

George Airport North Eastern Precinct Transport Study

George

October 2021



SUMMARY SHEET

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Project Team	Christoff Krogscheepers Carla Kleynhans
Contact Details	Tel: 021 914 6211
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1 INTRODUCTION

The George Airport North Eastern Precinct (GANEP) has several proposed developments, which will lead to an increase in traffic volumes in the area. As a result, the surrounding road network will need to be upgraded to accommodate the expected development trips. The purpose of this Traffic Study is to investigate the transport impact of the GANEP in George and steer the phased implementation of the required road infrastructure to accommodate the expected development traffic.

In 2019, a Road Master Plan was developed for the GANEP (Innovative Transport Solutions (ITS), 2019). This Road Master Plan was requested by the George Municipality. This traffic study evaluates the traffic impact of the proposed GANEP within the context of the master plan and based on new and updated development proposals as well as an adjusted timeline of the Western Bypass.

2 STUDY AREA

The study GANEP area is triangular shape and is bound by the R102 to the north, the R404 to the west and the future George Western Bypass to the east. This area is illustrated in Figure 1 which is an extract of the GANEP as it appears in the Gwyang Local Spatial Development Framework (GLSDF, Nov 2015). Refer to Figure A1 in Appendix A for the GLSDF.



Figure 1: Extract of Gwyang Local Spatial Development Framework (GLSDF, Nov 2015)

3 LAND USE

The GANEP covers approximately 26 hectares of developable land which is represented by the blue area in Figure 1. The blue area is designated for use defined as Airport Support Zone which is further defined in the GLSDF as follows:

“As explained in par 9.3 it is proposed that an airport support zone be permitted opposite the airport. The intent and context of this node must be noted when considering proposals for development. Only land uses that are supporting the airport facilities or that providing a direct service to tourists must be permitted.”

The GANEP currently consist of eight properties, each with certain land use rights and proposed development plans.

3.1 Airport Planning

ACSA was planning to expand the George Airport and specifically the commercial side of the airport in the light of more commercial flights. In the GANEP Roads Master Plan it was assumed that the airport activities would double within the 20-year planning horizon. However, due to the Covid-19 pandemic and the weakened economy, passenger numbers have declined to 50% of the pre-Covid levels. The airport passenger numbers are based on data received from ACSA for the Cape Town International Airport, the data for the George Airport could not be obtained. It is unlikely that the pre-Covid planning levels will materialise in the next 20 years. In fact, it may take several years to just get back to the pre-Covid levels. Therefore, in this study the traffic demand due to the airport expansion was adjusted down.

3.2 Portion 4 of Farm Gwayang No 208

An industrial development is proposed on Portion 4 of Farm Gwayang No 208. The site is located east of the R404 at the R404/Airport Main Access intersection. The development will consist of a Filling Station and Warehousing. Portion 4 of Farm Gwayang No 208 is zoned Agricultural Zone I and the proposed land uses have not yet been approved by the Council.

The proposed development will comprise of six erven. One erf will be zoned Business Zone VI with consent use for a Filling Station, while the other five erven will be zoned Industrial Zone I with consent for warehouses. Refer to Figure 2 for the Subdivision Plan.

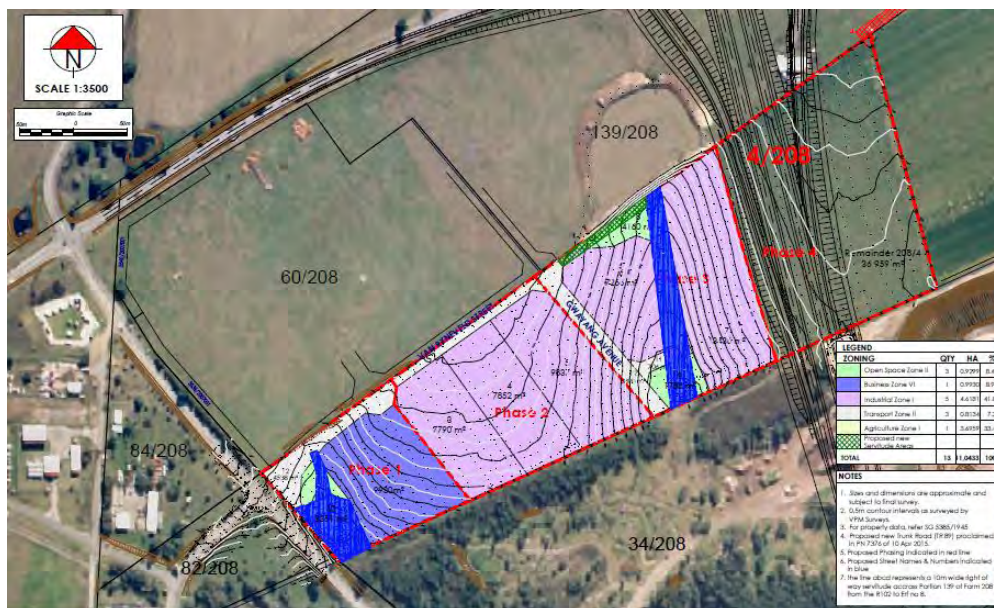


Figure 2: Farm Portion 4/208 proposed development access and access road to surrounding erven

3.3 Portion 130, 131 and 132 of Farm Gwayang No 208

These erven were subdivided and re-zoned from agricultural use in the recent past. The previously proposed zoning for each portion was as follows:

Farm Portion 130/208:

- Zoned: General Residential Zone VI
- Limited to a hotel
- Zoned: Agricultural Zone I
- Consent for tourist facilities

Farm Portion 131/208:

- Zoned: Business Zone V
- Limited to a filling station, excluding vehicle sales and repairs

Farm Portion 132/208:

- Zoned: Agricultural Zone II
- Consent for tourist facilities (theatre, crafts market, curio (gifts) shop, micro-brewery, museum and info centre)

Currently it is proposed that these erven be re-zoned as Industrial 1. The permitted use for Industrial 2 is light industry which include industrial hives, warehousing, service trade, restaurants, and car lots. This proposed development has consent for convenience shops, liquor stores and offices. The most recent proposed site development plan for all three the abovementioned portions, as obtained from the landowner, is illustrated in Figure 3.



Figure 3: Portions 130 to 132 of Farm 208 proposed concept plan

3.4 Portion 139 of Farm Gwayang No 208

This farm portion is zoned Agricultural Zone I, which allows for a shed to be constructed. Previously, the landowner was planning on obtaining land use rights for tourist activity. However, this has now changed, and the landowner is now applying for warehousing land use rights. The site development plan for this portion, as obtained from the landowner, is illustrated in Figure 4. A traffic impact assessment (TIA) (RTS, 2021) was conducted for Portion 139. There are minor differences between the TIA and this traffic study in terms of GLA and trip generation, however the upgrades proposed for the R404/George Airport Main Access are similar.



Figure 4: Portion 139 of Farm 208 proposed site plan

3.5 Portion 34 of Farm Gwyang No 208

It is currently still uncertain how, if and when Portion 34 will develop. To ensure that the whole GANEP area is considered in this study it is assumed that Portion 34 will develop with light industrial land uses, similar to the other portions of the GANEP. It is also assumed that an internal circular route will be constructed within the GANEP, providing two access locations to the R404. One opposite the George Airport Main Access intersection and the second opposite the George Airport secondary access.

4 SCENARIOS ANALYSED

To understand and evaluated the transport impact of the GANEP, the following scenarios were developed:

1. 2021 Existing Scenario (Section 5)
2. 2026 Background Scenario (Section 6)
 - a. Without the Bypass
 - b. With the Bypass
3. 2026 Future Scenario (Section 9)
 - a. Low ACSA and GANEP Trips – without bypass
 - b. High ACSA and GANEP Trips – without bypass
 - c. Low ACSA and GANEP Trips – with bypass
 - d. High ACSA and GANEP Trips – with bypass

5 STATUS QUO EVALUATION

5.1 Existing Roadways

The R102 is a trunk road (TR209). It is classified as a Class 2 road with a lane width of 3.5m and a 1m shoulder on both sides. The speed limit is 100km/h.

The R404 (MR 347) is a provincial main road and a Class 3 road with a lane width of 3.4m and gravel shoulders on both sides. The speed limit varies between 60km/h to 100km/h.

5.2 Existing Intersection Analyses

The intersection operational analyses were conducted to assess the following three intersections. All three these intersections are priority stop-controlled intersections. These intersections are:

- R102/R404
- R404/Airport Main Access
- R404/Airport Second Access

Due to the Covid-19 pandemic, current traffic surveys were not conducted. Instead, historical 2017 and 2019 traffic volumes were used. The 2019 traffic volumes were obtained from the Western Cape Government (WCG) Road Network Information System (RNIS) website (WCG, 2019). The 2017 traffic volumes were mainly used to determine the directional split and movement percentages at the various intersections.

SANRAL's permanent counting station data along the N2 was used to determine the reduction in the traffic volumes due to the Covid-19 pandemic. The data from the permanent counting station situated at the N2 interchange east of the George Airport was used. The 2019 and 2020 ADT were compared and there was a reduction in the traffic volumes of 25%, due to the Covid-19 pandemic. The historical 2019 traffic volumes were therefore used as the existing 2021 scenario volumes as these are pre-covid volumes.

The intersections in the study area were analysed based on the methods as described by the Highway Capacity Manual (HCM) as coded in the Traffix Software to determine the level of service (LOS), delay per vehicle (in seconds) and volume per capacity (v/c) for each intersection in the peak hour. Refer to Figure B1 for the existing weekday peak hour traffic demand and intersection operations. Based on the existing traffic analyses, all the intersections are operating acceptably with no capacity conditions being experienced.

6 BACKGROUND SCENARIO

6.1 Future Road Network

The *Western Bypass* will link the Outeniqua Pass with the N2. The northern section of the route will go through the farming and peri-urban area of Blanco to the north of the Geelhoutboom intersection, while the southern section will run from the N2/Herold's Bay interchange past the airport to the Geelhoutboom intersection. The approved route in the northern section is known as the Gwaing Blanco Alignment and the southern section as the Quarry Alternative 3 Alignment. This is illustrated in Figure 5. Refer to Figure A2 in Appendix A for the Preliminary Design drawings of the section passing the airport.

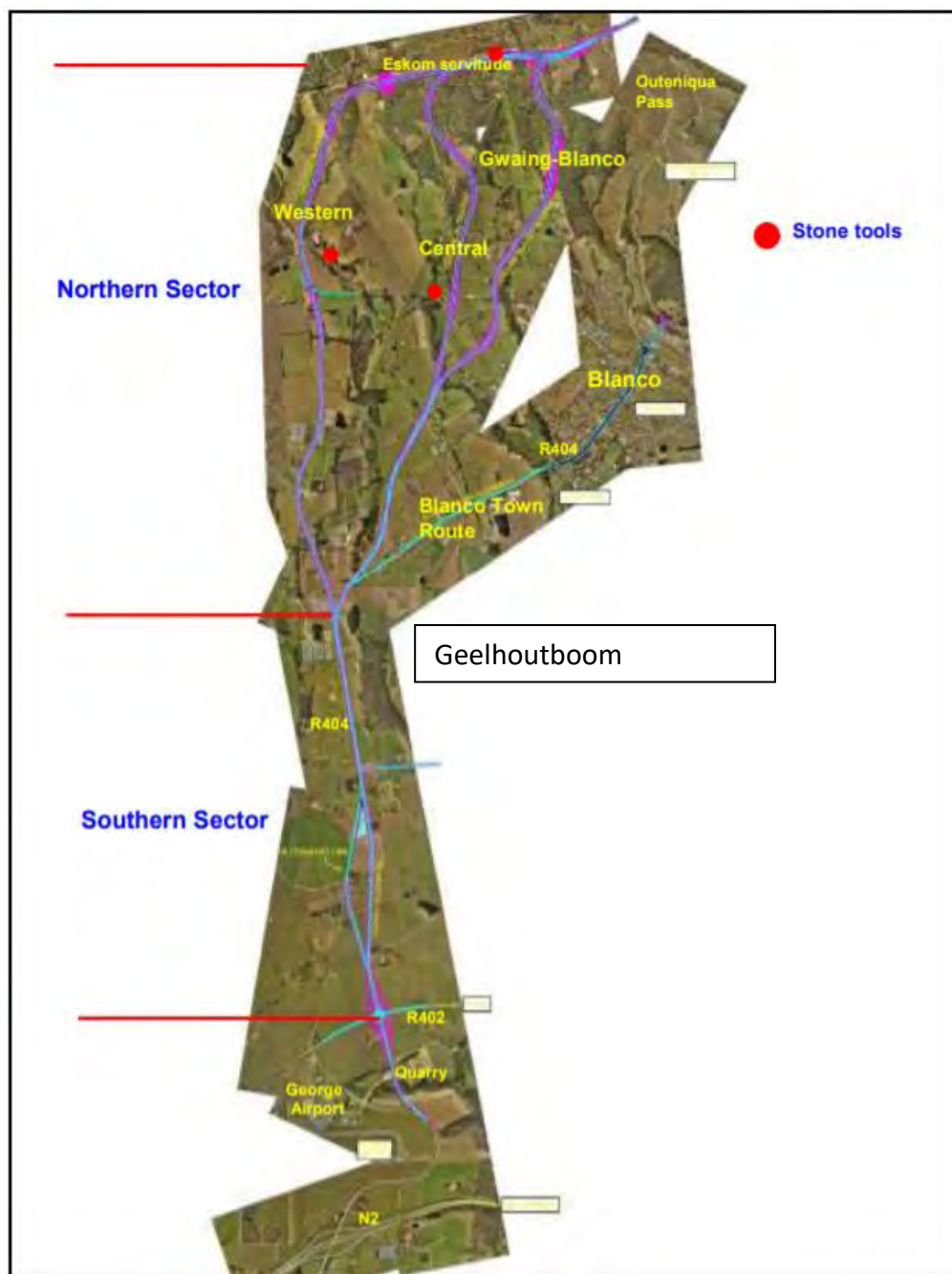


Figure 5: Western Bypass

Due to the bypass, a new access road needs to be constructed to the Quarry. The proposed access road to the Quarry is approximately 30 metres away from the watercourse. The overpass is designed as a means of a continued operational access to the eastern extremity of the Quarry. Refer to Figure A3 in Appendix A for the proposed overpass to the Quarry.

In the GANEP Road Master Plan (ITS, 2019) it was assumed that the bypass will be constructed in the distant future. However, according to the latest information obtained from the Western Cape Government relating to the timing of the bypass, it would now seem as if the bypass construction could be much sooner. For the purposes of this study, some of the scenarios included the bypass being in place in the next five years. Refer to Appendix C for the road network layouts with and without the bypass in place.

6.2 Background Traffic Growth

An average growth rate of 3% per annum was applied to the existing traffic volumes over a five-year horizon period. This is according to historical growth rates as recorded on the WCG RNIS website (WCG, 2021). This growth rate was applied to the entire road network for the scenarios where the bypass is in place. For the scenarios without the bypass, the growth rate was only applied to the R102/R404 intersection, specifically to the movements along the R102. If the bypass is in place the R404 will be reduced to a local access road and the growth will only be due to either development on the GANEP or the airport.

6.3 Background Intersection Analyses

Two background scenarios were investigated, these scenarios are discussed below:

- a) Excluding the Western Bypass – This scenario analyses the network conditions based on existing traffic volumes and existing network but with a 3% per annum growth rate for five years.
- b) Including the Western Bypass – This scenario investigates the network conditions with the bypass in place and re-assigned existing traffic volumes with a 3% per annum growth rate over five years. The re-assigned volumes are based on the existing volumes and how their paths will change with the bypass in place.

None of the study intersections are expected to experience capacity constraints in either of the two scenarios evaluated. Refer to Figure B2 and B3 in Appendix B for the background analysis results for both scenarios.

This also applies to the intersection of the R102/R404 which will continue to operate acceptably under its current control, i.e. stop control on the minor approaches. There are current concerns regarding the traffic safety of this intersection in the light of a number of serious crashes that have occurred there. Several opinions have been expressed by members of the public through the media as well as by airport management that an intervention is required at this intersection. However, purely from an operational perspective there is still spare capacity at this intersection to

accommodate growth in traffic volumes. But given the safety issues at the intersection it is recommended that the WCG address these concerns as a matter of urgency.

7 ACCESS

There is currently no formal public road access to the GANEP area. Access is proposed via a new road that links to the public road network at the R404/Airport Access. Other than a minor deviation close the intersection with the R404, the proposed public road will run on the boundary between Portion 4 and Portion 130. It will extend all the way to the east to also provide access to Portion 139.

A second access to the area is proposed via the R404 at an intersection further to the south and opposite the second access to the airport, which is close to the location where the quarry currently gains access. It is proposed that these two access roads be linked via a public road.

8 TRIP GENERATION AND DISTRIBUTION

8.1 Trip Generation

It is envisaged that the GANEP will develop with land uses such as light industrial, service industry, restaurants, and a filling station. The trip generation rates and the detailed trip generation are attached in Appendix D. The trip generation is based on the guidance as provided in the Trip Data Manual (TMH17, COTO, 2013). A 10% reduction was applied to the trip generation to account for internal trips since many of the proposed uses are complementary and there will be interaction between the uses not only directly but also indirectly with multi-destination trips. Refer to Table 1 for a summary of the estimated trip generation for the various properties. Noted that no detail plans were obtained for the development of Portion 34. The trip generation for this area was thus determined based on the following assumptions:

- Total Developable Area reduced by 13% to make provision for roads.
- A Floor Area Ratio of 75%.
- A Leasable Floor Space of 95%.

These assumptions are similar to what was initially used for the other portions.

Table 1: Total Trips after pass-by, diverted and internal trips deducted

Erven	Internal Portions	Land Use	Extent (m ² GLA)	Weekday AM Peak Hour			Weekday PM Peak Hour		
				In	Out	Total	In	Out	Total
Portion 4		Warehousing	35 262	95	64	159	71	87	158
		Filling Station Convenience Store	200	5	3	8	11	11	22
Portion 130 - 132	1	Service Industry	13 460	82	27	109	27	82	109
		Restaurant	500	0	0	0	14	8	22
		Fast Food	385	86	70	156	50	41	91
	2	Service Industry	5 634	34	12	46	12	34	46
	3-8	Light Industrial	26 816	116	29	145	29	116	145
Portion 139		Light Industrial	30 761	83	56	139	62	77	139
Portion 34		Light Industrial	26 643	115	29	144	29	115	144
GRAND TOTAL			139 660	616	289	905	305	571	877

According to the GANEP Road Master Plan (ITS, 2019) during the 2019 pre-covid period, the airport generated approximately 500 peak hour trips. Currently, due to economic constraints, international travel restrictions and changing user patterns, the passenger volumes through the airport is below the pre-covid volumes at approximately 50%. The airport passenger numbers are based on data received from ACSA for the Cape Town International Airport, the data for the George Airport could not be obtained.

Two scenarios are evaluated to allow for growth of the Airport:

- A low recovery rate of 10% per year in passenger activity which is directly linked to traffic volumes. This will result in the airport being at 80% of the 2019 traffic volumes within the next five years. This equates to approximately 400 trips.
- A high recovery rate of double the above. In the next five years, the passenger and traffic volumes will then be 20% higher than the pre-Covid volumes. This is approximately 600 trips.

8.2 TRIP DISTRIBUTION

Two trip distribution options were investigated as determined by the available road network with and without the Western Bypass. Without the Western Bypass, it is assumed that the trip distribution will be as follows:

- 20% to/from George via R102 east
- 10% to/from Groot-Brak via R102 west
- 30% to/from Fancourt via R404 north
- 20% to/from Herold's Bay via the R404 south
- 20% to/from the GANEP Area north of the Airport

It is assumed that the trip distribution will be as follows once the Western Bypass has been constructed:

- 60% to/from George/Western Bypass via R102 east
- 10% to/from Groot-Brak via R102 west
- 10% to/from Herold's Bay via the Western Bypass
- 20% to/from the GANEP Area north of the Airport

The above distributions are illustrated in Figures B4 to B7 in Appendix B.

9 FUTURE - TOTAL TRAFFIC SCENARIOS

To allow for a realistic review of possible future traffic conditions within the context of the uncertainties of economic growth and airport expansion options, four scenarios were evaluated. These scenarios are as follows:

- Low ACSA and GANEP Trips – without bypass
- High ACSA and GANEP Trips – without bypass
- Low ACSA and GANEP Trips – with bypass
- High ACSA and GANEP Trips – with bypass

For each scenario the existing traffic volumes were increased with a background growth rate of 3% per annum over five years (refer to Section 6.2) plus the estimated ACSA and GANEP trips were added to the road network.

The intersection capacity analyses are discussed in the following paragraphs based on whether the Western Bypass is constructed or not. This includes a proposal on phased implementation of any possible mitigation measures.

9.1 Without Western Bypass

Assuming a low recovery rate of only 10% per year in airport activity, with regional growth resulting in general background growth of 3% per year, the following would be required to accommodate the full development of the GANEP precinct:

- The main internal access roads are required to give access to the different portions, specifically the public road linking to the R404 at an intersection opposite the main airport access.
- If any development occurs in the southern parts of the precinct, the access road that links to the R404 and intersects the R404 opposite the secondary airport access will be required unless the internal link roads are constructed to allow access to the intersection opposite the main airport access.
- For full build out of the GANEP, the following will be required:
 - A roundabout/signal at the intersection of R404/R102. The actual type of control at this intersection needs to be determined through a specific study since there are various view points on what it should be.

- A single lane roundabout at the intersection of the R404/Airport Access/GANEP access.
- A stop-controlled intersection at the southern access to the GANEP opposite the secondary airport access.

Refer to Figure B8 and B9 for summaries of the intersection capacity analyses for both the low and the high ACSA recovery scenarios. These figures indicate the intersection operations for when the whole GANEP has been developed.

The development of the GANEP will obviously occur in phases and in line with market response. To enable a phased roll-out of the above-mentioned infrastructure which are required for the full development an analysis was done to determine when what will be required. The following is a summary of the phased analysis:

- Initially both roads into the GANEP which links to the R404 can be built with priority/stop control on the side roads at the R404 intersections. Similar to the link from the airport main access road. These priority/stop control approaches should function acceptably until 40% of the total trips from the proposed lands uses in GANEP has realised. The southbound approach to the R404, of the new public roads, should be built with a short right-turn lane and the shared through/left turn lane.
- The intersection of the R102/R404 will continue operate acceptably under its current control until 40% of the GANEP has developed (40% of the trips are on the network). Once the 40% point is reached, the intersection needs to be upgraded to either a roundabout or a traffic signal. These findings are purely from an operational perspective. Given the safety concerns as expressed by the public, it is recommended that the responsible road authority address these concerns.
- To accommodate further growth of the GANEP, the control at the R404/Airport Access/Main access to precinct be changed to a 4-way stop with dedicated right-turn lanes along three of the approaches. The 4-way stop control will operate acceptable until 70% of the trips from the GANEP are on the network. Without the Western Bypass, the R404 will still fulfil an important mobility function and it is not ideal to place a 4-way stop on a mobility route, although there are many other such examples. At the 40% growth point, it may be advantageous for the area and specifically as an access to the airport to construct a single lane roundabout instead of the 4-way stop. The roundabout will be required anyway to accommodate growth beyond the 70% ceiling.
- The above can be further summarised as follows:
 - Under the low-growth scenario, 40% of the GANEP traffic can be accommodated with only the construction of the main access road into the precinct and with stop control along the approach from the GANEP where it intersects with the R404 opposite the airport access road.
 - With development beyond 40% and up to 70% of the GANEP trips, the R404/Airport Access intersection will need to be changed to a 4-way stop with turning lanes along

three of the approaches. The intersection of the R102/404 needs to be improved to either a roundabout or traffic signal.

- To go beyond 70% of the GANEP trips, the intersection of the R404/Airport Access needs to be upgraded to a single lane roundabout

Assuming a high recovery rate of 20% per year in airport activity, with regional growth resulting in general background growth of 3% per year, the following would apply to the development of the GANEP precinct:

- The main internal access roads are required to give access to the different portions, specifically the public road linking to the R404 at the intersection opposite the main airport access.
- If any development occurs in the southern parts of the precinct, the access road that links to the R404 and intersects the R404 opposite the secondary airport access will be required unless the internal link roads are constructed to allow access to the intersection opposite the main airport access.
- For full build out of the GANEP, the following will be required, similar to the low-growth scenario:
 - A roundabout/signal at the intersection of R404/R102.
 - A single lane roundabout at the intersection of the R404/Airport Access/GANEP access.
 - A stop-controlled intersection at the southern access to the GANEP opposite the secondary airport access.
- Similar to the low-growth scenario, a phased analysis was done and this is summarised as follows:
 - Under the high-growth scenario, 25% of the GANEP traffic can be accommodated with only the construction of the main access road into the precinct and with stop control along the approach from the GANEP where it intersects with the R404 opposite the airport access road.
 - With development beyond 25% and up to 50% of the GANEP trips, the R404/Airport Access intersection will need to be changed to a 4-way stop with turning lanes along three of the approaches. The intersection of the R102/404 needs to be improved to either a roundabout or traffic signal.
 - To go beyond 50% of the GANEP trips, the intersection of the R404/Airport Access needs to be upgraded to a single lane roundabout

9.2 With Western Bypass

The traffic demand along the R404 will obviously be significantly different if the Western Bypass is built. The function of the R404 will change from a mobility function to a pure access function. It is also most likely that it will be taken over by the George Municipality as a municipal road. As a local access road, control types such as 4-way stops become more agreeable.

Refer to Figure B10 and B11s for the intersection capacity analyses for both the low and the high airport recovery scenarios. These figures indicate the intersection operations for when the whole GANEP has been developed.

At a minimum, the same conditions and infrastructure requirements as outlined in Section 9.1 will apply during the first years before the Western Bypass is constructed. However, if the Western Bypass is constructed within the next five years, a 4-way stop at the R404/Airport Access intersection will work acceptably for a long time, from an operations perspective. However, from different perspectives such as sense of place, visual main access to an airport, etc. a single lane roundabout could be more appropriate and preferred.

Given the extent of the work required to construct the Western Bypass, it is unlikely that the Bypass will be fully complete and operational within the next five years, hence the requirements in Section 9.1 will remain relevant. It is only in the event of exceptional economic recovery with the GANEP developing fast and the Airport recovery is fast that the situation can arise in the next five years where the ceiling of 25% is reached and a decision needs to be made of whether a single lane roundabout is required at the intersection of the R404/Airport Access or should a 4-way stop be implemented. If at that point, the construction of the bypass is in process and it is evident that it will be completed soon, that the requirement for a roundabout at the R404/Airport Access intersection to exceed the 25% ceiling could be waved.

The need for improvements at the R102/R404 intersection will remain the same as outlined in Section 9.1 irrespective of the presence of the Western Bypass.

9.3 Future Scenario Conclusion

A roundabout or traffic signal is required at the R102/R404 intersection with or without the Western Bypass. Even though the phasing indicated that it is not immediately required, it would be beneficial to upgrade this intersection immediately due to safety issues at this intersection.

A 4-way stop control will work acceptably at the R404/Airport Main Access intersection, if the Western Bypass is constructed. However, due to this access being at the entrance to the airport, a single lane roundabout would be more appropriate. The secondary access will function acceptably as a priority control with or without the Western Bypass in place.

10 PUBLIC TRANSPORT

There are three bus routes planned to service the GANEP. This is according to the George Integrated Public Transport Network (GIPTN). These bus routes are from:

- George CBD to Herold's Bay via the R102 and R404.
- George CBD to the Airport and Mossel Bay via the R102, R404 and the N2.
- George CBD along the R102 to the Sinksabrug area and the Mossel Bay.

Provision therefore needs to be made for bus facilities along the R102 and the R404. Six bus embayments are proposed within the vicinity of the GANEP. Two embayments are proposed along the R102, downstream of the R102/R404 on both sides of the R102. Four embayments are proposed along the R404, downstream of both R404/Airport Access/GANEP Access and the R404/Secondary Access on both sides of the R404.

With public transport (PT) embayments along the R404, PT passengers will be able to access the GANEP although they will have to walk distances varying between 500m and 800m depending on where they want to be within the precinct. The George CBD to the Airport is a direct route to and from the airport. This bus will enter the George Airport at the main access of the R404 to drop-off and pick-up passengers.

In summary, it is necessary to provide PT facilities along both the R102 and R404. Based on the walking distances and the proposed internal roads within the GANEP, a bus service through the GANEP will be beneficial as this will allow for shorter walking distances. This service will however be dependent on the development of both accesses into the precinct. At a minimum, PT passengers will have to walk into the area, which could be improved by adding minibus taxi feeders in the precinct. However, this has not been considered in detail and the demand for such feeder services could be low and infeasible.

11 NON-MOTORISED TRANSPORT

There are currently no sidewalks along the R404. The GANEP Roads Master Plan (ITS, 2019) proposed a change to the Class 3 dual carriageway cross section to increase the sidewalk size from 1.5m to 2m. However, this dual carriageway will not be required in the near future. Therefore, it is proposed that a 2m sidewalk be constructed from the proposed bus embayment along the R404 linking with the sidewalks along the internal roads of the GANEP.

12 PARKING

All GANEP parking must be implemented on-site. The parking bays to be provided by the various portions must be according to the George Municipal standards.

13 LONG TERM ROAD RESERVE OF R404

The Road Master Plan (ITS, 2019) recommended that the road reserve width of the R404 be increased from 25m to a 32m road, between KM 9.2 and KM 9.9. This is to allow for a dual carriageway with an increased sidewalk width of 2m.

A letter was obtained from the WCG dated 4 May 2021 regarding the EIA application for the proposed upgrade and widening of the R404 (WCG, 2021). The preferred alternative as stated in the above-mentioned letter is as follows:

“The preferred alternative entails the clearance of more than 300m² of endangered garden route granite fynbos vegetation, as well as the infilling and dredging of a watercourse in order to upgrade the R404. The intersection of the R404 and the R102 required upgrade to either a roundabout OR a traffic signal. This EA is for either option A or B:

- *Option A: 25m Road Reserve & Roundabout at R404/R102 intersection*
- *Option B: 32m road reserve widened to each side & traffic signal at R404/R102 intersection”*

Due to a single lane roundabout being proposed at the R404/Airport Main Access it is proposed that option A be implemented. This will allow for single lane roundabouts to be constructed on both ends of the R404. For future flexibility it will be prudent that the road reserve be 32 meters. Provision can be made for a narrow median along the R404 until the R102 intersection decision has been finalised.

14 COST APPORTIONMENT

As part of the Roads Master Plan for the GANEP, a simplified high-level model was developed for the apportionment of capital costs for the development of the required road infrastructure. This model was updated as part of this study since more detailed land use information has now become available and more detail is available regarding the required road infrastructure and specifically the following:

- Dualling of R404 between the Airport Main and Secondary Access may no longer be required due to the Western Bypass.
- An internal GANEP ring road which would link the primary and secondary accesses.
- The proposed roundabout at the R404/Secondary Access may no longer be required due to the Western Bypass.
- Two internal roundabouts as proposed in the SDP's.

Figure E1 in Appendix E indicates the different landowners that will need to contribute to the different roads and intersections.

14.1 Cost Estimate of the Roads

A high-level construction cost estimate was prepared for the roads and intersections and is summarised in Table 2. This estimate was based on a unit-cost per area of the road construction. The intersections and roads included in the cost estimate are illustrated on Figure E1 in Appendix E.

Table 2: Construction Cost Estimate

Construction Cost Estimate					
Intersection	Length (m)	Width (m)	Area (sqm)	Rate (R/sqm)	Total
Road A	250	17	4250	R1 500	R6 375 000
Road B	300	10	3000	R1 500	R4 500 000
Road C	300	10	3000	R1 500	R4 500 000
Roundabout/Traffic Signal 1			4500	R1 500	R6 750 000
Roundabout 2			4500	R1 500	R6 750 000
Roundabout 3			3000	R1 500	R4 500 000
Roundabout 4			3000	R1 500	R4 500 000
Total					R37 875 000

14.2 Cost Apportionment

The cost apportionment for the road infrastructure was calculated by dividing the total estimated construction costs of the required infrastructure by the total number of expected development trips during the critical peak periods. The critical peak being the hour in which the development as a collective generates the most trips.

Estimated infrastructure cost included in apportionment:	R 37 875 000
Estimated number of peak hour trips:	1 782 trips
Capital Contribution per peak hour trip:	R21 254

15 SUMMARY AND RECOMMENDATIONS

15.1 Summary

The findings of the study can be summarised as follows:

- The GANEP consists of eight properties, each with certain land use rights and proposed development plans.
- The GANEP will develop with land uses such as light industrial, service industry, restaurants, and a filling station.
- For the existing scenario, all the intersections are operating acceptably with no capacity conditions being experienced. Although safety concerns at the intersection of the R102/R404 have been raised by the public.
- The Western Bypass could be constructed within the next five years.
- An average growth rate of 3% per annum was applied to the existing traffic volumes over a five-year horizon period to determine the background traffic volumes.
- No capacity constraints will be experienced under the expected background traffic demand scenarios. However, from a safety perspective there is a need for improvements at the R102/R404 intersection.
- Access is proposed via the R404/Airport Main Access intersection.
- The access road will be situated on the property boundary of Portion 4, serving as a direct access to both adjacent erven.
- A total of 905 trips could be generated by the GANEP during the a.m. peak hour and 877 trips could be generated during the p.m. peak hour.
- The George Airport traffic volumes have decrease from 500 trips pre-Covid to 250 trips during the peak hours of the day. It is expected that these volumes will recover during the next few years, depending on the travel restrictions and the economic growth.
- Two growth scenarios were analysed for the George Airport:
 - A low recovery rate of 10% per year. This will lead to the airport being at 80% in five years' time of where it was in 2019. This is approximately a total of 400 trips in/out during the peak traffic hours.
 - A high recovery rate of double the above. The traffic to/from the airport will then be 20% higher in 5-years' time than what it was pre-Covid. This amounts to approximately 600 peak hour trips.
- For the ultimate scenario all the intersections will operate acceptably, once the recommended upgrades are in place. This is with or without the Western Bypass in place.
- A 4-way stop control will work acceptably at the R404/Airport Main Access intersection, if the Western Bypass is constructed. However, due to this access being at the entrance to the airport, a single lane roundabout would be more appropriate.
- A roundabout or traffic signal is required at the R102/R404 intersection with or without the Western Bypass. Even though the phasing indicated that it is not immediately required, it

would be beneficial to upgrade this intersection immediately due to safety issues at this intersection.

- Six bus embayment are proposed within the vicinity of the GANEP. Two embayments are proposed along the R102, downstream of the R102/R404 on both sides of the R102. Four embayments are proposed along the R404, downstream of both R404/Airport Access/GANEP Access and the R404/Secondary Access on both sides of the R404.
- It is proposed that a 2m wide sidewalk be constructed from the proposed bus embayment along the R404 linking with the sidewalks along the internal roads of the GANEP.
- All on-site parking must be according to the George Municipal Standards.

15.2 Recommendations

It is recommended that the proposed development of the GANEP be approved by the relevant authorities under the following conditions:

- The main access road be constructed with stop control at the intersection of the R404/Airport Access Road and that the total trips out of GANEP be capped at 25% unless the recovery of the airport is slow and the general growth in background traffic is low due to slow economic recovery. Then the ceiling can be raised to 40%. This will have to be confirmed with an updated traffic study.
- To develop beyond the ceiling of 25% or 40% trips (Depending on Airport Recovery) will require the following:
 - A roundabout/traffic signal at the R102/R404 intersection.
 - At a minimum, 4-way stop control at the intersection of the R404/Airport Access if the Western Bypass is built or imminent.
 - A single lane roundabout at the intersection of the R404/Airport Access.
- The requirements related to PT, NMT and parking is adhered to.
- That the road reserve requirements of an increase to 32m along the R404 be implemented.
- That a capital contribution of R21 254 per peak hour trip be used to apportion the costs of the required bulk road infrastructure in and around the precinct.

REFERENCES

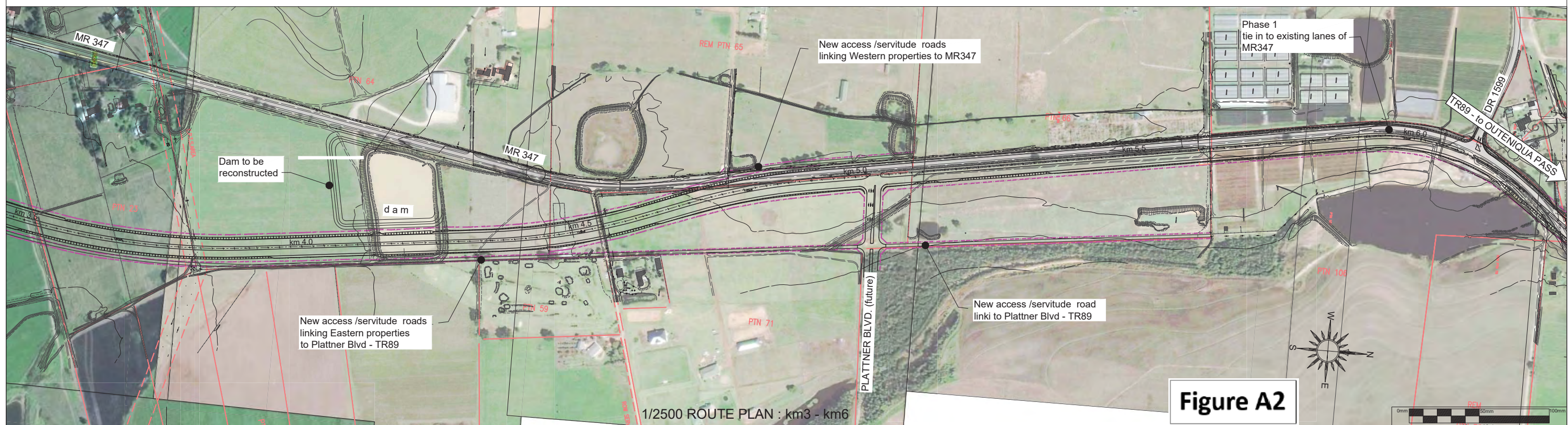
1. Arcus GIBB (Pty) Ltd, Archaeological Impact Assessment, The Proposed George Western Bypass Road, January 2009
2. Highway Capacity Manual (HCM), Quality and Level-of-Service Concepts, Transportation Research Board, 9 March 2015
3. Innovative Transport Solutions, Road Planning George Airport North Eastern Precinct, Road Master Plan and Cost Apportionment, March 2019
4. Kantey & Templer Consulting Engineers, km 1.9 Proposed Overpass to Quarry. Layout, Cross-section and TR89 Long Section, September 2018
5. Kantey & Templer Consulting Engineers, Proposed Trunk Road 89 km 0 to km 12.5 Preliminary Design, September 2016
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7. South African Trip Data Manual, TMH17, Version 1.1, COTO, September 2013
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Appendix A

Background Figures





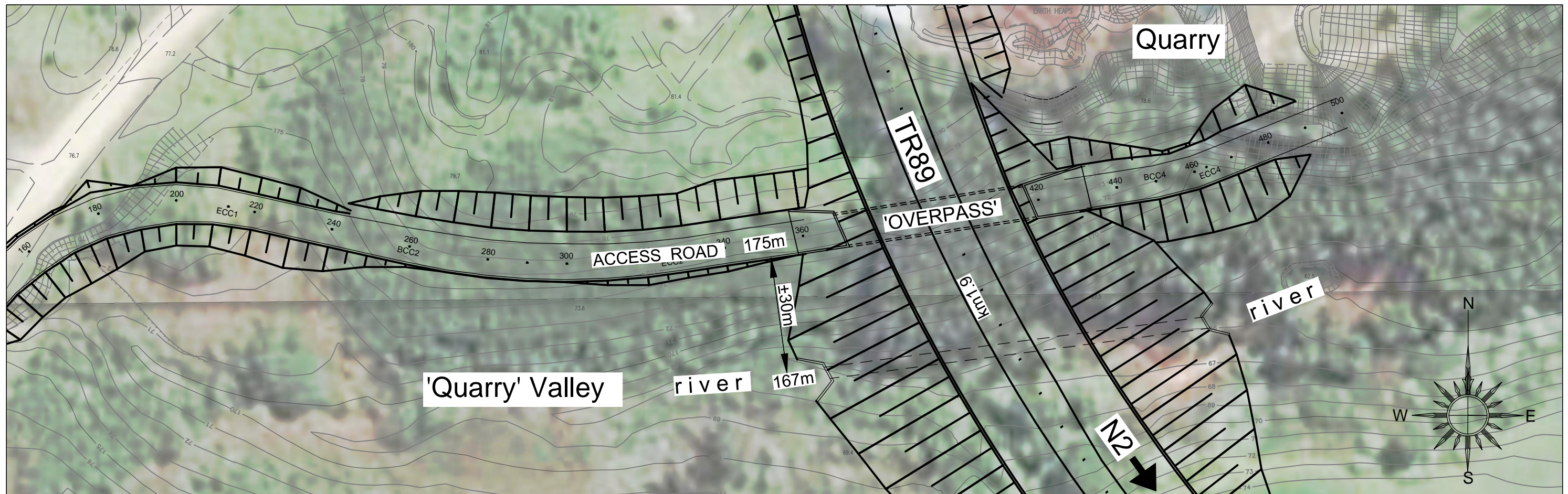
1/2500 ROUTE PLAN : : km0 - km3



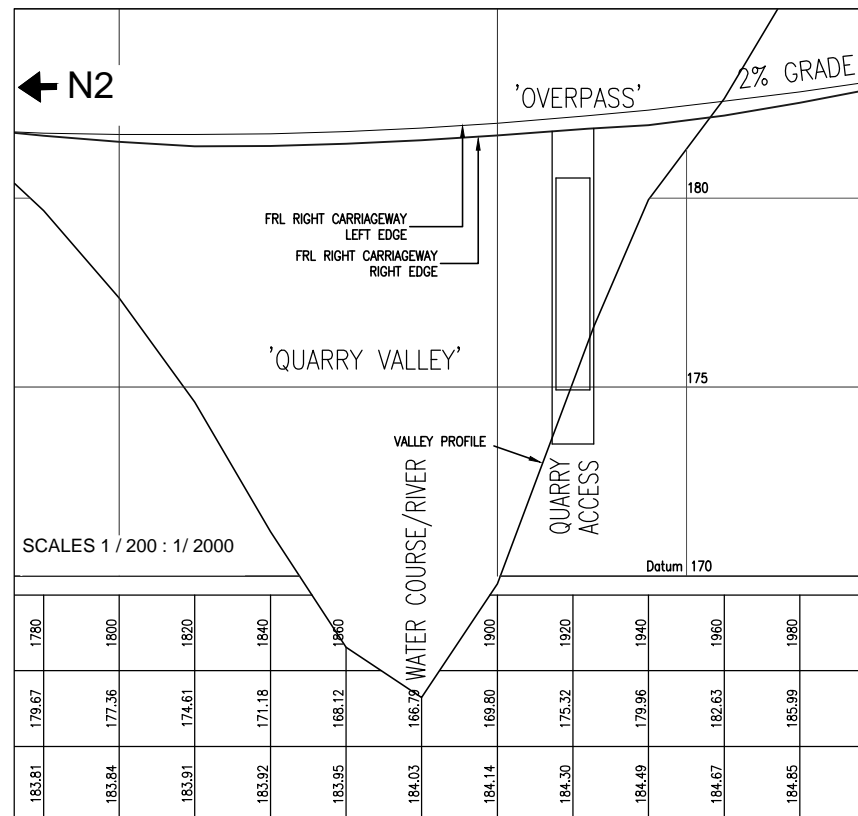
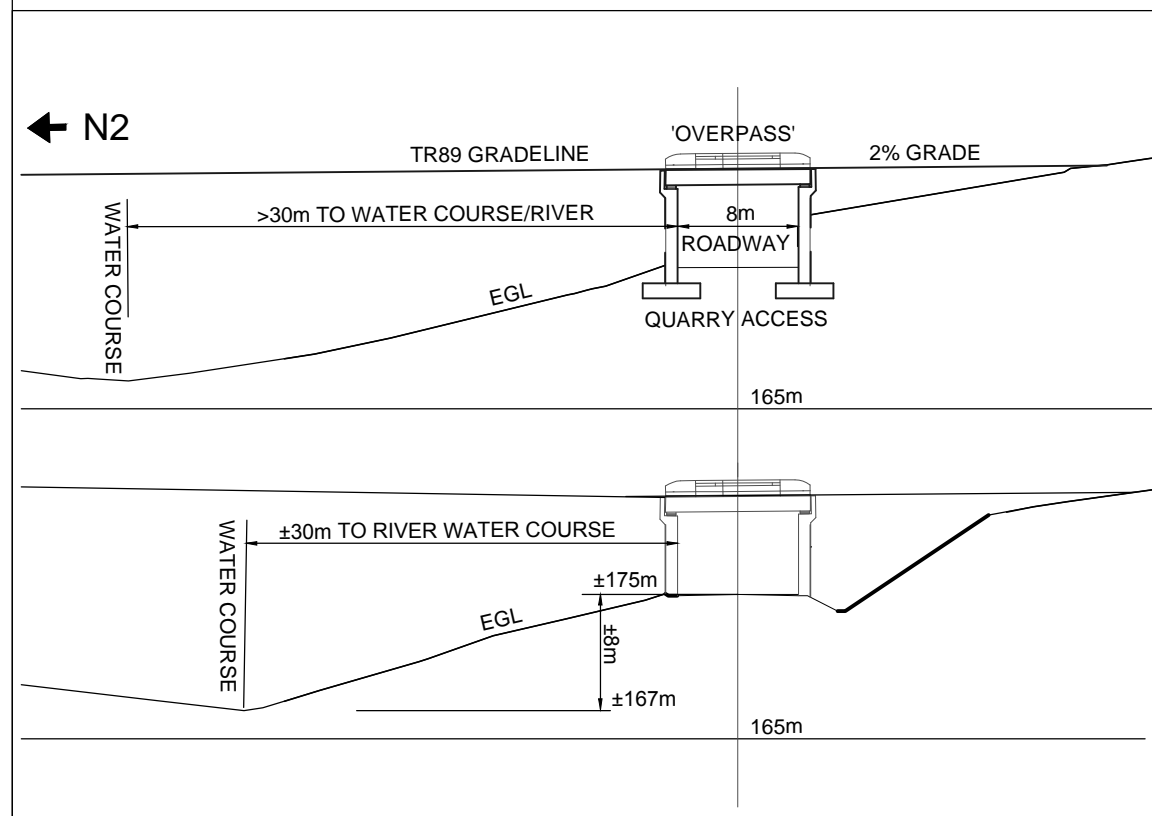
1/2500 ROUTE PLAN : km3 - km6

Figure A2

NO.	DATE	ADDITIONS AND AMENDMENTS	APPROVED		DESIGNED BY:	GR TYNDALL P BARKHUIZEN		CONSULTING ENGINEERS	WESTERN CAPE GOVERNMENT	APPROVED	Proposed Trunk Road 89 (George Western Bypass) km 0 (N2-6) to km12.5 (TR1-1: Outeniqua Pass) Preliminary Design	P.R.E.'s FILE No. 13/5/1/2/5-377.1	SCALE 1/2500
			CONS.	PRE									
A	01-09-2016	PLOTTED FOR DISCUSSION	FB	WS	DRAWN BY:	R FORD			DEPARTMENT OF TRANSPORT AND PUBLIC WORKS	THIS APPROVAL IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWSOEVER ARISING	Route Plan : km 0 to km 6		
					CHECKED BY:	P BARKHUIZEN							
					APPROVED BY:	GR TYNDALL							



1/1000 LAYOUT : TR89 km1.9 AT QUARRY ACCESS AND RIVER



TR 89 km9.1 Overpass : Design notes

1. Economics dictated that the TR89 cross the 'quarry' valley at minimum height.
2. This height was dictated by the required overpass access to the operational quarry.
3. The quarry access road position (on the valley slope) was in turn dictated by having to be (conservatively) some 8m above the 'river' watercourse.
4. The resultant design places the access road some 30m away from the river watercourse.

Figure A3

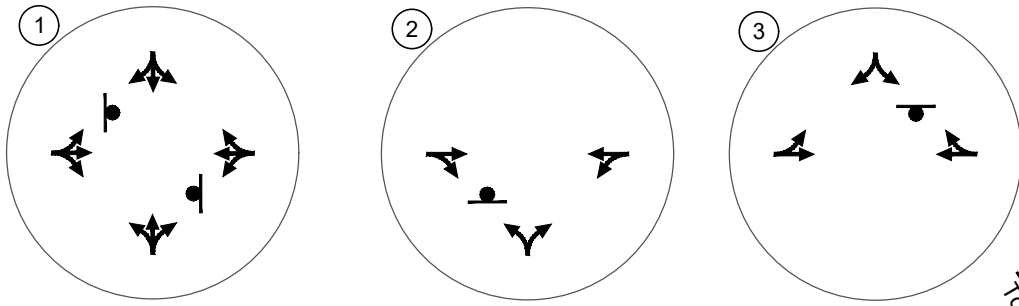
1 / 500 ACCESS ROAD CROSS SECTIONS SHOWING RIVER COURSE TR89 LONG SECTION ACROSS RIVER VALLEY

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	DRAWN								
	CHECKED								

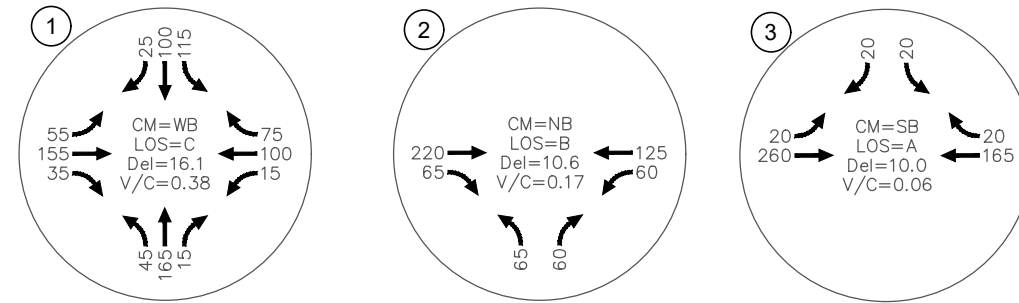
Appendix B

Traffic Analysis Figures

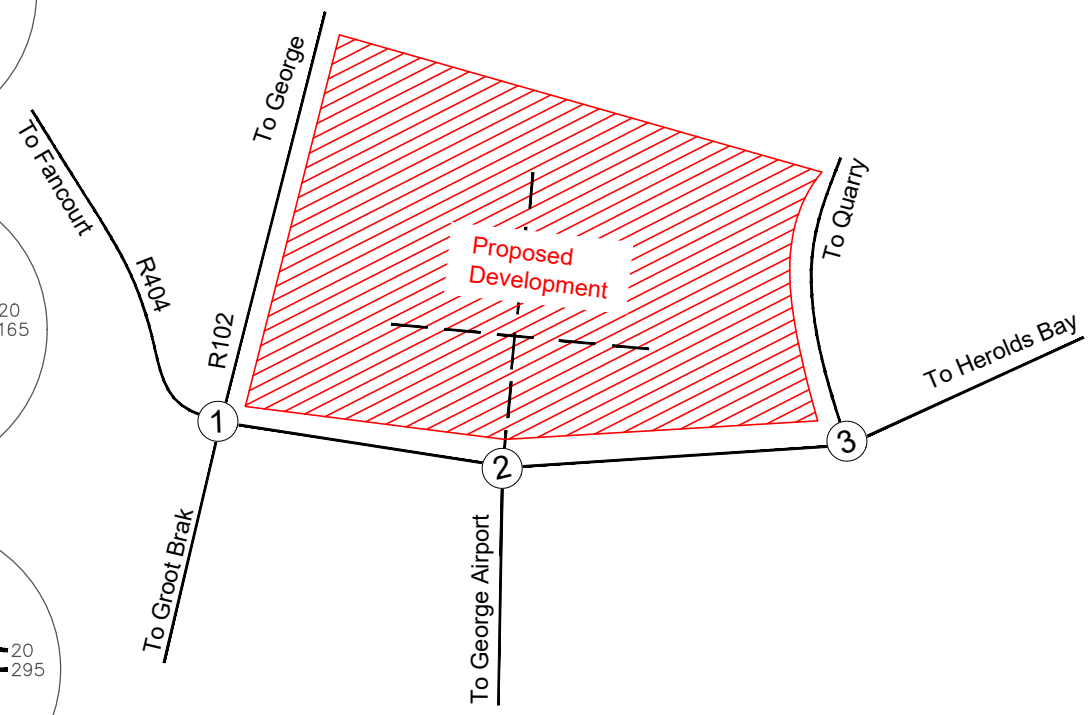
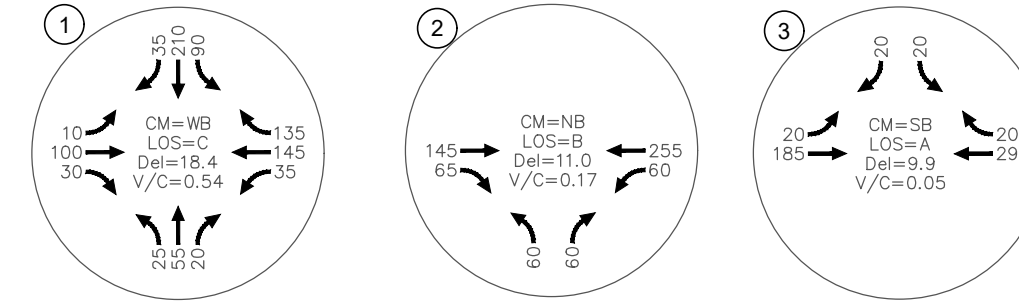
LANE CONFIGURATION



AM PEAK HOUR



PM PEAK HOUR



LEGEND	CONTROL LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)	TRAFFIC SIGNAL
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)	STOP/ YIELD CONTROL
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED	ROUNDABOUT
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO	

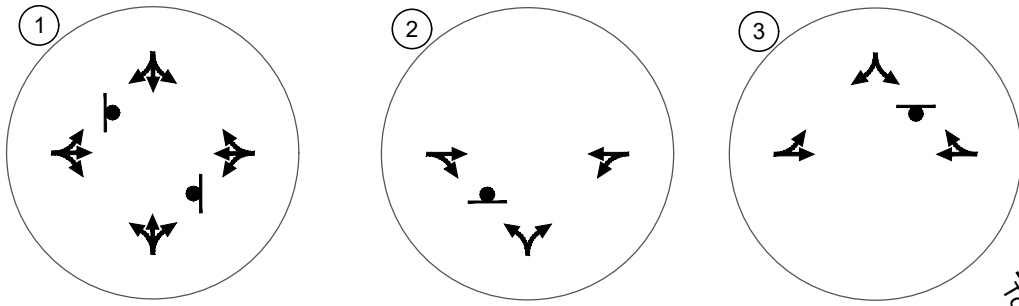


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GEORGE AIRPORT NORTH EASTERN PRECINT

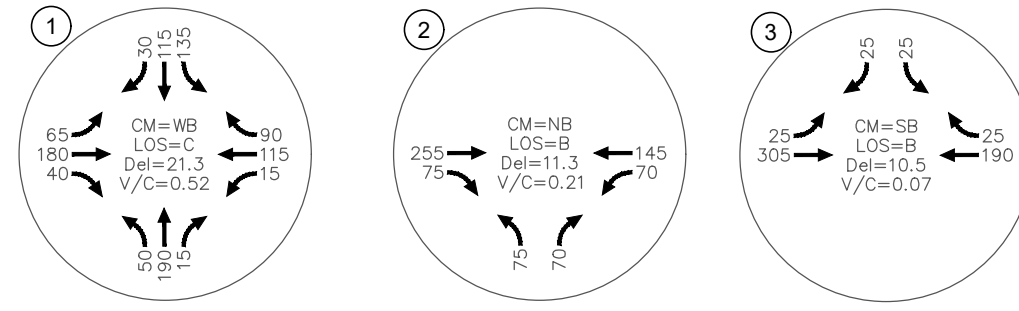
FIGURE: 2021 AM & PM: EXISTING GEOMETRY AND VOLUMES

NUMBER: B1

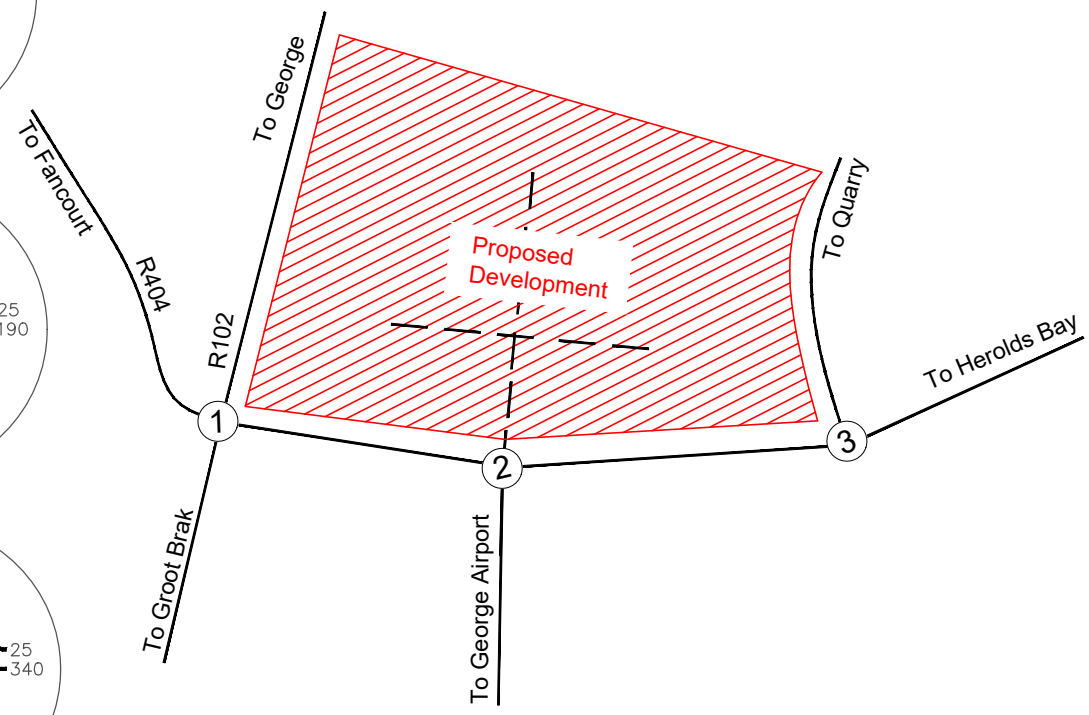
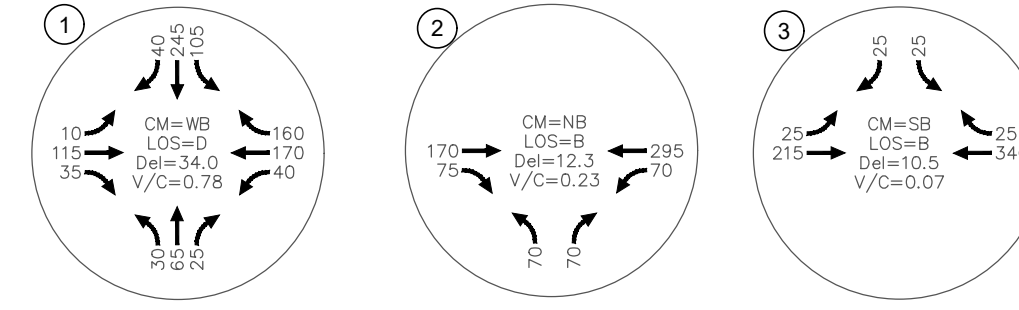
LANE CONFIGURATION



AM PEAK HOUR



PM PEAK HOUR



LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALISED)
 LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) /
 CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
 Del = INTERSECTION AVERAGE DELAY (SIGNALISED) /
 CRITICAL MOVEMENT DELAY UNSIGNALISED
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

CONTROL LEGEND



PROJECT:

ROAD PLANNING:
 GEORGE AIRPORT NORTH EASTERN PRECINT

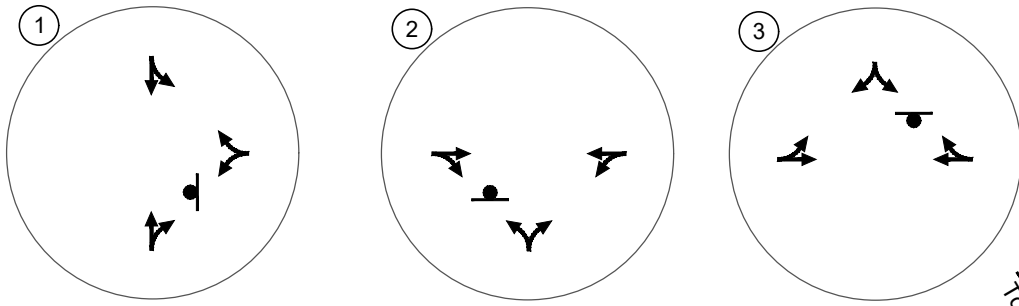
FIGURE:

2026 AM & PM: BACKGROUND SCENARIO
 (WITHOUT WESTERN BYPASS)

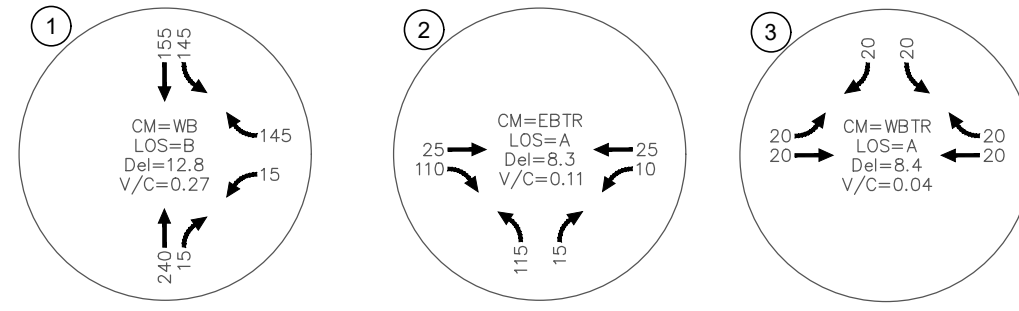
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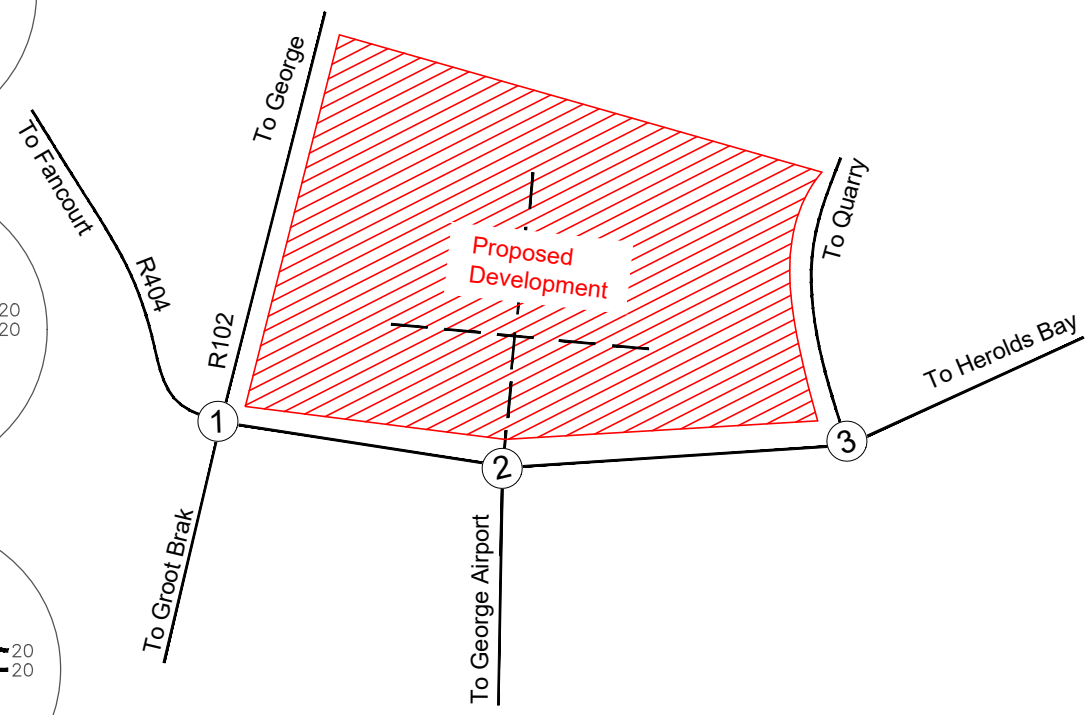
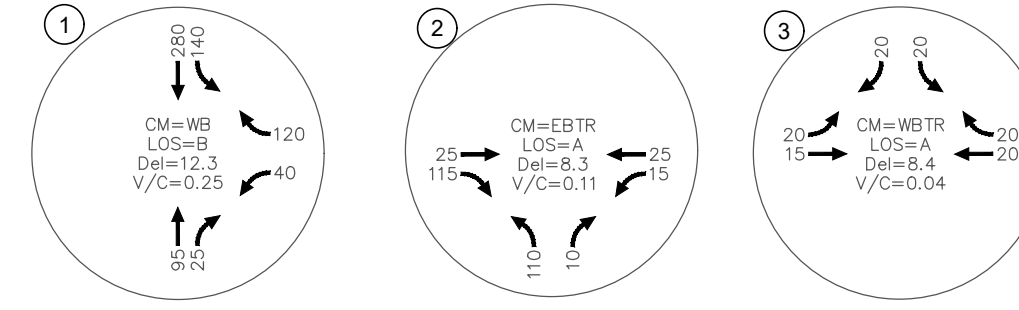
LANE CONFIGURATION



AM PEAK HOUR



PM PEAK HOUR



LEGEND	CONTROL LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALED)	TRAFFIC SIGNAL
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALED)	STOP/ YIELD CONTROL
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED	ROUNDABOUT
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO	



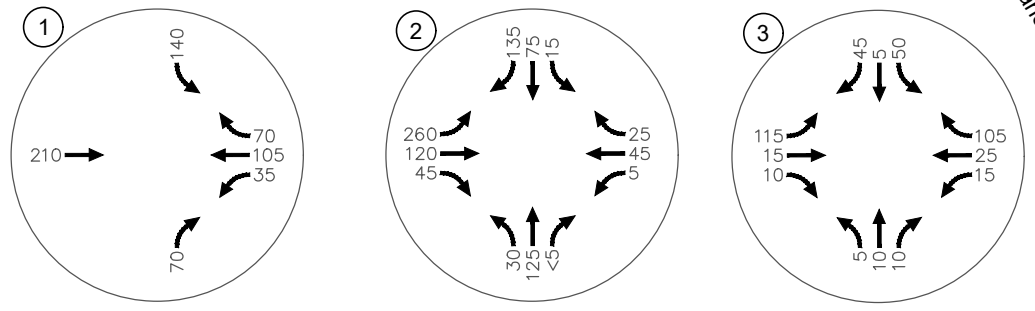
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FIGURE: 2026 AM & PM: BACKGROUND SCENARIO (WITH WESTERN BYPASS)

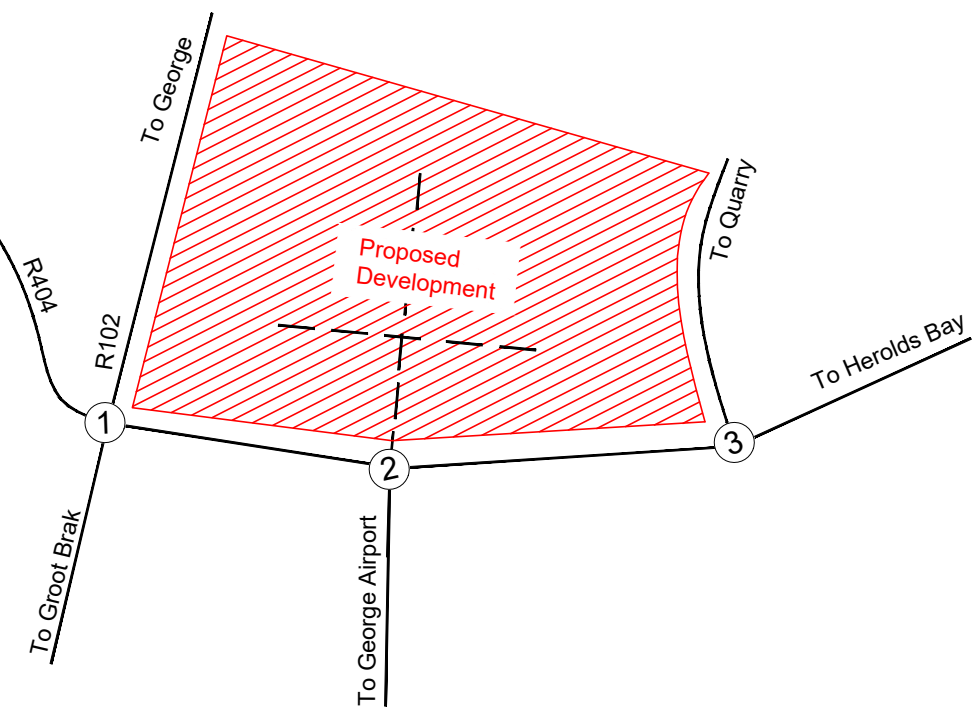
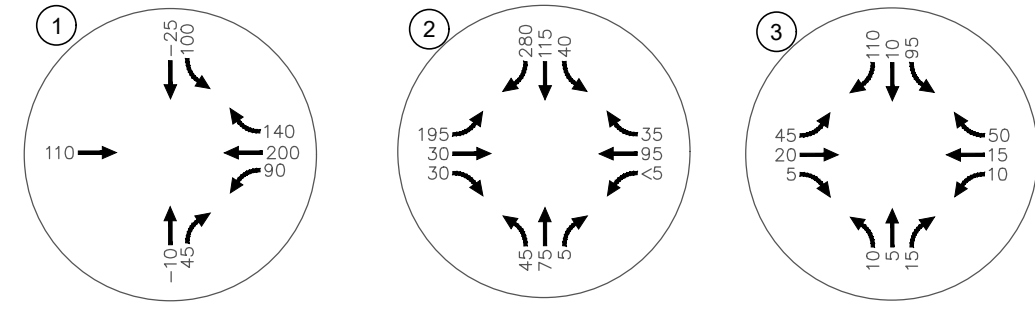
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AM PEAK HOUR



PM PEAK HOUR



LEGEND	
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Del	= INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C	= CRITICAL VOLUME-TO-CAPACITY RATIO

CONTROL LEGEND	
	TRAFFIC SIGNAL
	STOP/YIELD CONTROL
	ROUNDBOUT

3% BACKGROUND GROWTH
 10% AIRPORT GROWTH (LOW RECOVERY RATE)
 TRAFFIC SIGNAL ANALYSES IN SQUARE BLOCK



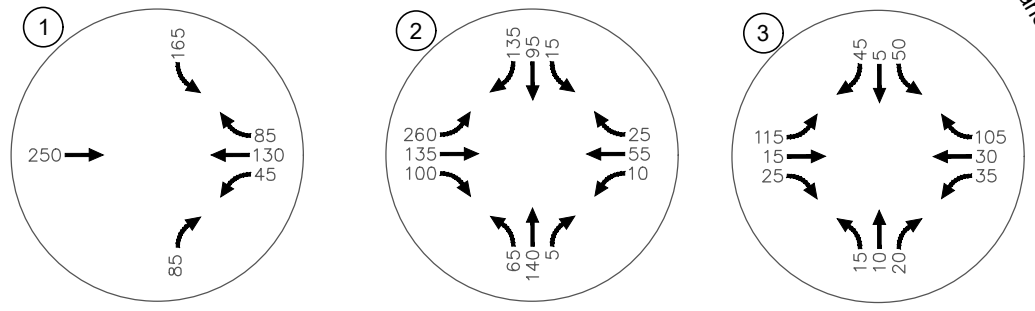
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FIGURE: 2026 AM & PM: TRIP GENERATION
 (WITHOUT WESTERN BYPASS: LOW ACSA AND GANEP)

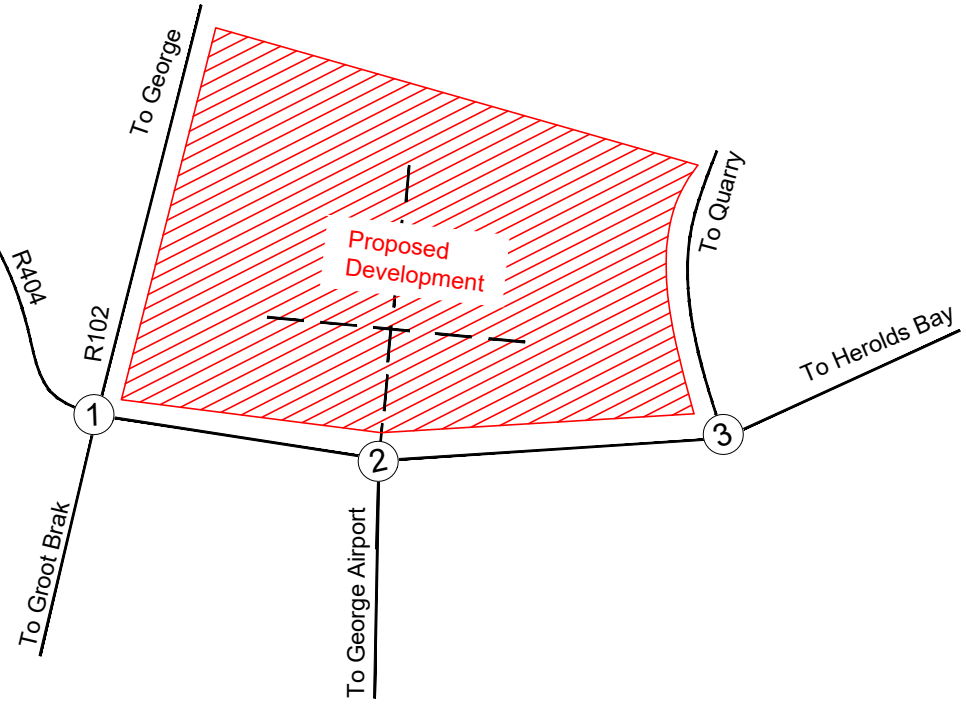
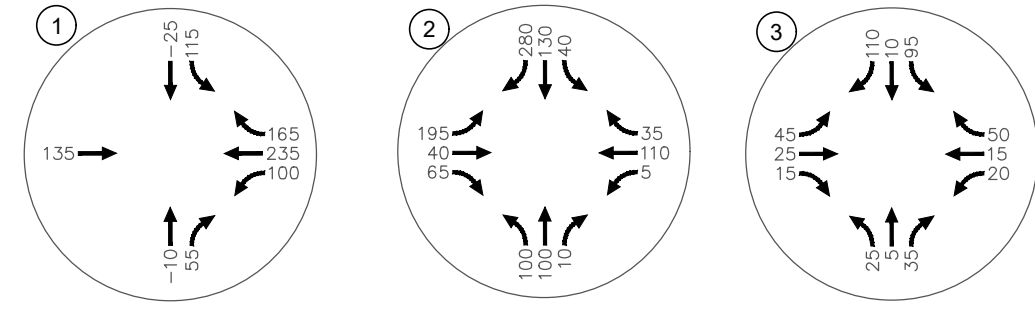
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AM PEAK HOUR



PM PEAK HOUR



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- Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

CONTROL LEGEND

- TRAFFIC SIGNAL
- STOP/YIELD CONTROL
- ROUNDABOUT

3% BACKGROUND GROWTH
 20% AIRPORT GROWTH (HIGH RECOVERY RATE)
 TRAFFIC SIGNAL ANALYSES IN SQUARE BLOCK



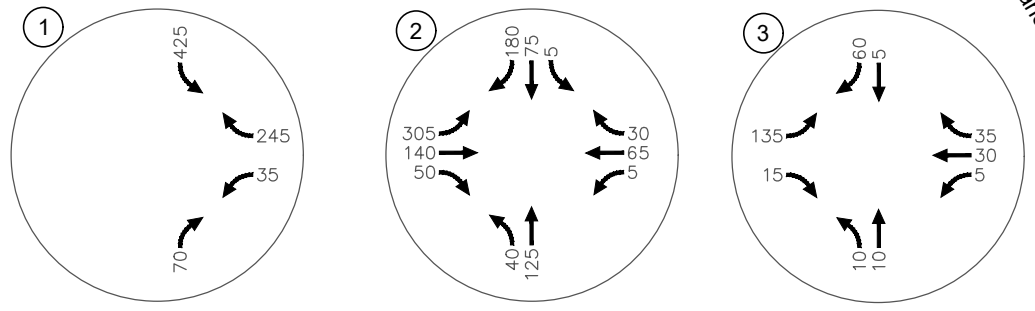
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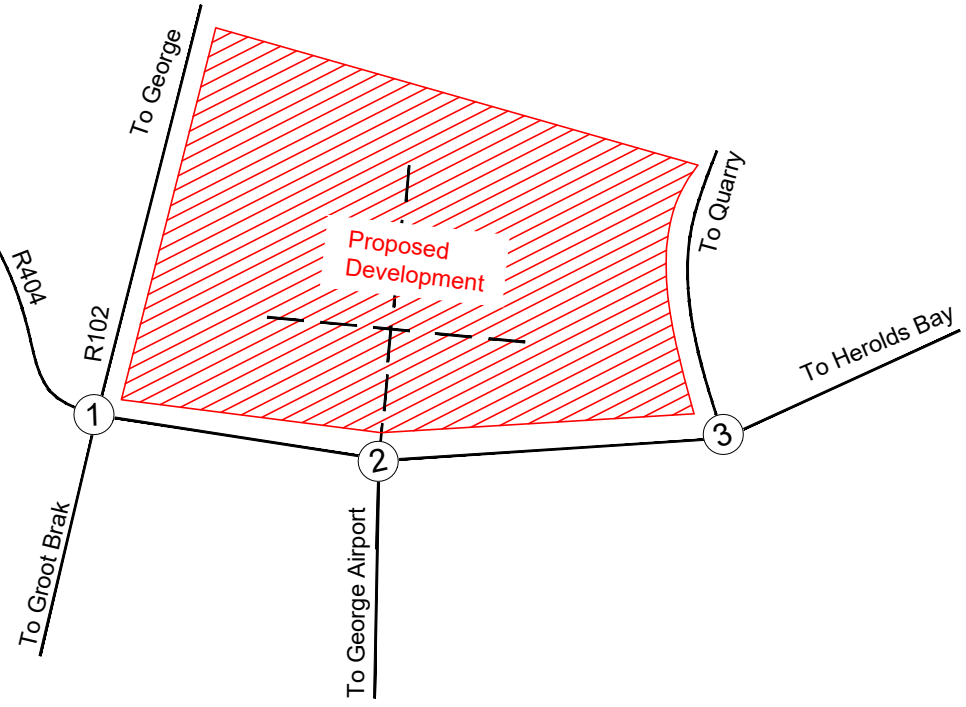
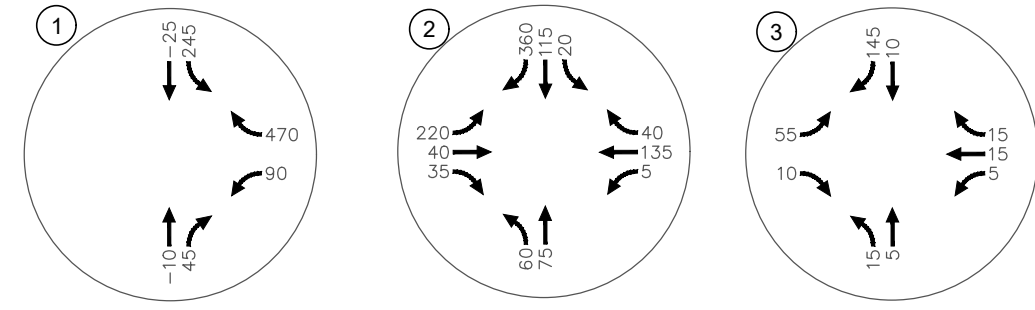
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AM PEAK HOUR



PM PEAK HOUR



LEGEND

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 CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
 Del = INTERSECTION AVERAGE DELAY (SIGNALISED) /
 CRITICAL MOVEMENT DELAY UNSIGNALISED
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

CONTROL LEGEND

TRAFFIC SIGNAL
 STOP/YIELD CONTROL
 ROUNDABOUT

3% BACKGROUND GROWTH
 10% AIRPORT GROWTH (LOW RECOVERY RATE)
 TRAFFIC SIGNAL ANALYSES IN SQUARE BLOCK



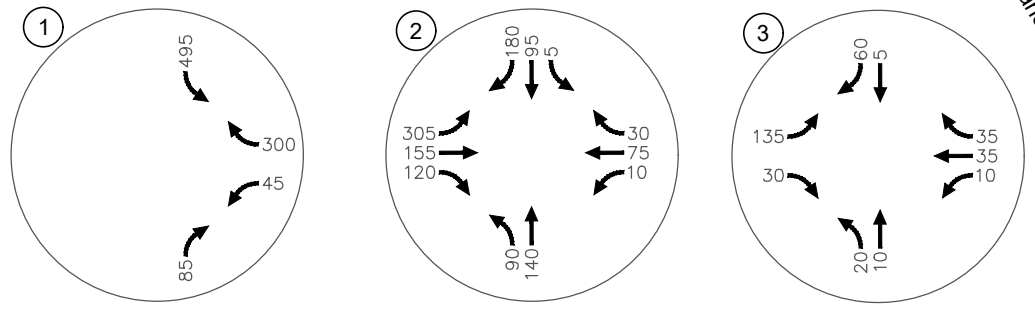
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 GEORGE AIRPORT NORTH EASTERN PRECINT

FIGURE: 2026 AM & PM: TRIP GENERATION
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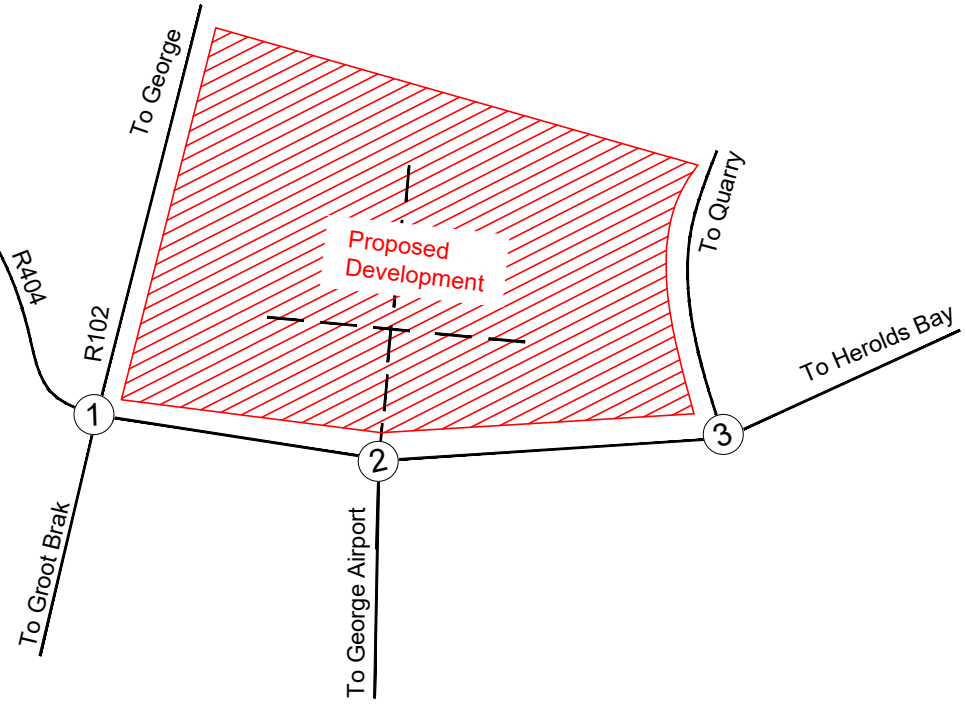
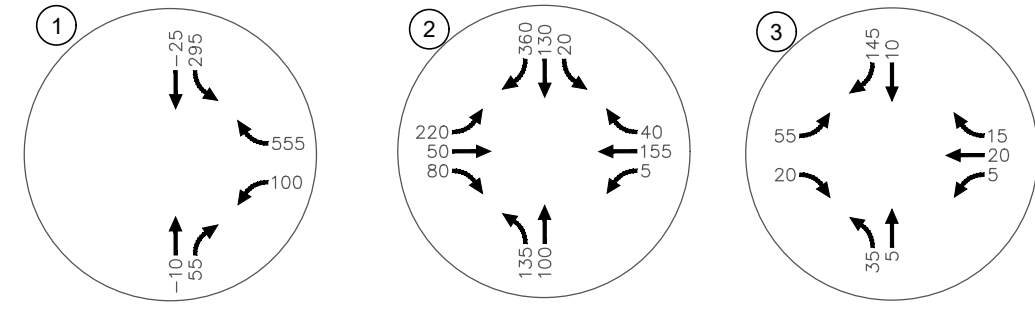
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AM PEAK HOUR



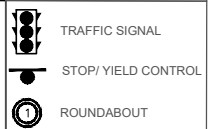
PM PEAK HOUR



LEGEND

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 CRITICAL MOVEMENT DELAY UNSIGNALISED
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

CONTROL LEGEND



3% BACKGROUND GROWTH
 HIGH AIRPORT GROWTH (HIGH RECOVERY RATE)
 TRAFFIC SIGNAL ANALYSES IN SQUARE BLOCK

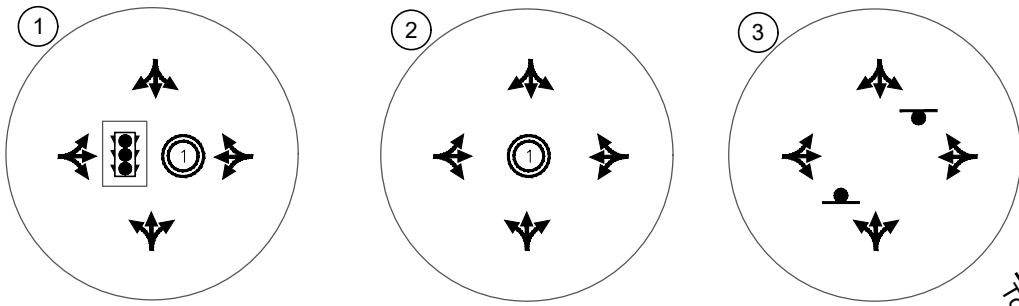


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 GEORGE AIRPORT NORTH EASTERN PRECINCT

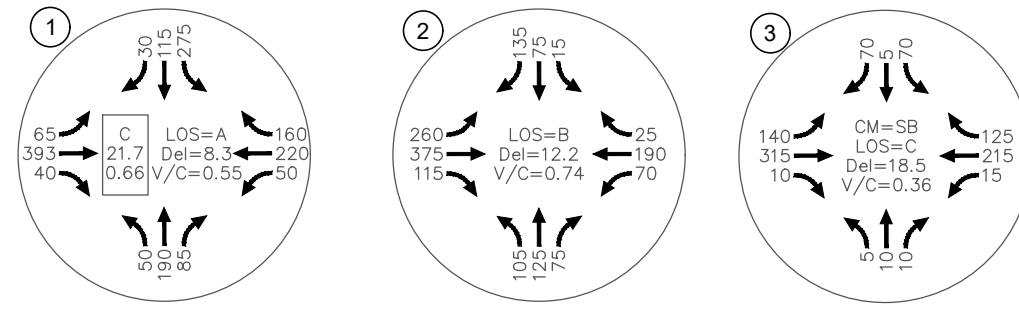
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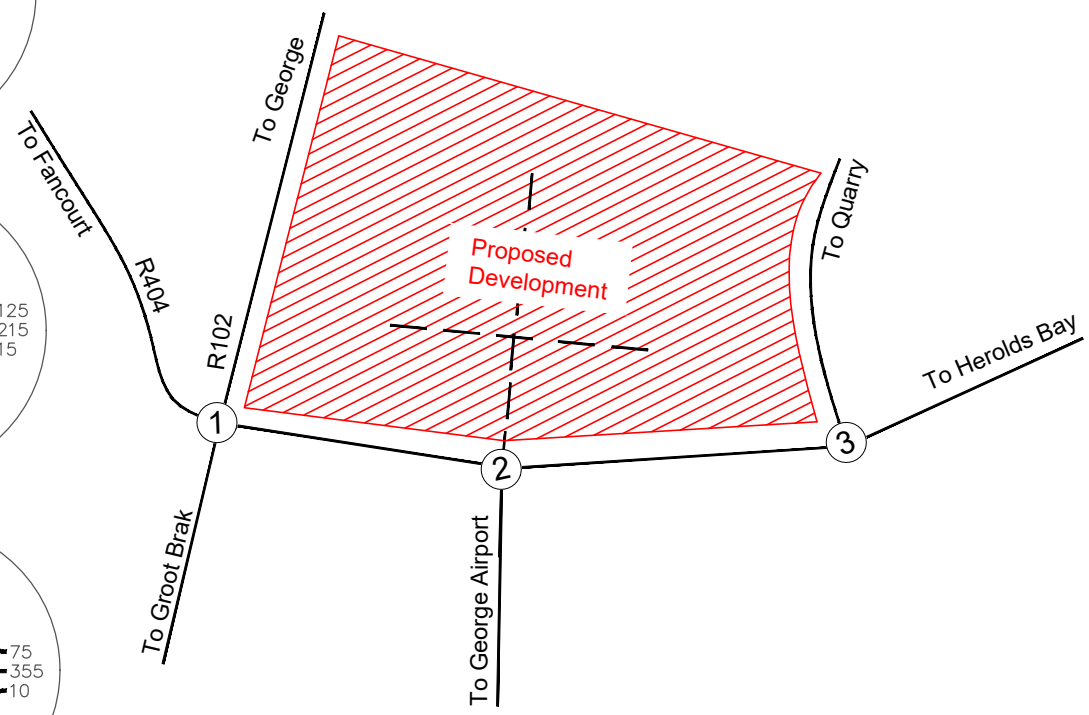
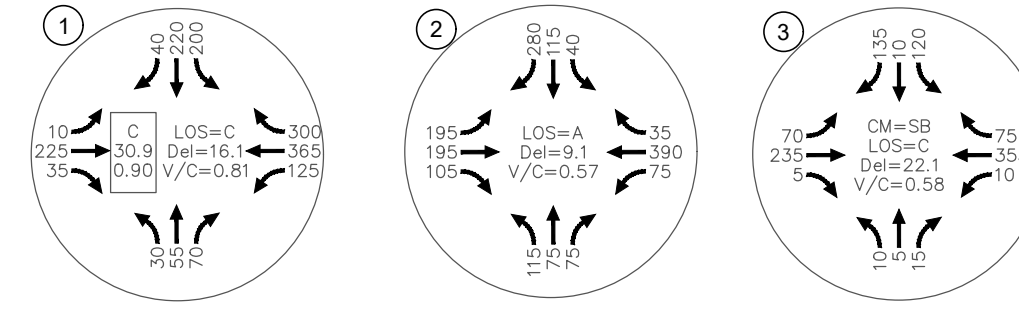
LANE CONFIGURATION



AM PEAK HOUR



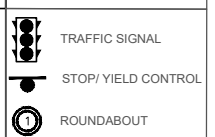
PM PEAK HOUR



LEGEND

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 CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
 Del = INTERSECTION AVERAGE DELAY (SIGNALISED) /
 CRITICAL MOVEMENT DELAY UNSIGNALISED
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

CONTROL LEGEND



3% BACKGROUND GROWTH
 LOW AIRPORT GROWTH (LOW RECOVERY RATE)
 TRAFFIC SIGNAL ANALYSES IN SQUARE BLOCK

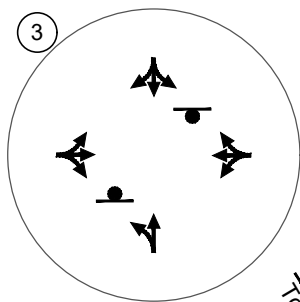
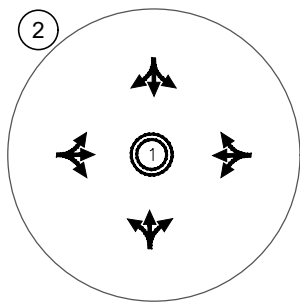
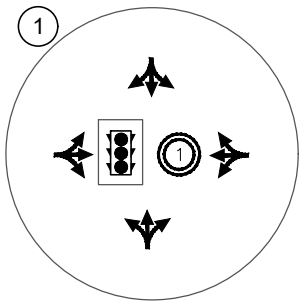


PROJECT: ROAD PLANNING:
 GEORGE AIRPORT NORTH EASTERN PRECINCT

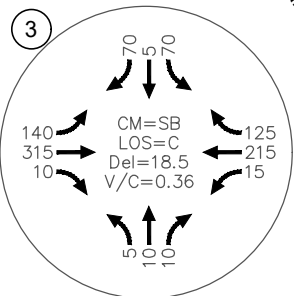
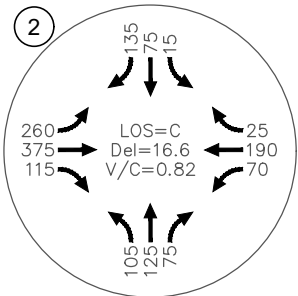
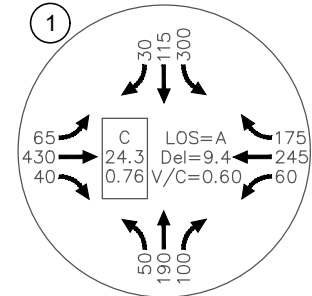
FIGURE: 2026 AM & PM: TOTAL SCENARIO
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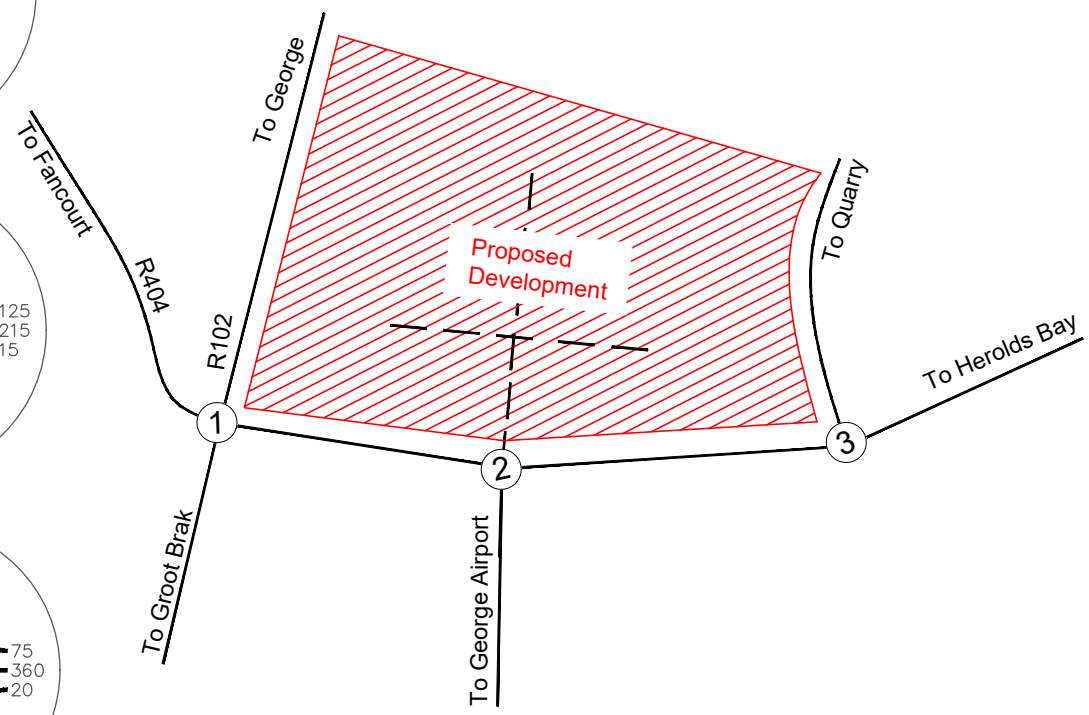
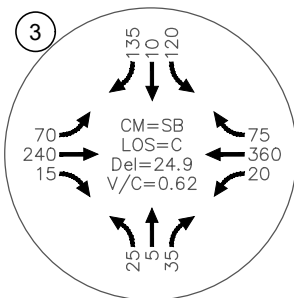
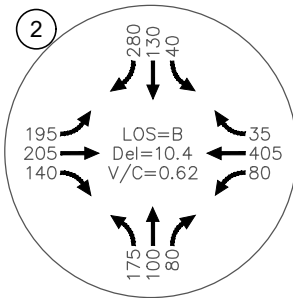
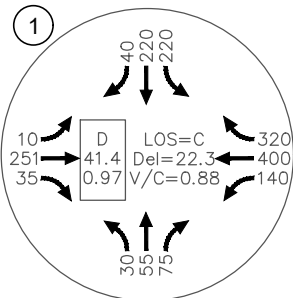
LANE CONFIGURATION



AM PEAK HOUR



PM PEAK HOUR



LEGEND	CONTROL LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALED)	TRAFFIC SIGNAL
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALED)	STOP/YIELD CONTROL
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V/C = CRITICAL VOLUME-TO-CAPACITY RATIO	

3% BACKGROUND GROWTH
 HIGH AIRPORT GROWTH (HIGH RECOVERY RATE)
 TRAFFIC SIGNAL ANALYSES IN SQUARE BLOCK

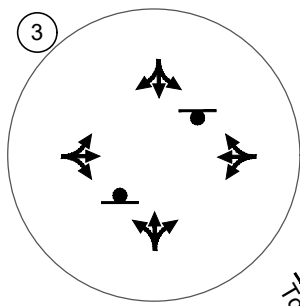
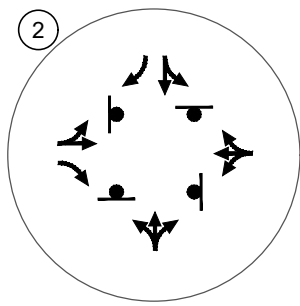
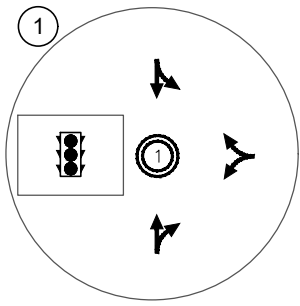


PROJECT: ROAD PLANNING:
 GEORGE AIRPORT NORTH EASTERN PRECINT

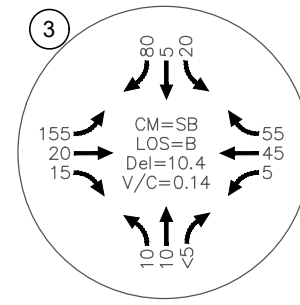
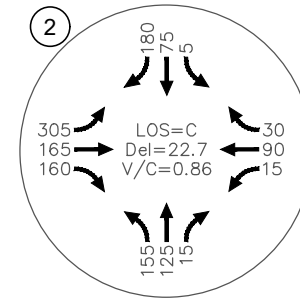
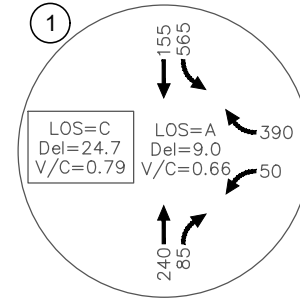
FIGURE: 2026 AM & PM: TOTAL SCENARIO
 (WITHOUT WESTERN BYPASS: HIGH ACSA AND GANEP)

NUMBER: B9

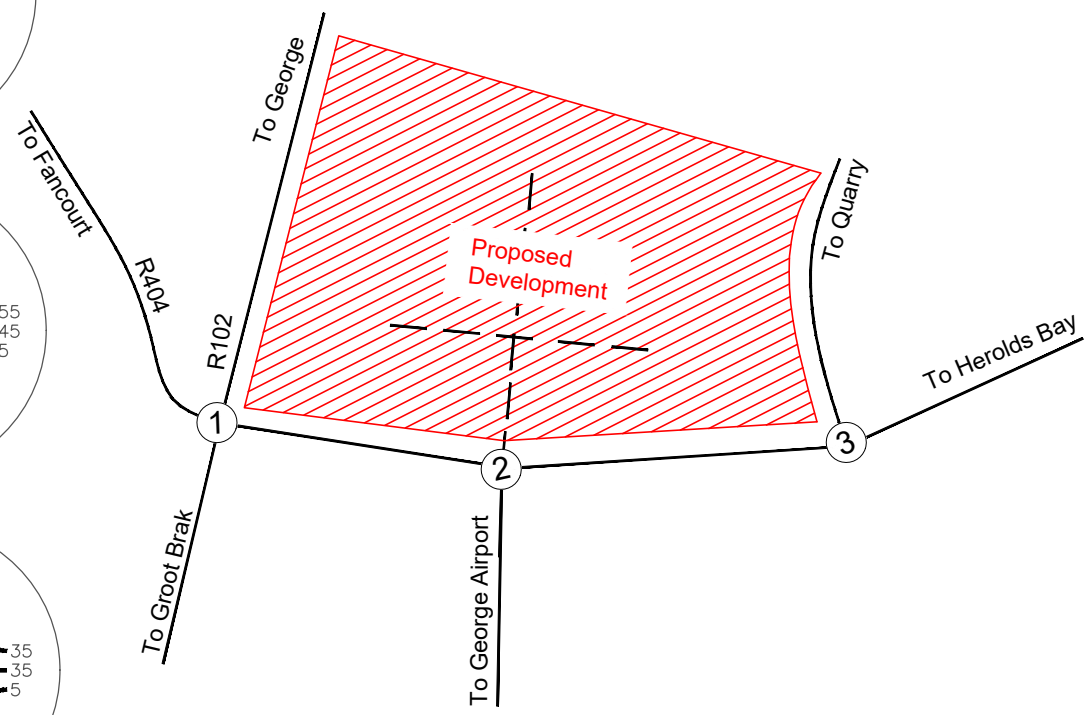
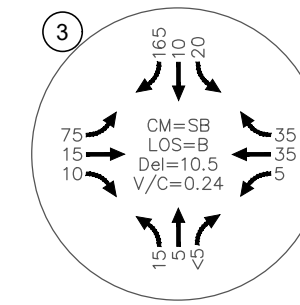
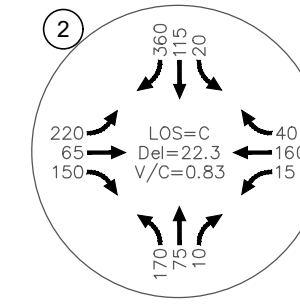
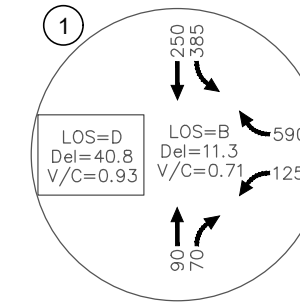
LANE CONFIGURATION



AM PEAK HOUR



PM PEAK HOUR



LEGEND	CONTROL LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)	TRAFFIC SIGNAL
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)	STOP/YIELD CONTROL
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED	ROUNDABOUT
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO	

3% BACKGROUND GROWTH
 10% AIRPORT GROWTH (LOW RECOVERY RATE)
 TRAFFIC SIGNAL ANALYSES IN SQUARE BLOCK

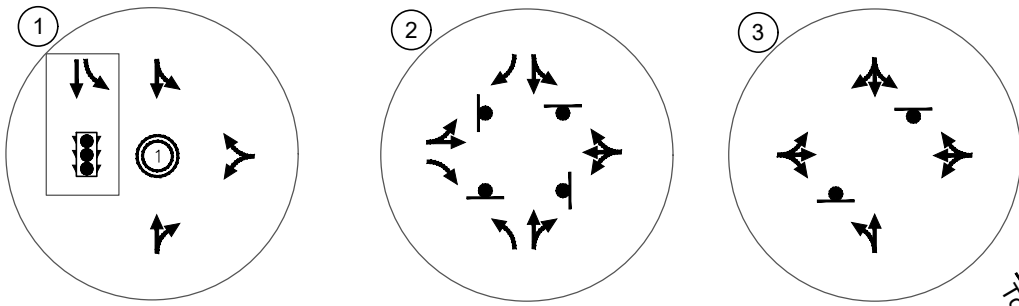


PROJECT: ROAD PLANNING:
 GEORGE AIRPORT NORTH EASTERN PRECINT

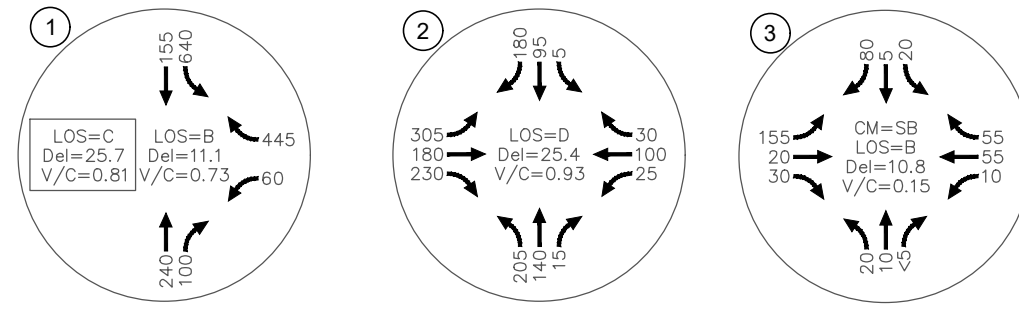
FIGURE: 2026 AM & PM: TOTAL SCENARIO
 (WITH WESTERN BYPASS: LOW ACSA AND GANEP)

NUMBER: B10

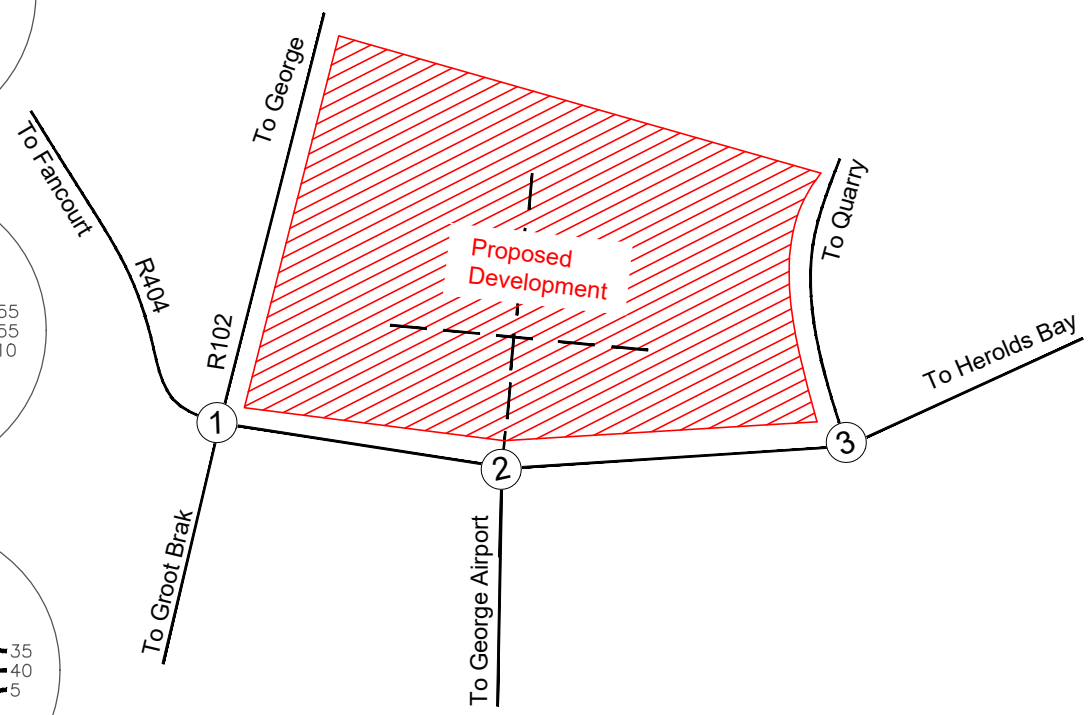
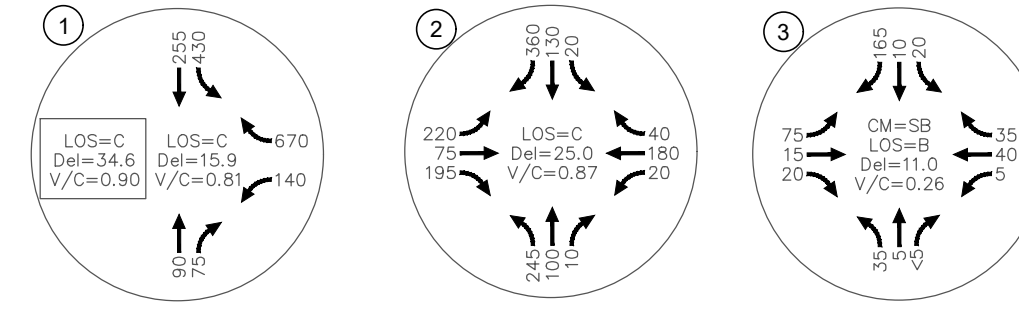
LANE CONFIGURATION



AM PEAK HOUR



PM PEAK HOUR



LEGEND	CONTROL LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)	TRAFFIC SIGNAL
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)	STOP/YIELD CONTROL
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED	ROUNDABOUT
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO	

3% BACKGROUND GROWTH
 HIGH AIRPORT GROWTH (HIGH RECOVERY RATE)
 TRAFFIC SIGNAL ANALYSES IN SQUARE BLOCK



PROJECT: ROAD PLANNING:
 GEORGE AIRPORT NORTH EASTERN PRECINT

FIGURE: 2026 AM & PM: TOTAL SCENARIO
 (WITH WESTERN BYPASS: HIGH ACSA AND GANEP)

NUMBER: B11

Appendix C

Road Planning Figures



its INNOVATIVE TRANSPORT SOLUTIONS

5th Floor
Imperial Terraces
Carl Cronje Drive
Tyger Waterfront, Bellville
7530

Postnet Suite 127
Private Bag X7
Tyger Valley
7536

Tel: (021) 914 6211
Fax: (021) 914 7403

westerncape@itsglobal.co.za
www.itsglobal.co.za



APPROVED - AS BUILTS		APPROVED - CONSTRUCTION		NO.		DATE		REVISION		SIGNED	
Name	:-	Name	:-								
Prof. Reg. No.	:-	Prof. Reg. No.	:-								
Date	:-	Date	:-								

DESIGNED:	NAME:	SIGNED:	DATE:
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DRAWN:			
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PROJECT: **George Airport Eas**

DRAWING TITLE: **Road Network - Without the Western Bypass**

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its INNOVATIVE TRANSPORT SOLUTIONS

5th Floor
Imperial Terraces
Carl Cronje Drive
Tyger Waterfront, Bellville
7530

Postnet Suite 127
Private Bag X7
Tyger Valley
7536

Tel: (021) 914 6211
Fax: (021) 914 7403

westerncape@itsglobal.co.za
www.itsglobal.co.za



APPROVED - AS BUILT		APPROVED - CONSTRUCTION		NO.		DATE		REVISION		SIGNED	
Name	:-	Name	:-								
Prof. Reg. No.	:-	Prof. Reg. No.	:-								
Date	:-	Date	:-								

NAME	SIGNED	DATE
DESIGNED:	-	
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Appendix D

Trip Generation Table

Ervens	Internal Portions	Land Use	Source	Size/ Volume (GLA)	Units	Weekday AM Peak Hour				
						Rate	In	Out	Pass-by	Diverted
Portion 4		Warehousing	COTO 150	35 262	m2	0.50	60%	40%	0%	0%
		Filling Station Convenience Store	COTO 820	200	m2	4.01	65%	35%	0%	0%
Portion 130 - 132	1	Service Industry	COTO 110	13 460	m2	0.90	75%	25%	0%	0%
		Family Restaurant (sit-down)	COTO 932	500	m2					
		Fast Food	COTO 933	385	m2	45.00	55%	45%	0%	0%
	2	Service Industry	COTO 110	5 634	m2	0.90	75%	25%	0%	0%
3-8	Light Industrial	COTO 140	26 816	m2	0.60	80%	20%	0%	0%	
Portion 139		Warehousing	COTO 150	30 761	m2	0.50	60%	40%	0%	0%
Portion 34		Light Industrial	COTO 140	26 643	m2	0.60	80%	20%	0%	0%
						Weekday PM Peak Hour				
Portion 4		Warehousing	COTO 150	35 262	m2	0.50	45%	55%	0%	0%
		Filling Station Convenience Store	COTO 820	200	m2	22.70	50%	50%	38%	29%
Portion 130 - 132	1	Service Industry	COTO 110	13 460	m2	0.90	25%	75%	0%	0%
		Family Restaurant (sit-down)	COTO 932	500	m2	8.00	65%	35%	38%	23%
		Fast Food	COTO 933	385	m2	50.00	55%	45%	52%	25%
	2	Service Industry	COTO 110	5 634	m2	0.90	25%	75%	0%	0%
3-8	Light Industrial	COTO 140	26 816	m2	0.60	20%	80%	0%	0%	
Portion 139		Warehousing	COTO 150	30 761	m2	0.50	45%	55%	0%	0%
Portion 34		Light Industrial	COTO 140	26 643	m2	0.60	20%	80%	0%	0%

Retail Factors	A	B	
Peak Hour	6	3500	6.68
Pass by	1.95	48000	2.94
Rate			
Retail AM	0.6		
PM	3.4		
Pass by	13%		


DRIVEWAY TRIPS								
Ervens	Internal Portions	Land Use	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
Portion 4		Warehousing	106	71	177	79	97	176
		Filling Station Convenience Store	5	3	8	23	23	46
Portion 130 - 132	1	Service Industry	91	30	121	30	91	121
		Family Restaurant (sit-down)	0	0	0	26	14	40
		Fast Food	95	78	173	106	87	193
	2	Service Industry	38	13	51	13	38	51
3-8	Light Industrial	129	32	161	32	129	161	
Portion 139		Warehousing	92	62	154	69	85	154
Portion 34		Light Industrial	128	32	160	32	128	160
Total Driveway Trips			684	321	1005	410	692	1102
Pass-by								
Portion 4		Warehousing	0	0	0	0	0	0
		Filling Station Convenience Store	0	0	0	4	4	8
Portion 130 - 132	1	Service Industry	0	0	0	0	0	0
		Family Restaurant (sit-down)	0	0	0	5	3	7
		Fast Food	0	0	0	27	22	48
	2	Service Industry	0	0	0	0	0	0
3-8	Light Industrial	0	0	0	0	0	0	
Portion 139		Warehousing	0	0	0	0	0	0
Portion 34		Light Industrial	0	0	0	0	0	0
Total Pass-by Trips			0	0	0	36	28	64
Diverted								
Portion 4		Warehousing	0	0	0	0	0	0
		Filling Station Convenience Store	0	0	0	6	6	12
Portion 130 - 132	1	Service Industry	0	0	0	0	0	0
		Family Restaurant (sit-down)	0	0	0	5	3	8
		Fast Food	0	0	0	24	20	44
	2	Service Industry	0	0	0	0	0	0
3-8	Light Industrial	0	0	0	0	0	0	
Portion 139		Warehousing	0	0	0	0	0	0
Portion 34		Light Industrial	0	0	0	0	0	0
Total Diverted Trips			0	0	0	35	29	64
TOTAL TRIPS (Inc. Internal Trips)								
Portion 4		Warehousing	106	71	177	79	97	176
		Filling Station Convenience Store	5	3	8	13	13	25
Portion 130 - 132	1	Service Industry	91	30	121	30	91	121
		Family Restaurant (sit-down)	0	0	0	16	9	24
		Fast Food	95	78	173	56	46	101
	2	Service Industry	38	13	51	13	38	51
3-8	Light Industrial	129	32	161	32	129	161	
Portion 139		Warehousing	92	62	154	69	85	154
Portion 34		Light Industrial	128	32	160	32	128	160
GRAND TOTAL			684	321	1005	339	635	974
Internal Trips								
			68%	32%		35%	65%	
			616	289	905	305	571	877
TOTAL TRIPS (After 10% Internal Trips deducted)								
Portion 4		Warehousing	95	64	159	71	87	158
		Filling Station Convenience Store	5	3	7	11	11	23
Portion 130 - 132	1	Service Industry	82	27	109	27	82	109
		Family Restaurant (sit-down)	0	0	0	14	8	22
		Fast Food	86	70	156	50	41	91
	2	Service Industry	34	12	46	12	34	46
3-8	Light Industrial	116	29	145	29	116	145	
Portion 139		Warehousing	83	56	139	62	77	139
Portion 34		Light Industrial	115	29	144	29	115	144
GRAND TOTAL			616	289	905	305	571	877

Pass-by Trips						
Filling Station	Trips Along R404	Capture Rate	In	Out	Total	
AM	320	4%	13	13	26	
PM	320	4%	13	13	26	

Appendix E

Cost Apportionment




 5th Floor
 Imperial Terraces
 Carl Cronje Drive
 Tyger Waterfront, Bellville
 7530
 Tel: (021) 914 6211
 Fax: (021) 914 7403

Postnet Suite 127
 Private Bag X7
 Tyger Valley
 7536
 www.itsglobal.co.za

CLIENT:



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Date : -	Date : -

NO.	DATE	REVISION	SIGNED

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