Northern Cape University

Mobility Study

August 2013
# SMEC REPORT

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EXECUTIVE SUMMARY

The aim of this study is to fully integrate all modes of transport within the new Northern Cape University, while keeping to the vision of the University facilities project management team and the vision set out by the Department of Higher Education and Training (DHET) as a university that will symbolize our new order, of democracy, inclusiveness, growth and opportunity.

The vision of the NC University, as determined by the DHET, is mentioned in this study as well as the prospected student numbers and layout of the NC University to give a holistic view of what is envisioned for the university. Parking provisions for the NC University is researched in terms of location, costing and the best design option for the campus. The parking needs for the campus are calculated and assigned to various locations across campus. Other parking implementations which will facilitate parking management are also proposed. The most important proposal made in this regard is the construction of a new parking facility next to Lyndhurst Road on the northern part of the campus.

With the layout of the NC University in mind, pedestrian and cycle routes are researched and proposed. Other implementations with regards to the pedestrian and cyclist modes of transport are also suggested. These implementations include two pedestrian signalised intersections in Scanlan Street and Dalham Road respectively. A traffic simulation using VISSIM was carried out in order to research the effect of the proposed pedestrian and cyclist movements on the vehicular traffic on campus. Safety and accessibility was the main consideration in the compilation of these proposals.

A public transport service is researched and proposed for students and staff travelling from the outlying suburbs of Kimberley. An internal shuttle service is proposed to operate on campus to transport students and staff moving around on campus. The option to cater for persons with disabilities is also researched and proposed for future considerations.

The study discusses institutional support issues and proposes the appointment of a so-called Transport Manager and Parking Manager who will serve to manage and plan all the transport and parking related issues respectively on campus. The Mobility Study discusses and proposes certain urban design aspects unique to the University of the Northern Cape. These aspects specifically include the proposed design of the proposed cycle racks, bus shelters, public transport terminus and the public transport buses/shuttles liveries.
The study goes in to some detail regarding regulatory aspects in terms of public transport and shuttle services as well as the parking management and control tariffs. The study concludes with an implementation plan and proposed schedule for the different mobility design proposals. The implementation plan also gives an estimated cost of each design proposal.

**The Mobility Study augments the Traffic Impact Assessment which was completed earlier. The Mobility Study does not supersede the TIA, but does tend to further clarify specific aspects.**
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<tr>
<td>HCM</td>
<td>Highway Capacity Manual</td>
</tr>
<tr>
<td>IPTS</td>
<td>Integrated Public Transport System</td>
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<tr>
<td>HGV</td>
<td>Heavy Goods Vehicle</td>
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<tr>
<td>LOS</td>
<td>Level of Service</td>
</tr>
<tr>
<td>NMBM</td>
<td>Nelson Mandela Bay Municipality</td>
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<tr>
<td>SQ</td>
<td>Status Quo</td>
</tr>
<tr>
<td>NDPW</td>
<td>National Department of Public Works</td>
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<td>SARTSM</td>
<td>South African Road Traffic Signs Manual</td>
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<td>TIA</td>
<td>Traffic Impact Assessment</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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1. INTRODUCTION

The aim of this study is to fully integrate all modes of transport within the new Northern Cape University, while keeping to the vision of the University facilities project management team and the vision set out by the Department of Higher Education and Training (DHET), as a university that will symbolize our new order, of democracy, inclusiveness, growth and opportunity. The DHET envisages this institution to become an enduring source of pride, both nationally and provincially. More specifically the DHET states that the institution must enable maximum access within the country and contribute to the economic and cultural development of the Northern Cape Province.

It is very achievable to combine safety and accessibility, whilst maintaining an aesthetically pleasing learning environment. In fact some of the proposals in this study will only enhance the historical town feel of Kimberley. However, it must be emphasised that traffic safety will be a top priority during the compilation of this document. All the proposals in this study will be developed up to the concept design level in order to have realistic cost estimates. Please refer to Chapter 14 for the costing and proposed phasing of all the proposed projects in order to facilitate implementation.

This mobility study should be viewed in conjunction with the New Northern Cape University, Kimberley Traffic Impact Assessment (SMEC South Africa 2013). An important focus in the Traffic Impact Assessment is the imperative to take road traffic safety very seriously during the planning stages of this new university. This is especially true since the proposed campus is integrated into the existing city fabric, where students will mix with the existing traffic patterns.

In this document, an important mobility hierarchy has been defined by emphasising the importance to focus on pedestrian and cycle routes as the primary method of travel on campus. Vehicle use on campus should be limited to the minimum. A pedestrian friendly campus will support social interaction, which, in turn, will contribute to a better quality life on campus. Future proposals should give preference to pedestrians, followed by bicycles and public transport services as an alternative to private vehicles.
2. MOBILITY THROUGH INTEGRATED MODES

The achievement of adequate mobility to the students of the University is subject to a number of constraints, which ultimately determine what can be implemented and what not. These are:

- The university will be an integral part of the town of Kimberley and cannot be fully secured as a separate entity;

- Some of the streets of Kimberley are at times very congested, with limited options for capacity enhancement, it is thus fair to say that the role of the private motor car is to be curtailed in future mobility scenarios within the campus area;

- The N12, which runs through the proposed campus area, is currently heavily trafficked. This not only influences the possible additional traffic that will be generated by the new university, but also creates a great safety concern for the vast number of anticipated students crossing this road daily;

- To a large extent, transport infrastructure shapes the fabric of the environment, and within the historical environment of Kimberley, the implementation of new transport infrastructure is a sensitive issue as the urban design characteristics are very important;

- The availability of land on the proposed campus area, for whatever purpose, is a huge constraint and features such as extended open parking areas, will not be an unlimited implementation option;

- By definition, students will not be part of the income generating section of the community at large, and thus will have limited capacity to pay for elaborate transportation schemes;

- Future transportation operations will be a new expense for the university and to curtail unnecessary wasteful endeavors, a cautious implementation policy, probably based on pilot projects, will be the prudent way to go;
• From the onset, the vision would be for the majority of on-campus movements to be non-motorised (cycling and walking), but in an environment where the emphasis will be to achieve traffic safety through engineering measures.

Coupled with the constraints listed above, in providing direction to the mobility study, are the known strengths and weaknesses of the various transportation modes as listed in table 2.1.
Table 2.1: Strengths and weaknesses of the various transportation modes

<table>
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<th>PRIVATE MOTOR CAR</th>
<th>WEAKNESSES</th>
<th>STRENGTHS</th>
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<td></td>
<td>-Huge, expensive spaces required for parking.</td>
<td>-Preferred mode for longer trips.</td>
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<td></td>
<td>-Traffic congestion.</td>
<td>-Save time on most trips.</td>
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<td></td>
<td>-Green issues in terms of pollution.</td>
<td>-Convenient for transporting accessories.</td>
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<td></td>
<td>-Traffic safety concerns.</td>
<td>-Can be utilized by small groups</td>
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<td>-Expensive to operate.</td>
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<th>CYCLING</th>
<th>WEAKNESSES</th>
<th>STRENGTHS</th>
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<td>-Secure storage requirements.</td>
<td>-Flexible operations.</td>
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<td></td>
<td>-Vulnerable in collisions.</td>
<td>-Cheap to operate.</td>
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<td>-Expensive own infrastructure.</td>
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<table>
<thead>
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<th>PEDESTRIAN</th>
<th>WEAKNESSES</th>
<th>STRENGTHS</th>
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<td>-Limited distance.</td>
<td>-Free operation.</td>
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<td></td>
<td>-Slow.</td>
<td>-Very flexible.</td>
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<td></td>
<td>-Very vulnerable.</td>
<td>-Integrated part of all transport.</td>
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<th>PUBLIC TRANSPORT</th>
<th>WEAKNESSES</th>
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<td>-Often inconvenient schedules.</td>
<td>-Capacity to transport groups.</td>
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<td></td>
<td>-Require terminal infrastructure.</td>
<td>-Decrease traffic congestion.</td>
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<td></td>
<td>-Viewed as expensive.</td>
<td>-Alternative for owning a private car.</td>
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<td></td>
<td>-Often require a second mode of transport.</td>
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The following guidelines have been defined for future campus circulation issues. These are:

- The provision of safe, efficient, user-friendly and aesthetically pleasing pedestrian routes to foster personal and social interaction and a pedestrian community on campus.

- Provide sufficient functional access for vehicles to do business and provide emergency and operational services.

- Work in conjunction with local traffic authorities to manage traffic on the campus and to improve pedestrian safety.

- To plan, provide and promote the use of a regular, convenient and safe shuttle service to the campus community.
• To make the use of bicycles possible with minimal disruption to pedestrians. The cycle routes should be integrated with the municipal routes and planning. Safe and user-friendly cycle racks and locking facilities where applicable, must be provided at campus buildings.

• The campus must be developed to include “human spaces” to enhance the “university town” idea.

• Traffic flow through the campus can be discouraged by closing some roads for through-traffic and making some roads less vehicle friendly.

• The development of periphery parking modes on the edges of the campus, to receive commuters before entering the core campus area. From these peripheral parking modes students and personnel can be transported to the core campus by means of shuttle services.

• Pedestrian movement lines needs to be redefined to develop certain main pedestrian routes on campus.

• The provision of parking can follow the “user pays” principle.

• Closer co-operation with the Sol Plaatje Municipality and business sector should look at wider solutions than only for the campus area.

The various aspects within the mobility study would include:

• Parking
• Pedestrians
• Cyclists
• Public transport
• Institutional support
• Normal traffic
• Implementation plan

In this Mobility Study, all of the above guidelines have been incorporated, which thus implies an integrated land-use/transportation approach to the further development of University of the Northern Cape.
3. STUDENT NUMBERS AND GROWTH PATTERNS

According to the DHET’s Development Framework for the New Universities in the Northern Cape and Mpumalanga Provinces, the establishment of the new university is an extension of current initiatives to expand the capacity of higher education institutions and to increase access considerably over the next 20-25 years. The National Plan on Higher Education and the Green Paper for Post-School Education and Training envisage an increase in enrolment for higher education to 20% by 2016 and 23% by 2030 respectively.

Against this background, it is important that the new university does not simply take over existing academic programmes run by other institutions, but adds to the array of available offerings. Over time the institution may develop as a multi-campus institution starting with the main campus (seat of learning) designed for an initial student population of 5000. Future expansion should include the potential for additional campuses where appropriate benefit can be realized.

It is important that the main campus and seat of the university should be based on a contact mode of learning, providing a rounded student experience. However, given the potential of evolving communication technology, future expansion could be through a variety of modes, including diverse combinations of contact, open and distance learning.

The establishment of the new university is another step towards redressing inequities by providing additional access to higher education to students who continue to suffer structural, racial and economic discrimination. Measures to achieve this must include initiatives to establish a student and academic profile that reflects the demographic make-up of South Africa.

Within the Northern Cape, access is constrained by distance and the lack of affordable accommodation in proximity to the new universities. This is particularly true for historically disadvantaged school leavers. At the same time, experience at existing universities has demonstrated that students in residence have a greater success rate.

For these reasons a high proportion of students will need to be accommodated in residence. On-campus residence provision should be made in Kimberley for up to 80% of the planned student enrolment.
The accommodation will need to be within walking distance of the main academic and social spaces to facilitate the integration of the academic community with the communities surrounding the universities. Academic, cultural and social spaces should promote formal and informal gathering, meeting and sharing with the diversity of the academic communities.

Work will continue on the development of plans for the establishment and operation of the new university, including detailed estimates and mobilization of capital and operating expenditure with the aim to affect the offering of selected academic programmes in the 2014 academic year, and to prepare a platform for proper management and governance of the institution.

The image below shows the proposed land uses for the Northern Cape University.

![Proposed land uses for the university](image)

**Figure 3.1: Proposed land uses for the university (Dept. HET, 2012)**

The following assumptions were made during the traffic analyses and writing of this report:

- The final land use pattern will be similar to that shown in the figure above.

- Approximately 5000 students are estimated to use the campus by 2022. A residency factor of approximately 80% is anticipated. This study worked with a total of 4000 residence beds (shown in yellow in the image above).
• The staff component is assumed to be approximately 500 staff members.

• The expected bulk land-uses planned for amounts to 80 000m² for residences and 50 000m² for green space, etc.

• The student target market will be both local and national.

Table 3.1 shows the expected annual growth for student numbers, starting with the initial intake of in 2014.

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<td>4210</td>
<td>4855</td>
<td>5500</td>
</tr>
</tbody>
</table>
4. PARKING

Parking is generally a huge problem on university campuses. As formal parking space requires approximately 25m$^2$ of space, and with limited land available in Kimberley, in the case of the new Northern Cape University, parking will present an available land, as well as development cost problem.

4.1 Parking Requirements

Parking standards issued by the National Department of Transport states that in order to safeguard traffic flow on adjacent arterials, ensure effective access and protect the transportation system’s functioning in general; a sufficient number of off-street parking spaces must be provided at all the different types of development in urban areas.

The parking standards recommend the minimum parking spaces to provide for a university is in the region of 0.4 $\times$ off-street spaces per student. For the anticipated 5000 students, a total of 2000 off-street parking spaces are required. These parking standards are also the required specifications of the local Sol Plaatje Municipality.

Due to the age of the National Department of Transport’s parking standards (1985), SMEC South Africa considered other, more updated sources in terms of parking provision ratios for universities. As mentioned in the Traffic Impact Assessment Report (SMEC International Pty (Ltd), 2012), the American Institute of Transportation Engineers’ Trip Generation rates (2012) was consulted.

These rates indicate that a ratio of 0.21 trips are generated per student population, split 80:20. The generated traffic in turn is calculated to be 840 vehicles towards the university in the morning peak. If a ratio of 0.05 is assumed to be drop-off and pass through only, a total of 800 parking bays should be provided for students and personnel arriving in the peak hour. To cater for staff, students and visitors that would arrive after the peak hour, a further 10% (or 80 parking spaces) need to be provided. This results in a total of 880 off-street parking spaces that need to be provided.

Stellenbosch University, which has a similar spatial fabric than the proposed NC University, implemented the rule which only allows senior students to be allocated parking on the campus area.
In addition to this, these parking bays require a market related annual fee to be paid for the privilege of using the parking space. The assumption is therefore made that the proposed NC University will implement similar rules in terms of parking provision for students residing on campus. If a ratio of 0.4 of the anticipated 1000 senior students, take up the offer of renting these parking spaces, a total of 400 additional parking spaces should be provided. This parking however should be off-street parking located within easy walking distance of each residence as indicated later.

These ratios can only be justified should alternative means of transport be available to and on campus. Alternatives would include shuttle services, cycle lanes/facilities and pedestrian routes. Please refer to chapters 3, 4 and 5 of this report in which pedestrian, cycle and public transport proposals reinforce the mobility structure for the proposed NC University.

A detailed VISSIM model was simulated by SMEC showing interaction between vehicles, cyclists and pedestrians. A video file of this model is included on the attached DVD at the back of the report.

4.2 Parking Provision

In order to distribute the required parking bays throughout the campus, the following parking provision options exist, and will be explored in terms of their feasibility:

- On-street parking
- Off-street at grade parking
- Off-street basement parking
- Off-street multi-level parking facility

4.2.1 On-Street Parking

As stated in the National Department of Transport’s parking standards, off-street parking should be provided for all proposed developments. On-street parking provision will therefore not be an option to provide the required parking. All on-street parking should be reserved for casual visitors to the University and should be regulated with a time limit of one hour.
4.2.2 Off-Street Parking at Grade

Referring to Table 4.1 below, off-street parking provision (open parking lots) is by far the cheapest option. As available land on the proposed campus area is however limited, this type of parking provision will be limited. It is by far the most economically feasible options, and should be implemented as far as possible. (The usual trade-off between gardens and parking will thus be even more acute on the campus of the proposed Northern Cape University.)

4.2.3 Off-Street Basement Parking

Off-street basement parking is the most expensive form of parking provision. Table 4.1 shows the upper rate of providing basement parking to be approximately R4, 800/m². This roughly equates to R120, 000 per basement parking space (based on an average of 25m² required per parking space). This provides a clear perspective on the cost of providing parking amenities to students and staff.

4.2.4 Off-Street Multi-Level Parking Facility

Although off-street structured parking still proves to be expensive, it is less expensive than the basement parking. Table 4.1 shows an upper rate of approximately R3, 800/m². This roughly equates to R95, 000 per parking space in a formal structure (based on an average of 25m² required per parking space).
If one would make the assumption that a 15% rate of return is required by a private developer of parking, the following annual and monthly fees below will have to be charged for the different types of parking. See Table 4.2.

### Table 4.2: Parking fees chargeable

<table>
<thead>
<tr>
<th>Parking Type</th>
<th>Fees per annum</th>
<th>Fees per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking on grade (off-street)</td>
<td>R1,800</td>
<td>R150</td>
</tr>
<tr>
<td>Parking in structure</td>
<td>R14,250</td>
<td>R1,188</td>
</tr>
<tr>
<td>Parking in basement</td>
<td>R18,000</td>
<td>R1,500</td>
</tr>
</tbody>
</table>

#### 4.2.5 Centralised Versus De-Centralised Parking

A total of 880 normal use parking bays, with an additional 400 resident bays are proposed for the campus. Table 4.3 provides a comparison of the different parking implementation costs for the proposed number of parking bays.

### Table 4.3: Comparative costs for implementing parking

<table>
<thead>
<tr>
<th>Parking</th>
<th>Cost for all 1,280 spaces</th>
<th>Cost for normal 880 spaces</th>
<th>Cost for 400 resident spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking at grade (off-street)</td>
<td>R15,4m</td>
<td>R10,6m</td>
<td>R4,8m</td>
</tr>
<tr>
<td>Parking in structure</td>
<td>R121,6m</td>
<td>R83,6m</td>
<td>R38,0m</td>
</tr>
<tr>
<td>Parking in basements</td>
<td>R153,6m</td>
<td>R105,6m</td>
<td>R48,0m</td>
</tr>
</tbody>
</table>

To solely provide at grade off-street parking for this vast amount of parking spaces will be impractical. Each parking space requires approximately 25m$^2$. For the total required 1,280 parking spaces; this amounts to an area of 32,000m$^2$ or 3.2ha, competing with developable land. Table 4.3 above also shows that sole provision of basement parking proves to be extremely expensive and unrealistic. An optimal mix between these types of parking provision should be sought during the next stage of the design process for the NC University.
4.3 Parking Proposals

In light of the above, at grade off-street parking would be the most economical option. SMEC therefore recommends that the designs should incorporate as much of the required residence parking bays as possible at grade, proportionally distributed throughout the residential campus, ideally all 400 of the required bays. The remainder of the required parking bays should then be incorporated into a centralised multi-level parking structure.

Figure 4.1 and Figure 4.2 shows the parking space requirements for each of the respective residences.

![Parking Distribution Map]

**Figure 4.1**: Proposed parking distribution for the southern campus’ residences
It would be very beneficial to make a decision as soon as possible as to how this will be addressed, either at grade, parking structure or basement parking. This information should be included in the initial design process.

As available open space for at grade off-street parking for the additional 880 parking bays, in close proximity to the proposed campus, is not available and basement parking is too expensive, it is proposed to implement a multi-level parking garage for these parking bays.

The location of this facility should ideally be part of the northern campus area, with the most probable location as shown in Figure 4.3 below.
To accommodate 880 vehicles on this site, a three-storey facility will be required, as detailed in the images below. (Conceptual design by SMEC project team). A 3D model of this parking facility is included in the DVD at the back of the report.
Figure 4.5: Possible parking facility adjacent to Lyndhurst Road (View 2)

Figure 4.6: Possible parking facility adjacent to Lyndhurst Road (View 3)
This proposed facility will ideally also include a minibus-taxi off-loading and ranking area, to facilitate those students and staff members that will make use of public transport to and from the university.
5. PEDESTRIANS

The mode of walking is the most common and popular means of transport. This mode is almost always the end and start mode of a journey and is usually the “bridge” to connect the different modes of transport. Walking is also the most vulnerable mode of transport. The safety of pedestrians should thus be a top priority in the design of pedestrian walkways.

5.1 Road Traffic Safety

The term road traffic safety is an indication of how safe individual users are on some particular road, or on the roads belonging to some region. The main danger to road users is the likelihood of a traffic collision. Such dangers can be reduced by individual road users operating cautiously and defensively, by building roads in alignment with competent traffic engineering practices, by the application of rational traffic control methods, and by designing road vehicles so that they are more able to avoid and survive collisions.

The figure below shows the leading world-wide cause of deaths. A projected 2030 table shows a worrying situation with road traffic related deaths, anticipated to move to the fifth highest cause of death.

![Figure 5.1: Leading world-wide causes of death, 2004 and projected for 2030 (WHO, 2009)](image-url)
The majority of the people to be attracted to this new University will be students in the age group of 18 to 30 years. If one filters further down into the accident data presented in the World Health organisation report, an even more worrying situation is highlighted. The number one cause of death world-wide, for the age group 15-29 years, is road traffic accidents. See Table 5.1.

Table 5.1: Leading world-wide cause of death by age for 2004 (WHO, 2009)

<table>
<thead>
<tr>
<th>RANK</th>
<th>0-4 YRS</th>
<th>5-14 YRS</th>
<th>15-29 YRS</th>
<th>30-44 YRS</th>
<th>45-64 YRS</th>
<th>65+ YRS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Perinatal causes</td>
<td>Lower respiratory infections</td>
<td>Road traffic injuries</td>
<td>HIV/AIDS</td>
<td>Tuberculosis</td>
<td>Ischemic heart disease</td>
<td>Ischemic heart disease</td>
</tr>
<tr>
<td>2</td>
<td>Lower respiratory infections</td>
<td>Road traffic injuries</td>
<td>HIV/AIDS</td>
<td>Tuberclosis</td>
<td>Ischemic heart disease</td>
<td>Ischemic heart disease</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Diarrhoeal diseases</td>
<td>Malaria</td>
<td>Tuberclosis</td>
<td>Road traffic injuries</td>
<td>HIV/AIDS</td>
<td>Chronic obstructive pulmonary disease</td>
<td>Lower respiratory infections</td>
</tr>
<tr>
<td>4</td>
<td>Malaria</td>
<td>Diarrhoeal diseases</td>
<td>Tuberculosis</td>
<td>Ischemic heart disease</td>
<td>Tuberculosis</td>
<td>Lower respiratory infections</td>
<td>Perinatal causes</td>
</tr>
<tr>
<td>5</td>
<td>Malaria</td>
<td>Meningitis</td>
<td>Self-inflicted injuries</td>
<td>Chronic obstructive pulmonary disease</td>
<td>Stroke, stroke, lung cancer</td>
<td>Diabetes mellitus</td>
<td>Chronic obstructive pulmonary disease</td>
</tr>
<tr>
<td>6</td>
<td>Congenital anomalies</td>
<td>Diarrhoeal diseases</td>
<td>Lower respiratory infections</td>
<td>Violence</td>
<td>Fetal anomalies, lung cancer</td>
<td>Diabetes mellitus</td>
<td>Diabetic diseases</td>
</tr>
<tr>
<td>7</td>
<td>HIV/AIDS</td>
<td>HIV/AIDS</td>
<td>Lower respiratory infections</td>
<td>Carbon monoxide poisoning</td>
<td>Cancer of the liver</td>
<td>Hypertensive heart disease</td>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>8</td>
<td>Whooping cough</td>
<td>Tuberculosis</td>
<td>Fires</td>
<td>Carbon monoxide poisoning</td>
<td>Road traffic injuries</td>
<td>Stomach cancer</td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>9</td>
<td>Meningitis</td>
<td>Protein-energy malnutrition</td>
<td>War and conflict</td>
<td>Cancer of the liver</td>
<td>Lower respiratory infections</td>
<td>Colon and rectum cancer</td>
<td>Trauma, stroke, lung cancer</td>
</tr>
<tr>
<td>10</td>
<td>Tetanus</td>
<td>Fires</td>
<td>Mental health services</td>
<td>Poisonings</td>
<td>Diabetes mellitus</td>
<td>Nephritis and nephrosis</td>
<td>Road traffic injuries</td>
</tr>
<tr>
<td>11</td>
<td>Malignant neoplasms</td>
<td>Ischemic heart disease</td>
<td>Mental health services</td>
<td>Ischemic heart disease</td>
<td>Nephritis and nephrosis</td>
<td>Diabetes mellitus</td>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>12</td>
<td>Sepsis</td>
<td>Leukaemia</td>
<td>Poisonings</td>
<td>Fires</td>
<td>Stomach cancer</td>
<td>Tuberculosis</td>
<td>Nephritis and nephrosis</td>
</tr>
<tr>
<td>13</td>
<td>Diarrhoeal diseases</td>
<td>Congenital anomalies</td>
<td>Abortion</td>
<td>Nephritis and nephrosis</td>
<td>Liver cancer</td>
<td>Liver cancer</td>
<td>Hypertensive heart disease</td>
</tr>
<tr>
<td>14</td>
<td>Road traffic injuries</td>
<td>Typhoid fever</td>
<td>Leukaemia</td>
<td>Drownings</td>
<td>Breast cancer</td>
<td>Oesophageal cancer</td>
<td>Self-inflicted injuries</td>
</tr>
</tbody>
</table>

The World Health Organisation (2009) states that pedestrians, cyclists and drivers of motorised two-wheelers and their passengers account for almost half of global road traffic deaths. It can be argued that in South Africa this number might even be higher due to the in-proportionally small middle class, resulting in very high NMT movements. Student populations in general tend to use NMT measures for the majority of their on-campus mobility.

It is therefore imperative to take road traffic safety very seriously during the planning stage of this new university. This is especially true when the proposed campus is integrated into the existing city fabric, where students will mix with normal existing traffic patterns.

5.2 Pedestrian Routes

Figure 5.2 shows a layout of the NC University and the proposed land uses as determined by the Department of Higher Education and Training. The figure also shows the proposed pedestrian and cycle routes, the location of the proposed multi-level parking structure (as discussed in Chapter 4).
and the cross-sections analysed in the study. The cycle routes and cross-sections will be discussed in more detail in Chapter 6.

The pedestrian routes are the routes shown in red and the figure should give an indication of the proposed movement of students between residences, academic and other facilities on campus.

Figure 5.2: Proposed land uses, pedestrian and cycle routes, location of the proposed multi-level parking structure and the cross-sections analysed
The provision of safe, efficient, user-friendly and aesthetically pleasing pedestrian routes is a key principle in terms of campus circulation as mentioned earlier. One should therefore focus on areas where pedestrians will have to cross the road. It is of vital importance to make these intersections as efficient and safe as possible for pedestrians so as to ensure that the University as a whole is operated at maximum functionality. Pedestrians should feel safe to use these crossings as this will add to the general well-being of the students on campus. The safety and efficiency of these crossings will ultimately determine the success of the campus as a pedestrian community.

### 5.3 Expected Pedestrian Flows

Pedestrian flows will be from the residences to the academic buildings during the AM peak hour as the students proceed to their places of instruction. There will also be a secondary movement between the parking area and the academic and admin buildings. The pedestrian flows have been defined in line with the following assumptions:

- 25% of the pedestrians will access the academic facilities in the Central Campus area.
- 75% of the pedestrians will access the facilities in the Northern Campus area.

### 5.4 Pedestrian / Vehicular Conflict Points

The layout of the NC University does not allow for an enclosed university structure and this means that it is inevitable that the different modes of transport will be in conflict at some point. The most dangerous places for pedestrians are anywhere where they mix with any other mode of transport. This is typically at intersections or mid-block crossings. The two intersections, where pedestrians will have to cross the road and mix with vehicular traffic, is highlighted in Figure 5.2. The first crossing is at Scanlan Street and the second crossing is at Dalham Road. Both roads are very busy and thus pedestrian safety need to be a key focus in the design of these crossings.

A proposed pedestrian crossing is shown in Figure 5.3. The pedestrian crossing will link the Central Campus to the North Campus via Dalham Road. An estimated 1500 pedestrians will desire access to the Northern Campus compared to an estimated 200 pedestrians moving towards the Central Campus from the north. Due to the large number of pedestrians, a signalised pedestrian crossing is required.
The provision of a pedestrian/cycle priority zone will considerably enhance the safety of pedestrians at these crossings. A signalised pedestrian crossing is proposed for the Scanlan Street and Dalham Road crossings respectively, with zebra crossings on either side of the intersections. It would be the prudent approach to physically slow vehicles down by way of speed humps and raised pedestrian crossings to enhance pedestrian safety. Over the long-term grade separation between pedestrians and vehicles is thus proposed.

The South African Road Traffic Signals Manual (SARTSM) (National Department of Transport, 2012) explains that the need for such crossings, shall, however, be subject to a comprehensive traffic engineering analysis. A traffic engineering analysis was thus performed on the NC University model using VISSIM, simulating the movement of the cars, pedestrians and cyclists. Table 5.2 shows the signal setting for this crossing. The VISSIM model indicated that the functionality of this crossing is acceptable without causing major congestion problems.

### Table 5.2: Pedestrian crossing signal settings

<table>
<thead>
<tr>
<th>Phase</th>
<th>Movement</th>
<th>Red</th>
<th>Green</th>
<th>Yellow/Flashing Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Traffic</td>
<td>2</td>
<td>55</td>
<td>3</td>
</tr>
<tr>
<td>Phase 2</td>
<td>Pedestrians</td>
<td>2</td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

According to the South African Road Traffic Signs Manual (National Department of Transport, 2012) pedestrian crossings of roads may, under certain circumstances, be necessary or desirable at mid-block locations. The SARTSM defines the term mid-block pedestrian crossing as a variety of...
pedestrian facilities provided to assist the pedestrian to cross at some location between junctions. The SARTSM further states that the warrants for installing a formal mid-block pedestrian crossing are based on pedestrian movement desire lines and volumes, and the vehicular volumes on the road needing to be crossed. According to the SARTSM formal mid-block pedestrian crossings may be considered under the circumstance where a road divides a large and integrated community, as is the case with the NC University.

The requirements for a signalised mid-block pedestrian crossing are given in detail in the South African Road Traffic Signs Manual (National Department of Transport, 2012). Figure 5.4 shows a typical design for a continuous pedestrian mall connection across an intervening street, which can also be used for a university crossing as the pedestrian volumes will be very similar. Something similar to that in the image is proposed for the Scanlan Street and Dallham Road pedestrian crossings. Zebra crossings for both directions however are proposed as well as an additional bicycle/cycle lane which will be discussed in more detail in Chapter 6.

Figure 5.4: Typical layout of crossing connecting a continuous university structure (National Department of Transport, 2012)
Figure 5.5 shows a typical signalised pedestrian crossing. In addition to this a raised intersection is proposed, together with zebra crossings in both directions to be able to carry the large pedestrian volumes in the peak hour. A cycle lane will also ideally be added to this crossing to cater for cyclists.

Figure 5.5: Typical signalised pedestrian crossing

As mentioned earlier, in light of safety concerns, and the fact that this is a major through route for regional traffic, a grade separated crossing for the Bultfontein Road pedestrian crossing will ultimately be required. It is proposed to raise the road level by approximately 1m whilst lowering the pedestrian surface by 2m.
6. CYCLING

The non-motorised transport (NMT) modes of walking and cycling are the most vulnerable modes of transport. It is therefore imperative to take road safety very seriously during the planning stage of this new university. This is especially true when the proposed campus is integrated into the existing city fabric, where students will mix with normal existing traffic patterns.

The image below shows the layout of the NC University with the proposed cycle lanes highlighted in green. The lighter green lines should be implemented immediately and the darker green lines propose informal cycle lanes to perhaps be implemented more permanently in the future.

Figure 6.1: Proposed land uses and pedestrian and cycle routes
These routes are identified through the proposed campus area and proposals are made in the next section, focusing on the different road cross-sections, to upgrade these routes to acceptable and safe standards. No formal cycle lock-up facilities are currently present within the Municipal area.

6.1 Mode Development

When facilitated properly, cycling is in fact one of the best means of transport, as it is very cheap and longer distances can be covered than walking in a much faster time. By definition, students will not be part of the income generating section of the community at large, and thus it can be assumed that most students will not have their own transport, and therefore, other than creating enough place in residences to place these students, one should also make provision for cyclists to travel in and to the University.

To increase the number of cyclists on the NC campus and Kimberley in general, the concerns of the broad spectrum cycle user would need to be addressed. In general the main concerns cyclists have include: theft, road safety, distance to cover and the weather. Unfortunately, nothing can be done about the weather. The other concerns should not pose a significant problem in addressing. The only distance problem could be that of the students coming from the outskirts of Kimberley. This problem can be addressed by providing lock up and go facilities for these students. This facility is similar to a large locker, securing the bicycle inside. The cost of implementing these lockers can be recovered relatively quickly when renting these lockers out.

Figure 6.2 shows examples of typical lock-up and go provision for bicycles for long-term storage.

Figure 6.2: Typical lock-up and go provision for long-term storage
The storage concept in the image above makes efficient use of space as can be seen below in Figure 6.3.

![Efficient storage concept](image)

**Figure 6.3: Efficient storage concept**

Cycle transport not only will benefit and empower existing and potential students; it also has some tourism potential. Due to Kimberley’s historical background, it is the ideal place to discover by bicycle, even more so if proper infrastructure is provided to create a safe environment for exploration.

### 6.2 Cycle Racks and Lockers

Unfortunately the reality exists that one cannot leave one’s belongings lying anywhere, the same goes for bicycles. Cycles locked to fences, lamp posts, benches and other street furniture seems cluttered and unappealing. Formal cycle racks do not have to be the traditional mundane and unpleasing sight that everyone is used to. For a relatively low cost, these racks can become an attractive piece of street furniture with endless possibilities, in terms of urban design themes. Figure 6.4 show some examples of creative cycle rack designs previously implemented by other parties.

![Examples of creative cycle rack designs](image)

**Figure 6.4: Examples of creative cycle rack designs (Google Images, 2010)**
As these facilities are fairly inexpensive to implement, the benefits of having such facilities would far outweigh the cost of implementation.

New cycle racks and lockers are to be introduced all over the campus:

- Each residence should preferably have a lockable storage room where students can store their bicycles while at residence.
- Storage lockers are to be constructed where storage rooms are not available in the residences.
- At each academic building it is proposed that at least 20 new cycle racks are to be provided.

### 6.3 Cycle Lanes

A series of cycle lanes in the city of Kimberley will cater for students and staff accessing the campus from the outlying suburbs of Kimberley. (As can be seen in Figure 6.1.)

The use of cycle lanes on roads has proven all over the world to be a very effective way of counteracting unsafe conditions for cyclists. These lanes can be implemented in various ways.

The most popular and cost effective cycle lane would be the demarcation of the cycle lane by means of road markings. In order for this to be feasible, the width of the existing roadway should be such that the minimum width required for a cycle plus a safety buffer distance between the cyclist and passing traffic can be accommodated. The minimum width required for such a cycle lane is between 1.8m and 1.5m. The absolute minimum allowed can be reduced to 1.2m.
It is also very beneficial to create a visual deterrent for vehicles to drive in the cycle lane. One very effective way of doing this is by surfacing the road with coloured slurry (anti-skid) as shown in Figure 6.5.

Another type of cycle lane is the segregated cycle lane. This lane is completely segregated by means of non-mountable kerbs or similar. Only at intersections and/or accesses are the level of kerbs lowered to street level to allow vehicles to cross the cycle lane. This is considerably safer than the painted line cycle lane as vehicles are physically segregated from the cyclists. Unfortunately, this is a very expensive exercise due to the drainage issues, materials and labour involved. These lanes are only required on higher volume and/or high speed roads. See Figure 6.6 for an example of a segregated cycle lane.

If possible, the safest option for providing a cycle lane would be to implement a specific cycle lane on the footway if possible. This lane would however still need to be demarcated as to prevent collisions with pedestrians. See Figure 6.7 for an example of a cycle lane on an existing footway.
For the cross-sections identified in Chapter 7, these types of cycle lanes identified above will be required. For each cross-section, one should investigate which of the cycle lane alternatives will best suit the specific cross-section and the needs of the cyclists/pedestrians in that area.

Figure 6.6: A typical example of a segregated cycle lane

Figure 6.7: A typical example of a cycle lane on an existing footway
7. EXISTING AND PROPOSED ROAD CROSS-SECTIONS

The different road cross-sections discussed in this chapter are shown in Figure 7.1 and highlighted in purple. This section shows the current cross-section and how it is proposed to upgrade each cross-section to accommodate cyclists, pedestrians, etc.

Figure 7.1: Identified cross-sections

Figure 7.2 shows cross-section 2. The image shows Reservoir Road, looking in an easterly direction. It is clear that the walkway on the right side of the image is wide enough to accommodate future formal NMT facilities. Although this is a fairly quiet street, it is important to remember that the safety of students walking and cycling can be dramatically increased with the provision of formal facilities. These will typically include a surfaced walkway for pedestrians and a cycle lane for cyclists as the bottom image proposes. The sides of the road are currently used as informal walkways but a
formal walk way and cycle lanes are proposed for pedestrians to increase safety as this is the main road connecting the southern campus to the rest of campus.

Figure 7.2: Cross-section 2, Reservoir Road (looking in an easterly direction)

Figure 7.3 shows cross-section 3. The image shows Lawson Street, looking in a Northerly direction. Pedestrian walkways are proposed on either side of the road with formal cycle lanes on the road itself as the road is wide enough to allow for the cycle lanes to be placed on the road.
Figure 7.3: Cross-section 3, Lawson Street (looking in a northerly direction)
Figure 7.4 shows cross-section 4. The image shows Scanlan Street looking in an easterly direction (left hand side photo) and looking in a westerly direction (right hand side photo). The proposed intersection design is focused on the photo looking in the westerly direction as the majority of the road looks like this. The median is only found as one nears the Bishops Avenue/ N12/ N8/ Dalham Road intersection, or the new proposed roundabout. The cross-section is thus designed without the median in mind. As seen from the images, the sidewalks have ample space to allow for both a pedestrian walkway and cycle lane on the sidewalks itself. This will enhance pedestrian and cyclist safety as the pedestrians and cyclist will be formally separated from the traffic by means of the sidewalk.

Figure 7.4: Cross-section 4, Scanlan Street (looking in an easterly and westerly direction)
Figure 7.5 shows cross-section 5. The image shows the N12 looking in a north-westerly direction (left hand side photo) and looking in south-easterly direction (right hand side photo). The figure also shows the main crossing point for NMT, connecting the northern and southern sections of campus. Unfortunately one of the most heavily trafficked roads in Kimberley, the N12, runs through this proposed crossing area. This is an aspect of serious safety concern that will require extreme traffic solutions. As discussed in Chapter 5, a signalised pedestrian and cyclist crossing is proposed (shown in yellow below).

Figure 7.5: Cross-section 5, the N12 (looking in a north-westerly and south-easterly direction)

Figure 7.6 shows cross-section 6. The image shows Dalham Road/ the N8 looking in a south-easterly direction. The image shows ample space for pedestrian walkways to be implemented on the sidewalks. It is proposed that the current cross-section can remain unchanged for the new university.

Figure 7.6: Cross-section 6, Dalham Road/ the N8 (looking in a south-easterly direction)
Figure 7.7 shows cross-section 7. The image shows Lyndhurst Road looking in a north-easterly direction. It is proposed that the current cross-section can remain unchanged for the new university. Future implementations, such as more street lights, campus security and waiting posts for pedestrians can be considered once the university has opened. All these aspects will serve to enhance the safety, efficiency and aesthetics of the walkways and the campus in general.

![Figure 7.7: Cross-section 7, Lyndhurst Road (looking in a north-easterly direction)](image)

Figure 7.8 shows cross-section 8. The image shows Synagogue Street looking in a south-easterly direction. It is proposed that the current cross-section can remain unchanged for the new university. Pedestrian walkways on the sidewalks are proposed and as the cycle lanes on this road is only proposed as informal cycle lanes it is not indicated in the image below. This road does not connect any major parts of the University and thus not too many pedestrians/cyclists are expected to move on this road. For the few students estimated using this road, the cyclists can mix with pedestrians on the sidewalk.

Figure 7.9 shows cross-section 9. The image shows a pedestrian walkway which will possibly connect the new parking facility to the northern campus. The existing cross-section can remain unchanged for the new university but future upgrades in terms of more street lights and other aesthetically pleasing elements such as upgrades in the surrounding garden can be considered once the University is functioning properly.
Figure 7.10 and Figure 7.11 shows cross-section 10 and cross-section 11, respectively. Figure 7.10 shows Chapel Road looking in a northerly direction and Figure 7.11 shows Lyndhurst Road looking in a north-easterly direction. Both cross-sections can remain unchanged for the new University. Again features to enhance these facilities, like waiting posts for pedestrians, can be considered in the future.

Figure 7.8: Cross-section 8, Synagogue Street (looking in a south-easterly direction)
Figure 7.9: Cross-section 9, Pedestrian walkway
Figure 7.10: Cross-section 10, Chapel Street (looking in a northerly direction)

Figure 7.11: Cross-section 11, Lyndhurst Road (looking in a north-easterly direction)
8. PUBLIC TRANSPORT

Public transport is too important a mode of transport not to be an integral part of the transportation links to the University campus.

Currently the Municipal Public Transport comprises of minibus-taxis, scheduled buses and metered taxis. The Sol Plaatje SDF states that an agreement has been reached between the minibus-taxis and the metered taxis that the metered taxis may operate to Galeshewe after 20:00. This is when the minibus-taxis stop their operations. Figure 8.1 shows the major mini-bus taxi routes and Figure 8.2 the existing bus routes.

Figure 8.1: Major minibus-taxi routes (Sol Plaatje Municipality in Partnership with the Department of Land Affairs, 2008-2012)
The public transport operations that are important for the traffic impact of the university are the expected minibus-taxi trips that are expected in the AM peak to the proposed parking facility as discussed in Chapter 4. The proposed parking facility will ideally include a minibus-taxi off loading and ranking area, to facilitate those students and staff members that will make use of public transport to and from the university.

8.1 Regulatory Environment

Public transport is too important a mode of transport not to be an integral part of the transportation links to the NC University campus.

The National Land Transport Act (Department of Transport, 2009) clearly states the following:

“An operating licence is not required for the conveyance by a university, teachers’ training college or similar educational institution of its own students and staff for educational, cultural or sports
purposes by means of a motor vehicle of which that educational institution is the owner, or by means of a motor vehicle of which, in terms of an agreement, is set apart for the use of that educational institution for these purposes.”

8.2 Design Elements of a Pilot Service

The following design elements are proposed for a possible future shuttle/public transport service:

- In order to create a sustainable system, a fixed route and timetable based system is proposed. This will provide a rock solid dependability to the system in the eyes of possible patrons.
- In terms of cost to the users of the services, it is proposed that it should be free to board any of the vehicles for any staff member/student of the NC University, brandishing his/her magnetic staff/student card.
- The huge advantage of such a free system would be that no driver or manager in the service would have the responsibility of ever handling money or tickets, etc. The only disadvantage would be that all the services will then be fully funded by the university as a direct cost of operations.
- Two supplementary systems are proposed for the ease of operation. The first would be the longer distance public transport service from the surrounding suburbs. The second would be the shuttle services inside the Kimberley campus area.
- Both services would however utilise the same type of vehicles from a single inter-operable fleet. This will only be possible if there is a time difference between what is seen as the public transport service and the circulating shuttle services.
- For the public transport services, it will be more feasible for the University to employ drivers (typically staff members) that currently reside in the suburb where the vehicle will originate from. This will cut the number of trips in half as the return trip to the Kimberley campus in the evening is eliminated.
- For the shuttle routes, professional drivers will have to be employed. It is proposed that the NC University purchases a few shuttles for this purpose as a pilot project. These shuttles can be transformed into NC University unique vehicles, in order for students to identify these shuttles easily and also to add to the feeling of a community on campus. The shuttles should clearly display the NC University logo and should not be accessible to any person other than students/staff members.
• The public transport routes will only do one trip per vehicle in the morning into Kimberley. It would typically arrive at 07:15 and depart again in the afternoon at 17:30 from Kimberley to the outer suburbs.

• The NC University should approach the problem of public transport in general very cautiously so as not to waste important financial resources, but with an open ended growth goal in mind.

As shuttles are very expensive the above proposals, in terms of a pilot service, is only seen as a long-term plan once the University is more sustainable. It is thus proposed that for the time being the NC University should liaise with the minibus-taxis already operating in this area. It is proposed that the NC University subsidise some of the funds for the minibus-taxis and that the owner of the minibus-taxis agree to a fixed time pick-up and drop-off on a fixed route. This will only be one trip once in the morning before class starts and one trip in the afternoon after class has ended. The minibus-taxis can thus operate their normal functions for the rest of the day without the University hampering their clientele. For the time being no shuttle service within the campus area is thus proposed, but can definitely be considered at a later stage should the need arise. Students must utilise the pedestrian and cycle routes made available to them to move around on campus. The possible shuttle pilot service and the long distance public transport service is however discussed in more detail in the next section, should the need arise to implement these proposals more permanently in the future.

8.3 Branded Shelters and Vehicle Liveries

By branding the proposed services with innovative infrastructure designs and vehicle liveries, acceptance and patronage growth will almost certainly follow. This concept will be further addressed in the section on urban design.

Shown below are some examples of innovative bus shelters. Providing something out of the ordinary will inevitably attract more potential passengers. Eventually, shelters are to be erected at all the stops of the shuttle routes, under the control and management of the NC University. See Figure 8.3 and Figure 8.4.
Figure 8.3: Examples of innovative bus shelters
The majority of these shelters make provision for advertising. This makes it possible for advertising to eventually pay for construction of such facilities, however careful management will need to be implemented. More examples of innovative bus shelters are shown in Figure 8.5.
Figure 8.5: Examples of innovative bus shelters
8.4 Shuttle Routes

The image below shows an aerial photograph of the proposed NC University. The proposed internal shuttle route is shown below in red. Proposed locations for the bus stops are also shown in the image. The image includes the new proposed traffic circle together with the proposed parking facility. See Figure 8.6.

Figure 8.6: Proposed internal shuttle route

The proposed route starts at the Hunt Street and Black Street intersection and moves in a westerly direction. The idea is that this road will allow the shuttle to pick up all the students who reside in the private residences enclosed by this route as well as other private residences in the vicinity. As the shuttle moves down to Reservoir Road, the idea is to capture all the students residing in the residences in the southern campus. As the route moves back up to Reservoir Road it is envisioned that a bus stop before the major pedestrian crossing will pick up the students residing in the central campus who wishes to go to the northern campus.
The route carries on to cross the proposed traffic circle into Lyndhurst Road and it is proposed that the majority of passengers will be dropped off at the proposed parking facility at a drop-off point. From here students can use the exclusive pedestrian walkway to connect to the northern campus. This bus stop is also proposed as a location for students/staff wishing to reach other parts of campus can get on the shuttle to travel as such.

As the route goes around the northern campus, a bus stop is suggested at the top of the northern campus where the last of the passengers can be dropped off, and the next group of the passengers wishing to reach other parts of campus be picked up. The route continues to connect with the N8 to go around the circle into Scanlan Street and finally reach the starting point of the route again. The route is approximately 5.2km one direction and an anticipated round trip time of ± 25-35 minutes.

The shuttle services are proposed to start between 07:00 and 07:15 in the morning when the long distance service is estimated to arrive from their various origins. At least one round trip should be completed before 08:00 with another two round trips before 09:00. Three complete trips are to be scheduled in the time slot between 12:00-14:00, with the final three trips at the end of the afternoon, 15:30-17:00. Students who wish to use the public transport outward to surrounding suburbs will then be in time for the bus/shuttle to pick them up.

8.5 Long Distance Public Transport Routes

The potential passengers that cannot be transported from places too far away for the shuttle services will be transported by the public transport service. As mentioned earlier in this chapter, this service will only run once in the morning towards Kimberley campus and once in the evening, when returning to its origin.

The long distance public transport routes are proposed to coincide with the current minibus-taxi routes for the time being. As the University becomes more established more attention can be given to the positioning of the long distance routes as a need first needs to be identified and established in various areas.

As a temporary solution, as mentioned earlier, it is possible that the NC University could liaise with the minibus-taxis already operating in this area. It is proposed that the NC University possibly subsidise some of the minibus-taxis and that the owner of the minibus-taxis agree to a fixed time
pick-up and drop-off on a fixed route. This will only be a single trip in the morning before class starts, and one trip in the afternoon after class has ended. The minibus-taxis can thus operate their normal functions for the rest of the day without the University hampering their clientele. For the time being, no city-wide transport service is thus proposed, but can definitely be considered at a later stage should the need arise. Students must utilise the pedestrian and cycle routes made available to them to move around on campus.

All of the long distance routes and the shuttle route will either terminate or pass by the new proposed parking facility. Sufficient infrastructure is therefore required as these facilities will be used by a large number of people.

A large lay-by adjacent to the parking facility is proposed for easy and safe pick-up and drop-off of passengers. This will not only enable private vehicle drivers to enter the public transport system from the parking facility, but also allow the drop-off of passengers from the various parts of Kimberley and will give students/staff the opportunity to switch to cycling if the proposed cycle “lockers” are provided.

It is therefore proposed to provide secure “locker type” cycle storage, mentioned in Chapter 6, inside the parking facility to enable the change of mode from private vehicle or public transport to cycling.

8.6 Lyndhurst Road Terminus

Once the NC University is sustainable, one can consider erecting a terminus on Lyndhurst Road at the new proposed parking facility. It is proposed that all the shuttle and public transport routes pass through this facility. This is a main point of convergence on campus as most of the private vehicles, shuttles, and minibus-taxis will move through this facility. There is also an exclusive pedestrian walkway next to this facility and a lot of pedestrian traffic is expected in this area. It is proposed to implement a small but very practical facility for commuters to use while they are waiting for the shuttle and/or public transport vehicles.

The aim of this facility is to serve as a hub for all the proposed shuttle and public transportation routes. All information on route scheduling will be displayed at this facility. The facility should blend in with the existing surrounding area with an excellent all-round view from the inside.
Some of the design features of the building are the following:

- Controlled access by student card only;
- Benches for waiting passengers;
- A few work stations with Wi-Fi web connectivity for those waiting students/personnel that wish to make use of such facilities; and
- A small ablution facility.

The images below show examples of the proposed facility. Figure 8.7-Figure 8.9 shows perspectives of the proposed public transport facility.

![Figure 8.7: Perspective of the proposed public transport facility](image-url)
Figure 8.8: Perspective of the proposed public transport facility

Figure 8.9: Perspective of the proposed public transport facility
The image below shows the proposed location and layout of the proposed public transport facility. The image highlights the area of the previously proposed parking facility in blue. The proposed hub/public transport facility is shown as the area in red. This is conveniently located near the pedestrian crossing, also shown in the image, as well as the proposed bus stop/minibus-taxi/shuttle drop-off and go area. The proposed drop-off and go area is shown in yellow in the image. To envision thus hub, the pedestrian flow is also highlighted in the image as the purple routes. The red route shows the part of the proposed shuttle route.

Figure 8.10: Proposed location and layout of the public transport facility

8.7 Summary of Operations

The proposed public transport / shuttle operations, as proposed here, can be summarised as follows:

- As the NC University grows in capacity and sustainability, the University is to “phase in” these operations in a conservative manner. A NC University “owned and operated” approach is proposed, which can, at a later stage, be converted to full tendered services by a private contractor. For the time being it is proposed to liaise with existing minibus-taxi operators in the area to fulfil the long distance public transport service.
• To keep costs as low as possible for these initial endeavours, an almost “skeleton” service is to be started with. This approach has however the inherent weakness that the proposed services can be swamped by potential users. This will necessitate an immediate expansion of services and/or continuous re-design.

• The initial operational proposal is based on a dual service design that will be extended, namely: Public transport services on a morning-in, afternoon-out concept between outlying areas and Kimberley campus area utilising existing minibus-taxi operators as drivers, and circulating shuttle services within the Kimberley campus area, utilising professional drivers.

• It is proposed for the University to purchase its own shuttles as the University becomes more sustainable. The cost analysis is based on the purchase by the University of 3 TATA 32-seater buses for R450 000 each. Once the shuttle and public transport services can be permanently implemented, it is proposed that the same vehicles that are being used for the public transport services will be utilised for the shuttle services during the day. For the pilot service only two buses should be used on the internal shuttle routes with the remaining vehicle used for backup, should either of the other two shuttles experience problems and also for the execution of University functions which requires larger transport capacities at the same time. As mentioned earlier, no extra buses should be purchased for the long-distance public transport for the time being as the demand first needs to be established. The existing minibus-taxi operators can execute the long distance public transport services for the time until the University has become more established and a more direct demand can be identified in terms of routes, number of students, etc.

• All the internal shuttle routes will do three round trips in the morning, with the first one to be completed before 08:00. Additional trips are proposed during the lunch hour (13:00-14:00) and three more round trips between 16:00 and 17:30. The public transport routes are proposed to depart at 17:30 from their various destinations.

8.8 Budgets

As was discussed in other sections of this document it is proposed that NC University fund the public transport/shuttle services from a levy on general tuition fees. The advantages of this costing and funding system can be defined as follows:

• As all the enrolled students thus pay for public transport there is a continuous incentive to make use of public transport.
• Nowhere in the system will money and/or electronic transfers be needed to take place, which automatically rules out corruption or the rectifying of mistakes.

• Complicated auditing systems, electronic ticketing machines, cash safes, etc. are simply not required.

• The cost of the pilot service (±R1,7904 million) per annum would hardly make a dent in tuition fees if spread over the 5000 expected students (R360 per student).

The implementation of the proposed public transport- and shuttle routes will have the following annual cost implications (calculations are based on an average of 22 working days per month):

**Initial cost, at start of the pilot service:**

• 3 x 32-seater TATA buses: 4 x R450 000 = R1, 35 million

• To calculate the annual costs of buying a few R450 000 buses the annual cost calculation is done by applying the capital-recovery factor. If the assumption is made that all the vehicles are totally written in five years and that the cost of capital for vehicles is 15%:

  Annual cost (TATA 32-seater) = R 450 000 x 0.29832
  = R 134 244 per vehicle

**Annual costs (2013 price levels):**

• The following costs are calculated on an operational cost of R5.14/km for the type of vehicle (AA Rates).

• Four professional drivers will need to be employed for the two shuttle buses. One driver for each bus and one for the case where one driver can’t perform his/her function due to reasons such as sickness.

In the next section, Chapter 9, the needs of persons with disabilities are also addressed, where it is made clear that an extra driver should be available to fulfil the students’ with disabilities transporting needs on a call-on-demand basis. In this regard one driver is thus required to perform this function.

• Services will run for 22 days a month, 11 months a year.

• It is assumed that the NC University will have to appoint a professional transport manager to oversee operations.

Table 8.1 shows the estimated annual costs involved for this pilot service.
Table 8.1: Estimated annual costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit / Cost</th>
<th>Total (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buses (Annual Cost)</td>
<td>3 for 5yr at 15%</td>
<td>400 000</td>
</tr>
<tr>
<td>Professional Drivers</td>
<td>4 Drivers @ R5000 pm</td>
<td>220 000</td>
</tr>
<tr>
<td>Transport Manager</td>
<td>Salary and Disbursements</td>
<td>250 000</td>
</tr>
<tr>
<td>Shuttle 1</td>
<td>9 trips/day, 10km</td>
<td>112 000</td>
</tr>
<tr>
<td>Shuttle 2</td>
<td>9 trips/day, 10km</td>
<td>112 000</td>
</tr>
<tr>
<td>Minibus-Taxi’s Subsidies</td>
<td>2 trips/day, average 20km, 8 taxi’s</td>
<td>398 000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1 492 000</td>
</tr>
<tr>
<td>Wages and Unforeseen Expenses (20%)</td>
<td></td>
<td>298 400</td>
</tr>
<tr>
<td><strong>Annual Cost</strong></td>
<td></td>
<td>1,7904 million</td>
</tr>
</tbody>
</table>

Ultimately various funding sources can be tapped to lower the annual levies on students for the above services. Some of these are:

- Advertising on buses and shelters;
- Sponsorships;
- Government transportation subsidies.

Once the pilot services are up and running, the NC University Transportation Manager should pursue all of these possibilities.
9. TRANSPORT AND ACCESS FOR PERSONS WITH DISABILITIES

9.1 Transportation Policy for Disabled Students

It is a known fact that to equip the proposed NC University shuttles with wheelchair lifts and other accessories to deal with disabled students and staff, would simply be an exorbitant cost, and would inevitably be utilised only at rare occasions. The following management system dealing with these aspects is therefore proposed to be implemented:

- The new proposed transport manager should be responsible for managing the transportation needs of all disabled students and staff on campus;
- A database of the disabled students and staff should be kept with details in terms of: type of disability, residence and regular transportation needs;
- A single vehicle should be equipped with the necessary accessories for transporting the disabled;
- The specially adapted vehicle and a dedicated driver be kept available for all the regular transportation needs of the disabled student and staff registered in the databank; and
- The specially equipped vehicle should be available for special trips on a call-on-demand basis.

The images below show examples of vehicle adaptation for persons with disabilities. Figure 9.1 shows the wheelchair lift system incorporated into a minibus.

Figure 9.1: Wheelchair lift system incorporated into a minibus
9.2 Service Costs

The implementation mentioned will require specific costs as defined in Table 9.1.

Table 9.1: Disabled transport service cost

<table>
<thead>
<tr>
<th>Capital Costs</th>
<th>Costs (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Tata Shuttle</td>
<td>450 000</td>
</tr>
<tr>
<td>Vehicle Adaption Cost</td>
<td>80 000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>530 000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Operational Costs</th>
<th>Costs (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver (R5000/month)</td>
<td>60 000</td>
</tr>
<tr>
<td>Km Cost (40 000km @ R5.14/km)</td>
<td>210 000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>270 000</strong></td>
</tr>
</tbody>
</table>

However, as this is a very expensive exercise, it is suggested that this service only be implemented after a demand survey has indicated that there is indeed a need for such a service on campus.
10. INSTITUTIONAL SUPPORT ISSUES

10.1 Transport Manager

With the creation of a whole new, potentially vast transportation function at the NC University, it is unrealistic to assume that the new responsibilities and functions could be executed by the normal personnel planned for the NC University.

It would thus be the prudent approach to create a new post of Transportation Manager. This person, once appointed, would thus be tasked with the day-to-day management of the transportation operations, including the duties of the professional shuttle drivers and the minibus-taxi operators who were proposed for the University to liaise with as a temporary long distance public transport solution.

The Transport Manager will also be responsible for the continuous upgrading of the services, which will almost certainly be required in coming years.

Specific functions associated with the new post of Transportation Manager will thus include the following:

- Management of the professional drivers and minibus-taxi operators and their duties;
- Management of the new fleet of shuttle buses;
- Line responsibility for the public transport and shuttle services;
- Preparation and management of future capital- and operational budgets;
- Continuous amendment and upgrading of schedules and services; and
- Responsibility for management of the transportation needs of disabled staff and students at the University of the Northern Cape.

One of the most important implementation aspects of the NC University’s Mobility Plan will be the appointment of a suitable candidate for the post of Transportation Manager.
10.2 Parking Manager

The parking areas of the NC University should be recognised for what it is, namely an asset, which are very expensive, as well as an important source of revenue. To effectively manage and upgrade these assets, a dedicated post of Parking Manager is required with the following functions assigned:

- The Parking Manager should ultimately be responsible for the assignment of all parking spaces to staff and students;
- Parking assignment rules and payment tariffs, to be calculated on an annual basis, will also be the responsibility of the Parking Manager;
- The Parking Manager will be responsible for collecting all parking revenue and will report on the Parking Fund;
- The Parking Manager will be responsible to plan and implement all future parking projects; and
- The Parking Manager will define parking fines for illegal parking on the Kimberley campus area and will police these areas in conjunction with campus security.

- For traffic fines to be executable in terms of the NATIS data bank, it would be necessary for the NC University staff to be trained and accredited by the Kimberley Municipality for this purpose.

10.3 Human Resource Issues

It will be primarily a human resource decision whether the new Transportation and Parking Managers are to be vested in the Department of Facilities Management or within another structure. Ultimately though, both posts should be tied to the implementation of the Northern Cape University’s Mobility Plan.
11. URBAN DESIGN ASPECTS

All of the transportation endeavors conceptually designed in this study will have a profound impact on the environmental fabric of the NC University campus and also the city of Kimberley as a whole.

In order for branding purposes to create a “cool” image for non-motorised transport amongst, especially the student body, the form aspects of transport infrastructure design is very important.

In some cases the above two objectives can be in contradiction with each other, but in this specific case study a theme of “contemporary green” is proposed. This implies specific use of modern materials in the infrastructure design and the blending of all designs with the Kimberley natural environment.

Specific characteristics required of the building and shelter designs will be the following:

- Simplicity of form;
- All-round surveillance;
- Safety; and
- Full operational usage in rainy weather.

The following form elements can be utilised to achieve the desired results:

- Cycle racks and lockers;
- Bus shelters;
- Public transport terminus; and
- Shuttle bus liveries.

The examples detailed below are the proposals of the study team:
11.1 Cycle Racks

Distinctive cycle racks should be designed to be implemented across the campus. Figure 11.1 shows a proposal of cycle racks for the campus.

Figure 11.1: A possible distinctive cycle rack for the University of the Northern Cape
11.2 Bus Shelters

As only a few bus shelters are proposed over campus, it is important that the shelters should be functional and aesthetically pleasing in the sense that it will only add to the value of the campus. See Figure 11.2 for an example of an up-market bus shelter that is proposed for the NC University. The proposed bus shelter will not be too expensive and has a simplistic design which will endure the test of time. The shelter will also protect its users from the elements. The sturdy design will also ensure minimal damage/theft by users.

Figure 11.2: An up-market bus shelter
11.3 Public Terminus

Figure 10.3 shows the design of the public terminus. The style of the terminus as depicted below will complement the bus shelter design.

Figure 11.3: Public terminus design
11.4    Shuttle Bus Liveries

It is proposed that the bus shelters should have a unique NC University branding which will enable users to easily identify the shuttles across company. Figure 11.4 shows an example of such branding of the Jamie Shuttle service incorporated at the University of Cape Town. It is proposed that the NC University’s branding should include the University’s logo and a distinctive livery in the formal colours of the University is proposed.

Figure 11.4: Example of the distinctive livery of the Jamie Shuttle used by UCT
12. REGULATORY ASPECTS

12.1 Public Transport and Shuttle Services

As was mentioned earlier, a public transportation permit will not be required by the University of the Northern Cape in order to operate the public transport and shuttle services as defined in this mobility study.

It is however possible that resistance and opposition to these services can be experienced from the local minibus-taxi community. It would thus be prudent to embark on structured stakeholder participation endeavours with all affected parties as detailed below:

- Liaison between the NC University and other institutional players in the transportation fields such as the District Municipality and the Northern Cape Province should ideally be on a quarterly frequency.
- Contact should be made with the local taxi industry and presentations should be made to its management structures to prevent rumours and possible destructive actions, before the introduction of the university’s public transport services and shuttles.

12.2 Parking Management Control and Tariffs

It is obvious that in the future there will be a classic carrot-and-stick standoff between the use of the free shuttle and public transport services (carrot), and access to a parking space (stick). The latter being defined as a stick, because once the parking facility is implemented it will be saved for a few visitors’ parking spaces, which need to be strictly controlled and demarcated. All parking on the NC University campus should ultimately be pay parking.

As mentioned earlier in Chapter 4, the minimum cost for the development of new surface parking spaces is R12 000 per space, while the cost of structured parking can be as high as R95 000 a space. The yearly cost of accessing a space should thus reflect a suitable return for the NC University on its parking development.
The following proposals are thus defined to manage and control the huge parking investment of the NC University:

- The parking spaces at residences play no role in the parking provision function for commuting students and personnel, and thus should be viewed as just another feature of each residence. Ideally, each parking space should be linked to a room in the residence and those with parking should be at least R1 500 p.a. more expensive. The monies so earned can be utilised for the development of more parking areas.
- As a rule all non-residential parking should be access controlled.
- Access to the new parking facility is to be reserved for personnel and primarily commuting students and can be paid for on a yearly (R 1500), monthly (R200) or a daily basis (R12).
- All the other parking spaces on campus should be access controlled and should be dedicated to an annual user at a cost of R1 500 p.a.
- All the monies earned from parking should then be invested into a dedicated fund for the further development of parking on the NC University campus.
13. NORMAL VEHICULAR TRAFFIC

13.1 Status Quo

The background road network around the new university sites is to a very large extent fixed. No road upgrades are contemplated by the municipality or any other road authority in the study area. All the changes to the road network to accommodate the development of the new university will thus be a direct cost for the establishment of the facility.

Although the road network in the vicinity of the proposed premises of the new Northern Cape University includes some of the busiest elements in the city, current traffic congestion is manageable. Only a few intersection turning movements are functioning at levels-of-service worse than D and all of these can be upgraded at low cost (intersection 1: Du Toitspan/Regiment/Lennox Str. intersection) or is seen as an integral part of the campus upgrade (intersection 7: N12/Bishops Ave/Lyndhurst Road/Dalham Road intersection). (See attached video of the SQ VISSIM model.)

13.2 Infrastructure Proposals

The only interventions required in terms of the status quo model are in terms of intersections 1 and 7, where some of the turning movements have a level-of-service worse than D.

Intersection 1 will function at acceptable levels-of-service with a change in traffic light settings, which can be implemented at a relatively low cost.

Intersection 7 is located at the heart of the new campus and is anyway due for a major upgrade to a large roundabout, as can be seen in Annexure A (Maps) of this report.
14. IMPLEMENTATION PLAN

14.1 Walking Mode Implementation Plan

Table 14.1 shows an indication of the walking mode capital budgets and the proposed implementation year.

<table>
<thead>
<tr>
<th>Project</th>
<th>Year</th>
<th>Cost (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian establishment (signs, speed humps, pedestrian crossings)</td>
<td>2014</td>
<td>500 000</td>
</tr>
<tr>
<td>Scanlan Street pedestrian crossing and signal</td>
<td>2014</td>
<td>400 000</td>
</tr>
<tr>
<td>Dalham Road pedestrian crossing and signal</td>
<td>2014</td>
<td>400 000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>1,3 million</strong></td>
</tr>
</tbody>
</table>

14.2 Cycle Mode Implementation Plan

Table 14.2 shows an indication of the cycle mode capital budgets and the proposed implementation year.

<table>
<thead>
<tr>
<th>Project</th>
<th>Year</th>
<th>Cost (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle storage racks</td>
<td>2015</td>
<td>100 000</td>
</tr>
<tr>
<td>Cycle storage lockers</td>
<td>2015</td>
<td>120 000</td>
</tr>
<tr>
<td>Cycle routes demarcation</td>
<td>2015</td>
<td>400 000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>620 000</strong></td>
</tr>
</tbody>
</table>

14.3 Public Transport/Shuttle Implementation Plan

### Table 14.3: Public transport operational budget for 2017

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost p.a. (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional drivers (3 drivers @ R2 500 pm)</td>
<td>82 500</td>
</tr>
<tr>
<td>Minibus-taxi subsidies</td>
<td>115 000</td>
</tr>
<tr>
<td>Transport Manager salary and disbursements</td>
<td>250 000</td>
</tr>
<tr>
<td>Operational expenses (fuel, maintenance, etc.)</td>
<td>64 000</td>
</tr>
<tr>
<td>Total</td>
<td>511 500</td>
</tr>
<tr>
<td>Wages and unforeseen expenses (20%)</td>
<td>102 300</td>
</tr>
<tr>
<td><strong>ANNUAL COST</strong></td>
<td><strong>613 800</strong></td>
</tr>
</tbody>
</table>

### Table 14.4: Public transport capital budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Year</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase 3 x 32-seater TATA buses</td>
<td>2017</td>
<td>1 350 000</td>
</tr>
<tr>
<td>Bus terminus (x1)</td>
<td>2019</td>
<td>8 000 000</td>
</tr>
<tr>
<td>Bus shelters (x7)</td>
<td>2018</td>
<td>2 100 000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>11 450 000</td>
</tr>
<tr>
<td>Unforeseen expenses (20%)</td>
<td></td>
<td>2 290 000</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td></td>
<td><strong>13.74 million</strong></td>
</tr>
</tbody>
</table>

### 14.4 Parking Implementation Plan

Table 12.5 shows the parking implementation plan for the NC University and gives an indication of the costs involved. Table 12.6 shows suggested additional planning studies and the costs involved.
### 14.5 Road Infrastructure Implementation Plan

The following upgrading of the road network in the study area is required in order to facilitate the development of the New University of the Northern Cape.

- All the signalised intersections in the study area are to be changed to a 90s cycle in the AM peak hour with new signal settings as provided in Appendix A: SIDRA MOVEMENT SUMMARIES.
  
  Cost: Minimal

- Intersection 7 (Scanlan/Bishops/Lyndhurst/Dalham) is to be upgraded to a large diameter roundabout (>50m). This is envisioned for 2014.
  
  Cost: R4.7m
• A signalised pedestrian crossing is to be constructed in Dalham Road to facilitate pedestrians crossing the busy road between the Central and Northern Campuses.

Cost: R0.5m

• The internal streets around the Oppenheimer Memorial in the heart of the campus, that has been identified for a possible future closure, can be done so readily, as this action will not result in any traffic congestion.

Cost: To be part of the building construction costs.

14.6 Action Plan

In order to effectively manage the implementation of the NC University Mobility Plan, the following actions are to be concluded by the NC University:

14.6.1 Walking Mode

• Nov. 2013- Liaise with the Sol Plaatje Municipality to finalise the new pedestrian signal set in Scanlan Street and Dalham Road;
• Jan. 2014- Implement speed humps, pedestrian signs and necessary pedestrian crossings;
• Jan. 2014- Implement Scanlan Street and Dalham Road pedestrian signals.

14.6.2 Cycle Mode

• Oct. 2014- Liaise with Student Council and define the latter’s management function with regard to the NC University’s proposed cycle fleet.
• Nov. 2014- Liaise with all the Faculty Managers and identify the areas, where at least 20 new cycle racks can be constructed for each faculty. Cycle lockers are to be implemented at residences with no storage rooms and at the new parking facility. Placement of these cycle lockers should be finalised.
• Jan. 2015- Purchase and install cycle racks and cycle lockers at the decided locations on campus.
• Jan. 2015 (on-going)- Student Council to initiate actions and marketing endeavours to promote cycling as a “green” mode of transport on campus.

### 14.6.3 Public Transport/Shuttle Mode

• Oct. 2016- Liaise with the Sol Plaatje Municipality and existing transport operators in the Kimberley area to inform them of the decision by the NC University to initiate pilot shuttle services from Feb. 2017.
• Oct. 2016- Liaise with existing local minibus-taxi operators to perform long distance public transport services. Correspondence in terms of payment agreement, schedule, locations etc.
• Nov. 2016 to Feb. 2017- Market future public transport and shuttle pilot services to staff and student body primarily via email. Also research maximum free advertising through a number of “press releases”.
• Jan. 2017- Initiate process to buy first 3 shuttle vehicles.
• Jan. 2017- Advertise and appoint 4 professional drivers.
• Jan. 2017- Have one shuttle adapted with a wheelchair lift and finalise the rules and management structure for the dedicated vehicle that will be at the disposal for the office dealing with students with disabilities.
• Jan. 2017- Finalise stops and schedules of the pilot services with a series of test runs.
• Feb. 2017- Start with the pilot public transport and shuttle services on a fixed schedule basis.
• Feb. 2017 to Dec 2017- Continuous monitoring of pilot services to assess applicability and possible first extensions of services.
• Aug. 2017- Submit amended design and budgets for 2018 to NC University management. As part of this process the cost allocation in terms of extra tuition fees to pay for shuttle pilot services are to be made.
• Nov. 2017- Finalise positions of bus stops and proposed bus shelters.
• Jan. 2018- Purchase and install decided bus shelters.
• Sept. 2018 to Nov.2018- Design and preparation of tender documentation for the terminus construction project.
14.6.4 Private Vehicle Mode (Parking)

- Nov. 2013- Formal negotiations are to be initiated with the management of the land for the acquirement, by lease or outright purchase, of the land required for the parking facility next to Lyndhurst Road.
- June. 2014- Design and prepare tender documentation for the parking facility.
- Oct. 2014- Construction of the first phase of the new parking facility next to Lyndhurst Road. (Ground level).
- Jan. 2016- Construction of the second phase of the parking facility. (First and second levels).

14.6.5 Private Vehicle Mode (Traffic)

- Aug. 2013- Advertise for tenders for the construction of the proposed traffic circle.
- March. 2014- Start with construction.

14.6.6 Institutional and Regulatory Aspects

- Jan. 2015- Advertise for, and appoint Parking Manager.
- Jan. 2015- Have campus police personnel trained and accredited as officials that can issue official parking fines on campus land.
- June 2015 to July 2015- Determine new parking tariffs, based on the development cost of a new parking space, for the 2016 budgetary process.
- Jan. 2017- Advertise for and appoint Transportation Manager.
- Sep. 2017 to Nov. 2017- SMEC to do annual update of Mobility Plan based on the results of the monitoring effects. This update will take into account, all the latest trends in terms of modal splits. User surveys will be conducted to assess perceptions after a year’s operation of the shuttle/public transport service.
15. SUMMARY

The mobility plan of the NC University addresses a wide range of important transportation plans with huge potential impacts for both the expected student/staff body and the existing Kimberley residents.

The projects and services proposed have been conceptually designed to fit into the following characteristic framework:

- All projects and services should be realistically implementable;
- Cost outlays are to be conservative while recognising growth potential;
- Traffic safety aspects are non-negotiable;
- Form and design are to be environmentally sound and sensitive;
- New management structures and adequate stakeholder liaison practices are to be implemented;
- Monitoring mechanisms are to be instituted on the pilot projects for continuous evaluation; and
- Parking regulations and policing are to be introduced, to provide a return on some huge investments required.

Ultimately, the students and staff’s main priority should be studying and lecturing; transportation should be a seamless background activity equipping students and staff to carry out their educational purposes.
16. REFERENCES


ANNEXURE A

PROPOSED TRAFFIC CIRCLE
ANNEXURE B

SIDRA MOVEMENT SUMMARIES
NEW UNIVERSITIES

SOL PLAATJE UNIVERSITY

THE ASSESSMENT TO USE NON POTABLE WATER FOR IRRIGATION ON AND AROUND THE NEW CAMPUS

REPORT : DRAFT 01

PREPARED BY

civilsense consulting

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P.O. Box 110228
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KIMBERLEY 8306

MARCH 2014
# REPORT: THE ASSESSMENT TO USE NON-POTABLE WATER FOR IRRIGATION ON AND AROUND THE NEW CAMPUS

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<td></td>
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<tr>
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<td></td>
</tr>
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<td></td>
</tr>
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</table>
1. INTRODUCTION

The new Sol Plaatje University will be established in the Inner City of Kimberley. A large portion of the area earmarked for the university will comprise of sport fields and open green areas. The current high cost of potable water that is distributed by Sol Plaatje Municipality will result in high irrigation costs. This is evident from discussions that took place with surrounding schools currently experiencing problems with very high costs to irrigate their sport fields.

An existing non-potable water supply system is already in operation in Kimberley. This scheme transfers excess non-potable water from the northern located Homevale Waste Water Treatment Works to green areas in Kimberley (CBD) and Galeshewe. The excess water originates from treated effluent from the Homevale Waste Water Treatment Works (WWTW), storm water and mine dewatering. In the recent pass the increasing water level in the Kamfersdam poses threats to a railway line passing the dam site and the ecosystem of the pan itself. The municipality has been investigating options to address this excess water problem and to supply this water into different “green belt” nodes in Kimberley and as such complement the proposed green belt throughout the city which has been identified and described in their Comprehensive Urban Planning Report.

This study will therefore focus on the following:

- Assessment of the existing Infrastructure - Assess the condition and capacity of the existing scheme and in particular the mechanical and electrical components and capacity of installed pipelines,
- Stakeholders and potential beneficiaries – identify and consult all stakeholders and potential beneficiaries that will benefit from the supply of non-potable water,
- Water demands - Determine the water demands for these beneficiaries for irrigation water, considering summer peaks,
- Yield - Assess the yield of the non-potable water source considering the seasonal runoff of water both from treated effluent return flows and from the storm water system,
- Route evaluation - Identify alternative routes to service all stakeholders that will take part in the venture,
- Water quality – evaluate the historic water quality results from this source and the appropriateness for use as irrigation water for sport fields and parks areas. Check also
the long term impact of using the non-potable water for irrigation of sport fields and on social environment around these irrigation points,

- Legislation – ensure that the use of non-potable water complies to existing legislation,
- Determine the Capital cost and Operating costs of the scheme,
- Determine the Operational Requirements and roles and responsibilities.
2. ASSESSMENT TO USE NON-POTABLE WATER FOR IRRIGATION PURPOSES

2.1 ASSESS THE EXISTING INFRASTRUCTURE

The existing infrastructure was assessed and the following recorded:

**Homevale WWTW to Eddie Williams**

A pump system at the Homevale WWTW delivers water (treated effluent) at a set rate of 75 l/s through a 3,2km 250mm diameter pipeline to a 712 Kl reservoir at Eddie Williams (EW). The Asbestos Cement (A.C.) pipe line is more than 25 years old. The pump system is capable of delivering water at a rate more than 100 l/s but had to be restrained because of the size and structural limitations presented by the old A.C. pipe line. The pump system consist of dual twin pumps each capable/set to delivering 75 l/s regulated by a switch gear programmed to use the pumps alternatively. Meaning while one pump is on duty the other is resting but ready as a stand by. The pumps are frequently alternated to manage the pump hours.

**Current Infrastructure Conditions**

The pump set at Homevale WWTW is currently non-operational. The pumps are sharing a common sump with a pump set delivering water to De Beers. The effluent pumps are experiencing priming problems due to the rate the De Beers pumps are abstracting water from the sump, subsequently leaving inadequate water levels for the effluent pumps to operate. To counter this problem the sump inflow has to be increased or the effluent pumps have to be replaced with newer technology self-priming pumps. Sol Plaatje Municipality is currently forced to irrigate their parks with potable water and is investigating this situation.

**Eddie Williams to Queens Park**

A pump system boosts water from the EW Reservoir through a 3,8km 200mm diameter A.C. pipeline to a 440 Kl reservoir at Queens Park.

**Current Infrastructure Conditions**

The pump station at Eddie Williams has been vandalised and completely destroyed. The municipality made a direct connection between the 250mm and 200mm diameter pipe lines which means the main pumps at Homevale WWTW now by-passes the Eddie Williams reservoir and pump the full 7km route to discharge directly into the 440kl reservoir at Queens Park. A connection has also been made to the 200mm diameter mPVC pipe line to Witdam, Galeshewe.
Eddie Williams to Witdam and Witdam to RC Elliot

A pump system also abstracts water from the EW Reservoir and feeds a 1ML reservoir at Witdam through a 3.0km 200mm diameter mPVC pipe line.

Another pump station abstracts water from Witdam reservoir and feeds an elevated reservoir near the Legislature building through a 5.5km 200mm mPVC pipe line.

Current Infrastructure Conditions

These infrastructure has never been in use since commissioning almost 10 years ago. All pumps will need refurbishment before re-commissioning. No problems are foreseen for the pipe line and electrical equipment.

Queens Park to Oppenheimer Park

A pump set at Queens Park pumps non-potable water through a 200mm diameter 1,17km pipeline to the Civic Centre and the Oppenheimer Gardens.

Current Infrastructure Conditions

This A.C. pipe line is also more than 25 years old.

2.2 POTENTIAL BENEFICIARIES AND STAKEHOLDERS

The proposed irrigation area has been divided into Phase A and Phase B beneficiaries.

Phase A Beneficiaries (See schematic layout 107NC14. 04 – Annexure C):

a) The new university including
   i. Oppenheimer memorial park on the north campus,
   ii. Sport fields on the central campus, and
   iii. Sport fields on the South Campus (existing Hoffe park)

b) Northern Cape High School

c) Kimberley Boys High School

d) Kimberley Junior Primary School

e) Diamond Field High School

f) CBC School

g) Vooruitsig Primary School

h) GWK rugby club near Hoffe park

i) AR ABASS Sport Facility

j) Kimberley Bowling Club
k) Neutral Sportground

l) Sol Plaatje Municipality recreational areas
   i. Square Hill Park gardens,
   ii. Queens Park gardens
   iii. Trim Park gardens

Phase B Beneficiaries (See schematic layout 107NC14_05 – Annexure C):

a) Galeshewe Stadium
b) Yorkshire Cricket Facility
c) Tshiamo Primary School
d) Thabane Public Secondary School
e) Tlhokomelo Thusong Service Centre
f) Moremogolo College
g) Phastimang Teachers College
h) Emang Mmogo Comprehensive
i) Sol Plaatje Higher Primary School
j) Peme Primary School
k) Greenpoint School
l) Boichoko H.P. School
m) Reneilwe School
n) Sol Plaatje Municipality Recreational Areas
   i. Witdam Park gardens,
   ii. Community Park gardens
   iii. Philip Mpiwa Park gardens
   iv. Legislature Building gardens
   v. RC Elliot Park gardens

The beneficiaries were chosen mainly based on their location alongside the existing infrastructure route and around the new Sol Plaatje University’s footprint in the Kimberley CBD.

Most of the **Phase A beneficiaries** have been consulted and are interested to become part of the scheme if the infrastructure is extended to the Sol Plaatje University’s planned footprint which currently includes the area from the existing Oppenheimer gardens near the Sol Plaatje Municipal chambers to Hoffe Park south of the Kimberley CBD. The mentioned schools are currently experiencing high irrigation costs to maintain their sport facilities and can benefit from a scheme which may be able to distribute water for a discounted rate. The other Phase A
beneficiaries includes existing sport facilities and municipal recreational areas alongside the existing pipe route.

**Phase B beneficiaries** are situated in Galeshewe alongside existing infrastructure constructed between 2003 and 2006 as part of the Galeshewe Urban Renewal Project for the very same purpose to distribute cheaper water for irrigation. These beneficiaries includes schools, municipal parks, community sport facilities and the Legislature Building. This infrastructure have not been efficiently utilised since commissioning but the Sol Plaatje Municipality feel strongly that it should be included in the larger irrigation scheme.

**Other important stakeholders** that need to be consulted and that will/can also play a role in this venture include:

a) The Sol Plaatje Municipality as the Water Services Authority and manager of the non-potable water system,
b) De Beers as a potential user and contributor to the future yield of the non-potable water,
c) DWA as custodian and regulator of water use,
d) Potential funders such as the Sol Plaatje University,
e) Others?

A concerted effort will be undertaken to approach these stakeholders and users to partake in the sharing of the non-potable water supply. A water services/supply agreement will have to document all roles and responsibilities of the different role players concerning the supply and use of non-potable water.

### 2.3 WATER REQUIREMENTS/ IRRIGATION DEMAND

The water requirements for the applicable public open spaces were derived from the SAPWAT computer program, which can be described as the ‘ideal’ situation, where water is supplied to meet the theoretical crop water demand.

For the purpose of the report the turf specie assumed on all the open spaces is Kikuyu. Kikuyu is a common lawn and pasture grass grown throughout South Africa in gardens and on cattle farms and sport fields. It is bright green with creeping rhizomes and leafy runners, which root from the nodes and form a dense mat of grass.

Factors employed to determine the irrigation requirement:

- Plant water requirement or evapotranspiration based on weather conditions.
- Functional objective and quality standard of the turf.
- Irrigation system application efficiency.
- Soil type and water holding capacity.
- Plant root zone depth.

The irrigation requirement for the area of 73.50 ha for a given period was based on climatic, agronomic, turf quality and system performance factors. The outcome is monthly water consumption targets, based on long term average climatic conditions, in mm depth of water as highlighted in the figure below.

![Crop Irrigation Requirements](Figure 1. **SAPWAT Irrigation Requirement Calculation**)

Irrigation systems do not apply water at 100% efficiency. The optimum performing irrigation system is subject to inherent system inefficiencies. Factors such as wind, misting, poor sprinkler spacing, nozzle loss and other system performance faults impact on the uniformity of water application. Therefore a factor must be applied to account for irrigation system performance. The water balance assumed a distribution uniformity of greater than 85% (in-field) which effectively means poorly functioning systems must be upgraded and or replaced.
Rainfall was not taken into account since it can be variable and is not always effective. Small rain events are lost by evaporation and do not soak into the soil, whereas large events may deliver more water than the soil can hold and can be lost either through drainage or run off.

In order to determine how much water the bulk water supply system from Homevale has to supply to sustain the area to the accepted standard, the peak month requirement of 255 mm (or 8.2 mm per day) for December was used. The system peak flow was calculated at 98 ℓ/s with the parameters as indicated in the table below.

Table 1. System Flow

<table>
<thead>
<tr>
<th>Description</th>
<th>Units</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Irrigation requirement (peak demand)</td>
<td>mm/d</td>
<td>8.20</td>
</tr>
<tr>
<td>Soil Water Holding Capacity</td>
<td>mm/m</td>
<td>100.00</td>
</tr>
<tr>
<td>Effective Plant Root Zone Depth</td>
<td>mm</td>
<td>300.00</td>
</tr>
<tr>
<td>Readily Available Water</td>
<td>mm</td>
<td>15.00</td>
</tr>
<tr>
<td>System efficiency</td>
<td>%</td>
<td>85.00</td>
</tr>
<tr>
<td>Bulk pump duration</td>
<td>hours</td>
<td>20.00</td>
</tr>
<tr>
<td>System flow</td>
<td>L/s</td>
<td>98.21</td>
</tr>
</tbody>
</table>

Note that passive irrigated areas require a lower standard and have lower risk ratings than active sports grounds. The standard to which turf is maintained has significant impact on water usage. Turf must be maintained at a level that ensures safety for users and meets the functional objective. A passive irrigated area can be maintained using up to 50% less water than an active sports ground. For the purpose of the report all areas was assumed to be active sports grounds.

An irrigation schedule of 16mm of application every second day was proposed for all beneficiaries. The scheme must therefore be divided into two parts of 37 hectare each receiving 16mm irrigation every second day which means 5.92Ml/day during the peak month for the entire scheme.

A daily and monthly irrigation limit was determined for each beneficiaries based on the abovementioned criteria. Please see Annexure A and Annexure B (beneficiaries’ profiles) for the demand calculations and individual allocations per beneficiary.
2.4 WATER AVAILABILITY (YIELD) AND QUALITY

2.4.1 Water Availability

According to Sol Plaatje Municipality the incoming flow to Homevale suddenly dropped from 37ML/day to approximately 22.5 ML/day since November 2011. Metering data has been monitored from January 2014 to date and is evident that the average daily inflow to Homevale is currently in the order of 22.5 ML/day. The estimated average effluent yield from the Homevale Waste Water Treatment Works is therefore 22.5 ML/day of which 11 ML/day is allocated to De Beers Consolidated Mines (DBCM) and the Kimberley Golf Course by means of existing MoA’s signed between the parties and the Sol Plaatje Municipality.

In a study done in 2006 it was determined that Kamfersdam needs an average inflow of 11 ML/day to counter evaporation and seepage in order to sustain suitable water levels. No effluent is discharge to Kamfersdam since October 2013 as the suitable operating level of the pan is exceeded by 2 meters.

Surplus water can be discharged into the Kamfersdam, transferred to Langleg 55 pan/dam and/or distributed for irrigation of existing parks. The current water (effluent) balance is therefore as per table 2.

Table 2. Water Balance

<table>
<thead>
<tr>
<th>MONTH</th>
<th>HOMVEALE AVERAGE EFFLUENT FLOW [m³/d]</th>
<th>ALLOCATION TO DE BEERS &amp; GOLF COURSE [m³/d]</th>
<th>WATER AVAILABLE FOR IRRIGATION AFTER 11 ML [m³/d]</th>
<th>IRRIGATION REQUIREMENTS FOR 74 ha GRASS [mm/md]</th>
<th>SURPLUS AVAILABLE FOR KAMFERSDAM [m³/d]</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>79</td>
<td>2,6</td>
</tr>
<tr>
<td>July</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>81</td>
<td>2,6</td>
</tr>
<tr>
<td>August</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>114</td>
<td>3,7</td>
</tr>
<tr>
<td>September</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>174</td>
<td>5,8</td>
</tr>
<tr>
<td>October</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>204</td>
<td>6,6</td>
</tr>
<tr>
<td>November</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>230</td>
<td>7,7</td>
</tr>
<tr>
<td>December</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>255</td>
<td>8,2</td>
</tr>
<tr>
<td>January</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>250</td>
<td>8,1</td>
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<tr>
<td>February</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>202</td>
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<tr>
<td>March</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>182</td>
<td>5,9</td>
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<tr>
<td>April</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>136</td>
<td>4,5</td>
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<tr>
<td>May</td>
<td>22500,0</td>
<td>11000,0</td>
<td>11500,0</td>
<td>117</td>
<td>3,8</td>
</tr>
</tbody>
</table>
The figure below graphically illustrates the water balance of the Homevale WWTW

![Homevale WWTW - Water Balance](image)

As indicated the water discharge into the Kamfersdam is dependent on the irrigation requirement and is below 7 Mℓ/day in the summer months and approximately 12 Mℓ/day in the winter. The average flow into the Kamfersdam or Langleg pan can be 9.3 Mℓ/day.

### 2.4.2 WATER QUALITY

Irrigation water quality affects the growth potential of crops, soil properties, the biological balance of soils as well as the irrigation equipment. In this case it can also affect the health of the end users (humans) using the sport and recreational facilities.

The water quality report was obtained from Homevale Wastewater Treatment Works. The results were compared to the Department of Water Affairs’ guidelines for irrigation water quality (Volume 4). The results are indicated in the table below.

A water classification could not be conducted due the absence of test results for sodium (Na), calcium (Ca) and magnesium (Mg). The concentration of these elements is used to calculate the sodium absorption ratio (SAR) of the water which together with the electrical conductivity is an indication of propensity of salinization.

From the available results, the water quality is suitable for irrigation of sport fields and parks.
Table 3. Water quality

<table>
<thead>
<tr>
<th>Water Quality Parameters</th>
<th>Possible Risk</th>
<th>Units</th>
<th>Homevale WTW Average</th>
<th>Acceptability Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH at 25°C</td>
<td>Absorption of N (5% loss at pH of 8)</td>
<td>pH units</td>
<td>7.5</td>
<td>Good: 7</td>
</tr>
<tr>
<td>Electrical conductivity at 25°C</td>
<td>Salinization hazard</td>
<td>mS/m</td>
<td>100</td>
<td>0 - 40</td>
</tr>
<tr>
<td>SAR</td>
<td>Salinization hazard</td>
<td>mmol/L</td>
<td>Not available</td>
<td>0 - 1.5</td>
</tr>
<tr>
<td>Chloride Cl</td>
<td>Toxic</td>
<td>mg/L</td>
<td>0.5</td>
<td>0 - 105</td>
</tr>
<tr>
<td>Nitrate N</td>
<td>Toxic</td>
<td>mg/L</td>
<td>1.5</td>
<td>0 - 3</td>
</tr>
<tr>
<td>Fluoride F</td>
<td>Trace Elements</td>
<td>mg/L</td>
<td>Not available</td>
<td>0 - 2.0</td>
</tr>
<tr>
<td>Aluminium Al</td>
<td>Trace Elements</td>
<td>mg/L</td>
<td>Not available</td>
<td>0 - 5.0</td>
</tr>
<tr>
<td>Iron Fe</td>
<td>Trace Elements</td>
<td>mg/L</td>
<td>Not available</td>
<td>0 - 5.0</td>
</tr>
</tbody>
</table>

Government Gazette Vol 579 No.36820 dated 06 September 2013, The General Authorisation (GA), Section 21(e) in terms of Section 39 of the National Water Act 36 of 1998, refers to irrigation of land with Waste or Water Containing Waste, See Annexure D for the relevant abstract from the Gazette. The Authorisation is summarised as follows:

1. The authorisation gives options for irrigating 2000kl/d or 500kl/d or 50kl/d on any given day.
2. For irrigation more than 2000 kl on any given day, an application for a water use licence, instead of registration under the GA requirements, need to be submitted to DWA.
3. Generally, the more water use for irrigation, the better the water quality will have to be.
4. Based on the analyses, the water quality will not constantly meet with the requirements for irrigating 2000kl, because of the ammonia and E.coli values.
5. A better option will be to comply with the irrigation requirements for **500kl/day**. But in this case, test for **Ca, Mg and Na**, need to be conducted in order to determine the Sodium Adsorption Ratio (SAR).

6. The total scheme exceeds the **2 000 kl/day** by far as it will be **5 920 Kl/day** during the peak month and **1 940Kl/day** during nadir the month. The General Authorisation will therefore had to be for individual beneficiaries. Most of the beneficiaries falls with the **500kl/day** threshold except Sol Plaatje Municipality and Sol Plaatje University.

7. A test for **Faecal Coliform**, not E.coli, as Faecal coliform gives the same or higher counts, and is a requirement in the Authorisation need to be conducted.

8. The authorisation lays out the Registration Process, Location of Irrigation with Wastewater, Record-keeping Requirements, and Precautionary Practices.

Upon submission of your proposed water use to the DWA, they might request the provision of additional information not contained in the Authorisation. An issue that the DWA might have is that of public health. As part of the management techniques, you will have to ensure that the public will not be exposed to mist, and that the effluent will at all times comply with a Faecal Coliform count of Nil count/100ml.

### 2.5 ROUTE EVALUATION

A new pipe route has been planned based on the location of prospective beneficiaries. Pipe line routing, sizing and strategic positioning of reservoir and elevated towers has been done to cater for the irrigation demand and calculated system flow as indicated under section 2.3.

The pump station at Homevale WWTW to be upgraded with variable speed self-priming twin pumps which can deliver a range of 75 l/s to 105 l/s. The existing 250mm A.C. pipe line will still be the link between Homevale WWTW and Eddie Williams Reservoir. It is further recommended that planning must start for the replacement of this pipe line as it is already older than 25 years and are restricting the entire scheme to 75 l/s (6.48ML/day base on a 24 hour pump day).

A new pump station to be introduced at Eddie Williams and the existing 712 KL reservoir refurbished and re-commissioned. The pump station to include two pump sets dividing the distribution between Galeshewe and Kimberley CBD. A twin pump set will therefore transfer water through the existing 200mm pipeline to Witdam at a rate of at least 68.5 l/s (5.92ML/day). Another twin pump set will transfer water through the existing A.C. 200mm pipeline. These pumps must also operate 24 hours a day to ensure at least 5.92ML/day at Queens Park.
It is also recommended that planning must start for the replacement of this pipe line as it is already older than 25 years.

Queens Park will become the new control centre for the Phase A development which will includes the new Sol Plaatje University sport grounds/parks, surrounding schools and sport facilities. A 600 KL reservoir will be added to the existing 440 kl tank to establish at least 1ML of storage capacity at the central station to counter the limitations caused by the 250mm and 200mm A.C. pipe lines from Homevale to Queens Park. A new 4.3km 315mm diameter pipe line to be constructed to distribute non potable water to all sport grounds and parks of the Sol Plaatje university, all other prospective beneficiaries as listed in sections 2.2 and existing recreational facilities of the Sol Plaatje Municipality and other sporting bodies. The pump station at Queens Park to be upgraded to transfer non potable water through the 4.3km pipe line at a flow rate of at least 98 l/s. A 20m high 500 KL elevated tower to be constructed at the highest point of the pipe line (Hoffe Park). The elevated tower will ensure pressures of between 2 and 3.8 bar (ignoring friction and minor losses) alongside the 4.3km pipe route at all times even if the pumps at Queens Park are in rest mode.

A telemetric system to be introduce to control the functioning of the entire irrigation scheme by means of radio signals communication.

The scope of Works can therefore be summarised as follows:

- Upgrade and refurbishment the Homevale WWTW pump Station
- New Pump Station and refurbishment of the 712 KL reservoir at Eddie Williams
- Upgrading of Queens Park pump Station
- New 600 KL reservoir at Queens Park
- New 500 KL elevated reservoir (with 20m stand) near Hoffe Park
- New 4.3km 315mm diameter class 9 uPVC pipe line from Queens Park to Northern Cape High School via Sol Plaatje University sport grounds at Hoffe Park. See image 107NC14_003.
- Interconnecting pipe work, minor refurbishment of existing mechanical equipment and general site works
- Telemetric Communication
2.6 LEGISLATION

2.6.1 National Environmental Manage Act 56 of 2002

A basic assessment is required under the following conditions:

- The construction of facilities or infrastructure exceeding 1000 m in length for the bulk transportation of water, sewage or storm water –
  
  (i) With an internal diameter of 0.36 m or more; or
  
  (ii) With a peak throughput of 120 litres per second or more,

Excluding where:

  (a) Such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or

  (b) Where such construction occurs within urban areas but further than 32 m from a watercourse, measured from the edge of the watercourse.

- Construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 m3 or more, unless such storage falls within the ambit of Activity 19 of Notice 545 of 2010.

A full environmental impact assessment (EIA) is required for the physical alteration of virgin soil to agriculture, afforestation for the purposes of commercial tree, timber or wood production of 100 hectares or more.

It is therefore evident that non of the proposed activities in this report necessitates a basic assessment nor a full EIA.

2.6.2 Legislation Regarding the use of Purified Effluent for Irrigation Purposes

The only reference that could be found regarding the use of treated effluent on public open spaces and sport ground were the Guide: Permissible Utilisation and Disposal of Treated Sewage Effluent - 30 May 1978.
According to the Guideline the Homevale WWTW is STD calcification - Primary, Secondary and Tertiary Treatment which entail that the final effluent complies with the General Standard with the E.coli count relaxed to a maximum of 1000 E. coli /100 ml.

Irrigation is permissible for Sports fields where contact is often made with the surface, i.e. Rugby fields, athletics tracks, etc School grounds and public parks are included with the exclusion of lawns at swimming pools, nursery schools and children’s playgrounds. However, such activities have to be registered in order to comply with the General Authorisation (GA), Section 21(e) in terms of Section 39 of the National Water Act 36 of 1998 as regulated by DWA and as describe in section 2.4.2 of this document.
3. COST ANALYSIS

3.1 CAPITAL COSTS

The capital cost breakdown below is as per activities listed under section 2.5 of this document and includes construction costs, professional fees, contingencies, escalation and VAT.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrade and Refurbishment of Homevale WWTW Pump Station and Sump</td>
<td>R 1 250 000.00</td>
</tr>
<tr>
<td>Proposed Pump Station and refurbishment of 712 Reservoir at Eddie Williams</td>
<td>R 2 250 000.00</td>
</tr>
<tr>
<td>Upgrading of Queens Park Pump Station</td>
<td>R 1 250 000.00</td>
</tr>
<tr>
<td>Additional 600 KL Reservoir at Queens Park</td>
<td>R 2 050 000.00</td>
</tr>
<tr>
<td>Proposed 400 KL elevated Reservoir (with 20m stand) at Hoffe Park</td>
<td>R 2 750 000.00</td>
</tr>
<tr>
<td>Proposed 4.3km, 315mm diameter uPVC distribution main (pump line)</td>
<td>R 8 600 000.00</td>
</tr>
<tr>
<td>Telemetric Communication</td>
<td>R 600 000.00</td>
</tr>
<tr>
<td>Interconnecting Pipe Work, minor refurbishment to existing mechanical equipment and general site works</td>
<td>R 750 000.00</td>
</tr>
<tr>
<td><strong>Sub Total 1</strong></td>
<td><strong>R 19 500 000.00</strong></td>
</tr>
<tr>
<td>Contingencies/Escalation (10%)</td>
<td>R 1 950 000.00</td>
</tr>
<tr>
<td><strong>Sub Total 2</strong></td>
<td><strong>R 21 450 000.00</strong></td>
</tr>
<tr>
<td>Professional Fees</td>
<td><strong>R 3 003 000.00</strong></td>
</tr>
<tr>
<td><strong>Sub Total 3</strong></td>
<td><strong>R 24 453 000.00</strong></td>
</tr>
<tr>
<td>VAT (14%)</td>
<td>R 3 423 420.00</td>
</tr>
<tr>
<td><strong>Total Estimated Project Costs</strong></td>
<td><strong>R 27 876 420.00</strong></td>
</tr>
</tbody>
</table>
3.2 OPERATING COSTS

The operation and maintenance cost associated with the proposed infrastructure listed above can be determined as follows:

<table>
<thead>
<tr>
<th>OPERATION RELATED COSTS</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational Cost per year (1 484 704KL/annum)</strong></td>
<td></td>
</tr>
<tr>
<td>Effluent Costs (R 0.00)/KL of 1 484 704 KL / annum</td>
<td>R 0.00</td>
</tr>
<tr>
<td>Treatment cost</td>
<td>R 742 352.00</td>
</tr>
<tr>
<td>Labour (use existing operators)</td>
<td>R 350,000.00</td>
</tr>
<tr>
<td><strong>SUB TOTAL 1</strong></td>
<td>R 1 092 352.00</td>
</tr>
<tr>
<td><strong>Maintenance Cost per year (1 484 704KL/annum)</strong></td>
<td></td>
</tr>
<tr>
<td>Mechanical/Electrical</td>
<td>R 250 000.00</td>
</tr>
<tr>
<td>Civil/Buildings</td>
<td>R 130 000.00</td>
</tr>
<tr>
<td>Pipelines</td>
<td>R 43 000.00</td>
</tr>
<tr>
<td><strong>SUB TOTAL 2</strong></td>
<td>R 423 000.00</td>
</tr>
<tr>
<td><strong>O&amp;M COST PER ANNUM</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>R 1 515 352.00</td>
</tr>
</tbody>
</table>

Average annual water supply 1 484 704 KL/annum

**O&M Cost per kilo litre**  R 1-02/KL

Notes:

1. **Annual maintenance cost used (DWA Guidelines)**
   - Mechanical / Electrical Installations – 4 % of capital cost p.a
   - Civil / Building installations – 2 % of capital cost p.a
   - Pipelines – 0.5 % of capital cost p.a

2. **Annual operating cost based on the following (DWA Guidelines)**
   - Treatment cost of R0-50/KL (chemicals and electrical)
4. OPERATIONAL REQUIREMENTS

Sol Plaatje Municipality is currently operating and maintaining the existing distribution of purified effluent system. It is therefore recommended that the proposed expansion must also be assigned to Sol Plaatje Municipality. The assets should then be registered to Sol Plaatje Municipality, irrespective of whom the funder or funders will be, to enable the municipality to operate and maintain the scheme.

Operation and maintenance costs can be covered by a tariff structure that can be agreed upon for the distribution of the non-potable water, per kilolitre, to the applicable beneficiaries.
ANNEXURE A

BENEFICIARIES PROFILE -

PHASE A BENEFICIARIES
ANNEXURE B

BENEFICIARIES PROFILE -

PHASE B BENEFICIARIES
ANNEXURE C

Schematic Layout Drawings

1. 107NC14_001 – Proposed Irrigation Network
2. 107NC14_002 – Existing Pipeline
3. 107NC14_003 – New Pipeline
4. 107NC14_004 – Phase A
5. 107NC14_005 – Phase B
ANNEXURE D

WATER QUALITY REPORT

1. Water Quality Test Results
2. Government Gazette No.36820