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Traffic Engineering
Transportation Planning
Transport Economy
Project Management
Project Financing & Viability

TRAFFIC IMPACT ASSESSMENT

New Township Greengate X98, Mogale City

November 2020

APPLICATION TO ROAD AUTHORITY

OUR REFERENCE	REP01/TW1145/09Nov20	
DATE	09 November 2020	
AGENCY	MOGALE CITY: Road and Stormwater Division, Infrastructure Department	GAUTRANS: Department of Public Transport, Roads and Works
MANAGER	Traffic Engineering and Road Network Planning	Deputy Director, Ribbon Development
ADDRESS	P.O. Box 94, Krugersdorp, 1740	Private Bag X83 Marshalltown, 2107
FOR ATTENTION	Noko Makitla	Slindile Buthelezi
SUBJECT	TRAFFIC IMPACT ASSESSMENT: NEW TOWNSHIP GREENGATE X98, MOGALE CITY	

This traffic impact assessment is done in support of a new township application for Greengate X98 on Portion 260 (a portion of Portion 114) of the Farm Rietfontein 189-IQ. The site is located on the southern side of Beyers Naude Drive (D374) K31 between planned Route K56 and Valley Road – Ibis Lane.

This application will allow the development of ±24,000 m² GLA for Business 1 and Commercial purposes. The expected trip generation of the application is ±519 vehicle trips during the weekday morning (AM) peak hour and ±1,352 vehicle trips during the weekday afternoon (PM) peak hour (based on COTO TMH 17, the South African Trip Data Manual).

The *Traffic Investigation in Support of the Design and Construction of Beyers Naude Drive (D374) as Route K31, Techworld, November 2016*, was considered in this traffic impact assessment. This investigation included the latent land use rights for the planned development of Greengate X54 – X57 and X75.

A traffic growth rate of 3.0% p.a. was assumed for the 5-year study period to account for growth in background traffic and unknown latent land use rights in the study area. It was assumed that the construction of Beyers Naude Drive will be completed in the design year of the TIA.

Beyers Naude Drive between the R114 (planned K52) in the west and Marina Street – Peter Road in the east is currently a two-lane single carriageway road. This route served about 15,000 vehicles/day in 2016 which requires the upgrading to a four-lane dual carriageway (i.e. Route K31). The upgrading of this section of Beyers Naude Drive was triggered not only by the normal growth in traffic but also by the planned development of Greengate X54 – X57 and X75 for commercial purposes. The planned upgrading is therefore a joint venture between GAUTRANS and the developer of the Greengate Townships.

Given the functional classification of Route K31 as a metropolitan distributor (i.e. Class 2 road) the spacing of accesses / intersections are strictly limited to 600m, although 800m is preferable in terms of the latest COTO TRH 26 Standards. Some of the accesses / intersections along Beyers Naude Drive will therefore be closed. The study area for this traffic impact assessment (i.e. Greengate X98) includes the section of Beyers Naude Drive from Jacaranda Street in the west to Boland Road – Indaba Lane in the east.

All the intersections along Route K31 will eventually be controlled by means of traffic signals. Traffic signals however can only be implemented if they are warranted in terms of the regulations in this regard, namely SARTSM (Volume 3). These regulations generally require average queue lengths of 4 vehicles during any hour on a normal day. Traffic signals in the study area are only planned at the intersections of Jacaranda Street and Valley Road – Ibis Lane with the upgrading of Beyers Naude Drive (Route K31).

Access to the application site will be obtained from Beyers Naude Drive in accordance with the Road Master Plan via the intersection with Valley Road – Ibis Lane and a new Class 5 road (i.e. Road A). Additional access is also proposed from Beyers Naude Drive via a proposed new marginal access (Class 4a road) with Beyers Naude Drive on the eastern boundary of the site (i.e. Road B).

The applicant will be responsible for the construction of Roads A and B, which includes the construction of the marginal intersection with Beyers Naude Drive and the intersection between Roads A and B, and the upgrading of the intersections of Beyers Naude Drive with Valley Road – Ibis Lane and Boland Road – Indaba Lane.

Your consideration and approval of this traffic impact assessment at your earliest convenience is hereby requested. Please do not hesitate to contact us immediately for any discussions or enquiries.

Kind Regards

Pieter Kruger for TECHWORLD

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TITLE OF REPORT	Traffic Impact Assessment: New Township Greengate X98, Mogale City
DESCRIPTION	This traffic study evaluates the expected traffic impact of a new township for retail and commercial purposes in Greengate (Mogale City).

DATE	STATUS OF REPORT
November 2020	Final Report
CLIENT	**PROJECT MANAGER**
HOCOM PROPERTIES (PTY) LTD PO Box 904 Ruimsig, 1732 Charl Fitzgerald 082 410 7143	VICTOR & PARTNERS Highcliff Office Park, Constantia Kloof Roodepoort, 1709 Robert Victor 082 809 7764
PROJECT NUMBER	**REPORT NUMBER**
TW1145	REP01/TW1145/09Nov20
POSTAL ADDRESS	**PHYSICAL ADDRESS**
PO Box 12530 Hatfield, 0028 Tel: (012) 348 0386 Fax: (012) 348 3587	78 Glenmore Avenue C/O Glenwood Road & Glenmore Avenue Lynnwood Glen, 0081 Email: admin@techworld.co.za
PROJECT TEAM	**COPYRIGHT**
P Kruger, M Ryan, M Wilson	TECHWORLD

1 APPLICATION

Description of the application and property in terms of location, extent, current, and future usage

THE TYPE OF LAND USE APPLICATION IS THE FOLLOWING		
Type	Establishment of a new township Greengate X98.	
THE LOCATION OF THE SITE IN TERMS OF THE PROPERTY DESCRIPTION IS THE FOLLOWING		
Erf / Portion	Portion 260 (a portion of Portion 114)	
Suburb / Farm	Farm Rietfontein 189-IQ	
THE FOLLOWING ROAD NETWORK SERVES THE APPLICATION SITE AND WAS HENCE INVESTIGATED		
Beyers Naude Drive (D374) Planned Route K31	Existing single carriageway road.	Class 2 Road
Valley Road – Ibis Lane	Existing single carriageway road north of Beyers Naude Dr (Valley Rd) and existing gravel road south of Beyers Naude Dr (Ibis Ln).	Class 4a Road
THE SIZE AND/OR EXTENT OF THE SITE IS THE FOLLOWING		
Extent of Total Property	±5.95 ha (excluding required road network area)	
THE EXISTING ZONING IS THE FOLLOWING		
Existing Zoning	Agricultural	
THE EXISTING USAGE OF THE SITE IS THE FOLLOWING		
Existing Usage	Vacant	
THE REQUIRED ZONING AND EXTENT IS THE FOLLOWING		
Erven 1 to 4, 6 and 7	*"Business 1"* with primary rights for shops, office use, dwelling units, residential use, hotel, restaurant, car dealerships and motor showrooms.	FAR = 0.40 Height = 4 storeys Coverage = 70%

Erf 5	*"Commercial"* with primary rights for warehousing and distribution.	FAR = 0.40 Height = 4 storeys Coverage = 70%
THE DEVELOPMENT THAT WAS INVESTIGATED FROM A CRITICAL TRAFFIC IMPACT POINT OF VIEW IS THE FOLLOWING		
Erven 1 to 4, 6 and 7	Shops / Retail Fast Food Restaurants Medical Consulting Rooms Building Materials Motor Dealership	12,000 m² GLA 400 m² GLA 600 m² GLA 1,250 m² GLA 3,750 m² GLA 1,250 m² GLA
Erf 5	Warehousing & Distribution	4,750 m² GLA
PHASING OF DEVELOPMENT		
Phasing	No phasing of the application was considered.	
THE FOLLOWING SCHEMATIC ILLUSTRATIONS ARE ATTACHED		
Schematic Illustrations	Refer to: *Figure 1: Locality Plan and Study Area* *Appendix A: Township Layout Plan*	

2 METHODOLOGY

The approach and methodology followed in the execution of this study is described in this section

THE FOLLOWING GENERAL APPROACH AND METHODOLOGY WAS UTILIZED	
Guidelines and Standards	TRH 26 – SA Road Classification and Access Management Manual TMH 17 – SA Trip Data Manual TMH 16 – Volume 1 & 2 – SA Traffic Impact and Site Traffic Assessment Manual
THE FOLLOWING TECHNICAL METHODOLOGY AND SOFTWARE WAS UTILIZED	
Traffic Impact Analysis Software	VISTRO 20.0 and SIDRA 8.0

Capacity and Operational Analysis Software	Latest HCM2010 methodology	
THE FOLLOWING CRITICAL PEAK HOURS WERE ANALYZED		
Critical Peak Hours	Weekday AM Peak Hour	
	Weekday PM Peak Hour	
THE STUDY PERIOD FOR THE DEVELOPMENT IS THE FOLLOWING		
Base Year (Existing Situation)	2019	
Study Period	5 years	
Horizon Year (Future Situation)	2024	2019 plus 5 years
THE FOLLOWING ROAD NETWORK ALTERNATIVES WERE INVESTIGATED		
Road Network Alternatives	None	
THE FOLLOWING SCENARIOS WERE ANALYZED		
Scenario 1	Estimated 2019 peak hours	Existing 2019 road network
Scenario 2	Expected 2024 peak hours with growth in background traffic and added latent rights	Committed road network
Scenario 3	Expected 2024 peak hours with growth in background traffic, added latent rights and application traffic	Committed road network
Scenario 4	Expected 2024 peak hours with growth in background traffic, added latent rights and application traffic	Mitigated road network
THE FOLLOWING TRAFFIC REPORTS WERE CONSIDERED		
Traffic Reports	*Traffic Investigation in Support of the Design and Construction of Beyers Naude Drive (D374) as Route K31, Techworld, November 2016*	

3 STUDY AREA AND NETWORK

This section describes the identification of an appropriate study area, and the characteristics of the network included in the study area.

3.1 LATENT DEVELOPMENT RIGHTS AND COMMITTED ROAD IMPROVEMENTS IN THE AREA

THE FOLLOWING LATENT LAND USE RIGHTS EXIST IN THE STUDY AREA	
Latent Land Use Rights	The development of Greengate X54 – X57 and X75 is planned for commercial purposes. These townships are situated on the northern side of Beyers Naude Drive, ±700m north-west of the application site. This development is expected to generate ±2,089 vehicle trips during both the weekday morning (AM) and afternoon (PM) peak hours.
Growth in background traffic	A traffic growth rate of 3.0% p.a. was applied during the 5-year study period to account for growth in background traffic and unknown latent land use rights in the study area.

3.2 STUDY AREA

THE STUDY AREA WAS DETERMINED BASED ON THE FOLLOWING		
The Layout of the road network, the expected Trip Generation and Distribution influences the required study area.	The study area comprises of the section of Beyers Naude Drive from Jacaranda Street in the west to Boland Road – Indaba Lane in the east, and the supporting internal road network along this section.	
THE FOLLOWING INTERSECTIONS WERE INCLUDED IN THE STUDY AREA (THE EXISTING TYPE OF TRAFFIC CONTROL IS ALSO INDICATED)		
Intersection 1	Jacaranda St / Beyers Naude Dr	Two-way Stop Control
Intersection 2	Rocky Ridge Rd / Beyers Naude Dr	Two-way Stop Control
Intersection 3	Tuohyvale Rd / Beyers Naude Dr	One-way Stop Control
Intersection 4	Valley Rd – Ibis Ln / Beyers Naude Dr	Two-way Stop Control

Intersection 5	Incolae Rd / Beyers Naude Dr	One-way Stop Control
Intersection 6	Centre Access / Beyers Naude Dr	One-way Stop Control
Intersection 7	Boland Rd – Indaba Ln / Beyers Naude Dr	Two-way Stop Control
Intersection 8	Planned K56 / Beyers Naude Dr	Planned Two-way Stop Control
Intersection 9	Road B / Beyers Naude Dr	Planned Marginal Intersection
Intersection 10	Ibis Ln / Road A	Planned Roundabout
Intersection 11	Road B / Road A	Planned Roundabout

3.3 ROAD NETWORK DESCRIPTION

ROAD NETWORK PLANNING IN AREA	
Gauteng Strategic Major Road Network	Beyers Naude Drive is a planned K-route, i.e. Route K31, for which a preliminary design (basic planning) was done in the 1970's (PRS72/52) and subsequently accepted (EC no 742 and EC date 75 04 22). This section of Beyers Naude Drive is also intersected by planned Routes K52 and K56. Although basic planning / preliminary design was done for both these routes, the designs have not yet been accepted. The planned K-routes are protected by the Gauteng Infrastructure Act of 2001. Route K31 (Beyers Naude Drive) has a 62m road reserve width which is already protected, i.e. not included in the application site. The construction of Route K31 by Gautrans is now eminent.
Mogale City Road Master Plan for Northern Areas	The Road Master Plan for Mogale City shows Ibis Lane as a Class 4a road with a 25m road reserve, a new Class 5 Road with a 20m road reserve (i.e. Road A) that will connect the application site to Ibis Lane, and a new Class 4a Road with a 25m road reserve (i.e. Road B) on the eastern boundary of the application site which will connect Beyers Naude Drive in the north (planned marginal access) with Road A. The required road reserves will be protected / kept out of the township application.

THE FOLLOWING ROAD NETWORK IMPROVEMENTS ARE COMMITTED IN THE STUDY AREA	
Committed Road Improvements	Beyers Naude Drive between Route R114 (planned K52) in the west and Marina Street – Peter Road in the east is currently a two-lane single carriageway provincial road, namely D374. This route served ±15,000 vehicles/day in 2016 which requires the upgrading to a four -lane dual carriageway road (i.e. Route K31). The upgrading of this section of Beyers Naude Dr was triggered not only by the normal growth in traffic but also by the planned development of Greengate X54 – X57 and X75. The planned upgrading is a joint venture between GAUTRANS and the developer of the Greengate Townships. Given the functional classification of Route K31 as a metropolitan distributor (i.e. Class 2 road) the spacing of accesses / intersections are strictly limited to 600m, although 800m is preferable in terms of the latest COTO TRH 26 Standards. Some of the accesses / intersections along Beyers Naude Drive will therefore be closed. All the intersections along Route K31 will eventually be controlled by means of traffic signals. Traffic signals however can only be implemented if they are warranted in terms of the regulations in this regard, namely SARTSM (Volume 3). These regulations generally require average queue lengths of 4 vehicles during any hour on a normal day. Traffic signals in the study area are only planned at the intersections of Jacaranda Street and Valley Road – Ibis Lane with the upgrading of Beyers Naude Drive (Route K31). Short sections of the planned local road network will be constructed in conjunction with the upgrading of Beyers Naude Drive (K31). These sections, which includes sections of planned Route K56 and Ibis Lane as single carriageway roads, will be constructed to provide access to properties that are affected by the closure of existing intersections along Beyers Naude Drive.
THE REGIONAL ACCESSIBILITY OF THE SITE IS PROVIDED BY THE FOLLOWING ROAD NETWORK	
N14 and N1 Freeways, Beyers Naude Drive (K31)	Regional accessibility to the application site in a north-south direction is provided by the N14 and N1 Freeways. Beyers Naude Drive (K31) provides access to the townships of Greengate.

THE LOCAL ACCESSIBILITY OF THE SITE IS PROVIDED BY THE FOLLOWING ROAD NETWORK	
Ibis Lane and Roads A and B	Local accessibility to the application site will be provided by Ibis Lane via planned Roads A and B
THE LOCAL ROAD NETWORK HAS THE FOLLOWING CHARACTERISTICS	
Local Network	Ibis Lane and Roads A and B will be constructed as two-lane single carriageway roads.

3.4 ACCESS

ACCESS TO THE DEVELOPMENT WILL BE OBTAINED FROM THE FOLLOWING STREETS	
Proposed Access	Access to the application site will be obtained from Beyers Naude Drive in accordance with the Road Master Plan via the intersection with Valley Road – Ibis Lane and a new Class 5 road (i.e. Road A). Additional access is also proposed from Beyers Naude Drive via a proposed new marginal access (Class 4a road) with Beyers Naude Drive on the eastern boundary of the site (i.e. Road B).
THE REQUIREMENTS FOR ACCESS CONTROL IS THE FOLLOWING	
Access Control	Access control is not planned.
THE FOLLOWING SCHEMATIC ILLUSTRATIONS ARE ATTACHED	
Schematic Illustrations	Refer to: *Figure 2: Existing Road Network and Lane Layout* *Figure 3: Committed Road Network Improvements* *Appendix B: Gauteng Strategic Major Road Network* *Appendix C: Mogale City Road Master Plan for the Northern Areas* *Appendix D: Beyers Naude Drive & Supporting Network Construction Plans – ILIFA AFRICA* *Appendix E: Route K31 (Beyers Naude Drive) Detail Design*

4 EXISTING TRAFFIC CHARACTERISTICS

The existing traffic demand is described in this section.

TRAFFIC COUNTS WERE CONDUCTED DURING THE FOLLOWING PERIODS		
Weekday AM Peak Period	Wednesday 06/11/2019 Counting Period 06:00 to 09:00	Peak Hour 06:45 to 07:45
Weekday PM Peak Period	Wednesday 06/11/2019 Counting Period 15:30 to 18:30	Peak Hour 16:45 to 17:45
THE CURRENT (2019) TWO DIRECTIONAL PEAK HOUR FLOWS ON THE NETWORK ARE AS FOLLOWS (WEEK AM / WEEK PM)		
Beyers Naude Drive	West of Valley Road – Ibis Lane	±2,030 / ±1,845
	East of Valley Road – Ibis Lane	±2,125 / ±1,930
Valley Road – Ibis Lane	North of Beyers Naude Drive	±125 / ±145
	South of Beyers Naude Drive	±40 / ±40
THE CURRENT AVERAGE PERCENTAGE HEAVY VEHICLES FOR THE INTERSECTIONS IN THE STUDY AREA ARE AS FOLLOWS		
% Heavy Vehicles	3.0% Heavy vehicles were surveyed and applied on all the roads.	
THE CURRENT AVERAGE PHF'S FOR THE INTERSECTIONS IN THE STUDY AREA ARE AS FOLLOWS		
PHF	Week AM / Week PM	0.88 / 0.94

THE FOLLOWING SCHEMATIC ILLUSTRATIONS ARE ATTACHED	
Schematic Illustrations	*Refer to:* *Figure 4: Weekday AM Peak Hour Traffic Demand* *Figure 5: Weekday PM Peak Hour Traffic Demand* *Appendix G: Traffic Counts*

5 TRIP CHARACTERISTICS

The expected trip characteristics of the development are described in this section in terms of trip generation, trip distribution, modal split, and trip assignment.

5.1 TRIP GENERATION

THE EXPECTED TRIP GENERATION WAS BASED ON THE FOLLOWING		
Business 1 and Commercial	TMH 17, the South African Trip Data Manual was used as the source for trip generation. A trip reduction of 15% is recommended since Beyers Naude Drive (Route K31) will serve as a transit corridor.	
THE DEVELOPMENT IS EXPECTED TO GENERATE THE FOLLOWING TOTAL NUMBER OF PEAK HOUR TRIPS DURING THE PEAK HOURS – SPLIT ALSO GIVEN		
Expected Generated peak Hour Trips	Morning (AM) Peak Hour Afternoon (PM) Peak Hour	519 (313 in / 206 out) 1,352 (664 in / 687 out)
IT IS EXPECTED THAT THE DEVELOPMENT WILL GENERATE THE FOLLOWING % BYPASS TRIPS DURING THE RESPECTIVE PEAK HOURS		
Bypass Trips	No bypass trips were assumed for any land uses during the weekday AM peak hour. Bypass trips of 13% for retail, 52% for fast food and 39% for restaurants were assumed during the weekday PM peak hour for the westbound traffic movement along Beyers Naude Drive.	
DETAIL ON THE EXPECTED TRIP GENERATION ARE SHOWN IN THE ATTACHED TABLE		
Detail Trip Generation	Refer to: *Table 1: Expected Trip Generation*	

5.2 TRIP DISTRIBUTION

THE TRIP DISTRIBUTION WAS BASED ON THE FOLLOWING METHODOLOGY		
Methodology for Trip Distribution	Analogy Method	An assessment of the existing traffic flow pattern in the area was used as an adaptation of the Analogy Method.
THE FOLLOWING TRIP DISTRIBUTION (%) IS EXPECTED		
Primary Trip Distribution	Beyers Naude WEST Beyers Naude EAST Valley Road NORTH Ibis Lane SOUTH	30% 60% 5% 5%

5.3 MODAL SPLIT

THE FOLLOWING MODAL SPLIT FOR PUBLIC TRANSPORT USAGE IS EXPECTED	
Modal Split	The trip reduction of 15% in private vehicle trips already make provision for the utilization of public transportation.
THE FOLLOWING ADJUSTMENTS ARE WARRENTED BY THE EXPECTED UTILIZATION OF PUBLIC TRANSPORT	
Adjustment for public transport	COTO TMH 17 reduction factors for transit corridors were applied.

5.4 TRIP ASSIGNMENT

THE TRIP ASSIGNMENT WAS BASED ON THE FOLLOWING METHODOLOGY	
Methodology for trip assignment	Shortest travel time assignments considering the layout of the road network and the traffic control at key intersections.
THE FOLLOWING SCHEMATIC ILLUSTRATIONS ARE ATTACHED	
Schematic Illustrations	*Refer to:* *Figure 4: Weekday AM Peak Hour Traffic Demand* *Figure 5: Weekday PM Peak Hour Traffic Demand*

6 CAPACITY AND OPERATIONAL ANALYSES

The capacity and operational analyses were subsequently done to determine the required road improvements for the various scenarios

THE FOLLOWING METHODOLOGY WAS UTILIZED		
Methodology capacity and operational analyses	Methodology according to the 2010 Highway Capacity Manual (2010 HCM)	
THE MEUSURES OF PERFORMANCE (MOE'S) ACCORDING TO THE HCM - BASED ON TOTAL (CONTROL) DELAY IN SECONDS - WERE UTILIZED		
The best service levels are LOS A which denotes free flow conditions while LOS F denotes congestion and jammed conditions.		
THE HCM2010 UTILIZES THE FOLLOWING LOS DELAY THRESHOLDS FOR SIGNALIZED AND UNSIGNALIZED INTERSECTIONS RESPECTIVELY		
The overall LOS and average delay are reported for the intersection except with priority control (stop on side road) where the critical side road LOS and delay is reported.	SIGNALIZED LOS A <10 LOS B >10 and <20 LOS C >20 and <35 LOS D >35 and <55 LOS E >55 and <80 LOS F >80	UNSIGNALIZED LOS A <10 LOS B >10 and <15 LOS C >15 and <25 LOS D >25 and <35 LOS E >35 and <50 LOS F >50
THE RESULTS OF THE CAPACITY AND OPERATIONAL ANALYSES ARE SUMMARIZED IN THE FOLLOWING TABLES		
Summary Results	Refer to: *Table 2: Results of Capacity and Operational Analyses*	
THE FOLLOWING RESULTS WERE OBTAINED FROM THE CAPACITY AND OPERATIONAL ANALYSES		
Intersection 1: Jacaranda Street / Beyers Naude Drive	The planned traffic signal-controlled intersection is expected to operate at LOS C/C (AM/PM) with the added latent and application traffic in the design year (Scenario 3). No mitigation measures are required.	

Intersection 4: Valley Road – Ibis Lane / Beyers Naude Drive	The planned traffic signal-controlled intersection is expected to operate at LOS C/C (AM/PM) with the added latent and application traffic in the design year (Scenario 3). However, average delays of 57.63 and 59.78 seconds per vehicle is expected during the weekday PM peak hour for the right-turning traffic on the southern and eastern approaches, respectively. The construction of a second exclusive right-turn lane on the southern approach will ensure LOS C/D (AM/PM) with acceptable average delays (Scenario 4). The required mitigation is the responsibility of the applicant.
Intersection 7: Boland Road – Indaba Lane / Beyers Naude Drive	The planned two-way stop-controlled intersection is expected to operate at LOS F/F (AM/PM) with the added latent and application traffic in the design year (Scenario 3). The implementation of traffic signals and the construction of exclusive turning lanes on the northern and southern approaches will ensure LOS A/A (AM/PM) (Scenario 4). The required mitigation is the responsibility of the applicant.
Intersection 8: Planned K56 / Beyers Naude Drive	The planned two-way stop-controlled intersection is expected to operate at LOS F/E (AM/PM) with the added latent and application traffic in the design year (Scenario 3). Traffic signals are however not yet warranted given average queue lengths of less than 4 vehicles on the northern and southern approaches. No mitigation measures are required.
Intersection 9: Road B / Beyers Naude Drive	The planned marginal intersection is expected to operate at LOS C/B (AM/PM) with the added latent and application traffic in the design year (Scenario 3). The construction is the responsibility of the applicant.
Intersection 10: Ibis Lane / Road A	The planned single-lane roundabout is expected to operate at LOS A/A (AM/PM) with the added latent and application traffic in the design year (Scenario 3). No mitigation measures are required.
Intersection 11: Road B / Road A	The planned single-lane roundabout is expected to operate at LOS A/A (AM/PM) with the added latent and application traffic in the design year (Scenario 3). The construction is the responsibility of the applicant.

7 ROAD IMPROVEMENTS AND MITIGATION MEASURES

All the required road improvements on the road network is discussed in this section.

7.1 REQUIRED ROAD SECTION CONSTRUCTION BY GREENGATE X98

THE REQUIRED ROAD SECTION CONSTRUCTION ARE THE FOLLOWING	
Road A	The construction of a new Class 5a (commercial local) road – 7.4m wide in a 20m road reserve – from Ibis Lane in the east to the application site in the west.
Road B	The construction of a new Class 4a (commercial collector) road – 7.4m wide in a 25m road reserve – on the eastern boundary of the application site from Beyers Naude Drive in the north to the southern boundary of the application site.

7.2 REQUIRED INTERSECTION IMPROVEMENTS BY GREENGATE X98

THE REQUIRED INTERSECTION IMPROVEMENTS ARE THE FOLLOWING	
Intersection 4: Valley Road – Ibis Lane / Beyers Naude Drive	The construction of a second exclusive right-turn lane (90m) on the southern approach.
Intersection 7: Boland Road – Indaba Lane / Beyers Naude Drive	The implementation of traffic signals and the construction of exclusive turning lanes (60m) on the northern and southern approaches.
Intersection 9: Road B / Beyers Naude Drive	The construction of a marginal intersection with an exclusive left-turn lane (60m) on the eastern approach.
Intersection 11: Road B / Road A	The construction of a single-lane roundabout (40m inscribed diameter).

7.3 REQUIRED RIGHT-OF-WAY BY APPLICATION

THE REQUIRED ROW THAT MUST BE PROVIDED BY THE APPLICATION ARE THE FOLLOWING	
ROW	The required ROW that must be protected and kept out of the township is 12.5m for Road B (25m ROW). The required ROW along Beyers Naude Drive is already protected.
THE FOLLOWING SCHEMATIC ILLUSTRATIONS ARE ATTACHED	
Schematic Illustrations	Refer to: *Figure 6: Required Road Network Improvements* *Appendix F: Proposed Access Arrangements*

8 PUBLIC TRANSPORT AND PEDESTRIANS REQUIREMENTS

This section describes requirements in terms of facilities for public transport and pedestrians (non-motorised forms of transport).

8.1 PUBLIC TRANSPORT BACKGROUND

THE FOLLOWING ASSESSMENT IS REQUIRED	
In terms of the National Land Transport Act (NLTA, Act 5 of 2009), it is required to carry out a public transport assessment for all new developments.	
THE ESTIMATED DEMAND FOR PUBLIC TRANSPORT USERS ARE THE FOLLOWING	
Demand for public transport	The estimated demand for public transportation is about 1 user for every 100 m² GLA, which translates into 240 users that can be transported by about 2 busses and 14 taxis (assuming a 30/70 split and occupancies of 60 and 12 respectively).
THE FOLLOWING PUBLIC TRANSPORT FACILITIES ARE RECOMMENDED	
Public Transport Facilities Required	The construction of bus / taxi loading facilities is already planned at the intersection along Beyers Naude Drive with the upgrading of this road.

8.2 PEDESTRIAN AND NMT FACILITIES

THE FOLLOWING PEDESTRIAN AND NMT FACILITIES ARE REQUIRED	
Pedestrian and NMT Facilities	The construction of 2.0m wide sidewalks are required along all the road boundaries adjacent to the application site.

9 PARKING REQUIREMENTS

This section describes the parking requirements of the site based on the relevant town planning scheme conditions

THE FOLLOWING NUMBER OF PARKING BAYS WILL BE PROVIDED ON THE SITE	
Parking Supply	Normal Town Planning Scheme requirements will apply.

10 SITE DEVELOPMENT PLAN (SDP) ISSUES

Internal circulation and parking issues which are important for the site development plan (SDP) are discussed in this section.

A SITE DEVELOPMENT PLAN (SDP) IS AVAILABLE FOR THE DEVELOPMENT	
SDP	No

TRAFFIC ENGINEERING INPUT WILL BE PROVIDED FOR THE FINAL SDP	
SDP	Affirmative

11 CONCLUSIONS AND RECOMMENDATIONS

This section contains the conclusions and recommendations of the report.

11.1 CONCLUSIONS

THE FOLLOWING IS CONCLUDED	
Type of Application	Establishment of a new township Greengate X98.
Property Description	The application site is located on Portion 260 (a portion of Portion 114) of the Farm Rietfontein 189-IQ, Mogale City.

Latent Land Use Rights	The development of Greengate X54 – X57 and X75 is planned for commercial purposes. These townships are situated on the northern side of Beyers Naude Drive, ±700m north-west of the application site. This development is expected to generate ±2,089 vehicle trips during both the weekday morning (AM) and afternoon (PM) peak hours.
Gauteng Strategic Major Road Network	Beyers Naude Drive is a planned K-route, i.e. Route K31, for which a preliminary design (basic planning) was done in the 1970's (PRS72/52) and subsequently accepted (EC no 742 and EC date 75 04 22). This section of Beyers Naude Drive is also intersected by planned Routes K52 and K56. Although basic planning / preliminary design was done for both these routes, the designs have not yet been accepted. The planned K-routes are protected by the Gauteng Infrastructure Act of 2001. Route K31 (Beyers Naude Drive) has a 62m road reserve width which is already protected, i.e. not included in the application site. The construction of Route K31 by Gautrans is now eminent.
Mogale City Road Master Plan for Northern Areas	The Road Master Plan for Mogale City shows Ibis Lane as a Class 4a road with a 25m road reserve, a new Class 5 Road with a 20m road reserve (i.e. Road A) that will connect the application site to Ibis Lane, and a new Class 4a Road with a 25m road reserve (i.e. Road B) on the eastern boundary of the application site which will connect Beyers Naude Drive in the north (planned marginal access) with Road A. The required road reserves will be protected / kept out of the township application.
Committed Road Improvements	Beyers Naude Drive between Route R114 (planned K52) in the west and Marina Street – Peter Road in the east is currently a two-lane single carriageway provincial road, namely D374. This route served ±15,000 vehicles/day in 2016 which requires the upgrading to a four -lane dual carriageway road (i.e. Route K31). The upgrading of this section of Beyers Naude Dr was triggered not only by the normal growth in traffic but also by the planned development of Greengate X54 – X57 and X75. The planned upgrading is a joint venture between GAUTRANS and the developer of the Greengate Townships. Given the functional classification of Route K31 as a metropolitan distributor (i.e. Class 2 road) the spacing of accesses / intersections are strictly limited to 600m, although 800m is preferable in terms of the latest COTO TRH 26 Standards.

	Some of the accesses / intersections along Beyers Naude Drive will therefore be closed. All the intersections along Route K31 will eventually be controlled by means of traffic signals. Traffic signals however can only be implemented if they are warranted in terms of the regulations in this regard, namely SARTSM (Volume 3). These regulations generally require average queue lengths of 4 vehicles during any hour on a normal day. Traffic signals in the study area are only planned at the intersections of Jacaranda Street and Valley Road – Ibis Lane with the upgrading of Beyers Naude Drive (Route K31). Short sections of the planned local road network will be constructed in conjunction with the upgrading of Beyers Naude Drive (K31). These sections, which includes sections of planned Route K56 and Ibis Lane as single carriageway roads, will be constructed to provide access to properties that are affected by the closure of existing intersections along Beyers Naude Drive.	
Proposed Access	Access to the application site will be obtained from Beyers Naude Drive in accordance with the Road Master Plan via the intersection with Valley Road – Ibis Lane and a new Class 5 road (i.e. Road A). Additional access is also proposed from Beyers Naude Drive via a proposed new marginal access (Class 4a road) with Beyers Naude Drive on the eastern boundary of the site (i.e. Road B).	
Expected Trip Generation	Morning (AM) Peak Hour Afternoon (PM) Peak Hour	519 (313 in / 206 out) 1,352 (664 in / 687 out)
Required Road Section Construction by Application	<u>Road A</u> The construction of a new Class 5a (commercial local) road – 7.4m wide in a 20m road reserve – from Ibis Lane in the east to the application site in the west. <u>Road B</u> The construction of a new Class 4a (commercial collector) road – 7.4m wide in a 25m road reserve – on the eastern boundary of the application site from Beyers Naude Drive in the north to the southern boundary of the application site.	

Required Intersection Improvements by Application	Intersection 4: Valley Rd – Ibis Ln / Beyers Naude Dr The construction of a second exclusive right-turn lane (90m) on the southern approach. Intersection 7: Boland Rd – Indaba Ln / Beyers Naude Dr The implementation of traffic signals and the construction of exclusive turning lanes (60m) on the northern and southern approaches. Intersection 9: Road B / Beyers Naude Dr The construction of a marginal intersection with an exclusive left-turn lane (60m) on the eastern approach. Intersection 11: Road B / Road A The construction of a single-lane roundabout (40m inscribed diameter).
ROW Requirements by Application	The required ROW that must be protected and kept out of the township is 12.5m for Road B (25m ROW). The required ROW along Beyers Naude Drive is already protected.
Public Transport Facilities Required	The construction of bus / taxi loading facilities is already planned at the intersection along Beyers Naude Drive with the upgrading of this road.
Pedestrian and NMT Facilities	The construction of 2.0m wide sidewalks are required along all the road boundaries adjacent to the application site.
Parking Supply	Normal Town Planning Scheme requirements will apply.

11.2 RECOMMENDATIONS

THE FOLLOWING IS RECOMMENDED	
Recommendation	The approval of the township application from a traffic and transportation point of view is recommended subject to the construction of the required road improvements, as well as the other conditions contained in this traffic impact assessment.
THE FOLLOWING SCHEMATIC ILLUSTRATIONS ARE ATTACHED	
Schematic Illustrations	Refer to: *Figure 6: Required Road Network Improvements* *Appendix F: Proposed Access Arrangements*

TABLES

Table 1: Expected Trip Generation

PEAK HOUR	LAND USE DESCRIPTION		GLA (m^2)	TRIP RATES			TRIPS		
				TRIP RATE	IN SPLIT	OUT SPLIT	TRIPS	IN TRIPS	OUT TRIPS
Weekday AM	Business 1	Retail	12,000	1.20	65%	35%	144	94	50
		Fast Food	400	38.25	55%	45%	153	84	69
		Restaurants	600	0.64	70%	30%	4	3	1
		Medical Consulting Rooms	1,250	6.80	55%	45%	85	47	38
		Building Materials	3,750	2.38	65%	35%	89	58	31
		Motor Dealership	1,250	1.87	65%	35%	23	15	8
	Commercial	Warehousing & Distribution	4,750	0.43	60%	40%	20	12	8
	TOTAL TRIPS		**24,000**	**2.16**	**60%**	**40%**	**519**	**313**	**206**
Weekday PM	Business 1	Retail	12,000	6.81	50%	50%	817	408	408
		Fast Food	400	42.50	55%	45%	170	94	77
		Restaurants	600	10.03	40%	60%	60	24	36
		Medical Consulting Rooms	1,250	6.80	45%	55%	85	38	47
		Building Materials	3,750	4.68	45%	55%	175	79	96
		Motor Dealership	1,250	1.96	50%	50%	24	12	12
	Commercial	Warehousing & Distribution	4,750	0.43	45%	55%	20	9	11
	TOTAL TRIPS		**24,000**	**5.63**	**49%**	**51%**	**1,352**	**664**	**687**

TABLES

Table 2: Results of Capacity and Operational Analyses

INTERSECTION	PEAK HOUR	MOE	1	2	3	4
			2019 EXISTING	2024 + LAT	2024 + LAT + APP	2024 + LAT + APP & MIT
INTERSECTION 1 Jacaranda St / Beyers Naude Dr	Intersection	Control	TWSC	TSC	TSC	
	Weekday AM	V/C	0.08	0.77	0.79	
		Delay	0.26 (163.64)	25.92 (32.4)	26.07 (33.86)	
		LOS	F	C	C	
	Weekday PM	V/C	0.29	0.68	0.69	
		Delay	1.00 (97.59)	22.06 (27.66)	23.37 (28.05)	
		LOS	F	C	C	
INTERSECTION 2 Rocky Ridge Rd / Beyers Naude Dr	Intersection	Control	TWSC			
	Weekday AM	V/C	0.38			
		Delay	1.57 (229.81)			
		LOS	F			
	Weekday PM	V/C	0.28			
		Delay	1.31 (101.36)			
		LOS	F			
INTERSECTION 3 Tuohyvale Rd / Beyers Naude Dr	Intersection	Control	OWSC			
	Weekday AM	V/C	0.20			
		Delay	0.60 (111.63)			
		LOS	F			
	Weekday PM	V/C	0.07			
		Delay	0.20 (60.68)			
		LOS	F			

TABLES

INTERSECTION	PEAK HOUR	MOE	1	2	3	4
			2019 EXISTING	2024 + LAT	2024 + LAT + APP	2024 + LAT + APP & MIT
INTERSECTION 4 Valley – Ibis Ln / Beyers Naude Dr	Intersection	Control	TWSC	TSC	TSC	TSC
	Weekday AM	V/C	1.09	0.57	0.73	0.69
		Delay	9.01 (641.11)	7.48 (29.17)	33.22 (50.62)	33.67 (50.62)
		LOS	F	A	C	C
	Weekday PM	V/C	0.21	0.49	0.71	0.67
		Delay	6.23 (230.38)	6.02 (51.24)	26.54 (53.40)	40.74 (44.98)
		LOS	F	A	C	D
INTERSECTION 5 Incolae Rd / Beyers Naude Dr	Intersection	Control	OWSC			
	Weekday AM	V/C	0.50			
		Delay	1.81 (183.15)			
		LOS	F			
	Weekday PM	V/C	0.26			
		Delay	0.94 (88.51)			
		LOS	F			
INTERSECTION 6 Centre Access / Beyers Naude Dr	Intersection	Control	OWSC			
	Weekday AM	V/C	0.20			
		Delay	0.67 (125.89)			
		LOS	F			
	Weekday PM	V/C	0.19			
		Delay	0.95 (76.47)			
		LOS	F			

TABLES

INTERSECTION	PEAK HOUR	MOE	1	2	3	4
			2019 EXISTING	2024 + LAT	2024 + LAT + APP	2024 + LAT + APP & MIT
INTERSECTION 7 Boland Rd - Indaba Ln / Beyers Naude Dr	Intersection	Control	TWSC	TWSC	TWSC	TSC
	Weekday AM	V/C	2.67	0.91	1.25	0.67
		Delay	67.19	7.17 (223.30)	10.43 (389.02)	7.95 (43.30)
		LOS	F	F	F	A
	Weekday PM	V/C	0.66	0.30	0.56	0.64
		Delay	5.89 (212.72)	1.40 (63.46)	2.57 (156.05)	6.17 (53.28)
		LOS	F	F	F	A
INTERSECTION 8 Planned K56 / Beyers Naude Dr	Intersection	Control		TWSC	TWSC	
	Weekday AM	V/C		0.22	0.25	
		Delay		0.58 (81.52)	0.62 (91.58)	
		LOS		F	F	
	Weekday PM	V/C		0.09	0.12	
		Delay		0.20 (38.01)	0.22 (49.20)	
		LOS		E	E	
INTERSECTION 9 Road B / Beyers Naude Dr	Intersection	Control			Marginal	
	Weekday AM	V/C			0.52	
		Delay			0.50 (15.80)	
		LOS			C	
	Weekday PM	V/C			0.52	
		Delay			1.20 (12.60)	
		LOS			B	

TABLES

INTERSECTION	PEAK HOUR	MOE	1	2	3	4
			2019 EXISTING	2024 + LAT	2024 + LAT + APP	2024 + LAT + APP & MIT
INTERSECTION 10 Ibis Ln / Road A	Intersection	Control		RBT	RBT	
	Weekday AM	V/C		0.07	0.21	
		Delay		3.18 (3.24)	4.24 (4.49)	
		LOS		A	A	
	Weekday PM	V/C		0.10	0.42	
		Delay		3.42 (3.51)	6.65 (7.13)	
		LOS		A	A	
INTERSECTION 11 Road B / Road A	Intersection	Control			RBT	
	Weekday AM	V/C			0.18	
		Delay			4.35 (4.68)	
		LOS			A	
	Weekday PM	V/C			0.54	
		Delay			8.55 (9.14)	
		LOS			A	

NOTE:

The MOE's in brackets show the worst / critical movement (OWSC and TWSC) or the worst / critical approach (TSC, AWSC and RBT).

TSC = Traffic Signal Control

AWSC = All-way Stop Control

TWSC = Two-way Stop Control

OWSC = One-way Stop Control

RBT = Roundabout

FIGURES

FIGURES

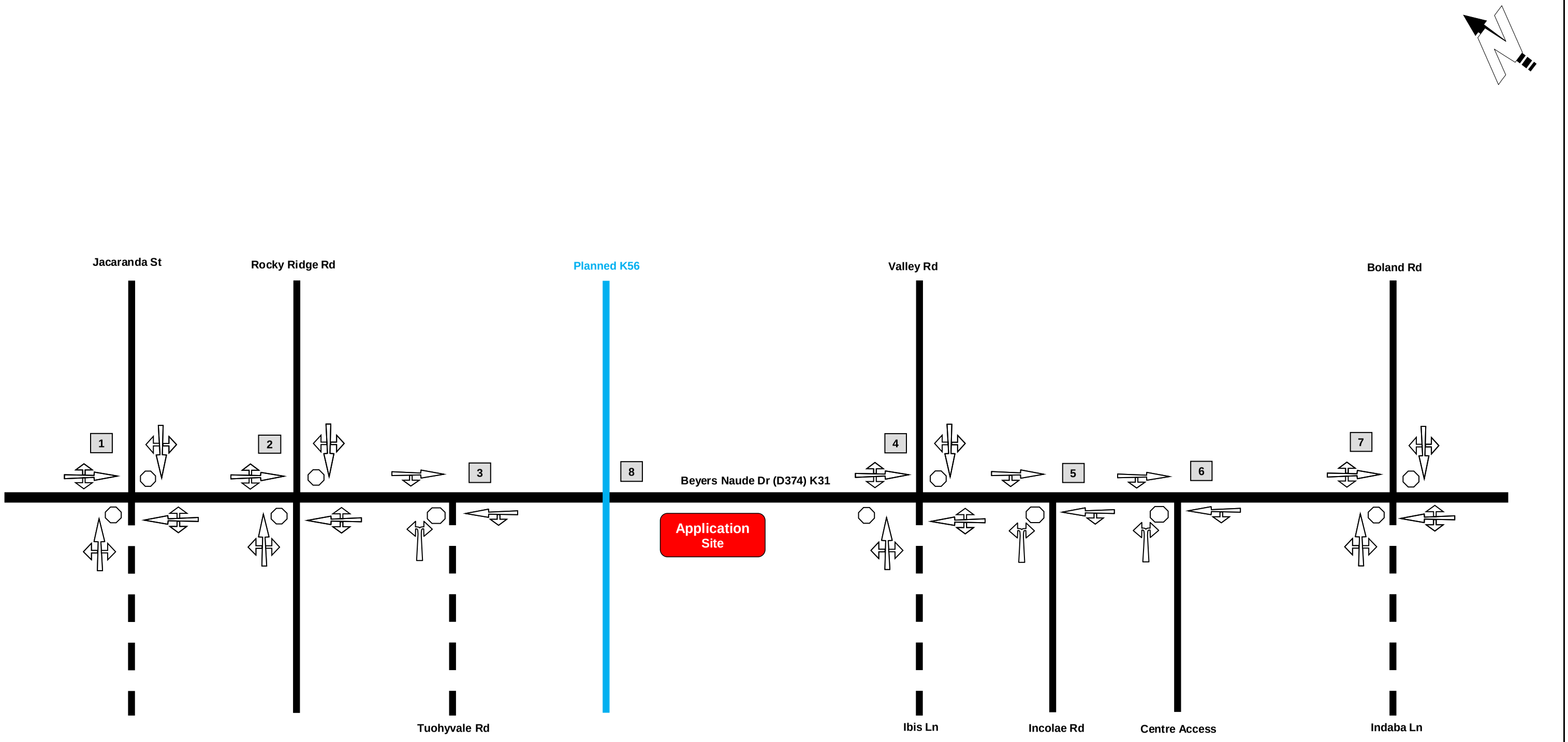
FIGURES

Figure 1: Locality Plan and Study Area

TECHWORLD	GREENGATE X98, MOGALE CITY	Locality Plan and Study Area	FIGURE 1

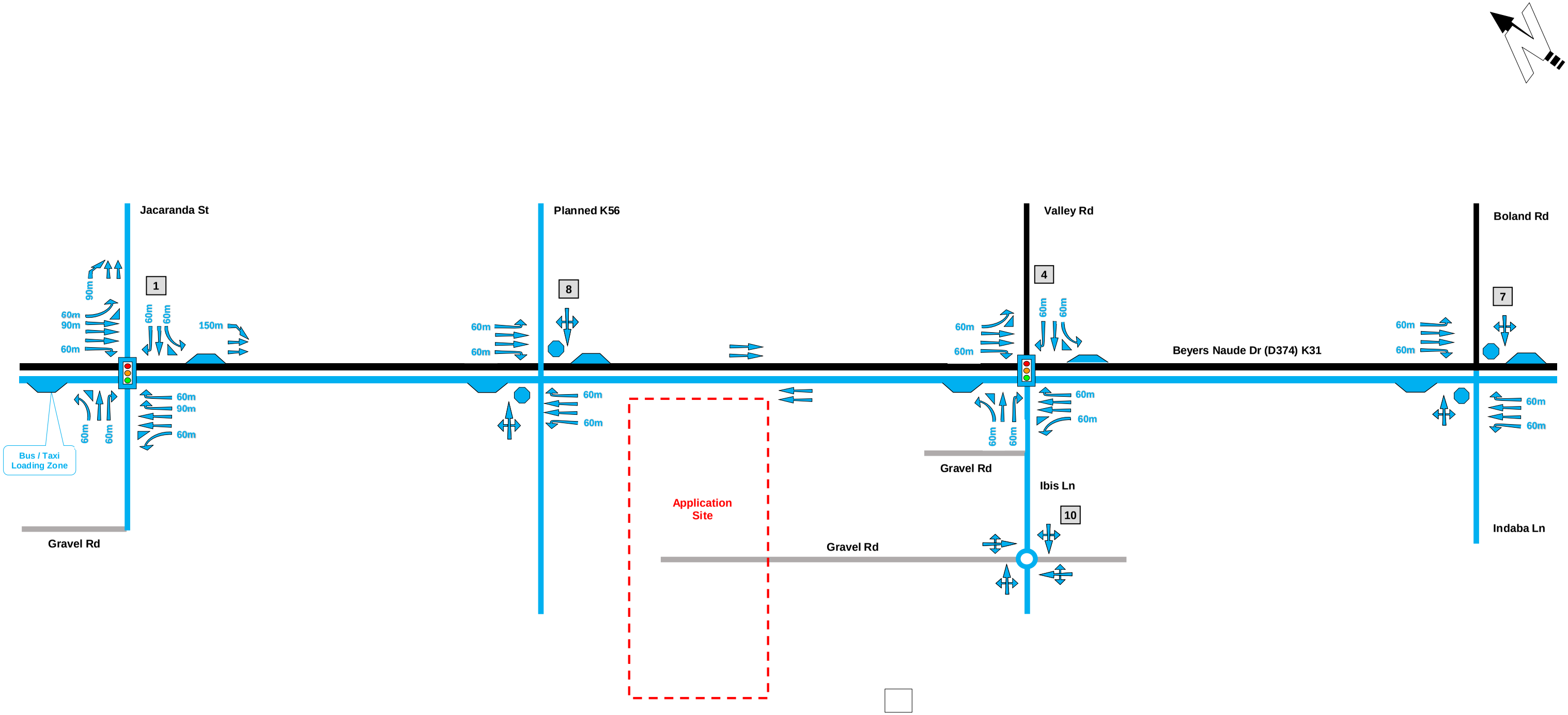
FIGURES

Figure 2: Existing Road Network and Lane Layout



TECHWORLD	GREENGATE X98, MOGALE CITY	Existing Road Network and Lane Layout	FIGURE 2

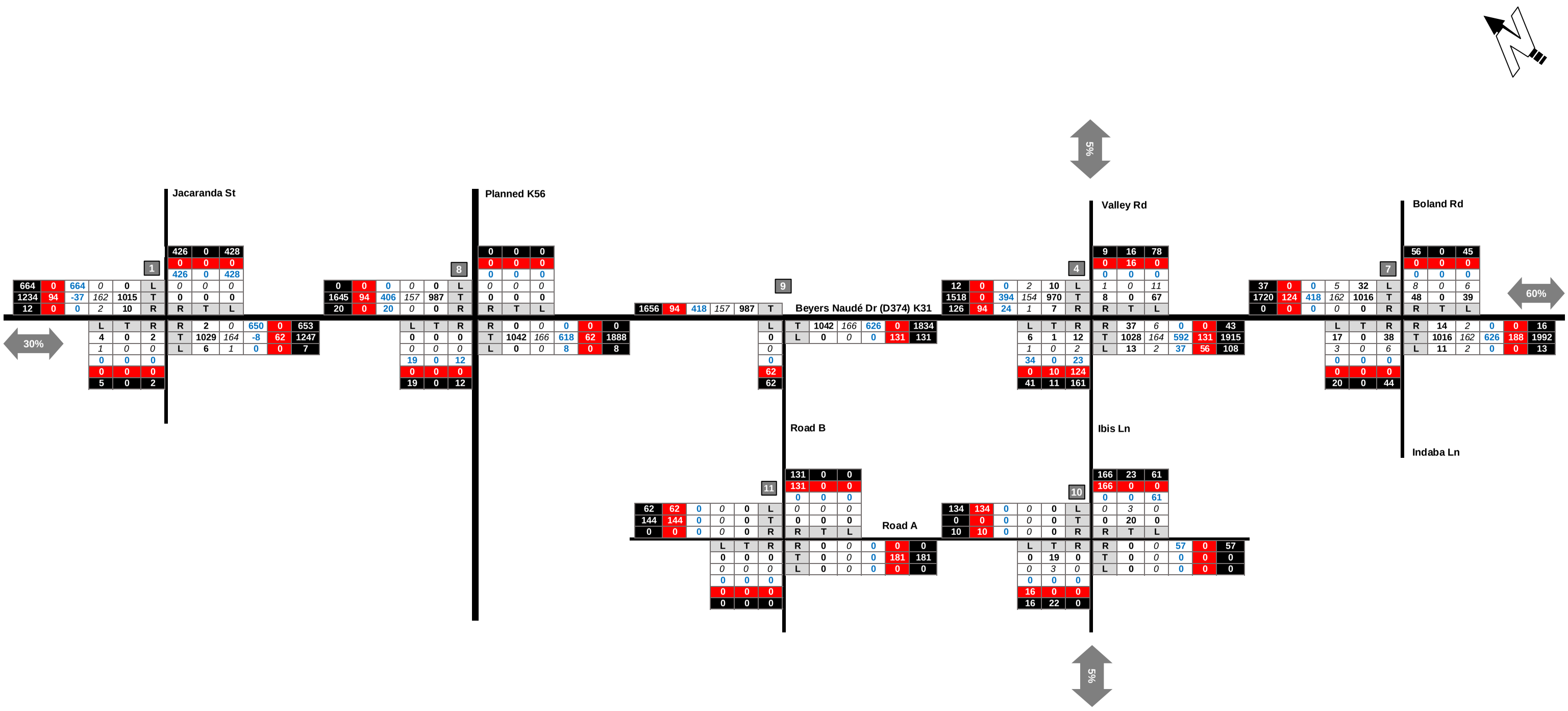
Figure 3: Committed Road Network Improvements



LEGEND	
	Existing Road Network
	Committed Road Improvements by Gautrans & Greengate X54 - X57 & X75

TECHWORLD	GREENGATE X98, MOGALE CITY	Committed Road Network Improvements	FIGURE 3

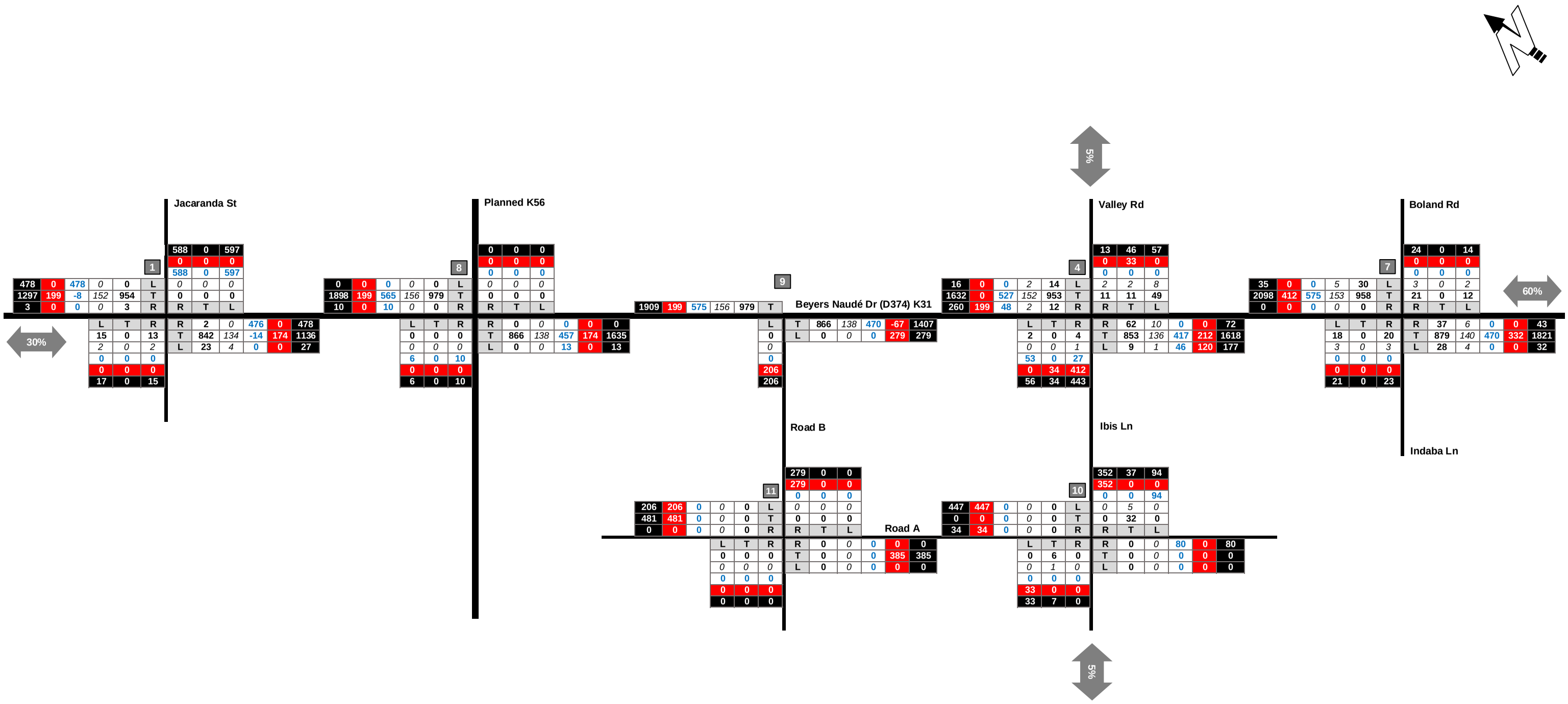
Figure 4: Weekday AM Peak Hour Traffic Demand



LEGEND	
L	Traffic Movement
2	Existing 2019 Weekday Peak Hour Traffic Demand
0	Background Traffic Growth
1	Latent Traffic Demand
5	Added Application Traffic & Redistribution
8	Expected 2024 Total Future Traffic Demand

TECHWORLD	GREENGATE X98, MOGALE CITY	Weekday AM Peak Hour Traffic Demand	FIGURE 4

Figure 5: Weekday PM Peak Hour Traffic Demand

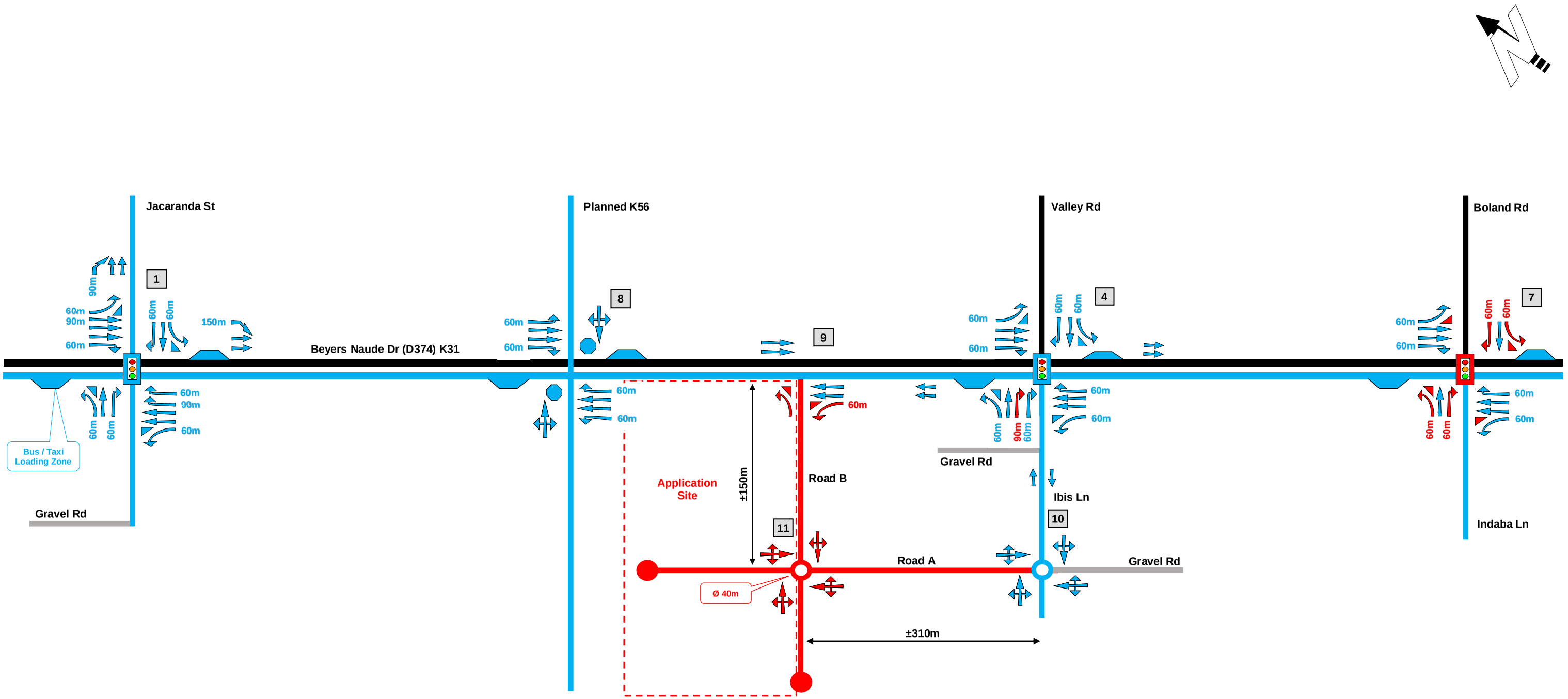


LEGEND	
L	Traffic Movement
2	Existing 2019 Weekday Peak Hour Traffic Demand
0	Background Traffic Growth
1	Latent Traffic Demand
5	Added Application Traffic & Redistribution
8	Expected 2024 Total Future Traffic Demand

TECHWORLD	GREENGATE X98, MOGALE CITY	Weekday PM Peak Hour Traffic Demand	FIGURE 5

FIGURES

Figure 6: Required Road Network Improvements



LEGEND
Existing Road Network
Committed Road Improvements by Gautrans & Greengate X54 - X57 & X75
Required Road Improvements by Greengate X98

TECHWORLD	GREENGATE X98, MOGALE CITY	Required Road Network Improvements	FIGURE 6