must be produced of a company policy with a higher than standard allowance for annual leave (i.e. greater than four weeks per annum).

## 8.1.5 Emissions Intensity Changes

Evidence must be produced of a company provided green fleet including vehicle specifications demonstrating the grams of CO<sub>2</sub>-e per VKT. The vehicles must be available for staff travel between home and work. A fleet

made available solely for staff transport during working hours cannot meet the requirements of this credit, as the credit covers only travel between home and the project.

## 8.2 Documentation Requirements

Refer to the respective Submission Guidelines for the Documentation Requirements.

## 9 Actions and Impacts

This section contains some potential actions which would be included to improve the Proposed Project compared to the Reference Project. Note that these are a small number of examples compared to the many potential changes, and each of these examples would need to be claimed with the submission requirements outlined in section 8.

### 9.1 Potential Improvements

Potential improvements for a variety of areas are listed below.

- Company car parking is converted to bicycle storage, to encourage an increase in cycling mode share and a decrease in car mode share.
- Public transport commutes are funded by the company, to incentivise an increase in public transport use.
- For an educational facility, enrolments are prioritised based on distance to the proposed project, reducing average trip length for the travel.
- A company policy encourages working from home several days per week, encouraging a reduction in trips taken.
- Annual leave amounts are increased, to reduce the number of work weeks.
- The company vehicle fleet is transitioned from petrol to hybrid, decreasing the average emissions intensity from cars.

### 9.2 Incorporation of External Infrastructure Projects

It is possible that external infrastructure projects will affect the mode shares and trip lengths for the Proposed Project. For example, a new train station close to the proposed project would be likely to increase the mode share from public transport. If the transport plan includes details of the external projects and fulfils the submission requirements, then the Proposed Project can include these improvements in their transport plan.

### 9.3 Hospitals and other sites with large parking needs

Hospitals often require a large amount of car parking for patients who are mobility impaired. The Transport Plan should encourage as many people as possible (staff, visitors, and out-patient visitors with mobility) to shift away from driving themselves. As the scores for Active Mode Encouragement or VKT Reduction are based upon percentage changes, so encouraging mode shift in those able to use other transport options will still have a significant impact. It should also be noted that increase in public transport provision to Hospitals also helps those who cannot afford or drive a car to access healthcare.

Similarly, other sites which typically require large parking sites should use the Transport Plan to encourage mode shift for those who have other transport choices.