SECTION 2: STATUS QUO

2.1. STUDY AREA

As depicted on Figure 2.1, the Study Area is located within the northern reaches of Johannesburg and stretches from Parktown is the south to Sunninghill in the north. The Study Area is aligned along Victoria, Oxford and Rivonia Roads, which pass through nodal areas that includes Sunninghill, Rivonia, Morningside, Illovo, Saxonwold, Killarney and Parktown. Sandton and Rosebank are excluded form the Study Area as they form par of the Urban Development Frameworks (UDFs) prepared for these areas. Apart from these nodes, the Study Area is a predominantly residential area. The N1 freeway traverses the northern reaches of the Study Area, whereas the M1 passes through the southern reaches of the Study Area.

2.2. TRANSPORTATION

2.2.1. MOVEMENT PATTERN

Movement is closely related the road hierarchy, because the order of a road in the road hierarchy determines its desing, which is turn determines the destinations to serves and the traffic volumes it can carry. In Gauteng, the road hierarchy functions on 4 levels (see Diagram below). The first level contains freeways, consisting of national freeways and provincial PWV roads. These roads provide regional access, connecting an area to neighbouring cities and towns. The second level comprises distributor roads or K-routes, which aim to provide better intra-urban access between suburbs and activity areas. The third level comprises collector roads. These roads connect residential areas to the mentioned distributor road network. On the fourth level, internal streets provide direct access the land uses and link these land uses to the mentioned collector roads.

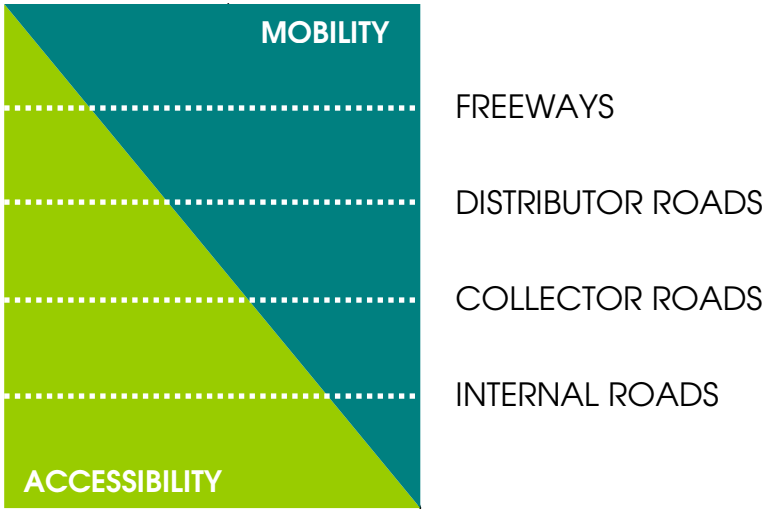

DIAGRAM 13: MOBILITY-ACCESSIBILITY RATIO

In essence, freeways and distributor roads are highly mobile and therefore aim to connect people over large distances to activity areas and neighbouring settlements. Collector roads and internal streets provide good accessibility and therefore aim to connect people and land uses to the more mobile roads. Road-based public transportation systems (taxis and busses) mostly use distributor roads and collector roads, as these provide an efficient balance between mobility and land use accessibility.

Based on the road hierarchy set out above, movement within the Study Area takes place on two levels and between two types of destinations (see Diagram below). The first level involves regional movement between the cities of Johannesburg and Tshwane. This movement takes place along the N1 and M1 freeways and involves fast-moving traffic destined for areas such as the Johannesburg CBD. In other words, the freeway network surrounding the Study Area is aimed at transporting people and goods between Johannesburg and Tshwane.

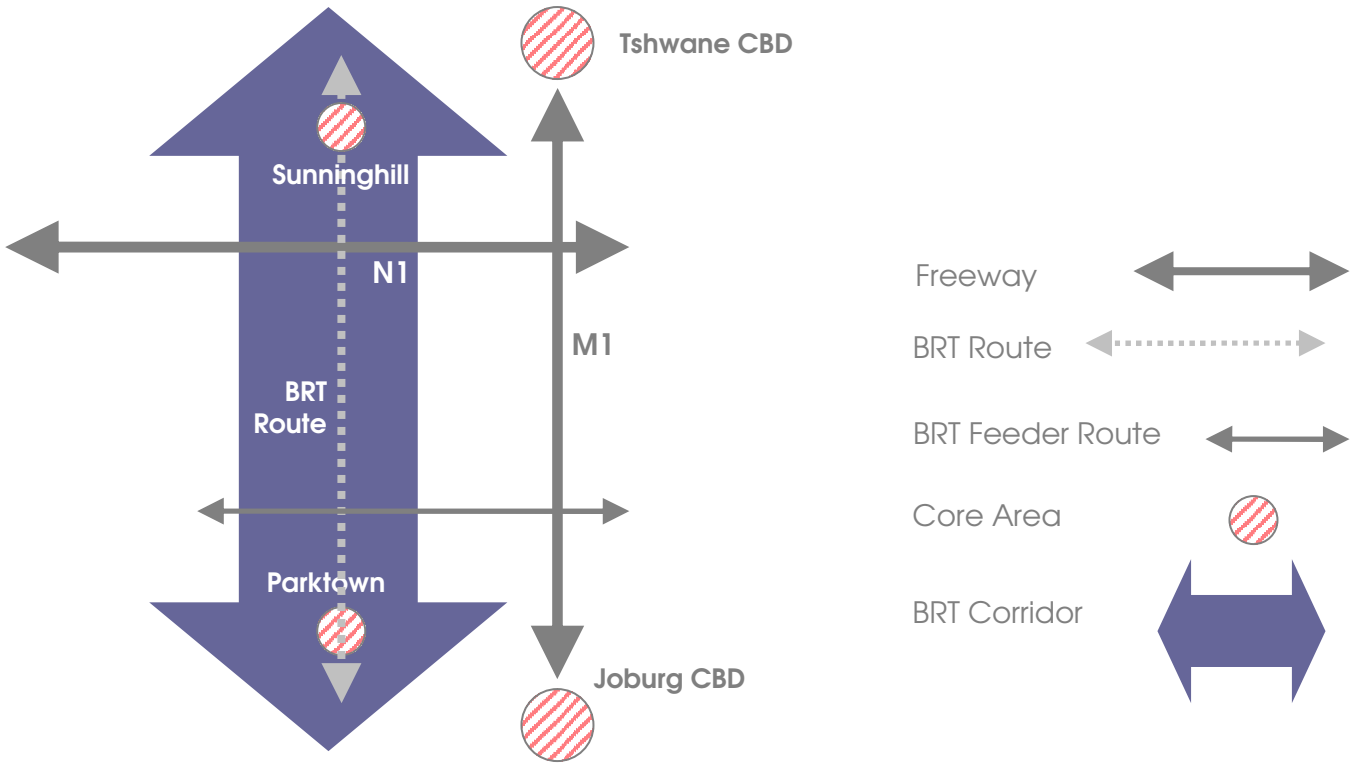

DIAGRAM 12: MOVEMENT PATTERN

The second level involves local movement within the Johannesburg metropolitan area (specifically the Study Area), between nodal areas such as Sunninghill, Rivonia, Sandton, Rosebank and Parktown. These nodes contain concentration of employment and shopping opportunities and are therefore primary destinations for intra-urban traffic. Traffic on this level is largely located on the distributor and collector road network. As was mentioned, these roads are also best suited for use by public transportation systems. The planned Parktown-Sunninghill BRT system uses this road network, comprising Rivonia, Oxford and Victoria Roads.

2.2.2. HIERARCHY OF PUBLIC TRANSIT

As with the road hierarchy, public transportation also function on different levels (see Diagram below). Up to date, public transportation in Gauteng consisted of 3-tier public transportation system. Mini-bus taxis are at the lowest level of the public transportation network, followed the metro busses (including cross-provincial border bus operators) and metro-rail, at the highest level of the public transportation network. A 5-tier public transportation system is in the process of being developed in Gauteng, adding 2 additional public transportation systems to the hierarchy. This first is the Gautrain, a provincial initiative that which will consist of a high speed intercity rail link and the other is the Bus Rapid Transit (BRT) system, a City of Johannesburg initiative that involves a fixed-route bus system operating within Johannesburg.

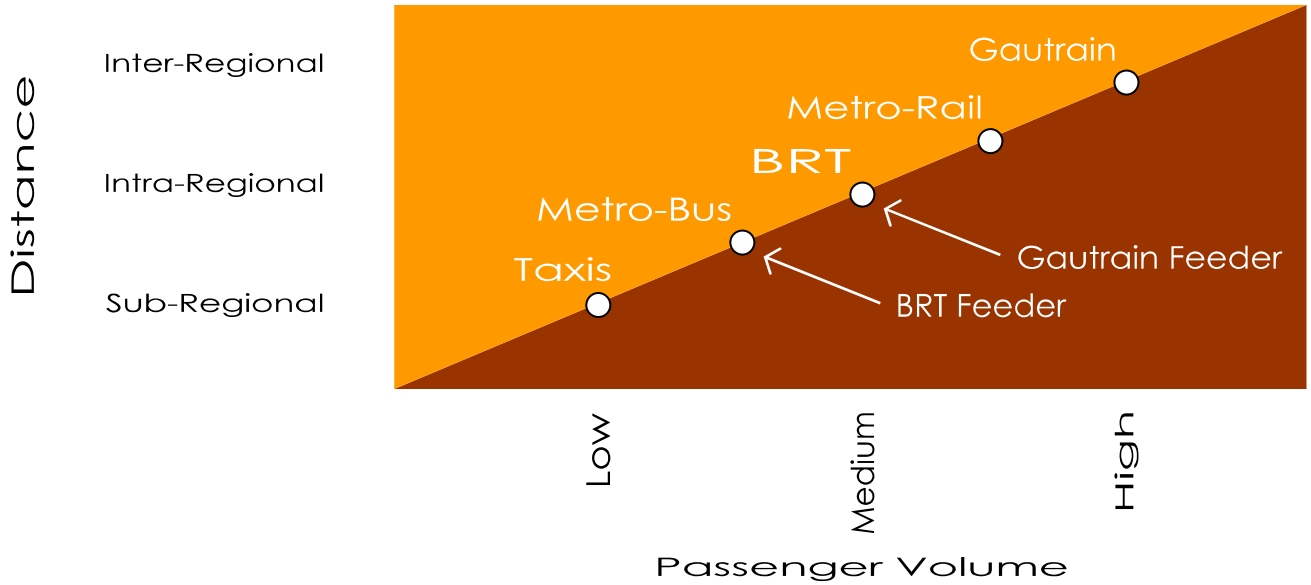

DIAGRAM: PUBLIC TRANSPORTATION HIERARCHY

The level on which each public transportation system within the public transportation hierarchy functions is determined by the type of transportation system that is used, the destination that is accesses, the passenger volumes it can carry and the flexibility of the system. The relationships between these elements are as follows:

- A direct relationship exists between the passenger volumes a public transportation system can carry and the distance that the public transportation system operates. The longer the distance over which a system operates the more passengers it needs to carry to make the operation of the system viable.
- An inverted relation exists between the passenger volumes that a public transportation system can carry and the flexibility of a system. As a rule of thumb, the less passenger that a public transportation system carries, the greater its flexibility in choosing the destinations that it can access. This is one of the reasons why the mini-bus taxi system is so successful linking commuter to the destinations of their choice. The BRT system operates in a fixed line (as opposed to the metro-bus system which has greater flexibility) serving fixed destinations along its route.

The intention of the public transportation network set out above is not that the functions of the various public transportation systems overlap, but that each system occupies a niche within the network fulfilling a specific function which the other systems in the network cannot fulfill. For example, the relatively low passenger volumes and low speeds of the BRT system make it unsuitable for intercity travel, as opposed to the Gautrain. In turn, for the Gautrain to maintain the speeds that it does, requires that it does not have as many stations as would a BRT system. The Gautrain will fulfill its function well because it will fulfill the need to transport commuter between Johannesburg and Tshwane in the shorted possible time (thus highest possible speed). What will make the BRT suitable as an intra-city public transportation system; will be its ability to access many nodal areas with Johannesburg providing a high level of accessibility.

Having a public transportation network that contains transit systems operating on different levels and having different functions, provides the bases for inter-modal connectivity and interchange. What this means is that the various transportation modes of a public transportation system need to be linked in order to provide the commuter with modal choice. Practically, a commuter living in Rivonia must be able the access a BRT system within walking distance of the commuter (the BRT system provides good accessibility) and use the system to connect to the Gautrain Sandton Station in order to travel to Tshwane (the Gautrain system provides fast long distance access). It is therefore imperative that a system such as the BRT is seen as a feeder system to the other public transportation systems higher up in the public transportation hierarchy, such as the Gautrain. This enables, for example, the Gautrain to limit its number of stations and therefore maintain it high-speed servide between Johannesburg and Tshwane. Key to the integration of public transportation systems and allowing lower-order systems to function as feeder systems to higher-order systems are the transit termini or stations. This requires, for example, a BRT station to be located within walking distance of a Gautrain station. Ideally these stations should be one station, catering for both modes of transport.

2.2.3. PUBLIC TRANSPORTATION USAGE

Census 2001 provides an indication of the modes of travel that commuters use to access places of employment, shopping and entertainment. It is clear from this Diagram that the Study Area is a private vehicle dominated area, with a low utilization of public transportation. Modes of public transportation that are used are mini-bus taxis and to a lesser extent busses. A relatively large number of people access employment, shopping and entertainment opportunities within the Study Area by foot. These pedestrians are potential user of the planned BRT system within the Study Area.

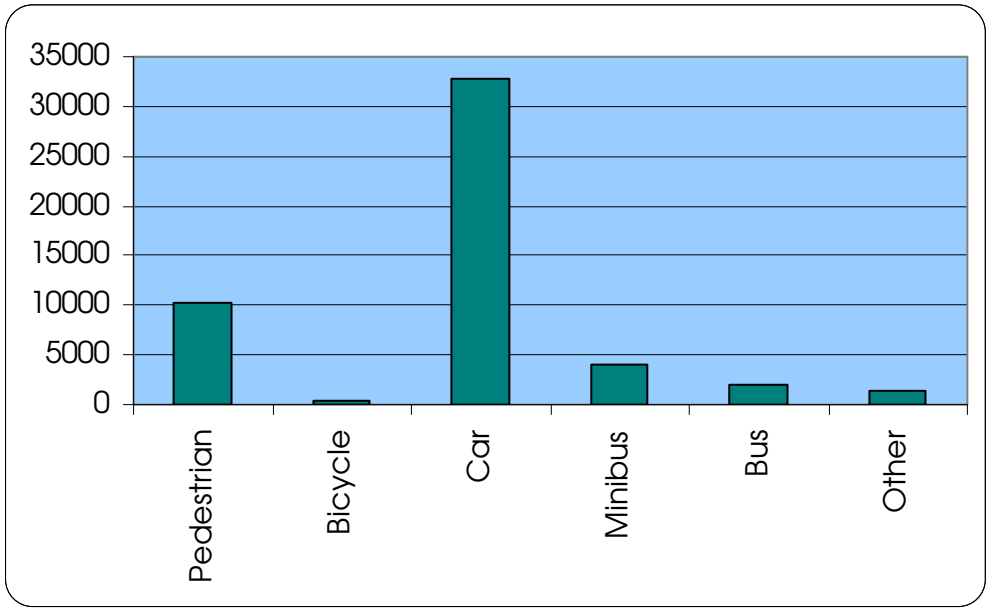

DIAGRAM 14: MODE OF TRANSPORT
Source: Census 2001

The industry, in which the Study Area population works, as surveyed by Census 2001, provides an indication of place of employment. In other words, it provides some indication of where people work and therefore where people travel to. As depicted on the diagram below, most people within the Study Area work in the retail, financial and services sector. This implies that most people within the Study Area work in business areas such as Rivonia, Sandton and Illovo. It can therefore be expected that most people travel between these business areas and the residential areas within the Study Area. The only other significant industry employment Study Area residents are the manufacturing and transportation industry. This suggests that the Study Area population also travels to places such as Midrand, Marlboro and the city centre industrial surroundings to access their place of employment.

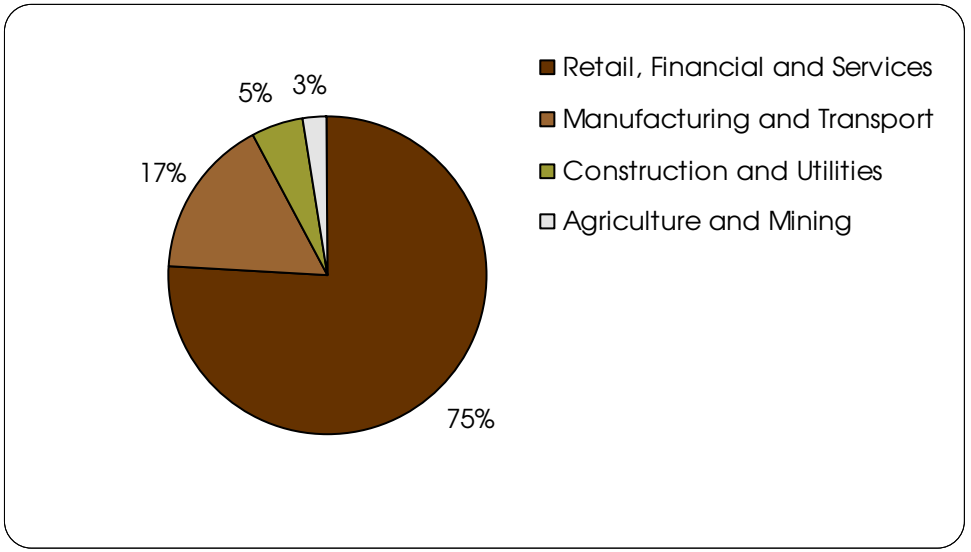

DIAGRAM 15: INDUSTRY OF EMPLOYMENT
Source: Census 2001

2.2.4. OVERVIEW OF BRT SYSTEM AND NETWORK

Ingérop South Africa (Pty) Ltd was appointed as a sub-consultant to Maluleke Luthuli & Associates providing specialised transportation planning/traffic engineering inputs. Accordingly, this section contains a discussion of the following:

- Defining the key characteristics of BRT, including how BRT fits into the overall vision for transportation and how BRT can promote mobility;
- Providing information on the station locations and feeder routes for the study area.
- Providing information on estimated passenger volumes per BRT station in the study area; and

2.2.4.1. DEFINITION OF BRT

BRT is a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective urban mobility through the provision of segregated right-of-way infrastructure, rapid and frequent operations, and excellence in marketing and customer service (Wright and Hook, 2006). BRT is simply the idea of creating a modern rail-like performance using road-based public transport technologies that are affordable to most cities.

2.2.4.2. MAJOR ELEMENTS OF BRT

The major elements of BRT are (Office of Research, Demonstration and Innovation, 2004):

- Running ways: BRT systems can operate on a variety of running way types that range from mixed-flow arterials and freeways, dedicated arterial and shoulders lanes, exclusive at-grade busways, to fully grade-separated transitways above or below the surface.
- Stations: Aesthetically designed stations enhance the permanence and attractiveness of the system and station areas with passenger amenities such as shelters, benches, lighting, ticket vending machines, security features and next vehicle arrival information.

- Vehicles: Stylized and specialized buses provide comfort, modern design, accessibility, maintainability, good passenger circulation and environmentally friendly propulsion.
- Intelligent Transportation Systems (ITS): Applications such as transit signal priority (TSP), advanced communication systems, automated scheduling and dispatch and real-time traveller information at stations and on vehicles allow faster and more convenient trips.
- Fare collection: Electronic fare cards, off-board fare collection or proof-of-payment options allow for shorter dwell times and shorter overall travel times.
- Service and operations plan: BRT systems generally include rapid transit features like more frequent service than local bus service, all-day service spans and greater spacing between stations. The flexibility and lower-cost of BRT allow it to provide greater network coverage.
- Branding and marketing: Distinctive logos, colors, styling and technologies for vehicles and facilities help develop a system identity. BRT services can be marketed as a new tier of service or as part of a multi-modal rapid transit network.

The selection and integration of these elements and their implementation over the length of the alignment, and over time, is also an important consideration in BRT planning. As with any truly integrated system of elements, the whole is greater than the sum of the parts.

2.2.4.3. SYSTEM PERFORMANCE

Among the most important measures of performance for a BRT system are (Office of Research, Demonstration and Innovation, 2004):

- Increased capacity: The maximum number of passengers carried by a critical segment of the BRT system in a period of time is a function of the size and design of the vehicles, stations, running way and the level of service. For instance, the maximum number of passengers carried per hour per direction typically ranges from 10,000 on arterials to more than 30,000 on exclusive running ways, which is comparable to the capacities of some rail-based transit systems.
- Decreased travel time: Exclusive busways have been shown to operate at an average of 48 kilometres per hour or more with travel time savings as high as 55 percent compared to regular bus services.
- Increased reliability: The use of exclusive running ways, level boarding, off-board fare collection and automated vehicle location technologies allow for greater service reliability in terms of running time, dwell time and recovery.
- Improved accessibility: The design of vehicles, stations, ITS and fare collection systems can greatly influence the accessibility of a BRT system to the mobility impaired and the general ridership as well.

- Increased safety and security: The combination of modern technologies, facilities and personnel can improve the customer perception of safety and security and reduce the number of incidents.
- Enhanced identity and image: The effective integration of the various elements can foster a quality image and unique identity for the BRT system as measured by public perception.

2.2.4.4. BENEFIT OF BRT

The potential benefits of a BRT system depend on the element and performance, and can be characterized by the following measures (Office of Research, Demonstration and Innovation, 2004):

- Increased ridership: BRT systems have been shown to attract choice ridership and increase total corridor ridership. As much as one-third of BRT riders have been shown to previously use private automobiles. Corridor ridership gains of 20 to 96 percent have also been recorded.
- Improved capital cost-effectiveness: BRT systems can use less costly or existing infrastructure compared to other rapid transit modes. BRT can also reduce fleet requirements with better vehicle utilization.
- Improved operating cost-efficiency: Indicators of operating efficiency such as passengers per revenue hour, subsidy per passenger mile and subsidy per passenger can improve when BRT service is introduced to a corridor.
- Improved environmental quality: By attracting choice riders and using advanced vehicles with cleaner propulsion systems and emissions controls, BRT may improve air quality, noise level and help reduce overall congestion.
- Transit-supportive land development: Investments in BRT infrastructure and related streetscape improvements may result in positive development effects much like other high-quality transit modes.

2.2.4.5. INTRODUCTION TO REA VAYA JOBURG

REA VAYA can be defined more precisely through an analysis of the features offered by the system (see Table below).

TABLE 2.1: FEATURES OF BRT

Category	Feature
Physical infrastructure	Segregated busways or bus-only roadways, predominantly in the median of the roadway Existence of an integrated "network" of routes and corridors Enhanced stations that are convenient, comfortable, secure, and weather-protected Stations provide level access between the platform and vehicle floor Special stations and terminals to facilitate easy physical integration between trunk routes, feeder services, and other mass public transport systems such as SARCC/Metrorail and the future Gautrain Improvements to nearby public space
Operations	Frequent and rapid service between major origins and destinations Ample capacity for passenger demand along corridors Rapid boarding and alighting Pre-board fare collection and fare verification Fare integration between routes, corridors, and feeder services
Business and institutional structure	Entry to system restricted to prescribed operators under a reformed business and administrative structure (i.e. "closed system") Competitively-bid and wholly-transparent processes for awarding all contracts and concessions Efficient management resulting in the elimination or minimisation of public sector subsidies towards system operations Independently operated and managed fare collection system Quality control oversight from an independent entity / agency
Technology	Low-emission vehicle technologies Low-noise vehicle technologies Automatic fare collection and fare verification technology System management through centralised control centre, utilising applications of Intelligent Transportation Systems (ITS) such as automatic vehicle location Signal priority or grade separation at intersections
Marketing and customer service	Distinctive marketing identity for system Excellence in customer service and provision of key customer amenities Ease of access between system and other urban mobility options (such as walking, bicycles, taxis, paratransit, private motorised vehicles, etc.) Special provisions to ease access for physically-disadvantaged groups, such as children, the elderly, and the physically disabled Clear route maps, signage, and/or real-time information displays that are visibly placed within stations and/or vehicles

Source: Rea Vaya Joburg. Scoping Study prepared by ITDP (Institute for Transportation & Development Policy), November 2006.

2.2.5. ROUTES, STATION AND ESTIMATED PASSENGER VOLUMES

The BRT system REA VAYA is based on exclusive trunk corridors with central stations where the trunk buses (articulated buses) allow the boarding and alighting of passengers. The primary source document used to prepare the write-up contained in the subsequent sub-sections is Rea Vaya, Operational Design, Final Report prepared by LOGIT and ITDP (Institute for Transportation & Development Policy) and dated May 2007. Some paragraphs below relevant to the current assignment were extracted directly from the said document.

2.2.5.1. BRT ROUTES AND ESTIMATED PASSENGER VOLUMES

The road geometric design proposed for the REA VAYA system includes overtaking lanes featured at stations. This enables the chance to implement express services and expand the system's transportation capacity. With this characteristic the implemented services vary between two types:

- Local services: stops at every single station along its path.
- Express services: stops only at determined groups of stations defined by origin and destination concentration criteria, missing some stations on their path, increasing operational speeds.

All services were designed based on a maximum frequency on AM peak hour of 40 buses/hour (1.5 minute headway) and a 6 buses/hour minimum frequency (10 minutes headway). Whenever running services have demand levels outside the limits, an operational revision would have to be performed to update the plan and service programming. The operational speed considered for trunk services was set at 22 kilometres per hour for local services and 28 km/h express services.
The results presented below include demand, fleet, cycle time and length for the scenario 2010 (baseline fare) in the peak morning hour.

Figure 2.3 graphically illustrates the proposed trunk routes. They are as follows:

- Sunninghill to Lenasia;
- Jabulani to Alexandra;

- Randburg to Joburg CBD;
- Alexandra to Randburg;
- Regina Mundi to Sunninghill; and
- Dobsonville to Sandton.

The Table below contains an operational summary for the designed trunk services applicable to the study area (i.e. wholly in the study area or traversing the study area), detailing boarding quantities, passenger loads and dispatch frequencies among other information in the morning peak hour.

TABLE 2.2: OPERATIONAL SUMMARY FOR TRUNK SERVICES IN THE MORNING PEAK HOUR

Service	Length (km)	Cycle Time (min)	Dispatch Frequency (vehicles/min)	Boarding Passengers	Maximum Passenger Volume
Sunninghill to Lenasia	99	244	40	17 916	4 465
Jabulani to Alexandra	83	174	40	13 613	3 797
Randburg to Joburg CBD	37	100	13	3 278	1 101
Alexandra to Randburg	27	66	37	4 768	3 279
Regina Mundi to Sunninghill	79	154	30	5 199	2 619
Dobsonville to Sandton	62	131	40	4 407	3 707

Source: Rea Vaya 2007

2.2.5.2. LOCATION OF BRT STATIONS AND TERMINALS

Stations were strategically placed at points where a potential higher passenger movement would take place. The station positioning process also considered the existing bus stands along the designed corridor since they represent an existing landmark for what transportation concerns. Contained in the physical and operational design the stations have been classified depending on its functionality and utility supplied thus having two types of stations. Conventional stations which are used by trunk services allowing passenger boarding and alighting and terminal stations which, aside from supplying the previous functions of passenger flow and feeder system integration, are start/end stations for trunk local and express services, hence

great transfer points for the system. These final stations also allow the transfer between different transportation means such as regional buses, private vehicles, bicycles and many more. Figure 2.4 graphically illustrates the proposed stations and terminals.

With the previous conditions and having in mind that in average people are willing to walk 500meters to attend public transportation, stations were located 700m apart from each other. Special cases in which the placement of a station was not required (absence of attraction/generation places) or simply because of physical requirements, this separation was increased or reduced. For the CBD area, the distances between stations are quite shorter than the average considered since this is the main trip attraction zone. The long-term vision is to develop a system that places over 85 percent of Johannesburg's population within 500 metres of a REA VAYA trunk or feeder corridor.

The system's general operational conditions are not usually compatible and the optimum choice at the end is usually:

- Location on existing terminals that are "natural" transfer points which usually may have some of the conditions above mentioned;
- On some available areas near the corridor main axis; and
- On major points of transit lines concentration.

REA VAYA's first phase corridors relevant to the study area:

- Sunninghill to Sandton; and
- Sandton to Victoria Rd (Parktown).

The Table below contains a summary of terminal and conventional stations defined for the first phase corridors relevant to the Study Area. The station locations are depicted on Figure…..

TABLE 2.3: STATIONS AND TERMINALS

Station Name	Station Code	Planned Feeder Fare Integration
Corridor: Sunninghill to Sandton		
Sunninghill Terminal	NA001	Yes
Un-named station	NA002	
Rivonia Centre	NA003	
Mutual Rd	NA004	Yes

Station Name	Station Code	Planned Feeder Fare Integration
North Rd	NA005	
The Pavilion Shops	NA006	Yes
The Wedge Shops	NA007	
Morningside shops	NA008	
Holiday Inn Morningside	NA009	
City Lodge Hotel	NA0010	
The Courtyard Hotel	NA0011	
Corridor: Sandton to Victoria Rd (Parktown)		
Sandton Interchange (Gautrain)	ND001	Yes
Sandhurst Centre	ND002	
St. Davids	ND003	
Illovo Square	ND004	
Corlett St	ND005	Yes
Pridwin Prep School	ND006	
Rosebank Interchange	ND007	Yes
Rutland St	ND008	
Engleworld	ND009	
Waltham Rd	ND0010	
Victoria Ave	ND0011	

Source: Rea Vaya 2007

2.2.5.3. FEEDER ROUTES

The proposed feeder routes connect to the following terminals:

- Sunninghill Terminal;
- Mutual Road;

- Pavillion Shops;
- Sandton Interchange;
- Corlett Street; and
- Rosebank Interchange.

The Table below contains an operational summary for the feeder routes applicable to the study area, detailing boarding quantities, passenger loads and dispatch frequencies among other information in the morning peak hour.

TABLE 2.4: OPERATIONAL SUMMARY FOR FEEDER ROUTES IN THE MORNING PEAK HOUR

Station Connection	Route Code	Length (km)	Cycle Time (min)	Dispatch Frequency (vehicles/min)	Boarding Passengers	Maximum Passenger Volume
Sunninghill Terminal	F1001	13	30	26	902	805
Sunninghill Terminal	F1003	23	62	13	735	413
Mutual Rd	F1004	10	30	7	360	213
Pavillion Shops	F1005	14	38	10	736	317
Pavillion Shops	F1006	7	19	8	389	227
Sandton Interchange	F1007	12	36	9	453	272
Corlett St	F1018	8	16	10	677	313
Rosebank Interchange	F1019	7	18	27	868	841
Rosebank Interchange	F1020	6	19	23	829	715
Rosebank Interchange	F4001	23	62	24	1 612	756

Source: Rea Vaya 2007

2.3. SOCIO-ECONOMIC

2.3.1. SOCIO-ECONOMIC PROFILE

A socio-economic analysis was conducted from Census 2001 data to determine the socio-economic profile of the Study Area. This data will assist in determining the public transport user profile of the Study Area.

2.3.1.1. POPULATION AND HOUSEHOLDS

The Study Area population was calculated using Census 2001 figures. As depicted by the Table below, the Study Area housed a population of approximately 77000 people by the year 2001. It was estimated that this population had increased to approximately 84000 people by the year 2007. The number of households that lived in the Study Area by 2001 was estimated to be approximately 25000. This figure has increased to an estimated 27000 by 2007.

TABLE 2.5: STUDY AREA POPULATION 2007

Census Place Name	Census Population Estimate (2001)	Census Household Estimate (2001)	Total Population Estimate (2007)	Total Household Estimate (2007)
Airdlin	277	90	305	99
Braamfontein	7011	2284	7712	2512
Bryanston	15341	4997	16874	5496
Dunkeld	696	227	766	249
Edenburg	2786	907	3064	998
Forest Town	1015	331	1116	364
Houghton Estate	6132	1997	6745	2197
Hyde Park	2428	791	2671	870
Illovo	1252	408	1377	449
Inanda	517	168	569	185
Killarney	4686	1526	5154	1679
Melrose	1024	334	1126	367
Melrose Estate	586	191	645	210
Morningside	8839	2879	9722	3167
Morningside Manor	1482	483	1630	531
Parktown	5623	1832	6185	2015
Parkwood	1544	503	1698	553
Paulshof	4494	1464	4943	1610
Riviera	582	190	640	209
Rivonia	1167	380	1284	418
Sandhurst	630	205	693	226
Saxonworld	2024	659	2226	725
Sunninghill	4633	1509	5096	1660
Wierda Valley	386	126	425	138
Woodmead	1436	468	1579	514
Total	76591	24948	84244	27441

Source: Estimated from Census 2001 figures

2.3.1.2. AGE PROFILE

Figure 2.5 and the Diagram below reflect the age distribution of the Study Area. From this Diagram it can be concluded that the Study Area has a predominantly young-adult and middle-age population with most of the residents between 20 and 60 years of age. What is also significant is the low number of children within the Study Area, compared to adults within the Study Area.

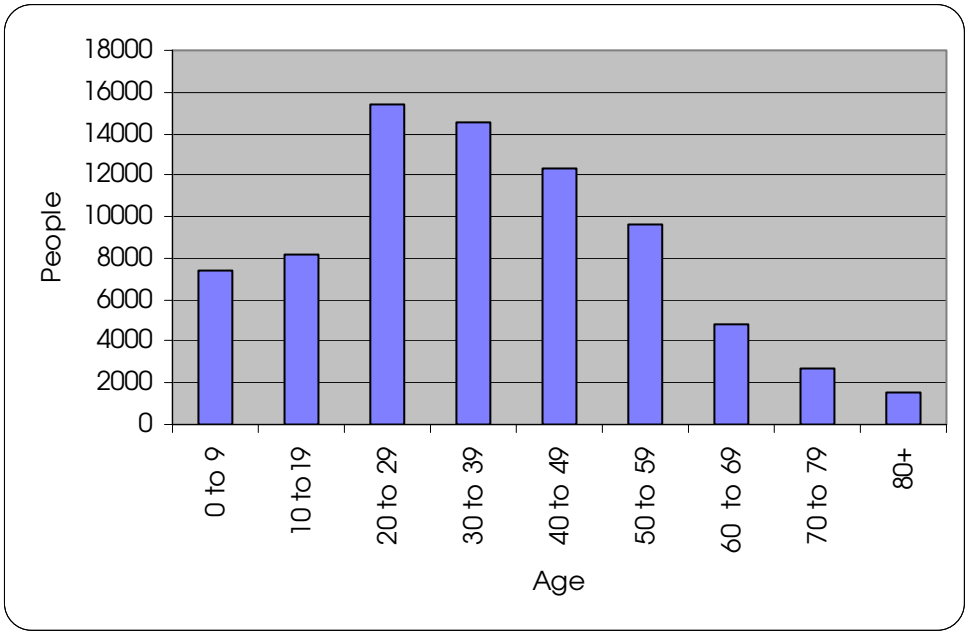

DIAGRAM 22: AGE PROFILE
Source: Census 2001

To certain extend, the age distribution provides an indication of public transport usage. Middle-age people typically own private vehicles and therefore tend not to use public transportation. Public transportation is favoured more by younger people not owning a private vehicle. The strong young adult segment (20 to 29 year age group) within the Study Area is most probably

the strongest age segment that would support public transport within the Study Area. This is also the age segment containing the most people within the Study Area.

2.3.1.3. MARITAL STATUS

The Diagram below shows the marital status of persons living within the Study Area. According to this Diagram, single is the predominant marital status within the Study Area, with almost 50% of the people surveyed falling within this category. This high single marital status can largely be attributed to the persons younger the 20 years of age within the Study Area, which as not yet of a marrying age. This is largely supported by the fact that the second largest category is married persons, making up more than 30% of the Study Area population.

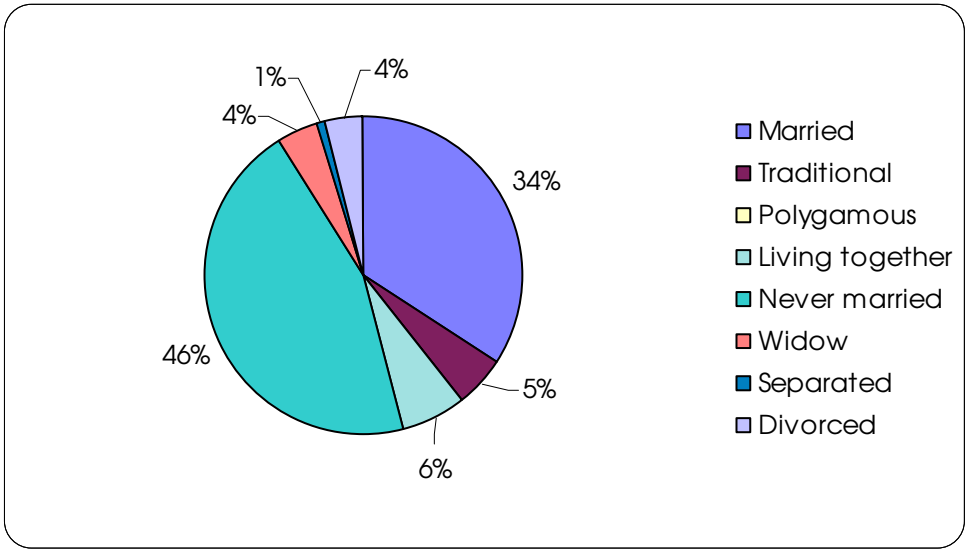

DIAGRAM 23: MARITAL STATUS
Source: Census 2001

Marital status provides impacts indirectly on the use of public transportation. Married persons, especially those with children, tend to use private vehicle transport because are more convenience as a mode of family transport. Typically, single persons are more likely to use public transport. The high number of single persons (even if children) do point to a sizable potential public commuter market.

2.3.1.4. EDUCATION LEVEL

The Diagram below illustrates the education levels within the Study Area. This Diagram shows that most (56%) of the residents within the Study Area have completed a secondary school educational qualification. Of specific note is the high number of university graduates within the Study Area, with 19% of the Study Area population having completed a degree or postgraduate degree. This is well above the national average of about 4%.

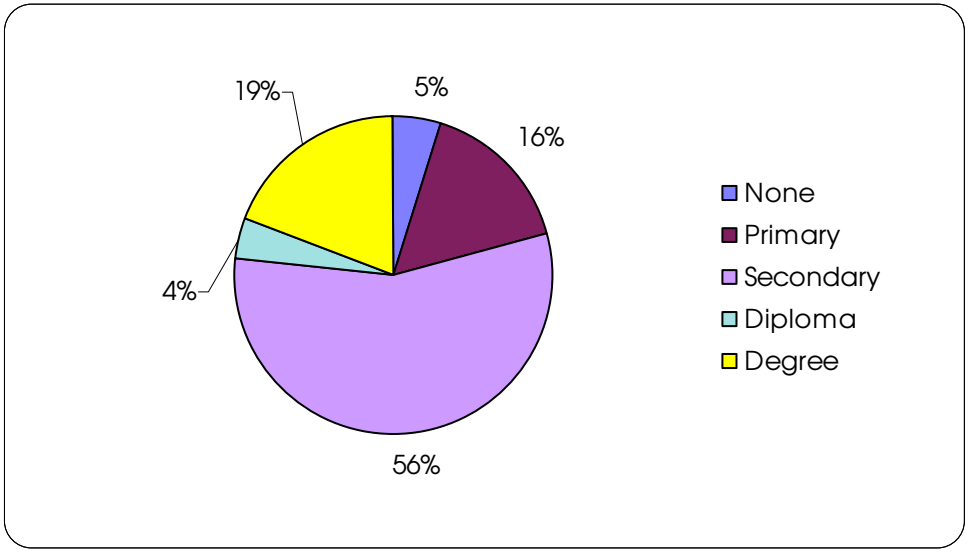

DIAGRAM 24: EDUCATION LEVEL
Source: Census 2001

Although the education profile does not directly relate to the use of public transportation, it is indirectly linked to it in the sense that higher-educated individuals earn higher incomes and therefore are more likely to afford private vehicles than do lower income individuals. Because most of the residents within the Study Area have high education levels and it can be deduced that most of these people would probably rather use private vehicles than public transport to access their destinations.

2.3.1.5. MONTHLY HOUSEHOLD INCOME

Figure 2.6 and the Diagram below gives an estimate of the monthly household incomes within the Study Area. The high number of households living with a household income of below R3000 can most probably be attributed to live-in domestic workers, which skews the income profile. Discarding this income category, the average income of the households within the Study Area appears to be relatively high, with most of the households earning between R12000 and R250000 per month. A significant number of households earns a household income higher than R25000 per month.

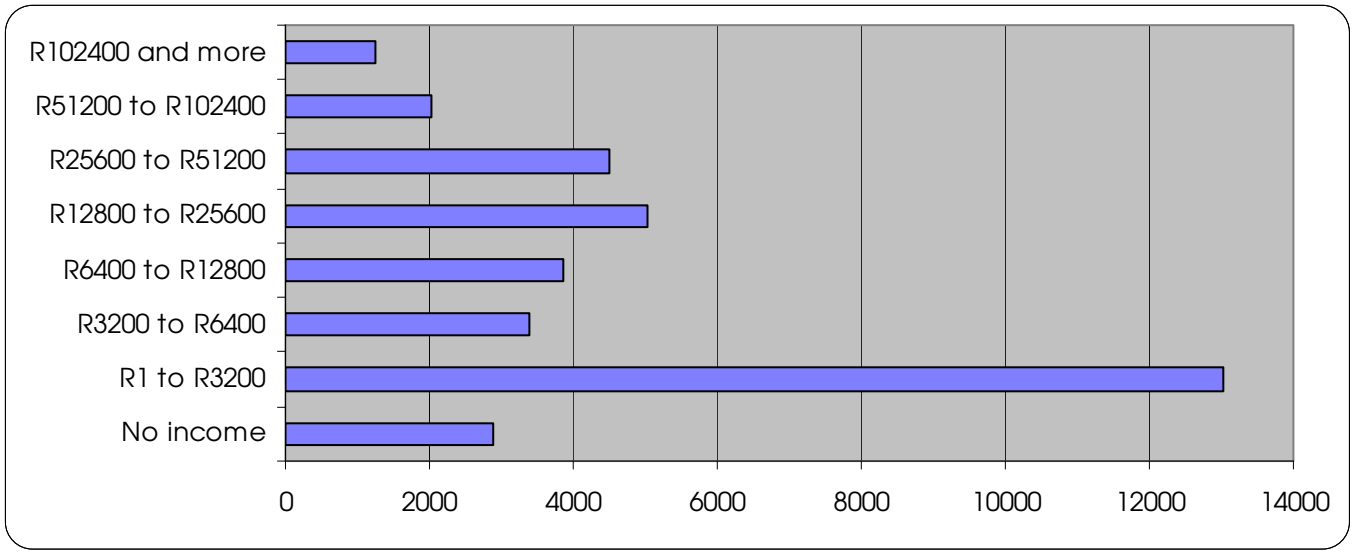

DIAGRAM 25: MONTHLY HOUSEHOLD INCOME
Source: Census 2001

The monthly household income has a direct impact on the use of public transportation, because this determines whether a household can afford a private vehicle. The wealthy households with the Study Area tend to have 2 private vehicles and are therefore less likely to use public transportation. However, the high number of households (single-person domestic workers) earning less than R3000 per month, does appear to provide a significant public transportation user market within the Study Area.

2.3.1.6. EMPLOYMENT LEVEL

The Diagram below shows the employment status of the Study Area residents. This Diagram indicates a high employment level, with more than 90% of the population being employed. This employment level is highly uncharacteristic for Gauteng and the country as a whole, which have far lower employment levels.

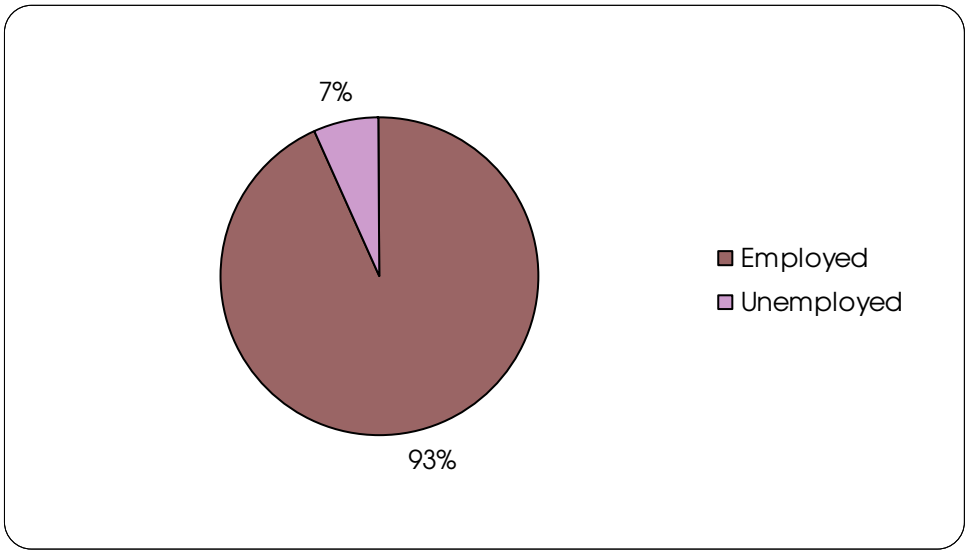

DIAGRAM 26: LEVEL OF EMPLOYMENT
Source: Census, 2001

Employment status is a relatively direct indication of whether households can afford private vehicles or not. Therefore, the very high employment rate within the Study Area suggests high private vehicle ownership. In turn, this directly impacts of the use of public transport.

2.3.1.7. OCCUPATION

The Diagram below depicts the occupations held by economically active persons within the Study Area. Of these, most persons within the Study Area are white-collar workers. These include clerks and salespersons that most work in the retail and services industry, followed by professional and officials/ managers. In other works, a large portion of the economically active persons within the Study Area not occupy highly-skilled positions. Occupation relates directly to other economic factors, such level of employment and level of income.

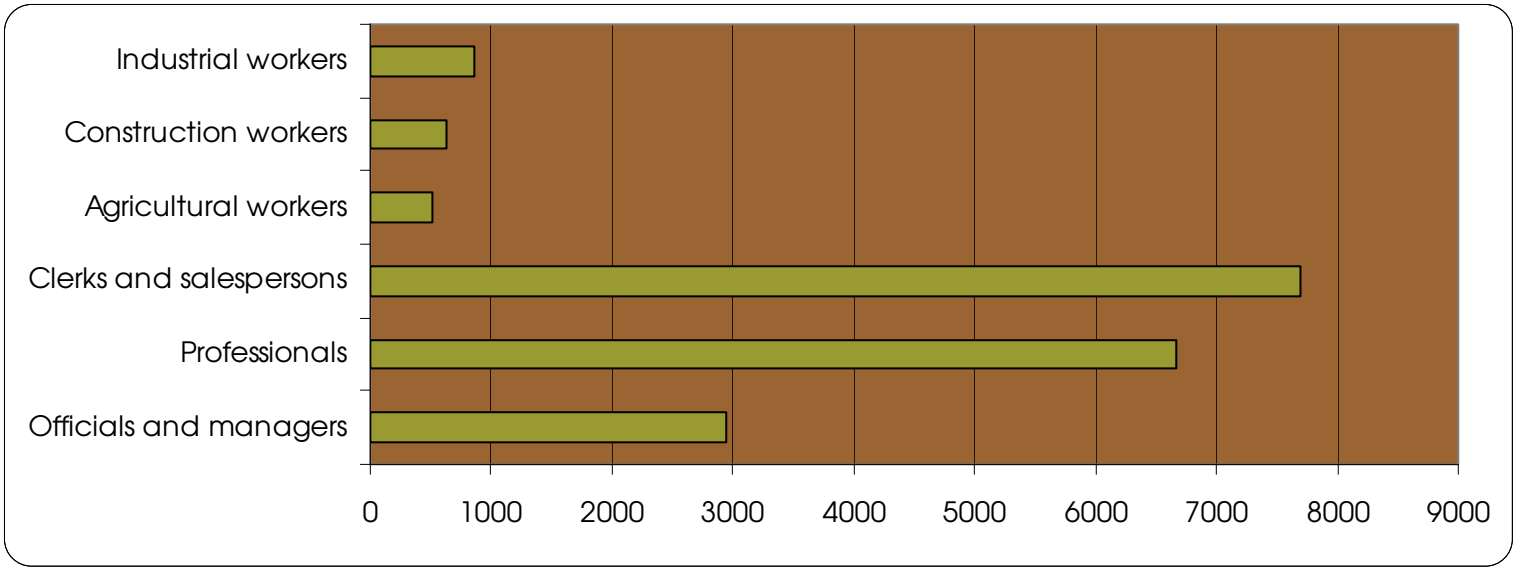

DIAGRAM 41: OCCUPATION
Source: Census 2001

With regard to the use of public transportation, those working in the industrial and clerks/ salesperson category would most likely make use of public transportation. The clerks/ salesperson category is the largest occupation category and indicating a potential public transportation commuter market within the Study Area.

2.3.2. SYNTHESIS

The following can be deduced from the socio-economic information set out above:

- The Study Area has a largely a young to middle-age demographic structure, as is illustrated by the population's age distribution.
- The Study Area population is well educated. In particular, the population is distinguished by a high number of people having university degrees.
- This high level of education translates into the Study Area population being mostly employed in senior positions, such as professionals and managers. In turn, this translates into low unemployment levels and high monthly households incomes.
- In general, the socio-economic profile of the Study Area population sketched above does not ideally support the use of public transportation. People falling within this profile tend to own private vehicles and require the flexibility of a private vehicle to conducts their daily tasks. For example, business managers need to access a number of destinations a day for business purposes, which is best done using a private vehicle.
- Despite the above, the Study Area contains a population segment that would be suited for public transport. For example, the Study Area has a large 20 to 30 year age group, which tends to use public transportation more often than people falling within older age groups.

2.4. LAND DEVELOPMENT

The land development profile attempts to provide a broad overview of development within the Study Area. To draw this profile, land use, municipal-owned land, zoning and building height is considered.

2.4.1. LAND USE PROFILE

Land uses within the Study Area roughly fall into 4 primary land use categories, as depicted in the Diagram below, namely residential, business, community and open space. Of these land uses, residential land uses cover the largest portion of the Study Area. Figure 10 provides a broad land use map of the Study Area, illustrating the spatial distribution of these land uses.

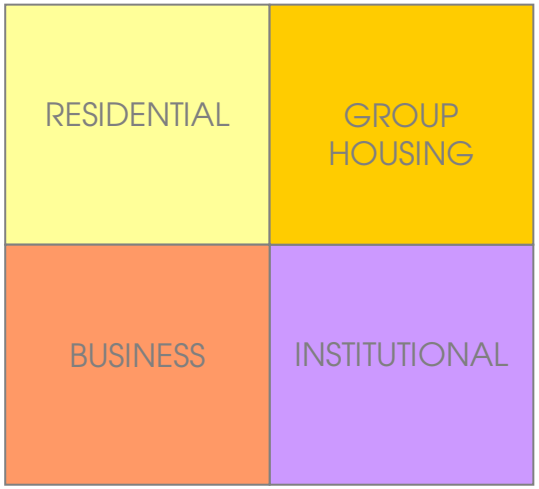

DIAGRAM 16: LAND USE SECTORS

2.4.1.1. RESIDENTIAL

Generally, the Study Area is characterized by relatively low residential densities, but with a range of residential typologies. Residential typologies found within the Study Area include single residential units, cluster developments and flats. Low densities residential areas primarily occur in the southern parts of the Study Area in suburbs such as Houghton Estates, Forrest Town and Saxonwold. Lower-density housing areas are also found in Illovo and Rivonia. Higher-density, cluster developments are largely centred in Morningside, in part of Rivonia and in Sunninghill. High density flat areas are found in Killarney and, to a lesser extent, in Illovo.

Although it may be argued that higher-density residential areas exist within the Study Area (such as Killarney and Morningside), the densities of the Study Area are relative low in transportation terms. More specifically, the pockets higher densities only occur in certain parts of the Study Area and therefore do not support the entire BRT route. For example, Saxonwold does not have the densities to support the BRT system and the planned stations within the area, whereas Killarney does support the BRT system.

2.4.1.2. SOCIAL AMENITIES

The Study Area has a reasonably well-developed community infrastructure network, providing educational, health and other essential social amenities. The number community facilities within the Study Area are listed in the Table below. Figure 11 illustrates the location of these community facilities within the Study Area.

TABLE 2.6: EXISITING COMMUNITY FACILITIES

Area	Education		Health		Community			
	School	Tertiary Institution	Clinic	Hospital	Library	Post Office	Police Station	Recreation Facility
Sunninghill				1				1
Rivonia	1	1			1	1		1
Morningside	1		1				1	
Illovo	3	1				1		
Killarney	2			1	2	1		
Parktown	11	2	3	2			1	1
Total	18	4	4	4	3	3	2	3

Maluleke Luthuli and Associates, 2007

The Study Area has the entire range of educational infrastructure, ranging from primary schools to tertiary education facilities. According to the Table above, the Study Area has 18 schools and 4 tertiary educational institutions. The tertiary educational institutions include, for example, the Gordon Institute for Business Science located in Illovo, and the East Campus of the University of the Witwatersrand located in Braamfontein. The Study Area contains a number of medical facilities, comprising 4 clinics and 4 hospitals. These include the Johannesburg General Hospital, the Sunninghill Hospital and the Sandton Surgical Day

Clinic. In addition, the Study Area contains a number of libraries, post offices, police stations and recreational facilities. These include the Rivonia Public library, the Morningside Country Club, the Houghton Post Office and the Hillbrow Police Station.

2.4.1.3. BUSINESS

The Study Area arguably contains some of the most valuable retail and office space within Gauteng and the country. Figure 11 illustrates the location of business nodes within the Study Area. These include the Regional Nodes (as defined in the Johannesburg MSDF) Sunninghill, Rinvonia, Rosebank and Parktown. In addition, it includes the District Nodes Illovo and Killarney. These nodes are well-developed, containing a mix of retail, office, community, and higher-density residential uses. These land uses are mostly mixed horizontally and not vertically. In other words, the individual buildings within these nodes are mostly used for single uses, such are offices, and do not contain a mix of uses within each individual building. These land use mix is thus obtained through the grouping of single use buildings, rather than mixing land uses within each building. The mentioned nodes are all located on the BRT route (comprising Rivonia, Oxford and Victoria Roads), thus having direct access to this public transportation spine.

2.4.1.4. INSTITUTIONAL

A significant institutional component is located in the southern part of the Study Area, in the suburbs of Parktown and Braamfontein. These include uses such as the Johannesburg General Hospital, the Witwatersrand East Campus and the Constitutional Court of South Africa. In particular, the development of the Constitutional Court represents a unique and significant land use precinct, anchoring the southern leg of the Parktown-Sunninghill BRT route.

2.4.1.5. VACANT LAND

The Study Area in intensively developed, with little vacant land remaining. The only significant vacant land parcels are located within Sunninghill, primarily because it is a relatively new node compared to nodes such as Rivonia and Killarney. Many of the vacant land parcels within Sunninghill area are currently being developed with only a few of the vacant land parcels not

earmarked for immediate development. Development in the remainder of the Study Area mainly constitutes the redevelopment of existing properties with higher-density, more intensive land uses.

2.4.2. HERITAGE SITES

The Study Area has a number of heritage sites that need to be taken into account. Figure …. identifies the properties located within the Study Area that are provincial heritage site. Most of the site ate located within the Forrest Town and Parktown areas. In particular, the Forrest Town area contains a number of houses designed by Sir Herbert Baker, who also designed the Union Building in Tshwane.

2.4.3. MUNICIPAL-OWNED LAND

Most of the properties within the Study Area are in private ownership, with relatively little land belonging to the Johannesburg Metropolitan Municipality. Most of the land that does belong to the Municipality is used as open space, recreation areas or storm water servitudes. No significant vacant land parcels that belong to the Municipality and which is suitable for development abut or is located close to the BRT route. Figure …. illustrates the Council-owned properties located within the Study Area.

2.4.4. ZONING

Figure .. provides a profile of the zonings that apply to the various properties within the Study Area. It is evident from this Figure that a wide range of zonings apply within the Study Area. Single residential is the primary zoning within the Study Area, covering most of the Study Area. Other significant zonings include business, community, institutional and special zoning. Properties zoned for business are primarily located within the Sunninghill Rivonia, Illovo, Killarney and Parktown area. Properties zoned for community uses are mainly located within the Parktown region and mostly apply to the large number of schools within this region. Properties zoned for institutional uses are also primarily located within the Parktown region, which includes for example the Johannesburg General Hospital. Properties zoned for special uses are also common and mainly involve a mix of business uses (office, retail, etc.). Properties zoned for special uses are therefore mostly located within the business nodes within the Study

Area, including Sunninghill, Illovo and Parktown. Of particular interest in the large number of properties within Morningside that are zoned for special uses.

2.4.5. BUILDING HEIGHT

Building height in the Study Area is important because building height is related to density, which in turn is a critical element in the efficient operation of a public transportation system such as the BRT. According to Figure .. building height within the Study Area ranges from 1 storey to 6 storeys in height. The height of buildings within the Study Area is linked to the nodes within the study area, with the nodes having higher densities than the surrounding residential areas. The Killarney node is the only node within the Study Area that has building ups to 6 storeys is height. These buildings are mostly flats. Nodes with buildings between 3 and 4 storeys in height include sections of Parktown, Rivonia and Sunninghill. The areas are all abut the BRT route, thus placing the highest densities within the Study Area within walking distance of the planned BRT system. Areas that contain buildings between 2 and 3 storeys is height include the peripheral areas of Sunninghill, Rivonia and Parktown. The Illovo business node and parts of Morningside also has buildings between 2 and 3 storeys in height.

2.5. HOUSING AND TENURE

2.5.1. HOUSING PROFILE

2.5.1.1. HOUSING TYPOLOGY

Census 2001 provides information with regard to the state of housing within the Study Area. This information is reflected in the Table below. According to this Table, roughly 14000 single housing units exist within the Study Area, making it the dominant housing type within the Study Area. The second largest housing type is flats, constituting approximately 8000 units, followed by cluster housing units, which make up approximately 6000 units of the total housing stock within the Study Area. Note that the above information is given by Census 2001 EA zone. Many of these EA zone partially fall outside the Study Area, as demarcated

for this project, thus impacting on the number of units presented in the Table above. Despite this, the numbers presented in the Table above does provide some insight into the number of dwelling units within the vicinity of the BRT route.

TABLE 2.7: NUMBER AND TYPE OF HOUSING 2001

Census Settlements	House on Stand	Traditional Dwelling	Flat	Town-house Cluster	Backyard Flat	Backyard Shack	Informal Shack	Rented Room	Other	Total Housing Types
Airdlin	12	0	0	80	3	0	0	3	32	130
Braamfontein	75	45	2673	15	77	29	27	12	137	3090
Bryanston	3692	102	192	748	1196	63	30	113	552	6688
Dunkeld	209	4	0	3	146	0	0	3	9	374
Edenburg	681	21	48	425	93	24	10	21	41	1364
Forest Town	260	0	0	3	141	0	3	15	9	431
Houghton Estate	1156	66	682	207	525	15	21	159	257	3088
Hyde Park	400	12	352	283	135	38	6	18	164	1408
Illovo	410	0	90	96	48	3	3	6	18	674
Inanda	122	3	42	41	9	0	0	3	3	223
Killarney	57	43	1905	164	137	36	81	179	209	2811
Melrose	199	6	191	12	115	6	0	0	15	544
Melrose Estate	106	3	7	112	62	0	3	3	37	333
Morningside	1788	27	339	1669	178	33	15	89	188	4326
Morningside Manor	485	9	0	7	73	3	0	0	0	577
Parktown	471	12	460	30	52	3	0	27	1283	2338
Parkwood	503	9	12	0	112	3	3	0	27	669
Paulshof	1023	3	102	722	33	3	0	34	55	1975
Riviera	114	0	156	30	9	0	0	0	6	315
Rivonia	256	9	0	204	3	3	3	3	38	519
Sandhurst	188	0	57	33	88	3	0	0	6	375
Saxonworld	576	21	33	121	81	6	9	9	63	919
Sunninghill	645	18	103	950	135	6	12	18	72	1959
Wierda Valley	185	9	0	0	3	0	6	0	0	203
Woodmead	318	6	71	141	50	12	12	15	6	631
Total	13931	428	7515	6096	3504	289	244	730	3227	35964

Source: Census 2001

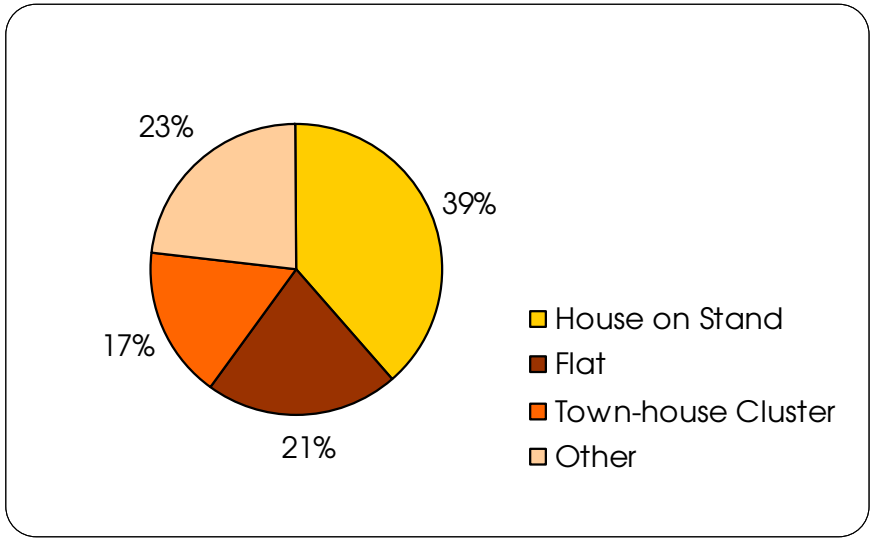

DIAGRAM 17: HOUSING TYPOLOGY RATIO
Source: Census 2001

The Diagram above illustrates the ratio between the higher-density and lower-density housing options. Because this is expressed in percentages, it better translated the dwelling typology distribution within the Study Area than the Table above. According to this Diagram, roughly 40% of the Study Area is made up of higher-density housing units, consisting of flats and townhouses. This is a significant higher-density housing component and suggests that the Study Area already contains the density elements required to support BRT within this region of Johannesburg.

2.5.1.2. TENURE

Tenure involves the type of ownership that people have of the dwelling they reside in. As depicted by the Diagram below, most households within the Study Area own properties that have been fully paid off. A significant number of people own properties that have a bond registered on the property. The Study Area also has a strong rental market, as well as properties that are occupied rent-free.

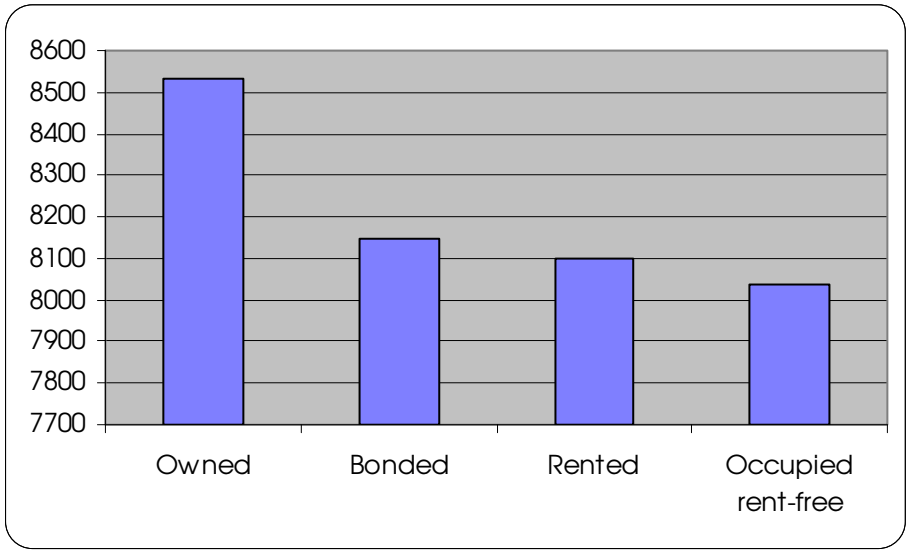

DIAGRAM 41: HOUSING TENURE
Source: Census 2001

In terms of public transportation usage, the rental market is of particular importance, because people that rent dwelling units also tend to be user of public transportation. This is due to the affordability of rental housing and the use of public transportation, as opposed to owning housing units and a private vehicle. Wealthier people are able to afford to their own homes and private vehicles and therefore tend not to use public transportation.

2.5.2. HOUSING BACKLOG

Collated from Census 2001 figures, there was a housing backlog of approximately 4000 dwelling units within the Study Area by the year 2001 (see Diagram below). This roughly constitutes a 1:10 ration with the existing housing stock within the Study Area. The existing housing stock comprises approximately 31000 dwelling units. Note that the housing backlog does not take into

account the demand for housing, arising from population growth. Also note that many of these Census 2001 EA zone partially fall outside the Study Area, as demarcated for this project, thus impacting on the numbers mentioned above.

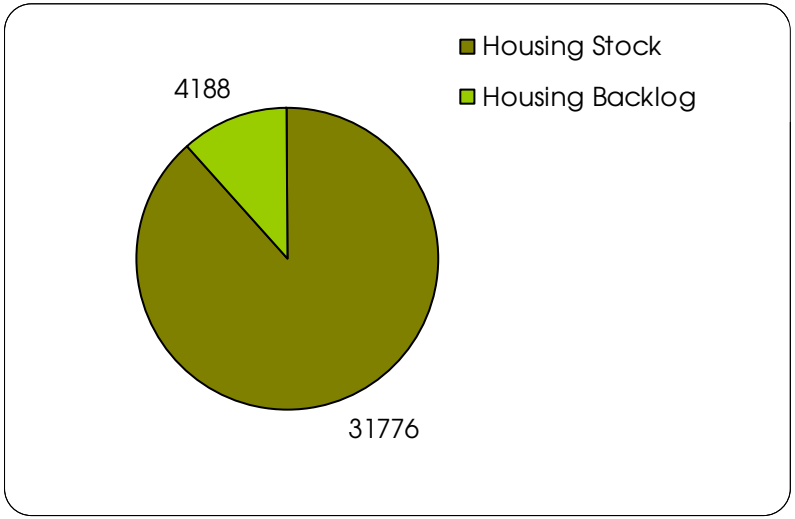

DIAGRAM 41: HOUSING BACKLOG
Source: Census 2001

The spatial distribution of the housing backlog within the Study Area is illustrated on Figure ….. It is evident from this Figure that most of the housing backlog is concentrated within Parktown region of the Study Area Proper. A limited housing backlog was also recorded in the Morningside area.