

Transport Impact Study
Vlakkeland Development

Paarl, Western Cape

August 2013

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Summary Sheet

Report Type	Transport Impact Study
Title	Vlakkeland Development
Location	Paarl, Western Cape
Client	Jubelie Projects
Ref. Number	ITS 3194
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This transport study was prepared in accordance with the South African National Department of Transport's 'Guidelines for Traffic Impact Studies' PR93/635 (1995) by a suitably qualified and registered professional traffic engineer. Details of any of the calculations on which the results in this report are based will be made available on request.

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Report - Summary Table

This transport impact study is reported in a summary table format instead of a lengthy report to assist review and interpretation of the results. This summary table contains all the relevant information that is contained in a report. It should be sufficient for review and interpretation of the expected traffic impacts as well as the comprehension of the required measures to mitigate the traffic impact. If any more detail is required please contact the authors.

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Transport Impact Study Vlakkeland Development - Paarl, Western Cape																	
1. Background and Purpose	<p>This study is an investigation of the expected transport related impacts of the Proposed Vlakkeland development on the surrounding road network.</p> <p>The purpose of the study is to identify constraints in the surrounding road network and to recommend appropriate mitigation measures that would support this planned development.</p>																
2. Locality	<p>Erf Number 8378, Paarl, Western Cape</p> <p>The proposed development is located along the eastern side of Jan van Riebeeck Drive (Provincial Main Road 201 or MR201), west of the Bo Dal Road (Provincial Divisional Road 1119 or DR1119) and south of Rand Street in Newton, Paarl.</p> <p>Refer to Appendix A, Figure 1 for the Locality Plan.</p>																
3. Existing/Proposed Land Use	<p>Existing Use: Vacant land with informal residential units</p> <p>The proposed development area is mostly vacant land with a few informal houses along the edges of the property.</p> <p>Proposed Future Land Use: Residential, Educational and Business</p> <p>The development will mainly consist of residential units, primary and high schools and a small business node. The proposed development will generate additional vehicle trips from the surrounding road network but it is expected that a substantial number of internal trips will be generated.</p> <p>The extent of the proposed land use is as follows:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding-right: 20px;">Primary Schools</td> <td style="text-align: right;">1 100 Pupils</td> </tr> <tr> <td>High Schools</td> <td style="text-align: right;">1 200 Pupils</td> </tr> <tr> <td style="padding-right: 20px;"><i>Subsidy Housing</i></td> <td style="text-align: right;"><i>2 350 Units</i></td> </tr> <tr> <td style="padding-right: 20px;"><i>Gap Housing</i></td> <td style="text-align: right;"><i>704 Units</i></td> </tr> <tr> <td style="padding-right: 20px;"><i>Commercial Res Units</i></td> <td style="text-align: right;"><i>107 Units</i></td> </tr> <tr> <td>Total Residential Units</td> <td style="text-align: right;">3 161 Units</td> </tr> <tr> <td>Businesses</td> <td style="text-align: right;">5 342m² GLA</td> </tr> <tr> <td>Municipal Offices</td> <td style="text-align: right;">4 313m² GLA</td> </tr> </table> <p>Refer to Appendix A, Figure 2 for a Site Development Plan of the proposed development.</p>	Primary Schools	1 100 Pupils	High Schools	1 200 Pupils	<i>Subsidy Housing</i>	<i>2 350 Units</i>	<i>Gap Housing</i>	<i>704 Units</i>	<i>Commercial Res Units</i>	<i>107 Units</i>	Total Residential Units	3 161 Units	Businesses	5 342m² GLA	Municipal Offices	4 313m² GLA
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4. Existing Access	<p>The Erf currently gains access from the Jan van Riebeeck Drive / Roggeland Road / Ring Road intersection. This intersection has stop control on the Roggeland and Ring Road approaches and is free flow on Jan van Riebeeck Drive.</p>																
5. Surrounding Roads	<p>The major roads in the vicinity of the proposed development are as follows:</p> <p><u>Jan van Riebeeck Drive (MR201)</u>: This is a typical Class 2 road with a 60km/h - 100km/h posted speed limit, two lanes per direction, a median island, shoulders on both sides and no sidewalks. MR201 is located to the west of the</p>																

	<p>development.</p> <p><u>Bo Dal Road (DR1119)</u>: This is a typical Class 3 road with a 60km/h posted speed limit, one lane per direction, no shoulders and no sidewalks. DR1119 is located to the east of the development.</p> <p><u>Rand Street</u>: Rand Street is a typical Class 5 residential street with no shoulders or sidewalks. Rand Street is located to the north of the development.</p> <p><u>Roggeland Road</u>: This is a typical Class 5 gravel road with one lane per direction and no shoulders or sidewalks. This road is located to the south of the development.</p> <p>The surrounding road network is show on the Locality Plan (Figure 1 of Appendix A).</p>
<p>6. Analyses Hours</p>	<p>The proposed development will include schools, residential units, businesses and municipal offices. This type of developments typically generate vehicle trips in both the weekday a.m. and p.m. peak hours.</p> <p>The Vlakkeland development will also include “Places of worship”. As these trips are mostly generated on Sundays, when the other development trips are at their lowest rate, it was not included in the analysis. The following peak hours were included in the analyses:</p> <ul style="list-style-type: none"> • Thursday a.m. peak hour (Surveyed peak hour 07:00 – 08:00) • Thursday p.m. peak hour (Surveyed peak hour 16:45 – 17:45)
<p>7. Scenarios Analysed</p>	<ul style="list-style-type: none"> • 2013 Existing Traffic conditions (<i>Based on counted traffic volumes</i>) • 2018 Background Traffic conditions (<i>Existing counted traffic volumes plus a traffic growth rate of 3% over five years as well as vehicles trips generated by the future Mbekweni development, proposed on Erf 557</i>) • 2018 Total Traffic conditions (<i>Background Traffic volumes plus the expected development trips expected from the Vlakkeland residential development</i>)
<p>8. Study Intersections (existing control)</p>	<ul style="list-style-type: none"> • Intersection 1: Jan van Riebeeck RD / Ring Road (Stop Control) • Intersection 2: Jan van Riebeeck RD / Future Development Access (Stop Control) • Intersection 3: Jan Van Riebeeck RD / Buitekant Street (Traffic Signal) • Intersection 4: Jan Van Riebeeck Rd / Bo Dal Road (Stop Control) <p>Refer to Figure 3 in Appendix A for the existing lane configuration and intersection controls.</p>
<p>9. 2013 Existing Traffic Conditions</p>	<p>The results of the existing intersection capacity analysis, based on existing traffic volumes and existing intersection geometry / control as indicated on Figure 3 of Appendix A, are as follows:</p> <p><u>Jan van Riebeeck Drive / Roggeland Road intersection</u>: This intersection operates at an acceptable Level-Of-Service (LOS C) during the a.m. peak hour and at a Level-Of-Service during the p.m. peak hours, with delays of 19.6 seconds and a volume to capacity (v/c) ratio of 0.31 during the a.m. peak hour and delays of 26.2 seconds and a v/c ratio of 0.42 during the p.m. peak hour.</p>

	<p><u>Jan van Riebeeck Drive / Buitekant Street intersection:</u> This intersection operates at an acceptable Level-Of-Service (LOS B) during both the a.m. and p.m. peak hours, with delays of 19.7 seconds and a v/c ratio of 0.49 in the a.m. peak hour and delays of 15.5 seconds and a v/c ratio of 0.45 in the p.m. peak hour.</p> <p><u>Jan van Riebeeck Drive / Bo Dal Road:</u> This intersection operates at an acceptable Level-Of-Service (LOS D, during the a.m. peak hour and Level-Of-Service C) in the p.m. peak hours with delays of 34.4 seconds and a volume to capacity ratio of 0.68 in the a.m. peak hour and delays of 22.8 seconds and a volume to capacity ratio of 0.44 in the p.m. peak hour.</p> <p>From an intersection capacity point-of-view, all of the study intersections are currently operating at acceptable Levels-Of-Service therefore no road upgrades are proposed. Figure 4 of Appendix A shows the analysis results of the existing a.m. peak and p.m. peak hours.</p>																					
<p>10. Approved Developments/ Latent Rights</p>	<p>The trips generated by the future Mbekweni development proposed on Erf 557 were included in the future operational analysis. This development is expected to consist of the following land uses:</p> <table border="0"> <tr> <td>Business zone</td> <td>9 553 m²</td> </tr> <tr> <td>Community facility</td> <td>3 171 m²</td> </tr> <tr> <td>Gap Housing</td> <td>436 units</td> </tr> </table> <p>Based on the extent of the development, it is expected to generate an additional 468 vehicle trips (211 inbound and 258 outbound) to the extended road network in 2018 during the a.m. peak hour and approximately 478 vehicle trips (266 inbound and 213 outbound) in the p.m. peak hour.</p>	Business zone	9 553 m ²	Community facility	3 171 m ²	Gap Housing	436 units															
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<p>11. Trip Generation Rates</p>	<p>The South African Department of Transport (DOT) Trip Generation rates, 2nd Edition, the Institute of Transport Engineers (ITE) Trip Generation manuals as well as surveys conducted by ITS Engineers (ITSE) were used to arrive at the following trip generation rates for the Vlakkeland development:</p> <table border="0"> <thead> <tr> <th>Land Use (Source Code)</th> <th>a.m. peak hour</th> <th>p.m. peak hour</th> </tr> </thead> <tbody> <tr> <td><i>Primary School (ITSE)</i></td> <td><i>0.9 / Pupil</i></td> <td><i>0.9 / Pupil</i></td> </tr> <tr> <td><i>High School (ITSE)</i></td> <td><i>0.9 / Pupil</i></td> <td><i>0.9 / Pupil</i></td> </tr> <tr> <td><i>Municipal Office (DOT710)</i></td> <td><i>2.3 / 100m²</i></td> <td><i>2.3 / 100m²</i></td> </tr> <tr> <td><i>Subsidy Housing (DOT210)</i></td> <td><i>0.5 / 100m²</i></td> <td><i>0.5 / 100m²</i></td> </tr> <tr> <td><i>Gap Housing (DOT210)</i></td> <td><i>0.5 / 100m²</i></td> <td><i>0.5 / 100m²</i></td> </tr> <tr> <td><i>Com Res Units (DOT210)</i></td> <td><i>0.5 / 100m²</i></td> <td><i>0.5 / 100m²</i></td> </tr> </tbody> </table> <p>The expected development trips were adjusted to include internal and public transport trips, as reflected in</p> <p>Table 5 of Appendix B.</p>	Land Use (Source Code)	a.m. peak hour	p.m. peak hour	<i>Primary School (ITSE)</i>	<i>0.9 / Pupil</i>	<i>0.9 / Pupil</i>	<i>High School (ITSE)</i>	<i>0.9 / Pupil</i>	<i>0.9 / Pupil</i>	<i>Municipal Office (DOT710)</i>	<i>2.3 / 100m²</i>	<i>2.3 / 100m²</i>	<i>Subsidy Housing (DOT210)</i>	<i>0.5 / 100m²</i>	<i>0.5 / 100m²</i>	<i>Gap Housing (DOT210)</i>	<i>0.5 / 100m²</i>	<i>0.5 / 100m²</i>	<i>Com Res Units (DOT210)</i>	<i>0.5 / 100m²</i>	<i>0.5 / 100m²</i>
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<p>12. Development Trips</p>	<p>It is expected that a large number of the generated vehicle trips will be internal trips. Trips would occur between the residential components and the business components, between the business and municipal offices, between the schools and the residential components and between the residential components and the municipal offices. Thus it can be seen that not all vehicle trips generated by</p>																					

	<p>the development will be distributed to the external road network.</p> <p>Large areas would be available for primary and high schools. It was assumed that approximately 1 100 primary school pupils and a 1 200 high school pupils would attend these schools.</p> <p>The proposed Vlakkeland development will be a general low income area and it is expected that a large component of the trips would be public transport and walking.</p> <p>Based on the expected trip generation rates as summarised above and the impact of internal and public transport trips, the Vlakkeland development is expected to generate the following peak hour trips to the external road network:</p> <table border="1"> <thead> <tr> <th>Peak Hour</th> <th>In</th> <th>Out</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Weekday a.m.</td> <td>992</td> <td>1 021</td> <td>2 013</td> </tr> <tr> <td>Weekday p.m.</td> <td>792</td> <td>564</td> <td>1 356</td> </tr> </tbody> </table> <p>These trips were used to determine the expected 2018 Total Traffic conditions.</p>	Peak Hour	In	Out	Total	Weekday a.m.	992	1 021	2 013	Weekday p.m.	792	564	1 356
Peak Hour	In	Out	Total										
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<p>13. Trip Distribution</p>	<p>The following trip distribution was used:</p> <ul style="list-style-type: none"> • 30% of trips to/from the north along Jan van Riebeeck Drive towards Wellington CBD • 55% of trips to/from the south along Jan van Riebeeck Drive towards Paarl CBD • 5% trips to/from Newton via Rand Street • 5% trips to/from the Mbekweni Shoprite Centre • 5% to/from Weltevrede, along Springbok Street <p>Refer to Appendix A, Figure 7 for an illustration of the Trip Distribution.</p>												
<p>14. Site Access/es</p>	<p>As discussed in Section 5 there is one existing accesses to the proposed development from the Jan van Riebeeck Drive / Roggeland Road intersection.</p> <p>The main access to the Vlakkeland site will be from Jan van Riebeeck Drive (MR201) at a new intersection, located 770m south of Buitekant Street and 800m north of Roggeland Road. However, other accesses to Jan van Riebeeck Drive are also proposed via Rand Street in the north and Roggeland Road in the south of the site.</p> <p>Three accesses are proposed from Jan van Riebeeck Drive as follows:</p> <ul style="list-style-type: none"> • From the existing Jan van Riebeeck Drive / Buitekant Street intersection, through the north of the site via Rand Street. • A new traffic signal controlled intersection (Main Development Access), located 770 meters south of Buitekant Street and 800 meters north of Roggeland Road. • From the existing Jan van Riebeeck Drive / Roggeland Road intersection, to the south of the site via Beets Street. <p>Jan van Riebeeck Road is a Class 2 Road within a “Sub-Urban” Road Side Environment (RSE). The recommended intersection spacing in the Road Access Guidelines (RAG) is 800 meters for traffic signal controlled intersections, with the above criteria. The distance between the existing Buitekant Street and</p>												

	<p>Roggeland Road intersections is 1 570 meters and there is also an open storm-water channel at the midpoint between these two intersections. Hence, the proposed new Vlakkeland Main Access have to be provided slightly north of the midpoint, at 770 meters south of the Buitekant Street intersection and 800 meters north of the Roggeland Road intersection. This intersection position was discussed and approved in principle with officials at the provincial government. See Figure 12 for the proposed location of the future Van Riebeeck Drive/Vlakkeland Access intersection.</p> <p>The following timeframes are expected for implementation of these development accesses subject to finalising the phasing detail for implementation:</p> <ul style="list-style-type: none"> • Start of development: Van Riebeeck Drive / Vlakkeland Access on MR201 at km 49,38. • 5 years after implementation: Access to Buitekant- and Roggeland Road via existing road network. <p>Pedestrian access across Van Riebeeck Drive will be possible at all the traffic signal controlled intersections discussed above.</p>
<p>15. 2018 Traffic Conditions</p>	<p>The 2018 Background Traffic volumes were determined by applying a growth rate of 3% per annum over a five year period to the 2013 traffic volumes as well as the trips generated by the future Mbekweni development.</p> <p>The analysis show that three of the four study intersections, i.e. the Jan van Riebeeck Drive / Bo Dal Road, Jan van Riebeeck Drive / Future Development Access and the Jan van Riebeeck Road / Roggeland Road intersections will operate unacceptably during the 2018 background traffic conditions. Consequently upgrades will be required to alleviate the situation.</p> <p>The 2018 Total Traffic volumes were calculated by adding the proposed Vlakkeland development trips to the 2018 Background traffic volumes. The analyses of the Total Traffic conditions are based on the intersection geometry / control / phasing as illustrated in Figure 12 of Appendix A.</p> <p><u>Jan van Riebeeck Drive / Roggeland Road intersection:</u> This study intersection will operate at unacceptable Level-Of-Service (LOS E) with delays of 39.6 seconds and a volume to capacity ratio of 0.62 during the a.m. peak hour in the background traffic conditions. Furthermore, the intersection will operate at an unacceptable Level-Of-Service (LOS F) with delays of longer than 50 seconds and a v/c of 0.89 during the p.m. peak hour in the background traffic conditions.</p> <ul style="list-style-type: none"> • <u>Proposed Upgrade:</u> Intersection upgrade from stop controlled on minor approaches to a signalised intersection. Dedicated right-turn lanes on the east and westbound approaches to the intersection. • <u>Operations after Upgrade:</u> This study intersection will operate at acceptable Level-Of-Service D during both the a.m. and p.m. peak hours in the total traffic conditions, with delays of 42.5 seconds and a v/c ratio of 0.98 in the a.m. peak hour and delays of 44.5 seconds and a v/c ratio of 0.73 during the p.m. peak hour. <p><u>Jan van Riebeeck Drive / Future Development Access Road intersection:</u> This intersection will operate at an acceptable Level-Of-Service (LOS D) with delays of 27.3 seconds and a v/c ratio of 0.50 during the a.m. peak hour. During the p.m. peak hour it will operate at an unacceptable Level-Of-Service (LOS F)</p>

	<p>with delays longer than 50 seconds and a v/c ratio of 0.64.</p> <ul style="list-style-type: none"> <p>Proposed Upgrade: The Future Development Access will have dedicated right-turn lanes and shared through and left turn lanes on the development approach to the intersection. Along Jan van Riebeeck drive it is proposed to add a dedicated left turn lane in the north- and southbound approach and a dedicated right turn lane in the north - and southbound approach of the intersection.</p> <p>According to the Road Access Guidelines (RAG) dedicated left and right turn lanes will be warranted in the above situation. These warrants are illustrated in Figure 10 of Appendix A.</p> <p>Operations after Upgrade: This study intersection will operate at acceptable LOS D and LOS C during the a.m. and the p.m. peak hours respectively with delays of 40.7 seconds and a v/c ratio of 0.93 in the a.m. peak hour and delays of 23.3 seconds and a v/c ratio of 0.81 during the p.m. peak hour.</p> <p>Jan van Riebeeck Drive / Buitekant Street intersection: The intersection will operate at an acceptable Level-Of-Service (LOS C) with delays of 22.1 seconds and a v/c ratio of 0.63 during the a.m. peak hour background traffic conditions. During the p.m. peak hour it will also operate at an acceptable Level-Of-Service (LOS B) with delays of 16.7 seconds and a v/c ratio of 0.74 during the p.m. peak hour background traffic conditions.</p> <p>During the total traffic conditions (Background traffic plus additional development trips) the intersection will operate at an acceptable Level-Of-Service (LOS C) with delays of 31.2 seconds and a v/c ratio of 0.83 during the a.m. peak hour total traffic conditions. During the p.m. peak hour it will also operate at an acceptable Level-Of-Service (LOS C) with delays of 21.6 seconds and a v/c ratio of 0.67 during the p.m. peak hour total traffic conditions.</p> <p>Jan van Riebeeck Drive / Springbok Street: This intersection will operate at an unacceptable Level-Of-Service (LOS F) with delays longer than 50 seconds during both the a.m. and p.m. peak hours. The v/c ratio is larger than 1 during the a.m. peak hour and 0.90 during the p.m. peak hour.</p> <ul style="list-style-type: none"> <p>Proposed Upgrade: This intersection is to be upgraded from stop controlled on minor approaches to a signalised intersection.</p> <p>Operations after Upgrade: This study intersection will operate at acceptable Level-Of-Service C during both the a.m. and p.m. peak hours, with delays of 29 seconds and a v/c ratio of 0.71 in the a.m. peak hour and delays of 26.3 seconds and a v/c ratio of 0.60 during the p.m. peak hour total traffic conditions.</p>
<p>16. Road Reserve widths and intersection spacing</p>	<p>There are two Class 3 roads proposed within the Vlakkeland development. The one is the Main Road Through the site between Jan van Riebeeck Drive (MR201) and Bo Dal Road (DR1119) as well as Beets Street that connects Roggeland Road with the Main Through Road. The recommended road reserve widths for these Class 3 roads are 25 meters. However, local widening, up to 30 meters wide, could be considered at major intersections to allow for turning lanes and other pedestrian and public transport facilities.</p> <p>The road reserve widths for the Class 4 roads on-site should be minimum 16</p>

	<p>meters, but it could range between 16 and 20 meters. The road reserve widths of the Class 5a roads should be minimum 13 meters wide. Any other Class 5 road reserve that is narrower than 10 meters should be negotiated with the municipal authorities, to illustrate that all municipal services can be accommodated within the specified road reserve space.</p> <p>The road surface (“black top”) width for the Class 2 and 3 roads should be 7,4 meters wide and the Class 4 roads should be minimum 7.0 meters wide, but also preferably also 7,4 meters to accommodate two-way traffic. The road width of the Class 5 roads could vary between 6 and 4 meters depending on the sub-class and function. This should be confirmed at the detail design stage with the municipal officials.</p> <p>The intersections spacing for the internal roads, as specified in the Provincial Administration of the Western Cape Road Access Guidelines, should be as follows:</p> <table border="1"> <thead> <tr> <th></th> <th>Between Signals</th> <th>Major Intersections</th> <th>Driveway Access</th> </tr> </thead> <tbody> <tr> <td>Class 3</td> <td>540 meters</td> <td>180 meters</td> <td>Not Recommended</td> </tr> <tr> <td>Class 4</td> <td>375 meters</td> <td>120 meters</td> <td>60 to 45 meters</td> </tr> </tbody> </table>		Between Signals	Major Intersections	Driveway Access	Class 3	540 meters	180 meters	Not Recommended	Class 4	375 meters	120 meters	60 to 45 meters
	Between Signals	Major Intersections	Driveway Access										
Class 3	540 meters	180 meters	Not Recommended										
Class 4	375 meters	120 meters	60 to 45 meters										
<p>17. Pedestrians</p>	<p>Existing facilities: There are no existing pedestrian facilities along the proposed development site frontages.</p> <p>Proposed facilities: It is recommended that pedestrian phases and crossing facilities be provided at the future traffic signals at the Jan van Riebeeck Drive / Vlakkeland Development Access intersection.</p> <p>From site observations it was noted that pedestrians walk along Jan van Riebeeck Drive. Visible pedestrian desire lines were observed on site. It was also observed that pedestrians cross Jan van Riebeeck Drive at various locations. Crossing Jan van Riebeeck Drive is unsafe due to the amount and high speeds of traffic along Jan van Riebeeck Drive. It is proposed that a fence be provided at both site frontages of the proposed Mbekweni and Vlakkeland Developments. This should keep pedestrians from crossing Jan van Riebeeck at various locations. Crossing would be possible at the future Vlakkeland Development Access / Jan van Riebeeck Drive intersection.</p> <p>There is an existing signalised pedestrian crossing 150m north of the Buitekant Street / Jan van Riebeeck Drive intersection but it is 920m north of the location where pedestrians currently cross the road thus new crossing facilities should be provided at the new Vlakkeland Development Access / Jan van Riebeeck Drive intersection.</p> <p>Streetlighting should also be provided at the future Jan van Riebeeck Drive / Vlakkeland Development Access intersection. This would lit up the road for pedestrians early morning and late afternoon.</p>												
<p>18. Public Transport</p>	<p>Existing facilities: Currently there are no public transport facilities along Jan van Riebeeck Drive in the vicinity of the proposed development.</p> <p>Proposed facilities: It is proposed that bus / taxi embayments be provided just south of the Jan van Riebeeck Drive / Development Access intersection in the southbound direction and just north of the Jan van Riebeeck Drive / Development Access intersection in the northbound direction.</p> <p>From site visit done it was observed that taxi’s drop / pick up commuters at the</p>												

	<p>proposed access locations on both sides of Jan van Riebeeck Drive. At times 3 taxis behind each other in the yellow lane were observed. Therefore it is deemed necessary to provide taxi embayment's next to Jan van Riebeeck Drive. Two taxi embayment's should be provided as shown in Figure 12, Appendix A.</p>								
<p>19. Parking</p>	<p>Parking for the Vlakkeland development should be provided at the rates as given below. These rates are given in the City of Cape Town's Zoning Scheme, February 2012. Rates for PT2 areas (High public transport dependency is given).</p> <table border="1"> <thead> <tr> <th>Land use</th> <th>Rate</th> </tr> </thead> <tbody> <tr> <td>Residential Units</td> <td>1 bay / unit</td> </tr> <tr> <td>Business</td> <td>1 bays / 100m²</td> </tr> <tr> <td>Municipal Offices</td> <td>1 bay / 100m²</td> </tr> </tbody> </table> <p>The development will be a low income area and it is expected that parking demanded would be less than required.</p>	Land use	Rate	Residential Units	1 bay / unit	Business	1 bays / 100m ²	Municipal Offices	1 bay / 100m ²
Land use	Rate								
Residential Units	1 bay / unit								
Business	1 bays / 100m ²								
Municipal Offices	1 bay / 100m ²								
<p>20. Conclusions and Recommendations</p>	<p>This report investigates the expected transport related impacts of the Vlakkeland development, which is located east of Jan van Riebeeck Drive, South of Newton, Wellington and West of Bo Dal Road on Erf 8378, Paarl.</p> <p>Existing Traffic: All study intersections are currently operating at acceptable Levels-Of-Service (LOS). Hence, no road upgrades are proposed from an intersection capacity point of view.</p> <p>Background Traffic: The study intersections will operate at unacceptable Levels-Of-Service (LOS) except the Buitekant Street / Van Riebeeck Drive intersection. Thus it is proposed that the Roggeland Street / Van Riebeeck Drive and the Springbok Street / Jan van Riebeeck Drive intersections be upgraded to signalised intersections. A dedicated right and left turn lanes are also proposed on the north and southbound approaches to the Jan van Riebeeck / Vlakkeland Development access. These turning lanes are warranted as requested in the Road Access Guidelines</p> <p>Development Trips: The development is expected to generate 2013 weekday a.m. peak hour trips (992/1021, in-/outbound) and 1356 p.m. peak hour trips (792/564, in-/outbound).</p> <p>Total Traffic: Most study intersections will continue to operate at acceptable LOS during all peak periods with all the proposed upgrades in place.</p> <p>It is proposed that dedicated right and left turn lanes be provided on the south and northbound approaches to the Jan van Riebeeck Drive / Vlakkeland Access intersection.</p> <p>The Jan van Riebeeck Drive / Roggeland Road intersection should be upgraded to a signalised intersection with additional dedicated right-turn lanes on both the east – and westbound approaches to the intersection.</p> <p>Jan van Riebeeck Drive should be upgraded to a signalised intersection.</p> <p>Access: There will be three accesses to the proposed development of which only one access currently exists. This access is from Jan van Riebeeck Drive / Roggeland Road intersections. The existing accesses will remain the accesses for the future additional development.</p>								

	<p>Parking: Parking should be required as described in section 19 above.</p> <p>Public Transport: It was observed that there is a need for public transport facilities on site. Taxis stop in the yellow shoulder and pick / drop people. Thus it is proposed that taxi embayments be provided next to the Jan van Riebeeck Drive / Vlakkeland development access intersection.</p> <p>Pedestrians: It is recommended that pedestrian sidewalks of at least 1.5 meters wide must be provided at all intersections, to ensure a safe walking environment at the intersection. Sufficient fencing should be provided to keep pedestrians from crossing the road wherever necessary. .</p> <p>See Figure 12, Appendix A for the proposed upgrades along Jan van Riebeeck Road as part of the Vlakkeland development.</p>
--	---

REFERENCES

- Provincial Administration: Western Cape, Department of Economic Affairs, Agriculture and Tourism: Transport Branch, Road Access Guidelines and Policies, 2002
- Department of Transport, Guidelines for Traffic Impact Studies, Report No. PR 93/645, Pretoria, 1995.
- Department of Transport, South African Trip Generation Rates, Report No. RR 92/228, Pretoria, 1995.
- Institute of Transportation Engineers. Trip Generation, 7th Edition. 2004.
- Transportation Research Board. Highway Capacity Manual, Special Report No. 209. 2000

Appendix A

Figures

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Figure 7: Expected Trip Distribution and Development Trips

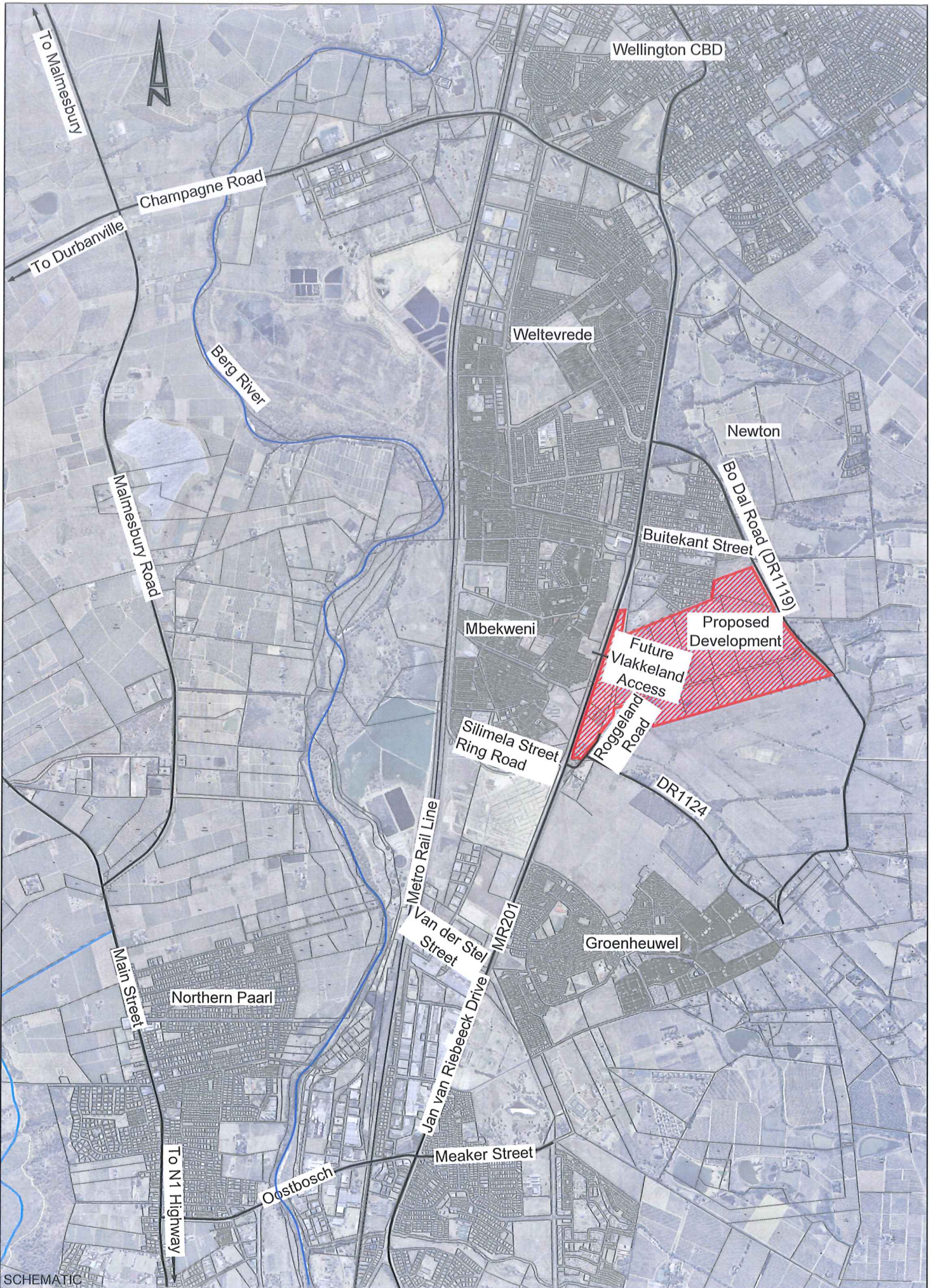
Figure 8: 2018 Total Traffic Conditions

Figure 9: Proposed 2018 Traffic Conditions Upgrades

Figure 10: Road Access Guidelines – Left and Right Turn Lane Warrants

Figure 11: Access Spacing

Figure 12: Proposed Intersection Upgrades along Jan van Riebeeck Drive



SCHEMATIC



PROJECT:
VLAKKELAND RESIDENTIAL DEVELOPMENT
ERF 8378, PAARL

FIGURE:

LOCALITY PLAN

NUMBER:

1

CIVIC NODE		
LAND USES	AREA (m ²)	GLA (m ²)
Business	6 181.2	4 945.0
Municipal	8 626.7	4 313.4
Parking	2 444.0	0.0
TOTAL	17 251.9	9 258.3
LOCAL BUSINESS NODE		
LAND USES	AREA (m ²)	GLA (m ²)
Business	793.8	396.9
TOTAL	793.8	396.9
TOTAL (both nodes)		9 655.2

RECEIVED 2013-07-18



PHASE 1 - PHASE 6						
ZONING	LAND USE	CONSENT USE	NR ERVEN	NR UNITS	AREA (ha)	%
Residential 1	Town houses Residential units	-	2350	2350	27,43	27,00
Residential 2	General residential building	-	3	704	4,05	4,58
Residential 2	Town houses	Businesses	137	137	1,29	1,27
Institutional 1	Place of instruction	-	15		14,33	14,11
Institutional 2	Place of worship	-	7		0,73	0,72
Business	Business General residential building / Hotel	Community facilities Place of instruction	15		1,38	1,36
Open space 1	Open spaces	-	14		11,07	10,89
Open space 1	Open spaces	Nature area	1		10,11	9,96
Open space 2	Sportsgrounds	Recreation facilities	3		6,98	6,87
Parking	Parking	-	2		0,24	0,24
Street	Street	-	15		23,37	23,00
TOTAL			2562	3191	101,58	100

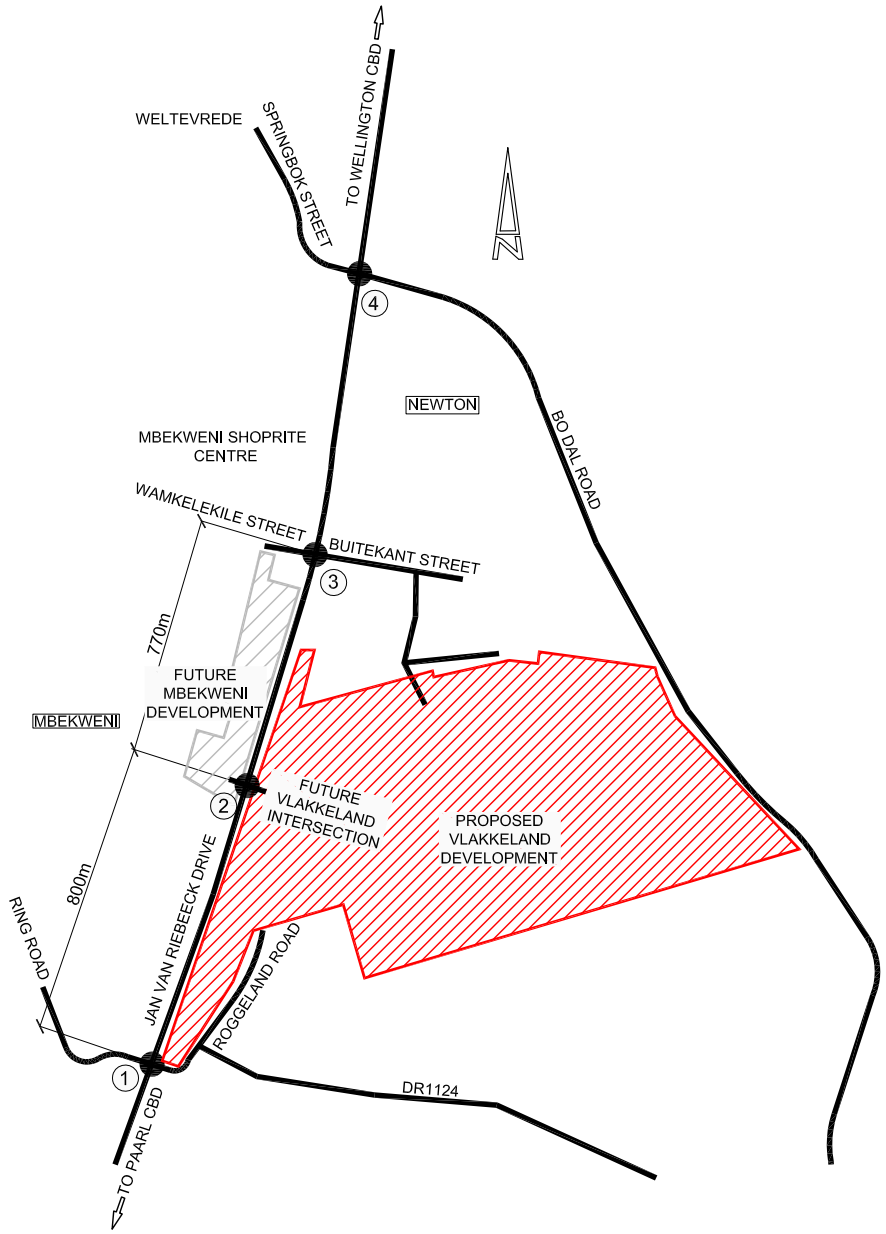
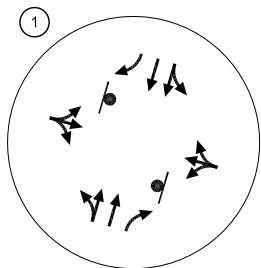
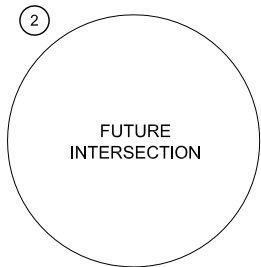
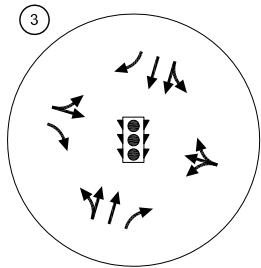
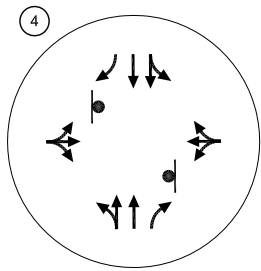
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HOUSING TYPE	
	Subsidy Housing
	GAP Housing
	TRA
	CRU'S

FIGURE 2
SITE DEVELOPMENT PLAN
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SECOND DRAFT

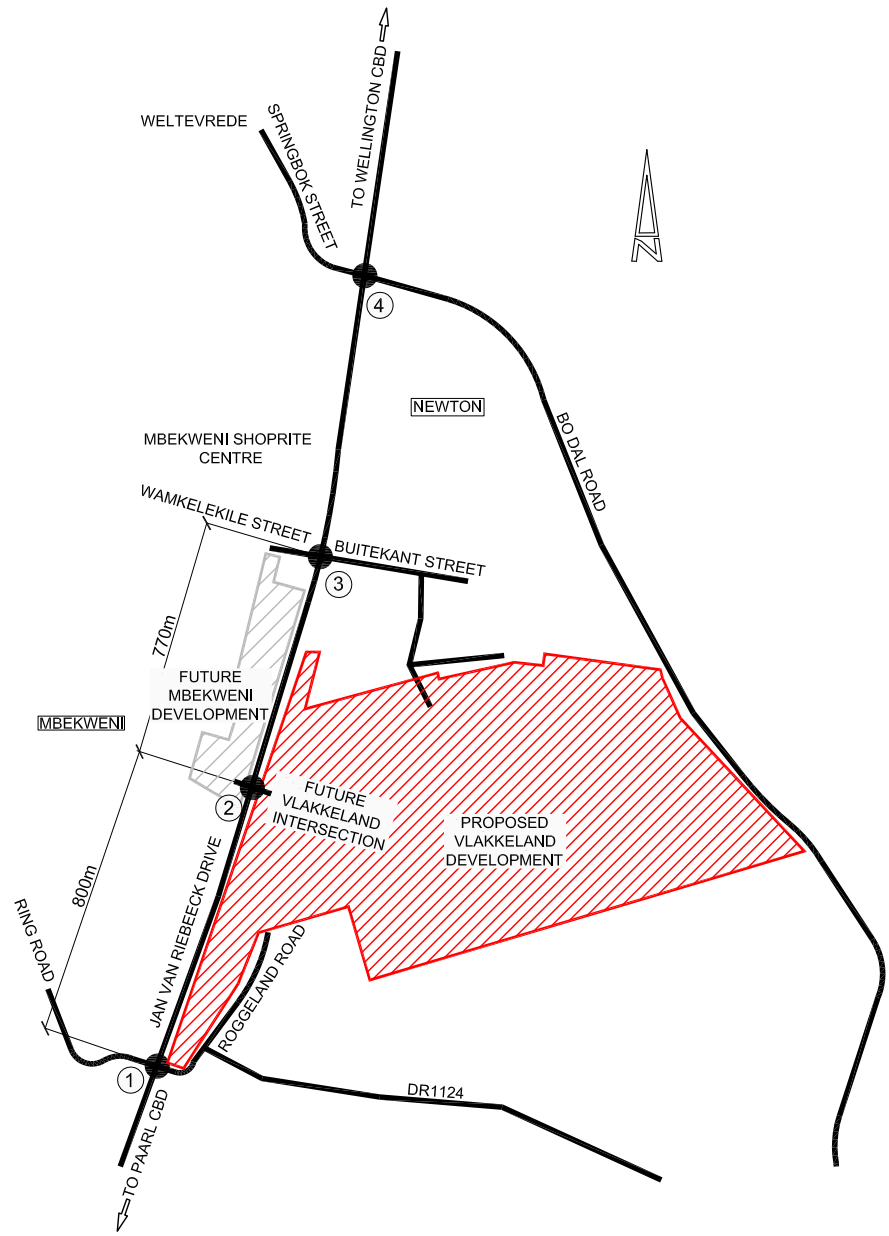
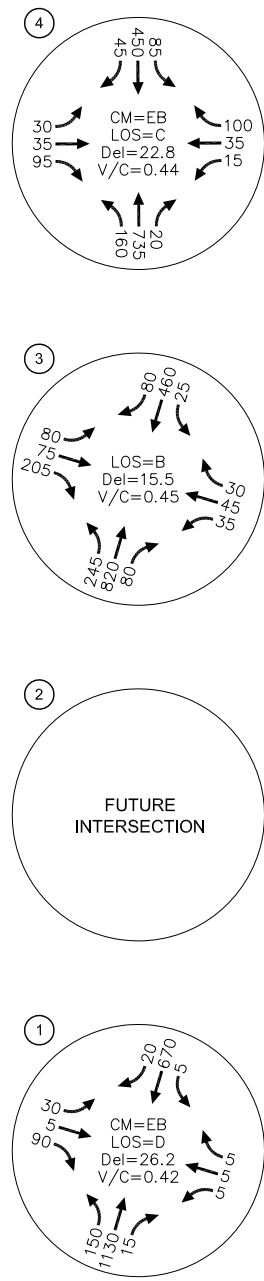
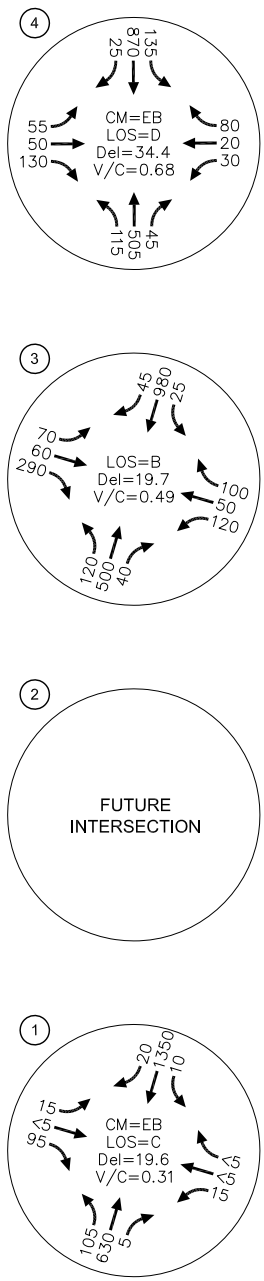
NOTA: ALLE AFSTANDE BY BENADERING EN ONDERHEWIG AAN OPMETING
NOTE: ALL MEASUREMENTS APPROXIMATE AND SUBJECT TO SURVEYING



LEGEND	
	ROUNDABOUT
	TRAFFIC SIGNAL
	STOP/ YIELD CONTROL

A.M. PEAK HOUR

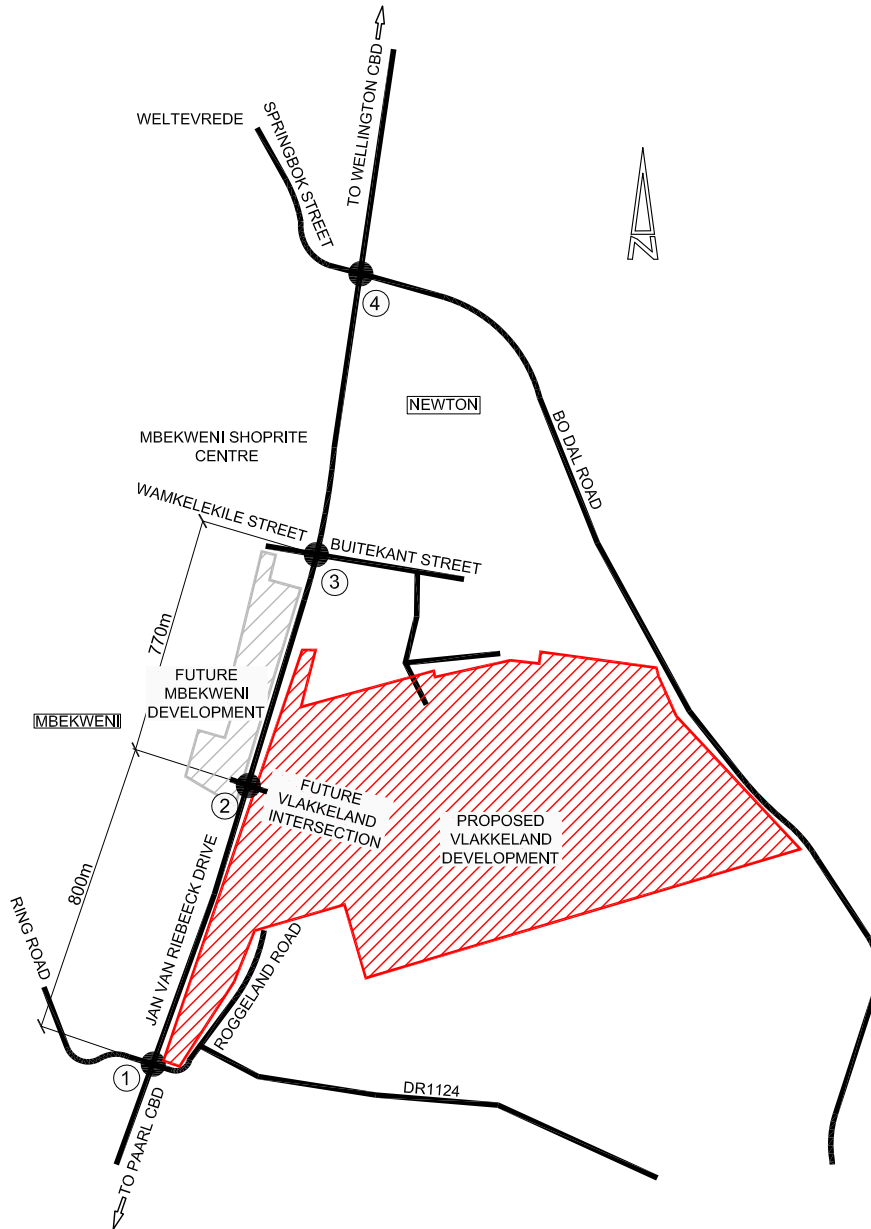
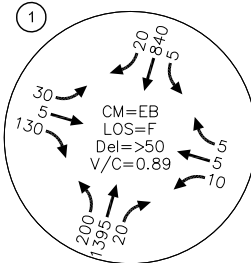
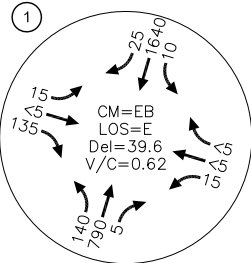
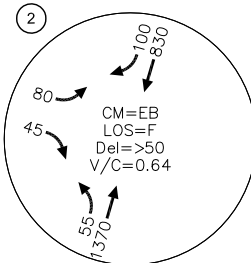
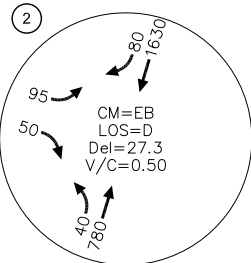
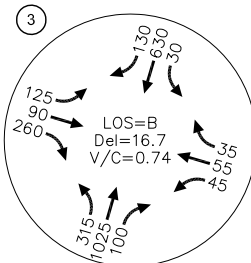
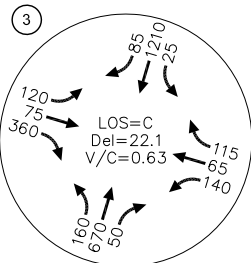
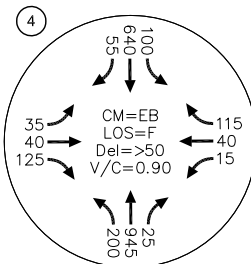
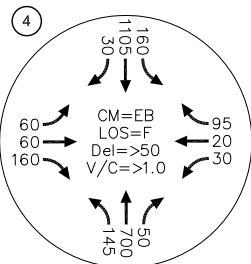
P.M. PEAK HOUR



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

A.M. PEAK HOUR

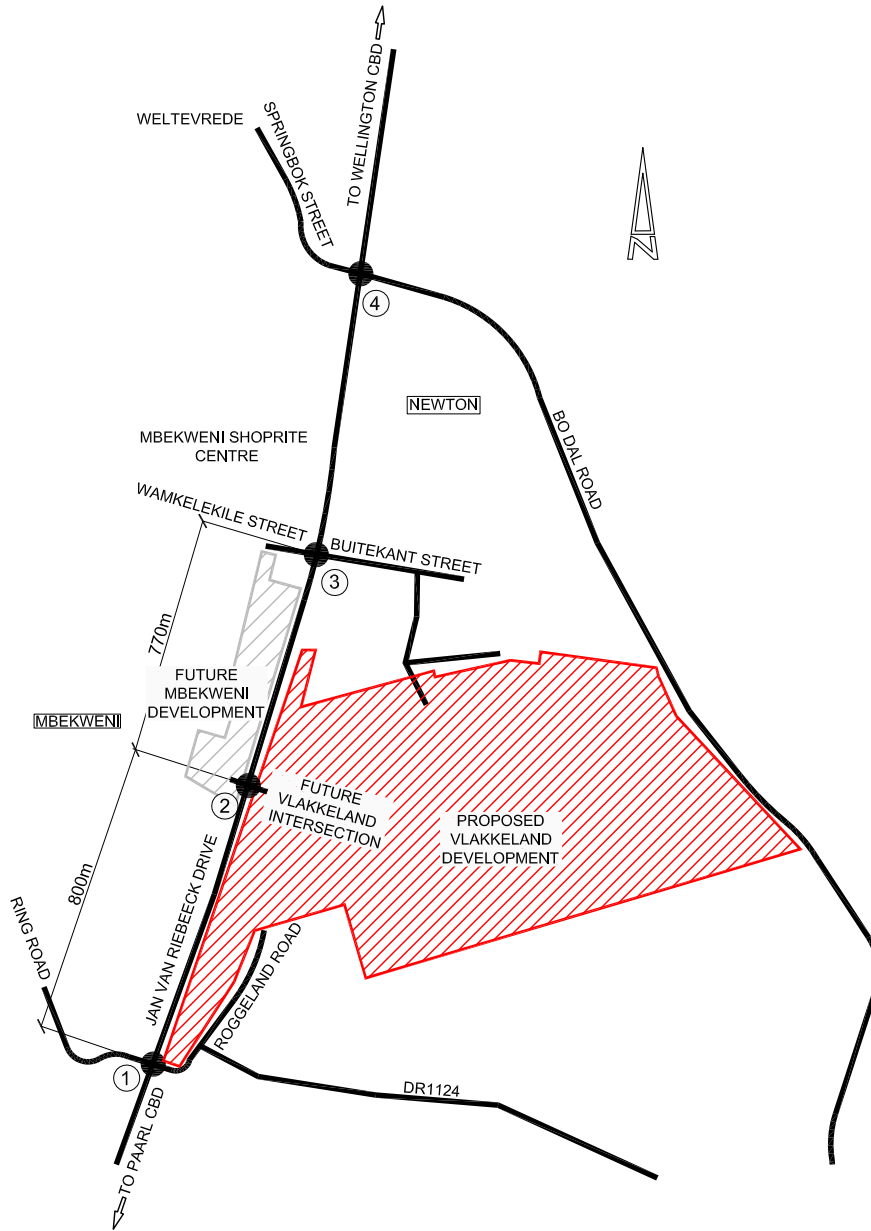
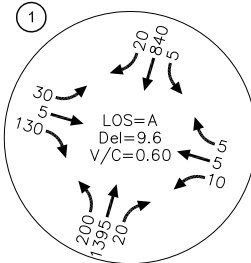
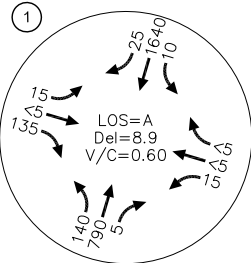
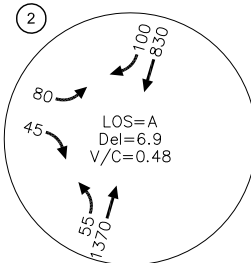
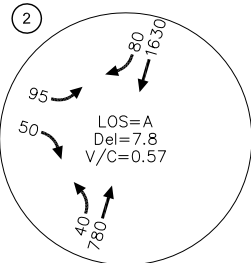
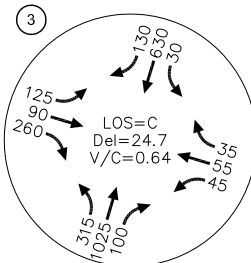
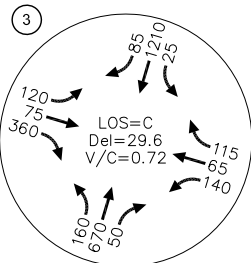
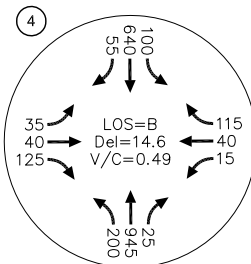
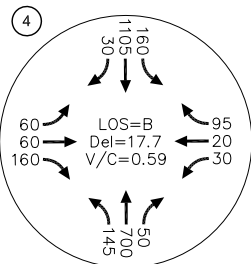
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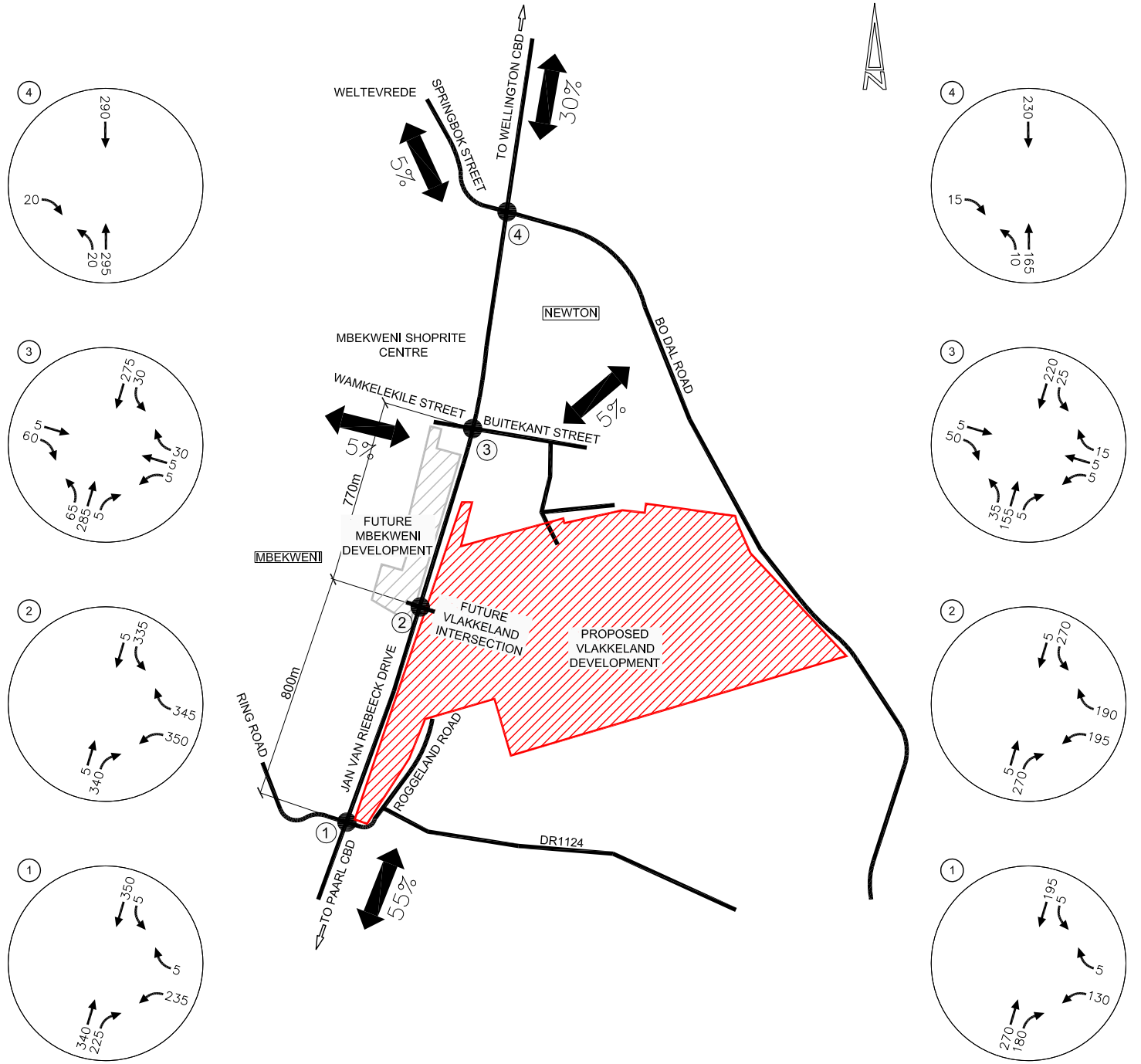
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Del	= INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALED
V/C	= CRITICAL VOLUME-TO-CAPACITY RATIO

A.M. PEAK HOUR

P.M. PEAK HOUR



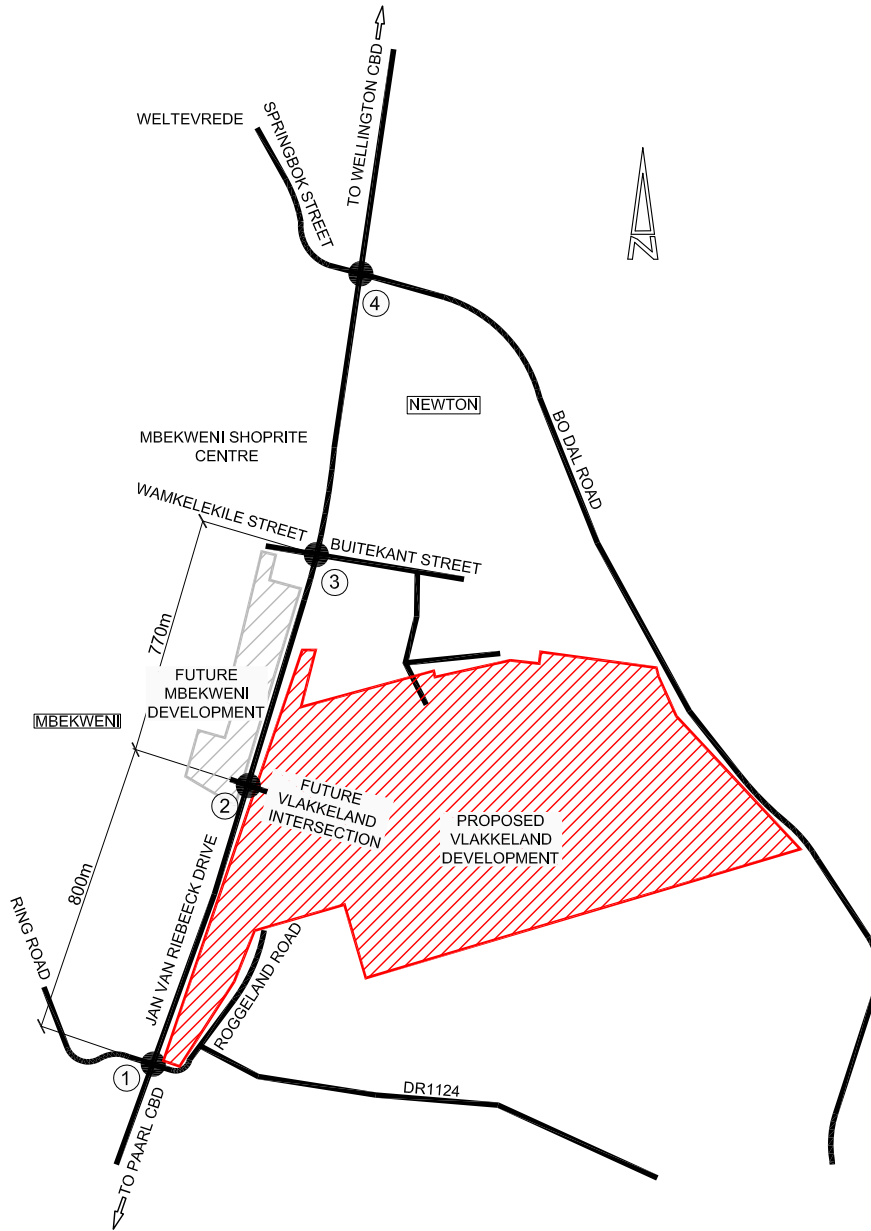
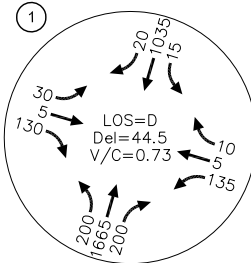
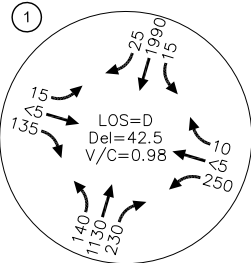
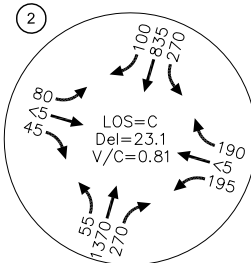
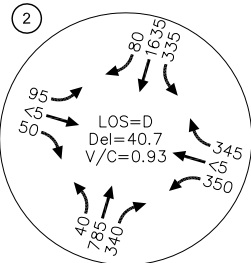
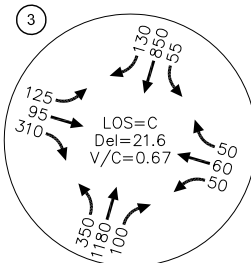
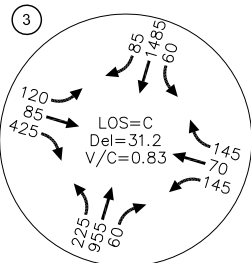
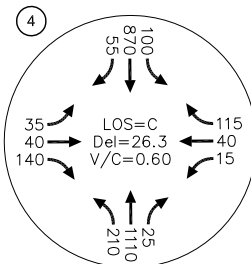
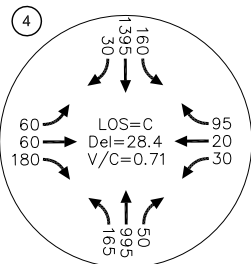
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Del	= INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C	= CRITICAL VOLUME-TO-CAPACITY RATIO



TRIP GENERATION			
PEAK HOUR	IN	OUT	TOTAL
AM	992	1021	2013
PM	792	564	1356

A.M. PEAK HOUR

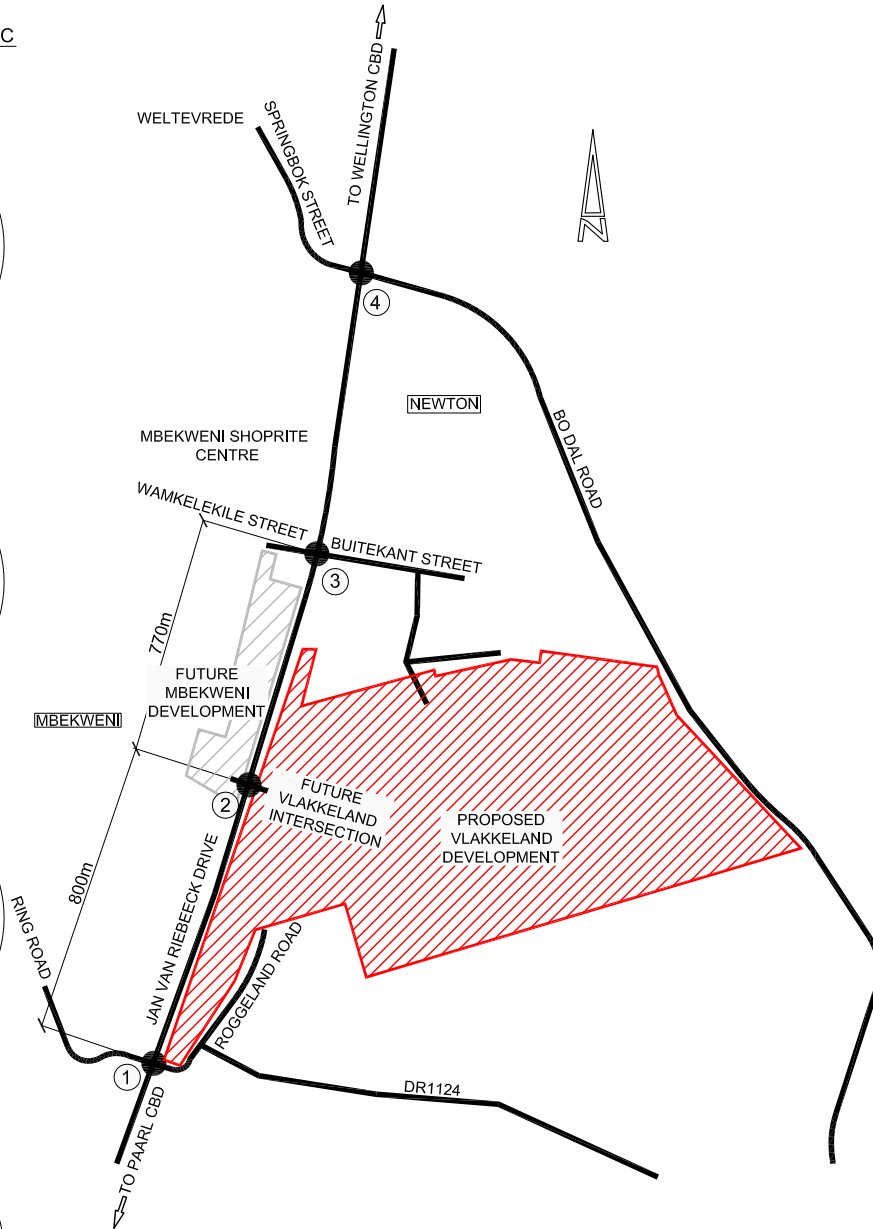
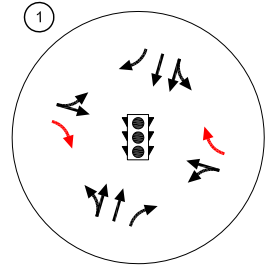
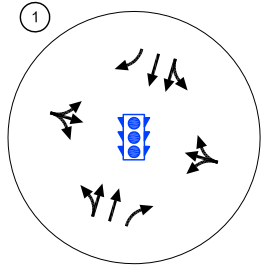
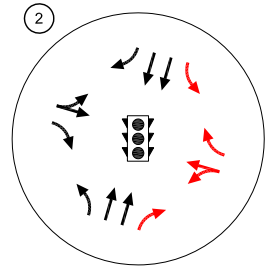
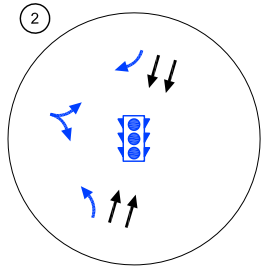
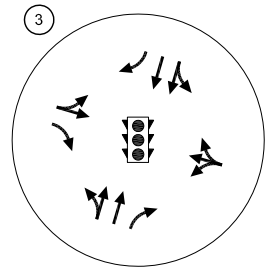
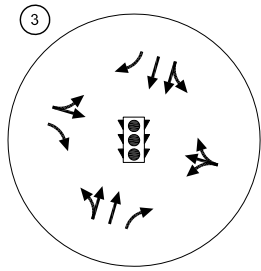
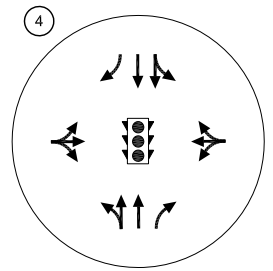
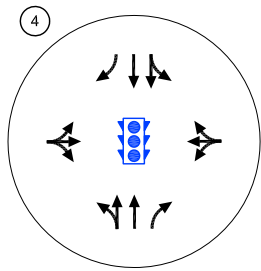
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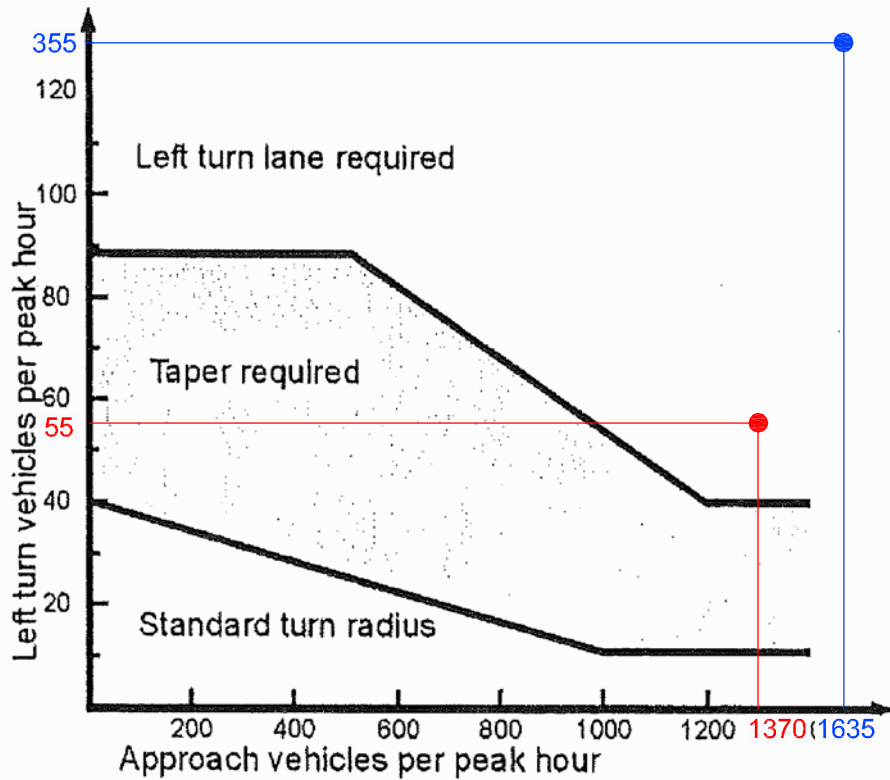
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LOS	= INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALED)
Del	= INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C	= CRITICAL VOLUME-TO-CAPACITY RATIO

2018 BACKGROUND TRAFFIC
LANE CONFIGURATION

2018 TOTAL TRAFFIC
LANE CONFIGURATION

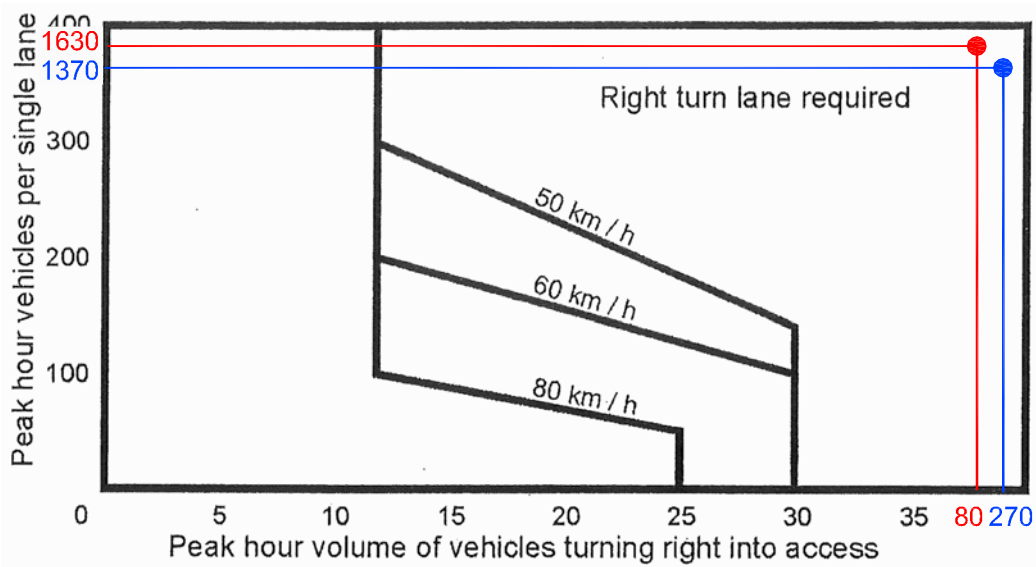


LEGEND	
	ROUNDABOUT
	TRAFFIC SIGNAL
	STOP/ YIELD CONTROL
	2018 BACKGROUND TRAFFIC CONDITIONS UPGRADES
	2018 TOTAL TRAFFIC CONDITIONS UPGRADES



GUIDELINE FOR LEFT TURN LANE ON 4-LANE ROADS

Source: Virginia Dot. USA
(adaption)

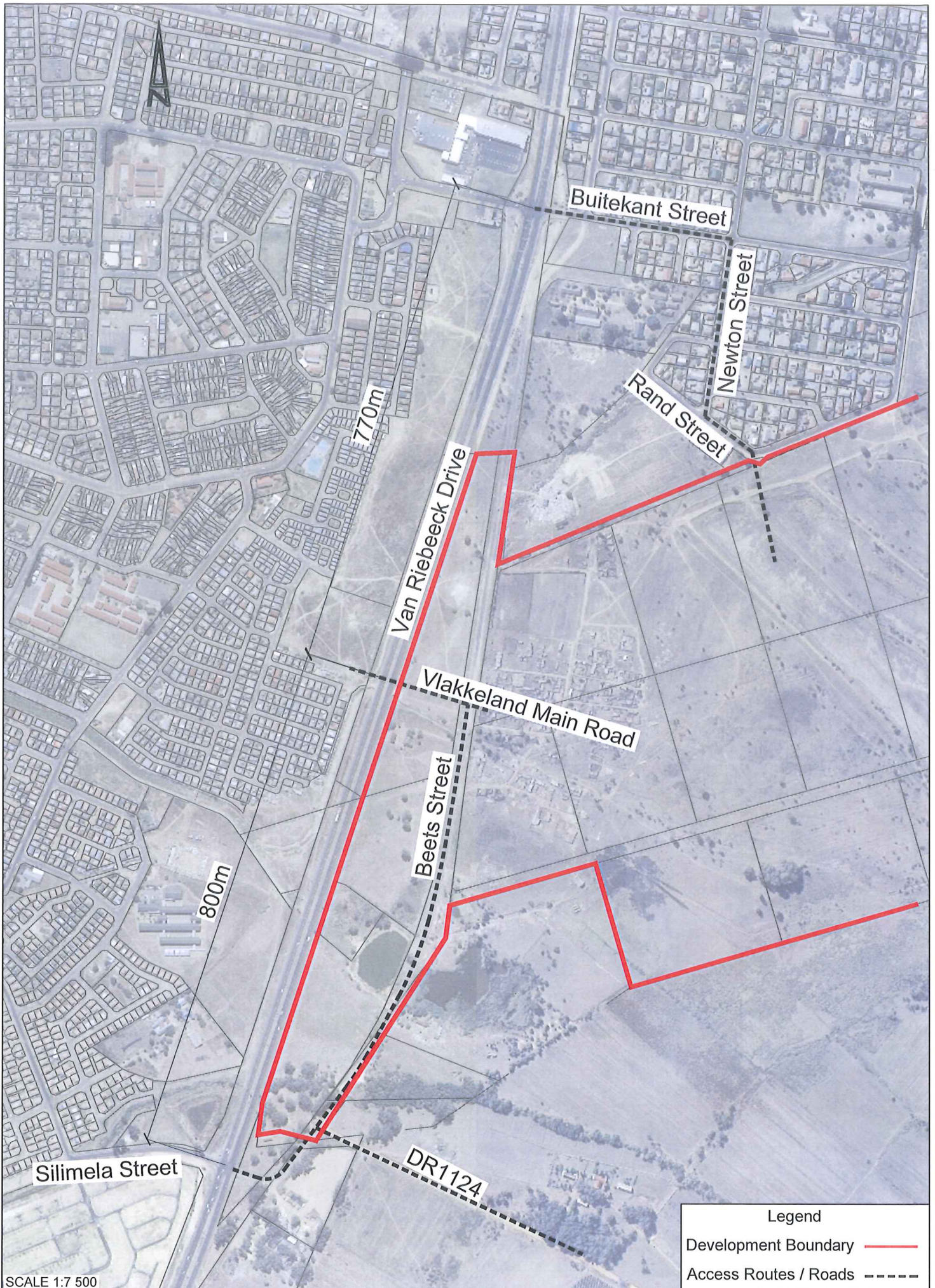


GUIDELINE FOR RIGHT TURN LANES

— THE RED INDICATES THAT LEFT AND RIGHT TURN LANES ARE WARRANTED IN THE BACKGROUND CONDITIONS INTO ERF557, MBEKWENI.

— THE BLUE INDICATES THAT LEFT AND RIGHT TURN LANES ARE WARRANTED IN THE TOTAL TRAFFIC CONDITIONS INTO THE PROPOSED VLAKKELAND RESIDENTIAL DEVELOPMENT.

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SCALE 1:7 500

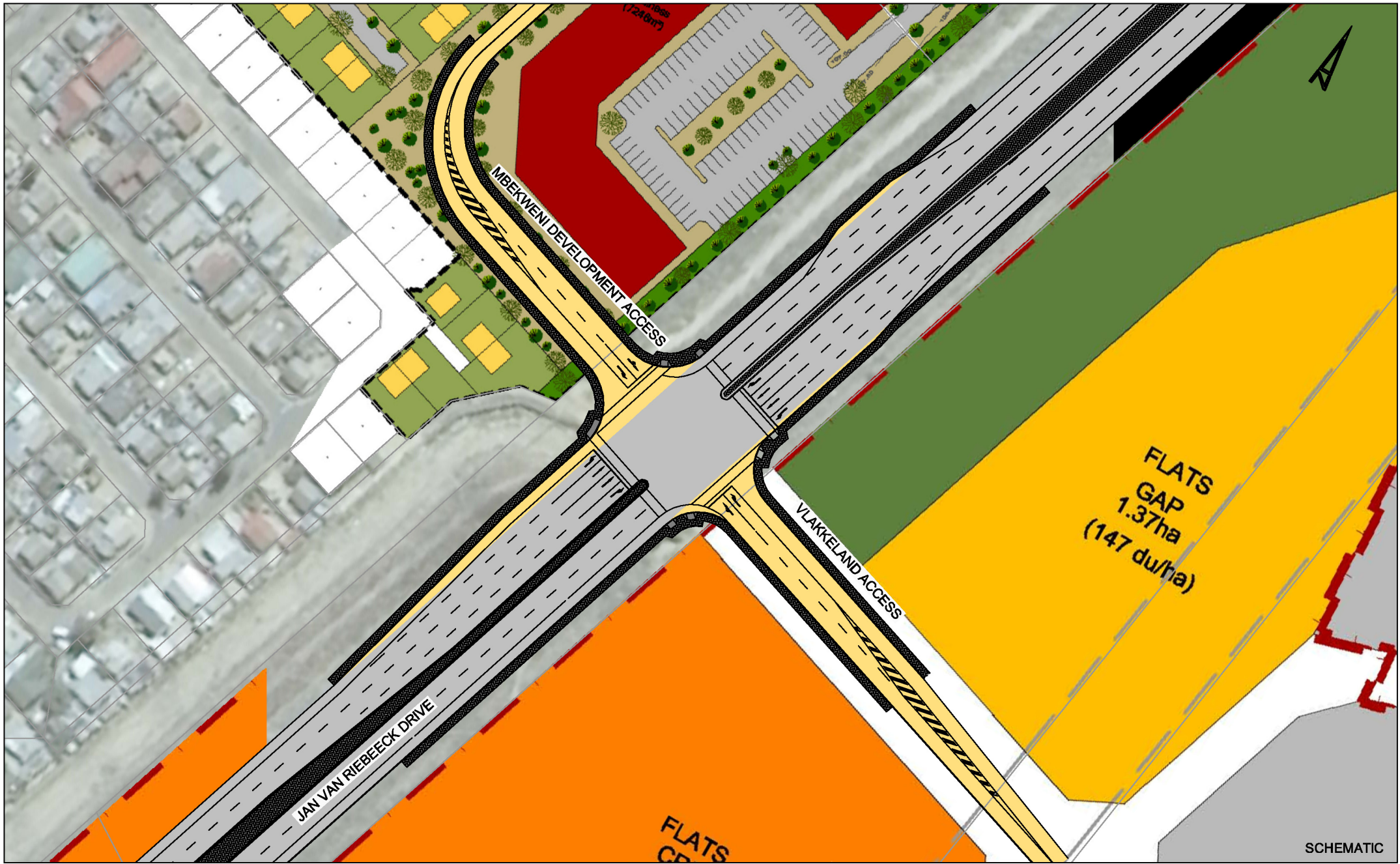
Legend	
Development Boundary	— (Red Line)
Access Routes / Roads	- - - - (Dashed Line)



PROJECT: Vlakkeland Residential Development ERF 8378, Paarl

FIGURE: Access Spacings

NUMBER: 11



<p>PROJECT:</p> <p>VLAKKELAND RESIDENTIAL DEVELOPMENT ERF 8378, PAARL</p>	<p>FIGURE:</p> <p>PROPOSED VLAKKELAND / JAN VAN RIEBEECK DRIVE INTERSECTION</p>	<p>NUMBER:</p> <p>12</p>
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Appendix B

Tables

List of Tables

Table 1: Existing 2013 Traffic and 2018 Background Traffic

Table 2: 2018 Background Traffic and 2018 Background Traffic (with upgrades).

Table 3: 2018 Background Traffic (with upgrades) – 2018 Total Traffic (with Total Traffic upgrades)

Table 4: Proposed Trip Generation Rates

Table 5: Expected Development Trips

Table 1: Existing 2013 Traffic and 2018 Background Traffic

No	Intersection	2013 Existing Peak Hour						2018 Background Peak Hours (2013 Geometry)					
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
		LOS	Delay	V/C	LOS	Delay	v/c	LOS	Delay	V/C	LOS	Delay	V/C
1	Van Riebeeck DR/ Roggeland RD	C	19.6	0.31	D	26.2	0.42	E	39.6	0.62	F	>50	0.89
2	Van Riebeeck DR/ Future Access	Future Intersection			Future Intersection			D	27.3	0.50	F	>50	0.64
3	Van Riebeeck DR/ Wamkelekile RD	B	19.7	0.49	B	15.5	0.45	C	22.1	0.63	B	16.7	0.74
4	Van Riebeeck DR/ Springbok St	C	34.4	0.68	C	22.8	0.44	F	>50	>1.0	F	>50	0.90

Table 2: 2018 Background Traffic and 2018 Background Traffic (with upgrades).

No	Intersection	2018 Background Peak Hours (2013 Geometry)						2018 Background Peak hour (2018 Background Geometry)					
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
		LOS	Delay	V/C	LOS	Delay	v/c	LOS	Delay	V/C	LOS	Delay	V/C
1	Van Riebeeck DR/ Roggeland RD	E	39.6	0.62	F	>50	0.89	A	8.9	0.60	A	9.6	0.60
2	Van Riebeeck DR/ Future Access	D	27.3	0.50	F	>50	0.64	A	7.8	0.57	A	6.9	0.48
3	Van Riebeeck DR/ Wamkelekile RD	C	22.1	0.63	B	16.7	0.74	C	29.6	0.72	C	24.7	0.64
4	Van Riebeeck DR/ Springbok St	F	>50	>1.0	F	>50	0.90	B	17.7	0.59	B	14.6	0.49

Table 3: 2018 Background Traffic (with upgrades) – 2018 Total Traffic (with Total Traffic upgrades)

No	Intersection	2018 Background Peak hour (2018 Background Geometry)						2018 Total Traffic Conditions (2018 Total Traffic Geometry)					
		PM Peak Hour			SAT Peak Hour			PM Peak Hour			SAT Peak Hour		
		LOS	Delay	V/C	LOS	Delay	v/c	LOS	Delay	V/C	LOS	Delay	V/C
1	Van Riebeeck DR/ Roggeland RD	A	8.9	0.60	A	9.6	0.60	D	42.5	0.98	D	44.5	0.73
2	Van Riebeeck DR/ Future Access	A	7.8	0.57	A	6.9	0.48	D	40.7	0.93	C	23.1	0.81
3	Van Riebeeck DR/ Wamkelekile RD	C	29.6	0.72	C	24.7	0.64	C	31.2	0.83	C	21.6	0.67
4	Van Riebeeck DR/ Springbok St	B	17.7	0.59	B	14.6	0.49	C	28.4	0.71	C	26.3	0.60

Table 4: Proposed Trip Generation Rates

Land Use	Units	Source	Size/ Volume	Weekday AM Peak Hour				
				Rate	In	Out	Internal	Public Transport
Primary School	100m ²	DOT	1 100	0.90	54%	46%	50%	10%
High School	100m ²	DOT	1 200	0.90	71%	29%	50%	10%
Subsidy Housing	Units	DOT210	2 350	0.50	35%	65%	25%	15%
Gap Housing	Units	DOT210	704	0.50	35%	65%	25%	15%
Community residential Units	Units	DOT210	137	0.50	35%	65%	25%	15%
Business	100m ²	ITE815	5 342	5.25	51%	49%	25%	15%
Municipal Office	100m ²	DOT710	4 313	2.30	85%	15%	25%	15%
				Weekday PM Peak Hour				
Primary School	100m ²	ITS Adj.	1 100	0.18	43%	57%	50%	10%
High School	100m ²	ITS Adj.	1 200	0.18	46%	54%	50%	10%
Subsidy Housing	Units	DOT210	2 350	0.50	65%	35%	25%	15%
Gap Housing	Units	DOT210	704	0.50	65%	35%	25%	15%
Community residential Units	Units	DOT210	137	0.50	65%	35%	25%	15%
Business	100m ²	ITE815	5 342	5.43	50%	50%	25%	15%
Municipal Office	100m ²	DOT710	4 313	2.30	15%	85%	25%	15%

Table 5: Expected Development Trips

Total Driveway Trips						
Land Use	Weekday AM Peak Hour			Weekday PM Peak Hour		
	In	Out	Total	In	Out	Total
Primary School	535	455	990	85	113	198
High School	767	313	1080	99	117	216
Subsidy Housing	411	764	1175	764	411	1175
Gap Housing	123	229	352	229	123	352
Community residential Units	24	45	69	45	24	69
Business	143	137	280	145	145	290
Municipal Office	84	15	99	15	84	99
Total Driveway Trips	2087	1958	4045	1381	1017	2399
Internal Trips						
Land Use	In	Out	Total	In	Out	Total
Primary School	267	228	495	43	56	99
High School	383	157	540	50	58	108
Subsidy Housing	103	191	294	191	103	294
Gap Housing	31	57	88	57	31	88
Community residential Units	6	11	17	11	6	17
Business	36	34	70	36	36	73
Municipal Office	21	4	25	4	21	25
Internal Trips	847	682	1529	391	312	703
Public Transport						
Land Use	In	Out	Total	In	Out	Total
Primary School	53	46	99	9	11	20
High School	77	31	108	10	12	22
Subsidy Housing	62	115	176	115	62	176
Gap Housing	18	34	53	34	18	53
Community residential Units	4	7	10	7	4	10
Business	21	21	42	22	22	44
Municipal Office	13	2	15	2	13	15
Public Transport	248	255	503	198	141	339
Total Net New Trips						
Land Use	In	Out	Total	In	Out	Total
Primary School	214	182	396	34	45	79
High School	307	125	432	40	47	86
Subsidy Housing	247	458	705	458	247	705
Gap Housing	74	137	211	137	74	211
Community residential Units	14	27	41	27	14	41
Business	86	82	168	87	87	174
Municipal Office	51	9	60	9	51	60
Total Net New Trips	992	1021	2013	792	564	1356

Appendix C

Photographs



Photo 1: Northbound view on the Western side of Jan van Riebeeck Drive



Photo 2: Southbound view on the Eastern Side of Jan van Riebeeck Drive



Photo 3: Informal Pedestrian pathways west of Jan van Riebeeck Drive



Photo 4: Pedestrian Pathways east of Jan van Riebeeck Drive



Photo 1: Roggeland Road / Jan van Riebeeck Drive intersection.



Photo 2: Jan van Riebeeck Drive / Buitekant Street intersection



Photo 3: Signalised Pedestrian Crossing on Jan van Riebeeck Drive



Photo 4: Jan van Riebeeck Drive / Springbok Street intersection



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Attention: Mr. Gerhard Nel

Dear Mr Nel,

TRANSPORT IMPACT OF COMBINED DEVELOPMENTS IN THE VICINITY OF THE VLAKKELAND DEVELOPMENT, IN PAARL

ITS Engineers compiled a Transport Impact Study (TIS) for the proposed Vlakkeland Development (ITS 3194) in Paarl, during August 2013. Although this is a comprehensive study, the Drakenstein Municipality requested an investigation for the combined transport impacts of various other developments planned in close proximity of the future Vlakkeland development. The purpose of this letter is to evaluate the transport related impacts of these combined developments and to identify the road upgrades required, over and above the road upgrades recommended for the Vlakkeland development.

The transport impacts of six developments were included in this investigation. These developments include Vlakkeland, Erf 553, Fynbos, Farm 1254 and Erf 16161 plus Erf 8398 Dal Josafat. All these developments will be mixed-use developments, however the majority will include residential land uses.

The locations of these developments relative to the Vlakkeland development are illustrated in **Figure 1** the Locality Plan. The expected vehicle trip generation for each of these developments are summarised below:

	A.M. Peak Hour			P.M. Peak Hour		
	In	Out	Total	In	Out	Total
1. Vlakkeland	992	1 021	2 013	792	564	1 356
2. Erf 553	211	258	469	266	213	479
3. Fynbos	18	34	52	25	27	52
4. Farm 1254	5	5	10	5	5	10
5. Erf 16161 Dal Josafat	797	1 243	2 040	1 202	947	2 149
6. Erf 8398 Dal Josafat	24	75	99	69	30	90
Total	2 047	2 636	4 683	2 359	1 786	4 145

Offices:
 Pretoria
 Cape Town

The expected vehicle trips from the above developments are illustrated in **Figures 2.1 to 2.6**. It is expected that the combined vehicle trips will be less than the sum of these individual developments, due to the interaction between them. However, these trips were used in the analyses and should illustrate a more critical traffic impact scenario.

Only the total traffic conditions from these combined development trips were investigated as part of this letter, as illustrated in **Figure 3**. The intersection geometries used for these analyses are based on the upgraded intersection layouts as illustrated in **Figure 4**. This figure illustrates both the upgrades recommended as part of the Vlakkeland development as well as the additional upgrades required for the combined developments, over and above the upgrades recommended for the Vlakkeland development. These additional upgrades include the following:

Intersection 1: Jan Van Riebeeck Drive / Ring Road / Roggeland Road intersection:

- Construct a westbound left-turn lane.

Intersection 3: Jan Van Riebeeck Drive / Wamkelekile Road / Buitekant Street intersection:

- Construct a westbound right-turn lane.

With the above upgrades in place all study intersections will continue to operate acceptably during the weekday a.m. and p.m. peak traffic periods of the 2018 Total Traffic conditions.

Annexure A

Figures

List of Figures

Figure 1: Future Development Locations

Figure 2.1: Expected Development Trips: Erf 16161, Dal Josafat

Figure 2.2: Expected Development Trips: Erf 8398, Dal Josafat

Figure 2.3: Expected Development Trips: Fynbos Development

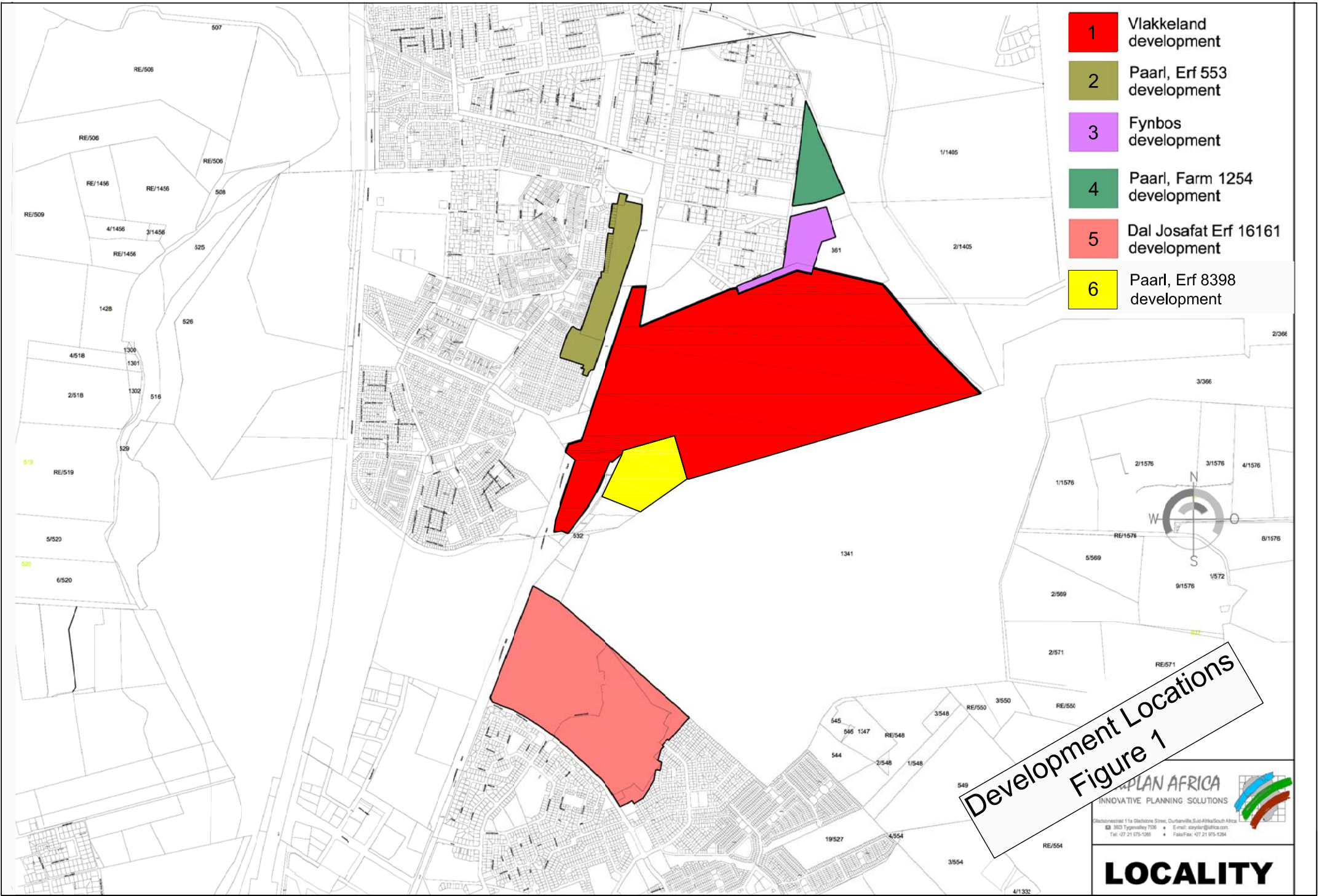
Figure 2.4: Expected Development Trips: Erf 553, Paarl

Figure 2.5: Expected Development Trips: Erf 1254, Paarl (Aurora)

Figure 2.6: Expected Development Trips: All Development Trips

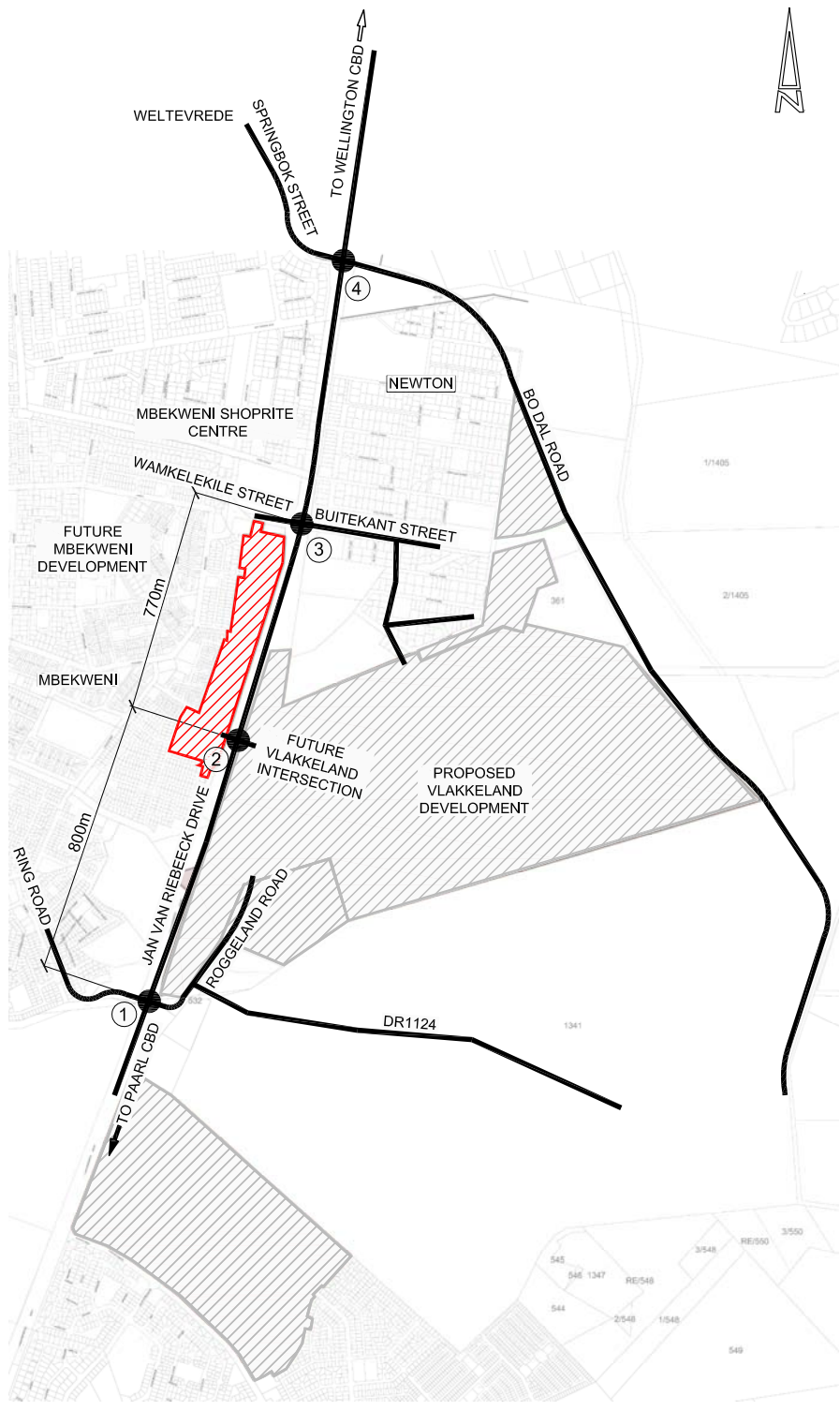
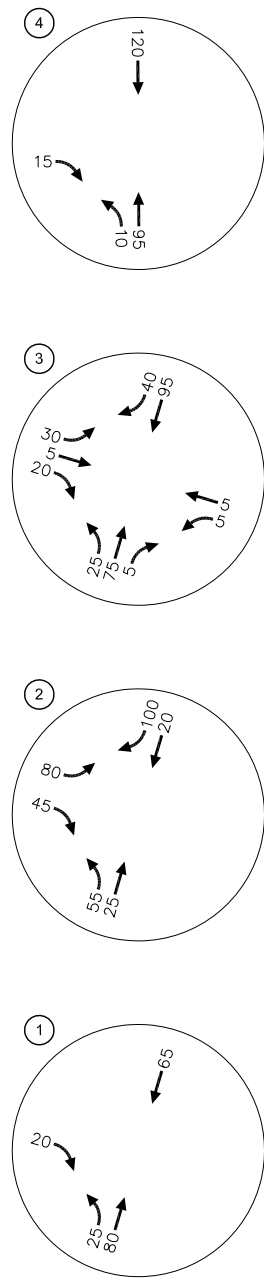
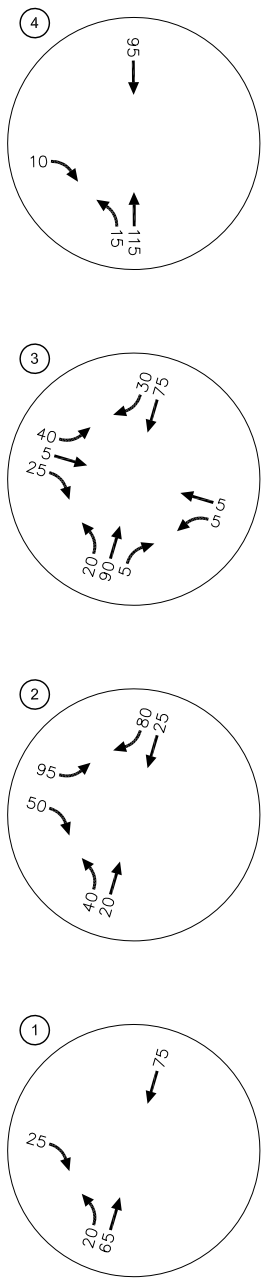
Figure 3: 2018 Total Traffic Conditions

Figure 4: Proposed Upgrades



A.M. PEAK HOUR

P.M. PEAK HOUR

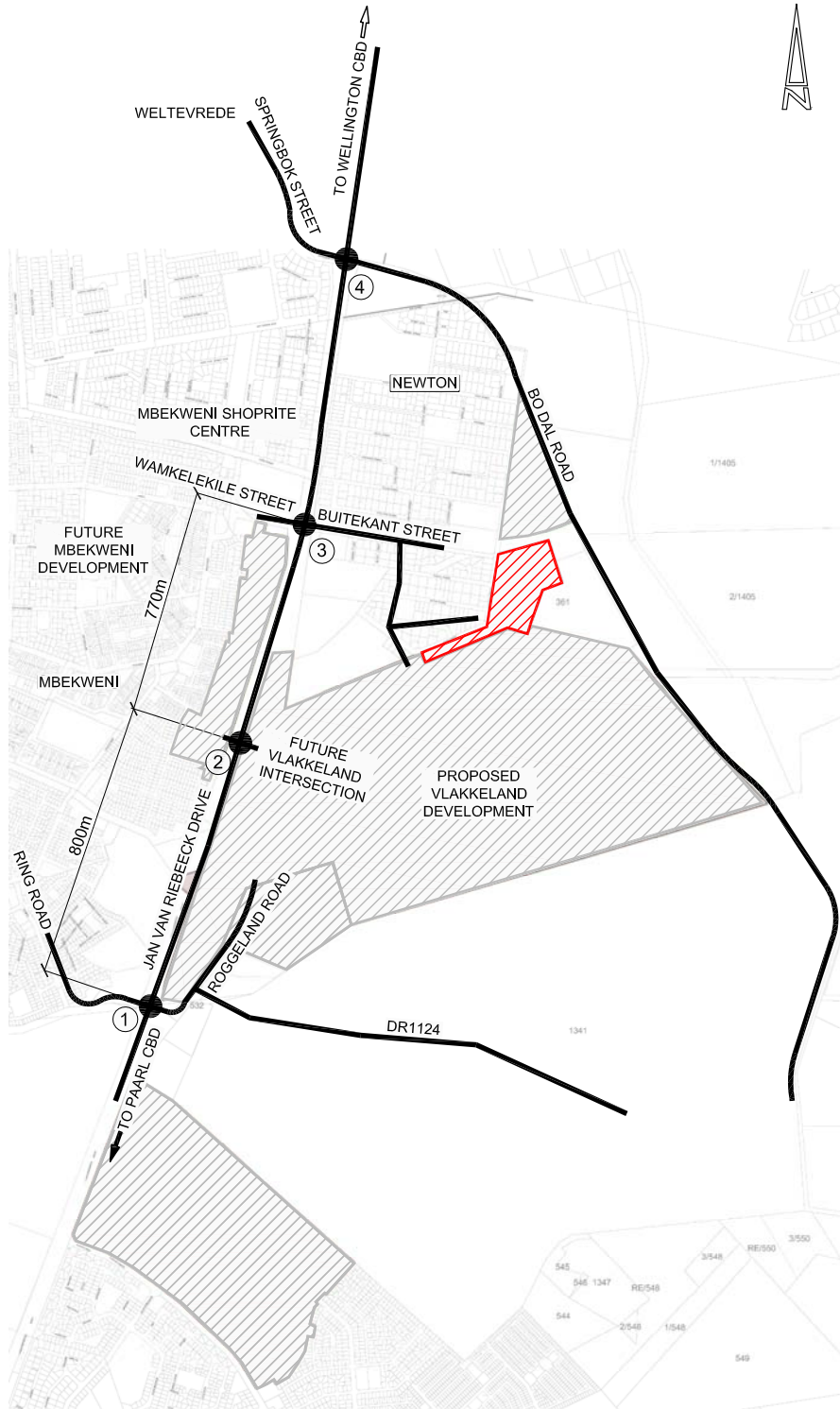
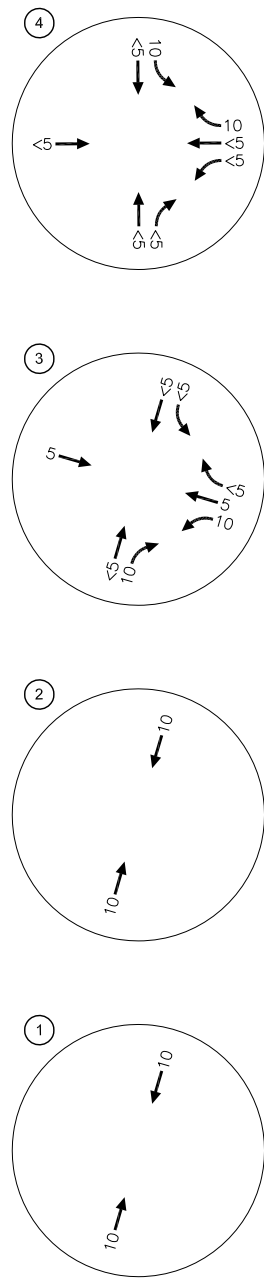
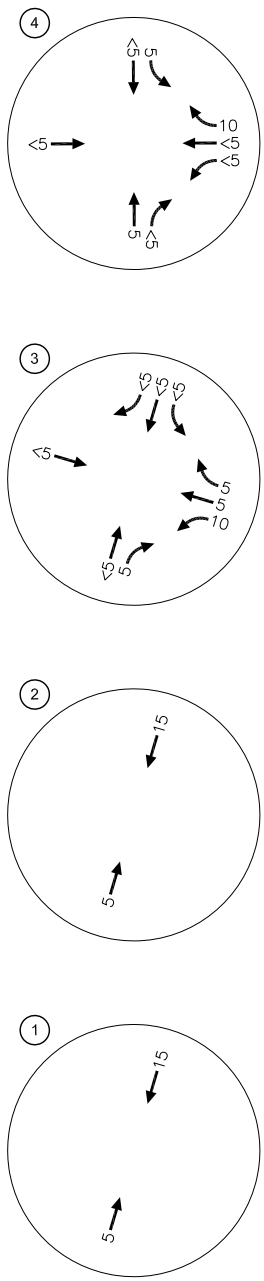


TRIP GENERATION			
PEAK HOUR	IN	OUT	TOTAL
AM	211	258	469
PM	266	213	479



A.M. PEAK HOUR

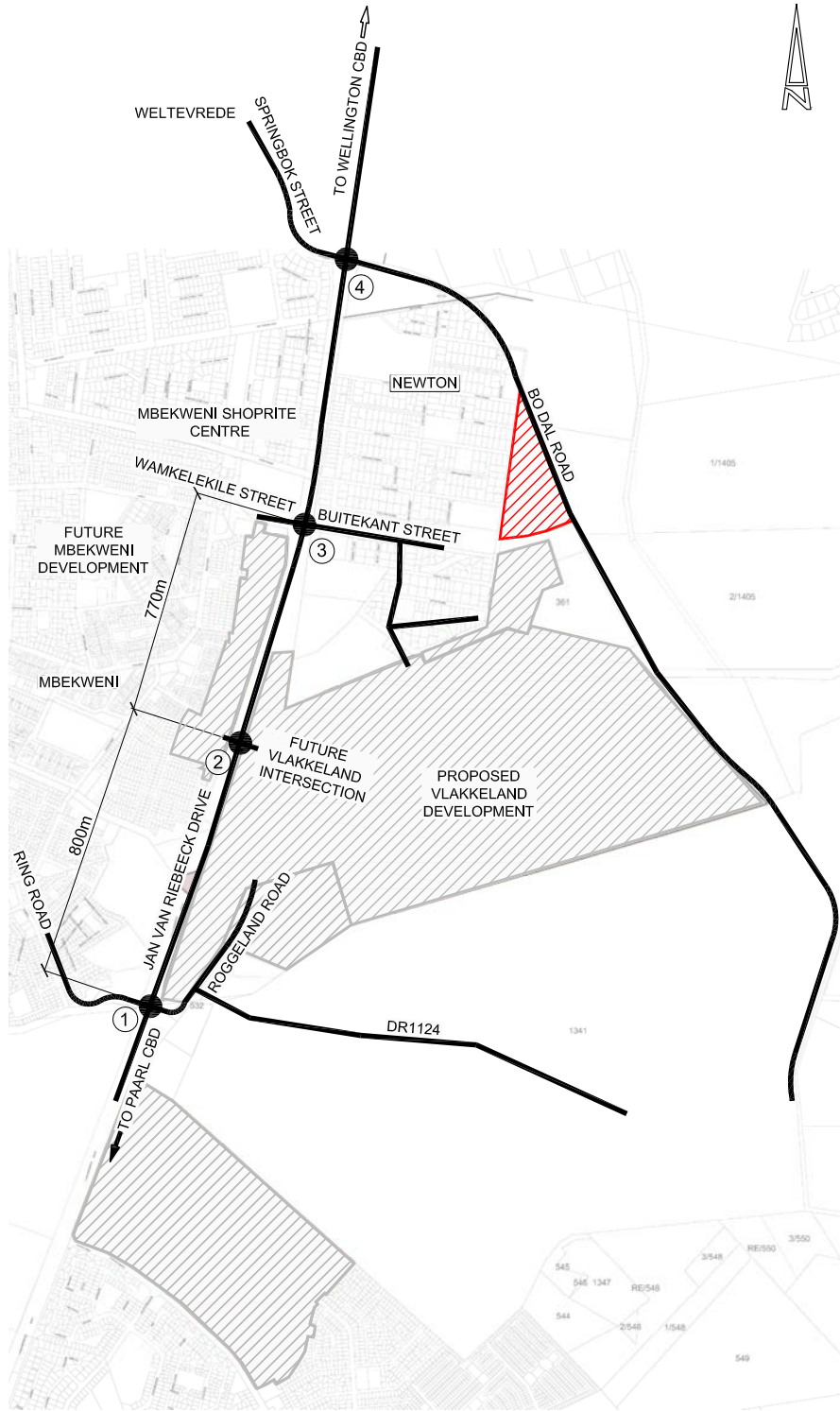
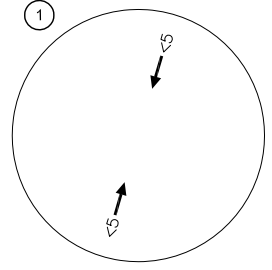
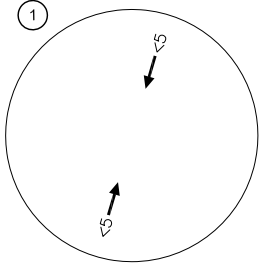
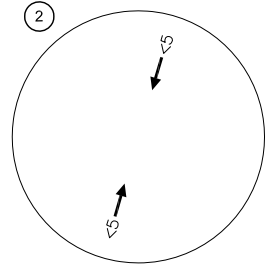
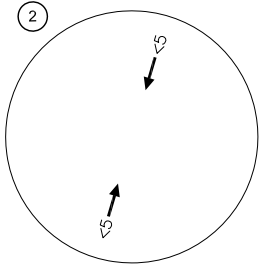
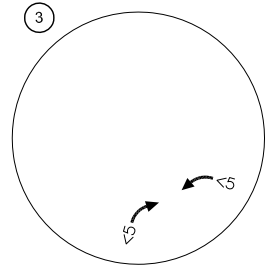
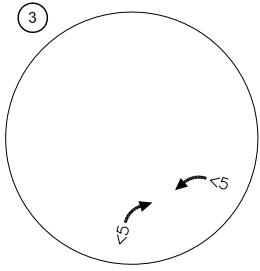
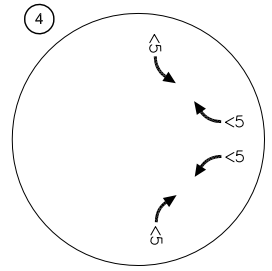
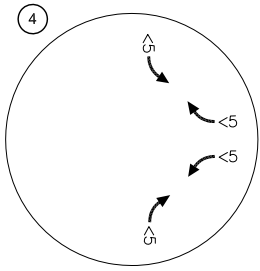
P.M. PEAK HOUR



TRIP GENERATION			
PEAK HOUR	IN	OUT	TOTAL
AM	18	34	52
PM	25	27	52

A.M. PEAK HOUR

P.M. PEAK HOUR



THE RESIDENTIAL COMPONENT OF THIS DEVELOPMENT WAS ALREADY BUILT AT THE TIME TRAFFIC COUNTS WAS DONE. THE BUSINESS AND CRECHE LAND USES STILL NEEDS TO BE CONSTRUCTED. HOWEVER MOST OF THESE TRIPS IS EXPECTED TO BE INTERNAL NEWTON TRIPS AND ONLY A SMALL PERCENTAGE WILL BE DISTRIBUTED ON THE LARGER ROAD NETWORK.

TRIP GENERATION			
PEAK HOUR	IN	OUT	TOTAL
AM	5	5	10
PM	5	5	10



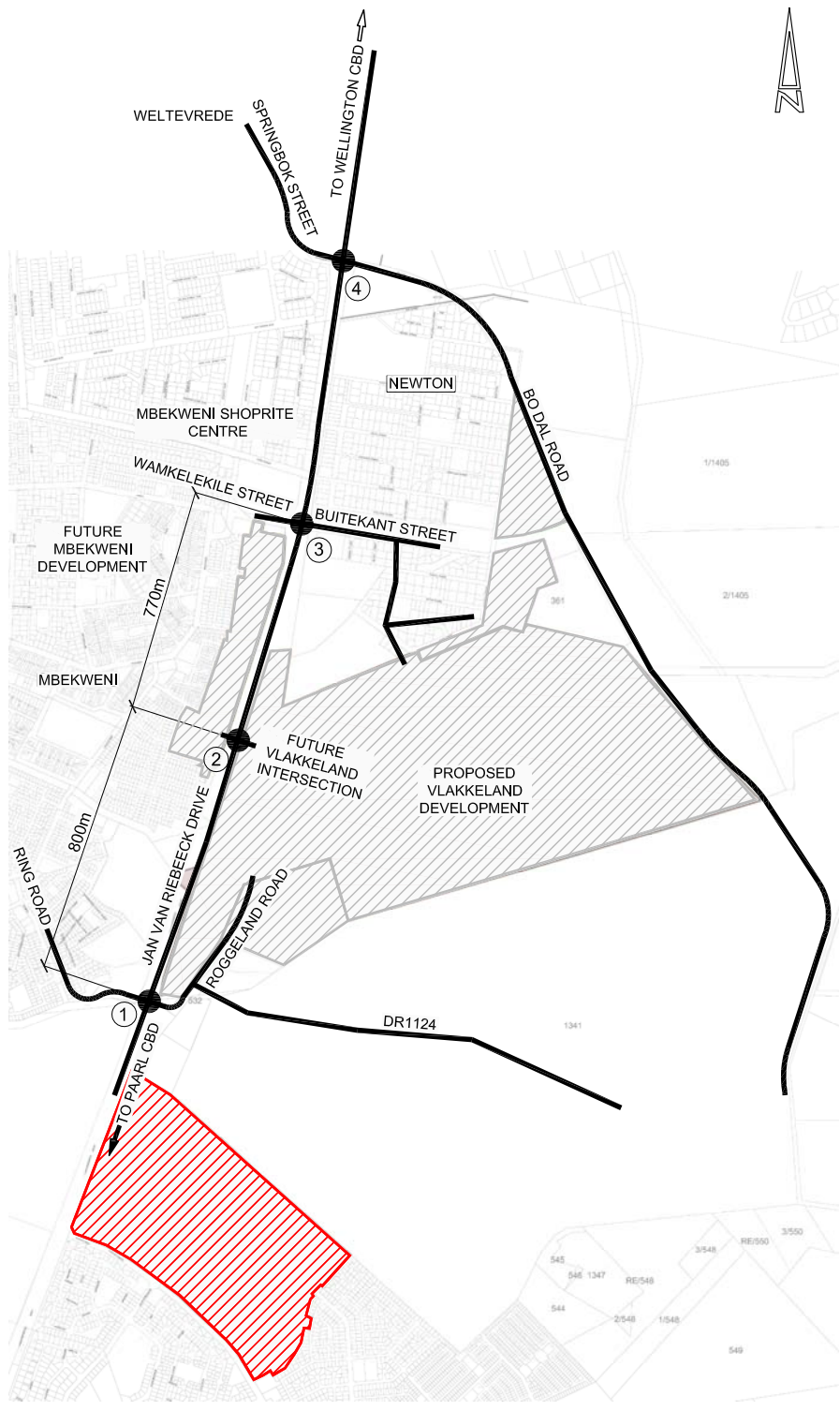
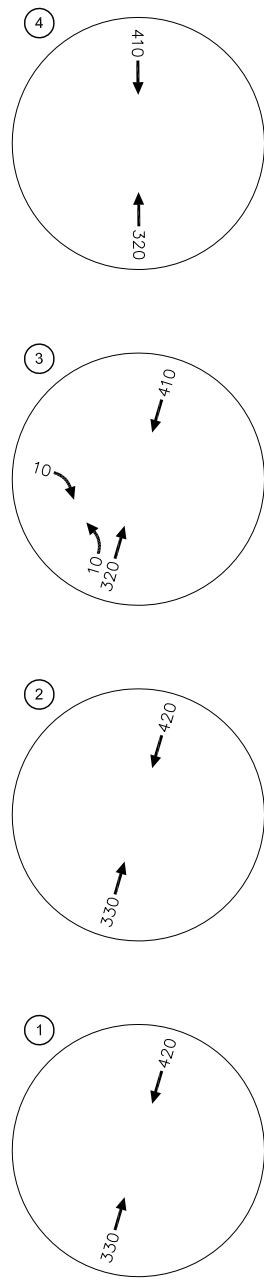
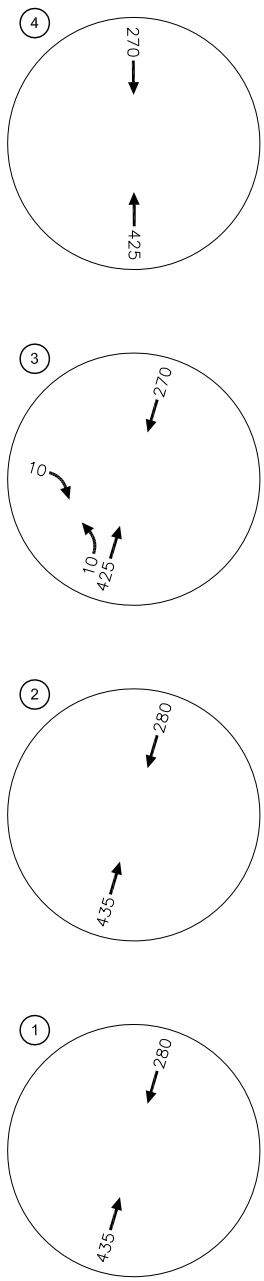
PROJECT: **VLAKKELAND RESIDENTIAL DEVELOPMENT**
ERF 8378, PAARL

FIGURE: **EXPECTED DEVELOPMENT TRIPS**
FARM 1254 (AURORA) DEVELOPMENT, PAARL

NUMBER: **2.3**

A.M. PEAK HOUR

P.M. PEAK HOUR

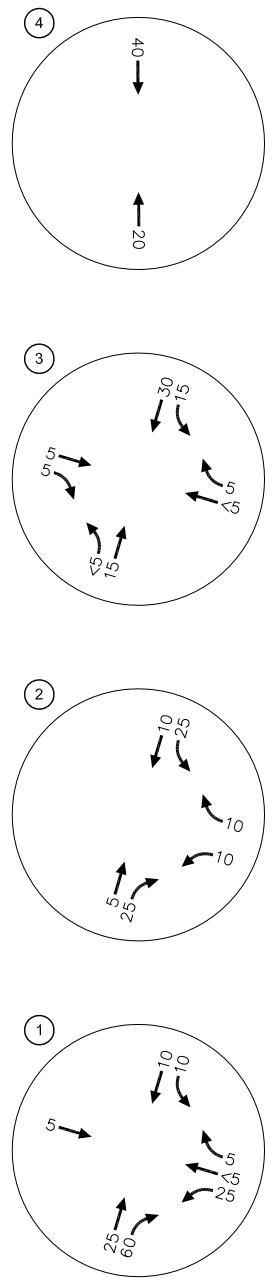
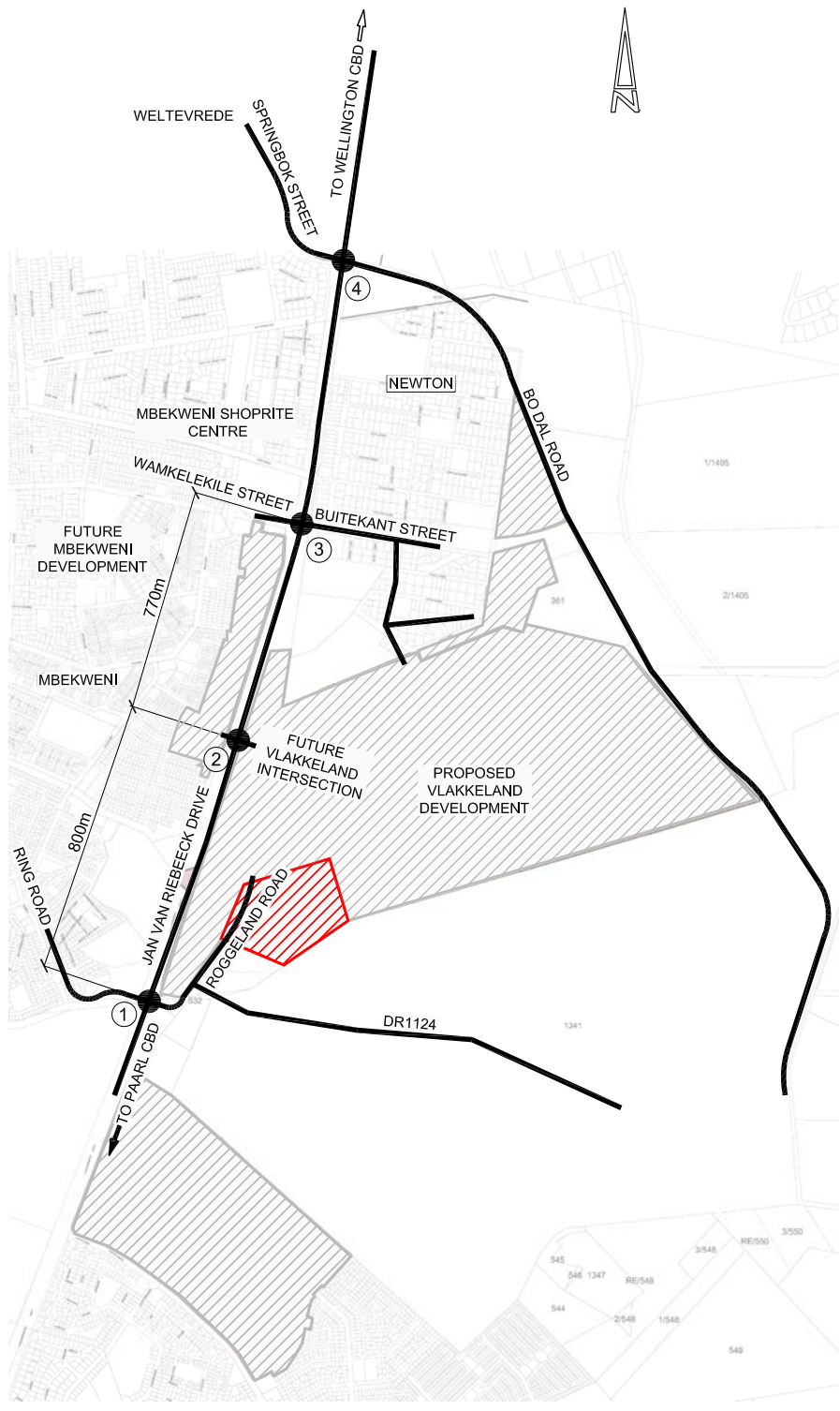
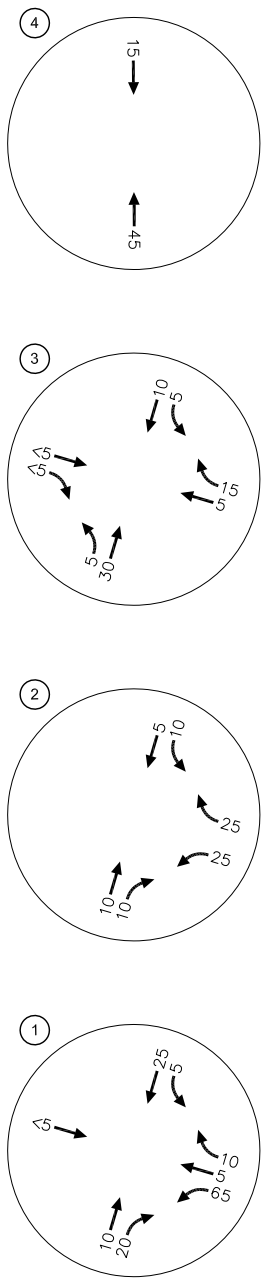


TRIP GENERATION			
PEAK HOUR	IN	OUT	TOTAL
AM	797	1243	2040
PM	1202	947	2149



A.M. PEAK HOUR

P.M. PEAK HOUR



TRIP GENERATION			
PEAK HOUR	IN	OUT	TOTAL
AM	24	75	99
PM	69	30	99



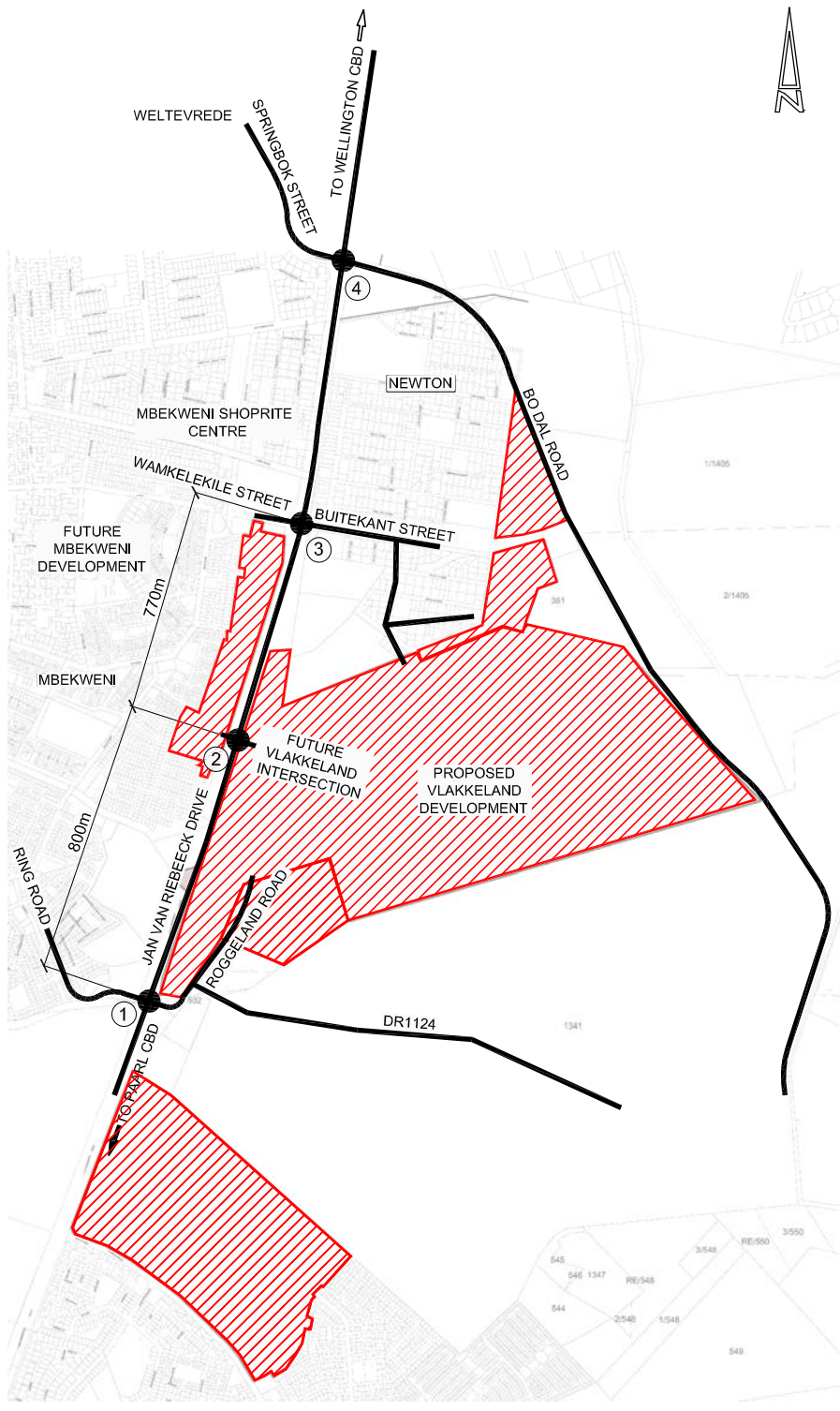
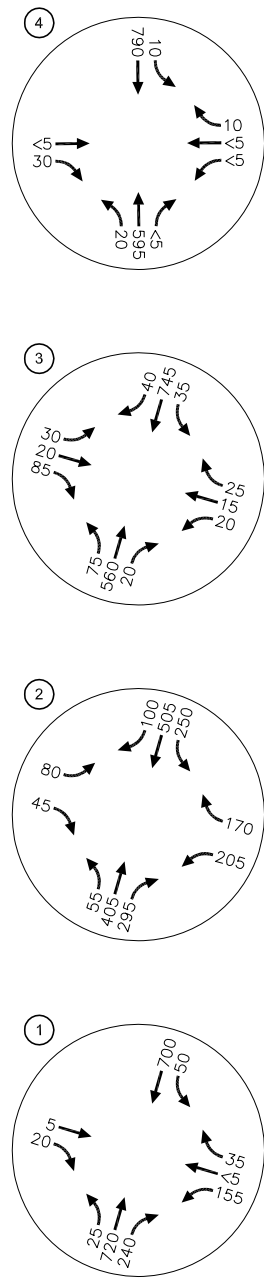
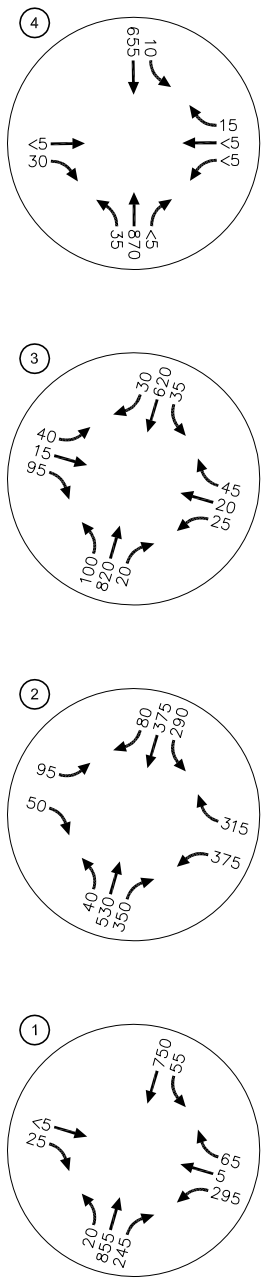
PROJECT: VLAKKELAND RESIDENTIAL DEVELOPMENT
ERF 8378, PAARL

FIGURE: EXPECTED DEVELOPMENT TRIPS
ERF 8398 (ROYAL PALMS) - DAL JOSAFAT
DEVELOPMENT

NUMBER:
2.5

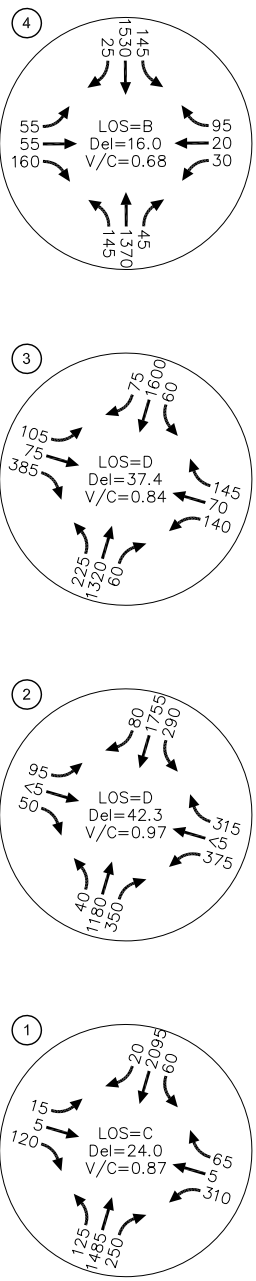
A.M. PEAK HOUR

P.M. PEAK HOUR

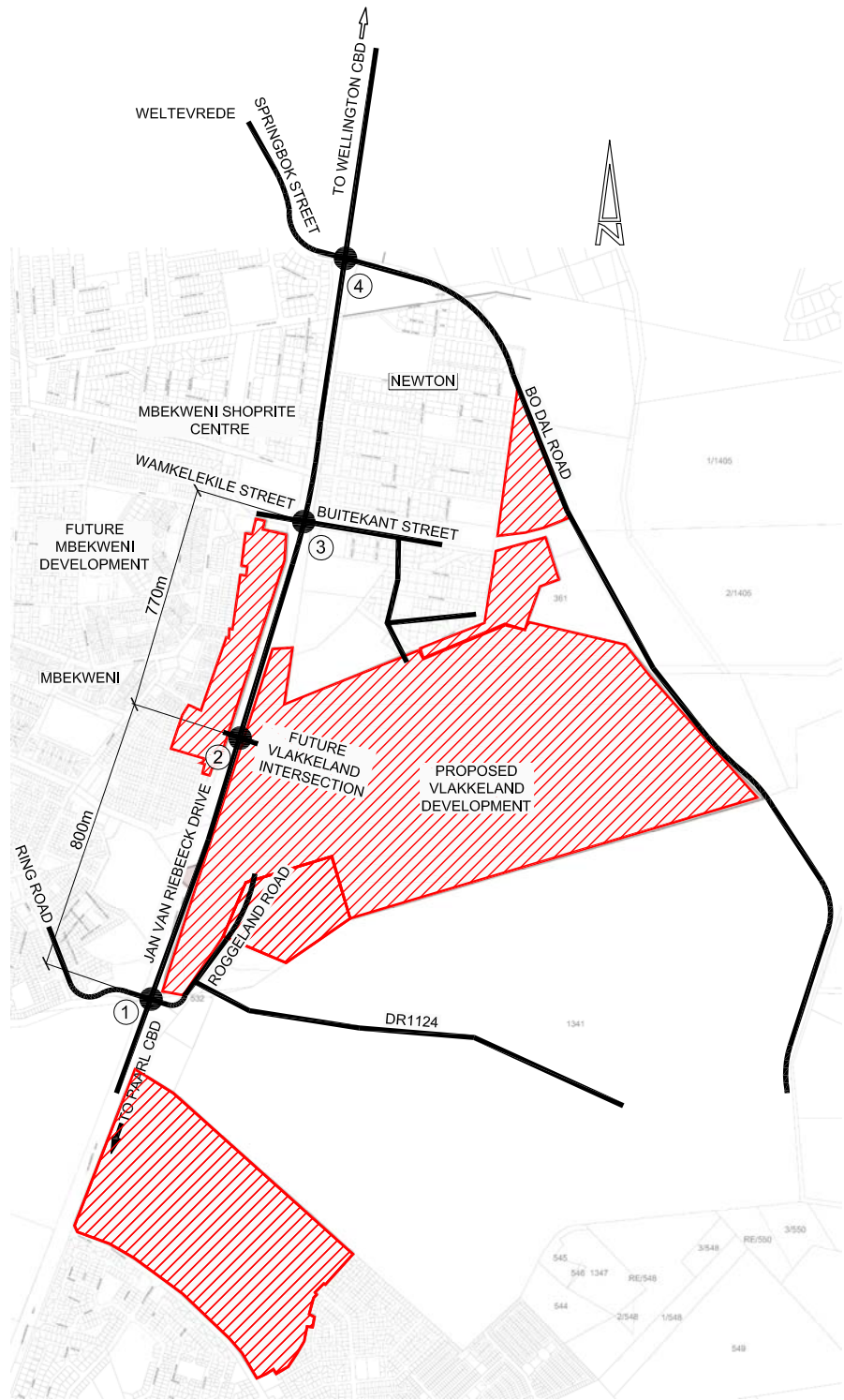
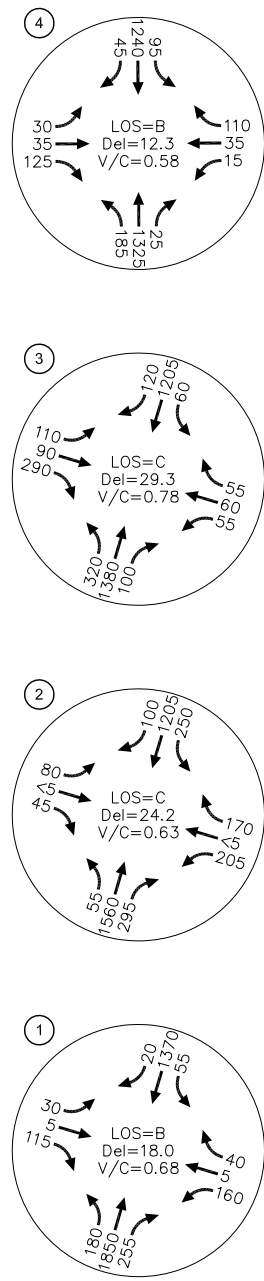


TRIP GENERATION			
PEAK HOUR	IN	OUT	TOTAL
AM	2047	2636	4683
PM	2359	1786	4145

A.M. PEAK HOUR



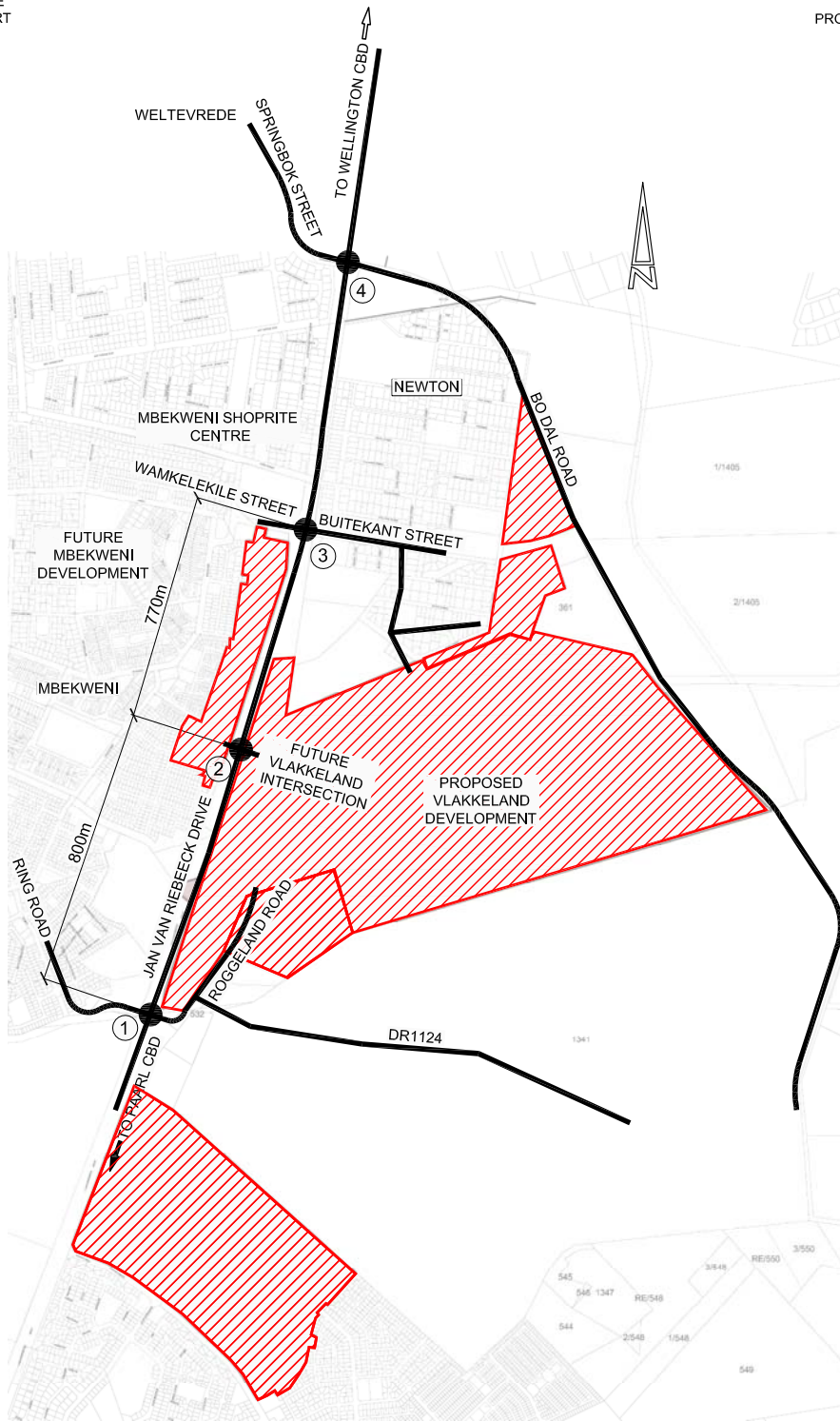
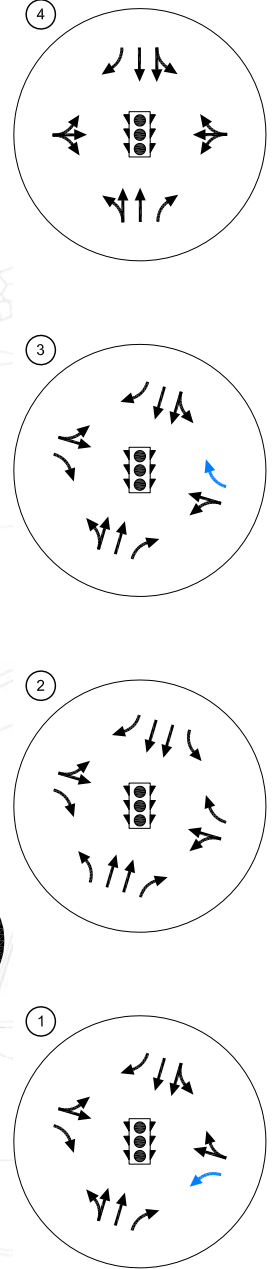
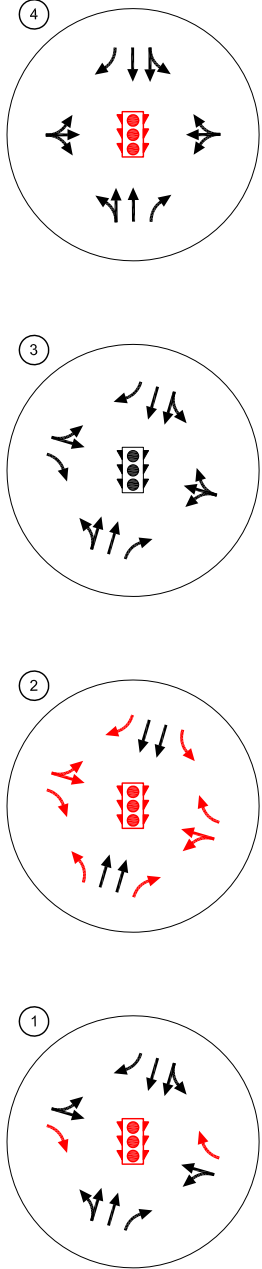
P.M. PEAK HOUR



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

UPGRADES PROPOSED AS PART OF THE VLAKKELAND TIA SECOND DRAFT REPORT

ADDITIONAL / CHANGED UPGRADES PROPOSED AS PART OF FULL PROPOSED DEVELOPMENT AREA TRIPS



LEGEND	
	TRAFFIC SIGNAL
	STOP/ YIELD CONTROL
	TRAFFIC UPGRADES PROPOSED FOR VLAKKELAND DEVELOPMENT
	ADDITIONAL UPGRADES PROPOSED DUE TO ADDITIONAL DEVELOPMENTS