TRAFFIC IMPACTS OF SHARED RIGHT-OF-WAY PUBLIC TRANSPORT SYSTEMS: A MICROSIMULATION BASED CASE STUDY

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DISSERTATION

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ABSTRACT

Bus Rapid Transit systems are becoming a more integral part of public transport systems in major African cities. Although BRT systems are more versatile than other public transport alternatives, they do require support from other transport systems. Due to geographic limitations and varying transport demand, a BRT system can only function optimally if it is well integrated with the surrounding transport network. In the case of most African transport networks, the informal modes serve as the foundation of the system. In South African cities the minibus taxi is responsible for over 60% of the daily passenger trips. It is evident that in order for a BRT system to function within the African context, a synergistic relationship between the BRT and minibus taxi must be found.

The interaction between BRT and minibus taxis is diverse and cannot be captured in one individual study. The aim of this study is to look at the traffic flow performance of road networks which operate under varying hybrid scenarios. These hybrid scenarios consist of varying configurations where minibus taxis and BRT buses are expected to use the same infrastructure. Specifically, the question is what the implications would be of using existing BRT infrastructure in a shared operational model. Traffic flow performance is calculated and measured by means of a microsimulation model which simulates various hybrid (between taxis and BRT) conditions.

Currently very limited detailed information is available about the interaction of these public transport modes. Modelling a calibrated microsimulation provides detailed insight into the interaction of minibus taxis and BRT buses and allows the testing of various experimental scenarios which have yet to be examined.

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The microsimulation and the data extracted from its analysis provides information about the individual performance of buses, minibus taxis and passenger vehicles. This provides decision makers with important data which can be used to optimise the network for the desired transport modes. The microsimulation also indicates a number of physical interactions between buses and taxis which can further assist in decision making and could indicate required physical changes in the network which may be required to optimise the system.

The analysis indicates that there are different scenarios available in order to achieve different objectives such as improving traffic conditions for general traffic, buses or taxis. The findings also indicate that the current operating conditions (BRT buses have exclusive use of the dedicated lanes) yields the worst traffic conditions for general traffic and minibus taxis. The current scenario also yields the highest overall travel time per passenger. This indicates that consideration should be given to implementing an alternative scenario.

The findings (which indicate positive results for shared Right-of-Way) are provisional and require further research. Further research should be focused on expanding on these findings by determining the effects of taxis stopping in BRT lanes as well as safety concerns which are caused by allowing taxis to use BRT lanes. This results in passengers boarding and alighting taxis in BRT lanes (on the moving traffic side of the taxi) and requires specific attention.

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TABLE OF CONTENTS

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LIST OF TABLES

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LIST OF FIGURES

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APPENDIXES

Appendix A: AASHTO Design Vehicles Dimensions

Appendix B: Traffic Counts

Appendix C: Signal Plans

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GLOSSARY

AASHTO: American Association of State Highway and Transport Officials

BRT: Bus Rapid Transit

CAD: Computer Aided Drawing

CBD: Central Business District

CoT: City of Tshwane

DoT: Department of Transport

FAR: Floor Area Ratio

GEH: Geoff E. Havers Statistic

GIS: Geographic Information System

GMA: Gautrain Management Agency

GPS: Global Positioning System

IRPTN: Integrated Rapid Public Transport Network

LOS: Level of Service

NATMAP: National Transport Masterplan

OD: Origin-Destination

ROW: Right of Way

SSE: Sum of Squared Error

TIA: Traffic Impact Assessment

VPH: Vehicles Per Hour

DMRB: Design Manual for Roads and Bridges

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1 INTRODUCTION

1.1 Background

To understand the relevance and purpose of the study it is important to know what the situation with South Africa's public transport is. Since the early 2000's the South African government has placed an emphasis on the development of public transport. With one of the key objectives of the National Transport Masterplan (NATMAP) 2050 being: *"Greater mobility options, particularly for those who do not have cars"*. Before 2010 the public transport in South Africa's major metropolitan areas comprised of minibus taxis, metro rail and limited bus routes. The current situation in 2019 looks a little different. The Gautrain (rapid rail) links Pretoria, Johannesburg and Ekurhuleni and also operates a bus feeder network. The N1 link between Johannesburg and Pretoria as well as the Johannesburg ring road is tolled by means of an open road tolling system and Bus Rapid Transit (BRT) networks have been constructed (to different extents) in Johannesburg, Cape Town, Pretoria and a few smaller cities around South Africa. It is clear that there is a major focus on public transport with a particular emphasis on buses.

Many authorities in African cities are looking at or have already started implementing BRT systems as a solution to the growing traffic demand. These systems have advantages and drawbacks which are largely dependent on the surrounding conditions. Since African countries do not have as vast amounts of data or experience around the field of BRT as some other countries do, some focus needs to be given on BRT research in an African context.

This study will form part of a larger study titled: "Hybrid operations integrating informal operator into BRT services" and funded by the Volvo Research and Education Foundation. The broad purpose of the study is to determine how to effectively implement BRT systems in cities which already make use of informal paratransit systems.

1.2 Problem statement

The BRT approach to public transport issues has become a popular approach in major cities across South Africa. Although BRT may be a suitable solution to improving public transport, the implementation of these systems has proved tougher for South Africa than many other countries. According to South Africa's then finance minister (Sunday Times, July 2017), Government has spent about 15 billion rand on BRT projects and currently have ridership figures of about 120 000 (van Ryneveld 2018) to 150 000 people per day with an operating cost recovery of about 40%. In the case of Rea Vaya (Johannesburg's BRT) only 3% of public transport trips are made using the BRT and the ridership figures (per bus) at one tenth that of more successful BRT's (Scorcia and Munos-Raskin 2019). The media

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consider these figures indicative of a flawed system when compared to other countries which have operating cost recoveries of well over 100% (Scorcia and Munos-Raskin 2019). According to van Ryneveld (2018) key decision makers have deemed the continued city-wide rollout of BRT's as financially unsustainable. Van Ryneveld (2018) also notes that design and implementation difficulties have resulted in continued operating deficits. Chitauka and Vanderschuren (2014) state that despite being cheaper than other mass public transit modes, most municipal authorities in South Africa are unable to sustain BRT operations or construction without state subsidy.

On the other hand, South Africa's leading (in passengers/annum) forms of transport is the informal minibus taxi. The minibus taxi operators have created an extensive transport system which South Africa (both the citizens and the economy) is highly dependent on. It is reported that in South African cities the mode share of minibus taxis is as high as 67% of all public transport trips (van Ryneveld 2018).

It is evident that in order for a formal public transport initiative (such as BRT) to operate successfully in South Africa, the taxi industry must be considered. The municipalities implementing BRT systems have all taken very similar approaches to dealing with the existing informal transport providers. The primary approach includes buying out the taxi operator's businesses and even converting the taxi operators to BRT operators. There is however a new approach which has even been requested by the mayor of Johannesburg, Herman Mashaba (Sunday Times 2017). This approach involves the informal minibus taxis and the formal BRT buses sharing the BRT infrastructure. This approach could be a "best of both worlds" approach which could make the system technically superior and could ease some of the socio-political issues.

The question is whether the proposal is feasible or in fact viable? Currently very limited research has been done, particularly on a detailed level, on the interaction between minibus taxis and buses. The capital expenditure spent on the BRT infrastructure does not necessarily justify the BRT volumes currently in operation. It is evident that the traffic demand is not spread evenly over the road network, with passenger vehicles and taxis operating under grid lock conditions during peak hours while BRT buses rarely experience any delays in dedicated BRT lanes. The various experimental scenarios aim to determine how the traffic demand can be distributed more evenly to have the greatest impact on the entire transport system (within the study area).

Although a network optimised scenario is desired, it is important to keep in mind that a properly functioning BRT system is dependent on a reliable timetable and an improved passenger experience (i.e. some BRT passenger only use the BRT because it is faster, or more convenient than other available modes). An optimised network scenario might

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negatively impact the BRT to such an extent that the BRT ridership figures significantly reduce. This would further exacerbate the unjustifiably high Capital Expenditure (CAPEX) of the BRT infrastructure which could then just as well rather have been spent on upgrading the existing road infrastructure at a lower cost.

A fundamental part of this study is based on the postulation that BRT and taxis sharing infrastructure is an improvement on the current system where these modes are separated. Looking at existing research it is possible to see to which extent and in which formats their interaction is possible.

In the scenario where taxis are not permitted to make use of BRT infrastructure, it is assumed that the BRT lanes are not operating anywhere near the maximum capacity of the infrastructure. During peak traffic hours the normal lanes are expected to perform under congested conditions where the vehicles are separated by minimum following distances and the average travel speed is much lower than the designed speed. Under these circumstances, shifting the taxis from the normal lanes to the BRT lanes should increase the overall capacity by reducing the demand in the congested lanes and increasing the demand in the underutilised BRT lanes.

Theoretically the capacity should increase, but how would the taxis switching from the normal lanes to the BRT lanes under congested conditions affect the overall performance?

1.3 Purpose

Ignoring the existing taxi industry when operating a public transport system in South Africa is not possible. By incorporating the taxis from inception phase through to operation, the BRT's sustainability can be improved. Unfortunately, the opportunity to fully integrate the two systems (from inception) has not been capitalised and South Africa currently sits with costly infrastructure that is underutilised. It is now necessary to consider how to merge the two systems in such a way that benefits both. In order to do this, there are multiple aspects that need to be considered, one of which is the technical aspect of determining how to merge the systems in order to improve traffic conditions for all road users.

The purpose of this study is to determine how to improve integration of the two systems and then determine the effect that these hybrid (between BRT and paratransit) configurations will have on the public transport and external traffic systems. These effects of various configurations are measured using typical traffic analysis measures such as queue lengths, travel times and Level of Service (LOS). The study will also provide detailed information on BRT and taxi interactions which is currently not available. While the purpose of passenger transport is to provide mobility to people and not the vehicles (which are merely the tools), the approach used in this research is based on vehicular performance. By determining the vehicular performance, it is possible to deduce the effects (of various

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scenarios) on passengers. However, it is acknowledged that much further research is needed to address issues related to the impacts of hybrid systems on passengers and pedestrians.

1.4 Specific Objectives

The following key objectives form part of the study:

1. Setup a well calibrated microsimulation model capable of capturing the interactions between BRT buses and minibus taxis.
2. Compare various experimental scenarios with one another to determine an optimised network (network producing overall lowest travel times and queue lengths for passenger vehicles and public transport modes).
3. Determine steps that can be taken to improve the network for various transport modes.
4. Provide authorities and decision makers with information which can be used to improve the current traffic conditions.

1.5 Scope

The limitations of this study are as follows:

- The research is based on a simulation and limited empirical data which is collected in field.
- The simulation takes a case study approach by being limited to a particular operating case and is not necessarily generalisable to other situations. The study is focused on observing effects specific to the chosen location to gain an in depth understanding of the hybrid scenarios. The methodology can however be used in assisting similar studies in other locations.
- The study is limited to traffic performance and is not focused on determining economic or user-based performance measures. Defining an “optimal solution” (taking economic variables, user-based performance and traffic flow into account) is entirely dependent on who the solution is optimised for. Furthermore, the solution is dependent on so many underlying variables (such as demand, price elasticity and topology) that a separate study would be required to properly investigate this aspect of the selected scenarios.
- Minibus taxi driver behaviour has not been studied extensively, and the study is based on limited information. Driver behaviour studies lie outside the scope of this study but will need to be addressed for more detailed design questions.
- In field observations indicated that (within the study area) most taxi stops occurred without disrupting traffic flow. This was done during red phases at signalised intersections or by pulling over onto the sidewalk. During the simulation, the effect of taxis disrupting traffic flow was ignored.

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- All road users (including passenger vehicles, buses, taxis, pedestrians and cyclists) are potentially affected by the proposed scenarios. However, the direct impact on passenger vehicles, minibus taxis and buses were included and the effect on pedestrians and cyclists were not considered.

1.6 Methodology

The required analysis is undertaken by modelling a chosen set of transport facilities using microsimulation software. Microsimulation is appropriate since the vehicle interaction is critical to the performance of hybrid shared right of way systems. The study area falls within the Pretoria Central Business District (CBD) in Gauteng, South Africa. This area was considered since members of the research team have extensive existing data and local knowledge pertaining to the recently implemented BRT system in Tshwane. The research area is typical for modelling and researching BRT's in the African context as per the scope of the research project. The study area was selected for a section of the network where there is at least two stations and multiple intersections. The corridor was also selected since it has significant (in South African terms) volumes of BRT buses and taxis.

The study area selected is in the centre of the Pretoria CBD. The trunk route of the BRT runs in an east west direction through the study area with a number of one-way roads running perpendicular to the BRT route and spaced at approximately 250-meter intervals. The CBD has a typical high-density land use layout which results in a high parking demand with limited parking supply. Although there are some private basement parking facilities available the predominant form of public parking available is on street parallel parking. There are various minibus taxis routes which pass through the study area, however there are no start/end terminals for taxi routes in the study area. Taxi passengers typically board and alight at intersections while taxis are stopped at traffic signals. There are wide pedestrian walkways on either side of the streets with relatively high pedestrian volumes. Peak hour traffic conditions are poor with major congestion and grid lock traffic.

The study area is modelled on PTV's VISSIM microsimulation software suite. This software package is widely used both internationally as well as locally and can be calibrated specifically for the observed traffic conditions. Within the software package the modeller can specify vehicle characteristics for a range of expected travel modes. It is also possible to specify vehicle-infrastructure interactions which is a key component for the defined objective.

Once the facilities were accurately modelled, input data (including driver characteristics, vehicle performance and -where available- existing traffic volumes) were fed into the model and then calibrated. The software allows the modeller to decide on a wide range of parameters which are used to calibrate the model to specific conditions. Some sample

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investigations were required to determine vehicle characteristics and taxi behaviour. The model is also validated against existing data which was not used to calibrate the model.

The modelling procedure includes various scenarios modelled on the selected corridor; these scenarios include:

- Scenario 1: Existing conditions as observed in field (Benchmark model)
- Scenario 2: Taxis completely removed from the feeder route (as intended by the municipality)
- Scenario 3: BRT Buses and taxis share dedicated lanes and modified BRT stations so that minibus taxis can stop at stations with minimal interference on the BRT operations.
- Scenario 4*: Taxis can use either general or BRT lanes as they desire.

**Scenario 4 was selected as a realistic scenario which may occur if taxis are forced to use the BRT lanes. Without proper law enforcement it is possible that the taxis will use both the BRT and general lanes.*

Each modelling scenario is modelled as accurately as the available information makes it possible. Scenario 1 was used as a benchmark for the external traffic conditions, meaning any proposed BRT configuration should aim to have equal or improved external traffic conditions to scenario 1.

Once the model was completed and the various scenarios executed, the output data was collected and analysed. The output data includes standard performance measures such as travel times, queue lengths and LOS. The study is then focused on answering questions pertaining to which hybrid system configurations have the least negative effects on both the public transport network as well as the general traffic.

1.7 Outline

The remainder of the study will comprise of the following:

- Literature study
- Case study description
- Model setup
- Results
- Conclusions and Recommendations

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2 LITERATURE STUDY

2.1 Introduction

A literature study is undertaken to gather existing research and information which will be relevant to the dissertation. This literature study will look at information about shared right of way public transportation systems as well as previous microsimulations undertaken to understand BRT and minibus taxi interactions. Specific focus will be given to South African cases. By gathering the necessary information, the dissertation will use the literature study as a platform from which the study can commence.

2.2 Minibus taxis in South Africa

Within this study the South African minibus taxi will be referred to as 'taxi'. The South African taxi is a "jitney" paratransit mode. This term relates to the relatively unstructured way in which the system works, where there is no schedule or ticket system. Rather, when a passenger wants to use a taxi, they would need some basic local knowledge of how and where to hail a taxi. The taxi driver will operate a specific route or area and will depart when the taxi driver deems it worthwhile.

The mode was formed extemporaneously in South Africa as a response to the government's transport and spatial policies which segregated people by race. The taxi industry in South Africa has a complex history starting in the 1930's and has been riddled with government regulation and deregulation, taxi associations conflict and evolution of the vehicles. The history of the taxi industry has been well documented in studies such as that of Woolf and Joubert (2013) as well as Barrett (2003). The taxi falls between a standard bus and a passenger-van. Depending on the model, a taxi has a capacity of 16 passengers (older models) or 18-35 passengers (new models) (Venter 2012). Taxi drivers often operate under taxi associations which regulate the region which a taxi can operate within. The taxi operator does not necessarily make use of any formal public transport infrastructure, schedules or routes. Rather, the taxi departs when the operator is satisfied with the number of passengers on board and performs pickups and drop offs when and where necessary, often pulling over on the side of the road where a potential passenger calls for the taxi. Passengers make use of localized hand signal systems which indicate to the taxi operator the passengers desired destination.

Although the system seems to lack coordination and structure, it is the most used form of public transport in South Africa. In certain major cities up to 67% of the public transport commuters make use of the taxi (van Ryneveld 2018). Since the system is less structured than other transport modes, the operators can offer their service at a lower apparent cost to the passenger. Taxis can offer their services cheaper than other modes but it is only cheaper

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for the taxi passengers because the (less apparent) costs (which other modes are forced to pay) such as keeping the vehicle well maintained are either ignored or paid for by someone else. The “additional costs” to the passenger are not necessarily direct financial costs that the passenger will incur but rather costs incurred by others. Once such example is the R7.7 billion financial injection the taxi industry received from government (Venter 2012) in order to replace old and (often) unroadworthy taxis with new and safer models. Furthermore, in many instances the majority of taxi passengers are captive to the taxi since there are no other public transport alternatives. This cheaper (for the passengers) service, captivity and the flexibility of the system has contributed to its success.

Taxi operators are notorious for their lack of adherence to traffic regulations. This lack of law abidance is largely due to the payment strategy employed by taxi owners. Taxi owners often appoint multiple operators to run their taxi fleets. According to Barrett (2003) the majority of taxis are not owner driven, with most taxi owners owning between one and ten taxis. Each operator earns their income as a percentage of the daily fees they generate on their route. This means the more passengers an operator transports in a day the more they earn. This format incentivizes operators to focus on production rather than quality of service. Since the majority of passengers are captive to the mode, the passengers do not have a say in the driving behaviour of the operator. This lack of law abidance results in driver behaviour which differs from typically observed driver behaviour. In a study done by Sinclair and Imaniranzi (2015) in South Africa taxis were observed performing unsafe driving events such as red light running and obstructing traffic more than 5 times more frequently than passenger vehicles. Other unsafe driving events observed by Sinclair and Imaniranzi (2015) included passing vehicles in turning lanes, passing vehicles on the road shoulder and passing on solid white lines.

The observed driver behaviour of taxis has led to increased safety concerns for road users. According to Fourie (2003), despite taxis forming 2-3% of South African road vehicles, they accounted for 25% of road accident fatalities in 1998. Statistics released by the Road Traffic Management Corporation (2017) show that taxis accounted for 12.6% of major accidents despite only forming 2.6% of the vehicles on the roads. This is skewed when comparing the percentage of major accidents light motor vehicles were involved in (39.2%) when representing 59% of registered vehicles. The only other mode of transport (which the Road Traffic Management Corporation (2017) reported on) which contributed to a higher percentage of accidents than their portion of registered vehicles where buses. The report done by the Road Traffic Management Corporation (2017) also shows that 16% of registered taxis were either unlicensed or unroadworthy which is twice as high as the same statistic for light motor vehicles. Furthermore, due to the informal nature and origins of the industry the taxi industry is widely associated with violence, with instances of this violence

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taking place as early as the 1980's (Woolf and Joubert 2013). Reports of so-called taxi violence still often appear in the media. One South African news source lists at least 10 different reports of taxi violence occurrences within the first 6 months of 2019 (Eye Witness News 2019).

The minibus taxi has put South African authorities in a predicament. The system has many flaws, arguably one of the worst being the safety concerns. However, the mode is considered highly versatile and due to the informal nature of the industry the service can be offered at rates which can only be matched by subsidized systems. The authorities cannot feasibly replace the taxi industry with an equally comprehensive system that is fully regulated. At the same time, the authorities need to mitigate the negative effects of the informal industry.

Many attempts at formalization of the industry (in varied approaches) have been made with varying success. Attempts at formalization of the taxi industry have been around since the start of the industry in the 1930's (Woolf and Joubert 2013) and still continues, from administrative to industrial relation formalisation (where the government supported the formation of a single industry governing body) (Venter 2012). One of the more recent and most successful attempts at formalizing the industry came in the form of the "financial formalisation and recapitalisation" (Venter 2012). This initiative came about when the government realized that the informal taxi operators struggled with formal funding to replace fleets in poor conditions. The government provided funding for these operators for new safer and larger vehicles. The funding was however provided on condition that the recipient was tax registered which is another form of financial formalisation. These newer models have capacities of between 18 and 35 passengers and are currently the predominant vehicle used by the taxi industry.

The taxi industry is strongly rooted in South Africa's recent (last 100 years) history and cannot be ignored. It is evident that there are flaws in the taxi industry, but that government and the industry's role players are committed to improving (and continue using) the system. It would therefore be unreasonable to think that any large-scale public transport initiatives would be able to proceed let alone function sustainably without consideration and involvement of the taxi industry.

2.3 Bus Rapid Transit

Bus Rapid Transit (BRT) is a public transport system developed in the mid 1970's in Canada and Brazil. Today there are BRT's in over 180 cities worldwide with over 31 million passengers (Zottis 2014; Munoz and Paget Seekins 2016). The system comprises of buses which operate on dedicated infrastructure in order to improve the LOS. The system provides the quality of railways with the flexibility of buses (Munoz and Paget-Seekins

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2016). BRT's are implemented in different formats and to different extents, however there are some typical features of a BRT system. The dedicated lanes are often separated from the general lanes by means of a physical barrier such as a barrier kerb or level difference. The buses stop at stations with platforms on the same level as the bus floor, these stations are also situated in the centre of the road so that buses traveling in either direction can make use of the same station. The system allows passengers to pay for their desired trip before boarding the bus. The design allows for boarding and alighting to take place much faster than with traditional bus systems. The system also typically makes use of trunk and feeder routes with varying bus sizes being used on different routes depending on the demand. The system provides the BRT buses with dedicated infrastructure and a higher Right of Way (ROW) than other transport modes. The system has many advantages and disadvantages over traditional bus systems but have proven to be implemented very successfully in various countries across the world.

BRT systems are most commonly constructed along existing roads which are used predominantly by private passenger vehicles and some form of public transport like taxis or buses. Due to the limitation of space, the dedicated bus lane is constructed in place of an existing lane rather than in addition to the existing lanes. This means that there is a capacity reduction in the road network for the existing road users. The assumption is that once the BRT is available, a mode shift will take place since the BRT offers a potentially faster, cheaper, more reliable or comfortable service. This shift should result in reduced road users on the existing lanes (with low ridership figures) and an increase in BRT passengers which would result in an increase in overall passenger capacity.

BRT in South Africa has been developing in many places including, Gauteng, Western Cape, KwaZulu Natal, Eastern Cape and North-West. The development started in the mid 2000's with the first full BRT (as opposed to the "Lite BRT" implemented in Lagos) in Africa (Johannesburg's Rea Vaya) opening in 2009. Since then 13 BRT's have been planned in South Africa with only a few operational (to different extents) (Wood 2015). The South African BRT's have been funded by both national and local government with the idea being that local municipality's fund the ongoing costs of the systems. The push for BRT has come in an attempt to improve public transport availability in South Africa. South Africa's recent efforts to introduce BRT has pushed South Africa to the leading BRT (by distance, passenger and income) provider in Africa. Africa's BRT figures are however insignificantly small in comparison to the rest of the world. According to Munoz and Paget-Seekins (2016) Africa has implemented BRT's in 2 countries with a total of 81 km of networks and 0.24 million passengers/day. Compared to Latin America (the world leaders in BRT) who have 1 675km of network and 19.28 million passengers/day, it is clear that there is major room for growth in Africa.

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Although the initiative is necessary and is arguably overdue in South Africa, there is evidence to suggest that the systems are not operating as intended. Johannesburg's Rea Vaya system is one of South Africa's biggest BRT's with over 43km of trunk corridors. The Rea Vaya's first phase was constructed to connect Soweto with Johannesburg CBD and would serve one of the highest demand routes in the province. It is however reported to be operating at 37% of the forecasted daily trips (Scorcia and Munos-Raskin 2019). There are several reasons for this as discussed by Scorcia and Munos-Raskin (2019) some of which include the presence of other services running parallel to the BRT, high costs of the formal BRT relative to other informal alternatives and high peak demand with low base demand which arises from the historic spatial planning which separates suburbs from job opportunities. The separation of suburbs and job locations also means the system has very long cycle times which requires more buses to provide a frequent service. These issues are inherent and indicate a system that has potential for improvement.

2.4 Hybrid solutions

Hybrid public transport systems usually refer to networks that are shared between formal (planned) modes such as BRT, rail or trams and informal (paratransit) modes such as minibus taxis or rickshaws. These hybrid systems generally form naturally without any interference form authorities. There has however been a shift in attitude towards formally accommodating hybrid systems. The change in approach has come about since the "natural" formation of these systems causes some problems. One of the major problems experienced worldwide is competition between formal and informal modes. Planned public transport systems are often times introduced to a system that already has established informal transport modes. The planned systems are also typically introduced into high demand corridors where paratransit modes generate most of their revenue (Salazar Ferro 2011). This is the start of issues which perpetuate throughout the lifecycle of the new systems.

There are however cases of hybrid systems that work well when formal and informal systems are integrated properly. In a study performed by Venter (2016) an analytical tool called "Access Envelopes" was used to determine the job accessibility within the study area (Alexandra, South Africa). The analysis compared various public transport scenarios ranging from taxis only on the main corridor to BRT only on the corridor with various hybrid scenarios also being evaluated. The results showed that the highest number of accessible job opportunities arose from the two hybrid scenarios where BRT and taxis operated together. The study by Venter (2016) shows that a hybrid scenario is potentially a better scenario (than current) from a socio-economic perspective.

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2.4.1 Network alternatives

Integration of taxis in the BRT system can take place in many forms. Some examples of these alternatives include any combination of taxis as feeders, buses as feeders, taxis as distributors, shared routes, hybrid situations during peak periods and more (Behrens et. Al. 2015). Considering the entire BRT network, the possibility exists that taxis can serve the BRT trunk routes by collecting passengers along lower order roads and dropping them off at BRT stations and vice versa. An illustration of this network layout, as prepared by Del Mistro and Behrens (2014) can be seen in Figure 2-1.

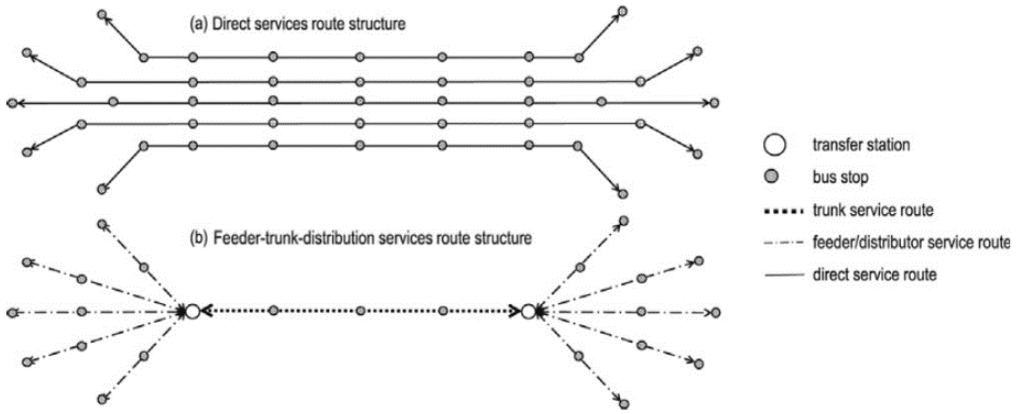

Figure 2-1: Route Structures (Del Mistro and Behrens 2014)

Image a) in Figure 2-1 indicates the current network configuration where taxis and BRT buses both share parts of the network to complete their routes. Image b) indicates the proposed layout where taxis manage the feeder routes and serve the BRT buses which operate exclusively along the trunk routes.

The demand-responsiveness and lower capacity of taxis would make them ideally suited for this role. The success of this scenario would depend on the taxis not being permitted to use the trunk routes, be it on the general lanes or the BRT lanes. The scenario is very effective from a theoretical point of view because the smaller and cheaper vehicles (taxis) will operate in lower density areas and the BRT buses will be better served and have less competition on BRT routes.

The research by Del Mistro and Behrens (2014) shows that the proposed scenario could increase the taxi industry's profit margins but would certainly reduce the fair income as well as the required taxi fleet size. For any transport planner this information is a cause for concern since the negotiation process with the taxi industry has historically proven to be an intensive and time-consuming process. During the negotiations between the City of Johannesburg municipality and Johannesburg regional taxi association a statement was released by the taxi association. The statement indicated that after one and a half years of

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negotiations the taxi association was still undecided about whether or not to merge with the BRT and that they felt that “there is still a lot of ground to be covered to reach a final decision…” (Taxi vs BRT 2008). This configuration requires stringent interaction between BRT planners and taxi operators before construction and has several operational implications. Enforcement of the agreement terms would require continuous monitoring and may be very volatile in the current South African political climate.

An easier (or interim) approach would be to accommodate the unregulated nature of the taxi industry. Reducing the restrictions imposed on the taxi operators would reduce the amount of monitoring and enforcement required, it would also reduce the complexity of pre-implementation negotiations. The alternative scenarios which will be investigated in this study will be based on the taxi operators being permitted to operate in any region (as they currently are). The scenarios would simply vary the amount of access the taxis have to the BRT infrastructure. Although this set up is not as advantageous from a network perspective, it may prove to be more implementable and still has advantages over the current configuration. The inclusion of the taxis on BRT routes will also improve the taxi operator’s perspective of the BRT which would make it easier for taxi operators to accept the newly introduced competitor. This scenario might not be the final solution but may be an interim solution which facilitates the integration of the taxis and BRTs. Rapid integration of transport systems is not always the correct solution, this concept will be discussed further in this study.

2.4.2 Taxis as feeders

South Africa's only passenger rapid rail system (known as Gautrain) links two of the most populated metropolitans. The Gautrain network runs parallel to the busiest highway in the country. From a public transport perspective, Gautrain does not have any direct competition. Public transport passengers make use of the bus feeder system which has local routes running near most stations. This feeder system is a formal service which was developed and operated by Gautrain Management Agency (GMA). Since Gautrain is not in direct competition with taxis it was not necessary for GMA to remove taxis from the Gautrain route. The taxis were however not intended to form part of the formal Gautrain system. In recent years however, GMA has realised the potential for taxis to serve lower density areas and have recruited taxi operators to form part of the Gautrain system (Gautrain Management Agency 2019). The taxis now operate on a fixed schedule determined by GMA. The taxis do not operate on the existing Gautrain bus routes but rather on lower density routes. At some stations, the taxis are used as a shuttle service to drop passengers off at a specific requested location. The taxi can be pre-booked via the internet. GMA has assisted some taxi operators by helping purchase new vehicles, in some cases the taxis are

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even Gautrain branded. The taxi's need to comply with GMA's minimum standards and the taxi operator's driving is also monitored. By doing this, Gautrain has improved its service and extended its accessibility without purchasing or constructing any new facilities which it needs to operate or maintain. Gautrain's taxi negotiations provide evidence that under the correct circumstances South Africa's taxi operators can successfully be integrated into formal public transport operations and can effectively perform as a feeder service.

2.4.3 BRT and taxi interaction

Very limited research on bus and taxi interaction is currently available. Some information on the effect of taxis lane changes on buses has been done by Fowkes et al. (2014). In the study Fowkes et al. (2014) performed a mathematical analysis to determine what effect taxi lane changes (from general to BRT lanes) would have on overall network performance. It is important to note that the study was based on the theoretical Lighthill and Whitham continuum model (which was further developed for multilane flow) and not on empirical data or simulations. The Lighthill and Whitham continuum model is a conceptual model which describes the flow of traffic along a single lane under crowded conditions (Fowkes et al. 2014). The analysis indicated that although during the lane change action the flow density in the normal lanes reduces, the overall capacity does improve by allowing the taxis to move from the normal to BRT lanes. The study also shows that there is a specific traffic density where the taxis must switch from the general lanes to the BRT lanes in order to ensure maximum capacity for the entire network. Since the study was performed on theoretical data and due to the various factors influencing a networks capacity, it is not possible to determine the optimal switch point using the model Fowkes et al. (2014) did.

Although the outcome of the study indicated positive results, it is important to note that the flow speed in the BRT lane does decrease as the taxis switch over. This will result in the reduction of bus performance and could reduce timetable reliability of the BRT network. It may be necessary to investigate a scenario where a limited number of taxis will be permitted to use the BRT infrastructure. Enforcement of this type of situation would be challenging and would require either law enforcement officers being present during peak traffic hours, or the infrastructure being upgraded to open and close the access to the BRT lanes for taxis depending on demand.

2.4.4 Integrated Transport Systems

Integration of transport systems is an important aspect of any transport network and is often overlooked. Any public transport system is designed to perform a specific role in the transportation network. Some systems have high levels of mobility and transport large volumes of passengers between predetermined locations while other systems have lower capacities but higher degrees of flexibility. Each system performs a specific role, but in

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order to achieve maximum mobility the individual systems need to work together. In some instances, the success of one system is dependent on its compatibility with another system. One such example would be rapid rail systems which are very effective at transporting large volumes of passengers along a corridor but require a bus feeder system which can transport passengers from surrounding nodes to the rail stations.

Integration of modern public transport systems has been under consideration as far back as 1947 (Hidalgo et al. 2016). Transportation integration has been achieved with varying degrees of success around the world. Some countries such as Germany have highly integrated systems while most third world countries struggle to achieve even the most basic forms of integration.

Improving integration can be achieved by introducing information systems, constructing compatible systems, combined fare systems and pricing packages (considered as one of the most important integration factors) and management techniques such as schedule coordination. Some factors, which people in management positions have less control over, cause some difficulties with integration. Factors such as cross jurisdictional networks and privatised industries (such as the minibus taxi industry) are very common in third world countries and make achieving integration that much more difficult.

In some instances, a predetermined system can be designed to incorporate maximum integration between new projects, however this is rarely the case. When planning a new element in a transport network it is important to establish where the demand lies. Before designing the solution, it is necessary to quantify the existing network. After determining the demand and the appropriate solution it is then important to determine how the solution ties in with the existing network. In the case of most African cities the minibus taxi is very well-established and cannot be ignored when attempting to introduce a new network into the system.

Another important aspect of integration is the method of integration. The rate of introducing integration varies from gradual to sudden. Three main regulatory approaches are currently considered in South Africa namely (Schalekamp et. al. 2010):

1. Comprehensive BRT implementation and paratransit assimilation: The formal system is fully adopted, and paratransit operators are either removed or assimilated into the formal system.
2. Stepped, flexible transition to bus system improvement and paratransit integration: This approach is a more gradual approach. The paratransit operators are assisted in formalising their operations as is. Once the organization is more formalised, they are

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then assisted by improving their fleets and formalising the system gradually. The end goal will be to fully convert the existing paratransit into a formal BRT.

3. Incremental existing operator upgrade: This approach is similar to the second in that it proposes the upgrading of the existing paratransit. However, this approach involves less formalisation and the end goal would not be to replace the paratransit with formal systems rather just improve the existing paratransit.

Each option has advantages and drawbacks and should be considered carefully before making decisions. In the case of constructing new systems it is difficult to introduce the integration gradually since the system will be designed to incorporate maximum integration. However, retrofit designs present the opportunity to gradually integrate existing systems.

A comparison between rapid and gradual implementation of the Santiago and Bogota BRT systems respectively was undertaken by Hidalgo et al. (2016). The comparison could not definitively identify the superior method but did show the advantages and disadvantages of each approach.

One of the disadvantages of rapid integration is that a negative public perception will result in low acceptance of the new system. An example of this happening is Gauteng's e-toll system which was introduced very rapidly (in the public's perspective) and never fully recovered the public's support. With recent reports stating that the political party who implemented the system in the first place are considering scrapping the system due to compliance figures below 30%.

Hidalgo et al. (2016) states that due to the risks associated with implementing a highly complex, rapid implementation approach, transportation planners tend to prefer a more gradual implementation approach. This approach does have its own drawbacks such as the risk of not completing the project due to change in political priorities as time goes on. Furthermore, as in the case of Bogota, the public lost trust in the transport system due to it taking much longer to implement that initially anticipated.

2.5 Simulation of taxi and bus operations

2.5.1 Vehicle following and lane changing models

Software used to micro simulate traffic models do so based on underlying vehicle behaviour models. Two fundamental behavioural models which these software packages need (in order to simulate traffic interaction) are the vehicle following and lane changing models. There are various models available for each of these behaviours and software package do not all use the same models. Gao (2008) compared the different models used in commonly

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used microsimulation software packages. The models used by each software package have been summarised below:

Table 2-1: Vehicle behaviour models

Software Package	Vehicle following model	Lane change model
AIMSUN	Gipps (1981)	Gipps (1986)
VISSIM	Wiedemann (1974,1999)	Willmann and Sparmann (1978)
PARAMICS	Fritzche (1994)	PARAMICS
CORSIM	FRESIM + NETSIM	Gipps (1981)
INTEGRATION	Van Aerde (1995)	INTEGRATION

The purpose of the table is simply to illustrate the number of models available and indicates the range of research that has been done in attempting to quantify these behaviours. The behavioural models used in VISSIM will however be discussed in more detail.

The Wiedemann 74 and 99 vehicle following model comprises of three input parameters:

1. The stand still distance between vehicles.
2. The additive part of the factor used to calculate safe following distance. This parameter determines the spread (variance) of the saturation flow rate observed in the model.
3. The multiplicative part of the factor used to calculate safe following distance. This parameter determined the magnitude of the saturation flow rates observed in the model.

These three parameters need to be calculated by measuring the saturation flow rates and standstill distances in field.

The lane changing model developed by Willmann and Sparmann is known as a psychophysical model which defines decision making based on human perception (Aghabayk et al. 2010). The model requires a positive response to the following questions before a lane change can be considered: Is there a desire to change lanes, what is the driving situation in adjacent lanes, is the lane change possible. In order to answer these questions, the agent considers the driving speed in the current and adjacent lanes as well as the front to rear distance between vehicles. The physical lane change is then influenced by the type of lane change required depending on the relative speeds and positions of vehicles.

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2.5.2 Behavioural driving parameters

All microsimulations (regardless of software package used) have the common feature that they require behavioural driving parameters as inputs. Although most of the software packages have pre-set values that they may use, a calibrated model requires the modeller to verify or update these parameters. Depending on the software used and the level of detail being modelled, various forms of driving parameters can be required. Some of the more common parameters include:

Headway: This is the distance or time between successive vehicles traveling in the same direction. The headway is used to determine the theoretical saturation capacity of a lane. Headway is influenced by physical factors such as lane width as well as travel speed with headway distances typically increasing as the travel speed increases. A study by Taieb-Maimon and David (2001) showed that nonstationary vehicle's headway distances increased as the vehicle's speed increased but that the headway time remained constant. This parameter is crucial when calibrating a model to specific conditions. The headway values are used to calculate the saturation flow rate as well as the variance in flow rates which indicates how homogeneous traffic composition is. Headway can be controlled (in microsimulations) using driving behaviour models such as Wiedemann 74 Gao (2008). By measuring the headways (in field) the input parameters required by the Wiedemann 74 model can be determined. The process is an iterative process whereby the input parameters are selected, and the model run to determine the headways (and variance) and then the parameters are adjusted until the recorded values are replicated in the model.

Acceleration/deceleration: The rate of change in velocity is a body's acceleration. Acceleration and deceleration values differ across vehicle modes as well as traffic flow conditions. Acceleration and deceleration values can also be split into desired acceleration/deceleration and emergency acceleration/deceleration (PTV VISSIM, 2018). The desired values are typically experienced, but the emergency values can be used in situations such as overtaking or obstruction avoidance.

Desired speed: This is the speed that a specific vehicle mode would travel at if the road network were completely empty of other vehicles. This is the speed that a vehicle would attempt to travel at if there were no influence by other vehicles. The desired travel speed is specific to each mode and depends on physical conditions such as lane width and gradient. The desired speed is an important input parameter since it is used to calculate a link's capacity and it is used on individual vehicles to determine if a safe passing manoeuvre can be performed when travelling behind a slower vehicle. Since the exact desired speed is not easily obtainable the observed speed under free flow conditions is used. Observed speeds

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are obtained by measuring travel speeds of various modes during off peak periods when there is no traffic congestion.

Look ahead distance: The distance between an event that requires a driver to change its behaviour and the position of the driver. This is how far ahead a driver can anticipate a movement. An example of such an event would be a driver that needs to change lanes in order to perform the desired turning movement at the next intersection.

Queuing space: The amount of distance a travel mode utilises when stationary in a queue. This comprises of the average vehicle length and the distance between the stationary vehicles. Queuing space can also be replaced by standstill distance which is only the distance between stationary vehicles and does not include the vehicle length. This parameter is typically used in microsimulations since each vehicle has its own assigned length.

Safety distance factors: These are factors used in driving behaviour models which determine the distance between vehicles while traveling. The factors determine the distance between vehicles under different driving conditions such as stationary vehicles, slow moving and fast-moving vehicles. These factors are representative of the "aggressiveness" of the motorists.

Route choice: VISSIM has two methods for assigning routes to vehicles. The first is static assignment and the second is dynamic assignment.

Static assignment makes use of vehicle inputs and vehicle routing choices. A vehicle input is located at any point on the network where vehicles can enter the network, this would typically be at the edges of the network. In the vehicle input the modeller specifies the vehicle composition (mode split) and demand volumes. At any point where more than one route choice exists the modeller must specify the desired route split, this is done with a vehicle routing choice. Vehicles enter the network based on the vehicle inputs and then navigate the network based on the routing choices that they encounter along the way (PTV VISSIM, 2018). One advantage of static assignment is that the exact vehicle movements recorded during the traffic counts can be modelled at each intersection. The issue however is that for modelling scenarios that do not yet exist the modeller does not know the exact vehicle distribution on the network. This is where dynamic assignment is required.

Dynamic assignment makes use of origin destination nodes. The modeller specifies the Origin Destination (OD) matrices. Each vehicle entering the network has a predetermined destination node but no predetermined route. The dynamic assignment method requires multiple simulation runs so that the vehicles can learn iteratively which routes to select to produce the lowest overall generalised cost. In a simple network where there is one origin node and one destination node with two available routes (with different travel times on each

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route) the dynamic assignment will work as follows: On the first run all the vehicles will travel on the first available route. On the second run all the vehicles will travel on the second available route. Now that both routes have been travelled the generalised cost at different traffic volumes is known on both routes and the vehicles start deciding on which of the two routes to select in order to minimise their generalised cost (which consists of travel time, route distance and financial costs). The simulation is run iteratively until a network optimised solution is determined where vehicles travel on both routes until the same generalised cost is reached on both routes (PTV VISSIM 2018).

2.5.3 Taxis

As noted in the scope of the study, data availability on taxi behaviour is limited. In order to reach the goal of providing a first-cut analysis of the practical implications of hybridity in public transport operations, this study elected not to spend the bulk of its energies developing new models of taxi driving behaviour. Instead, we draw on available research on taxis to gather information which could improve the quality of the model.

The simulation of vehicles (including taxis) can be done in various ways. More modern approaches include microsimulations and agent-based simulations. According to Bonabeau (2002) agent-based simulation can be defined as a system of autonomous decision-making entities called agents. Each agent assesses its situation individually and makes decisions based on a given set of rules defined by the modeller. In transportation engineering traffic networks are simulated on different scales with varying levels of detail. On the smallest scale networks are simulated as microsimulations. Microsimulations model a specific part of a transport network at a high level of detail. A microsimulation should capture all the necessary detail that would influence the performance of the vehicle.

Neumann et al. (2015) performed a simulation study which improved on an existing model. The agent-based simulation allowed taxi operators to purchase and sell vehicles and change or drop routes depending on their personal profitability. The simulation showed (as seen in real life) that operators tend to over supply transport along profitable trunk routes. The less densely populated areas are not served as well, with passengers walking over 15 minutes to reach a taxi pick up point. The study's results lead to the question: If minibus taxis are permitted to use BRT lanes and the capacity along trunk routes increases, will the taxi operators simply increase the supply along these routes? This again leads to the previous idea that access to the BRT lanes should not be unlimited to the taxi operators.

Since the simulation in this study will be a microsimulation limited to a section of a network and not a mesoscopic or macroscopic network analysis, it is important to gather information pertaining to the performance of the simulated vehicles. Various studies such as that of Cheng et al. (2014) have investigated the capacity effect of heterogeneous vehicle

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behaviour (such as that of taxis) on a network. It was suggested that the physical vehicle performance (such as dimensions and mechanical performance) of taxis do not differ significantly from private vehicles. The difference comes in with the driver behaviour. Taxis are seen as aggressive road users who exhibit poor lane-adherence discipline and do not adhere to the standard rules of the road to the degree of private vehicles. The research by Cheng et al. (2014) showed that when taxis led a queue at a signalised intersection, the start-up lost time was reduced which improved the overall capacity of the intersection. Although the research was based on taxis in China (which are assumed to behave differently from South African taxis), it is reasonable to suggest that similar effects will be observed in South Africa.

Another phenomenon that was mentioned in a case study by Dumba et al. (2016) was that although the capacity of an intersection increased with the presence of taxis, the overall network's vehicular delay increased. This can be explained by the taxi's pick-up and drop-off behaviour which is very erratic as well as the aggressive lane change behaviour which causes delays for private vehicles.

2.5.4 BRT

With various modern microsimulation software packages being widely used, BRT networks have been simulated extensively. Examples include the microsimulation of bus stations in Brisbane, Australia by Widanapathiranage, Bunker and Bhaskar (2015) using Aimsun. This study focused on congestion caused by bus to bus interference which occurred at bus stations when multiple buses make use of one station. The data collected during the model development showed that bus headways were random regardless of that fact that they were operating on a fixed schedule. The headways were influenced by the route characteristics.

A micro simulation of the A Re Yeng BRT was performed by private consultants during the compilation of the preliminary design report. The microsimulation was done at the Nelson Mandela/Skinner/Kotze intersections situated along the trunk route on line 2A. The study provides information about the calibration techniques that were used and showed that a microsimulation model can be calibrated within the context of the chosen study area.

Another example is the microsimulation performed by Zhou, Wang and Liu (2017). The focus of the study was to optimise the BRT performance by modifying traffic signal timing. Zhou, Wang and Liu (2017) setup a VISSIM model with dedicated bus lanes and general lanes. The model was tested with different volumes of general traffic at the entrance to dedicated BRT lanes. Although the purpose of the model was to determine the effect of traffic volumes on the optimisation, the model also indicated the effect of traffic volumes of BRT performance. The model indicated increased passenger delay and decreased BRT

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travel speeds as the volume of general traffic increased (despite the fact that buses operated in dedicated lanes).

Chitauka and Vanderschuren (2014) performed a microsimulation of two corridors in Cape Town, South Africa. The purpose of the study was to determine if partial bus priority strategies could provide the same performance benefits that a full BRT could. In the study they modelled two separate corridors and analysed intersections in PARAMICS and evaluated various scenarios (including a scenario with a dedicated taxi lane). The study showed that the delay experienced in public transit modes could be reduced by over 30% while the delay experienced in the general lanes only increased by 1-6% (depending on the scenario). One of the corridors evaluated by Chitauka and Vanderschuren (2014) was previously simulated by Ntoi and Vanderschuren (2007). The microsimulation produced similar results indicating that travel times in public transit modes can be reduced by a larger percentage than the travel time increase for general traffic.

Yu et al. (2006) used the Sum of Squared Error to validate the data from a BRT microsimulation compared to GPS data they collected. The equation:

$$SSE = \sum_{i=1}^{n} (v_i^c - v_i^s)^2$$

With:

i= Measuring station number

n=Number of measuring stations

v_i^c= Vehicle speed at station i measured with GPS

v_i^s= Vehicle speed at station i measured on VISSIM

This equation was applied to various parameters to determine the optimal input values so as to minimise the SSE. The optimal values determined by Yu et al. (2006) are summarised in Table 2-2:

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Table 2-2: Input parameter values (Yu et al. 2006)

Driving Behavior Parameter	*Default Value*	*Optimal Value*	
		BRT	*Car*
Waiting time before diffusion (s)	60.00	43.30	64.20
Minimum headway (m)	0.50	0.22	1.00
Maximum deceleration (m/s^2)	-4.00	-4.40	-4.40
-1m/s^2per distance (m)	100.00	133.20	78.80
Accepted deceleration (m/s^2)	-1.00	-0.10	-0.30
Maximum look ahead distance (m)	250.00	300.0	273.70
Average standstill distance (m)	2.00	1.60	1.60
Additive part of desired safety distance (m)	2.00	1.60	4.40
Multiple part of desired safety distance (m)	3.00	2.70	3.72
Distance of standing and at 50 km/h (m)	1.00	2.00	1.90

Although these values are not necessarily the same for the South African model, they can be used as a benchmark to start the calibration process.

2.6 Calibration and validation

Once a traffic model is designed it must be calibrated and validated before it can be used. Data calibration is the iterative process of refining a model's input parameters until the data output of the model corresponds with the observed in field data. Data calibration can be done in different ways and to different levels of accuracy. According to Kabashkin et al. (2017) traffic microsimulation models can be calibrated using the Geoffrey E. Havers (GEH) statistic. The GEH statistic is calculated as follows:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

Where:

M= Modelled hourly traffic volume

C= Counted hourly traffic volume

A GEH statistic of 4 or less is usually accepted as a calibrated model.

According to the United Kingdom Department of Transport's Design Manual for Roads and Bridges (DMRB) a model's output flow rates may differ from observed values by varying degrees depending on the magnitude of the flow. According to the DMRB model flows should not exceed the following limits in 85% of cases:

- 100 vph for individual flows less than 700 vph

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- 15% for individual flows between 700-2700 vph
- 400 vph for individual flows greater than 2700 vph

If these limits are not exceeded a model can be deemed to be acceptably calibrated.

Data validation is the process of confirming if a model's output is in line with observed data. In order to validate a model, the output data of the model must be compared to observed data that was not used to calibrate the model with. The same techniques used in the model calibration are applied but with a new comparison data set.

It is important to distinguish between data that will be input into the model in order to calibrate the model and data that will be recorded from the model in order to determine whether or not the model is in fact calibrated.

2.6.1 Input data

The required data that is entered into the model for calibration purposes includes:

- Accurately built physical network
- Preferred travel speeds at various locations on the network
- Correct vehicle compositions (mode split)
- Driver behaviour factors
- Saturation flow rate factors

Desired travel speed is defined as the observed travel speed under completely uncongested conditions. GPS recording devices can be used to determine the desired travelling speeds. The GPS recording device can be fitted to various vehicles which will then travel the network during off-peak periods in order to determine the maximum preferred travel speeds. The preferred travel speed will vary for different vehicles and so data should be captured for a range of vehicles.

Saturation flow rates are determined by calculating the shortest headway times between vehicles after a signal has turned green and using that to determine the equivalent hourly flow rate. The saturation flow rate will be used to define an intersection's capacity and is therefore a critical data set. The driving behaviour model used by the microsimulation software package will determine the parameters that can be modified in order to calibrate the saturation flow rates. A well-developed driving behaviour model which is used is the Wiedemann 74 model which is based on research completed by Wiedemann R. in 1974 (Gao, 2008).

More detail on input data has been discussed in chapter 2.5.

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2.6.2 Output data

In order to compare the performance of different scenarios with one another some form of output data (key performance indicator) must be selected. The following output data sets can be used to evaluate and compare scenarios:

- Average queue lengths
- Maximum queue lengths
- Number of stops
- Travel time
- Travel speed
- Vehicle delay
- Level of Service

These performance measures are often used in industry and can easily be obtained from most traffic analysis software packages.

2.7 The use of VISSIM as a simulation tool

Modern traffic engineering problems are rarely solved without the aid of specialised traffic engineering software packages. Each of these software packages has been developed with key focus points and each package has its own advantages and disadvantages.

VISSIM is an agent based micro simulation traffic analysis software package with 3D visualisation features. The software is developed by the German based PTV Group. The software has been used extensively in South Africa and can be calibrated for local conditions. One such example is the VISSIM model used to analyse Skinner and Kotze Streets which are in the same study area as this study (City of Tshwane 2012). In this study the general and dedicated BRT lanes are modelled and analysed in VISSIM under observed traffic volumes.

VISSIM has been used extensively to simulate the interaction between various transport modes in the past. In a simulation performed by Mao and Bertini (2008) a congested arterial road in Beijing, China was simulated using VISSIM. The model included general lanes, bus only lanes and pedestrian facilities. The model captured the interaction of buses, non-buses and pedestrians at locations where the infrastructure crossed. Mao and Bertini (2008) motivate the use of a microsimulation by stating that collecting sufficient empirical data to analyse all the desired conditions would be difficult or impossible. With a microsimulation various conditions (scenarios) can be simulated repeatedly in order to produce more reliable data.

The software can be used to simulate intersections, public transport networks and pedestrian interaction. VISSIM allows the user to model unique infrastructure such as dedicated bus

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lanes and stations. Furthermore, the software gives the modeller full control over "driving rules" such as restricting use of specific infrastructure to selected vehicle classes. In VISSIM the modeller builds the physical road network to scale, defines the possible route choices and directional splits, defines the mode types, characteristics and distributions and then simulates the vehicles operating on the physical road network. Vehicles travel on the modelled network using a psycho-physical perception traffic flow model (PTV VISSIM 2018). Which means that rather than simply using constant speed and acceleration (across all vehicle being simulated), each vehicle's acceleration/deceleration, speed and following distance is influenced by the vehicles around it. In order to account for variable driver behaviour each vehicle's speed and behaviour is randomly determined from a distribution (which can be specified) rather than a static value assigned to all vehicles.

The model runs at up to a one tenth of second time step interval. During every time step the model is able to record information of each individual agent (in this case vehicles). This information includes the vehicle's position as well as other (user specified) information such as speed, acceleration and driving behaviour parameters. In order to determine network performance, the software records and evaluates the time step data. This data can then be analysed in the same way that one would analyse empirical data.

The advantage of this analysis approach is that the modeller can analyse the effect of physical changes in the infrastructure. It is also possible to analyse the effect of unique physical characteristics which traditional analysis packages cannot.

In order to translate the primary (vehicle based) data into data relating to people's mobility, occupancy rates need to be assigned to vehicles by class. Once occupancy rates are assigned to each vehicle class it is possible to measure performance for persons rather than vehicles.

VISSIM was selected as the most appropriate software analysis tool for the purposes of this study. A full functionality version of the software was made available by PTV Group for the analysis of this thesis.

2.8 Performance measures

In order to quantify the performance of a network alternative, a performance measure is required. Traditionally traffic network performance is measured by Level of Service (LOS), volume/capacity ratios and queue lengths.

2.8.1 Level of Service

Level of Service is a qualitative performance measurement. LOS can be measured in different ways depending on the part of a network under consideration. Through road's LOS can be determined by the vehicle flow density while intersection's LOS can be measured by its average control delay. According to the Transportation Research Board's

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Highway Capacity Manual (2000) the LOS of various network parts are measured as seen in the following tables:

Table 2-3: Lane Level of Service

Level of Service	Follower Density (pc/km/lane)
A	0-7
B	7-11
C	11-16
D	16-22
E	22-28
F	>28

Table 2-4: Intersection Level of Service

Level of Service	Average Control Delay (s/veh)	
	Stop Control Intersections	Signalised Intersections
A	0-10	0-10
B	10-15	10-20
C	15-25	20-35
D	25-35	35-55
E	35-50	55-80
F	>50	>80

2.8.2 Volume/capacity

Volume over capacity or v/c is a quantitative performance measure which compares a network part's demand with its capacity. An intersection operating at a v/c of 1 is operating at maximum capacity. When the v/c ratio exceeds 1 the intersection is no longer able to cope with the traffic demand and long queues start forming. A v/c capacity of 1 or more indicates a LOS F.

2.8.3 Queue length

Queue length is another quantitative performance measure that is often used in traffic engineering. The queue length can either be measured in number of vehicles or distance of the queue. A queue will always form as soon as the demand exceeds the capacity. A queue is deemed to have formed at a signalised intersection when the green phase ends and all the vehicles waiting from the previous green phase have not been processed. This is because queues can form due to the randomness of the arrival process even when there is not a prolonged oversaturated period. Since queues can easily be formed by irregular pelotons it is common to measure the 90^{th} or 95^{th} percentile queue length rather than the maximum queue length. It is also important to measure the duration of a queue. A queue that forms and dissipates in under 15 minutes is possibly caused by some other externality rather than the capacity of the intersection being exceeded.

2.9 Conclusion

Upon reviewing South Africa's current public transport situation (with particular focus on BRT's and taxis) it is evident that South Africa is experiencing a public transport

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progression. The issue that South Africa faces is that the introduction of new transport systems cannot be done without consideration of the already established systems. South Africa's leadership have decided to embrace the BRT system as a nationwide public transport solution and have implemented them in some of the major cities with some smaller cities also earmarked to receive funding for BRT. South Africa's leading public transport mode (the taxi) is well established and unlikely to be outcompeted any time soon. The new BRT's and those in the planning phase need to be compatible with the existing taxi industry in such a way that provides the most benefits to the public while maintaining socio-political stability. Various alternatives of how the two modes can be merged have been reviewed but the effect of these alternatives (specifically in an African context) needs to be analysed. Microsimulation of BRT's and hybrid scenarios were reviewed as a tool for the analysis. Microsimulation has been used successfully in the past and has been selected as the appropriate analysis tool to determine the effects of the hybrid traffic scenarios.

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3 CASE STUDY DESCRIPTION

3.1 Study area

The A Re Yeng BRT is situated in the City of Tshwane, Gauteng, South Africa. The route connects north western suburbs of Pretoria with the CBD and further east to Hatfield where the city's university and Rapid Rail (Gautrain) is situated. The extent of the route can be seen in Figure 3-1 below:

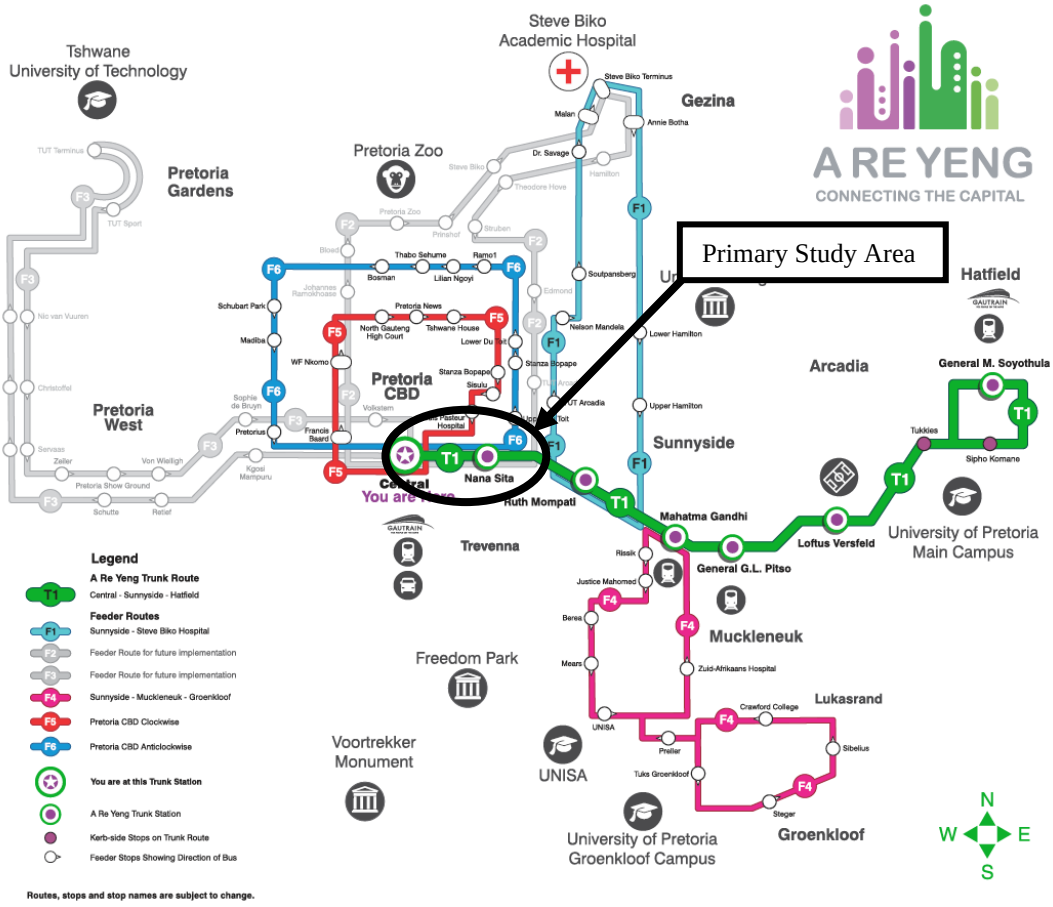

Figure 3-1: A Re Yeng extent (City of Tshwane, 2015)

The study area selected is located where three trunk routes overlap, these three trunk routes are T1, F5 and F6. This is currently the only section of the route where three trunk routes overlap and is therefore the busiest section of the network. The selected trunk route (Line 2A) can be seen in the following figure (note only lines 1A, 1B and 2A have been constructed):

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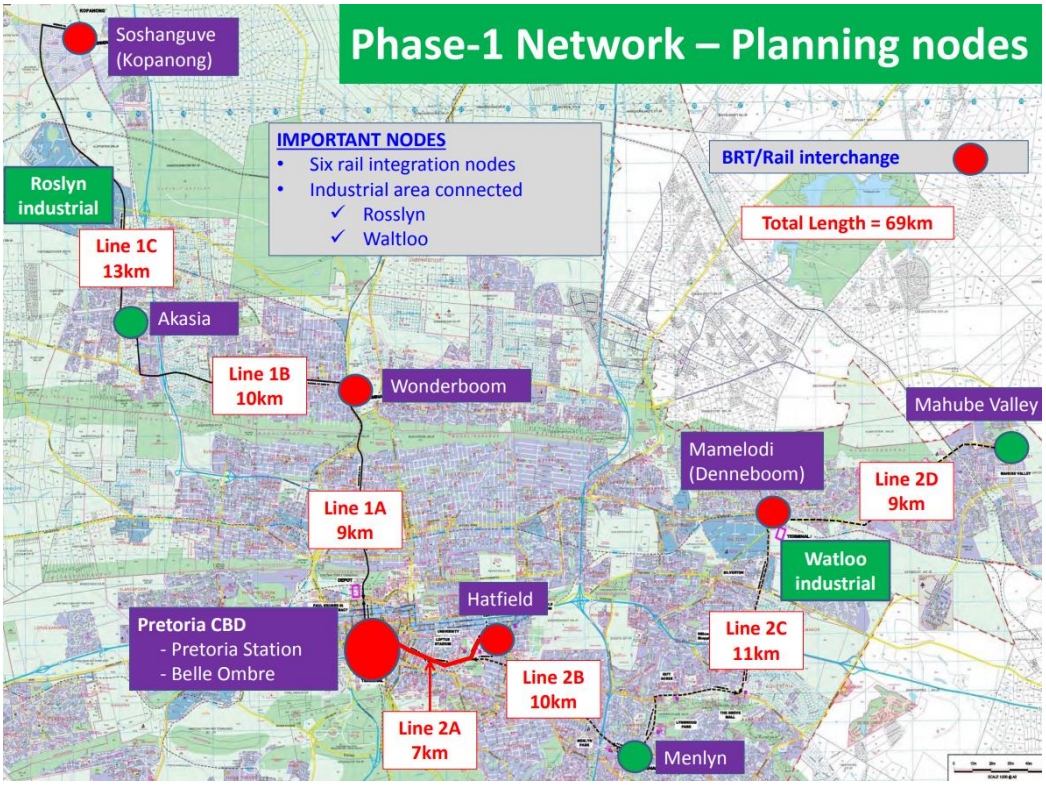

Figure 3-2: Network diagram (City of Tshwane, 2015)

The primary study area (seen in Figure 3-3) is located in the CBD of Pretoria in South Africa. The corridor which runs in an east west direction is named Nana Sita Street. The first intersection (western boundary) is between Nana Sita Street and Paul Kruger Street. The last intersection (eastern boundary) is between Nana Sita Street and Nelson Mandela Drive. The primary study area forms part of the city's BRT trunk route and holds two of the trunk route's BRT stations. The first is Central Station and is situated at the Nana Sita/Paul Kruger intersection. The second is Nana Sita Station and is situated after the Nana Sita/Kotze intersection. Both the stations serve the trunk route as well as secondary feeder routes. In order to ensure higher levels of detail were modelled, only a portion (1.2 km) of the trunk route was selected.

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Figure 3-3: Primary study area

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The study area's traffic composition (during the 12-hour traffic counts) is as follows: passenger vehicles (80-97%), minibus taxis (1-16%) and heavy vehicles (0-4%). There are several taxi routes which overlap with the BRT route, however there are no formal origin/destination nodes along the primary study area. The nearest taxi node is situated 2 blocks north of the primary study area. Passengers boarding or alighting taxis can do so at signalised intersections (usually during the red phase). There are no formal layby's for taxis in the primary study area.

The BRT buses used along the primary study area are standard 75-seater buses as well as 120-seater articulated buses. There are three trunk routes in the study area T1, F5 and F6. Route T1 is the main trunk route that runs laterally from the CBD to Hatfield. The Hatfield station is located next to Gautrain's (Rapid Rail) north most station and is also located walking distance from the University of Pretoria. Route F5 and F6 are both ring routes that operate within the Pretoria CBD.

The primary study area was selected for several reasons including:

1. It is located along one of the most extensive BRT's in South Africa.
2. It has fully dedicated BRT lanes.
3. There is a large minibus taxi demand.
4. There are multiple bus stations.
5. There are multiple signalised intersections (increasing the measurable effect on traffic conditions).
6. There are multiple general traffic lanes per direction. This further increases the level of detail that will be captured by a microsimulation.

The case study approach is aimed at capturing high levels of detail that are specific to the study area. The findings are not necessarily applicable globally, however the study area provides in depth in sight into African conditions.

3.2 Background

Since the study's simulation will be performed using the Tshwane BRT (known as A Re Yeng) it is necessary to understand the BRT network in Tshwane. The first phase of A Re Yeng was opened to the public at the end of 2014. The current route links the Tshwane University of Technology and the Hatfield Gautrain station in an east-west direction and links Steve Biko Academic Hospital and University of Pretoria's Groenkloof campus in a north-south direction.

The fully dedicated trunk route (line 2A) starts in the Pretoria CBD and passes through Sunnyside ending at the Loftus station slightly west of Hatfield and is just under 4km long. The dedicated trunk route is median separated with a dedicated BRT lane in each direction.

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The BRT lane is separated from the normal lanes by means of a delineator kerb which prevents general traffic from switching into the BRT lanes. The signalised intersections along the trunk route are fitted with bus specific signal heads which provide buses with higher ROW than other vehicles. The dedicated trunk route has 6 stations between the start and end points and these stations have raised platforms and are in the centre of the road reserve so that buses traveling in both directions can make use of the stations. At the stations, an additional pass-by lane of approximately 120 meters is constructed to allow buses to pass stationary buses. The buses operating along the trunk route are 18-meter-long articulated buses with a capacity of up to 120 passengers.

The dedicated trunk route has a travel time of approximately 19 minutes in each direction and runs from 5:00 AM to 21:00 PM during weekdays. Hours between 6:00-9:00 AM and 15:00-19:00 PM are considered peak hours with buses departing every 7 minutes. During off peak times buses depart every 20 minutes. Weekends have slightly shorter operating hours with buses departing every 30 minutes.

The remainder of the network is considered feeder routes with varying degrees of dedicated infrastructure. The feeder route is currently serviced by means of 12-meter standard buses with a capacity of 75 passengers.

3.2.1 Bus lanes

The main feature of a BRT network is the dedicated bus infrastructure. In order to provide the buses with higher ROW the buses must be separated from the general traffic lanes. This separation is achieved by placing a barrier between the BRT and general lanes. The barrier can be in many different forms such as a raised lane or a barrier kerb as used in Tshwane. The dedicated bus lane is often also marked with a different colour in order to draw attention to the lane so that motorists do not accidentally use the dedicated lane. In some situations, the separation is in the form of a standard raised median island which would traditionally be used as lane separation on high order mobility routes.

Figure 3-4 illustrates the separation kerb as well as the dedicated bus lane which is coloured red in the case of Tshwane’s BRT:

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Figure 3-4: Separation kerb (Miya and Westwood 2018)

3.2.2 Pass-by lanes

A common design technique used when designing BRT systems is the inclusion of pass-by lanes situated at BRT stations. The pass-by lane is situated within the BRT's separated infrastructure and allows buses to pass one another without leaving the dedicated BRT lane. The purpose of this lane is to ensure that buses traveling different operating routes or at different capacities do not cause congestion. The dedicated BRT lanes are typically separated from general lanes by means of a physical barrier which means that without the pass-by lanes, buses would be restrained from passing one another. The following figure shows the pass-by lanes in each direction at A Re Yeng's Nana Sita station in the Pretoria CBD.

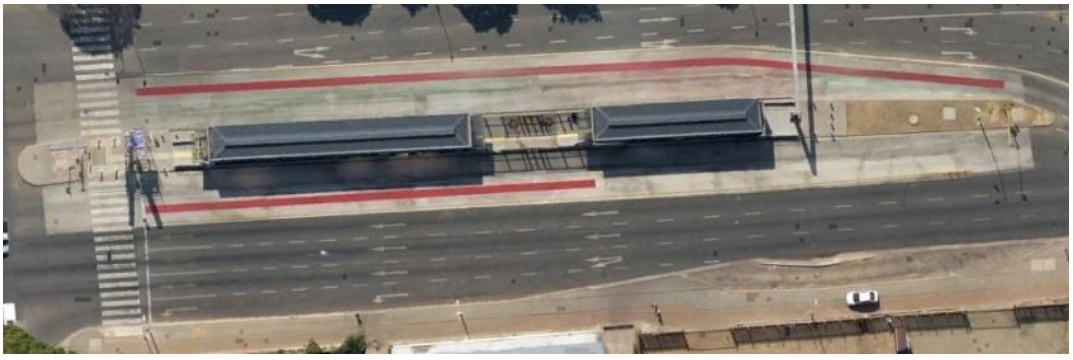

Figure 3-5: Pass-by lanes

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3.2.3 Priority signals

Another design feature of BRT systems is the priority signal at signalised intersections. The signal has separate signal faces which are exclusively for BRT buses. The signalised intersections are programmed to provide buses with higher ROW than general traffic. The signals can also be vehicle actuated which means that the program of the signal will change as a BRT bus approaches in order to minimise the bus's delay. According to Chitauka (2014), these priority signals can reduce BRT delays by up to 18%. Furthermore, consecutive BRT signals can be coordinated in order to ensure that BRT buses can pass through signals without needing to stop.

3.2.4 Public transport layby

During the design of the A Re Yeng, public transport other than the BRT were still considered. A large public transport layby can be seen in Figure 3-6. The layby is reserved for vehicles registered at the municipality. The layby is situated directly across from the Nana Sita station in Pretoria's CBD. The location of the layby improves integration of the BRT with other transport modes such as passengers being dropped off by passenger vehicles, taxis or ride sharing services such as Uber.

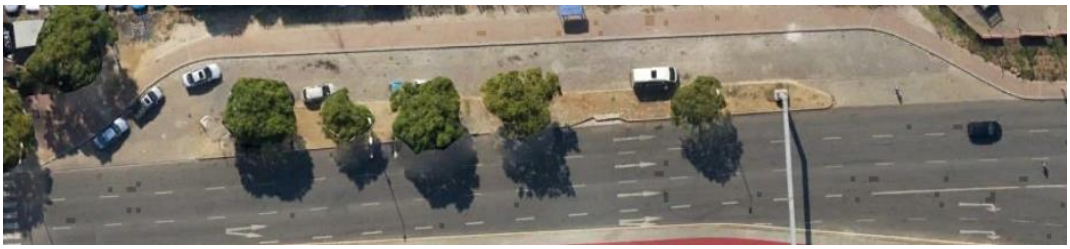

Figure 3-6: Public transport layby

3.2.5 Pedestrian infrastructure

Since the BRT stations are located in the centre of the road reserve pedestrians accessing the stations are forced to cross public roads. In order to ensure the safety of pedestrians and ease of access, some necessary infrastructure was put in place. Some of the pedestrian infrastructure installed for A Re Yeng include raised pedestrian walkways along road shoulders, pedestrian crossings, tactile paving (for blind pedestrians), pedestrian ramps for disabled pedestrians, pedestrian signals at signalised intersections, bollards, bicycle parking facilities and directional signage.

3.2.6 Bus stations

BRT bus stations are typically situated in the centre of the road. This allows for one station to serve vehicles travelling in both directions. The station's platforms are raised approximately 350 mm from the road level which is the same level as the bus floors. This ensures that passengers can board the buses quickly and easily, it also improves access for

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disabled persons. In order to access the platforms, passengers must have a ticket purchased at the ticket kiosk. This system ensures that payment delays do not take place on the bus, resulting in a faster and more reliable system. The bus stations are also fitted with real time information systems which provided passengers with important information which also improves the system's performance. The following figure indicates the modern stations constructed for the A Re Yeng:

Figure 3-7: A Re Yeng BRT station

3.2.7 Clearance strategy

Before the A Re Yeng service was implemented, public transport between Pretoria's CBD and Menlyn was limited to the taxi industry. The taxi associations responsible for this route are the Menlyn Taxi Association, Elardus Park Taxi association and the Pretoria Station Taxi Association. Taxi operators would purchase operating permits from the provincial department of transport, which enabled the operators to drive their desired routes for a period of 7 years. Once it was decided to implement the BRT, the municipality needed to decide how to accommodate the existing taxi operators. According to the Corridor Clearance Strategy (City of Tshwane 2015), CoT's approach would be to ultimately remove all (236) taxis from the CBD to Menlyn route completely. The phased approach would work as follows:

1. Line 2A was constructed between CBD and Hatfield. The first phase was partial compensation. CoT would pay an operator the amount of profit they were expected to

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lose as a result of the competing service running in parallel. During this stage taxi operators would still be permitted to operate along the CBD to Menlyn route.

2. A transfer station would be constructed just after the Loftus station. This would allow passengers traveling from CBD to Menlyn to make use of the BRT from CBD to the transfer station and then transfer to a taxi and complete the rest of the route. In order for this situation to be implemented the CoT would first need to construct the transfer station and then fully compensate operators (depending on how much of their 7-year operating permit was still valid) for the expected profit they would have made. Further terms of the agreement stipulated that the fares for the bus service would need to be based on existing taxi fares. During the compilation of the agreement a taxi from the CBD to Menlyn would cost R14.00 while a taxi from Menlyn to the transfer station would cost R8.00, this would mean a bus ticket from the transfer station to the CBD would be limited to a maximum value of R6.00.
3. The following phase of the BRT (Line 2B) will link Loftus station to Menlyn. Once this route is operational (expected in 2021), the taxis that were operating between the transfer station and Menlyn will be fully compensated (for the remainder of their 7-year permits) and then expected to leave the CBD to Menlyn route completely to the BRT.

The corridor clearance strategy makes it clear that CoT's service is aimed to compete directly with the taxi industry. CoT's approach is to remove the taxis from BRT routes and allow taxis to operate as a feeder service. CoT intends to enforce their strategy by means of law enforcement officers which will monitor the BRT routes.

This strategy makes sense from a technical perspective since the BRT is aimed at the same target income group as the taxis. The strategy does however come with draw backs, one of which is competing taxi associations. Before the implementation of the BRT Menlyn Taxi Association was responsible for the CBD to Menlyn route. The Mamelodi taxi association would operate from Hatfield to Mamelodi. Since line 2A has been in operation, the number of taxis (from the Menlyn Taxi Association) has reduced to make room for the BRT. This has allowed Mamelodi taxi operators to start infiltrating the CBD to Hatfield route. According to the taxi association's operating areas, this is not permitted. This observation further reinforces the point made by Neumann et al. (2015) that operators tend to oversaturate profitable routes.

CoT have also tried to incentivise their strategy by offering taxi operators shares in the A Re Yeng system as an alternative to financial compensation. This would mean that a profitable BRT route would be beneficial to the taxi operators which would promote taxi operators to leave BRT routes to the buses.

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3.2.8 Cost saving

After the implementation of the first phases of the BRT, the Department of Transport (DoT) (who is the national department responsible for providing CoT with funding for the BRT from national treasury) instructed CoT to implement cost saving strategies on the next phase. The next phase (Line 2B) runs between Loftus and Menlyn. CoT undertook a cost saving study to determine how they would complete Line 2B within the approved budget. The cost saving strategy proposed that more affordable stations be constructed between Loftus and Menlyn. The stations will be more traditional open bus stations with less costly aesthetic designs. The route will not make use of fully dedicated bus lanes for the entire route. CoT appointed private consultants to investigate a queue-jumping technique which could reduce construction costs while maintaining the higher ROW for the BRT.

3.2.9 Queue jumping

According to A Re Yeng's IRPTN (Integrated Rapid Public Transport Network) Specialized Unit represented by Ms Sedimogang Moraka, the municipality has started investigating the use of queue-jumping infrastructure for the next phases of the BRT. The queue-jumping infrastructure involves BRT buses using general lanes between intersections. At intersections, a dedicated BRT lane will be constructed, and the traffic signal will give the BRT movement its own dedicated phase.

The idea of the queue-jumping infrastructure is that the construction cost is reduced drastically (by not building dedicated lanes throughout the network) but maintaining the preferred ROW for the buses.

3.2.10 Right of Way

Right of Way (ROW) is a traffic engineering term which refers to the order of priority of conflicting transport routes or modes. ROW can be implemented in a transport network by means of regulations or physical infrastructure. Vehicles approaching from the right in a traffic circle always have ROW, this is an example of regulations enforcing ROW. BRT routes make use of infrastructure to implement the ROW hierarchy. Dedicated bus lanes and traffic signals are used to ensure that buses have a higher order of ROW than other transport modes. According to AECOM (2012), the key objectives of the study were to minimise delay and maximise priority for the BRT while attempting to minimise dis-benefits to general traffic. This statement clarifies that the approach taken by CoT was to prioritise the BRT buses over the general traffic.

3.2.11 Parking

Many Central Business Districts (CBD) have high densities and Floor Area Ratios (FAR). This results in space being limited. Because of the limited available space parking areas are

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not easy to construct, with most parking lots being private parking lots in the basement of high-rise buildings. The result is that on street parking becomes essential. Pretoria's CBD is no exception and when travelling in the CBD it is evident that on street parking is the norm. Vehicles often park in parallel parking bays on the pavement or on the sidewalk. The effect of the on-street parking on traffic flow is severe. In many cases the left most lane is used almost exclusively for vehicles entering and exiting parking spots with the only traffic flow capacity being for vehicles turning left at intersections.

3.2.12 Road access

Typically access to high order roads (such as the trunk route of the A Re Yeng BRT) is very restricted. Access on high order mobility routes is usually limited in order to preserve the mobility of the road. Increased access locations along a road increases the travel time and delay to road users. However, the buildings located along route 2A outdate the modern traffic engineering regulations implemented in South Africa. These accesses result in discontinuous traffic flow volumes between intersections. The combination of on street parking and multiple access locations reduces the available sight distance which in turn increases the required gap acceptance times. The effect is that capacity along the route is further reduced.

3.2.13 Transfer stations

The IRPTN specialised unit has also indicated that the municipality is planning on constructing a transfer station in addition to the existing transfer station in Annlin. The proposed location of the new transfer station is on the corner of Lynwood and University Street in Hatfield.

The purpose of the transfer station is to provide a cross over point for public transport passengers using taxis along routes where there are no BRT services. The Transfer stations were included in the network as a request from the taxi associations. The taxi associations currently operating between Menlyn and the Pretoria CBD have specified the construction of the Hatfield transfer facility as a requirement before the taxis will completely evacuate the CBD to Hatfield route.

The fact that these negotiations are taking place and that one such transfer facility is already constructed and operational provides evidence that the municipality and the taxi associations are both willing and capable of finding common ground and accommodating one another.

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4 MODEL SETUP

This section illustrates the method used to build and run the microsimulation model. This chapter comprises of data collection, microsimulation model, scenarios, key performance indicators and the comparison procedure. This section aims to provide the reader with sufficient information to understand how the results in subsequent chapters were obtained.

4.1 Data collection

4.1.1 Network configuration

Satellite imagery available in Computer Aided Drawing (CAD) software packages is regularly updated and offers the user the ability to look at satellite imagery over the past years. By looking at the imagery as a time laps it is possible to see road network configurations as time progresses. The imagery available in the Pretoria CBD is of high enough quality to measure accurately to the nearest meter. For the purposes of microsimulation model building the satellite imagery is sufficient to determine the general layout of the network.

Detailed information about the network such as platform length, lane widths kerb details and road markings were obtained directly from City of Tshwane's IRPTN specialised unit.

The existing network was modelled based on the latest (taken 11/9/2018) GIS images available. Where measurements could not be determined accurately from the available GIS data the network was physically measured on site. The gathered data included: lane dimensions, intersection layouts (lane configuration and turning movements), traffic signal positions, pedestrian crossing positions and dimensions, BRT lane dimensions, BRT station dimensions and positions, on street parking location and dimensions and horizontal alignment. The vertical alignment of the network was ignored since the terrain is relatively flat (mean gradient 1.3%, maximum gradient 4%). Any effects that the vertical alignment may have will be accounted for by the observed desired speeds and saturation flow rates.

4.1.2 Vehicles

The physical dimensions of vehicles simulated is according to the 2011 American Association of State Highway and Transport Officials (AASHTO) Policy on Geometric Design of Highways and Streets. This international guideline for geometric design is used extensively in South Africa for the design of road geometry. The physical dimensions of various design vehicles used in the simulation can be seen in **Appendix A**. It must be noted that the AASHTO design vehicle has been selected with a focus on geometric design and not traffic simulation. The result is that the design vehicles are based on approximately 98% percentile vehicle sizes. The standard vehicle size distribution provided by VISSIM was used in this study.

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4.1.3 Dwell times

In a recent report prepared for the Tshwane municipality (Mothapo 2018) the dwelling time of taxis performing pick-up and drop-offs at various ranks in Pretoria was measured. The dwelling time is measured from when the taxi stops until it departs. Very low dwelling times (shorter than 5 seconds) indicates that no passenger transfer occurred. The dwelling time data that was obtained from Mothapo's (2018) report has been plotted on a frequency distribution graph (Figure 4-1). The Average dwell time was calculated as 9.57 sec with a standard deviation of 5.94.

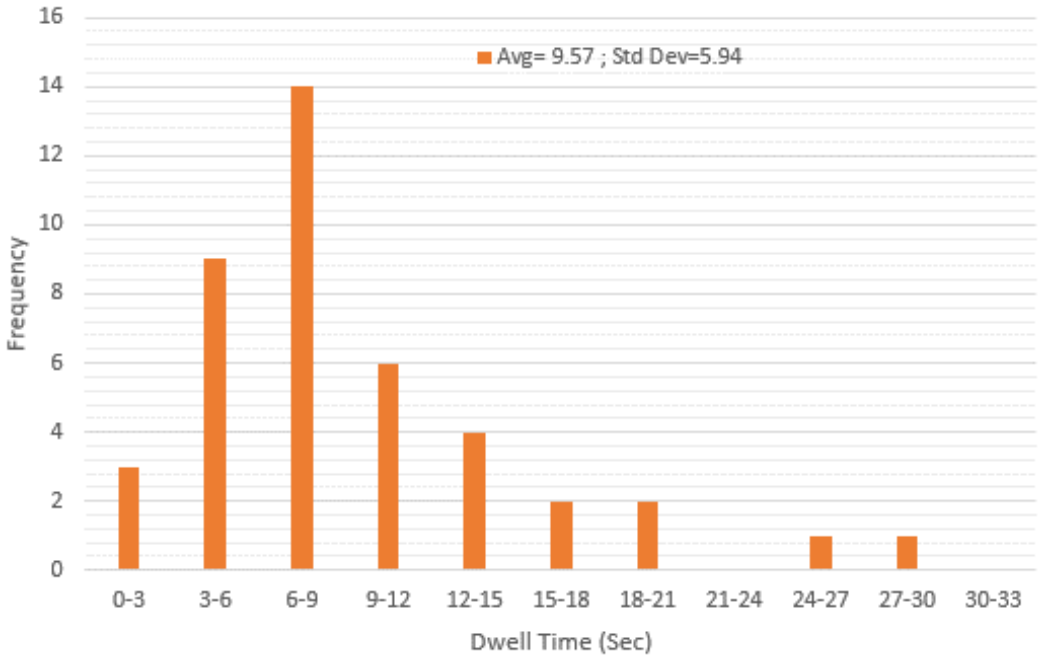

Figure 4-1: Dwell time frequency distribution of taxis

The dwell times used for buses was based on the video footage data. The 30 second dwell time distribution available in VISSIM was used. The distribution used is a normal distribution with a lower bound of 0 an upper bound of 130 a standard deviation of 10 and a mean of 30.

4.1.4 GPS tracking

In order to determine travel speeds and acceleration and deceleration rates, GPS tracking devices were used. The hand-held tracking devices recorded the location and speed at a frequency of 1 hertz. GPS tracking was performed during the expected AM and PM peak periods as well as off peak periods. The travel data collected during the off-peak periods was used to determine the desired performance of vehicles under uncongested conditions while the data collected during peak periods provided data which could later be used to validate the model. GPS data was recorded on separate days and on 3 passenger vehicles, 5 minibus taxis and 5 BRT buses.

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The recorded data was converted into KML format which was then plotted in Google's Geographic Information System (GIS) interface (Google Earth). Within the interface the travel speed and time can be seen at each recorded data point. This data was used to predict the desired travel speeds at the points of interest. Points of interest included positions where maximum straight-line speeds are observed as well as horizontal curves where the desired speed is limited to the cornering speed.

Input parameters used in the VISSIM model are input as distributions rather than static values. This ensures that all vehicles of the same class do not travel at the exact same speed but rather within a specified range. The data recorded was used to determine the mean desired travel speed per mode. Very extensive research would be required in order to determine the exact desired speed distribution for each mode. For this reason, the distribution provided by VISSIM was left unchanged. The mean values determined from the GPS data were used together with the standard distribution specified by VISSIM. For instance, if the recorded mean speed at a given location is 42km/h for a given vehicle class, the speed distribution (linear curve supplied by VISSIM) of 40km/h would be adjusted by shifting the distribution curve up by 2 km/h. The distribution would remain unchanged while the mean value would be modified. An example of such a distribution can be seen in the following figure. The figure was extracted from VISSIM's desired speed input tool. The X axis indicates the speed in km/h while the Y axis indicates the cumulative probability. The red dot indicates the average desired speed (42.5km/h). The figure illustrates that for an average speed of 42.5 km/h the lower limit assigned to any particular vehicle will be 40km/h and the upper limit assigned to any vehicle will be 45km/h. 50% of vehicles will be assigned a speed below 42.5km/h and 50% of vehicles will be assigned a speed above 42.5km/h:

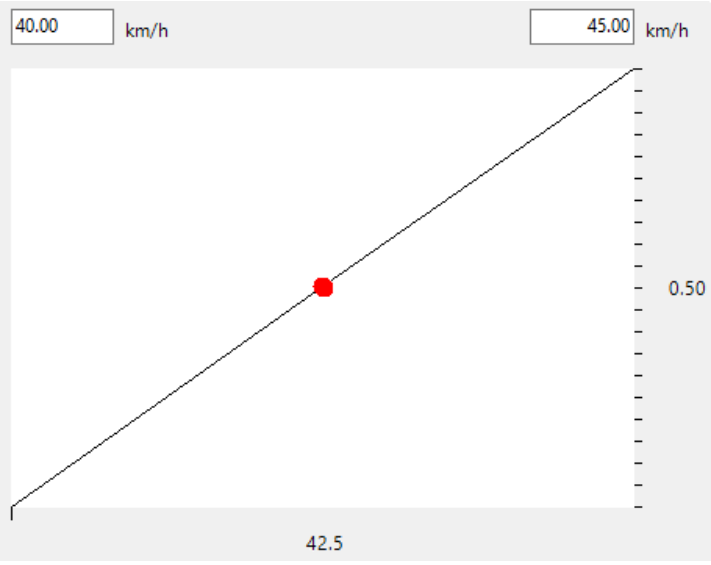

Figure 4-2: VISSIM desired speed distribution

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In the plot the x axis is the desired travel speed (km/h) and the y axis is the probability of the desired speed (ranging from 0-1). The example point shown on the graph is point (42.5;0.5) which means that 50% of vehicles would have a desired speed of between 40 and 42.5 km/h.

The distribution is used to assign a desired travel speed to each individual vehicle. In order to generate new distributions, very extensive data samples would be required. Since the available data is too limited to fit entirely new distributions, the available data is rather used to modify the distribution to reflect the correct (measured) mean, while retaining the original spread of speeds.

The GPS data was also used to verify dwell times at BRT stations as well as dwell times and locations for minibus taxis.

4.1.4.1 Desired Speeds

The following figure indicates the estimated desired travel speeds (km/h) for various vehicle classes that was recorded from the GPS data and were used as inputs to the simulation model. The blue dots indicate the location that the desired travel speeds were calculated. As seen in the figure the travel speeds vary for all three vehicle classes. Taxis have the highest desired travel speed with a maximum recorded value of 53.3km/h. Passenger vehicles have a maximum recorded desired speed of 45.2km/h. The desired speeds are lower than the speed limit of 60 km/h. The section of road has constant changes in horizontal alignment, barrier kerbs and frequent intersections which could all contribute to the desired speed being lower than the speed limit. The desired speed of the buses was lower than that of the taxis and passenger vehicles. The low desired travel speeds (below 25km/h) are located at intersections where vehicles are required to turn 90 degrees onto a crossroad.

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Passenger Vehicles BRT Taxis

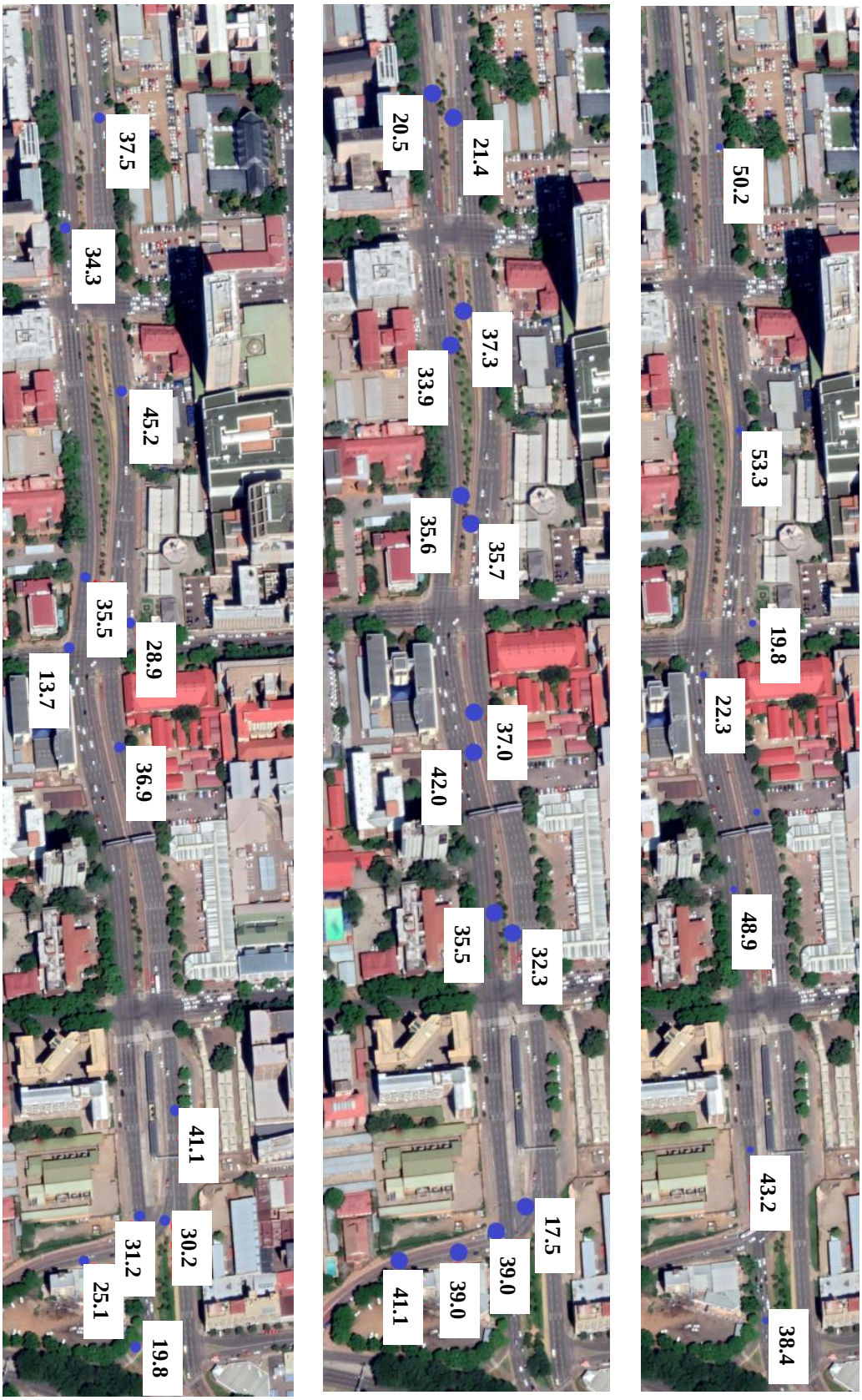

Figure 4-3: Desired travel speeds

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4.1.4.2 Acceleration and deceleration

In order to calibrate the model to South African conditions, the observed acceleration and deceleration rates for passenger vehicles, BRT buses and taxis was calculated. VISSIM requires the upper bound, mean and lower bound acceleration/deceleration rate at different speeds. The speed ranges were selected to ensure that at least 20 data points per range were available. The observed acceleration and deceleration rates per mode, determined from the GPS data and used in the model, can be seen in the following figures:

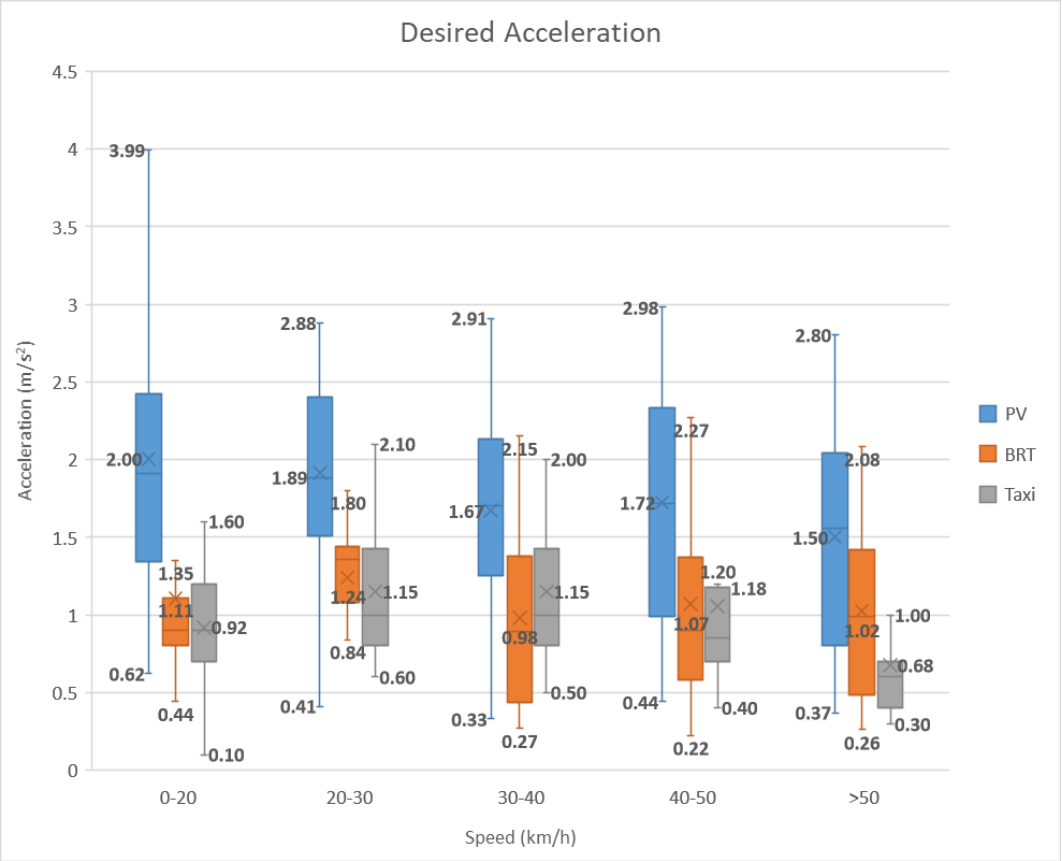

Figure 4-4: Observed acceleration

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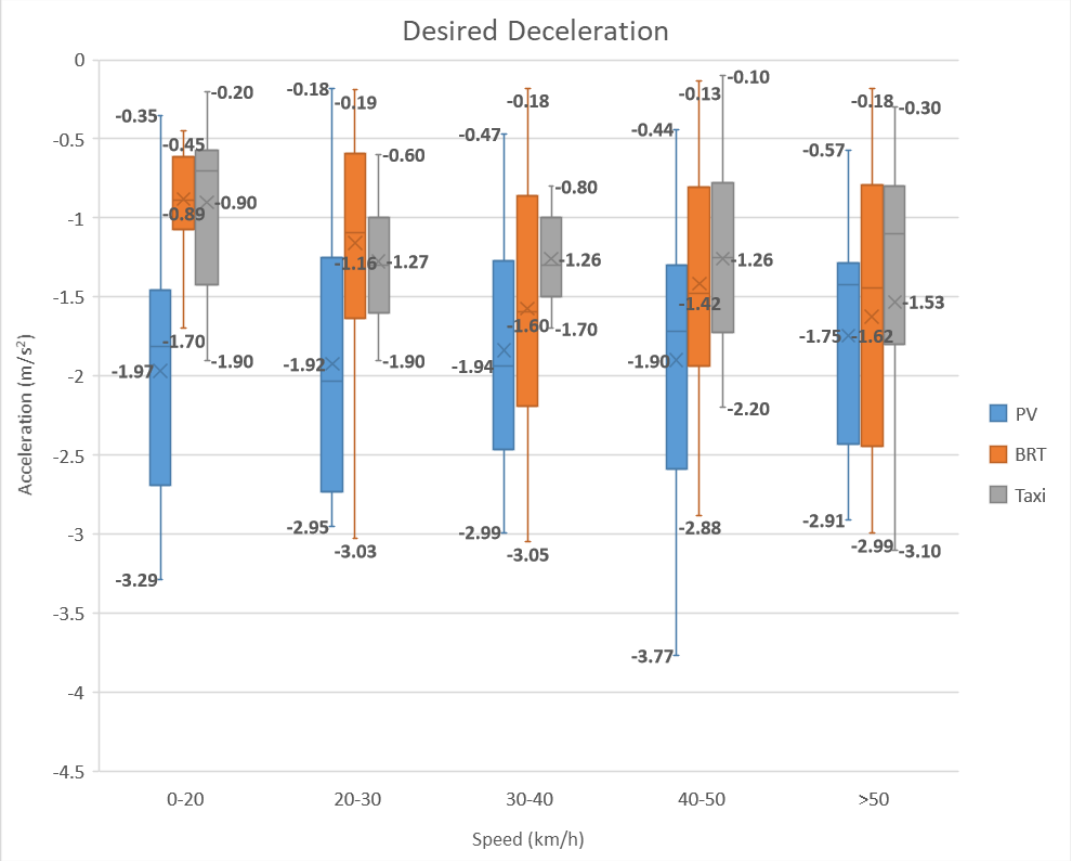

Figure 4-5: Observed deceleration

4.1.5 Traffic counting

In order to determine the existing traffic conditions various traffic counting methods are available. These methods include electromagnetic traffic counting, manual counts and video counting.

Electromagnetic counting methods are extremely reliable and cost effective for long term traffic counts, but they do not provide detailed information about the vehicles being counted. Electromagnetic counting methods are typically used along high order mobility roads since it is not practical to count an intersection with multiple possible movements.

Manual counting is less reliable than electromagnetic counting due to the human error factor. This method does however have the advantage of counting traffic at intersections with multiple movement possibilities and distinguishes between vehicle classes. These counts are cost effective and are typically used for short duration counts that are used to sample traffic conditions in a confined area.

Video counting is performed by installing a video camera along a road and then using software to count the traffic. This method is cost effective, accurate and can be used to count intersections with multiple possible movements with various vehicle classes. This method also has the added advantage of being able to review the video footage in order to

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determine other information such as approximate signal programs, saturation flow rates, headway times, Level of Service and driver behaviour.

Traffic counts were performed between 6:00-18:00 on Thursday the 14th of February 2019. The traffic counts were performed at all the intersections within the primary study area. The vehicle counts were performed using video recordings of the intersections. The 12-hour counts were recorded in 15-minute intervals and were separated by movement and vehicle class. The recorded vehicle classes included buses, heavy vehicles, passenger vehicles and minibus taxis. Refer to **Appendix B** for the traffic count data. An example of peak demand values counted can be seen in the following table. The values are the total hourly vehicles that passed through the intersection. The intersections are all along Nana Sita Drive and only the intersecting road's names have been listed:

Table 4-1:Peak hour observed traffic demand volumes per (8 approach lanes) intersection (veh/h)

Intersection	AM (07:15-08:15)	Mid-day (12:00-13:00)	PM (15:15-16:15)
Paul Kruger	3847	3330	3915
Andries	4109	3752	3846
Lilian	4300	3344	3892
Sisulu	3604	3115	4053
Kotze	2395	2053	2461
Du-Toit	1106	1010	1127
Nelson-Mandela	1950	1563	2021

The following figure illustrates the eastbound and westbound volumes over the 12-hour counting period. The volumes were taken at the Lilian Ngoyi Intersection.

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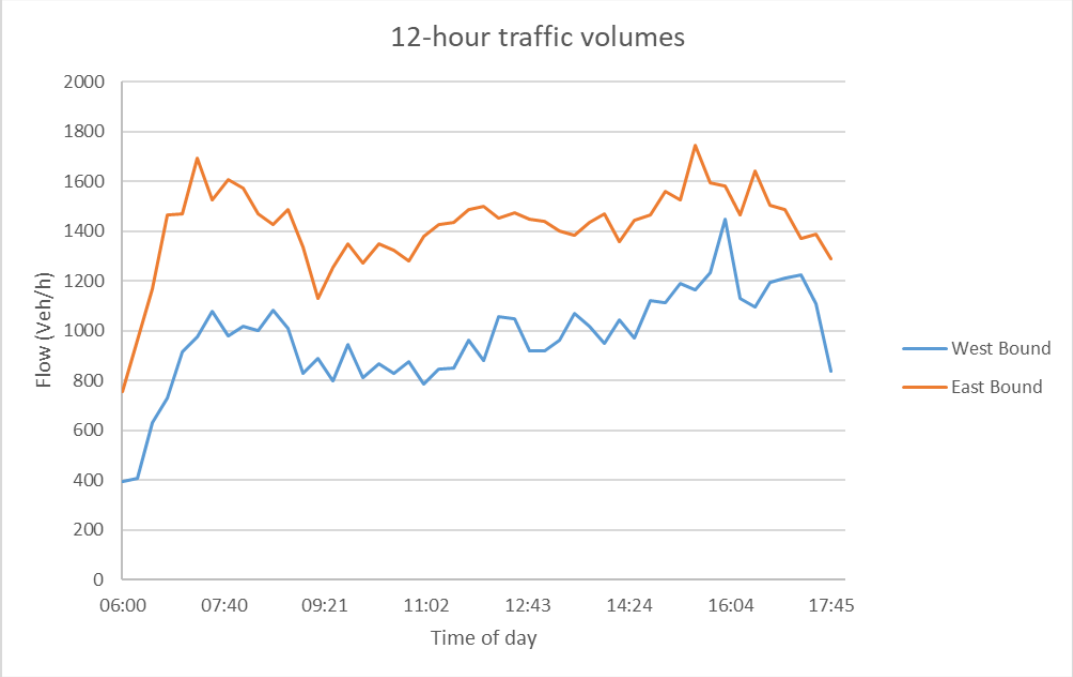

Figure 4-6: 12-hour traffic volumes

As seen in both the table and graph above there are three peak periods. The AM peak period occurs from 07:00 to 08:00, the mid-day peak occurs from 12:00-13:00 and the PM peak occurs from 15:15 to 16:15. The peaks all occur within the 12-hour simulation period that was selected. The traffic counts also indicate that the eastbound volumes are higher than westbound throughout the day. The total demand differs in each direction which indicates that motorists use alternative routes in the westbound direction.

4.1.6 Video footage

The video footage recorded during the traffic counts were used to determine queue lengths, vehicle adherence to regulations, parking times, dwell times at BRT stations, taxi dwell times and traffic signal timing and phasing.

The signal plans used for the base model were obtained from the video footage and compared with the signal plans provided by CoT. The signal plans correlated at most intersections except for the Paul Kruger and Nana Sita intersection. At this intersection it was evident that the main BRT movement was designed to be along Nana Sita Drive. The video footage revealed that the actual main BRT movement is the turning movement between Nana Sita and Paul Kruger Street (both north and south bound). The observation was further confirmed by the dedicated bus lanes being constructed along Paul Kruger Street which is the only north south route in the study area to have dedicated BRT lanes. The signal timing diagrams for this intersection were determined from the video footage. The signal plans can be seen in **Appendix C**.

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4.1.7 Pedestrians

The focus of the study is to determine the traffic impact of the hybrid scenarios on the vehicles in the network. Although pedestrians can have a significant impact on the performance of a road network, their influence does not necessarily need to be captured by modelling the pedestrians in the simulation. In order to account for the effect of pedestrians on the road network certain physical elements were incorporated in the model. These include the modelling of traffic signal phasing including the pedestrian phases, and dwell times of taxis and buses.

4.1.8 Taxi driver discipline

Taxi driving behaviour differs from passenger vehicles in two main categories. Firstly, the physical performance (which has been discussed in section 4.1.3). Secondly is taxi driver's adherence to traffic rules. The lower driving discipline of taxi drivers is often observed as taxis starting to accelerate during all red period, ignoring amber phase, stopping for passengers during green phases, higher/lower travel speeds and using emergency lanes as taxi lanes. This behaviour will have an effect on a hybrid transport service and is a topic for further investigation. These behaviours have however been limited within the study area due to the following reasons:

1. Geometry: Barrier kerbs and narrow lanes in the study area prohibit taxis from "creating lanes". "Creating lanes" refers to taxis which used unused space (emergency lanes, wide lanes, or road shoulders) as dedicated taxi infrastructure. This behaviour is often experienced where geometry permits.
2. Drop-off locations: There is limited place for taxis to perform pickup and drop-off procedures, so these manoeuvres generally take place when taxis are stopped at a traffic signal during the red phase.
3. Traffic volumes: The traffic is congested and the taxis are therefore forced to travel at the same speeds as the surrounding traffic.
4. Median island: The wide median island (consisting of BRT stations and lanes) deters taxis from performing U-turns and travelling in the oncoming traffic lanes.
5. Policing: During a number of site investigations and in the video footage, a strong metro police presence is observed. A continued presence of law enforcement tends to result in better adherence to traffic regulations.

For these reasons, the taxis have been modelled to follow the same driving rules as the passenger vehicles. The car following behaviour, acceleration/deceleration and travel speeds for taxis has however been modelled uniquely based on the observed data.

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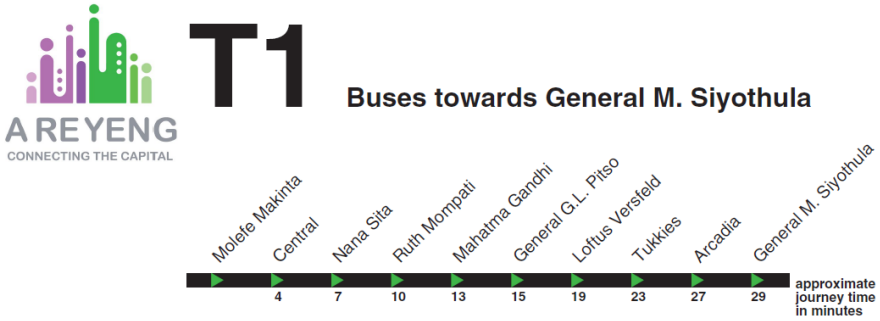
4.1.9 BRT schedule

The BRT schedule was simulated according to the formal bus schedule made available by the BRT operator (City of Tshwane 2015). The claimed bus schedule was validated against the video footage. The bus schedule indicated that during weekdays the bus schedule started before and ended after the simulation period. The result is that the simulation never runs without an active BRT schedule. The bus schedules provided by the operator were verified with the video footage and can be seen below.



Monday - Friday									
First buses	6 to 7am	7 to 8am	8am to 3pm	3 to 4pm	4 to 5pm	5 to 6pm	6 to 7pm	7 to 8pm	Last bus
0500	0600	0703	minutes 15	1505	1601	1704	1820	1900	2000
0520	0607	0710	past each 35	1512	1608	1711	1841	1920	
0540	0614	0717	hour 55	1519	1615	1718		1940	
0553	0621	0724		1526	1622	1725			
	0628	0731		1533	1629	1732			
	0635	0738		1540	1636	1739			
	0642	0745		1547	1643	1746			
	0649	0752		1554	1650	1753			
	0656				1657	1759			

Figure 4-7: Route T1 bus schedule

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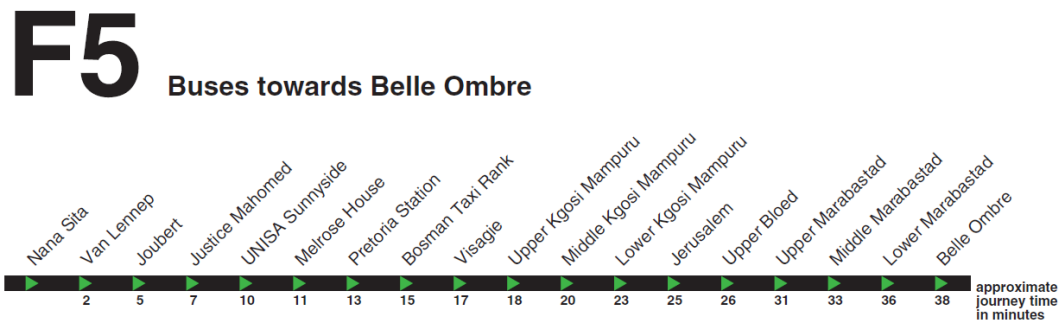
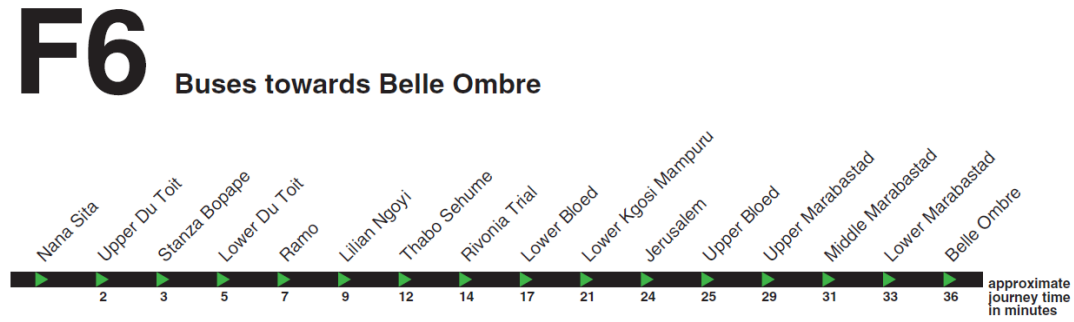


Monday - Friday									
First buses	6 to 7am	7 to 8am	8 to 9am	9 to 11am	11am to Midday	Midday to 3pm	3 to 5pm	5 to 6pm	Last buses
0500	0600	0700	0830	minutes 00	1100	minutes 00	minutes 00	1700	1800
0515	0615	0715		past each 30	1132	past each 30	past each 15	1715	1830
0530	0630	0730		hour		hour	hour 30	1730	
0545	0645	0759					45		

Feeder Route

Figure 4-8: Route F5 bus schedule



Monday - Friday							
First buses	6 to 7am	7 to 8am	8am to 2pm	2 to 3pm	3 to 5pm	5 to 6pm	Last buses
0500	0600	0700	minutes 00	1400	minutes 00	1700	1800
0520	0620	0720	past each 30	1430	past each 20	1720	1830
0540	0640		hour	1450	hour 40		

Figure 4-9: Route F6 bus schedule

4.2 Microsimulation model

Using the recorded data, a 2019 base model (see Figure 4-10) was modelled in VISSIM. The network data collected was modelled as accurately as possible without deviating from the measurements of the physical network. The base model was used to calibrate and validate the model and will be used as the base line for traffic performance.

The following figures illustrate the modelled network:

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Figure 4-10: Base model plan view

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Figure 4-11: 3D model comparison view

4.2.1 Calibration

The simulation was programmed to run between 6:00 AM and 18:00 PM and represents a typical 12-hour weekday. The simulation captures the peak periods seen in section 4.1.4 and has an active bus schedule throughout. Because the simulation is a random process the simulation must be repeated to capture the variation in output data. Each simulation runs for 10 repetitions (each with a different random seed) in order to capture the variation within a reasonable time (since each individual run increases the simulation run time significantly).

4.2.1.1 Queue Lengths

The first stage of the model calibration was performed using the observed maximum and average queue lengths. The video footage obtained during the traffic count was used to record the queue length for selected approaches per traffic signal cycle. The video footage was not able to show the entire queue length for each approach and so only approaches where the queue length could be observed were selected. The queue length calibration was

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performed with data obtained during the AM peak period from 7:15-8:15 at the following locations:

- Nana Sita/Lillian Ngoyi intersection, right turn movement on Nana Sita westbound approach.
- Nana Sita/Kotze intersection, right turn movement on Nana Sita eastbound approach.
- Nana Sita/Kotze intersection, straight through movement on Nana Sita westbound approach.

In order to adjust the observed queue lengths, certain input parameters needed to be adjusted. The traffic volumes and mode distributions were fixed (based on the observed data). The remaining parameters that could be adjusted where: desired speeds, acceleration/deceleration rates, parking distribution times, delay times caused by parking, taxi dwell times, driving behaviour and the model's physical parameters.

1. The input parameters used for the vehicle following model were determined by measuring saturation flow rates and stand still following distances in the video footage. For the additive and multiplicative factors initial "typical" values are selected. The saturation flow rate of the model is then determined, and the factors adjusted until the observed and simulated saturation flow rates match. The values obtained for the model are as follows: The stand still distance between vehicles = 1.2 meters
2. The additive part of the following distance factor = 2.9
3. The multiplicative part of the following distance factor = 2

These factors are used for the general traffic which includes taxis and passenger vehicles. The software allows an adjustment to be made when the leading vehicle is a specific mode. The standstill distance for taxis, buses and passenger vehicles was determined from the video footage. However, in order to determine the following distance factors for each individual mode a homogeneous stream of the given mode would need to be observed. Further investigation is required to determine mode specific driving behaviour parameters.

The input parameters related to desired speeds, acceleration/deceleration rates, following distances, and parking were specified based on video observation (see section 4.1.3), and not adjusted further. Some fine-tuning of the model's physical parameters, including lane positions, lane widths, link positions and conflict areas were undertaken to improve the realism of the simulation of the interaction between vehicles.

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During the calibration procedure it became evident that the way that the modelled vehicles behave during the amber and all red phase of a cycle differs from the actual driver behaviour observed. When a leading dedicated right turn phase is included in a cycle the modelled drivers will not cross the stop line at the end of the phase (which is correct according to driving rules). The video footage showed that even at a leading right turn phase the last 2-3 vehicles waiting to turn right will cross the stop line at the end of the phase even though there is no amber signal for them. When this behaviour was adjusted in the model, the model's queue lengths started matching the observed queue lengths better. The behaviour was altered by "converting" a portion of the amber time to green time, so that the vehicles performing the right turn were permitted to continue the right turn movement (for a short period longer) even though the opposing movements were required to stop.

The video footage further revealed that some of the signals were coordinated with one another. After adjusting the signal timing so that the models traffic signals were also coordinated the modelled queue lengths matched the observed queue lengths better.

4.2.1.2 Travel times

The model was further calibrated by comparing observed travel times with modelled travel times. The travel times were split into four categories:

1. General lanes eastbound
2. General lanes westbound
3. Bus lane eastbound
4. Bus lane westbound

Vehicle travel times were recorded at the start and end of the route at locations shown in Figure 4-12. The following abbreviation format was used: Vehicle class-Direction (eastbound or westbound)-Start/End

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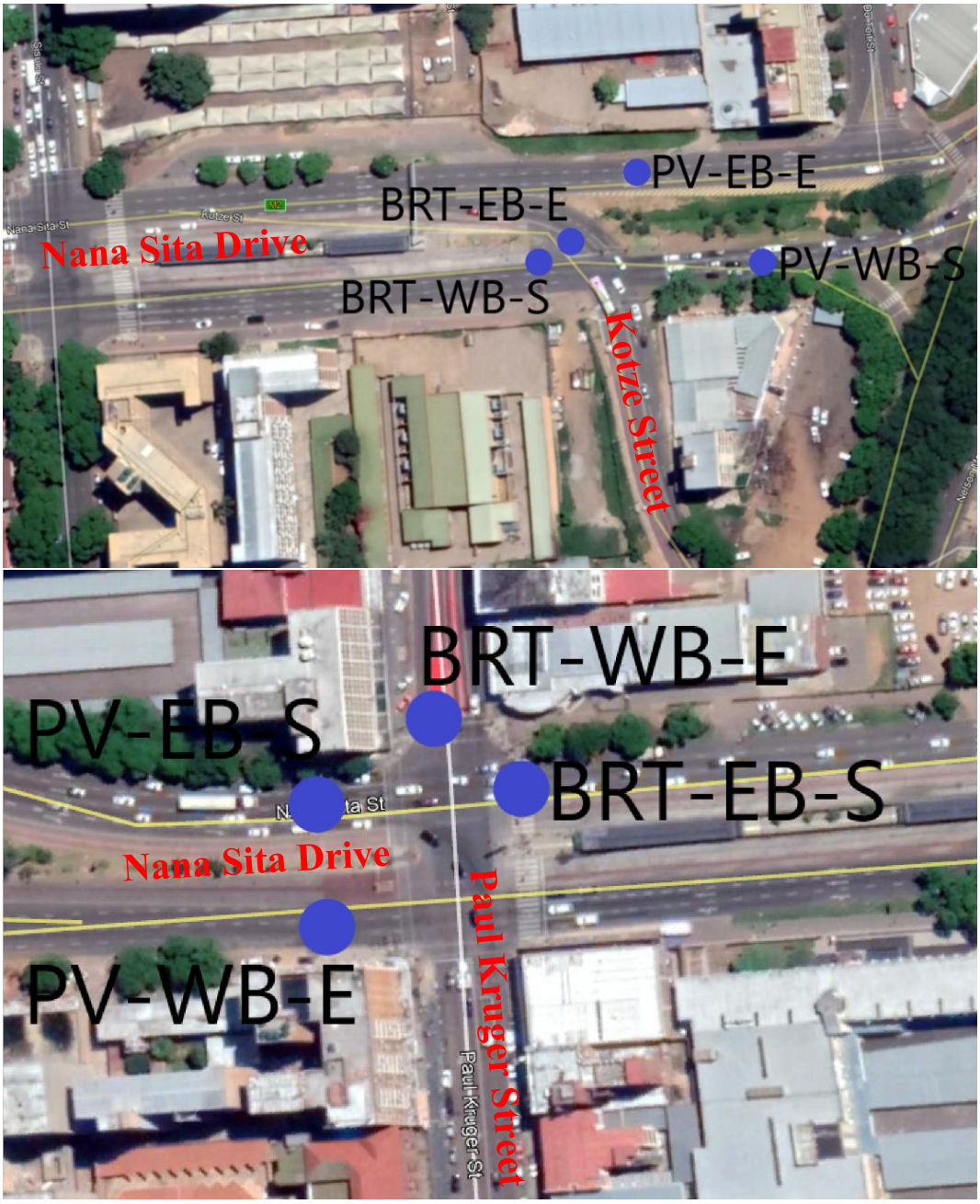

Figure 4-12: Travel times recording locations

The recorded vehicles were selected at random based on easily identifiable physical attributes such as unusual colours or paint works, branding on the vehicle, after market accessories or rare vehicle makes. The minimum required sample size was determined as follows:

Eastbound general lanes:

Flow from start to end of route between 06:00-07:00 AM = 1385 veh/hour

Probability of staying on route at each intersection:

Andries Street=0.6

Lillian Ngoyi Street=0.85

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Sisulu Street=0.7

Kotze Street=0.65

Population size= $1385x0.6x0.85x0.7x0.65$=321 veh

Required sample size for a 10% confidence interval at 95% confidence level (Z=1.96):

SS=$\frac{Z^2xpx(1-p)}{c^2}$=$\frac{1.96^2x0.5x(1-0.5)}{0.1^2}$=96

Correction for finite population:

SS=$\frac{ss}{1+\frac{ss-1}{pop}}$=$\frac{96}{1+\frac{96-1}{321}}$=74 veh

Westbound general lanes:

Flow from start to end of route between 06:00-07:00 AM = 550 veh/hour

Probability of staying on route at each intersection:

Sisulu Street=0.86

Lillian Ngoyi Street=0.9

Andries Street=0.88

Paul Kruger Street=0.92

Population size= $550x0.86x0.9x0.88x0.92$=344 veh

Required sample size for a 10% confidence interval at 95% confidence level (Z=1.96):

SS=$\frac{Z^2xpx(1-p)}{c^2}$=$\frac{1.96^2x0.5x(1-0.5)}{0.1^2}$=96

Correction for finite population:

SS=$\frac{ss}{1+\frac{ss-1}{pop}}$=$\frac{96}{1+\frac{96-1}{344}}$=75 veh

The results below indicate the observed queue lengths (in number of vehicles) and the modelled queuing at the traffic signal per cycle. The mean capacity indicates the number of queued vehicles that passed through the signal for the specified movement per cycle. It is important to note that these values are not the demand per movement per cycle but only the vehicles that formed part of the queue during the red phase of the cycle. The calculated GEH values (seen in Table 4-2) are all below 4 except for one minimum queue length. The model can therefore be deemed calibrated.

Table 4-2: Queue length calibration results

Intersection	Nana Sita/Lillian Ngoyi			Nana Sita/Kotze			Nana Sita/Kotze		
Move	Nana Sita Westbound Right Turn			Nana Sita Eastbound Right Turn			Nana Sita Westbound Straight		
	Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH
Mean Queue	5.1	4.4	0.32	1.2	1.9	0.6	17.3	24	1.47
Min Queue	1	1	0	0	0	0	0	15	5.48
Max Queue	9	9	0	4	5	0.47	41	39	0.32
Mean Capacity	4.2	3.8	0.2	1.2	1.9	0.56	17.3	24	1.47

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Max Capacity	7	6	0.4	4	5	0.47	41	39	2

The two movements where the mean capacity and the mean queue are equal indicate that for each cycle the entire queue was able to pass through the intersection.

The following table indicates the observed and modelled travel times between 6:00 and 7:00 AM (in seconds) for the four different groups:

Table 4-3: Travel time calibration results

Eastbound general			Westbound general			Eastbound BRT			Westbound BRT		
Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH
136.1	147.5	0.96	250.4	246.7	0.23	238.9	228.1	0.71	267.1	269.7	0.16

The GEH values calculated are all well below 4 which is usually accepted as the upper limit for a calibrated model. The results indicate that according to the measured travel times the model is calibrated.

4.2.1 Validation

Calibration was performed using data from 06:00-07:00 AM. In order to validate the model, the average travel times of vehicles were recorded from 07:00 to 08:00. The observed and modelled travel times were compared and can be seen below:

Table 4-4: travel time validation results

Eastbound general			Westbound general			Eastbound BRT			Westbound BRT		
Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH
120.2	150.9	2.64	289.3	320.7	1.80	275.6	232.5	2.7	224.9	279.8	3.46

The validation results obtained indicate GEH values of below 4. According to the modelled travel times the model is deemed validated.

4.3 Scenarios

The hybrid scenarios simulated were designed based on practically implementable options that could be used to improve the traffic impact that public transport modes have on the road network. The scenarios that were designed are discussed below:

4.3.1 Scenario 1 (Benchmark)

The 2019 base model which was used to calibrate and validate the simulation model was used as the benchmark scenario. This scenario has been modelled as close to the observed network as possible, with the traffic volumes coming directly from the traffic counts.

After calibrating the model and seeing the traffic conditions with the existing traffic volumes it was determined that during the PM peak the model was already operating past its maximum capacity. This was confirmed when comparing the model's traffic conditions with the traffic conditions observed in the video footage. With traffic volumes of up to 4 100 veh/hour/intersection during the peak hours, LOS F was measured on all major approaches in the study area.

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4.3.2 Scenario 2 (Removal)

All minibus taxis are removed from the network. This scenario will indicate the direct traffic impact that the minibus taxis have on the network. This is the scenario that the local municipality finally intends to implement. It is assumed that all taxi passengers shift to the BRT buses. A ratio of 5 taxis to 1 BRT bus is assumed (with vehicle occupancies of 15 passengers per taxi:75 passengers per bus). The taxi volumes recorded per hour were divided by 5 to determine the additional buses required (per hour) to accommodate the new passengers. For comparison purposes the buses and taxis are assumed to be operating at full capacity.

4.3.3 Scenario 3 (Shift)

Minibus taxis are forced to share the dedicated BRT lanes and use them as express lanes. In this scenario the minibus taxis will not be permitted to use the general lanes. Practical implementation of this scenario is a concern. In order to "force" taxis to use the dedicated lanes, some form of stricter law enforcement would be required. It may not be practical to implement this sort of intensive monitoring.

Since taxis turning off of the corridor are forced to do so at intersections in the BRT lanes there are new turning movements that are introduced to the intersections. In order to safely accommodate these new turning movements, further research will be required on the appropriate signal timing and phasing. In the model the phasing and timing was left unchanged. The taxis would only make the turning movement when a sufficient gap was available in the traffic stream being crossed. This movement typically took place during the amber and all red phases.

In order to effectively implement this scenario, the existing BRT stations may need to be adapted in order for taxis to perform pick-ups and drop-offs without hindering the flow of traffic in the BRT lanes.

Figure 4-13 illustrates what these upgrades might look like. The first layby is placed between the station and the intersection and has space for one taxi. This will require the existing station to be shortened by approximately 7.5 meters. The second layby is placed before the station and has capacity for 2 taxis. The second layby requires no alterations to be made to the station buildings. This proposal does however create a safety concern since the taxi's doors are situated on the left side of the vehicle. Passengers will be expected to board and alight between the stationary taxi and the moving vehicles in the BRT lanes. Although this does not form part of the scope of this research, further thought is needed on design approaches.

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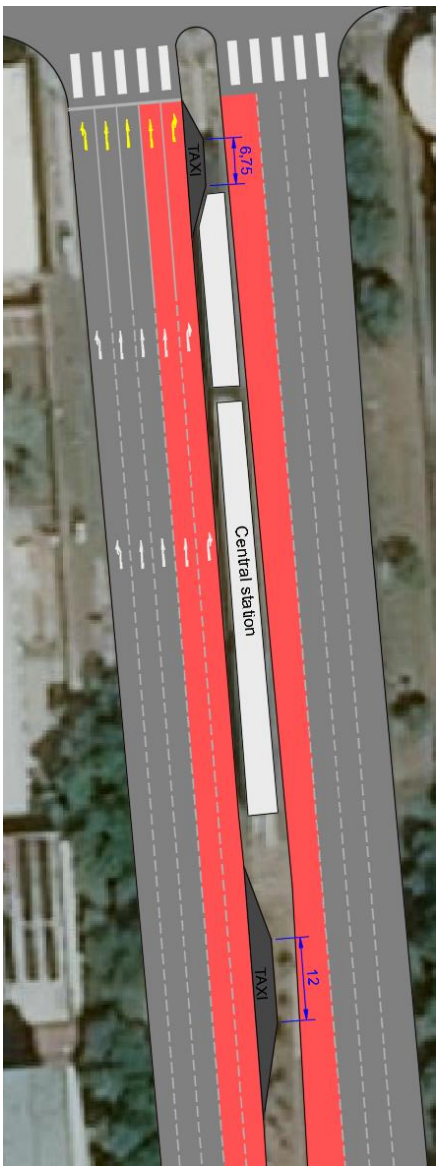

Figure 4-13: Concept taxi layby

4.3.4 Scenario 4 (Share)

This scenario is not ideal but rather selected to indicate a likely outcome if taxis are permitted to use BRT lanes. The scenario will have minibus taxis using any lanes (general or dedicated BRT). The minibus taxis will be able to use any lane based on their preferred choice. The only limitation is that taxis will only be able to switch between BRT and general lanes at intersections since the barrier kerbs will prevent lane changes.

4.4 Key performance indicators

The key performance indicators used to measure the traffic impact are queue lengths, average travel speeds and travel times.

Average speeds were measured on all links in the study area. The speeds were calculated by measuring the entry and exit time of each vehicle. The entry and exit recording position

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is specified and the distance between the points is known. The recorded times are used to calculate the average travel speed.

Queue lengths were measured at the following positions:

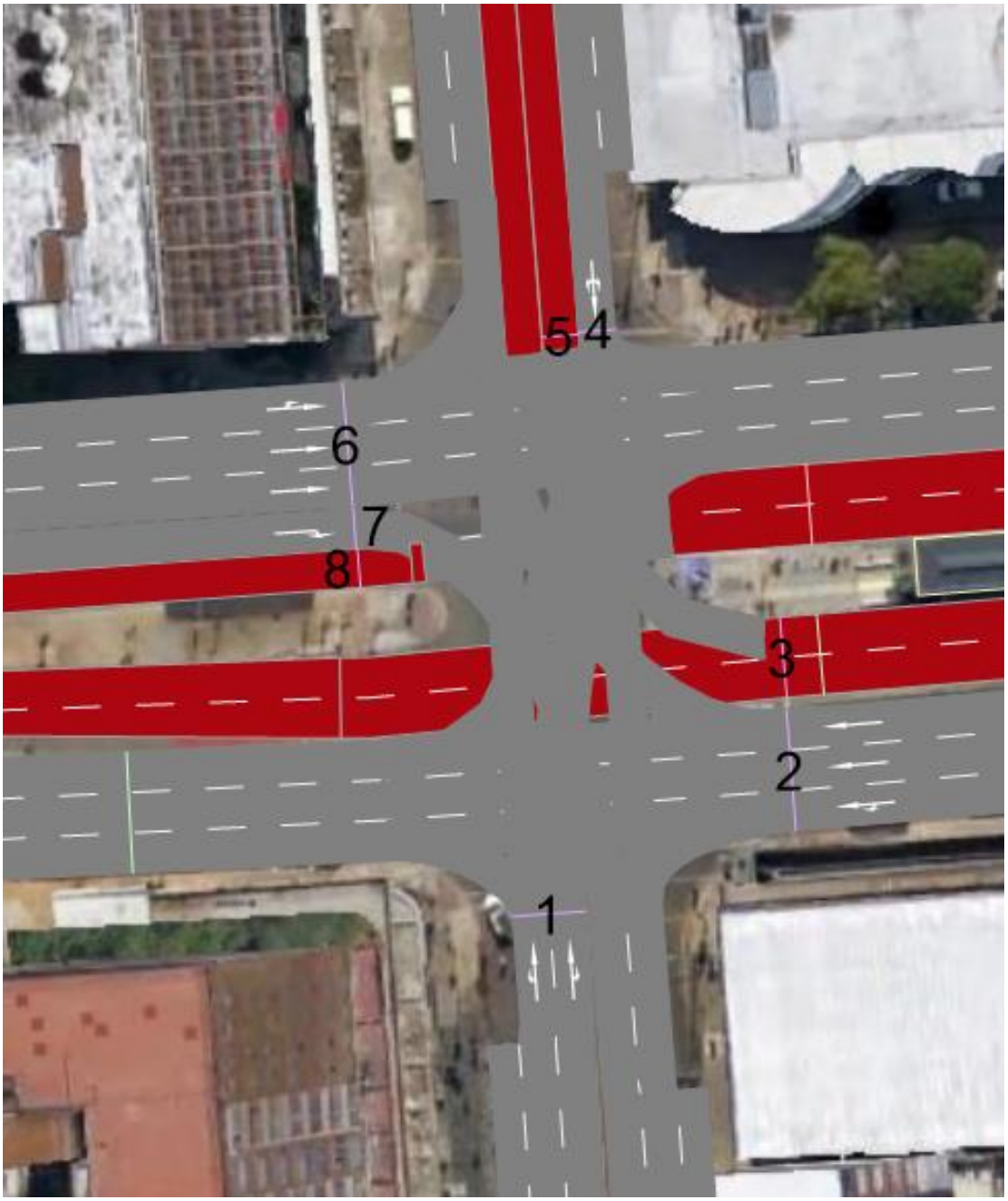

Figure 4-14: Paul Kruger Street queue counting positions

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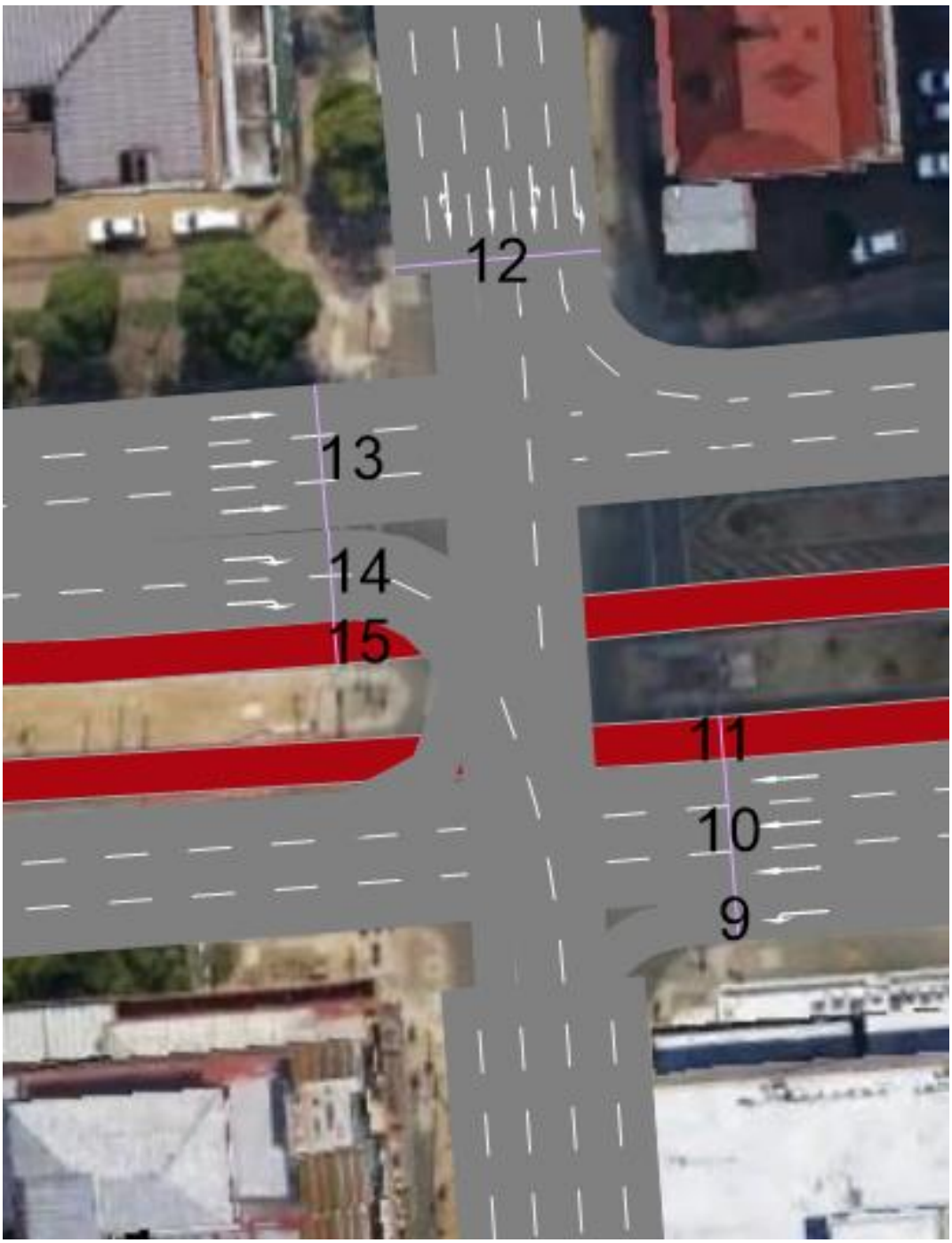

Figure 4-15: Andries Street queue counting positions

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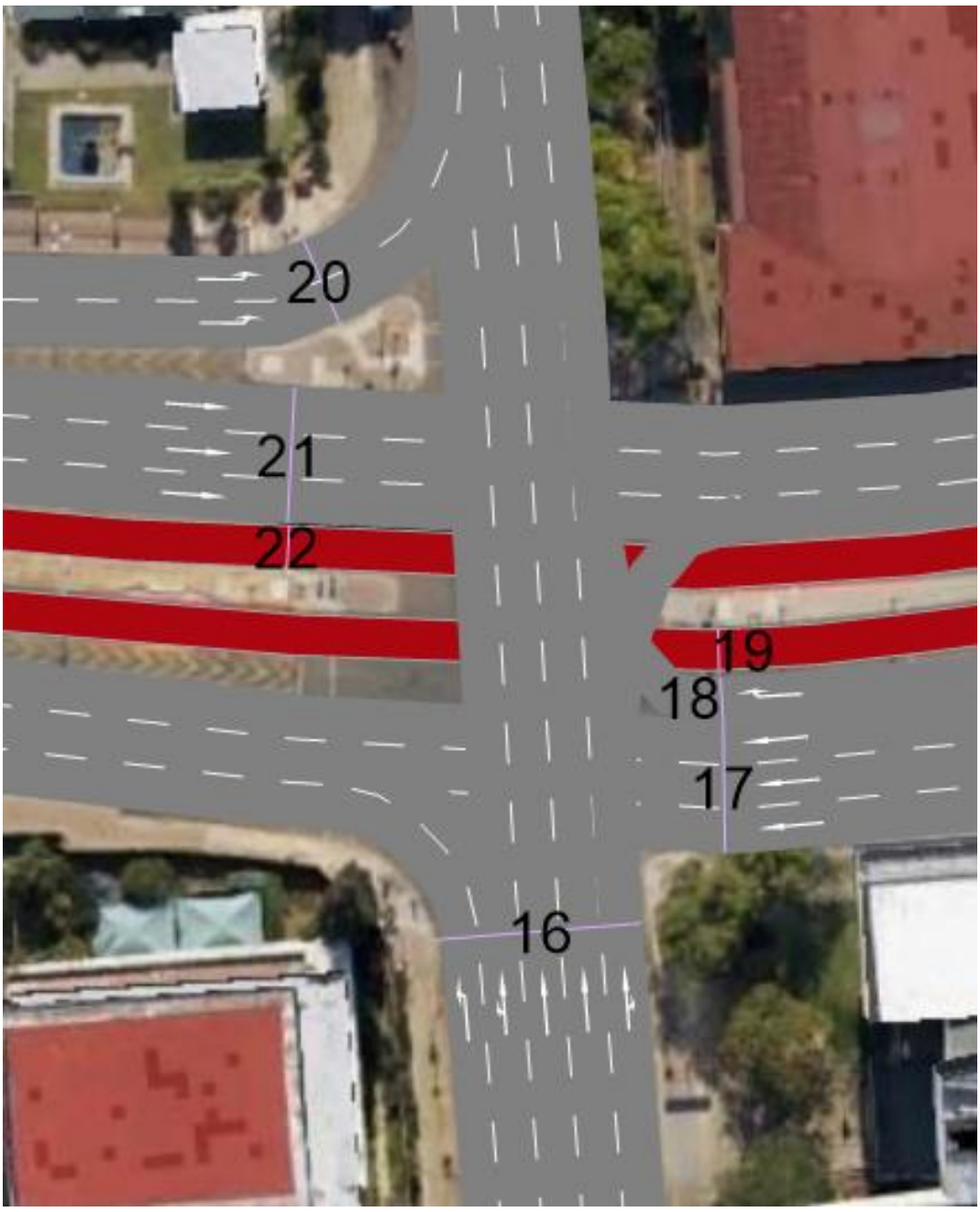

Figure 4-16: Lillian Ngoyi Street queue counting positions

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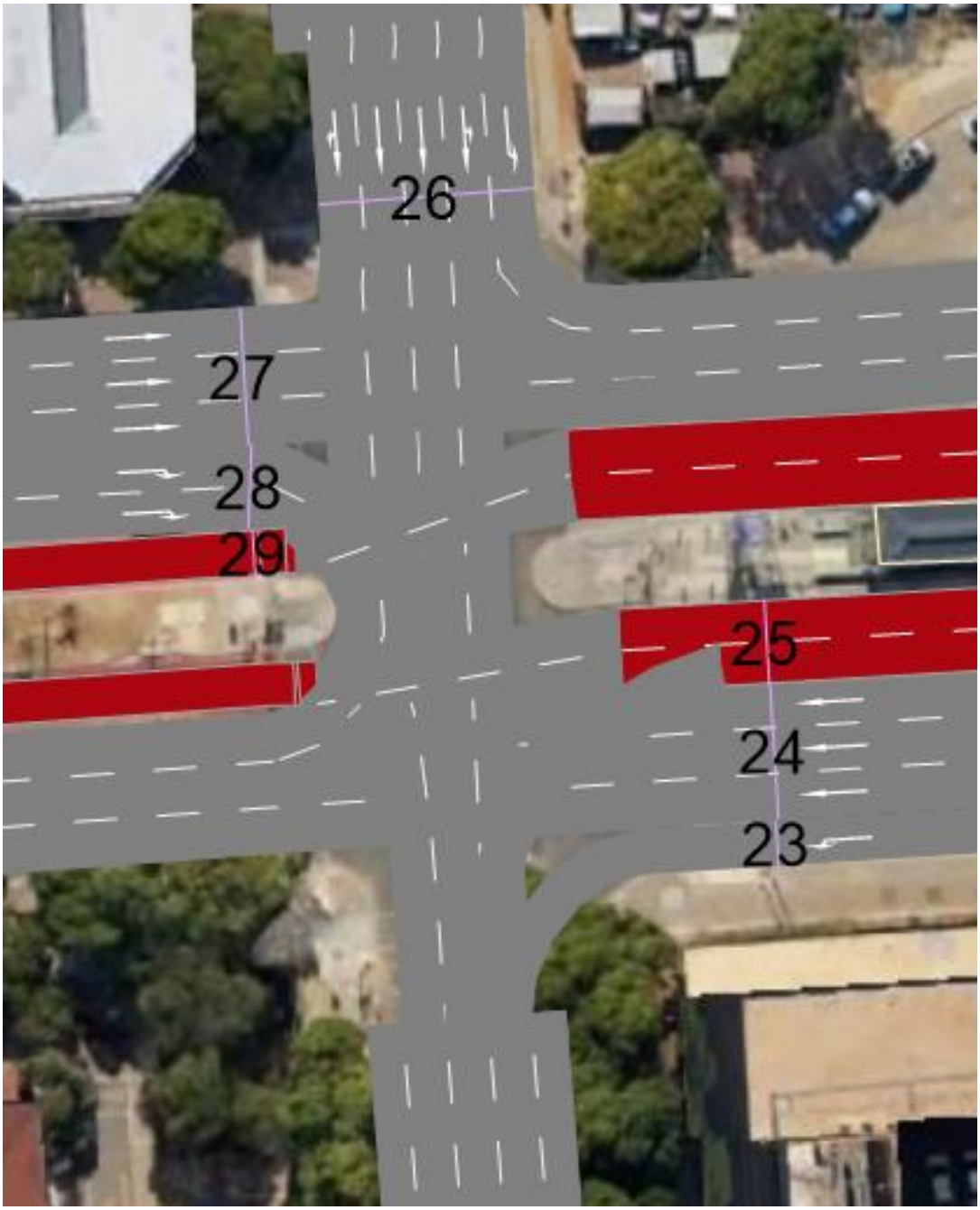

Figure 4-17: Sisulu Street queue counting positions

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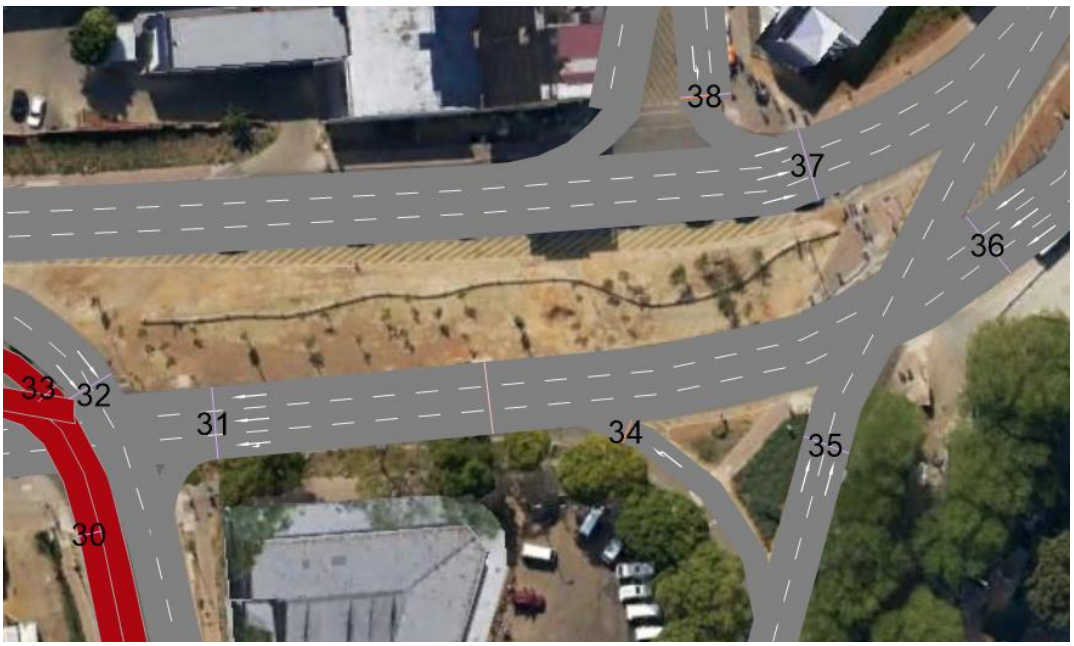

Figure 4-18: Kotze/du Toit/Nelson Mandela Streets queue counting positions

Travel times were measured along four routes as follows:

1. Nana Sita westbound for all general lanes
2. Nana Sita westbound for BRT lanes
3. Nana Sita eastbound for all general lanes
4. Nana Sita eastbound for BRT lanes

4.5 Comparison procedure

Each scenario is analysed with two different procedures. Firstly, a twelve-hour (full day) simulation is performed to determine passenger travel times, LOS and queue lengths throughout the day. Secondly each scenario is analysed during the AM peak period in order to compare travel mode performances across scenarios.

4.5.1 Full day analysis

First each scenario is run for a 12-hour full simulation. The simulation runs from 6:00 AM to 18:00 PM. These results are used to calculate the average travel time per person, LOS and queue lengths for each scenario. The average travel time per person (per time period) is calculated as follows:

$$T_t = \frac{75xT_bxN_b + 15xT_axN_a + 1.5xT_pxN_p}{75xN_b + 15xN_a + 1.5xN_p}$$

With:

T_t = Average travel time per person

T_b = Average bus travel time

T_a = Average taxi travel time

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T_p= Average passenger vehicle travel time

N_b = Number of buses

N_a = Number of taxis

N_p = Number of passenger vehicles

4.5.2 AM peak analysis

In order to compare the performance per travel mode of the scenarios with one another a second analysis is performed. The second (comparative) analysis is described below:

The current public transport demand is calculated for the AM peak period 07:15-8:15 (see chapter five for more details on why the AM peak period was selected). The public transport demand is calculated using assumed peak hour vehicle occupancies. The bus occupancy is 75 passengers/vehicle and the taxi occupancy is 15 passengers/vehicle. Bus and taxi volumes (that travel through the whole measurement section per direction) are normalised and denoted as follows: current bus volumes=14 veh/h = B, current taxi volumes (westbound) = 147 veh/h = T_w and current taxi volumes (eastbound) = 118 veh/h = T_e. The upper and lower bound values for bus and taxi volumes are as follows:

Bus lower bound = B - This is because the current bus volumes already exist, and buses will not be removed from the BRT network for any of the scenarios.

Bus upper bound = $1.4(B + \frac{15}{75}T)$ - This is selected so that if all the taxis are removed the total public transport passenger capacity does not change i.e. all taxi passengers are moved to buses. The total demand is then increased by 40% to simulate the increase in volumes observed during the AM and PM peak periods. This composition has two functions. Firstly, it replicates a future scenario where the public transport demand increases. Secondly, it accounts for the possible latent demand that is present during the AM peak period.

Taxi lower bound = 0 - This is one of the scenarios being considered by the authorities (Scenario 2).

Taxi upper bound = 1.4T – This composition is analysed for the same reasons as the bus upper limit.

For each of the scenarios being compared the travel time per mode is determined. The travel time is recorded between the Paul Kruger and Sisulu intersections. Travel times are calculated for each mode and not per person. This is done in order to compare traffic performances per mode between scenarios.

For each scenario four bus and taxi volume compositions are tested. Note that for compositions a, b and c the total public transport demand is kept constant and equal to the observed public transport demand. The four traffic compositions are as follows:

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A) Bus= B; Taxi = T

B) Bus= B+$\frac{1}{10}$T; Taxi = 0.5T

C) Bus= B+$\frac{1}{5}$T; Taxi = 0

D) Bus= 1.4B; Taxi = 1.4T*

*For scenario 2D, the taxis are also converted to buses since there are no taxis in scenario 2. This means that the total public transport supply is raised by 40% for all four scenarios under traffic composition D.

A summary of the scenarios and compositions (in veh/hour) that are simulated can be seen below:

Table 4-5: Comparison compositions

Scenario	Composition A	Composition B	Composition C	Composition D
1	Bus=B=14 Taxi =T_w=147 T_e=118	Bus= B+$\frac{1}{10}$T=29/26 Taxi= 0.5T=74/59	NA	Bus=1.4B=20 Taxi=1.4T_w=206 1.4Te=165
2	NA	NA	Bus=B+$\frac{1}{5}$T=43/38 Taxi = 0T= 0	B=1.4B+$\frac{1.4}{5}$T=55/47 T= 0T= 0
3	Bus=B=14 Taxi =T_w=147 T_e=118	Bus= B+$\frac{1}{10}$T=29/26 Taxi= 0.5T=74/59	NA	Bus=1.4B=20 Taxi=1.4T_w=206 1.4Te=165
4	Bus=B=14 Taxi =T_w=147 T_e=118	Bus= B+$\frac{1}{10}$T=29/26 Taxi= 0.5T=74/59	NA	Bus=1.4B=20 Taxi=1.4T_w=206 1.4Te=165

Composition B is an intermediate case which illustrates the performance of a transitional period or a case where full transformation from taxi to bus is not achieved.

An example of the notation used is as follows: 1A will be scenario 1 (benchmark) with traffic composition A (Bus=B; Taxi=T). By looking at these four traffic compositions of each scenario it is possible to compare the optimal travel time of each scenario with one another.

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5 RESULTS

A comparison of the results obtained during the analysis will indicate the performance of each scenario relative to the other scenarios. In this comparison the performance of the cars, taxis and buses will be evaluated.

It is important to note that the traffic counts were performed over a 12-hour period and during that period a number of peak traffic periods were counted. During the highest peak period the traffic was operating under fully congested conditions. During this peak period the traffic counts reflect the network capacity traffic volumes rather than the total demand traffic volumes. The effect of this is that the model's input demand volumes are possibly lower than the actual demand volumes. Changing any model parameters (for scenarios 2-4) that would increase the network's capacity or reduce the traffic demand would have an impact on the model's performance (output) because the model was already operating at the exact point of maximum capacity. In reality an increase in capacity or reduction in demand would be filled by the deficit in capacity volume and demand volume (i.e. the latent demand) that was not measured in the traffic counts. Since it is known (from traffic counts) that the PM peak traffic demand is higher than the AM and mid-day peaks it is evident that the AM and mid-day peaks are not operating at the maximum demand and therefore the latent demand does not affect them as much as the PM peak. In order to mitigate any effect of the latent demand the comparison between scenarios (for the travel time per mode analysis) is done during the AM peak period. Furthermore, the travel time per mode analysis includes a traffic composition where bus and taxi volumes are increased by 40% to account for any possible latent demand. A 40% increase was selected as this was the difference in traffic volumes between the AM and PM peak traffic volumes (See Figure 4-6 section 4.1.4).

Another important aspect that should be considered when comparing the following results is the comparison between eastbound and westbound traffic conditions. The traffic signals along Nana Sita Drive (main corridor) have been configured to reduce driving time in the eastbound direction. This results in much lower driving times in the eastbound direction in the general lanes. The result is that the westbound direction experiences far higher levels of congestion than the eastbound direction. This provides insight into the performance of each scenario under congested and uncongested conditions.

For the 12-hour simulations the LOS was recorded in the general lanes and the BRT lanes. The LOS results are indicated on the mean travel time per person graphs. The LOS is indicated as follows: $\frac{LOS\ General\ Lanes}{LOS\ BRT\ Lanes}$

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5.1 Twelve-hour simulation

5.1.1 Scenario 1 (Benchmark)

The 2019 base model which was used to calibrate and validate the simulation model was used as the benchmark scenario. This scenario has been modelled as close to the observed network as possible, with the traffic volumes coming directly from the traffic counts.

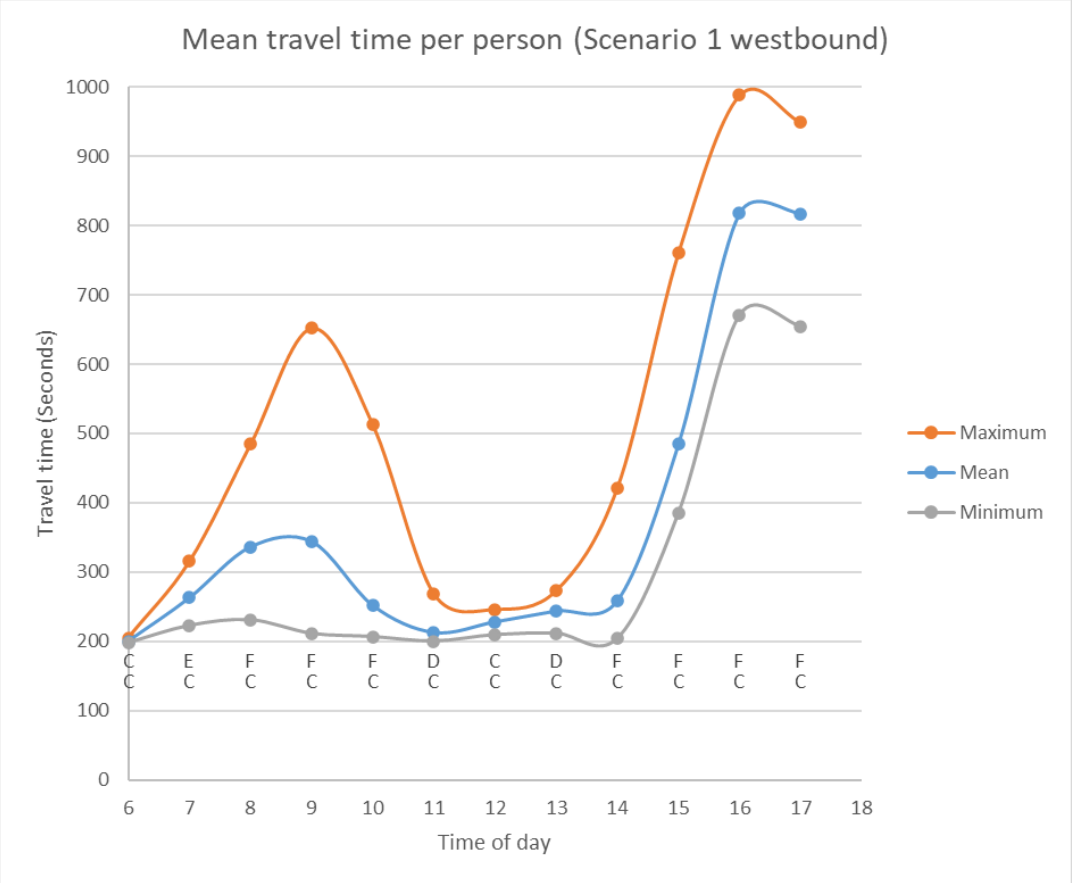

Figure 5-1: Scenario 1 westbound travel times

The mean travel time per person seen in Figure 5-1 (across all modes) ranges from 197 to 988 seconds per person. There is a large difference between individual runs and the difference is further pronounced during peak periods. The largest standard deviation recorded was 227 seconds and occurred during the AM peak period. The AM and PM peak periods travel times increase significantly which indicates a change in traffic conditions. The congestion was however limited to the general lanes with travel times in the bus lanes never exceeding 290 seconds (which includes the time stopped at bus stations).

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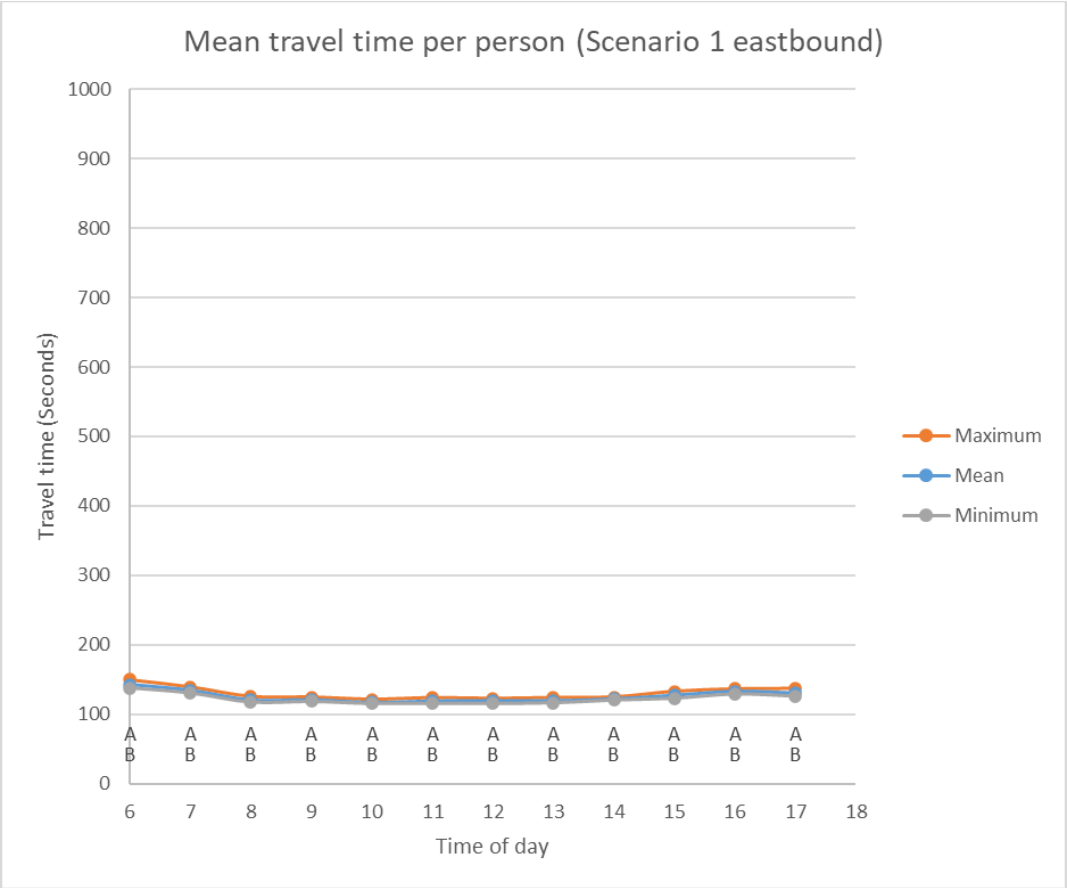

Figure 5-2: Scenario 1 eastbound travel times

The travel times in the eastbound direction seen in Figure 5-2 remained relatively constant with the biggest difference in travel time throughout the 12-hour simulation (across all 10 runs) being 40 seconds. The travel times between peak and off-peak periods was also relatively constant which indicated (and confirmed by the LOS) free flow conditions. The LOS remains at LOS A and B for general and BRT lanes respectively throughout the 12-hour simulation period.

5.1.2 Scenario 2 (Removal)

All minibus taxis are removed from the network. This scenario will indicate the direct traffic impact that the minibus taxis have on the network.

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Figure 5-3: Scenario 2 westbound travel times

The mean travel time per person seen in Figure 5-3 in scenario 2 is constant throughout the 12-hour analysis with minimal variance between the 10 simulation runs. There is a noticeable increase in travel time during the PM peak period. The increase in travel time during the peak period is however not big enough to change the LOS. The mean passenger travel time is consistently lower than for scenario 1. The measured LOS was LOS C in both general and BRT lanes throughout the 12-hour simulation period. The LOS in the BRT lanes is the same as for scenario 1 since the conditions in the BRT lanes have remained unchanged. This indicates that removing the taxis from the network alleviated congestion for the general lanes while the BRT lanes remained uncongested. This also indicates that there is spare capacity in the BRT lanes which can be utilised by increasing volumes on the BRT lanes.

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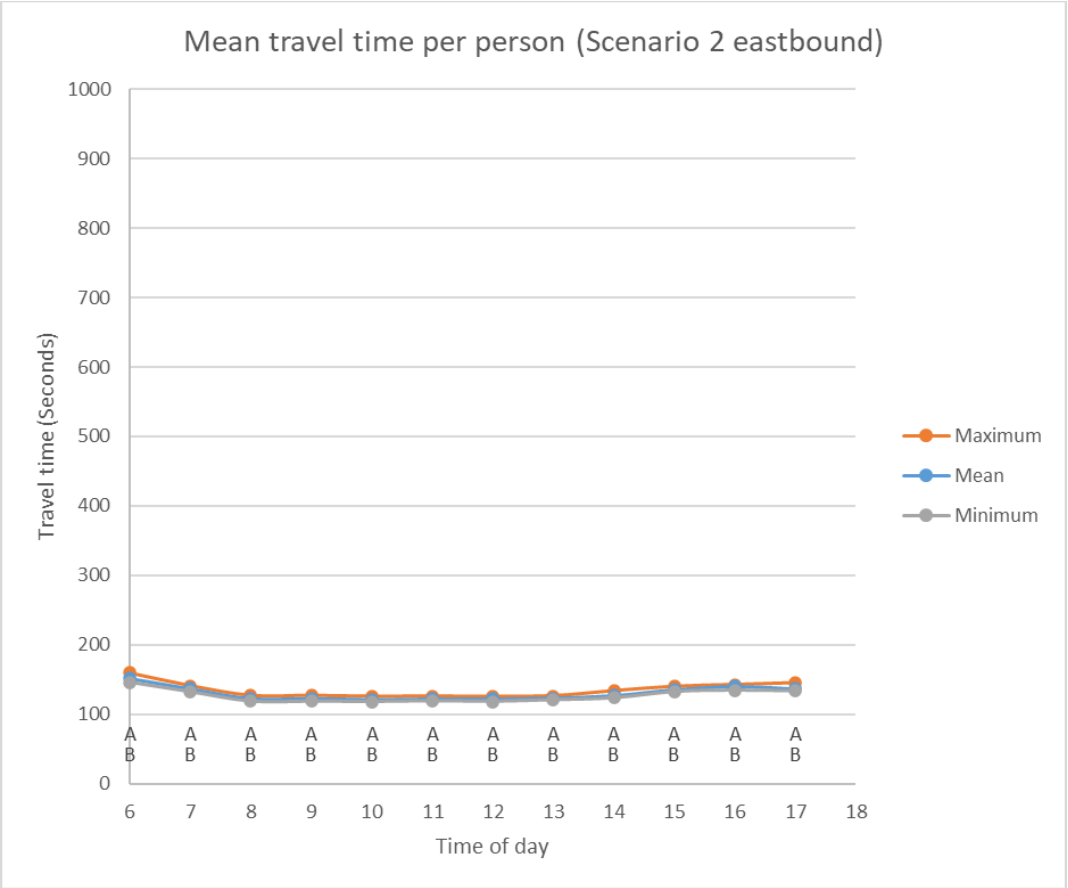

Figure 5-4: Scenario 2 eastbound travel times

There is minimal difference in travel times throughout the 12-hour simulation period and very little variance across the 10 simulation runs seen in Figure 5-4. The eastbound travel times for scenario 2 are similar to the eastbound travel times in scenario 1. The traffic operated under free flow conditions (LOS A and B for general and BRT lanes respectively throughout the 12-hour simulation period). This indicates that under free flow conditions removing the taxis does not improve travel times significantly. The results do however indicate that there is spare capacity in both the general and the BRT lanes.

5.1.3 Scenario 3 (Shift)

Minibus taxis are forced to share the dedicated BRT lanes and use them as express lanes. In this scenario the minibus taxis will not be permitted to use the general lanes.

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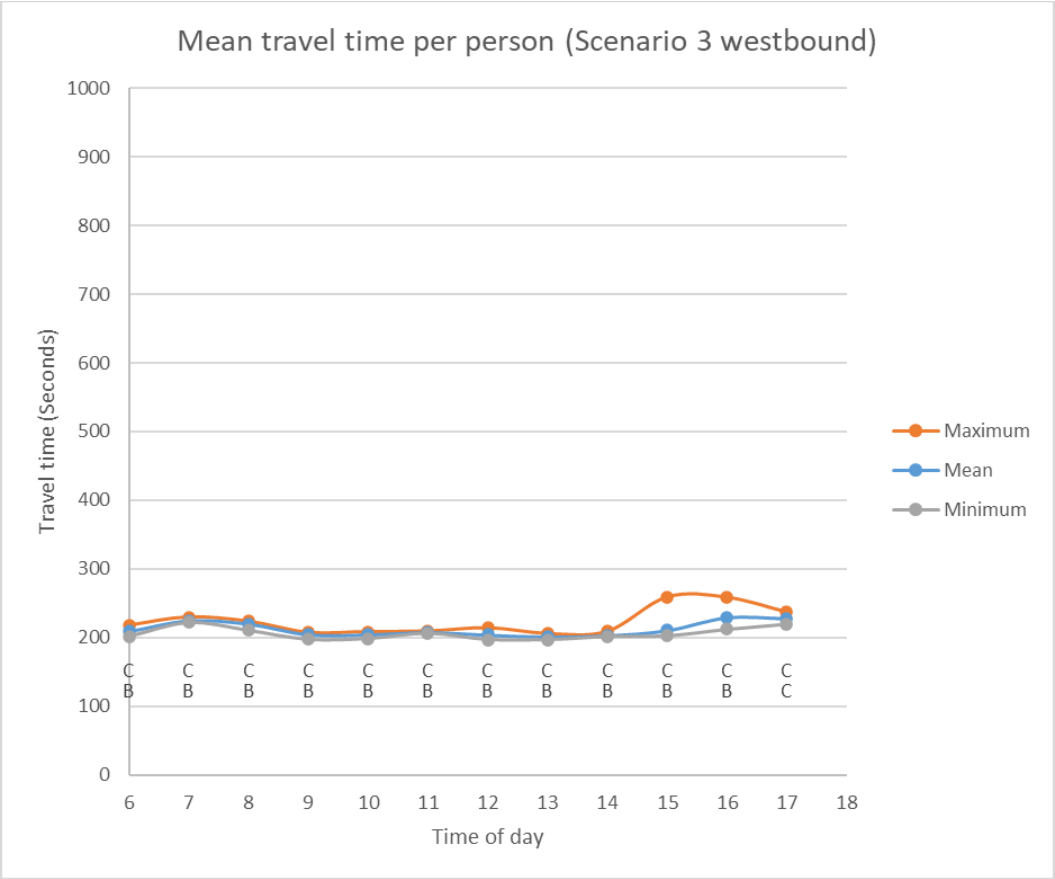

Figure 5-5: Scenario 3 westbound travel times

The average travel time per person for scenario 3 seen in Figure 5-5 remained relatively constant over the 12-hour simulation period. The highest travel time was 259 seconds. The measured LOS remained at LOS C for general lanes throughout the 12-hour simulation period. The LOS in the BRT lane improved to LOS B (from LOS C in scenarios 1 and 2) until the final simulation hour where it reduced to LOS C. The improved LOS in the BRT lanes are due to the faster taxis being introduced to the BRT lanes at volumes that do not cause congestion. In scenarios 1 and 2 (only buses in the BRT lanes) the slower buses experience more delays at intersections than the taxis do. In some instances, the taxis are fast enough to travel through two green phases at successive intersections without stopping while the buses stop at one or both intersections. It should also be noted that the LOS recorded (in BRT lanes) for all three scenarios where near their respective LOS limit (LOS is reported as a value between 1 and 6 in VISSIM and an average LOS value can therefore be calculated for each scenario). The LOS C recorded in scenarios 1 and 2 were close to LOS B while the LOS B recorded in scenario 3 was close to LOS C (as seen during the final simulation hour where the LOS reduces to LOS C). The level of congestion between scenarios 1,2 and 3 are more similar than the LOS would suggest. This is evident in the travel times between scenarios 1,2 and 3 which are similar. The LOS and travel time results in the general lanes are similar to scenario 2 and are an improvement on scenario 1. The

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travel times remain relatively constant even during peak periods which indicates that there is no increase in congestion during peak periods. There was relatively little variance throughout the simulation with the biggest difference in travel time (across all runs) being 60 seconds (much lower than scenario 1). This scenario indicates that there is still spare capacity in the BRT lanes even if the taxis are moved to the BRT lanes. This scenario also indicates (as seen in scenario 2) that removal of taxis from the general lanes alleviates the congestion in the general lanes.

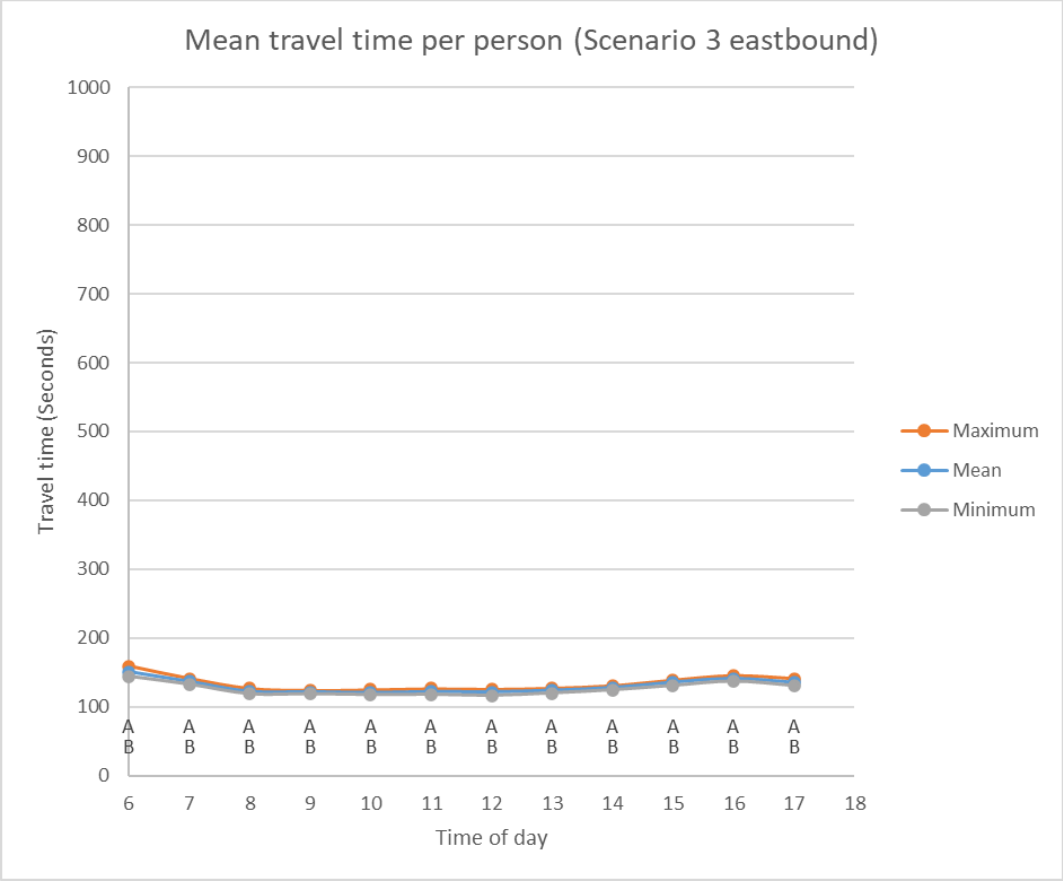

Figure 5-6: Scenario 3 eastbound travel times

Travel times in the eastbound direction for scenario 3 (seen in Figure 5-6) indicate that minimal congestion occurred during the 12-hour simulation period (LOS A and B in general and BRT lanes respectively). The biggest difference in travel time recorded overall the runs was 20 seconds. The average travel times and LOS for scenario 1, 2 and 3 are similar which indicates that there is very little effect on traffic conditions for the different scenarios under free flow conditions.

5.1.4 Scenario 4 (Share)

This scenario is not ideal but rather selected to indicate a likely outcome if taxis are permitted to use BRT lanes. The scenario will have minibus taxis using any lanes (general

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or dedicated BRT). The minibus taxis will be able to use any lane based on their preferred choice. The only limitation is that taxis are only be able to switch between BRT and general lanes at intersections since the barrier kerbs prevent lane changes.

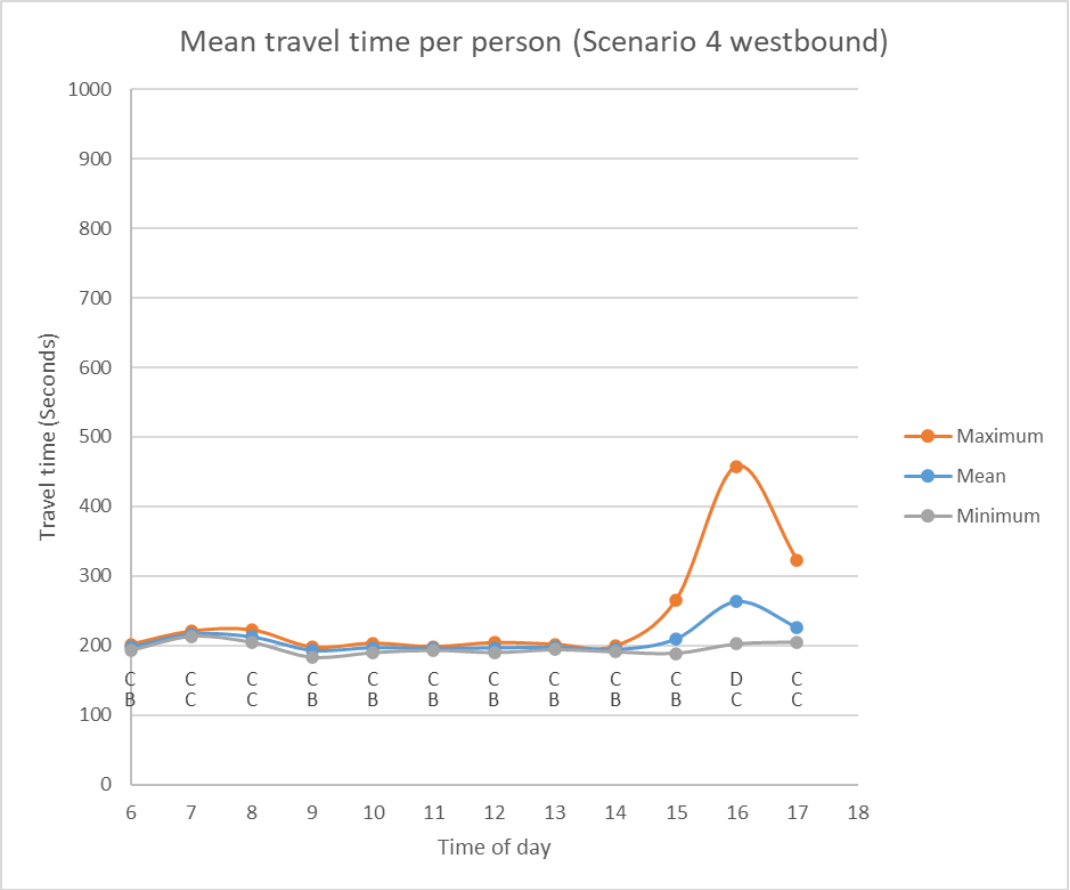

Figure 5-7: Scenario 4 westbound travel times

The mean travel times in scenario 4 seen in Figure 5-7 were similar to scenario 2 and 3 from 06:00 to 14:00. However, during the PM peak period the travel times increased noticeably, and the LOS decreased in both the general and BRT lanes. The performance results are an improvement on scenario 1 but worse than scenario 2 and 3. The travel times across the 10 simulation runs were relatively constant but not as constant as with scenario 2 and 3. The measured LOS in general lanes was LOS C during the AM and mid-day periods with the PM peak reaching LOS D. The LOS in BRT lanes was LOS C during peak periods and LOS B during off peak periods. This further proves that the LOS in BRT lanes was at the limit of LOS B and C as discussed in scenario 3's results. The LOS results lie between the results obtained in scenario 1 and scenario 3 which is correct since the volumes of taxis in BRT lanes is between scenario 1 and scenario 3's volumes. This scenario indicates that there is spare capacity in the BRT lanes. The partial removal of the taxis from the general lanes does improve traffic conditions but not the extent of a full removal. The data indicated that the ratio of taxis in general lanes to BRT lanes ranged from a 50:50 split to a 30:70 split with the majority of taxis traveling in the BRT lanes.

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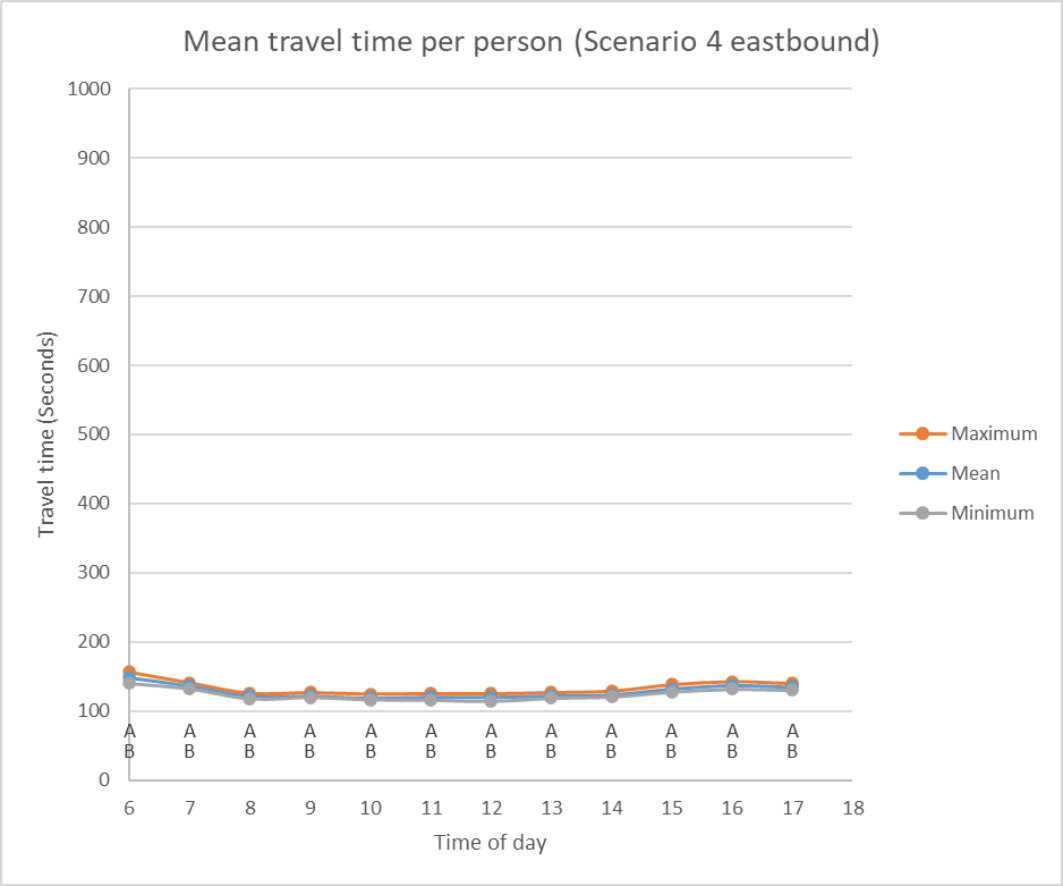

Figure 5-8: Scenario 4 eastbound travel times

Travel times in the eastbound direction for scenario 4 (seen in Figure 5-8) indicate that minimal congestion occurred during the 12-hour simulation period (LOS A and B in general and BRT lanes respectively). The average travel times and LOS for scenario 1, 2, 3 and 4 are similar. Implementing the different scenarios has no effect on travel times under free flow conditions.

5.1.5 Queue results

During each of the 12-hour simulation runs the average queue lengths were recorded. The queue lengths seen in the following figures are the combined average over the 10 simulation runs. The queue lengths have been measured at the stop lines along Nana Site Drive in both the general lanes and the BRT lanes (in both directions).

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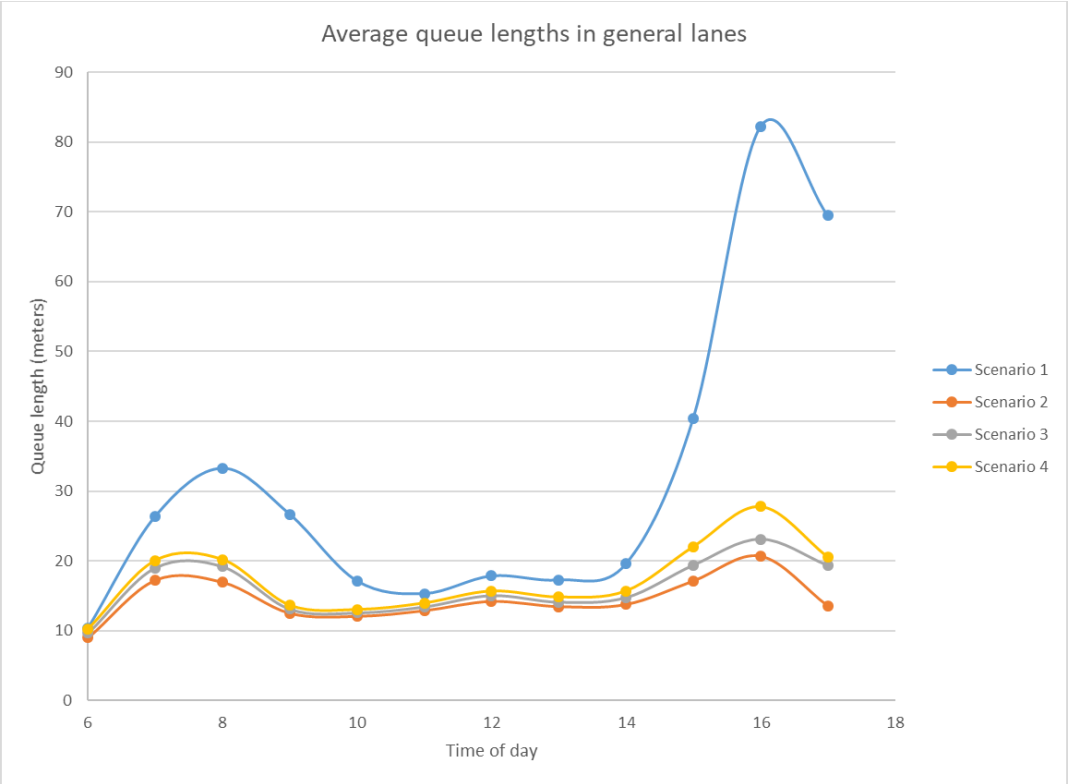

Figure 5-9: General lanes queue lengths

As seen in Figure 5-9 the results of the queue lengths correspond with the travel times recorded. The average queue lengths in the general lanes are the highest for scenario 1 and the lowest for scenario 2 with scenario 3 and 4 performing similar (but slightly higher) than scenario 2. The average queue lengths during peak periods increase drastically in scenario 1 while the effect is less pronounced for the remaining scenarios. The average queue lengths recorded are proportional to the volume of traffic in the general lanes. As the taxis are removed from the general lanes the average queue lengths decrease.

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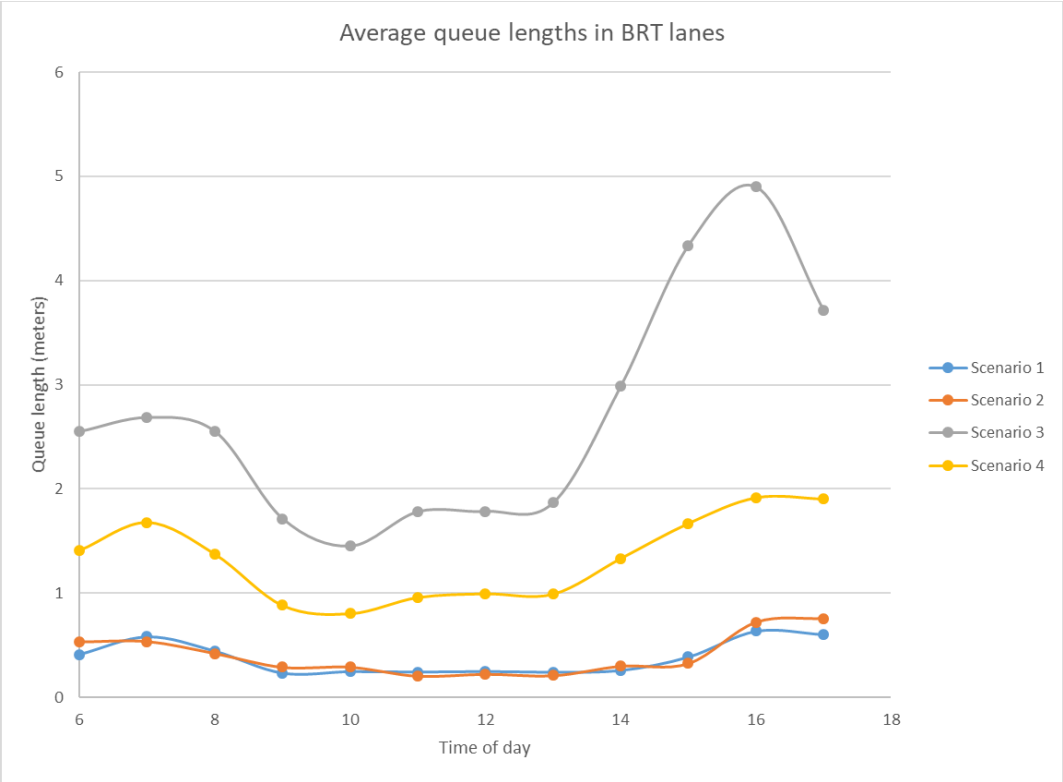

Figure 5-10: BRT lanes queue lengths

The queue lengths in the BRT lanes are directly proportional to the volume of traffic traveling in the BRT lanes. Scenario 1 and 2 have no taxis traveling in the BRT lanes and subsequently have queue lengths between 0 and 1 meters. Scenario 3 has the highest volume of taxis and the highest queue lengths which range from 1.5 to 5 meters. Scenario 4 which has taxis split between general and BRT lanes has queue lengths between scenario 1 and scenario 3. It should be noted that although the average queue lengths differ drastically in relation to one another, the difference is not as significant as observed in the general lanes. Queue lengths of 5 and less (vehicles) are typically short enough to dissipate within one green phase of a traffic signal which means that minimal congestion occurs. While the queue lengths observed during peak periods (in the general lanes) are too long to dissipate within one green phase. This phenomenon was confirmed visually when observing the microsimulation.

5.2 Peak hour comparison of travel modes

The following section is a direct vehicle travel time comparison between the scenarios. The comparison indicates the performance of different scenarios as taxis are increasingly replaced by buses. The comparison is done as described in chapter 4.5.

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5.2.1 Westbound

The following four graphs indicate the average vehicle travel time (per mode) for scenarios 1-4 under traffic compositions a, b, c and d as discussed in chapter 4.5. For each scenario and vehicle composition, 10 simulation runs were performed. The results of the 10 runs were plotted as a boxplot in order to illustrate the range of travel times recorded.

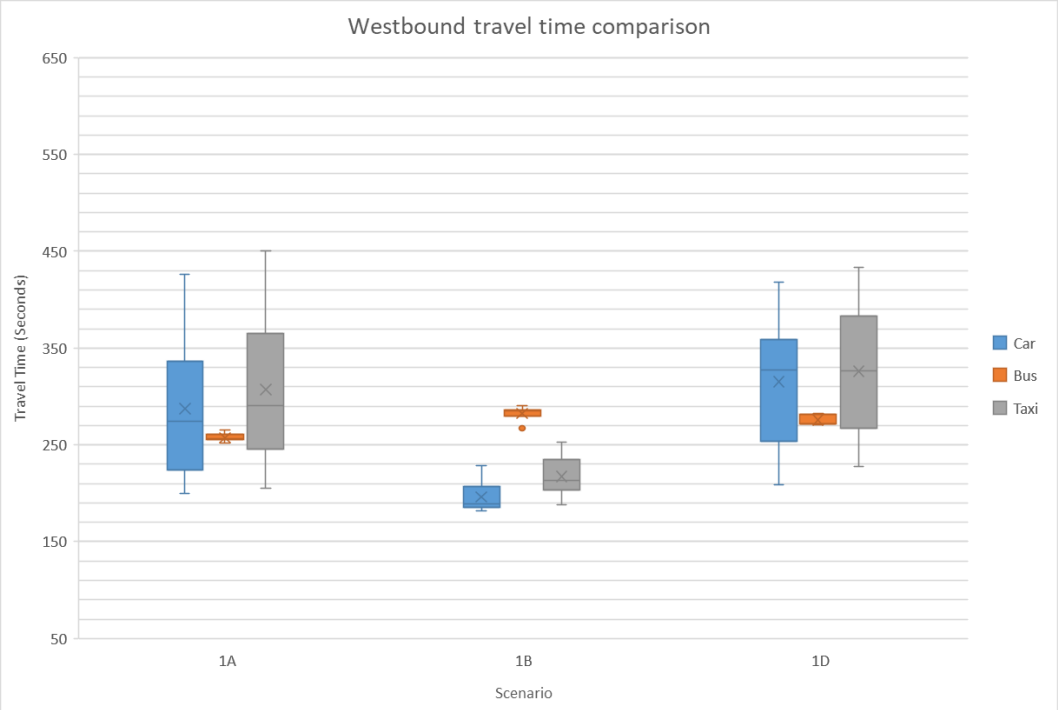

Figure 5-11: Westbound travel time comparison (Scenario 1)

The travel times of cars, buses and taxis traveling westbound during the AM peak for scenario 1 under various traffic compositions can be seen in Figure 5-11. When comparing traffic compositions A and B it should be noted that the total public transport demand remains constant (only the ratio of taxis to buses is changed). For traffic composition D the total public transport demand is raised by 40%. As seen in Figure 5-11, composition B produces the lowest travel time for cars and taxis travelling in the general lanes. The average travel time in the general lanes decreases by 31.7% from composition A to B. This once again confirms that removing the taxis from the general lanes improves traffic conditions. Although the volume of buses in BRT lanes increases by 40% from composition A to D, the average travel times in the BRT lanes only increase by 7%. This means that the improvement experienced in the general lanes is greater than the reduction in performance experienced in BRT lanes as taxis are replaced by buses.

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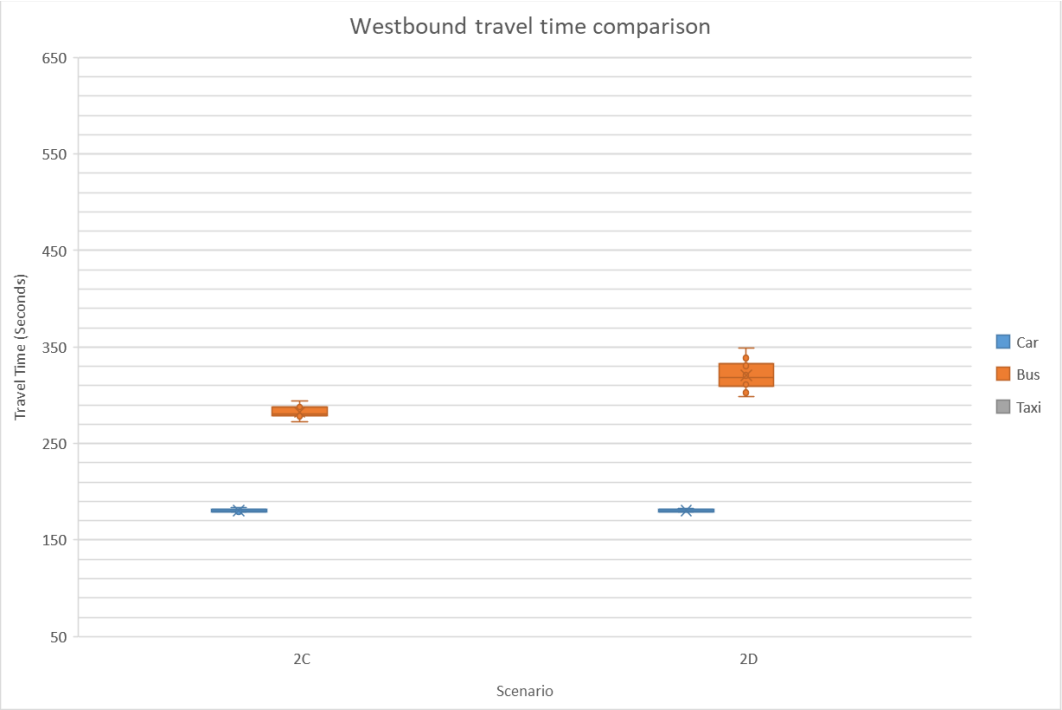

Figure 5-12: Westbound travel time comparison (Scenario 2)

The travel times of cars, buses and taxis traveling westbound during the AM peak for scenario 2 under various traffic compositions can be seen in Figure 5-12. Since scenario 2 involves the complete removal of taxis from the network it is not possible to simulate compositions A and B. Scenario 2C is therefore representative of composition C for all 4 scenarios. The average travel time in general lanes remains unchanged between composition C and D since the traffic volumes are unchanged. Composition D has 28% higher bus volumes than composition C. The travel time in the BRT lanes increases by 13.5% from composition C to D. It should be noted that the public transport demand in composition C is the same as composition A and B in scenarios 1, 3 and 4.

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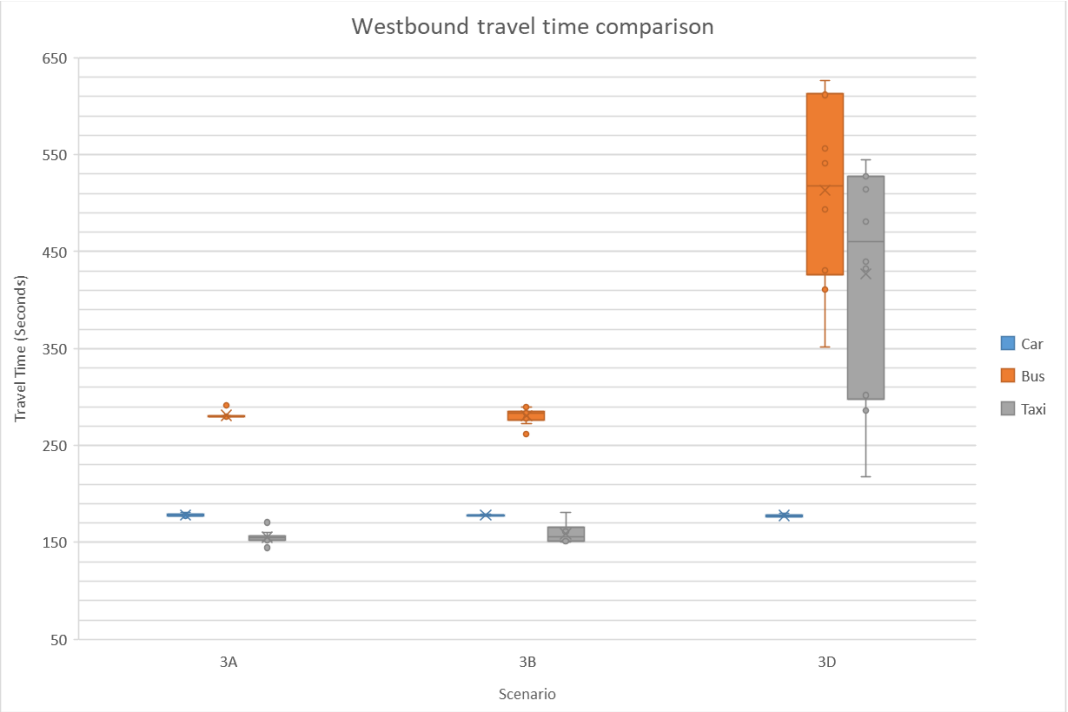

Figure 5-13: Westbound travel time comparison (Scenario 3)

The travel times of cars, buses and taxis traveling westbound during the AM peak for scenario 3 under various traffic compositions can be seen in Figure 5-13. Since scenario 2 and 3 have the same traffic volumes and compositions in the general lanes the travel times recorded are also the same. Composition A and B have similar travel times which indicates that with the current public transport demand replacing taxis with buses (under scenario 3 conditions) does not have a significant effect. Under composition A and B (existing public transport demand) the taxis have lower travel times than cars which was not the case in scenario 1. However, when the public transport demand is increased by 40% (composition D) the travel times in the BRT lanes are significantly higher. The average travel time for buses and taxis increases by 82.5% and 168.6% respectively. The average travel time in the general lane remains constant for all three traffic compositions. These results indicate that travel times in BRT lanes under scenario 3 conditions are sensitive to an increase in public transport demand.

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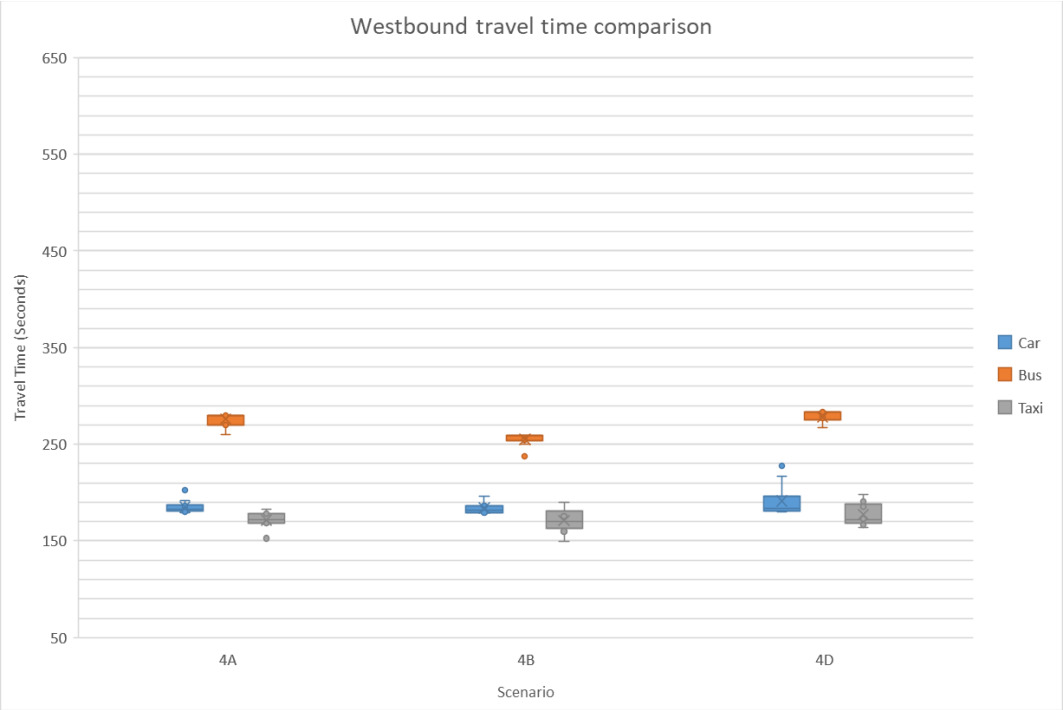

Figure 5-14: Westbound travel time comparison (Scenario 4)

The travel times of cars, buses and taxis traveling westbound during the AM peak for scenario 4 under various traffic compositions can be seen in Figure 5-14. The results for scenario 4 are consistent for all three traffic compositions. For composition D the public transport demand is increased by 40%. The travel times in general lanes for composition D increased by 3.9% while the travel times in BRT lanes increased by 9%. The results also indicate that scenario 4 produces lower travel times for taxis than for cars.

Below follows a summary of the average travel times recorded in the westbound comparison. For each travel mode the longest and the shortest travel times have been indicated in red and green respectively.

Table 5-1: Westbound travel time comparison summary

Scenario	Car	Bus	Taxi
1A	**287.5**	**257.2**	**307.3**
1B	**196.4**	**282.5**	**217.3**
1D	**315.1**	**275.5**	**326.1**
2C	**180.5**	**282.4**	**-**
2D	**180.4**	**320.4**	**-**

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3A	**178.1**	**281.2**	**155.2**
3B	**178.1**	**280.4**	**159.1**
3D	**177.8**	**513.4**	**427.2**
4A	**185.2**	**276**	**171.7**
4B	**183.9**	**255.1**	**170.8**
4D	**191.2**	**278**	**177.6**

As seen in Table 5-2 scenario 3D produces the best travel times for cars and the lowest travel times for buses and taxis.

Figure 5-15 illustrates the results reported in section 5.2.1 combined in one figure.

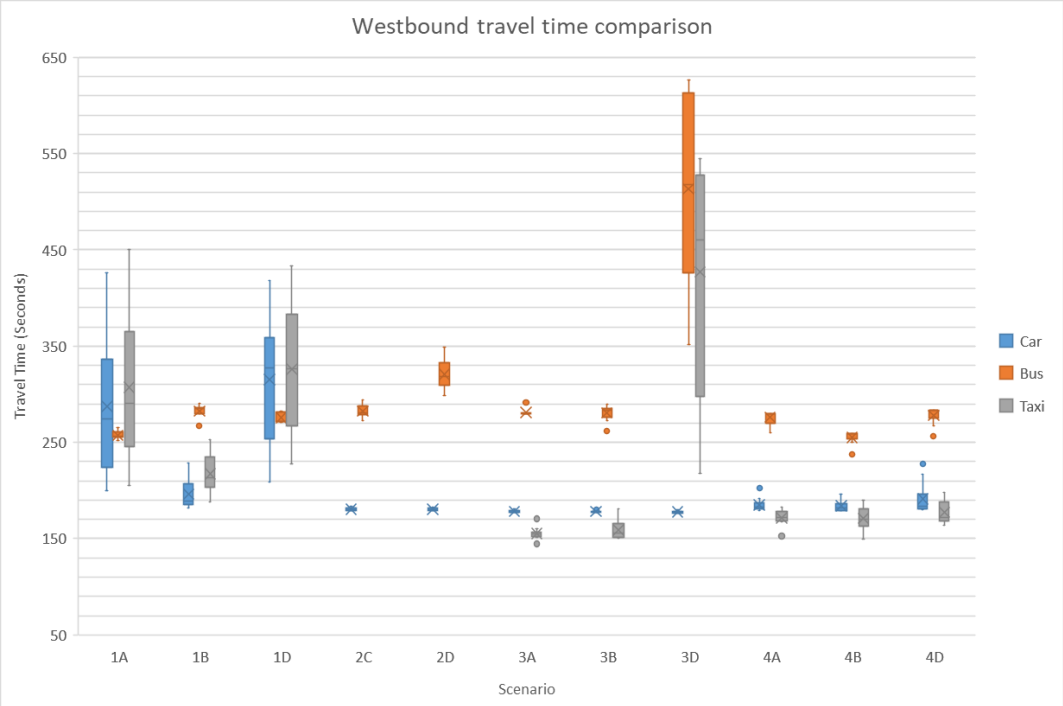

Figure 5-15: Westbound travel time comparison

The results seen in Table 5-2 and Figure 5-15 indicate that under current public transport demand scenario 3 produces the lowest travel times for cars, buses and taxis. Scenario 3 is however sensitive to an increase in public transport demand. Under composition D (40% increase in public transport demand) scenario 3 produces the highest travel times in BRT lanes compared to all other scenarios and compositions evaluated. Under composition D scenario 4 produces the lowest travel time for buses and taxis. The results indicate that scenario 1 (current configuration) produces the highest average travel times when all three travel modes are considered. Scenario 2 (which authorities intend on implementing)

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drastically improves travel time for vehicles in general lanes. However scenario 2D's results indicate that if all taxi passengers move to BRT and the demand increases the travel times in the BRT lanes will be negatively impacted more so than if the taxis are permitted to operate in the BRT lanes (scenario 4D).

5.2.2 Eastbound

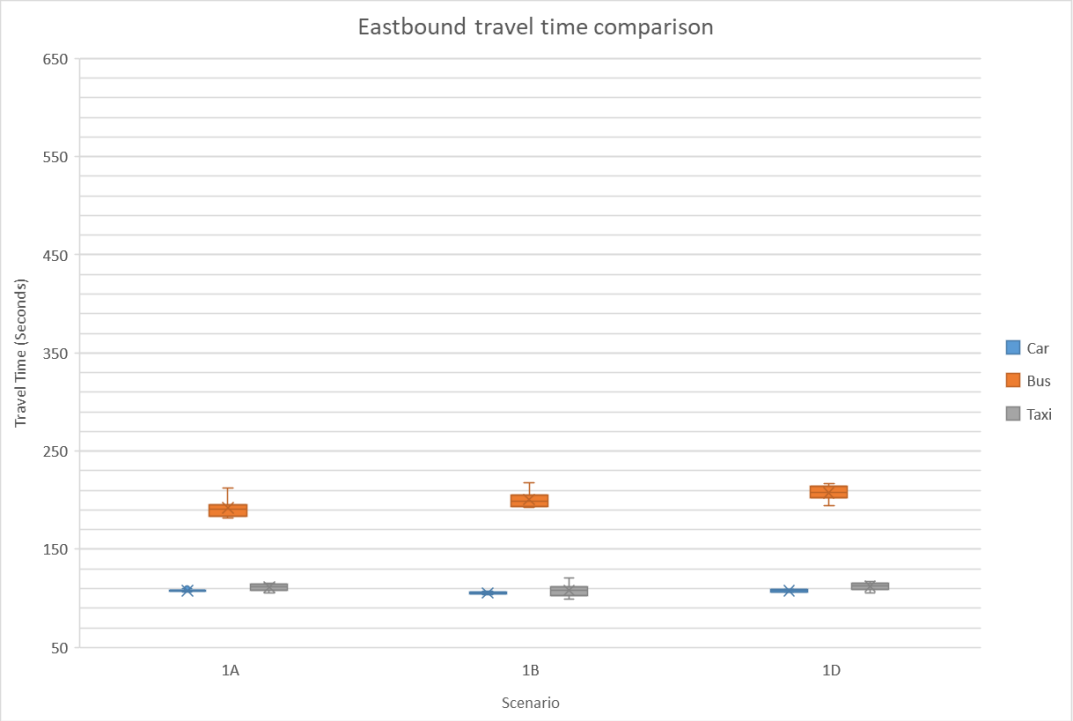

Figure 5-16: Eastbound travel time comparison (Scenario 1)

The travel times of cars, buses and taxis traveling eastbound during the AM peak for scenario 1 under various traffic compositions can be seen in Figure 5-16. The eastbound travel times are lower than the westbound, visual observation of the microsimulation as well as LOS results from the 12-hour analysis confirmed that traffic (for all three modes) were under free flow conditions with minimal congestion along the main corridor. The travel times for all three travel modes remained relatively constant for all the operating conditions. This indicates that the eastbound direction has sufficient spare capacity to accommodate a 40% increase in public transport demand during the AM peak.

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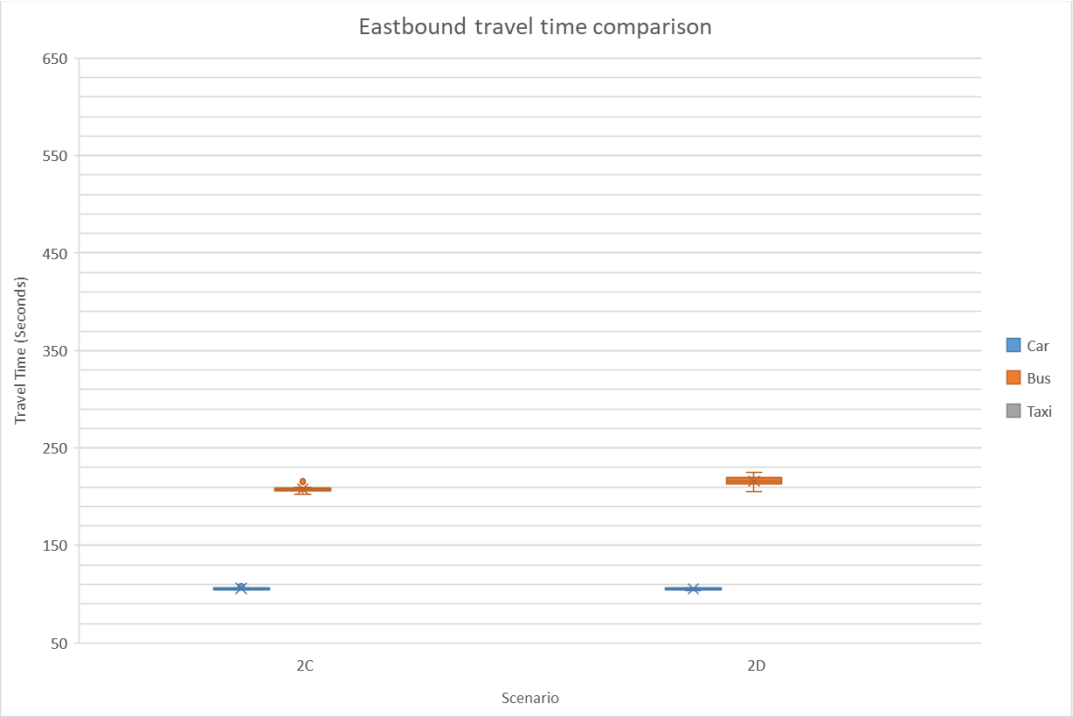

Figure 5-17: Eastbound travel time comparison (Scenario 2)

The travel times of cars, buses and taxis traveling eastbound during the AM peak for scenario 2 under various traffic compositions can be seen in Figure 5-17. The results are the same as with scenario 1. There is no change in travel time in the general lanes while the travel time in the bus lanes increases by 3.9% when the public transport demand increases by 28%.

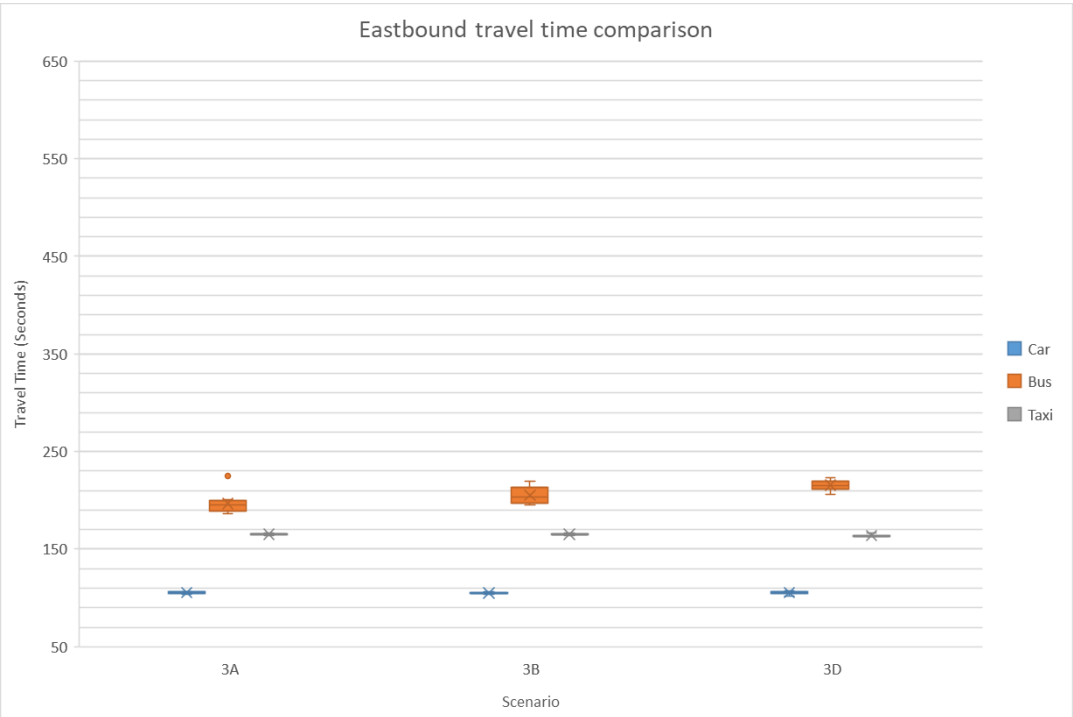

Figure 5-18: Eastbound travel time comparison (Scenario 3)

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The travel times of cars, buses and taxis traveling eastbound during the AM peak for scenario 3 under various traffic compositions can be seen in Figure 5-18. Scenario 3's results are similar to scenario 1 for both the passenger vehicles and buses. The travel times for taxis however increased by 48.5% from scenario 1 to scenario 3. These results again indicate that under free flow conditions the current configuration (scenario 1A) produces the better results for the entire system and especially for the taxis.

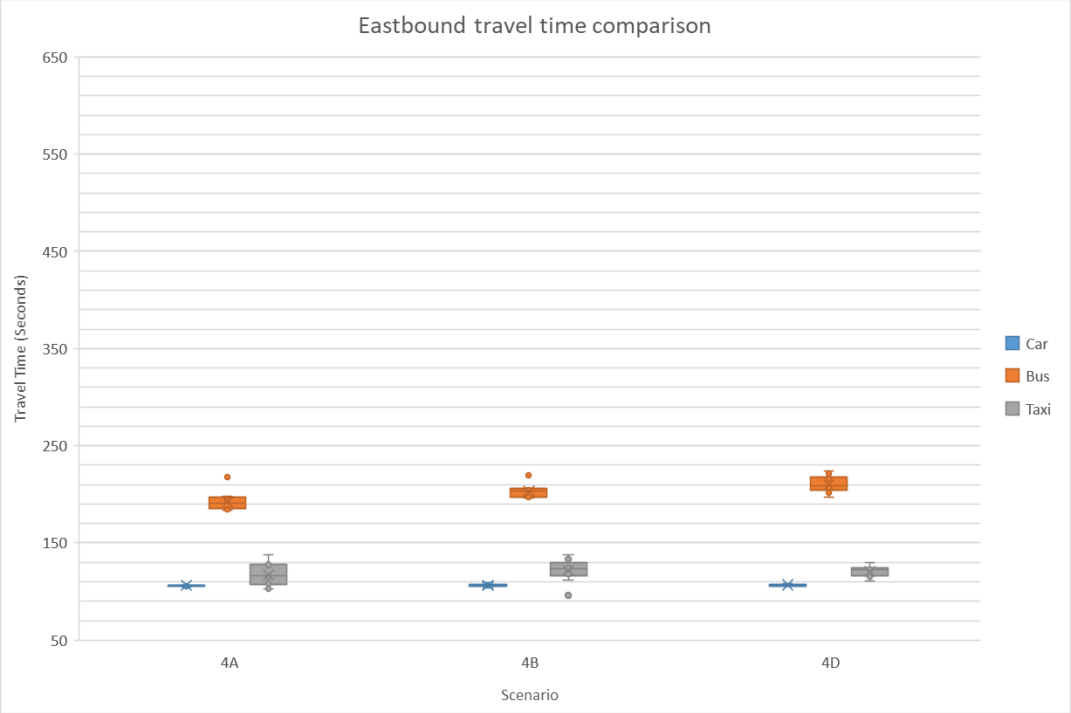

Figure 5-19: Eastbound travel time comparison (Scenario 4)

The travel times of cars, buses and taxis traveling eastbound during the AM peak for scenario 4 under various traffic compositions can be seen in Figure 5-19. Scenario 4 indicates that under free flow conditions scenario 1A produces the best travel time for the whole system.

Below follows a summary of the average travel times recorded in the eastbound comparison. For each travel mode the longest and the shortest travel times have been indicated in red and green respectively.

Table 5-2: Eastbound travel time comparison summary

Scenario	Car	Bus	Taxi
1A	107.9	191.9	111.3
1B	105.6	200.5	108.1

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1D	**107.8**	**207.3**	**112.3**
2C	**105.8**	**207.8**	**-**
2D	**105.4**	**215.9**	**-**
3A	**105.3**	**196.8**	**165.3**
3B	**105**	**205.1**	**165**
3D	**105.4**	**215.3**	**163.7**
4A	**106.2**	**192.7**	**117.4**
4B	**106.3**	**203.3**	**121.7**
4D	**106.6**	**209.8**	**120.8**

Figure 5-20 illustrates the results reported in section 5.2.2 combined in one figure.

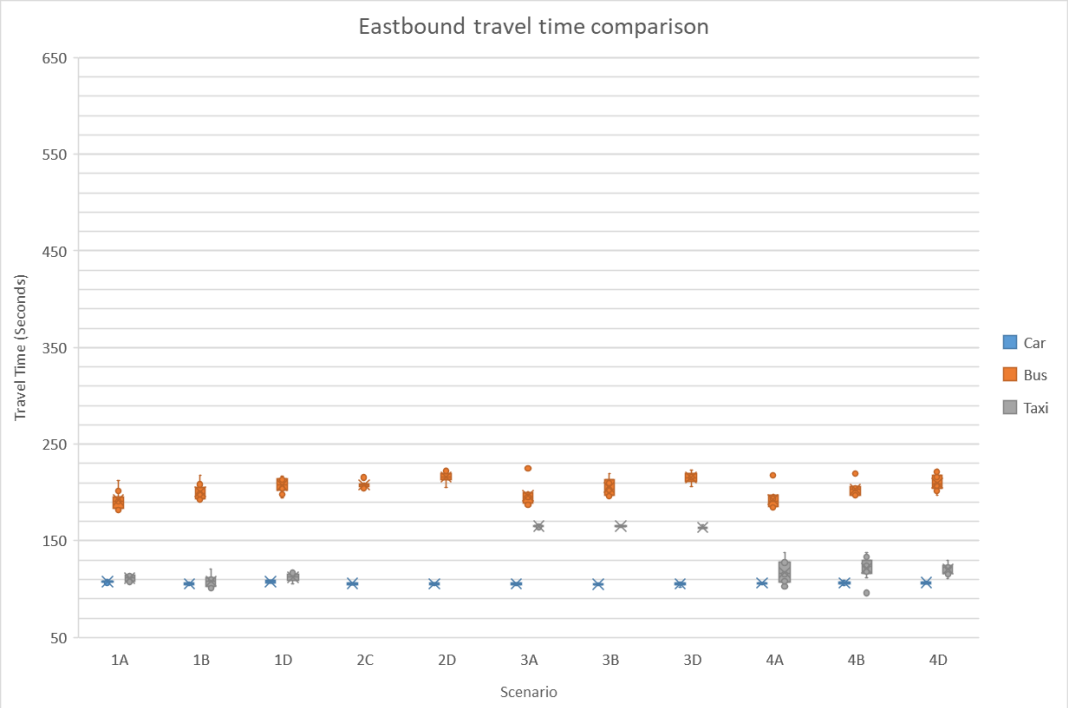

Figure 5-20: Eastbound travel time comparison

As seen in Table 5-3 and Figure 5-20 the lowest travel times for passenger vehicles is produced in scenario 3. The highest travel times for passenger vehicles is produced during scenario 1. However, the travel times for passenger vehicles remains relatively constant throughout the scenarios. The lowest travel times for taxis and buses are produced during scenario 1 (opposite to passenger vehicles) while the highest travel times for buses are

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produced in scenario 2. The highest travel times for taxis is produced in scenario 3. The travel times across all three modes are relatively constant for all the scenarios and compositions with the exception of scenario 3 which produces noticeably higher travel times for taxis. These results all indicate that under free flow conditions the change in hybrid public transport configurations does not improve the traffic performance.

5.2.3 Comparison summary

The comparison of the scenarios under different operating conditions is used as a direct comparison of traffic performance across the different travel modes. The results indicated that the best performing scenario was dependant on the traffic conditions. Under free flow conditions scenario 1A produced the best travel times across all the modes, however under congested conditions scenario 1 had the highest travel times.

Passenger vehicles: The travel times for passenger vehicles reduced as the taxi volumes in the general lanes decreased. The standard deviation also reduced as the taxi volumes in the general lanes decreased. The travel times of passenger vehicles is relatively unaffected by taxis under free flow conditions however under congested conditions the travel times in general lanes are increased as taxi volumes increase.

Taxis: Under free flow conditions the taxis have higher travel times when moved to the BRT lanes. This is partly due to the signal timing which is optimised for predicted bus volumes only. As the traffic becomes congested the travel times for taxis in BRT lanes remain relatively unchanged while the travel times in the general lanes increase. Under congested conditions the travel times for taxis are optimised by moving to the BRT lanes. This is however only true under existing public transport demand. As the public transport demand increases the performance of taxis in the BRT lanes decreases. The best results for taxis under higher public transport demands is achieved in scenario 4 where taxis are permitted to use both general and BRT lanes.

Buses: The travel time for buses increases as the traffic in BRT lanes increase. The results indicate that under current public transport demand there is spare capacity in the BRT lanes that can be filled by buses or taxis. Introducing current taxi volumes onto the BRT lanes does not impact bus travel times significantly. However, if taxi and bus volumes are increased sufficiently (40% in this evaluation) the bus travel times are impacted significantly.

The results indicate that the appropriate operating condition is dependent on traffic conditions. Under free flow conditions the best results are obtained by leaving the system as is with taxis traveling in the general lanes. This produces the lowest travel times for all travel modes and produces the lowest standard deviation for bus travel times which means

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the bus schedule will be more reliable. Under congested conditions it is more suitable for taxis to be permitted to travel in the bus lanes. The travel times for all three modes (under congested conditions) are optimised in scenarios 3 and 4. The travel times for scenario 3 and 4 are similar under existing traffic volumes. Once the public transport demand is increased scenario 3 produces higher travel times in BRT lanes than scenario 4. In order to implement scenario 3 or 4 safely additional infrastructure may need to be constructed and the traffic signals will need to be re-designed. Re-designing the signals to accommodate scenario 3 or 4 may further improve the results obtained.

The complete removal of taxis (scenario 2) reduces travel times for cars while increasing travel times for buses (since taxi passengers move to buses). One advantage of this scenario over scenario 3 and 4 is that it improves traffic conditions without any additional infrastructure being required.

5.3 Observations

During the analysis of each scenario the following notable observations were made:

Scenario 3 had a lower overall capacity than scenario 4. This was however only due to the first intersection's BRT signal not being optimised for the new higher volumes. The following figure indicates the taxi congestion in the BRT lane at the first intersection while the remaining lanes and intersections still have spare capacity.

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Figure 5-21: Taxi capacity restriction

Taxis exiting BRT lanes to the left need to cross general traffic lanes. This means the left turn movements have the same effect on the BRT lanes as right turn movements. In order to mitigate these effects, the BRT lanes will need to be made wider to allow for buses and taxis to pass vehicles waiting to perform left or right turn movements. Traffic signals will also need to be adapted to account for this movement. This movement also poses safety concerns since the taxi driver is forced to look through the left side of the vehicle to spot oncoming traffic. The left (far) side of the vehicle's view is more obstructed since the driver needs to look past passengers in the vehicle. The following figure illustrates one such left turn movement (see vehicles circled in blue).

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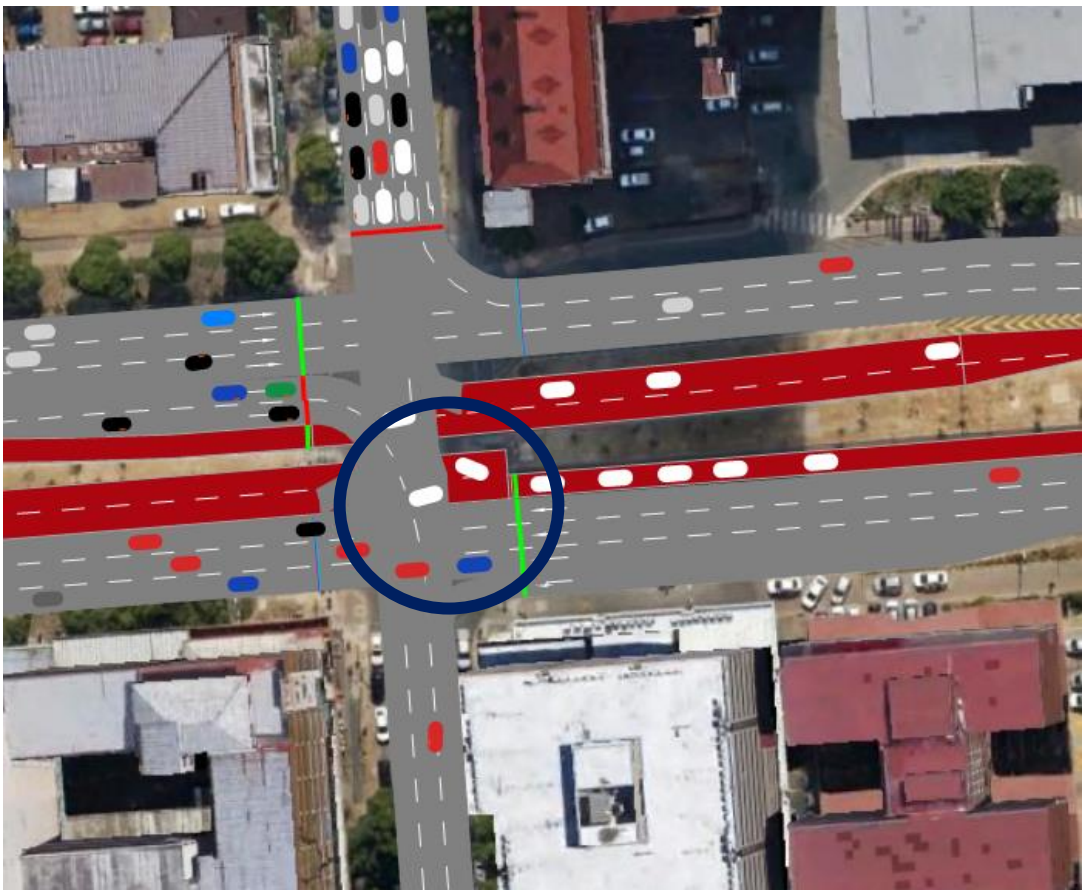

Figure 5-22: Left turn BRT movements

Taxis traveling in the BRT lanes pre-empt the traffic conditions at the next intersection. The conditions however change very rapidly (as soon as the green phase starts) which often results in taxis leaving a better performing lane for a worse performing lane. This also results in taxis switching between BRT and general lanes more often than expected. The following series of images illustrates such an event.

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Figure 5-23: Taxi lane change series

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As seen in the above figures, the taxi is stopped at a red signal while traveling in the BRT lane. The taxi opts to exit the BRT lane and rather travel in the general lane. When reaching the next intersection, the signal is green for general and BRT lanes, but the taxi is forced to the back of the general traffic queue. Had the taxi remained in the BRT lanes there would be no vehicles ahead of it. As the taxis learn how the network functions the occurrence reduces, this will also be true in a real-world situation where taxis drivers operate the same route daily. This event is however also explainable in many situations where the taxi would like to exit the corridor at one of the following intersections. The taxi exits the BRT lanes on a through movement at the prior intersection to perform a left turn movement in the general lanes (at the desired exit intersection) rather than in the BRT lanes where there are more delays (when performing a left turn movements).

Taxi volumes are generally low enough that congestion does not build up far enough to restrict buses from stopping at bus station platforms. The second pass-by lane doubles the storage capacity of the BRT lane at bus stations which reduces individual queue lengths. However as seen in Figure 5-21 the taxi volumes are sometimes significant enough to cause taxis to queue past the station platform.

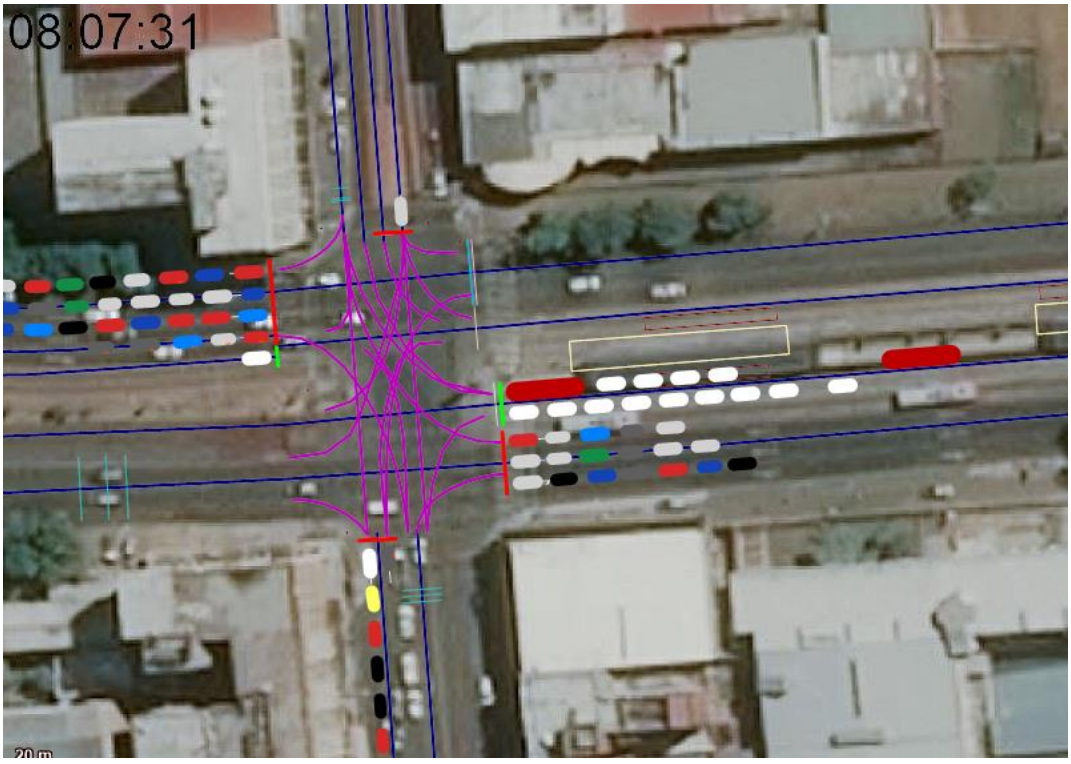

Figure 5-24: Taxi queueing causing bus delays

As seen in Figure 5-24 the taxis have formed a queue in the BRT lane, and the last two taxis are stopped at the bus station platform. The approaching bus is unable to stop at the station and must first wait for the queue to dissipate. In this instance the traffic signal has turned green and the queue starts dissipating short after the bus arrives. This bus only experienced

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a few seconds delay. However, as the taxi and bus volumes increase this phenomenon will become more common and more severe.

A more common phenomenon that was observed can be seen in Figure 5-25 below. In the figure a bus has stopped at the bus station and three taxis are stopped behind it. The three taxis must wait for the left queue to dissipate and then change lane in order to pass the stationary bus. This event will occur less frequently as taxi drivers learn the bus driving patterns.

Figure 5-25: Bus causing taxi delays

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6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The purpose of this study was to determine the effect that various hybrid (between BRT and taxi) configurations would have on the public transport and external traffic systems. During the study four different scenarios were defined and modelled. The scenarios include:

1. Scenario 1 (Benchmark): This scenario is based on the observed traffic conditions as they are currently. In this scenario only BRT buses are permitted to use the BRT lanes, taxis travel in the general lanes.
2. Scenario 2 (Removal): This scenario is based on taxis being removed from the network entirely. This scenario is used to determine the entire effect of the taxis on the network and was modelled since this is the scenario that the authorities are considering implementing.
3. Scenario 3 (Shift): In this scenario the taxis are moved to the BRT lanes. The taxis are not permitted to use the general lanes in this scenario.
4. Scenario 4 (Share): The taxis are permitted to use either the general or BRT lanes. This scenario was modelled as a likely outcome if taxis are forced to use the BRT lanes.

The results indicated that scenario 1 was the poorest performing scenario under congested conditions but the best performing scenario under free flow conditions. This suggests that under free flow conditions there is little benefit gained from hybrid operations, as having taxis in general traffic does not increase congestion or travel times.

Scenario 2 improves travel times under congested conditions. Scenario 2 has the benefit of being implementable without the addition of costly infrastructure. The complete removal of taxis also produced the lowest standard deviation in travel times for passenger vehicles and buses. Under current operating conditions there is sufficient spare capacity in BRT lanes to accommodate the shift of passengers from taxis to BRT. The public transport capacity is maintained by increasing bus frequencies by 3 times. Under this condition the performance in the BRT lanes is not reduced significantly.

Scenario 3 and 4 produced the best overall performance with scenario 3 performing better during peak periods than scenario 4. Scenario 3 however produces the worst travel times of all scenarios once the public transport demand is increased (by 40% in this case). Scenario 4 has slightly higher travel times in the general lanes than scenario 3 but is able to maintain its performance levels under higher public transport demand. If scenario 3 or 4 are to be implemented, certain infrastructure upgrades would need to be researched and constructed to ensure safe operation.

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The scenario which should be implemented depends on what the authorities would like to achieve. The results do however indicate that the current scenario is the worst performing scenario for all vehicles (under congested conditions with existing public transport demand). If the authorities intend on and are able to completely remove the taxis from the network (scenario 2) this would produce the best traffic conditions for the general traffic and will not have a major negative impact BRT performance. Improved traffic conditions can be achieved with the added benefit of not requiring any additional infrastructure. This scenario will however require strict policing and expensive buy out of taxi business owners.

If the authorities are unable to remove the taxis from the network, scenario 3 or 4 should be considered for congested conditions. Scenario 3 produces the best performance results under current demand volumes but is unable to accommodate as much growth as scenario 4. Scenario 4 has the added benefit of not requiring strict policing of taxis since the taxis are permitted to use both the general and BRT lanes.

It must be noted that under free flow conditions the current configuration (scenario 1) produces the best performance results. If scenario 3 or 4 are implemented the average travel time for taxis will increase during off peak periods.

Considering that one of the key objectives of South Africa's National Transport Masterplan is *"Greater mobility options, particularly for those who do not have cars".* It would make sense that scenario 3 or 4 be implemented since they provide the performance advantages of removing the taxis while maintaining the option for public transport users to choose between taxis and buses.

The travel time results indicate that the travel times during off peak periods are very similar for all scenarios while the differences in travel times start becoming more evident during the peak hour periods. The direct comparison between scenarios indicated that under congested conditions scenario 1 produces the worst travel times. This suggests that the proposed scenarios which should be implemented, could be implemented during peak traffic periods rather than throughout the entire day. This does however introduce logistical issues with implementation.

This study also indicates that it is possible to calibrate (to a reasonable degree of accuracy) a standard microsimulation package to model the behaviour of minibus taxis based on observed driving metrics. The modelling of minibus taxis is however a complex matter and requires additional attention. It is essential to perform specific and detailed data collection in order to improve the accuracy of minibus taxi modelling.

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6.2 Recommendations

Further investigation into the findings of this report can be used to produce more detailed information. The following items could be refined and further investigated in future studies.

Taxi behaviour: Limited research and data on taxi driving behaviour (within South Africa) is available. Research is required to better quantify and define the behaviour patterns and driving patterns of taxis. This can be obtained by performing detailed GPS tracking investigations. For the purposes of this study a small sample of taxis were recorded and only within the primary study area. A larger sample of taxis should be recorded, and the data should be investigated thoroughly. This information could then be incorporated into the microsimulation which will improve the accuracy of the model. This data should be used to refine the input parameters used to model taxi characteristics, performance and behaviour. Some of these parameters include desired travel speeds, desired and emergency acceleration and deceleration rates, dwell times and input parameters used in car following and lane changing models.

Signal optimization: During this study traffic signal phasing and timing of traffic signals was left as observed in field. The phasing and timing is designed for the existing lane configurations and traffic volumes and does not take the various scenarios into account. A detailed investigation should be undertaken to determine optimal signal phasing and timing and to determine the effect that it would have on various vehicle classes. The study could be used to determine an optimised signal phasing and timing per scenario and time period. The results of such a study could have an influence some of the findings of this study.

Safety concerns of signal timing and phasing: As mentioned above, the signal phasing and timing was left unchanged throughout the scenarios. However, during scenarios 3 and 4 the taxis are permitted to travel in the BRT lanes. The traffic signals in the BRT lanes are designed for the current BRT operations where the desired movements of the buses are known and are limited. The introduction of taxis (with additional and less predictable turning movements than BRT buses) introduces an issue with the signal phasing and timing. Taxis are able to make right turn and left turn movements at all intersections (which BRT buses cannot) which conflict with vehicles traveling in the general lanes. In practise these moves would only be safely executable during a dedicated phase for the specific movement. It is suggested that further investigations be done into the appropriate signal phasing and timing that would be both efficient and safe.

Road infrastructure: For the purposes of this study the network geometry was left constant across all the scenarios in order to ensure a valid comparison between scenarios. However, slight changes in geometry, such as the addition of short right turn lanes in the BRT lanes,

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could have significant effects on the performance of scenario's 3 and 4. Further studies could be undertaken to determine the effect on capacity that such changes would have.

Simulation model behaviour adjustments: The model was built and calibrated as well as possible with the given resources. However, the model accuracy could be improved by including specific driving behaviour that was observed in field. Examples of such behaviour include vehicles performing right turns during the red signals, vehicles waiting in intersections so that vehicles can pass behind them and vehicles creeping over the stop line in anticipation of the green signal. In order to include these behaviours, further investigation will need to be undertaken.

Implementation periods: The results of this study indicate that the appropriate hybrid scenario that should be implemented is dependent on the traffic conditions. This leads to the possibility of only implementing the chosen scenarios during congested periods. In order to do this in the most effective way additional research will be required. The research should cover both when to change between scenarios and the practical implications of frequently switching between scenarios.

Decision making: This thesis focused on the traffic impact of various hybrid public transport scenarios. The broader question trying to be answered is how the taxis and BRT should be dealt with together. This is a complex question with multiple variables and in order to answer this question all the variables need to be considered. These variables include cost of implementation, performance measures per mode, effect on pedestrians, the effect on taxi industry and how implementable the alternatives are. The results from this study can be used in further studies where all the variables are considered in order to make a complete decision. It is recommended that the results of this study form part of a multi criteria analysis of the entire problem to determine the most appropriate scenario to be implemented.

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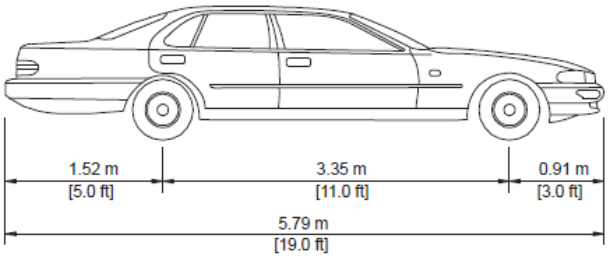
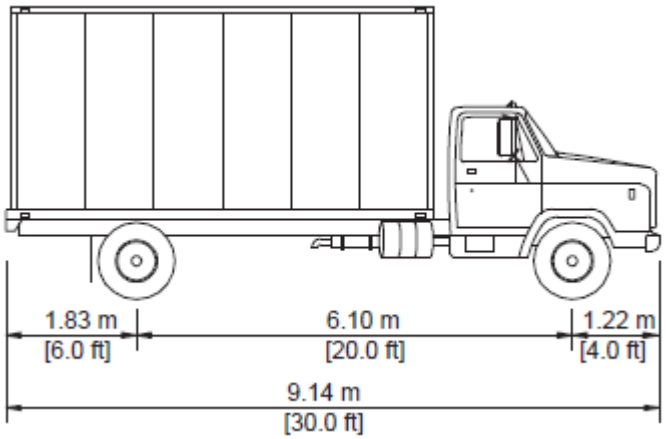
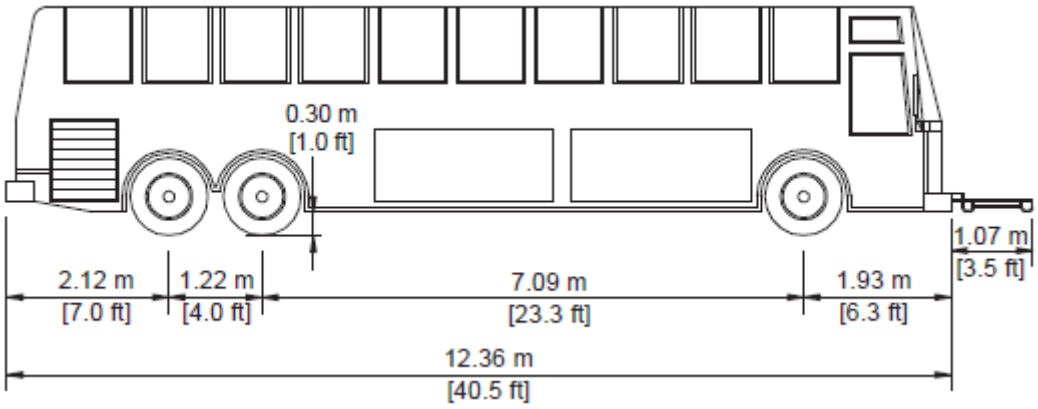
Appendix A- Design Vehicle Dimensions



Passenger Car



Single Unit Truck



Intercity Bus

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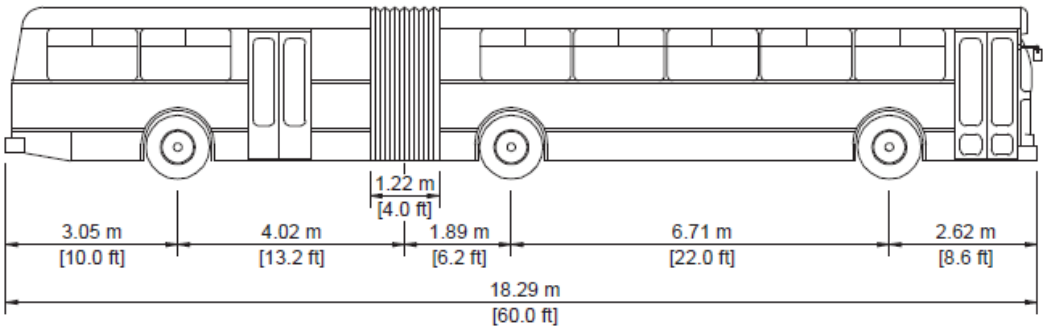

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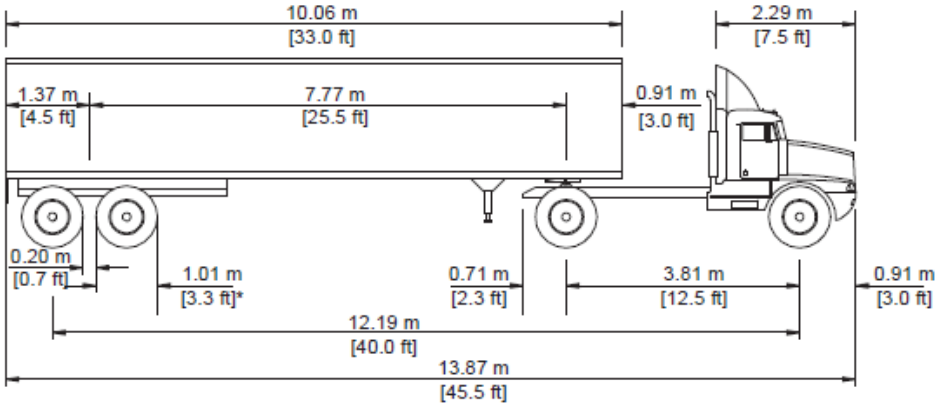
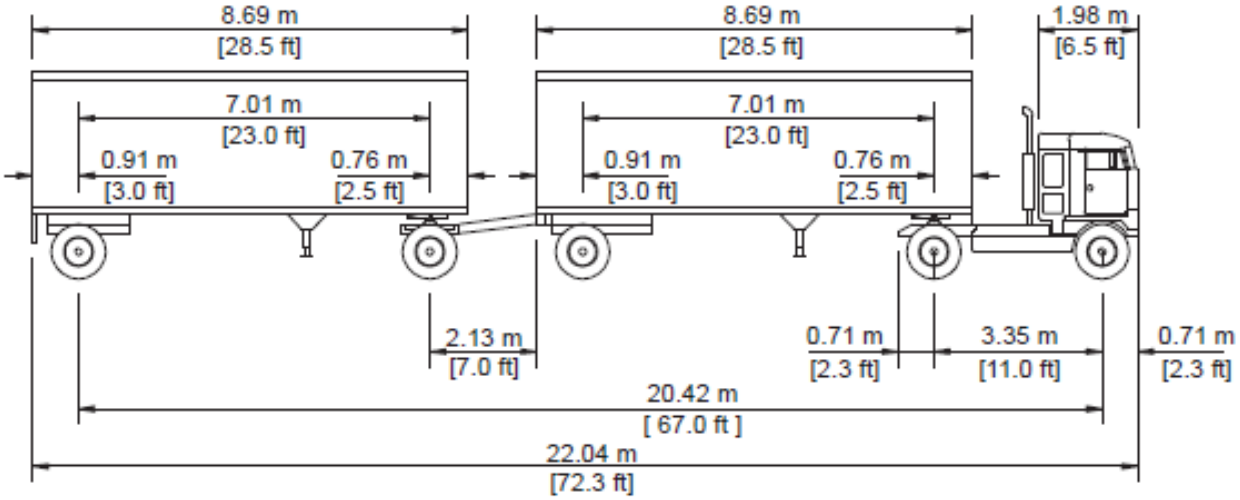
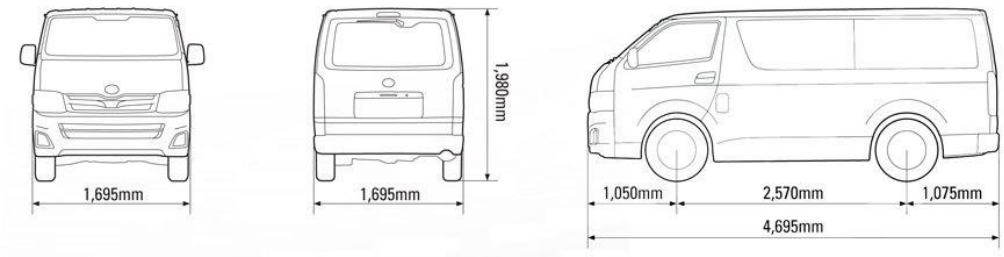


Intermediate Semitrailer



Double Trailer



Minibus Taxi

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Appendix B- Traffic Counts

SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:	UT2019-522-UNI PTA		
SURVEY TIMES:	06H00-18H00	JOB TITLE:	UNI PTA-TRAFFIC COUNT		
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:	UT2019-522-P1		

Turnkey Traffic Monitoring & Data Collection Solutions

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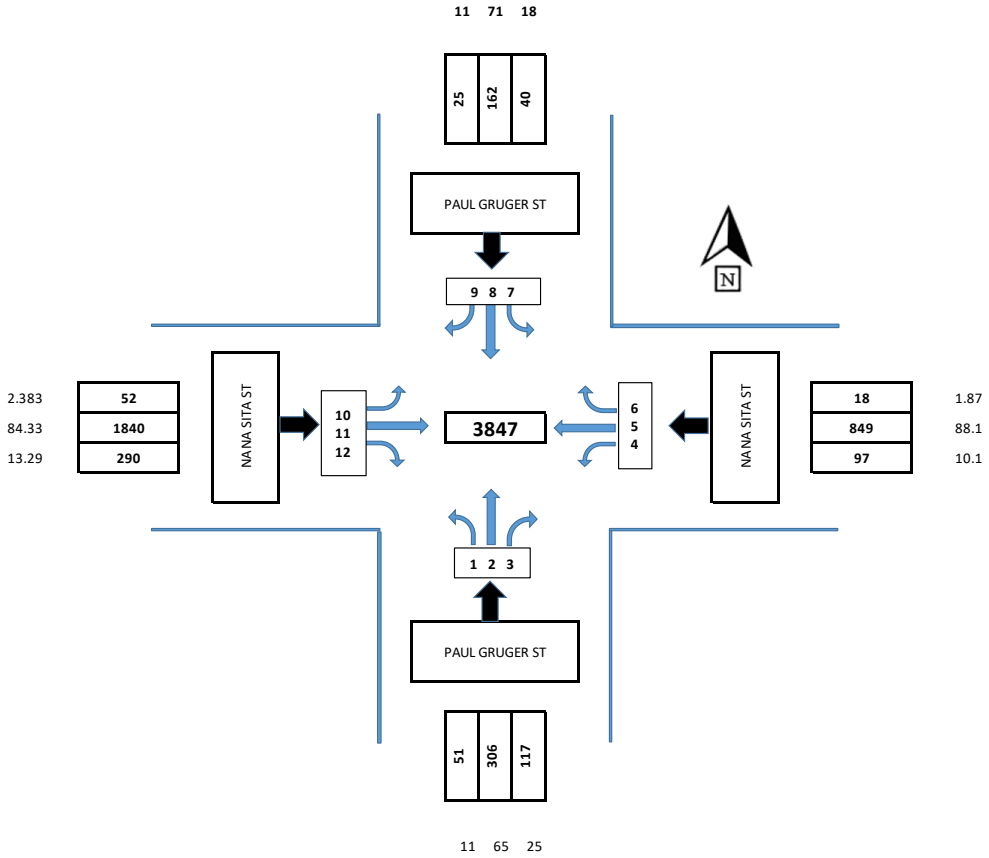
SITE LOCATION:	**UNI PTA**	**JOB NR:**	UT2019-522	**DRAWN:**	**D.L**
SURVEY DATE:	Thursday, 14 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P1	



Peak time : 07:15 - 08:15 **Background peak :**

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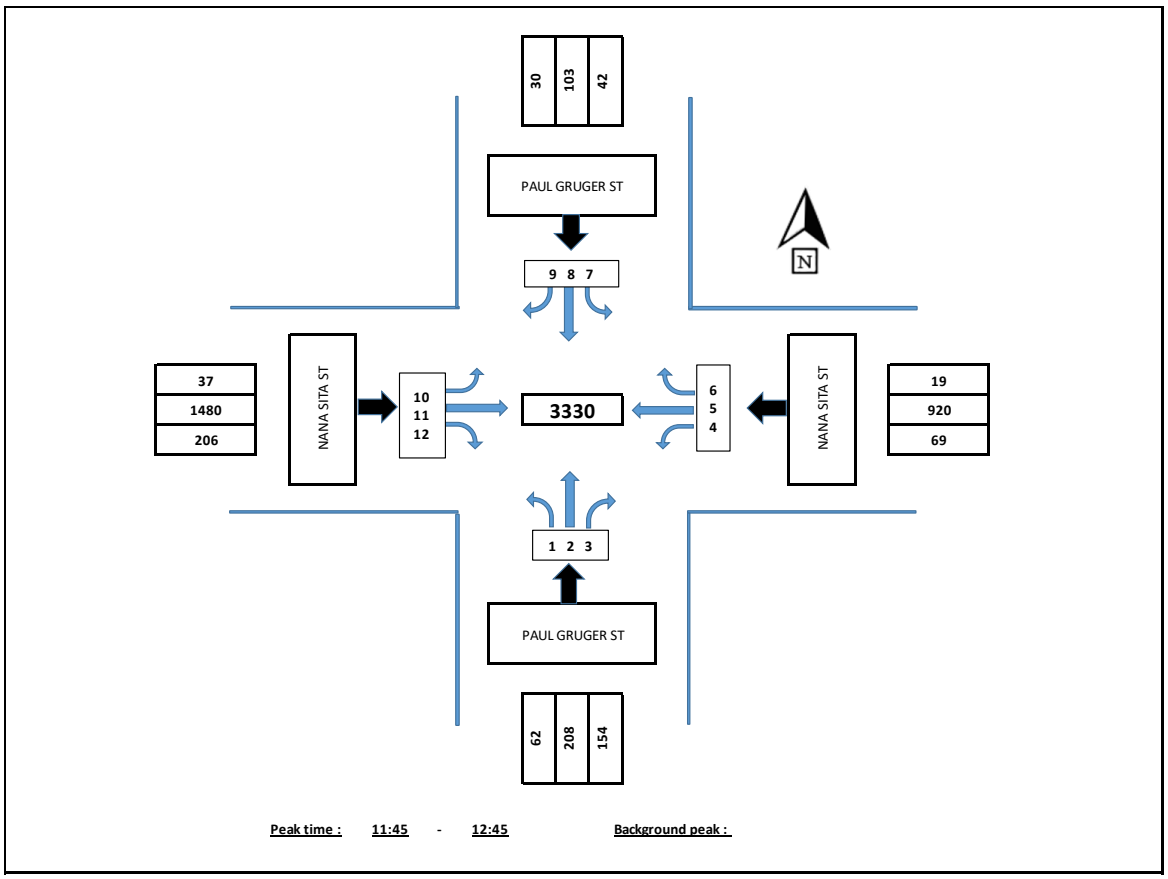

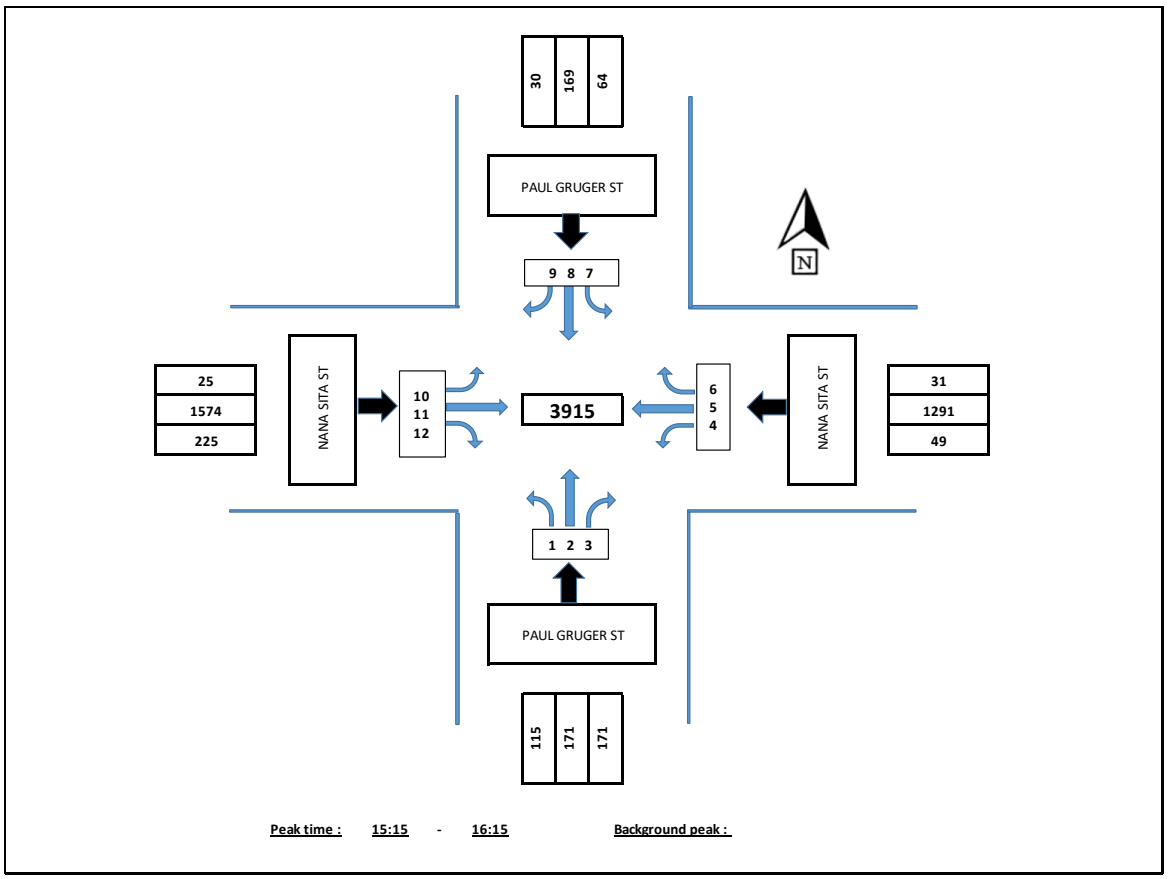

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AM PEAK (06H00 - 9H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	4	26	16	2	106	3	7	18	3	4	281	51	521
06:15	06:30	5	39	12	5	100	3	4	31	6	4	307	58	574
06:30	06:45	12	45	26	12	129	3	17	29	8	5	359	61	706
06:45	07:00	11	46	30	15	168	4	11	28	7	2	438	56	816
07:00	07:15	15	74	31	11	201	7	8	31	4	2	391	56	831
07:15	07:30	13	78	37	24	217	5	7	48	3	14	479	81	1 006
07:30	07:45	20	74	30	26	210	5	12	42	5	6	454	70	954
07:45	08:00	7	70	28	27	233	3	10	40	8	22	455	62	965
08:00	08:15	11	84	22	20	189	5	11	32	9	10	452	77	922
08:15	08:30	15	56	38	16	240	9	9	35	19	18	414	61	930
08:30	08:45	27	56	35	19	222	11	9	33	8	13	409	70	912
08:45	09:00	11	55	41	16	229	4	10	32	7	11	426	71	913
TOTALS		151	703	346	193	2 244	62	115	399	87	111	4 865	774	10 050

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	51	306	117	97	849	18	40	162	25	52	1840	290	3 847

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	17	53	30	12	218	14	10	25	11	14	378	74	856
09:15	09:30	12	52	23	14	211	9	11	28	6	16	284	47	713
09:30	09:45	11	49	36	14	218	5	12	23	6	6	332	56	768
09:45	10:00	14	60	21	16	229	6	12	26	6	1	346	56	793
10:00	10:15	11	43	41	17	197	9	8	18	7	3	322	49	725
10:15	10:30	17	44	32	15	215	5	11	13	5	11	333	42	743
10:30	10:45	23	40	37	23	201	2	7	21	10	7	321	55	747
10:45	11:00	12	29	35	20	214	8	15	19	3	6	305	45	711
11:00	11:15	13	37	37	18	210	6	9	27	5	8	320	38	728
11:15	11:30	19	50	34	10	213	5	6	33	4	7	357	52	790
11:30	11:45	19	45	31	16	193	9	5	39	8	4	355	57	781
11:45	12:00	19	48	47	19	223	4	8	20	10	12	378	49	837
12:00	12:15	15	59	38	19	206	3	10	26	4	9	356	50	795
12:15	12:30	16	44	37	14	215	8	12	31	11	8	381	51	828
12:30	12:45	12	57	32	17	276	4	12	26	5	8	365	56	870
12:45	13:00	18	44	37	14	217	11	17	31	5	4	335	48	781
13:00	13:15	21	46	31	17	210	9	18	25	4	7	362	45	795
13:15	13:30	23	46	33	16	233	10	6	25	6	6	339	48	791
13:30	13:45	10	47	27	21	258	11	8	26	4	5	325	53	795
13:45	14:00	15	53	43	23	246	3	18	26	8	7	312	40	794
14:00	14:15	16	47	29	17	237	2	5	28	6	4	339	64	794
14:15	14:30	11	51	29	11	258	4	7	37	9	10	356	53	836
14:30	14:45	16	39	24	12	257	9	9	24	9	5	369	49	822
14:45	15:00	15	36	36	15	217	5	11	30	7	5	329	60	766
TOTALS		375	1 119	800	390	5 372	161	247	627	159	173	8 199	1 237	18 859

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:45	12:45	62	208	154	69	920	19	42	103	30	37	1480	206	3 330

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	17	60	48	12	304	11	9	33	12	3	315	50	874
15:15	15:30	18	39	43	9	311	6	19	44	6	7	369	60	931
15:30	15:45	23	44	47	11	317	9	19	36	6	2	399	53	966
15:45	16:00	29	47	38	12	355	9	17	45	6	5	391	61	1 015
16:00	16:15	45	41	43	17	308	7	9	44	12	11	415	51	1 003
16:15	16:30	29	51	34	16	281	10	12	42	8	-	345	54	882
16:30	16:45	52	57	31	17	304	9	15	37	9	3	417	59	1 010
16:45	17:00	27	52	34	9	227	8	13	35	15	2	363	47	832
17:00	17:15	24	52	29	15	241	8	12	33	12	3	383	57	869
17:15	17:30	21	49	23	7	272	4	12	39	6	4	334	50	821
17:30	17:45	15	46	28	10	253	7	6	36	7	3	370	46	827
17:45	18:00	18	46	37	11	234	8	13	24	5	2	305	44	747
TOTALS		318	584	435	146	3 407	96	156	448	104	45	4 406	632	10 777

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	115	171	171	49	1291	31	64	169	30	25	1574	225	3 915

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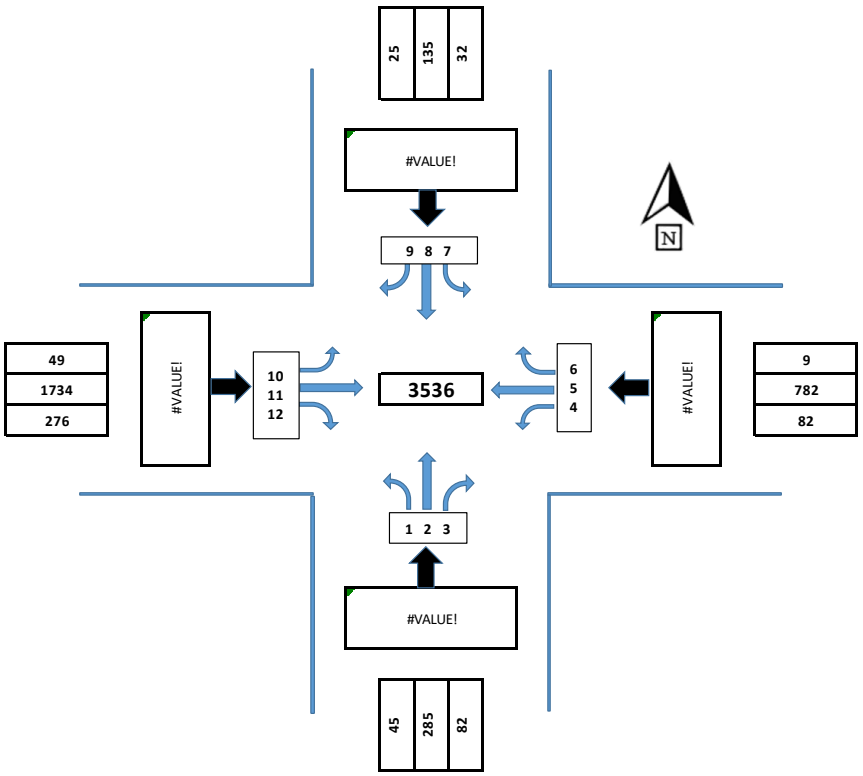
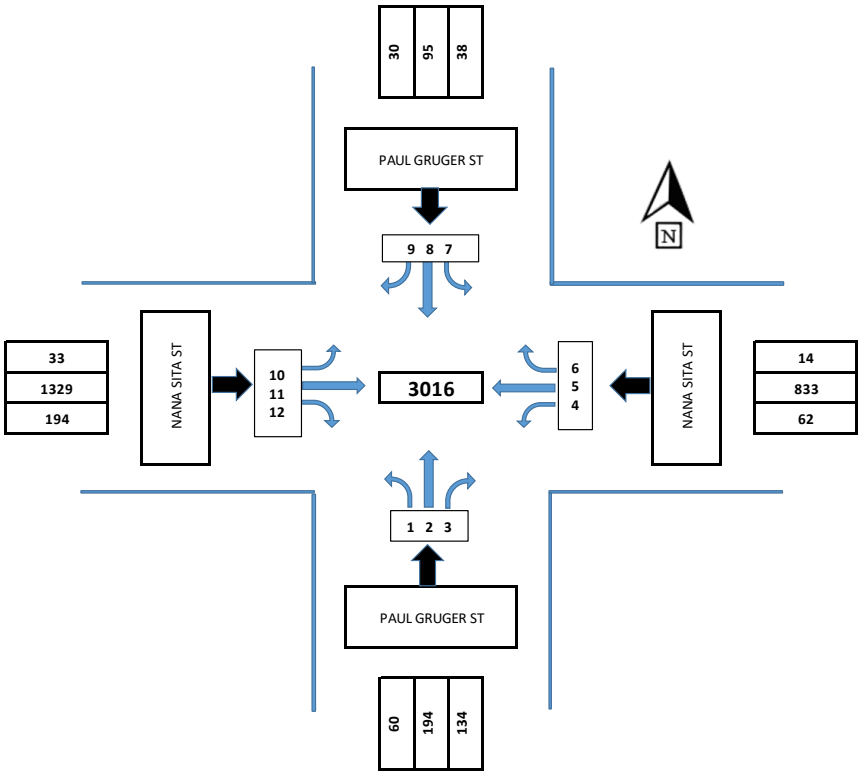
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P1	



Peak time : 07:15 - 08:15 Background peak :



Peak time : 11:45 - 12:45 Background peak :

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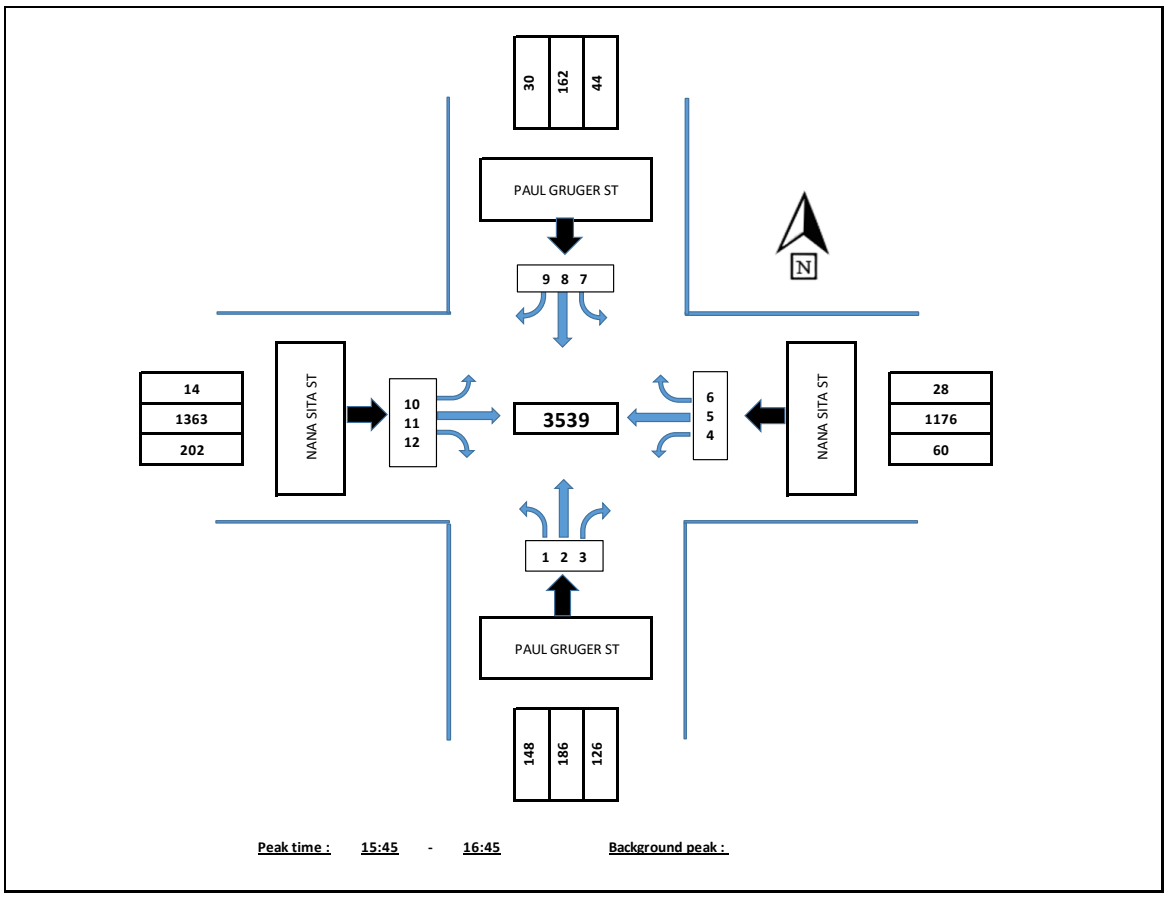

AM PEAK (06H00 - 09H00)														
MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	4	24	7	2	87	3	1	15	2	2	255	45	447
06:15	06:30	5	37	9	4	89	1	1	26	5	3	276	51	507
06:30	06:45	10	43	17	8	115	1	13	26	7	5	327	56	628
06:45	07:00	11	41	19	12	149	2	8	22	6	2	405	50	727
07:00	07:15	12	73	21	10	187	3	7	26	4	2	353	52	750
07:15	07:30	11	72	26	19	203	3	4	40	3	14	457	77	929
07:30	07:45	19	67	19	22	192	2	10	36	5	5	424	66	867
07:45	08:00	6	65	20	23	211	2	9	33	8	22	434	59	892
08:00	08:15	9	81	17	18	176	2	9	26	9	8	419	74	848
08:15	08:30	15	52	31	13	222	5	7	32	18	18	388	55	856
08:30	08:45	24	50	24	14	202	10	9	27	6	11	367	67	811
08:45	09:00	10	53	34	14	198	3	8	30	7	9	380	65	811
TOTALS		136	658	244	159	2 031	37	86	339	80	101	4 485	717	9 073

Background peak hour														
MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	45	285	82	82	782	9	32	135	25	49	1734	276	3 536

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MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	17	46	19	11	195	9	9	21	9	14	346	69	765
09:15	09:30	12	51	17	12	187	8	9	27	5	16	261	44	649
09:30	09:45	10	46	29	13	195	5	12	20	6	6	294	54	690
09:45	10:00	14	52	17	13	206	5	9	24	6	1	316	52	715
10:00	10:15	9	38	35	15	187	7	7	15	7	3	303	46	672
10:15	10:30	16	40	29	15	198	5	10	13	5	10	289	38	668
10:30	10:45	22	37	33	22	178	2	7	19	9	7	299	51	686
10:45	11:00	11	25	32	17	200	6	14	18	3	5	273	40	644
11:00	11:15	13	34	29	17	193	5	9	26	3	8	284	33	654
11:15	11:30	18	46	30	10	195	4	5	32	4	7	331	49	731
11:30	11:45	17	43	26	15	179	9	4	34	8	3	320	52	710
11:45	12:00	18	46	40	17	199	2	6	19	10	12	335	45	749
12:00	12:15	15	57	32	18	186	3	10	25	4	9	318	46	723
12:15	12:30	15	41	34	12	194	5	11	26	11	6	346	49	750
12:30	12:45	12	50	28	15	254	4	11	25	5	6	330	54	794
12:45	13:00	16	41	33	13	205	10	15	31	5	4	300	45	718
13:00	13:15	21	45	29	15	192	8	17	23	4	7	332	41	734
13:15	13:30	22	46	31	13	217	9	5	25	6	6	301	39	720
13:30	13:45	9	45	25	20	239	11	8	25	4	5	295	49	735
13:45	14:00	15	51	37	21	221	3	17	25	6	7	271	36	710
14:00	14:15	16	44	23	12	216	-	4	25	5	4	284	59	692
14:15	14:30	**11**	**48**	**26**	**11**	**235**	**3**	**7**	**35**	**7**	**8**	**314**	**51**	756
14:30	14:45	**16**	**36**	**21**	**11**	**231**	**9**	**8**	**22**	**9**	**5**	**321**	**41**	730
14:45	15:00	**14**	**31**	**31**	**15**	**194**	**4**	**10**	**28**	**4**	**5**	**285**	**55**	676
TOTALS		**359**	**1 039**	**686**	**353**	**4 896**	**136**	**224**	**583**	**145**	**164**	**7 348**	**1 138**	**17 071**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:45	12:45	60	194	134	62	833	14	38	95	30	33	1329	194	3 016

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	17	55	42	10	277	11	8	30	9	3	265	44	771
15:15	15:30	17	37	39	8	283	4	17	42	5	4	311	54	821
15:30	15:45	22	40	42	9	295	8	15	35	4	-	348	48	866
15:45	16:00	26	46	31	12	329	9	13	44	5	2	338	57	912
16:00	16:15	44	41	40	16	291	4	7	43	10	10	353	42	901
16:15	16:30	27	46	33	15	269	8	10	40	7	-	309	47	811
16:30	16:45	51	53	22	17	287	7	14	35	8	2	363	56	915
16:45	17:00	26	47	26	9	207	6	8	31	15	2	324	41	742
17:00	17:15	23	49	23	14	228	4	9	30	11	3	341	50	785
17:15	17:30	20	42	16	7	254	2	9	37	6	3	303	46	745
17:30	17:45	14	39	22	10	238	4	5	32	5	3	341	40	753
17:45	18:00	18	40	26	10	218	3	11	24	4	1	279	39	673
TOTALS		**305**	**535**	**362**	**137**	**3 176**	**70**	**126**	**423**	**89**	**33**	**3 875**	**564**	**9 695**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:45	16:45	148	186	126	60	1176	28	44	162	30	14	1363	202	3 539

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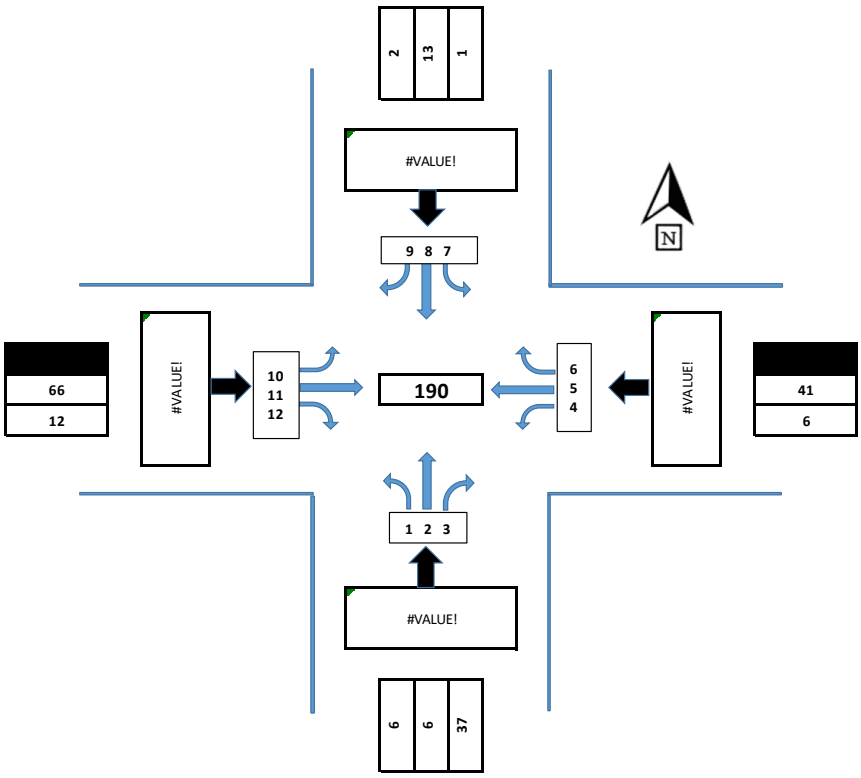
SITE LOCATION:	**UNI PTA**	**JOB NR:**	UT2019-522	**DRAWN:**	**D.L**
SURVEY DATE:	Thursday, 14 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P1	

unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : **06:30** - **07:30** **Background peak :**

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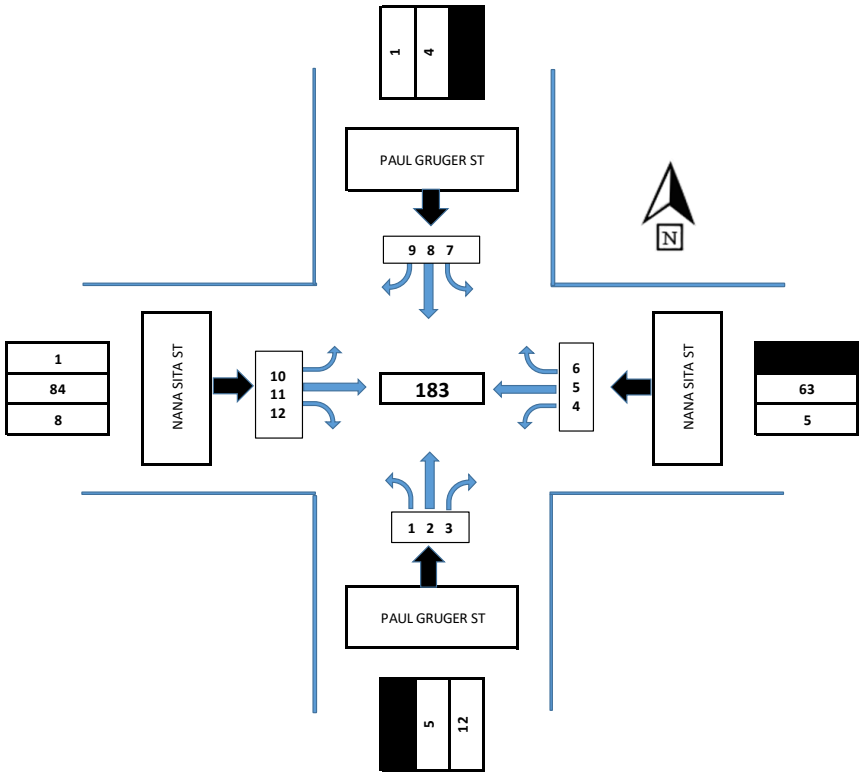
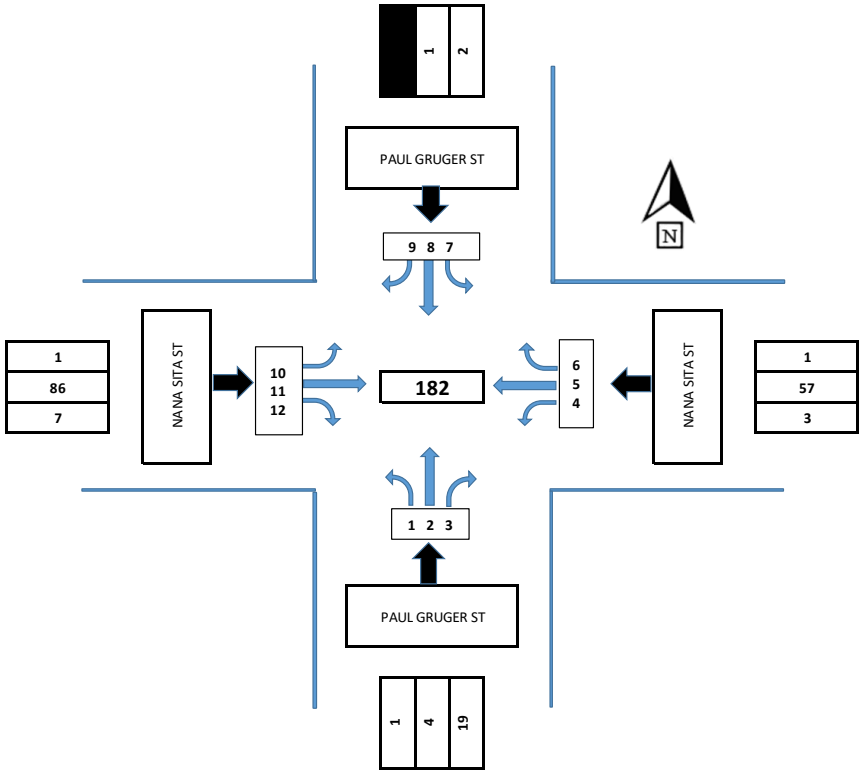


Peak time : 13:45 - 14:45 **Background peak :**



Peak time : 15:00 - 16:00 **Background peak :**

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	7	-	11	-	-	2	-	-	13	4	37
06:15	06:30	-	1	3	-	8	-	-	3	1	-	15	3	34
06:30	06:45	1	-	8	2	9	-	-	2	1	-	16	4	43
06:45	07:00	-	3	10	1	12	-	1	2	1	-	20	4	54
07:00	07:15	3	-	10	-	12	-	-	4	-	-	18	2	49
07:15	07:30	2	3	9	3	8	-	-	5	-	-	12	2	44
07:30	07:45	1	3	9	3	10	-	-	4	-	-	10	3	43
07:45	08:00	1	3	7	3	14	-	-	6	-	-	6	-	40
08:00	08:15	2	1	5	1	6	-	-	5	-	-	7	3	30
08:15	08:30	-	2	6	2	7	-	-	2	-	-	8	-	27
08:30	08:45	-	3	8	4	11	-	-	5	-	2	13	1	47
08:45	09:00	1	1	6	2	12	-	-	2	-	1	19	2	46
TOTALS		11	20	88	21	120	-	1	42	3	3	157	28	494

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:30	07:30	6	6	37	6	41	0	1	13	2	0	66	12	190

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	3	8	1	9	-	-	2	2	-	6	2	33
09:15	09:30	-	-	3	1	14	-	1	-	-	-	10	2	31
09:30	09:45	1	1	5	-	16	-	-	1	-	-	13	-	37
09:45	10:00	-	1	1	2	10	-	2	2	-	-	9	-	27
10:00	10:15	-	2	4	-	3	1	1	1	-	-	6	-	18
10:15	10:30	-	2	3	-	9	-	-	-	-	-	21	2	37
10:30	10:45	-	-	1	1	14	-	-	1	1	-	4	1	23
10:45	11:00	-	1	2	1	5	-	-	1	-	1	11	2	24
11:00	11:15	-	1	4	-	9	-	-	-	1	-	16	2	33
11:15	11:30	-	1	2	-	10	-	-	-	-	-	9	1	23
11:30	11:45	-	1	3	1	6	-	-	1	-	1	11	2	26
11:45	12:00	-	1	4	1	14	1	-	-	-	-	12	1	34
12:00	12:15	-	-	4	-	4	-	-	-	-	-	11	2	21
12:15	12:30	-	2	2	-	9	1	-	3	-	1	13	-	31
12:30	12:45	-	4	3	2	11	-	1	-	-	1	14	2	38
12:45	13:00	-	1	3	1	6	-	1	-	-	-	15	2	29
13:00	13:15	-	-	2	-	8	-	-	-	-	-	14	4	28
13:15	13:30	-	-	2	1	11	-	-	-	-	-	14	7	35
13:30	13:45	-	1	1	-	9	-	-	-	-	-	13	2	26
13:45	14:00	-	1	3	-	14	-	-	1	-	-	19	1	39
14:00	14:15	-	1	5	4	15	-	-	1	-	-	28	1	55
14:15	14:30	-	3	3	-	16	-	-	1	1	1	13	1	39
14:30	14:45	-	-	1	1	18	-	-	1	-	-	24	5	50
14:45	15:00	-	1	4	-	15	-	1	1	-	-	9	4	35
TOTALS		1	28	73	17	255	3	7	17	5	5	315	46	772

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
13:45	14:45	0	5	12	5	63	0	0	4	1	1	84	8	183

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	2	5	2	21	-	-	1	-	-	26	3	60
15:15	15:30	-	1	3	-	11	1	-	-	-	-	22	2	40
15:30	15:45	-	-	5	1	13	-	1	-	-	-	15	2	37
15:45	16:00	1	1	6	-	12	-	1	-	-	1	23	-	45
16:00	16:15	-	-	1	-	7	-	-	-	-	-	22	2	32
16:15	16:30	-	2	1	1	7	-	-	-	-	-	16	2	29
16:30	16:45	1	3	9	-	5	-	-	-	1	-	19	2	40
16:45	17:00	-	1	6	-	9	-	2	3	-	-	20	2	43
17:00	17:15	-	2	5	1	4	-	-	1	-	-	18	3	34
17:15	17:30	-	1	6	-	10	2	-	1	-	-	13	3	36
17:30	17:45	-	4	5	-	8	1	-	1	-	-	14	2	35
17:45	18:00	-	3	9	1	5	-	-	-	1	-	15	2	36
TOTALS		2	20	61	6	112	4	4	7	2	1	223	25	467

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	16:00	1	4	19	3	57	1	2	1	0	1	86	7	182

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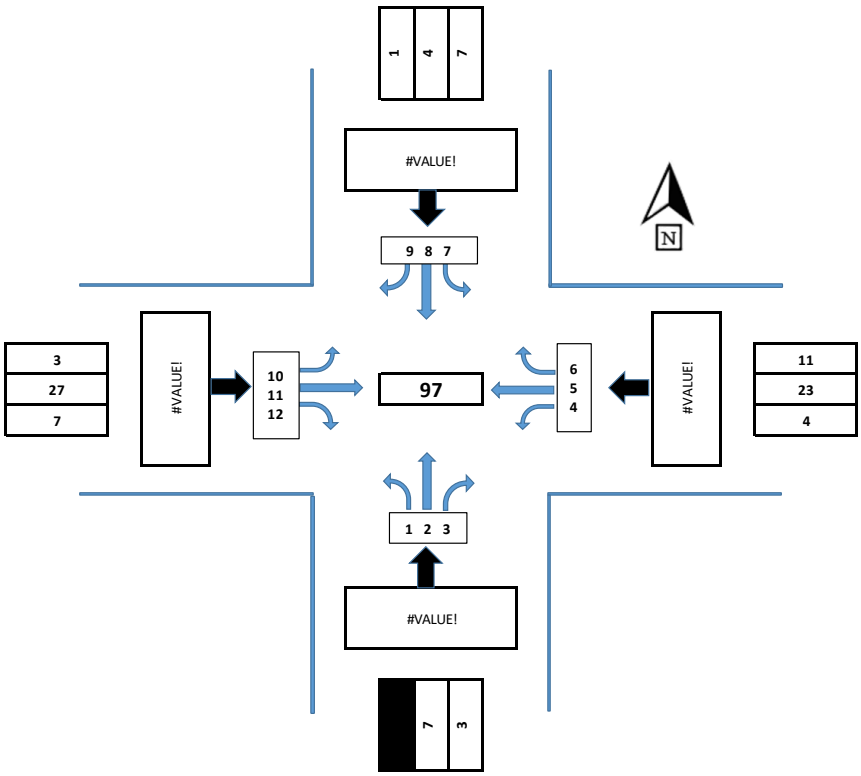
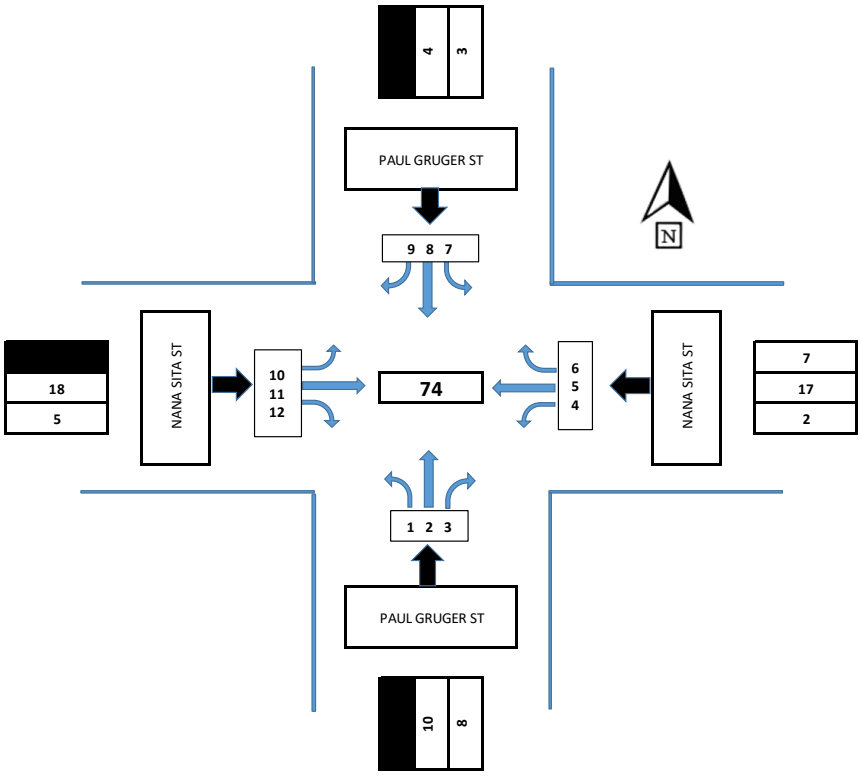
SITE LOCATION:	**UNI PTA**	**JOB NR:**	UT2019-522	**DRAWN:**	**D.L**
SURVEY DATE:	Thursday, 14 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P1	

unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 07:30 - 08:30 **Background peak :**



Peak time : 09:00 - 10:00 **Background peak :**

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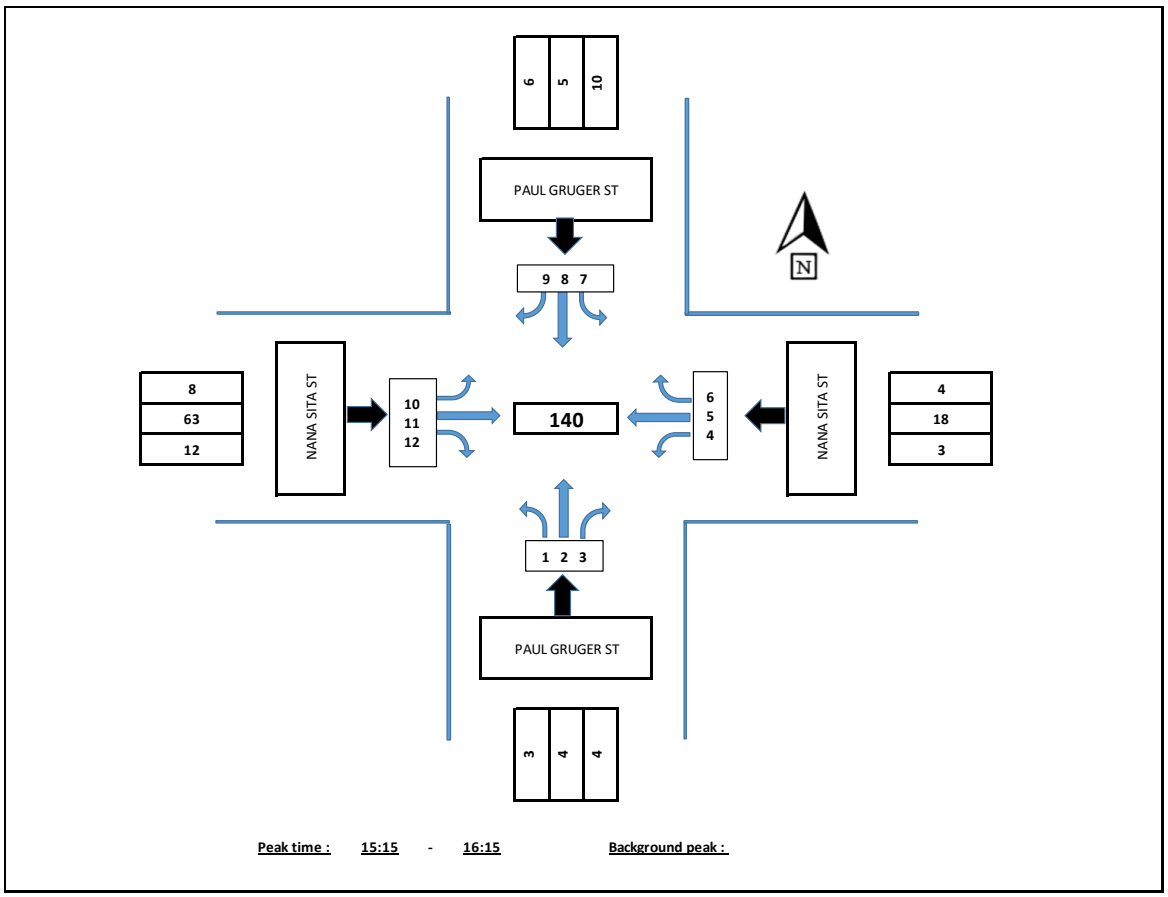

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	2	1	-	6	-	6	1	1	2	5	2	26
06:15	06:30	-	1	-	1	1	2	3	2	-	1	6	4	21
06:30	06:45	1	2	1	1	1	2	4	1	-	-	10	1	24
06:45	07:00	-	2	1	2	3	2	2	4	-	-	4	2	22
07:00	07:15	-	1	-	1	1	4	1	1	-	-	8	1	18
07:15	07:30	-	2	2	2	4	2	3	2	-	-	3	2	22
07:30	07:45	-	3	2	1	6	3	2	1	-	1	5	1	25
07:45	08:00	-	2	-	1	3	1	1	1	-	-	8	1	18
08:00	08:15	-	2	-	1	5	3	2	1	-	2	8	-	24
08:15	08:30	-	-	1	1	9	4	2	1	1	-	6	5	30
08:30	08:45	1	2	3	-	3	1	-	1	2	-	11	1	25
08:45	09:00	-	1	1	-	7	1	1	-	-	-	6	1	18
TOTALS		2	20	12	11	49	25	27	16	4	6	80	21	273

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:30	08:30	-	7	3	4	23	11	7	4	1	3	27	7	97

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	4	3	-	7	5	1	2	-	-	6	2	30
09:15	09:30	-	-	2	-	2	1	1	1	-	-	3	-	10
09:30	09:45	-	2	1	1	3	-	-	1	-	-	7	-	15
09:45	10:00	-	4	2	1	5	1	1	-	-	-	2	3	19
10:00	10:15	1	2	1	1	-	1	-	2	-	-	2	2	12
10:15	10:30	1	2	-	-	-	-	1	-	-	-	4	1	9
10:30	10:45	-	1	2	-	2	-	-	1	-	-	5	-	11
10:45	11:00	-	2	-	-	-	1	1	-	-	-	3	2	9
11:00	11:15	-	1	3	1	-	-	-	1	1	-	-	1	8
11:15	11:30	-	-	2	-	2	1	1	-	-	-	2	1	9
11:30	11:45	1	1	2	-	2	-	1	2	-	-	3	2	14
11:45	12:00	-	-	1	1	2	1	1	1	-	-	4	2	13
12:00	12:15	-	1	-	-	2	-	-	1	-	-	4	-	8
12:15	12:30	1	-	-	1	1	1	1	2	-	-	7	1	15
12:30	12:45	-	1	1	-	1	-	-	1	-	1	6	-	11
12:45	13:00	-	1	1	-	-	1	1	-	-	-	4	-	8
13:00	13:15	-	1	-	1	1	1	1	2	-	-	3	-	10
13:15	13:30	-	-	-	1	-	1	1	-	-	-	2	-	5
13:30	13:45	-	1	1	1	1	-	-	1	-	-	8	1	14
13:45	14:00	-	-	2	-	-	-	1	-	1	-	4	1	9
14:00	14:15	-	1	1	1	1	2	1	1	1	-	6	2	17
14:15	14:30	-	-	-	-	**2**	**1**	-	**1**	**1**	**1**	**6**	**1**	13
14:30	14:45	-	**3**	**2**	-	**3**	-	**1**	**1**	-	-	**7**	**3**	20
14:45	15:00	**1**	**2**	**1**	-	**2**	**1**	-	**1**	**3**	-	**9**	-	20
TOTALS		5	30	28	10	39	19	15	22	7	2	107	25	309

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	10:00	0	10	8	2	17	7	3	4	0	0	18	5	74

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	2	1	-	2	-	1	2	3	-	14	2	27
15:15	15:30	1	-	1	1	7	1	2	2	1	3	16	3	38
15:30	15:45	1	4	-	1	3	1	3	1	2	2	18	2	38
15:45	16:00	1	-	1	-	5	-	3	1	1	2	16	2	32
16:00	16:15	-	-	2	1	3	2	2	1	2	1	13	5	32
16:15	16:30	1	3	-	-	2	2	2	1	1	-	8	2	22
16:30	16:45	-	1	-	-	5	2	1	2	-	1	8	-	20
16:45	17:00	-	4	1	-	6	2	3	-	-	-	2	3	21
17:00	17:15	-	-	1	-	3	4	3	2	1	-	7	2	23
17:15	17:30	-	6	1	-	2	-	2	1	-	1	4	1	18
17:30	17:45	1	3	1	-	3	2	1	2	2	-	7	3	25
17:45	18:00	-	3	2	-	6	5	2	-	-	1	3	3	25
TOTALS		5	26	11	3	47	21	25	15	13	11	116	28	321

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	3	4	4	3	18	4	10	5	6	8	63	12	140

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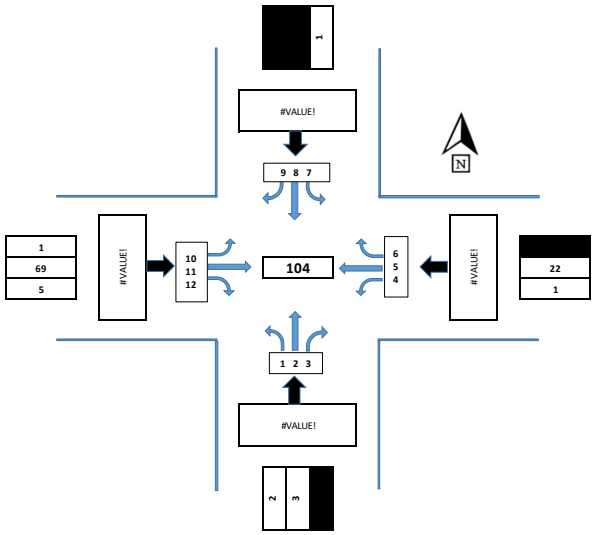
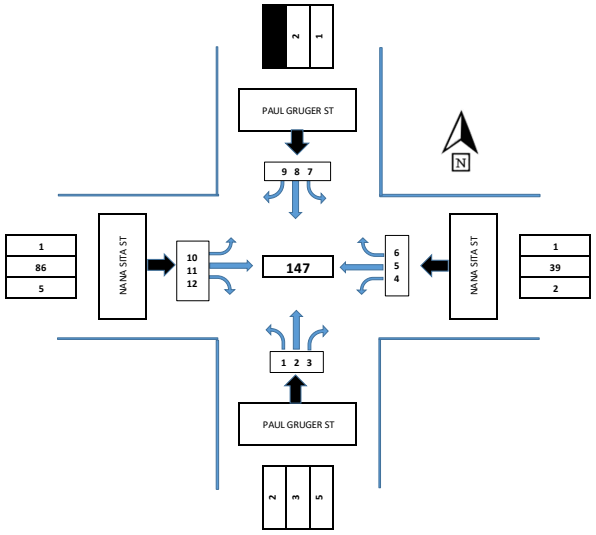
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	HF
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P1	

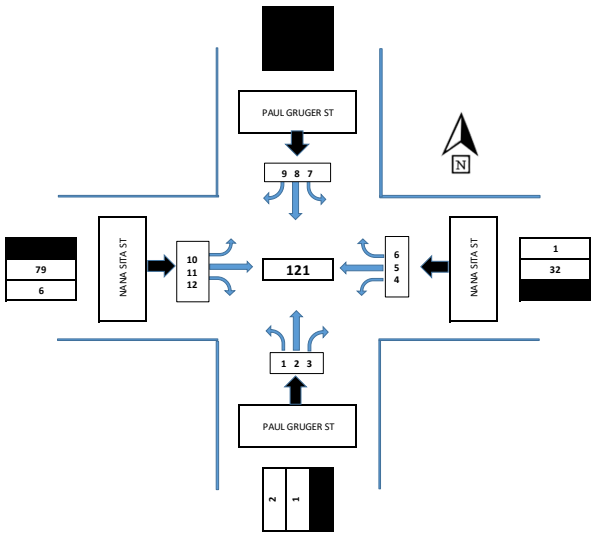
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 08:00 - 09:00 Background peak :



Peak time : 11:30 - 12:30 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	1	-	2	-	-	-	-	-	8	-	11
06:15	06:30	-	-	-	-	2	-	-	-	-	-	10	-	12
06:30	06:45	-	-	-	1	4	-	-	-	-	-	6	-	11
06:45	07:00	-	-	-	-	4	-	-	-	-	-	9	-	13
07:00	07:15	-	-	-	-	1	-	-	-	-	-	12	1	14
07:15	07:30	-	1	-	-	2	-	-	1	-	-	7	-	11
07:30	07:45	-	1	-	-	2	-	-	1	-	-	15	-	19
07:45	08:00	-	-	1	-	5	-	-	-	-	-	7	2	15
08:00	08:15	-	-	-	-	2	-	-	-	-	-	18	-	20
08:15	08:30	-	2	-	-	2	-	-	-	-	-	12	1	17
08:30	08:45	2	1	-	1	6	-	-	-	-	-	18	1	29
08:45	09:00	-	-	-	-	12	-	1	-	-	1	21	3	38
TOTALS		2	5	2	2	44	-	1	2	-	1	143	8	210

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	2	3	0	1	22	0	1	0	0	1	69	5	104

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	7	-	-	-	-	-	20	1	28
09:15	09:30	-	1	1	1	8	-	-	-	1	-	10	1	23
09:30	09:45	-	-	1	-	4	-	-	1	-	-	18	2	26
09:45	10:00	-	3	1	-	8	-	-	-	-	-	19	1	32
10:00	10:15	1	1	1	1	7	-	-	-	-	-	11	1	23
10:15	10:30	-	-	-	-	8	-	-	-	-	1	19	1	29
10:30	10:45	1	2	1	-	7	-	-	-	-	-	13	3	27
10:45	11:00	1	1	1	2	9	1	-	-	-	-	18	1	34
11:00	11:15	-	1	1	-	8	1	-	-	-	-	20	2	33
11:15	11:30	1	3	-	-	6	-	-	1	-	-	15	1	27
11:30	11:45	1	-	-	-	6	-	-	2	-	-	21	1	31
11:45	12:00	1	1	2	-	8	-	1	-	-	-	27	1	41
12:00	12:15	-	1	2	1	14	-	-	-	-	-	23	2	43
12:15	12:30	-	1	1	1	11	1	-	-	-	1	15	1	32
12:30	12:45	-	2	-	-	10	-	-	-	-	-	15	-	27
12:45	13:00	2	1	-	-	6	-	-	-	-	-	16	1	26
13:00	13:15	-	-	-	1	9	-	-	-	-	-	13	-	23
13:15	13:30	1	-	-	1	5	-	-	-	-	-	22	2	31
13:30	13:45	1	-	-	-	9	-	-	-	-	-	9	1	20
13:45	14:00	-	1	1	2	11	-	-	-	1	-	18	2	36
14:00	14:15	-	1	-	-	5	-	-	1	-	-	21	2	30
14:15	14:30	-	-	-	-	5	-	-	-	-	-	23	-	28
14:30	14:45	-	-	-	-	5	-	-	-	-	-	17	-	22
14:45	15:00	-	2	-	-	6	-	-	-	-	-	26	1	35
TOTALS		10	22	13	10	182	3	1	5	2	2	429	28	707

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:30	12:30	2	3	5	2	39	1	1	2	0	1	86	5	147

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	1	-	-	4	-	-	-	-	-	10	1	16
15:15	15:30	-	1	-	-	10	-	-	-	-	-	20	1	32
15:30	15:45	-	-	-	-	6	-	-	-	-	-	18	1	25
15:45	16:00	1	-	-	-	9	-	-	-	-	-	14	2	26
16:00	16:15	1	-	-	-	7	1	-	-	-	-	27	2	38
16:15	16:30	1	-	-	-	3	-	-	1	-	-	12	3	20
16:30	16:45	-	-	-	-	7	-	-	-	-	-	27	1	35
16:45	17:00	1	-	1	-	5	-	-	1	-	-	17	1	26
17:00	17:15	1	1	-	-	6	-	-	-	-	-	17	2	27
17:15	17:30	1	-	-	-	6	-	1	-	-	-	14	-	22
17:30	17:45	-	-	-	-	4	-	-	1	-	-	8	1	14
17:45	18:00	-	-	-	-	5	-	-	-	-	-	8	-	13
TOTALS		6	3	1	-	72	1	1	3	-	-	192	15	294

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	2	1	0	0	32	1	0	0	0	0	79	6	121

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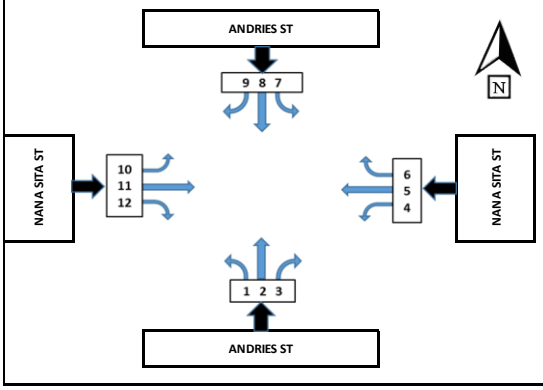
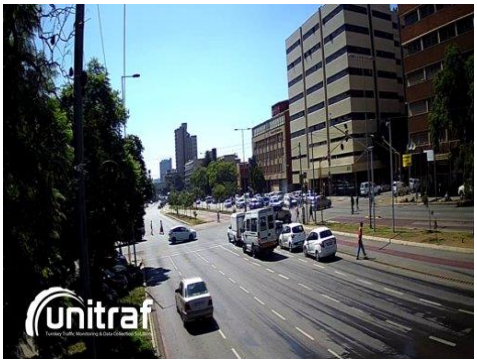
SITE LOCATION:	**UNITRAF HQ**	**JOB NR:**	UT2019-522	**DRAWN:**	**D.L**
SURVEY DATE:	Thursday, 14 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P2	





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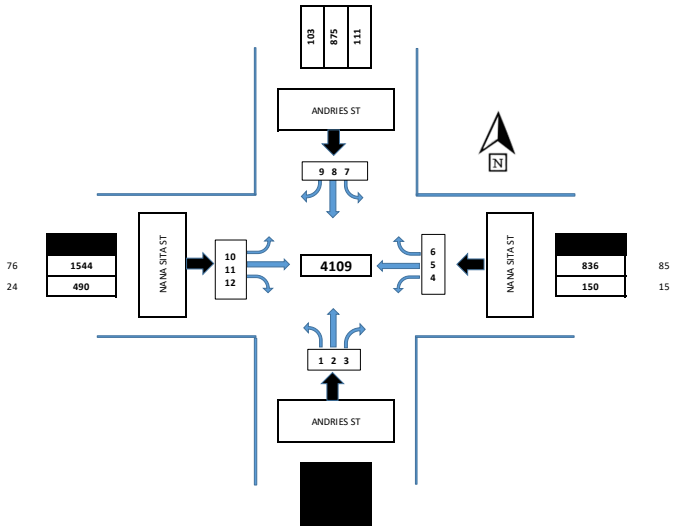
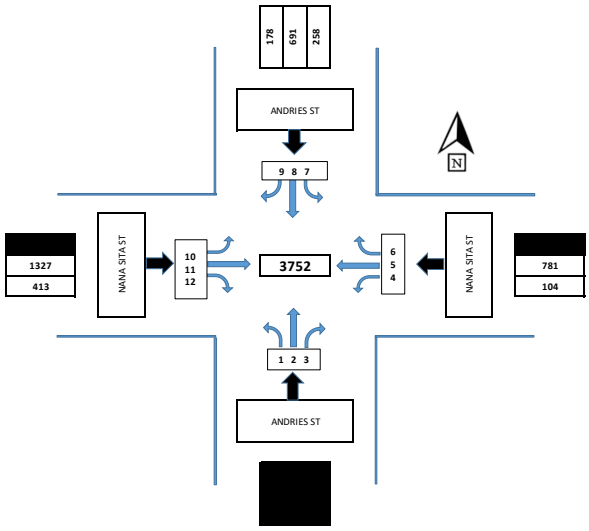
SITE LOCATION:	UNITRAF HQ	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P2	

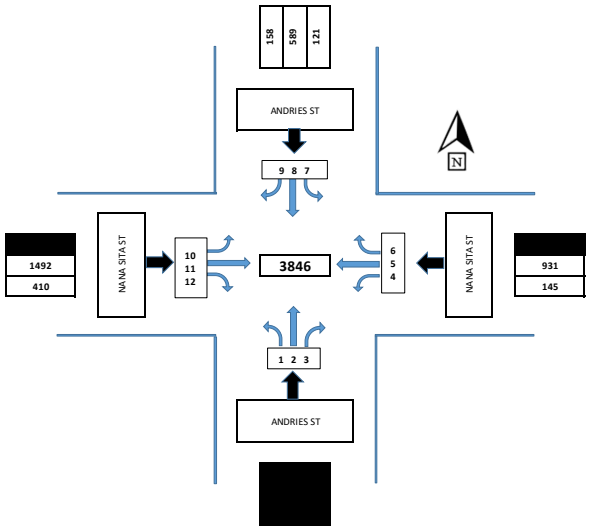
9.5 80 10



Peak time : 07:15 - 08:15 Background peak :



Peak time : 12:00 - 13:00 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 9H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	13	96	-	6	213	19	-	177	164	688
06:15	06:30	-	-	-	12	81	-	20	227	20	-	217	174	751
06:30	06:45	-	-	-	20	131	-	8	212	27	-	275	184	857
06:45	07:00	-	-	-	21	154	-	22	204	32	-	337	185	955
07:00	07:15	-	-	-	26	180	-	20	214	34	-	349	106	929
07:15	07:30	-	-	-	46	213	-	32	257	31	-	395	137	1 111
07:30	07:45	-	-	-	35	194	-	25	223	32	-	377	125	1 011
07:45	08:00	-	-	-	28	225	-	23	184	22	-	392	111	985
08:00	08:15	-	-	-	41	204	-	31	211	18	-	380	117	1 002
08:15	08:30	-	-	-	23	219	-	28	195	22	-	346	110	943
08:30	08:45	-	-	-	32	233	-	20	138	22	-	348	107	900
08:45	09:00	-	-	-	27	209	-	27	157	36	-	387	109	952
TOTALS		-	-	-	324	2 139	-	262	2 435	315	-	3 980	1 629	11 084

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	0	0	0	150	836	0	111	875	103	0	1544	490	4 109

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	23	192	-	33	167	34	-	330	93	872
09:15	09:30	-	-	-	32	196	-	10	148	36	-	283	85	790
09:30	09:45	-	-	-	23	191	-	19	152	32	-	289	97	803
09:45	10:00	-	-	-	24	213	-	26	130	32	-	308	93	826
10:00	10:15	-	-	-	24	190	-	34	142	31	-	296	84	801
10:15	10:30	-	-	-	17	186	-	22	149	63	-	310	83	830
10:30	10:45	-	-	-	28	193	-	28	118	43	-	292	81	783
10:45	11:00	-	-	-	30	186	-	48	138	49	-	287	80	818
11:00	11:15	-	-	-	19	191	-	41	179	41	-	294	82	847
11:15	11:30	-	-	-	30	195	-	33	126	31	-	317	99	831
11:30	11:45	-	-	-	23	189	-	61	150	40	-	312	106	881
11:45	12:00	-	-	-	29	209	-	48	120	33	-	351	94	884
12:00	12:15	-	-	-	27	171	-	66	146	45	-	347	102	904
12:15	12:30	-	-	-	22	208	-	60	175	40	-	315	122	942
12:30	12:45	-	-	-	31	229	-	68	184	45	-	348	99	1 004
12:45	13:00	-	-	-	24	173	-	64	186	48	-	317	90	902
13:00	13:15	-	-	-	32	191	-	29	146	38	-	326	116	878
13:15	13:30	-	-	-	21	195	-	38	153	37	-	320	81	845
13:30	13:45	-	-	-	23	203	-	36	169	40	-	291	92	854
13:45	14:00	-	-	-	18	183	-	39	154	42	-	321	82	839
14:00	14:15	-	-	-	21	199	-	25	148	29	-	315	84	821
14:15	14:30	-	-	-	26	217	-	16	129	25	-	312	95	820
14:30	14:45	-	-	-	25	177	-	39	158	37	-	344	94	874
14:45	15:00	-	-	-	27	205	-	35	160	41	-	328	94	890
TOTALS		-	-	-	599	4 682	-	918	3 627	932	-	7 553	2 228	20 539

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
12:00	13:00	0	0	0	104	781	0	258	691	178	0	1327	413	3 752

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	18	187	-	34	200	36	-	333	70	878
15:15	15:30	-	-	-	25	205	-	41	149	53	-	352	105	930
15:30	15:45	-	-	-	38	234	-	33	127	42	-	399	104	977
15:45	16:00	-	-	-	41	236	-	23	189	42	-	376	97	1 004
16:00	16:15	-	-	-	41	256	-	24	124	21	-	365	104	935
16:15	16:30	-	-	-	38	213	-	8	181	37	-	333	109	919
16:30	16:45	-	-	-	39	214	-	41	161	32	-	371	111	969
16:45	17:00	-	-	-	55	183	-	26	117	21	-	352	59	813
17:00	17:15	-	-	-	58	196	-	30	100	17	-	343	97	841
17:15	17:30	-	-	-	54	208	-	24	130	9	-	314	72	811
17:30	17:45	-	-	-	56	226	-	14	147	21	-	327	80	871
17:45	18:00	-	-	-	42	160	-	22	149	19	-	290	93	775
TOTALS		-	-	-	505	2 518	-	320	1 774	350	-	4 155	1 101	10 723

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	0	0	0	145	931	0	121	589	158	0	1492	410	3 846

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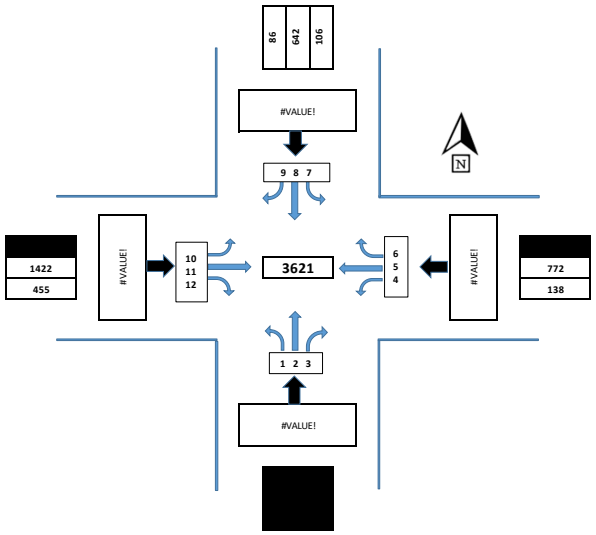
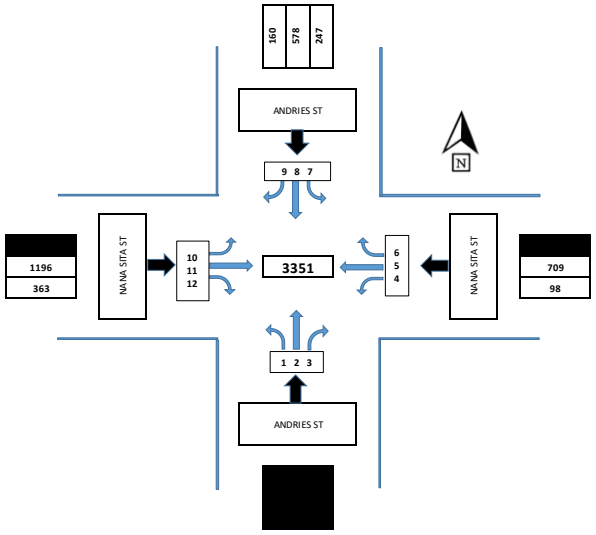
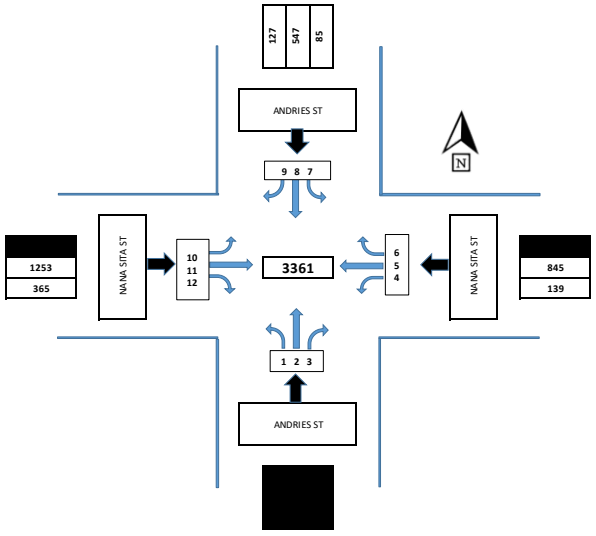
SITE LOCATION:	UNITRAF HQ	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P2	



Peak time : 07:15 - 08:15 Background peak :



Peak time : 12:00 - 13:00 Background peak :



Peak time : 15:45 - 16:45 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	11	84	-	6	162	14	-	146	140	563
06:15	06:30	-	-	-	9	72	-	18	169	14	-	182	165	629
06:30	06:45	-	-	-	16	114	-	8	153	19	-	236	171	717
06:45	07:00	-	-	-	18	140	-	22	143	22	-	293	176	814
07:00	07:15	-	-	-	23	167	-	18	148	26	-	302	98	782
07:15	07:30	-	-	-	43	200	-	32	178	24	-	364	133	974
07:30	07:45	-	-	-	32	175	-	23	174	28	-	344	113	889
07:45	08:00	-	-	-	27	205	-	21	130	19	-	369	103	874
08:00	08:15	-	-	-	36	192	-	30	160	15	-	345	106	884
08:15	08:30	-	-	-	19	201	-	24	145	17	-	317	104	827
08:30	08:45	-	-	-	28	210	-	20	106	19	-	303	97	783
08:45	09:00	-	-	-	22	181	-	27	114	30	-	335	104	813
TOTALS		-	-	-	284	1 941	-	249	1 782	247	-	3 536	1 510	9 549

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	0	0	0	138	772	0	106	642	86	0	1422	455	3 621

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	21	170	-	32	129	28	-	292	84	756
09:15	09:30	-	-	-	27	177	-	9	112	27	-	259	75	686
09:30	09:45	-	-	-	19	172	-	18	123	28	-	259	82	701
09:45	10:00	-	-	-	22	188	-	24	106	29	-	273	83	725
10:00	10:15	-	-	-	23	177	-	34	121	29	-	277	78	739
10:15	10:30	-	-	-	16	173	-	21	119	59	-	274	71	733
10:30	10:45	-	-	-	24	176	-	26	96	34	-	270	71	697
10:45	11:00	-	-	-	28	170	-	44	115	47	-	260	72	736
11:00	11:15	-	-	-	13	175	-	38	137	37	-	264	71	735
11:15	11:30	-	-	-	28	179	-	31	102	29	-	295	88	752
11:30	11:45	-	-	-	22	177	-	56	127	36	-	285	93	796
11:45	12:00	-	-	-	26	186	-	47	103	30	-	311	81	784
12:00	12:15	-	-	-	25	154	-	60	126	39	-	316	87	807
12:15	12:30	-	-	-	21	184	-	60	147	36	-	283	107	838
12:30	12:45	-	-	-	28	207	-	67	152	43	-	311	92	900
12:45	13:00	-	-	-	24	164	-	60	153	42	-	286	77	806
13:00	13:15	-	-	-	25	172	-	26	122	35	-	296	109	785
13:15	13:30	-	-	-	19	177	-	38	130	35	-	289	68	756
13:30	13:45	-	-	-	20	188	-	34	136	37	-	268	84	767
13:45	14:00	-	-	-	12	164	-	33	119	34	-	286	66	714
14:00	14:15	-	-	-	21	180	-	22	129	26	-	268	70	716
14:15	14:30	-	-	-	**23**	**196**	-	**12**	**100**	**24**	-	**281**	**72**	708
14:30	14:45	-	-	-	**25**	**155**	-	**35**	**137**	**31**	-	**311**	**78**	772
14:45	15:00	-	-	-	**25**	**185**	-	**31**	**126**	**33**	-	**295**	**76**	771
TOTALS		-	-	-	537	4 246	-	858	2 967	828	-	6 809	1 935	18 180

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
12:00	13:00	0	0	0	98	709	0	247	578	160	0	1196	363	3 351

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	14	168	-	33	171	33	-	285	58	762
15:15	15:30	-	-	-	23	182	-	39	128	50	-	307	84	813
15:30	15:45	-	-	-	33	210	-	28	110	39	-	348	81	849
15:45	16:00	-	-	-	36	214	-	19	160	40	-	326	80	875
16:00	16:15	-	-	-	34	238	-	22	100	19	-	314	84	811
16:15	16:30	-	-	-	35	197	-	8	146	36	-	297	101	820
16:30	16:45	-	-	-	34	196	-	36	141	32	-	316	100	855
16:45	17:00	-	-	-	49	162	-	22	96	19	-	309	51	708
17:00	17:15	-	-	-	53	179	-	25	75	17	-	311	83	743
17:15	17:30	-	-	-	45	188	-	23	97	9	-	283	61	706
17:30	17:45	-	-	-	48	210	-	13	111	20	-	304	71	777
17:45	18:00	-	-	-	37	145	-	18	107	19	-	259	85	670
TOTALS		-	-	-	441	2 289	-	286	1 442	333	-	3 659	939	9 389

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:45	16:45	0	0	0	139	845	0	85	547	127	0	1253	365	3 361

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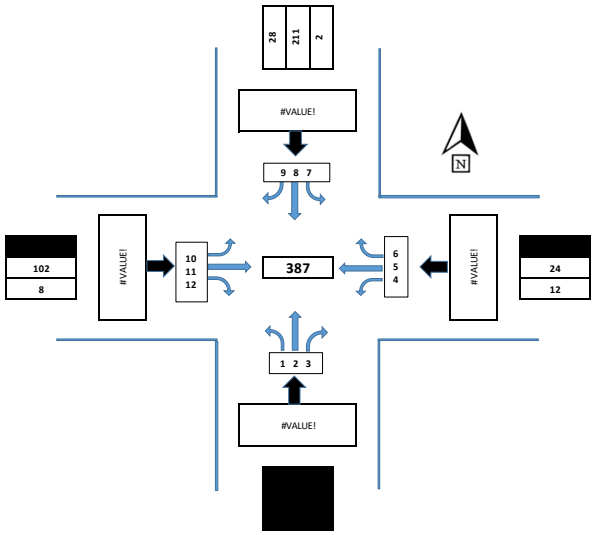
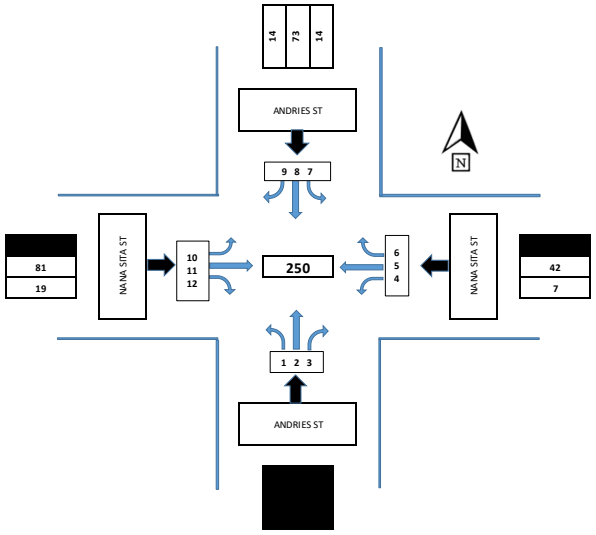
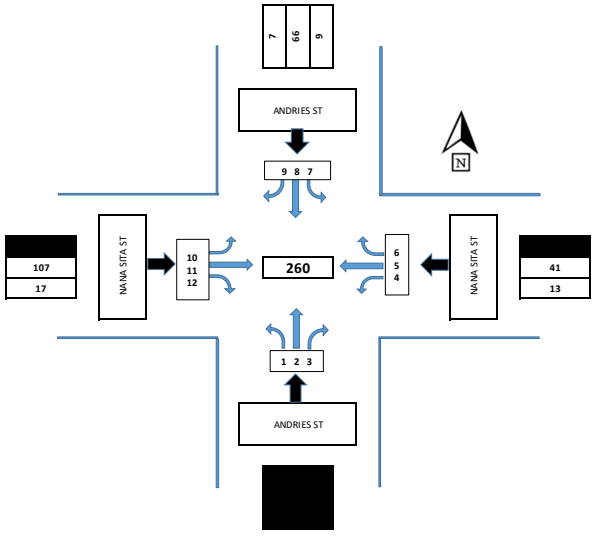
SITE LOCATION:	UNITRAF HQ	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P2	



Peak time : 06:30 - 07:30 Background peak :



Peak time : 13:45 - 14:45 Background peak :



Peak time : 15:00 - 16:00 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	2	6	-	-	38	4	-	17	6	73
06:15	06:30	-	-	-	1	3	-	2	50	6	-	19	3	84
06:30	06:45	-	-	-	4	6	-	-	47	8	-	22	3	90
06:45	07:00	-	-	-	2	6	-	-	50	9	-	30	3	100
07:00	07:15	-	-	-	3	7	-	2	52	6	-	29	1	100
07:15	07:30	-	-	-	3	5	-	-	62	5	-	21	1	97
07:30	07:45	-	-	-	3	7	-	1	44	4	-	17	1	77
07:45	08:00	-	-	-	1	9	-	2	44	3	-	12	1	72
08:00	08:15	-	-	-	3	3	-	1	46	3	-	12	3	71
08:15	08:30	-	-	-	3	3	-	2	43	4	-	12	1	68
08:30	08:45	-	-	-	3	11	-	-	30	3	-	19	4	70
08:45	09:00	-	-	-	3	13	-	-	35	3	-	24	2	80
TOTALS		-	-	-	31	79	-	10	541	58	-	234	29	982

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:30	07:30	0	0	0	12	24	0	2	211	28	0	102	8	387

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	2	5	-	1	28	4	-	16	-	56
09:15	09:30	-	-	-	3	11	-	1	25	7	-	13	1	61
09:30	09:45	-	-	-	3	12	-	-	23	3	-	12	4	57
09:45	10:00	-	-	-	1	10	-	-	18	2	-	16	3	50
10:00	10:15	-	-	-	1	4	-	-	15	1	-	10	1	32
10:15	10:30	-	-	-	1	5	-	1	21	4	-	20	5	57
10:30	10:45	-	-	-	3	7	-	2	20	7	-	5	2	46
10:45	11:00	-	-	-	1	7	-	4	19	-	-	10	3	44
11:00	11:15	-	-	-	3	6	-	2	32	3	-	12	4	62
11:15	11:30	-	-	-	1	8	-	2	16	1	-	7	5	40
11:30	11:45	-	-	-	1	5	-	4	16	3	-	10	3	42
11:45	12:00	-	-	-	2	14	-	1	13	1	-	14	2	47
12:00	12:15	-	-	-	2	2	-	3	17	3	-	15	2	44
12:15	12:30	-	-	-	1	7	-	-	20	3	-	9	8	48
12:30	12:45	-	-	-	2	13	-	1	26	1	-	19	3	65
12:45	13:00	-	-	-	-	5	-	3	24	4	-	17	3	56
13:00	13:15	-	-	-	4	6	-	2	12	2	-	18	1	45
13:15	13:30	-	-	-	2	11	-	-	17	2	-	18	1	51
13:30	13:45	-	-	-	3	7	-	1	23	-	-	10	3	47
13:45	14:00	-	-	-	4	7	-	5	23	5	-	20	4	68
14:00	14:15	-	-	-	-	12	-	3	12	3	-	26	5	61
14:15	14:30	-	-	-	**3**	**11**	-	**4**	**21**	-	-	**16**	**4**	59
14:30	14:45	-	-	-	-	**12**	-	**2**	**17**	**6**	-	**19**	**6**	62
14:45	15:00	-	-	-	**2**	**11**	-	**3**	**28**	**5**	-	**13**	**4**	66
TOTALS		-	-	-	45	198	-	45	486	70	-	345	77	1 266

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
13:45	14:45	0	0	0	7	42	0	14	73	14	0	81	19	250

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	3	13	-	1	19	2	-	28	4	70
15:15	15:30	-	-	-	2	7	-	2	15	1	-	25	6	58
15:30	15:45	-	-	-	4	12	-	3	8	2	-	23	3	55
15:45	16:00	-	-	-	4	9	-	3	24	2	-	31	4	77
16:00	16:15	-	-	-	4	7	-	2	17	1	-	20	4	55
16:15	16:30	-	-	-	1	5	-	-	27	1	-	20	-	54
16:30	16:45	-	-	-	3	5	-	3	13	-	-	29	2	55
16:45	17:00	-	-	-	5	8	-	2	14	1	-	26	2	58
17:00	17:15	-	-	-	5	5	-	3	20	-	-	20	2	55
17:15	17:30	-	-	-	7	9	-	1	20	-	-	19	1	57
17:30	17:45	-	-	-	5	8	-	1	28	1	-	16	1	60
17:45	18:00	-	-	-	2	7	-	4	37	-	-	22	4	76
TOTALS		-	-	-	45	95	-	25	242	11	-	279	33	730

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	16:00	0	0	0	13	41	0	9	66	7	0	107	17	260

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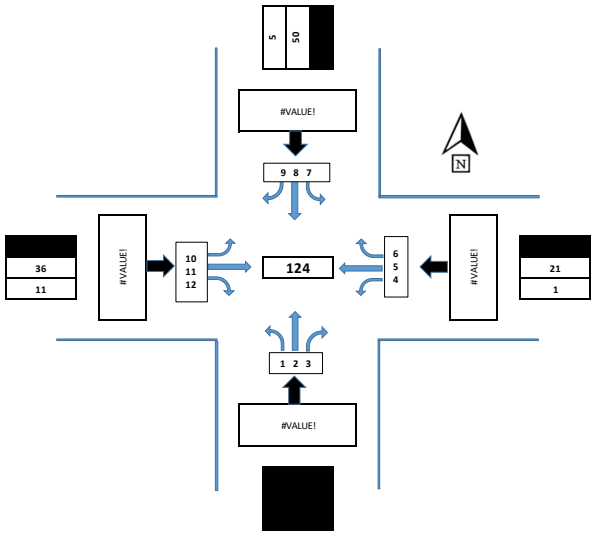
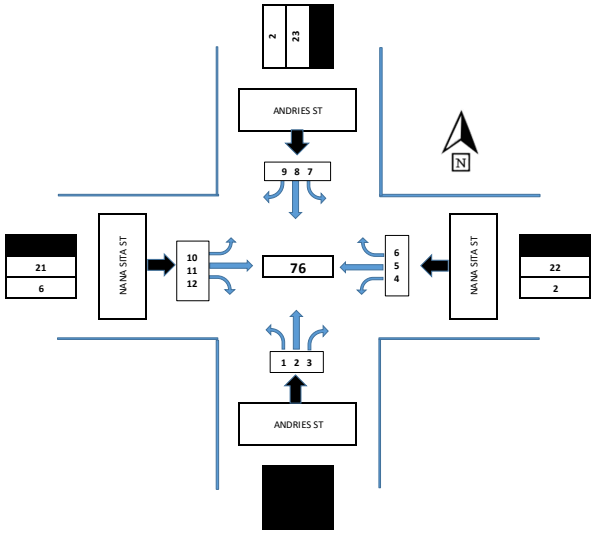
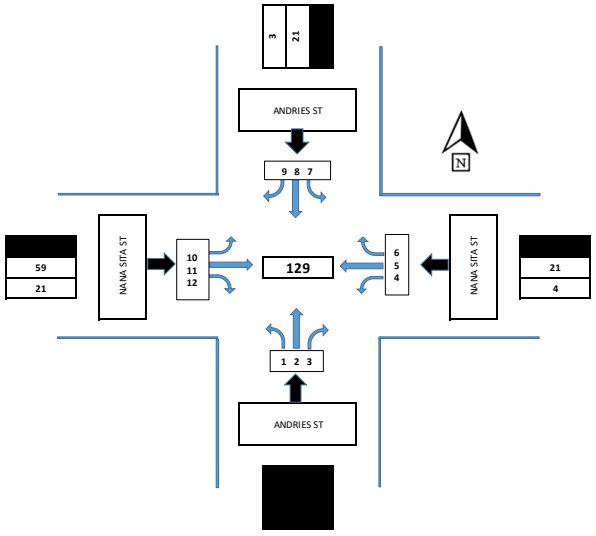
SITE LOCATION:	UNITRAF HQ	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P2	



Peak time : 06:30 - 07:30 Background peak :



Peak time : 09:00 - 10:00 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	4	-	-	11	1	-	10	4	30
06:15	06:30	-	-	-	1	4	-	-	6	-	-	9	-	20
06:30	06:45	-	-	-	-	5	-	-	12	-	-	12	6	35
06:45	07:00	-	-	-	1	5	-	-	10	1	-	7	3	27
07:00	07:15	-	-	-	-	4	-	-	14	2	-	11	1	32
07:15	07:30	-	-	-	-	7	-	-	14	2	-	6	1	30
07:30	07:45	-	-	-	-	10	-	1	5	-	-	7	1	24
07:45	08:00	-	-	-	-	6	-	-	6	-	-	9	2	23
08:00	08:15	-	-	-	1	7	-	-	5	-	-	10	2	25
08:15	08:30	-	-	-	1	12	-	-	3	1	-	9	1	27
08:30	08:45	-	-	-	1	4	-	-	2	-	-	12	-	19
08:45	09:00	-	-	-	1	6	-	-	6	1	-	8	1	23
TOTALS		-	-	-	6	74	-	1	94	8	-	110	22	315

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:30	07:30	0	0	0	1	21	0	0	50	5	0	36	11	124

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	11	-	-	8	1	-	4	2	26
09:15	09:30	-	-	-	1	2	-	-	5	-	-	5	2	15
09:30	09:45	-	-	-	-	4	-	-	5	-	-	8	1	18
09:45	10:00	-	-	-	1	5	-	-	5	1	-	4	1	17
10:00	10:15	-	-	-	-	1	-	-	3	1	-	2	1	8
10:15	10:30	-	-	-	-	-	-	-	2	-	-	3	1	6
10:30	10:45	-	-	-	-	2	-	-	2	1	-	6	2	13
10:45	11:00	-	-	-	-	4	-	-	4	-	-	3	-	11
11:00	11:15	-	-	-	2	1	-	1	5	-	-	4	-	13
11:15	11:30	-	-	-	-	3	-	-	2	-	-	6	-	11
11:30	11:45	-	-	-	-	4	-	-	2	-	-	5	1	12
11:45	12:00	-	-	-	-	1	-	-	1	2	-	3	3	10
12:00	12:15	-	-	-	-	2	-	1	2	-	-	4	-	9
12:15	12:30	-	-	-	-	5	-	-	4	-	-	7	1	17
12:30	12:45	-	-	-	1	-	-	-	4	-	-	6	2	13
12:45	13:00	-	-	-	-	1	-	-	4	-	-	4	2	11
13:00	13:15	-	-	-	1	3	-	-	6	-	-	2	2	14
13:15	13:30	-	-	-	-	1	-	-	4	-	-	4	-	9
13:30	13:45	-	-	-	-	-	-	-	4	3	-	7	1	15
13:45	14:00	-	-	-	1	1	-	-	8	-	-	6	2	18
14:00	14:15	-	-	-	-	3	-	-	1	-	-	8	-	12
14:15	14:30	-	-	-	-	**3**	-	-	**3**	**1**	-	**6**	**2**	15
14:30	14:45	-	-	-	-	**3**	-	**1**	**4**	-	-	**9**	-	17
14:45	15:00	-	-	-	-	**6**	-	-	**3**	**1**	-	**5**	**3**	18
TOTALS		-	-	-	7	66	-	3	91	11	-	121	29	328

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	10:00	0	0	0	2	22	0	0	23	2	0	21	6	76

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	1	3	-	-	9	-	-	15	1	29
15:15	15:30	-	-	-	-	6	-	-	6	2	-	9	4	27
15:30	15:45	-	-	-	1	6	-	-	7	-	-	17	8	39
15:45	16:00	-	-	-	1	5	-	-	4	-	-	11	7	28
16:00	16:15	-	-	-	2	4	-	-	4	1	-	22	2	35
16:15	16:30	-	-	-	1	8	-	-	4	-	-	10	1	24
16:30	16:45	-	-	-	1	5	-	-	5	-	-	10	-	21
16:45	17:00	-	-	-	1	10	-	2	6	1	-	7	-	27
17:00	17:15	-	-	-	-	7	-	-	2	-	-	6	2	17
17:15	17:30	-	-	-	2	6	-	-	9	-	-	4	1	22
17:30	17:45	-	-	-	3	4	-	-	6	-	-	6	1	20
17:45	18:00	-	-	-	2	4	-	-	3	-	-	5	-	14
TOTALS		-	-	-	15	68	-	2	65	4	-	122	27	303

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	0	0	0	4	21	0	0	21	3	0	59	21	129

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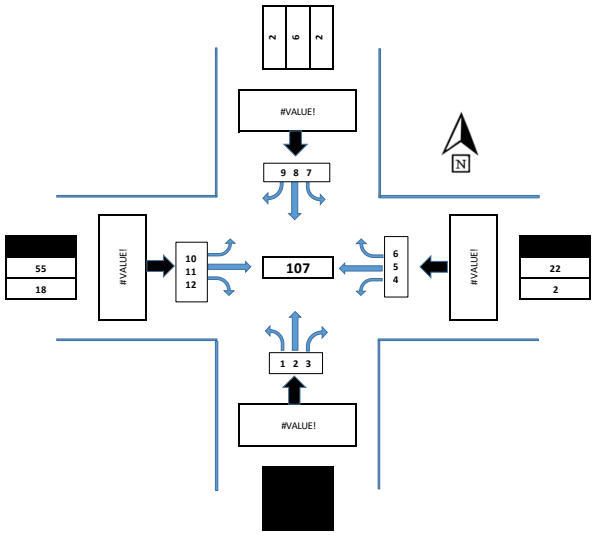
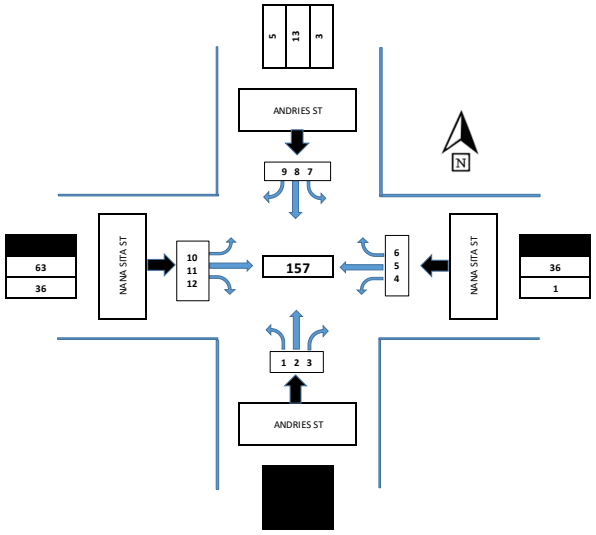
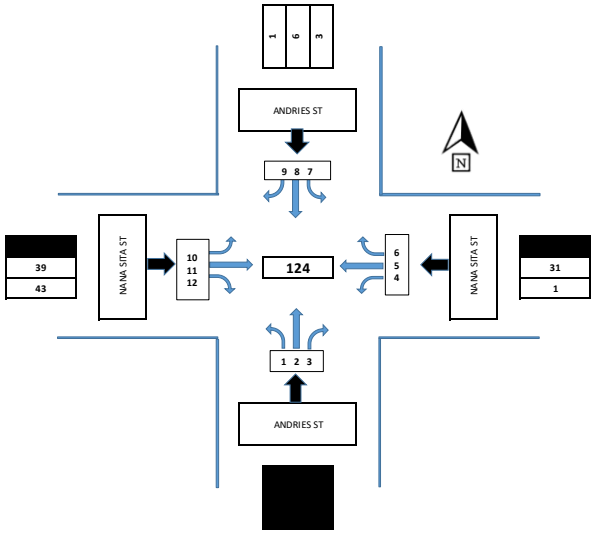
SITE LOCATION:	UNITRAF HQ	JOB NR:	UT2019-522	DRAWN:	HF
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P2	



Peak time : 08:00 - 09:00 Background peak :



Peak time : 11:30 - 12:30 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	2	-	-	2	-	-	4	14	22
06:15	06:30	-	-	-	1	2	-	-	2	-	-	7	6	18
06:30	06:45	-	-	-	-	6	-	-	-	-	-	5	4	15
06:45	07:00	-	-	-	-	3	-	-	1	-	-	7	3	14
07:00	07:15	-	-	-	-	2	-	-	-	-	-	7	6	15
07:15	07:30	-	-	-	-	1	-	-	3	-	-	4	2	10
07:30	07:45	-	-	-	-	2	-	-	-	-	-	9	10	21
07:45	08:00	-	-	-	-	5	-	-	4	-	-	2	5	16
08:00	08:15	-	-	-	1	2	-	-	-	-	-	13	6	22
08:15	08:30	-	-	-	-	3	-	2	4	-	-	8	4	21
08:30	08:45	-	-	-	-	8	-	-	-	-	-	14	6	28
08:45	09:00	-	-	-	1	9	-	-	2	2	-	20	2	36
TOTALS		-	-	-	3	45	-	2	18	2	-	100	68	238

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	0	0	0	2	22	0	2	6	2	0	55	18	107

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	6	-	-	2	1	-	18	7	34
09:15	09:30	-	-	-	1	6	-	-	6	2	-	6	7	28
09:30	09:45	-	-	-	1	3	-	1	1	1	-	10	10	27
09:45	10:00	-	-	-	-	10	-	2	1	-	-	15	6	34
10:00	10:15	-	-	-	-	8	-	-	3	-	-	7	4	22
10:15	10:30	-	-	-	-	8	-	-	7	-	-	13	6	34
10:30	10:45	-	-	-	1	8	-	-	-	1	-	11	6	27
10:45	11:00	-	-	-	1	5	-	-	-	2	-	14	5	27
11:00	11:15	-	-	-	1	9	-	-	5	1	-	14	7	37
11:15	11:30	-	-	-	1	5	-	-	6	1	-	9	6	28
11:30	11:45	-	-	-	-	3	-	1	5	1	-	12	9	31
11:45	12:00	-	-	-	1	8	-	-	3	-	-	23	8	43
12:00	12:15	-	-	-	-	13	-	2	1	3	-	12	13	44
12:15	12:30	-	-	-	-	12	-	-	4	1	-	16	6	39
12:30	12:45	-	-	-	-	9	-	-	2	1	-	12	2	26
12:45	13:00	-	-	-	-	3	-	1	5	2	-	10	8	29
13:00	13:15	-	-	-	2	10	-	1	6	1	-	10	4	34
13:15	13:30	-	-	-	-	6	-	-	2	-	-	9	12	29
13:30	13:45	-	-	-	-	8	-	1	6	-	-	6	4	25
13:45	14:00	-	-	-	1	11	-	1	4	3	-	9	10	39
14:00	14:15	-	-	-	-	4	-	-	6	-	-	13	9	32
14:15	14:30	-	-	-	-	7	-	-	5	-	-	9	17	38
14:30	14:45	-	-	-	-	7	-	1	-	-	-	5	10	23
14:45	15:00	-	-	-	-	3	-	1	3	2	-	15	11	35
TOTALS		-	-	-	10	172	-	12	83	23	-	278	187	765

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:30	12:30	0	0	0	1	36	0	3	13	5	0	63	36	157

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	3	-	-	1	1	-	5	7	17
15:15	15:30	-	-	-	-	10	-	-	-	-	-	11	11	32
15:30	15:45	-	-	-	-	6	-	2	2	1	-	11	12	34
15:45	16:00	-	-	-	-	8	-	1	1	-	-	8	6	24
16:00	16:15	-	-	-	1	7	-	-	3	-	-	9	14	34
16:15	16:30	-	-	-	1	3	-	-	4	-	-	6	7	21
16:30	16:45	-	-	-	1	8	-	2	2	-	-	16	9	38
16:45	17:00	-	-	-	-	3	-	-	1	-	-	10	6	20
17:00	17:15	-	-	-	-	5	-	2	3	-	-	6	10	26
17:15	17:30	-	-	-	-	5	-	-	4	-	-	8	9	26
17:30	17:45	-	-	-	-	4	-	-	2	-	-	1	7	14
17:45	18:00	-	-	-	1	4	-	-	2	-	-	4	4	15
TOTALS		-	-	-	4	66	-	7	25	2	-	95	102	301

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	0	0	0	1	31	0	3	6	1	0	39	43	124

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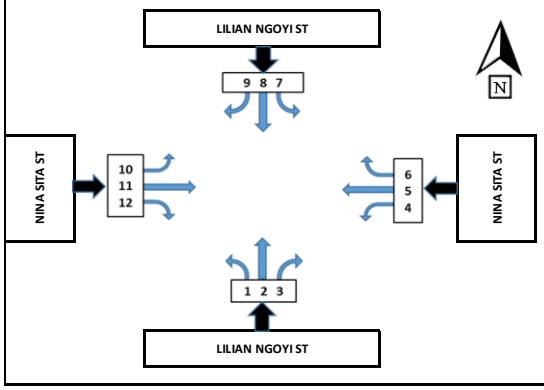
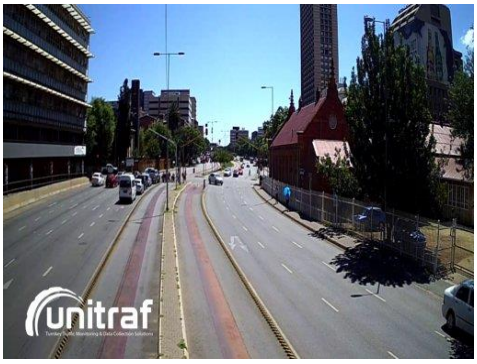
SITE LOCATION:	**UNI PTA**	**JOB NR:**	UT2019-522	**DRAWN:**	**A.A**
SURVEY DATE:	Thursday, 28 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P3	





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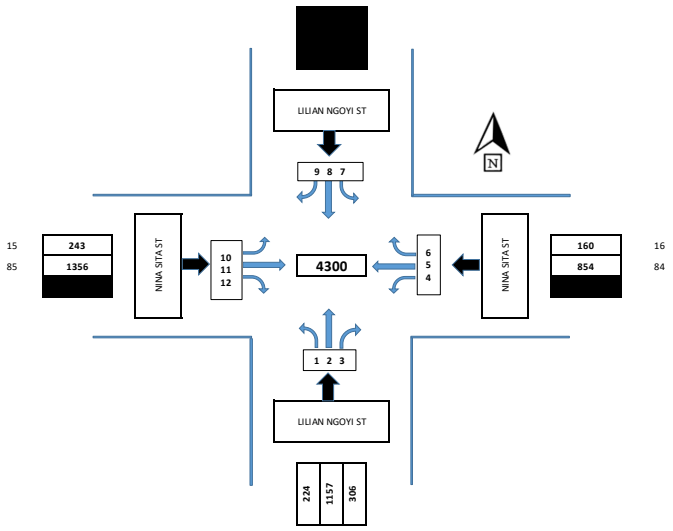
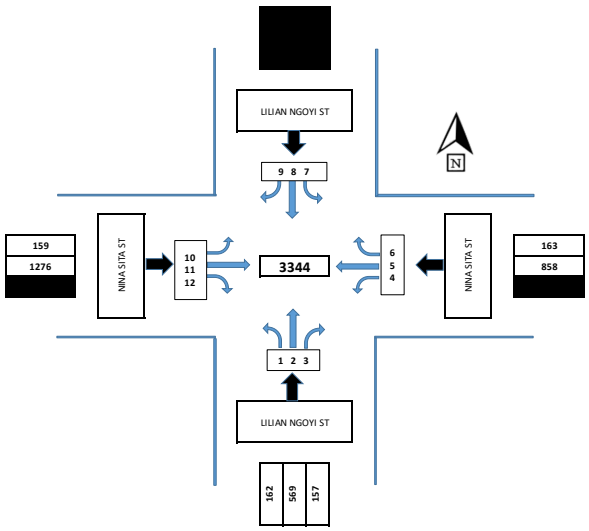
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	A.A
SURVEY DATE:	Thursday, 28 February 2019	DWG TITLE:	UT2019-522-UNI PTA		
SURVEY TIMES:	06H00-18H00	JOB TITLE:	UNI PTA-TRAFFIC COUNT		
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:	UT2019-522-P3		

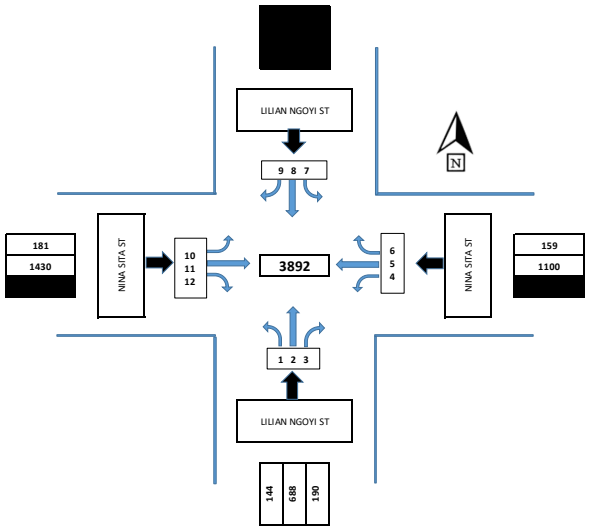
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 07:15 - 08:15 Background peak :



Peak time : 14:00 - 15:00 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 9H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	20	114	14	-	89	9	-	-	-	27	162	-	435
06:15	06:30	12	151	28	-	92	10	-	-	-	29	212	-	534
06:30	06:45	25	176	56	-	142	16	-	-	-	30	262	-	707
06:45	07:00	31	209	49	-	166	16	-	-	-	44	322	-	837
07:00	07:15	38	264	52	-	200	29	-	-	-	57	311	-	951
07:15	07:30	52	299	79	-	209	35	-	-	-	67	356	-	1 097
07:30	07:45	56	296	89	-	225	45	-	-	-	52	329	-	1 092
07:45	08:00	63	299	77	-	206	39	-	-	-	68	334	-	1 086
08:00	08:15	53	263	61	-	214	41	-	-	-	56	337	-	1 025
08:15	08:30	51	261	64	-	206	44	-	-	-	51	316	-	993
08:30	08:45	52	238	47	-	228	43	-	-	-	56	301	-	965
08:45	09:00	42	212	36	-	213	39	-	-	-	43	329	-	914
TOTALS		495	2 782	652	-	2 190	366	-	-	-	580	3 571	-	10 636

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	224	1157	306	0	854	160	0	0	0	243	1356	0	4 300

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	36	184	31	-	172	35	-	-	-	50	284	-	792
09:15	09:30	43	180	41	-	188	34	-	-	-	41	241	-	768
09:30	09:45	34	146	34	-	164	36	-	-	-	43	271	-	728
09:45	10:00	43	157	29	-	200	36	-	-	-	52	285	-	802
10:00	10:15	29	140	37	-	174	29	-	-	-	44	274	-	727
10:15	10:30	38	128	20	-	180	37	-	-	-	41	296	-	740
10:30	10:45	30	135	29	-	177	30	-	-	-	35	296	-	732
10:45	11:00	33	165	36	-	185	34	-	-	-	63	257	-	773
11:00	11:15	30	151	27	-	167	29	-	-	-	53	292	-	749
11:15	11:30	47	132	27	-	174	37	-	-	-	42	315	-	774
11:30	11:45	33	140	33	-	173	40	-	-	-	42	317	-	778
11:45	12:00	40	147	23	-	197	43	-	-	-	45	327	-	822
12:00	12:15	36	149	29	-	173	47	-	-	-	42	333	-	809
12:15	12:30	34	116	22	-	208	56	-	-	-	36	327	-	799
12:30	12:45	47	150	36	-	222	40	-	-	-	51	318	-	864
12:45	13:00	34	119	32	-	186	44	-	-	-	36	326	-	777
13:00	13:15	34	134	31	-	184	46	-	-	-	43	317	-	789
13:15	13:30	37	132	27	-	210	31	-	-	-	43	307	-	787
13:30	13:45	26	159	38	-	221	46	-	-	-	48	298	-	836
13:45	14:00	31	147	34	-	204	50	-	-	-	56	303	-	825
14:00	14:15	39	134	39	-	191	46	-	-	-	54	314	-	817
14:15	14:30	28	140	43	-	224	37	-	-	-	35	305	-	812
14:30	14:45	45	131	38	-	212	31	-	-	-	37	324	-	818
14:45	15:00	50	164	37	-	231	49	-	-	-	33	333	-	897
TOTALS		877	3 480	773	-	4 617	943	-	-	-	1 065	7 260	-	19 015

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
14:00	15:00	162	569	157	0	858	163	0	0	0	159	1276	0	3 344

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	33	194	42	-	234	44	-	-	-	38	352	-	937
15:15	15:30	35	153	47	-	260	38	-	-	-	53	328	-	914
15:30	15:45	29	159	45	-	246	45	-	-	-	49	387	-	960
15:45	16:00	42	183	51	-	272	36	-	-	-	46	353	-	983
16:00	16:15	38	193	47	-	322	40	-	-	-	33	362	-	1 035
16:15	16:30	35	184	45	-	245	37	-	-	-	54	312	-	912
16:30	16:45	39	182	43	-	243	31	-	-	-	55	356	-	949
16:45	17:00	38	200	44	-	239	60	-	-	-	49	327	-	957
17:00	17:15	28	213	42	-	258	45	-	-	-	44	328	-	958
17:15	17:30	34	196	30	-	261	45	-	-	-	35	308	-	909
17:30	17:45	29	195	49	-	241	36	-	-	-	47	300	-	897
17:45	18:00	21	177	39	-	175	34	-	-	-	51	271	-	768
TOTALS		401	2 229	524	-	2 996	491	-	-	-	554	3 984	-	11 179

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	144	688	190	0	1100	159	0	0	0	181	1430	0	3 892

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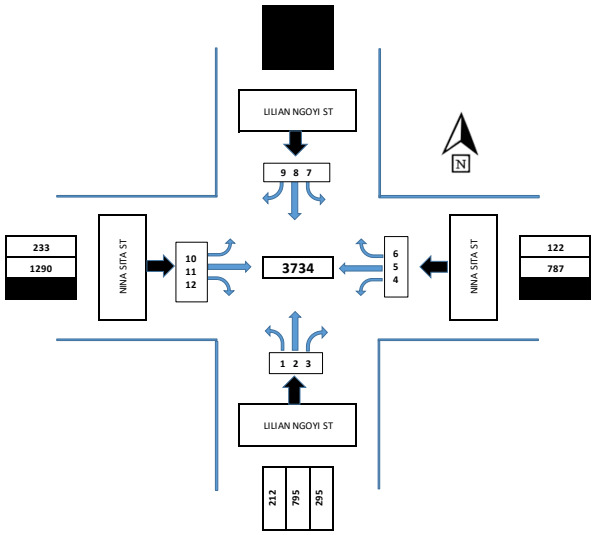
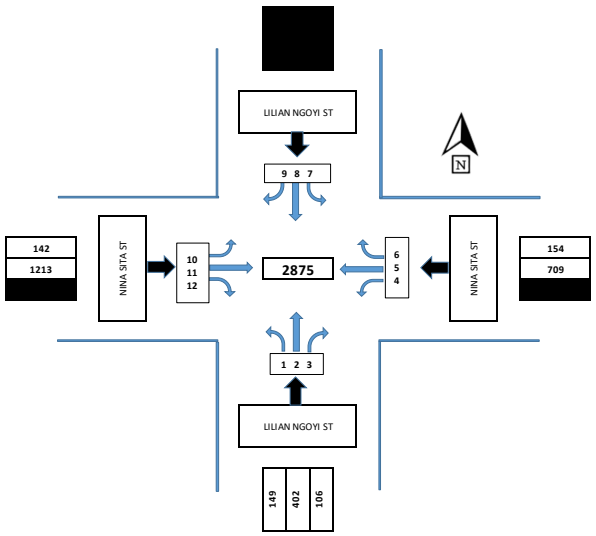
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	A.A
SURVEY DATE:	Thursday, 28 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P3	

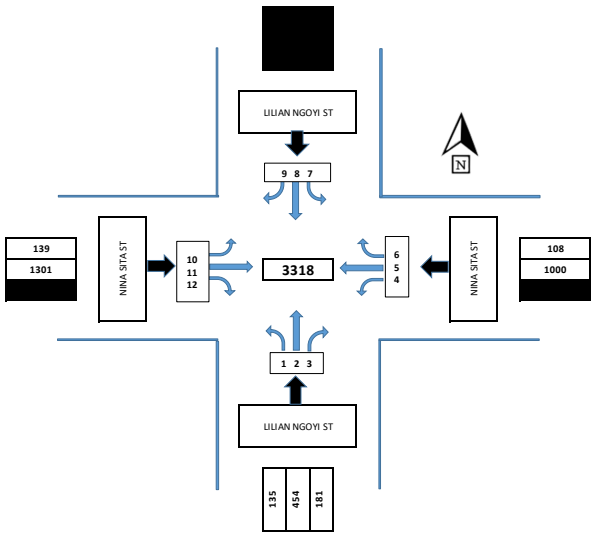
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 07:15 - 08:15 Background peak :



Peak time : 11:45 - 12:45 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	16	65	12	-	80	4	-	-	-	16	148	-	341
06:15	06:30	8	92	24	-	84	5	-	-	-	17	196	-	426
06:30	06:45	24	106	55	-	122	9	-	-	-	26	244	-	586
06:45	07:00	28	135	47	-	154	7	-	-	-	34	302	-	707
07:00	07:15	38	166	50	-	187	24	-	-	-	57	286	-	808
07:15	07:30	46	209	74	-	199	29	-	-	-	67	341	-	965
07:30	07:45	54	208	87	-	203	34	-	-	-	52	314	-	952
07:45	08:00	59	206	76	-	188	27	-	-	-	63	320	-	939
08:00	08:15	53	172	58	-	197	32	-	-	-	51	315	-	878
08:15	08:30	46	184	58	-	190	30	-	-	-	46	294	-	848
08:30	08:45	46	173	42	-	203	29	-	-	-	43	277	-	813
08:45	09:00	33	153	35	-	187	23	-	-	-	33	297	-	761
TOTALS		451	1 869	618	-	1 994	253	-	-	-	505	3 334	-	9 024

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	212	795	295	0	787	122	0	0	0	233	1290	0	3 734

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	31	114	30	-	155	27	-	-	-	40	258	-	655
09:15	09:30	39	125	39	-	170	28	-	-	-	34	224	-	659
09:30	09:45	30	96	33	-	143	29	-	-	-	37	248	-	616
09:45	10:00	40	119	28	-	182	28	-	-	-	44	259	-	700
10:00	10:15	27	101	34	-	162	23	-	-	-	38	264	-	649
10:15	10:30	34	90	19	-	166	30	-	-	-	35	268	-	642
10:30	10:45	28	98	28	-	156	19	-	-	-	29	281	-	639
10:45	11:00	30	120	34	-	171	25	-	-	-	57	240	-	677
11:00	11:15	29	118	26	-	149	22	-	-	-	43	268	-	655
11:15	11:30	45	91	24	-	158	27	-	-	-	39	296	-	680
11:30	11:45	30	95	31	-	164	34	-	-	-	32	297	-	683
11:45	12:00	39	99	22	-	170	33	-	-	-	38	300	-	701
12:00	12:15	34	110	27	-	155	40	-	-	-	35	309	-	710
12:15	12:30	31	87	22	-	183	48	-	-	-	31	303	-	705
12:30	12:45	45	106	35	-	201	33	-	-	-	38	301	-	759
12:45	13:00	32	76	29	-	176	35	-	-	-	25	311	-	684
13:00	13:15	33	101	29	-	161	37	-	-	-	32	302	-	695
13:15	13:30	35	96	25	-	191	27	-	-	-	37	286	-	697
13:30	13:45	22	112	37	-	203	38	-	-	-	39	283	-	734
13:45	14:00	28	107	33	-	180	44	-	-	-	45	284	-	721
14:00	14:15	37	94	38	-	171	39	-	-	-	38	283	-	700
14:15	14:30	**24**	**97**	**41**	-	**206**	**29**	-	-	-	**25**	**283**	-	705
14:30	14:45	**41**	**90**	**31**	-	**193**	**21**	-	-	-	**29**	**302**	-	707
14:45	15:00	**45**	**103**	**36**	-	**206**	**39**	-	-	-	**22**	**307**	-	758
TOTALS		809	2 445	731	-	4 172	755	-	-	-	862	6 757	-	16 531

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:45	12:45	149	402	106	0	709	154	0	0	0	142	1213	0	2 875

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	30	135	42	-	216	34	-	-	-	25	325	-	807
15:15	15:30	33	108	45	-	231	26	-	-	-	40	304	-	787
15:30	15:45	29	100	43	-	224	29	-	-	-	40	353	-	818
15:45	16:00	40	121	48	-	246	27	-	-	-	30	323	-	835
16:00	16:15	33	125	45	-	299	26	-	-	-	29	321	-	878
16:15	16:30	32	110	43	-	224	31	-	-	-	43	296	-	779
16:30	16:45	37	97	40	-	230	21	-	-	-	38	324	-	787
16:45	17:00	36	118	40	-	219	49	-	-	-	33	306	-	801
17:00	17:15	26	125	35	-	236	31	-	-	-	30	308	-	791
17:15	17:30	31	117	24	-	245	34	-	-	-	22	286	-	759
17:30	17:45	28	114	45	-	217	22	-	-	-	40	289	-	755
17:45	18:00	20	108	36	-	154	21	-	-	-	37	259	-	635
TOTALS		375	1 378	486	-	2 741	351	-	-	-	407	3 694	-	9 432

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	135	454	181	0	1000	108	0	0	0	139	1301	0	3 318

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SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	A.A
SURVEY DATE:	Thursday, 28 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P3	

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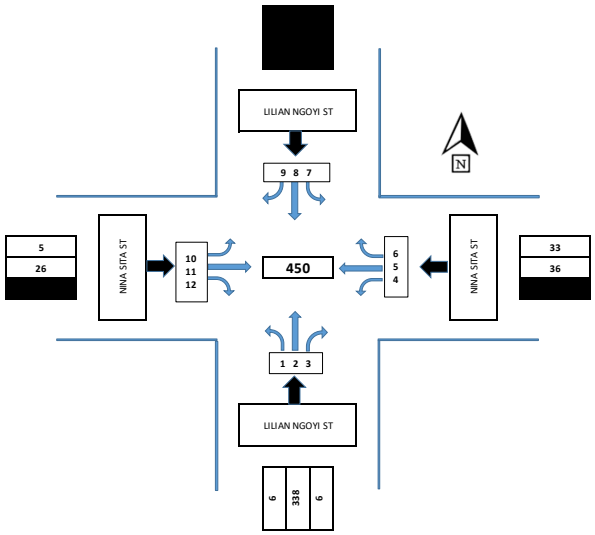
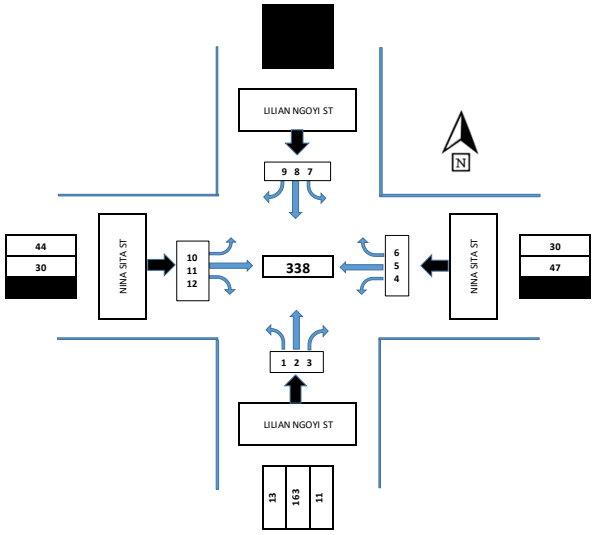
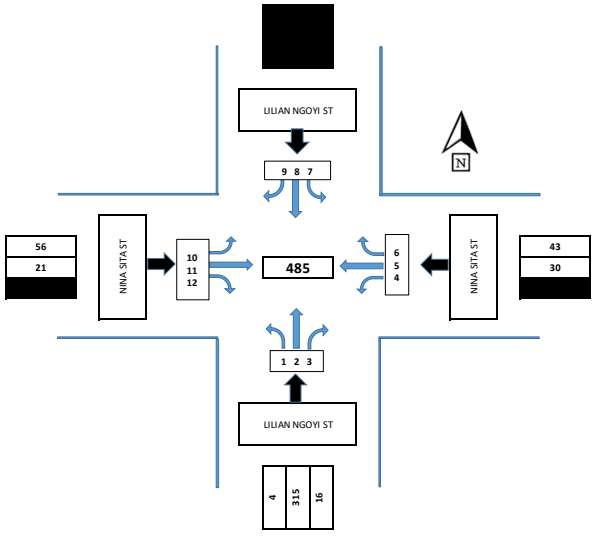


Peak time : 07:00 - 08:00 Background peak :



Peak time : 14:00 - 15:00 Background peak :



Peak time : 16:30 - 17:30 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	2	43	2	-	6	5	-	-	-	11	1	-	70
06:15	06:30	2	49	4	-	4	3	-	-	-	11	2	-	75
06:30	06:45	-	63	1	-	9	7	-	-	-	4	5	-	89
06:45	07:00	-	68	2	-	7	7	-	-	-	9	10	-	103
07:00	07:15	-	90	2	-	10	5	-	-	-	-	11	-	118
07:15	07:30	3	85	3	-	5	6	-	-	-	-	7	-	109
07:30	07:45	-	79	1	-	12	10	-	-	-	-	2	-	104
07:45	08:00	3	84	-	-	9	12	-	-	-	5	6	-	119
08:00	08:15	-	85	3	-	5	9	-	-	-	5	3	-	110
08:15	08:30	1	72	4	-	7	14	-	-	-	5	6	-	109
08:30	08:45	2	60	2	-	14	14	-	-	-	13	4	-	109
08:45	09:00	5	46	1	-	13	15	-	-	-	10	8	-	98
TOTALS		18	824	25	-	101	107	-	-	-	73	65	-	1 213

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:00	08:00	6	338	6	0	36	33	0	0	0	5	26	0	450

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	1	63	1	-	6	8	-	-	-	9	5	-	93
09:15	09:30	2	48	2	-	10	6	-	-	-	7	6	-	81
09:30	09:45	-	46	1	-	13	7	-	-	-	3	7	-	77
09:45	10:00	-	32	-	-	8	7	-	-	-	7	11	-	65
10:00	10:15	-	34	2	-	4	5	-	-	-	6	3	-	54
10:15	10:30	-	33	1	-	9	4	-	-	-	6	11	-	64
10:30	10:45	1	34	-	-	11	11	-	-	-	5	2	-	64
10:45	11:00	1	37	1	-	8	8	-	-	-	5	1	-	61
11:00	11:15	-	30	1	-	7	5	-	-	-	10	8	-	61
11:15	11:30	2	32	2	-	8	9	-	-	-	3	5	-	61
11:30	11:45	1	36	1	-	5	5	-	-	-	8	4	-	60
11:45	12:00	1	36	1	-	16	10	-	-	-	7	5	-	76
12:00	12:15	1	33	1	-	3	6	-	-	-	5	6	-	55
12:15	12:30	-	26	-	-	12	8	-	-	-	5	2	-	53
12:30	12:45	2	42	1	-	12	6	-	-	-	13	1	-	77
12:45	13:00	-	38	-	-	7	8	-	-	-	11	4	-	68
13:00	13:15	-	28	1	-	11	7	-	-	-	11	3	-	61
13:15	13:30	1	33	1	-	12	4	-	-	-	6	8	-	65
13:30	13:45	2	40	1	-	14	8	-	-	-	9	4	-	78
13:45	14:00	1	36	-	-	14	6	-	-	-	11	5	-	73
14:00	14:15	2	34	1	-	13	7	-	-	-	15	12	-	84
14:15	14:30	4	37	2	-	8	6	-	-	-	10	8	-	75
14:30	14:45	3	35	7	-	12	9	-	-	-	8	6	-	80
14:45	15:00	4	57	1	-	14	8	-	-	-	11	4	-	99
TOTALS		29	900	29	-	237	168	-	-	-	191	131	-	1 685

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
14:00	15:00	13	163	11	0	47	30	0	0	0	44	30	0	338

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	1	52	-	-	15	9	-	-	-	13	7	-	97
15:15	15:30	1	42	2	-	12	10	-	-	-	12	5	-	84
15:30	15:45	-	53	1	-	11	15	-	-	-	9	6	-	95
15:45	16:00	1	59	2	-	13	9	-	-	-	16	12	-	112
16:00	16:15	2	63	1	-	12	12	-	-	-	4	9	-	103
16:15	16:30	2	66	1	-	10	5	-	-	-	11	2	-	97
16:30	16:45	1	78	1	-	5	10	-	-	-	17	6	-	118
16:45	17:00	1	77	2	-	6	10	-	-	-	15	6	-	117
17:00	17:15	2	84	7	-	12	13	-	-	-	12	3	-	133
17:15	17:30	-	76	6	-	7	10	-	-	-	12	6	-	117
17:30	17:45	-	72	3	-	15	13	-	-	-	7	5	-	115
17:45	18:00	-	65	3	-	10	12	-	-	-	14	5	-	109
TOTALS		11	787	29	-	128	128	-	-	-	142	72	-	1 297

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
16:30	17:30	4	315	16	0	30	43	0	0	0	56	21	0	485

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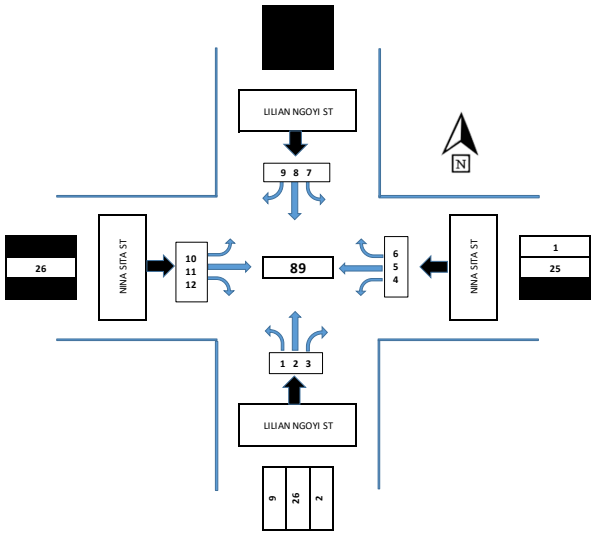
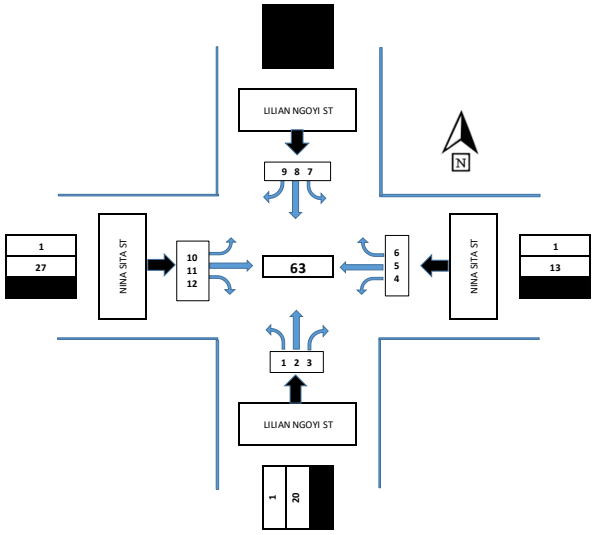
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	A.A
SURVEY DATE:	Thursday, 28 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P3	

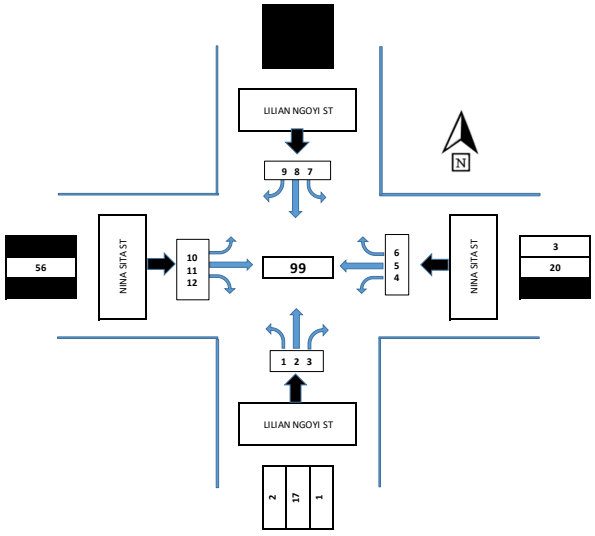
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 08:00 - 09:00 Background peak :



Peak time : 14:00 - 15:00 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	2	6	-	-	1	-	-	-	-	-	8	-	17
06:15	06:30	-	10	-	-	2	2	-	-	-	-	8	-	22
06:30	06:45	-	5	-	-	6	-	-	-	-	-	10	-	21
06:45	07:00	1	5	-	-	4	2	-	-	-	-	3	-	15
07:00	07:15	-	7	-	-	1	-	-	-	-	-	8	-	16
07:15	07:30	3	5	-	-	3	-	-	-	-	-	4	-	15
07:30	07:45	2	6	1	-	7	-	-	-	-	-	6	-	22
07:45	08:00	1	9	1	-	4	-	-	-	-	-	6	-	21
08:00	08:15	-	5	-	-	8	-	-	-	-	-	6	-	19
08:15	08:30	**4**	4	-	-	7	-	-	-	-	-	7	-	22
08:30	08:45	**1**	5	2	-	6	-	-	-	-	-	6	-	20
08:45	09:00	**4**	12	-	-	4	1	-	-	-	-	7	-	28
TOTALS		**18**	**79**	**4**	-	**53**	**5**	-	-	-	-	**79**	-	**238**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	**9**	**26**	**2**	**0**	**25**	**1**	**0**	**0**	**0**	**0**	**26**	**0**	**89**

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	2	5	-	-	8	-	-	-	-	1	3	-	19
09:15	09:30	1	4	-	-	2	-	-	-	-	-	5	-	12
09:30	09:45	1	4	-	-	6	-	-	-	-	1	7	-	19
09:45	10:00	1	5	-	-	3	-	-	-	-	-	2	-	11
10:00	10:15	-	5	1	-	1	-	-	-	-	-	2	-	9
10:15	10:30	1	2	-	-	-	1	-	-	-	-	3	-	7
10:30	10:45	-	2	-	-	1	-	-	-	-	1	4	-	8
10:45	11:00	-	8	1	-	1	-	-	-	-	-	3	-	13
11:00	11:15	-	2	-	-	3	-	-	-	-	-	2	-	7
11:15	11:30	-	7	-	-	2	-	-	-	-	-	4	-	13
11:30	11:45	-	6	-	-	2	-	-	-	-	-	4	-	12
11:45	12:00	-	6	-	-	1	-	-	-	-	-	2	-	9
12:00	12:15	-	4	-	-	4	-	-	-	-	-	3	-	11
12:15	12:30	-	3	-	-	2	-	-	-	-	-	6	-	11
12:30	12:45	-	2	-	-	1	-	-	-	-	-	4	-	7
12:45	13:00	-	4	1	-	1	-	-	-	-	-	3	-	9
13:00	13:15	-	2	-	-	3	2	-	-	-	-	1	-	8
13:15	13:30	-	3	-	-	-	-	-	-	-	-	4	-	7
13:30	13:45	-	5	-	-	-	-	-	-	-	-	5	-	10
13:45	14:00	-	2	-	-	1	-	-	-	-	-	5	-	8
14:00	14:15	-	5	-	-	3	-	-	-	-	1	6	-	15
14:15	14:30	-	**6**	-	-	**2**	**1**	-	-	-	-	**6**	-	15
14:30	14:45	-	**5**	-	-	**2**	-	-	-	-	-	**9**	-	16
14:45	15:00	**1**	**4**	-	-	**6**	-	-	-	-	-	**6**	-	17
TOTALS		**7**	**101**	**3**	-	**55**	**4**	-	-	-	**4**	**99**	-	**273**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
14:00	15:00	**1**	**20**	**0**	**0**	**13**	**1**	**0**	**0**	**0**	**1**	**27**	**0**	**63**

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	1	7	-	-	1	1	-	-	-	-	14	-	24
15:15	15:30	1	3	-	-	6	2	-	-	-	-	8	-	20
15:30	15:45	-	4	-	-	7	1	-	-	-	-	17	-	29
15:45	16:00	-	2	-	-	6	-	-	-	-	-	11	-	19
16:00	16:15	2	4	1	-	2	1	-	-	-	-	19	-	29
16:15	16:30	-	7	-	-	5	1	-	-	-	-	9	-	22
16:30	16:45	1	7	1	-	4	-	-	-	-	-	10	-	23
16:45	17:00	-	5	2	-	7	-	-	-	-	-	7	-	21
17:00	17:15	-	2	-	-	4	1	-	-	-	1	10	-	18
17:15	17:30	2	2	-	-	6	1	-	-	-	-	6	-	17
17:30	17:45	1	7	1	-	5	1	-	-	-	-	5	-	20
17:45	18:00	1	4	-	-	7	1	-	-	-	-	3	-	16
TOTALS		**9**	**54**	**5**	-	**60**	**10**	-	-	-	**1**	**119**	-	**258**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:30	16:30	**2**	**17**	**1**	**0**	**20**	**3**	**0**	**0**	**0**	**0**	**56**	**0**	**99**

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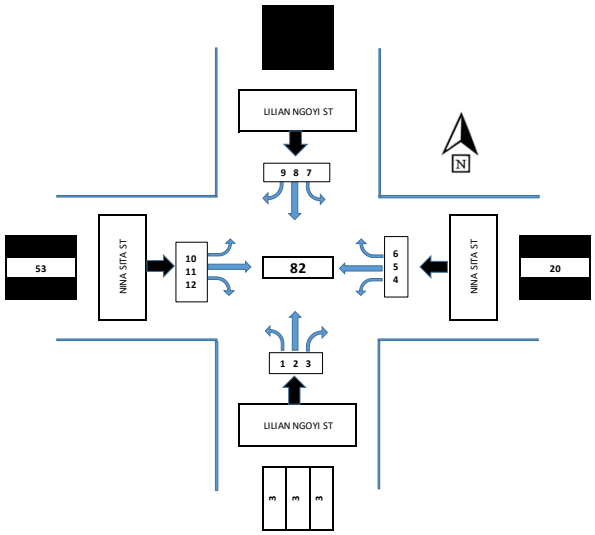
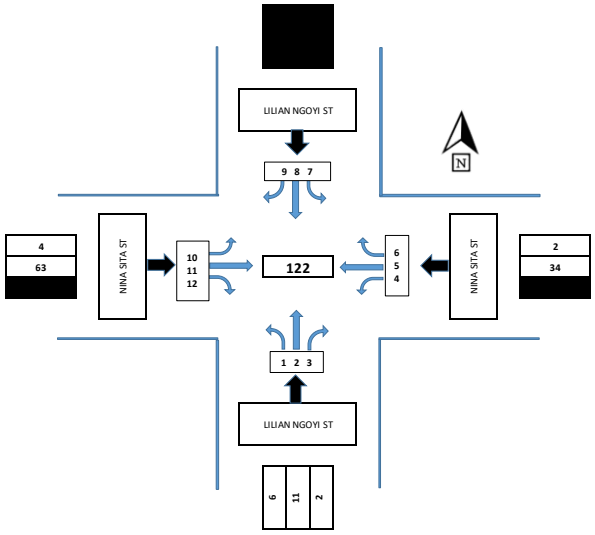
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	HF
SURVEY DATE:	Thursday, 28 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P3	

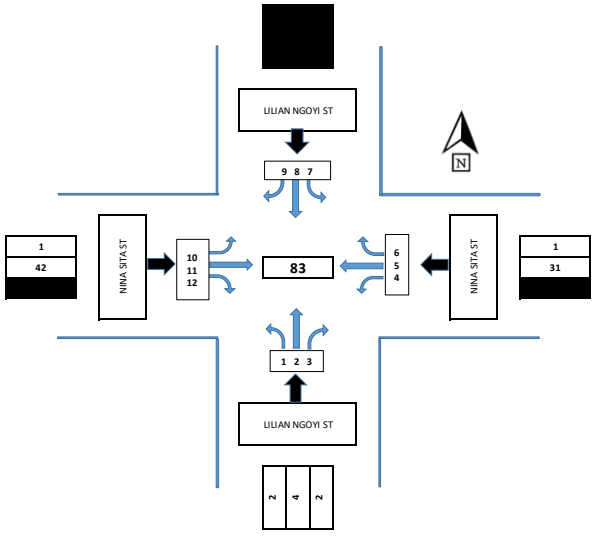
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 08:00 - 09:00 Background peak :



Peak time : 11:30 - 12:30 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	2	-	-	-	-	-	5	-	7
06:15	06:30	2	-	-	-	2	-	-	-	-	1	6	-	11
06:30	06:45	1	2	-	-	5	-	-	-	-	-	3	-	11
06:45	07:00	2	1	-	-	1	-	-	-	-	1	7	-	12
07:00	07:15	-	1	-	-	2	-	-	-	-	-	6	-	9
07:15	07:30	-	-	2	-	2	-	-	-	-	-	4	-	8
07:30	07:45	-	3	-	-	3	1	-	-	-	-	7	-	14
07:45	08:00	-	-	-	-	5	-	-	-	-	-	2	-	7
08:00	08:15	-	1	-	-	4	-	-	-	-	-	13	-	18
08:15	08:30	-	**1**	**2**	-	**2**	-	-	-	-	-	**9**	-	14
08:30	08:45	**3**	-	**1**	-	**5**	-	-	-	-	-	**14**	-	23
08:45	09:00	-	**1**	-	-	**9**	-	-	-	-	-	**17**	-	27
TOTALS		**8**	**10**	**5**	-	**42**	**1**	-	-	-	**2**	**93**	-	**161**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	**3**	**3**	**3**	**0**	**20**	**0**	**0**	**0**	**0**	**0**	**53**	**0**	**82**

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	2	2	-	-	3	-	-	-	-	-	18	-	25
09:15	09:30	1	3	-	-	6	-	-	-	-	-	6	-	16
09:30	09:45	3	-	-	-	2	-	-	-	-	2	9	-	16
09:45	10:00	2	1	1	-	7	1	-	-	-	1	13	-	26
10:00	10:15	2	-	-	-	7	1	-	-	-	-	5	-	15
10:15	10:30	3	3	-	-	5	2	-	-	-	-	14	-	27
10:30	10:45	1	1	1	-	9	-	-	-	-	-	9	-	21
10:45	11:00	2	-	-	-	5	1	-	-	-	1	13	-	22
11:00	11:15	1	1	-	-	8	2	-	-	-	-	14	-	26
11:15	11:30	-	2	1	-	6	1	-	-	-	-	10	-	20
11:30	11:45	2	3	1	-	2	1	-	-	-	2	12	-	23
11:45	12:00	-	6	-	-	10	-	-	-	-	-	20	-	36
12:00	12:15	1	2	1	-	11	1	-	-	-	2	15	-	33
12:15	12:30	3	-	-	-	11	-	-	-	-	-	16	-	30
12:30	12:45	-	-	-	-	8	1	-	-	-	-	12	-	21
12:45	13:00	2	1	2	-	2	1	-	-	-	-	8	-	16
13:00	13:15	1	3	1	-	9	-	-	-	-	-	11	-	25
13:15	13:30	1	-	1	-	7	-	-	-	-	-	9	-	18
13:30	13:45	2	2	-	-	4	-	-	-	-	-	6	-	14
13:45	14:00	2	2	1	-	9	-	-	-	-	-	9	-	23
14:00	14:15	-	1	-	-	4	-	-	-	-	-	13	-	18
14:15	14:30	-	-	-	-	**8**	**1**	-	-	-	-	**8**	-	17
14:30	14:45	**1**	**1**	-	-	**5**	**1**	-	-	-	-	**7**	-	15
14:45	15:00	-	-	-	-	**5**	**2**	-	-	-	-	**16**	-	23
TOTALS		**32**	**34**	**10**	-	**153**	**16**	-	-	-	**8**	**273**	-	**526**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:30	12:30	**6**	**11**	**2**	**0**	**34**	**2**	**0**	**0**	**0**	**4**	**63**	**0**	**122**

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	1	-	-	-	2	-	-	-	-	-	6	-	9
15:15	15:30	-	-	-	-	11	-	-	-	-	1	11	-	23
15:30	15:45	-	2	1	-	4	-	-	-	-	-	11	-	18
15:45	16:00	1	1	1	-	7	-	-	-	-	-	7	-	17
16:00	16:15	1	1	-	-	9	1	-	-	-	-	13	-	25
16:15	16:30	1	1	1	-	6	-	-	-	-	-	5	-	14
16:30	16:45	-	-	1	-	4	-	-	-	-	-	16	-	21
16:45	17:00	1	-	-	-	7	1	-	-	-	1	8	-	18
17:00	17:15	-	2	-	-	6	-	-	-	-	1	7	-	16
17:15	17:30	1	1	-	-	3	-	-	-	-	1	10	-	16
17:30	17:45	-	2	-	-	4	-	-	-	-	-	1	-	7
17:45	18:00	-	-	-	-	4	-	-	-	-	-	4	-	8
TOTALS		**6**	**10**	**4**	-	**67**	**2**	-	-	-	**4**	**99**	-	**192**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	**2**	**4**	**2**	**0**	**31**	**1**	**0**	**0**	**0**	**1**	**42**	**0**	**83**

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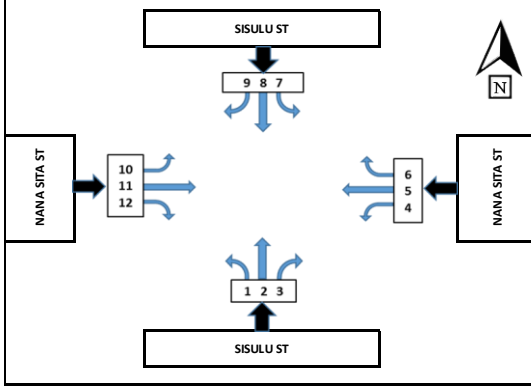
SITE LOCATION:	**UNI PTA**	**JOB NR:**	UT2019-522	**DRAWN:**	**D.L**
SURVEY DATE:	Thursday, 14 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P4	



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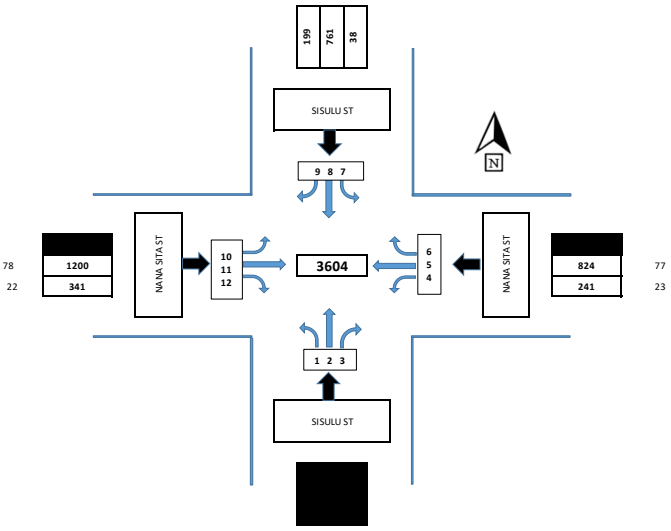
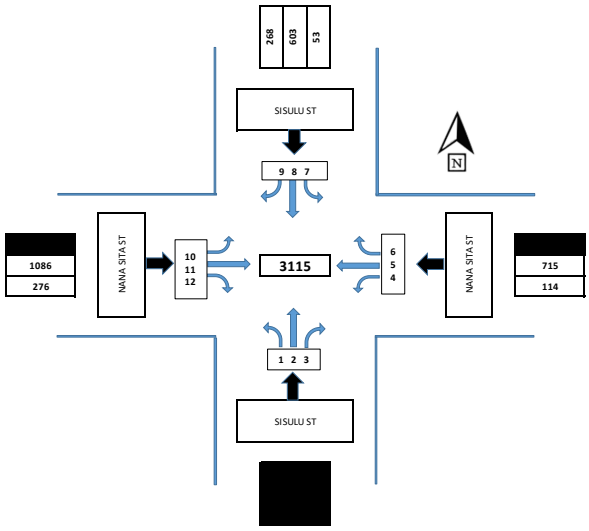
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P4	

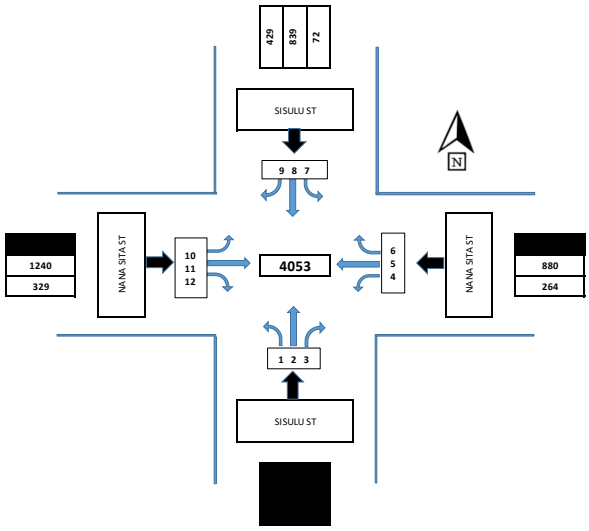
20 76 3.8



Peak time : 07:00 - 08:00 Background peak :



Peak time : 14:00 - 15:00 Background peak :



Peak time : 15:30 - 16:30 Background peak :

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AM PEAK (06H00 - 9H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	12	75	-	2	131	18	-	110	51	399
06:15	06:30	-	-	-	18	81	-	2	155	27	-	156	75	514
06:30	06:45	-	-	-	27	134	-	4	211	35	-	224	73	708
06:45	07:00	-	-	-	52	136	-	4	190	37	-	259	88	766
07:00	07:15	-	-	-	74	183	-	11	186	55	-	254	86	849
07:15	07:30	-	-	-	66	193	-	5	214	59	-	309	100	946
07:30	07:45	-	-	-	54	242	-	12	187	41	-	316	86	938
07:45	08:00	-	-	-	47	206	-	10	174	44	-	321	69	871
08:00	08:15	-	-	-	43	195	-	7	152	50	-	319	73	839
08:15	08:30	-	-	-	54	190	-	13	166	55	-	317	58	853
08:30	08:45	-	-	-	48	181	-	8	147	66	-	274	64	788
08:45	09:00	-	-	-	23	214	-	12	114	50	-	281	69	763
TOTALS		-	-	-	518	2 030	-	90	2 027	537	-	3 140	892	9 234

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:00	08:00	0	0	0	241	824	0	38	761	199	0	1200	341	3 604

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	21	156	-	11	112	37	-	262	67	666
09:15	09:30	-	-	-	14	159	-	9	107	68	-	217	40	614
09:30	09:45	-	-	-	11	145	-	11	129	44	-	261	57	658
09:45	10:00	-	-	-	23	188	-	10	128	60	-	244	51	704
10:00	10:15	-	-	-	17	156	-	10	122	48	-	254	36	643
10:15	10:30	-	-	-	20	166	-	16	117	51	-	235	59	664
10:30	10:45	-	-	-	17	157	-	8	101	55	-	250	58	646
10:45	11:00	-	-	-	20	136	-	16	121	63	-	244	51	651
11:00	11:15	-	-	-	25	145	-	10	129	61	-	259	39	668
11:15	11:30	-	-	-	18	149	-	15	132	70	-	250	43	677
11:30	11:45	-	-	-	15	158	-	14	126	49	-	291	66	719
11:45	12:00	-	-	-	19	180	-	11	129	72	-	257	62	730
12:00	12:15	-	-	-	28	155	-	15	146	65	-	297	62	768
12:15	12:30	-	-	-	25	200	-	5	127	69	-	285	71	782
12:30	12:45	-	-	-	24	171	-	20	137	79	-	310	68	809
12:45	13:00	-	-	-	20	157	-	14	142	72	-	275	55	735
13:00	13:15	-	-	-	27	153	-	15	155	70	-	263	56	739
13:15	13:30	-	-	-	25	160	-	13	150	81	-	266	63	758
13:30	13:45	-	-	-	17	179	-	13	150	78	-	261	59	757
13:45	14:00	-	-	-	25	182	-	18	146	69	-	247	70	757
14:00	14:15	-	-	-	38	170	-	14	162	67	-	262	65	778
14:15	14:30	-	-	-	25	204	-	13	146	52	-	276	64	780
14:30	14:45	-	-	-	25	161	-	14	155	64	-	259	71	749
14:45	15:00	-	-	-	26	180	-	12	140	85	-	289	76	808
TOTALS		-	-	-	525	3 967	-	307	3 209	1 529	-	6 314	1 409	17 260

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
14:00	15:00	0	0	0	114	715	0	53	603	268	0	1086	276	3 115

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	35	198	-	15	180	72	-	285	73	858
15:15	15:30	-	-	-	28	212	-	12	179	77	-	285	66	859
15:30	15:45	-	-	-	50	214	-	21	212	89	-	332	83	1 001
15:45	16:00	-	-	-	60	210	-	23	222	99	-	321	77	1 012
16:00	16:15	-	-	-	73	239	-	13	210	119	-	312	82	1 048
16:15	16:30	-	-	-	81	217	-	15	195	122	-	275	87	992
16:30	16:45	-	-	-	66	233	-	14	172	88	-	289	85	947
16:45	17:00	-	-	-	84	194	-	19	213	96	-	282	83	971
17:00	17:15	-	-	-	76	167	-	9	207	107	-	282	80	928
17:15	17:30	-	-	-	86	208	-	16	187	97	-	290	79	963
17:30	17:45	-	-	-	53	177	-	6	205	85	-	251	77	854
17:45	18:00	-	-	-	30	145	-	10	192	56	-	212	81	726
TOTALS		-	-	-	722	2 414	-	173	2 374	1 107	-	3 416	953	11 159

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:30	16:30	0	0	0	264	880	0	72	839	429	0	1240	329	4 053

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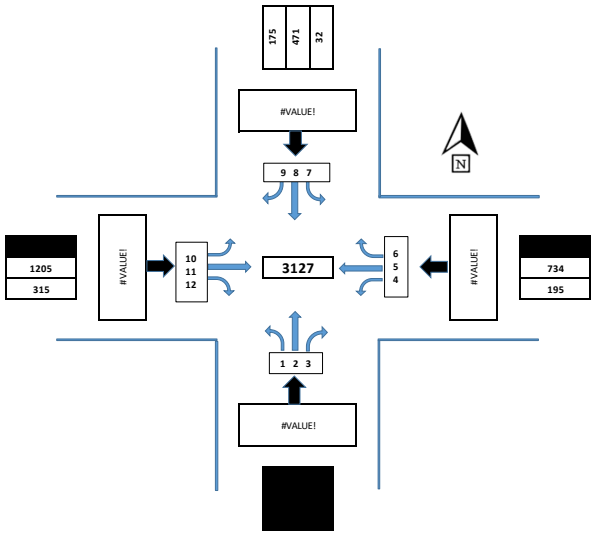
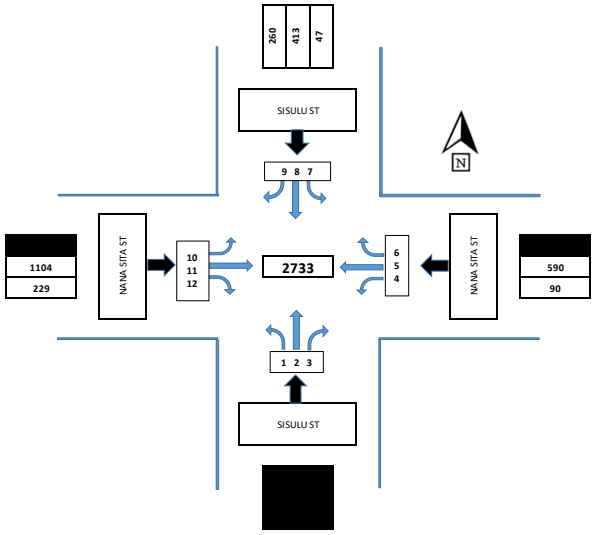
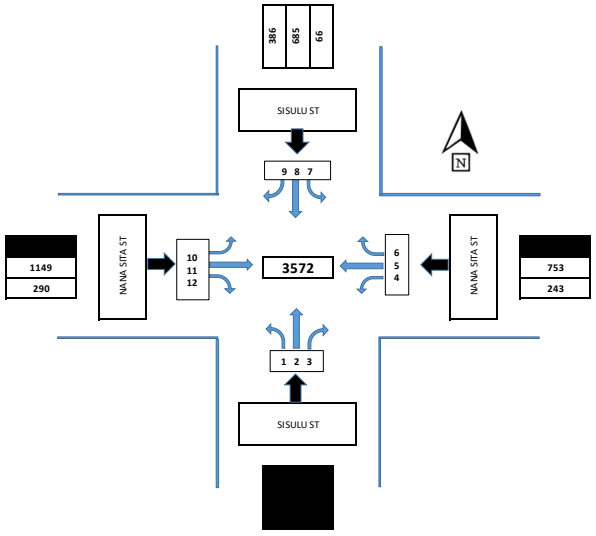
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P4	



Peak time : 07:15 - 08:15 Background peak :



Peak time : 12:00 - 13:00 Background peak :



Peak time : 15:30 - 16:30 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	11	63	-	2	72	15	-	97	46	306
06:15	06:30	-	-	-	14	65	-	2	82	25	-	141	70	399
06:30	06:45	-	-	-	25	110	-	4	113	31	-	208	69	560
06:45	07:00	-	-	-	46	117	-	3	114	34	-	245	80	639
07:00	07:15	-	-	-	71	168	-	11	102	49	-	236	79	716
07:15	07:30	-	-	-	62	174	-	5	141	55	-	295	95	827
07:30	07:45	-	-	-	50	213	-	11	120	35	-	299	85	813
07:45	08:00	-	-	-	44	180	-	10	114	39	-	311	67	765
08:00	08:15	-	-	-	39	167	-	6	96	46	-	300	68	722
08:15	08:30	-	-	-	51	163	-	9	113	50	-	293	53	732
08:30	08:45	-	-	-	48	151	-	5	85	52	-	251	59	651
08:45	09:00	-	-	-	21	185	-	10	75	37	-	256	64	648
TOTALS		-	-	-	482	1 756	-	78	1 227	468	-	2 932	835	7 778

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	0	0	0	195	734	0	32	471	175	0	1205	315	3 127

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	17	134	-	7	62	33	-	243	62	558
09:15	09:30	-	-	-	13	138	-	7	71	62	-	201	37	529
09:30	09:45	-	-	-	10	123	-	9	83	35	-	241	52	553
09:45	10:00	-	-	-	20	161	-	9	88	49	-	229	43	599
10:00	10:15	-	-	-	16	140	-	3	89	47	-	244	33	572
10:15	10:30	-	-	-	16	144	-	10	77	46	-	215	53	561
10:30	10:45	-	-	-	17	130	-	6	76	50	-	233	54	566
10:45	11:00	-	-	-	19	122	-	11	87	55	-	230	48	572
11:00	11:15	-	-	-	21	127	-	6	85	53	-	239	36	567
11:15	11:30	-	-	-	14	124	-	12	98	65	-	235	40	588
11:30	11:45	-	-	-	13	140	-	11	91	47	-	275	58	635
11:45	12:00	-	-	-	18	147	-	7	99	66	-	239	50	626
12:00	12:15	-	-	-	24	140	-	13	108	57	-	280	54	676
12:15	12:30	-	-	-	24	167	-	5	98	64	-	265	65	688
12:30	12:45	-	-	-	23	146	-	18	104	70	-	294	61	716
12:45	13:00	-	-	-	19	137	-	11	103	69	-	265	49	653
13:00	13:15	-	-	-	23	134	-	11	119	57	-	253	50	647
13:15	13:30	-	-	-	21	138	-	12	108	75	-	249	58	661
13:30	13:45	-	-	-	13	157	-	12	108	71	-	253	51	665
13:45	14:00	-	-	-	22	158	-	16	107	61	-	235	64	663
14:00	14:15	-	-	-	35	148	-	8	120	60	-	245	53	669
14:15	14:30	-	-	-	**22**	**176**	-	**11**	**110**	**49**	-	**257**	**58**	683
14:30	14:45	-	-	-	**23**	**136**	-	**10**	**112**	**55**	-	**242**	**59**	637
14:45	15:00	-	-	-	**23**	**148**	-	**11**	**93**	**76**	-	**277**	**67**	695
TOTALS		-	-	-	466	3 415	-	236	2 296	1 372	-	5 939	1 255	14 979

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
12:00	13:00	0	0	0	90	590	0	47	413	260	0	1104	229	2 733

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	29	171	-	9	133	64	-	268	66	740
15:15	15:30	-	-	-	25	174	-	10	130	68	-	268	58	733
15:30	15:45	-	-	-	48	176	-	18	170	80	-	310	73	875
15:45	16:00	-	-	-	57	174	-	21	177	87	-	297	69	882
16:00	16:15	-	-	-	66	209	-	13	162	110	-	281	69	910
16:15	16:30	-	-	-	72	194	-	14	176	109	-	261	79	905
16:30	16:45	-	-	-	57	194	-	12	143	82	-	270	71	829
16:45	17:00	-	-	-	71	159	-	18	173	89	-	264	75	849
17:00	17:15	-	-	-	62	125	-	9	144	96	-	261	69	766
17:15	17:30	-	-	-	72	179	-	15	138	88	-	264	74	830
17:30	17:45	-	-	-	46	146	-	5	130	77	-	237	71	712
17:45	18:00	-	-	-	30	117	-	10	135	51	-	202	80	625
TOTALS		-	-	-	635	2 018	-	154	1 811	1 001	-	3 183	854	9 656

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:30	16:30	0	0	0	243	753	0	66	685	386	0	1149	290	3 572

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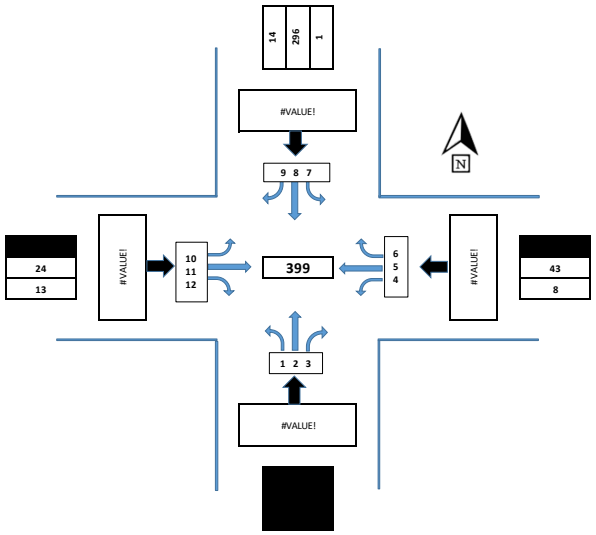
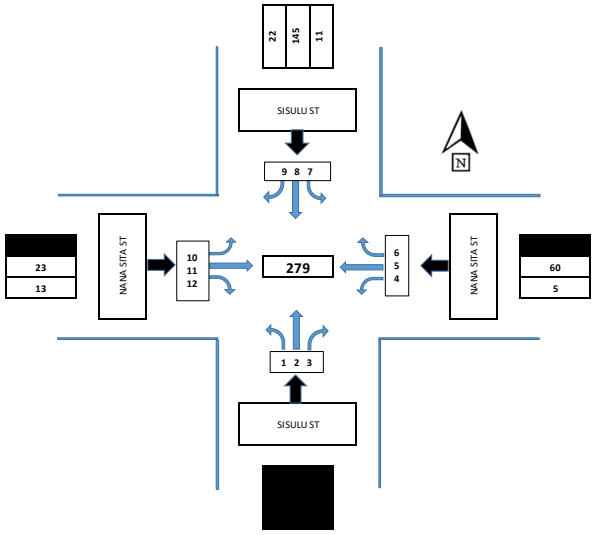
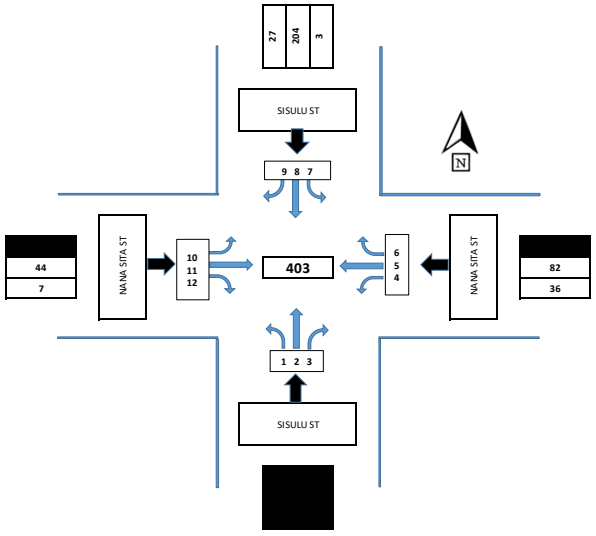
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P4	



Peak time : 06:15 - 07:15 Background peak :



Peak time : 14:00 - 15:00 Background peak :



Peak time : 16:45 - 17:45 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	6	-	-	49	3	-	3	2	63
06:15	06:30	-	-	-	2	9	-	-	68	2	-	4	3	88
06:30	06:45	-	-	-	1	14	-	-	83	3	-	6	1	108
06:45	07:00	-	-	-	5	11	-	1	68	3	-	8	4	100
07:00	07:15	-	-	-	-	9	-	-	77	6	-	6	5	103
07:15	07:30	-	-	-	3	11	-	-	63	3	-	6	2	88
07:30	07:45	-	-	-	3	20	-	1	58	5	-	5	1	93
07:45	08:00	-	-	-	1	15	-	-	52	4	-	2	1	75
08:00	08:15	-	-	-	2	13	-	1	46	4	-	7	1	74
08:15	08:30	-	-	-	2	17	-	3	45	5	-	10	1	83
08:30	08:45	-	-	-	-	17	-	3	51	11	-	5	-	87
08:45	09:00	-	-	-	1	16	-	2	32	9	-	8	-	68
TOTALS		-	-	-	20	158	-	11	692	58	-	70	21	1 030

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:15	07:15	0	0	0	8	43	0	1	296	14	0	24	13	399

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	3	11	-	4	41	4	-	4	-	67
09:15	09:30	-	-	-	-	12	-	2	28	4	-	4	3	53
09:30	09:45	-	-	-	-	13	-	1	34	8	-	5	3	64
09:45	10:00	-	-	-	2	11	-	-	34	6	-	5	2	60
10:00	10:15	-	-	-	1	6	-	7	29	1	-	6	-	50
10:15	10:30	-	-	-	2	11	-	5	33	3	-	9	2	65
10:30	10:45	-	-	-	-	15	-	2	19	4	-	1	2	43
10:45	11:00	-	-	-	-	9	-	4	29	6	-	3	-	51
11:00	11:15	-	-	-	2	11	-	4	37	4	-	7	-	65
11:15	11:30	-	-	-	-	15	-	3	26	2	-	7	-	53
11:30	11:45	-	-	-	1	9	-	3	30	2	-	2	3	50
11:45	12:00	-	-	-	-	19	-	4	26	5	-	4	4	62
12:00	12:15	-	-	-	1	4	-	1	33	3	-	4	2	48
12:15	12:30	-	-	-	1	15	-	-	24	3	-	2	1	46
12:30	12:45	-	-	-	1	14	-	2	29	7	-	4	-	57
12:45	13:00	-	-	-	1	13	-	2	26	3	-	2	3	50
13:00	13:15	-	-	-	2	7	-	4	30	11	-	2	2	58
13:15	13:30	-	-	-	2	10	-	1	36	6	-	8	1	64
13:30	13:45	-	-	-	2	17	-	1	35	6	-	3	1	65
13:45	14:00	-	-	-	1	12	-	2	31	5	-	2	4	57
14:00	14:15	-	-	-	1	14	-	6	39	5	-	6	6	77
14:15	14:30	-	-	-	**2**	**12**	-	**2**	**32**	**2**	-	**7**	**2**	59
14:30	14:45	-	-	-	-	**16**	-	**3**	**34**	**7**	-	**8**	**4**	72
14:45	15:00	-	-	-	**2**	**18**	-	-	**40**	**8**	-	**2**	**1**	71
TOTALS		-	-	-	27	294	-	63	755	115	-	107	46	1 407

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
14:00	15:00	0	0	0	5	60	0	11	145	22	0	23	13	279

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	4	21	-	6	44	6	-	4	2	87
15:15	15:30	-	-	-	2	16	-	2	44	6	-	2	4	76
15:30	15:45	-	-	-	2	22	-	3	38	8	-	5	1	79
15:45	16:00	-	-	-	3	17	-	2	37	9	-	8	4	80
16:00	16:15	-	-	-	5	17	-	-	46	6	-	13	2	89
16:15	16:30	-	-	-	7	9	-	1	14	10	-	3	2	46
16:30	16:45	-	-	-	8	26	-	2	24	5	-	5	3	73
16:45	17:00	-	-	-	11	23	-	1	34	4	-	9	-	82
17:00	17:15	-	-	-	11	24	-	-	55	9	-	13	1	113
17:15	17:30	-	-	-	9	17	-	1	47	7	-	15	2	98
17:30	17:45	-	-	-	5	18	-	1	68	7	-	7	4	110
17:45	18:00	-	-	-	-	15	-	-	49	5	-	5	-	74
TOTALS		-	-	-	67	225	-	19	500	82	-	89	25	1 007

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
16:45	17:45	0	0	0	36	82	0	3	204	27	0	44	7	403

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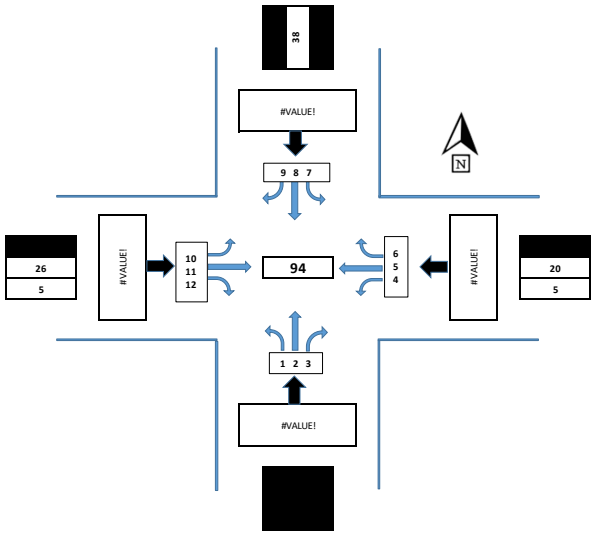
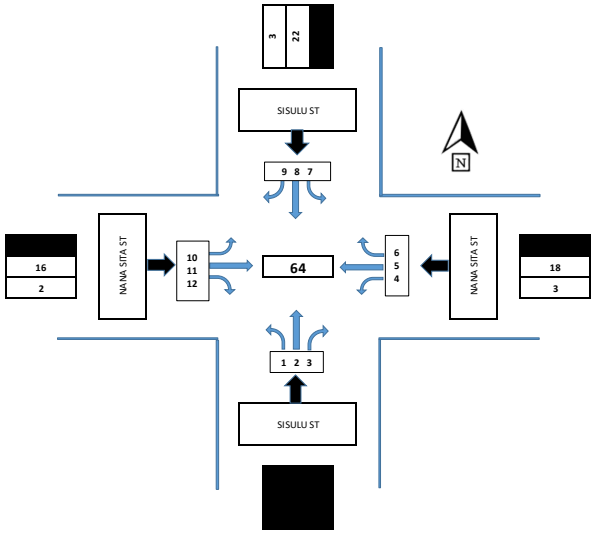
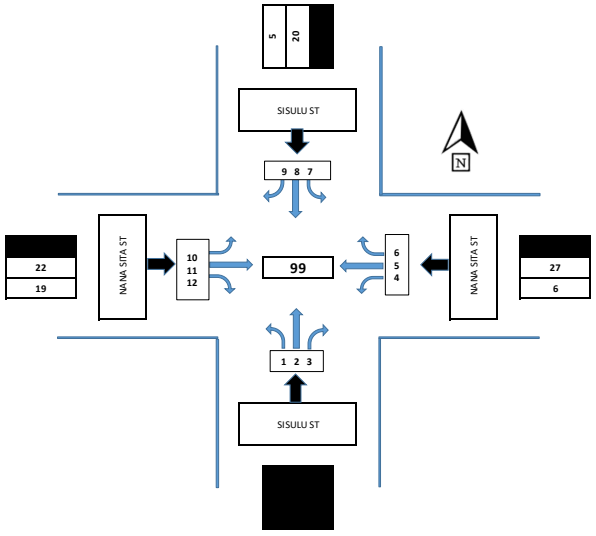
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P4	



Peak time : 06:00 - 07:00 Background peak :



Peak time : 09:00 - 10:00 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	1	4	-	-	10	-	-	8	1	24
06:15	06:30	-	-	-	2	4	-	-	5	-	-	6	2	19
06:30	06:45	-	-	-	1	6	-	-	15	-	-	9	1	32
06:45	07:00	-	-	-	1	6	-	-	8	-	-	3	1	19
07:00	07:15	-	-	-	2	4	-	-	5	-	-	8	1	20
07:15	07:30	-	-	-	1	4	-	-	8	1	-	4	-	18
07:30	07:45	-	-	-	1	6	-	-	6	1	-	7	-	21
07:45	08:00	-	-	-	1	7	-	-	7	-	-	5	1	21
08:00	08:15	-	-	-	1	8	-	-	9	-	-	5	1	24
08:15	08:30	-	-	-	-	9	-	-	5	-	-	5	2	21
08:30	08:45	-	-	-	-	6	-	-	7	1	-	7	1	22
08:45	09:00	-	-	-	-	5	-	-	7	1	-	6	2	21
TOTALS		-	-	-	11	69	-	-	92	4	-	73	13	262

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	07:00	0	0	0	5	20	0	0	38	0	0	26	5	94

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	1	7	-	-	6	-	-	2	1	17
09:15	09:30	-	-	-	-	3	-	-	7	-	-	5	-	15
09:30	09:45	-	-	-	1	5	-	-	7	1	-	7	1	22
09:45	10:00	-	-	-	1	3	-	-	2	2	-	2	-	10
10:00	10:15	-	-	-	-	1	-	-	4	-	-	2	-	7
10:15	10:30	-	-	-	-	1	-	1	5	-	-	2	1	10
10:30	10:45	-	-	-	-	3	-	-	5	-	-	4	-	12
10:45	11:00	-	-	-	-	1	-	-	1	-	-	3	-	5
11:00	11:15	-	-	-	2	1	-	-	5	1	-	1	1	11
11:15	11:30	-	-	-	-	3	-	-	6	1	-	3	-	13
11:30	11:45	-	-	-	-	3	-	-	3	-	-	4	1	11
11:45	12:00	-	-	-	-	-	-	-	3	-	-	2	-	5
12:00	12:15	-	-	-	1	4	-	-	4	1	-	1	1	12
12:15	12:30	-	-	-	-	4	-	-	2	-	-	6	3	15
12:30	12:45	-	-	-	-	-	-	-	2	-	-	3	1	6
12:45	13:00	-	-	-	-	2	-	-	10	-	-	4	1	17
13:00	13:15	-	-	-	1	4	-	-	4	1	-	1	-	11
13:15	13:30	-	-	-	-	1	-	-	4	-	-	2	3	10
13:30	13:45	-	-	-	1	-	-	-	5	-	-	1	4	11
13:45	14:00	-	-	-	1	2	-	-	5	-	-	3	1	12
14:00	14:15	-	-	-	1	2	-	-	1	-	-	2	4	10
14:15	14:30	-	-	-	-	**3**	-	-	**3**	-	-	**3**	**3**	12
14:30	14:45	-	-	-	-	**3**	-	-	**7**	-	-	**4**	**6**	20
14:45	15:00	-	-	-	**1**	**8**	-	-	**5**	-	-	**2**	**4**	20
TOTALS		-	-	-	11	64	-	1	106	7	-	69	36	294

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	10:00	0	0	0	3	18	0	0	22	3	0	16	2	64

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	2	3	-	-	1	1	-	10	3	20
15:15	15:30	-	-	-	1	7	-	-	4	-	-	5	2	19
15:30	15:45	-	-	-	-	8	-	-	2	-	-	10	8	28
15:45	16:00	-	-	-	-	7	-	-	5	2	-	9	2	25
16:00	16:15	-	-	-	1	3	-	-	2	-	-	12	6	24
16:15	16:30	-	-	-	1	6	-	-	4	1	-	6	3	21
16:30	16:45	-	-	-	1	9	-	-	5	1	-	5	6	27
16:45	17:00	-	-	-	2	6	-	-	5	2	-	7	4	26
17:00	17:15	-	-	-	2	6	-	-	6	1	-	4	6	25
17:15	17:30	-	-	-	1	4	-	-	-	2	-	4	2	13
17:30	17:45	-	-	-	1	8	-	-	4	1	-	4	2	20
17:45	18:00	-	-	-	-	8	-	-	4	-	-	3	-	15
TOTALS		-	-	-	12	75	-	-	42	11	-	79	44	263

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
16:15	17:15	0	0	0	6	27	0	0	20	5	0	22	19	99

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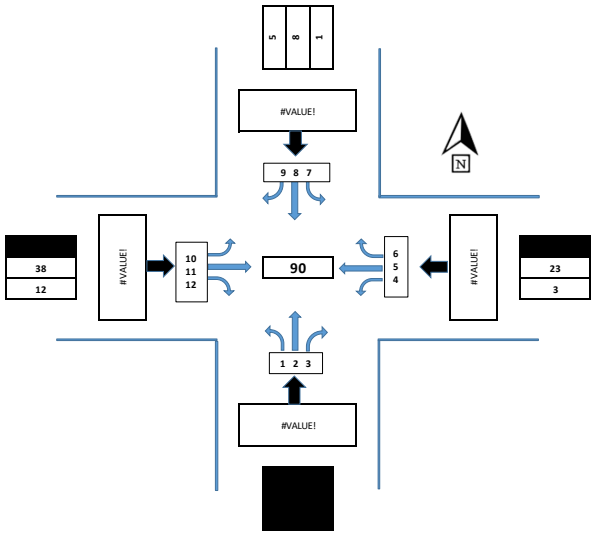
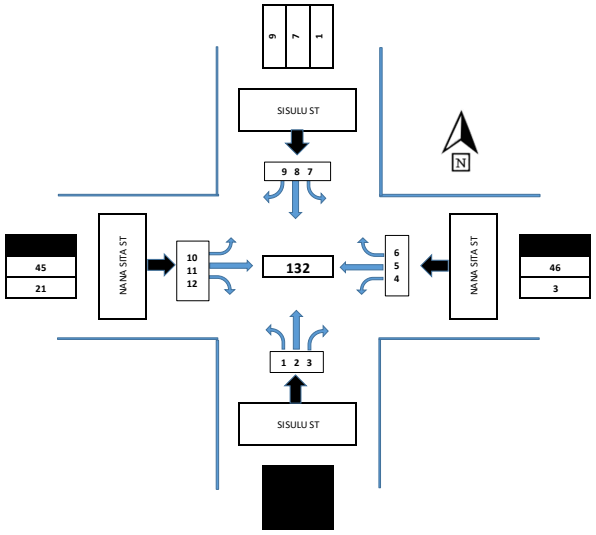
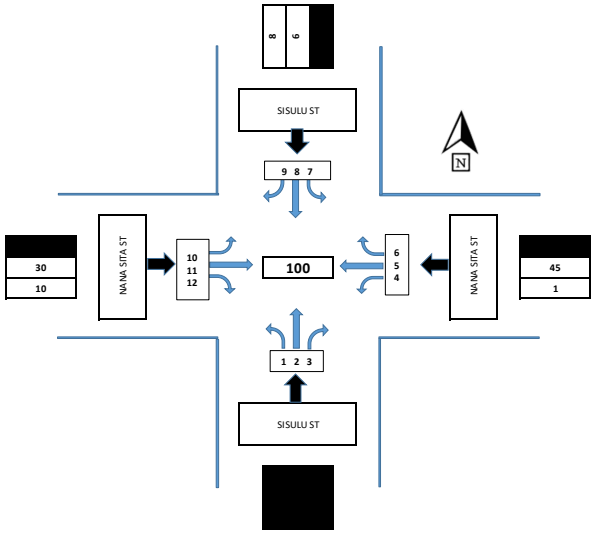
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	HF
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P4	



Peak time : 08:00 - 09:00 Background peak :



Peak time : 11:45 - 12:45 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	2	-	-	-	-	-	2	2	6
06:15	06:30	-	-	-	-	3	-	-	-	-	-	5	-	8
06:30	06:45	-	-	-	-	4	-	-	-	1	-	1	2	8
06:45	07:00	-	-	-	-	2	-	-	-	-	-	3	3	8
07:00	07:15	-	-	-	1	2	-	-	2	-	-	4	1	10
07:15	07:30	-	-	-	-	4	-	-	2	-	-	4	3	13
07:30	07:45	-	-	-	-	3	-	-	3	-	-	5	-	11
07:45	08:00	-	-	-	1	4	-	-	1	1	-	3	-	10
08:00	08:15	-	-	-	1	7	-	-	1	-	-	7	3	19
08:15	08:30	-	-	-	**1**	**1**	-	**1**	**3**	-	-	**9**	**2**	17
08:30	08:45	-	-	-	-	**7**	-	-	**4**	**2**	-	**11**	**4**	28
08:45	09:00	-	-	-	**1**	**8**	-	-	-	**3**	-	**11**	**3**	26
TOTALS		-	-	-	5	47	-	1	16	7	-	65	23	**164**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	0	0	0	3	23	0	1	8	5	0	38	12	90

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	4	-	-	3	-	-	13	4	24
09:15	09:30	-	-	-	1	6	-	-	1	2	-	7	-	17
09:30	09:45	-	-	-	-	4	-	1	5	-	-	8	1	19
09:45	10:00	-	-	-	-	13	-	1	4	3	-	8	6	35
10:00	10:15	-	-	-	-	9	-	-	-	-	-	2	3	14
10:15	10:30	-	-	-	2	10	-	-	2	2	-	9	3	28
10:30	10:45	-	-	-	-	9	-	-	1	1	-	12	2	25
10:45	11:00	-	-	-	1	4	-	1	4	2	-	8	3	23
11:00	11:15	-	-	-	-	6	-	-	2	3	-	12	2	25
11:15	11:30	-	-	-	4	7	-	-	2	2	-	5	3	23
11:30	11:45	-	-	-	1	6	-	-	2	-	-	10	4	23
11:45	12:00	-	-	-	1	14	-	-	1	1	-	12	8	37
12:00	12:15	-	-	-	2	7	-	1	1	4	-	12	5	32
12:15	12:30	-	-	-	-	14	-	-	3	2	-	12	2	33
12:30	12:45	-	-	-	-	11	-	-	2	2	-	9	6	30
12:45	13:00	-	-	-	-	5	-	1	3	-	-	4	2	15
13:00	13:15	-	-	-	1	8	-	-	2	1	-	7	4	23
13:15	13:30	-	-	-	2	11	-	-	2	-	-	7	1	23
13:30	13:45	-	-	-	1	5	-	-	2	1	-	4	3	16
13:45	14:00	-	-	-	1	10	-	-	3	3	-	7	1	25
14:00	14:15	-	-	-	1	6	-	-	2	2	-	9	2	22
14:15	14:30	-	-	-	**1**	**13**	-	-	**1**	**1**	-	**9**	**1**	26
14:30	14:45	-	-	-	**2**	**6**	-	**1**	**2**	**2**	-	**5**	**2**	20
14:45	15:00	-	-	-	-	**6**	-	**1**	**2**	**1**	-	**8**	**4**	22
TOTALS		-	-	-	21	194	-	7	52	35	-	199	72	**580**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:45	12:45	0	0	0	3	46	0	1	7	9	0	45	21	132

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	3	-	-	2	1	-	3	2	11
15:15	15:30	-	-	-	-	15	-	-	1	3	-	10	2	31
15:30	15:45	-	-	-	-	8	-	-	2	1	-	7	1	19
15:45	16:00	-	-	-	-	12	-	-	3	1	-	7	2	25
16:00	16:15	-	-	-	1	10	-	-	-	3	-	6	5	25
16:15	16:30	-	-	-	1	8	-	-	1	2	-	5	3	20
16:30	16:45	-	-	-	-	4	-	-	-	-	-	9	5	18
16:45	17:00	-	-	-	-	6	-	-	1	1	-	2	4	14
17:00	17:15	-	-	-	1	12	-	-	2	1	-	4	4	24
17:15	17:30	-	-	-	4	8	-	-	2	-	-	7	1	22
17:30	17:45	-	-	-	1	5	-	-	3	-	-	3	-	12
17:45	18:00	-	-	-	-	5	-	-	4	-	-	2	1	12
TOTALS		-	-	-	8	96	-	-	21	13	-	65	30	**233**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	0	0	0	1	45	0	0	6	8	0	30	10	100

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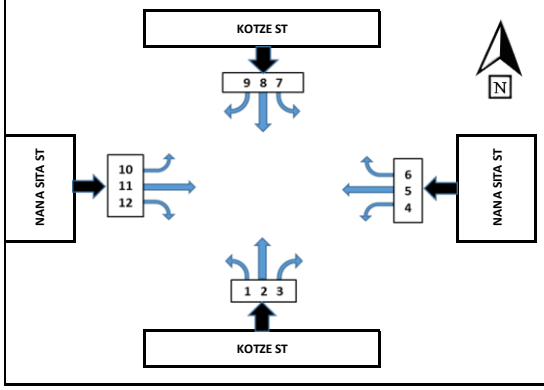
SITE LOCATION:	**UNI PTA**	**JOB NR:**	UT2019-522	**DRAWN:**	**D.L**
SURVEY DATE:	Thursday, 14 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P5	



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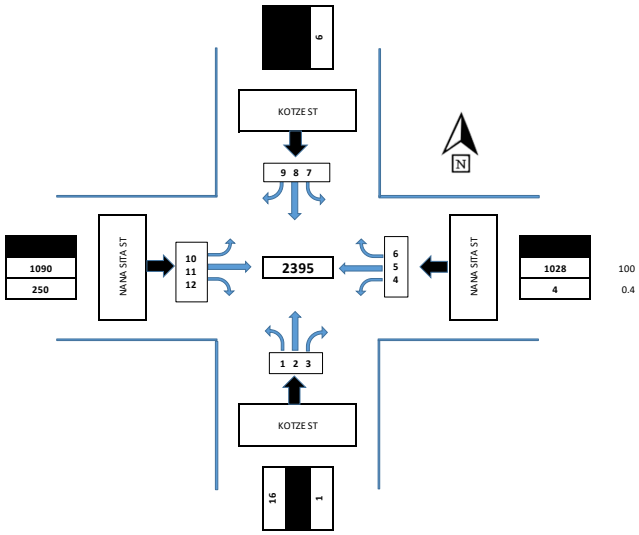
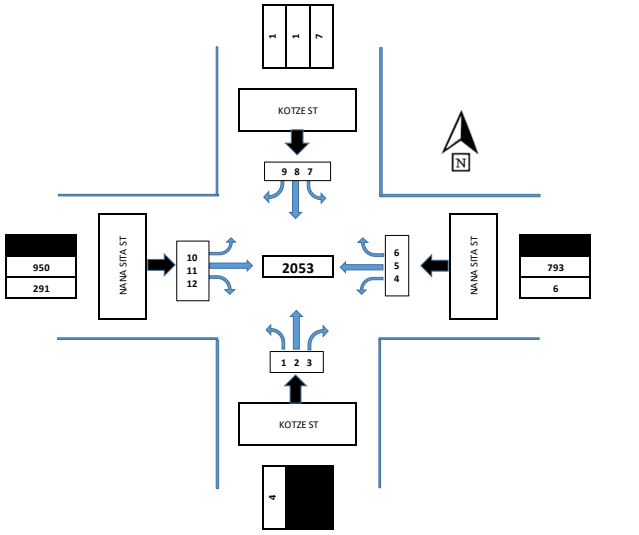
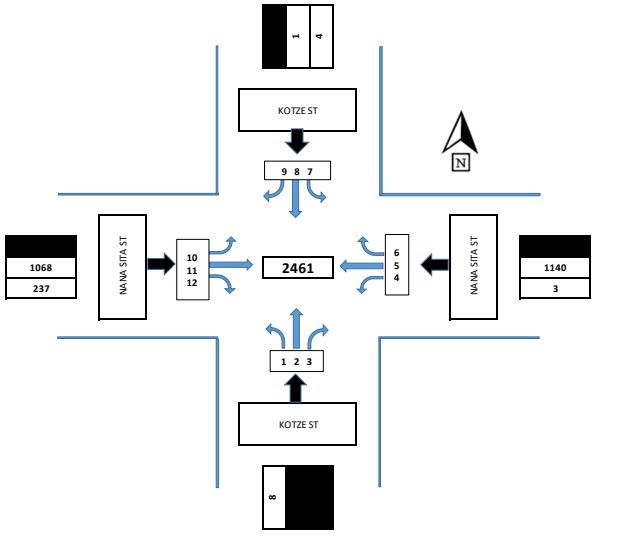
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P5	



Peak time : 07:30 - 08:30 Background peak :



Peak time : 12:00 - 13:00 Background peak :



Peak time : 15:30 - 16:30 Background peak :

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AM PEAK (06H00 - 9H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	1	-	-	-	89	-	-	-	-	-	80	23	193
06:15	06:30	1	-	-	1	101	-	-	-	-	-	132	25	260
06:30	06:45	3	-	-	1	161	-	2	-	-	-	181	60	408
06:45	07:00	2	-	-	2	199	-	1	1	-	-	198	57	460
07:00	07:15	5	-	-	-	263	-	-	-	-	-	215	61	544
07:15	07:30	3	-	-	4	253	-	1	-	-	-	256	53	570
07:30	07:45	3	-	-	2	294	-	2	-	-	-	266	65	632
07:45	08:00	4	-	-	1	245	-	2	-	-	-	276	61	589
08:00	08:15	4	-	1	-	238	-	-	-	-	-	286	54	583
08:15	08:30	5	-	-	1	251	-	2	-	-	-	262	70	591
08:30	08:45	1	-	-	1	233	-	1	-	-	-	219	61	516
08:45	09:00	2	-	-	1	244	-	-	-	-	-	240	52	539
TOTALS		34	-	1	14	2 571	-	11	1	-	-	2 611	642	5 885

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:30	08:30	16	0	1	4	1028	0	6	0	0	0	1090	250	2 395

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	6	-	-	-	192	-	1	-	-	-	213	64	476
09:15	09:30	2	-	-	1	186	-	2	-	-	-	173	58	422
09:30	09:45	-	-	-	1	161	-	1	-	-	-	212	60	435
09:45	10:00	3	-	-	2	197	-	-	2	-	-	196	58	458
10:00	10:15	1	-	-	-	179	-	3	-	-	-	220	60	463
10:15	10:30	-	-	-	3	177	-	1	-	1	-	191	57	430
10:30	10:45	2	-	-	1	167	-	-	-	1	-	206	59	436
10:45	11:00	2	-	-	4	176	-	2	-	-	-	188	70	442
11:00	11:15	1	-	-	2	168	-	1	-	-	-	217	57	446
11:15	11:30	3	-	-	-	152	-	-	-	1	-	217	68	441
11:30	11:45	2	-	-	-	185	-	2	1	-	-	240	63	493
11:45	12:00	-	-	-	1	194	-	1	-	-	-	210	64	470
12:00	12:15	1	-	-	2	198	-	2	-	-	-	237	71	511
12:15	12:30	1	-	-	1	217	-	3	-	-	-	229	68	519
12:30	12:45	1	-	-	1	199	-	1	-	-	-	256	77	535
12:45	13:00	1	-	-	2	179	-	1	1	1	-	228	75	488
13:00	13:15	1	-	-	1	167	-	-	1	1	-	221	74	466
13:15	13:30	2	-	-	1	191	-	2	-	1	-	213	62	472
13:30	13:45	1	-	-	4	198	-	-	-	-	-	207	74	484
13:45	14:00	2	-	-	5	206	-	-	-	-	-	203	66	482
14:00	14:15	2	-	-	2	207	-	3	-	-	-	229	59	502
14:15	14:30	3	-	-	2	225	-	-	1	-	-	224	65	520
14:30	14:45	3	-	-	1	186	-	1	-	-	-	226	72	489
14:45	15:00	1	-	-	-	202	-	-	-	-	-	240	63	506
TOTALS		41	-	-	37	4 509	-	27	6	6	-	5 196	1 564	11 386

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
12:00	13:00	4	0	0	6	793	0	7	1	1	0	950	291	2 053

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	1	-	-	1	227	-	1	-	-	-	269	55	554
15:15	15:30	2	-	-	1	231	-	3	-	-	-	252	48	537
15:30	15:45	2	-	-	-	236	-	2	-	-	-	291	66	597
15:45	16:00	2	-	-	2	273	-	-	1	-	-	282	56	616
16:00	16:15	-	-	-	-	334	-	1	-	-	-	265	62	662
16:15	16:30	4	-	-	1	297	-	1	-	-	-	230	53	586
16:30	16:45	7	-	-	2	268	-	1	1	-	-	234	63	576
16:45	17:00	7	-	-	6	277	-	1	-	-	-	245	60	596
17:00	17:15	3	-	-	6	274	-	1	-	-	-	222	67	573
17:15	17:30	-	-	-	2	287	-	-	-	-	-	217	82	588
17:30	17:45	5	-	-	3	231	-	1	-	-	-	207	66	513
17:45	18:00	5	-	-	1	170	-	1	-	-	-	165	66	408
TOTALS		38	-	-	25	3 105	-	13	2	-	-	2 879	744	6 806

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:30	16:30	8	0	0	3	1140	0	4	1	0	0	1068	237	2 461

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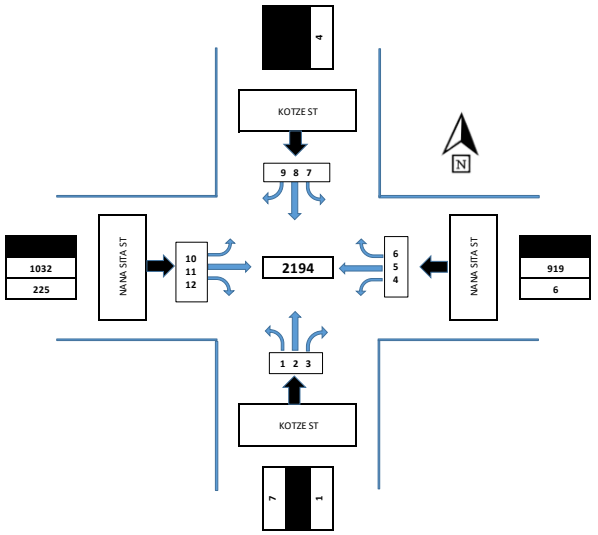
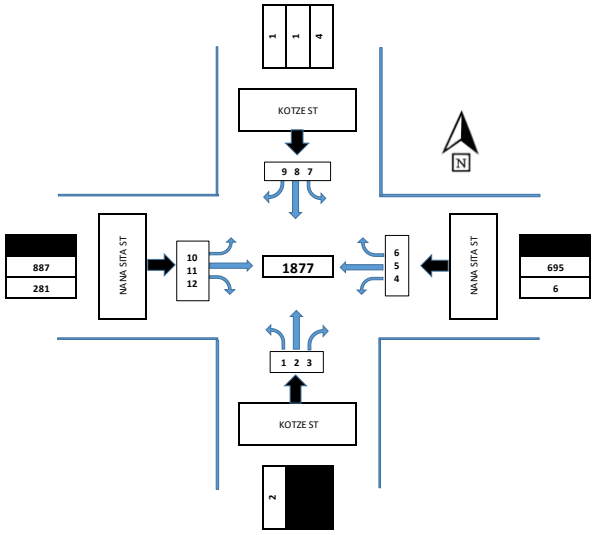
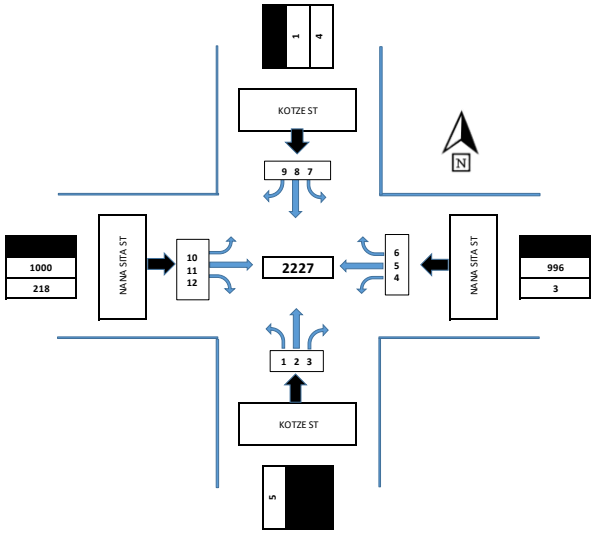
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P5	



Peak time : 07:15 - 08:15 Background peak :



Peak time : 12:00 - 13:00 Background peak :



Peak time : 15:30 - 16:30 Background peak :

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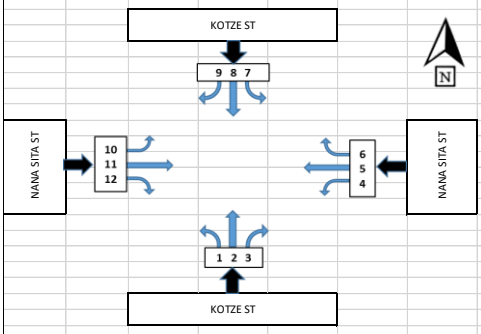
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P5	



AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	77	-	-	-	-	-	74	18	169
06:15	06:30	-	-	-	1	83	-	-	-	-	-	119	22	225
06:30	06:45	-	-	-	1	134	-	2	-	-	-	169	57	363
06:45	07:00	-	-	-	2	179	-	1	1	-	-	188	54	425
07:00	07:15	-	-	-	-	248	-	-	-	-	-	198	58	504
07:15	07:30	2	-	-	3	233	-	1	-	-	-	247	50	536
07:30	07:45	1	-	-	2	261	-	1	-	-	-	249	64	578
07:45	08:00	1	-	-	1	216	-	2	-	-	-	270	58	548
08:00	08:15	3	-	1	-	209	-	-	-	-	-	266	53	532
08:15	08:30	-	-	-	1	226	-	2	-	-	-	244	61	534
08:30	08:45	-	-	-	1	204	-	1	-	-	-	202	52	460
08:45	09:00	-	-	-	1	211	-	-	-	-	-	216	48	476
TOTALS		7	-	1	13	2 281	-	10	1	-	-	2 442	595	5 350

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	7	0	1	6	919	0	4	0	0	0	1032	225	2 194

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	1	-	-	-	172	-	-	-	-	-	194	61	428
09:15	09:30	1	-	-	1	167	-	2	-	-	-	160	53	384
09:30	09:45	-	-	-	1	134	-	-	-	-	-	193	58	386
09:45	10:00	1	-	-	2	175	-	-	1	-	-	183	55	417
10:00	10:15	-	-	-	-	161	-	1	-	-	-	208	58	428
10:15	10:30	-	-	-	3	152	-	-	-	-	-	170	52	377
10:30	10:45	1	-	-	1	145	-	-	-	-	-	190	57	394
10:45	11:00	1	-	-	3	157	-	1	-	-	-	174	65	401
11:00	11:15	1	-	-	2	142	-	1	-	-	-	200	49	395
11:15	11:30	2	-	-	-	130	-	-	-	1	-	204	67	404
11:30	11:45	1	-	-	-	160	-	1	-	-	-	226	57	445
11:45	12:00	-	-	-	1	164	-	-	-	-	-	194	59	418
12:00	12:15	1	-	-	2	181	-	2	-	-	-	219	69	474
12:15	12:30	-	-	-	1	183	-	2	-	-	-	212	65	463
12:30	12:45	1	-	-	1	172	-	-	-	-	-	243	76	493
12:45	13:00	-	-	-	2	159	-	-	1	1	-	213	71	447
13:00	13:15	-	-	-	-	147	-	-	1	1	-	209	72	430
13:15	13:30	1	-	-	1	166	-	2	-	1	-	196	61	428
13:30	13:45	1	-	-	4	168	-	-	-	-	-	198	73	444
13:45	14:00	-	-	-	3	177	-	-	-	-	-	193	64	437
14:00	14:15	1	-	-	1	185	-	2	-	-	-	212	54	455
14:15	14:30	**3**	-	-	**2**	**193**	-	-	**1**	-	-	**212**	**59**	470
14:30	14:45	**3**	-	-	**1**	**161**	-	-	-	-	-	**208**	**71**	444
14:45	15:00	-	-	-	-	**163**	-	-	-	-	-	**230**	**61**	454
TOTALS		20	-	-	32	3 914	-	14	4	4	-	4 841	1 487	10 316

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
12:00	13:00	2	0	0	6	695	0	4	1	1	0	887	281	1 877

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	1	-	-	1	195	-	1	-	-	-	248	50	496
15:15	15:30	-	-	-	1	196	-	3	-	-	-	235	47	482
15:30	15:45	2	-	-	-	198	-	2	-	-	-	275	60	537
15:45	16:00	1	-	-	2	236	-	-	1	-	-	262	51	553
16:00	16:15	-	-	-	-	301	-	1	-	-	-	244	58	604
16:15	16:30	2	-	-	1	261	-	1	-	-	-	219	49	533
16:30	16:45	4	-	-	2	226	-	1	1	-	-	219	58	511
16:45	17:00	4	-	-	5	232	-	-	-	-	-	234	54	529
17:00	17:15	1	-	-	4	219	-	1	-	-	-	206	62	493
17:15	17:30	-	-	-	2	244	-	-	-	-	-	195	79	520
17:30	17:45	1	-	-	3	195	-	1	-	-	-	200	60	460
17:45	18:00	1	-	-	1	145	-	1	-	-	-	159	62	369
TOTALS		17	-	-	22	2 648	-	12	2	-	-	2 696	690	6 087

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:30	16:30	5	0	0	3	996	0	4	1	0	0	1000	218	2 227

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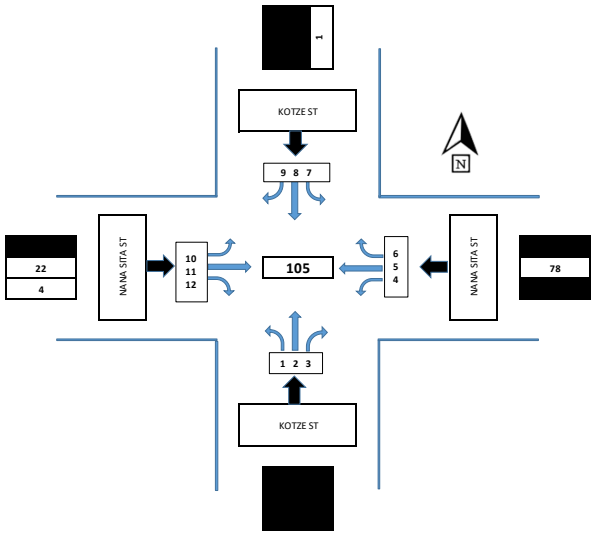
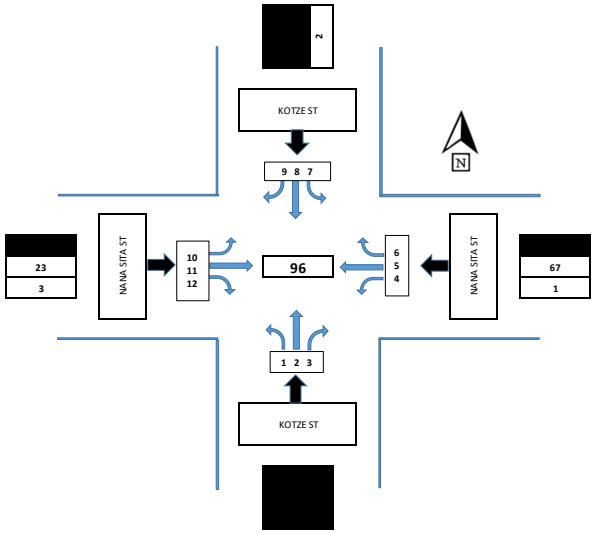
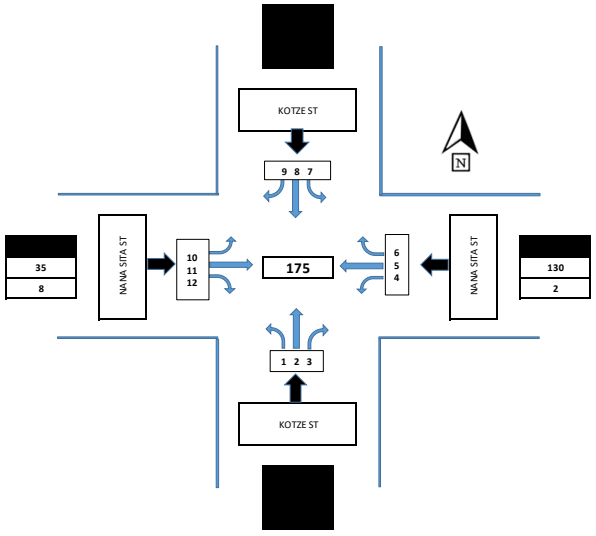
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P5	



Peak time : 07:30 - 08:30 Background peak :



Peak time : 14:00 - 15:00 Background peak :



Peak time : 16:30 - 17:30 Background peak :

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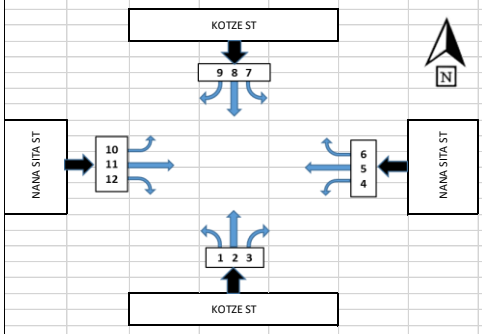
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P5	



AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	6	-	-	-	-	-	2	-	8
06:15	06:30	-	-	-	-	12	-	-	-	-	-	4	-	16
06:30	06:45	-	-	-	-	17	-	-	-	-	-	5	-	22
06:45	07:00	-	-	-	-	15	-	-	-	-	-	5	2	22
07:00	07:15	-	-	-	-	10	-	-	-	-	-	8	-	18
07:15	07:30	-	-	-	-	12	-	-	-	-	-	5	-	17
07:30	07:45	-	-	-	-	24	-	1	-	-	-	5	-	30
07:45	08:00	-	-	-	-	20	-	-	-	-	-	2	-	22
08:00	08:15	-	-	-	-	15	-	-	-	-	-	8	1	24
08:15	08:30	-	-	-	-	19	-	-	-	-	-	7	3	29
08:30	08:45	-	-	-	-	17	-	-	-	-	-	4	3	24
08:45	09:00	-	-	-	-	19	-	-	-	-	-	8	1	28
TOTALS		-	-	-	-	186	-	1	-	-	-	63	10	260

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:30	08:30	0	0	0	0	78	0	1	0	0	0	22	4	105

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	13	-	1	-	-	-	7	1	22
09:15	09:30	-	-	-	-	11	-	-	-	-	-	4	1	16
09:30	09:45	-	-	-	-	15	-	1	-	-	-	6	-	22
09:45	10:00	-	-	-	-	10	-	-	-	-	-	5	-	15
10:00	10:15	-	-	-	-	8	-	2	-	-	-	8	2	20
10:15	10:30	-	-	-	-	12	-	1	-	1	-	11	3	28
10:30	10:45	-	-	-	-	13	-	-	-	1	-	3	-	17
10:45	11:00	-	-	-	1	12	-	1	-	-	-	5	1	20
11:00	11:15	-	-	-	-	14	-	-	-	-	-	6	7	27
11:15	11:30	-	-	-	-	12	-	-	-	-	-	7	1	20
11:30	11:45	-	-	-	-	14	-	1	1	-	-	4	3	23
11:45	12:00	-	-	-	-	16	-	1	-	-	-	6	1	24
12:00	12:15	-	-	-	-	6	-	-	-	-	-	5	1	12
12:15	12:30	-	-	-	-	18	-	1	-	-	-	2	1	22
12:30	12:45	-	-	-	-	15	-	1	-	-	-	4	1	21
12:45	13:00	-	-	-	-	14	-	1	-	-	-	3	3	21
13:00	13:15	-	-	-	1	8	-	-	-	-	-	4	-	13
13:15	13:30	-	-	-	-	13	-	-	-	-	-	8	-	21
13:30	13:45	-	-	-	-	20	-	-	-	-	-	4	1	25
13:45	14:00	-	-	-	1	16	-	-	-	-	-	2	1	20
14:00	14:15	-	-	-	1	14	-	1	-	-	-	7	1	24
14:15	14:30	-	-	-	-	15	-	-	-	-	-	5	2	22
14:30	14:45	-	-	-	-	15	-	1	-	-	-	9	-	25
14:45	15:00	-	-	-	-	23	-	-	-	-	-	2	-	25
TOTALS		-	-	-	4	327	-	13	1	2	-	127	31	505

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
14:00	15:00	0	0	0	1	67	0	2	0	0	0	23	3	96

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	21	-	-	-	-	-	7	3	31
15:15	15:30	1	-	-	-	18	-	-	-	-	-	4	1	24
15:30	15:45	-	-	-	-	25	-	-	-	-	-	5	3	33
15:45	16:00	-	-	-	-	18	-	-	-	-	-	7	3	28
16:00	16:15	-	-	-	-	23	-	-	-	-	-	5	2	30
16:15	16:30	-	-	-	-	22	-	-	-	-	-	1	1	24
16:30	16:45	-	-	-	-	31	-	-	-	-	-	2	3	36
16:45	17:00	-	-	-	-	35	-	-	-	-	-	6	3	44
17:00	17:15	-	-	-	2	37	-	-	-	-	-	12	1	52
17:15	17:30	-	-	-	-	27	-	-	-	-	-	15	1	43
17:30	17:45	-	-	-	-	25	-	-	-	-	-	2	3	30
17:45	18:00	-	-	-	-	17	-	-	-	-	-	4	1	22
TOTALS		1	-	-	2	299	-	-	-	-	-	70	25	397

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
16:30	17:30	0	0	0	2	130	0	0	0	0	0	35	8	175

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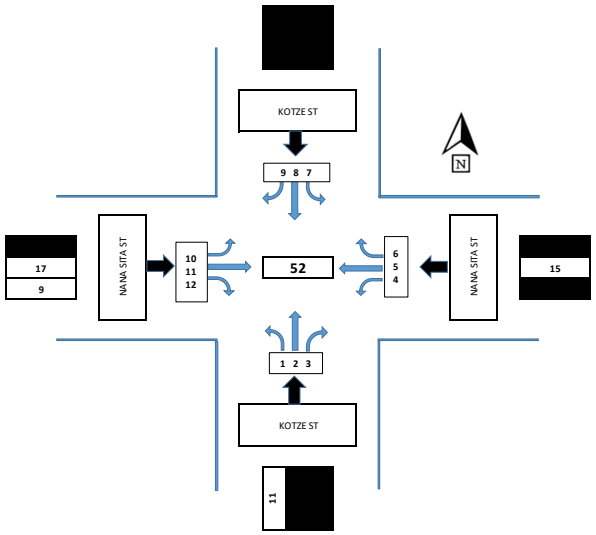
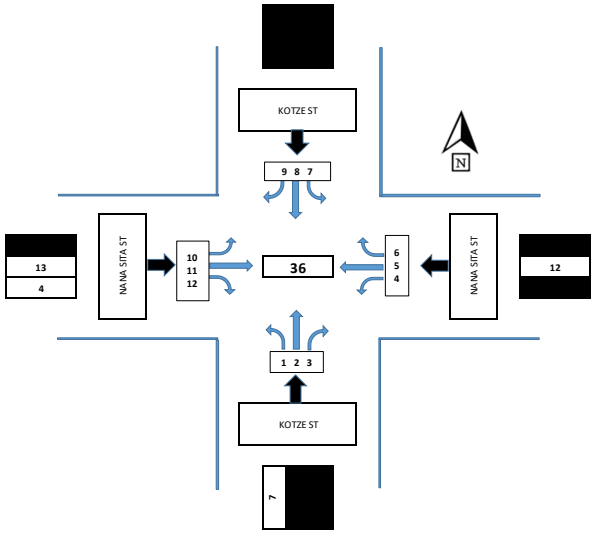
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P5	

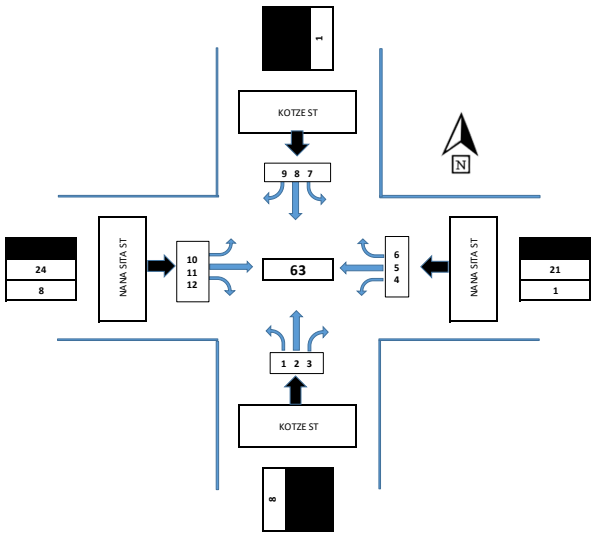
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 06:15 - 07:15 Background peak :



Peak time : 09:00 - 10:00 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	1	-	-	-	4	-	-	-	-	-	3	4	12
06:15	06:30	1	-	-	-	4	-	-	-	-	-	3	3	11
06:30	06:45	3	-	-	-	6	-	-	-	-	-	6	3	18
06:45	07:00	2	-	-	-	4	-	-	-	-	-	2	1	9
07:00	07:15	5	-	-	-	1	-	-	-	-	-	6	2	14
07:15	07:30	1	-	-	-	4	-	-	-	-	-	1	2	8
07:30	07:45	2	-	-	-	5	-	-	-	-	-	6	1	14
07:45	08:00	3	-	-	-	4	-	-	-	-	-	2	3	12
08:00	08:15	1	-	-	-	7	-	-	-	-	-	5	-	13
08:15	08:30	**5**	-	-	-	2	-	-	-	-	-	2	4	13
08:30	08:45	**1**	-	-	-	6	-	-	-	-	-	6	-	13
08:45	09:00	**2**	-	-	-	3	-	-	-	-	-	5	1	11
TOTALS		27	-	-	-	50	-	-	-	-	-	47	24	148

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:15	07:15	11	0	0	0	15	0	0	0	0	0	17	9	52

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	4	-	-	-	3	-	-	-	-	-	3	-	10
09:15	09:30	1	-	-	-	2	-	-	-	-	-	3	2	8
09:30	09:45	-	-	-	-	7	-	-	-	-	-	5	1	13
09:45	10:00	2	-	-	-	-	-	-	-	-	-	2	1	5
10:00	10:15	1	-	-	-	-	-	-	-	-	-	1	-	2
10:15	10:30	-	-	-	-	1	-	-	-	-	-	2	1	4
10:30	10:45	1	-	-	-	1	-	-	-	-	-	3	-	5
10:45	11:00	1	-	-	-	1	-	-	-	-	-	2	1	5
11:00	11:15	-	-	-	-	2	-	-	-	-	-	1	-	3
11:15	11:30	1	-	-	-	3	-	-	-	-	-	2	-	6
11:30	11:45	1	-	-	-	1	-	-	-	-	-	2	2	6
11:45	12:00	-	-	-	-	2	-	-	-	-	-	1	1	4
12:00	12:15	-	-	-	-	3	-	-	-	-	-	2	-	5
12:15	12:30	1	-	-	-	2	-	-	-	-	-	5	1	9
12:30	12:45	-	-	-	-	-	-	-	-	-	-	2	-	2
12:45	13:00	1	-	-	-	2	-	-	-	-	-	3	1	7
13:00	13:15	1	-	-	-	3	-	-	-	-	-	1	1	6
13:15	13:30	1	-	-	-	-	-	-	-	-	-	1	1	3
13:30	13:45	-	-	-	-	3	-	-	-	-	-	1	-	4
13:45	14:00	2	-	-	-	1	-	-	-	-	-	-	1	4
14:00	14:15	1	-	-	-	1	-	-	-	-	-	2	1	5
14:15	14:30	-	-	-	-	**3**	-	-	-	-	-	**2**	**1**	6
14:30	14:45	-	-	-	-	**3**	-	-	-	-	-	**2**	**1**	6
14:45	15:00	**1**	-	-	-	**8**	-	-	-	-	-	**2**	-	11
TOTALS		20	-	-	-	52	-	-	-	-	-	50	17	139

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	10:00	7	0	0	0	12	0	0	0	0	0	13	4	36

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	3	-	-	-	-	-	11	1	15
15:15	15:30	1	-	-	-	6	-	-	-	-	-	4	-	11
15:30	15:45	-	-	-	-	7	-	-	-	-	-	3	2	12
15:45	16:00	1	-	-	-	6	-	-	-	-	-	6	2	15
16:00	16:15	-	-	-	-	3	-	-	-	-	-	10	2	15
16:15	16:30	2	-	-	-	6	-	-	-	-	-	5	3	16
16:30	16:45	3	-	-	-	7	-	-	-	-	-	5	1	16
16:45	17:00	3	-	-	1	5	-	1	-	-	-	4	2	16
17:00	17:15	2	-	-	-	7	-	-	-	-	-	1	3	13
17:15	17:30	-	-	-	-	3	-	-	-	-	-	2	-	5
17:30	17:45	2	-	-	-	6	-	-	-	-	-	3	3	14
17:45	18:00	4	-	-	-	3	-	-	-	-	-	1	2	10
TOTALS		18	-	-	1	62	-	1	-	-	-	55	21	158

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
16:00	17:00	8	0	0	1	21	0	1	0	0	0	24	8	63

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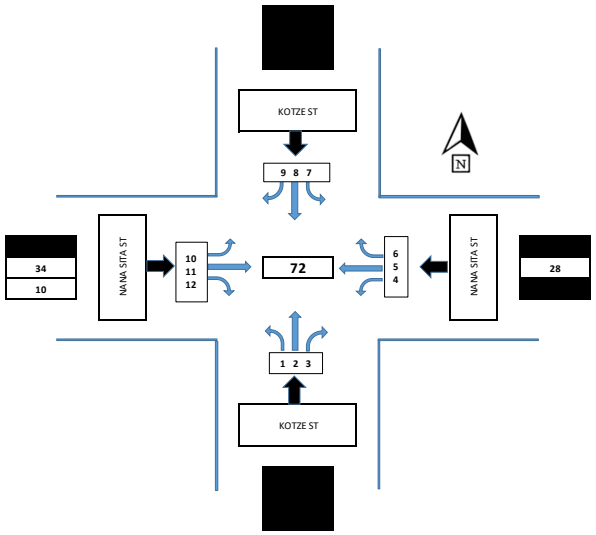
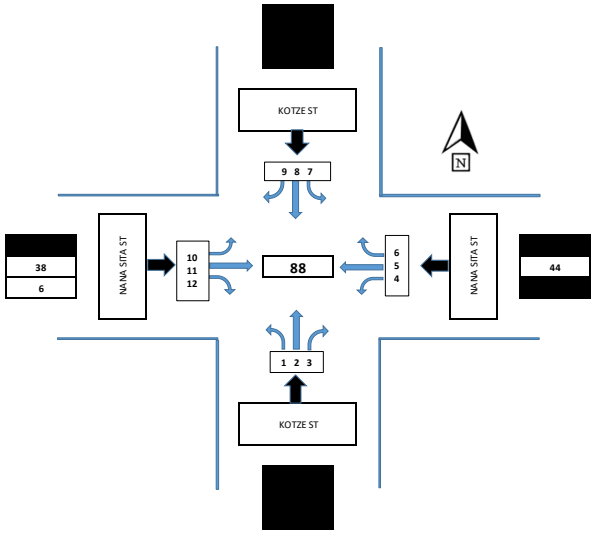
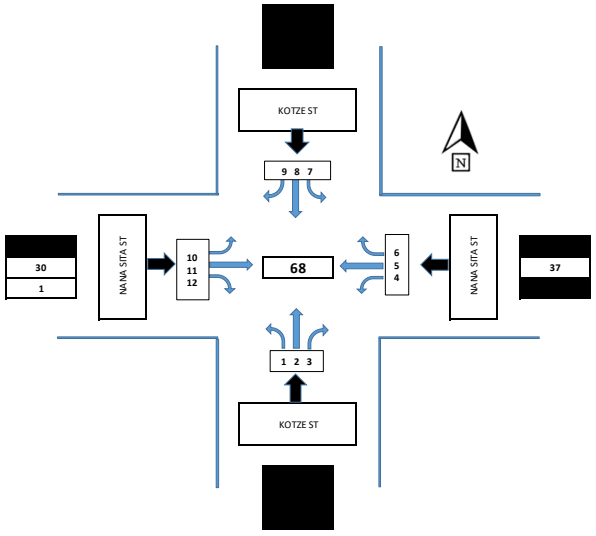
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	HF
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P5	



Peak time : 08:00 - 09:00 Background peak :



Peak time : 11:30 - 12:30 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	2	-	-	-	-	-	1	1	4
06:15	06:30	-	-	-	-	2	-	-	-	-	-	6	-	8
06:30	06:45	-	-	-	-	4	-	-	-	-	-	1	-	5
06:45	07:00	-	-	-	-	1	-	-	-	-	-	3	-	4
07:00	07:15	-	-	-	-	4	-	-	-	-	-	3	1	8
07:15	07:30	-	-	-	1	4	-	-	-	-	-	3	1	9
07:30	07:45	-	-	-	-	4	-	-	-	-	-	6	-	10
07:45	08:00	-	-	-	-	5	-	-	-	-	-	2	-	7
08:00	08:15	-	-	-	-	7	-	-	-	-	-	7	-	14
08:15	08:30	-	-	-	-	**4**	-	-	-	-	-	**9**	**2**	15
08:30	08:45	-	-	-	-	**6**	-	-	-	-	-	**7**	**6**	19
08:45	09:00	-	-	-	-	**11**	-	-	-	-	-	**11**	**2**	24
TOTALS		-	-	-	1	54	-	-	-	-	-	59	13	**127**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	0	0	0	0	28	0	0	0	0	0	34	10	72

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	1	-	-	-	4	-	-	-	-	-	9	2	16
09:15	09:30	-	-	-	-	6	-	-	-	-	-	6	2	14
09:30	09:45	-	-	-	-	5	-	-	-	-	-	8	1	14
09:45	10:00	-	-	-	-	12	-	-	1	-	-	6	2	21
10:00	10:15	-	-	-	-	10	-	-	-	-	-	3	-	13
10:15	10:30	-	-	-	-	12	-	-	-	-	-	8	1	21
10:30	10:45	-	-	-	-	8	-	-	-	-	-	10	2	20
10:45	11:00	-	-	-	-	6	-	-	-	-	-	7	3	16
11:00	11:15	-	-	-	-	10	-	-	-	-	-	10	1	21
11:15	11:30	-	-	-	-	7	-	-	-	-	-	4	-	11
11:30	11:45	-	-	-	-	10	-	-	-	-	-	8	1	19
11:45	12:00	-	-	-	-	12	-	-	-	-	-	9	3	24
12:00	12:15	-	-	-	-	8	-	-	-	-	-	11	1	20
12:15	12:30	-	-	-	-	14	-	-	-	-	-	10	1	25
12:30	12:45	-	-	-	-	12	-	-	-	-	-	7	-	19
12:45	13:00	-	-	-	-	4	-	-	-	-	-	9	-	13
13:00	13:15	-	-	-	-	9	-	-	-	-	-	7	1	17
13:15	13:30	-	-	-	-	12	-	-	-	-	-	8	-	20
13:30	13:45	-	-	-	-	7	-	-	-	-	-	4	-	11
13:45	14:00	-	-	-	1	12	-	-	-	-	-	8	-	21
14:00	14:15	-	-	-	-	7	-	-	-	-	-	8	3	18
14:15	14:30	-	-	-	-	**14**	-	-	-	-	-	**5**	**3**	22
14:30	14:45	-	-	-	-	**7**	-	-	-	-	-	**7**	-	14
14:45	15:00	-	-	-	-	**8**	-	-	-	-	-	**6**	**2**	16
TOTALS		1	-	-	1	216	-	-	1	-	-	178	29	**426**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:30	12:30	0	0	0	0	44	0	0	0	0	0	38	6	88

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	8	-	-	-	-	-	3	1	12
15:15	15:30	-	-	-	-	11	-	-	-	-	-	9	-	20
15:30	15:45	-	-	-	-	6	-	-	-	-	-	8	1	15
15:45	16:00	-	-	-	-	13	-	-	-	-	-	7	-	20
16:00	16:15	-	-	-	-	7	-	-	-	-	-	6	-	13
16:15	16:30	-	-	-	-	8	-	-	-	-	-	5	-	13
16:30	16:45	-	-	-	-	4	-	-	-	-	-	8	1	13
16:45	17:00	-	-	-	-	5	-	-	-	-	-	1	1	7
17:00	17:15	-	-	-	-	11	-	-	-	-	-	3	1	15
17:15	17:30	-	-	-	-	13	-	-	-	-	-	5	2	20
17:30	17:45	2	-	-	-	5	-	-	-	-	-	2	-	9
17:45	18:00	-	-	-	-	5	-	-	-	-	-	1	1	7
TOTALS		2	-	-	-	96	-	-	-	-	-	58	8	**164**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	0	0	0	0	37	0	0	0	0	0	30	1	68

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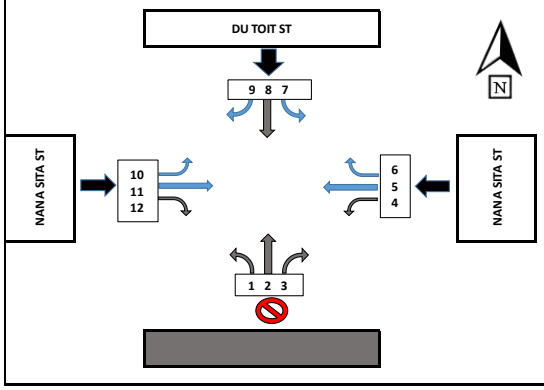
SITE LOCATION:	**UNI PTA**	**JOB NR:**	UT2019-522	**DRAWN:**	**D.L**
SURVEY DATE:	Thursday, 14 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P6	



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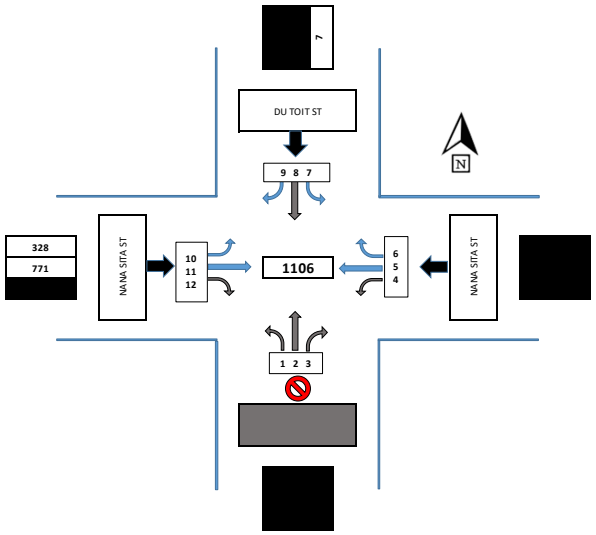
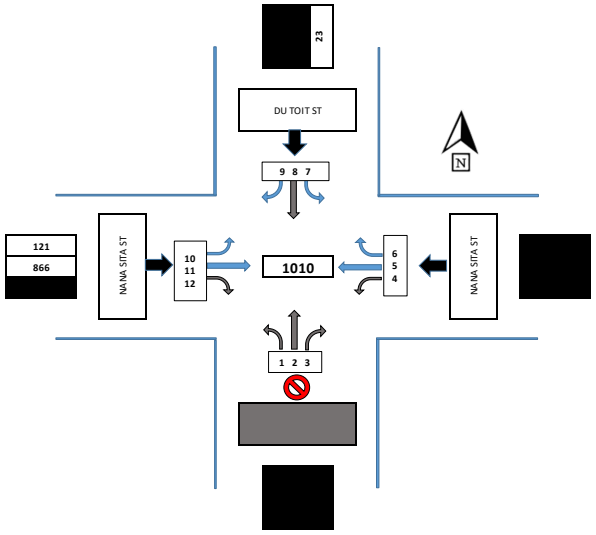
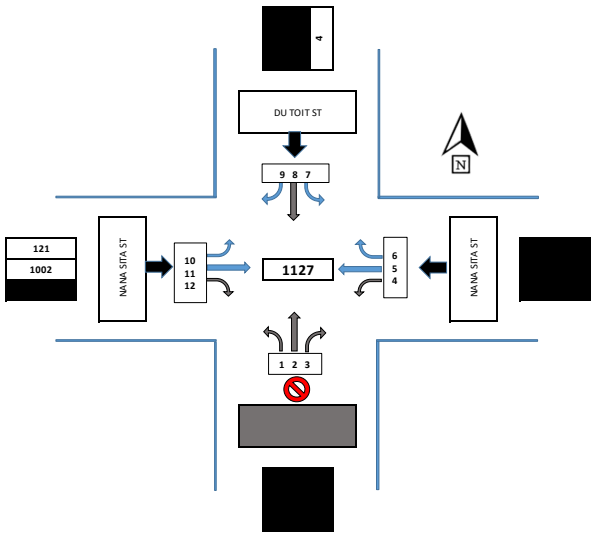
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P6	



Peak time : 07:30 - 08:30 Background peak :



Peak time : 12:00 - 13:00 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	-	-	-	-	-	13	65	-	78
06:15	06:30	-	-	-	-	-	-	-	-	-	23	116	-	139
06:30	06:45	-	-	-	-	-	-	-	-	-	41	132	-	173
06:45	07:00	-	-	-	-	-	-	-	-	-	44	159	-	203
07:00	07:15	-	-	-	-	-	-	1	-	-	47	166	-	214
07:15	07:30	-	-	-	-	-	-	1	-	-	52	182	-	235
07:30	07:45	-	-	-	-	-	-	-	-	-	91	188	-	279
07:45	08:00	-	-	-	-	-	-	-	-	-	81	187	-	268
08:00	08:15	-	-	-	-	-	-	-	-	-	84	200	-	284
08:15	08:30	-	-	-	-	-	-	7	-	-	72	196	-	275
08:30	08:45	-	-	-	-	-	-	2	-	-	50	184	-	236
08:45	09:00	-	-	-	-	-	-	2	-	-	46	195	-	243
TOTALS		-	-	-	-	-	-	13	-	-	644	1 970	-	2 627

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:30	08:30	0	0	0	0	0	0	7	0	0	328	771	0	1 106

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	-	-	2	-	-	35	181	-	218
09:15	09:30	-	-	-	-	-	-	4	-	-	43	130	-	177
09:30	09:45	-	-	-	-	-	-	2	-	-	31	180	-	213
09:45	10:00	-	-	-	-	-	-	1	-	-	30	171	-	202
10:00	10:15	-	-	-	-	-	-	7	-	-	31	188	-	226
10:15	10:30	-	-	-	-	-	-	3	-	-	25	180	-	208
10:30	10:45	-	-	-	-	-	-	2	-	-	28	164	-	194
10:45	11:00	-	-	-	-	-	-	1	-	-	25	177	-	203
11:00	11:15	-	-	-	-	-	-	8	-	-	18	198	-	224
11:15	11:30	-	-	-	-	-	-	4	-	-	23	184	-	211
11:30	11:45	-	-	-	-	-	-	6	-	-	36	218	-	260
11:45	12:00	-	-	-	-	-	-	5	-	-	28	178	-	211
12:00	12:15	-	-	-	-	-	-	4	-	-	30	213	-	247
12:15	12:30	-	-	-	-	-	-	3	-	-	28	221	-	252
12:30	12:45	-	-	-	-	-	-	4	-	-	39	225	-	268
12:45	13:00	-	-	-	-	-	-	12	-	-	24	207	-	243
13:00	13:15	-	-	-	-	-	-	6	-	-	26	189	-	221
13:15	13:30	-	-	-	-	-	-	5	-	-	19	201	-	225
13:30	13:45	-	-	-	-	-	-	3	-	-	29	184	-	216
13:45	14:00	-	-	-	-	-	-	6	-	-	21	186	-	213
14:00	14:15	-	-	-	-	-	-	3	-	-	31	202	-	236
14:15	14:30	-	-	-	-	-	-	2	-	-	27	198	-	227
14:30	14:45	-	-	-	-	-	-	1	-	-	21	206	-	228
14:45	15:00	-	-	-	-	-	-	2	-	-	19	219	-	240
TOTALS		-	-	-	-	-	-	96	-	-	667	4 600	-	5 363

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
12:00	13:00	0	0	0	0	0	0	23	0	0	121	866	0	1 010

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	-	-	-	-	-	16	235	-	251
15:15	15:30	-	-	-	-	-	-	-	-	-	40	228	-	268
15:30	15:45	-	-	-	-	-	-	-	-	-	29	259	-	288
15:45	16:00	-	-	-	-	-	-	2	-	-	27	276	-	305
16:00	16:15	-	-	-	-	-	-	2	-	-	25	239	-	266
16:15	16:30	-	-	-	-	-	-	5	-	-	27	203	-	235
16:30	16:45	-	-	-	-	-	-	10	-	-	25	219	-	254
16:45	17:00	-	-	-	-	-	-	5	-	-	16	238	-	259
17:00	17:15	-	-	-	-	-	-	3	-	-	30	189	-	222
17:15	17:30	-	-	-	-	-	-	3	-	-	34	203	-	240
17:30	17:45	-	-	-	-	-	-	1	-	-	21	197	-	219
17:45	18:00	-	-	-	-	-	-	3	-	-	21	138	-	162
TOTALS		-	-	-	-	-	-	34	-	-	311	2 624	-	2 969

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	0	0	0	0	0	0	4	0	0	121	1002	0	1 127

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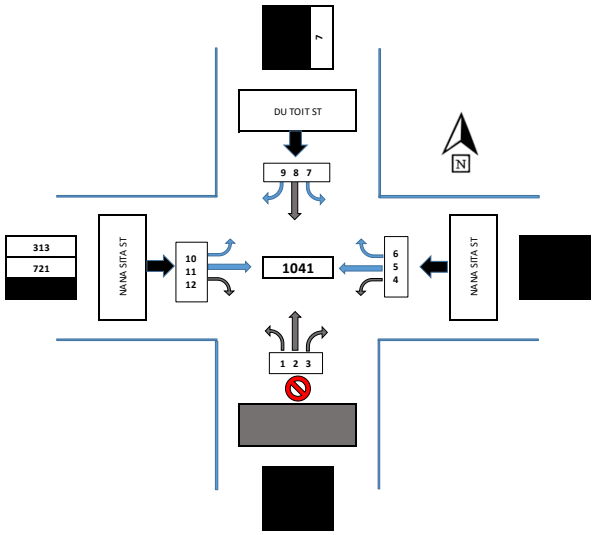
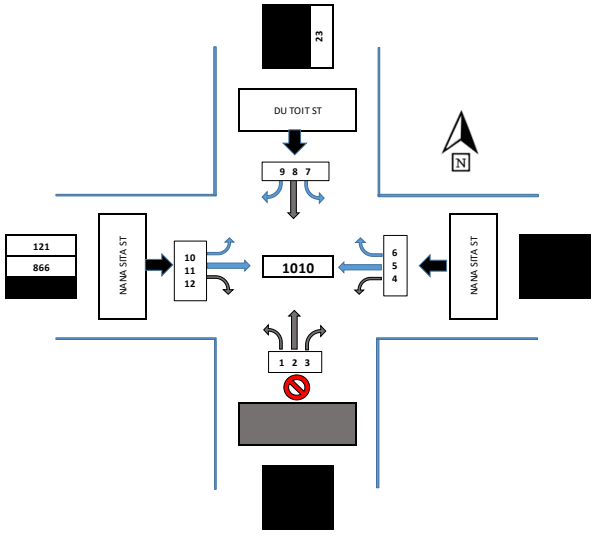
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P6	

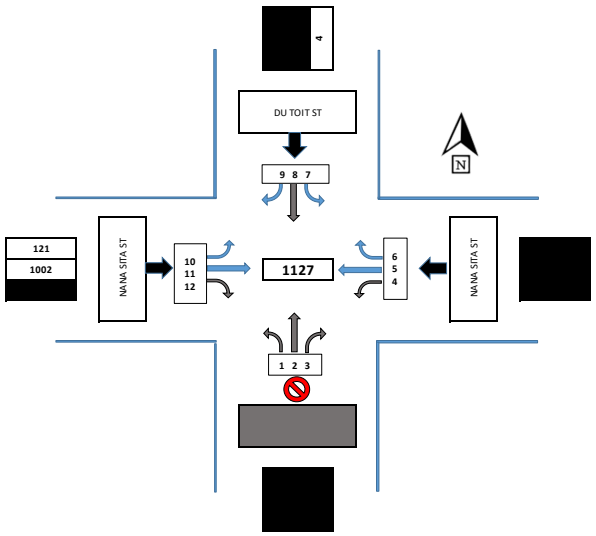
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 07:30 - 08:30 Background peak :



Peak time : 12:00 - 13:00 Background peak :



Peak time : 15:15 - 16:15 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	-	-	-	-	-	9	62	-	71
06:15	06:30	-	-	-	-	-	-	-	-	-	19	105	-	124
06:30	06:45	-	-	-	-	-	-	-	-	-	37	123	-	160
06:45	07:00	-	-	-	-	-	-	-	-	-	43	149	-	192
07:00	07:15	-	-	-	-	-	-	1	-	-	43	152	-	196
07:15	07:30	-	-	-	-	-	-	1	-	-	51	174	-	226
07:30	07:45	-	-	-	-	-	-	-	-	-	87	173	-	260
07:45	08:00	-	-	-	-	-	-	-	-	-	81	179	-	260
08:00	08:15	-	-	-	-	-	-	-	-	-	78	189	-	267
08:15	08:30	-	-	-	-	-	-	7	-	-	67	180	-	254
08:30	08:45	-	-	-	-	-	-	2	-	-	46	169	-	217
08:45	09:00	-	-	-	-	-	-	2	-	-	43	174	-	219
TOTALS		-	-	-	-	-	-	13	-	-	604	1 829	-	2 446

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:30	08:30	0	0	0	0	0	0	7	0	0	313	721	0	1 041

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	-	-	2	-	-	31	171	-	204
09:15	09:30	-	-	-	-	-	-	4	-	-	43	130	-	177
09:30	09:45	-	-	-	-	-	-	2	-	-	31	180	-	213
09:45	10:00	-	-	-	-	-	-	1	-	-	30	171	-	202
10:00	10:15	-	-	-	-	-	-	7	-	-	31	188	-	226
10:15	10:30	-	-	-	-	-	-	3	-	-	25	180	-	208
10:30	10:45	-	-	-	-	-	-	2	-	-	28	164	-	194
10:45	11:00	-	-	-	-	-	-	1	-	-	25	177	-	203
11:00	11:15	-	-	-	-	-	-	8	-	-	18	198	-	224
11:15	11:30	-	-	-	-	-	-	4	-	-	23	184	-	211
11:30	11:45	-	-	-	-	-	-	6	-	-	36	218	-	260
11:45	12:00	-	-	-	-	-	-	5	-	-	28	178	-	211
12:00	12:15	-	-	-	-	-	-	4	-	-	30	213	-	247
12:15	12:30	-	-	-	-	-	-	3	-	-	28	221	-	252
12:30	12:45	-	-	-	-	-	-	4	-	-	39	225	-	268
12:45	13:00	-	-	-	-	-	-	12	-	-	24	207	-	243
13:00	13:15	-	-	-	-	-	-	6	-	-	26	189	-	221
13:15	13:30	-	-	-	-	-	-	5	-	-	19	201	-	225
13:30	13:45	-	-	-	-	-	-	3	-	-	29	184	-	216
13:45	14:00	-	-	-	-	-	-	6	-	-	21	186	-	213
14:00	14:15	-	-	-	-	-	-	3	-	-	31	202	-	236
14:15	14:30	-	-	-	-	-	-	**2**	-	-	**27**	**198**	-	227
14:30	14:45	-	-	-	-	-	-	**1**	-	-	**21**	**206**	-	228
14:45	15:00	-	-	-	-	-	-	**2**	-	-	**19**	**219**	-	240
TOTALS		-	-	-	-	-	-	96	-	-	663	4 590	-	5 349

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
12:00	13:00	0	0	0	0	0	0	23	0	0	121	866	0	1 010

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	-	-	-	-	-	16	235	-	251
15:15	15:30	-	-	-	-	-	-	-	-	-	40	228	-	268
15:30	15:45	-	-	-	-	-	-	-	-	-	29	259	-	288
15:45	16:00	-	-	-	-	-	-	2	-	-	27	276	-	305
16:00	16:15	-	-	-	-	-	-	2	-	-	25	239	-	266
16:15	16:30	-	-	-	-	-	-	5	-	-	27	203	-	235
16:30	16:45	-	-	-	-	-	-	10	-	-	25	219	-	254
16:45	17:00	-	-	-	-	-	-	5	-	-	16	238	-	259
17:00	17:15	-	-	-	-	-	-	3	-	-	30	189	-	222
17:15	17:30	-	-	-	-	-	-	3	-	-	34	203	-	240
17:30	17:45	-	-	-	-	-	-	1	-	-	21	197	-	219
17:45	18:00	-	-	-	-	-	-	3	-	-	21	138	-	162
TOTALS		-	-	-	-	-	-	34	-	-	311	2 624	-	2 969

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:15	16:15	0	0	0	0	0	0	4	0	0	121	1002	0	1 127

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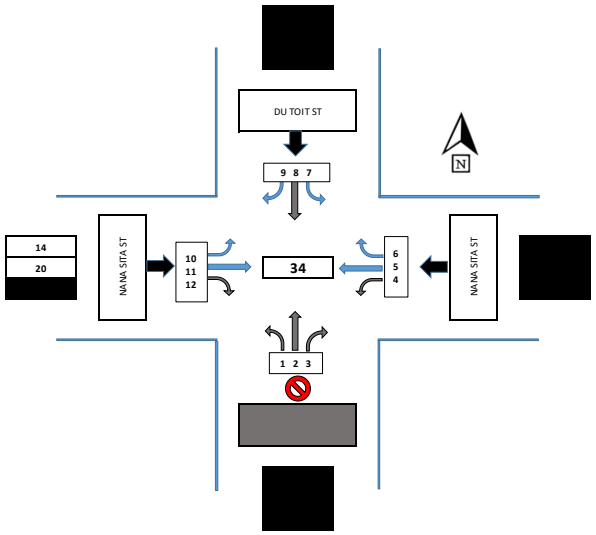
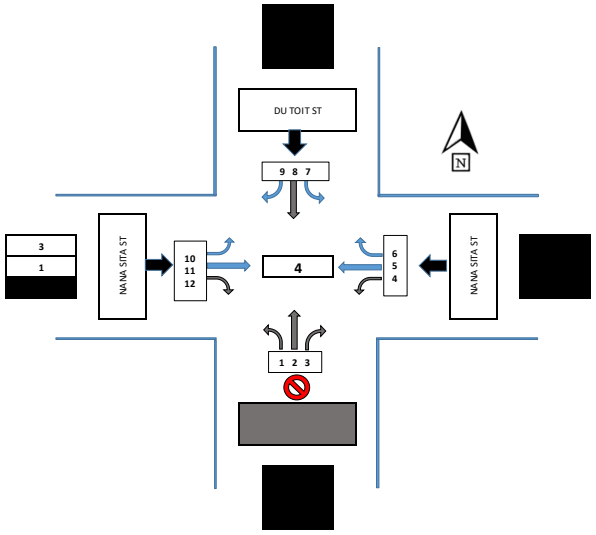
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P6	

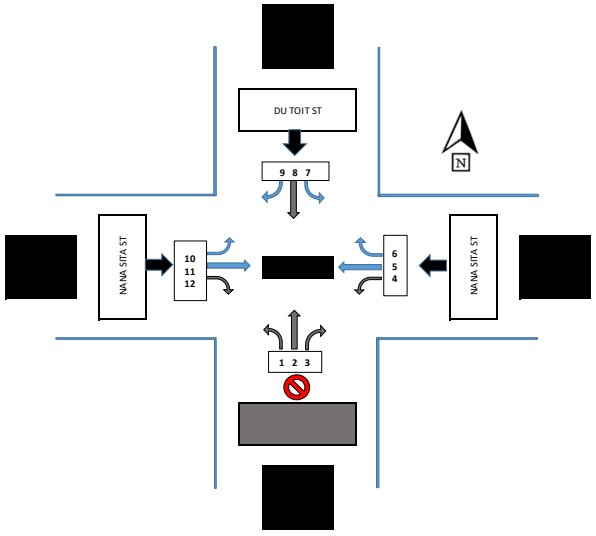
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 08:00 - 09:00 Background peak :



Peak time : 09:00 - 10:00 Background peak :



Peak time : 15:00 - 16:00 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	-	-	-	-	-	1	2	-	3
06:15	06:30	-	-	-	-	-	-	-	-	-	1	4	-	5
06:30	06:45	-	-	-	-	-	-	-	-	-	1	5	-	6
06:45	07:00	-	-	-	-	-	-	-	-	-	1	5	-	6
07:00	07:15	-	-	-	-	-	-	-	-	-	1	7	-	8
07:15	07:30	-	-	-	-	-	-	-	-	-	-	5	-	5
07:30	07:45	-	-	-	-	-	-	-	-	-	3	4	-	7
07:45	08:00	-	-	-	-	-	-	-	-	-	-	5	-	5
08:00	08:15	-	-	-	-	-	-	-	-	-	5	-	-	5
08:15	08:30	-	-	-	-	-	-	-	-	-	5	7	-	12
08:30	08:45	-	-	-	-	-	-	-	-	-	3	4	-	7
08:45	09:00	-	-	-	-	-	-	-	-	-	1	9	-	10
TOTALS		-	-	-	-	-	-	-	-	-	22	57	-	79

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	0	0	0	0	0	0	0	0	0	14	20	0	34

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	-	-	-	-	-	3	1	-	4
09:15	09:30	-	-	-	-	-	-	-	-	-	-	-	-	-
09:30	09:45	-	-	-	-	-	-	-	-	-	-	-	-	-
09:45	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00	10:15	-	-	-	-	-	-	-	-	-	-	-	-	-
10:15	10:30	-	-	-	-	-	-	-	-	-	-	-	-	-
10:30	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-
10:45	11:00	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00	11:15	-	-	-	-	-	-	-	-	-	-	-	-	-
11:15	11:30	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30	11:45	-	-	-	-	-	-	-	-	-	-	-	-	-
11:45	12:00	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00	12:15	-	-	-	-	-	-	-	-	-	-	-	-	-
12:15	12:30	-	-	-	-	-	-	-	-	-	-	-	-	-
12:30	12:45	-	-	-	-	-	-	-	-	-	-	-	-	-
12:45	13:00	-	-	-	-	-	-	-	-	-	-	-	-	-
13:00	13:15	-	-	-	-	-	-	-	-	-	-	-	-	-
13:15	13:30	-	-	-	-	-	-	-	-	-	-	-	-	-
13:30	13:45	-	-	-	-	-	-	-	-	-	-	-	-	-
13:45	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-
14:00	14:15	-	-	-	-	-	-	-	-	-	-	-	-	-
14:15	14:30	-	-	-	-	-	-	-	-	-	-	-	-	-
14:30	14:45	-	-	-	-	-	-	-	-	-	-	-	-	-
14:45	15:00	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS		-	-	-	-	-	-	-	-	-	3	1	-	4

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	10:00	0	0	0	0	0	0	0	0	0	3	1	0	4

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	-	-	-	-	-	-	-	-	-
15:15	15:30	-	-	-	-	-	-	-	-	-	-	-	-	-
15:30	15:45	-	-	-	-	-	-	-	-	-	-	-	-	-
15:45	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-
16:00	16:15	-	-	-	-	-	-	-	-	-	-	-	-	-
16:15	16:30	-	-	-	-	-	-	-	-	-	-	-	-	-
16:30	16:45	-	-	-	-	-	-	-	-	-	-	-	-	-
16:45	17:00	-	-	-	-	-	-	-	-	-	-	-	-	-
17:00	17:15	-	-	-	-	-	-	-	-	-	-	-	-	-
17:15	17:30	-	-	-	-	-	-	-	-	-	-	-	-	-
17:30	17:45	-	-	-	-	-	-	-	-	-	-	-	-	-
17:45	18:00	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS		-	-	-	-	-	-	-	-	-	-	-	-	-

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	16:00	0	0	0	0	0	0	0	0	0	0	0	0	-

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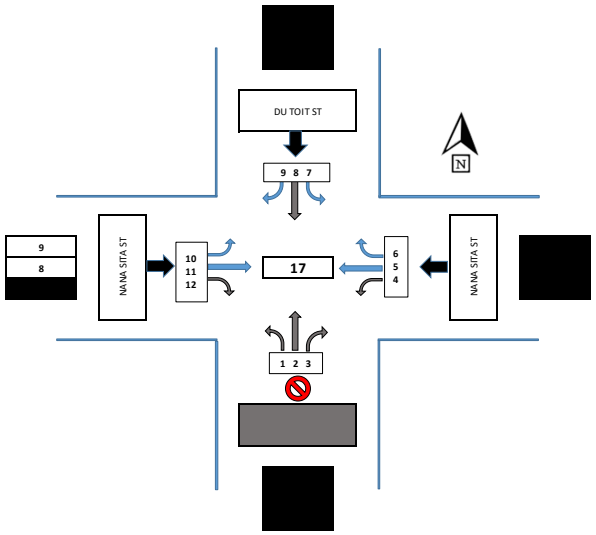
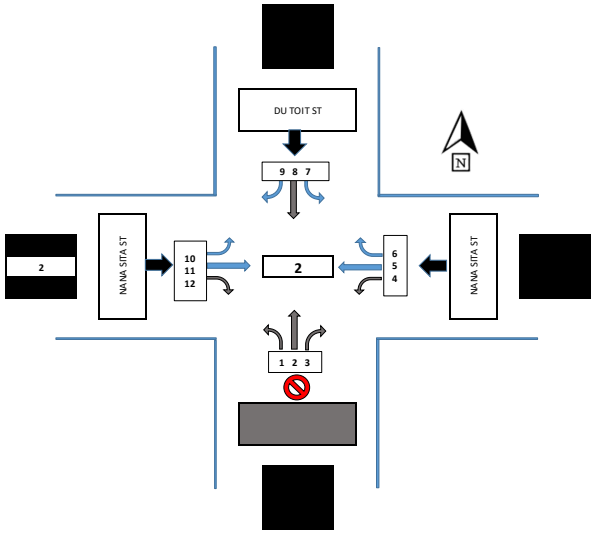
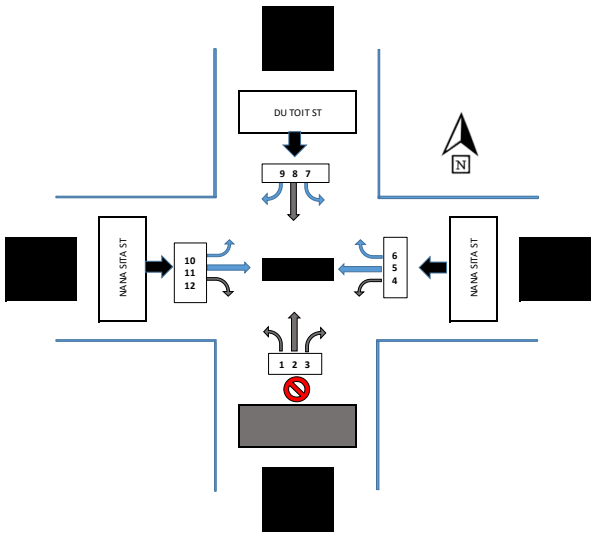
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P6	



Peak time : 06:15 - 07:15 Background peak :



Peak time : 09:00 - 10:00 Background peak :



Peak time : 15:00 - 16:00 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	-	-	-	-	-	2	1	-	3
06:15	06:30	-	-	-	-	-	-	-	-	-	3	-	-	3
06:30	06:45	-	-	-	-	-	-	-	-	-	3	3	-	6
06:45	07:00	-	-	-	-	-	-	-	-	-	-	1	-	1
07:00	07:15	-	-	-	-	-	-	-	-	-	3	4	-	7
07:15	07:30	-	-	-	-	-	-	-	-	-	1	-	-	1
07:30	07:45	-	-	-	-	-	-	-	-	-	1	4	-	5
07:45	08:00	-	-	-	-	-	-	-	-	-	-	1	-	1
08:00	08:15	-	-	-	-	-	-	-	-	-	1	3	-	4
08:15	08:30	-	-	-	-	-	-	-	-	-	-	2	-	2
08:30	08:45	-	-	-	-	-	-	-	-	-	-	4	-	4
08:45	09:00	-	-	-	-	-	-	-	-	-	1	3	-	4
TOTALS		-	-	-	-	-	-	-	-	-	15	26	-	41

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:15	07:15	0	0	0	0	0	0	0	0	0	9	8	0	17

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	-	-	-	-	-	-	2	-	2
09:15	09:30	-	-	-	-	-	-	-	-	-	-	-	-	-
09:30	09:45	-	-	-	-	-	-	-	-	-	-	-	-	-
09:45	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00	10:15	-	-	-	-	-	-	-	-	-	-	-	-	-
10:15	10:30	-	-	-	-	-	-	-	-	-	-	-	-	-
10:30	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-
10:45	11:00	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00	11:15	-	-	-	-	-	-	-	-	-	-	-	-	-
11:15	11:30	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30	11:45	-	-	-	-	-	-	-	-	-	-	-	-	-
11:45	12:00	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00	12:15	-	-	-	-	-	-	-	-	-	-	-	-	-
12:15	12:30	-	-	-	-	-	-	-	-	-	-	-	-	-
12:30	12:45	-	-	-	-	-	-	-	-	-	-	-	-	-
12:45	13:00	-	-	-	-	-	-	-	-	-	-	-	-	-
13:00	13:15	-	-	-	-	-	-	-	-	-	-	-	-	-
13:15	13:30	-	-	-	-	-	-	-	-	-	-	-	-	-
13:30	13:45	-	-	-	-	-	-	-	-	-	-	-	-	-
13:45	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-
14:00	14:15	-	-	-	-	-	-	-	-	-	-	-	-	-
14:15	14:30	-	-	-	-	-	-	-	-	-	-	-	-	-
14:30	14:45	-	-	-	-	-	-	-	-	-	-	-	-	-
14:45	15:00	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS		-	-	-	-	-	-	-	-	-	-	2	-	2

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	10:00	0	0	0	0	0	0	0	0	0	0	2	0	2

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	-	-	-	-	-	-	-	-	-
15:15	15:30	-	-	-	-	-	-	-	-	-	-	-	-	-
15:30	15:45	-	-	-	-	-	-	-	-	-	-	-	-	-
15:45	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-
16:00	16:15	-	-	-	-	-	-	-	-	-	-	-	-	-
16:15	16:30	-	-	-	-	-	-	-	-	-	-	-	-	-
16:30	16:45	-	-	-	-	-	-	-	-	-	-	-	-	-
16:45	17:00	-	-	-	-	-	-	-	-	-	-	-	-	-
17:00	17:15	-	-	-	-	-	-	-	-	-	-	-	-	-
17:15	17:30	-	-	-	-	-	-	-	-	-	-	-	-	-
17:30	17:45	-	-	-	-	-	-	-	-	-	-	-	-	-
17:45	18:00	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS		-	-	-	-	-	-	-	-	-	-	-	-	-

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	16:00	0	0	0	0	0	0	0	0	0	0	0	0	-

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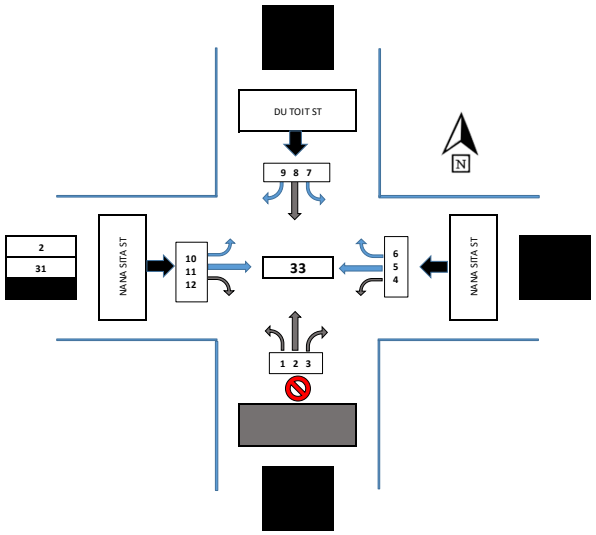
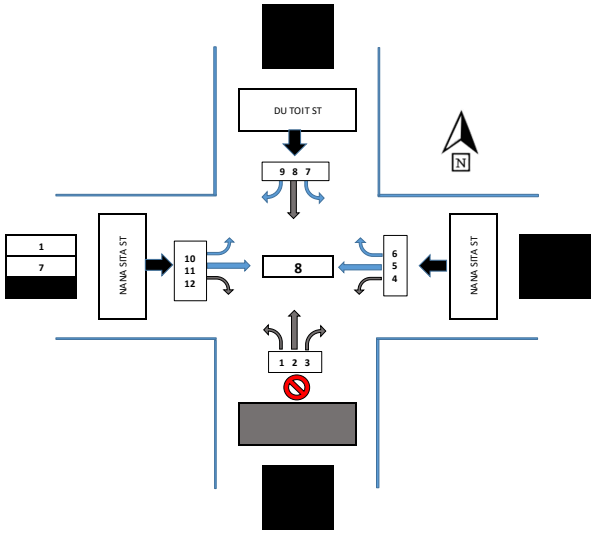
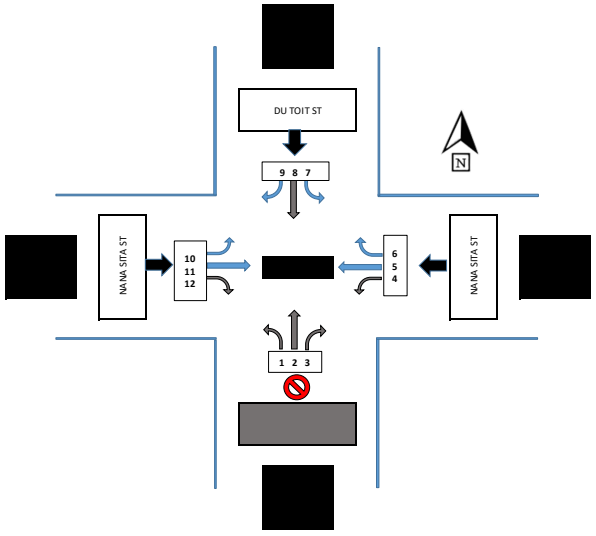
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	HF
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P6	



Peak time : 08:00 - 09:00 Background peak :



Peak time : 09:00 - 10:00 Background peak :



Peak time : 15:00 - 16:00 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	-	-	-	-	-	1	-	-	1
06:15	06:30	-	-	-	-	-	-	-	-	-	-	7	-	7
06:30	06:45	-	-	-	-	-	-	-	-	-	-	1	-	1
06:45	07:00	-	-	-	-	-	-	-	-	-	-	4	-	4
07:00	07:15	-	-	-	-	-	-	-	-	-	-	3	-	3
07:15	07:30	-	-	-	-	-	-	-	-	-	-	3	-	3
07:30	07:45	-	-	-	-	-	-	-	-	-	-	7	-	7
07:45	08:00	-	-	-	-	-	-	-	-	-	-	2	-	2
08:00	08:15	-	-	-	-	-	-	-	-	-	-	8	-	8
08:15	08:30	-	-	-	-	-	-	-	-	-	-	7	-	7
08:30	08:45	-	-	-	-	-	-	-	-	-	1	7	-	8
08:45	09:00	-	-	-	-	-	-	-	-	-	1	9	-	10
TOTALS		-	-	-	-	-	-	-	-	-	3	58	-	61

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	0	0	0	0	0	0	0	0	0	2	31	0	33

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	-	-	-	-	-	1	7	-	8
09:15	09:30	-	-	-	-	-	-	-	-	-	-	-	-	-
09:30	09:45	-	-	-	-	-	-	-	-	-	-	-	-	-
09:45	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00	10:15	-	-	-	-	-	-	-	-	-	-	-	-	-
10:15	10:30	-	-	-	-	-	-	-	-	-	-	-	-	-
10:30	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-
10:45	11:00	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00	11:15	-	-	-	-	-	-	-	-	-	-	-	-	-
11:15	11:30	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30	11:45	-	-	-	-	-	-	-	-	-	-	-	-	-
11:45	12:00	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00	12:15	-	-	-	-	-	-	-	-	-	-	-	-	-
12:15	12:30	-	-	-	-	-	-	-	-	-	-	-	-	-
12:30	12:45	-	-	-	-	-	-	-	-	-	-	-	-	-
12:45	13:00	-	-	-	-	-	-	-	-	-	-	-	-	-
13:00	13:15	-	-	-	-	-	-	-	-	-	-	-	-	-
13:15	13:30	-	-	-	-	-	-	-	-	-	-	-	-	-
13:30	13:45	-	-	-	-	-	-	-	-	-	-	-	-	-
13:45	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-
14:00	14:15	-	-	-	-	-	-	-	-	-	-	-	-	-
14:15	14:30	-	-	-	-	-	-	-	-	-	-	-	-	-
14:30	14:45	-	-	-	-	-	-	-	-	-	-	-	-	-
14:45	15:00	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS		-	-	-	-	-	-	-	-	-	1	7	-	8

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	10:00	0	0	0	0	0	0	0	0	0	1	7	0	8

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	-	-	-	-	-	-	-	-	-	-	-	-
15:15	15:30	-	-	-	-	-	-	-	-	-	-	-	-	-
15:30	15:45	-	-	-	-	-	-	-	-	-	-	-	-	-
15:45	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-
16:00	16:15	-	-	-	-	-	-	-	-	-	-	-	-	-
16:15	16:30	-	-	-	-	-	-	-	-	-	-	-	-	-
16:30	16:45	-	-	-	-	-	-	-	-	-	-	-	-	-
16:45	17:00	-	-	-	-	-	-	-	-	-	-	-	-	-
17:00	17:15	-	-	-	-	-	-	-	-	-	-	-	-	-
17:15	17:30	-	-	-	-	-	-	-	-	-	-	-	-	-
17:30	17:45	-	-	-	-	-	-	-	-	-	-	-	-	-
17:45	18:00	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS		-	-	-	-	-	-	-	-	-	-	-	-	-

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	16:00	0	0	0	0	0	0	0	0	0	0	0	0	-

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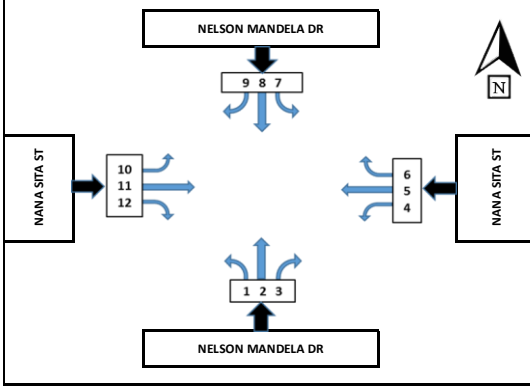
SITE LOCATION:	**UNI PTA**	**JOB NR:**	UT2019-522	**DRAWN:**	**D.L**
SURVEY DATE:	Thursday, 14 February 2019	**DWG TITLE:**		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	**JOB TITLE:**		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	**UNITRAF (PTY) LTD**	**DWG NR:**		UT2019-522-P7	



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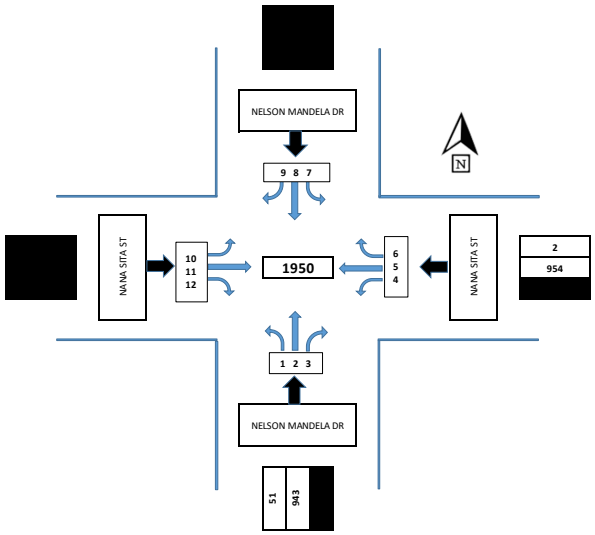
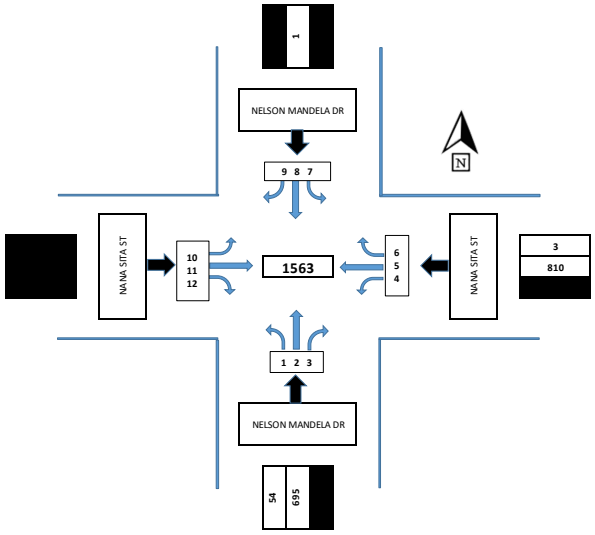
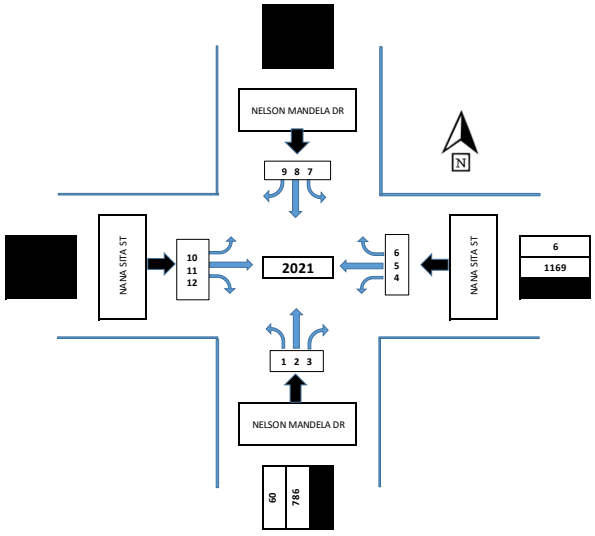
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P7	



Peak time : 07:15 - 08:15 Background peak :



Peak time : 13:45 - 14:45 Background peak :



Peak time : 15:45 - 16:45 Background peak :

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AM PEAK (06H00 - 9H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	6	80	-	-	81	-	-	-	-	-	-	-	167
06:15	06:30	6	139	-	-	98	-	-	-	-	-	-	-	243
06:30	06:45	8	180	-	-	154	-	-	-	-	-	-	-	342
06:45	07:00	7	217	-	-	202	-	-	-	-	-	-	-	426
07:00	07:15	11	207	-	-	251	3	-	-	-	-	-	-	472
07:15	07:30	17	236	-	-	236	-	-	-	-	-	-	-	489
07:30	07:45	15	249	-	-	266	1	-	-	-	-	-	-	531
07:45	08:00	9	223	-	-	220	1	-	-	-	-	-	-	453
08:00	08:15	10	235	-	-	232	-	-	-	-	-	-	-	477
08:15	08:30	7	200	-	-	264	-	-	-	-	-	-	-	471
08:30	08:45	7	229	-	-	232	-	-	-	-	-	-	-	468
08:45	09:00	8	204	-	-	198	2	-	-	-	-	-	-	412
TOTALS		111	2 399	-	-	2 434	7	-	-	-	-	-	-	4 951

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:15	08:15	51	943	0	0	954	2	0	0	0	0	0	0	1 950

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	8	168	-	-	170	-	-	-	-	-	-	-	346
09:15	09:30	5	189	-	-	169	1	-	-	-	-	-	-	364
09:30	09:45	7	194	-	-	153	2	-	-	-	-	-	-	356
09:45	10:00	14	184	-	-	172	-	-	-	-	-	-	-	370
10:00	10:15	5	148	-	-	168	-	-	-	-	-	-	-	321
10:15	10:30	6	135	-	-	160	1	-	-	-	-	-	-	302
10:30	10:45	6	149	-	-	156	-	-	-	-	-	-	-	311
10:45	11:00	16	153	-	-	155	1	-	-	-	-	-	-	325
11:00	11:15	11	157	-	-	149	1	-	-	-	-	-	-	318
11:15	11:30	7	161	-	-	121	1	-	-	-	-	-	-	290
11:30	11:45	13	134	-	-	172	2	-	-	-	-	-	-	321
11:45	12:00	8	133	-	-	170	-	-	-	-	-	-	-	311
12:00	12:15	11	156	-	-	182	1	-	-	-	-	-	-	350
12:15	12:30	5	153	-	-	207	1	-	-	-	-	-	-	366
12:30	12:45	6	156	-	-	184	1	-	-	-	-	-	-	347
12:45	13:00	6	134	-	-	163	1	-	-	-	-	-	-	304
13:00	13:15	14	169	-	-	159	1	-	-	-	-	-	-	343
13:15	13:30	12	180	-	-	188	2	-	-	-	-	-	-	382
13:30	13:45	7	149	-	-	204	-	-	-	1	-	-	-	361
13:45	14:00	11	175	-	-	209	2	-	-	-	-	-	-	397
14:00	14:15	18	168	-	-	188	1	-	-	-	-	-	-	375
14:15	14:30	11	169	-	-	229	-	-	1	-	-	-	-	410
14:30	14:45	14	183	-	-	184	-	-	-	-	-	-	-	381
14:45	15:00	6	167	-	-	205	2	-	-	-	-	-	-	380
TOTALS		227	3 864	-	-	4 217	21	-	1	1	-	-	-	8 331

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
13:45	14:45	54	695	0	0	810	3	0	1	0	0	0	0	1 563

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	6	181	-	-	228	1	-	-	-	-	-	-	416
15:15	15:30	12	187	-	-	244	-	-	-	-	-	-	-	443
15:30	15:45	4	161	-	-	247	1	-	-	-	-	-	-	413
15:45	16:00	9	182	-	-	296	1	-	-	-	-	-	-	488
16:00	16:15	12	187	-	-	304	2	-	-	-	-	-	-	505
16:15	16:30	9	198	-	-	281	1	-	-	-	-	-	-	489
16:30	16:45	30	219	-	-	288	2	-	-	-	-	-	-	539
16:45	17:00	21	174	-	-	252	3	-	-	-	-	-	-	450
17:00	17:15	20	210	-	-	276	1	-	-	-	-	-	-	507
17:15	17:30	15	207	-	-	285	1	-	-	-	-	-	-	508
17:30	17:45	10	219	-	-	223	2	-	-	-	-	-	-	454
17:45	18:00	11	166	-	-	164	2	-	-	-	-	-	-	343
TOTALS		159	2 291	-	-	3 088	17	-	-	-	-	-	-	5 555

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:45	16:45	60	786	0	0	1169	6	0	0	0	0	0	0	2 021

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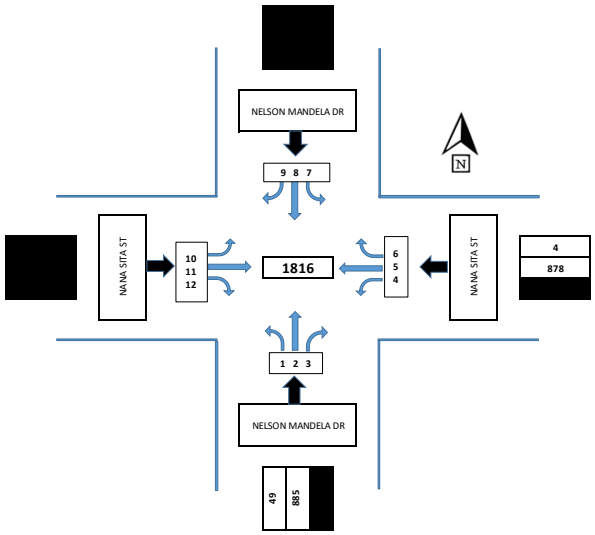
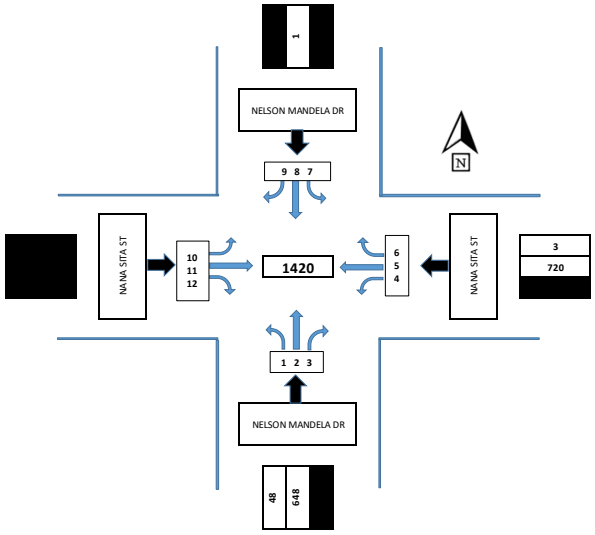
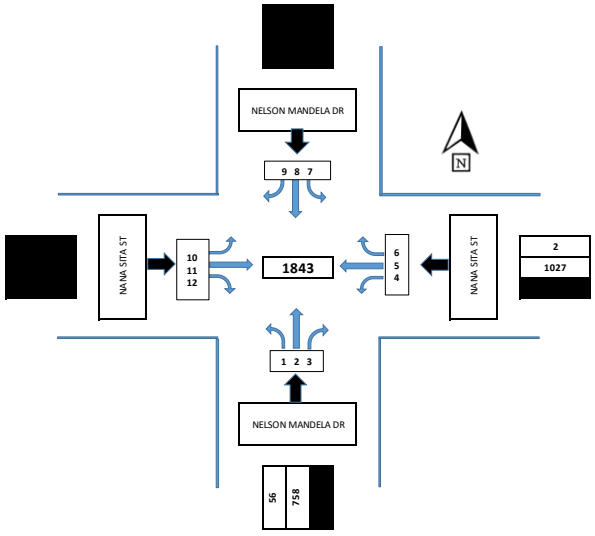
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P7	



Peak time : 07:00 - 08:00 Background peak :



Peak time : 13:45 - 14:45 Background peak :



Peak time : 15:45 - 16:45 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	4	75	-	-	68	-	-	-	-	-	-	-	147
06:15	06:30	5	132	-	-	79	-	-	-	-	-	-	-	216
06:30	06:45	6	172	-	-	130	-	-	-	-	-	-	-	308
06:45	07:00	7	205	-	-	179	-	-	-	-	-	-	-	391
07:00	07:15	11	199	-	-	234	2	-	-	-	-	-	-	446
07:15	07:30	15	226	-	-	216	-	-	-	-	-	-	-	457
07:30	07:45	15	244	-	-	232	1	-	-	-	-	-	-	492
07:45	08:00	8	216	-	-	196	1	-	-	-	-	-	-	421
08:00	08:15	9	229	-	-	207	-	-	-	-	-	-	-	445
08:15	08:30	7	192	-	-	238	-	-	-	-	-	-	-	437
08:30	08:45	6	218	-	-	203	-	-	-	-	-	-	-	427
08:45	09:00	8	189	-	-	175	-	-	-	-	-	-	-	372
TOTALS		101	2 297	-	-	2 157	4	-	-	-	-	-	-	4 559

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:00	08:00	49	885	0	0	878	4	0	0	0	0	0	0	1 816

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	7	154	-	-	153	-	-	-	-	-	-	-	314
09:15	09:30	4	178	-	-	154	1	-	-	-	-	-	-	337
09:30	09:45	6	181	-	-	126	-	-	-	-	-	-	-	313
09:45	10:00	13	170	-	-	153	-	-	-	-	-	-	-	336
10:00	10:15	4	141	-	-	154	-	-	-	-	-	-	-	299
10:15	10:30	5	131	-	-	139	1	-	-	-	-	-	-	276
10:30	10:45	5	137	-	-	136	-	-	-	-	-	-	-	278
10:45	11:00	14	141	-	-	140	-	-	-	-	-	-	-	295
11:00	11:15	11	145	-	-	126	1	-	-	-	-	-	-	283
11:15	11:30	5	149	-	-	104	1	-	-	-	-	-	-	259
11:30	11:45	12	125	-	-	153	2	-	-	-	-	-	-	292
11:45	12:00	8	123	-	-	144	-	-	-	-	-	-	-	275
12:00	12:15	11	145	-	-	166	1	-	-	-	-	-	-	323
12:15	12:30	5	141	-	-	173	1	-	-	-	-	-	-	320
12:30	12:45	4	144	-	-	168	1	-	-	-	-	-	-	317
12:45	13:00	6	129	-	-	146	1	-	-	-	-	-	-	282
13:00	13:15	13	154	-	-	137	1	-	-	-	-	-	-	305
13:15	13:30	11	171	-	-	166	2	-	-	-	-	-	-	350
13:30	13:45	7	136	-	-	177	-	-	-	1	-	-	-	321
13:45	14:00	10	160	-	-	185	2	-	-	-	-	-	-	357
14:00	14:15	15	156	-	-	171	1	-	-	-	-	-	-	343
14:15	14:30	11	162	-	-	199	-	-	1	-	-	-	-	373
14:30	14:45	12	170	-	-	165	-	-	-	-	-	-	-	347
14:45	15:00	4	161	-	-	175	2	-	-	-	-	-	-	342
TOTALS		203	3 604	-	-	3 710	18	-	1	1	-	-	-	7 537

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
13:45	14:45	48	648	0	0	720	3	0	1	0	0	0	0	1 420

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	4	176	-	-	199	1	-	-	-	-	-	-	380
15:15	15:30	10	180	-	-	214	-	-	-	-	-	-	-	404
15:30	15:45	4	152	-	-	205	1	-	-	-	-	-	-	362
15:45	16:00	9	176	-	-	261	-	-	-	-	-	-	-	446
16:00	16:15	12	182	-	-	274	2	-	-	-	-	-	-	470
16:15	16:30	8	186	-	-	251	-	-	-	-	-	-	-	445
16:30	16:45	27	214	-	-	241	-	-	-	-	-	-	-	482
16:45	17:00	20	168	-	-	217	1	-	-	-	-	-	-	406
17:00	17:15	18	202	-	-	222	-	-	-	-	-	-	-	442
17:15	17:30	15	194	-	-	242	-	-	-	-	-	-	-	451
17:30	17:45	9	212	-	-	188	1	-	-	-	-	-	-	410
17:45	18:00	11	159	-	-	143	2	-	-	-	-	-	-	315
TOTALS		147	2 201	-	-	2 657	8	-	-	-	-	-	-	5 013

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:45	16:45	56	758	0	0	1027	2	0	0	0	0	0	0	1 843

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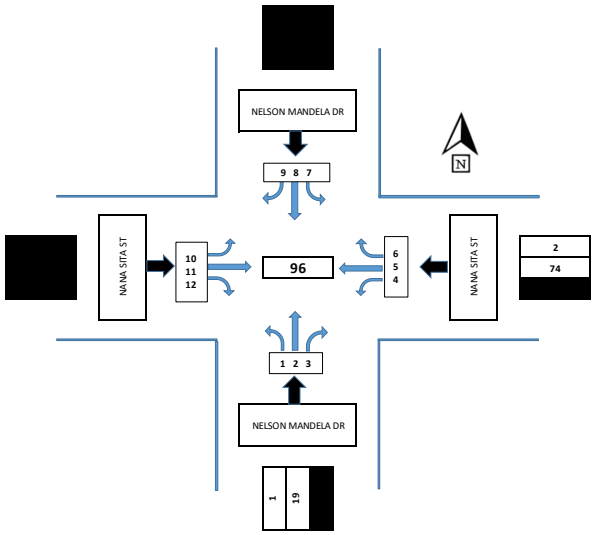
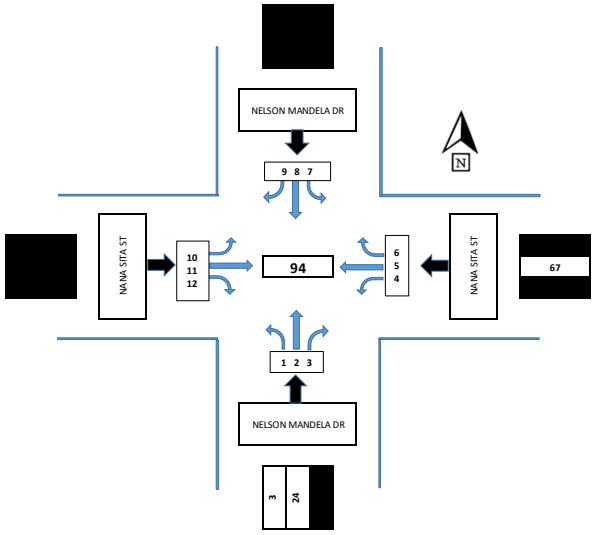
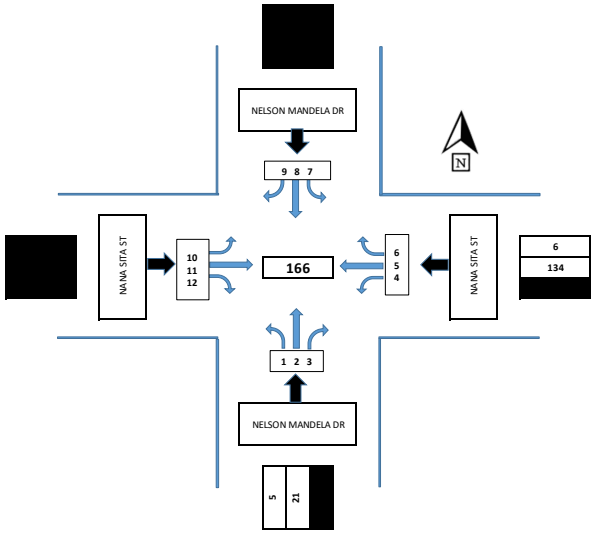
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P7	



Peak time : 08:00 - 09:00 Background peak :



Peak time : 13:30 - 14:30 Background peak :



Peak time : 16:30 - 17:30 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	2	3	-	-	8	-	-	-	-	-	-	-	13
06:15	06:30	1	6	-	-	12	-	-	-	-	-	-	-	19
06:30	06:45	2	6	-	-	14	-	-	-	-	-	-	-	22
06:45	07:00	-	8	-	-	18	-	-	-	-	-	-	-	26
07:00	07:15	-	5	-	-	13	1	-	-	-	-	-	-	19
07:15	07:30	2	5	-	-	12	-	-	-	-	-	-	-	19
07:30	07:45	-	2	-	-	26	-	-	-	-	-	-	-	28
07:45	08:00	-	5	-	-	18	-	-	-	-	-	-	-	23
08:00	08:15	1	3	-	-	15	-	-	-	-	-	-	-	19
08:15	08:30	-	2	-	-	22	-	-	-	-	-	-	-	24
08:30	08:45	-	5	-	-	20	-	-	-	-	-	-	-	25
08:45	09:00	-	9	-	-	17	2	-	-	-	-	-	-	28
TOTALS		8	59	-	-	195	3	-	-	-	-	-	-	265

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	1	19	0	0	74	2	0	0	0	0	0	0	96

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	1	7	-	-	13	-	-	-	-	-	-	-	21
09:15	09:30	1	1	-	-	11	-	-	-	-	-	-	-	13
09:30	09:45	1	8	-	-	19	2	-	-	-	-	-	-	30
09:45	10:00	1	8	-	-	13	-	-	-	-	-	-	-	22
10:00	10:15	1	2	-	-	7	-	-	-	-	-	-	-	10
10:15	10:30	1	2	-	-	11	-	-	-	-	-	-	-	14
10:30	10:45	1	4	-	-	12	-	-	-	-	-	-	-	17
10:45	11:00	1	10	-	-	12	1	-	-	-	-	-	-	24
11:00	11:15	-	6	-	-	14	-	-	-	-	-	-	-	20
11:15	11:30	-	3	-	-	12	-	-	-	-	-	-	-	15
11:30	11:45	-	3	-	-	13	-	-	-	-	-	-	-	16
11:45	12:00	-	4	-	-	15	-	-	-	-	-	-	-	19
12:00	12:15	-	5	-	-	5	-	-	-	-	-	-	-	10
12:15	12:30	-	10	-	-	17	-	-	-	-	-	-	-	27
12:30	12:45	2	7	-	-	11	-	-	-	-	-	-	-	20
12:45	13:00	-	1	-	-	12	-	-	-	-	-	-	-	13
13:00	13:15	1	11	-	-	10	-	-	-	-	-	-	-	22
13:15	13:30	-	3	-	-	14	-	-	-	-	-	-	-	17
13:30	13:45	-	6	-	-	19	-	-	-	-	-	-	-	25
13:45	14:00	1	8	-	-	16	-	-	-	-	-	-	-	25
14:00	14:15	2	7	-	-	14	-	-	-	-	-	-	-	23
14:15	14:30	-	3	-	-	18	-	-	-	-	-	-	-	21
14:30	14:45	-	9	-	-	15	-	-	-	-	-	-	-	24
14:45	15:00	2	3	-	-	20	-	-	-	-	-	-	-	25
TOTALS		16	131	-	-	323	3	-	-	-	-	-	-	473

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
13:30	14:30	3	24	0	0	67	0	0	0	0	0	0	0	94

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	2	3	-	-	21	-	-	-	-	-	-	-	26
15:15	15:30	1	4	-	-	20	-	-	-	-	-	-	-	25
15:30	15:45	-	3	-	-	28	-	-	-	-	-	-	-	31
15:45	16:00	-	4	-	-	23	1	-	-	-	-	-	-	28
16:00	16:15	-	4	-	-	24	-	-	-	-	-	-	-	28
16:15	16:30	1	6	-	-	18	1	-	-	-	-	-	-	26
16:30	16:45	2	2	-	-	37	2	-	-	-	-	-	-	43
16:45	17:00	1	4	-	-	26	2	-	-	-	-	-	-	33
17:00	17:15	2	5	-	-	38	1	-	-	-	-	-	-	46
17:15	17:30	-	10	-	-	33	1	-	-	-	-	-	-	44
17:30	17:45	1	4	-	-	29	1	-	-	-	-	-	-	35
17:45	18:00	-	4	-	-	15	-	-	-	-	-	-	-	19
TOTALS		10	53	-	-	312	9	-	-	-	-	-	-	384

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
16:30	17:30	5	21	0	0	134	6	0	0	0	0	0	0	166

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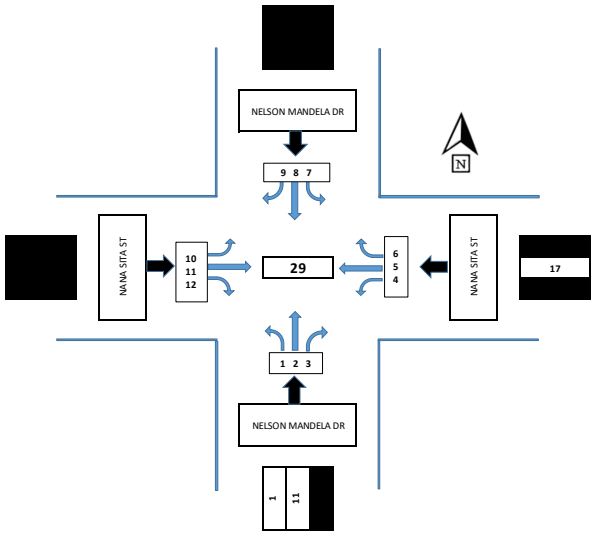
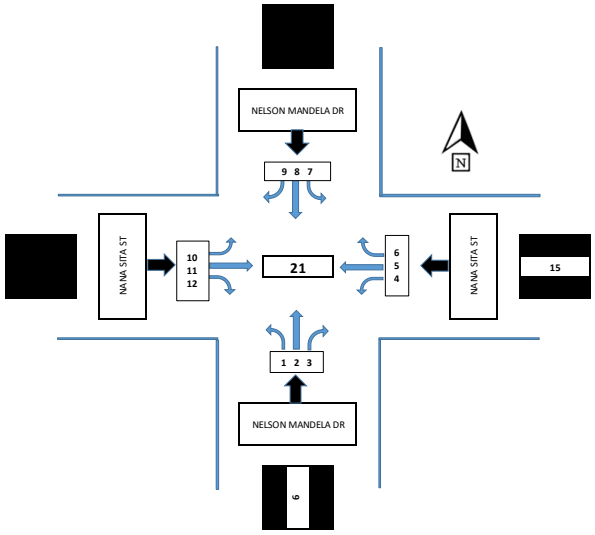
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	D.L
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P7	

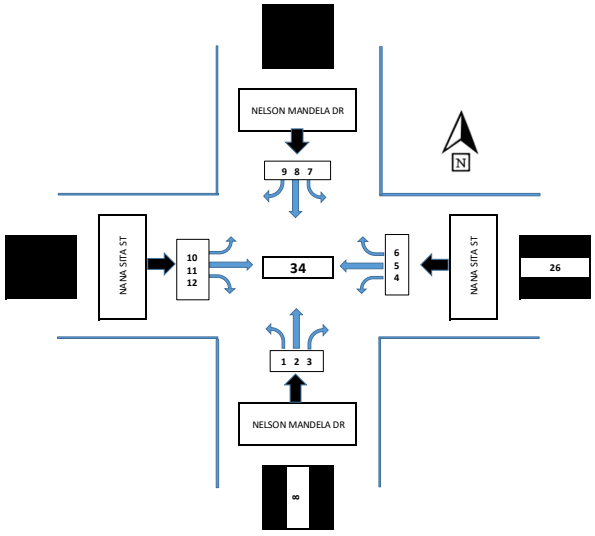
unitraf
Turnkey Traffic Monitoring & Data Collection Solutions



Peak time : 07:45 - 08:45 **Background peak :**



Peak time : 14:00 - 15:00 **Background peak :**



Peak time : 15:30 - 16:30 **Background peak :**

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	2	-	-	3	-	-	-	-	-	-	-	5
06:15	06:30	-	-	-	-	5	-	-	-	-	-	-	-	5
06:30	06:45	-	1	-	-	6	-	-	-	-	-	-	-	7
06:45	07:00	-	3	-	-	4	-	-	-	-	-	-	-	7
07:00	07:15	-	-	-	-	-	-	-	-	-	-	-	-	-
07:15	07:30	-	2	-	-	4	-	-	-	-	-	-	-	6
07:30	07:45	-	1	-	-	4	-	-	-	-	-	-	-	5
07:45	08:00	1	2	-	-	4	-	-	-	-	-	-	-	7
08:00	08:15	-	3	-	-	6	-	-	-	-	-	-	-	9
08:15	08:30	-	3	-	-	2	-	-	-	-	-	-	-	5
08:30	08:45	-	3	-	-	5	-	-	-	-	-	-	-	8
08:45	09:00	-	2	-	-	1	-	-	-	-	-	-	-	3
TOTALS		1	22	-	-	44	-	-	-	-	-	-	-	67

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
07:45	08:45	1	11	0	0	17	0	0	0	0	0	0	0	29

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	-	-	-	2	-	-	-	-	-	-	-	2
09:15	09:30	-	1	-	-	1	-	-	-	-	-	-	-	2
09:30	09:45	-	-	-	-	5	-	-	-	-	-	-	-	5
09:45	10:00	-	2	-	-	-	-	-	-	-	-	-	-	2
10:00	10:15	-	3	-	-	-	-	-	-	-	-	-	-	3
10:15	10:30	-	1	-	-	1	-	-	-	-	-	-	-	2
10:30	10:45	-	4	-	-	1	-	-	-	-	-	-	-	5
10:45	11:00	-	-	-	-	1	-	-	-	-	-	-	-	1
11:00	11:15	-	-	-	-	2	-	-	-	-	-	-	-	2
11:15	11:30	1	1	-	-	1	-	-	-	-	-	-	-	3
11:30	11:45	-	2	-	-	1	-	-	-	-	-	-	-	3
11:45	12:00	-	3	-	-	2	-	-	-	-	-	-	-	5
12:00	12:15	-	2	-	-	2	-	-	-	-	-	-	-	4
12:15	12:30	-	1	-	-	2	-	-	-	-	-	-	-	3
12:30	12:45	-	1	-	-	-	-	-	-	-	-	-	-	1
12:45	13:00	-	2	-	-	2	-	-	-	-	-	-	-	4
13:00	13:15	-	-	-	-	2	-	-	-	-	-	-	-	2
13:15	13:30	-	3	-	-	-	-	-	-	-	-	-	-	3
13:30	13:45	-	1	-	-	3	-	-	-	-	-	-	-	4
13:45	14:00	-	3	-	-	2	-	-	-	-	-	-	-	5
14:00	14:15	-	2	-	-	1	-	-	-	-	-	-	-	3
14:15	14:30	-	**2**	-	-	**3**	-	-	-	-	-	-	-	5
14:30	14:45	-	**1**	-	-	**3**	-	-	-	-	-	-	-	4
14:45	15:00	-	**1**	-	-	**8**	-	-	-	-	-	-	-	9
TOTALS		1	36	-	-	45	-	-	-	-	-	-	-	82

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
14:00	15:00	0	6	0	0	15	0	0	0	0	0	0	0	21

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	1	-	-	3	-	-	-	-	-	-	-	4
15:15	15:30	-	3	-	-	5	-	-	-	-	-	-	-	8
15:30	15:45	-	2	-	-	8	-	-	-	-	-	-	-	10
15:45	16:00	-	2	-	-	3	-	-	-	-	-	-	-	5
16:00	16:15	-	-	-	-	2	-	-	-	-	-	-	-	2
16:15	16:30	-	3	-	-	5	-	-	-	-	-	-	-	8
16:30	16:45	-	2	-	-	7	-	-	-	-	-	-	-	9
16:45	17:00	-	2	-	-	5	-	-	-	-	-	-	-	7
17:00	17:15	-	1	-	-	9	-	-	-	-	-	-	-	10
17:15	17:30	-	1	-	-	3	-	-	-	-	-	-	-	4
17:30	17:45	-	1	-	-	3	-	-	-	-	-	-	-	4
17:45	18:00	-	2	-	-	3	-	-	-	-	-	-	-	5
TOTALS		-	20	-	-	56	-	-	-	-	-	-	-	76

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
16:15	17:15	0	8	0	0	26	0	0	0	0	0	0	0	34

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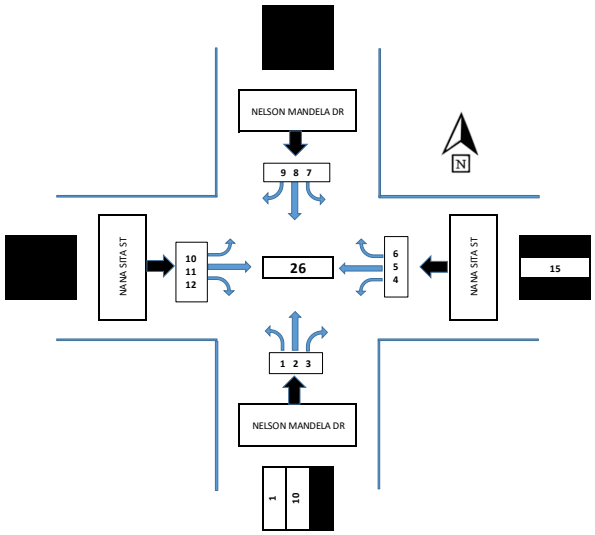
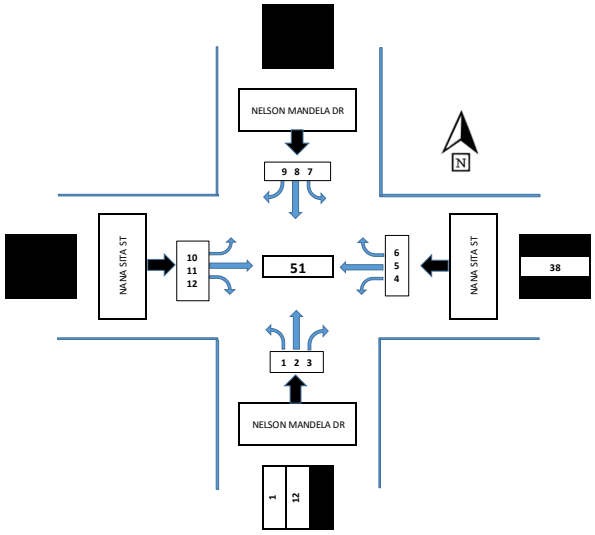
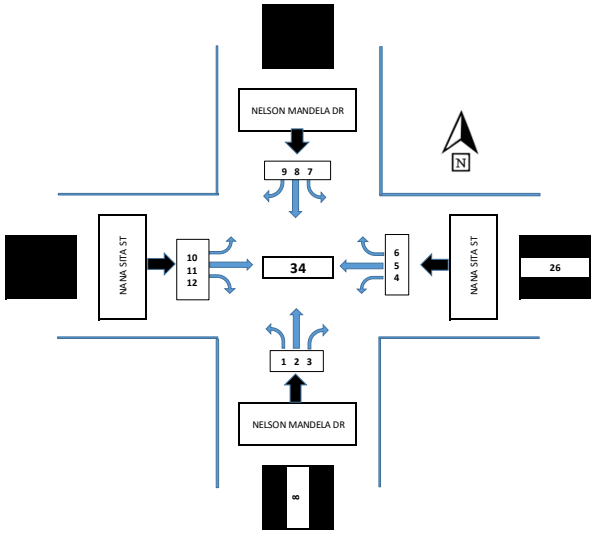
SITE LOCATION:	UNI PTA	JOB NR:	UT2019-522	DRAWN:	HF
SURVEY DATE:	Thursday, 14 February 2019	DWG TITLE:		UT2019-522-UNI PTA	
SURVEY TIMES:	06H00-18H00	JOB TITLE:		UNI PTA-TRAFFIC COUNT	
TRAFFIC SURVEY CONSULTANT:	UNITRAF (PTY) LTD	DWG NR:		UT2019-522-P7	



Peak time : 08:00 - 09:00 Background peak :



Peak time : 11:30 - 12:30 Background peak :



Peak time : 15:30 - 16:30 Background peak :

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AM PEAK (06H00 - 09H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
06:00	06:15	-	-	-	-	2	-	-	-	-	-	-	-	2
06:15	06:30	-	1	-	-	2	-	-	-	-	-	-	-	3
06:30	06:45	-	1	-	-	4	-	-	-	-	-	-	-	5
06:45	07:00	-	1	-	-	1	-	-	-	-	-	-	-	2
07:00	07:15	-	3	-	-	4	-	-	-	-	-	-	-	7
07:15	07:30	-	3	-	-	4	-	-	-	-	-	-	-	7
07:30	07:45	-	2	-	-	4	-	-	-	-	-	-	-	6
07:45	08:00	-	-	-	-	2	-	-	-	-	-	-	-	2
08:00	08:15	-	-	-	-	4	-	-	-	-	-	-	-	4
08:15	08:30	-	**3**	-	-	**2**	-	-	-	-	-	-	-	5
08:30	08:45	**1**	**3**	-	-	**4**	-	-	-	-	-	-	-	8
08:45	09:00	-	**4**	-	-	**5**	-	-	-	-	-	-	-	9
TOTALS		**1**	**21**	-	-	**38**	-	-	-	-	-	-	-	**60**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
08:00	09:00	**1**	**10**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**26**

MID PEAK (09H00 - 15H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
09:00	09:15	-	7	-	-	2	-	-	-	-	-	-	-	9
09:15	09:30	-	9	-	-	3	-	-	-	-	-	-	-	12
09:30	09:45	-	5	-	-	3	-	-	-	-	-	-	-	8
09:45	10:00	-	4	-	-	6	-	-	-	-	-	-	-	10
10:00	10:15	-	2	-	-	7	-	-	-	-	-	-	-	9
10:15	10:30	-	1	-	-	9	-	-	-	-	-	-	-	10
10:30	10:45	-	4	-	-	7	-	-	-	-	-	-	-	11
10:45	11:00	1	2	-	-	2	-	-	-	-	-	-	-	5
11:00	11:15	-	6	-	-	7	-	-	-	-	-	-	-	13
11:15	11:30	1	8	-	-	4	-	-	-	-	-	-	-	13
11:30	11:45	1	4	-	-	5	-	-	-	-	-	-	-	10
11:45	12:00	-	3	-	-	9	-	-	-	-	-	-	-	12
12:00	12:15	-	4	-	-	9	-	-	-	-	-	-	-	13
12:15	12:30	-	1	-	-	15	-	-	-	-	-	-	-	16
12:30	12:45	-	4	-	-	5	-	-	-	-	-	-	-	9
12:45	13:00	-	2	-	-	3	-	-	-	-	-	-	-	5
13:00	13:15	-	4	-	-	10	-	-	-	-	-	-	-	14
13:15	13:30	1	3	-	-	8	-	-	-	-	-	-	-	12
13:30	13:45	-	6	-	-	5	-	-	-	-	-	-	-	11
13:45	14:00	-	4	-	-	6	-	-	-	-	-	-	-	10
14:00	14:15	1	3	-	-	2	-	-	-	-	-	-	-	6
14:15	14:30	-	**2**	-	-	**9**	-	-	-	-	-	-	-	11
14:30	14:45	**2**	**3**	-	-	**1**	-	-	-	-	-	-	-	6
14:45	15:00	-	**2**	-	-	**2**	-	-	-	-	-	-	-	4
TOTALS		**7**	**93**	-	-	**139**	-	-	-	-	-	-	-	**239**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
11:30	12:30	**1**	**12**	**0**	**0**	**38**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**51**

PM PEAK (15H00 - 18H00)

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:00	15:15	-	1	-	-	5	-	-	-	-	-	-	-	6
15:15	15:30	1	-	-	-	5	-	-	-	-	-	-	-	6
15:30	15:45	-	4	-	-	6	-	-	-	-	-	-	-	10
15:45	16:00	-	-	-	-	9	-	-	-	-	-	-	-	9
16:00	16:15	-	1	-	-	4	-	-	-	-	-	-	-	5
16:15	16:30	-	3	-	-	7	-	-	-	-	-	-	-	10
16:30	16:45	1	1	-	-	3	-	-	-	-	-	-	-	5
16:45	17:00	-	-	-	-	4	-	-	-	-	-	-	-	4
17:00	17:15	-	2	-	-	7	-	-	-	-	-	-	-	9
17:15	17:30	-	2	-	-	7	-	-	-	-	-	-	-	9
17:30	17:45	-	2	-	-	3	-	-	-	-	-	-	-	5
17:45	18:00	-	1	-	-	3	-	-	-	-	-	-	-	4
TOTALS		**2**	**17**	-	-	**63**	-	-	-	-	-	-	-	**82**

Background peak hour

MOVEMENT NR:		1	2	3	4	5	6	7	8	9	10	11	12	
DIRECTION:		LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	LEFT	STRAIGHT	RIGHT	
TIME STARTING:		NORTHBOUND			WESTBOUND			SOUTHBOUND			EASTBOUND			TOTALS
15:30	16:30	**0**	**8**	**0**	**0**	**26**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34**

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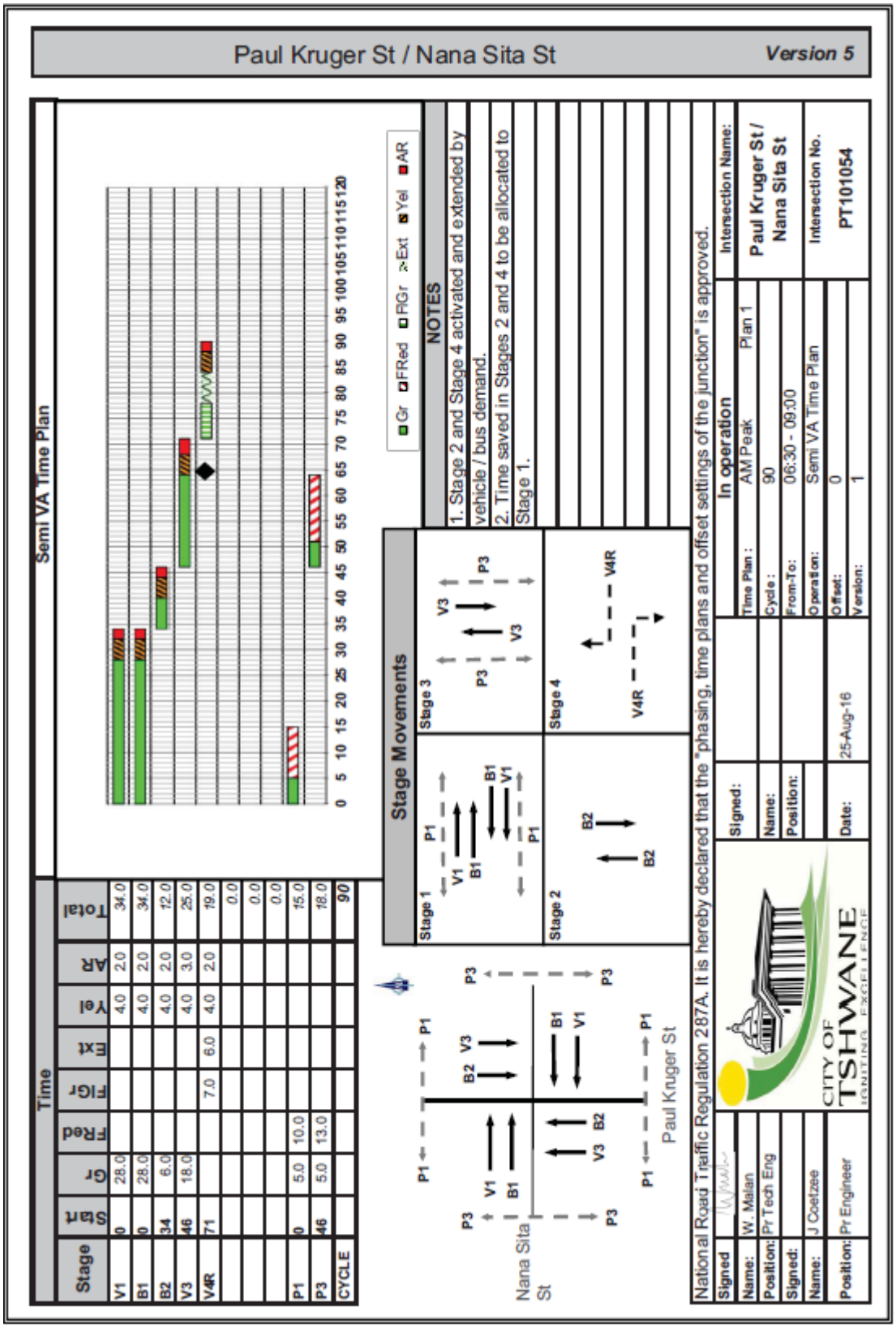
Appendix C- Signal Plans



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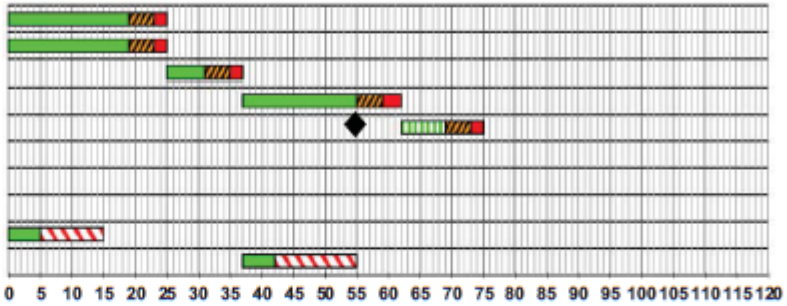
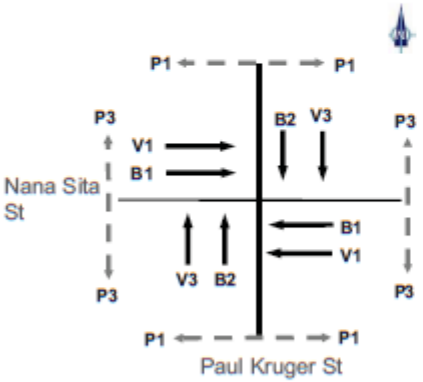
Time

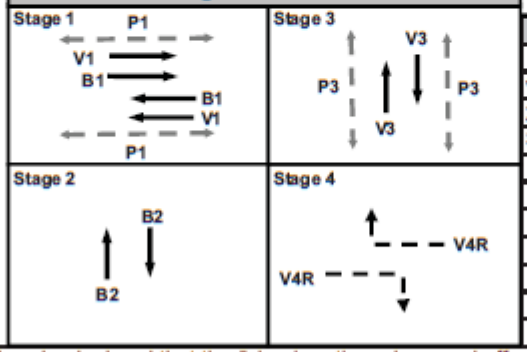
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	19.0				4.0	2.0	25.0
B1	0	19.0				4.0	2.0	25.0
B2	25	6.0				4.0	2.0	12.0
V3	37	18.0				4.0	3.0	25.0
V4R	62			7.0		4.0	2.0	13.0
								0.0
								0.0
								0.0
P1	0	5.0	10.0					15.0
P3	37	5.0	13.0					18.0
CYCLE								75

Semi VA Time Plan





Stage Movements



NOTES

1. Stage 2 and Stage 4 activated and extended by vehicle / bus demand.
2. Time saved in Stages 2 and 4 to be allocated to Stage 1.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		In operation	Intersection Name:
Name:	W. Malan	Name:		Time Plan : OFF Peak Plan 2	Paul Kruger St / Nana Sita St
Position:	Pr Tech Eng	Position:		Cycle : 75	
Signed:				From-To: Weekday:09:00-15:30 / 18:30-21:00 Weekend: 09:00-21:00	
Name:	J Coetzee			Operation: Semi VA Time Plan	Intersection No.
Position:	Pr Engineer	Date:	25-Aug-16	Offset: 0	PT101054
				Version: 1	

CITY OF TSHWANE
IGNITING EXCELLENCE

Paul Kruger St / Nana Sita St

Version 5

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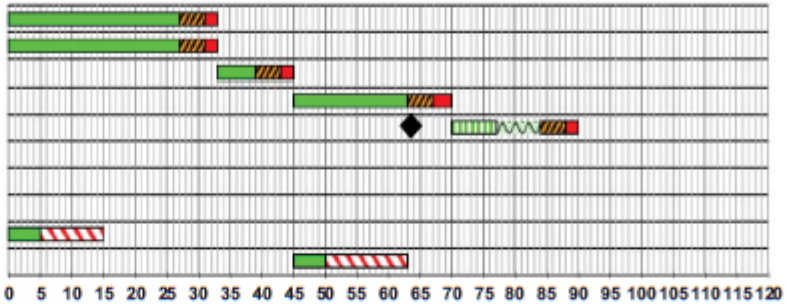
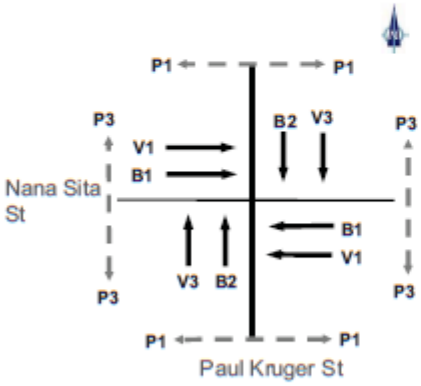
Time

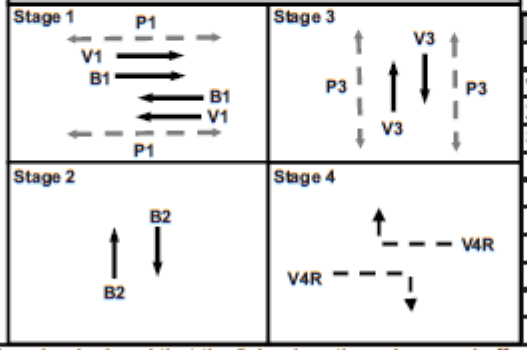
Stage	Start	Gr	FRed	FIGr	Ext	Yel	AR	Total
V1	0	27.0				4.0	2.0	33.0
B1	0	27.0				4.0	2.0	33.0
B2	33	6.0				4.0	2.0	12.0
V3	45	18.0				4.0	3.0	25.0
V4R	70			7.0	7.0	4.0	2.0	20.0
								0.0
								0.0
								0.0
P1	0	5.0	10.0					15.0
P3	45	5.0	13.0					18.0
CYCLE								90

Semi VA Time Plan





Stage Movements



NOTES

1. Stage 2 and Stage 4 activated and extended by vehicle / bus demand.
2. Time saved in Stages 2 and 4 to be allocated to Stage 1.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		
Name:	W. Malan	Name:		
Position:	Pr Tech Eng	Position:		
Signed:				
Name:	J Coetzee	Date:	25-Aug-16	
Position:	Pr Engineer			

CITY OF TSHWANE
IGNITING EXCELLENCE

In operation		
Time Plan :	PM Peak	Plan 3
Cycle :	90	
From-To:	15:30 - 18:30	
Operation:	Semi VA Time Plan	
Offset:	0	
Version:	1	

Intersection Name: Paul Kruger St / Nana Sita St

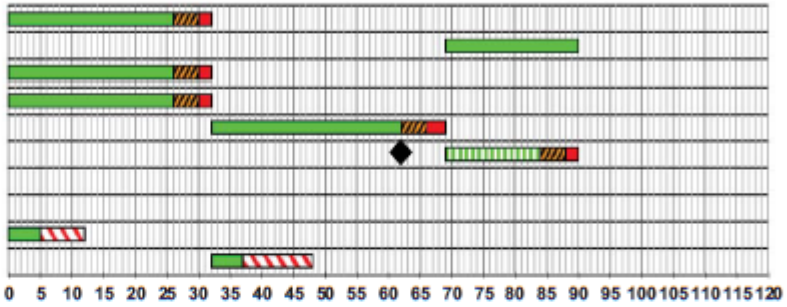
Intersection No. PT101054

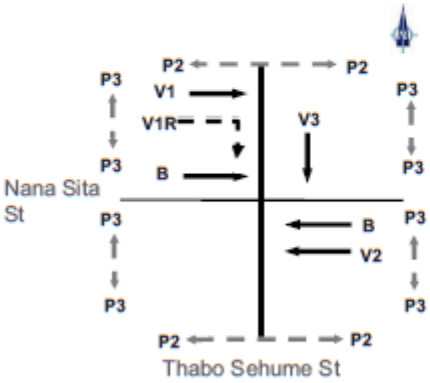
Paul Kruger St / Nana Sita St — Version 5

Time

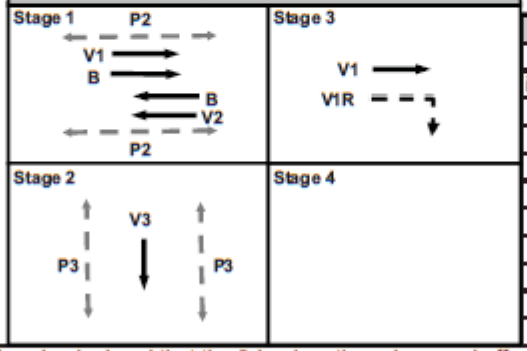
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	26.0				4.0	2.0	32.0
V1	69	21.0						21.0
V2	0	26.0				4.0	2.0	32.0
B	0	26.0				4.0	2.0	32.0
V3	32	30.0				4.0	3.0	37.0
V1R	69			15.0		4.0	2.0	21.0
								0.0
								0.0
P2	0	5.0	7.0					12.0
P3	32	5.0	11.0					16.0
CYCLE								90

Fixed Time Plan





Stage Movements



NOTES

1. Stage 3 activated by vehicle demand. Time saved in stage 3 to be allocated to stage 1

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		In operation	Intersection Name:
Name:	W. Malan	Name:		Time Plan : AM Peak Plan 1	Thabo Sehume St / Nana Sita St
Position:	Pr Tech Eng	Position:		Cycle : 90	
Signed:				From-To: 06:30 - 09:00	
Name:	J Coetzee			Operation: Fixed Time Plan	Intersection No.
Position:	Pr Engineer	Date:	26-May-15	Offset: 21	PT101070
				Version: 1	

CITY OF TSHWANE
IGNITING EXCELLENCE

Thabo Sehume St / Nana Sita St

Version 3

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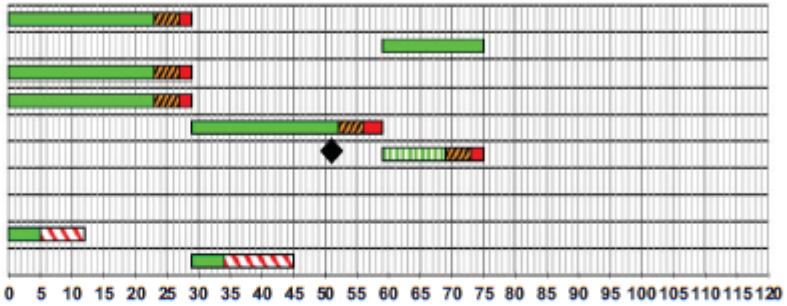
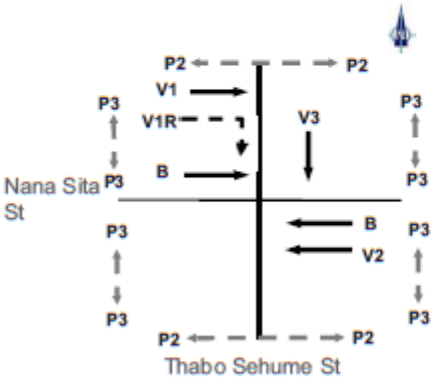
Time

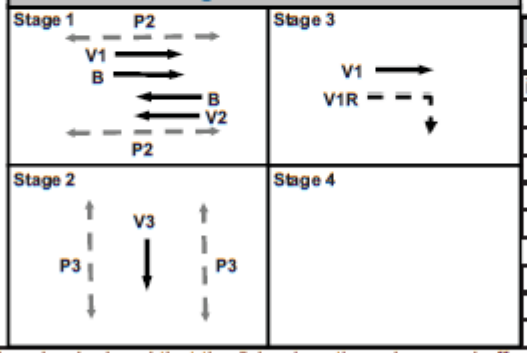
Stage	Start	Gr	FRed	FIGr	Ext	Yel	AR	Total
V1	0	23.0				4.0	2.0	29.0
V1	59	16.0						16.0
V2	0	23.0				4.0	2.0	29.0
B	0	23.0				4.0	2.0	29.0
V3	29	23.0				4.0	3.0	30.0
V1R	59			10.0		4.0	2.0	16.0
								0.0
								0.0
P2	0	5.0	7.0					12.0
P3	29	5.0	11.0					16.0
CYCLE								75

Fixed Time Plan





Stage Movements



NOTES

1. Stage 3 activated by vehicle demand. Time saved in stage 3 to be allocated to stage 1

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		In operation	Intersection Name:
Name:	W. Malan	Name:		Time Plan : OFF Peak Plan 2	Thabo Sehume St / Nana Sita St
Position:	Pr Tech Eng	Position:		Cycle : 75	
Signed:				From-To: Weekday:09:00-15:30 / 18:30-21:00 Weekend: 09:00-21:00	
Name:	J Coetzee			Operation: Fixed Time Plan	Intersection No.
Position:	Pr Engineer	Date:	26-May-15	Offset: 18	PT101070
				Version: 1	

CITY OF TSHWANE
IGNITING EXCELLENCE

Thabo Sehume St / Nana Sita St

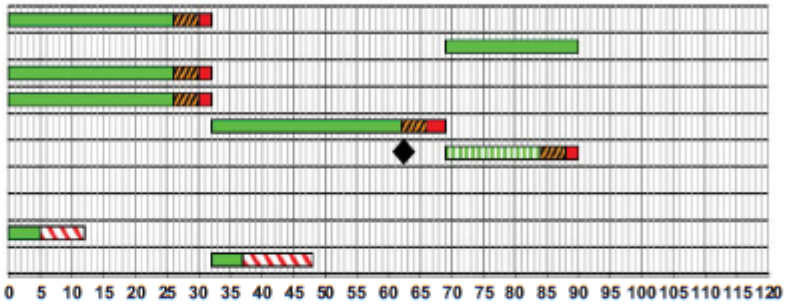
Version 3

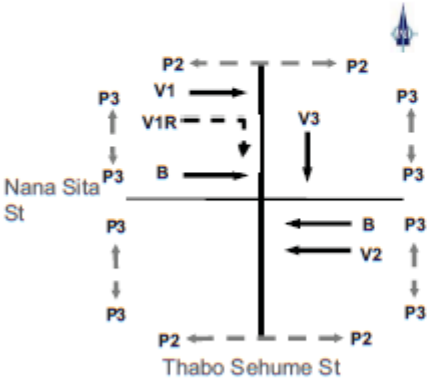
© University of Pretoria

Time

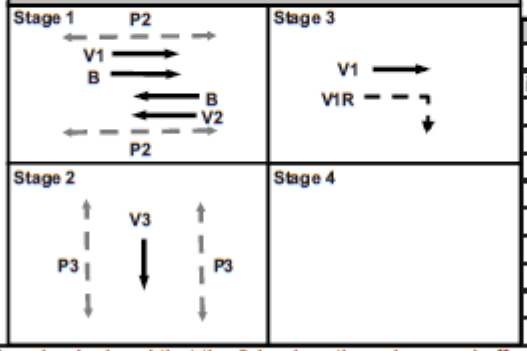
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	26.0				4.0	2.0	32.0
V1	69	21.0						21.0
V2	0	26.0				4.0	2.0	32.0
B	0	26.0				4.0	2.0	32.0
V3	32	30.0				4.0	3.0	37.0
V1R	69			15.0		4.0	2.0	21.0
								0.0
								0.0
P2	0	5.0	7.0					12.0
P3	32	5.0	11.0					16.0
CYCLE								90

Fixed Time Plan





Stage Movements



NOTES

1. Stage 3 activated by vehicle demand. Time saved in stage 3 to be allocated to stage 1

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed	
Name:	W. Malan
Position:	Pr Tech Eng
Signed:	
Name:	J Coetzee
Position:	Pr Engineer

CITY OF TSHWANE
IGNITING EXCELLENCE

Signed:	
Name:	
Position:	
Date:	26-May-15

In operation

Time Plan :	PM Peak	Plan 3
Cycle :	90	
From-To:	15:30 - 18:30	
Operation:	Fixed Time Plan	
Offset:	89	
Version:	1	

Intersection Name: Thabo Sehume St / Nana Sita St

Intersection No. PT101070

Thabo Sehume St / Nana Sita St — Version 3

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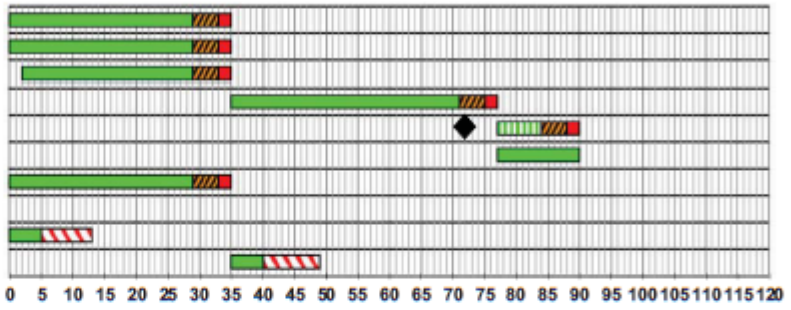
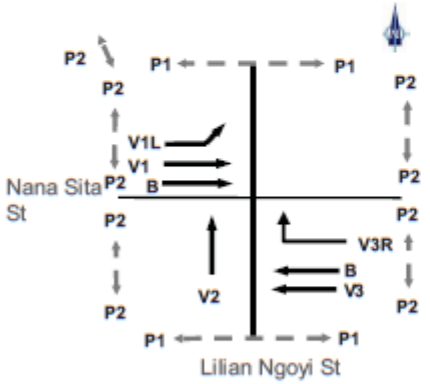
Time

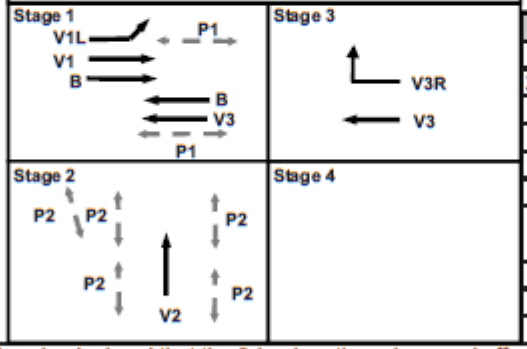
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	29.0				4.0	2.0	35.0
B	0	29.0				4.0	2.0	35.0
V1L	2	27.0				4.0	2.0	33.0
V2	35	36.0				4.0	2.0	42.0
V3R	77			7.0		4.0	2.0	13.0
V3	77	13.0						13.0
V3	0	29.0				4.0	2.0	35.0
								0.0
P1	0	5.0	8.0					13.0
P2	35	5.0	9.0					14.0
CYCLE								90

Semi VA Time Plan





Stage Movements



NOTES

1. Stage 3 activated by vehicle demand.
2. Time saved in Stage 3 to be allocated to Stage 2.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		
Name:	W. Malan	Name:		
Position:	Pr Tech Eng	Position:		
Signed:				
Name:	J Coetzee	Date:	16-May-14	
Position:	Pr Engineer			

CITY OF TSHWANE
IGNITING EXCELLENCE

In operation		
Time Plan :	AM Peak	Plan 1
Cycle :	90	
From-To:	06:30 - 09:00	
Operation:	Semi VA Time Plan	
Offset:	39*	
Version:	1	

Intersection Name: Lilian Ngoyi St / Nana Sita St

Intersection No. PT101080

Lilian Ngoyi St / Nana Sita St

Version 2

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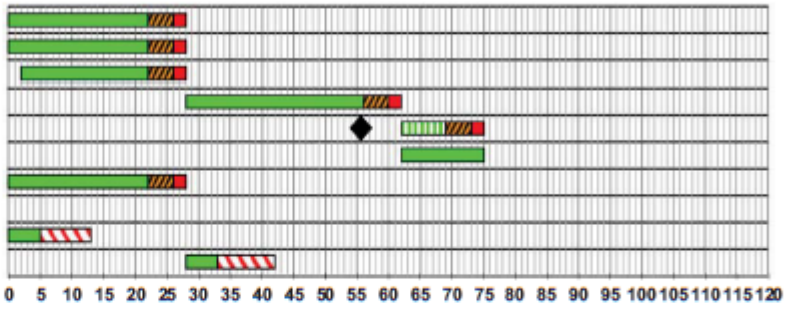
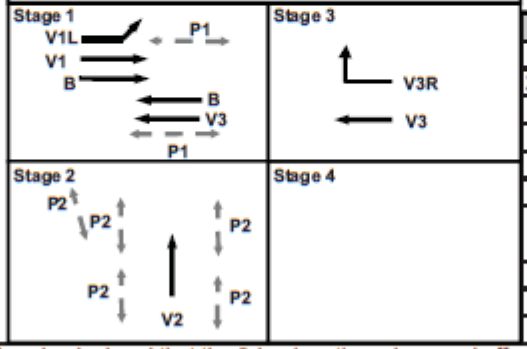
Time

Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	22.0				4.0	2.0	28.0
B	0	22.0				4.0	2.0	28.0
V1L	2	20.0				4.0	2.0	26.0
V2	28	28.0				4.0	2.0	34.0
V3R	62			7.0		4.0	2.0	13.0
V3	62	13.0						13.0
V3	0	22.0				4.0	2.0	28.0
								0.0
P1	0	5.0	8.0					13.0
P2	28	5.0	9.0					14.0
CYCLE								75

Semi VA Time Plan



Stage Movements



NOTES

1. Stage 3 activated by vehicle demand.
2. Time saved in Stage 3 to be allocated to Stage 2.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		In operation	Intersection Name:
Name:	W. Malan	Name:		Time Plan : OFF Peak Plan 2	Lilian Ngoyi St / Nana Sita St
Position:	Pr Tech Eng	Position:		Cycle : 75	
Signed:				From-To: Weekday:09:00-15:30 / 18:30-21:00 Weekend: 09:00-21:00	
Name:	J Coetzee			Operation: Semi VA Time Plan	Intersection No.
Position:	Pr Engineer	Date:	16-May-14	Offset: 37"	PT101080
				Version: 1	

CITY OF TSHWANE
IGNITING EXCELLENCE

Lilian Ngoyi St / Nana Sita St

Version 2

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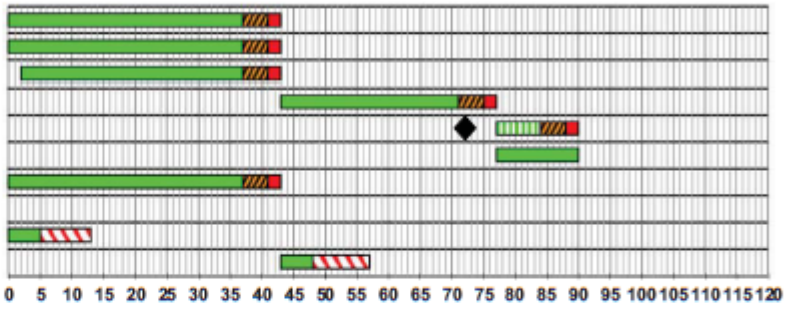
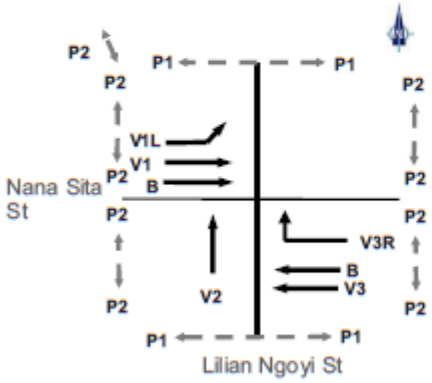
Time

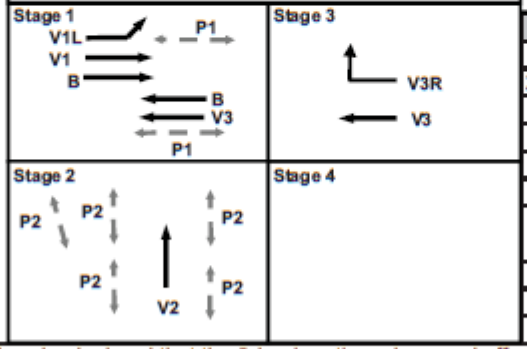
Stage	Start	Gr	FRed	FIGr	Ext	Yel	AR	Total
V1	0	37.0				4.0	2.0	43.0
B	0	37.0				4.0	2.0	43.0
V1L	2	35.0				4.0	2.0	41.0
V2	43	28.0				4.0	2.0	34.0
V3R	77			7.0		4.0	2.0	13.0
V3	77	13.0						13.0
V3	0	37.0				4.0	2.0	43.0
								0.0
P1	0	5.0	8.0					13.0
P2	43	5.0	9.0					14.0
CYCLE								90

Semi VA Time Plan





Stage Movements



NOTES

1. Stage 3 activated by vehicle demand.
2. Time saved in Stage 3 to be allocated to Stage 2.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		
Name:	W. Malan	Name:		
Position:	Pr Tech Eng	Position:		
Signed:				
Name:	J Coetzee	Date:	16-May-14	
Position:	Pr Engineer			

CITY OF TSHWANE
IGNITING EXCELLENCE

In operation		
Time Plan :	PM Peak	Plan 3
Cycle :	90	
From-To:	15:30 - 18:30	
Operation:	Semi VA Time Plan	
Offset:	37*	
Version:	1	

Intersection Name: Lilian Ngoyi St / Nana Sita St

Intersection No. PT101080

Lilian Ngoyi St / Nana Sita St

Version 2

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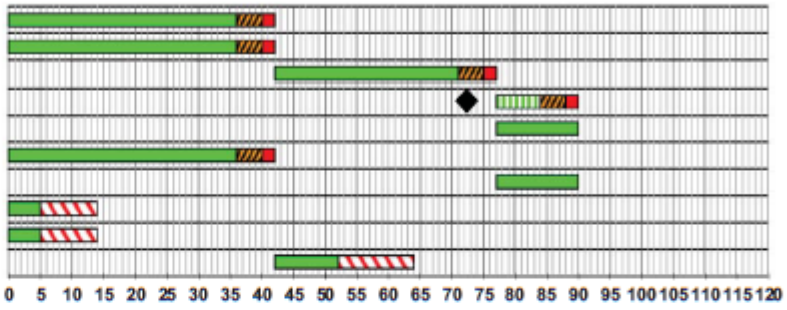
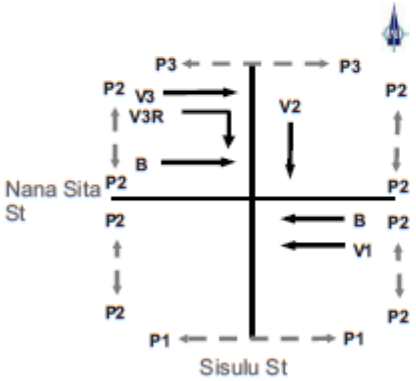
Time

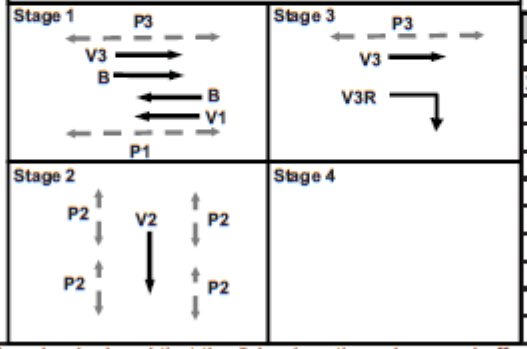
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	36.0				4.0	2.0	42.0
B	0	36.0				4.0	2.0	42.0
V2	42	29.0				4.0	2.0	35.0
V3R	77			7.0		4.0	2.0	13.0
V3	77	13.0						13.0
V3	0	36.0				4.0	2.0	42.0
P3	77	13.0						13.0
P3	0	5.0	9.0					14.0
P1	0	5.0	9.0					14.0
P2	42	10.0	12.0					22.0
CYCLE								90

Semi VA Time Plan





Stage Movements



NOTES

1. Stage 3 activated by vehicle demand.
2. Time saved at Stage 3 to be allocated to Stage 2.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		
Name:	W. Malan	Name:		
Position:	Pr Tech Eng	Position:		
Signed:				
Name:	J Coetzee	Date:	26-May-14	
Position:	Pr Engineer			

CITY OF TSHWANE
IGNITING EXCELLENCE

In operation	
Time Plan :	AM Peak Plan 1
Cycle :	90
From-To:	06:30 - 09:00
Operation:	Semi VA Time Plan
Offset:	1"
Version:	1

Intersection Name: Sisulu St / Nana Sita St

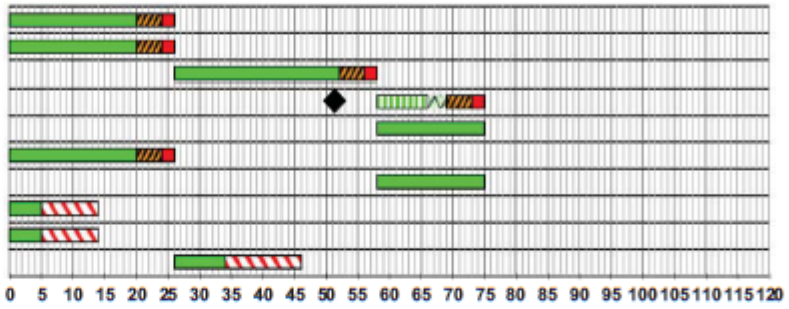
Intersection No. PT101096

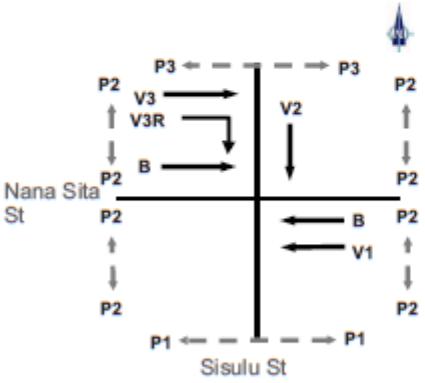
Sisulu St / Nana Sita St Version 2

Time

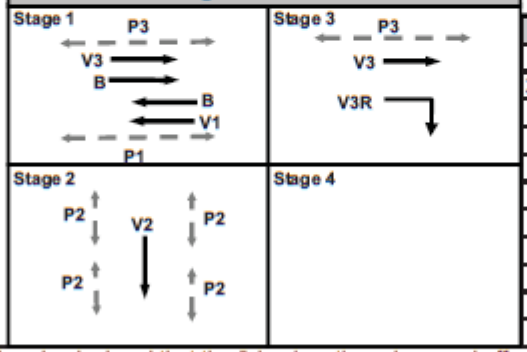
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	20.0				4.0	2.0	26.0
B	0	20.0				4.0	2.0	26.0
V2	26	26.0				4.0	2.0	32.0
V3R	58			8.0	3.0	4.0	2.0	17.0
V3	58	17.0						17.0
V3	0	20.0				4.0	2.0	26.0
P3	58	17.0						17.0
P3	0	5.0	9.0					14.0
P1	0	5.0	9.0					14.0
P2	26	8.0	12.0					20.0
CYCLE								75

Semi VA Time Plan





Stage Movements



NOTES

1. Stage 3 activated and extended by vehicle demand
2. Time saved at Stage 3 to be allocated to Stage 2.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		In operation	Intersection Name:
Name:	W. Malan	Name:		Time Plan : OFF Peak Plan 2	Sisulu St / Nana Sita St
Position:	Pr Tech Eng	Position:		Cycle : 75	
Signed:				From-To: Weekday:09:00-15:30 / 18:30-21:00 Weekend: 09:00-21:00	
Name:	J Coetzee			Operation: Semi VA Time Plan	Intersection No.
Position:	Pr Engineer	Date:	26-May-14	Offset: 68"	PT101096
				Version: 1	

CITY OF TSHWANE
IGNITING EXCELLENCE

Sisulu St / Nana Sita St

Version 2

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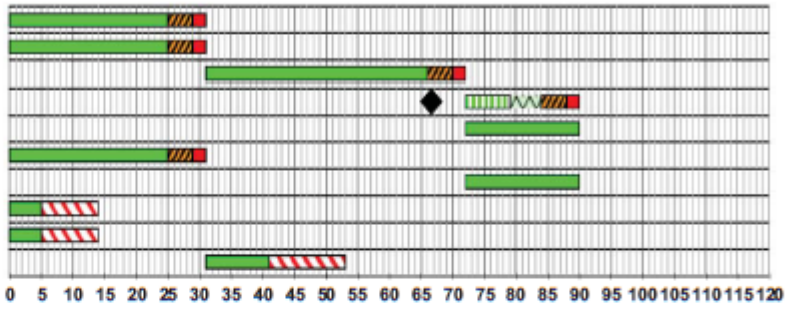
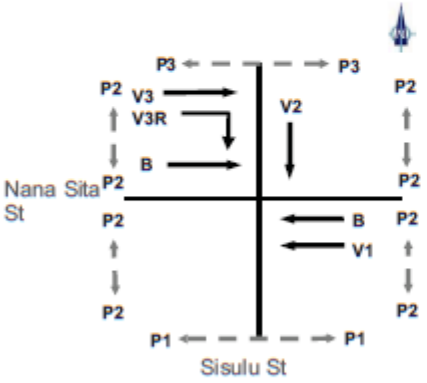
Time

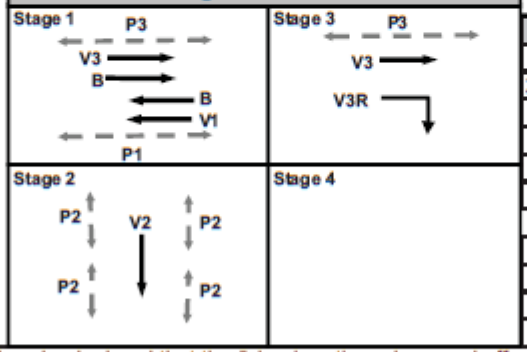
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	25.0				4.0	2.0	31.0
B	0	25.0				4.0	2.0	31.0
V2	31	35.0				4.0	2.0	41.0
V3R	72			7.0	5.0	4.0	2.0	18.0
V3	72	18.0						18.0
V3	0	25.0				4.0	2.0	31.0
P3	72	18.0						18.0
P3	0	5.0	9.0					14.0
P1	0	5.0	9.0					14.0
P2	31	10.0	12.0					22.0
CYCLE								90

Semi VA Time Plan





Stage Movements



NOTES

1. Stage 3 activated and extended by vehicle demand
2. Time saved at Stage 3 to be allocated to Stage 2.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		In operation	Intersection Name:
Name:	W. Malan	Name:		Time Plan : PM Peak Plan 3	Sisulu St / Nana Sita St
Position:	Pr Tech Eng	Position:		Cycle : 90	
Signed:				From-To: 15:30 - 18:30	
Name:	J Coetzee	Date:	26-May-14	Operation: Semi VA Time Plan	Intersection No.
Position:	Pr Engineer			Offset: 39"	PT101096
				Version: 1	

CITY OF TSHWANE
IGNITING EXCELLENCE

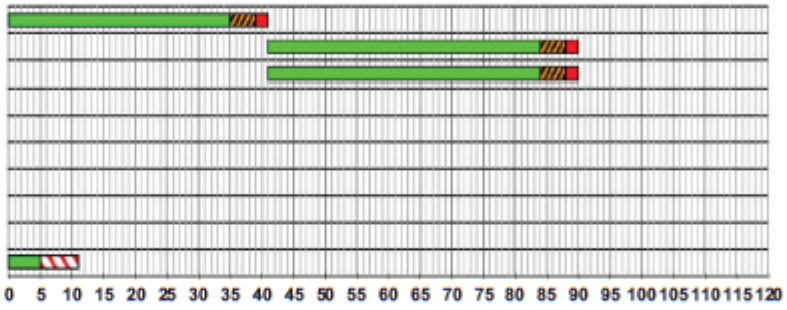
Sisulu St / Nana Sita St

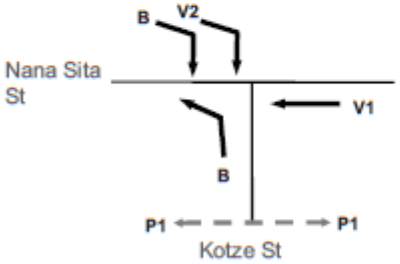
Version 2

Time

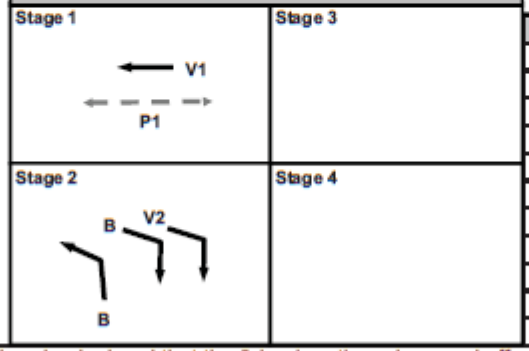
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	35.0				4.0	2.0	41.0
V2	41	43.0				4.0	2.0	49.0
B	41	43.0				4.0	2.0	49.0
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
P1	0	5.0	6.0					11.0
CYCLE								90

Fixed Time Plan





Stage Movements



NOTES

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed	
Name:	W. Malan
Position:	Pr Tech Eng
Signed:	
Name:	J Coetzee
Position:	Pr Engineer

CITY OF TSHWANE
IGNITING EXCELLENCE

Signed:	
Name:	
Position:	
Date:	26-May-14

In operation		
Time Plan :	AM Peak	Plan 1
Cycle :	90	
From-To:	06:30 - 09:00	
Operation:	Fixed Time Plan	
Offset:	37	
Version:	1	

Intersection Name: Kotze St / Nana Sita St

Intersection No. PT101116

Kotze St / Nana Sita St Version 4

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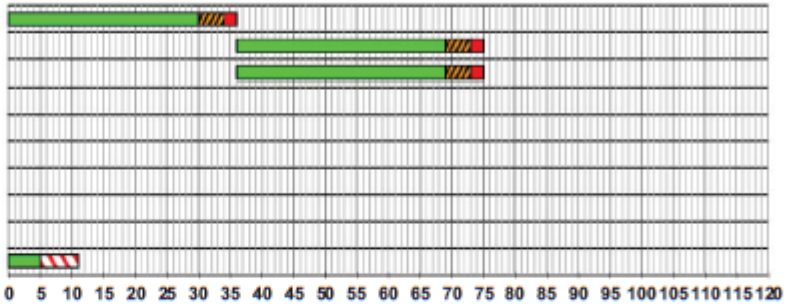
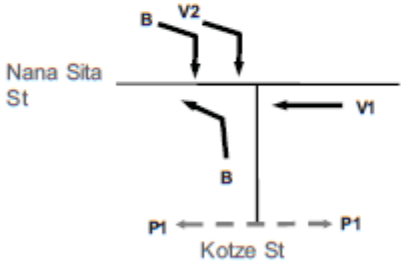
Time

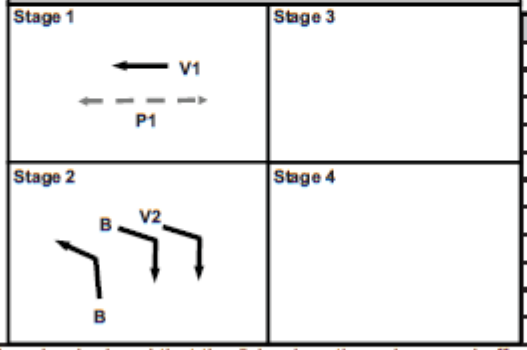
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	30.0				4.0	2.0	36.0
V2	36	33.0				4.0	2.0	39.0
B	36	33.0				4.0	2.0	39.0
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
P1	0	5.0	6.0					11.0
CYCLE								75

Fixed Time Plan





Stage Movements



NOTES

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		In operation	Intersection Name:
Name:	W. Malan	Name:		Time Plan : OFF Peak Plan 2	Kotze St / Nana Sita St
Position:	Pr Tech Eng	Position:		Cycle : 75	
Signed:				From-To: Weekday:09:00-15:30 / 18:30-21:00 Weekend: 09:00-21:00	
Name:	J Coetzee			Operation: Fixed Time Plan	Intersection No.
Position:	Pr Engineer	Date:	26-May-14	Offset: 28	PT101116
				Version: 1	

CITY OF TSHWANE
IGNITING EXCELLENCE

Kotze St / Nana Sita St

Version 4

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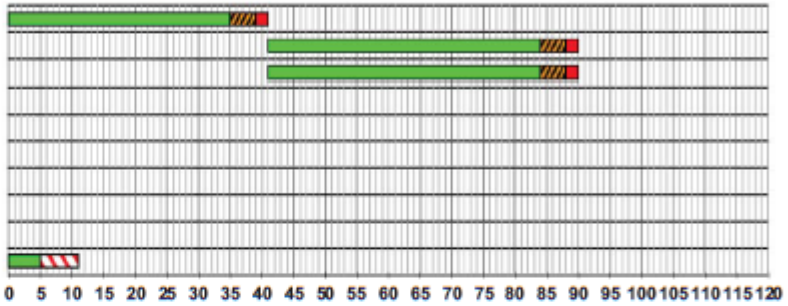
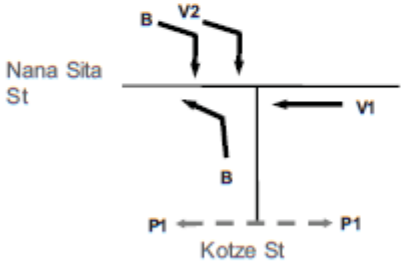
Time

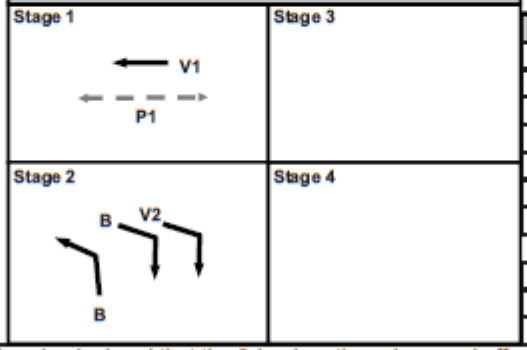
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	0	35.0				4.0	2.0	41.0
V2	41	43.0				4.0	2.0	49.0
B	41	43.0				4.0	2.0	49.0
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
P1	0	5.0	6.0					11.0
CYCLE								90

Fixed Time Plan





Stage Movements



NOTES

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed		Signed:		In operation	Intersection Name:
Name:	W. Malan	Name:		Time Plan : PM Peak Plan 3	Kotze St / Nana Sita St
Position:	Pr Tech Eng	Position:		Cycle : 90	
Signed:				From-To: 15:30 - 18:30	
Name:	J Coetzee			Operation: Fixed Time Plan	Intersection No.
Position:	Pr Engineer	Date:	26-May-14	Offset: 38	PT101116
				Version: 1	

CITY OF TSHWANE
IGNITING EXCELLENCE

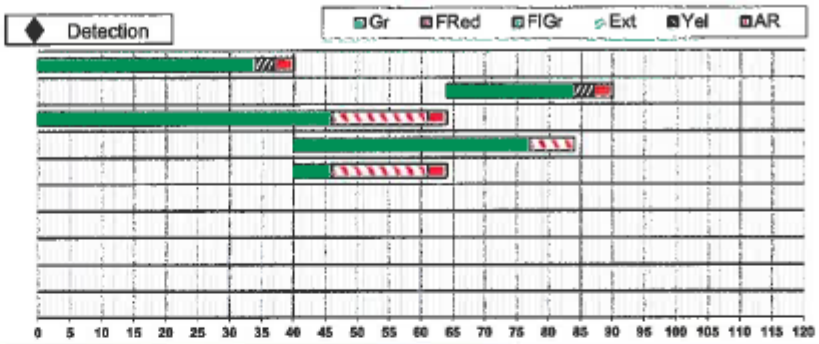
Kotze St / Nana Sita St

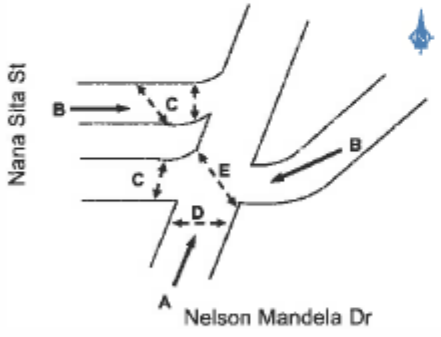
Version 4

Time

Phase	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
A	0	34,0				3,0	3,0	*40,0*
B	64	20,0				3,0	3,0	*26,0*
C	0	46,0	15,0				3,0	*64,0*
D	40	37,0	7,0					*44,0*
E	40	6,0	15,0				3,0	*24,0*
CYCLE								*90*

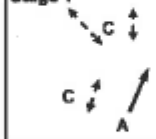
Fixed Time Plan



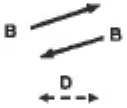


Stage Movements

Stage 1

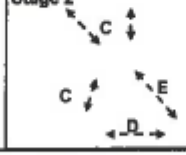


Stage 3



Stage 5

Stage 2



Stage 4

Stage Sequence

Notes

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

DESIGNED BY		APPROVED BY		In Operation		Intersection Name:
Signed		Signed		Plan Name:	AM Peak	Nelson Mandela Dr / Nana Sita St
Name:	W. Malan	Name:		Plan No:	1 of 4	
Registration No:	201270207	Registration No:		Operation Mode:	Fixed Time Plan	
Date:	22-Jan-16	Date:		Operation Time:	See Event Table	Intersection No:
Version No:	1	Version No:	5	Cycle :	90 sec.	PT101103
				Offset:	5 sec.	

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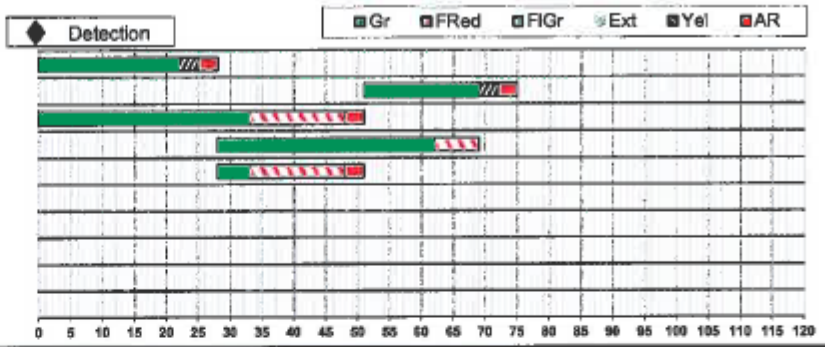
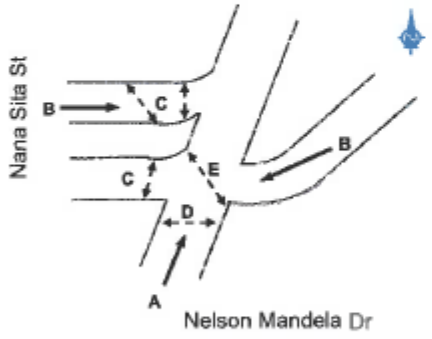
Time

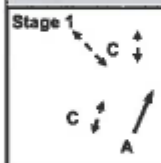
Phase	Start	Gr	FRed	FIGr	Ext	Yel	AR	Total
A	0	22,0				3,0	3,0	*28,0*
B	51	18,0				3,0	3,0	*24,0*
C	0	33,0	15,0				3,0	*51,0*
D	28	34,0	7,0					*41,0*
E	28	5,0	15,0				3,0	*23,0*
CYCLE								*75*

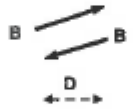
Fixed Time Plan



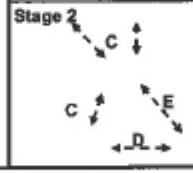


Stage Movements





Stage 5



Stage 4

Stage Sequence

Notes

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

DESIGNED BY		APPROVED BY		In Operation		Intersection Name:
Signed		Signed		Plan Name:	Off Peak	Nelson Mandela Dr / Nana Sita St
Name:	W. Malan	Name:		Plan No:	2 of 4	
Registration No:	201270207	Registration No:		Operation Mode:	Fixed Time Plan	
Date:	22-Jan-16	Date:		Operation Time:	See Event Table	Intersection No:
Version No:	1	Version No:	5	Cycle :	75 sec.	PT101103
				Offset:	26 sec.	

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CITY OF TSHWANE IGNITING EXCELLENCE

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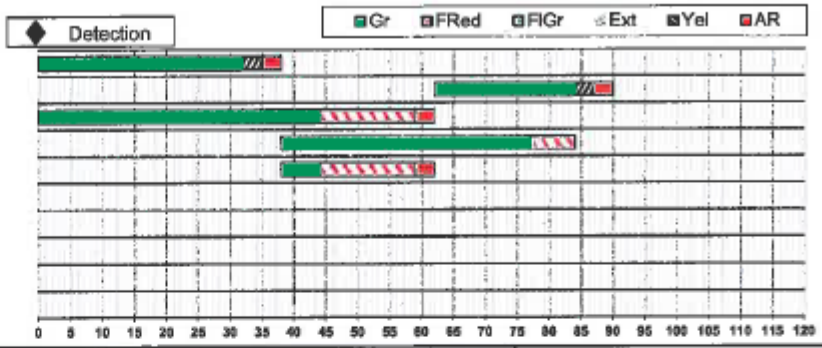
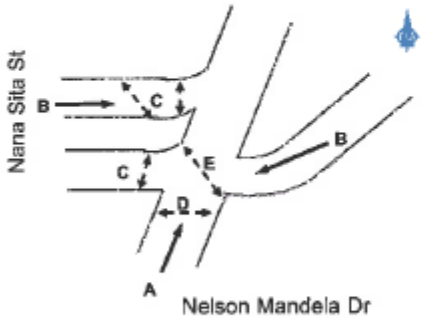
Time

Phase	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
A	0	32,0				3,0	3,0	38,0
B	62	22,0				3,0	3,0	28,0
C	0	44,0	15,0				3,0	62,0
D	38	39,0	7,0					46,0
E	38	6,0	15,0				3,0	24,0
CYCLE								90

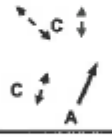
Fixed Time Plan





Stage Movements

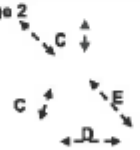
Stage 1



Stage 3

Stage 5

Stage 2



Stage 4

Stage Sequence

Notes

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

DESIGNED BY		APPROVED BY		In Operation		Intersection Name:
Signed		Signed		Plan Name:	PM Peak	Nelson Mandela Dr / Nana Sita St
Name:	W. Malan	Name:		Plan No:	3 of 4	
Registration No:	201270207	Registration No:		Operation Mode:	Fixed Time Plan	
Date:	22-Jan-16	Date:		Operation Time:	See Event Table	Intersection No:
Version No:	1	Version No:	5	Cycle :	90 sec.	PT101103
				Offset:	80 sec.	

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