TRAFFIC IMPACT ASSESSMENT

## CLAYVILLE EXTENSIONS 50 AND 71

NOVEMBER 2015

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## Certification

It is herewith certified that this Traffic Impact Assessment has been prepared according to requirements of the South African Traffic Impact and Site Traffic Assessment Manual.

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## TABLE OF CONTENTS

1 INTRODUCTION ..... 1
1.1 BACKGROUND ..... 1
1.2 EXTENT OF THE DEVELOPMENT. ..... 1
1.3 PHASING OF THE DEVELOPMENT ..... 2
1.4 APPROVAL OF SUBMISSION ..... 2
2 DATA COLLECTION ..... 3
2.1 SITE VISIT ..... 3
2.2 TRAFFIC COUNT DATA. ..... 3
2.3 LATENT DEVELOPMENTS ..... 3
CLAVILLE EXTENSIONS 52 \& 66 . ..... 3
TEMBISA EXTENSION 25 ..... 4
REMAINDER OF PORTION 122 OF THE FARM OLIFONSTFONTEIN 402-JR ..... 4
STERKFONTEIN EXTENSION 12. .....  4
CLAYVILLE EXTENSION 45 ..... 4
3 SURROUNDING ROAD NETWORK \& STUDY AREA ..... 5
3.1 ROAD NETWORK \& MASTER PLANNING ..... 5
MUNICIPAL PLANNING ..... 5
PROVINCIAL AND NATIONAL PLANNING ..... 5
3.2 SURROUNDING ROAD NETWORK ..... 5
3.3 DETERMINATION OF THE STUDY AREA ..... 5
4 SITE ACCESS ..... 7
4.1 SITE ACCESS ..... 7
5 EXISTING TRAFFIC VOLUMES ..... 8
5.1 GENERAL ..... 8
5.2 OLIFANTSFONTEIN ROAD (R562)/OLIFANTSFONTEIN ROAD INTERSECTION .....  8
5.3 OLIFANTSFONTEIN ROAD (R562)/MAIN ROAD (FUTURE K111) INTERSECTION ..... 8
5.4 MAIN ROAD (FUTURE K111)/THABANA NTLENYANA DRIVE INTERSECTION. ..... 8
5.5 MAIN ROAD (FUTURE K111)/RIVERSIDE STREET INTERSECTION. ..... 8
5.6 MAIN ROAD (FUTURE K111)/KAREE STREET INTERSECTION ..... 9
5.7 DALE ROAD/ARCHERFISH DRIVE INTERSECTION. ..... 9
5.8 DALE ROAD/MODDERFONTEIN ROAD INTERSECTION ..... 9
5.9 DALE ROAD/OLD PRETORIA ROAD INTERSECTION. .....  9
6 DEVELOPMENT TRIP GENERATION AND TRAFFIC VOLUME SCENARIOS ..... 10
6.1 ADJUSTMENT FACTORS ..... 10
MIXED USE DEVELOPMENTS (MUD). ..... 10
LOW VEHICLE OWNERSHIP (LVO) \& VERY LOW VEHICLE OWNERSHIP (VLVO) ..... 10
TRANSIT NODE OR CORRIDORS ..... 10
6.2 TRIP SUMMARY ..... 11
6.3 GROWTH RATE ..... 11
6.4 TRAFFIC VOLUME SCENARIOS ..... 11
6.5 TRIP DISTRIBUTION AND ASSIGNMENT ..... 12
7 TRAFFIC IMPACT AND CAPACITY ANALYSIS ..... 13
7.1 SCENARIOS ANALYSED ..... 13
7.2 CAPACITY ANALYSIS ..... 13
7.2.1 Olifantsfontein Road (R562)/Olifantsfontein Road Intersection ..... 13
7.2.2 Olifantsfontein Road (R562)/Main Road (Future K111) Intersection ..... 18
7.2.3 Main Road (Future K111)/Thabana Ntlenyana Drive Intersection. ..... 21
7.2.4 Main Road (Future K111)/Riverside Street intersection ..... 25
7.2.5 Main Road/Karee Street Intersection ..... 29
7.2.6 Dale Road (Future K109)/Archerfish Drive Intersection ..... 33
7.2.7 Dale Road/Modderfontein Road Intersection ..... 37
7.2.8 Old Pretoria Road/Dale Road/Kerk Street Intersection ..... 41
7.2.9 Olifantsfontein Road (R562)/ K109 (Intersection A). ..... 44
7.2.10 Access Road/K109 (Intersection B) ..... 45
7.2.11 Access Road/K109 (Intersection C) ..... 46
8 ROAD AND INTERSECTION UPGRADES ..... 47
8.1 GENERAL ..... 47
9 NON-MOTORISED AND PUBLIC TRANSPORT ..... 49
9.1 BACKGROUND ..... 49
9.2 EXISTING PUBLIC TRANSPORT SERVICES AND FACILITIES ..... 49
MINIBUS TAXIS ..... 49
PUBLIC TRANSPORT LAY-BYS ..... 49
9.3 PROPOSED / NEW FACILITIES ..... 49
PUBLIC TRANSPORT LAY-BYS ..... 49
PAVED SIDEWALKS ..... 49
10 CONCLUSIONS AND RECOMMENDATIONS ..... 50
11 REFERENCES ..... 52

## LIST OF ABBREVIATIONS

GDRT Gauteng Provincial Department of Roads and Transport
EM M Ekurhuleni M etropolitan M unicipality
COTO Committee of Transport Officials
GLA Gross Leasable Area
LOS Level of Service
LVO Low Vehicle Ownership
MUD Mixed Use Development
SDP Site Development Plan
SEC Seconds
SIDRA Micro-analytical traffic evaluation
TM H Technical M ethods for Highways
V/C Volume/Capacity ratio
VPH Vehicles per hour
VLVO Very Low Vehicle Ownership

## LIST OF FIGURES

FIGURE 1: LOCALITY PLAN
FIGURE 2: SITE AERIAL VIEW \& KEY PLAN
FIGURE 3: EXISTING 2015 PEAK HOUR TRAFFIC VOLUMES
FIGURE 4a: LATENT DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES - CLAYVILLE EXTENSIONS 52 \& 66
FIGURE 4b: LATENT DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES - TEMBISA EXTENSION 25

FIGURE 4c: LATENT DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES - REMAINDER OF PORTION 122 OLIFANTSFONTEIN

FIGURE 4d: LATENT DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES - STERKFONTEIN X12
FIGURE 4e: LATENT DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES - CLAYVILLE EXTENSION 45

FIGURE 4f: TOTAL LATENT DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES
FIGURE 5: 2020 BACKGROUND PEAK HOUR TRAFFIC VOLUMES
FIGURE 6: 2020 BACKGROUND PLUS TOTAL LATENT DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES
FIGURE 7: EXPECTED TRIP DISTRIBUTION FOR THE PROPOSED DEVELOPMENT
FIGURE 8: DEVELOPMENT GENERATED PEAK HOUR TRAFFIC VOLUMES
FIGURE 9: 2020 BACKGROUND PLUS TOTAL LATENT DEVELOPMENT PLUS DEVELOPMENT GENERATED PEAK HOUR TRAFFIC VOLUMES

## LIST OF APPENDICES

APPENDIX A-1 SITE DEVELOPMENT PLAN \& SCHEDULE OF RIGHTS TABLES
APPENDIX A-2 ROAD NETWORK PLANNING \& GAUTENG STRATEGIC NETWORK PLAN
APPENDIX A-3 DRAWINGS: INTERSECTION LAYOUTS
APPENDIX A-4 TRIP GENERATION CALCULATIONS
APPENDIX A-1 SITE DEVELOPMENT PLAN \& SCHEDULE OF RIGHTS TABLES
APPENDIX A- 2 ROAD NETWORK PLANNING \& GAUTENG STRATEGIC NETWORK PLAN
APPENDIX A-3 DRAWINGS: INTERSECTION LAYOUTS
APPENDIX A-4 TRIP GENERATION CALCULATIONS

## INTRODUCTION

### 1.1 BACKGROUND

WSP Group Africa (Pty) Ltd. (WSP) has been appointed by Valumax Midrand (Pty) Ltd to undertake a Traffic Impact Assessment for the proposed township developments known as Clayville Extensions 50 and 71. Clayville Extension 50 will be situated on the Remainder of Portion 183 and Portions 30 and 31 of the farm Olifantsfontein 410 JR. Clayville Extension 71 will be situated on Portion 207 (a Portion of Portion 183) of the farm Olifantsfontein 410 JR.

The proposed township developments are bounded by the farm Olifantsfontein 410 JR to the north, Dale Road to the south Clayville Extension 45 Township to the east and Glen Austin Agricultural Holdings to the west. The proposed township developments are within Region B of the northern planning region of the Ekurhuleni Metropolitan Municipality (EMM).

The site is currently undeveloped. The proposed township locality and the surrounding road network are indicated on Figures 1 and 2. The purpose of this traffic impact assessment is to illustrate the proposed developments impact on the surrounding road network and possible mitigation of the anticipated traffic impact. This report also comments on the proposed site accesses and non-motorised and public transport aspects.

Clayville Extensions 50 and 71 together with Clayville Extension 45 form the Clayville/Tembisa Mega Housing Development as announced by the Premier and MEC of Human Settlements and it will assist government to alleviate the critical housing shortage in the Tembisa area in EMM. The funding for the road network and intersection upgrades will be provided by EMM.

### 1.2 EXTENT OF THE DEVELOPMENT

According to the information provided by the town planner, Clayville Extensions 50 and 71 will comprise of the following land-uses and development extents as shown on Table 1. The trips generated and anticipated by the proposed filling station (4\% to 6\%) are already included in the traffic generated by the residential and business nodes. The trips generated from the proposed crèche/church and clinic/library nodes fall outside the AM and PM peak hours, therefore they have not been included in this traffic assessment. The site development plan and the schedule of rights are contained in Appendix A-1.

Table 1a: Development Extent for Clayville Extension 50

| ZONING | EXTENT |
| :--- | :--- |
| Residential 1 | 595 units |
| Residential 2 | 1683 units |
| Residential 4 | 2833 units |
| Business 2 | 1.63 hectares |
| Business 3 | 2.56 hectares |
| Community Facility (Secondary School) | 1200 students |
| Community Facility (Creche/Church) | 3 stands |
| Social Services (Clinic/Library) | 3 stands |

Table 1b: Development Extent for Clayville Extension 71

| ZONING | EXTENT |
| :--- | :--- |
| Residential 2 | 2220 units |
| Residential 4 | 3814 units |
| Business 2 | 4.33 hectares |
| Community Facility (Primary School) | 1200 students |
| Public Garage (Filling Station) | 1 stand |
| Community Facility (Creche/Church) | 7 stands |
| Social Services (Clinic/Library) | 2 stands |

### 1.3 PHASING OF THE DEVELOPMENT

This report presents the traffic impact assessment for the ultimate township establishment of Clayville Extensions 50 and 71. Clayville Extension 50 will not be phased and will only be developed after the development Clayville Extension 71.

Clayville Extension 71 will be phased as follows:

- Phase 1: 749 units (434 residential 2 and 315 residential 4)
- Phase 2: 1295 units (523 residential 2 and 772 residential 4)
- Phase 3: 742 units (480 residential 2 and 262 residential 4)
- Phase 4: 1186 units (274 residential 2 and 912 residential 4) and a public primary school
- $\quad$ Phase 5: 1054 units (257 residential 2 and 797 residential 4)
- Phase 6: 1008 units (252 residential 2 and 756 residential 4) and shopping centre (business 2)


### 1.4 APPROVAL OF SUBMISSION

This traffic impact assessment report will be subject approval by the relevant roads authorities listed below:
$\rightarrow$ Gauteng Provincial Department of Roads and Transport (GDRT)
$\rightarrow$ Ekurhuleni Metropolitan Municipality (EMM)

## 2

## DATA COLLECTION

### 2.1 SITE VISIT

During February 2015 a site visit was undertaken for this study and the following was confirmed:
$\rightarrow$ Layouts of intersections considered in the study
$\rightarrow$ Appropriateness of recommended site access
$\rightarrow$ Intersection control for relevant intersections
$\rightarrow$ Presence of existing public transport and non-motorised transport facilities

### 2.2 TRAFFIC COUNT DATA

Traffic counts were used to estimate the traffic demand and traffic volumes for the proposed development. A traffic count was commissioned by WSP on Thursday $5^{\text {th }}$ February 2015 at the following intersections:
$\rightarrow$ Olifantsfontein Road (R562)/Olifantsfontein Road
$\rightarrow$ Olifantsfontein Road (R562)/Main Road (Future K111)
$\rightarrow$ Main Road (Future K111)/Thabana Ntlenyana Drive
$\rightarrow$ Main Road (Future K111)/Riverside Street
$\rightarrow$ Main Road (Future K111)/Karee Street
$\rightarrow$ Dale Road/Archerfish Drive
$\rightarrow$ Dale Road/Modderfontein Road
$\rightarrow$ Dale Road/Old Pretoria Road
The existing 2015 peak hour traffic volumes are presented in Figure 3.

### 2.3 LATENT DEVELOPMENTS

Several latent developments are situated within the study area (refer to Figures 4a, 4b, 4c, 4d, $\mathbf{4 e}$ and $\mathbf{4 f}$ ). The following developments were considered as latent developments in this study:

## CLAVILLE EXTENSIONS 52 \& 66

A traffic study for the proposed development known as Clayville Extensions 52 \& 66 was undertaken by E.D.S Transportation Engineers. The development is for the following rights:
$\rightarrow 85000 \mathrm{~m}^{2}$ GLA of Shopping Centre;
$\rightarrow 34000 \mathrm{~m}^{2}$ GLA of Offices;
$\rightarrow 11000 \mathrm{~m}^{2}$ GLA of Motor Dealership
The latent development is expected to fully realise by the year 2020 and the latent trips were taken into consideration in this traffic study.

## TEMBISA EXTENSION 25

A traffic study for the proposed development known as Tembisa Extension 25 was undertaken by GIBB Consulting Engineers. The development is for the following rights:
$\rightarrow 1555$ Residential Units with subservient land uses
The latent development is expected to fully realise by the year 2025. For this traffic study, it has been assumed that $50 \%$ of the latent trips of Tembisa Extension 25 will be on the road network by the year 2020.

## REMAINDER OF PORTION 122 OF THE FARM OLIFONSTFONTEIN 402-JR

A traffic study for the proposed industrial development on Remainder of Portion 122 of the farm Olifantsfontein 402-JR was undertaken by E.D.S Transportation Engineers. The development is for the following rights:
$\rightarrow 43385 m^{2}$ GLA of Industrial Development
The latent development is expected to fully realise by the year 2018 and the latent trips were taken into consideration in this traffic study.

## STERKFONTEIN EXTENSION 12

A traffic study for the proposed development known as Sterkfontein Extension 12 was undertaken by E.D.S Transportation Engineers. The development is for the following rights:
$\rightarrow 349622 \mathrm{~m}^{2}$ GLA of Warehousing and Distribution Centre
The latent development is expected to fully realise by the year 2024. For this traffic study, it has been assumed that $60 \%$ of the latent trips of Sterkfontein Extension 12 will be on the road network by the year 2020.

## CLAYVILLE EXTENSION 45

A traffic study for the proposed development known as Clayville Extension 45 was undertaken by WSP Traffic and Transportation Engineers. The development is for the following rights:

```
->4763m}\mp@subsup{}{}{2}\mathrm{ GLA of Shopping Centre
-> 389 Residential Units (single dwelling units)
->440 Residential Units (apartments and flats)
-1 Public Primary School (1200 students)
->1 Public Secondary School (1200 students)
```

The latent development is expected to fully realise by the year 2020 and the latent trips were taken into consideration in this traffic study.

## SURROUNDING ROAD NETWORK \& STUDY AREA

### 3.1 ROAD NETWORK \& MASTER PLANNING

## MUNICIPAL PLANNING

The local roads will include proposed accesses from the provincial roads through the proposed development. The road network planning is contained in Appendix A-2.

## PROVINCIAL AND NATIONAL PLANNING

- Planned K111: Provincial dual carriageway road, K111 is planned on the existing Main Road alignment. The existing Main Road is currently operating at capacity. Therefore the planned K111 road will mitigate capacity constraints in the future.
- Planned K109: Provincial dual carriageway road, K109 is planned adjacent to the proposed development. The planned K109 will run in a north south direction and will connect Olifantsfontein Road (R562) to Dale Road/Archerfish Road. Two access points will be provided off the K109 to the proposed development.
- Planned PWV5: Provincial Class 1 freeway which is planned to run in the east west direction passing the north of the proposed Clayville Extension 50 township.

The 2010 Gauteng Major Road Network is contained in Appendix A-2.

### 3.2 SURROUNDING ROAD NETWORK

The following roads in the vicinity of the proposed development are regarded as relevant to this study and are discussed in detail below:
$\rightarrow$ Olifantsfontein Road (R562): This is a Class 2 dual carriageway road located to the north of the site which provides a link between the R101 and the R21 national freeway.
$\rightarrow$ Olifantsfontein Road: This is a Class 2 single carriageway road located to the north of the site which provides a link between the R101 and the R562.
$\rightarrow$ Main Road (Future K111): This is a Class 3 single carriageway road which runs in a north south direction pass the east boundary of the site.
$\rightarrow$ Dale Road: This is a Class 3 road located to the west of the site; this road follows a north south west alignment.
$\rightarrow$ Allan Road/Modderfontein Road: This is a Class 3 road located to the west of the site; this road follows a north - south east alignment.

### 3.3 DETERMINATION OF THE STUDY AREA

In determining the site area TMH 16 volume 1 recommends the following:
$\rightarrow$ "Class 4 and 5 roads in the vicinity of the development up to the first Class 1 to 3 roads that can be reached by the Class 4 and 5 road network from the development, up to and including the first connection(s) on the Class 1 to 3 roads.
$\rightarrow$ The elements shall be restricted to those within a maximum distance of 1.5 km from the accesses to the site, measured along the shortest routes to the accesses, provided that there is at least one intersection within this distance. Where there is no such intersection, the distance will be extended to include at least one intersection."

TMH 16 also states that judgement should be used in selecting the intersections considered and therefore specific elements like extent of the development were also considered. A larger development will by its nature require a wider study area to be considered while for a smaller development the opposite will be true.

## 4

## SITE ACCESS

## 4.1 <br> SITE ACCESS

It is proposed that the development be served by two primary accesses off the planned future K109 route. The secondary access to the proposed development is off Main Road (planned future K111 route) and Thabana Ntlenyana Drive. Furthermore a future access is planned 500 m north from the K111/Thabana Ntlenyana Drive intersection. The proposed access positions are shown on drawing SKC001 and SKC002 contained in Appendix A-2.

## 5 <br> EXISTING TRAFFIC VOLUMES

### 5.1 GENERAL

From the traffic count a common peak hour was determined (the busiest hour) for each counted period and was found to be:

$$
\begin{array}{ll}
\rightarrow \text { Weekday AM peak hour } & 06: 45-07: 45 \\
\rightarrow \text { Weekday PM peak hour } & 16: 30-17: 30
\end{array}
$$

The existing 2015 peak hour traffic volumes are shown on Figure 3. The following subheadings provide a brief overview of the existing intersections.

### 5.2 OLIFANTSFONTEIN ROAD (R562)/OLIFANTSFONTEIN ROAD INTERSECTION

This intersection is currently an all-way stop control and has an overall LOS F during the AM and PM peak hour s. Long queues and high levels of delay have been obs erved on site on the west and east appr oaches during both peak hours. Traffic counts ha ve rev ealed that Olif antsfontein Road (R562) has in the order of 2460 vph and 2800 vph duri ng the AM and PM peak hour s respectively (in and out bound). Therefore Olifantsfontein Road (R562) has approximately 50\% of capacity available.

### 5.3 OLIFANTSFONTEIN ROAD (R562)/MAIN ROAD (FUTURE K111) INTERSECTION

This intersection is signalised and has an o verall LOS F and LO S B during the AM and PM peak hours re spectively. Long queues and high levels of delay have been observ ed on sit e on the south and west appr oaches during the A M peak hour. Traff ic counts have re vealed that Mai $n$ Road has in the order of 1560 vph and 1160 vph during the AM and PM peak hours respectively (in and outbound). Therefore Main Road is currently operating at capacity.

### 5.4 MAIN ROAD (FUTURE K111)/THABANA NTLENYANA DRIVE INTERSECTION

This int ersection is currentl y a tw o-way stop c ontrol and has the worst LOS F f or the west approach, right turn movement for both the AM and PM peak hours. The west approach, left turn movement has a LOS B and all other movements have LOS A during both the AM and PM peak hours. Long queues and high levels of delay have been observed on site on the west approach during bot h peak hour s . Thabana Nt lenyana Driv e p rovides access to Cl ayville Extension 45. Traffic from Kaalfontein (township south of Clayville Extension 45) has been ob served using this road for access via Main Road.

### 5.5 MAIN ROAD (FUTURE K111)/RIVERSIDE STREET INTERSECTION

This intersection is currently at wo-way stop cont rol and has the worst LOSFf ort he east approach during both the AM and PM peak hours. All other approaches have LOS A, LO S B or LOS D for the AM and PM peak hours. Long queues and high levels of delay have been observed on site on the west approach during both peak hours.
Traffic from Iv ory Park and Tembisa Township has been ob served using Riverside Street $f$ or access via Main Road.

### 5.6 MAIN ROAD (FUTURE K111)/KAREE STREET INTERSECTION

This intersection is signalised and has an overall LOS F during the AM and PM peak hours. Long queues and high l evels of delay ha ve been obs erved on site on the nor th, west and e ast approaches during both peak hours.
Traffic from Iv ory Park and Tembisa Township has been ob served using Riverside Street $f$ or access via Main Road.

### 5.7 DALE ROAD/ARCHERFISH DRIVE INTERSECTION

This intersection is currently at wo-way stop cont rol and has the worst LOSFf ort he eas t approach during the PM peak hour. Long queues and high levels of delay have been observed on site on the east approach during the PM peak hour. Traffic counts have revealed that Dale Road has in the order of 1470vph and 1195vph during the AM and PM peak hours respectively (in and outbound). Therefore Dale Road is currently operating close to capacity.

### 5.8 DALE ROAD/MODDERFONTEIN ROAD INTERSECTION

This intersection is signalised and has an overall LOS F and LOS C during the AM and PM peak hours respectively. Long queues and high levels of delay have been observed on site on the north and west approaches during the AM peak hour.

## 5.9 <br> DALE ROAD/OLD PRETORIA ROAD INTERSECTION

This intersection is signalised and has an ov erall LOS B during both the AM and PM peak hours. Site observations confirm that queuing and delays related to normal traffic conditions are nominal.

DEVELOPMENT TRIP GENERATION AND TRAFFIC VOLUME SCENARIOS

### 6.1 ADJUSTMENT FACTORS

Various trip adjustment factors have been introduced into the COTO document to allow for trip reductions. These adjustment factors are discussed briefly below.

## MIXED USE DEVELOPMENTS (MUD)

According to the COTO manual "mixed use developments are defined as developments in an area that consist of two or more single-use developments between which trips can be made by means of non-motorised modes of transport (such as walking). This has the net effect of reducing the vehicle trip generation in the area."

Since this development will consist of a mixed land use, the reduction factors which have been applied are listed in Table 2 below. Note, $\mathbf{P}_{\mathbf{m}}=$ Reduction factor for mixed-use development.

## LOW VEHICLE OWNERSHIP (LVO) \& VERY LOW VEHICLE OWNERSHIP (VLVO)

According to COTO "the vehicle ownership in areas with high levels of vehicle ownership varies between one or two per household. In areas with a low level of vehicle ownership, the majority of households (more than 50\%) does not own a vehicle and relies on public transport for transportation. In areas with very low level of vehicle ownership, nearly all households (more than $90 \%$ ) do not own a vehicle and rely on public transportation."

This study considered low to very low vehicle ownership and the reduction factors which have been applied are listed in Table $\mathbf{2}$ below. Note, $\mathbf{P}_{\mathbf{v}}=$ Reduction factor for vehicle ownership.

## TRANSIT NODE OR CORRIDORS

According to COTO "the transit reduction factors are applicable to developments that are located within a reasonable walking distance from a major transit node or stops on a major transit corridor."

This study considered transit nodes and a $15 \%$ reduction factor has been applied for all land uses as recommended in the COTO manual. See Table $\mathbf{2}$ below. Note, $\mathbf{P}_{\mathbf{t}}=$ Reduction factor for transit nodes or corridors.

Table 2: Adjustment Factors Applied for Trip Reductions

| TRIP CODE | $\mathbf{P}_{\mathbf{M}}$ | $\mathbf{P}_{\mathbf{V}}$ | $\mathbf{P}_{\mathbf{T}}$ |
| :--- | :---: | :---: | :---: |
| Shopping Centre | $10 \%$ | $40 \%$ | $15 \%$ |
| Residential 1 (single dwelling units) | $0 \%$ | $30 \%$ | $15 \%$ |
| Residential 2 (single dwelling units) | $0 \%$ | $40 \%$ | $15 \%$ |
| Apartments \& Flats | $0 \%$ | $50 \%$ | $15 \%$ |
| Offices | $5 \%$ | $40 \%$ | $15 \%$ |
| Public Primary School | $0 \%$ | $60 \%$ | $15 \%$ |
| Public Secondary School | $0 \%$ | $60 \%$ | $15 \%$ |

### 6.2 TRIP SUMMARY

The detailed trip generation calculations are included in Appendix C-1. Using the COTO document the expected peak hour trip generation for the proposed development was calculated and indicated in Table 3 below.

Table 3: Development Generated Trips (Clayville Extensions 50 and 71)

| $\begin{gathered} \text { TMH } 17 \\ \text { CODE } \end{gathered}$ | LAND USE | EXTENT | AM PEAK |  |  | PM PEAK |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | In | Out | Total | In | Out | Total |
| 820 | Shopping Centre | $\begin{gathered} 16300 \mathrm{~m}^{2} \\ \text { GLA } \end{gathered}$ | 60 | 32 | 93 | 262 | 262 | 524 |
| 820 | Shopping Centre | $\begin{gathered} 43300 \mathrm{~m}^{2} \\ \text { GLA } \end{gathered}$ | 112 | 60 | 173 | 489 | 489 | 979 |
| 210 | Res 1 Single Dwelling Units | 595 Units | 89 | 266 | 354 | 248 | 106 | 354 |
| 231 | Res 2 Single Dwelling Units | 3903 Units | 423 | 1269 | 1692 | 1184 | 508 | 1692 |
| 220 | Apartments and Flats | 6647 Units | 459 | 1377 | 1836 | 1285 | 551 | 1836 |
| 520 | Public Primary School | $\begin{gathered} 1200 \\ \text { Students } \end{gathered}$ | 173 | 173 | 347 | 61 | 61 | 122 |
| 530 | Public Secondary School | $\begin{gathered} 1200 \\ \text { Students } \end{gathered}$ | 153 | 153 | 306 | 51 | 51 | 102 |
|  | TOTAL TRIPS |  | 1691 | $\underline{3370}$ | $\underline{5061}$ | $\underline{3634}$ | $\underline{\underline{2237}}$ | $\underline{5870}$ |

The TMH 16 Volume 1 document requires that a traffic impact assessment be done for developments which generate more than 50 peak hour trips.

### 6.3 GROWTH RATE

TMH 16 Volume 1 requires that a five year horizon be considered for developments that generate more than 50 trips. TMH 17 recommends growth rates for developments as shown in Table 4

Table 4: Typical Traffic Growth Rates
DEVELOPMENT AREA
GROWTH RATES

| Low growth areas | $0-3 \%$ |
| :--- | :---: |
| Average growth areas | $3-4 \%$ |
| Above average growth areas | $4-6 \%$ |
| Fast growing areas | $6-8 \%$ |
| Exceptionally high growth areas | $>8 \%$ |

A growth rate of $3 \%$ was considered appropriate for this study

### 6.4 TRAFFIC VOLUME SCENARIOS

The existing 2015 peak hour traffic volumes (see Figure 3) were thus subjected to a 3\% growth rate over five years; this is in line with an above average growth rate as given in Table 4 above. The 2020 bac kground peak hour $t$ raffic volumes are presented on Figure 5. The 2020 background plus total latent rights peak hour traffic volumes are presented on Figure 6.

### 6.5 TRIP DISTRIBUTION AND ASSIGNMENT

Assumptions with respect to the expected trip distribution were based on the location of the site access in relation to the surrounding road network; the existing traffic volumes, travel patterns as well as the land use nature of the proposed development.

The ex pected trip di stribution and dev elopment gener ated tr affic of the propo sed development can be seen on Figure 7 and Figure 8 respectively. The 2020 background plus total latent rights plus development generated peak hour traffic volumes are presented on Figure 9.

## 7

## TRAFFIC IMPACT AND CAPACITY

 ANALYSIS
### 7.1 SCENARIOS ANALYSED

The AM and PM peak hour trip generation of the development was analysed. The critical peak hour analysis was considered for the following scenarios:
$\rightarrow$ Scenario 1: 2020 background plus latent rights peak hour traffic volumes
$\rightarrow$ Scenario 2: 2020 background plus latent rights plus development generated peak hour traffic volumes
$\rightarrow$ Scenario 3: 2020 background plus latent rights plus development generated peak hour traffic volumes (with upgrades)

This is in line with TMH16 document requirement for scenarios to be considered in a traffic impact assessment.

### 7.2 CAPACITY ANALYSIS

### 7.2.1 Olifantsfontein Road (R562)/Olifantsfontein Road Intersection

## Scenario 1: 2020 Background plus Latent Rights Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will further perform at a worse level of service wit h i ncreased queui ng and del ays. The summ ary of the SI DRA int ersection results are contained in Table 5a.

Table 5a: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562) \& Olifantsfontein Road Intersection, Scenario 1
CONTROL: STOP (ALL-WAY)

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 1.202 | 267.5 | F | 2.571 | 1471.7 | F |
|  | THROUGH | 1.202 | 268.1 | F | 2.571 | 1472.3 | F |
|  | RIGHT | 1.202 | 267.7 | F | 2.571 | 1471.9 | F |
|  | APPROACH | 1.202 | 267.7 | F | 2.571 | 1471.9 | F |
| $\begin{aligned} & \text { 号 } \\ & 0 \\ & 0 \\ & 5 \\ & 5 \\ & \stackrel{\sim}{3} \end{aligned}$ | LEFT |  | 822.8 | F | 1.420 | 436.0 | F |
|  |  | 1.868 |  |  |  |  |  |
|  | THROUGH | 2.541 | 1421.1 | F | 3.357 | 2153.6 | F |
|  | RIGHT | 2.541 | 1422.3 | F | 3.357 | 2154.7 | F |
|  | APPROACH | 2.541 | 1265.3 | F | 3.357 | 1864.2 | F |
| 0 <br>  <br> 0 <br> 0 <br> I <br>  <br> 0 <br> 0 | LEFT | 0.001 | 8.1 | A | 0.000 | 8.1 | A |
|  | THROUGH | 0.001 | 8.7 | A | 0.000 | 8.7 | A |
|  | RIGHT | 0.001 | 8.2 | A | 0.000 | 8.2 | A |
|  | APPROACH | 0.001 | 8.3 | A | 0.000 | 8.4 | A |
|  | LEFT | 2.415 | 1304.7 | F | 2.786 | 1638.8 | F |
|  | THROUGH | 2.415 | 1305.2 | F | 2.786 | 1639.3 | F |
|  | RIGHT | 1.021 | 130.3 | F | 1.120 | 196.3 | F |
|  | APPROACH | 2.415 | 1107.7 | F | 2.786 | 1407.1 | F |
| ALL VEHICLES |  | 2.541 | 1113.1 | F | 3.357 | 1626.5 | F |

Scenario 2: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

It is evident that the proposed development generated trips added onto the congested intersection will cause $f$ urther queui ng and del ays unl ess upgrad es are undert aken. The summ ary of the SIDRA intersection results are contained in Table 5b.

Table 5b: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562) \& Olifantsfontein Road Intersection, Scenario 2

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 1.265 | 319.8 | F | 2.803 | 1683.3 | F |
|  | THROUGH | 1.256 | 230.4 | F | 2.803 | 1683.9 | F |
|  | RIGHT | 1.265 | 319.9 | F | 2.803 | 1683.4 | F |
|  | APPROACH | 1.265 | 319.9 | F | 2.803 | 1683.4 | F |
| 号0055$\stackrel{1}{3}$ | LEFT | 1.843 | 800.3 | F | 1.376 | 398.0 | F |
|  | THROUGH | 2.852 | 1698.8 | F | 4.033 | 2759.5 | F |
|  | RIGHT | 2.852 | 1700.0 | F | 4.033 | 2760.5 | F |
|  | APPROACH | 2.852 | 1486.6 | F | 4.033 | 2427.2 | F |
| $\begin{aligned} & 0 \\ & Z \\ & 0 \\ & 0 \\ & \text { M } \\ & 5 \\ & 0 \\ & 0 \end{aligned}$ | LEFT | 0.001 | 8.1 | A | 0.000 | 8.1 | A |
|  | THROUGH | 0.001 | 8.7 | A | 0.000 | 8.7 | A |
|  | RIGHT | 0.001 | 8.2 | A | 0.000 | 8.2 | A |
|  | APPROACH | 0.001 | 8.3 | A | 0.000 | 8.4 | A |
|  | LEFT | 3.005 | 1833.0 | F | 3.221 | 2028.6 | F |
|  | THROUGH | 3.005 | 1833.4 | F | 3.211 | 2029.1 | F |
|  | RIGHT | 1.006 | 121.9 | F | 1.116 | 193.2 | F |
|  | APPROACH | 3.005 | 1596.6 | F | 3.221 | 1768.7 | F |
| ALL VEHICLES |  | 3.005 | 3.005 | F | 4.033 | 2079.3 | F |

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes (with upgrades)

Intersection upgrades ha ve been conduc ted in $t$ his s cenario and $t$ he SI DRA analy sis res ults indicate that the intersection is expected to perform at an overall LOS B and LOS C during the AM and PM peak hours respectively.

The upgrades required at this intersection are as follows:

- The intersection is required to be signalised
- A dedicated right turn lane is required on the south approach
- A dedicated right turn lane $(60 \mathrm{~m})$ is required on the south approach
- A shared through and left turn lane $(30 \mathrm{~m})$ is required on the south approach
- An additional exit lane $(60 \mathrm{~m})$ is required on the south approach
- A slip lane $(60 \mathrm{~m})$ is required on the east approach
- A dedicated right turn lane $(30 \mathrm{~m})$ is required on the east approach
- An additional right turn lane $(60 \mathrm{~m})$ is required on the west approach

The s ummary of the SI DRA analy sis results for $t$ he upgraded $i$ ntersection are $c$ ontained in Table 5c. Refer to drawing SKC010 contained in Appendix A-3.

Table 5c: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562) \& Olifantsfontein Road Intersection, Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS |
| $\begin{aligned} & \text { O} \\ & Z \\ & 0 \\ & 0 \\ & I \\ & 1 \\ & 0 \\ & O \end{aligned}$ | LEFT | 0.032 | 36.3 | D | 0.008 | 47.7 | D |
|  | THROUGH | 0.032 | 30.7 | C | 0.008 | 42.2 | D |
|  | RIGHT | 0.682 | 41.0 | D | 0.925 | 74.7 | E |
|  | APPROACH | 0.682 | 40.8 | D | 0.925 | 74.6 | E |
|  | LEFT | 0.386 | 8.0 | A | 0.260 | 8.9 | A |
|  | THROUGH | 0.695 | 12.6 | B | 0.916 | 32.7 | C |
|  | RIGHT | 0.029 | 15.7 | B | 0.007 | 20.3 | C |
|  | APPROACH | 0.695 | 11.5 | B | 0.916 | 29.3 | C |
|  | LEFT | 0.026 | 36.2 | D | 0.008 | 47.7 | D |
|  | THROUGH | 0.026 | 30.7 | C | 0.008 | 42.2 | D |
|  | RIGHT | 0.005 | 35.7 | D | 0.004 | 47.7 | D |
|  | APPROACH | 0.026 | 34.3 | C | 0.008 | 45.9 | D |
|  | LEFT | 0.621 | 11.1 | B | 0.630 | 13.1 | B |
|  | THROUGH | 0.621 | 5.5 | A | 0.630 | 7.2 | A |
|  | RIGHT | 0.455 | 16.6 | B | 0.830 | 47.9 | D |
|  | APPROACH | 0.621 | 7.0 | A | 0.830 | 13.0 | B |
| ALL VEHICLES |  | 0.695 | 11.5 | B | 0.925 | 27.0 | C |

### 7.2.2 Olifantsfontein Road (R562)/Main Road (Future K111) Intersection

## Scenario 1: 2020 Background plus Latent Rights Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will further perform at a worse level of service wit h i ncreased queui ng and del ays. The summ ary of the SI DRA int ersection results are contained in Table 6a.

Table 6a: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562) \& Main Road (Future K111), Scenario 1
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 2.169 | 1100.7 | F | 1.500 | 498.0 | F |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 2.169 | 1100.3 | F | 1.500 | 497.7 | F |
|  | APPROACH | 2.169 | 1100.5 | F | 1.500 | 497.8 | F |
|  | LEFT | 1.095 | 129.4 | F | 0.617 | 22.1 | C |
|  | THROUGH | 0.471 | 5.8 | A | 0.590 | 5.1 | A |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 1.095 | 47.3 | D | 0.617 | 8.2 | A |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.380 | 5.3 | A | 0.571 | 5.0 | A |
|  | RIGHT | 2.354 | 1282.6 | F | 1.690 | 684.1 | F |
|  | APPROACH | 2.354 | 469.0 | F | 1.690 | 108.0 | F |
| ALL VE | CLES | 2.354 | 464.8 | F | 1.690 | 113.9 | F |

Scenario 2: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

It is evident that the proposed development generated trips added onto the congested intersection will cause $f$ urther queui ng and del ays unl ess upgrad es are undert aken. The summ ary of the SIDRA intersection results are contained in Table 6b.

Table 6b: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562) \& Main Road (Future K111), Scenario 2
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | PM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 2.558 | 1448.9 | F | 1.947 | 897.3 | F |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 2.558 | 1448.6 | F | 1.947 | 897.0 | F |
|  | APPROACH | 2.558 | 1448.7 | F | 1.947 | 897.1 | F |
| 号0055$\stackrel{1}{3}$ | LEFT | 1.107 | 138.3 | F | 0.712 | 17.9 | B |
|  | THROUGH | 0.550 | 6.2 | A | 0.737 | 6.0 | A |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 1.107 | 50.5 | D | 0.737 | 8.6 | A |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.527 | 6.0 | A | 0.664 | 5.4 | A |
|  | RIGHT | 2.768 | 1655.7 | F | 1.977 | 938.1 | F |
| APPRROACH |  | 2.768 | 492.6 | F | 1.977 | 131.0 | F |
| ALL VEHICLES |  | 2.768 | 563.8 | F | 1.977 | 171.7 | F |

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour

 Traffic Volumes (with upgrades)Intersection upgrades ha ve been conduc ted in $t$ his s cenario and $t$ he SI DRA analy sis res ults indicate that the intersection is expected to perform at and overall LOS C during both the AM and PM peak hours. The Main Road is planned to become the Future K111 route and the additional through lanes were taken into account in this analysis.

The upgrades required at this intersection are as follows:

- A slip lane $(70 \mathrm{~m})$ is required on the south approach
- An additional right turn lane on the south approach
- An additional exit lane on the south approach
- An additional right turn lane $(120 \mathrm{~m})$ is required on the west approach

The s ummary of the SI DRA analy sis results for $t$ he upgraded $i$ ntersection are $c$ ontained in Table 6c. Refer to drawing SKC011 contained in Appendix A-3.

Table 6c: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562) \& Main Road (Future K111), Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
| 0 <br> 1 <br> 0 <br> 0 <br> 1 <br> 1 <br> 0 <br> 0 <br> $\mathbf{O}$ | LEFT | 0.499 | 18.3 | B | 0.442 | 36.3 | D |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 0.942 | 59.3 | E | 0.870 | 63.1 | E |
|  | APPROACH | 0.942 | 45.8 | D | 0.870 | 54.1 | D |
|  | LEFT | 0.564 | 9.2 | A | 0.475 | 11.3 | B |
|  | THROUGH | 0.922 | 42.8 | D | 0.862 | 20.7 | C |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.922 | 31.6 | C | 0.862 | 18.7 | B |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.584 | 11.1 | B | 0.625 | 6.9 | A |
|  | RIGHT | 0.890 | 39.8 | D | 0.804 | 47.7 | D |
|  | APPROACH | 0.890 | 19.6 | B | 0.804 | 12.4 | B |
| ALL VEHICLES |  | 0.942 | 30.9 | C | 0.870 | 20.8 | C |

### 7.2.3 Main Road (Future K111)/Thabana Ntlenyana Drive Intersection

## Scenario 1: 2020 Background plus Latent Rights Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will further perform at a worse level of service wit hincreased queui ng and del ays. The summ ary of the SI DRA int ersection results are contained in Table 7a.

Table 7a: Summary of SIDRA Intersection Capacity Analysis Results
Main Road (Future K111)/Thabana Ntlenyana Drive, Scenario 1
CONTROL: STOP (TWO-WAY)

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 0.165 | 5.6 | A | 0.116 | 5.6 | A |
|  | THROUGH | 0.375 | 0.0 | A | 0.337 | 0.0 | A |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.375 | 1.6 | NA | 0.337 | 1.3 | NA |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.502 | 0.0 | A | 0.419 | 0.0 | A |
|  | RIGHT | 0.678 | 22.9 | C | 0.633 | 17.7 | C |
|  | APPROACH | 0.678 | 4.9 | NA | 0.633 | 5.0 | NA |
|  | LEFT | 1.484 | 464.3 | F | 1.170 | 185.4 | F |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 8.825 | 7104.5 | F | 5.246 | 3891.5 | F |
|  | APPROACH | 8.825 | 3804.3 | F | 5.246 | 1606.1 | F |
| ALL VEHICLES |  | 8.825 | 1219.7 | NA | 5.246 | 474.1 | NA |

Scenario 2: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

It is evident that the proposed development generated trips added onto the congested intersection will cause $f$ urther queui ng and del ays unl ess upgrad es are undert aken. The summ ary of the SIDRA intersection results are contained in Table 7b.

Table 7b: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562)/Thabana Ntlenyana Drive, Scenario 2

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS |
|  | LEFT | 0.269 | 5.6 | A | 0.340 | 5.6 | A |
| O | THROUGH | 0.375 | 0.0 | A | 0.337 | 0.0 | A |
| $\xrightarrow{\text { ¢ }}$ | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.375 | 2.2 | NA | 0.340 | 2.7 | NA |
|  | LEFT |  |  |  |  |  |  |
| O | THROUGH | 0.049 | 43.7 | E | 1.143 | 128.3 | F |
| O | RIGHT | 1.199 | 220.8 | F | 1.790 | 740.5 | F |
|  | APPROACH | 1.199 | 90.6 | NA | 1.790 | 363.7 | NA |
|  | LEFT | 2.295 | 1192.5 | F | 1.941 | 874.3 | F |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 14.737 | 12421.1 | F | 9.158 | 7403.8 | F |
| APPROACH |  | 14.737 | 7460.0 | F | 9.158 | 3931.2 | F |
| ALL VEHICLES |  | 14.737 | 2921.2 | NA | 9.158 | 1369.0 | NA |

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes (with upgrades)

Intersection upgrades ha ve been conduc ted in $t$ his s cenario and $t$ he SI DRA analy sis res ults indicate that the intersection is expected to perform at an overall LOS C and LOS B during the AM and PM peak hours respectively. The Main Road is planned to become the future K111 route and the additional through lanes were taken into account in this analysis.

The upgrades required at this intersection are as follows:

- The intersection is required to be signalised
- An additional through lane on the north and south approaches
- An additional exit lane on the north and south approaches
- Two dedicated right turn lanes on the west approach
- A slip lane $(100 \mathrm{~m})$ on the west approach
- An additional exit lane is required on the west approach

The s ummary of the SI DRA analy sis results for $t$ he upgraded $i$ ntersection are $c$ ontained in Table 7c. Refer to drawing SKC012 contained in Appendix A-3.

Table 7c: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562)/Thabana Ntlenyana Drive, Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS |
|  | LEFT | 0.427 | 8.7 | A | 0.623 | 11.3 | B |
|  | THROUGH | 0.804 | 28.2 | C | 0.778 | 27.8 | C |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.804 | 20.7 | C | 0.778 | 20.0 | C |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.502 | 10.9 | B | 0.350 | 6.5 | A |
|  | RIGHT | 0.837 | 34.7 | C | 0.820 | 29.7 | C |
|  | APPROACH | 0.837 | 17.2 | B | 0.820 | 15.5 | B |
|  | LEFT | 0.679 | 10.6 | B | 0.602 | 9.7 | A |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 0.863 | 36.3 | D | 0.804 | 35.8 | D |
|  | APPROACH | 0.863 | 24.9 | C | 0.804 | 21.9 | C |
| ALL VEHICLES |  | 0.863 | 21.2 | C | 0.820 | 19.0 | B |

### 7.2.4 Main Road (Future K111)/Riverside Street intersection

## Scenario 1: 2020 Background plus Latent Rights Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will further perform at a worse level of service wit h i ncreased queui ng and del ays. The summ ary of the SI DRA int ersection results are contained in Table 8a.

Table 8a: Summary of SIDRA Intersection Capacity Analysis Results
Main Road (Future K111) \& Riverside Street, Scenario 1
CONTROL: STOP (TWO-WAY)

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 1.431 | 387.7 | F | 0.215 | 0.0 | A |
|  | RIGHT | 2.510 | 1408.4 | F | 0.769 | 23.1 | c |
|  | APPROACH | 2.510 | 765.4 | NA | 0.769 | 10.6 | NA |
|  | LEFT | 9.649 | 7840.3 | F | 4.902 | 3539.3 | F |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 9.649 | 7843.9 | F | 4.902 | 3598.0 | F |
|  | APPROACH | 9.649 | 7842.1 | F | 4.902 | 3574.7 | F |
|  | LEFT | 0.070 | 5.6 | A | 0.085 | 5.6 | A |
|  | THROUGH | 0.665 | 0.0 | A | 0.388 | 0.0 | A |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.665 | 0.6 | NA | 0.388 | 0.9 | NA |
| ALL VEHICLES |  | 9.649 | 2058.7 | NA | 4.902 | 756.8 | NA |

Scenario 2: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

It is evident that the proposed development generated trips added onto the congested intersection will cause $f$ urther queui ng and del ays unl ess upgrad es are undert aken. The summ ary of the SIDRA intersection results are contained in Table 8b.

Table 8b: Summary of SIDRA Intersection Capacity Analysis Results
Main Road (Future K111) \& Riverside Street, Scenario 2

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | PM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 2.918 | 1725.9 | F | 0.928 | 15.4 | C |
|  | RIGHT | 5.246 | 3894.9 | F | 1.238 | 253.8 | F |
|  | APPROACH | 5.246 | 2400.7 | NA | 1.238 | 90.5 | NA |
|  | LEFT | 11.754 | 9743.5 | F | 5.831 | 4379.5 | F |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 11.754 | 9730.6 | F | 5.831 | 4415.7 | F |
|  | APPROACH | 11.754 | 9736.8 | F | 5.831 | 4402.4 | F |
|  | LEFT | 0.092 | 5.6 | A | 0.099 | 5.6 | A |
|  | THROUGH | 0.831 | 0.0 | A | 0.498 | 0.0 | A |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.831 | 0.9 | NA | 0.498 | 0.9 | NA |
| ALL VEHICLES |  | 11.754 | 2677.9 | NA | 5.831 | 814.6 | NA |

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes (with upgrades)

Intersection upgrades ha ve been conduc ted in $t$ his s cenario and $t$ he SI DRA analy sis res ults indicate that the intersection is expected to perform at an overall LOS C and LOS B during the AM and PM peak hours respectively. Main Road is planned to become the future K111 route and the additional through lanes were taken into account in this analysis.

The upgrades required at this intersection are as follows:

- The intersection is required to be signalised
- An additional through lane on the north and south approaches
- An additional exit lane on the north and south approaches
- A dedicated full right turn lane is required on the east approach
- A dedicated right turn lane $(60 \mathrm{~m})$ is required on the east approach
- A dedicated slip lane $(60 \mathrm{~m})$ is required on the east approach
- An additional exit lane $(60 \mathrm{~m})$ is required on the east approach

The s ummary of the SI DRA analy sis results for $t$ he upgraded $i$ ntersection are contained in Table 8c. Refer to drawing SKC013 contained in Appendix A-3.

Table 8c: Summary of SIDRA Intersection Capacity Analysis Results
Main Road (Future K111) \& Riverside Street, Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.251 | 3.7 | A | 0.294 | 4.4 | A |
|  | RIGHT | 0.860 | 43.9 | D | 0.684 | 24.2 | C |
|  | APPROACH | 0.860 | 16.2 | B | 0.684 | 10.7 | B |
| 00001$\ldots$$\vdots$3 | LEFT | 0.519 | 16.6 | B | 0.203 | 9.4 | A |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 0.873 | 47.8 | D | 0.623 | 34.4 | C |
|  | APPROACH | 0.873 | 32.7 | C | 0.623 | 25.3 | C |
| $\begin{aligned} & \text { O} \\ & 0 \\ & \text { O} \\ & \text { O } \\ & \text { I } \\ & \text { O} \end{aligned}$ | LEFT | 0.188 | 16.6 | B | 0.270 | 20.2 | C |
|  | THROUGH | 0.856 | 24.4 | C | 0.679 | 18.0 | B |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.856 | 23.7 | C | 0.679 | 18.3 | B |
| ALL VEHICLES |  | 0.873 | 23.3 | C | 0.684 | 16.4 | B |

### 7.2.5 Main Road/Karee Street Intersection

## Scenario 1: 2020 Background plus Latent Rights Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will further perform at a worse level of service wit h i ncreased queui ng and del ays. The summ ary of the SI DRA int ersection results are contained in Table 9a.

Table 9a: Summary of SIDRA Intersection Capacity Analysis Results
Main Road \& Karee Street, Scenario 1
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
| $\begin{aligned} & \text { O} \\ & Z \\ & 0 \\ & 0 \\ & I \\ & \vdots \\ & 0 \\ & 0 \end{aligned}$ | LEFT | 0.657 | 23.1 | C | 0.974 | 64.1 | E |
|  | THROUGH | 0.657 | 17.5 | B | 1.860 | 58.8 | E |
|  | RIGHT | 1.459 | 488.3 | F | 1.860 | 827.3 | F |
|  | APPROACH | 1.459 | 107.5 | F | 1.860 | 213.5 | F |
| $\begin{aligned} & \text { 号 } \\ & 0 \\ & 0 \\ & \stackrel{0}{\infty} \\ & \stackrel{\omega}{3} \end{aligned}$ | LEFT | 1.533 | 544.9 | F | 2.034 | 984.9 | F |
|  | THROUGH | 1.533 | 539.3 | F | 2.034 | 979.4 | F |
|  | RIGHT | 1.533 | 544.9 | F | 2.034 | 984.9 | F |
|  | APPROACH | 1.533 | 542.8 | F | 2.034 | 983.2 | F |
| $\begin{aligned} & \text { O} \\ & \text { Z } \\ & \text { O} \\ & \text { m } \\ & \text { I } \\ & 0 \\ & 0 \end{aligned}$ | LEFT | 0.745 | 24.5 | C | 1.062 | 120.3 | F |
|  | THROUGH | 1.422 | 246.6 | F | 2.028 | 152.5 | F |
|  | RIGHT | 1.422 | 444.2 | F | 2.028 | 979.4 | F |
|  | APPROACH | 1.422 | 237.5 | F | 2.028 | 287.8 | F |
|  | LEFT | 1.510 | 525.2 | F | 0.938 | 53.9 | D |
|  | THROUGH | 1.510 | 519.7 | F | 0.938 | 48.4 | D |
|  | RIGHT | 1.510 | 525.2 | F | 0.938 | 53.9 | D |
|  | APPROACH | 1.510 | 523.4 | F | 0.938 | 51.4 | D |
| ALL VEHICLES |  | 1.533 | 311.7 | F | 2.034 | 345.1 | F |

Scenario 2: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

It is evident that the proposed development generated trips added onto the congested intersection will cause $f$ urther queui ng and del ays unl ess upgrad es are undert aken. The summ ary of the SIDRA intersection results are contained in Table 9b.

Table 9b: Summary of SIDRA Intersection Capacity Analysis Results
Main Road \& Karee Street, Scenario 2
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 0.766 | 21.7 | C | 1.254 | 275.0 | F |
|  | THROUGH | 0.766 | 16.2 | B | 2.394 | 382.9 | F |
|  | RIGHT | 1.686 | 679.3 | F | 2.394 | 1296.0 | F |
|  | APPROACH | 1.686 | 123.0 | F | 2.394 | 502.0 | F |
| 号00$\ldots$5$\stackrel{1}{3}$ | LEFT | 1.890 | 862.9 | F | 2.365 | 1278.0 | F |
|  | THROUGH | 1.890 | 587.3 | F | 2.365 | 1272.4 | F |
|  | RIGHT | 1.890 | 862.8 | F | 2.365 | 1277.9 | F |
|  | APPROACH | 1.890 | 860.9 | F | 2.365 | 1276.3 | F |
| $\begin{aligned} & 0 \\ & \text { O } \\ & 0 \\ & 0 \\ & \text { I } \\ & 5 \\ & 0 \\ & \hline \end{aligned}$ | LEFT | 1.012 | 99.0 | F | 1.207 | 234.1 | F |
|  | THROUGH | 1.933 | 589.8 | F | 2.304 | 373.2 | F |
|  | RIGHT | 1.933 | 900.8 | F | 2.304 | 1222.5 | F |
|  | APPROACH | 1.933 | 552.4 | F | 2.304 | 464.5 | F |
|  | LEFT | 1.562 | 566.1 | F | 0.952 | 54.7 | D |
|  | THROUGH | 1.562 | 560.6 | F | 0.952 | 49.1 | D |
|  | RIGHT | 1.562 | 566.1 | F | 0.952 | 54.7 | D |
|  | APPROACH | 1.562 | 564.3 | F | 0.952 | 52.2 | D |
| ALL VEHICLES |  | 1.933 | 503.5 | F | 2.394 | 544.3 | F |

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes (with upgrades)

Intersection upgrades ha ve been conduc ted in $t$ his s cenario and $t$ he SI DRA analy sis res ults indicate that the intersection is expected to perform at an ov erall LOS B during both the AM and PM peak hours.

The upgrades required at this intersection are as follows:

- A dedicated right turn lane $(100 \mathrm{~m})$ on the north and south approach
- An additional through lane (120m) on the north approach
- A slip lane $(100 m)$ on the north approach
- A slip lane (60m) on the west approach
- A slip lane (60m) on the east approach
- An additional exit lane (30m) on the east approach
- A dedicated right turn lane (30m) on the west and east approach

The s ummary of the SI DRA analy sis results for $t$ he upgraded $i$ ntersection are $c$ ontained in Table 9c. Refer to drawing SKC014 contained in Appendix A-3.

Table 9c: Summary of SIDRA Intersection Capacity Analysis Results
Main Road \& Karee Street, Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
| 0 <br>  <br> 0 <br> 0 <br> 0 <br> 1 <br> 1 <br> 0 <br> 0 <br> 0 | LEFT | 0.279 | 12.8 | B | 0.431 | 15.4 | B |
|  | THROUGH | 0.488 | 8.2 | A | 0.754 | 13.4 | B |
|  | RIGHT | 0.823 | 39.5 | D | 0.626 | 23.2 | C |
|  | APPROACH | 0.823 | 13.8 | B | 0.754 | 15.2 | B |
| $\begin{aligned} & \text { 号 } \\ & \text { O} \\ & \text { 号 } \\ & \stackrel{\omega}{3} \end{aligned}$ | LEFT | 0.393 | 12.2 | B | 0.216 | 8.1 | A |
|  | THROUGH | 0.512 | 21.7 | C | 0.334 | 18.1 | B |
|  | RIGHT | 0.822 | 38.5 | D | 0.908 | 46.4 | D |
|  | APPROACH | 0.822 | 24.2 | C | 0.908 | 26.8 | C |
|  | LEFT | 0.265 | 11.2 | B | 0.321 | 10.7 | B |
|  | THROUGH | 0.634 | 9.5 | A | 0.395 | 9.5 | A |
|  | RIGHT | 0.501 | 20.4 | C | 0.891 | 47.1 | D |
|  | APPROACH | 0.634 | 10.7 | B | 0.891 | 15.2 | B |
|  | LEFT | 0.303 | 9.8 | A | 0.418 | 14.5 | B |
|  | THROUGH | 0.434 | 21.2 | C | 0.490 | 19.1 | B |
|  | RIGHT | 0.800 | 38.1 | D | 0.304 | 27.0 | C |
|  | APPROACH | 0.800 | 22.5 | C | 0.490 | 18.7 | B |
| ALL VEHICLES |  | 0.823 | 15.4 | B | 0.908 | 17.7 | B |

### 7.2.6 Dale Road (Future K109)/Archerfish Drive Intersection

## Scenario 1: 2020 Background plus Latent Rights Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will further perform at a worse level of service wit h i ncreased queui ng and del ays. The summ ary of the SI DRA int ersection results are contained in Table 10a.

Table 10a: Summary of SIDRA Intersection Capacity Analysis Results
Dale Road (Future K109) \& Archerfish Drive, Scenario 1
CONTROL: STOP (TWO-WAY)

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
| LEFT |  |  |  |  |  |  |  |
| O | THROUGH | 0.906 | 15.8 | C | 0.923 | 18.5 | C |
| $\begin{aligned} & \mathrm{r} \\ & \mathrm{O} \end{aligned}$ | RIGHT | 0.906 | 21.5 | c | 0.923 | 24.0 | C |
|  | APPROACH | 0.906 | 20.1 | NA | 0.923 | 23.1 | NA |
|  | LEFT | 1.954 | 880.4 | F | 0.864 | 37.4 | E |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 1.954 | 1042.3 | F | 0.864 | 144.4 | F |
|  | APPROACH | 1.954 | 892.1 | F | 0.864 | 44.8 | E |
| $\begin{aligned} & \text { O} \\ & \text { O } \\ & 0 \\ & 0 \\ & \text { I } \\ & 5 \\ & 0 \\ & 0 \end{aligned}$ | LEFT | 0.250 | 5.6 | A | 0.263 | 5.6 | A |
|  | THROUGH | 0.250 | 0.0 | A | 0.263 | 0.0 | A |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.250 | 0.4 | NA | 0.263 | 0.7 | NA |
| ALL VEHICLES |  | 1.954 | 323.6 | NA | 0.923 | 20.7 | NA |

Scenario 2: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

It is evident that the proposed development generated trips added onto the congested intersection will cause $f$ urther queui ng and del ays unl ess upgrad es are undert aken. The summ ary of the SIDRA intersection results are contained in Table 10b.

Table 10b: Summary of SIDRA Intersection Capacity Analysis Results
Dale Road (Future K109) \& Archerfish Drive, Scenario 2


## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes (with upgrades)

Intersection upgrades ha ve been conduc ted in $t$ his s cenario and $t$ he SI DRA analy sis res ults indicate that the intersection is expected to perform at an overall LOS C and LOS B during the AM and PM peak hours respectively. The future K109 alignment is planned to run in a north to south direction passing the site. The K109 alignment will provide a link to Olifantsfontein Road (R562) in the north to K109/Dale road/Archerfish Intersection in the south. Therefore the additional through lanes were taken into account in this analysis.

The upgrades required at this intersection are as follows:

- The intersection is required to be signalised
- An additional through lane on the north and south approach
- An additional exit lane on the north and south approaches
- An additional exit lane (60m) on the north approach
- A dedicated left turn lane $(30 \mathrm{~m})$ on the north approach
- Two dedicated right turn lanes $(60 \mathrm{~m})$ on the south approach
- An additional exit lane ( 60 m ) on the south approach
- A continuous slip lane $(60 m)$ on the east approach
- An additional exit lane $(120 m)$ on the east approach

The summary of the SIDRA analysis results for the upgraded intersection are contained in Table 10c. Refer to drawing SKC015 contained in Appendix A-3.

Table 10c: Summary of SIDRA Intersection Capacity Analysis Results
Dale Road (Future K109) \& Archerfish Drive, Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.409 | 2.2 | A | 0.843 | 3.4 | A |
|  | RIGHT | 0.848 | 47.1 | D | 0.643 | 28.0 | C |
|  | APPROACH | 0.848 | 21.3 | C | 0.843 | 10.8 | B |
|  | LEFT | 0.398 | 5.7 | A | 0.167 | 5.6 | A |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 0.757 | 67.8 | E | 0.644 | 65.9 | E |
|  | APPROACH | 0.757 | 11.5 | B | 0.644 | 16.1 | B |
| $\begin{aligned} & \text { O} \\ & 工 \\ & 0 \\ & 0 \\ & \text { I } \\ & 5 \\ & 0 \\ & 0 \end{aligned}$ | LEFT | 0.070 | 17.5 | B | 0.097 | 23.1 | C |
|  | THROUGH | 0.863 | 27.1 | C | 0.775 | 26.1 | C |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.863 | 26.7 | C | 0.775 | 25.9 | C |
| ALL VEHICLES |  | 0.863 | 22.0 | C | 0.843 | 16.4 | B |

### 7.2.7 Dale Road/Modderfontein Road Intersection

## Scenario 1: 2020 Background plus Latent Rights Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will further perform at a worse level of service wit h i ncreased queui ng and del ays. The summ ary of the SI DRA int ersection results are contained in Table 11a

Table 11a: Summary of SIDRA Intersection Capacity Analysis Results
Dale Road \& Modderfontein Road, Scenario 1
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 0.419 | 14.7 | B | 0.141 | 10.8 | B |
|  | THROUGH | 0.593 | 13.0 | B | 0.912 | 34.3 | C |
|  | RIGHT | 1.205 | 229.6 | F | 1.500 | 496.4 | F |
|  | APPROACH | 1.205 | 58.8 | E | 1.500 | 171.9 | F |
| $\begin{aligned} & \text { O} \\ & 0 \\ & \text { O} \\ & 0 \\ & \leftarrow \\ & \stackrel{W}{3} \end{aligned}$ | LEFT | 1.145 | 179.5 | F | 0.868 | 33.2 | C |
|  | THROUGH | 1.145 | 174.0 | F | 0.868 | 27.6 | C |
|  | RIGHT | 1.253 | 272.5 | F | 1.253 | 273.2 | F |
|  | APPROACH | 1.253 | 193.9 | F | 1.253 | 84.7 | F |
| $\begin{aligned} & \text { O} \\ & 0 \\ & 0 \\ & \text { M } \\ & \text { I } \\ & 0 \\ & 0 \end{aligned}$ | LEFT | 0.350 | 10.2 | B | 0.336 | 10.9 | B |
|  | THROUGH | 1.394 | 394.0 | F | 0.771 | 19.6 | B |
|  | RIGHT | 0.940 | 54.4 | D | 1.461 | 462.1 | F |
|  | APPROACH | 1.394 | 253.0 | F | 1.461 | 138.3 | F |
|  | LEFT | 1.179 | 208.8 | F | 0.895 | 37.0 | D |
|  | THROUGH | 1.179 | 203.3 | F | 0.895 | 31.5 | C |
|  | RIGHT | 2.048 | 987.0 | F | 1.310 | 324.7 | F |
|  | APPROACH | 2.048 | 410.2 | F | 1.310 | 103.3 | F |
| ALL VEHICLES |  | 2.048 | 244.3 | F | 1.500 | 127.4 | F |

Scenario 2: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

It is evident that the proposed development generated trips added onto the congested intersection will cause $f$ urther queui ng and del ays unl ess upgrad es are undert aken. The summ ary of the SIDRA intersection results are contained in Table 11b.

Table 11b: Summary of SIDRA Intersection Capacity Analysis Results
Dale Road \& Modderfontein Drive, Scenario 2
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 0.459 | 19.4 | B | 0.239 | 19.2 | B |
|  | THROUGH | 0.986 | 61.4 | E | 1.666 | 641.9 | F |
|  | RIGHT | 1.341 | 351.4 | F | 2.393 | 1298.1 | F |
|  | APPROACH | 1.341 | 114.9 | F | 2.393 | 788.5 | F |
|  | LEFT | 2.160 | 1088.2 | F | 1.400 | 401.4 | F |
|  | THROUGH | 2.160 | 1082.7 | F | 1.400 | 395.9 | F |
|  | RIGHT | 1.791 | 755.6 | F | 1.703 | 676.1 | F |
|  | APPROACH | 2.160 | 1049.9 | F | 1.703 | 433.6 | F |
| $\begin{aligned} & \text { O} \\ & \text { 1 } \\ & 0 \\ & \infty \\ & \text { I } \\ & \hline 0 \\ & 0 \end{aligned}$ | LEFT | 0.626 | 21.3 | C | 0.805 | 32.0 | C |
|  | THROUGH | 2.058 | 990.9 | F | 1.683 | 652.7 | F |
|  | RIGHT | 1.967 | 915.0 | F | 2.514 | 1406.6 | F |
|  | APPROACH | 2.058 | 771.1 | F | 2.514 | 674.7 | F |
|  | LEFT | 1.529 | 518.6 | F | 1.824 | 783.2 | F |
|  | THROUGH | 1.529 | 513.1 | F | 1.824 | 777.6 | F |
|  | RIGHT | 2.048 | 987.0 | F | 1.502 | 495.5 | F |
|  | APPROACH | 2.048 | 590.6 | F | 1.824 | 753.1 | F |
| ALL VEHICLES |  | 2.160 | 744.7 | F | 2.514 | 653.4 | F |

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes (with upgrades)

Intersection upgrades ha ve been conduc ted in $t$ his s cenario and $t$ he SI DRA analy sis res ults indicate that the intersection is expected to perform at LOS C and LOS D during the AM and PM peak hours respectively.

The upgrades required at this intersection are as follows:

- An additional dedicated right turn lane $(90 \mathrm{~m})$ on the north approach
- An additional through lane (160m) on the north approach
- An additional exit lane $(200 \mathrm{~m})$ on the north approach
- An additional through lane (120m) on the south approach
- An additional dedicated right turn lane $(60 \mathrm{~m})$ on the south approach
- An additional exit lane (200m) on the south approach
- An additional exit lane (60m) on the south approach
- A slip lane (60m) on the east approach
- An additional through lane on the east approach
- An extension of the right turn lane on the east approach ( 80 m to 120 m )
- An additional exit lane on the east approach
- An additional dedicated right turn lane $(100 \mathrm{~m})$ on the west approach
- An additional through lane on the west approach
- A slip lane (160m) on the west approach
- An additional exit lane on the west approach

The summary of the SIDRA analysis results for the upgraded intersection are contained in
Table 11c. Refer to drawing SKC016 contained in Appendix A-3.

Table 11c: Summary of SIDRA Intersection Capacity Analysis Results
Dale Road \& Modderfontein Drive, Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 0.401 | 20.0 | C | 0.116 | 10.5 | B |
|  | THROUGH | 0.950 | 47.0 | D | 0.536 | 28.6 | C |
|  | RIGHT | 0.708 | 40.1 | D | 0.957 | 70.2 | E |
|  | APPROACH | 0.950 | 37.4 | D | 0.957 | 40.3 | D |
|  | LEFT | 0.196 | 5.7 | A | 0.170 | 5.6 | A |
|  | THROUGH | 0.942 | 38.5 | D | 0.499 | 9.8 | A |
|  | RIGHT | 0.901 | 48.6 | D | 0.927 | 43.2 | D |
|  | APPROACH | 0.942 | 34.3 | C | 0.927 | 13.4 | B |
| $\begin{aligned} & \text { O} \\ & \text { 1 } \\ & 0 \\ & 0 \\ & I \\ & 5 \\ & 0 \\ & 0 \end{aligned}$ | LEFT | 0.484 | 11.7 | B | 0.577 | 25.1 | C |
|  | THROUGH | 0.915 | 36.9 | D | 0.602 | 29.1 | C |
|  | RIGHT | 0.535 | 25.6 | C | 0.892 | 56.4 | E |
|  | APPROACH | 0.915 | 29.4 | C | 0.892 | 35.0 | D |
|  | LEFT | 0.406 | 12.6 | B | 0.237 | 9.6 | A |
|  | THROUGH | 0.535 | 11.1 | B | 1.004 | 76.1 | E |
|  | RIGHT | 1.019 | 79.1 | E | 0.383 | 23.0 | c |
|  | APPROACH | 1.019 | 22.4 | C | 1.004 | 62.9 | E |
| ALL VEHICLES |  | 1.019 | 30.3 | C | 1.004 | 39.9 | D |

### 7.2.8 Old Pretoria Road/Dale Road/Kerk Street Intersection

## Scenario 1: 2020 Background plus Latent Rights Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will operate at an overall LOS B during both $t$ he AM and PM peak hours. The summary of the SI DRA intersection resul ts are contained in Table 12a.

Table 12a: Summary of SIDRA Intersection Capacity Analysis Results
Old Pretoria Road/Dale Road/Kerk Street, Scenario 1
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS |
| 0 <br> 1 <br> 0 <br> 0 <br> 0 <br> 1 <br> 1 <br> 0 <br> 0 | LEFT | 0.136 | 9.4 | A | 0.122 | 7.7 | A |
|  | THROUGH | 0.190 | 15.5 | B | 0.247 | 18.2 | B |
|  | RIGHT | 0.651 | 28.0 | C | 0.707 | 32.5 | C |
|  | APPROACH | 0.651 | 19.7 | B | 0.707 | 21.5 | C |
|  | LEFT | 0.260 | 9.7 | A | 0.214 | 11.7 | B |
|  | THROUGH | 0.369 | 11.2 | B | 0.231 | 8.6 | A |
|  | RIGHT | 0.588 | 22.5 | C | 0.251 | 15.7 | B |
|  | APPROACH | 0.588 | 13.2 | B | 0.251 | 10.5 | B |
|  | LEFT | 0.298 | 9.5 | A | 0.274 | 8.5 | A |
|  | THROUGH | 0.233 | 15.8 | B | 0.308 | 18.6 | B |
|  | RIGHT | 0.604 | 26.2 | C | 0.464 | 28.1 | C |
|  | APPROACH | 0.604 | 17.3 | B | 0.464 | 17.3 | B |
|  | LEFT | 0.056 | 8.7 | A | 0.084 | 7.4 | A |
|  | THROUGH | 0.293 | 10.7 | B | 0.164 | 8.2 | A |
|  | RIGHT | 0.643 | 24.9 | C | 0.730 | 23.4 | C |
| APPROACH |  | 0.643 | 14.3 | B | 0.730 | 15.0 | B |
| ALL VEHICLES |  | 0.651 | 15.6 | B | 0.730 | 15.7 | B |

## Scenario 2: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

The SIDRA analysis results indicate that the existing intersection will operate at an overall LOS F during both $t$ he $A M$ and $P \quad M$ peak hour s with the addi tion of development gener ated tr affic. Therefore upgrades are required at this intersection for it to perform at a satisfactory LOS.

The summary of the SIDRA intersection results are contained in Table 12b.
Table 12b: Summary of SIDRA Intersection Capacity Analysis Results
Old Pretoria Road/Dale Road/Kerk Street, Scenario 2
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS |
|  | LEFT | 0.151 | 9.4 | A | 0.114 | 8.1 | A |
|  | THROUGH | 0.237 | 19.0 | B | 0.140 | 8.7 | A |
|  | RIGHT | 1.863 | 822.7 | F | 1.637 | 619.8 | F |
|  | APPROACH | 1.863 | 514.0 | F | 1.637 | 434.4 | F |
|  | LEFT | 0.993 | 62.5 | E | 0.701 | 11.7 | B |
|  | THROUGH | 0.357 | 8.7 | A | 0.437 | 18.7 | B |
|  | RIGHT | 1.960 | 913.5 | F | 1.908 | 864.2 | F |
|  | APPROACH | 1.960 | 341.4 | F | 1.908 | 301.7 | F |
| O000I500 | LEFT | 0.870 | 27.9 | C | 1.964 | 899.4 | F |
|  | THROUGH | 0.291 | 19.3 | B | 0.174 | 8.9 | A |
|  | RIGHT | 0.754 | 33.2 | C | 0.262 | 16.4 | B |
|  | APPROACH | 0.870 | 26.6 | C | 1.964 | 582.8 | F |
|  | LEFT | 0.095 | 17.6 | B | 0.109 | 10.3 | B |
|  | THROUGH | 0.274 | 8.3 | A | 0.349 | 18.1 | B |
|  | RIGHT | 0.606 | 21.2 | C | 1.390 | 398.4 | F |
|  | APPROACH | 0.606 | 12.1 | B | 1.390 | 172.7 | F |
| ALL VEHICLES |  | 1.960 | 253.4 | F | 1.964 | 389.5 | F |

Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes (with upgrades)

Intersection upgrades ha ve been conduc ted in t his s cenario and t he SI DRA analy sis res ults indicate that the intersection is expected to perform at an overall LOS C during both the AM and PM peak hours respectively.

The upgrades required at this intersection are as follows:

- An additional dedicated right turn lane $(100 \mathrm{~m})$ on the south and east approach

The summ ary of the SIDRA intersection results are contained in Table 12c. Refer to drawing SKC017 contained in Appendix A-3.

Table 12c: Summary of SIDRA Intersection Capacity Analysis Results
Old Pretoria Road/Dale Road/Kerk Street, Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | $\begin{aligned} & \text { DELAYS } \\ & \text { (SEC) } \end{aligned}$ | LOS | V/C | DELAYS (SEC) | LOS |
| $\begin{aligned} & 0 \\ & \vdots \\ & 0 \\ & 0 \\ & 0 \\ & 1 \\ & 1 \\ & 0 \\ & 0 \\ & \hline \mathbf{O} \end{aligned}$ | LEFT | 0.108 | 10.4 | B | 0.100 | 8.3 | A |
|  | THROUGH | 0.343 | 18.5 | B | 0.258 | 12.2 | B |
|  | RIGHT | 0.876 | 41.7 | D | 0.924 | 47.7 | D |
|  | APPROACH | 0.876 | 32.0 | C | 0.924 | 36.6 | D |
|  | LEFT | 0.778 | 12.6 | B | 0.585 | 10.7 | B |
|  | THROUGH | 0.815 | 28.8 | C | 0.875 | 35.8 | D |
|  | RIGHT | 0.860 | 27.7 | C | 0.747 | 25.1 | C |
|  | APPROACH | 1.960 | 22.7 | C | 0.875 | 23.6 | C |
| $\begin{aligned} & 0 \\ & \vdots \\ & 0 \\ & 0 \\ & \hline \\ & 5 \\ & 5 \\ & 0 \end{aligned}$ | LEFT | 0.300 | 5.7 | A | 0.515 | 5.7 | A |
|  | THROUGH | 0.274 | 18.4 | B | 0.209 | 12.1 | B |
|  | RIGHT | 0.785 | 35.1 | D | 0.336 | 21.7 | c |
|  | APPROACH | 0.785 | 15.9 | B | 0.515 | 9.0 | A |
|  | LEFT | 0.058 | 10.2 | B | 0.085 | 8.9 | A |
|  | THROUGH | 0.626 | 23.3 | C | 0.698 | 28.9 | C |
|  | RIGHT | 0.465 | 17.6 | B | 0.945 | 43.4 | D |
|  | APPROACH | 0.626 | 21.1 | C | 0.945 | 32.8 | C |
| ALL VEHICLES |  | 0.876 | 22.6 | C | 0.945 | 24.3 | C |

### 7.2.9 Olifantsfontein Road (R562)/ K109 (Intersection A)

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

This intersection will materialise when the future K109 is constructed. Therefore only scenario 3 is analysed. The SI DRA anal ysis results indicate that the intersection will perform at an ov erall LOS B and LOS C during the AM and PM peak hours respectively. The summary of the SIDRA intersection resul ts are c ontained in Table 13. Refer t o drawing SKC018 contained in Appendix A-3.

Table 13: Summary of SIDRA Intersection Capacity Analysis Results
Olifantsfontein Road (R562) \& K109 (Intersection A), Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 0.659 | 14.6 | B | 0.754 | 19.3 | B |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 0.839 | 45.5 | D | 0.929 | 67.4 | E |
|  | APPROACH | 0.839 | 21.0 | C | 0.929 | 29.9 | C |
|  | LEFT | 0.185 | 8.8 | A | 0.414 | 19.2 | B |
|  | THROUGH | 0.653 | 21.2 | C | 0.925 | 49.4 | D |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.653 | 19.7 | B | 0.925 | 43.6 | D |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.835 | 9.1 | A | 0.742 | 6.8 | A |
|  | RIGHT | 0.519 | 14.4 | B | 0.935 | 54.2 | D |
|  | APPROACH | 0.835 | 10.7 | B | 0.935 | 29.8 | C |
| ALL VEHICLES |  | 0.839 | 16.3 | B | 0.935 | 33.8 | C |

### 7.2.10 Access Road/K109 (Intersection B)

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

This intersection will materialise when the future K109 is constructed and will provide access to the proposed township development. The SIDRA analysis results indicate that the intersection will perform at an ov erall LOS B and L OS C duri ng the AM and PM peak hour s res pectively. The summary of the SIDRA intersection results are contained in Table 14. Refer to drawing SKC019 contained in Appendix A-3.

Table 14: Summary of SIDRA Intersection Capacity Analysis Results
Access Road \& K109 (Intersection B), Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT | 0.069 | 16.9 | B | 0.098 | 10.6 | B |
|  | THROUGH | 0.452 | 13.7 | B | 0.198 | 5.4 | A |
|  | RIGHT | 0.615 | 20.8 | C | 0.890 | 33.8 | C |
|  | APPROACH | 0.615 | 15.8 | B | 0.890 | 20.2 | C |
|  | LEFT | 0.514 | 8.1 | A | 0.374 | 9.8 | A |
|  | THROUGH | 0.001 | 12.0 | B | 0.001 | 23.1 | C |
|  | RIGHT | 0.730 | 25.1 | C | 0.919 | 49.6 | D |
| $\begin{aligned} & 0 \\ & \text { Q } \\ & 0 \\ & 0 \\ & \text { I } \\ & 5 \\ & 0 \\ & 0 \end{aligned}$ | APPROACH | 0.730 | 18.3 | B | 0.919 | 33.8 | C |
|  | LEFT | 0.248 | 5.6 | A | 0.493 | 5.7 | A |
|  | THROUGH | 0.731 | 30.4 | C | 0.881 | 36.1 | D |
|  | RIGHT | 0.287 | 32.9 | C | 0.421 | 30.0 | C |
|  | APPROACH | 0.731 | 17.8 | B | 0.881 | 20.5 | C |
|  | LEFT | 0.201 | 11.9 | B | 0.089 | 8.4 | A |
|  | THROUGH | 0.001 | 12.0 | B | 0.001 | 23.1 | C |
|  | RIGHT | 0.175 | 19.0 | B | 0.221 | 30.9 | C |
| APPROACH |  | 0.201 | 15.4 | B | 0.221 | 19.7 | B |
| ALL VEHICLES |  | 0.731 | 17.3 | B | 0.919 | 23.4 | C |

### 7.2.11 Access Road/K109 (Intersection C)

## Scenario 3: 2020 Background plus Latent Rights plus Development Generated Peak Hour Traffic Volumes

This intersection will materialise when the future K109 is constructed and will provide access to the proposed township development. The SIDRA analysis results indicate that the intersection will perform at an overall LOS C during both the AM and PM peak hours. The summary of the SIDRA intersection resul ts are c ontained in Table 15. Refert o drawing SKC020 contained in Appendix A-3.

Table 15: Summary of SIDRA Intersection Capacity Analysis Results
Access Road \& K109 (Intersection C), Scenario 3
CONTROL: TRAFFIC SIGNAL

| APPROACH |  | OPERATING CONDITIONS |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | AM PEAK HOUR |  |  | PM PEAK HOUR |  |  |
|  |  | V/C | DELAYS (SEC) | LOS | V/C | DELAYS (SEC) | LOS |
|  | LEFT |  |  |  |  |  |  |
|  | THROUGH | 0.157 | 7.1 | A | 0.268 | 4.6 | A |
|  | RIGHT | 0.814 | 31.3 | C | 0.895 | 35.1 | D |
|  | APPROACH | 0.814 | 21.1 | C | 0.895 | 21.4 | C |
|  | LEFT | 0.786 | 13.6 | B | 0.477 | 8.2 | A |
|  | THROUGH |  |  |  |  |  |  |
|  | RIGHT | 0.791 | 32.7 | C | 0.894 | 51.1 | D |
|  | APPROACH | 0.791 | 22.5 | C | 0.894 | 28.1 | C |
|  | LEFT | 0.205 | 5.6 | A | 0.427 | 5.7 | A |
|  | THROUGH | 0.802 | 28.8 | C | 0.866 | 43.0 | D |
|  | RIGHT |  |  |  |  |  |  |
|  | APPROACH | 0.802 | 20.5 | C | 0.866 | 19.2 | B |
| ALL VEHICLES |  | 0.814 | 21.5 | C | 0.895 | 22.5 | C |

## 8

## ROAD AND INTERSECTION UPGRADES

## 8.1

GENERAL

The upgrades to the major road network and intersections are discussed in this chapter. Table 16 illustrates the upgrades required to mitigate congestion on the surrounding road network within the vicinity of the proposed development sites. The upgrades are differentiated for EMM and GDRT.

Table 16: Major Road and Intersection Upgrades Required Within the Vicinity of the Proposed Township Development

| Extension | Phases | UPGRADESSPUTBEIWETNEMM ANDGDRT AUTHORTIES |  |
| :---: | :---: | :---: | :---: |
|  |  | EMM UPGRADES | GDRT UPGRADES |
| 71 | $\begin{aligned} & 1 \\ & 2 \\ & 3 \\ & 4 \\ & 5 \\ & 6 \end{aligned}$ | - Intersedion 1 upgrades as discussed in Section 7.2.1. <br> - Intersection 2upgrades for the west and east approach as discussed in Section 7.2.2. A 70 m slip lane and the first 100 m additional right turn lane is required on south approach. <br> - Intersection 3upgrades for the west approach as discussed in Section 7.2.3. A 90m slip lane is required on the south approach. <br> - The access road (single carriageway) between intersection C and intersection 3 <br> - Intersection 7 upgrades as discussed in Section 7.2.7. <br> - Intersection 8 upgrades as discussed in Section 7.2.8. <br> - Intersection 6 upgrades as discussed in Section 7.2.6. <br> - The construction of intersection Bas discussed in Section 7.2.10. | -The future K111: Construction of the additional through lane (south bound) from intersedion 2 to intersection 3. <br> - Construction of the additional through lane (south bound) from intersection $\mathbf{3}(100 \mathrm{~m})$. <br> - The future K109: Construction of a singlecomiageway of theK109from intersection 6 to the site access at intersection C . <br> - Intersedion Cto connect to the K109 construction discussed above so that access to the site will be gained from the south approach. <br> - The future K111: Construction of the additional through lane (north bound) from intersection 4 to intersection 3. <br> - The future K109: Construction of the remaining carriageway (dual carriageway) of the K109 from intersection 6 to the site access at intersection C <br> - The future K111: Construction of the additional through lane (north bound) from intersection 5to intersection 4 <br> - The future K111: Construction of the additional through lane (north bound) from intersection 3 to intersection $\mathbf{2}$ and the additional through lane (south bound) from intersection $\mathbf{3}$ to intersection 5 . This will complete the construction of the dual carriageway. <br> - The construction of the additional lanes between intersection Cand intersection 3and creating a dual carriageway. <br> - The construction of intersectionAas discussed in Section 7.2.9. <br> - The future K109: Construction of the single carriageway between intersection Aand intersection C <br> - The future K109: Construction of the remaining carriageway between intersection Cand intersection A creating a dual carriageway. |
| 50 | TBA |  |  |

## 9

NON-MOTORISED AND PUBLIC TRANSPORT

### 9.1 BACKGROUND

In terms of the National Land Transport Act 5 of 2009, section 38, it is a requirement that an assessment of the public transport be included in a traffic impact assessment.

### 9.2 EXISTING PUBLIC TRANSPORT SERVICES AND FACILITIES

The area surrounding the proposed development site is currently served by the following public transport services:

MINIBUS TAXIS

Minibus taxis were observed operating on Main Road, Archerfish Drive and Dale Road.

## PUBLIC TRANSPORT LAY-BYS

Taxi/Bus lay-bys are provided near the following intersections:

- A pair of lay-bys along Main Road near the Main Road/Riverside Street Intersection
- A pair of lay-bys along Main Road nears the Main Road/Thabana Ntlenyana Drive Intersection.


## $9.3 \quad$ PROPOSED / NEW FACILITIES

PUBLIC TRANSPORT LAY-BYS

It is recommended that K109 be provided with a pair of public transport lay-bys in the form of bus and taxi stops at each access point where access to the township is gained. It is further recommended that the proposed lay-bys be constructed to the appropriate design standards of the relevant roads authority.

## PAVED SIDEWALKS

In order to ease and formalise the movement of pedestrians between site accesses and the recommended lay-bys, it is proposed to construct at least 1.5 m wide paved (or dust free) sidewalk along at least one side of all roads within the development.

## CONCLUSIONS AND

 RECOMMENDATIONSBased on the assessment of the existing and planned future road network, traffic counts, a traffic analysis and capacity analysis of road links in the study area, the following concluding remarks are relevant:
$\rightarrow$ This Traffic Impact Assessment pertains to the proposed township known as Clayville Extensions 50 and 71. Clayville Extension 50 will be situated on the Remainder of Portion 183 and Portions 30 and 31 of the farm Olifantsfontein 410 JR. Clayville Extension 71 will be situated on Portion 207 of Portion 183 of the farm Olifantsfontein 410 JR.
$\rightarrow$ The site is currently undeveloped. The township locality and the surrounding road network are indicated on Figures 1 and 2.
$\rightarrow$ This proposed township will comprise of residential, business, community facilities, public garage and social services as indicated in the schedule of rights attached in Appendix A-1.
$\rightarrow$ Detailed traffic surveys were carried at the following intersections:

- Olifantsfontein Road (R562)/Olifantsfontein Road
- Olifantsfontein Road (R562)/Main Road (Future K111)
- Main Road (Future K111)/Thabana Ntlenyana Drive
- Main Road (Future K111)/Riverside Street
- Main Road (Future K111)/Karee Street
- Dale Road/Archerfish Drive
- Dale Road/Modderfontein Road
- Dale Road/Old Pretoria Road
$\rightarrow$ The proposed development is expected to generate approximately 5061 trips and 5870 trips (in and outbound) during the Weekday AM and PM peak hours respectively on the external road network. See Appendix A4.
$\rightarrow$ It is proposed that the development be served by two primary accesses off the planned future K109 route. The secondary access to the proposed development is off Main Road (planned future K111 route) and Thabana Ntlenyana Drive. Furthermore a future access is planned 500m north from K111/Thabana Ntlenyana Drive intersection. The proposed access positions are shown on drawing SKC001 and SKC002 contained in Appendix A-2.
$\rightarrow$ From the analysis performed, it was found that the impact of the proposed developments can be mitigated by means of a number of road and intersection improvements as shown in Appendix A-3.
$\rightarrow$ The 2020 background traffic plus latent rights traffic show that the there is an existing capacity constraint. Therefore the developers of the latent rights developments are required to contribute towards roads and intersection upgrades. The upgrading will be as per the requirements of EMM and GDRT.
$\rightarrow$ The 2010 Gauteng Major Road Network shows the planned K109 and K111 provincial roads which are relevant to this development. See Appendix A-2.
$\rightarrow$ The following existing intersections will require improvements:

[^0]- Olifantsfontein Road (R562)/Main Road (Future K111)
- Main Road (Future K111)/Thabana Ntlenyana Drive
- Main Road (Future K111)/Riverside Street
- Main Road (Future K111)/Karee Street
- Dale Road/Archerfish Drive
- Dale Road/Modderfontein Road
$\rightarrow$ The following new intersections external to the development are required:
< Olifantsfontein Road (R562)/K109 (Intersection A)
< Access Road (R562)/K109 (Intersection B)
< Access Road (R562)/K109 (Intersection C)
$\rightarrow$ The road and intersection upgrades will be in accordance with the phasing of the project. The upgrades are listed in Table 16 contained in Chapter 8.
$\rightarrow$ The following are required in terms of Non-Motorised \& Public Transport
- It is recommended that K109 be provided with a pair of public transport lay-bys in the form of bus and taxi stops at each access point where access to the township is gained. It is further recommended that the proposed lay-bys be constructed to the appropriate design standards of the relevant roads authority.
- In order to ease and formalise the movement of pedestrians between site accesses and the recommended lay-bys, it is proposed to construct at least 1.5 m wide paved (or dust free) sidewalk along at least one side of all roads within the development.

From a traffic engineering perspective, the proposed development is thus regarded as feasible and sustainable and is therefore supported.

## REFERENCES

$\rightarrow$ TMH 16 Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, Version 1.0, Committee of Transport Officials (COTO) August 2012
$\rightarrow$ TMH 17 Volume 1, South African Trip Data Manual, Version 1.0, Committee of Transport Officials (COTO) September 2012
$\rightarrow$ Highway Capacity Manual, Transportation Research Board, National Research Council Washington D.C., 2010
$\rightarrow$ Manual for Traffic Impact Studies, Department of Transport (DOT), October 1995
$\rightarrow$ Clayville Extensions 52 \& 66 Retail Development, Traffic Impact Study, EDS Engineering Design Services, May 2015
$\rightarrow$ Tembisa Extension 25 Residential Development, Traffic Impact Study, GIBB Engineering \& Architecture, May 2015
$\rightarrow$ Remainder of Portion 122 of The Farm Olifantsfontein 402-JR Industrial Development, Traffic Impact Study, EDS Engineering Design Services, March 2013
$\rightarrow$ Sterkfontein Extension 12 Warehousing \& Distribution Centre Development, Traffic Impact Study, EDS Engineering Design Services, February 2015

## FIGURES

Figure 1: Locality Plan
Figure 2: Site Aerial View \& Key Plan
Figure 3: Existing 2015 Peak Hour Traffic Volumes
Figure 4a: Latent Development Peak Hour Traffic Volumes - Clayville Extensions 52 \& 66
Figure 4b: Latent Development Peak Hour Traffic Volumes - Tembisa Extension 25
Figure 4c: Latent Development Peak Hour Traffic Volumes - Remainder of Portion 122 Olifantsfontein

Figure 4d: Latent Development Peak Hour Traffic Volumes - Sterkfontein X12
Figure 4e: Latent Development Peak Hour Traffic Volumes - Clayville Extension 45
Figure 4f: Total Latent Development Peak Hour Traffic Volumes
Figure 5: 2020 Background Peak Hour Traffic Volumes
Figure 6: 2020 Background Plus Total Latent Development Peak Hour Traffic Volumes
Figure 7: Expected Trip Distribution for the Proposed Development
Figure 8: Development Generated Peak Hour Traffic Volumes
Figure 9: 2020 Background Plus Total Latent Development Plus Development Generated Peak Hour Traffic Volumes















Project:

APPENDIX A-1
SITE DEVELOPMENT PLAN \& SCHEDULE OF RIGHTS TABLES


Table 1: Proposed zoning \& development controls for the proposed Clayville Extension 50 Township.

| ZONING | LAND USE | NO OF <br> ERVEN <br> / <br> UNITS | DEVELOPMENT CONTROLS |
| :---: | :---: | :---: | :---: |
| Residential 1 | Dwelling Houses $400 \mathrm{~m}^{2}$ ( $25 \mathrm{du} / \mathrm{ha}$ ) | 5 | Density: 25 du/ha; Height: As Per Scheme (2 Storeys); Coverage: As Per Scheme (60\%) ; Parking: As Per Scheme (One Parking Bay Per Erf); Building Lines: 1 m on All Sides |
| Residential 2 | Dwelling Houses $160 \mathrm{~m}^{2}$ ( $60 \mathrm{du} / \mathrm{ha}$ ) | 6 | Density: 60 du/ha; Height: As Per Scheme (2 Storeys); Coverage: As Per Scheme (60\%) ; Parking: As Per Scheme (One Parking Bay Per Erf); Building Lines: 1 m on All Sides |
|  | Dwelling Houses $180 \mathrm{~m}^{2}$ ( $55 \mathrm{du} / \mathrm{ha}$ ) | 6 | Density: 55 du/ha; Height: As Per Scheme (2 Storeys); Coverage: As Per Scheme (60\%) ; Parking: As Per Scheme (One Parking Bay Per Erf); Building Lines: 1 m on All Sides |
|  | Dwelling Houses $216 \mathrm{~m}^{2}$ ( $45 \mathrm{du} / \mathrm{ha}$ ) | 4 | Density: 45 du/ha; Height: As Per Scheme (2 Storeys); Coverage: As Per Scheme (60\%) ; Parking: As Per Scheme (One Parking Bay Per Erf); Building Lines: 1m on All Sides |
| Residential 4 | Dwelling Houses, Dwelling Units, Residential Buildings And Private Roads (180 du/ha) | $\begin{array}{\|l\|} \hline 13 \\ \text { (2833 } \\ \text { Units) } \end{array}$ | Density: 180 du/ha; Height: 4 <br> Storeys; Coverage: 60\% <br> Parking: 0.5 Parking Bays Per Unit; Building Lines: 2 m on all sides |
| Community Facility | Places of Education | 1 | Height: As Per Scheme (3 Storeys); Coverage: As Per Scheme (50\%); Parking: As Per Scheme; Building Lines: As Per Scheme (5m On All Street Boundaries \& 3m On All Other Boundaries) |
|  | Places Of Instruction, Places Of Education, Social Halls, Places Of Public Worship, Libraries, Child Care Facilities, Sport And Recreation Clubs, Sports Grounds, Monasteries, Convents | 3 | Height: As Per Scheme (3 Storeys); Coverage: As Per Scheme (50\%); Parking: As Per Scheme; Building Lines: As Per Scheme (5m On All Street Boundaries \& 3m On All Other Boundaries) |
| Business 2 | For Business Purposes, Shops, Places Of Public <br> Worship, Places Of Instuction, Places Of <br> Education, Dwelling Units, Residential Buildings, <br> Restaurants, Medical Consulting Rooms, <br> Gymnasium, Plant Nurseries, Service Industries, <br> Parking Bays, Parking Garages | 2 | Height: As Per Scheme (2 Storeys) ; Coverage: As Per Scheme (70\%); Parking: As Per Scheme; Building Lines: As Per Scheme (3m On Street Boundaries) |
| Business 3 | Offices, Medical Consulting Rooms, Dwelling | 2 | Height: As Per Scheme (2 |


|  | Houses |  | Storeys) ; Coverage: As Per <br> Scheme (70\%); Parking: As Per <br> Scheme; Building Lines: As Per <br> Scheme (3m On Street <br> Boundaries) |
| :---: | :---: | :---: | :---: |
| Public Services | Produce Markets, Abattoirs, Cemeteries, Water Works, Reservoirs, Gas Works, Power/Sub Stations, Mortuaries, Sewage Disposal Works, Waste Disposal Sites, Municipal Purposes, Postal Depots, Telecommunications, Parking, Swimming Pools, Stormwater Retention And Attenuation Ponds | 3 | As per Scheme |
| Social Services | Hospitals, Clinics, Libraries, Police Stations, Law Courts, Fire Stations, Municipal \& Government Offices, Institutions, Places Of Public Worship, Places Of Instruction, Child Care Facilities, Social Halls, Old Age Home | 3 | As per Scheme |
| Transportation | Transport Centers, Taxi Ranks, Parking Bays, Parking Garages | 1 | As per Scheme |
| Public Open Space | Parks, Gardens, Botanical Gardens, Zoological Gardens, Conservation Areas, Art Galleries, Sport \& Recreation Clubs, Social Halls, Open Spaces, Play Parks, Squares And Buildings Used In Connection Herewith, Municipal Purposes, Sports Grounds, Swimming Pools, Stormwater Retention \& Attenuation Ponds. | 4 | As per Scheme |
| Special | Electrical Powerlines \& Municipal Services | 3 | As per Scheme |
| Roads | Streets/Roads, Private Roads, Toll Gates, Weigh Bridges, Parking, Cycle Lanes, Bus Lanes, Municipal Services And Infrastructure |  | As Per Scheme |

[^1]

Table 1: Proposed zoning \& development controls for the proposed Clayville Extension 71, 76-80 Township.

| ZONING | LAND USE | NO OF ERVEN / UNITS | DEVELOPMENT CONTROLS |
| :---: | :---: | :---: | :---: |
| Residential$2$ | Dwelling Houses $9 \mathrm{~m} \times 18 \mathrm{~m}=160 \mathrm{~m}^{2}$ | 1369 | Density: As Per Scheme (One Dwelling Per Erf); Height: As Per Scheme (2 Storeys); Coverage: As Per Scheme (60\%) ; Parking: As Per Scheme (One Parking Bay Per Erf); Building Lines: 1 m on All Sides |
|  | Dwelling Houses $9 \mathrm{~m} \times 20 \mathrm{~m}=180 \mathrm{~m}^{2}$ | 420 | Density: As Per Scheme (One Dwelling Per Erf); Height: As Per Scheme (2 Storeys); Coverage: As Per Scheme (60\%) ; Parking: As Per Scheme (One Parking Bay Per Erf); Building Lines: 1 m on All Sides |
|  | Dwelling Houses $9,8 \mathrm{~m} \times 22 \mathrm{~m}=216 \mathrm{~m}^{2}$ | 431 | Density: As Per Scheme (One Dwelling Per Erf); Height: As Per Scheme (2 Storeys); Coverage: As Per Scheme (60\%) ; Parking: As Per Scheme (One Parking Bay Per Erf); Building Lines: 1 m on All Sides |
| $\begin{gathered} \text { Residential } \\ 4 \end{gathered}$ | Dwelling Houses, Dwelling Units, Residential Buildings And Private Roads | $13$ <br> (3814 <br> Units) | Density: 180 du/ha; Height: 4 <br> Storeys; Coverage: 60\% <br> Parking: 0.5 Parking Bays Per Unit; Building Lines: 2 m on all sides |
| Business 2 | For Business Purposes, Shops, Places Of Public Worship, Places Of Instuction, Places Of Education, Dwelling Units, Residential Buildings, Restaurants, Medical Consulting Rooms, Gymnasium, Plant Nurseries, Service Industries, Parking Bays, Parking Garages | 2 | Height: As Per Scheme (2 <br> Storeys) ; Coverage: As Per <br> Scheme (70\%); Parking: As Per <br> Scheme; Building Lines: As Per <br> Scheme (3m On Street <br> Boundaries) |
| Public Garage | Filling Station, Car Wash, Motor Dealers, Motor Workshops | 1 | Height: As Per Scheme (2 <br> Storeys); Coverage: As Per <br> Scheme (60\%); Parking: As Per <br> Scheme; Building Lines: As Per <br> Scheme (3m On Street <br> Boundaries \& 5m On All Other <br> Boundaries) |
| Public Open Space | Parks, Gardens, Botanical Gardens, Zoological Gardens, Conservation Areas, Art Galleries, Sport \& Recreation Clubs, Social Halls, Open Spaces, Play Parks, Squares And Buildings Used In Connection Herewith, Municipal Purposes, Sports Grounds, Swimming Pools, Stormwater Retention \& Attenuation Ponds. | 48 | As per Scheme |
| Community Facility | Places of Education | 1 | Height: As Per Scheme (3 Storeys); Coverage: As Per Scheme (50\%); Parking: As Per Scheme; Building Lines: As Per Scheme (5m On All Street |


|  |  |  | Boundaries \& 3m On All Other <br> Boundaries) |
| :---: | :--- | :--- | :--- |
|  | Places Of Instruction, Places Of Education, Social <br> Halls, Places Of Public Worship, Libraries, Child <br> Care Facilities, Sport And Recreation Clubs, <br> Sports Grounds, Monasteries, Convents | 7 | Height: As Per Scheme (3 <br> Storeys); Coverage: As Per <br> Scheme (50\%); Parking: As Per <br> Scheme; Building Lines: As Per <br> Scheme (5m On All Street <br> Boundaries \& 3m On All Other <br> Boundaries) |
| Social <br> Service | Hospitals, Clinics, Libraries, Police Stations, Law <br> Courts, Fire Stations, Municipal \& Government <br> Offices, Institutions, Places Of Public Worship, <br> Places, Of Instruction, Child Care Facilities, Social <br> Halls, Old Age Home | 2 | As per Scheme |
| Public <br> Services | Produce Markets, Abattoirs, Cemeteries, Water <br> Works, Reservoirs, Gas Works, Power/Sub <br> Stations, Mortuaries, Sewage Disposal Works, <br> Waste Disposal Sites, Municipal Purposes, Postal <br> Depots, Telecommunications, Parking, <br> Swimming Pools, Stormwater Retention And <br> Attenuation Ponds | 2 | As per Scheme |
| Special | Electrical Powerlines \& Municipal Services | 3 | As per Scheme |
| Roads | Streets/Roads, Private Roads, Toll Gates, Weigh <br> Bridges, Parking, Cycle Lanes, Bus Lanes, <br> Municipal Services And Infrastructure | As Per Scheme |  |

[^2]
## APPENDIX A-2

## ROAD NETWORK PLANNING \& GAUTENG STRATEGIC NETWORK PLAN




EXISTING INTERSECTION LAYOUTS

## 1. SITE LAYOUT

ज़ा०5 Site: 2015 AM
Olifantsfontein Rd (R562) \& Olifantsfontein Rd Intersection - 2015 AM Peak Hour Traffic Volumes Stop (All-Way)


## 2. SITE LAYOUT

E Site: 2015 AM
Olifantsfontein Rd (R562) \& Future K111-2015 AM Peak Hour Traffic Volumes
Signals - Fixed Time Isolated


## 3. SITE LAYOUT

## जТञा) Site: 2015 AM

Future K111 \& Thabana Ntlenyana Drive - 2015 AM Peak Hour Traffic Volumes
Stop (Two-Way)


## 4. SITE LAYOUT

งง0F Site: 2015 AM
Future K111 \& Riverside St - 2015 AM Peak Hour Traffic Volumes
Stop (Two-Way)


## 5. SITE LAYOUT

## B Site: 2015 AM

Future K111 \& Karee St - 2015 AM Peak Hour Traffic Volumes
Signals - Fixed Time Isolated


## 6. SITE LAYOUT

ज50\% Site: 2015 AM
Dale Rd \& Archerfish Dr - 2015 AM Peak Hour Traffic Volumes
Stop (Two-Way)


## 7. SITE LAYOUT

Site: 2015 AM
Dale Rd \& Modderfontein Rd - 2015 AM Peak Hour Traffic Volumes
Signals - Fixed Time Isolated


## 8. SITE LAYOUT

## Site: 2015 AM

Dale Rd \& Old Pretoria Rd - 2015 AM Peak Hour Traffic Volumes
Signals - Fixed Time Isolated


## UPGRADED / NEW INTERSECTION LAYOUTS

Please note: All upgrades mentioned in this appendix which are due to the developer or others are a guide and are required to be agreed and confirmed with EMM and GDRT. The phasing of upgrades are discussed in Chapter 8.

## 1. SITE LAYOUT

Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Olifantsfontein Rd (R562) \& Olifantsfontein Rd Intersection
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- No upgrades are due to developer since this intersection is currently congested and the background traffic volumes affect capacity in the horizon year.


## 2. SITE LAYOUT

Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Olifantsfontein Rd (R562) \& Future K111
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- The intersection is currently congested. However the developer will be responsible for the upgrade of the right turn lane on the west approach. The developer will contribute to the upgrade of the future K111. Note that the existing Main Road (future K111 route) is currently operating at capacity.


## 3. SITE LAYOUT

目 Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Future K111 \& Thabana Ntlenyana Drive
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- Upgrade of the west approach leg of this intersection.
- Upgrade of a slip lane and the right turn lane on the south and north approach respectively.


## 4. SITE LAYOUT

8 Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Future K111 \& Riverside St
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- No upgrades are due to the developer as this intersection is a background problem.


## 5. SITE LAYOUT

Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Future K111 \& Karee St
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- No upgrades are due to the developer as this intersection is a background problem.


## 6. SITE LAYOUT

Bite: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Dale Rd \& Archerfish Dr
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- The developer will be required to contribute to the upgrade of the link (Dale Road)


## 7. SITE LAYOUT

Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Dale Rd \& Modderfontein Rd
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- The developer will be required to contribute to the upgrade of the link (Dale Road)
- Other upgrades to this intersection are not for the account of the developer as this intersection currently operates at capacity.


## 8. SITE LAYOUT

Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Dale Rd \& Old Pretoria Rd
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour
Signals - Fixed Time Isolated


Upgrades due to developer:

- Upgrade of the right turn lane on the south and east approach.


## A. SITE LAYOUT

Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Olifantsfontein Rd (R562) \& K109 Intersection
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- Upgrade of the right turn lane on the west approach.
- Upgrade of the slip lanes and one right turn lane on the south approach.
- Upgrade of the exit lane on the south approach.
- Upgrade of the left turn lane on the east approach.
- Other upgrades are not for the account of the developer.


## B. SITE LAYOUT

Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
K109 \& Access Road Intersection B
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- Upgrade of the west and east approach.
- Upgrade of the left and right turn lanes on the south approach.
- Upgrade of the left and right turn lanes on the north approach.
- The developer will be required to contribute to the upgrade of the K109 link.


## C. SITE LAYOUT

目 Site: Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
K109 \& Access Road Intersection C
Dev Plus 2020 Background Plus Latent Dev_AM Peak Hour_UPGRADES
Signals - Fixed Time Isolated


Upgrades due to developer:

- Upgrade of the east approach.
- Upgrade of the right turn lane on the south approach.
- Upgrade of the left turn lanes on the north approach.












APPENDIX A-4
TRIP GENERATION CALCULATIONS



[^0]:    - Olifantsfontein Road (R562)/Olifantsfontein Road

[^1]:    * Proposed Zonings are in terms of the Ekurhuleni Town Planning Scheme, 2014.

[^2]:    * Proposed Zonings are in terms of the Ekurhuleni Town Planning Scheme, 2014.

