

Andeon Ext. 47

(Proposed New Residential Development to be situated on Portion 183 of the Farm Zandfontein No. 317 - JR)

TRAFFIC IMPACT ASSESSMENT (DRAFT 1)

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1. Introduction & Background

Dhubecon Consulting Engineers (Pty) Ltd have been appointed to undertake this Traffic Impact Assessment (TIA) as part of the township application for a proposed new residential development which is to be situated on Portion 183 of the Farm Zandfontein No. 317 – JR in Andeon. The site location is shown in attached **Figure 1** and **Figure 2** and falls under the jurisdiction of the City of Tshwane (CoT).

The subject site, as a whole, extends approximately 7ha and the proposed township will be known as Andeon Ext. 47. With reference to the town planner's proposed township layout plan enclosed in **Annexure A**, the subject site will be zoned 'Residential 3' with a proposed density of 60 units/ ha. Based on this density, the development has a permissible extent of 420 units.

Through correspondence with the developers, it is understood that the development will comprise of a mix of 300 apartments and 120 duplex units i.e. a total of 420 units are proposed which is in accordance with the township's proposed rights. Considering the type of units and the proposed density, the lower to middle income market is targeted, which is similar to that of the surrounding Andeon area.

This study investigates the impact of the additional traffic to be generated by the proposed development on the immediate surrounding road network and determines whether it is necessary to implement any road and/or intersection improvements to mitigate the anticipated traffic impact. New traffic counts had been undertaken at identified key intersections in the study area in order to quantify and assess the traffic flow operations. The study also investigates the proposed site layout, the site access arrangements and provides comments with respect to non-motorised and public transport.

2. Site Location & Surrounding Road Network

2.1 SITE LOCATION

The subject is situated about 350m north of Van Der Hoff Road, in the Andeon area. As shown in **Figure 1** and **Figure 2**, the site is bordered by:

- ✦ Vacant land to the north;
- ✦ Erma Street to the south;
- ✦ Mulder Street to the east; and
- ✦ The future PWV9 freeway to the west.

The following existing and/or future streets are relevant to the study area:

2.2 EXISTING ROAD NETWORK

Erma Street: is classified as a Class 4a collector road which travels in an east-west direction along the southern boundary of the site. It is expected that some of the development's traffic would distribute westbound along Erma Street as there are a variety of businesses, mostly industrial, situated in this direction. This road comprises of a single carriageway road (one lane per direction) and currently the traffic volumes on this road, past the site, are in the order of 910vph and 790vph (total both directions), during the weekday AM and PM peak hours, respectively.

Mulder Street: is classified as a Class 4a collector road which travels in a north-south direction along the eastern boundary of the site. It is proposed to provide the development's access at the existing T-intersection between Mulder Street and Boekenhoutkloof Street (See Section 3.2). It is expected that some of the development's traffic would distribute northbound along Mulder Street towards Bremer Street (R55) via Wilhelm Street, however, given the position of the site's access, it is anticipated that the majority of the development's traffic would rather opt to travel directly east from the site access to Bremer Street (R55) via Boekenhoutkloof Street and Market Street. This road comprises of a single carriageway road (one lane per direction) and currently the traffic volumes on this road, past the site, are in the order of 970vph and 780vph (total both directions), during the weekday AM and PM peak hours, respectively.

Boekenhoutkloof Street: is viewed as an east-west Class 4b collector road which currently forms a priority stop controlled T-intersection with Mulder Street (at the site's proposed access position). This road comprises of a single carriageway road (one lane per direction) and currently the traffic volumes on this road, at its intersection with Mulder Street, are in the order of 580vph and 530vph (total both directions), during the weekday AM and PM peak hours, respectively.

Bremer Street (R55): is classified as a north-south Class 3 arterial road which is situated approximately 1.6km to the east site. Traffic from the proposed development can only access this road via Market Street and Wilhelm Street, however, Market Street is closer to the site and therefore it is expected that most of the traffic would instead travel via Boekenhoutkloof Street and Market Street to get to Bremer Street (R55). This road comprises of a dual carriageway road (two lanes per direction) and the current traffic volumes on this road, at its intersection with Market Street, is in the order of 3,600vph and 2,900vph, during the weekday AM and PM peak hours, respectively.

2.3 PLANNED FUTURE ROAD NETWORK

Attached **Figure 3** and **Figure 4** shows the relevant extracts of CoT's Road Master Plan (2015) and Gautrans Strategic Road Network (2007), respectively, in the vicinity of the subject site.

According to CoT's local road network master plan shown in **Figure 3**, both Erma Street and Mulder Street are planned class 4a roads, however, both these roads have already been implemented past the site and there are no other planned municipal roads that will be affected by the proposed development, or *vice versa*.

In terms of Gautrans' provincial road network shown in **Figure 4**, the future PWV9 is a planned class 1 freeway that will travel in a north-south direction past the western boundary of the site. The township layout in **Annexure A** has taken into account the road reserve and relevant building lines related to this future road and therefore this road will not directly affect the proposed development, or *vice versa*.

3. Proposed Development & Site Access

3.1 PROPOSED DEVELOPMENT

The proposed development will be situated on Portion 183 of the Farm Zandfontein No. 317 – JR in Andeon. The site location is shown in attached **Figure 1** and **Figure 2** and falls under the jurisdiction of the City of Tshwane (CoT).

The subject site, as a whole, extends approximately 7ha and the proposed township will be known as Andeon Ext. 47. With reference to the town planner's proposed Township Layout Plan enclosed in **Annexure A**, the subject site will be zoned 'Residential 3' with a proposed density of 60 units/ ha. Based on this density, the development has a permissible extent of 420 units.

Through correspondence with the developers, it is understood that the development will comprise of a mix of 300 apartments and 120 duplex units i.e. a total of 420 units are proposed. Considering the type of units and the proposed density, the lower to middle income market is targeted, which is similar to that of the surrounding Andeon area.

Parking will be provided as per the requirements of the relevant Town Planning Scheme, or as separately motivated otherwise.

3.2 SITE ACCESS ARRANGEMENTS

As shown in attached **Figure 2** and **Drawing No. 0592/CL/01**, a single access to the development is proposed off Mulder Street (Class 4a road) at its existing T-intersection with Boekenhoutkloof Street. A fourth (western) leg will be added to this intersection for the access to the development.

With reference to **Figure 2**, the site aerial view indicates that as you move southbound past the site's access on Mulder Street, the road curves in a western direction into Erma Street. Due to this curve, the available shoulder sight distance at the access is restricted and therefore to address this, it is recommended that a traffic circle with an outside diameter between 25-30m be implemented at the Mulder Street and Boekenhoutkloof Street intersection. This upgrade would provide the necessary traffic calming along Mulder Street so that the shoulder sight distance at the access will not be a reason for concern anymore. It can be noted that the proposed traffic circle can be accommodated comfortably within the road reserve.

At the guard house of the access, two inbound lanes (one lane for visitors and one lane for residents) and two outbound lanes (one lane for visitors and one lane for residents) are recommended for the access geometry. Important to note is that the access will be security controlled and therefore adequate stacking distance should be provided to ensure that inbound vehicles queuing at the security gate do not impact on other traffic along the adjacent roads. For this purpose, *THM 16 Vol 2 (Committee Draft 2.0, October 2019)*, was used to determine the required stacking distance for this site access. The following assumptions were made:

- ✚ Total development trip generations for weekday PM peak entering the development is **208vph** (see Section 4.3);
- ✚ Service flow rate of 450 veh/hr was assumed for 'Swipe Magnetic Card'; it is expected that this system will be used or something very similar, such as a biometric system; and
- ✚ Peak hour factor (PHF) = 0.85.

The traffic ratio percentage calculated to be about 54% (for the 90th percentile queue), which then according to Table 33 of the *THM 16 (Vol 2)* a theoretical storage length of only one vehicle (approximately 6.5m) is required for a double entry channel. It is recommended, however, that a minimum stacking distance of 25m be provided. This is in line with the minimum required stacking distance for accesses off Class 4a collector roads, as per Table 30 of the *THM 16 (Vol 2)*.

In order to accommodate emergency and service vehicles, it is also necessary to ensure that at least one traffic lane (inbound or outbound) has a width of at least 3.5m wide with a total free-space of 4.5m and a height clearance of 5.2m, or as per the requirements of the local authority.

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4. Traffic Flows & Development Trip Generation

4.1 EXISTING TRAFFIC FLOWS & OPERATIONS

Given the type and extent of the proposed development, new detailed traffic surveys were carried out to quantify the existing traffic volumes in the vicinity of the site. The traffic surveys comprised of manual traffic counts which were done on the 18th of January 2022 at the following key intersections:

- ✚ Mulder Street / Boekenhoutkloof Street (Site Access);
- ✚ Erma Street / Johnston Street; and
- ✚ Market Street / Bremer Street (R55).

Classified traffic counts were undertaken at the intersection of Mulder Street and Boekenhoutkloof Street as well as the intersection of Market Street / Bremer Street (R55) to determine if there is an existing public transport presence in the area. The existing weekday morning (AM) and afternoon (PM) peak hour traffic volumes at the above-mentioned key intersections are summarised in **Figure 5**. It was found that the weekday AM peak hour traffic occurred during 06:30 - 07:30, while the PM peak hour traffic occurred during 16:45 - 17:45.

From a traffic engineering perspective, it can be noted that the Covid-19 pandemic has also had an impact on the traffic volumes on the roads in general, with the Covid-19 lockdown regulations resulting in less traffic overall on the roads. However, it is submitted that by the time these traffic surveys were conducted, the majority of industries, businesses and schools had been fully operational again, with the resultant effect that traffic volumes had almost restored back to normal.

4.2 FUTURE BACKGROUND TRAFFIC FLOWS

Apart from the existing 2022 traffic volumes, a future base traffic volume scenario had been considered for the report, namely 2027. The future 2027 background traffic presented in this document, and as summarised in **Figure 6**, comprises of traffic growth over 5 years at the rate discussed below.

4.2.1 Traffic growth

The *THM16, Volume 1, South African Traffic Impact and Site Traffic Assessment Manual (Committee Draft 2.0, May 2018)* suggests that for developments which generate more than 50 peak hour trips, it is necessary to undertake a full traffic impact assessment which must also include traffic growth and/or the potential traffic generations of other nearby approved developments that still need to realise.

In order to make provision for other developments in the area and increases in traffic along the main routes, traffic growth is added. In this case the traffic growth makes provision for those other developments not accounted for in Section 4.2.2 below.

It has been assumed that the background traffic would increase at the rate of 3.0% per annum for 5 years to future 2027, which is in accordance with the *TMH17 guidelines*. The growth rate is considered reasonable and typical to that used in most traffic studies in Gauteng.

4.2.2 Trips Generations from "Other Developments" (Latent Rights)

No 'Other Developments' have been included as latent rights in this document. There are currently no other planned or approved developments nearby that are known of at this stage.

4.3 DEVELOPMENT TRIP GENERATION

In order to estimate the expected trip generations of the proposed development, the latest and most relevant guideline, entitled *TMH 17 Volume 1, South African Trip Data Manual (Committee Draft 2.0, May 2018)* had been used as a basis, which has been based on a comprehensive data base, which makes provision for different types of residential developments, as well different income levels of developments, vehicle ownership and availability of public transport services.

Based on the planned units for this development, the *Trip Data Manual* allows for '*Apartments and Flats*' and '*Townhouses (Simplexes and Duplexes)*' with adjustments in terms of '*Low Vehicle Ownership*', '*Transit Nodes and Corridors*' (availability of public transport) and '*Mixed Land Use Developments*'.

The following assumptions and notes are relevant with respect to the trip generation calculations:

- ❖ Standard trip rate for '*Apartments and Flats*' is 0.65/unit and for '*Townhouses (Simplexes and Duplexes)*' is 0.85/unit;
- ❖ Trip rate adjustment factor allowed for low vehicle ownership is 30% and that for very low vehicle ownership is 50%. In this case, no reduction had been applied;
- ❖ For '*Transit nodes or Corridors*' (i.e. availability of public transport) a maximum adjustment of 15% is allowed. In this case, no reduction had been applied; and
- ❖ No '*Mixed Land Use*' reduction factor had been applied, since this is only a residential development.

Based on the above assumptions, a conservative trip rate of **0.65 trips/ unit and 0.85 trips/ unit** was used for the '*Apartments and Flats*' units and the '*Townhouses (Simplexes and Duplexes)*' units, respectively.

By applying the above trip rates to the total number of units proposed, the maximum number of peak hour trips is estimated at:

- For 300 '*Apartments and Flats*' units = $300 \times 0.65 = \mathbf{195 \text{ trips}}$
- For 120 '*Townhouses (Simplexes and Duplexes)*' units = $120 \times 0.85 = \mathbf{102 \text{ trips}}$

Therefore, for the 420-unit development the estimated total development trips during both the AM and PM peak hours is **297 trips**. The estimated total development trips are summarised in **Table 1** below, given the directional splits (IN:OUT) of 25:75 and 70:30 for the AM and PM peaks, respectively.

Table 1: Estimated Development Trips

Peak	Development Trips (vph)		
	IN	OUT	TOTAL
Weekday AM Peak hr	74	223	297
Weekday PM Peak hr	208	89	297

4.4 TRIP DISTRIBUTION & ASSIGNMENT

Assumptions on the expected trip distribution were based on the location of the site access in relation to the surrounding road network, existing traffic volumes and patterns in the study area, the type of development in relation to employment opportunities as well as our knowledge of the area.

Figure 7 depicts the expected trip distribution of the proposed development onto the surrounding road network.

Given the above distribution, **Figure 8** summarizes the estimated development trips at the identified key intersections, for the weekday AM and PM peak hours, respectively.

4.5 ASSESSMENT TRAFFIC FLOWS WITH DEVELOPMENT

Figure 9 shows the total existing 2022 peak hour traffic volumes with the estimated traffic generations from the proposed development, which is the summation of **Figure 5** and **Figure 8**.

Figure 10 shows the total future 2027 base traffic volumes with the estimated traffic generations from the proposed development, which is the summation of **Figure 6** and **Figure 8**.

In this report **Figure 5**, **Figure 6**, **Figure 9** and **Figure 10** had been used for assessing the current traffic conditions, as well as the traffic impact of the proposed development and future background traffic flows, onto the surrounding road network.

5. Traffic Impact & Capacity Analyses

Capacity analyses had been undertaken in order to quantify the anticipated traffic impact of the proposed development. For this purpose, the latest *SIDRA Intersection 9* traffic engineering software was used. With reference to the analyses of the various scenarios mentioned below, this section comments on the current traffic operations without the additional development traffic, as well as the likely traffic flow conditions with the additional development traffic. Where necessary and feasible, intersection improvements have been identified that would mitigate the likely traffic impact and/or improve current traffic flow conditions.

The following key intersections have been analysed for potential traffic impact, namely:

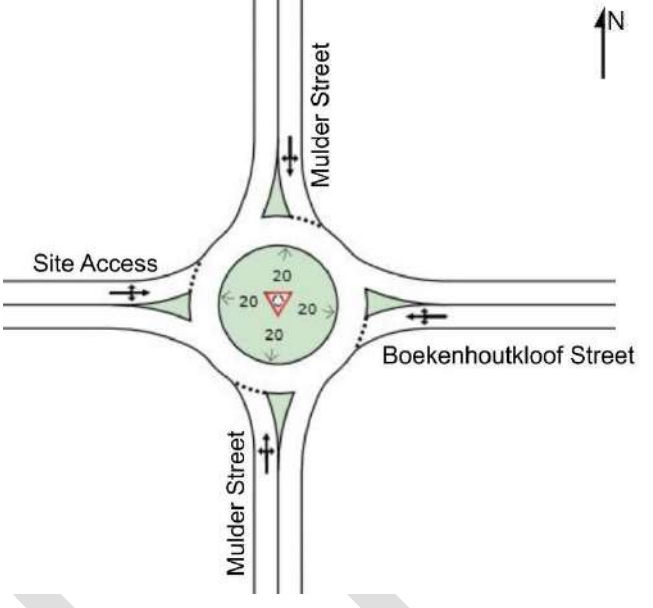
- ✦ Mulder Street / Boekenhoutkloof Street / Site Access;
- ✦ Erma Street / Johnston Street; and
- ✦ Market Street / Bremer Street (R55).

The following scenarios were analysed, namely:

- **Scenario 1:** Existing 2022 weekday AM and PM peak hour traffic volumes WITHOUT the estimated development trips (as per **Figure 5**);
- **Scenario 2:** Future 2027 base weekday AM and PM peak hour traffic volumes WITHOUT the estimated development trips (as per **Figure 6**);
- **Scenario 3:** Existing 2022 weekday AM and PM peak hour traffic volumes PLUS the estimated development trips (as per **Figure 9**);
- **Scenario 4:** Future 2027 base weekday AM and PM peak hour traffic volumes PLUS the estimated development trips (as per **Figure 10**).

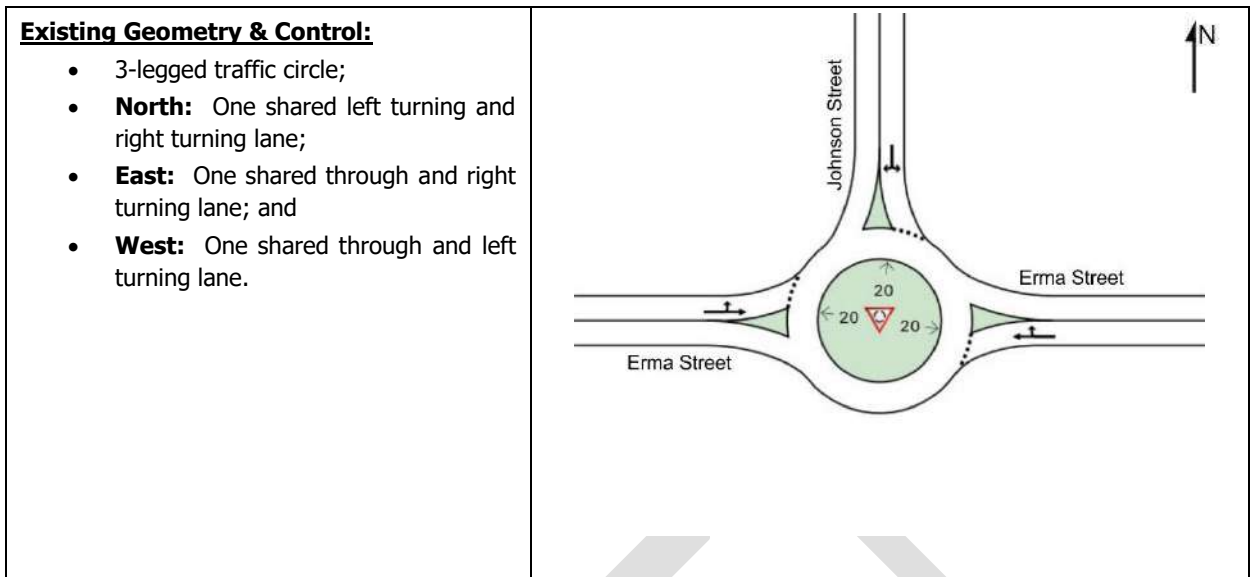
Results of the SIDRA capacity analyses at the various intersections are discussed in the following sub-sections, with the details of the outputs enclosed in **Annexure B**. It is important to note that for all the traffic analyses at signalised intersections, optimised traffic signal phasing and settings had been used.

5.1 MULDER STREET / BOEKENHOUTKLOOF STREET / SITE ACCESS

<p>Proposed Geometry & Control:</p> <ul style="list-style-type: none"> • 4-legged traffic circle • North: One shared through, left turning and right turning lane; • South: One shared through, left turning and right turning lane; • East: One shared through, left turning and right turning lane; • West: One shared through, left turning and right turning lane; 	
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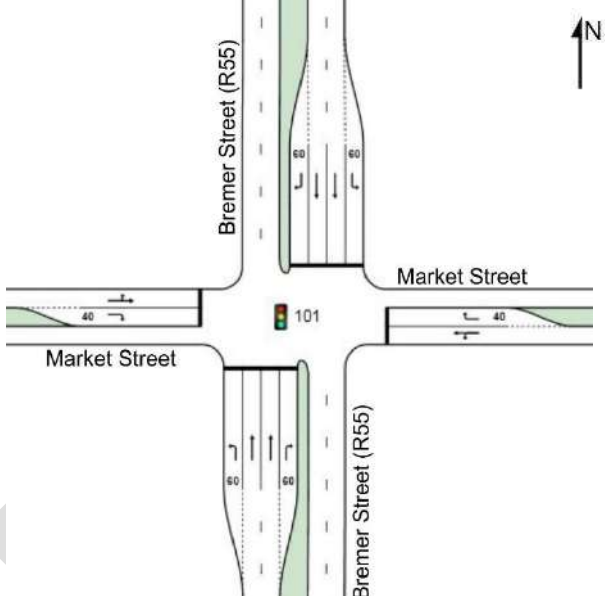
Analysis Results & Conclusion			Intersection: Mulder St / Boekenhoutkloof St / Site Access			
Detailed Results: Annexures B1.1 to B1.4						
Scenario	Geometry & Control	Peak	Overall			Comment
			LOS	Delay(s)	v/C _{max}	
Scenario 3	Proposed geometry	AM	A	8	0.54	Very good overall level of operation
Scenario 4	Proposed geometry	AM	A	8	0.62	Very good overall level of operation
Scenario 3	Proposed geometry	PM	A	7	0.42	Very good overall level of operation
Scenario 4	Proposed geometry	PM	A	7	0.49	Very good overall level of operation
Conclusion:		The proposed circle at the site access intersection will adequately provide sufficient capacity with minimal delays on all approaches while also providing traffic calming on Mulder Street. Furthermore, as discussed in Section 3.2, the shoulder site distance at the access is a concern due to the road curving in a western direction as you move southbound from the site access. Thus, the implementation of a traffic circle instead of a priority stop controlled intersection would be more beneficial as the shoulder site distance at a traffic circle becomes less relevant.				
Upgrade Required:		Yes, as per Drawing No. 0592/CL/01				
Upgrade Responsibility:		Developer				

5.2 ERMA STREET / JOHNSTON STREET



Analysis Results & Conclusion			Intersection: Erma St / Johnston St			
Detailed Results: Annexures B2.1 to B2.8						
Scenario	Geometry & Control	Peak	Overall			Comment
			LOS	Delay(s)	v/c _{max}	
Scenario 1	Existing geometry	AM	A	5	0.48	Very good overall level of operation
Scenario 2	Existing geometry	AM	A	5	0.56	Very good overall level of operation
Scenario 3	Existing geometry	AM	A	5	0.49	Very good overall level of operation
Scenario 4	Existing geometry	AM	A	5	0.58	Very good overall level of operation
Scenario 1	Existing geometry	PM	A	7	0.37	Very good overall level of operation
Scenario 2	Existing geometry	PM	A	7	0.43	Very good overall level of operation
Scenario 3	Existing geometry	PM	A	7	0.39	Very good overall level of operation
Scenario 4	Existing geometry	PM	A	7	0.45	Very good overall level of operation
Conclusion:		All approaches of this intersection operate with an overall level of service A during both peak hours with ample spare capacity and minimal delays experienced. No further upgrades are therefore warranted or required for this intersection.				
Upgrade Required:		None				
Upgrade Responsibility:		N/A				

5.3 MARKET STREET / BREMER STREET (R55)

<p>Existing Geometry & Control:</p> <ul style="list-style-type: none"> • 4-legged signalized intersection; • North: Two through lanes and one short left turning lane and one short right turning lane; • South: Two through lanes and one short left turning lane and one short right turning lane; • East: One shared through and left turning with a short right turning lane; and • West: One shared through and left turning lane with a short right turning lane; 	
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Analysis Results & Conclusion			Intersection: Market St / Bremer St (R55)			
Detailed Results: Annexures B3.1 to B3.9						
Scenario	Geometry & Control	Peak	Overall			Comment
			LOS	Delay(s)	v/c _{max}	
Scenario 1	Existing geometry	AM	F	85	1.53	Very poor overall level of operation
Scenario 2	Existing geometry	AM	F	154	2.04	Very poor overall level of operation
Scenario 3	Existing geometry	AM	F	106	1.69	Very poor overall level of operation
Scenario 4	Existing geometry	AM	F	179	2.20	Very poor overall level of operation
Scenario 4	Proposed geometry and updated signal timing plans	AM	F	116	1.34	Very poor overall level of operation, however, significant improvement in capacity and delay.
Scenario 1	Existing geometry	PM	B	15	0.64	Good overall level of operation
Scenario 2	Existing geometry	PM	B	16	0.85	Good overall level of operation
Scenario 3	Existing geometry	PM	B	16	0.68	Good overall level of operation
Scenario 4	Existing geometry	PM	B	18	0.88	Good overall level of operation
Scenario 4	Proposed geometry and updated signal timing plans	PM	B	18	0.88	Good overall level of operation

Conclusion:	<p>This intersection is currently a 2-phase signalized intersection and this phasing operates well for all scenario's during the PM peak hour; however, regarding the AM peak hour, with reference to Figure 5, the existing right turning volumes at the western and southern approach of this intersection are significantly high (greater than 200vph) which already warrants dedicated phases for these movements to be installed (without even considering the additional development traffic).</p> <p>It can further be mentioned that the available road reserve to do geometric upgrades at this intersection is limited. In an east-west direction (Market Street), there is space at the western approach to do some geometric upgrades, however, at the eastern approach no additional lanes can be accommodated. Thus, the addition of any extra lanes at the western leg would consequently cause the eastern and western approaches to be misaligned and therefore not practical to implement.</p> <p>Due to the limited available space in the road reserve, it is recommended that no extra lanes be added at this intersection, however, it is proposed that the developer do a status quo upgrade by extending the existing right turning auxiliary lane on the western approach of Market Street. This lane is expected to accommodate the majority of the development's traffic and this specific right turning movement is already high during the peaks. It is proposed to extend this lane to have a straight distance of 52.5m with a 17.5m taper i.e the total lane length would be 70m (the existing straight length is approximately 25m thus the available straight distance would effectively be doubled). Furthermore, it is recommended to install right turning signal heads for the western and southern approaches of this intersection as well as to update the existing signal timing plans to have dedicated phases for both these approaches (refer to Drawing No. 0592/CL/02).</p> <p>These proposed upgrades will substantially improve the capacity and delays at this intersection. When comparing the analysis results for the AM peak hour of the upgraded geometry and signal timings using the Scenario 4 traffic volumes, which is the future 2027 base beak hour traffic with the additional development traffic (as per Figure 10), with the existing geometry analysed with the future 2027 peak hour volumes (Scenario 2 as per Figure 5), it is evident that the implementation of these upgrades would improve the intersection to be better off than what it will be in the future 2027 base scenario without any development traffic. These upgrades successfully mitigate the development's effect on this intersection and therefore no further upgrades than the above-mentioned should be the developer's responsibility.</p>
Upgrade Required:	Yes, as per Drawing No. 0592/CL/02
Upgrade Responsibility:	Developer

6. Road and/or Intersection Upgrades

Based on the estimated additional traffic generations that will result from the proposed development and the projected trip distribution onto the surrounding road network during the weekday AM and PM peak hours, the capacity analyses in Section 5, as well as site observations during the peaks, road and intersection upgrades will be required.

The following external road and intersection upgrades were identified:

❖ **Mulder Street / Boekenhoutkloof Street / Site Access Intersection:**

This intersection is currently a priority stop-controlled T-intersection between Mulder Street (northern and southern approach) and Boekenhoutkloof Street (eastern approach), however, a western fourth leg will be added to this intersection to provide access to the development. It is also recommended to implement a single lane approach traffic circle with an approximate outside diameter between 25-30m as the intersection control. The developer would be responsible to implement the required access configuration as discussed in Section 3.2 of this study (see also **Drawing No. 0592/CL/01**).

❖ **Market Street / Bremer Street (R55) Intersection:**

1. Extend the right turning auxiliary lane on the western approach of Market Street to 70m in total (52.5m straight with 17.5m taper).
2. Installation of right turning signal heads on the western and southern approaches of the intersection.
3. The implementation of updated signal timing plans (see also **Drawing No. 0592/CL/02**).

In the event of bulk engineering contributions payable with respect to roads and stormwater, it is recommended that the bulk contributions be off-set against the above-mentioned upgrades. It is argued that the proposed upgrades will improve the current traffic flow conditions in the area and should be viewed as beneficial to the road network.

7. Non-Motorised & Public Transport

7.1 AVAILABILITY OF SERVICES & FACILITIES

On-site observations and the classified traffic surveys indicated that there is an existing public transport presence in the study area comprising mainly of minibus taxis. From the classified traffic surveys recorded at the intersection between Market Street and Bremer Street (R55) it was determined that approximately 3.5% of all the traffic accounted for during the survey was minibus taxis while at the intersection between Mulder Street and Boekenhoutkloof Street it was determined that 2% of all the traffic through this intersection were minibus taxis.

It is expected that most of the residents/ tenants of the proposed development will use their own private vehicles for commuting, instead of public transport, given the medium income target market. The proposed development will however create various employment opportunities for domestic workers, security staff, gardening and maintenance personnel, who are generally public transport users. It is expected that particularly minibus taxis would respond to this demand by providing more services in the area.

In terms of the existing non-motorised and public transport facilities, there are currently no paved sidewalks provided around the site's boundary.

7.2 PROPOSED FACILITIES

In order to make provision for users of public transport, generated by the proposed development, the following facilities are proposed:

- ✦ **Paved Sidewalks:** It is recommended that a new paved sidewalk of at least 1.8m wide be constructed along the eastern and southern boundary of the site (i.e. Mulder Street and Erma Street), starting from the gate house of the access. The proposed sidewalk is shown conceptually in attached **Drawing No. 0592/CL/01**.
- ✦ **Public Transport Laybys:** It is recommended that a set of public transport laybys be constructed at the access intersection on Mulder Street and as shown conceptually in **Drawing No. 0592/CL/01**. These laybys can then be used by minibus taxis as well as refuse collection vehicles.

More details of the above would be submitted as part of the Site Development Plans and/or detail designs of the external roads.

8. Summary, Conclusions & Recommendations

Based on the content of this document, the following key conclusions and recommendations are relevant:

1. This Traffic Impact Assessment (TIA) has been undertaken as part of the township application for a proposed new residential development which is to be situated on Portion 183 of the Farm Zandfontein No. 317 – JR in Andeon. The site location is shown in attached **Figure 1** and **Figure 2** and falls under the jurisdiction of the City of Tshwane (CoT).
2. The subject site, as a whole, extends approximately 7ha and the proposed township will be known as Andeon Ext. 47. With reference to the town planner's proposed township layout plan enclosed in **Annexure A**, the subject site will be zoned 'Residential 3' with a proposed density of 60 units/ ha. Based on this density, the development has a permissible extent of 420 units.
3. Through correspondence with the developers, it is understood that the development will comprise of a mix of 300 apartments and 120 duplex units i.e. a total of 420 units are proposed which is in accordance with the township's proposed rights. Considering the type of units and the proposed density, the lower to middle income market is target, similar to that of the surrounding Andeon area.
4. **ACCESS:** As shown in attached **Figure 2** and **Drawing No. 0592/CL/01**, a single access to the development is proposed off Mulder Street (Class 4a road) at its existing T-intersection with Boekenhoutkloof Street. A fourth (western) leg will be added to this intersection for the access to the development.

With reference to **Figure 2**, the site aerial view indicates that as you move southbound past the site's access on Mulder Street, the road curves in a western direction into Erma Street. Due to this curve, the available shoulder sight distance at the access is restricted and therefore to address this, it is recommended that a traffic circle with an outside diameter between 25-30m be implemented at the Mulder Street and Boekenhoutkloof Street intersection. This upgrade would provide the necessary traffic calming along Mulder Street so that the shoulder sight distance at the access will not be a reason for concern anymore. It can be noted that the proposed traffic circle can be accommodated comfortably within the road reserve.

Two inbound lanes (one lane for visitors and one lane for residents) and two outbound lanes are recommended for the access geometry. Important to note is that the access will be security controlled and therefore adequate stacking distance should be provided to ensure that inbound vehicles queuing at the security gate do not impact on other traffic along the adjacent roads. It is recommended that a minimum stacking distance of 25m be provided. This is in line with the minimum required stacking distance for accesses off Class 4a roads, as per Table 30 of the *THM 16 (Vol 2)*.

5. In order to accommodate emergency and service vehicles, it is also necessary to ensure that at least one traffic lane (inbound or outbound) has a width of at least 3.5m wide with a total free-space of 4.5m and a height clearance of 5.2m, or as per the requirements of the local authority.
6. **TRIP GENERATIONS:** It is estimated that the proposed residential development, will generate a maximum of approximately **297vph** (total IN plus OUT) during both the weekday AM and PM peak hours.
7. **ROAD & INTERSECTION UPGRADES:** Based on the estimated additional traffic generations that will result from the proposed development and the projected trip distribution onto the surrounding road network during the weekday AM and PM peak hours, the capacity analyses in Section 5, as well as site observations during the peaks, road intersection upgrades will be required.

At the following key intersections, upgrades were identified as per Section 6:

❖ Mulder Street / Boekenhoutkloof Street / Site Access Intersection:

Refer to **Drawing No. 0592/CL/01.**

❖ Market Street / Bremer Street Intersection:

Refer to **Drawing No. 0592/CL/02.**

8. In the event of bulk engineering contributions payable with respect to roads and stormwater, it is recommended that the bulk contributions be off-set against the above-mentioned upgrades. It is argued that the proposed upgrades will improve the current traffic flow conditions in the area and should be viewed as beneficial to the road network.

9. **NON-MOTORISED & PUBLIC TRANSPORT:** On-site observations and the classified traffic surveys indicated that there is an existing public transport presence in the study area comprising mainly of minibus taxis. From the classified traffic surveys recorded at the intersection between Market Street and Bremer Street (R55) it was determined that approximately 3.5% of all the traffic accounted for during the survey was minibus taxis while at the intersection between Mulder Street and Boekenhoutkloof Street it was determined that 2% of all the traffic through this intersection were minibus taxis.

It is expected that most of the residents/ tenants of the proposed development will use their own private vehicles for commuting, instead of public transport, given the medium income target market. The proposed development will however create various employment opportunities for domestic workers, security staff, gardening and maintenance personnel, who are generally public transport users. It is expected that particularly minibus taxis would respond to this demand by providing more services in the area.

10. **PROPOSED FACILITIES:** In order to make provision for users of public transport, generated by the proposed development, the following facilities are proposed:

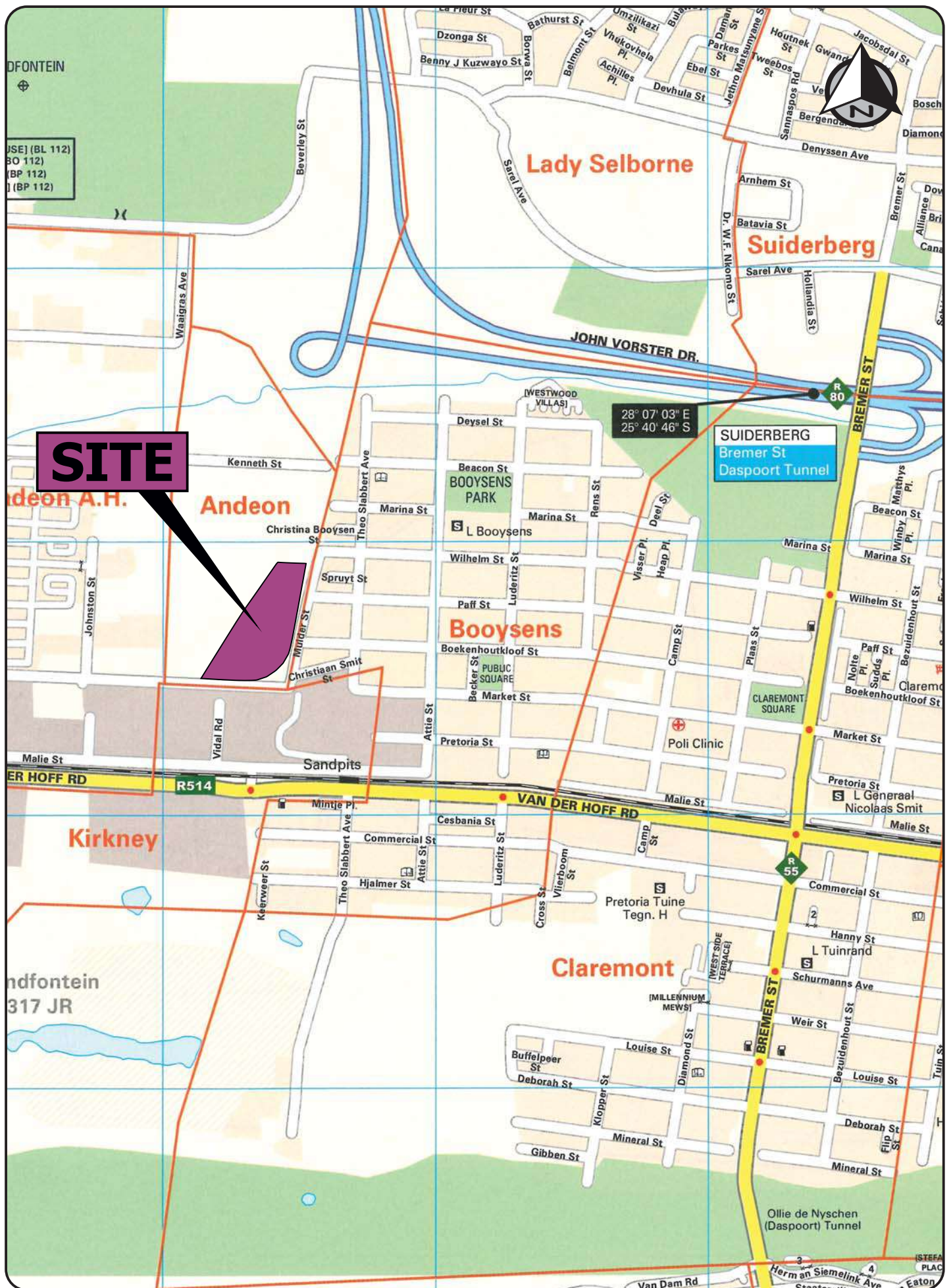
- **Paved Sidewalks:** It is recommended that a new paved sidewalk of at least 1.8m wide be constructed along the eastern and southern boundary of the site (i.e. Mulder Street and Erma Street), starting from the gate house of the access. The proposed sidewalk is shown conceptually in attached **Drawing No. 0592/CL/01.**
- **Public Transport Laybys:** It is recommended that a set of public transport laybys be constructed at the access intersection on Mulder Street and as shown conceptually in **Drawing No. 0592/CL/01.** These laybys can then be used by minibus taxis as well as refuse collection vehicles.

More details of the above would be submitted as part of the Site Development Plans and/or detail designs of the external roads.

From a traffic engineering perspective, the proposed new residential development known as Andeon Ext. 47 is supported, provided that the proposed external upgrades, site access and NMT facilities as proposed in this TIA are being implemented to the relevant design standards of the City of Tshwane.

Figures

- Figure 1 Locality Plan
- Figure 2 Site Aerial View & Key Plan
- Figure 3 Extract of CoT's Road Master Plan (2015)
- Figure 4 Extract of Gautrans' Strategic Major Road Network (2007)
- Figure 5 Existing 2022 Peak Hour Traffic Volumes
- Figure 6 Future 2027 Base Peak Hour Traffic Volumes
- Figure 7 Expected Development Trip Distribution
- Figure 8 Estimated Development Trips
- Figure 9 Existing 2022 Peak Hour Traffic Volumes PLUS
Estimated Development Trips
- Figure 10 Future 2027 Base Peak Hour Traffic Volumes PLUS
Estimated Development Trips

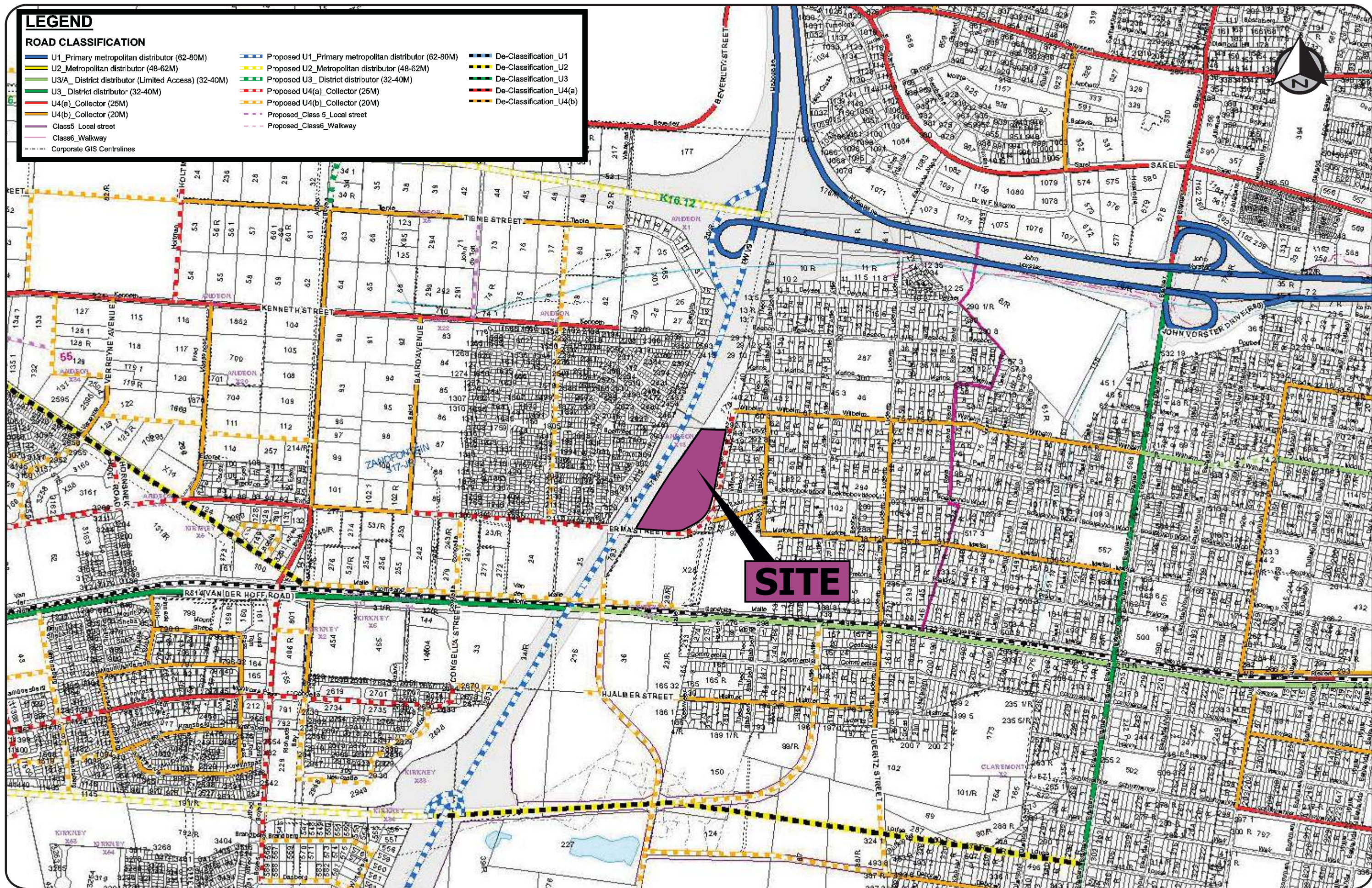




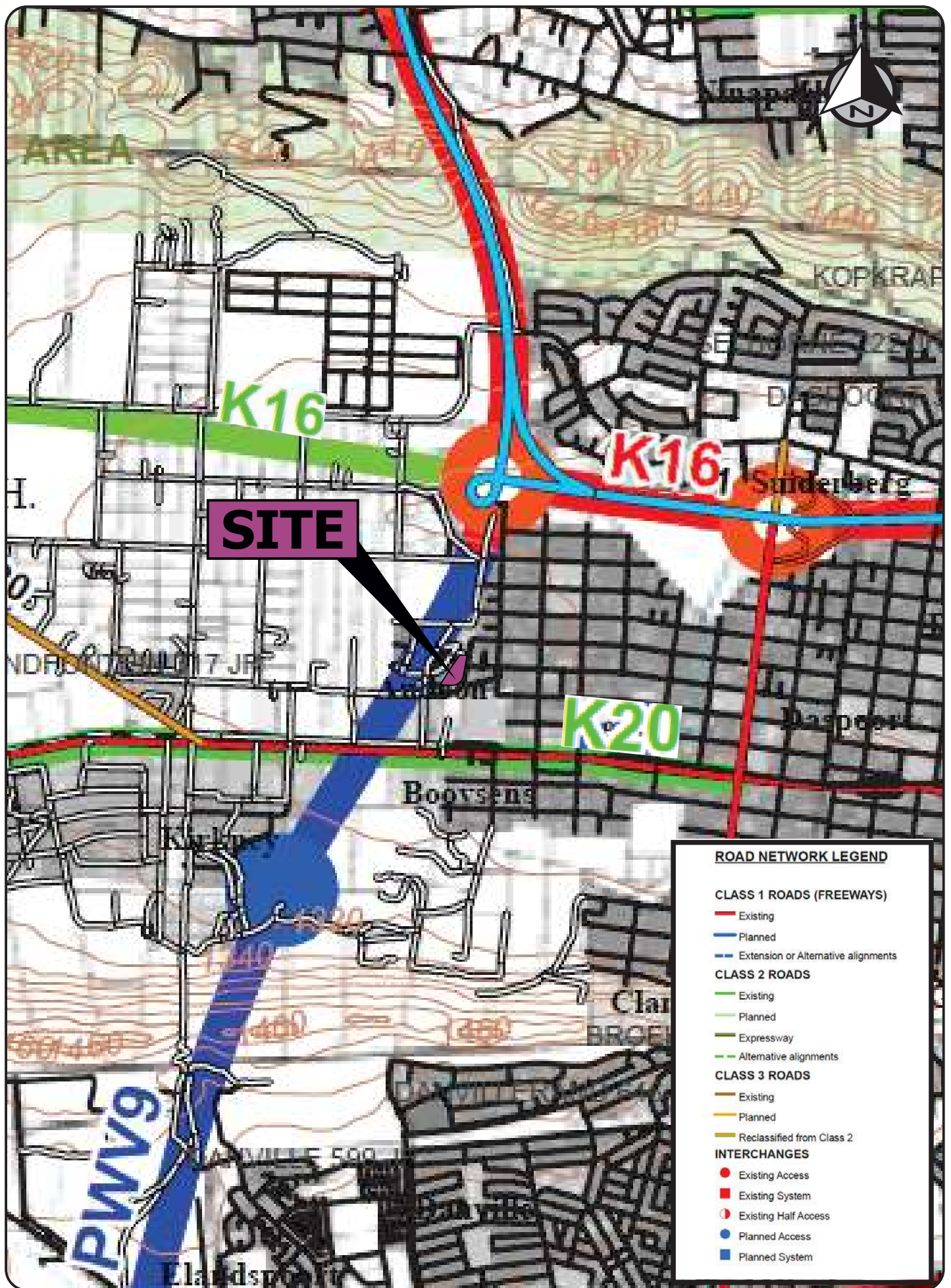
LEGEND

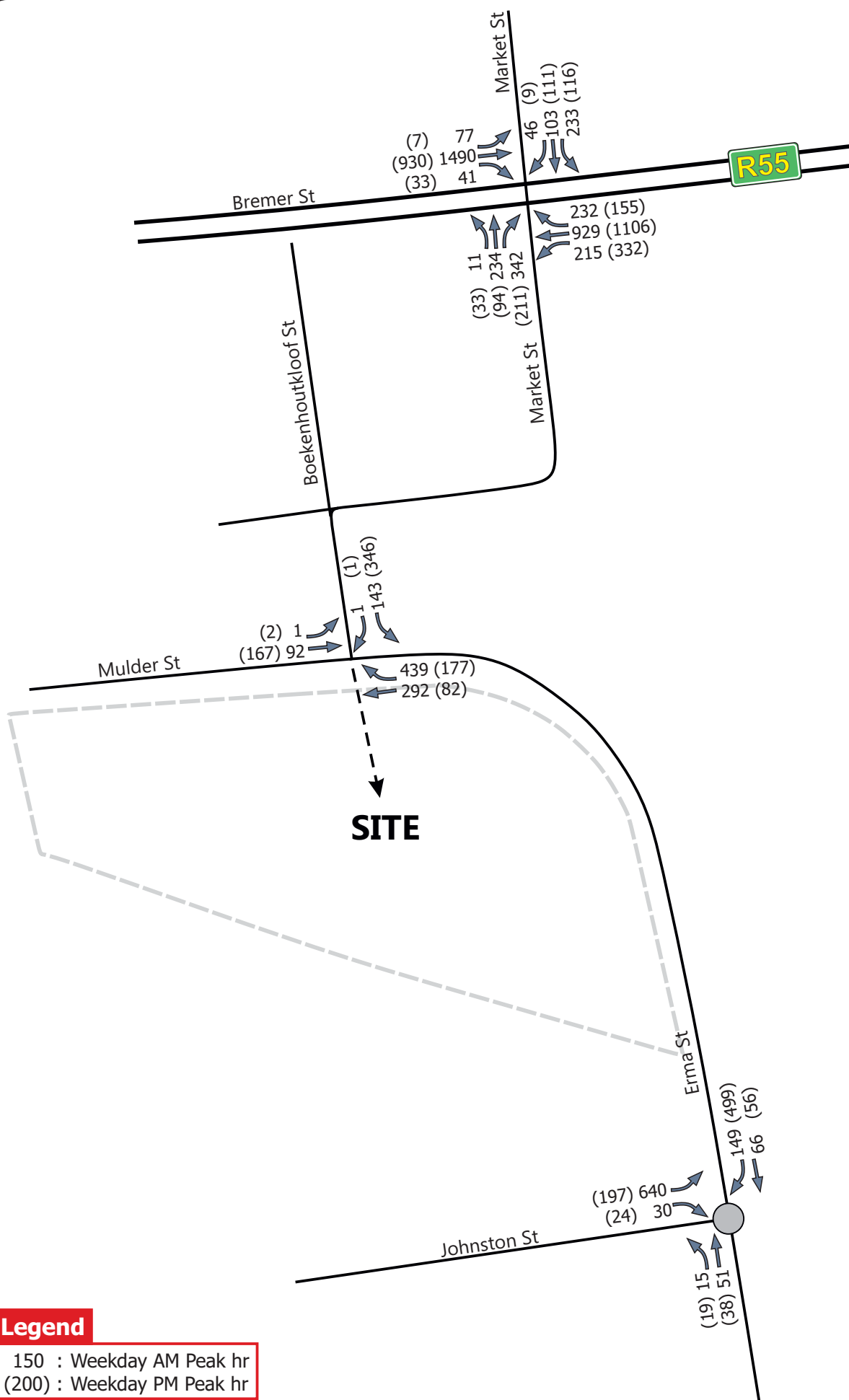
ROAD CLASSIFICATION

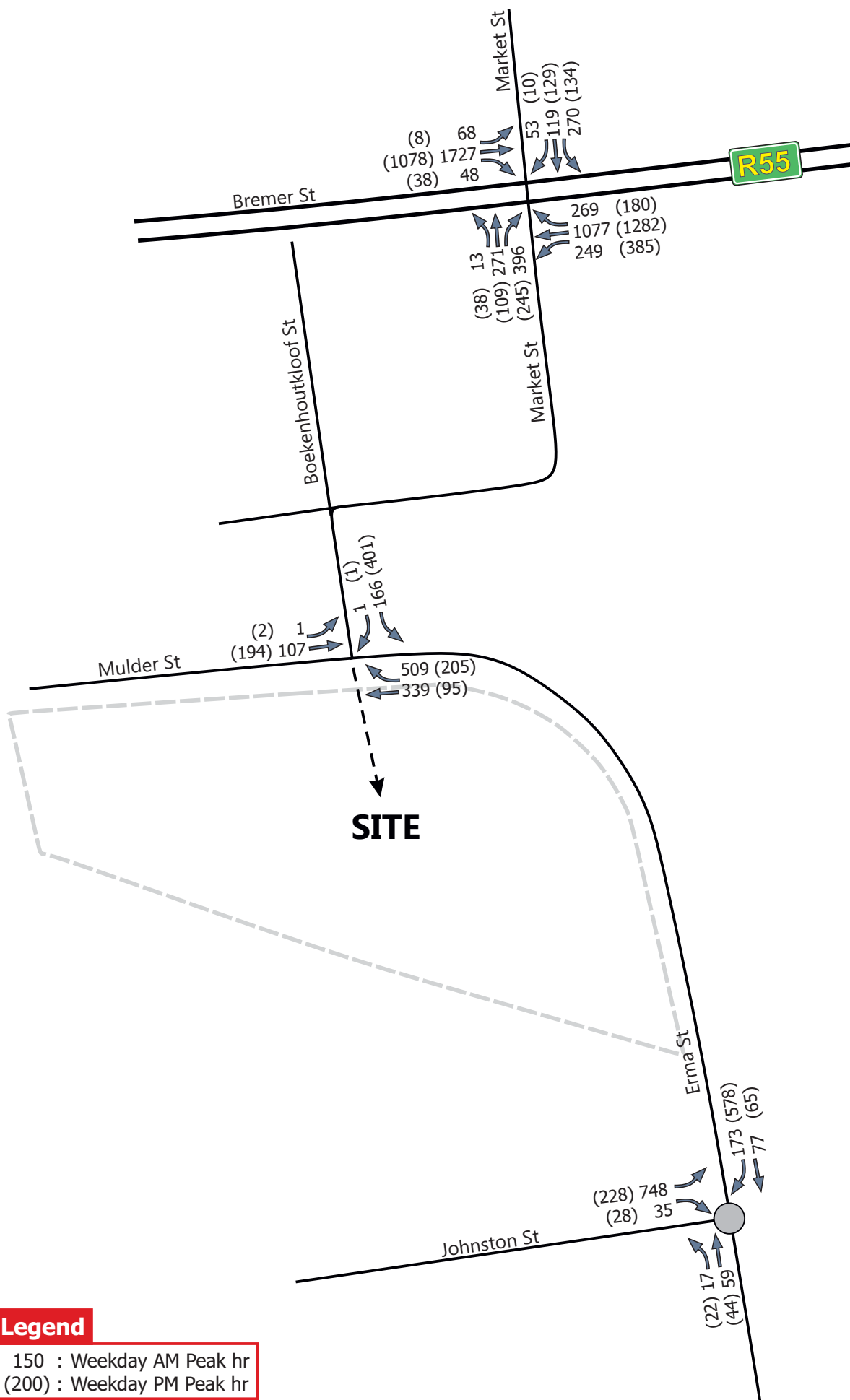
- U1_Primary metropolitan distributor (62-80M)
- U2_Metropolitan distributor (48-62M)
- U3/A_District distributor (Limited Access) (32-40M)
- U3_District distributor (32-40M)
- U4(a)_Collector (25M)
- U4(b)_Collector (20M)
- Class5_Local street
- Class6_Walkway
- Corporate GIS Centrelines
- Proposed U1_Primary metropolitan distributor (62-80M)
- Proposed U2_Metropolitan distributor (48-62M)
- Proposed U3_District distributor (32-40M)
- Proposed U4(a)_Collector (25M)
- Proposed U4(b)_Collector (20M)
- Proposed_Class 5_Local street
- Proposed_Class6_Walkway
- De-Classification_U1
- De-Classification_U2
- De-Classification_U3
- De-Classification_U4(a)
- De-Classification_U4(b)

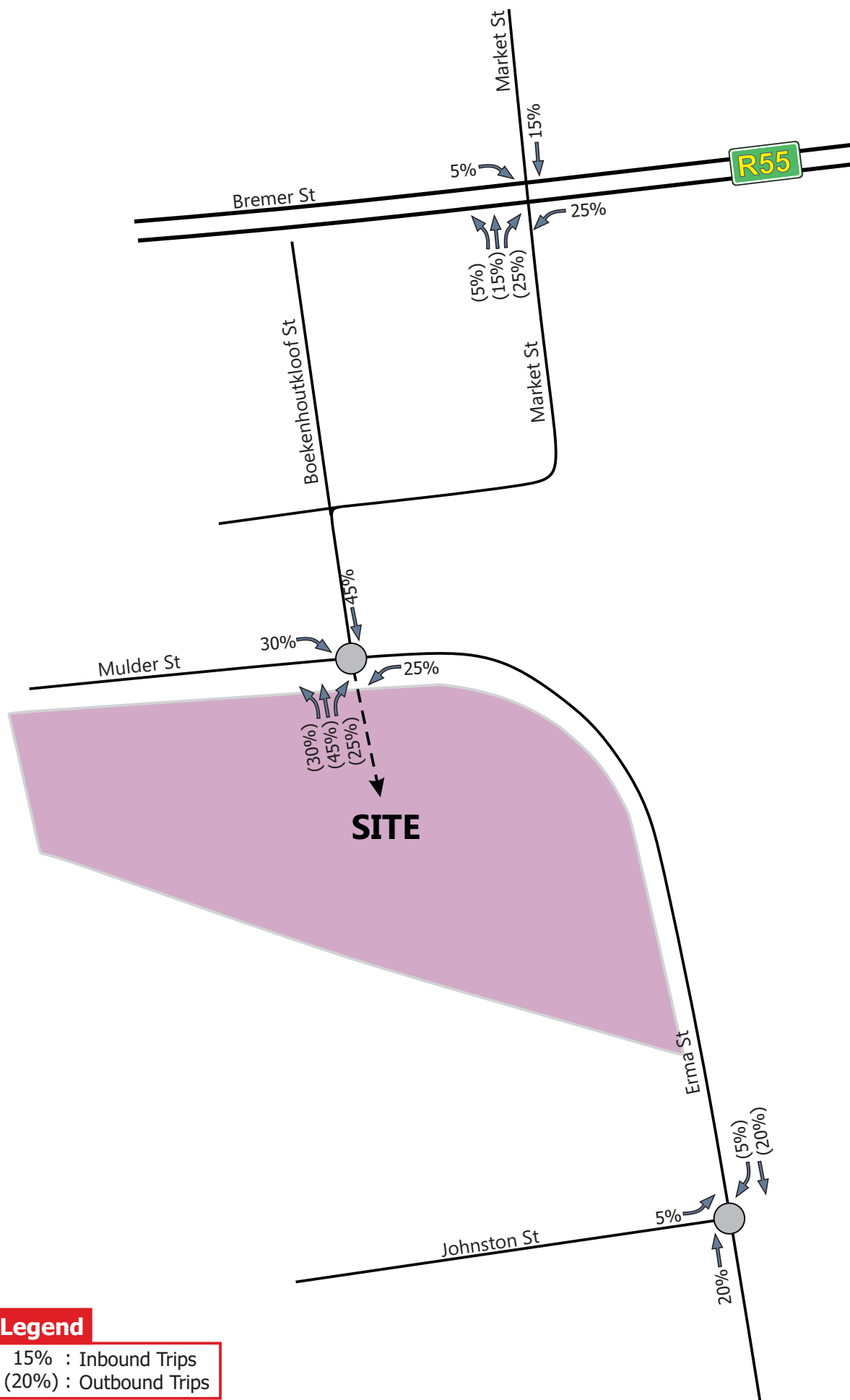


SITE



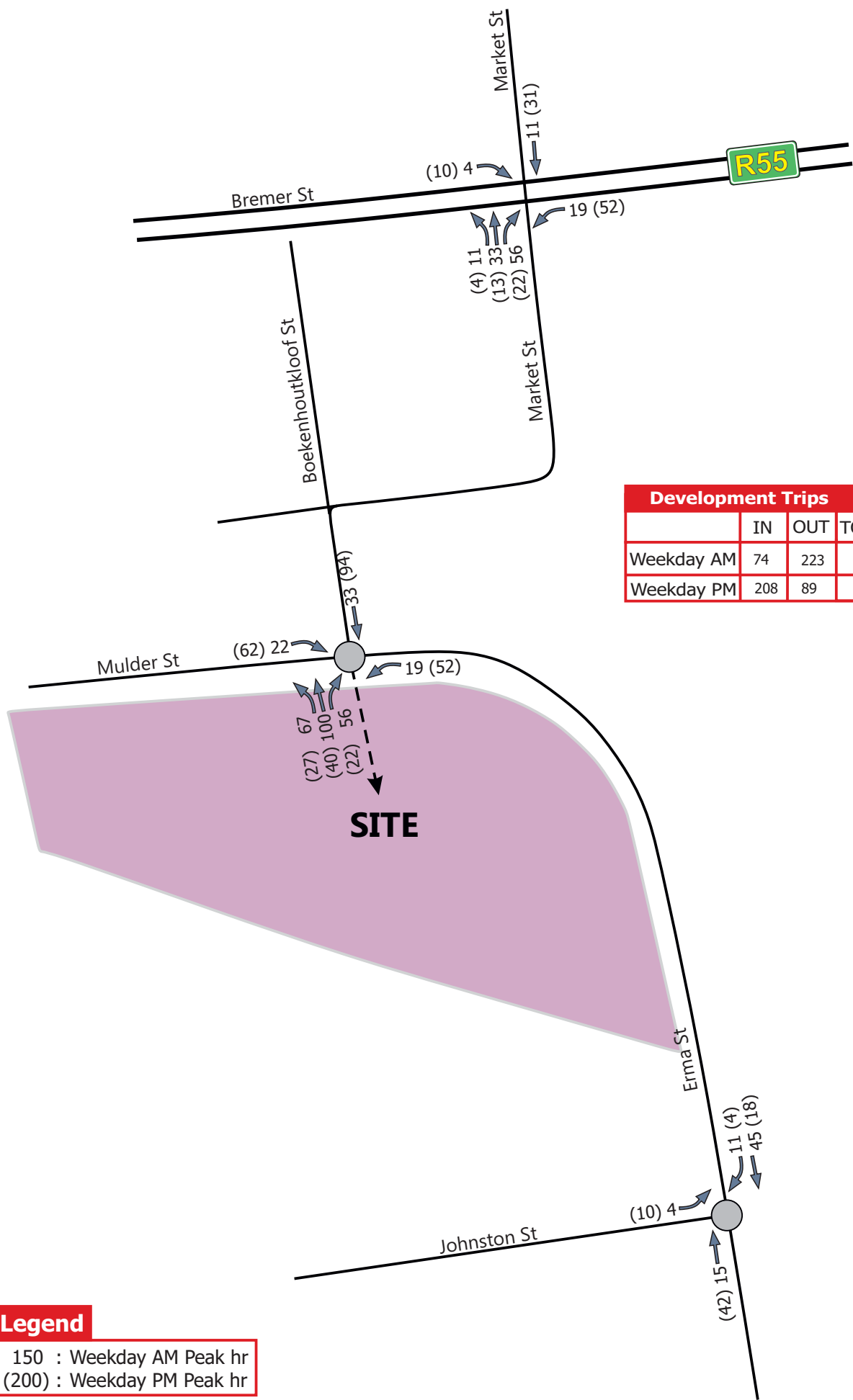








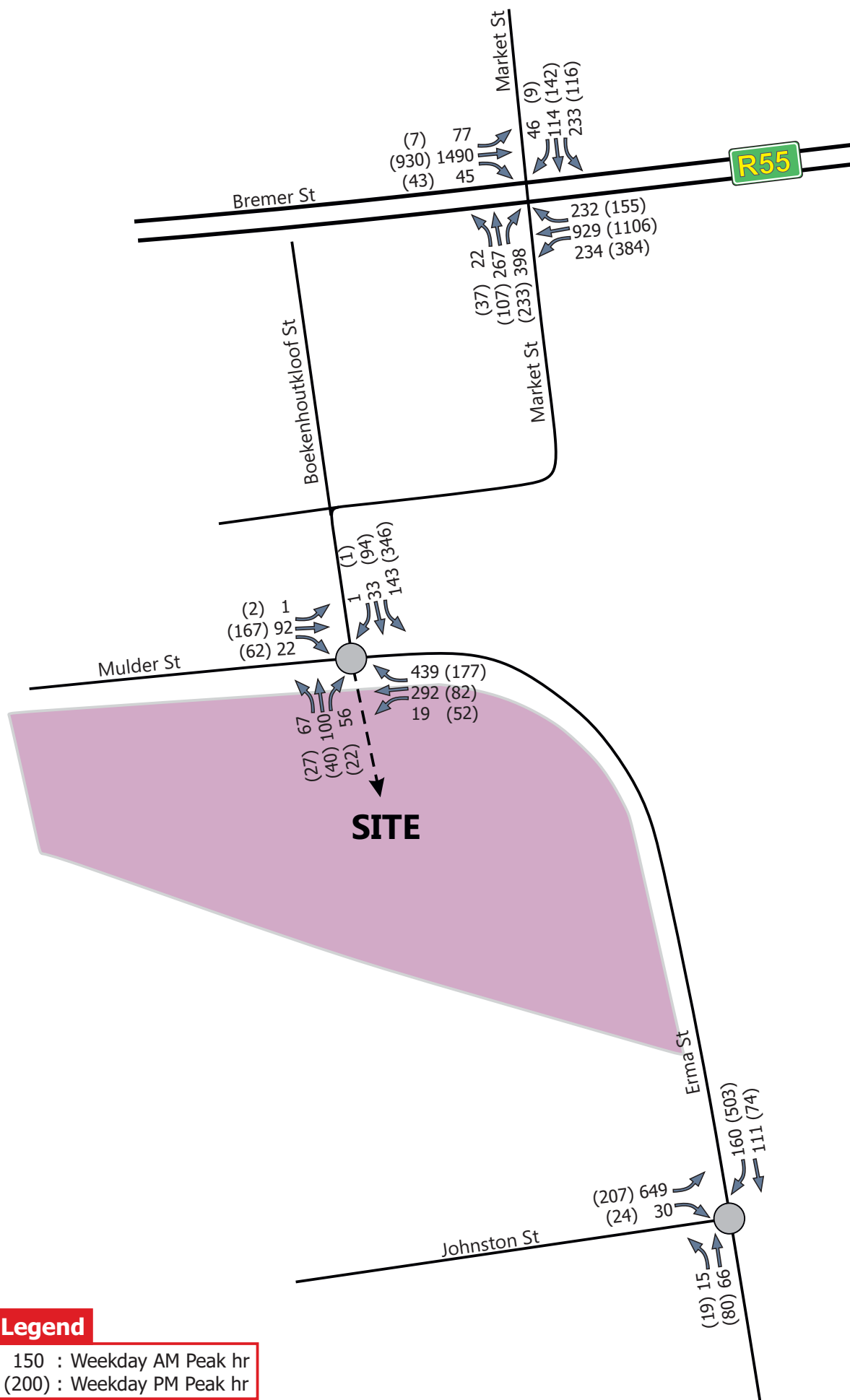
R55

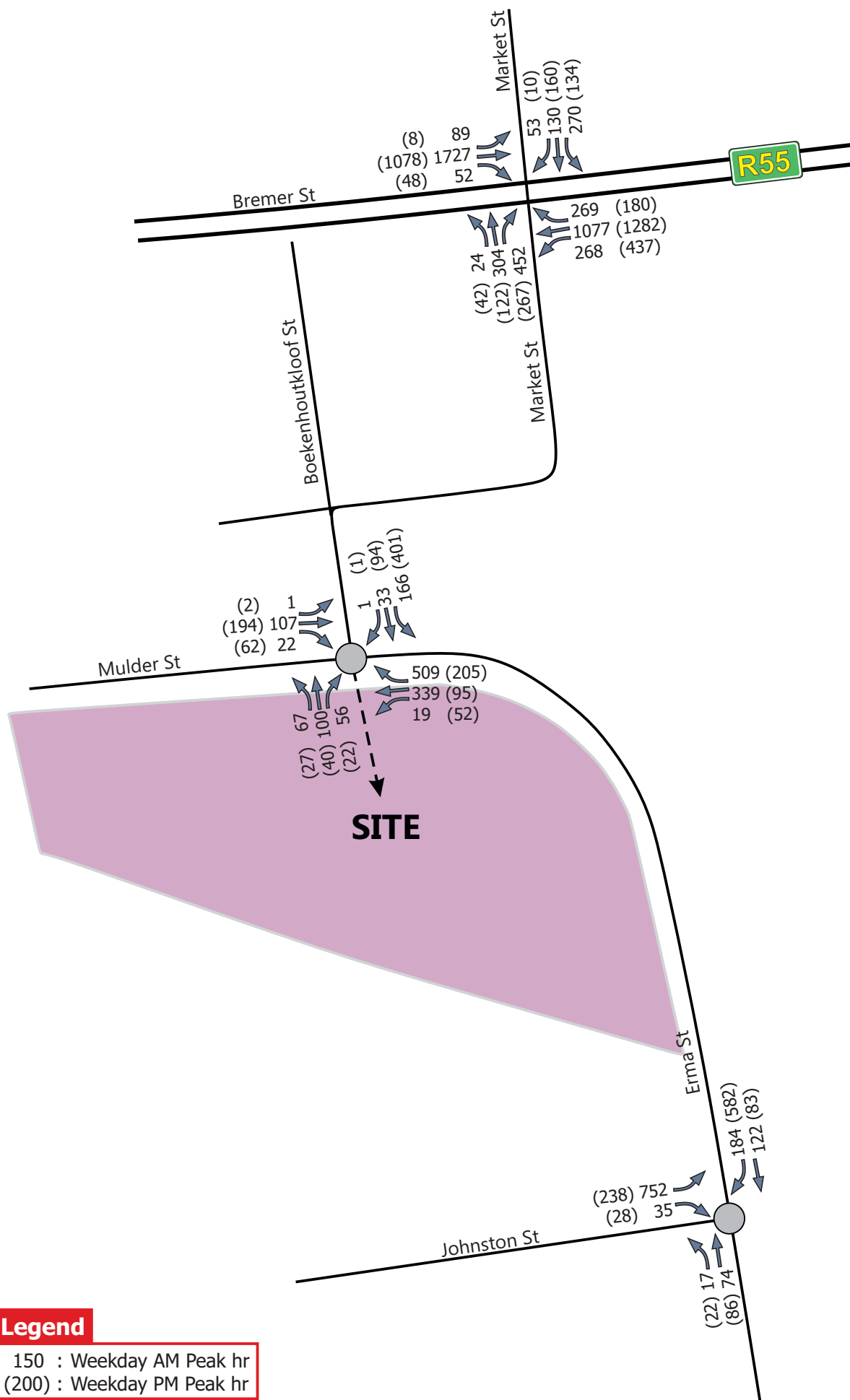


Development Trips			
	IN	OUT	TOTAL
Weekday AM	74	223	297
Weekday PM	208	89	297

Legend

150 : Weekday AM Peak hr
(200) : Weekday PM Peak hr





Drawings

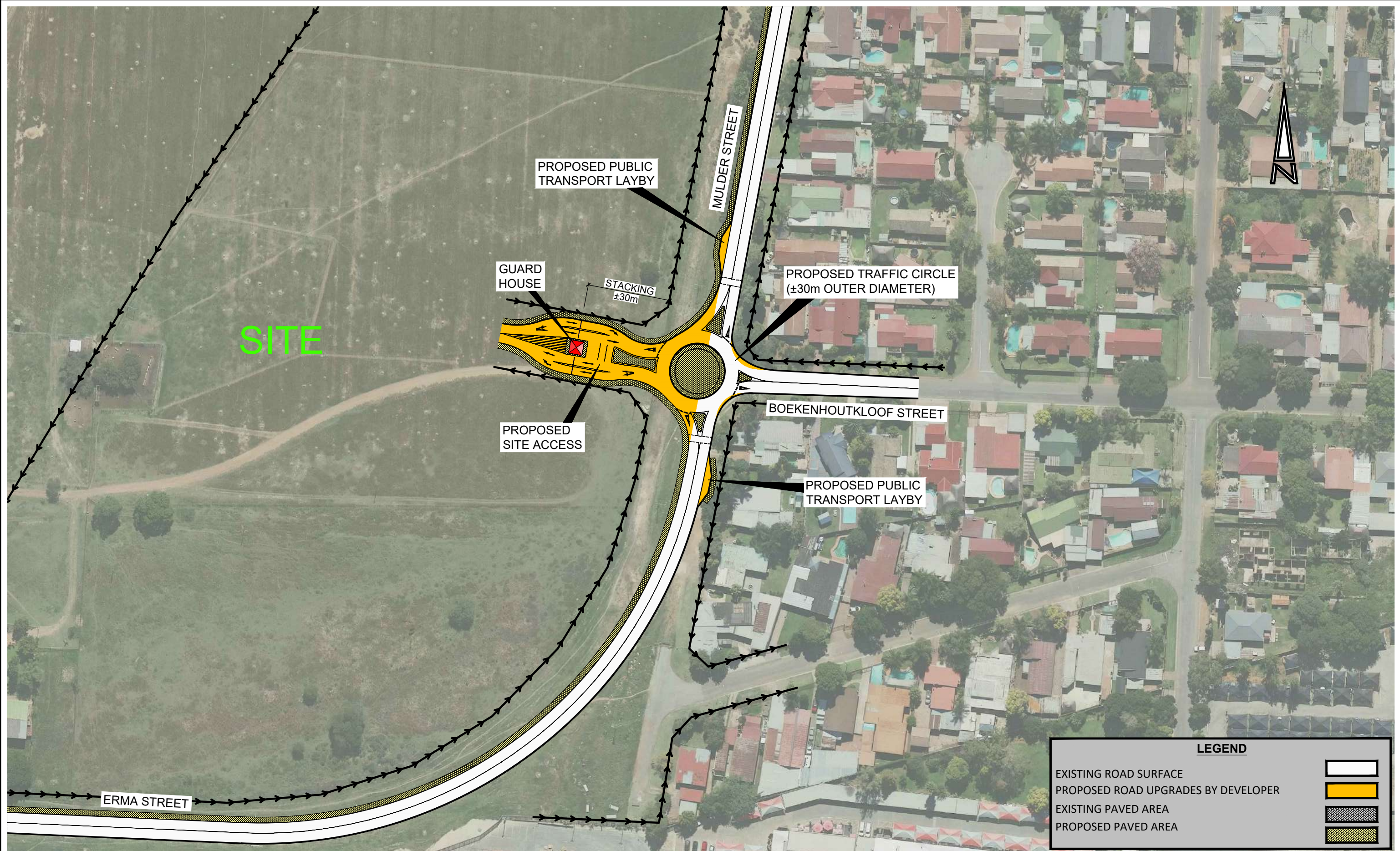
Drawing No. 0592/CL/01

Proposed Site Access Arrangement

Drawing No. 0592/CL/02

Proposed Intersection Upgrade:
Bremer Street (R55) / Market Street

DRAFT



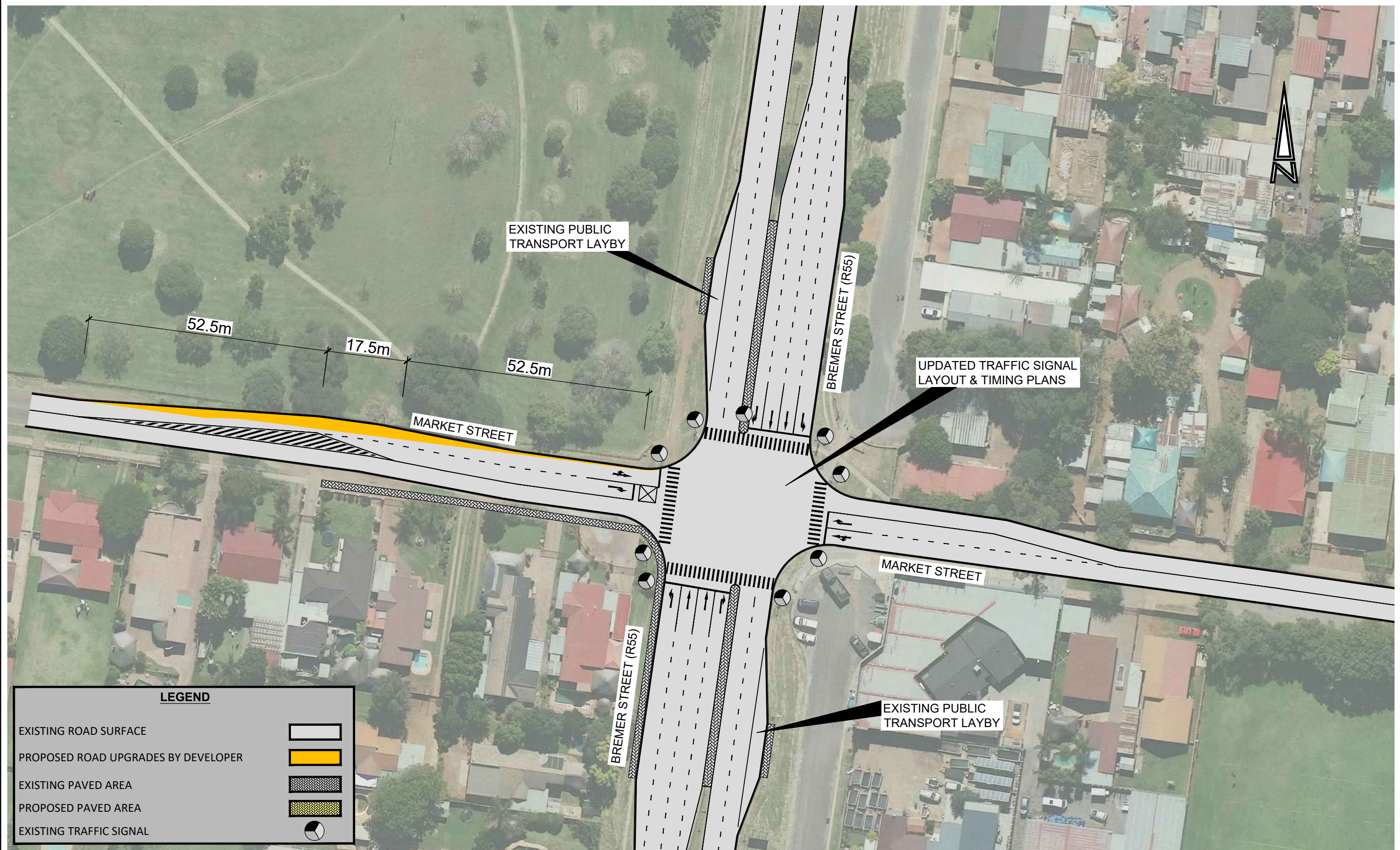
A	-	-	INITIAL ISSUE	-	-
REV	DATE	BY	DESCRIPTION	CHK	APD
DRAWING STATUS: TRAFFIC IMPACT ASSESSMENT					

Dhubecon Consulting Engineers
41 Via Aurelia Drive
Irene Corporate Corner
Irene, Centurion
Tel: 012 667 5531
Email: admin@dhubecon.co.za



PROJECT:	Andeon Ext. 47
TITLE:	Proposed Road & Site Access Upgrades: Mulder Street / Site Access & Boekenhoutkloof Street

SCALE:	1:1250	CHECKED:	R VAN DER WALT	APPROVED:	D HUNDERMARK
DESIGN:	-	DRAWN:	V MTHOMBENI	DATE:	2022/02/01
PROJECT No:	P0592	DRAWING No:	0592/CL/01	REV:	-



A	-	-	INITIAL ISSUE	-	-
REV	DATE	BY	DESCRIPTION	CHK	APD
DRAWING STATUS: TRAFFIC IMPACT ASSESSMENT					

Dhubecon Consulting Engineers
41 Via Aurelia Drive
Irene Corporate Corner
Irene, Centurion
Tel: 012 667 5531
Email: admin@dhubecon.co.za



PROJECT:	Andeon Ext. 47	SCALE :	1:750	CHECKED:	R VAN DER WALT	APPROVED:	D HUNDERMARK	
		DESIGN:	-	DRAWN:	V MTHOMBENI	DATE:	2022/01/31	
TITLE:	Proposed Intersection Upgrade: Bremer Street (R55) / Market Street	PROJECT No:	P0592	DRAWING No:		0592/CL/02	REV:	-

Annexures

Annexure A

Town Planner's Proposed Township Layout Plan

Annexure B

Relevant Outputs of the SIDRA Intersection Capacity Analyses

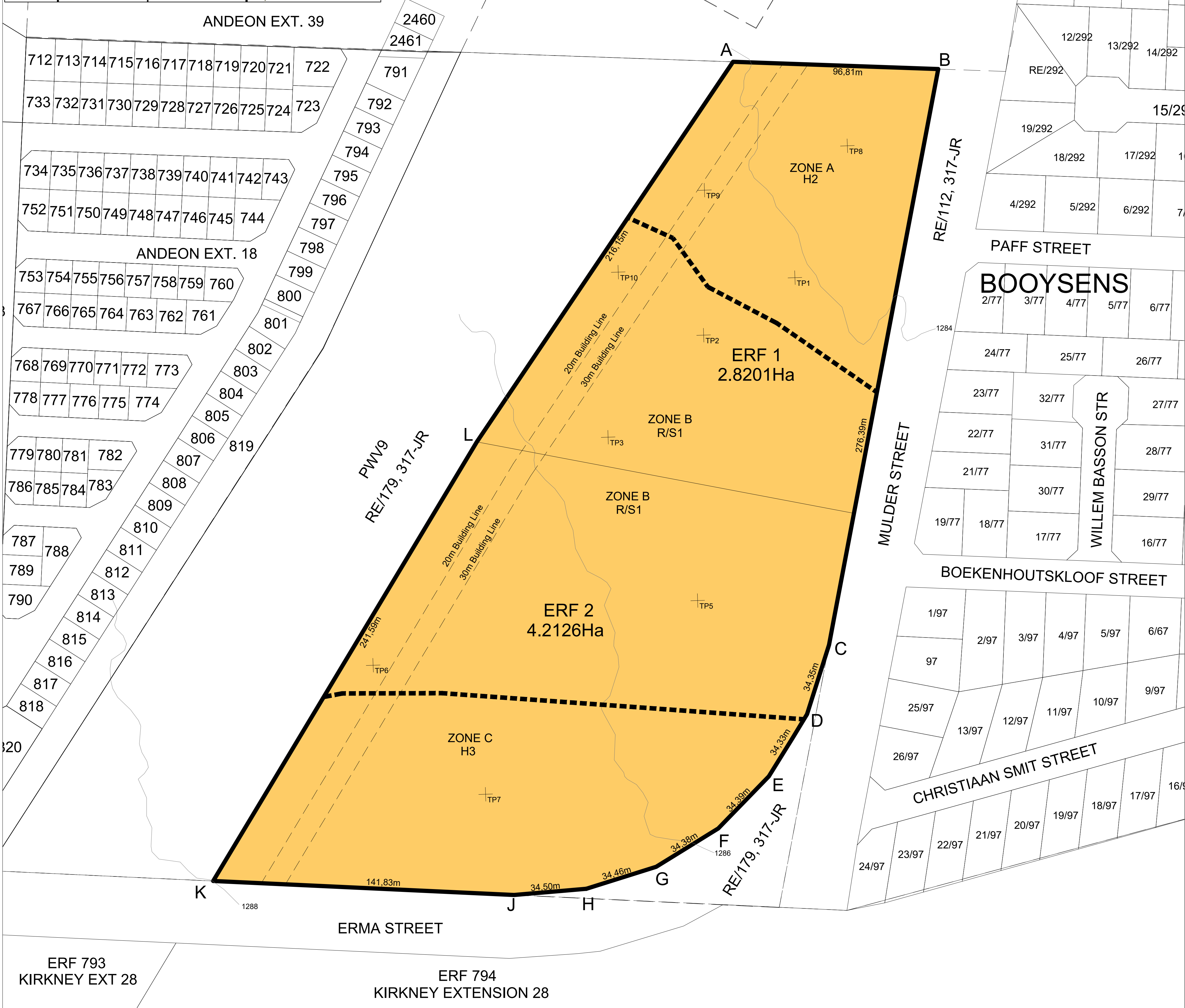
DRAFT

Annexure A

Town Planner's Proposed Township Layout Plan

DRAFT

Zone	NHBRC Class	Amount of movement due to heave mm	Competent founding level
A	H2	20mm	>2,5 to >3,4m
B	R/S1	<5mm	0,2m to 1m with avg 0,6m
C	H3	>30	2,5m+



GENERAL NOTES

1. TOWNSHIP BOUNDARY
A-B-C-D-E-F-G-H-J-K-L-A
2. CONTOUR LINES
The Contour lines are in accordance with the standards laid down in of the City of Tshwane Municipal Planning By-Law, 2016.

..... DATE

Eamon Swart

- ### 3. CO-ORDINATES
- The Co-ordinate reference is based on LO 29° system. Baseplan mapping was done by:

..... DATE

Eamon Swart

- 4. DIMENSIONS**
All dimensions shown on the plan are approximate,
scaled in meters and subject to final survey

5. GEOLOGICAL
It is hereby certified that the layout of the township complies with the recommendations and requirements set out in the Geotechnical Report Ref. K9884-01 dated December 2021.

Engineering Geologist: SP Kok (Pr Sci Nat)
Firm: Geo Buro Geotechnical Surveys

- 6. FLOODLINE**
It is hereby certified that in accordance with the Water Act (Act 36 of 1998), it is hereby stated that this township is NOT affected by a flood with an expected frequency of one every 50 years and on every 100 years in the public stream.

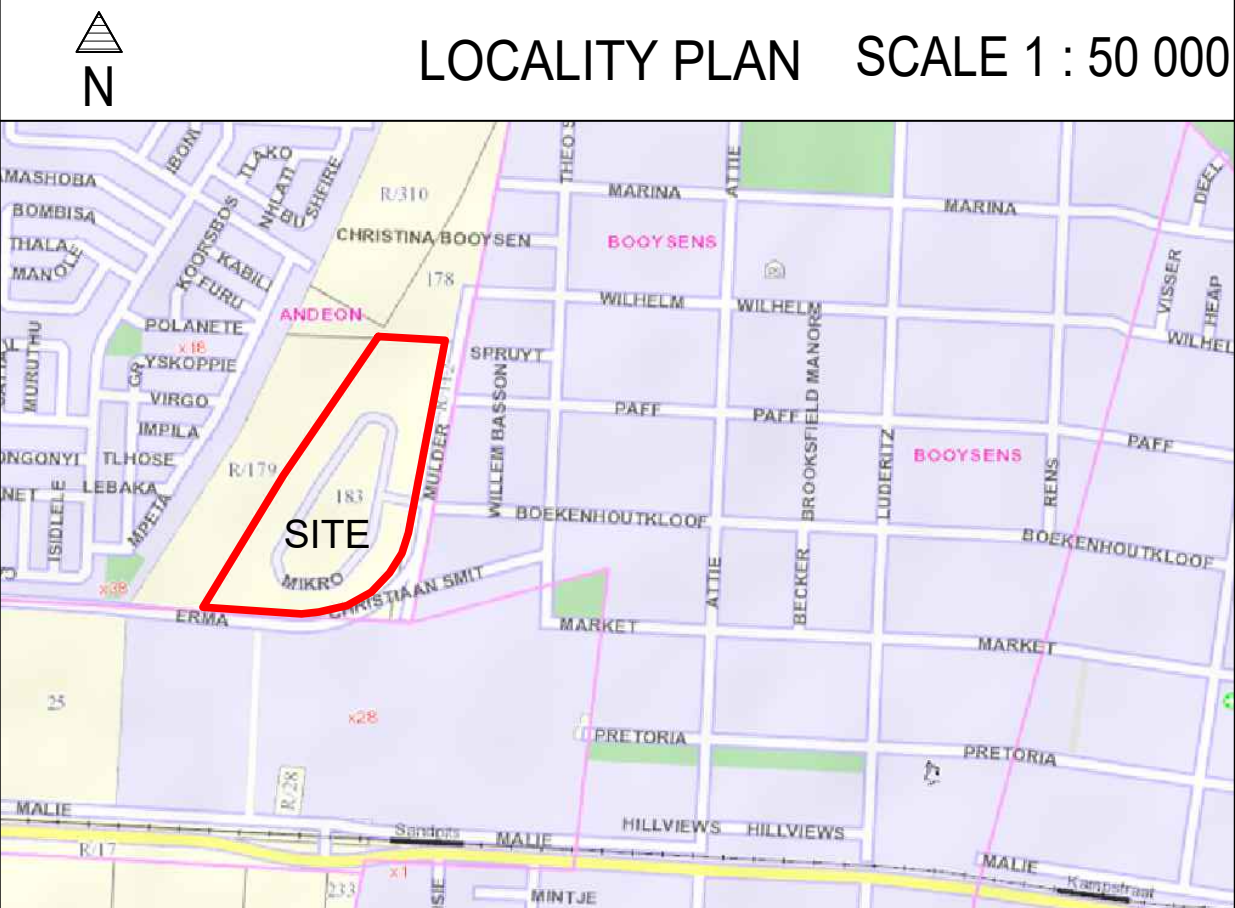
PR. Engineer: Arno Beck (Pr. Eng)
Firm: Civil Craft Consulting Engineers

7. Erf 1 and Erf 2 will be consolidated.

PROPOSED TOWNSHIP ANDEON EXTENSION 47

SITUATED ON PORTION 183
OF THE FARM
ZANDFONTEIN NO. 317 - JR

CITY OF TSHWANE METROPOLITAN MUNICIPALITY



SCHEDULE OF ERVEN

ZONING	LAND USE	± ha	%	NUMBERS	QUANTITY
RESIDENTIAL 3		7.0327	100%	1 - 2	2
TOTAL		7.0327	100		144

NOTES

-
- | | |
|--|------------------------------|
| | OUTSIDE BOUNDARY OF TOWNSHIP |
| | FARM BOUNDARY |
| | GEOTECHNICAL ZONES |
| | GEOLOGICAL INSPECTION PIT |

DATE	TYPE OF AMENDMENT

REGISTERED OWNER: (PTY) LTD (REG. NO:)	DESIGNED AND DRAWN: Anton Mathey
--	-------------------------------------



P.O. Box 754
Auckland Park
Tel: (011) 541-3800

Date:	FEB 2022
Scale:	1 : 5 500
PLAN No:	CPD ADN47/1

Annexure B

Relevant Outputs of the SIDRA Intersection Capacity Analyses:

(Order of Appearance)

B1 – Mulder Street / Boekenhoutkloof Street / Site Access Intersection;

B2 – Erma Street / Johnson Street Intersection; and

B3 – Market Street / Bremer Street (R55) Intersection.