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Spatial Analysis of the Northern Expressway and Environs

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1.Introduction

The construction of the Northern Expressway Project consists of two parts, the new Northern Expressway and the Port Wakefield Road upgrade. The Northern Expressway is a new 23-kilometer road built to 4-lane standards, providing a faster route between Adelaide and the STURT highway entrance, while reducing traffic on the Main North Road, the road It also includes a pedestrian and bicycle path connecting Gawler Bypass and Port Wakefield Road, approximately 3 km north of the Waterloo Corner Road intersection. The specific construction detail standards for the Northern Expressway Project construction and the environmental protection during operation may differ from the items described, but the limitations and design principles and standards in the report will remain essentially unchanged.

1.1 Project description

This report will first compare traffic conditions before and after the completion of the Northern Expressway. Traffic must travel along Main North Road and Gawler Bypass to reach the Sturt Highway before it is built, but it can be reached faster through Port Wakefield Rd after completion. The next step is to estimate the average pass time of the two methods, by comparing the length data of the two paths. At the same time, according to the land use data within 320 meters from the construction route, organize land use types, areas and areas of native vegetation coverage. Finally, a potential loop walk/bicycle path is created by analyzing the surrounding population density and surrounding roads and other related data.

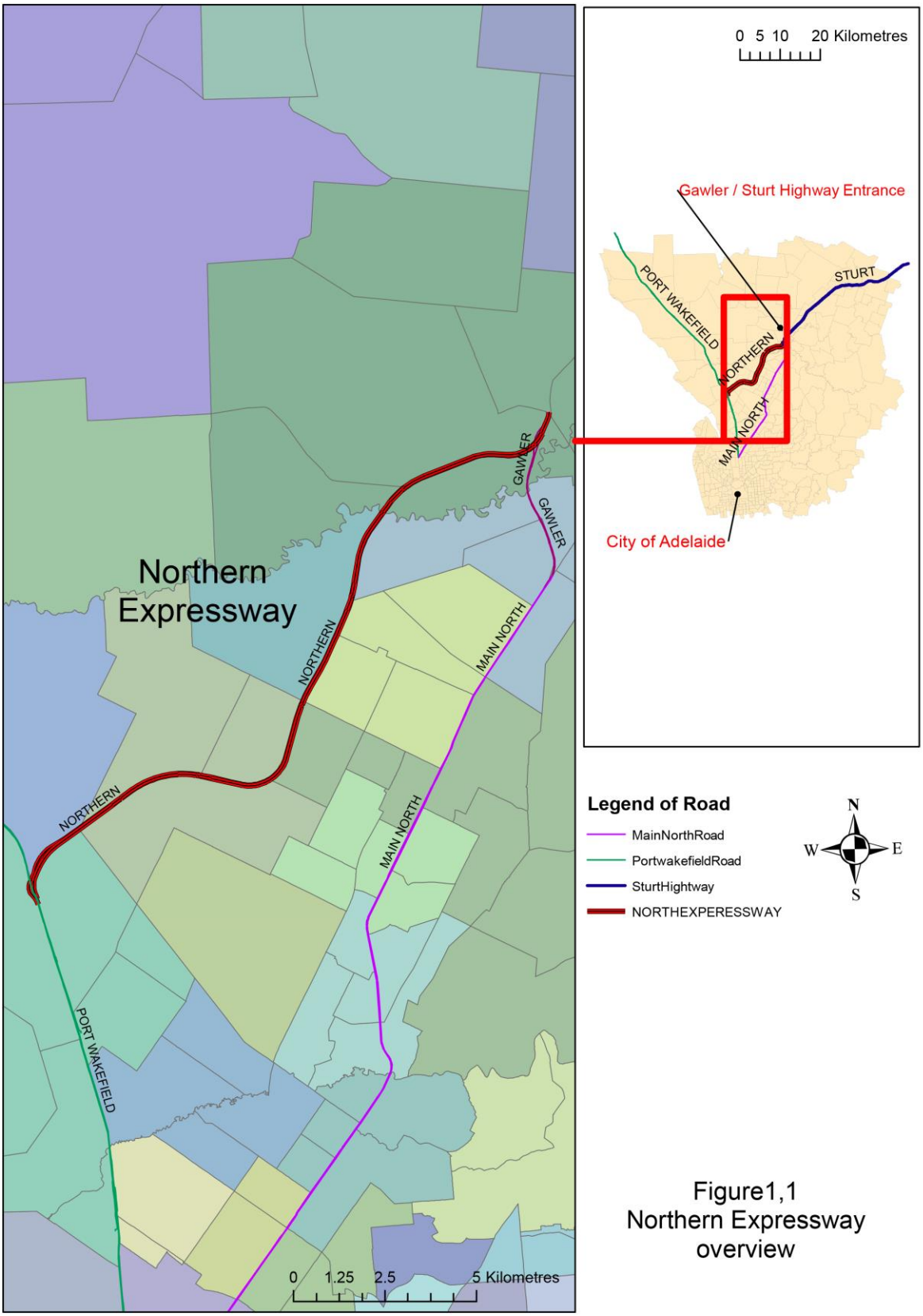

Figure1,1
Northern Expressway
overview

Figure1.1 Northern Expressway (study area) Overview

2. Methods and materials

2.1 Method of Compare the path before and after construction

In order to compare the differences between the roads before and after the completion, analyze and find out the roads that need to pass before and after the completion. The road data contains data that is not related to Northern Expressway, Main North Road, and Gawler Bypass. All information can be found in the attribute table of the road data, and the data matching the road name is selected and the new road layer is extracted. The length of the new route and other information can be found in the attribute table of the separate layer.

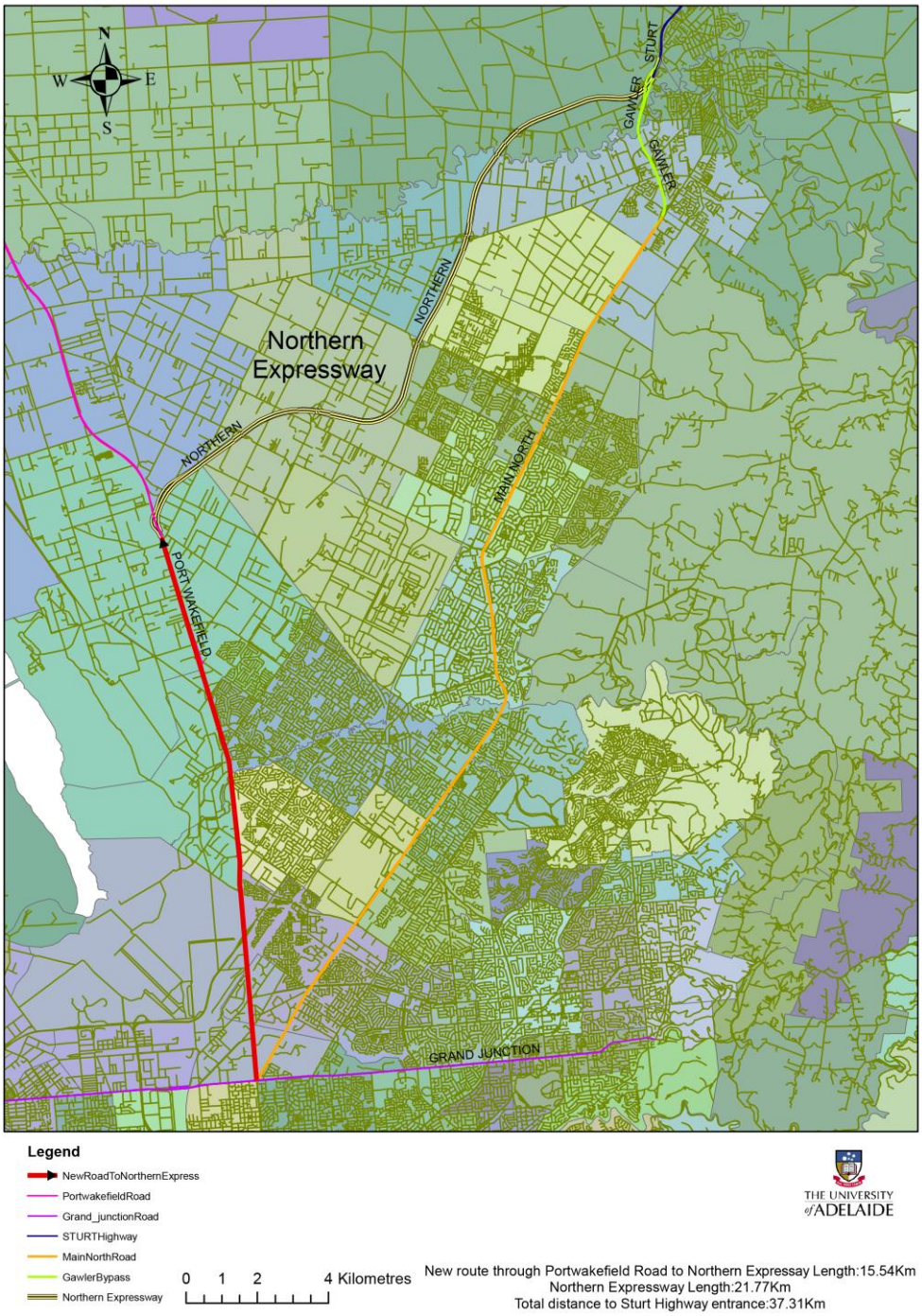

Figure2.1 New Through route

The new route through Port Wakefield RD to Northern Expressway' length is 15.54Km, and the Length of Northern Expressway is 21.77Km, Total distance to Sturt Highway is 15.54+21.77=37.13Km

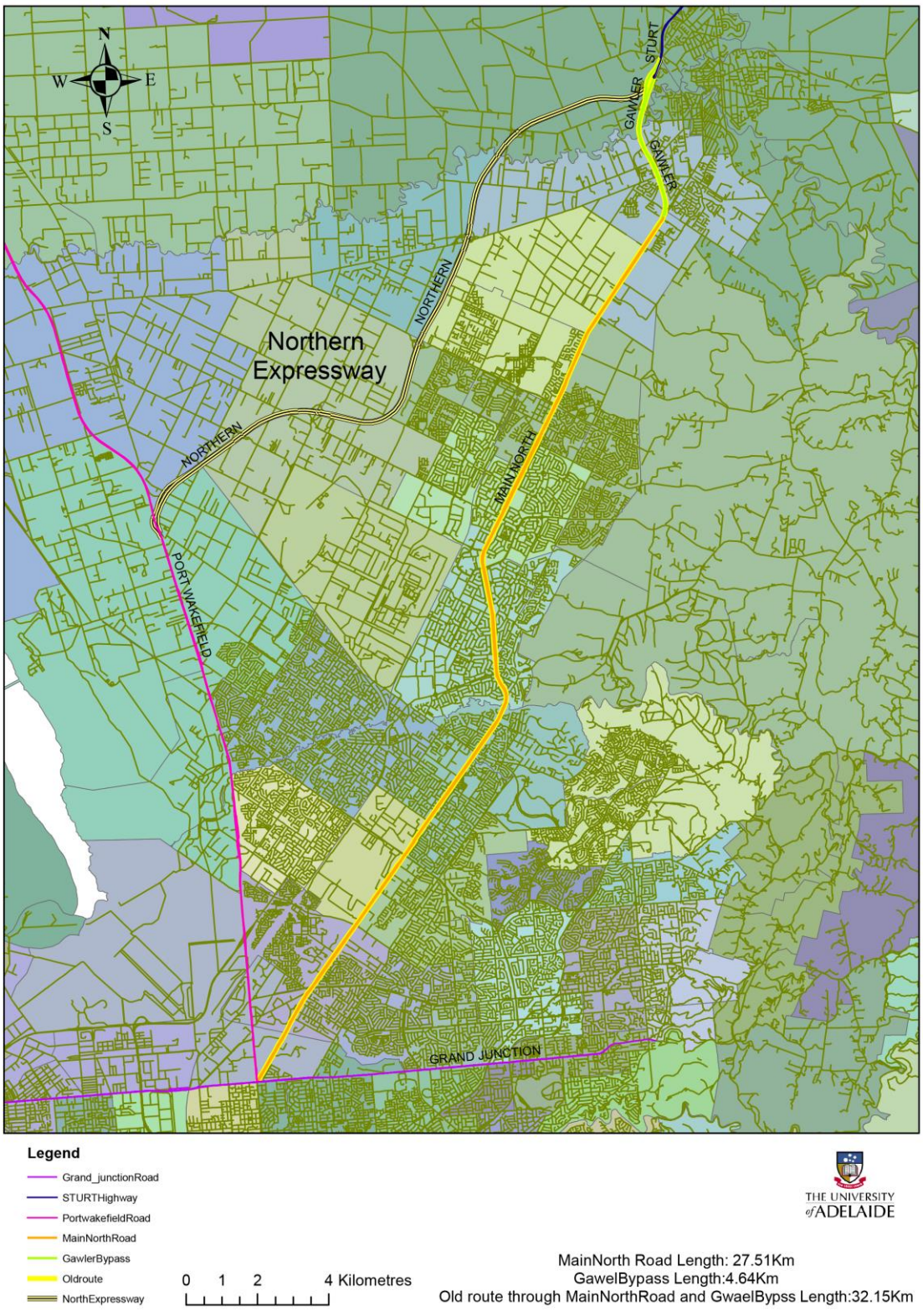

Figure2.2 Old Through route

The old route through Main North Road (27.51Km) and Gawler Bypass (4.64Km), and the Total distance to Sturt Highway is 27.51+4.64=32.15Km

2.2 Calculate the average transit time

Assuming an average traveling speed of 90Km/h via the new route and 60Km/h via the old route:

Old route distance=32.15Km
Speed =60Km/h
Time (min)=[(distance/speed)*60]=32.15min

New route distance=37.13Km
Speed=90Km/h
Time (min)=[(distance/speed)*60]=24.7min

2.3Method of analyzing attributes around the road

In order to assess the impact of the highway construction on the surrounding land within 320 meters, a buffer zone of 320 meters was established around all parts of the highway. This buffer was then used to clip the land use layer, extracting only those area of land use data that occur entirely within the buffer zone. Then can analyze and sort out various land use data from the clipped impact land use layer.

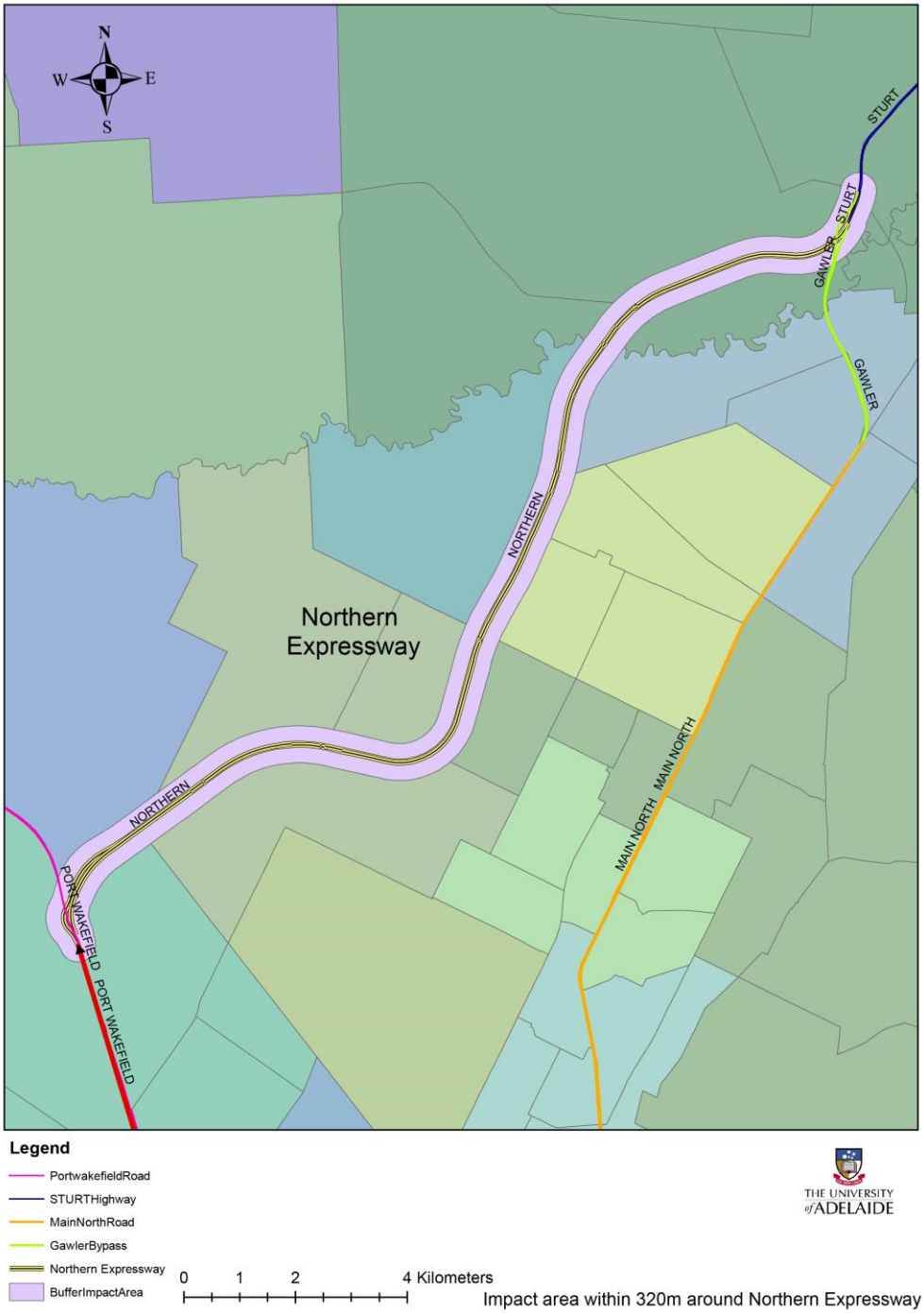

Figure2.3 Buffer layer (impact area) around Northern Expressay

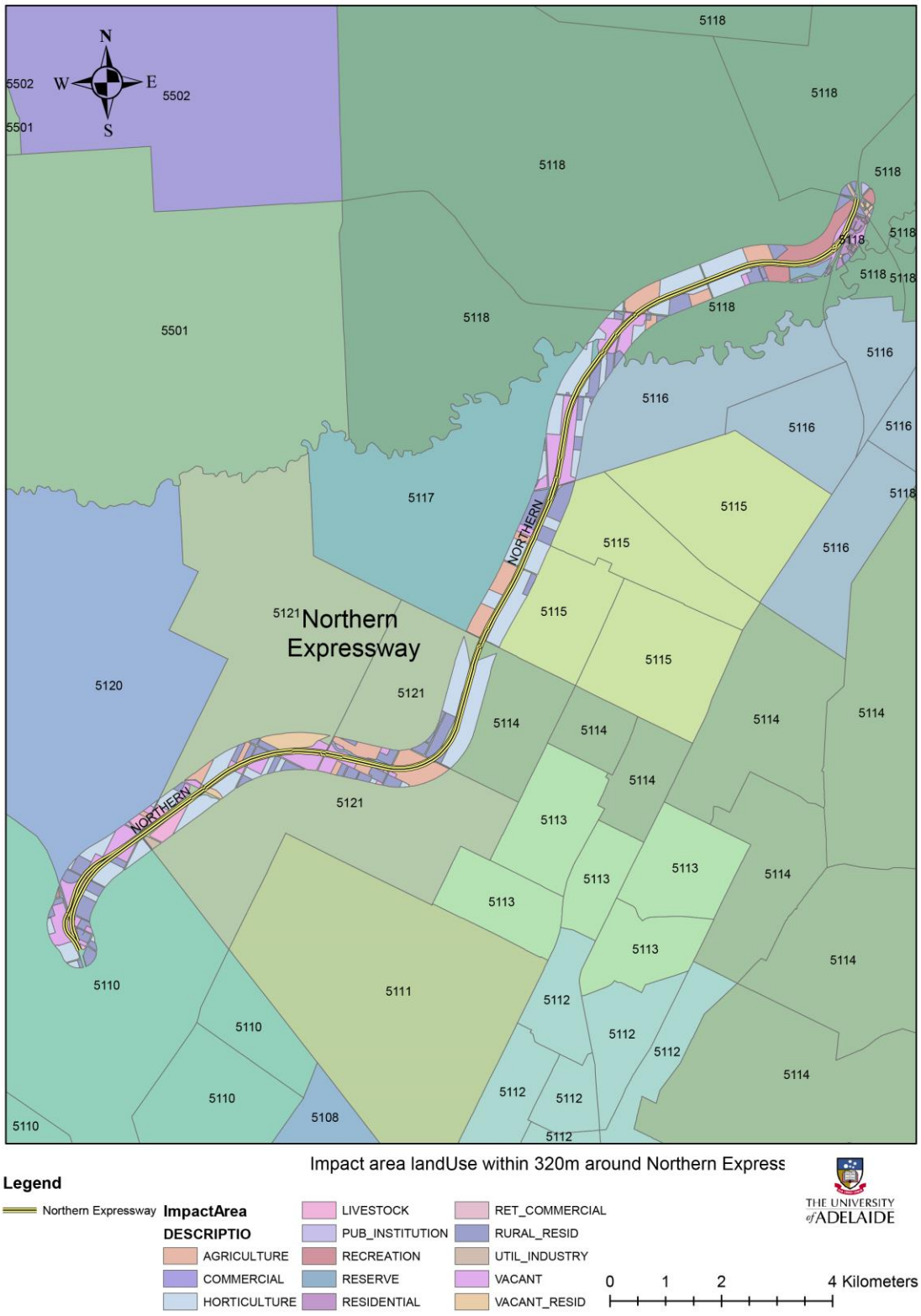

Figure2.4 Clipped layer (impact area land use) around Northern Expressay.

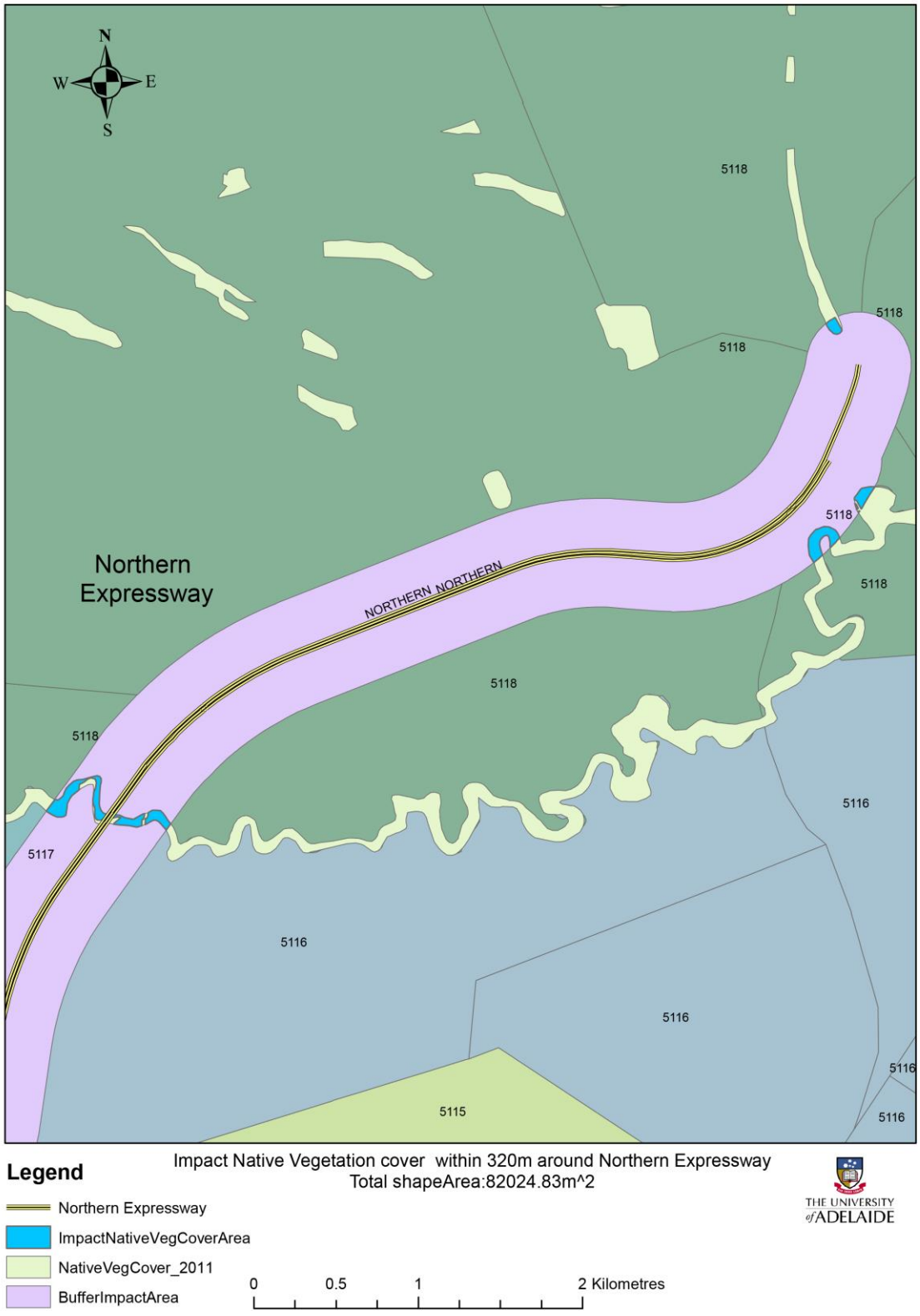

Figure2.5 Clipped layer (impact Native Vegetation cover) around Northern Expressay.

2.4 Method of create a loop path

The circular walkway and bicycle lane along the expressway are for the convenience of the surrounding residents. In order to analyze the convenience of the construction location, first select the residential area containing the area within 2Km from the high speed by using the select by location. Target layer choose population data, and source layer chose Northern Expressway, use within 2000km distance of the source layer feature. Give priority to areas with high population density to build.

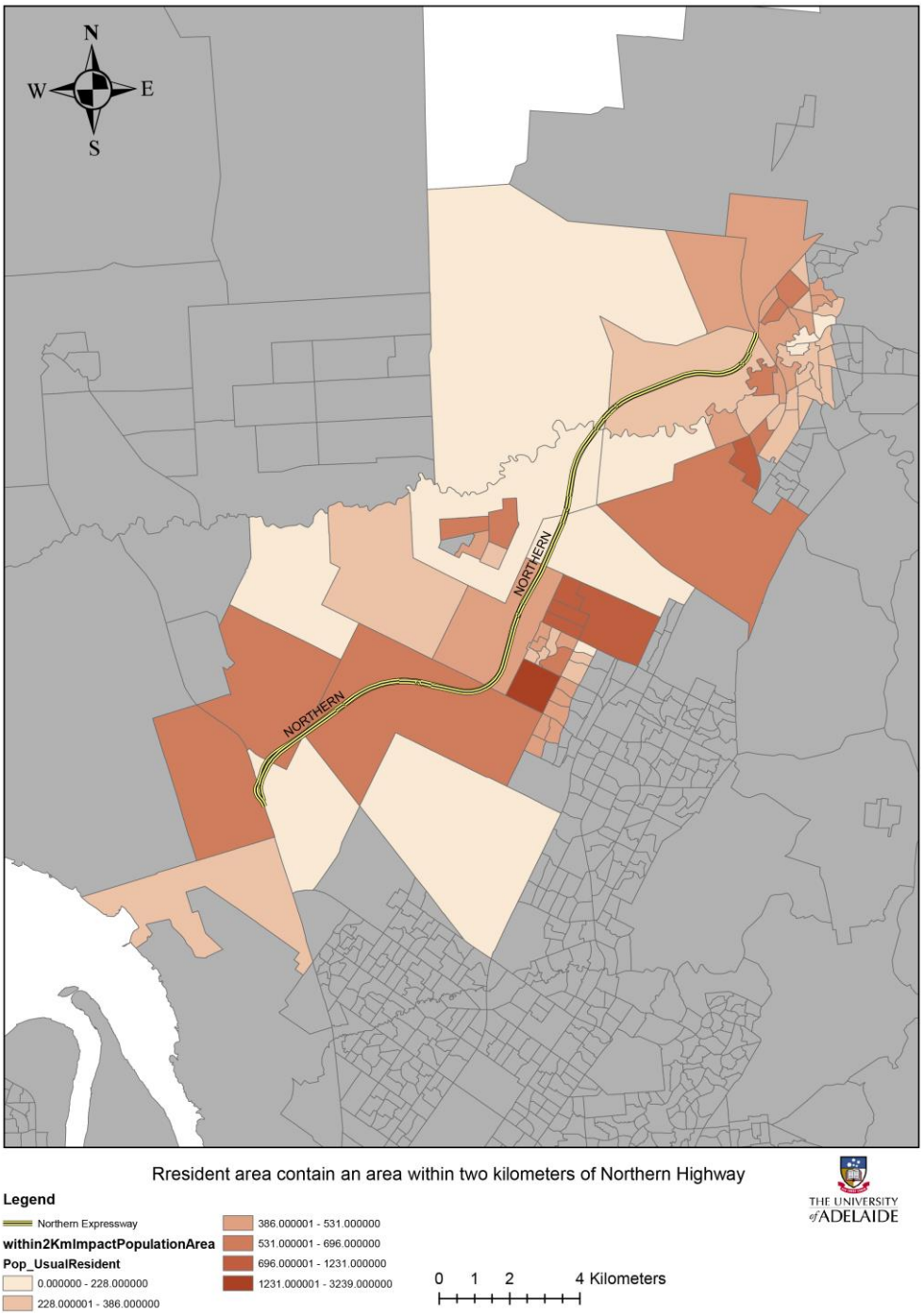

Figure2.6 Population within 2Km impact area

View the land use data of the selected area. The circular path needs to be easily passed by the surrounding residents. Choose a location with more surrounding residential areas and fewer main roads.

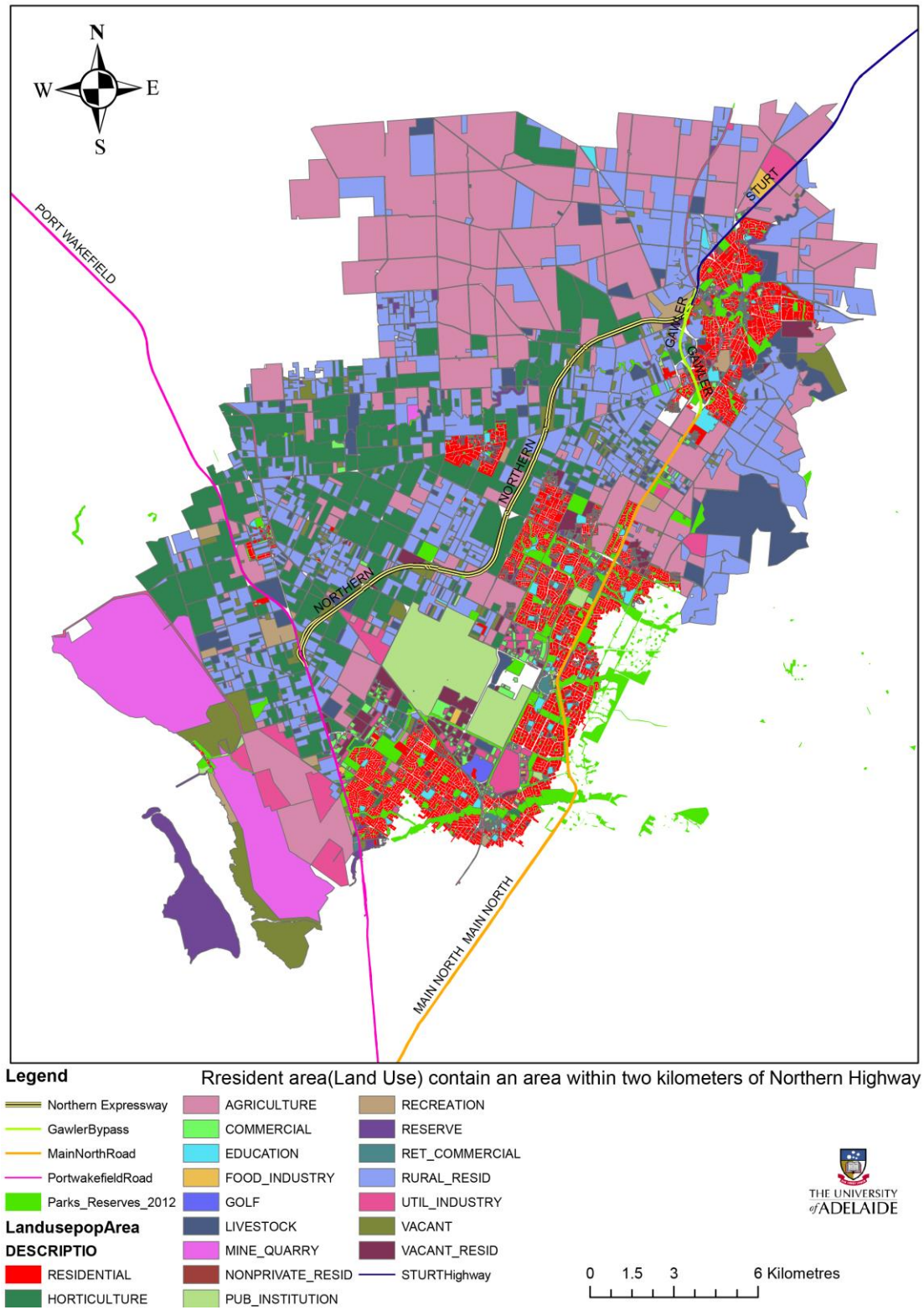

Figure2.7 Impact area (contain area with 2Km) land use

Choose a residential area located approximately 3 kilometers north of the Waterloo Corner Road intersection, which connects Gawler Bypass and Port Wakefield Road, a densely populated area with more connected roads and horticultural landscapes.

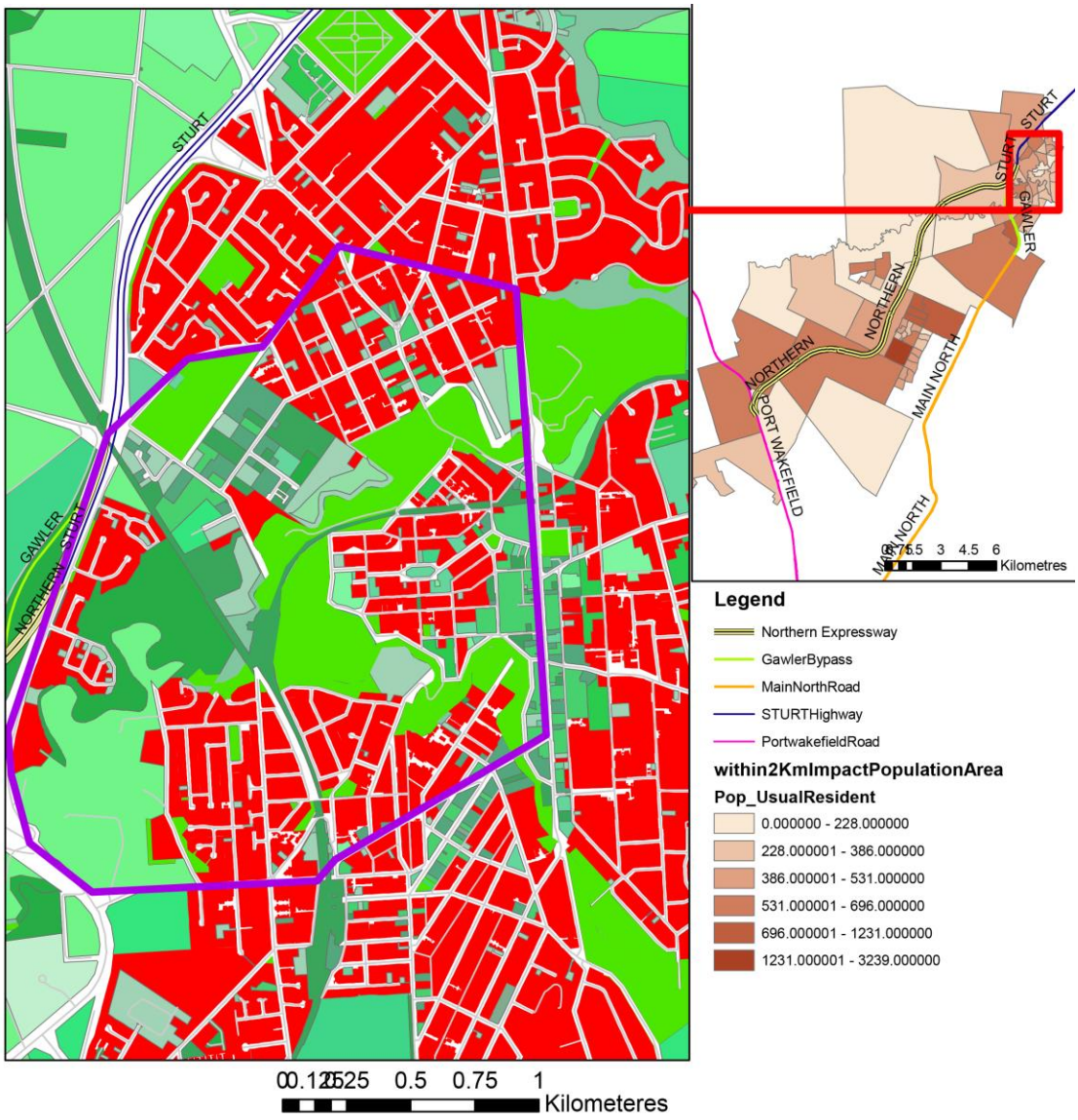

Figure2.8 Walking/Cycing Trail along the Northern Expressay

3.Results

3.1 Comparison of the distance before and after the completion of Northern Expressway

Comparison of the distance before and after the completion of the Northern Expressway:
Before the completion of the Northern Expressway, from the intersection of Port wakefield road and Main north Road to the beginning of the Sturt highway, only along Main North Road and Gawler Bypass, the total distance is 32.13Km;
After the completion of the Northern Expressway, the new route will be along the Port wakefield road, up to the Northern Expressway, and quickly reach the starting point of the Sturt highway through the newly built high-speed, total distance is 37.13Km.

3.2 Result of the travel time

Assuming an average traveling speed of 90Km/h via the new route and 60Km/h via the old route, The old route takes 32.15min, and new route takes 27.7min

3.3 Land use in affected areas

Descriptions	**Count**	**Shape Area**
Agriculture	**17**	**1540790.81m^2**
Commercial	**4**	**14953.84m^2**
Horticulture	**46**	**4630025.95m^2**
Livestock	**4**	**273915.70 m^2**
Pub_Institution	**2**	**18986.62 m^2**
Recreation	**4**	**592172.4 m^2**
Reserve	**9**	**85200.29 m^2**
Residential	**13**	**124484.40 m^2**
Ret_commercial	**2**	**11151.24 m^2**
Rural_resid	**81**	**2408887.53 m^2**
Util_industry	**5**	**72833.33 m^2**
Vacant	**95**	**3320499.43 m^2**
Vacant_Resid	**19**	**430488.64 m^2**
		Total: 13524390.26m^2

Table 1.1 Impact Area land use

3.4 Land use in affected areas

The total area of native vegetation cover falling within the 320m zone of impact is 82024.83m^2

3.5 Walking/Cycing Trail along the Northern Expressay

As shown in Figure 2.8, the total length is 10.09Km.

4.Discussion

There are many options for the choice of circular walkways and bicycle lanes. This project only selects one of them.

5.Conclusions

Although the completion of the Northern Expressay has increased the distance from the original junction to the Sturt highway entrance, the faster passage and speed have eased the increasingly congested Main north road, making it possible for large trucks not to cross the area of the population, and occupied vegetation area is also less. At the same time, the circular corridor built together can make the surrounding residents more convenient to connect the main roads.

6.Bibliography/reference

Landuse_2016

A polygon feature class of generalised land use types in the study area

Source: Department of Planning, Transport and Infrastructure (DPTI) 2016, Government of South Australia [Online] Available from: www.data.sa.gov.au/

NativeVegCover_2011

A polygon feature class of the remnant native vegetation in the region

Source: Source: Nature Maps, Department of Environment, Water and Natural Resources (DEWNR) 2011, Government of South Australia

Parks_Reserves_2012

A polygon feature class of existing council reserves near the Northern Expressway

Source: City of Port Adelaide Enfield, 2012 [Online] Available from: www.data.sa.gov.au/

Roads_2016

A line feature class of all the existing roads within the region

Source: Department of Planning, Transport and Infrastructure (DPTI) 2016, Government of South Australia. [Online] Available from: www.data.sa.gov.au/

SA1_2011

A polygon feature class of the Statistical Area 1 (SA1) census boundaries and total population counts surrounding the Northern Expressway. *Source: Australian Bureau of Statistics (ABS) 2011*

Suburbs_2016

A polygon feature class outlining the suburbs near the Northern Expressway

Source: Department of Planning, Transport and Infrastructure (DPTI) 2016, Government of South Australia [Online] Available from: www.data.sa.gov.au/

7.Appendices

https://www.infrastructure.sa.gov.au/nsc/northern_connector

https://southroad.sa.gov.au/northern_expressway