HOLISTIC APPROACH TO PEDESTRIAN SAFETY - MAUNDE STREET ATTERIDGEVILLE

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1. INTRODUCTION

Maunde Street is an important east-west arterial serving Atteridgeville and the new extensions of Atteridgeville. The location of Maunde Street is shown in **Figure 1**. Maunde Street is a typical Township Street - a long straight street that has a mobility function, but has direct residential access, no paved sidewalks, many pedestrians and many taxis.

The need to conduct a road safety investigation in Maunde Street was identified and the City Council of Pretoria launched a study with the following objectives:

- evaluate the correct usage of existing traffic control measures,
- determine the extent, type and cause of accidents along Maunde Street,
- compile a strategy for the management of existing and future implementation of traffic control devices along Maunde Street,
- evaluate the applicability of existing public transport facilities along Maunde Street,
- identify locations for possible future public transport facilities, and
- improve pedestrian safety along the street.

The **purpose** of the traffic control plan and road safety investigation is to evaluate the existing traffic control measures and pedestrian facilities in order to determine the effectiveness thereof.

The **methodology** followed consisted of obtaining all the relevant status quo data - traffic counts, accident statistics, previous planning studies, etc. Extensive field observations were done and intersections were analysed. Liaison with the community also took place in the form of a meeting and a bus tour through Maunde Street as well as meetings with ASTRASA (Atteridgeville / Saulsville Road Safety Forum). This was followed by detail analysis and development of solutions.

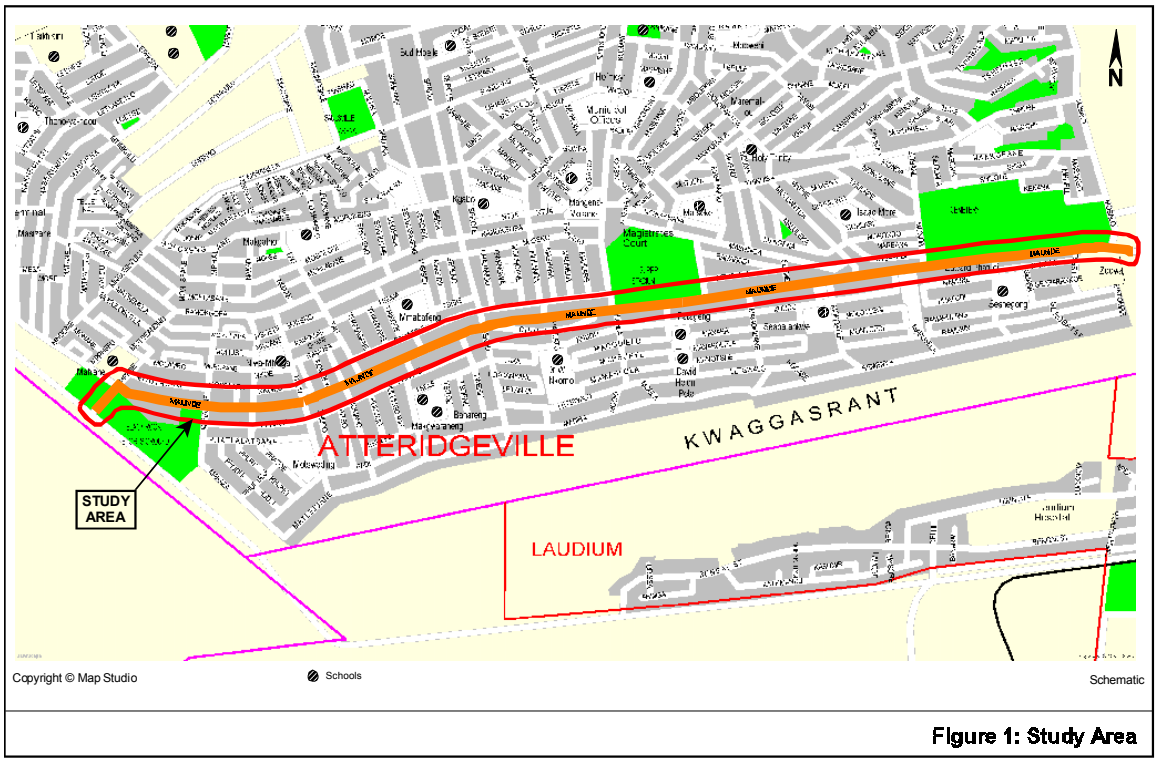

Figure 1: Study Area

2. STATUS QUO

2.1 Geometry

Maunde Street has a road reserve width of 25m. The road has one lane per direction of 3,7 m wide and a pedestrian walkway on the northern side of the road of 1,5 m wide. Taxi and bus bays of approximately 2,5 to 3,0 m wide are provided at regular intervals.

There is no paving or grassing of the sidewalk other than where the pedestrian walkway is provided. The spacing between intersections is shown in Table 1 below. The typical sidewalks and intersections are shown in Photos 1 and 2.

TABLE 1: SPACING BETWEEN INTERSECTIONS (STOP CONTROL)

From Street	To Street	Distance (m)
Makaza	Mphalane	345
Mphalane	Ntsu	355
Ntsu	Sekhu	730
Sekhu	Hlahla	480
Hlahla	Magombane	490
Hlahla	Moloantoa	410
Moloantoa	Khoza	915
TOTAL LENGTH		**3725**

Photo 1: Pedestrian Crossing. Note unpaved sidewalks

Photo 2: Corner of Hlahla- and Maunde Streets. Note mountable kerb with no protection to pedestrians, as well as hawkers.

2.4 Public Transport

Maunde Street is a major public transport route carrying relative high volumes of buses and taxis. At present, there are several taxi lay-byes located on the northern and southern sides of the road.

Bus volumes range from 30 to 45 buses per hour per direction, taxis range from 120 to 300 taxis per hour per direction. The modal split was determined on different sections of Maunde Street and is shown in Table 2 below.

TABLE 2: MODAL SPLIT - PERCENTAGES

	East of Mphalane	East of Moloantoa	East of Mosalo	AVERAGE
Buses	6.50%	8.00%	4.50%	6.33%
Taxis	67.00%	34.00%	28.50%	43.17%
Cars	25.50%	57.50%	64.00%	49.00%
Heavy Vehicles	1.00%	0.50%	3.00%	1.50%
TOTAL	100.00%	100.00%	100.00%	100.00%

2.5 Accident Statistics

Accident statistics for Maunde Street was obtained from the Pretoria Traffic Department. The statistics was in varying formats and for different periods, some of them overlapping and not all with the same detail information. The statistics are shown in Tables 3 to 7 below.

The following conclusions can be made from the accident statistics:

- Three main types of accidents occur, namely head to rear end collisions, accidents with pedestrians and sideswipe accidents.
- The intersections where the highest frequency of accidents occur, are also the intersections with the highest traffic volumes.
- In the 29 month period for which data on the grade of accidents is available, 4 fatalities and 25 serious injuries were reported. The frustration expressed by the community relates well to these statistics.
- The frequency of accidents is higher during the off peak period, when speeds are probably higher due to lower traffic volumes. It is important to note the high frequency of accidents at night between 18:00 and 06:00, when 35% of accidents occur. This is an indication that the lighting is inadequate, which was confirmed with field surveys.
- The location of accidents with pedestrians indicate that Ajay walking@ - pedestrians crossing the street uncontrolled between intersections - is the highest cause of pedestrian accidents. It is an indication that pedestrians should be encouraged to stay on the side walk.

TABLE 3: FREQUENCY OF TYPE OF ACCIDENTS

Type of Accident	01/01/97-30/06/98 (18 months)	01/01/99-31/05/99 (5 months)	Both periods: 23 months	Percentage of Total
Unknown	0	27	27	**16.77%**
Head/rear end	27	13	40	24.84%
Accident with pedestrian	32	7	39	24.22%
Head on	1	6	7	4.35%
Approach at angle	0	6	6	3.73%
Accident with fixed object	0	2	2	1.24%
Accident with parked vehicle	0	1	1	0.62%
Sideswipe - same direction	18	1	19	11.80%
Single vehicle overturned	3	1	4	2.48%
Sideswipe - opposite direction	3	0	3	1.86%
Turn in face of traffic	5	0	5	3.11%
Right angle collision	1	0	1	0.62%
One or both turning	3	0	3	1.86%
Reversing	4	0	4	2.48%
Total	97	64	161	**100.00%**

TABLE 4: LOCATION OF ACCIDENTS (PERIOD FROM 1/6/98 TO 31/5/99)

Street intersecting with Maunde Street	Fatal	Serious Injury	Injury	Damage only	Total	Percentage
Makaza		1		2	3	10.0%
Mphalane			2	5	7	23.3%
Sekhu				3	3	10.0%
Nchare				1	1	3.3%
Tau				1	1	3.3%
Tlou				1	1	3.3%
Mhlanga				1	1	3.3%
Hlahla				5	5	16.7%
Magombane		1		2	3	10.0%
Senthumule				1	1	3.3%
Mokgatle				1	1	3.3%
Khudu			1		1	3.3%
Moloantoa	1		1		2	6.7%
TOTAL	1	2	4	23	30	100.0%

TABLE 5: GRADE OF ACCIDENTS

Period for which data is available	Fatal	Serious Injury	Injury	Damage only	Total
1/1/97 - 30/6/98 (18 months)	3	17	14	63	97
1/7/98 - 31/5/99 (11 months)	1	8	5	69	83
Total	4	25	19	132	180
Percentage	2.2%	13.9%	10.6%	73.3%	100.0%

TABLE 6: TIME OF DAY WHEN ACCIDENTS OCCUR

TIME PERIOD	1/1/97-30/6/98	1/7/98 - 31/5/99	Total	Percentage
06:00 - 09:00	6	20	26	15.6%
09:00 - 16:00	35	26	61	36.5%
16:00 - 18:00	8	14	22	13.2%
18:00 - 06:00	35	23	58	34.7%
TOTAL	84	83	167	100.0%

TABLE 7: LOCATION OF ACCIDENTS WITH PEDESTRIANS (1/1/97-30/6/98)

Location of accident with Pedestrian	Total for period	Percentage
Crossing street at intersection	7	28.0%
Crossing street between intersections	12	48.0%
Walking in the street	6	24.0%
TOTAL	25	100.0%

2.6 Problems identified by the community and ASTRASA

The following problems were identified by the community:

1. Elderly and children are walking from the informal settlement in the west to the station, crossing Maunde Street west of Makaza Street.
2. Speed humps are required for the western section of Maunde Street.
3. The implementation of traffic circles is a problem, motorists do not know who has right-of-way.
4. Pedestrian walkways on both sides of Maunde Street would improve safety. At present there is only a walkway on the northern side.
5. Signage on Maunde Street to major attractions and community facilities.
6. The 3-way stop control at the intersection of Moloantoa- and Maunde Streets is ignored, speed humps are required.
7. The taxis moved from Maunde Street to Ramokgopa Street, because of the speed humps in Maunde Street.
8. More speed humps are required between Mphalane- and Sekhu Streets.
9. Speed humps are required at the intersections of Maunde Street with Nchare- and Ramano Streets, due to the schools on both sides of Maunde Street.

10. The taxis use the sidewalks to skip the intersections and stop streets.

2.7 General problems observed with field surveys

Table 8 shows the general problems observed with field surveys. This confirmed problems identified by the community.

TABLE 8: GENERAL PROBLEMS FROM VISUAL FIELD SURVEYS

Nr	DESCRIPTION
1.	Stop control at intersections is ignored.
2.	Utilisation of the taxi and bus bays should be addressed.
3.	Street lighting should be improved.
4.	A traffic problem is experienced during funerals at the two cemeteries next to Maunde Street.
5.	The absence of paving behind the existing mountable kerb result in gravel and sand being washed into the road surface.
6.	The several Informal trade stalls result in pedestrians having to walk in the street to pass these hawker stands.
7.	The provision of rails or barriers to channelize people waiting for taxis on the sidewalks should be considered.
8.	Taxis pile-up in the intersections to make U-turns to pick up passengers in the intersection, before continuing on their routes.

3. PROBLEM IDENTIFICATION AND ANALYSES

3.1 Traffic Control

The existing traffic control on Maunde Street is stop control - most streets intersecting with Maunde Street has stop control (on the intersecting street) and a few intersections has all-way stop control.

To determine the optimum type of control at an intersection, the aspects that need to be considered include traffic safety, capacity and level of service. The feasibility of providing traffic signals or other form of traffic control was specifically investigated at a few intersections, namely:

9. Mphalane / Maunde
10. Sekhu / Maunde
11. Hlahla / Maunde

The provision of traffic signals at these intersections are not supported, for the following reasons:

- $ The traffic volumes on the side streets are lower than the minimum required in the South African Road Traffic Signs Manual.
- $ The speed of vehicles through the intersections may increase - not the average speed, but the speed of individual vehicles as they speed to go through on either the end of green or through yellow.
- $ It will be more effective to provide raised pedestrian crossings for school children as it will force motorists to reduce speed and yield for pedestrians. People don=t cross at the intersections.
- $ In the South African Road Traffic Signs Manual (Volume 1, Part 3, Par 6.8.2.2) it is also clearly stated that collisions may increase at traffic signals, although the type and severity of collisions may change.
- $ The provision of mini-circles was also investigated as a method of control at the intersections. Mini-circles however, do not always function well in conjunction with high pedestrian volumes.

The above motivation can be applied to the approval of traffic signals in other similar areas. The results of the capacity analyses also show that most intersections operate at acceptable levels of service at present.

3.2 Traffic Safety

A detailed analyses of accident statistics was done as part of the Status Quo investigation. The main causes of accidents, can be summarised as follows:

- $ Poor driver behaviour - this includes speeding, ignoring stop control at intersections and taxis loading passengers anywhere and not only at the designated bays.
- $ Poor pedestrian behaviour - this includes Ajay walking@, not waiting for taxis at the designated loading bays, walking in the roadway.
- $ The above two issues relate to education of drivers and pedestrians as well as to law enforcement.
- $ The impact of vehicles that are not roadworthy on traffic safety is not quantified in this report but should be addressed through law enforcement.

The following physical aspects of Maunde Street were identified as problems which need to be addressed:

- $ Lighting - the high frequency of accidents at night show clearly that the lighting is inadequate.
- $ Pedestrian / vehicle conflict can be controlled through reducing speed by the provision of additional raised pedestrian crossings - at intersections and midblock.
- $ Vehicles stopping on the side walk at locations other than the designated taxi bays can be controlled by erecting vertical kerbs and painting a red no stop line. The red line will assist in law enforcement.
- $ The fact that a paved sidewalk or pedestrian path is only provided on the one side of Maunde Street (the northern side) for the largest length thereof, possibly result in pedestrians crossing the street between intersections to walk on the sidewalk. There is a need for a pedestrian walkway both sides of the road.
- $ Apart from the fact that the existing sidewalk is not aesthetical, the unpaved area force

pedestrians onto the road when it rains to avoid standing or walking in the mud.

$ A significant problem is hawkers that have shelters within the road reserve, especially where their stands extend over the pedestrian walkway.

To address the above mentioned problems and to improve traffic safety, a range of physical measures can be implemented. The different measures are shown in **Table 9**.

TABLE 9: POSSIBLE PHYSICAL MEASURES TO IMPROVE ROAD SAFETY

Nr	Measure	Application and function
1	Provision of a median island	Reduce turning movements, refuge for pedestrians
2	Limit turning and conflict movements	Improve traffic safety
3	Speed humps	Reduce speed
4	Pedestrian Paths	Separate pedestrians and vehicular traffic
5	Additional turning lanes	Improve capacity and reduce vehicle conflict
6	Provide vertical kerbing	Protect pedestrians on side walks
7	Provide raised pedestrian crossings	Reduce speed and improve pedestrian safety
8	Improve lighting	Improve traffic safety at night (sight distance)
9	Provide additional signage	Warning signs to improve driver awareness
10	Reduce number of direct erf accesses	Reduce conflict movements
11	Reduce traffic volumes by diverting traffic to other roads	Improve spare capacity, reduce through traffic and hence conflict movements
12	Channelize pedestrians	Improve pedestrian safety
13	Remove or control hawkers from side walks	Improve pedestrian level of service
14	Change control of intersections to circle control or traffic signals	Improve capacity, not necessarily traffic safety
15	Additional bus and taxi bays	Improve public transport level of service
16	Provide shelters for bus and taxi bays	Improve public transport level of service

9. PROPOSED ROAD UPGRADES TO IMPROVE TRAFFIC CONTROL AND ROAD SAFETY

The different measures identified in Section 3.2 were applied for the whole section of Maunde Street. The total cost of the proposed measures, as proposed in Table 10, is approximately R 1,5 million. A prioritisation of the measures is proposed to assist in planning for the implementation thereof. Some of these measures are under construction at present.

TABLE 10: PRIORITISATION OF MEASURES AND ESTIMATED COST

Priority	Description	Cost
1	7 Additional raised pedestrian crossings	R70,000
2	Pedestrian walkways south of Maunde Street	R299,000
3	Improvement of road markings	R39,500
4	Improvement of street lighting	R75,000
5	Provision of vertical kerb at intersections	R70,000
6	Additional turning lanes at Hlahla and Maunde Street	R160,000
7	Provision of paving around intersections	R488,400
8	Provision of additional taxi bays	R84,000
9	Provision of paving behind taxi bays	R224,000
	TOTAL	R1,509,900

Figure 2 show a typical plan of some of the measures that are implemented.

5. ADDITIONAL ACTIONS UNDERTAKEN BY THE CITY COUNCIL, ASTRASA AND GAUTRANS

The following actions were also undertaken in addition to the road improvements below. These actions have reference to the specific problems as identified in the report.

5.1 Education

Gautrans Road Safety Promotion will provide road safety education to the residents living along Maunde Street. Educational material such as leaflets and audio visual media will be used at schools, clinics and along the street. The local road safety forum ASTRASA (Atteridgeville / Saulsville Road Safety Forum) will be linked into the project through information sessions on community meetings, workshops and general assistance with Gautrans Road Safety Promotion.

5.2 Marketing

ASTRASA, together with City Council of Pretoria and Gautrans, is involved with the launch of the project before and after completion. The relevant local print media will be invited as well as all relevant role-players and stakeholders. An information billboard was erected.

5.3 Law Enforcement

In addition to the involvement of the local Pretoria Law Enforcement team, the Gautrans Pretoria Regional Office was also brought in to provide a supplementary service. The two teams will work in co-operation with one another and will assist in joint law enforcement campaign after the completion of the project. The local SAPS will also be drawn in to provide a backup service.

Speed measurement, visible patrolling, K78 and selective law enforcement will be the main

thrust of the law enforcement agencies on Maunde Street.

6. FINDINGS

The Maunde Street Traffic Safety Project had a specific focus, namely to improve safety in a higher order street through a Township Street. The findings from the study are generalised to assist in the execution of other similar projects in future:

1) Township Streets have unique problems. Maunde Street is an example of many typical streets in Townships - a relative high mobility function combined with direct residential access, public transport usage and high pedestrian volumes.

2) The verges on these roads are seldom paves or grassed which result in pedestrians within the roadway, gravel on the road reducing skid resistance and an overall poor aesthetical appearance.

3) The vehicle volumes on these roads are seldom high enough to warrant traffic signals, although there can be pressure in many cases from the community to provide traffic signals. The disadvantages of traffic signals in terms of safety should be clearly explained to the community and should only be implemented where the traffic demand adequately warrants it.

4) This study showed that a proper engineering analyses, based on adequate traffic data - volumes, accident statistics etc, combined with community participation, can deliver traffic safety solutions that can be expected to yield results.

5) There are a limited range of physical measures that can be done from an engineering perspective to improve traffic safety. These typical measures are listed in Table 9. The implementation of such measures should coincide with a proper education and law enforcement programme.

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Helius obtained his MBA degree during 1997, at the University of Pretoria and during 1998 his B ENG (Hons) degree in Transportation, also at the University of Pretoria.