

# CHAPTER 3

## Traffic and Transport *Status Quo* Assessment

**March 2009**

*A Local Area Plan and Land Use Management Scheme for the Back of Port Interface*

Prepared by **ARUP**

eThekweni Municipality



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Job number 181772

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# 1 Introduction

## 1.1 Background

Arup Transport Planning were commissioned by Graham Muller and Associates to investigate the traffic and transport implications of developments within the Back of Port area broadly defined as the area from the Port of Durban in the north to Isipingo in the south. The aim of the study was to undertake an appraisal of the current road network in terms of the performance and to also evaluate the impact of future land use changes on the road network.

## 1.2 Extent of Road Network

The study will assess the various port proposals and defined by Transnet and will consider the following:

- Design of the new or improvements to existing infrastructure; and the
- Phasing of road network improvements.

The main road network included within the study area are as follows:

- M4 Southern Freeway;
- N2 Outer Ring Road;
- M7 – Edwin Swales Drive;
- Umbilo and Sydney Road;
- Bluff Road; and
- South Coast and Maydon Rd.

## 1.3 Literature Review and Previous Studies

### *South Durban Industrial Basin SATURN Model*

In October 2005 Arup Transport Planning were tasked by the eThekweni Transport Authority to develop a SATURN traffic model (known as the SDIB model) of the South Durban Industrial Basin broadly defined as the area from the Port of Durban in the north to Amanzimtoti in the south.

The aim of the study was to undertake an appraisal of eTA's Integrated Transport Plan (ITP) road schemes in the area in light of a number of significant development proposals. These included:

- Port of Durban Draft masterplan undertaken in 2004;
- Clairwood regeneration proposals;
- Development options at Clairwood Racecourse;
- Durban International Airport Site; and
- Arbour Town – a mixed use development proposal near Umbogintwini.

The study concluded that the ITP schemes provided adequate capacity and improvement within the network but should be supported by a number of smaller improvements at key intersections through the study area. In relation to the Port:

- It was confirmed that Edwin Swales Link Rd and Khangela Bridge provided vital relief to the Port in the short to medium term but would not support the Port much beyond 2015;
- It was recommended that Umhlathuzana Arterial was a key new route required to support the expansion of the Port and the route should connect through to Edwin Swales Drive which reduced delays at Edwin Swales / South Coast Rd intersection.

Since the study concluded, Transnet have further developed proposals at the Port of Durban and have undertaken a Traffic Study to assess various Port proposals including:

- Bayhead Expansion – the provision of a new container terminal;
- Maydon Wharf – Rationalisation of terminals and infrastructure;
- Re-engineering of Durban Container Terminal;
- Pier 1 Container Terminal; and
- Salisbury Island Container Facility;

These typically have focused on the southern side of the Port, however proposals for the Point Terminals do exist but fall out of the scope of that report. As well as these port proposals, increases in the demand of various cargoes over a planning horizon of 30 years have been considered.

### *Durban Bayhead Expansion: Traffic and Transportation Study*

The Bayhead Expansion Study: Traffic & Transportation Assessment, was commissioned by the Bayhead Expansion Feasibility Study to identify the specific road infrastructure requirements for the proposed Bayhead Container Terminal (Phase 1).

In this regard, the Bayhead Expansion Study: Traffic & Transportation Assessment was tailored to be a consolidated traffic study for the Port of Durban and takes cognisance of the following proposed developments:

- The Bayhead Expansion Study (Short to Medium Term Project)
- The Salisbury Island Car Terminal (Short Term Project)
- Pier One container conversion (Current Project – in implementation)
- Maydon Wharf Redevelopment (Short to Medium Term Project)
- Salisbury Island Container Terminal (Medium Term)

The core study area (defined as the Port area bounded by Edwin Swales VC Drive, Victoria Embankment, South Coast Road, Bluff Road, and the Durban Harbour) was modelled using the AIMSUN NG (Advanced Interactive Microscopic Simulator for Urban and Non-Urban Networks) software suite, developed by Transport Simulation Systems (TSS) of Spain.

The AIMSUN NG software is a dynamic simulation environment geared to assess road network performance, through the continuous modelling of individual vehicle movements for various vehicle classes throughout the simulation period, using several vehicle behaviour models.

## 2 Status and Performance of Road Infrastructure within the Study Area

In order to assess the road network (including the newly built Khangela Bridge) within the study area certain criteria have been used including:

- Network wide statistics;
- Network stress (volume to capacity plots); and
- Traffic flows on key routes;

These statistics provide an overview of the performance of the road network and helps to identify any problems areas that need to be addressed.

### 2.1 Network Wide Statistics

A comparison with existing conditions shows that during both the AM and IP peak hours there is only a marginal decrease in total travel times for both port freight and other network traffic. This is also the case with the total travel distances for both time periods. From an average speed point of view, there is no difference between the existing 2007 conditions during both time periods. **Table 1** provides an overview of the network wide statistics.

Table 1 – Assignment statistics

	AM Peak	IP Peak
Total Trips Assigned (PCUs)	60649	42319
Total Travel Time (PCU Hrs)	11262	5774
Travel Distance (PCU Kms)	594572	394470
Speed (kph)	53	68

### 2.2 Network Stress

**Figure 1** shows the network stress levels during the AM peak period and **Figure 2** shows the network stress levels during the IP peak.

The road network operates at approximately 80% during the AM peak hour, but this level drops to less than 60% during the IP. During the AM several sections and road intersections operate at over 80% as for the current 2007 AM peak.

### 2.3 Traffic flows

**Figure 3** shows that the 2007 AM peak hour traffic demand on the Khangela Bridge is approximately 770 PCU's per hour (northbound) and 1570 PCU's per hour (southbound). The corresponding demand volumes for the IP (**Figure 4**) are 770 and 1270 PCU's per hour. In both instances these are significant traffic volumes.

The diversion of these trips to the bridge has resulted in significant drops in the traffic demand on the Francois Road bridge (760 to 430 PCU's northbound and 1470 to 1060 PCU's southbound in the AM peak and 1030 to 650 PCU's and 880 to 440 PCU's in the IP). The traffic demand on Queen Mary Avenue increases correspondingly, while there are also significant drops in traffic demand on the South Coast Road between the two bridges.

### 2.4 Key Points

At a network level:

- No significant change between AM and IP peak periods impact on the overall network performance from a vehicle-hour, vehicle-distance or average network speed perspective

In terms of network stress:

- The AM peak shows lower V/C characteristics and higher V/C levels during the IP peak
- The introduction of the Khangela Bridge shows an increased V/C ratio on certain routes and in particular Umbilo Road, which operates at V/C ratios of over 80% during the AM and IP periods.

Analysis of changes in traffic flow indicate:

- The opening of Khangela Bridge results in a significant reduction on traffic demand on Francois and Umbilo Road, with volumes reducing by up to 50% in the AM peak hour.

### 3 Status Quo Analysis

With regards to the status quo traffic operating conditions, the Bayhead Road / South Coast Road and the Edwin Swales / South Coast Road intersections operate at poor levels of service.

#### 3.1 Status Quo

The status quo assessment considers existing port developments that comprises of the following major land uses:

- Durban Container Terminal (DCT) Re-engineering
- Salisbury Island – occupied by the South African Army and Navy
- Pier 1 Container Terminal
- Redevelopment of Maydon Wharf

#### 3.2 Road Hierarchy

The Road Hierarchy is shown in **Figure 5**. The regional network that serves the Port of Durban consists of:

- National Route 2 (N2)
- Metropolitan Route 4 (M4)
- National Route 3 (N3)
- Metropolitan Route 7 (M7) – Edwin Swales VC Drive

The N2 along with the M4 forms part of the North South Transportation Corridor. Both these routes are heavily trafficked and are currently operating at capacity over one or more segments during the peaks.

The N2 has an operating speed of 120km/h and carries traffic to and from the northern and southern extremities of eThekweni from areas such as Tongaat, Umhlanga & Phoenix in the north and areas such as Isipingo, Chatsworth, etc in the south. The N2 is a major carrier of freight from industrial developments in the south to Johannesburg via the N3 or to the Port via the M7.

The N3 and the M7 forms part of the western transportation corridor and carries traffic movement in a west to east direction and vice-versa. The N3 forms the primary link between the Port of Durban and Gauteng, the economic hub of South Africa. As with the N2 and the M4, many sections of these roads are already operating at capacity.

The port of Durban is currently served or connected to the regional road network by four arterials:

- South Coast Road
- Maydon Road
- Victoria Embankment
- Edwin Swales Drive

These form a continuous closed link around the port with local roads radiating from it.

Victoria Embankment is a six lane dual carriage way that is heavily traffic by both light and heavy vehicles (Excess of 48,000 PCU's per day). The existing port terminals of the Port of Durban are serviced by Victoria Embankment via Bay Terrace & Shepstone Road. The high traffic volumes on Victoria Embankment supplemented with high road based port traffic volumes has resulted in congested operating conditions at some key intersections along Victoria Embankment.

The segment of South Coast Road that currently services the port is a four lane road that is trafficked primarily by industrial or heavy vehicles (Approximately, 2100 pcu's during the peak hour).

Maydon Road is essentially the northward continuation of South Coast Road and maintains the same characteristics.

Within the Port precinct, port activities are accessible via two main collectors, as follows:

- Bayhead Road
- Langeberg Road

Bayhead Road currently exhibits signs of excessive congestion at times. This congestion is not however, related to a lack of capacity but rather traffic control or management system currently in place. Heavy vehicles tend to stack along Bayhead Road while waiting to gain access to the port for the off-loading and loading of cargo. With economic growth resulting in increased freight movement, this problem of congestion along Bayhead Road is expected to worsen over time.

#### 3.3 Analysis Results

##### Intersection Operational Characteristics

- The Bayhead Road / South Coast Road Intersection operates at LOS F in both the AM peak and IP. The south approach to the intersection is the most critical approach. High delays and queuing during the AM peak can be attributed to the high volumes of commuter vehicles approaching the intersection from the south. During the IP, high delays are caused by high volumes of heavy goods vehicles accessing the port from the South approach. It is during this IP period, between 13:00 and 14:00, that the highest volumes of heavy goods vehicles are generated by the port.
- The Edwin Swales Drive / South Coast Road intersection operates at acceptable levels of service during the IP and at LOS E during the AM peak period. This is due to the higher volumes of light vehicles generated during the AM commuter peak.
- The Langeberg Road / Bayhead Road intersection operates at acceptable levels of service during both the AM peak and IP.

##### Route Operational Characteristics

- Most Road Links operate at acceptable levels during both the AM peak and IP. Traffic streams operating at the highest V/C ratio and lowest speeds are South Coast Road and Edwin Swales VC Drive.

## 4 Summary and Conclusions

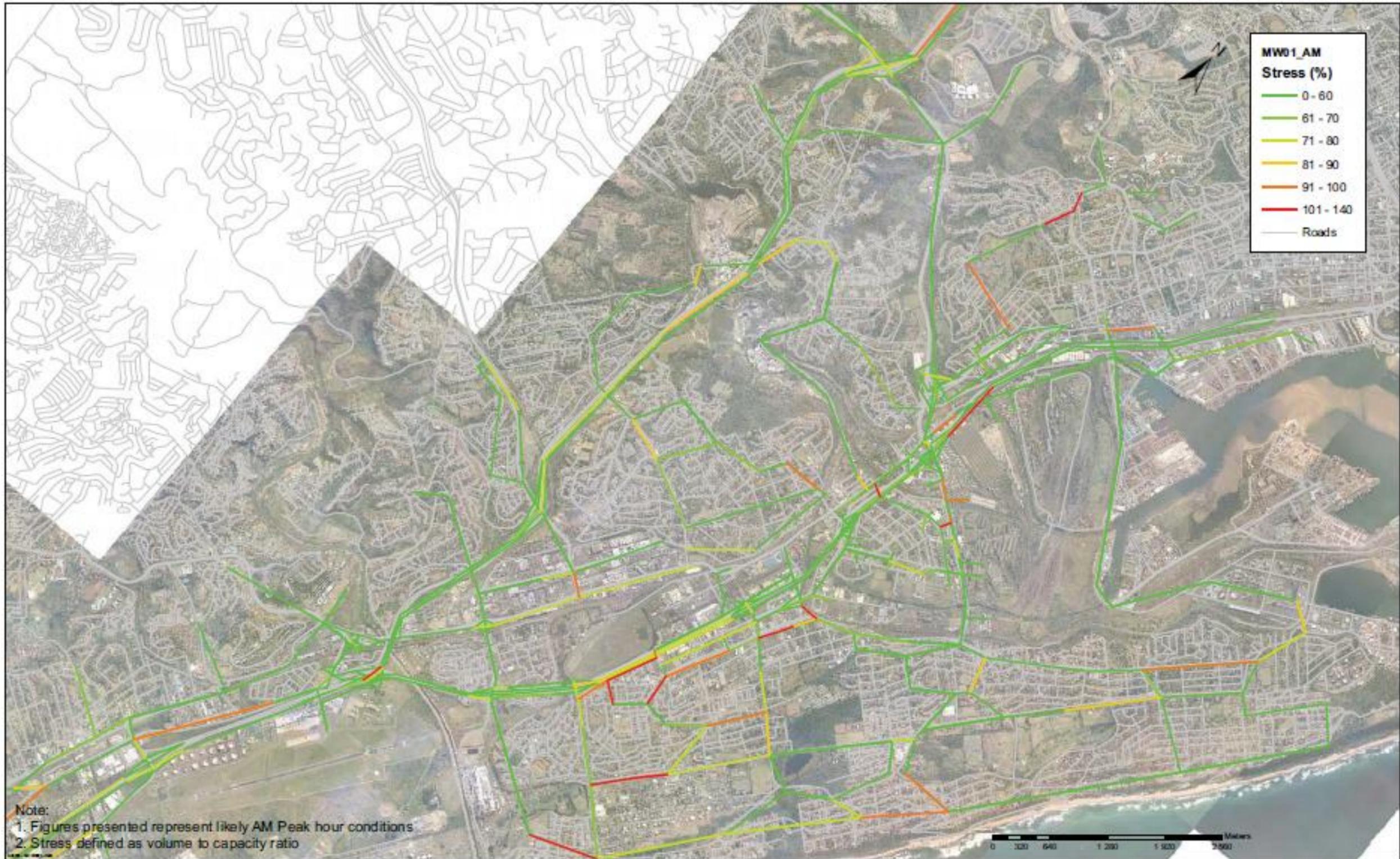
With regards to the status quo traffic operating conditions, the Bayhead Road / South Coast Road and the Edwin Swales / South Coast Road intersections operate at poor levels of service.

The addition of Khangela Bridge helps reduce congestion at the Bayhead Road / South Coast Road intersection by providing an alternate route to both light and heavy vehicles utilising this intersection. However, the Edwin Swales / South Coast Road intersection still operates at unacceptable levels due to high commuter peak volumes.

## 5 COMPOSITE SUMMARY AND STRATEGIC ISSUES

PROBLEMS	POSSIBILITIES	STRATEGIC ISSUES FOR BOP PROJECT
<b>NATIONAL CONTEXT</b>		
<ul style="list-style-type: none"> <li>Lack of sufficient access to National Road Network</li> </ul>	<ul style="list-style-type: none"> <li>Add additional interchange on N2 south of the M7/N2 interchange</li> </ul>	<ul style="list-style-type: none"> <li>Provide direct access to national road network with limited influence from local and regional traffic</li> </ul>
<ul style="list-style-type: none"> <li>Lack of sufficient access to National Road Network</li> </ul>	<ul style="list-style-type: none"> <li>Improve existing interchange at the DIA</li> </ul>	<ul style="list-style-type: none"> <li>Provide improved and direct access to the DIA area and the future possible Dig-out port</li> </ul>
<ul style="list-style-type: none"> <li>Lack of sufficient access to National Road Network</li> </ul>	<ul style="list-style-type: none"> <li>Improve Prospecton Road interchange</li> </ul>	<ul style="list-style-type: none"> <li>Allow for an additional access to the DIA (Dig-out) port and improve access to the Prospecton area</li> </ul>
<ul style="list-style-type: none"> <li>Lack of sufficient access to National Road Network</li> </ul>	<ul style="list-style-type: none"> <li>Introduce a Dedicated Freight Route from Port to the National Road Network away from the already congested road network</li> </ul>	<ul style="list-style-type: none"> <li>Allow for dedicated freight movement that could be easily controlled and managed to reduce traffic congestion</li> </ul>
<b>PROVINCIAL CONTEXT</b>		
<ul style="list-style-type: none"> <li>Lack of sufficient access to Provincial Road Network</li> </ul>	<ul style="list-style-type: none"> <li>Allow for an additional links from the DIA / Dig-out port to provincial roads such as the R603 (Umbumbulu Road)</li> </ul>	<ul style="list-style-type: none"> <li>Improve accessibility to an already access limited road network</li> </ul>
<b>METROPOLITAN CONTEXT</b>		
<ul style="list-style-type: none"> <li>Road congestion on wider road network influence movement in BOP area</li> </ul>	<ul style="list-style-type: none"> <li>Upgrading of wider area road network according to ITP document</li> </ul>	<ul style="list-style-type: none"> <li>Metropolitan road upgrades should focus on the BOP area</li> </ul>
<b>SOUTH DURAN BASIN CONTEXT</b>		
<ul style="list-style-type: none"> <li>Congestion at critical intersections along the major route within the area:                             <ul style="list-style-type: none"> <li>South Coast / Edwin Swales Drive</li> <li>Bayhead Road / Edwin Swales Drive</li> <li>Langeberg / Bayhead Road</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Upgrade intersections and introduce dedicated freight movements and routes</li> </ul>	<ul style="list-style-type: none"> <li>Allow for direct freight access and limit freight vehicle movement on mainly residential road network</li> </ul>
<ul style="list-style-type: none"> <li>Congestion on certain sections of road network:                             <ul style="list-style-type: none"> <li>South Coast Road in the Clairwood CBD area</li> <li>South Coast Road between Edwin Swales Drive and Bayhead Road</li> <li>Edwin Swales Drive between Bluff and South Coast Road</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Introduce dedicated routes and increase number of lanes where light and heavy vehicles share roads</li> </ul>	<ul style="list-style-type: none"> <li>Allow for direct freight access and limit freight vehicle movement on mainly residential road network</li> </ul>
<ul style="list-style-type: none"> <li>No proper Traffic Management</li> </ul>	<ul style="list-style-type: none"> <li>Introduce Traffic Demand Measure within the area. Limit access of Freight vehicles onto local residential roads</li> </ul>	<ul style="list-style-type: none"> <li>Improve traffic flow in general in the area and allow for more capacity on the road network</li> </ul>
<ul style="list-style-type: none"> <li>Lack of Traffic Demand Measure</li> </ul>	<ul style="list-style-type: none"> <li>Introduce dedicated freight routes to limit freight and light vehicle conflict</li> </ul>	<ul style="list-style-type: none"> <li>Improve traffic flow in general in the area and allow for more capacity on the road network</li> </ul>
<ul style="list-style-type: none"> <li>Lack of a well structured road hierarchy within the BOP area</li> </ul>	<ul style="list-style-type: none"> <li>Ensure effective law enforcement to reduce freight movement on local roads</li> </ul>	<ul style="list-style-type: none"> <li>Improve traffic flow in general in the area and allow for more capacity on the road network</li> </ul>
<ul style="list-style-type: none"> <li>Number of freight vehicles parking and staying over night in the area</li> </ul>	<ul style="list-style-type: none"> <li>Introduce Truck Stops and Parking areas away from the BOP area</li> </ul>	<ul style="list-style-type: none"> <li>Improve the character of the area, reduce damage to road infrastructure</li> </ul>
<ul style="list-style-type: none"> <li>Intersection congestion and flow</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance and replacement of defective traffic signals</li> </ul>	<ul style="list-style-type: none"> <li>Ensure proper traffic flow</li> </ul>
<ul style="list-style-type: none"> <li>Limit rail access to DIA site</li> </ul>	<ul style="list-style-type: none"> <li>Improve rail infrastructure to DIA area</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the need for additional freight vehicles on road network and free up critical road capacity</li> </ul>
<ul style="list-style-type: none"> <li>Rail transport efficiency and usage</li> </ul>	<ul style="list-style-type: none"> <li>Encourage the use of rail instead of road to reduce the impact of road network</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the need for additional freight vehicles on road network and free up critical road capacity</li> </ul>
<ul style="list-style-type: none"> <li>Operational hours and effective management thereof</li> </ul>	<ul style="list-style-type: none"> <li>Encourage 24 hours operations and introduce incentives to operate during off peak hours</li> </ul>	<ul style="list-style-type: none"> <li>Increase capacity of the road system and allow for the more even distribution of vehicles through-out the day</li> </ul>
<ul style="list-style-type: none"> <li>Wide spread locations of Empty containers</li> </ul>	<ul style="list-style-type: none"> <li>Consolidation of empty containers to reduce the need for traffic to operate between these different areas</li> </ul>	<ul style="list-style-type: none"> <li>No double movement of containers and the management of empty container to reduce traffic congestion</li> </ul>
<ul style="list-style-type: none"> <li>Wide spread locations of Third Party Logistic Operations</li> </ul>	<ul style="list-style-type: none"> <li>Consolidation of 3PL's to reduce the need for traffic to operate between these</li> </ul>	<ul style="list-style-type: none"> <li>No double movement of containers and the management of 3PL's to reduce traffic</li> </ul>

	different areas	congestion
<b>PLANNING AREA CONTEXT</b>		
<ul style="list-style-type: none"> <li>Congestion at critical intersections along the major route within the area:                             <ul style="list-style-type: none"> <li>South Coast / Edwin Swales Drive</li> <li>Bayhead Road / Edwin Swales Drive</li> <li>Langeberg / Bayhead Road</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Upgrade intersections and introduce dedicated freight movements and routes</li> </ul>	<ul style="list-style-type: none"> <li>Allow for direct freight access and limit freight vehicle movement on mainly residential road network</li> </ul>
Congestion on certain sections of road network: <ul style="list-style-type: none"> <li>South Coast Road in the Clairwood CBD area</li> <li>South Coast Road between Edwin Swales Drive and Bayhead Road</li> <li>Edwin Swales Drive between Bluff and South Coast Road</li> </ul>	<ul style="list-style-type: none"> <li>Introduce dedicated routes and increase number of lanes where light and heavy vehicles share roads</li> </ul>	<ul style="list-style-type: none"> <li>Allow for direct freight access and limit freight vehicle movement on mainly residential road network</li> </ul>
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<ul style="list-style-type: none"> <li>Number of freight vehicles parking and staying over night in the area</li> </ul>	<ul style="list-style-type: none"> <li>Introduce Truck Stops and Parking areas away from the BOP area</li> </ul>	<ul style="list-style-type: none"> <li>Improve the character of the area, reduce damage to road infrastructure</li> </ul>
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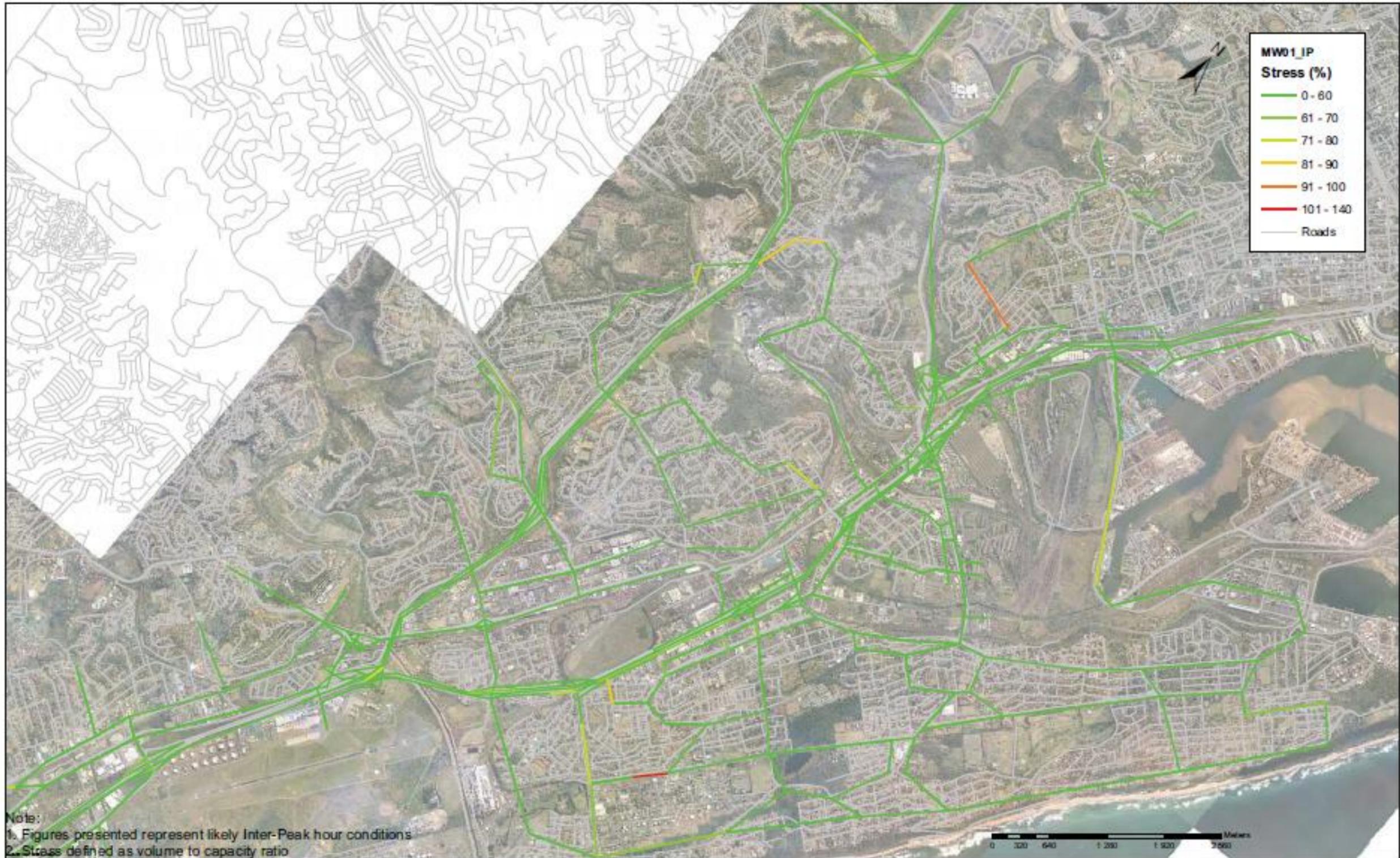


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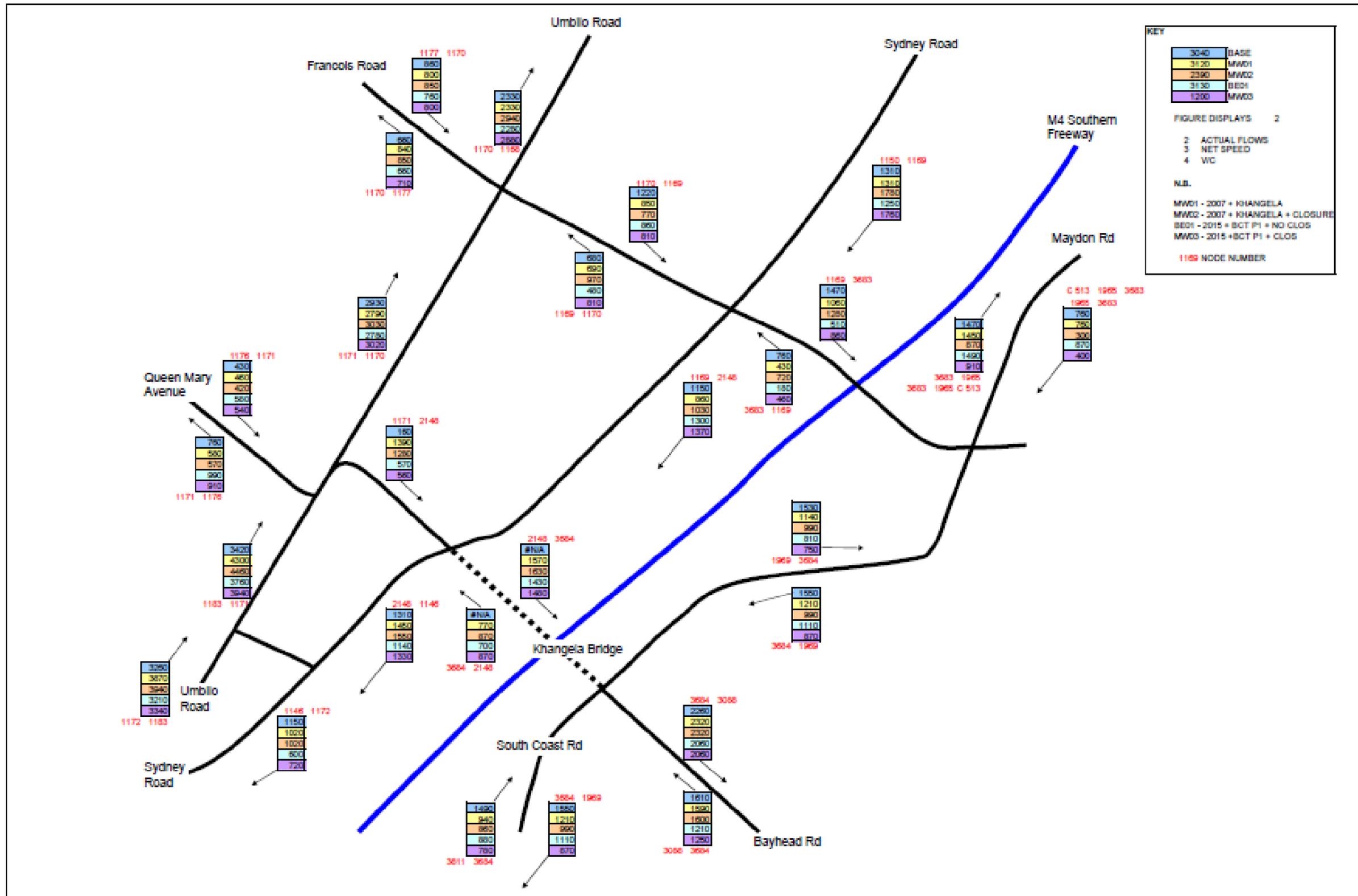
**AM - STRESS DIAGRAM**

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Fig.: **1**



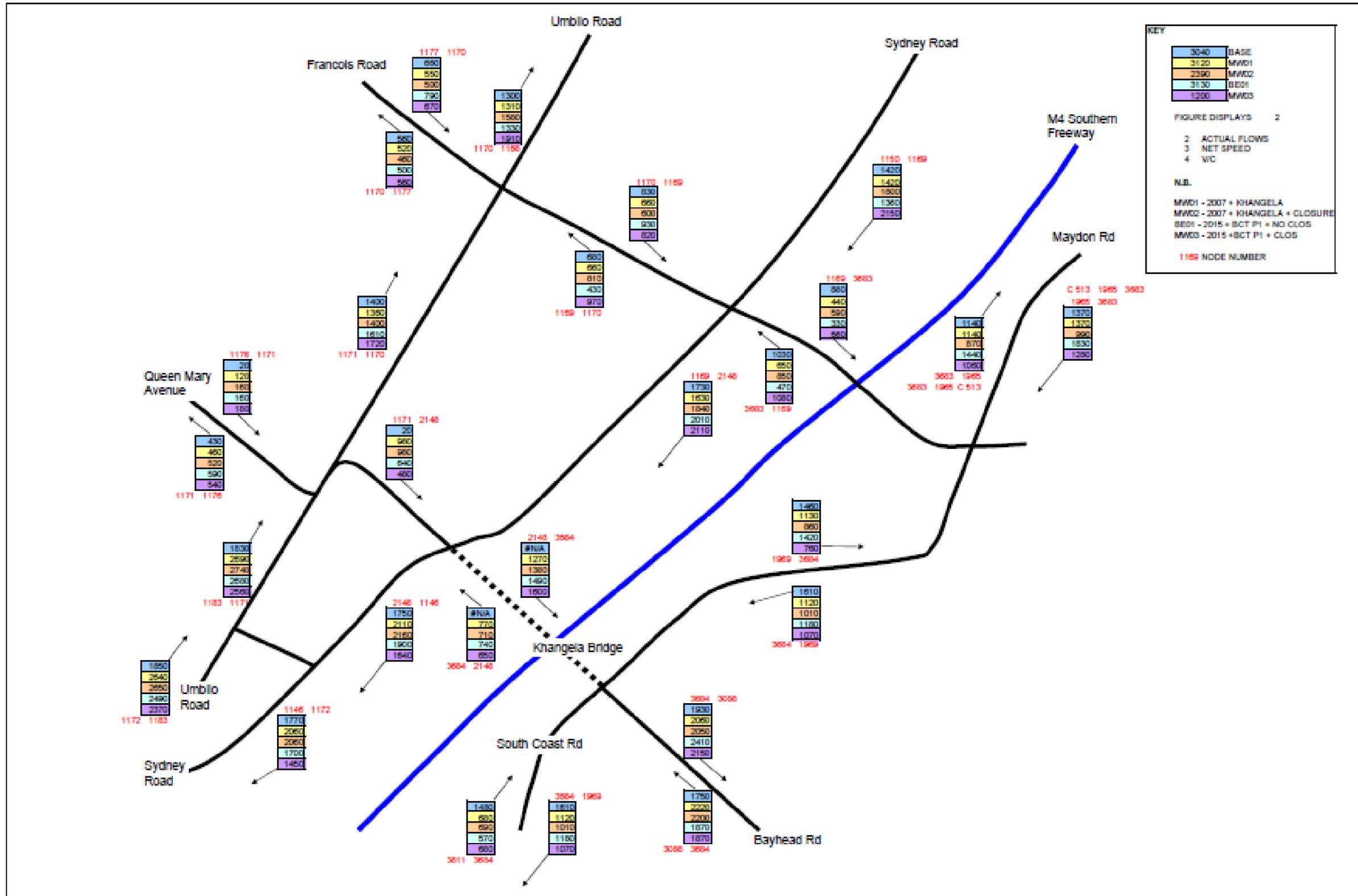
 <p>ARUP Transport Planning Tel: (011) 303 2500</p>	Back of Port Study - eThekweni Municipality	Job Ref No.: 181772
	<b>IP - STRESS DIAGRAM</b>	Fig.: <b>2</b>



Back of Port Study - eThekweni Municipality

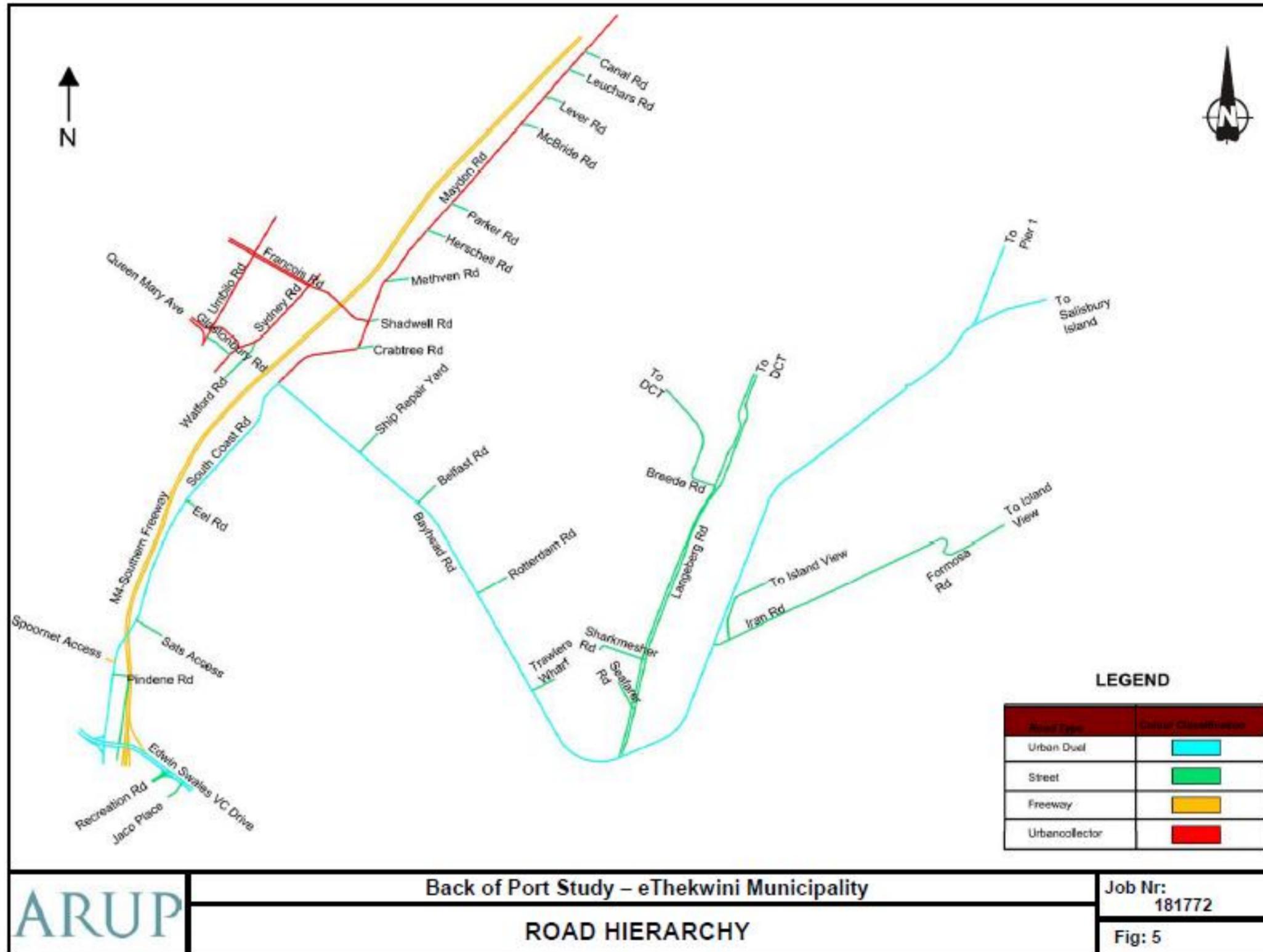
**FORECAST TRAFFIC VOLUMES FOR AM PEAK HOUR**

Job No:	<b>181772</b>
Figure No:	<b>3</b>



Back of Port Study - eThekweni Municipality  
**FORECAST TRAFFIC VOLUMES FOR IP PEAK HOUR**

Job No:	<b>181772</b>
Figure No:	<b>4</b>



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ROAD HIERARCHY

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Fig: 5