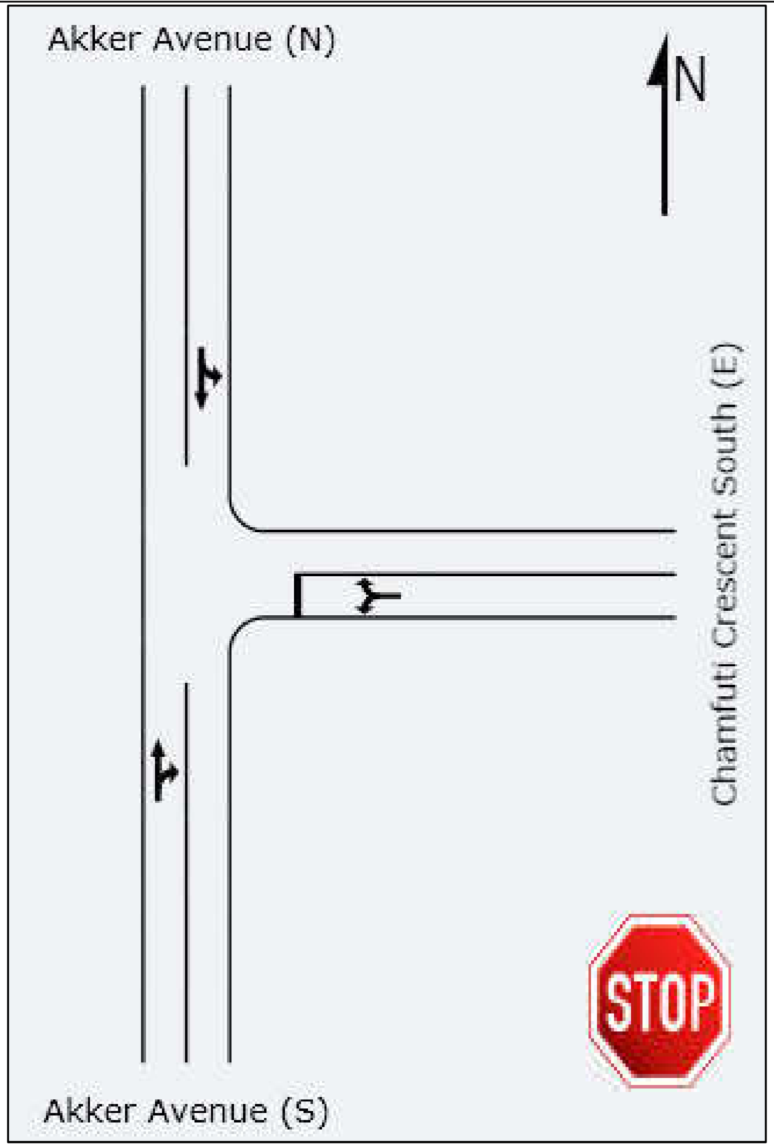
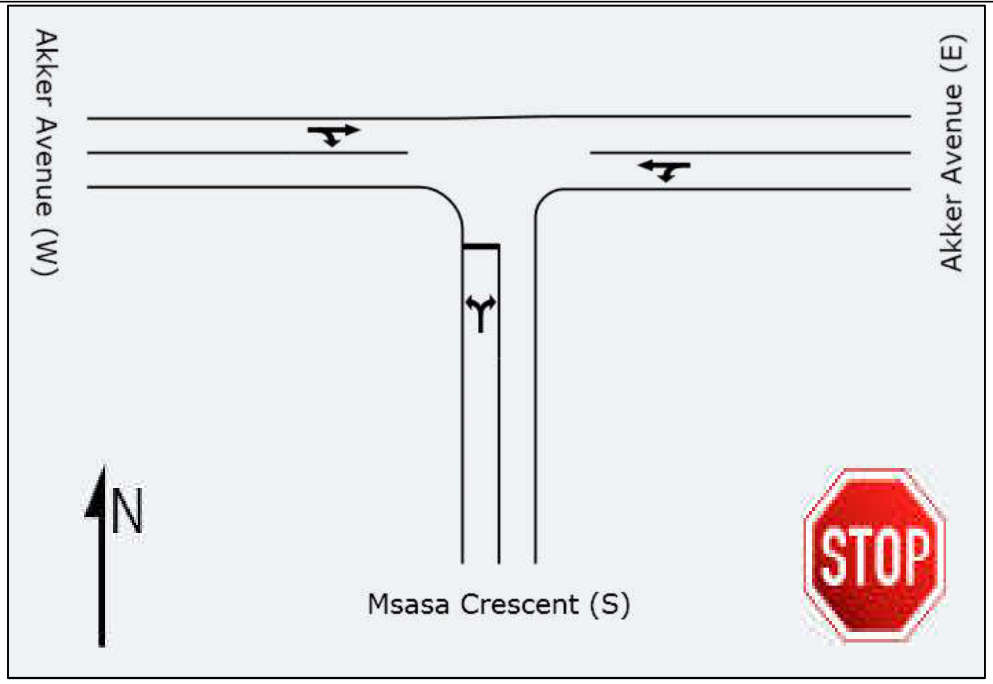
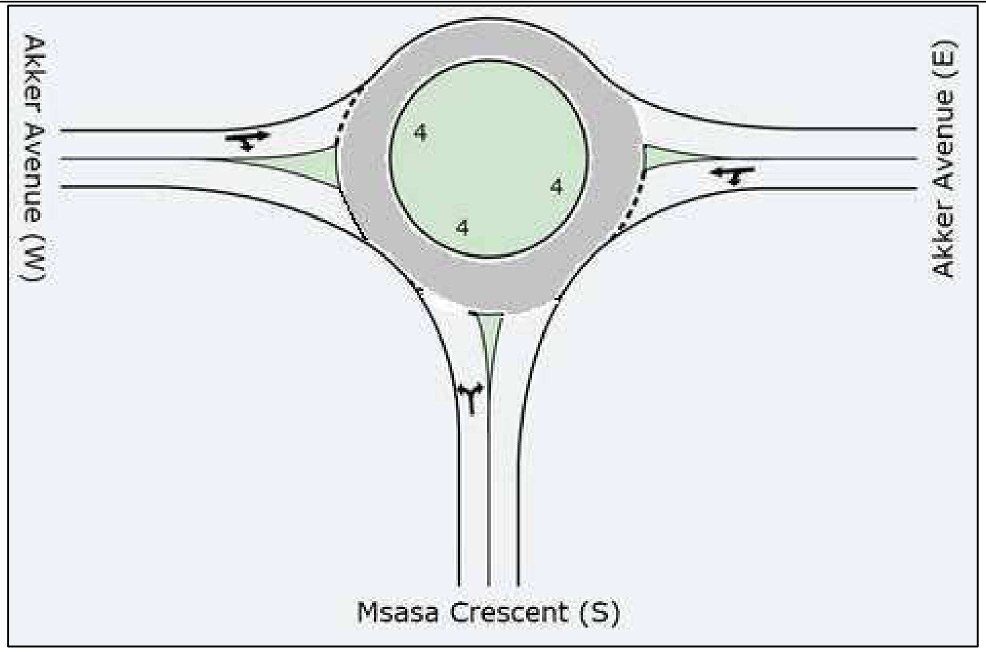
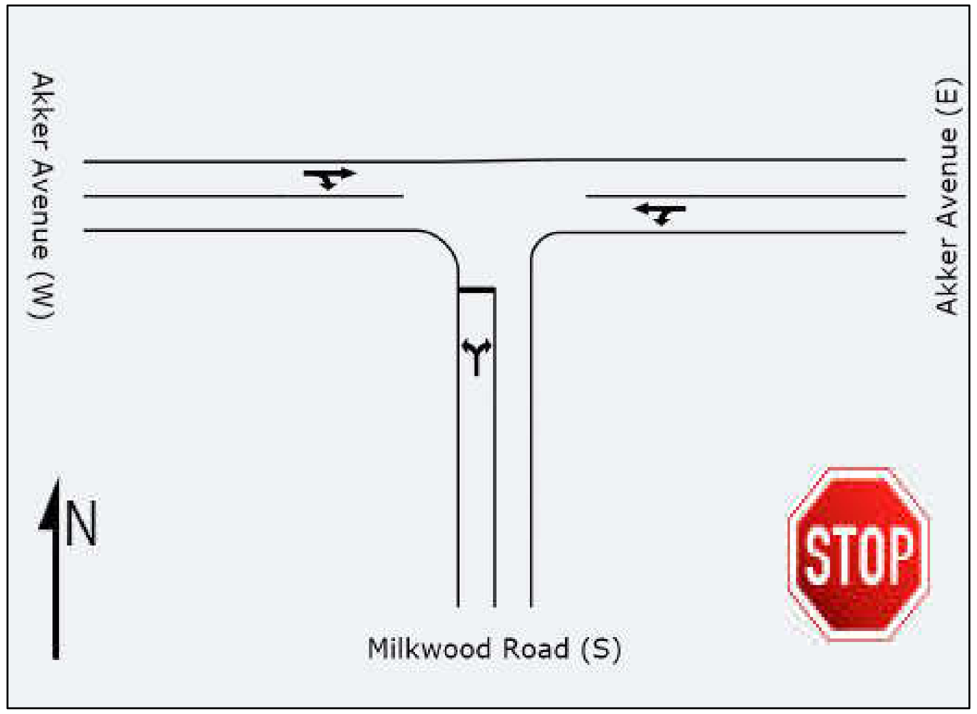
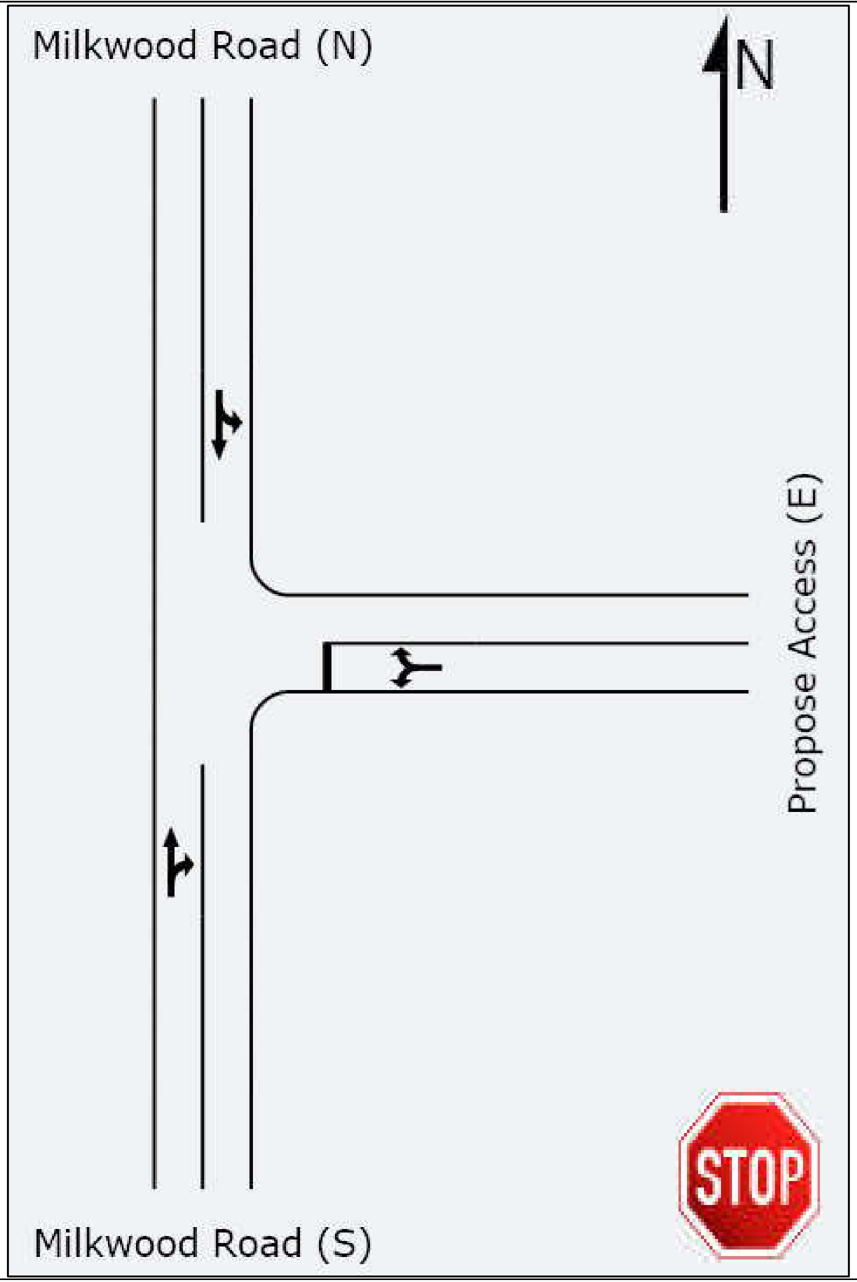
4. Akker Avenue / Chamfuti Crescent South		
EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
	**NO UPGRADES ARE REQUIRED**	**NO UPGRADES ARE REQUIRED**

5. Akker Avenue / Msasa Crescent

EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
	**NO UPGRADES ARE REQUIRED**	 It is proposed that this junction be converted to a mini-circle.

6. Akker Avenue / Milkwood Road

EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
	**NO UPGRADES ARE REQUIRED**	**NO UPGRADES ARE REQUIRED**

7. **Milkwood Road / Proposed Access**		
EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
N/A	**N/A**	

Refer to **ANNEXURE F** for the proposed road upgrades layout plans.

10. FINANCE AND COST ESTIMATES

10.1 Total Improvement Cost Estimates

The cost estimate for the proposed total road upgrades at the following junctions (excluding VAT and professional fees):

- Akker Avenue / Alwen Road / Shakespeare Avenue is ±R.
- Dorado Avenue / Alwen Road is ±R;
- Akker Road / Chamfuti Crescent North is ±R; and
- Akker Avenue / Msasa Crescent is ±R.

The total amount to be payable is ±R.

Refer to **ANNEXURE G** for the cost estimates.

10.2 Contributions per Development

The contributions payable are shown in Table 10.1 below.

TABLE 10.1: BULK CONTRIBUTIONS

Development	Units	Trips	Contribution/ Trip	Total Contribution
Site B – Erven 962 and 963, Ormonde Extension 22	176	150		
Site C – Erven 1010 and 1011, Ormonde Extension 22	192	163		
Site D – Erf 982, Ormonde Extension 22	88	75		
Site E - Erven 1130 and 1131, Ormonde Extension 24	192	163		

Site D – Erf 982, Ormonde Extension 22 will not contribute towards the road upgrading for the Akker Avenue / Msasa Crescent junction since it will generate close to 0% trips on this junction, however it will have to contribute towards all the other three (3) junctions on the north.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

The proposed residential development site is located on Erven 1130 and 1131, Ormonde Extension 24 in Johannesburg.

The developer has three (3) other development sites in the close proximity of Erven 1130 and 1131 and form part of the study area. The developer might construct any of the development sites before Erven 1130 and 1131. Civil Concepts (Pty) Ltd prepared separate traffic studies for each site (three (3) other development sites):

- A residential development on Erven 962 and 963;
- A residential development on Erf 982; and
- A residential development on Erven 1010 and 1011.

The Traffic Impact Assessment of Erven 1130 and 1131 was prepared lastly and takes into consideration the above-mentioned developments as latent rights.

The proposed development will consist of **192** "Residential 3" dwelling units.

The development will generate **163** trips during both the weekday morning and afternoon peak hours, respectively.

The base year (2017) and the horizon year (2022) were considered in this study.

Access to the proposed development site will be off Milkwood Road.

Fix (6) of the seven (7) junctions analysed will operate satisfactorily for the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place as shown in **Section 9** of this report.

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems for the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades in place as shown in **Section 9** of this report. It will however operate the same when compared to the 2022 weekday morning peak hour background traffic scenario.

The proposed road upgrades are for the developer's account.

No public transport facilities are proposed.

Pedestrian walkways have to be provided along the site frontage by the developer to the satisfaction of the CoJ.

11.2 Recommendations

It is recommended that:

- the developer carry out the proposed road upgrades to mitigate the effect of the development traffic;
- the developer construct pedestrian walkways in consultation with the relevant departments of CoJ; and
- this traffic assessment be approved.

REFERENCES

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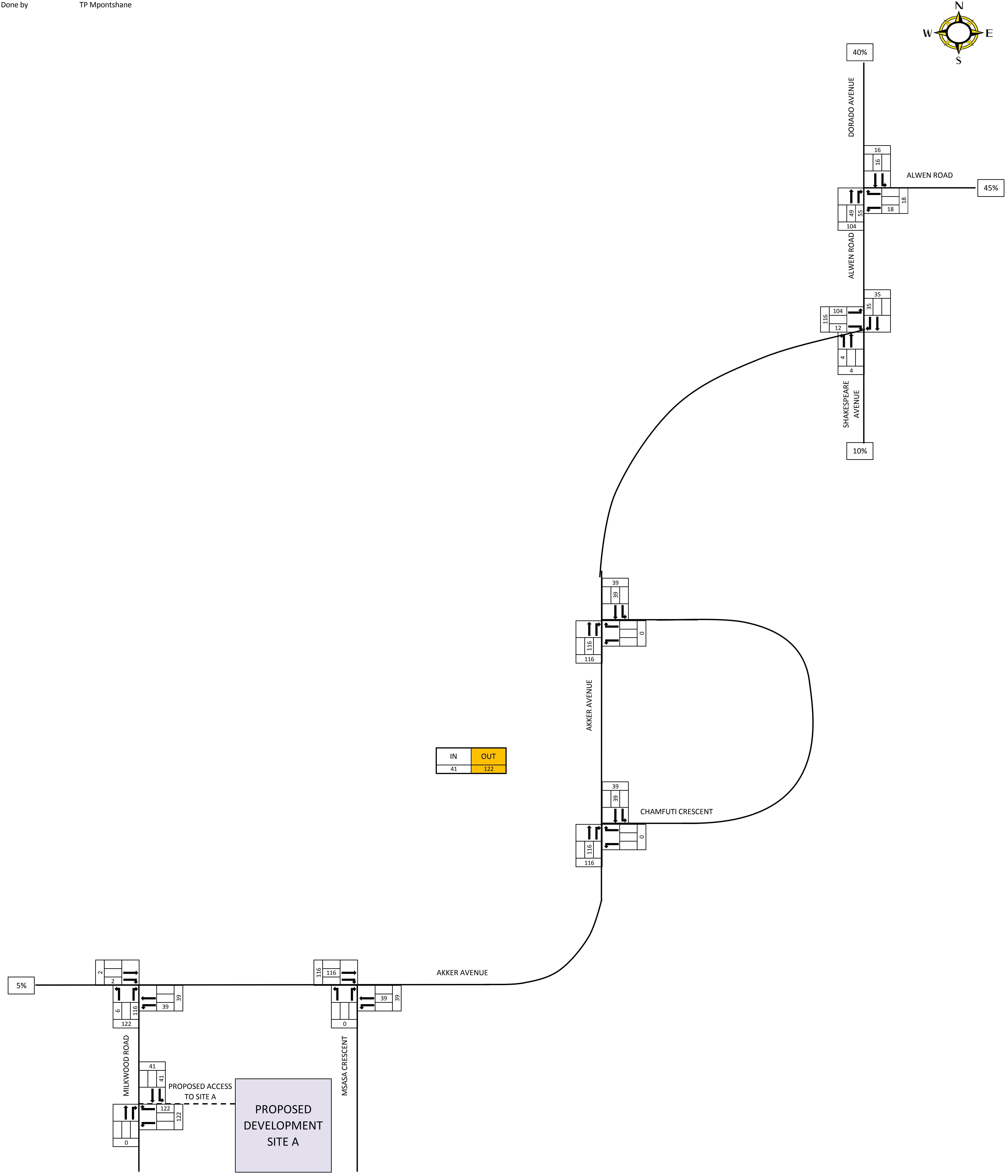
FIGURES

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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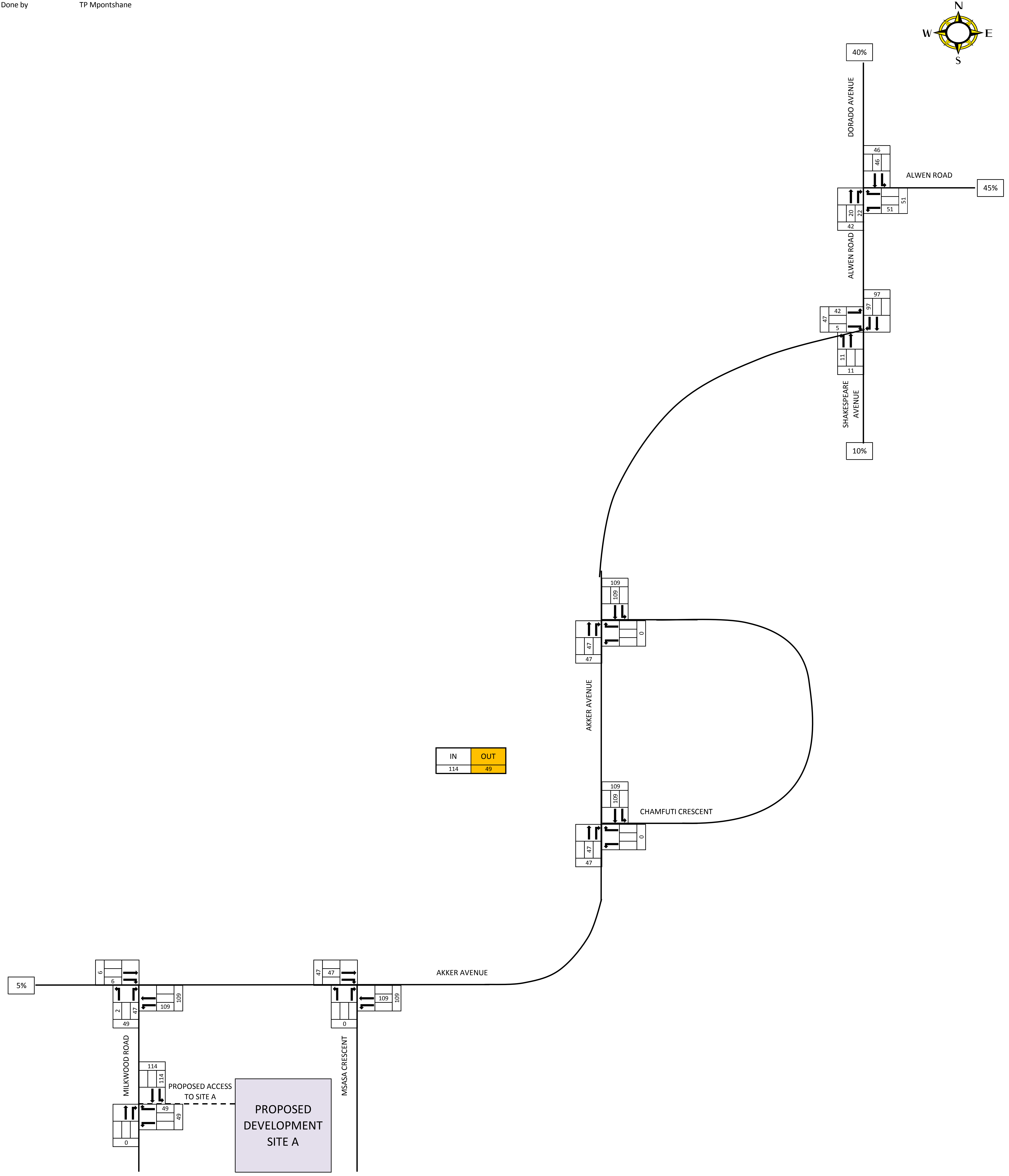
WEEKDAY MORNING PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.1

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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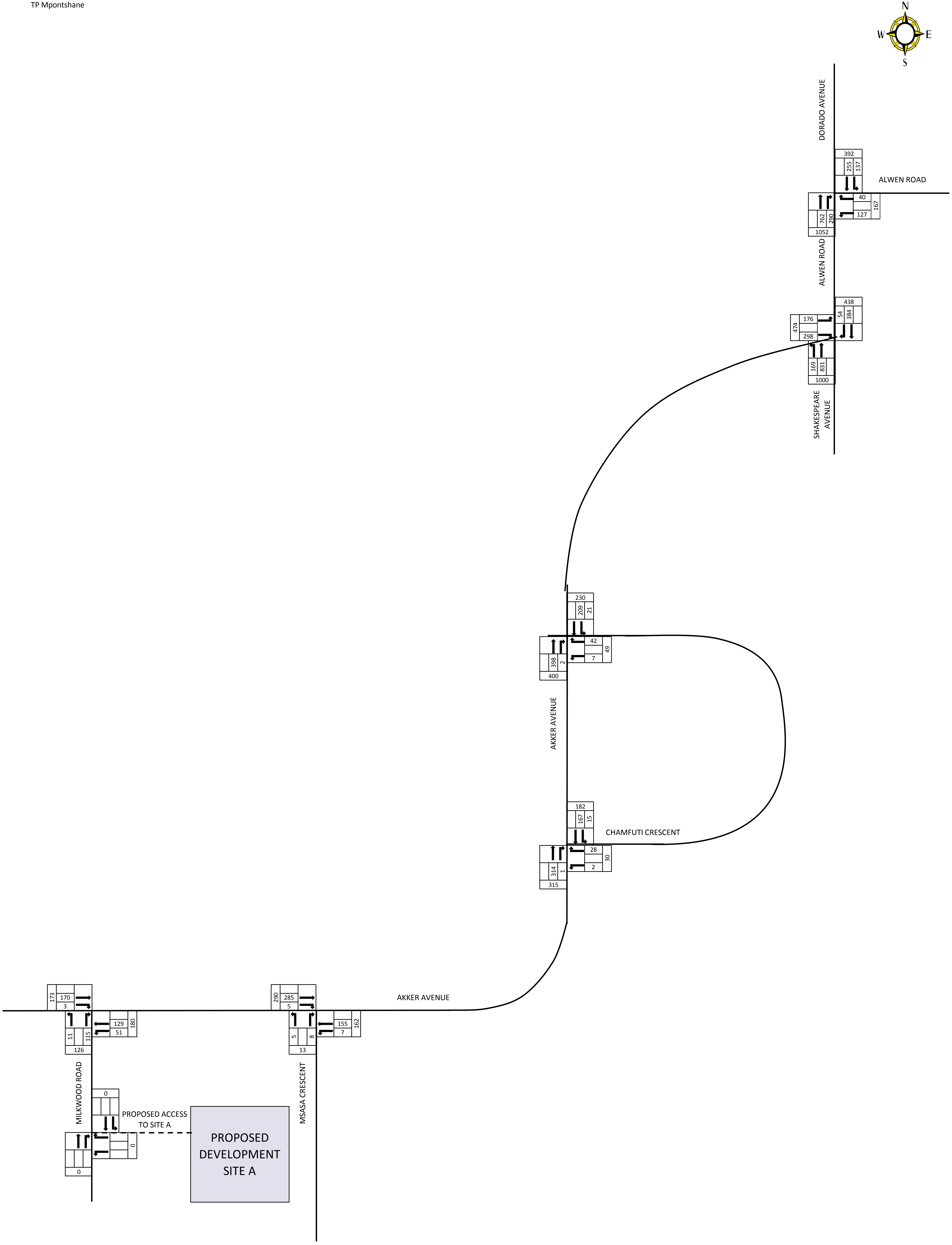
WEEKDAY AFTERNOON PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.2

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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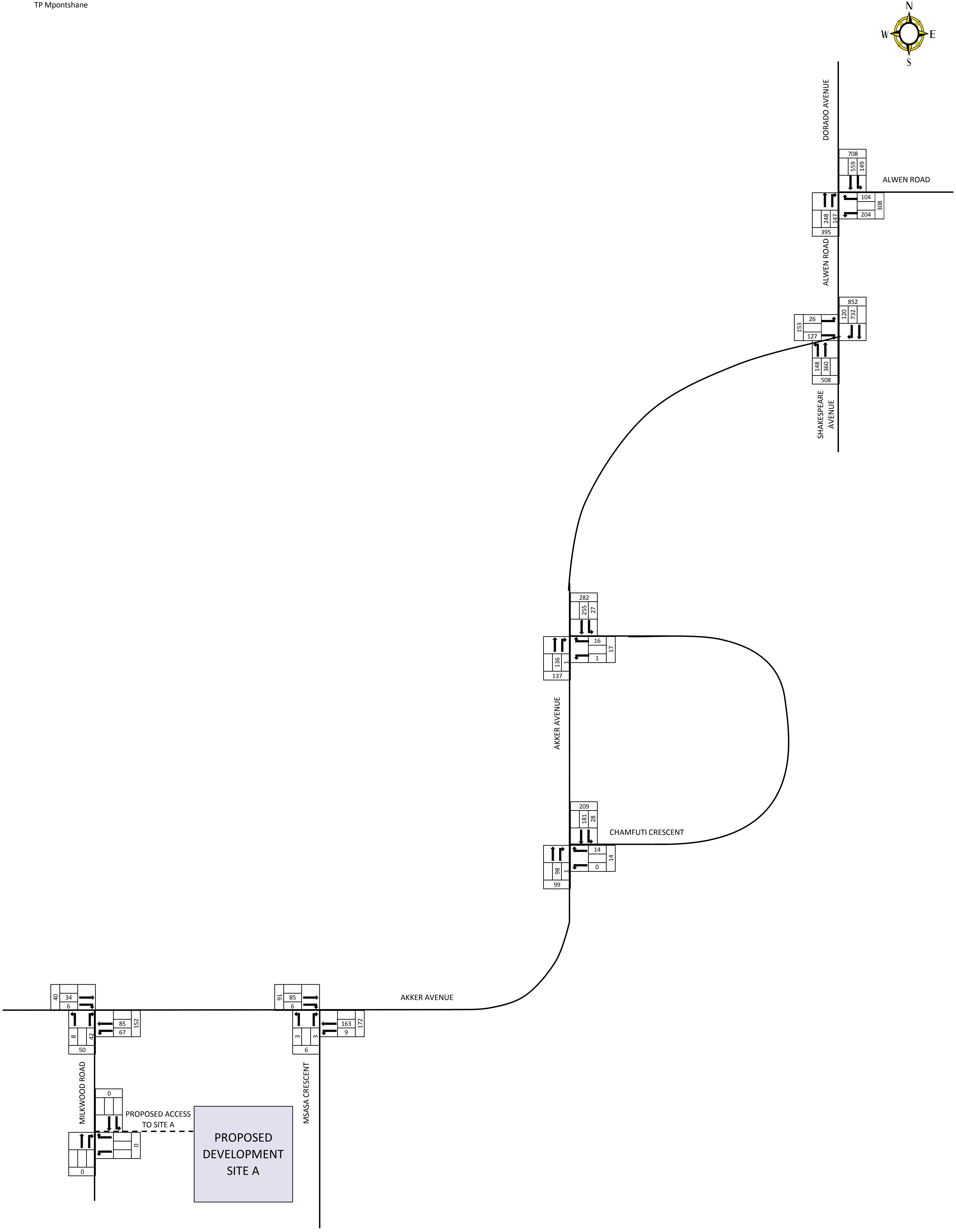
2016 WEEKDAY MORNING PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.1

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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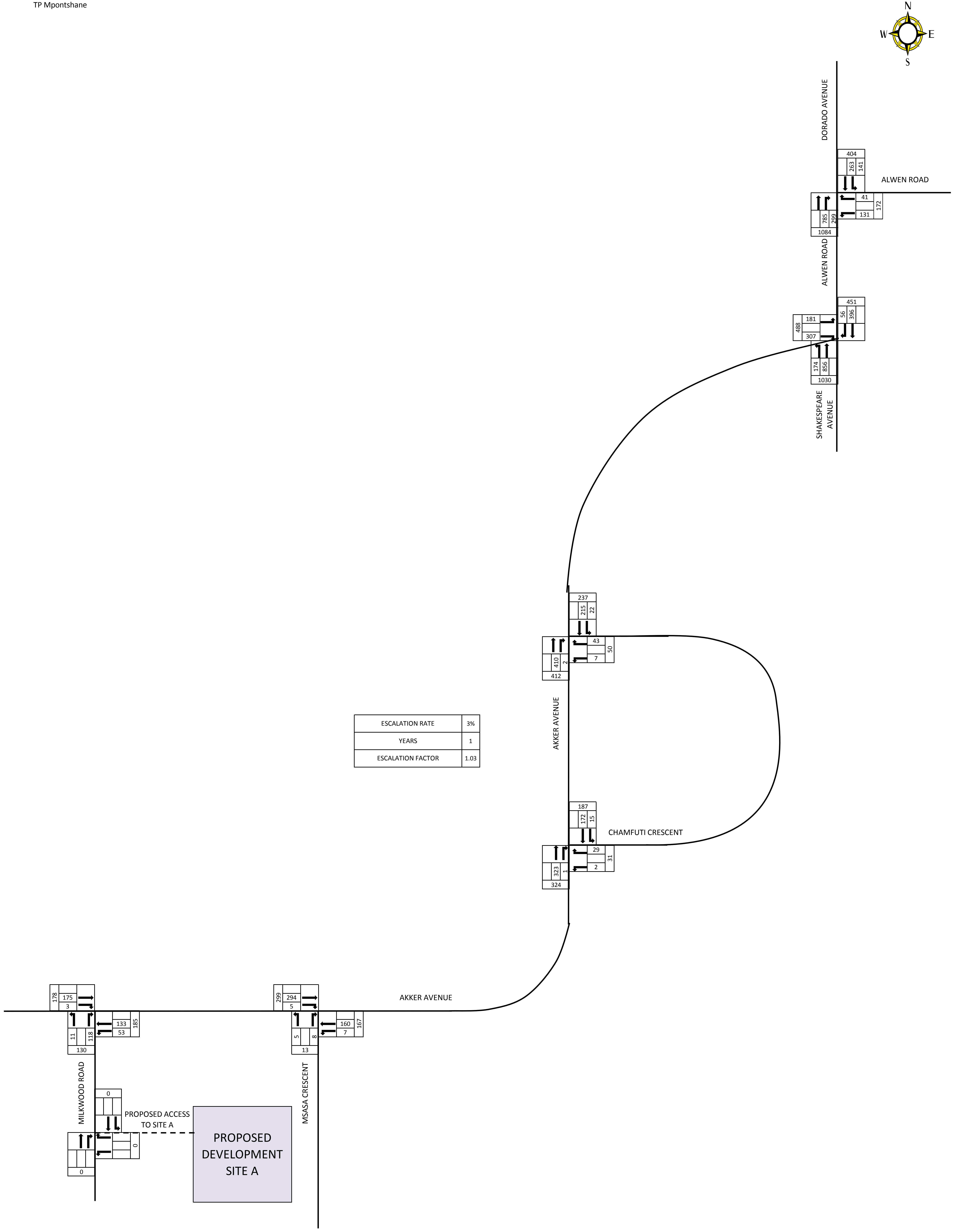
2016 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.2

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 08:47
Done by TP Mpontshane



ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

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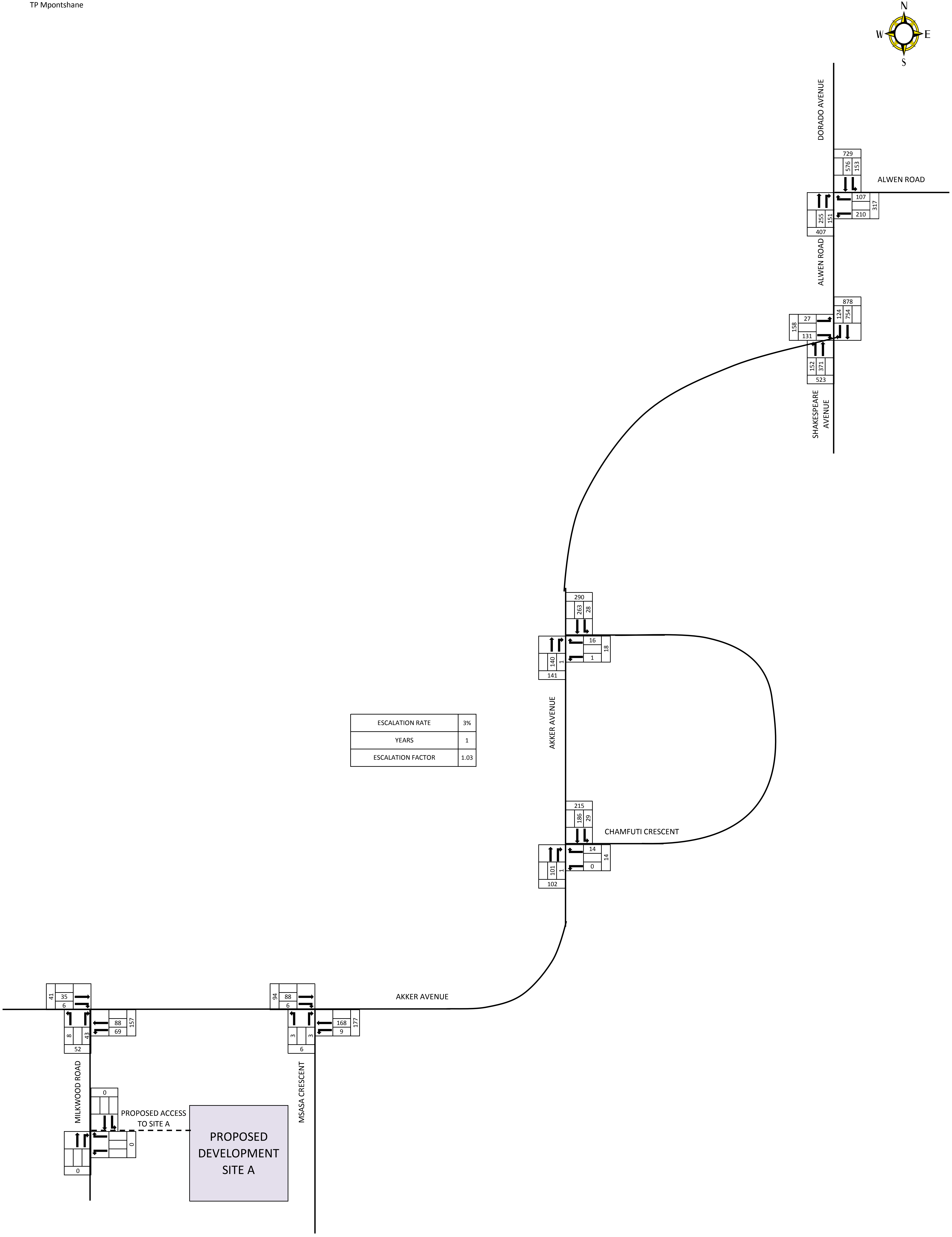
2017 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.3

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

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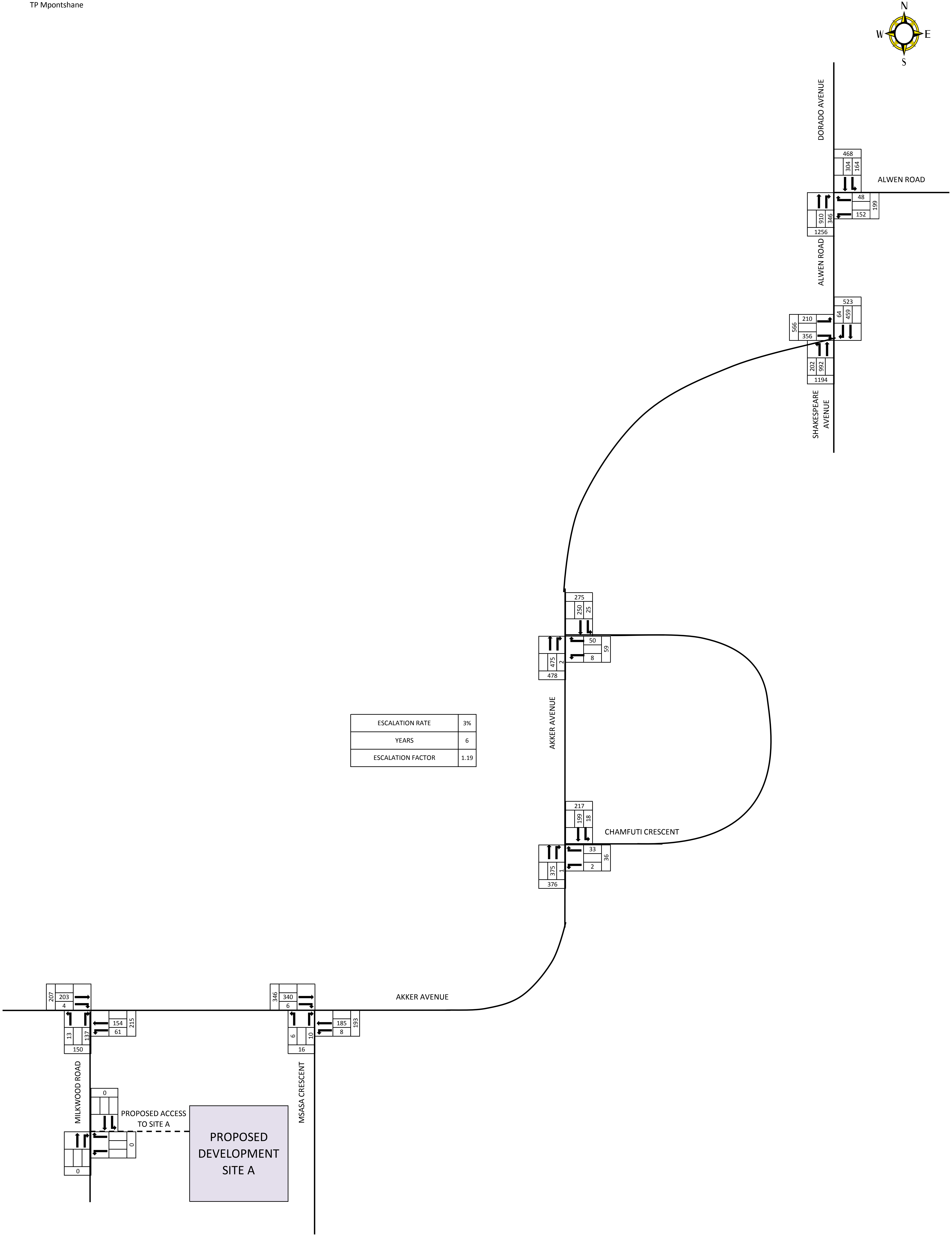
2017 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.4

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



ESCALATION RATE	3%
YEARS	6
ESCALATION FACTOR	1.19

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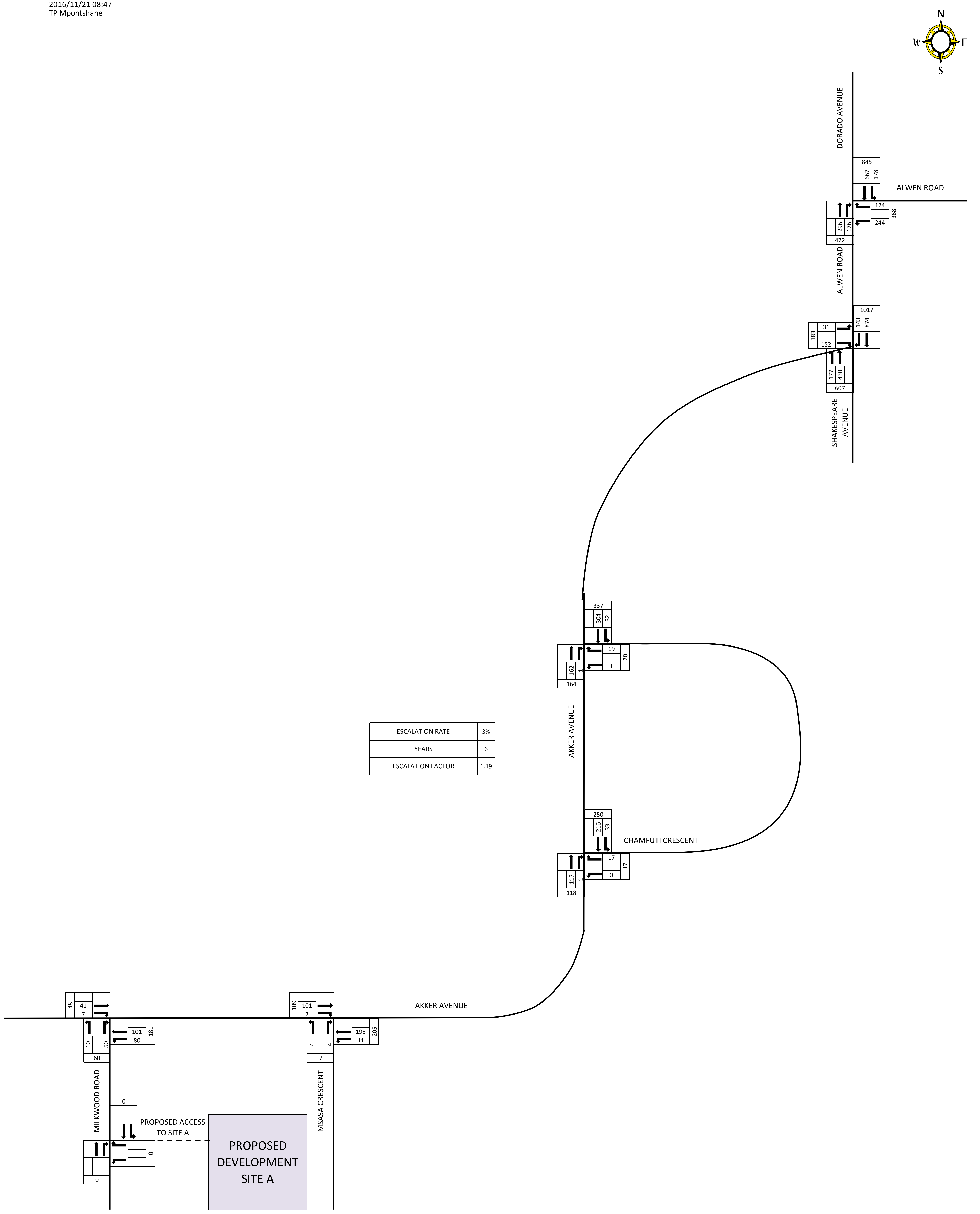
2022 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.5

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 08:47
Done by TP Mpontshane



ESCALATION RATE	3%
YEARS	6
ESCALATION FACTOR	1.19

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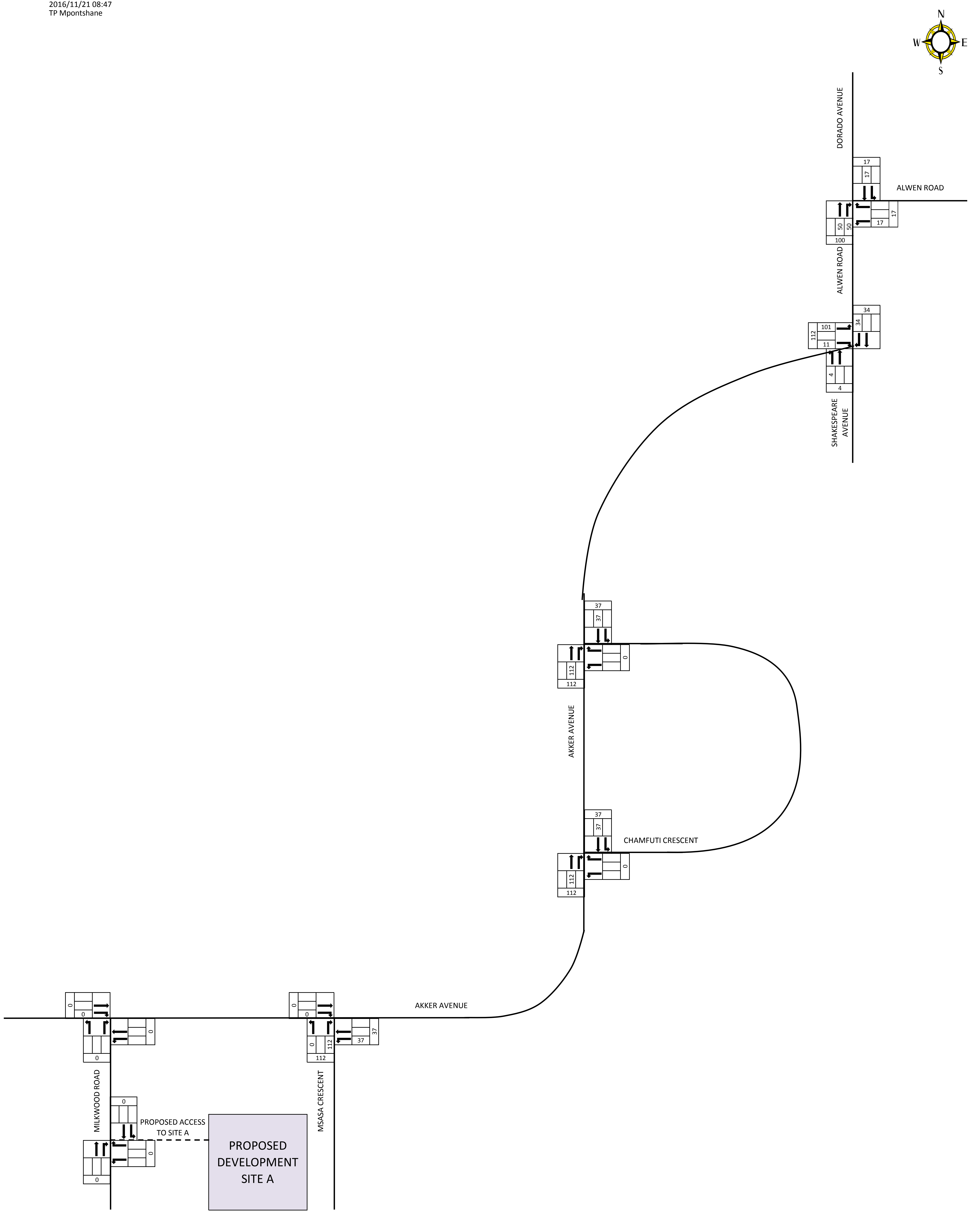
2022 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.6

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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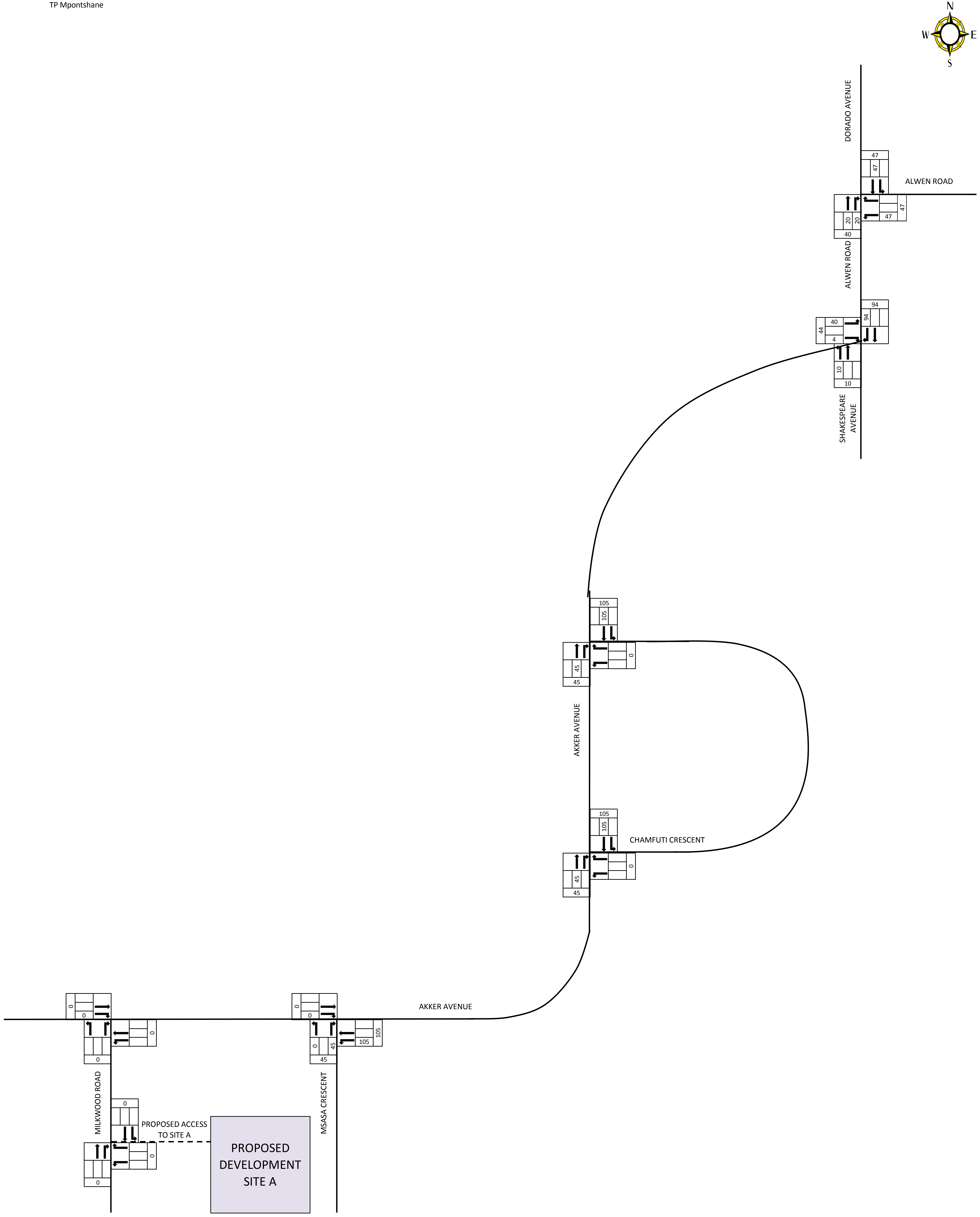
WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE

FIGURE 3.7

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 08:47
Done by TP Mpontshane



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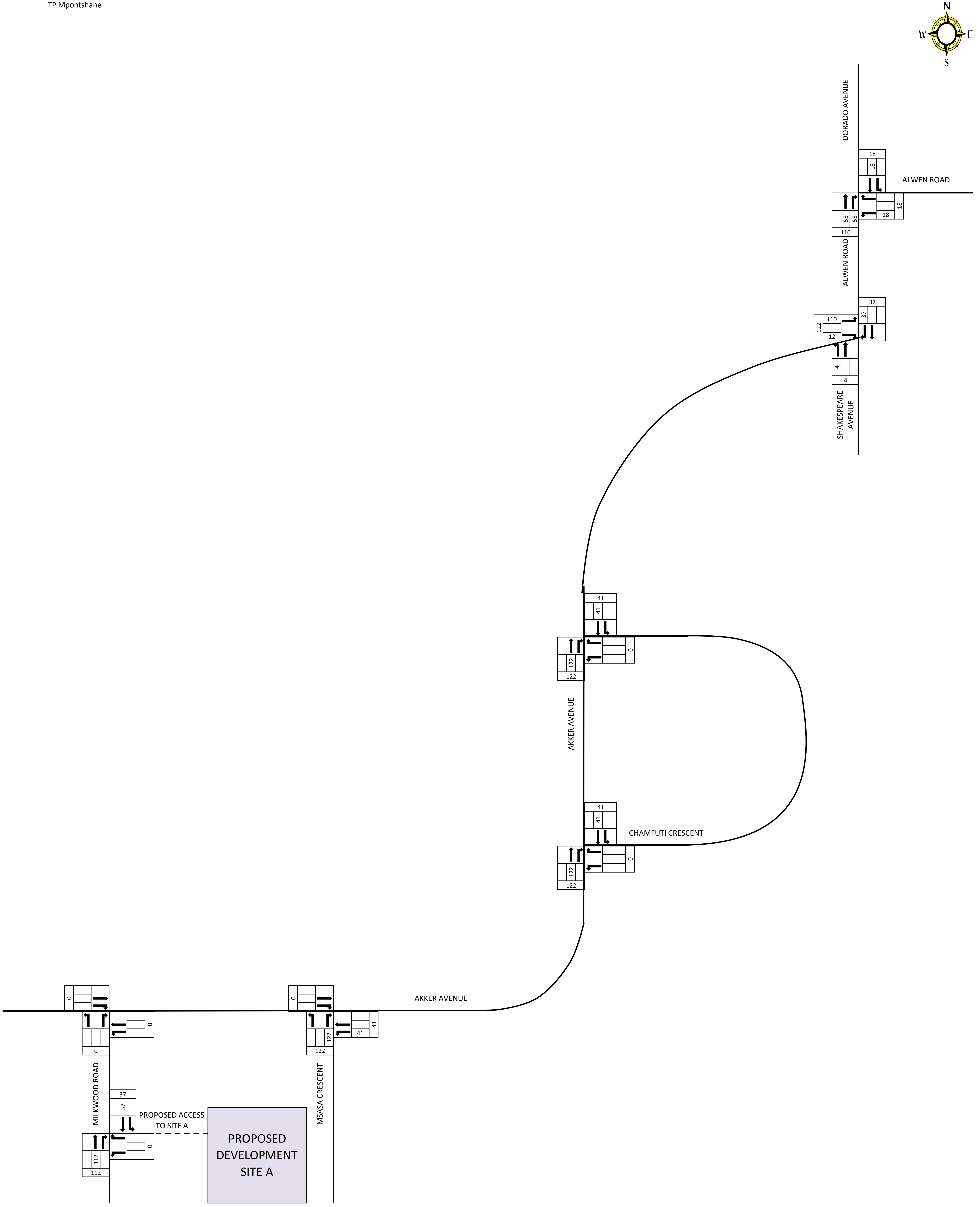
WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE

FIGURE 3.8

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 08:47
Done by TP Mpontshane



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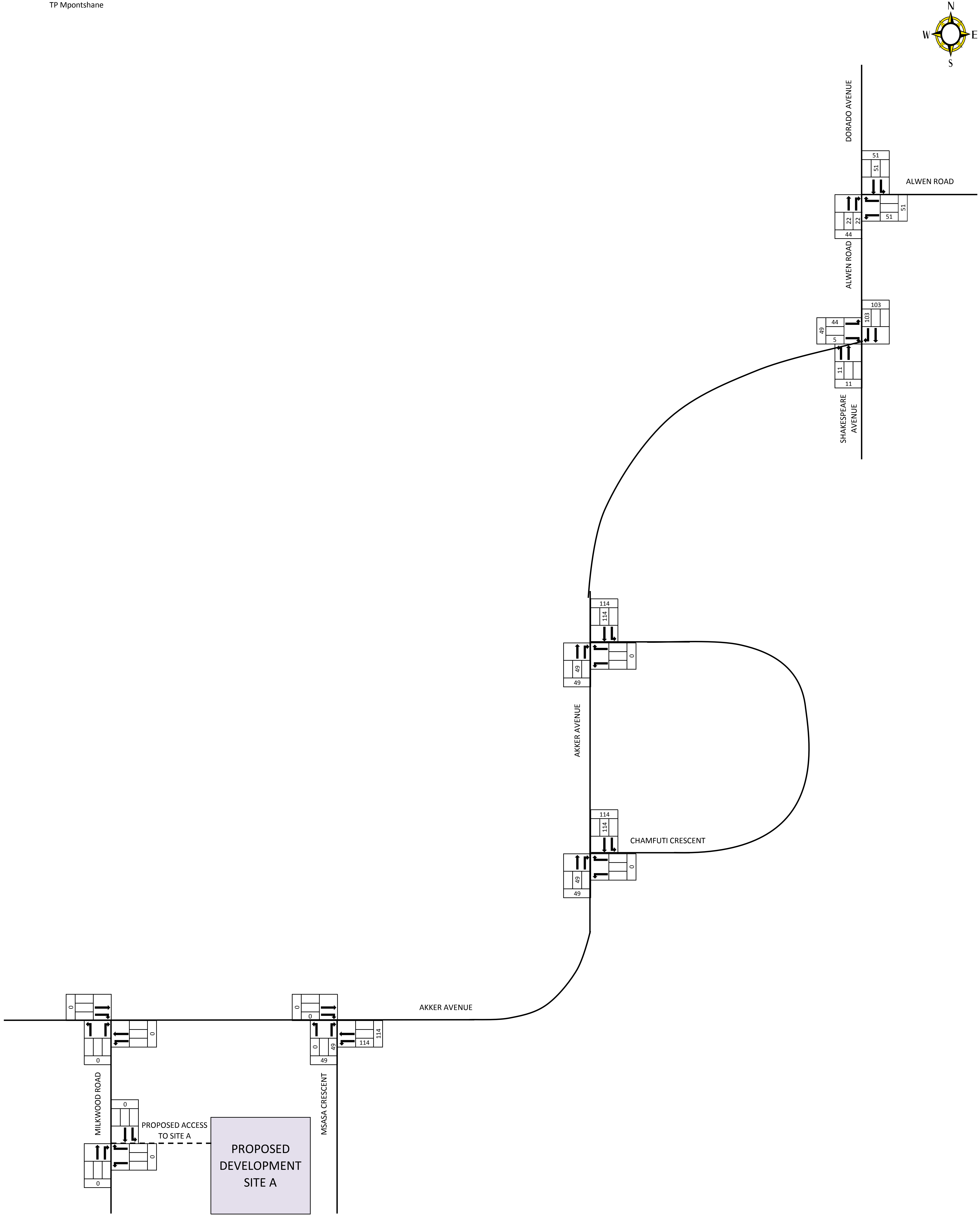
WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE

FIGURE 3.9

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 08:47
Done by TP Mpontshane



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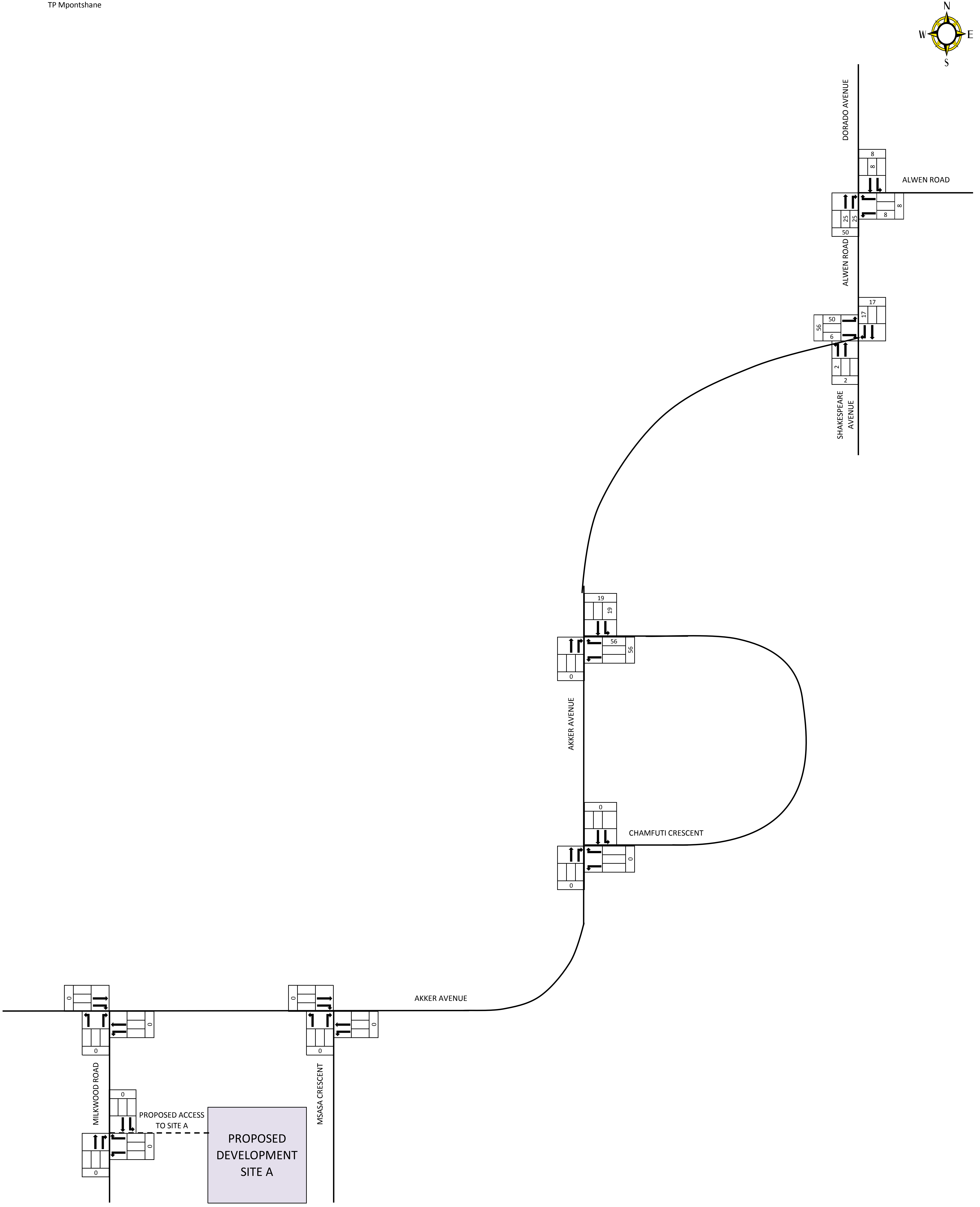
WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE

FIGURE 3.10

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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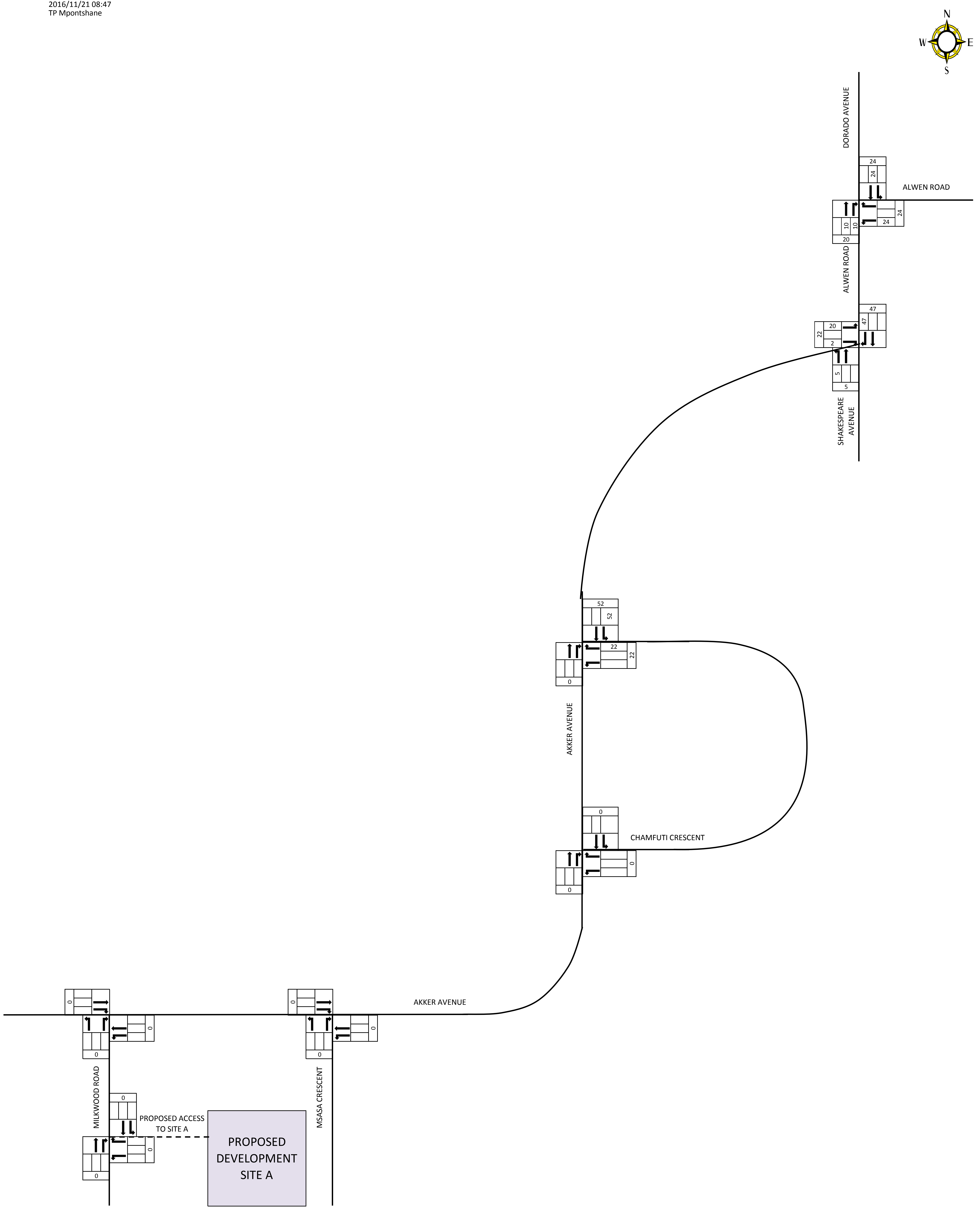
WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE

FIGURE 3.11

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 08:47
Done by TP Mpontshane



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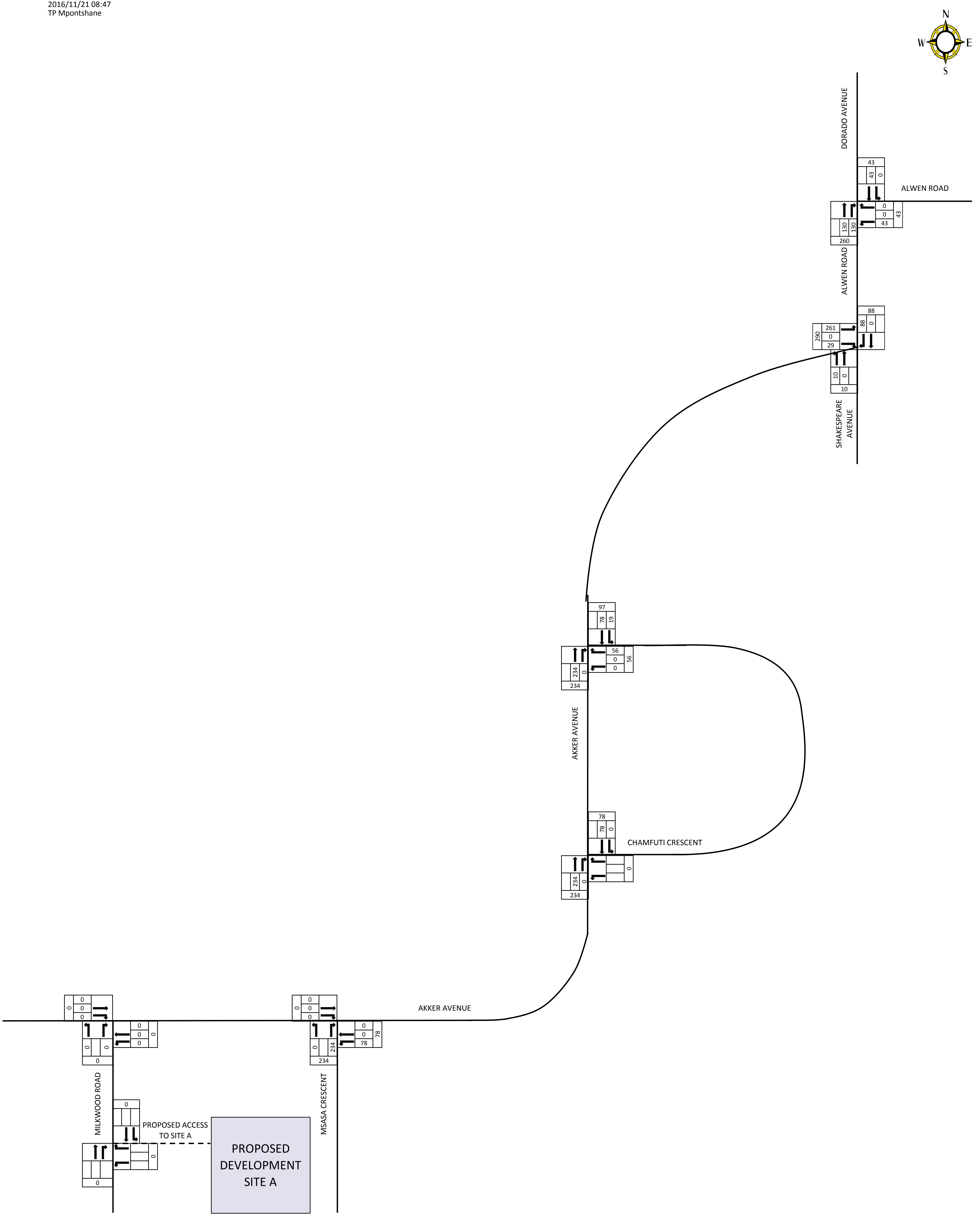
WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE

FIGURE 3.12

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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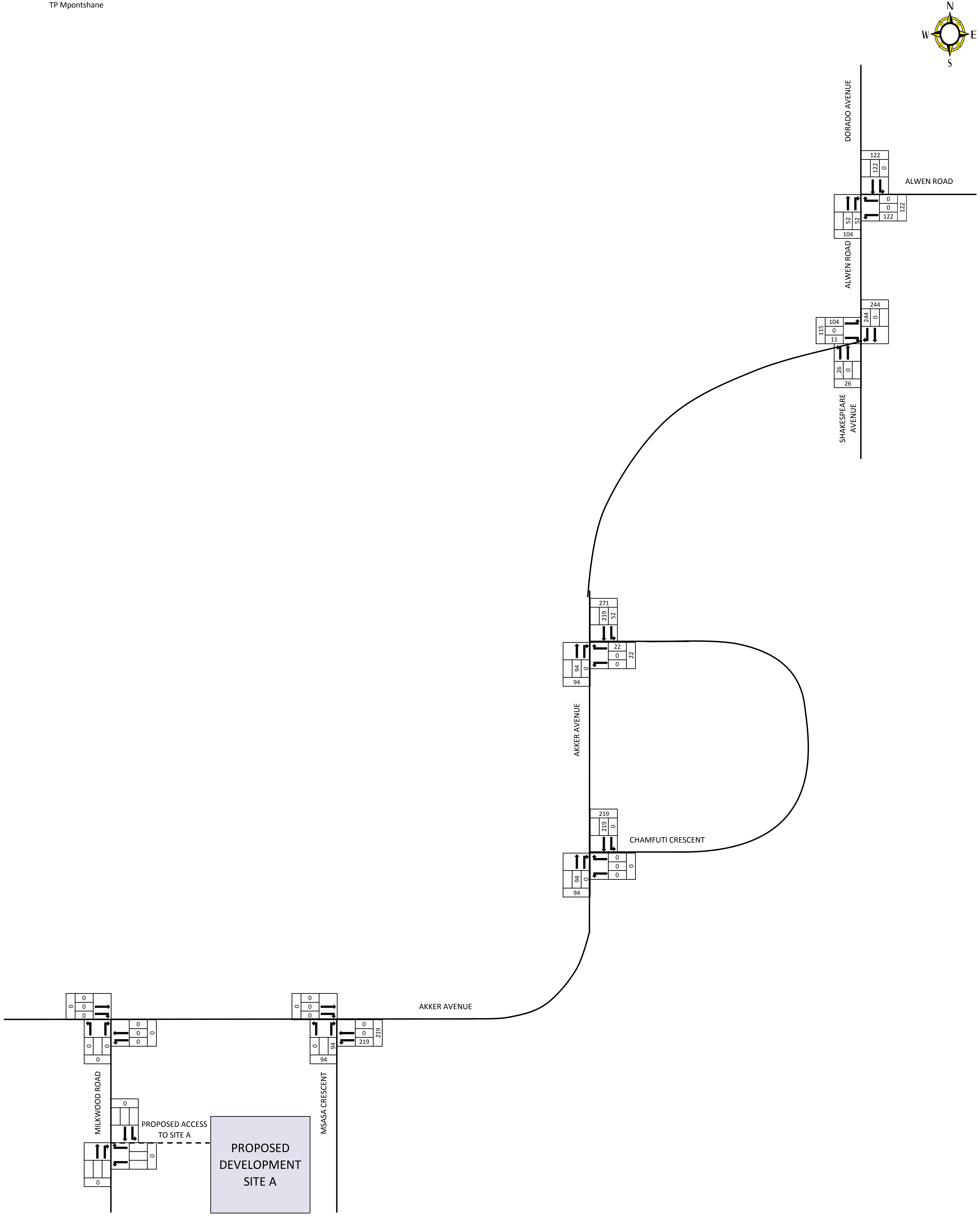
WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE

FIGURE 3.13

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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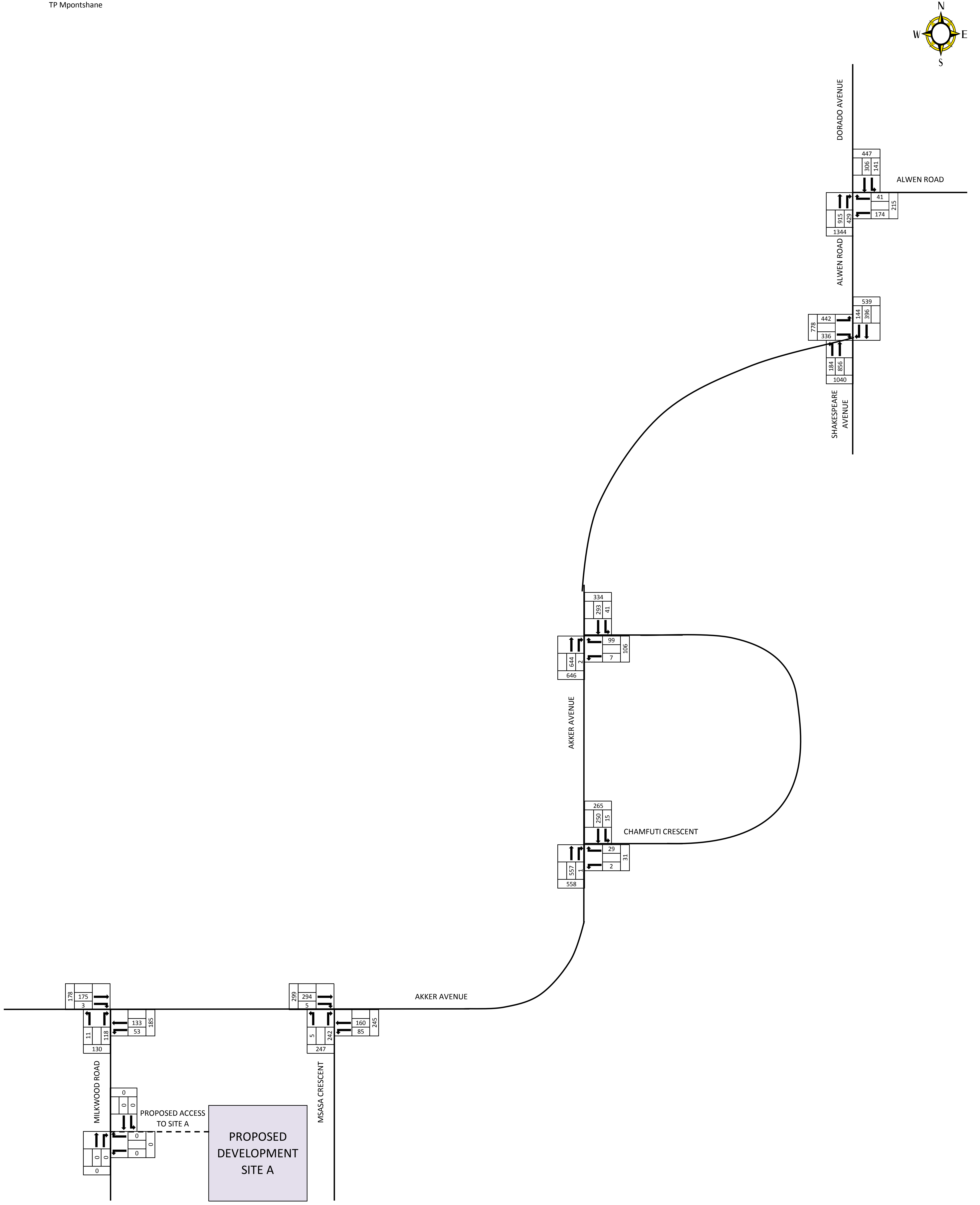
WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE

FIGURE 3.14

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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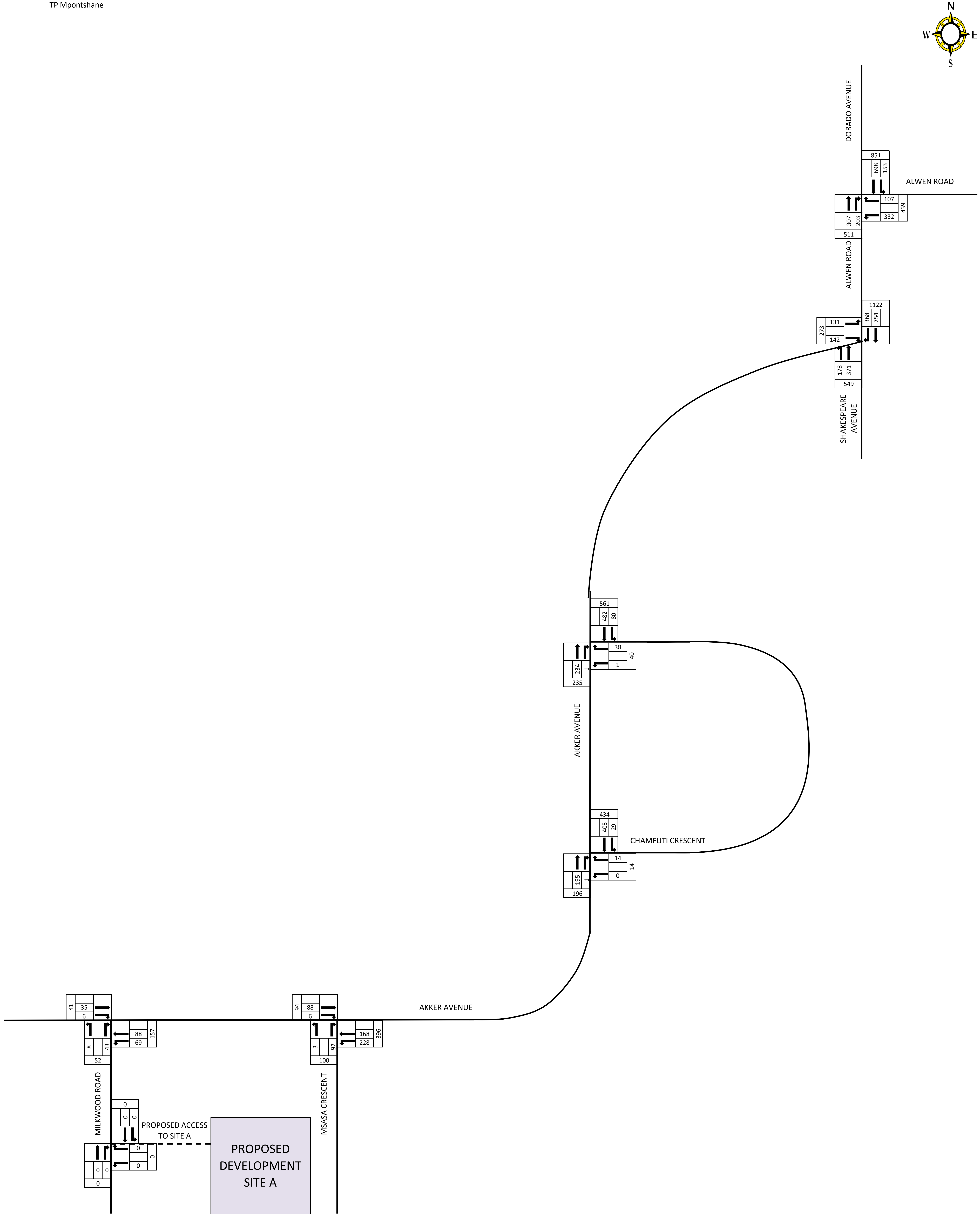
2017 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.15

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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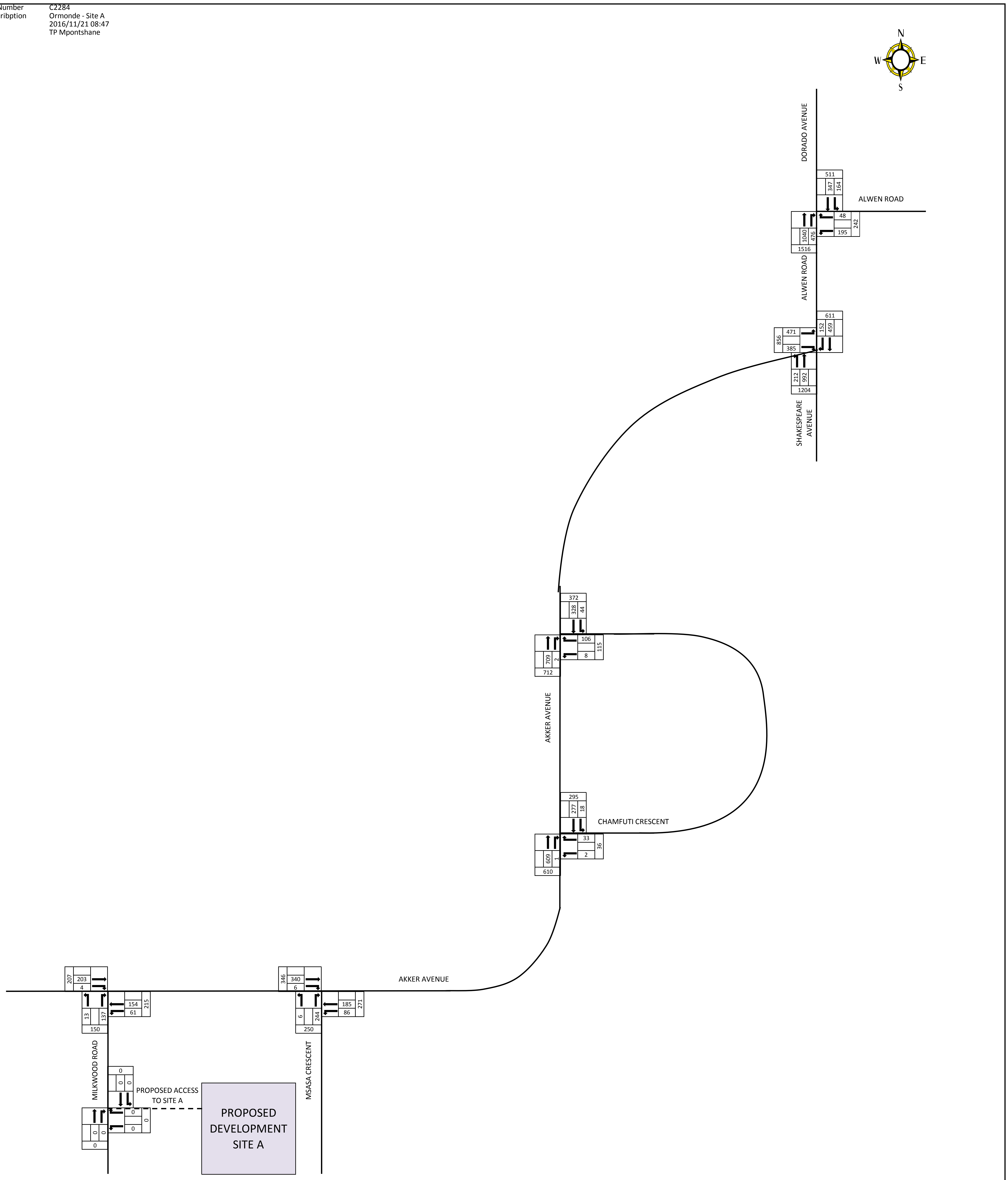
2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.16

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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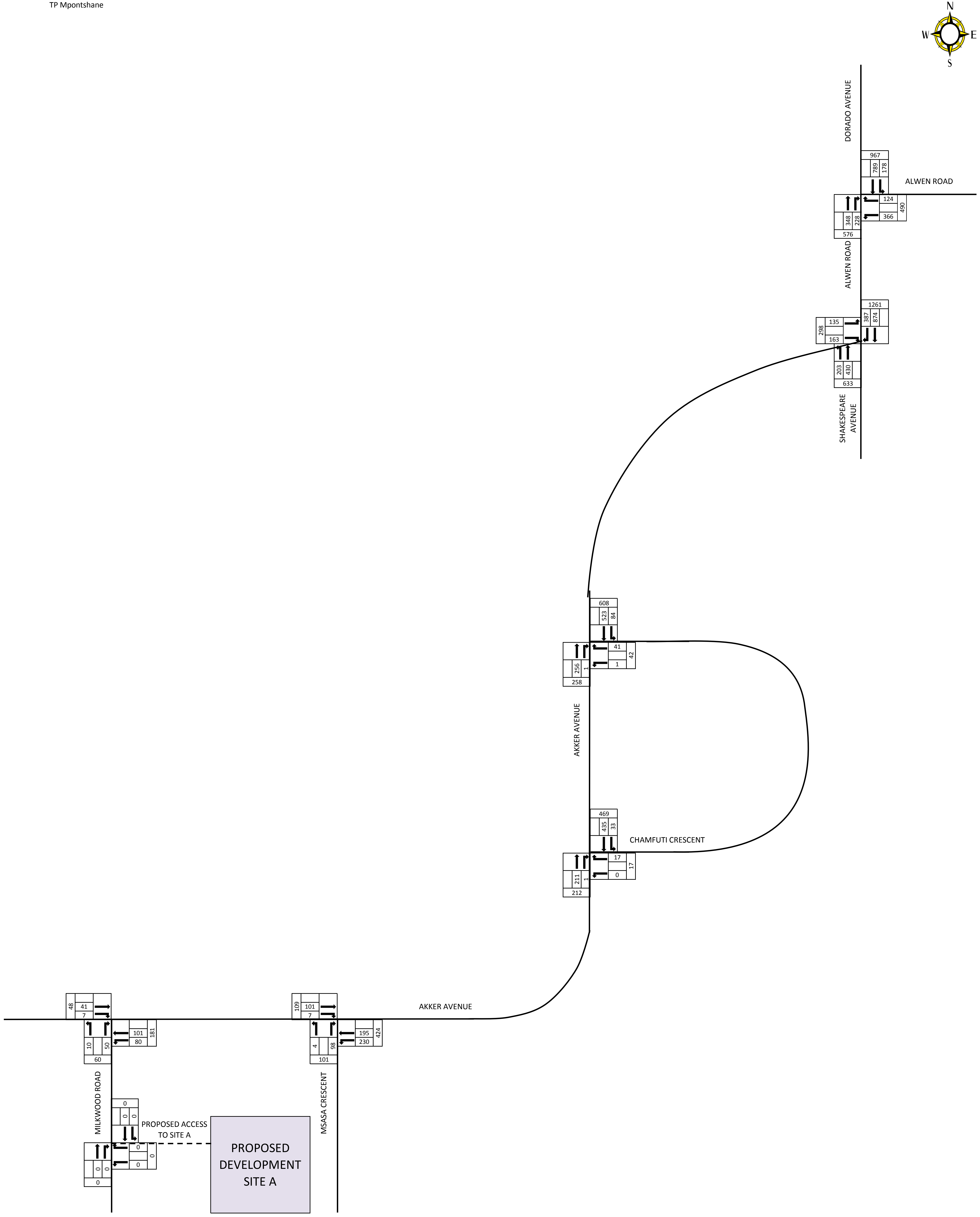
2022 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.17

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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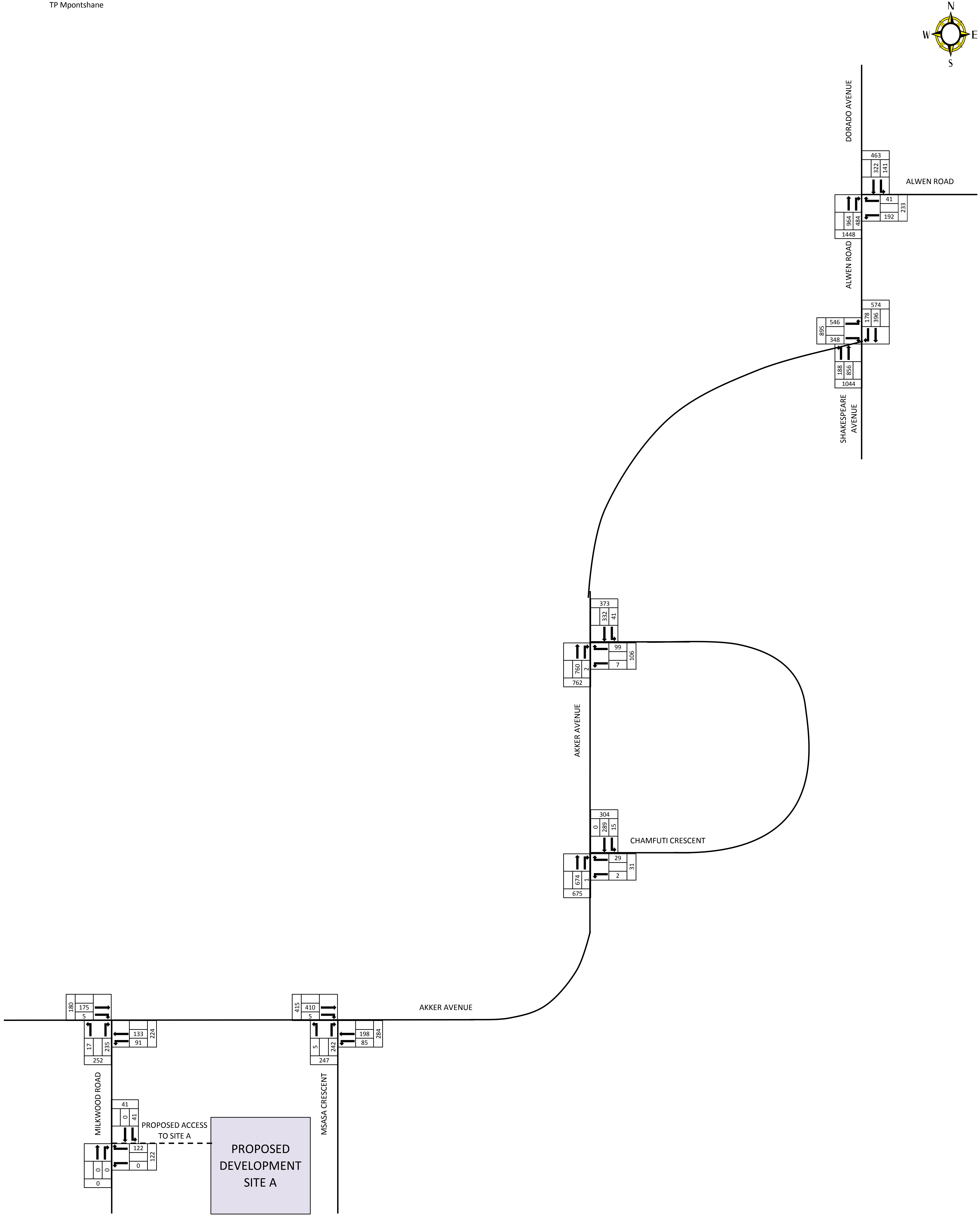
2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.18

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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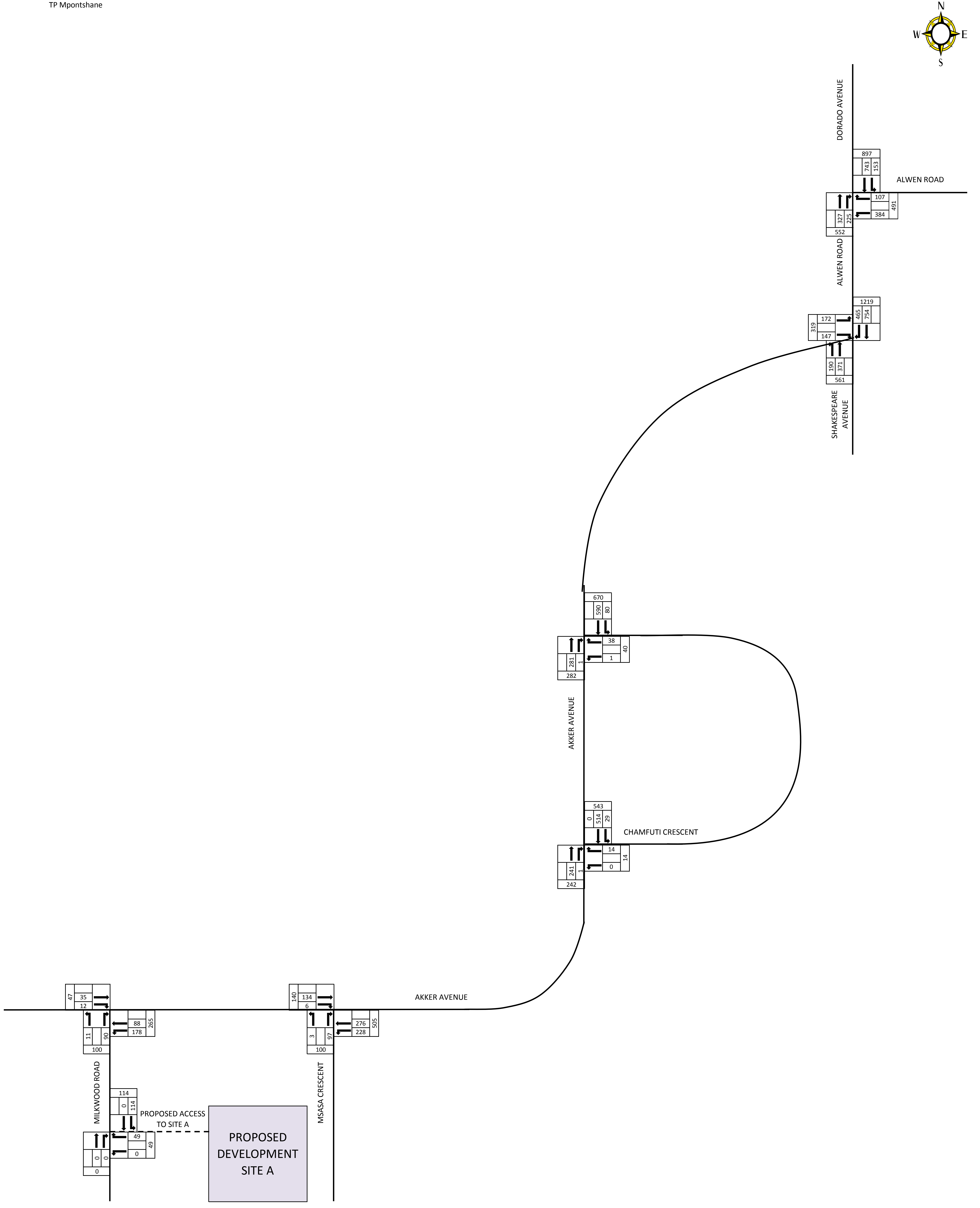
2017 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.19

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 08:47
Done by TP Mpontshane



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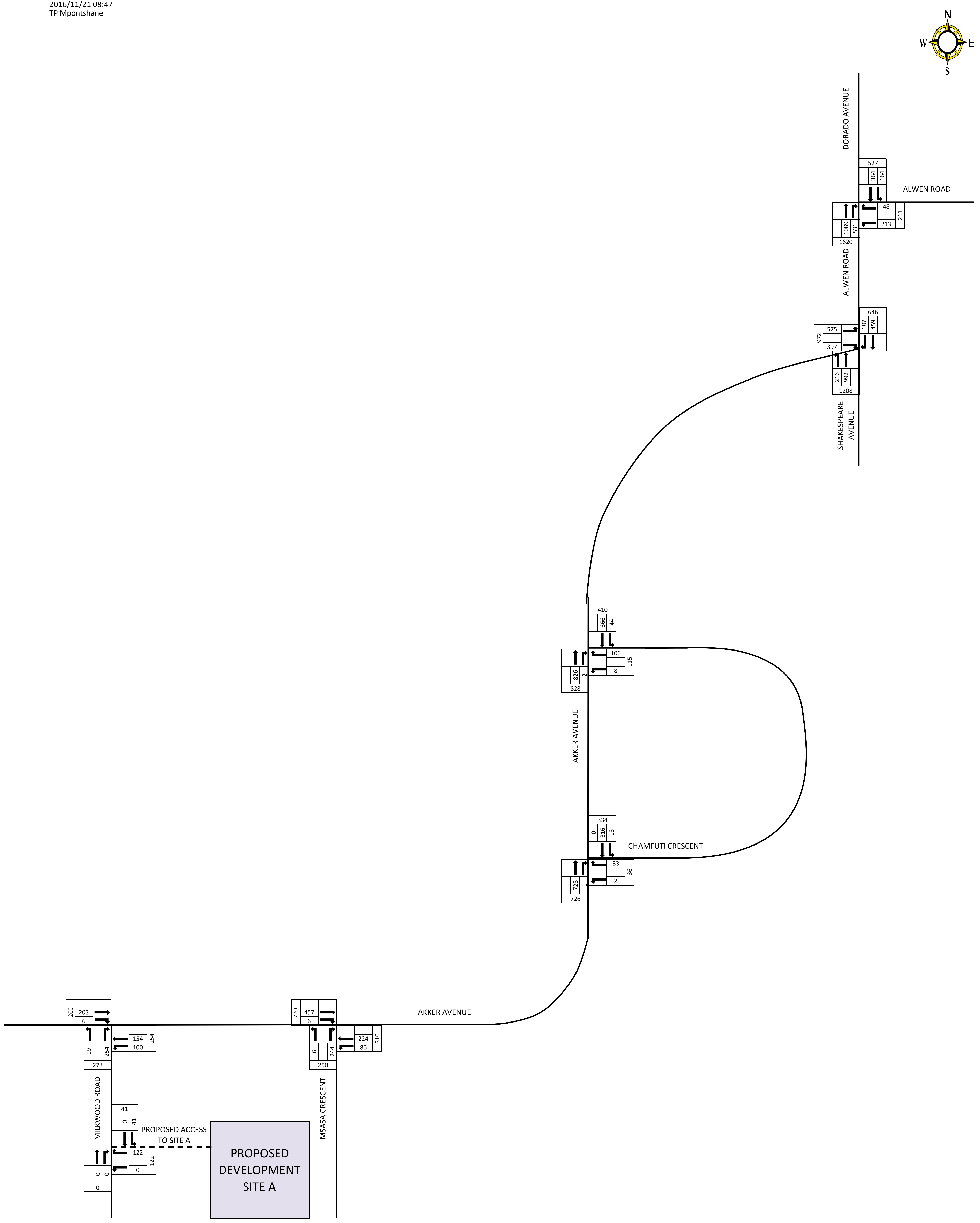
2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.20

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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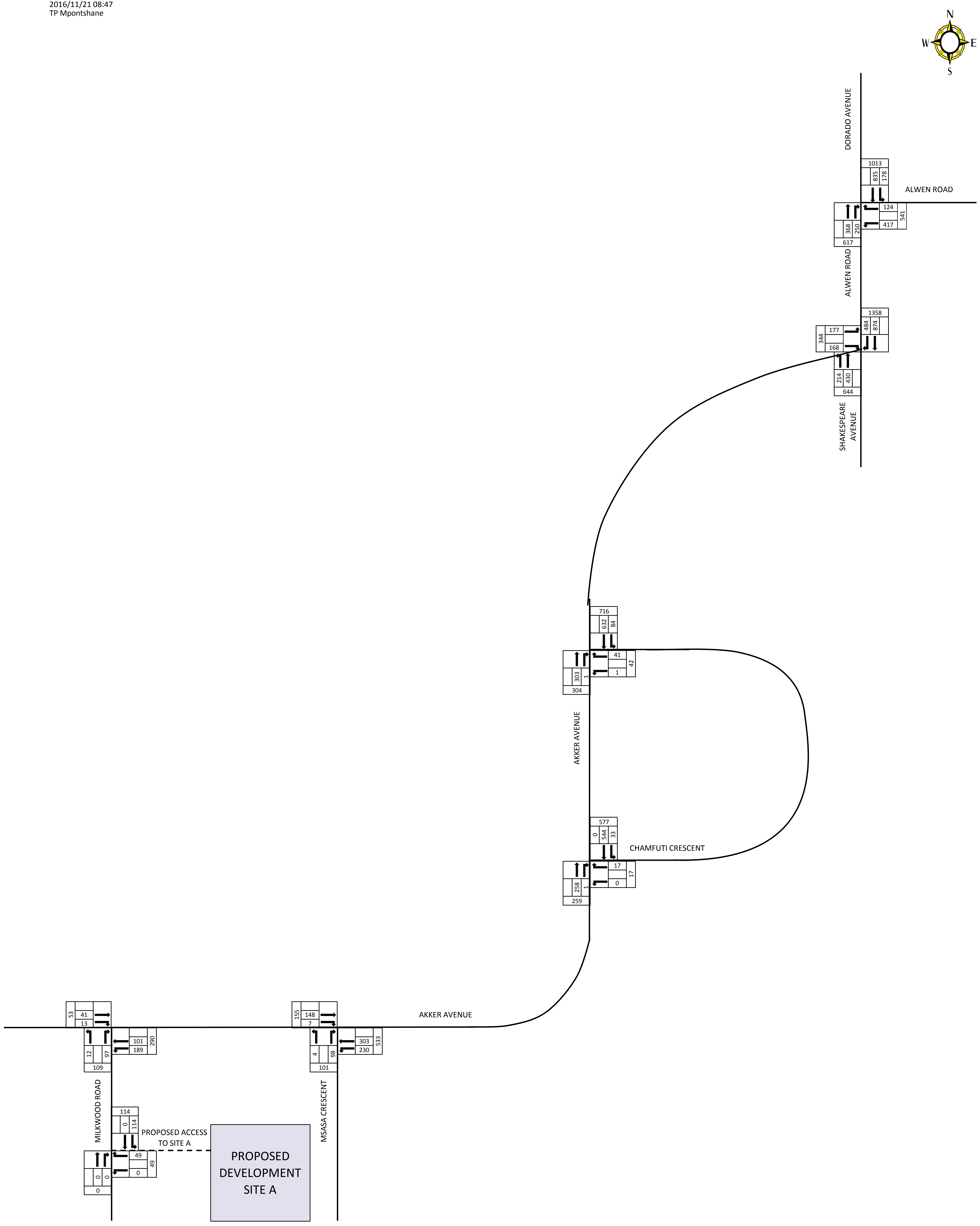
2022 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.21

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 08:47
Done by	TP Mpontshane



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2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.22

ANNEXURE A

TOWNSHIP LAYOUT PLAN

OCT 2016	-	ISSUED FOR APPROVAL
DATE	NO	REVISION

CLIENT

Kale Developments

LOCAL AUTHORITY

Joburg
a world class African city

Civil Concepts (Pty) Ltd
Consulting Civil & Structural Engineers
PO Box 36148, Menlo Park, 0102
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PROJECT

ORMONDE SOUTH

SITE B ON ERF 962 & 963

DRAWING TITLE

SITE LAYOUT PLAN

DRAWING NO C2284-B-201

REV.NO. -

SCALE	1:500	DESIGNED	A.OOSTHUIZEN
		DRAWN	A.OOSTHUIZEN
DATE	OCTOBER 2016	CHECKED	L.ZIETSMAN

ANNEXURE B

CONDITIONS OF ESTABLISHMENT

1. EXECUTIVE SUMMARY

1.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of The City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the rezoning of Erven 962 & Erf 963, Ormonde Extension 22, subject to certain conditions.

1.2 Application is made for the amendment of the Johannesburg Town-Planning Scheme, 1979, by way of the rezoning of the subject property from "Residential 3" with a density of "25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%" to "Residential 3" with a density of "110 dwelling units per hectare", and subject to the following conditions:

Floor Area Ratio	:	0.7
Coverage	:	30%
Height	:	Four (4) storeys
Parking requirements	:	1.3 parking bays per unit
Building lines	:	In accordance with an approved site development plan
Number of Units	:	176 units

1.3 The purpose of this application is to obtain the appropriate land use rights to enable the registered property owner to develop a higher residential development on the erf.

1.4 Note that a separate application for the consolidation of the two properties, in terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

1.5 This memorandum provides the relevant property information, and motivates the merits of the development proposal from a development planning perspective.

1.6 The consolidation application is submitted separately and will be handled as a separate application, but will form part of the rezoning of the erven.

2. PROPERTY INFORMATION

2.1 Locality

The subject property is situated along Msasa Crescent in Ormonde, towards the north of the M1 Freeway and towards the south of Akker Street. A Locality Plan is attached hereto as **Annexure A**. The site is situated in close proximity to Rand Show Road, Nasrec Road and the M1-Highway.

The figure below gives the context of the application site.

Figure 1: Aerial view of the property

2.2 Property description, ownership and size

Details pertaining to property description, ownership and extent of the subject properties are provided in the table below:

PROPERTY DESCRIPTION	REGISTERED OWNER	DEED OF TRANSFER NUMBER	SIZE
Ormonde X22: Erf 962	Matla Projects (Pty) Ltd	T27309/2009	5 942m^2
Ormonde X22: Erf 963	Matla Projects (Pty) Ltd	T27310/2009	10 274m^2

Deeds of Transfer T27309/2009 and T27310/2009 are attached as **Annexures B** to form part of the application documentation.

The signed and completed Company Resolution, Power of Attorney and Proof of Directors are attached as **Annexure C** respectively.

2.3 Zoning

The subject properties are currently zoned "Residential 3", in terms of the Johannesburg Town-Planning Scheme, 1979, subject to the following conditions:

Floor Area Ratio : 0.4

Density : 25 Dwelling units per ha

Coverage : 30%

Height : Three storeys

The relevant Zoning Certificate is attached hereto as **Annexure D.**

The zoning regime of the surrounding area includes the following zonings:

"Residential 1"; "Residential 3;" "Business 3"; "Institutional" and "Municipal".

2.4 Land Use

A land use plan, based on a visual survey, is attached as **Annexure E**. The subject property is currently vacant, while surrounding land uses include:

- Dwelling houses;
- Open Spaces; and
- Public Roads.

It becomes clear that the area is a predominantly residential area. The proposal to develop the subject property for higher density residential uses will contribute to the livelihood of the area and create additional housing opportunities.

The proposed land-use will have no detrimental effect on any of the surround properties on municipal infrastructure.

3. BONDS, CONDITIONS OF TITLE AND SERVITUDES

3.1 Mortgage Bond

There is currently no bond registered over the property. The consent from a bondholder is therefore not required.

3.2 Conditions of title

The subject property is not affected by any conditions of title which may prove to be restrictive to the proposed development. No removal of restrictions is therefore required.

3.3 Servitudes

In terms of Deed of Transfers T27309/2009 and T27310/2009 the properties are subject to the following servitude:

- A servitude for sewer and other municipal services purposes 2 metres wide, in favour of the City Council of Johannesburg along any two boundaries other than a street boundary.

This servitude will be retained and accommodated in the development proposal and on the final Site Development Plan.

4. DEVELOPMENT PROPOSAL

4.1 Application Particulars and Development Proposal

4.1.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the simultaneous rezoning of Erf 962 & Erf 963, Ormonde Extension 22, subject to the following conditions:

Floor Area Ratio : 0.7

Coverage : 30%

Height : Four (4) storeys

Parking requirements : 1.3 parking bays per unit

Building lines : In accordance with an approved site development plan

Number of Units : 176 units

4.1.2 Al parking and manoeuvring space will be provide on-site. No parking within the road reserve will be allowed or will be necessary. The proposed site plan is attached hereto as **Annexure G.** Parking will be provided at a ratio of 1.3 parking bays per unit, with a total of 229 parking bays being required. A total of 230 parking bays will be provided on-site, to ensure sufficient parking for residents and visitors. All parking and manoeuvring space will be covered with a permanent dust-free surface.

4.1.3 Access to the development will be obtained via Msasa Crescent. Access will be provided to the satisfaction of the municipality. The current road network is sufficient to accommodate the minimal increase in traffic. If so required by Council, upgrades to the road and services network can be made through a service agreement between the developer and Council.

4.1.3 Sufficient opens space (gardens / lawns) will be provide within the development, as per the minimum requirements from Council.

4.1.4 The privacy of the neighbouring properties will be protected by means of building design, landscaping and building lines. The height of the proposed development will be limited four storeys and building lines will be determined in accordance with an approved site development plan.

4.2 Existing vs Proposed Zoning

4.2.1 The proposed scheme document is attached hereto as **Annexure F**.

4.2.2 The type of housing unit that is being proposed is IHS C-Type (3-4 levels). The design of the units will be done by Boogertman & Partners Architects. A formal Site Development Plan and Building Plans will be submitted to Council after approval of the rezoning application. A concept plan is attached to form part of the application documentation.

4.2.3 The following table compares the current and proposed land use rights:

CURRENT ZONING	PROPOSED ZONING
Existing Zoning: "Residential 3"	**Proposed Zoning:** "Residential 3"
Permitted land uses: Residential dwelling units	**Permitted land uses:** Residential dwelling units
Permitted Density: 25 units/ha	**Proposed Density:** 110 units/ha
Number of Units allowed: 40 sectional title units	**Number of Units allowed:** 176 sectional title units
Height Restriction: Three (3) storeys	**Proposed Height Restriction:** Four (4) storeys
Coverage: 30%	**Proposed Coverage:** 30%
Floor Area Ratio: 0.4	**Proposed Floor Area Ratio:** 0.7
Parking: 1 parking space per dwelling unit of 3 or less habitable rooms. 2 parking space per dwelling unit of 4 or more habitable rooms. Plus 0.3 parking spaces per dwelling unit for visitors.	**Parking:** 1.3 parking bays per unit Required: 229 Provided: 230
Building lines: 0m on all street fronts	**Building lines:** In accordance with an approved site development plan

5. MUNICIPAL SERVICES

5.1 The region is generally well provided with civil service infrastructure. Development pressure in this area challenges the rate at which bulk infrastructure can be provided to accommodate expansion. Existing infrastructure will however be capable of accommodating the proposed additional land-use rights.

5.2 During the application stage, the different engineering departments will get an opportunity to indicate whether additional engineering studies will be required before the rezoning application can be approved. If so required, Professional Engineers will be appointed to investigate the civil services and compile an outline scheme document.

5.3 The amount of Bulk Services Contributions for civil services payable to the City of Joburg will be determined with the finalisation of the rezoning application. Rebate will be given for the existing land use rights on the final amounts.

5.4 A formal Traffic Access Study is currently being prepared by the project Engineers. It will be submitted to Council as soon as it is received.

5.5 The electricity connection has been discussed with City Power. Adequate capacity is currently available for the development at the nearby Crown substation and an estimated 2,2 MVA can therefore be made available for planned developments in the Ormonde area, of which this application forms part of.

Capacity can be released by shifting loads between the various distributor areas. A feeder cable from Crown substation is thus not required. A detailed Electrical Report and/or Outline Scheme Report will be submitted to Council in due course.

6. POLICIES

6.1 National Development Guidelines

6.1.1 Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

Section 7 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) confirms that the following principles applies to spatial planning, land development and land use management:

7(a) The principle of spatial justice, whereby-:

(i) Past spatial and other development imbalances must be redressed through improved access to and use of land.

It is our opinion that the greater community of this area will benefit from the development proposal through various new housing opportunities.

The development will enhance the urban environment through the strengthening of the residential character and the creation of economic growth, as required in terms of local policies.

(ii) Spatial development frameworks and policies at all spheres of government must address the inclusion of persons and areas that were previously excluded, with an emphasis on informal settlements, former homeland areas and areas characterised by widespread poverty and deprivation.

(iii) Spatial planning mechanism, including land use schemes, must incorporate provisions that enable redress in access to land by disadvantaged communities and persons.

(iv) Land use management system must include all areas of a municipality and specifically include provisions that are flexible and appropriate for the management of disadvantaged areas, informal settlements and former homeland areas.

(v) Land development procedures must include provisions that accommodate access to secure tenure and incremental upgrading of informal areas.

(vi) A Municipal Planning Tribunal considering an application before it, may not be implemented or restricted in the exercise of its discretion solely on the ground that the value of land or property is affected by the outcome of the application.

Principles (7)(a) (ii) to (vi) relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(b) The principle of spatial sustainability, whereby spatial planning and land use management systems must-:

(i) Promote land development that is within the fiscal, institutional and administrative means of the Republic.

The proposed development, as motivated, complies with the fiscal, institutional and

administrative means of the Republic as well as the Local Authority.

Development Policies, related administration and laws (City of Johannesburg Municipal Planning By-Law, 2016) and the National Environmental Management Act, 1998, do allow for the application, as submitted, to be entertained. The proposal has been discussed with the relevant Town Planners at Council before submission of the application.

(ii) Ensure that special consideration is given to the protection of prime and unique agricultural land.

The property is surrounded by existing urban infrastructure, and in terms of Municipal policy, the property is earmarked for higher density residential development.

(iii) Uphold consistency of land use measures in accordance with environmental management instruments.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iv) Promote and stimulate the effective and equitable functioning of land markets.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(v) Consider all current and future cost to all parties for the provision of infrastructure and social services in land developments.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(vi) Promote land development in locations that are sustainable and limit urban sprawl.

The subject property is situated within Region F of the City of Johannesburg and will not contribute to urban sprawl. The proposed development will serve as infill development and will ensure the optimisation of developable land and municipal infrastructure and services.

According to relevant policy guidelines of the Municipality (i.e. the Municipal Spatial Development Framework), the subject property is earmarked for purposes of higher density residential development. The proposal is, in principle, supported by Council.

(vii) Result in communities that are viable.

The proposed development is in close proximity to other residential, some commercial, lifestyle and educational opportunities. It is furthermore located near public transport facilities and is also ideally situated in terms of the main through routes in the area (i.e. the M1-Highway).

7(c) The principle of efficiency, whereby-:

(i) Land development optimises the use of existing resources and infrastructure.

The proposed development will promote efficient land development, as it entails the development of residential housing in close proximity to commercial, lifestyle and educational opportunities. Public transport is also available in close proximity.

The subject property is strategically situated in relation to transportation routes, e.g. M1 Freeway and Shakespeare Avenue.

Civil services are also available in the area for the proposed development.

(ii) Decision-making procedures are designed to minimise negative financial, social, economic or environmental impacts.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iii) Development application procedures are efficient and streamlined and timeframes are adhered to by all parties.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(d) **Principal of spatial resilience** whereby flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(e) **The principle of good administration, whereby-:**

(i) All spheres of government ensure an integrated approach to land use and land development that is guided by the spatial planning and land use management systems as embodied in this Act.

This principle relates to obligations imposed on local government. The application will be circulated to relevant internal municipal departments for their comments.

(ii) All government departments must provide their sector inputs and comply with any other prescribed requirements during the preparation or amendment of spatial planning frameworks.

This principle relates to obligations imposed on local government.

(iii) The requirements of any law relating to land development and land use are met timeously.

This principle relates to obligations imposed on local government.

(iv) The preparation and amendment of spatial plans, policies, land use schemes as well as procedures for development applications, include transparent processes of public participation that afford all parties the opportunity to provide inputs on matters affecting them.

This principle relates to obligations imposed on local government. It is also confirmed

that the application will be advertised by the applicant in the prescribed manner.

(v) Policies, legislation and procedures must be clearly set in order to inform and empower members of the public.

This principle relates to obligations imposed on local government.

6.1.2 National Development Plan, 2030

The National Development Plan identifies five principles for spatial development: spatial justice, spatial sustainability, spatial resilience, spatial quality and special efficiency.

It confirms that South African cities are highly fragmented, as little has been achieved in reversing apartheid geography. The Plan proposes that the situation be addressed by establishing new norms and standards: amongst others by densifying cities, improving transport and locating jobs where people live.

The containment of urban sprawl is particularly highlighted in the Plan, confirming that sprawl be contained and reversed (if possible), "… as denser forms of development are more efficient in terms of land usage, infrastructure cost and environmental protection."

The proposed development aligns with the vision of the National Development Plan, as it will promote compaction of the city and limiting urban sprawl (by means of infill development), by the redevelopment of a property which is currently vacant instead of developing outside the urban edge.

6.2 Provincial Development Guidelines

6.2.1 Gauteng Metropolitan Spatial Development Framework, 2011

The Gauteng Metropolitan Spatial Development Framework (MSDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The MSDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities' spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The MSDF confirms that "it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system".

The development proposal will not contribute to urban sprawl and should be regarded as infill development.

6.2.2 Gauteng Spatial Development Framework, 2011

The Gauteng Spatial Development Framework (SDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The SDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities' spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The SDF confirms on page 128 that "it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system".

The SDF furthermore identified four critical factors for development in the province, relevant to this development:

- **Contained urban growth:**

  To contain urban growth, an Urban Edge was identified to curb urban sprawl. The idea behind the urban edge is to limit development within certain areas of a city. Only certain types of developments are allowed on the outside of the urban edge. The goal is to curb urban sprawl and thereby protecting the natural environment. One way to do this is to increase the densities of the built environment within the urban edge.

  This edge is however not set in stone and can be amended if development pressure in an area requires the alteration of this "line" or edge. Normally, areas identified for future development or as future development nodes are not included within the urban edge of a municipality. Amendments to the relevant spatial legislation and frameworks of the municipality usually later include these areas within the edge, so the development potential can be unlocked. Approval of net land-use rights and applications in an area indicates that the characteristics of the area have changed over the ears.

- **Resourced based economic development:**

  Resource based economic development should result in identification of the economic core. Development should be encouraged in close proximity to existing resources, which includes infrastructure such as roads, water and electricity.

  The proposed development is situated near existing and adjacent to approved proposed developments and infrastructure networks. Recent similar approved township establishment applications indicate that there is a growing economic base in the area.

- **Re-direction of urban growth:**

  Developments in economically non-viable areas should be limited and thereby achieving growth within the economic growth sphere. This part of the Municipality is a fast growing sector in Joburg and growth should be encouraged in the precinct.

- **Increased access and mobility:**

  The proposed land development area could be regarded as highly accessible.

6.3 Local Development Guidelines

6.3.1 Spatial Development Framework (SDF), 2011

The SDF was compiled to realise the vision of the Municipality through spatial restructuring and to integrate all aspects of spatial planning.

The subject property is earmarked for purposes of residential development. The Ormonde area is situated within a mixed use area, focussing on sporting / entertainment facilities, light industrial with a very large residential component.

In light of the above, it is apparent that the proposed development is consistent with the principles contained in the SDF.

6.3.2 Integrated Development Plan (IDP), 2012/2016

The Municipality has adopted an Integrated Development Plan (IDP) for 2012/2016 in terms of Section 25 of the Local Government, Municipal Systems Act, 2000 (Act No. 32 of 2000), which plan integrates and coordinates plans and aligns the resources and capacity of the Municipality to implement these plans. The compilation of Spatial Development Frameworks forms part of the IDP.

The Johannesburg Municipality seeks to focus its efforts to complement National and Provincial Government to accomplish the following strategic objectives through the IDP:

- Provide quality basic services and infrastructure;
- Facilitate higher and shared economic growth and development;
- To fight poverty, build clean, healthy, safe and sustainable communities;
- Foster participatory democracy through a caring, accessible and accountable service; and
- To ensure good governance, financial viability and optimal institutional transformation with capacity to execute its mandate.

The Strategic Levers emanating from the city's macro and long-term strategy, including the medium-term plan reflect Joburg's attempts in actively working towards achieving the targets set out at national and provincial level

The IDP confirms the status of the Ormonde area which focusses on the residential component as indicated in the SDF. The proposed development therefore finds support in the IDP.

7. MOTIVATION AND BURDEN OF PROOF

7.1 Need

7.1.1 The need for the development of residential units on the property is acknowledged in the land use policies of the Municipality, particularly the SDF which confirms that the property is earmarked for purposes of residential development. This confirms that the need for the development on the property is also acknowledged from a policy perspective.

7.1.2 The proximity of the subject property to important transport routes (e.g. the, M1 freeway and Shakespeare Avenue), public transport, job opportunities and most importantly renders that the property ideal for the intended land use.

7.1.3 Open and vacant, unutilised land within a build-up area can be perceived as a weakness due to the security threat that vacant land imposes, as well as the negative influence it has on the image of a neighbourhood. Unused open or vacant land, which implies lower densities, makes the provision of essential municipal services less viable and more expensive to provide. By developing the existing land, the development of urban fibre can be stimulated through the strengthening of the development node and region. The proposed land use rights of the erf accommodated in this application is in accordance with the proposals of the Integrated Development Plan (IDP), as the IDP earmarks this area for medium to high density residential uses.

7.1.4 The proposed development will positively influence the income base of the Municipality. The income generated by rates is a function of land value, which is in turn a function of the land use. The establishment of the residential townships (which includes a retail erf) broadens the economic base of the area. The

development will also ensure the following:

- Infill development – The application site is a vacant portion of land situated adjacent to an existing and future residential townships, within the Municipality;
- New work opportunities in close proximity to place of residence during construction; and
- Optimal use of existing infrastructure.

7.1.5 The proposed development is also consistent with approved land use policies in Johannesburg. The need for the proposed development is substantiated by the principles of the IDP, i.e. the infill of vacant land and the optimal use of existing infrastructure, as well as from current market forces.

7.2 Desirability

7.2.1 There is a need for more residential units within the Ormonde area and this development will contribute to this need. Mounting development pressure within the municipality is resulting in all available developable land being developed.

7.2.2 The development proposal is also consistent with, and will promote, the land use policy guidelines of the Municipality. The development can be regarded as being desirable and will have several beneficial social and economic impacts on the area, which can be summarised as follow:

- Optimum utilisation of services and infrastructure;
- Increase in property values of surrounding properties;
- Increased security;
- Compatibility with surrounding land uses; and
- Increased housing opportunities

7.2.3 The proposed development will maximize the potential of the subject property and is consistent with the strategic location of the site. The proposed development will additionally contribute to the overall efficiency, sustainability and improved quality of the greater area. The development will have several beneficial social, economic and ecological impacts once the construction thereof is finalised, which can be summarised as follow:

- Reduction of potential dumping areas and informal settlements;
- Optimum utilisation of services and infrastructure;
- Expansion of municipal infrastructure and services;
- Increase in property values of surrounding properties;
- Increased security;
- Eradication of invasive species;
- Compatibility with surrounding land uses; and
- Landscaping could improve fauna numbers and species.

As mentioned above, the proposed development will include community and will be easy accessible through public transport. The need for social and economic facilities in this area is identified in various planning policies and policy frameworks of the Municipality. The development will provide much needed residential and retail facilities for the area, and thus make a positive contribution with regards to social welfare.

7.2.4 The proposed development will align with the existing urban form and character of the area. It will uplift the area economically and might attract other potential developers to the area as well. Thus, in effect, in might have a very positive financial influence to the precinct. Furthermore, the proposed development will contribute to an economic base in the area. Thus, it is argued that the proposed development will have a positive influence to the area.

7.2.5 When considering that the Building Plans and Site Development Plans which must be submitted to the Municipality, will have to comply with the relevant design guidelines and development parameters of land

use policies, the proposed development can be perceived as desirable from a land use perspective.

7.3 Compliance with SPLUMA principles

7.3.1 With reference to Section 7.1.1 of this Memorandum, it is confirmed that the development proposal complies with the principles of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.4 Public interest in terms of Section 47(2) of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.4.1 The proposed development is in the public interest, as the land use rights is consistent with approved policy guidelines on national, provincial and local level.

7.5 Facts and circumstances of application in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.5.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 962 & Erf 963, Ormonde Extension 22, from "Residential 3" with 25 dwelling units per hectare to **"Residential 3"** with **"110 dwelling units per hectare".**

7.5.2 The proposed development aligns with approved policy guidelines on national, provincial and local level.

7.6 Rights and obligations of affected parties in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.6.1 The rights and obligations of affected parties will be taken into account in the following manner:

- The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, by the publications of notices in the Gauteng Provincial Gazette, Beeld and Citizen during February/ March 2017, and by the simultaneous display of a notice on site for fourteen (14 days). An objection period of 28 days will be afforded to any affected parties; and

- The City Planning Department will circulate the application for comments from internal departments of the Municipality. Any concerns raised will have to be dealt with to the satisfaction of the relevant department.

7.7 Interested persons in terms of Section 45 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.7.1 The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, granting any person the opportunity to register as an interested party.

7.8 Impact on engineering services, social infrastructure and open space in terms of Sections 42 and 49 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013), read with Section 46, 47 and 48 of the City of Johannesburg Municipal Planning By-Law, 2016

7.8.1 The impact of the proposed development will be confirmed by the internal departments of the Municipality who will be afforded an opportunity to comment on the application.

7.8.2 Any adverse impacts will be mitigated and addressed by suitable solutions, which may include service agreements and/or payment of bulk contributions to upgrade existing services infrastructure.

7.9 Reply to objections

7.9.1 The applicant will reply to any valid objections to the application.

7.9.2 The advertisements will comply with the requirements of the relevant sections of the City of Johannesburg Municipal Planning By-Law, 2016. The rights of potential objectors and or interested parties will be brought to the attention of probable objectors and or interested parties in terms of the requirements of Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016.

7.9.3 In submitting this application, applicant has endeavoured to comply with the requirements of the relevant provincial legislation as well as the provisions of the City of Johannesburg Municipal Planning By-Law, 2016, read with the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.9.4 The application clearly indicates the land- use rights, scheme documents, diagrams, layout plans, need and desirability, co-ordinated harmonious development and all other relevant requirements in terms of provincial legislation.

7.9.5 The application further complies with the relevant requirements of the Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013). Specifically, Sections 7, 42, 47 and 49 thereof.

8. CONCLUSION

8.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 962 & Erf 963, Ormonde Extension 22, from "Residential 3" with a density of "25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%" to "Residential 3" with a density of "110 dwelling units per hectare; FAR of 0.7; Height of 4 storeys; and coverage of 30%", subject to the following conditions

8.2 The purpose of this application is to obtain the appropriate land use rights to enable higher residential development. The application clearly confirms the need and desirability and compliance with all other relevant requirements in terms of relevant policies and legislation.

8.3 Note that a separate application for the consolidation of the two properties, terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

8.4 We trust that Council will evaluate and consider the application on its merit.

Werner Slabbert B(TRP)
Professional Planner - Pr. Pln A/2190/2015

URBAN INNOVATE CONSULTING CC
CK2007/191853/23

November 2016 R16026

LIST OF ANNEXURES

ANNEXURE A	-	LOCALITY PLAN
ANNEXURE B	-	DEED OF TRANSFER
ANNEXURE C	-	POWER OF ATTORNEY, COMPANY RESOLUTION & PROOF OF DIRECTORS
ANNEXURE D	-	ZONING CERTIFICATE AND ZONING MAP
ANNEXURE E	-	LAND USE MAP
ANNEXURE F	-	PROPOSED SCHEME DOCUMENTATION
ANNEXURE G	-	PROPOSED SITE PLAN AND GATEHOUSE DESIGN
ANNEXURE H	-	GENERAL PLAN / S.G DIAGRAMS

ANNEXURE C

CAPACITY CALCULATION RESULTS

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background Traffic Volume
Proposed by latents
Signals - Fixed Time   Cycle Time = 100 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	187	0.0	0.173	8.5	LOS A	0.8	5.5	0.12	0.69	48.4
2	T	901	0.0	0.870	30.4	LOS C	43.9	307.0	0.96	0.96	31.1
Approach		1088	0.0	0.870	26.6	LOS C	43.9	307.0	0.81	0.91	33.2
North: Alwen Road (N)											
8	T	417	0.0	0.403	16.6	LOS B	14.1	98.4	0.67	0.59	39.4
9	R	95	0.0	0.852	69.1	LOS E	7.2	50.2	1.00	1.01	20.6
Approach		512	0.0	0.852	26.4	LOS C	14.1	98.4	0.73	0.66	33.7
West: Akker Avenue (W)											
10	L	297	0.0	0.850	44.3	LOS D	31.9	223.4	0.98	0.94	27.0
12	R	335	0.0	0.850	44.4	LOS D	31.9	223.4	0.98	0.94	27.0
Approach		632	0.0	0.850	44.4	LOS D	31.9	223.4	0.98	0.94	27.0
All Vehicles		2232	0.0	0.870	31.6	LOS C	43.9	307.0	0.84	0.86	31.2

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background Traffic Volumes
Proposed by Latents
Signals - Fixed Time   Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	171	0.0	0.853	39.3	LOS D	7.5	52.3	0.85	0.83	28.8
2	T	391	0.0	0.526	32.5	LOS C	19.0	132.9	0.85	0.73	30.4
Approach		561	0.0	0.854	34.6	LOS C	19.0	132.9	0.85	0.76	29.9
North: Alwen Road (N)											
8	T	794	0.0	0.494	5.2	LOS A	17.7	123.8	0.40	0.36	50.8
9	R	229	0.0	0.679	16.9	LOS B	5.1	35.5	0.56	0.79	40.8
Approach		1023	0.0	0.679	7.8	LOS A	17.7	123.8	0.43	0.46	48.2
West: Akker Avenue (W)											
10	L	71	0.0	0.808	67.8	LOS E	14.6	102.0	1.00	0.90	20.9
12	R	142	0.0	0.808	67.9	LOS E	14.6	102.0	1.00	0.90	20.9
Approach		213	0.0	0.808	67.9	LOS E	14.6	102.0	1.00	0.90	20.9
All Vehicles		1797	0.0	0.853	23.3	LOS C	19.0	132.9	0.63	0.61	35.8

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents
Signals - Fixed Time   Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	217	0.0	0.200	8.4	LOS A	0.9	6.4	0.10	0.68	48.5
2	T	1044	0.0	0.917	39.1	LOS D	65.8	460.8	0.99	1.02	27.6
Approach		1261	0.0	0.917	33.9	LOS C	65.8	460.8	0.83	0.96	29.8
North: Alwen Road (N)											
8	T	501	0.0	0.441	16.9	LOS B	18.2	127.6	0.64	0.57	39.2
9	R	85	0.0	1.001[3]	80.5	LOS F	7.5	52.3	1.00	0.86	18.6
Approach		586	0.0	1.000	26.2	LOS C	18.2	127.6	0.69	0.61	33.8
West: Akker Avenue (W)											
10	L	327	0.0	0.987	104.7	LOS F	65.6	459.2	1.00	1.14	15.4
12	R	386	0.0	0.987	104.8	LOS F	65.6	459.2	1.00	1.14	15.4
Approach		714	0.0	0.987	104.8	LOS F	65.6	459.2	1.00	1.14	15.4
All Vehicles		2561	0.0	1.001	51.9	LOS D	65.8	460.8	0.85	0.93	24.2

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

[3] x = 1.00 due to short lane

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SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background Traffic Volumes
Proposed by latents
Signals - Fixed Time   Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	197	0.0	0.682	23.1	LOS C	5.7	39.7	0.69	0.83	36.6
2	T	453	0.0	0.525	14.2	LOS B	11.7	81.7	0.80	0.69	40.8
Approach		649	0.0	0.682	16.9	LOS B	11.7	81.7	0.76	0.73	39.5
North: Alwen Road (N)											
8	T	920	0.0	0.720	8.6	LOS A	19.6	137.4	0.75	0.68	45.9
9	R	249	0.0	0.645	17.7	LOS B	5.1	35.5	0.79	0.82	40.2
Approach		1169	0.0	0.720	10.5	LOS B	19.6	137.4	0.75	0.71	44.5
West: Akker Avenue (W)											
10	L	75	0.0	0.588	31.9	LOS C	8.3	57.8	0.95	0.82	31.9
12	R	164	0.0	0.588	32.0	LOS C	8.3	57.8	0.95	0.82	31.9
Approach		239	0.0	0.588	32.0	LOS C	8.3	57.8	0.95	0.82	31.9
All Vehicles		2058	0.0	0.720	15.0	LOS B	19.6	137.4	0.78	0.73	41.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	198	0.0	0.377	10.8	LOS B	2.7	18.6	0.31	0.71	46.2
2	T	901	0.0	0.923	37.3	LOS D	41.2	288.6	1.00	1.21	28.3
Approach		1099	0.0	0.923	32.5	LOS C	41.2	288.6	0.88	1.12	30.4
North: Alwen Road (N)											
8	T	417	0.0	0.313	6.0	LOS A	8.0	55.9	0.48	0.42	49.6
9	R	187	0.0	0.589	24.7	LOS C	5.2	36.6	0.97	0.80	35.7
Approach		604	0.0	0.589	11.8	LOS B	8.0	55.9	0.63	0.54	44.2
West: Akker Avenue (W)											
10	L	575	0.0	0.802	33.0	LOS C	20.5	143.8	0.95	0.93	31.4
12	R	366	0.0	0.921	48.5	LOS D	16.4	115.0	1.00	1.01	25.6
Approach		941	0.0	0.920	39.0	LOS D	20.5	143.8	0.97	0.96	28.9
All Vehicles		2644	0.0	0.923	30.1	LOS C	41.2	288.6	0.85	0.93	32.1

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	200	0.0	0.640	20.0	LOS B	5.2	36.1	0.63	0.79	38.7
2	T	391	0.0	0.707	23.1	LOS C	12.6	88.3	0.96	0.86	34.7
Approach		591	0.0	0.707	22.0	LOS C	12.6	88.3	0.85	0.84	36.0
North: Alwen Road (N)											
8	T	794	0.0	0.535	4.2	LOS A	12.2	85.7	0.50	0.45	51.5
9	R	489	0.0	0.859	22.2	LOS C	9.9	69.0	0.78	0.90	37.2
Approach		1283	0.0	0.859	11.0	LOS B	12.2	85.7	0.60	0.62	44.9
West: Akker Avenue (W)											
10	L	181	0.0	0.172	14.9	LOS B	3.6	25.5	0.51	0.75	42.5
12	R	155	0.0	0.714	39.4	LOS D	6.4	45.1	1.00	0.88	28.7
Approach		336	0.0	0.714	26.2	LOS C	6.4	45.1	0.73	0.81	34.8
All Vehicles		2209	0.0	0.859	16.3	LOS B	12.6	88.3	0.69	0.71	40.5

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	227	0.0	0.432	11.2	LOS B	3.1	21.4	0.36	0.73	45.8
2	T	1044	0.0	0.984	72.4	LOS E	73.2	512.1	1.00	1.50	19.4
Approach		1272	0.0	0.984	61.4	LOS E	73.2	512.1	0.89	1.36	21.7
North: Alwen Road (N)											
8	T	483	0.0	0.352	6.3	LOS A	9.9	69.3	0.47	0.42	49.2
9	R	197	0.0	0.725	33.2	LOS C	6.8	47.5	1.00	0.86	31.3
Approach		680	0.0	0.725	14.1	LOS B	9.9	69.3	0.63	0.55	42.2
West: Akker Avenue (W)											
10	L	629	0.0	0.934	58.5	LOS E	34.3	240.3	1.00	1.09	23.0
12	R	395	0.0	1.000[3]	43.4	LOS D	17.2	120.2	1.00	0.86	27.3
Approach		1023	0.0	1.000	52.7	LOS D	34.3	240.3	1.00	1.00	24.4
All Vehicles		2975	0.0	1.000	47.6	LOS D	73.2	512.1	0.87	1.05	25.5

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

[3] x = 1.00 due to short lane

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SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	225	0.0	0.741	25.1	LOS C	6.6	46.4	0.69	0.87	35.5
2	T	453	0.0	0.874	32.5	LOS C	17.1	119.6	1.00	1.09	30.2
Approach		678	0.0	0.874	30.0	LOS C	17.1	119.6	0.90	1.01	31.7
North: Alwen Road (N)											
8	T	920	0.0	0.620	4.7	LOS A	15.1	105.6	0.55	0.50	50.7
9	R	509	0.0	0.948	20.0	LOS C	9.9	69.0	0.79	0.86	38.6
Approach		1429	0.0	0.949	10.1	LOS B	15.1	105.6	0.64	0.63	45.6
West: Akker Avenue (W)											
10	L	186	0.0	0.172	14.4	LOS B	3.6	25.3	0.49	0.75	42.9
12	R	177	0.0	0.816	42.1	LOS D	7.6	53.0	1.00	0.97	27.7
Approach		363	0.0	0.816	27.9	LOS C	7.6	53.0	0.74	0.85	33.9
All Vehicles		2471	0.0	0.948	18.2	LOS B	17.1	119.6	0.72	0.77	39.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354
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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 AM BGD

Dorado Avenue / Alwen Road Junction
2017 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 65 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	884	0.0	0.603	5.2	LOS A	15.6	109.1	0.55	0.50	50.1
3	R	373	0.0	0.666	16.3	LOS B	6.5	45.8	0.78	0.82	41.4
Approach		1257	0.0	0.666	8.5	LOS A	15.6	109.1	0.62	0.60	47.2
East: Alwen Road (E)											
4	L	157	0.0	0.172	19.2	LOS B	4.1	28.8	0.62	0.76	39.2
6	R	43	0.0	0.203	38.6	LOS D	2.0	14.0	0.95	0.73	29.0
Approach		200	0.0	0.203	23.4	LOS C	4.1	28.8	0.69	0.75	36.5
North: Dorado Avenue (N)											
7	L	148	0.0	0.593	26.3	LOS C	13.1	91.8	0.86	0.87	36.2
8	T	296	0.0	0.593	18.1	LOS B	13.1	91.8	0.86	0.75	37.0
Approach		444	0.0	0.593	20.8	LOS C	13.1	91.8	0.86	0.79	36.7
All Vehicles		1901	0.0	0.666	12.9	LOS B	15.6	109.1	0.68	0.66	43.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Dorado Avenue / Alwen Road Junction
2017 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Alwen Road (S)											
2	T	313	0.0	0.207	3.2	LOS A	4.7	32.8	0.34	0.29	53.5
3	R	203	0.0	0.534	20.9	LOS C	5.6	39.2	0.89	0.82	38.0
Approach		516	0.0	0.534	10.2	LOS B	5.6	39.2	0.56	0.50	46.1
East: Alwen Road (E)											
4	L	325	0.0	0.577	31.7	LOS C	11.4	79.6	0.91	0.83	32.0
6	R	113	0.0	0.571	43.3	LOS D	5.4	37.7	1.00	0.79	27.3
Approach		438	0.0	0.577	34.7	LOS C	11.4	79.6	0.93	0.82	30.6
North: Dorado Avenue (N)											
7	L	161	0.0	0.773	22.3	LOS C	24.7	172.8	0.84	0.94	39.1
8	T	709	0.0	0.773	14.1	LOS B	24.7	172.8	0.84	0.78	40.3
Approach		871	0.0	0.773	15.6	LOS B	24.7	172.8	0.84	0.81	40.1
All Vehicles		1824	0.0	0.773	18.7	LOS B	24.7	172.8	0.78	0.73	38.6

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2022 AM BGD

Dorado Avenue / Alwen Road Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	1068	0.0	0.708	5.7	LOS A	21.2	148.3	0.61	0.56	49.3
3	R	475	0.0	0.918	18.4	LOS B	10.1	70.6	0.89	0.86	39.7
Approach		1543	0.0	0.918	9.6	LOS A	21.2	148.3	0.70	0.65	45.9
East: Alwen Road (E)											
4	L	197	0.0	0.225	21.2	LOS C	5.6	39.4	0.66	0.77	37.9
6	R	51	0.0	0.256	41.6	LOS D	2.5	17.6	0.96	0.74	27.9
Approach		247	0.0	0.256	25.4	LOS C	5.6	39.4	0.72	0.77	35.3
North: Dorado Avenue (N)											
7	L	173	0.0	0.654	26.8	LOS C	16.2	113.3	0.87	0.88	35.9
8	T	358	0.0	0.654	18.6	LOS B	16.2	113.3	0.87	0.76	36.7
Approach		531	0.0	0.654	21.2	LOS C	16.2	113.3	0.87	0.80	36.5
All Vehicles		2321	0.0	0.918	14.0	LOS B	21.2	148.3	0.74	0.70	42.1

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Dorado Avenue / Alwen Road Junction
2022 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	356	0.0	0.225	2.9	LOS A	5.3	37.3	0.31	0.27	54.1
3	R	229	0.0	0.689	26.8	LOS C	8.6	60.4	0.99	0.88	34.5
Approach		585	0.0	0.689	12.3	LOS B	8.6	60.4	0.57	0.51	44.2
East: Alwen Road (E)											
4	L	360	0.0	0.730	39.9	LOS D	15.0	105.2	0.98	0.88	28.6
6	R	131	0.0	0.756	51.6	LOS D	7.2	50.1	1.00	0.88	24.7
Approach		491	0.0	0.756	43.0	LOS D	15.0	105.2	0.98	0.88	27.4
North: Dorado Avenue (N)											
7	L	187	0.0	0.800	21.9	LOS C	30.7	215.0	0.82	0.94	39.3
8	T	806	0.0	0.800	13.7	LOS B	30.7	215.0	0.82	0.77	40.6
Approach		994	0.0	0.800	15.3	LOS B	30.7	215.0	0.82	0.81	40.3
All Vehicles		2069	0.0	0.800	21.0	LOS C	30.7	215.0	0.79	0.74	37.1

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Dorado Avenue / Alwen Road Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 65 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	1015	0.0	0.692	5.8	LOS A	19.4	135.7	0.62	0.57	49.1
3	R	509	0.0	0.796	23.2	LOS C	11.4	80.1	0.91	0.93	36.6
Approach		1524	0.0	0.796	11.6	LOS B	19.4	135.7	0.72	0.69	44.1
East: Alwen Road (E)											
4	L	202	0.0	0.222	19.5	LOS B	5.3	36.9	0.64	0.77	39.0
6	R	43	0.0	0.203	38.6	LOS D	2.0	14.0	0.95	0.73	29.0
Approach		245	0.0	0.222	22.9	LOS C	5.3	36.9	0.69	0.76	36.8
North: Dorado Avenue (N)											
7	L	148	0.0	0.654	26.8	LOS C	14.5	101.5	0.89	0.87	36.0
8	T	339	0.0	0.653	18.7	LOS B	14.5	101.5	0.89	0.77	36.7
Approach		487	0.0	0.653	21.1	LOS C	14.5	101.5	0.89	0.80	36.5
All Vehicles		2257	0.0	0.796	14.9	LOS B	19.4	135.7	0.75	0.72	41.3

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Dorado Avenue / Alwen Road Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	344	0.0	0.228	3.3	LOS A	5.2	36.2	0.35	0.30	53.4
3	R	237	0.0	0.675	25.1	LOS C	7.5	52.5	0.98	0.86	35.4
Approach		581	0.0	0.675	12.2	LOS B	7.5	52.5	0.61	0.53	44.3
East: Alwen Road (E)											
4	L	404	0.0	0.717	34.1	LOS C	14.5	101.8	0.96	0.87	30.9
6	R	113	0.0	0.571	43.3	LOS D	5.4	37.7	1.00	0.79	27.3
Approach		517	0.0	0.717	36.1	LOS D	14.5	101.8	0.97	0.86	30.1
North: Dorado Avenue (N)											
7	L	161	0.0	0.837	27.0	LOS C	31.1	217.6	0.90	1.00	36.3
8	T	782	0.0	0.838	18.8	LOS B	31.1	217.6	0.90	0.90	36.9
Approach		943	0.0	0.838	20.2	LOS C	31.1	217.6	0.90	0.92	36.8
All Vehicles		2041	0.0	0.838	21.9	LOS C	31.1	217.6	0.83	0.79	36.5

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2022 AM BGD

Dorado Avenue / Alwen Road Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	1146	0.0	0.760	6.2	LOS A	24.3	170.1	0.66	0.61	48.6
3	R	559	0.0	0.921	28.3	LOS C	14.3	100.0	0.96	0.96	33.7
Approach		1705	0.0	0.921	13.4	LOS B	24.3	170.1	0.76	0.73	42.5
East: Alwen Road (E)											
4	L	224	0.0	0.257	21.4	LOS C	6.4	44.6	0.67	0.78	37.7
6	R	51	0.0	0.256	41.6	LOS D	2.5	17.6	0.96	0.74	27.9
Approach		275	0.0	0.257	25.1	LOS C	6.4	44.6	0.72	0.77	35.4
North: Dorado Avenue (N)											
7	L	173	0.0	0.687	27.1	LOS C	17.1	119.6	0.89	0.88	35.8
8	T	383	0.0	0.687	18.9	LOS B	17.1	119.6	0.89	0.78	36.5
Approach		556	0.0	0.686	21.4	LOS C	17.1	119.6	0.89	0.81	36.3
All Vehicles		2536	0.0	0.921	16.5	LOS B	24.3	170.1	0.78	0.75	40.1

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Dorado Avenue / Alwen Road Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Alwen Road (S)											
2	T	387	0.0	0.245	2.9	LOS A	5.8	40.8	0.31	0.27	54.0
3	R	263	0.0	0.857	44.5	LOS D	11.5	80.3	1.00	1.06	26.9
Approach		651	0.0	0.857	19.7	LOS B	11.5	80.3	0.59	0.59	38.4
East: Alwen Road (E)											
4	L	439	0.0	0.890	51.5	LOS D	21.4	149.5	1.00	1.02	24.8
6	R	131	0.0	0.756	51.6	LOS D	7.2	50.1	1.00	0.88	24.7
Approach		569	0.0	0.890	51.5	LOS D	21.4	149.5	1.00	0.98	24.8
North: Dorado Avenue (N)											
7	L	187	0.0	0.859	27.5	LOS C	39.3	275.0	0.89	1.00	35.9
8	T	879	0.0	0.859	19.3	LOS B	39.3	275.0	0.89	0.89	36.6
Approach		1066	0.0	0.859	20.8	LOS C	39.3	275.0	0.89	0.91	36.5
All Vehicles		2286	0.0	0.890	28.1	LOS C	39.3	275.0	0.83	0.84	33.1

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	678	0.0	0.333	2.4	LOS A	4.3	29.8	0.63	0.00	49.6
3	R	2	0.0	0.351	10.8	LOS B	4.3	29.8	0.63	0.97	49.3
Approach		680	0.0	0.333	2.5	LOS B	4.3	29.8	0.63	0.00	49.6
East: Chamfuti Crescent North (E)											
4	L	7	0.0	0.819	71.0	LOS F	5.3	37.4	0.95	1.38	20.6
6	R	104	0.0	0.784	70.8	LOS F	5.3	37.4	0.95	1.29	20.6
Approach		112	0.0	0.785	70.8	LOS F	5.3	37.4	0.95	1.29	20.6
North: Akker Avenue (N)											
7	L	43	0.0	0.173	8.2	LOS A	0.0	0.0	0.00	1.01	49.0
8	T	308	0.0	0.173	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		352	0.0	0.173	1.0	LOS A	0.0	0.0	0.00	0.12	58.4
All Vehicles		1143	0.0	0.819	8.7	NA	5.3	37.4	0.47	0.17	45.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	246	0.0	0.122	3.8	LOS A	1.7	11.7	0.67	0.00	49.0
3	R	1	0.0	0.117	12.2	LOS B	1.7	11.7	0.67	1.03	48.0
Approach		247	0.0	0.122	3.9	LOS B	1.7	11.7	0.67	0.00	49.0
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.175	26.2	LOS D	0.8	5.5	0.79	1.00	35.6
6	R	40	0.0	0.183	26.0	LOS D	0.8	5.5	0.79	1.00	35.7
Approach		41	0.0	0.183	26.0	LOS D	0.8	5.5	0.79	1.00	35.7
North: Akker Avenue (N)											
7	L	84	0.0	0.290	8.2	LOS A	0.0	0.0	0.00	1.00	49.0
8	T	507	0.0	0.291	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		592	0.0	0.291	1.2	LOS A	0.0	0.0	0.00	0.14	58.1
All Vehicles		880	0.0	0.291	3.1	NA	1.7	11.7	0.23	0.14	53.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Akker Avenue (S)											
2	T	746	0.0	0.366	3.1	LOS A	5.5	38.2	0.69	0.00	48.8
3	R	2	0.0	0.351	11.5	LOS B	5.5	38.2	0.69	1.00	48.9
Approach		748	0.0	0.366	3.1	LOS B	5.5	38.2	0.69	0.00	48.8
East: Chamfuti Crescent North (E)											
4	L	8	0.0	1.053	322.8	LOS F	23.9	167.2	1.00	3.37	6.1
6	R	112	0.0	1.105	322.6	LOS F	23.9	167.2	1.00	2.55	6.1
Approach		120	0.0	1.104	322.6	LOS F	23.9	167.2	1.00	2.61	6.1
North: Akker Avenue (N)											
7	L	46	0.0	0.192	8.2	LOS A	0.0	0.0	0.00	1.01	49.0
8	T	345	0.0	0.192	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		392	0.0	0.192	1.0	LOS A	0.0	0.0	0.00	0.12	58.4
All Vehicles		1260	0.0	1.105	32.9	NA	23.9	167.2	0.51	0.29	30.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
222 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	269	0.0	0.133	4.4	LOS A	2.0	13.8	0.70	0.00	48.6
3	R	1	0.0	0.132	12.9	LOS B	2.0	13.8	0.70	1.05	47.5
Approach		271	0.0	0.133	4.5	LOS B	2.0	13.8	0.70	0.00	48.6
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.211	30.3	LOS D	1.0	7.1	0.83	1.02	33.4
6	R	43	0.0	0.230	30.2	LOS D	1.0	7.1	0.83	1.02	33.5
Approach		44	0.0	0.230	30.2	LOS D	1.0	7.1	0.83	1.02	33.5
North: Akker Avenue (N)											
7	L	88	0.0	0.314	8.2	LOS A	0.0	0.0	0.00	1.00	49.0
8	T	551	0.0	0.314	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		639	0.0	0.314	1.1	LOS A	0.0	0.0	0.00	0.14	58.2
All Vehicles		954	0.0	0.314	3.4	NA	2.0	13.8	0.24	0.14	53.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\03 Akker_Chamfuti N\BG\Existing\Akker_Chamfuti N_REV1(C).sip

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	800	0.0	0.643	8.9	LOS A	8.7	60.7	0.57	0.59	47.0
3	R	2	0.0	0.702	11.9	LOS B	8.7	60.7	0.57	0.69	45.6
Approach		802	0.0	0.643	8.9	LOS B	8.7	60.7	0.57	0.59	47.0
East: Chamfuti Crescent North (E)											
4	L	7	0.0	0.127	11.5	LOS B	0.9	6.0	0.53	0.73	45.5
6	R	104	0.0	0.127	13.1	LOS B	0.9	6.0	0.53	0.75	44.2
Approach		112	0.0	0.127	13.0	LOS B	0.9	6.0	0.53	0.74	44.3
North: Akker Avenue (N)											
7	L	43	0.0	0.240	8.9	LOS A	2.1	15.0	0.03	0.77	48.0
8	T	349	0.0	0.239	7.6	LOS A	2.1	15.0	0.03	0.62	49.4
Approach		393	0.0	0.239	7.8	LOS A	2.1	15.0	0.03	0.64	49.2
All Vehicles		1306	0.0	0.702	8.9	LOS A	8.7	60.7	0.40	0.62	47.4

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

Processed: 18 November 2016 03:43:07 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\03 Akker_Chamfuti N\BG+D\Proposed\Akker_Chamfuti N_REV1(C).sip
Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	296	0.0	0.222	7.9	LOS A	1.9	13.4	0.21	0.58	48.6
3	R	1	0.0	0.211	10.9	LOS B	1.9	13.4	0.21	0.76	46.2
Approach		297	0.0	0.222	7.9	LOS B	1.9	13.4	0.21	0.58	48.6
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.058	13.5	LOS B	0.4	2.7	0.65	0.76	43.6
6	R	40	0.0	0.059	15.2	LOS B	0.4	2.7	0.65	0.77	42.4
Approach		41	0.0	0.059	15.1	LOS B	0.4	2.7	0.65	0.77	42.5
North: Akker Avenue (N)											
7	L	84	0.0	0.425	8.9	LOS A	4.3	30.2	0.03	0.77	48.0
8	T	621	0.0	0.425	7.6	LOS A	4.3	30.2	0.03	0.62	49.4
Approach		705	0.0	0.425	7.8	LOS A	4.3	30.2	0.03	0.64	49.2
All Vehicles		1043	0.0	0.425	8.1	LOS A	4.3	30.2	0.10	0.63	48.7

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

Processed: 18 November 2016 03:53:04 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\03 Akker_Chamfuti N\BG+D\Proposed\Akker_Chamfuti N_REV1(C).sip

SIDRA INTERSECTION

Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Akker Avenue (S)											
2	T	869	0.0	0.703	9.2	LOS A	10.4	72.8	0.65	0.60	46.6
3	R	2	0.0	0.702	12.1	LOS B	10.4	72.8	0.65	0.68	45.5
Approach		872	0.0	0.704	9.2	LOS B	10.4	72.8	0.65	0.60	46.6
East: Chamfuti Crescent North (E)											
4	L	8	0.0	0.138	11.5	LOS B	0.9	6.5	0.53	0.73	45.5
6	R	112	0.0	0.137	13.1	LOS B	0.9	6.5	0.53	0.75	44.2
Approach		120	0.0	0.137	13.0	LOS B	0.9	6.5	0.53	0.75	44.3
North: Akker Avenue (N)											
7	L	46	0.0	0.241	8.9	LOS A	2.2	15.5	0.04	0.76	48.0
8	T	349	0.0	0.241	7.6	LOS A	2.2	15.5	0.04	0.62	49.4
Approach		396	0.0	0.241	7.8	LOS A	2.2	15.5	0.04	0.64	49.2
All Vehicles		1387	0.0	0.703	9.1	LOS A	10.4	72.8	0.46	0.62	47.1

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

Processed: 18 November 2016 03:52:09 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\03 Akker_Chamfuti N\BG+D\Proposed\Akker_Chamfuti N_REV1(C).sip
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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	319	0.0	0.240	7.9	LOS A	2.1	14.9	0.22	0.58	48.5
3	R	1	0.0	0.263	10.9	LOS B	2.1	14.9	0.22	0.75	46.2
Approach		320	0.0	0.240	7.9	LOS B	2.1	14.9	0.22	0.58	48.5
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.066	14.0	LOS B	0.4	3.1	0.67	0.78	43.2
6	R	43	0.0	0.066	15.7	LOS B	0.4	3.1	0.67	0.79	42.0
Approach		44	0.0	0.066	15.6	LOS B	0.4	3.1	0.67	0.79	42.1
North: Akker Avenue (N)											
7	L	88	0.0	0.453	8.9	LOS A	4.8	33.7	0.03	0.77	48.0
8	T	665	0.0	0.454	7.6	LOS A	4.8	33.7	0.03	0.62	49.4
Approach		754	0.0	0.454	7.8	LOS A	4.8	33.7	0.03	0.64	49.2
All Vehicles		1118	0.0	0.454	8.1	LOS A	4.8	33.7	0.11	0.63	48.7

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	586	0.0	0.287	1.7	LOS A	3.3	22.9	0.53	0.00	51.0
3	R	1	0.0	0.263	10.1	LOS B	3.3	22.9	0.53	0.96	49.4
Approach		587	0.0	0.287	1.7	LOS B	3.3	22.9	0.53	0.00	51.0
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.162	27.8	LOS D	0.7	4.7	0.79	0.80	34.7
6	R	31	0.0	0.161	27.6	LOS D	0.7	4.7	0.79	1.00	34.8
Approach		33	0.0	0.161	27.6	LOS D	0.7	4.7	0.79	0.99	34.8
North: Akker Avenue (N)											
7	L	16	0.0	0.136	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	263	0.0	0.136	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		279	0.0	0.136	0.5	LOS A	0.0	0.0	0.00	0.06	59.2
All Vehicles		899	0.0	0.287	2.3	NA	3.3	22.9	0.37	0.06	52.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354
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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	205	0.0	0.101	2.5	LOS A	1.2	8.2	0.58	0.00	50.3
3	R	1	0.0	0.105	10.9	LOS B	1.2	8.2	0.58	0.99	49.0
Approach		206	0.0	0.101	2.5	LOS B	1.2	8.2	0.58	0.01	50.3
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.050	20.1	LOS C	0.2	1.5	0.66	0.87	39.4
6	R	15	0.0	0.050	19.9	LOS C	0.2	1.5	0.66	0.99	39.6
Approach		16	0.0	0.050	19.9	LOS C	0.2	1.5	0.66	0.98	39.6
North: Akker Avenue (N)											
7	L	31	0.0	0.223	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
8	T	426	0.0	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		457	0.0	0.224	0.5	LOS A	0.0	0.0	0.00	0.07	59.1
All Vehicles		679	0.0	0.224	1.6	NA	1.2	8.2	0.19	0.07	55.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\04 Akker_Chamfuti S\BG\Existing\Akker_Chamfuti S_REV1(C).sip
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Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	641	0.0	0.314	2.0	LOS A	3.8	26.4	0.57	0.00	50.4
3	R	1	0.0	0.351	10.4	LOS B	3.8	26.4	0.57	0.97	49.5
Approach		642	0.0	0.314	2.0	LOS B	3.8	26.4	0.57	0.00	50.4
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.211	33.5	LOS D	0.9	6.6	0.84	0.86	31.8
6	R	35	0.0	0.221	33.3	LOS D	0.9	6.6	0.84	1.02	31.9
Approach		37	0.0	0.222	33.3	LOS D	0.9	6.6	0.84	1.01	31.9
North: Akker Avenue (N)											
7	L	16	0.0	0.150	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	292	0.0	0.150	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		307	0.0	0.150	0.4	LOS A	0.0	0.0	0.00	0.05	59.3
All Vehicles		986	0.0	0.351	2.7	NA	3.8	26.4	0.40	0.06	51.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	222	0.0	0.110	2.8	LOS A	1.3	9.3	0.61	0.00	49.9
3	R	1	0.0	0.105	11.2	LOS B	1.3	9.3	0.61	1.00	48.7
Approach		223	0.0	0.110	2.9	LOS B	1.3	9.3	0.61	0.00	49.9
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.066	21.7	LOS C	0.3	2.0	0.70	0.89	38.4
6	R	18	0.0	0.067	21.5	LOS C	0.3	2.0	0.70	1.00	38.5
Approach		19	0.0	0.067	21.5	LOS C	0.3	2.0	0.70	0.99	38.5
North: Akker Avenue (N)											
7	L	35	0.0	0.241	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
8	T	458	0.0	0.241	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		493	0.0	0.241	0.6	LOS A	0.0	0.0	0.00	0.07	59.1
All Vehicles		735	0.0	0.241	1.8	NA	1.3	9.3	0.20	0.08	55.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 03:47:50 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\04 Akker_Chamfuti S\BG\Existing\Akker_Chamfuti S_REV1(C).sip
Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	709	0.0	0.347	2.2	LOS A	4.4	30.6	0.61	0.00	49.9
3	R	1	0.0	0.351	10.6	LOS B	4.4	30.6	0.61	0.97	49.4
Approach		711	0.0	0.347	2.2	LOS B	4.4	30.6	0.61	0.00	49.9
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.234	39.1	LOS E	1.0	6.9	0.87	0.88	29.5
6	R	31	0.0	0.237	38.9	LOS E	1.0	6.9	0.87	1.02	29.5
Approach		33	0.0	0.237	38.9	LOS E	1.0	6.9	0.87	1.01	29.5
North: Akker Avenue (N)											
7	L	16	0.0	0.156	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
8	T	304	0.0	0.156	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		320	0.0	0.156	0.4	LOS A	0.0	0.0	0.00	0.05	59.3
All Vehicles		1063	0.0	0.351	2.8	NA	4.4	30.6	0.43	0.05	51.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	296	0.0	0.146	3.7	LOS A	2.0	14.0	0.68	0.00	49.0
3	R	1	0.0	0.150	12.2	LOS B	2.0	14.0	0.68	1.03	48.1
Approach		297	0.0	0.146	3.8	LOS B	2.0	14.0	0.68	0.00	49.0
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.075	27.0	LOS D	0.3	2.2	0.79	0.94	35.1
6	R	15	0.0	0.078	26.8	LOS D	0.3	2.2	0.79	1.00	35.2
Approach		16	0.0	0.077	26.9	LOS D	0.3	2.2	0.79	1.00	35.2
North: Akker Avenue (N)											
7	L	31	0.0	0.280	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	541	0.0	0.280	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		572	0.0	0.280	0.4	LOS A	0.0	0.0	0.00	0.06	59.3
All Vehicles		884	0.0	0.280	2.0	NA	2.0	14.0	0.24	0.06	54.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 03:49:37 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\04 Akker_Chamfuti S\BG+D\Existing\Akker_Chamfuti S_REV1(C).sip

MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	641	0.0	0.314	2.0	LOS A	3.8	26.5	0.58	0.00	50.3
3	R	1	0.0	0.351	10.4	LOS B	3.8	26.5	0.58	0.97	49.5
Approach		642	0.0	0.314	2.0	LOS B	3.8	26.5	0.58	0.00	50.3
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.234	33.6	LOS D	0.9	6.6	0.84	0.86	31.8
6	R	35	0.0	0.223	33.4	LOS D	0.9	6.6	0.84	1.02	31.9
Approach		37	0.0	0.222	33.4	LOS D	0.9	6.6	0.84	1.01	31.9
North: Akker Avenue (N)											
7	L	19	0.0	0.152	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	292	0.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		311	0.0	0.152	0.5	LOS A	0.0	0.0	0.00	0.06	59.2
All Vehicles		989	0.0	0.351	2.7	NA	3.8	26.5	0.40	0.06	51.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 02:14:15 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\02 SITE C\02 Sidras\04 Akker_Chamfuti S\BG+D\Existing\Akker_Chamfuti S_REV1(C).sip

MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	272	0.0	0.134	4.1	LOS A	1.9	13.3	0.69	0.00	48.8
3	R	1	0.0	0.132	12.5	LOS B	1.9	13.3	0.69	1.04	47.8
Approach		273	0.0	0.134	4.1	LOS B	1.9	13.3	0.69	0.00	48.8
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.096	27.8	LOS D	0.4	2.8	0.80	0.97	34.7
6	R	18	0.0	0.096	27.6	LOS D	0.4	2.8	0.80	1.00	34.8
Approach		19	0.0	0.096	27.6	LOS D	0.4	2.8	0.80	1.00	34.8
North: Akker Avenue (N)											
7	L	35	0.0	0.297	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
8	T	573	0.0	0.297	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		607	0.0	0.297	0.5	LOS A	0.0	0.0	0.00	0.06	59.2
All Vehicles		899	0.0	0.297	2.1	NA	1.9	13.3	0.23	0.06	54.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Msasa Crescent Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	5	0.0	0.658	27.2	LOS D	6.3	44.4	0.80	1.13	35.0
3	R	256	0.0	0.677	27.1	LOS D	6.3	44.4	0.80	1.25	35.1
Approach		261	0.0	0.676	27.1	LOS D	6.3	44.4	0.80	1.25	35.1
East: Akker Avenue (E)											
4	L	89	0.0	0.128	8.2	LOS A	0.0	0.0	0.00	0.89	49.0
5	T	168	0.0	0.128	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		258	0.0	0.128	2.8	LOS A	0.0	0.0	0.00	0.31	55.7
West: Akker Avenue (W)											
11	T	309	0.0	0.163	1.3	LOS A	1.5	10.7	0.44	0.00	52.3
12	R	5	0.0	0.164	9.7	LOS A	1.5	10.7	0.44	0.97	49.3
Approach		315	0.0	0.163	1.4	LOS A	1.5	10.7	0.44	0.02	52.3
All Vehicles		834	0.0	0.677	9.9	NA	6.3	44.4	0.41	0.49	46.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 14 November 2016 10:44:37 AM
SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Msasa Crescent Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	3	0.0	0.211	15.8	LOS C	1.1	7.5	0.56	0.87	42.5
3	R	102	0.0	0.215	15.7	LOS C	1.1	7.5	0.56	0.98	42.7
Approach		105	0.0	0.214	15.7	LOS C	1.1	7.5	0.56	0.98	42.7
East: Akker Avenue (E)											
4	L	241	0.0	0.210	8.2	LOS A	0.0	0.0	0.00	0.79	49.0
5	T	177	0.0	0.210	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		418	0.0	0.210	4.7	LOS A	0.0	0.0	0.00	0.46	53.1
West: Akker Avenue (W)											
11	T	93	0.0	0.054	2.0	LOS A	0.5	3.6	0.50	0.00	51.1
12	R	6	0.0	0.054	10.5	LOS B	0.5	3.6	0.50	0.95	48.9
Approach		99	0.0	0.054	2.6	LOS B	0.5	3.6	0.50	0.06	51.0
All Vehicles		622	0.0	0.215	6.2	NA	1.1	7.5	0.18	0.48	50.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354
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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Msasa Crescent Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	6	0.0	0.789	36.2	LOS E	8.5	59.3	0.88	1.37	30.7
3	R	257	0.0	0.785	36.0	LOS E	8.5	59.3	0.88	1.41	30.7
Approach		263	0.0	0.786	36.0	LOS E	8.5	59.3	0.88	1.41	30.7
East: Akker Avenue (E)											
4	L	91	0.0	0.141	8.2	LOS A	0.0	0.0	0.00	0.90	49.0
5	T	195	0.0	0.141	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		285	0.0	0.141	2.6	LOS A	0.0	0.0	0.00	0.29	56.0
West: Akker Avenue (W)											
11	T	358	0.0	0.189	1.5	LOS A	1.9	13.1	0.47	0.00	51.8
12	R	6	0.0	0.191	9.9	LOS A	1.9	13.1	0.47	0.97	49.3
Approach		364	0.0	0.189	1.6	LOS A	1.9	13.1	0.47	0.02	51.7
All Vehicles		913	0.0	0.789	11.8	NA	8.5	59.3	0.44	0.50	44.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354
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SIDRA INTERSECTION

Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Msasa Crescent Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	4	0.0	0.234	16.7	LOS C	1.2	8.3	0.59	0.90	41.8
3	R	103	0.0	0.235	16.6	LOS C	1.2	8.3	0.59	1.00	42.0
Approach		107	0.0	0.235	16.6	LOS C	1.2	8.3	0.59	1.00	42.0
East: Akker Avenue (E)											
4	L	242	0.0	0.224	8.2	LOS A	0.0	0.0	0.00	0.81	49.0
5	T	205	0.0	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		447	0.0	0.224	4.4	LOS A	0.0	0.0	0.00	0.44	53.5
West: Akker Avenue (W)											
11	T	106	0.0	0.063	2.3	LOS A	0.6	4.3	0.53	0.00	50.8
12	R	7	0.0	0.063	10.7	LOS B	0.6	4.3	0.53	0.96	48.7
Approach		114	0.0	0.063	2.8	LOS B	0.6	4.3	0.53	0.06	50.7
All Vehicles		668	0.0	0.235	6.1	NA	1.2	8.3	0.18	0.46	50.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Msasa Crescent Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Msasa Crescent (S)											
1	L	5	0.0	0.263	10.6	LOS B	1.9	13.6	0.47	0.70	46.3
3	R	255	0.0	0.260	12.3	LOS B	1.9	13.6	0.47	0.72	44.9
Approach		260	0.0	0.260	12.3	LOS B	1.9	13.6	0.47	0.72	44.9
East: Akker Avenue (E)											
4	L	89	0.0	0.188	9.0	LOS A	1.6	11.5	0.06	0.74	47.9
5	T	208	0.0	0.189	7.6	LOS A	1.6	11.5	0.06	0.60	49.2
Approach		298	0.0	0.189	8.0	LOS A	1.6	11.5	0.06	0.64	48.8
West: Akker Avenue (W)											
11	T	432	0.0	0.463	10.2	LOS B	4.4	31.0	0.66	0.71	46.6
12	R	5	0.0	0.478	13.2	LOS B	4.4	31.0	0.66	0.79	44.6
Approach		437	0.0	0.462	10.3	LOS B	4.4	31.0	0.66	0.72	46.6
All Vehicles		995	0.0	0.478	10.1	LOS B	4.4	31.0	0.43	0.70	46.8

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

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SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Msasa Crescent Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	3	0.0	0.113	11.0	LOS B	0.8	5.4	0.49	0.71	46.0
3	R	102	0.0	0.114	12.6	LOS B	0.8	5.4	0.49	0.73	44.6
Approach		105	0.0	0.114	12.6	LOS B	0.8	5.4	0.49	0.72	44.6
East: Akker Avenue (E)											
4	L	240	0.0	0.331	9.0	LOS A	3.1	21.5	0.07	0.72	47.9
5	T	291	0.0	0.331	7.7	LOS A	3.1	21.5	0.07	0.59	49.2
Approach		531	0.0	0.331	8.3	LOS A	3.1	21.5	0.07	0.65	48.6
West: Akker Avenue (W)											
11	T	141	0.0	0.133	8.4	LOS A	1.0	7.2	0.33	0.59	48.0
12	R	6	0.0	0.134	11.4	LOS B	1.0	7.2	0.33	0.74	46.0
Approach		147	0.0	0.133	8.5	LOS B	1.0	7.2	0.33	0.60	47.9
All Vehicles		783	0.0	0.331	8.9	LOS A	3.1	21.5	0.17	0.65	47.9

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

Processed: 18 November 2016 03:55:11 PM
SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Msasa Crescent Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	6	0.0	0.275	10.9	LOS B	2.0	14.3	0.50	0.72	46.1
3	R	257	0.0	0.272	12.6	LOS B	2.0	14.3	0.50	0.73	44.7
Approach		263	0.0	0.271	12.5	LOS B	2.0	14.3	0.50	0.73	44.7
East: Akker Avenue (E)											
4	L	91	0.0	0.208	9.0	LOS A	1.9	13.0	0.07	0.74	47.9
5	T	236	0.0	0.208	7.6	LOS A	1.9	13.0	0.07	0.60	49.2
Approach		326	0.0	0.208	8.0	LOS A	1.9	13.0	0.07	0.64	48.8
West: Akker Avenue (W)											
11	T	481	0.0	0.514	10.4	LOS B	5.2	36.2	0.69	0.72	46.4
12	R	6	0.0	0.526	13.4	LOS B	5.2	36.2	0.69	0.79	44.5
Approach		487	0.0	0.514	10.4	LOS B	5.2	36.2	0.69	0.73	46.4
All Vehicles		1077	0.0	0.526	10.2	LOS B	5.2	36.2	0.46	0.70	46.7

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Msasa Crescent Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	4	0.0	0.120	11.2	LOS B	0.8	5.7	0.51	0.72	45.8
3	R	103	0.0	0.120	12.9	LOS B	0.8	5.7	0.51	0.73	44.4
Approach		107	0.0	0.120	12.8	LOS B	0.8	5.7	0.51	0.73	44.5
East: Akker Avenue (E)											
4	L	242	0.0	0.351	9.0	LOS A	3.4	23.5	0.08	0.72	47.9
5	T	319	0.0	0.352	7.7	LOS A	3.4	23.5	0.08	0.59	49.1
Approach		561	0.0	0.352	8.2	LOS A	3.4	23.5	0.08	0.65	48.6
West: Akker Avenue (W)											
11	T	156	0.0	0.147	8.4	LOS A	1.1	8.0	0.34	0.59	48.0
12	R	7	0.0	0.147	11.4	LOS B	1.1	8.0	0.34	0.74	46.0
Approach		163	0.0	0.147	8.5	LOS B	1.1	8.0	0.34	0.60	47.9
All Vehicles		832	0.0	0.352	8.9	LOS A	3.4	23.5	0.18	0.65	47.9

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

Processed: 18 November 2016 03:55:58 PM
SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Milkwood Road Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	12	0.0	0.252	15.1	LOS C	1.3	9.1	0.53	0.80	43.1
3	R	124	0.0	0.250	14.9	LOS B	1.3	9.1	0.53	0.97	43.3
Approach		136	0.0	0.250	14.9	LOS C	1.3	9.1	0.53	0.96	43.3
East: Akker Avenue (E)											
4	L	56	0.0	0.097	8.2	LOS A	0.0	0.0	0.00	0.92	49.0
5	T	140	0.0	0.097	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		196	0.0	0.097	2.3	LOS A	0.0	0.0	0.00	0.26	56.4
West: Akker Avenue (W)											
11	T	184	0.0	0.097	0.8	LOS A	0.8	5.7	0.35	0.00	53.7
12	R	3	0.0	0.096	9.3	LOS A	0.8	5.7	0.35	0.98	49.1
Approach		187	0.0	0.097	1.0	LOS A	0.8	5.7	0.35	0.02	53.6
All Vehicles		519	0.0	0.252	5.1	NA	1.3	9.1	0.27	0.35	51.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 17 November 2016 09:16:17 AM
SIDRA INTERSECTION 5.0.0.1354
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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Milkwood Road Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Milkwood Road (S)											
1	L	8	0.0	0.073	12.2	LOS B	0.4	2.5	0.33	0.82	45.5
3	R	45	0.0	0.073	12.0	LOS B	0.4	2.5	0.33	0.89	45.6
Approach		54	0.0	0.073	12.0	LOS B	0.4	2.5	0.33	0.87	45.6
East: Akker Avenue (E)											
4	L	73	0.0	0.082	8.2	LOS A	0.0	0.0	0.00	0.85	49.0
5	T	93	0.0	0.082	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		165	0.0	0.082	3.6	LOS A	0.0	0.0	0.00	0.37	54.6
West: Akker Avenue (W)											
11	T	37	0.0	0.024	0.6	LOS A	0.2	1.2	0.29	0.00	54.4
12	R	6	0.0	0.024	9.0	LOS A	0.2	1.2	0.29	0.90	48.8
Approach		43	0.0	0.024	1.8	LOS A	0.2	1.2	0.29	0.13	53.5
All Vehicles		262	0.0	0.082	5.0	NA	0.4	2.5	0.12	0.44	52.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 17 November 2016 09:17:07 AM
SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Milkwood Road Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	14	0.0	0.318	16.9	LOS C	1.9	13.3	0.59	0.85	41.7
3	R	144	0.0	0.320	16.7	LOS C	1.9	13.3	0.59	1.03	41.9
Approach		158	0.0	0.320	16.7	LOS C	1.9	13.3	0.59	1.02	41.9
East: Akker Avenue (E)											
4	L	64	0.0	0.112	8.2	LOS A	0.0	0.0	0.00	0.92	49.0
5	T	162	0.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		226	0.0	0.112	2.3	LOS A	0.0	0.0	0.00	0.26	56.4
West: Akker Avenue (W)											
11	T	214	0.0	0.113	1.0	LOS A	1.0	6.9	0.39	0.00	53.1
12	R	4	0.0	0.114	9.4	LOS A	1.0	6.9	0.39	0.97	49.2
Approach		218	0.0	0.113	1.2	LOS A	1.0	6.9	0.39	0.02	53.0
All Vehicles		602	0.0	0.320	5.7	NA	1.9	13.3	0.29	0.37	50.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Milkwood Road Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Milkwood Road (S)											
1	L	11	0.0	0.088	12.5	LOS B	0.4	3.0	0.36	0.82	45.2
3	R	53	0.0	0.089	12.3	LOS B	0.4	3.0	0.36	0.89	45.4
Approach		63	0.0	0.089	12.3	LOS B	0.4	3.0	0.36	0.88	45.4
East: Akker Avenue (E)											
4	L	84	0.0	0.095	8.2	LOS A	0.0	0.0	0.00	0.85	49.0
5	T	106	0.0	0.095	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		191	0.0	0.095	3.6	LOS A	0.0	0.0	0.00	0.37	54.6
West: Akker Avenue (W)											
11	T	43	0.0	0.028	0.7	LOS A	0.2	1.4	0.31	0.00	54.0
12	R	7	0.0	0.028	9.2	LOS A	0.2	1.4	0.31	0.90	48.8
Approach		51	0.0	0.028	2.0	LOS A	0.2	1.4	0.31	0.13	53.2
All Vehicles		304	0.0	0.095	5.1	NA	0.4	3.0	0.13	0.44	52.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 17 November 2016 09:18:25 AM
SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Milkwood Road Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	18	0.0	0.511	18.8	LOS C	4.3	30.4	0.65	0.93	40.3
3	R	247	0.0	0.512	18.6	LOS C	4.3	30.4	0.65	1.12	40.5
Approach		265	0.0	0.512	18.7	LOS C	4.3	30.4	0.65	1.10	40.5
East: Akker Avenue (E)											
4	L	96	0.0	0.117	8.2	LOS A	0.0	0.0	0.00	0.86	49.0
5	T	140	0.0	0.117	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		236	0.0	0.117	3.3	LOS A	0.0	0.0	0.00	0.35	55.0
West: Akker Avenue (W)											
11	T	184	0.0	0.099	1.0	LOS A	0.9	6.0	0.39	0.00	53.0
12	R	5	0.0	0.099	9.5	LOS A	0.9	6.0	0.39	0.97	49.2
Approach		189	0.0	0.099	1.3	LOS A	0.9	6.0	0.39	0.03	52.9
All Vehicles		691	0.0	0.512	8.7	NA	4.3	30.4	0.36	0.55	47.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 17 November 2016 09:22:36 AM
SIDRA INTERSECTION 5.0.0.1354
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Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Milkwood Road Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	12	0.0	0.161	13.1	LOS B	0.8	5.8	0.43	0.83	44.7
3	R	95	0.0	0.161	13.0	LOS B	0.8	5.8	0.43	0.91	44.9
Approach		106	0.0	0.161	13.0	LOS B	0.8	5.8	0.43	0.90	44.9
East: Akker Avenue (E)											
4	L	187	0.0	0.141	8.2	LOS A	0.0	0.0	0.00	0.76	49.0
5	T	93	0.0	0.141	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		280	0.0	0.141	5.5	LOS A	0.0	0.0	0.00	0.51	52.1
West: Akker Avenue (W)											
11	T	37	0.0	0.031	1.2	LOS A	0.2	1.5	0.38	0.00	52.6
12	R	13	0.0	0.031	9.6	LOS A	0.2	1.5	0.38	0.85	48.6
Approach		49	0.0	0.031	3.3	LOS A	0.2	1.5	0.38	0.22	51.6
All Vehicles		436	0.0	0.161	7.1	NA	0.8	5.8	0.15	0.57	50.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 17 November 2016 09:23:10 AM
SIDRA INTERSECTION 5.0.0.1354
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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Milkwood Road Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	20	0.0	0.606	22.1	LOS C	5.8	40.6	0.72	1.04	38.1
3	R	267	0.0	0.612	22.0	LOS C	5.8	40.6	0.72	1.19	38.2
Approach		287	0.0	0.612	22.0	LOS C	5.8	40.6	0.72	1.18	38.2
East: Akker Avenue (E)											
4	L	105	0.0	0.133	8.2	LOS A	0.0	0.0	0.00	0.87	49.0
5	T	162	0.0	0.133	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		267	0.0	0.133	3.2	LOS A	0.0	0.0	0.00	0.34	55.1
West: Akker Avenue (W)											
11	T	214	0.0	0.115	1.2	LOS A	1.0	7.3	0.42	0.00	52.5
12	R	6	0.0	0.115	9.7	LOS A	1.0	7.3	0.42	0.96	49.2
Approach		220	0.0	0.115	1.5	LOS A	1.0	7.3	0.42	0.03	52.4
All Vehicles		775	0.0	0.612	9.7	NA	5.8	40.6	0.39	0.56	46.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION

Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Milkwood Road Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
1	L	13	0.0	0.180	13.5	LOS B	0.9	6.5	0.45	0.84	44.4
3	R	102	0.0	0.181	13.4	LOS B	0.9	6.5	0.45	0.92	44.6
Approach		115	0.0	0.181	13.4	LOS B	0.9	6.5	0.45	0.91	44.5
East: Akker Avenue (E)											
4	L	199	0.0	0.154	8.2	LOS A	0.0	0.0	0.00	0.77	49.0
5	T	106	0.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		305	0.0	0.154	5.3	LOS A	0.0	0.0	0.00	0.50	52.3
West: Akker Avenue (W)											
11	T	43	0.0	0.035	1.3	LOS A	0.3	1.8	0.40	0.00	52.3
12	R	14	0.0	0.035	9.7	LOS A	0.3	1.8	0.40	0.86	48.7
Approach		57	0.0	0.035	3.3	LOS A	0.3	1.8	0.40	0.21	51.4
All Vehicles		477	0.0	0.181	7.0	NA	0.9	6.5	0.16	0.56	50.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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MOVEMENT SUMMARY

Site: 2017 AM BGD

Milkwood Road / Proposed Access Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
2	T	1	0.0	0.001	0.1	LOS A	0.0	0.1	0.12	0.00	57.2
3	R	1	0.0	0.001	8.6	LOS A	0.0	0.1	0.12	0.79	48.5
Approach		2	0.0	0.001	4.3	LOS A	0.0	0.1	0.12	0.39	52.5
East: Propose Access (E)											
4	L	1	0.0	0.150	10.9	LOS B	0.8	5.6	0.12	0.87	46.3
6	R	128	0.0	0.149	10.7	LOS B	0.8	5.6	0.12	0.92	46.5
Approach		129	0.0	0.149	10.7	LOS B	0.8	5.6	0.12	0.92	46.5
North: Milkwood Road (N)											
7	L	43	0.0	0.024	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	1	0.0	0.024	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		44	0.0	0.024	8.0	LOS A	0.0	0.0	0.00	0.66	49.2
All Vehicles		176	0.0	0.150	10.0	NA	0.8	5.6	0.09	0.84	47.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 17 November 2016 09:28:39 AM
SIDRA INTERSECTION 5.0.0.1354

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MOVEMENT SUMMARY

Site: 2017 PM BGD

Milkwood Road / Proposed Access Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
2	T	1	0.0	0.001	0.4	LOS A	0.0	0.1	0.22	0.00	55.1
3	R	1	0.0	0.001	8.8	LOS A	0.0	0.1	0.22	0.75	48.3
Approach		2	0.0	0.001	4.6	LOS A	0.0	0.1	0.22	0.37	51.5
East: Propose Access (E)											
4	L	1	0.0	0.062	11.2	LOS B	0.3	2.2	0.20	0.84	46.2
6	R	52	0.0	0.064	11.0	LOS B	0.3	2.2	0.20	0.89	46.3
Approach		53	0.0	0.064	11.0	LOS B	0.3	2.2	0.20	0.89	46.3
North: Milkwood Road (N)											
7	L	120	0.0	0.062	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	1	0.0	0.062	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		121	0.0	0.062	8.1	LOS A	0.0	0.0	0.00	0.66	49.0
All Vehicles		176	0.0	0.064	8.9	NA	0.3	2.2	0.06	0.73	48.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354
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MOVEMENT SUMMARY

Site: 2022 AM BGD

Milkwood Road / Proposed Access Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Milkwood Road (S)											
2	T	1	0.0	0.001	0.1	LOS A	0.0	0.1	0.12	0.00	57.2
3	R	1	0.0	0.001	8.6	LOS A	0.0	0.1	0.12	0.79	48.5
Approach		2	0.0	0.001	4.3	LOS A	0.0	0.1	0.12	0.39	52.5
East: Propose Access (E)											
4	L	1	0.0	0.150	10.9	LOS B	0.8	5.6	0.12	0.87	46.3
6	R	128	0.0	0.149	10.7	LOS B	0.8	5.6	0.12	0.92	46.5
Approach		129	0.0	0.149	10.7	LOS B	0.8	5.6	0.12	0.92	46.5
North: Milkwood Road (N)											
7	L	43	0.0	0.023	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	1	0.0	0.023	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		44	0.0	0.023	8.0	LOS A	0.0	0.0	0.00	0.66	49.2
All Vehicles		176	0.0	0.150	10.0	NA	0.8	5.6	0.09	0.84	47.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 04:01:23 PM
SIDRA INTERSECTION 5.0.0.1354

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Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2022 PM BGD

Milkwood Road / Proposed Access Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Milkwood Road (S)											
2	T	1	0.0	0.001	0.4	LOS A	0.0	0.1	0.22	0.00	55.1
3	R	1	0.0	0.001	8.8	LOS A	0.0	0.1	0.22	0.75	48.3
Approach		2	0.0	0.001	4.6	LOS A	0.0	0.1	0.22	0.37	51.5
East: Propose Access (E)											
4	L	1	0.0	0.062	11.2	LOS B	0.3	2.2	0.20	0.84	46.2
6	R	52	0.0	0.064	11.0	LOS B	0.3	2.2	0.20	0.89	46.3
Approach		53	0.0	0.064	11.0	LOS B	0.3	2.2	0.20	0.89	46.3
North: Milkwood Road (N)											
7	L	120	0.0	0.062	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	1	0.0	0.062	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		121	0.0	0.062	8.1	LOS A	0.0	0.0	0.00	0.66	49.0
All Vehicles		176	0.0	0.064	8.9	NA	0.3	2.2	0.06	0.73	48.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 04:01:43 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras \07Milkwood_Access\BG+D\Proposed\Milkwood_Access_REV1(C).sip

ANNEXURE D

PROPOSED TRAFFIC SIGNAL PHASINGS AND TIMINGS

Unlicensed Trial Version
PHASING SUMMARY

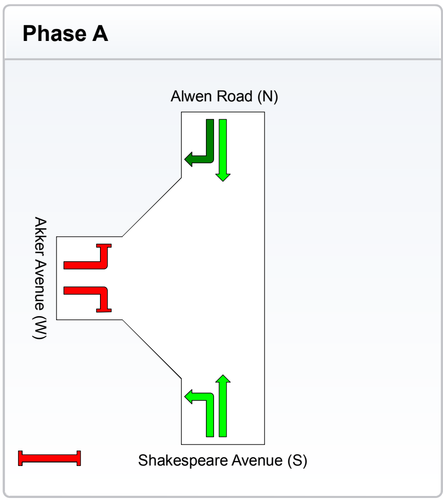
Site: 2017 AM BGD

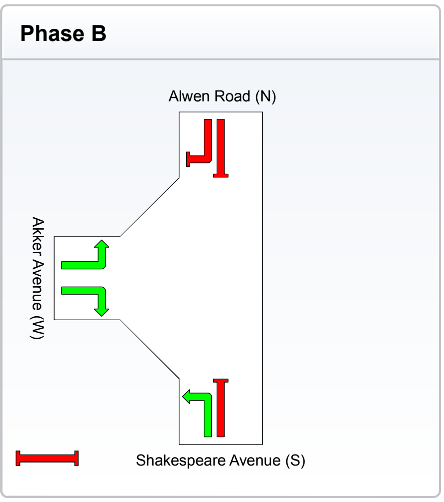
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

Phase	**A**	**B**
Green Time (sec)	30	20
Yellow Time (sec)	3	3
All-Red Time (sec)	2	2
Phase Time (sec)	35	25
Phase Split	58%	42%


Phase A


Phase B

🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:02:50 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\02 Akker_Alwen_shakespeare\BG\Latents\Akker_Alwen_hakespeare_REV1(C).sip
Unlicensed Trial Version

PHASING SUMMARY

Site: 2017 PM BGD

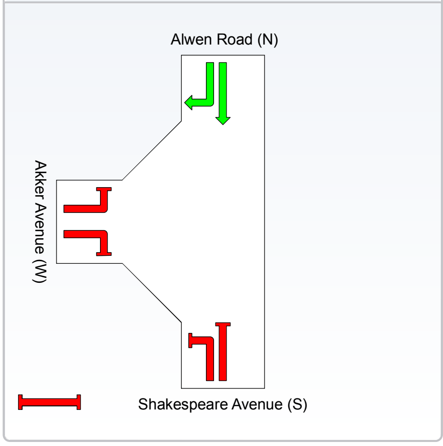
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

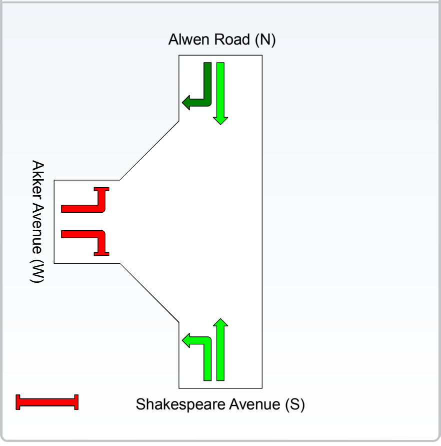
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	19	15	11
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	24	20	16
Phase Split	40%	33%	27%

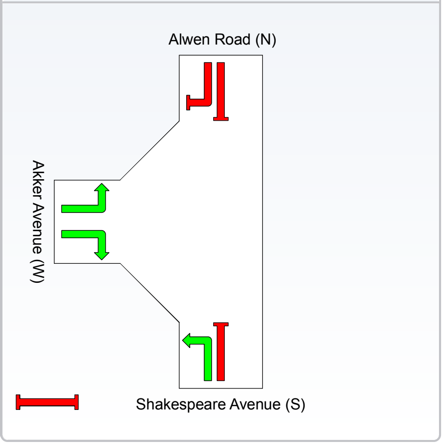
Phase A



Phase B



Phase C



🟩 Normal Movement
🟪 Slip-Lane Movement
🟥 Stopped Movement
🟥 Turn On Red
🟩 Permitted/Opposed
🟪 Opposed Slip-Lane
🟦 Continuous Movement
🟦 Undetected Movement
● Phase Transition Applied

Processed: 18 November 2016 03:03:01 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\02 Akker_Alwen_shakespeare\BG\Latents\Akker_Alwen_hakespeare_REV1(C).sip

PHASING SUMMARY

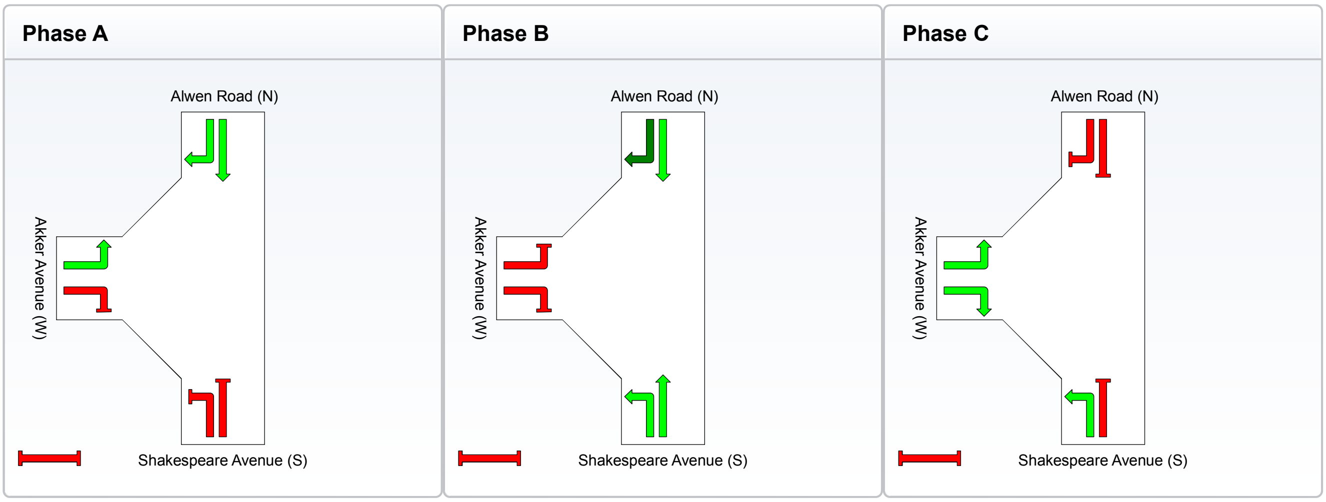
Site: 2022 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Cycle Time Option: **Optimum Cycle Time (Minimum Delay)**
Phase times determined by the program
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	6	41	18
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	11	46	23
Phase Split	14%	58%	29%



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:03:14 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\02 Akker_Alwen_shakespeare\BG\Latents\Akker_Alwen_hakespeare_REV1(C).sip
Unlicensed Trial Version

PHASING SUMMARY

Site: 2022 PM BGD

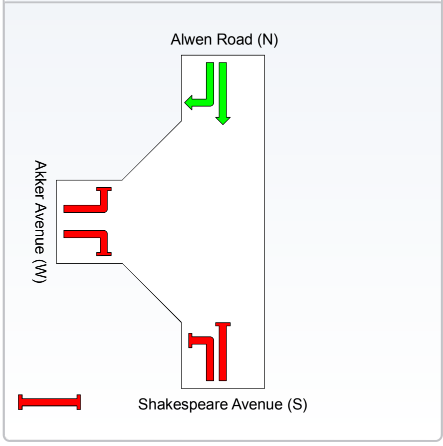
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

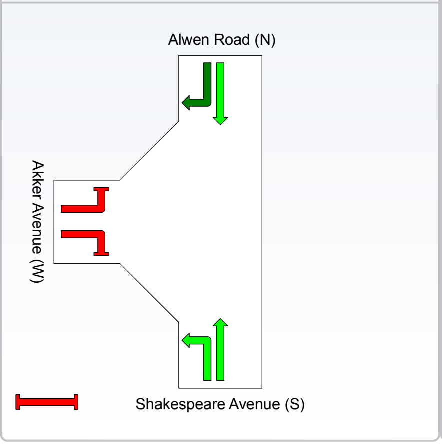
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	7	25	13
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	30	18
Phase Split	20%	50%	30%

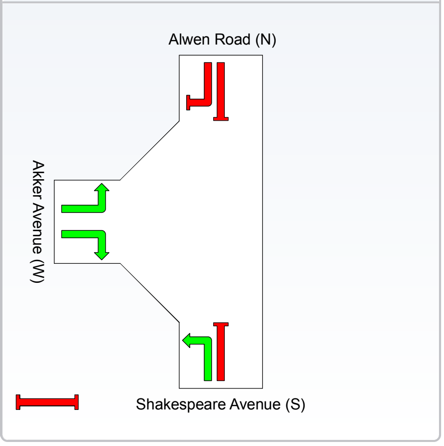
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:03:23 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\02 Akker_Alwen_shakespeare\BG\Latents\Akker_Alwen_hakespeare_REV1(C).sip

Unlicensed Trial Version
PHASING SUMMARY

Site: 2017 AM BGD

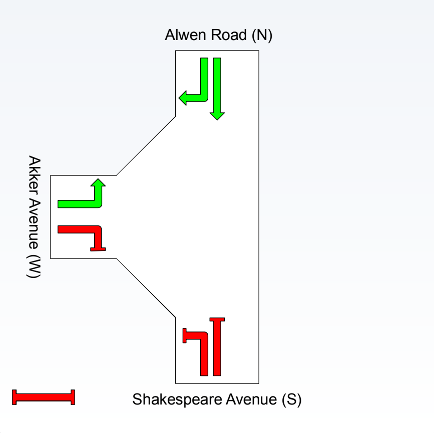
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

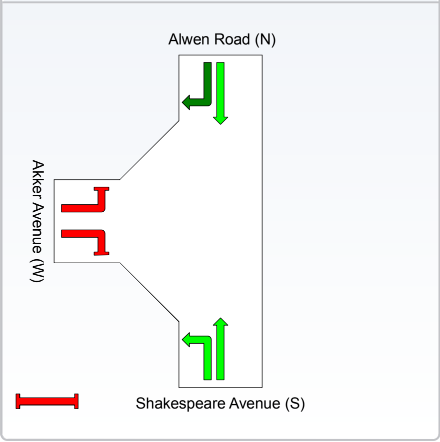
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	7	33	15
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	38	20
Phase Split	17%	54%	29%

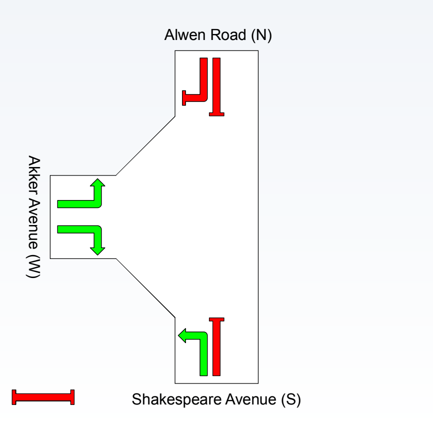
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	▭	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:08:28 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip
Unlicensed Trial Version

PHASING SUMMARY

Site: 2017 PM BGD

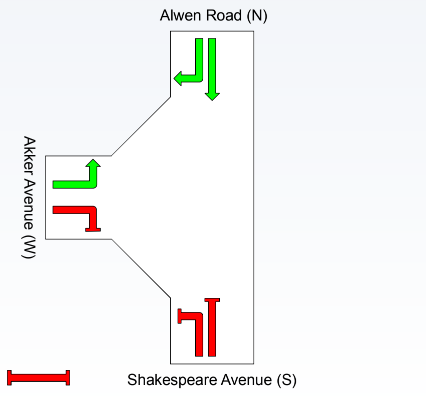
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

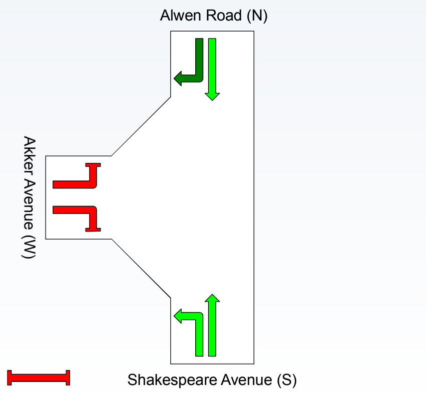
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	22	16	7
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	27	21	12
Phase Split	45%	35%	20%

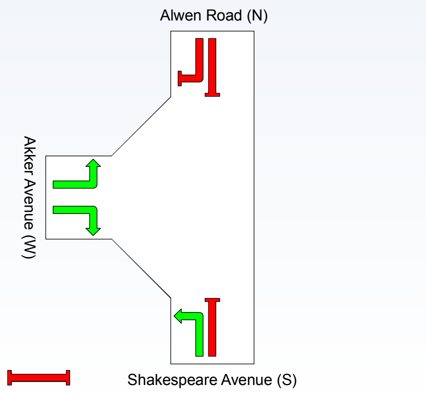
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	▭	Undetected Movement
		●	Phase Transition Applied

PHASING SUMMARY

Site: 2022 AM BGD

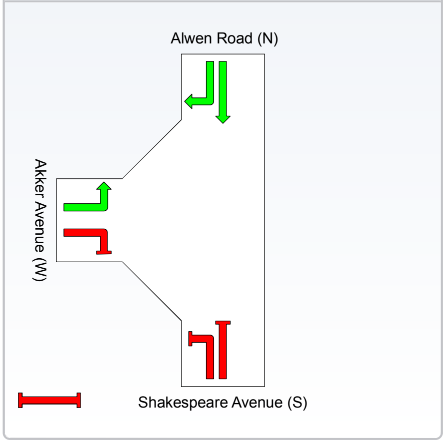
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

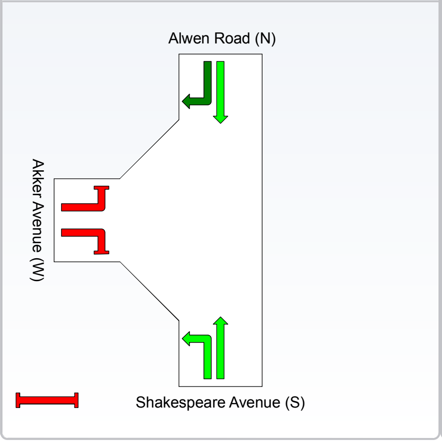
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	7	41	17
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	46	22
Phase Split	15%	58%	28%

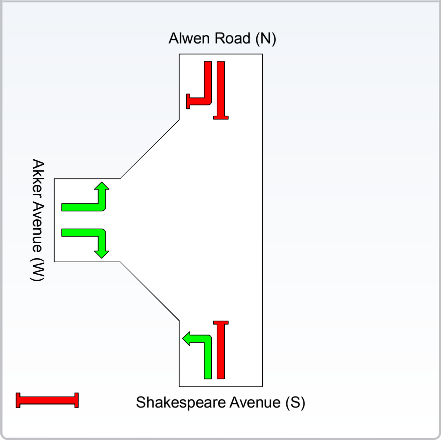
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:09:05 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip
Unlicensed Trial Version

PHASING SUMMARY

Site: 2022 PM BGD

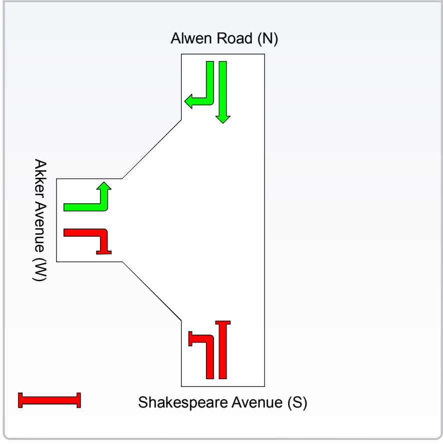
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

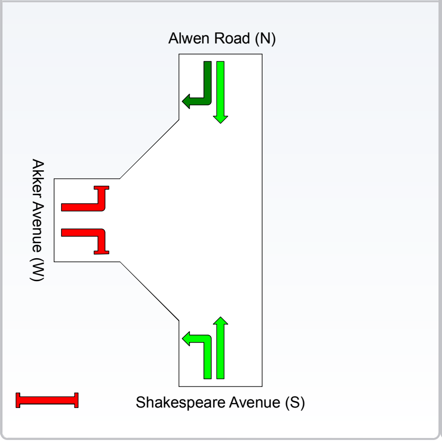
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	23	15	7
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	28	20	12
Phase Split	47%	33%	20%

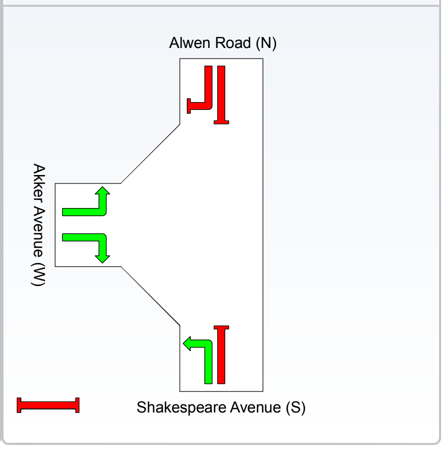
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:09:19 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip

Unlicensed Trial Version

PHASING SUMMARY

Site: 2017 AM BGD

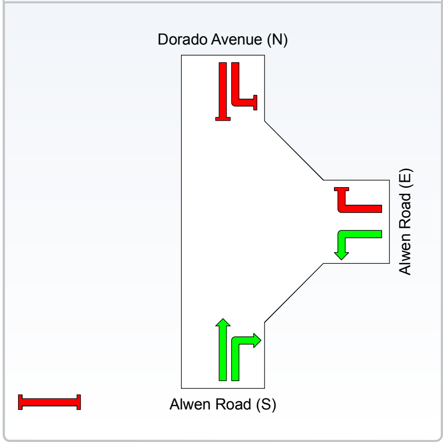
Dorado Avenue / Alwen Road Junction
2017 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time Cycle Time = 65 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

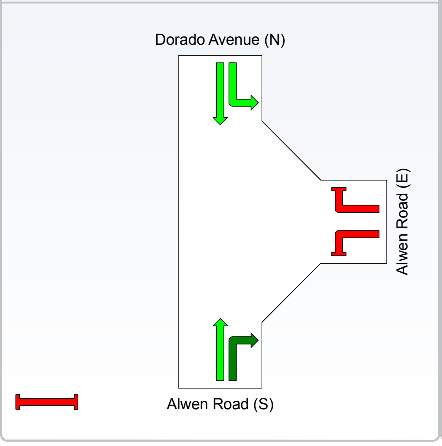
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	17	23	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	23	29	13
Phase Split	35%	45%	20%

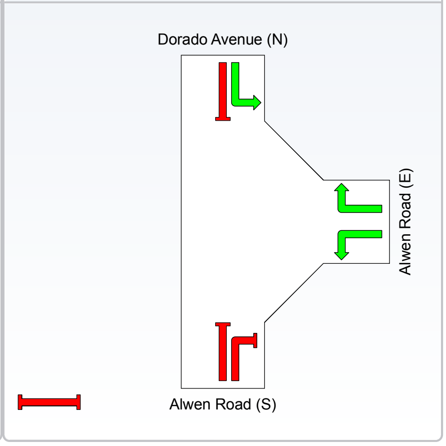
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:12:00 PM
SIDRA INTERSECTION 5.0.0.1354

SIDRA INTERSECTION

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\01 Dorado_ Alwen\BG\Latents\Dorado_ Alwen_REV2(C).sip
Unlicensed Trial Version

PHASING SUMMARY

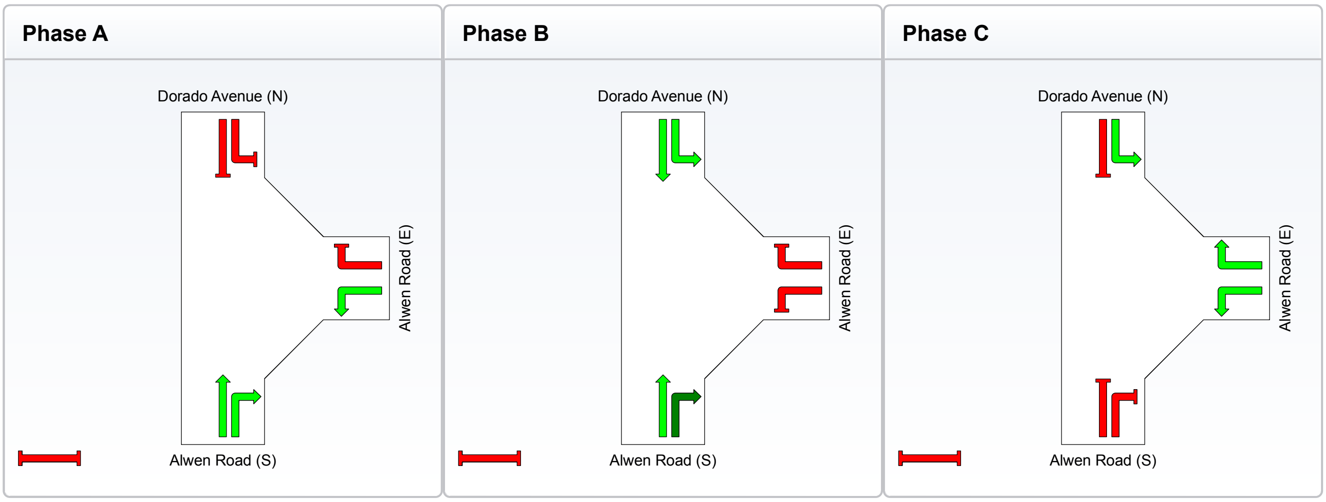
Site: 2017 PM BGD

Dorado Avenue / Alwen Road Junction
2017 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	7	38	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	13	44	13
Phase Split	19%	63%	19%



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	▬	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:12:13 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\01 Dorado_ Alwen\BG\Latents\Dorado_ Alwen_REV2(C).sip

PHASING SUMMARY

Site: 2022 AM BGD

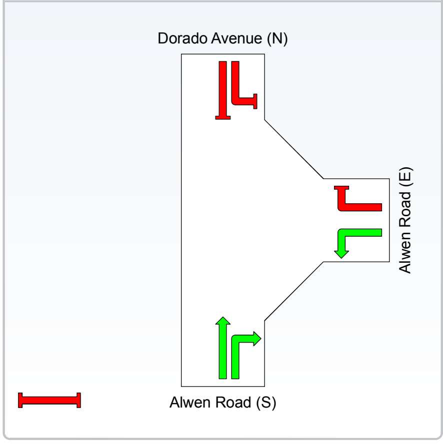
Dorado Avenue / Alwen Road Junction
2022 AM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

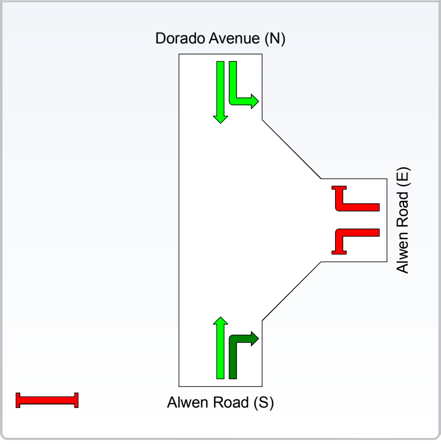
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	18	27	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	24	33	13
Phase Split	34%	47%	19%

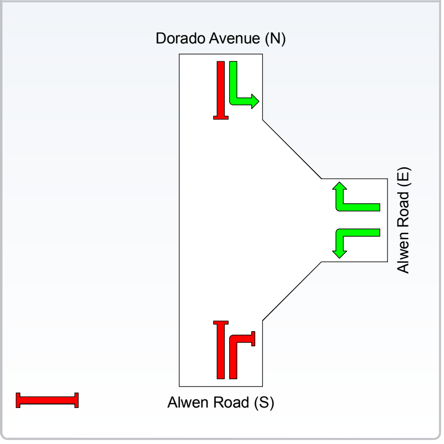
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:12:23 PM
SIDRA INTERSECTION 5.0.0.1354

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Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\01 Dorado_ Alwen\BG\Latents\Dorado_ Alwen_REV2(C).sip

Unlicensed Trial Version
PHASING SUMMARY

Site: 2022 PM BGD

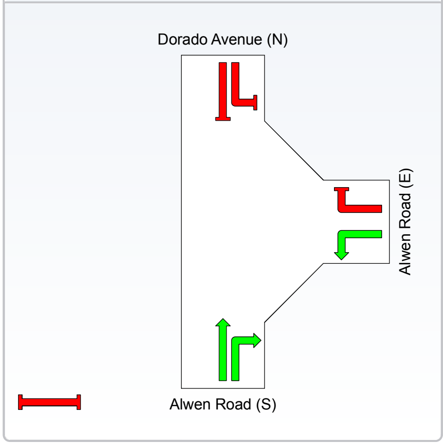
Dorado Avenue / Alwen Road Junction
2022 PM Peak Hour Background Traffic Volumes
Proposed by Latents Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

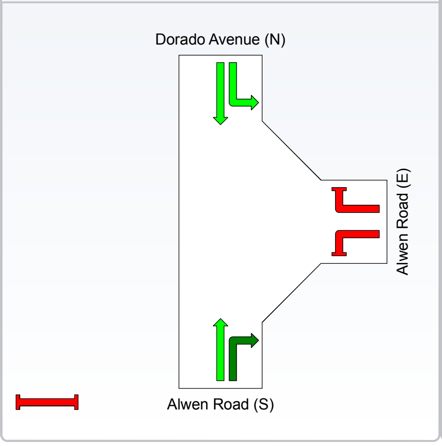
Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	48	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	13	54	13
Phase Split	16%	68%	16%

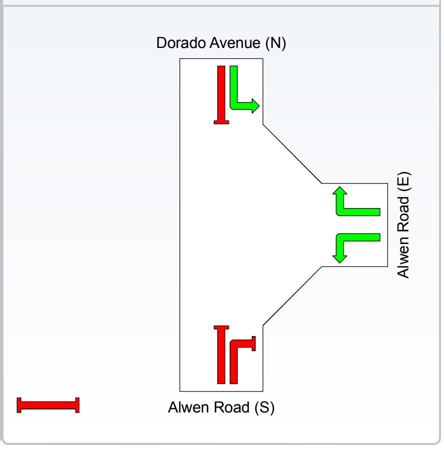
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:12:34 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\01 Dorado_ Alwen\BG\Latents\Dorado_ Alwen_REV2(C).sip
Unlicensed Trial Version

PHASING SUMMARY

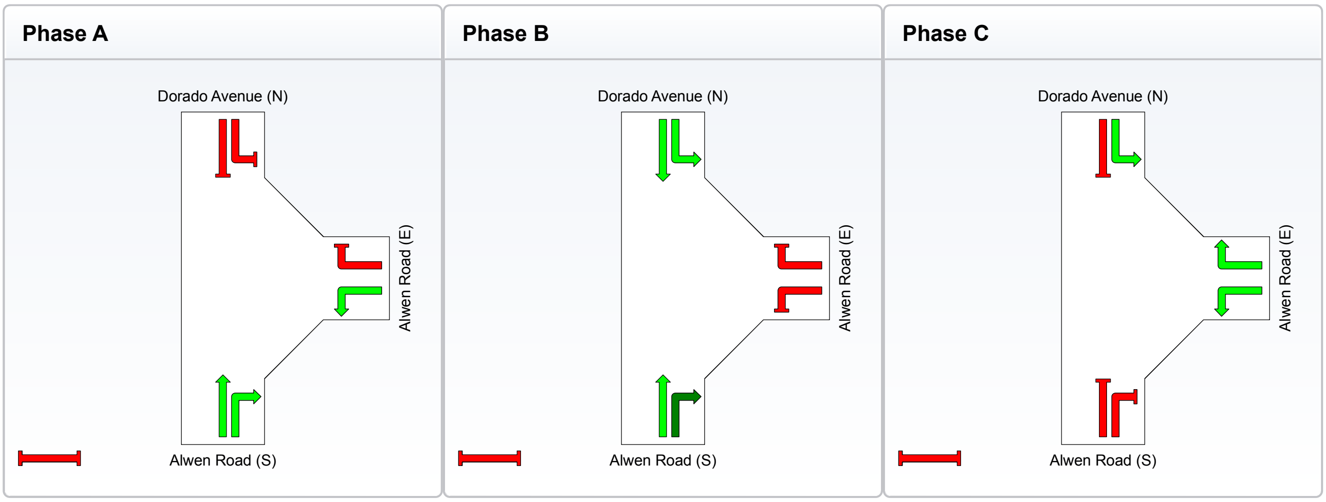
Site: 2017 AM BGD

Dorado Avenue / Alwen Road Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 65 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	17	23	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	23	29	13
Phase Split	35%	45%	20%



🟩 Normal Movement	🟩 Permitted/Opposed
🟪 Slip-Lane Movement	🟪 Opposed Slip-Lane
🟥 Stopped Movement	🟦 Continuous Movement
🟥 Turn On Red	🟦 Undetected Movement
	● Phase Transition Applied

Processed: 18 November 2016 03:16:18 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\01 Dorado_ Alwen\BG+D\Proposed\Dorado_ Alwen_REV2(C).sip

PHASING SUMMARY

Site: 2017 PM BGD

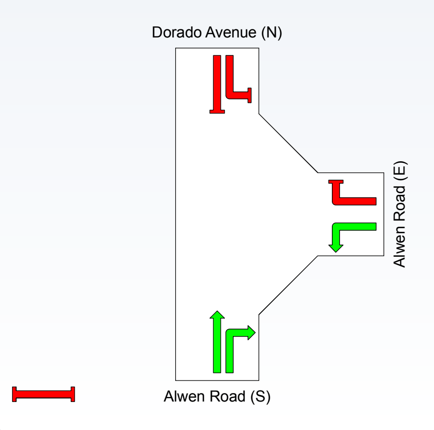
Dorado Avenue / Alwen Road Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

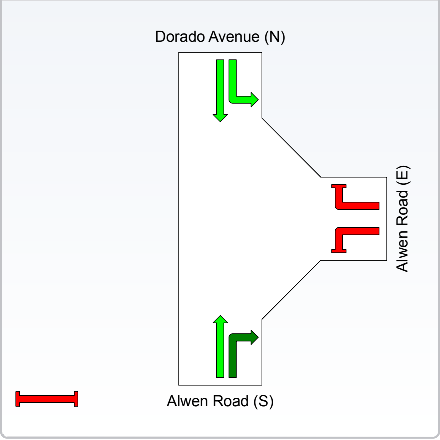
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	7	38	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	13	44	13
Phase Split	19%	63%	19%

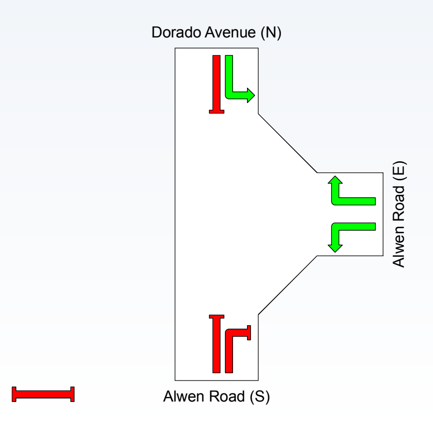
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	▭	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:16:50 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\01 Dorado_ Alwen\BG+D\Proposed\Dorado_ Alwen_REV2(C).sip

PHASING SUMMARY

Site: 2022 AM BGD

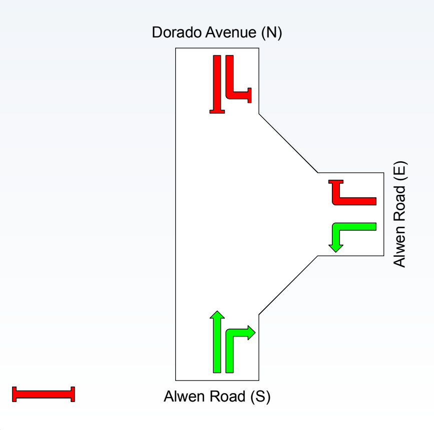
Dorado Avenue / Alwen Road Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

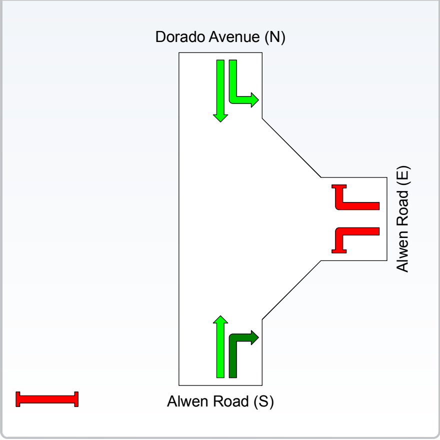
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	18	27	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	24	33	13
Phase Split	34%	47%	19%

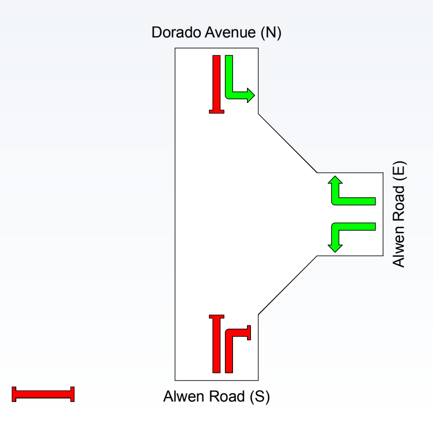
Phase A



Phase B



Phase C



🟩 Normal Movement
🟪 Slip-Lane Movement
🟥 Stopped Movement
🟥 Turn On Red

🟩 Permitted/Opposed
🟪 Opposed Slip-Lane
🟦 Continuous Movement
🟦 Undetected Movement
● Phase Transition Applied

Processed: 18 November 2016 03:17:17 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\01 Dorado_ Alwen\BG+D\Proposed\Dorado_ Alwen_REV2(C).sip
Unlicensed Trial Version

Unlicensed Trial Version

PHASING SUMMARY

Site: 2022 PM BGD

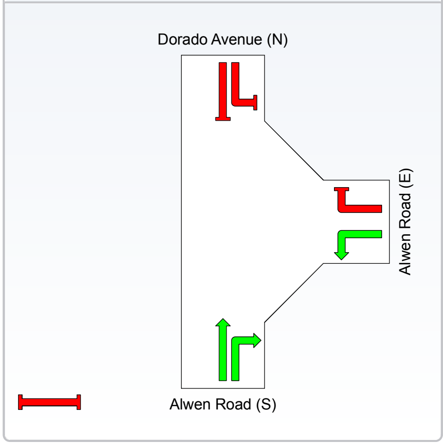
Dorado Avenue / Alwen Road Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

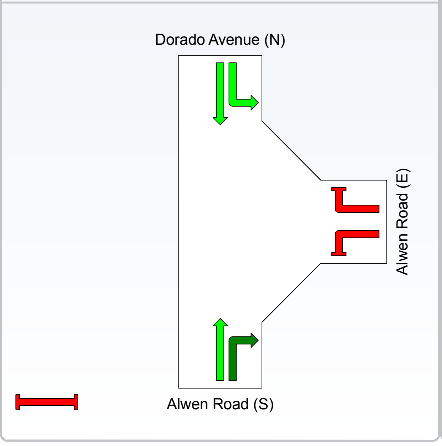
Phase Timing Results

Phase	A	B	C
Green Time (sec)	7	48	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	13	54	13
Phase Split	16%	68%	16%

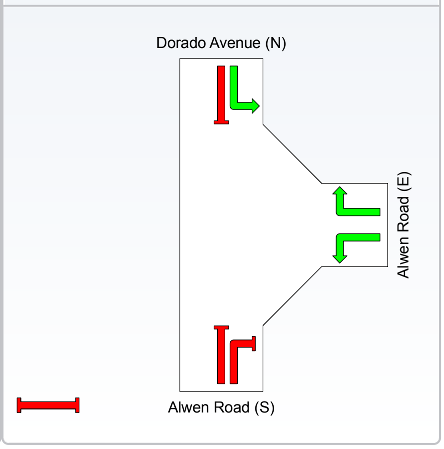
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	▭	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 03:17:38 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\04 SITE A\02 Sidras\01 Dorado_ Alwen\BG+D\Proposed\Dorado_ Alwen_REV2(C).sip
Unlicensed Trial Version

ANNEXURE E

STORAGE LANE CALCULATIONS

Required Storage Lane Calculation

18-Nov-16

ORMONDE EXTENSION 24 - SITE A DEVELOPMENT

PM PEAK HOUR TRIP ASSIGMENT (ACCESS OFF MILKWOOD ROAD)

Input Values:

Trips

	Development IN	41	/h
	Development OUT	122	/h

from: Guidelines for traffic Impact Studies - Table 5.2: Typical parking control service rates per lane

Security gate	max. service rate: Coded Card Reader	350	/hour
Number of channels (IN)	**N**:	1	lanes
Number of channels (OUT)	**N**:	1	lanes
Exceed Probability:	M (queue L) could be exceeded	5%	of the time

Output values:
Trips Generated:

Peak hour:	Primary direction (demand/arrival rate) **q1**:	41	
	Secondary direction (demand/arrival rate) **q2**:	122	
		163	v/h (100%)

Queue length (M) *(ref. Transport & Land Development By Stover / Koepke Eq 8-9b)*

Utilization factor (ρ): ***ρ = q(1,2) / NQ*** *= arrival rate [demand] / (number of channels x service rate per channel)*

ρ =demand (arrive) rate / (**N** x max. service rate)
= 41 / (1 x 350) = 0.1171
= 122 / (1 x 350) = 0.3486

Qm1 (from Table 8-11) = 0.1171

Qm2 (from Table 8-11) = 0.2971

Queue length (M)1 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1
= ((LN[0.05]-LN[0.117]) / LN[0.117]) - 1
= (-0.851 / -2.144) - 1 = **-0.7** **Zero queue**
-6 *m*

Queue length (M)2 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1
= ((LN[0.05]-LN[0.297]) / LN[0.349]) - 1
= (-1.782 / -1.054) - 1 = **0.9** **Vehicles**
6 *m*

Required Storage Lane Calculation

18-Nov-16

ORMONDE EXTENSION 24 - SITE A DEVELOPMENT

PM PEAK HOUR TRIP ASSIGMENT
(ACCESS OFF MILKWOOD ROAD)

Input Values:

Trips

	Development IN	114	/h
	Development OUT	49	/h

from: Guidelines for traffic Impact Studies - Table 5.2: Typical parking control service rates per lane

Security gate	max. service rate: Coded Card Reader	350	/hour
Number of channels (IN)	**N**:	1	lanes
Number of channels (OUT)	**N**:	1	lanes
Exceed Probability:	M (queue L) could be exceeded	5%	of the time

Output values:
Trips Generated:

Peak hour:	Primary direction (demand/arrival rate) **q1**:	114	
	Secondary direction (demand/arrival rate) **q2**:	49	
		163	v/h (100%)

Queue length (M) *(ref. Transport & Land Development By Stover / Koepke Eq 8-9b)*

Utilization factor (ρ): *ρ = q(1,2) / NQ = arrival rate [demand] / (number of channels x service rate per channel)*

ρ =demand (arrive) rate / (**N** x max. service rate)
= 114 / (1 x 350) = 0.3257
= 49 / (1 x 350) = 0.1400

Qm1 (from Table 8-11) = 0.2514

Qm2 (from Table 8-11) = 0.1400

Queue length (M)1 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1
= ((LN[0.05]-LN[0.251]) / LN[0.326]) - 1
= (-1.615 / -1.122) - 1 = **0.7** **Vehicles**
6 *m*

Queue length (M)2 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1
= ((LN[0.05]-LN[0.140]) / LN[0.140]) - 1
= (-1.030 / -1.966) - 1 = **-0.5** **Zero queue**
-6 *m*

ANNEXURE F

PROPOSED ROAD UPGRADES LAYOUT PLANS

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
ALWEN ROAD / DORADO AVENUE INTERSECTION

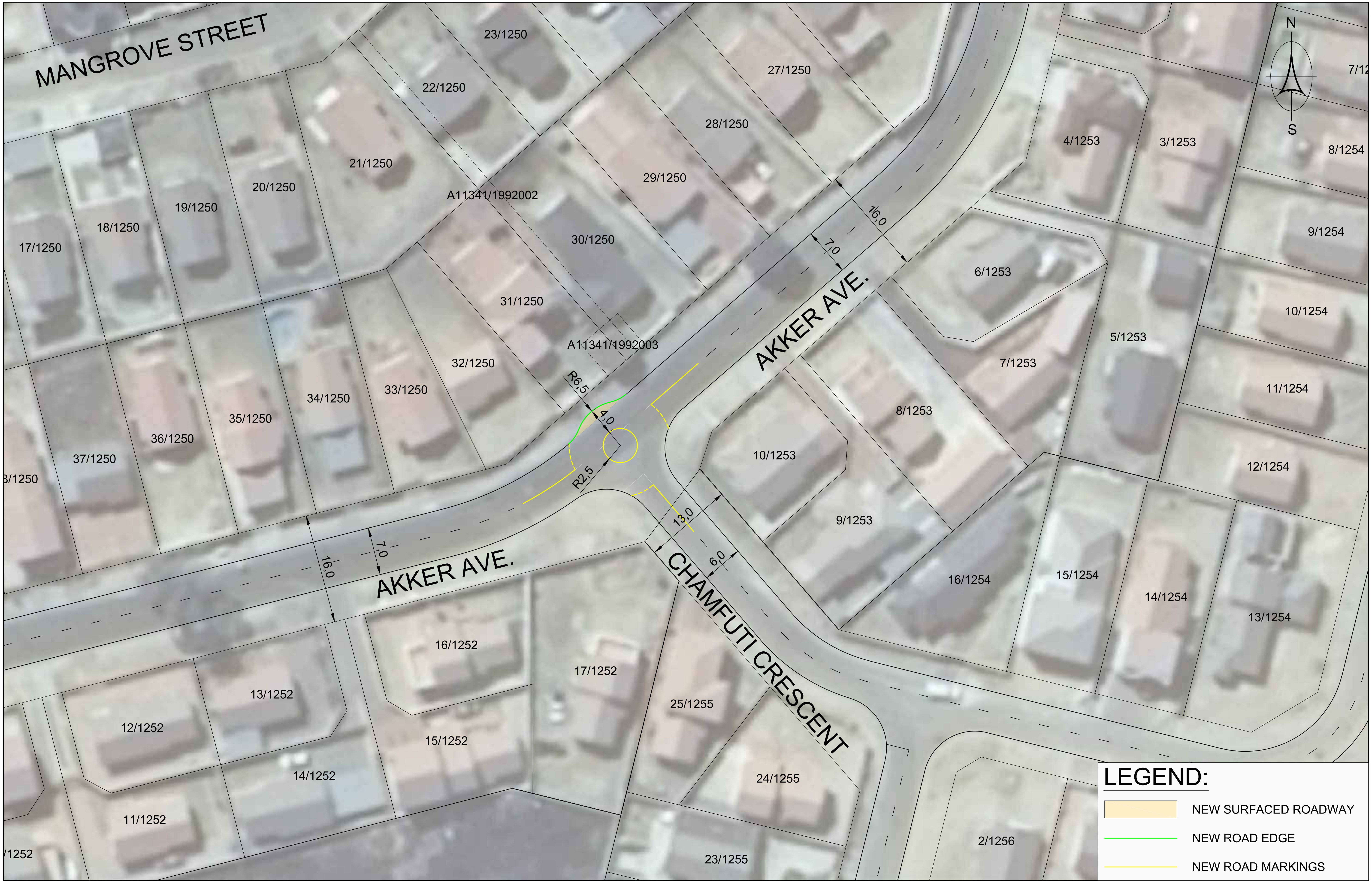
DATE
2016/11/17

SCALE
1:1000

CIVIL CONCEPTS

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / MSASA CRESCENT INTERSECTION

DATE	2016/11/17
SCALE	1:500



CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / CHAMFUTI CRESCENT INTERSECTION

DATE
2016/11/17

SCALE
1:500

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / ALWEN ROAD / SHAKESPEARE AVENUE INTERSECTION

DATE
2016/11/17

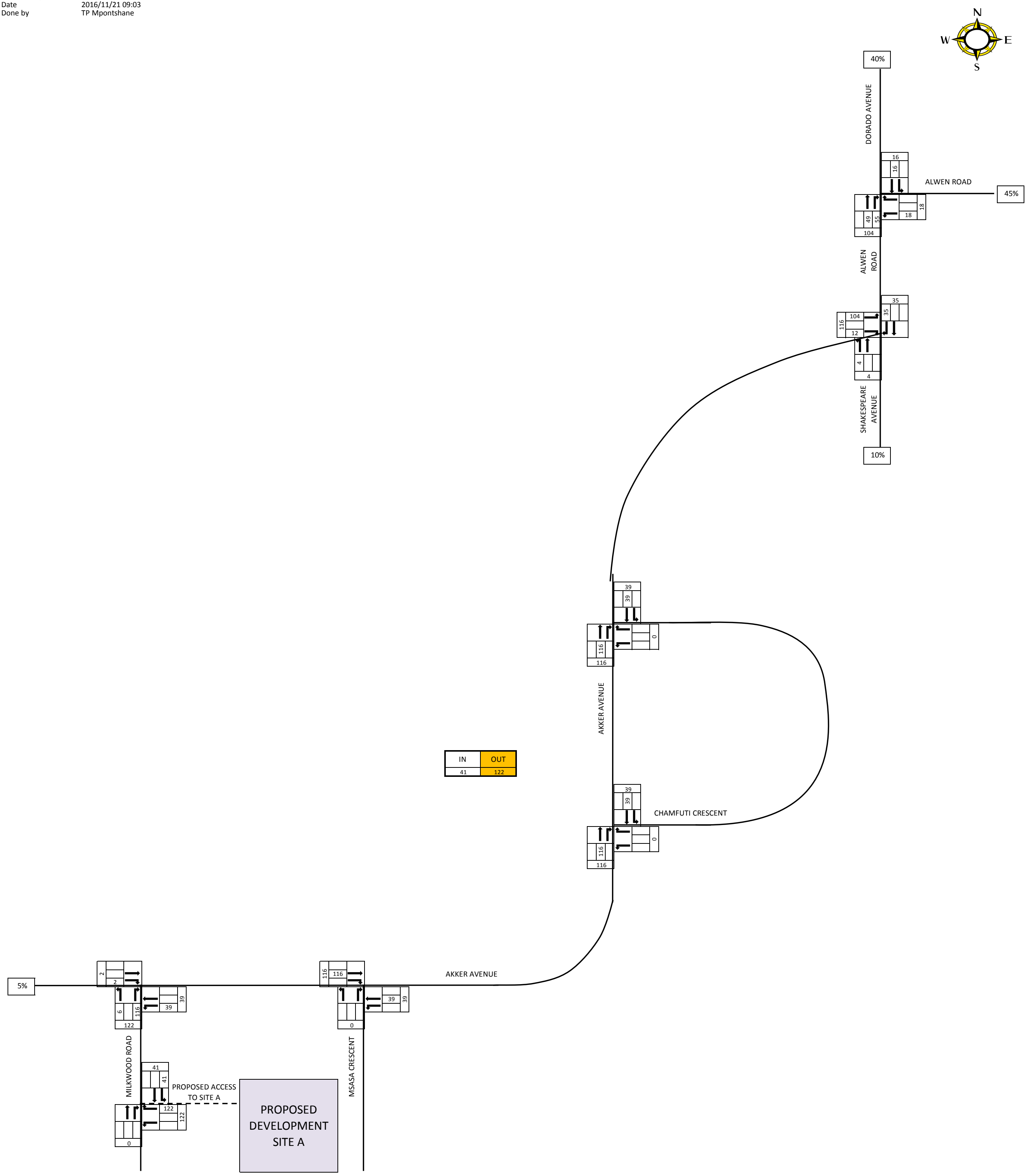
SCALE
1:1000

ANNEXURE G

COST ESTIMATES OF THE PROPOSED UPGRADES

No	INTERSECTION	CONSTRUCTION TYPE	ROADWAY	EARTH WORKS	KERBING	REMOVE KERBS	PAINT LINES	PAINT SYMBOL	REMOVE & REPLACE GUARDRAIL	RELOCATE KERB INLET	RELOCATE STREET LIGHT	RELOCATE SIGN	REMOVE TREE	TRAFFIC SIGNALS	TOTAL PER UPGRADE (RANDS)
		UNIT	m²	m²	m	m	m	m²	m	No.	No.		No.	COMPLETE	
		RANDS / UNIT	***1200***	***120***	***170***	***60***	***80***	***150***	***700***	***15000***	***7500***	***3500***	***3500***	***1000000***	
1	AKKER AVE / ALWEN RD / SHAKESPEARE AVE		840	1150	360	365	650	65	100	2	3	2	11	0.5	**R 1 958 850.00**
2	ALWEN ROAD / DORADO AVE		625		280	285	505	65		1	6	3	2	1	**R 1 942 350.00**
3	AKKER AVE / MSASA CRESCENT		15		12	11	60	10							**R 27 000.00**
4	AKKER AVE / CHAMFUTI CRESCENT		15		12	11	60	10			1				**R 34 500.00**
5															
6															
	SUB-TOTAL UNITS		1495	1150	664	672	1275	150	100	3	10	5	13		
	SUB-TOTAL PRICE (RANDS)		**R 1 794 000**	**R 138 000**	**R 112 880**	**R 40 320**	**R 102 000**	**R 22 500**	**R 70 000**	**R 45 000**	**R 75 000**	**R 17 500**	**R 45 500**		
												TOTAL			**R 3 962 700.00**
												Add: Contingencies	**10%**		R 396 270.00
															R 4 358 970.00
												VAT	**14%**		R 610 255.80
												AMOUNT			**R 4 969 225.80**

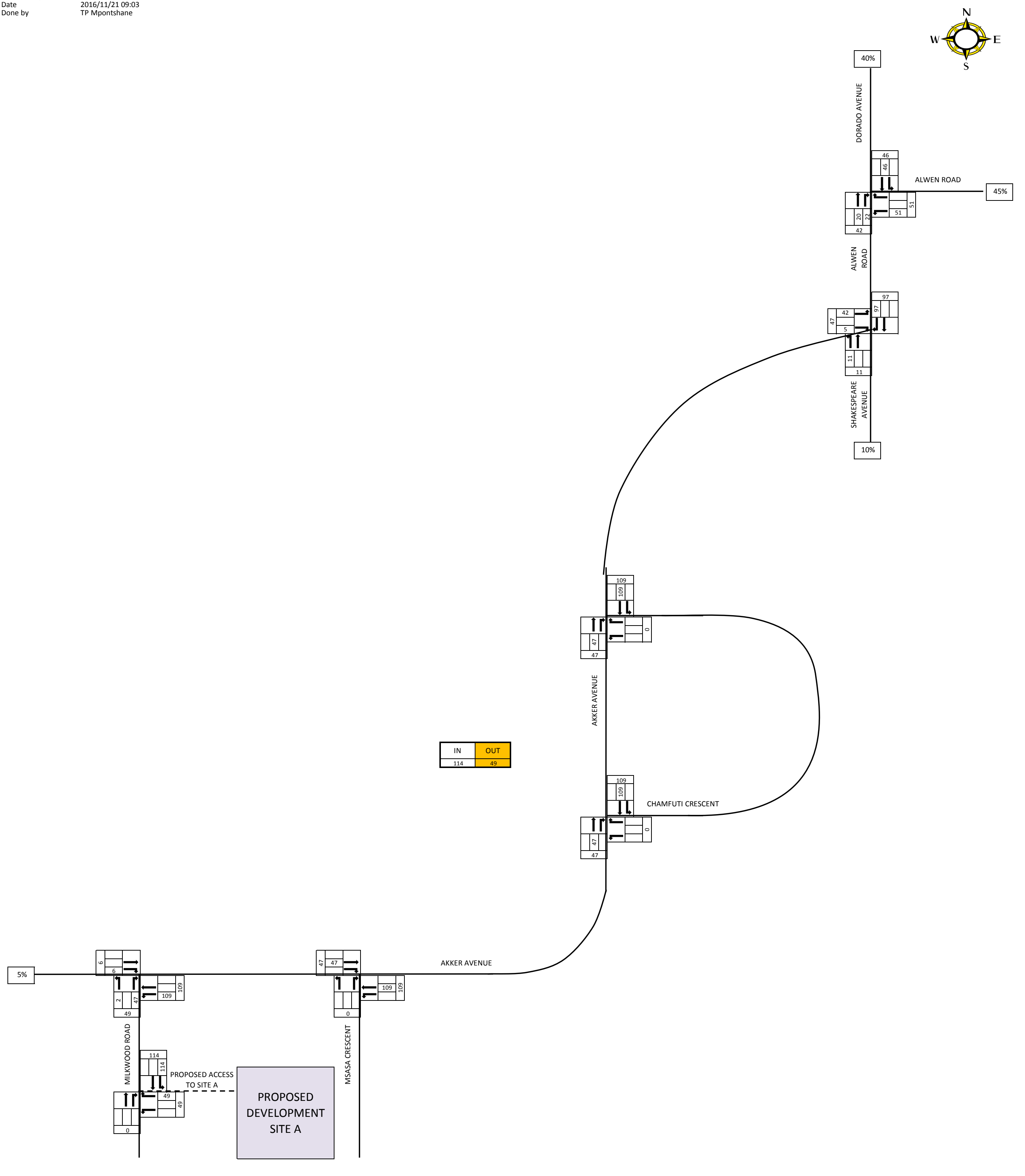
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.1

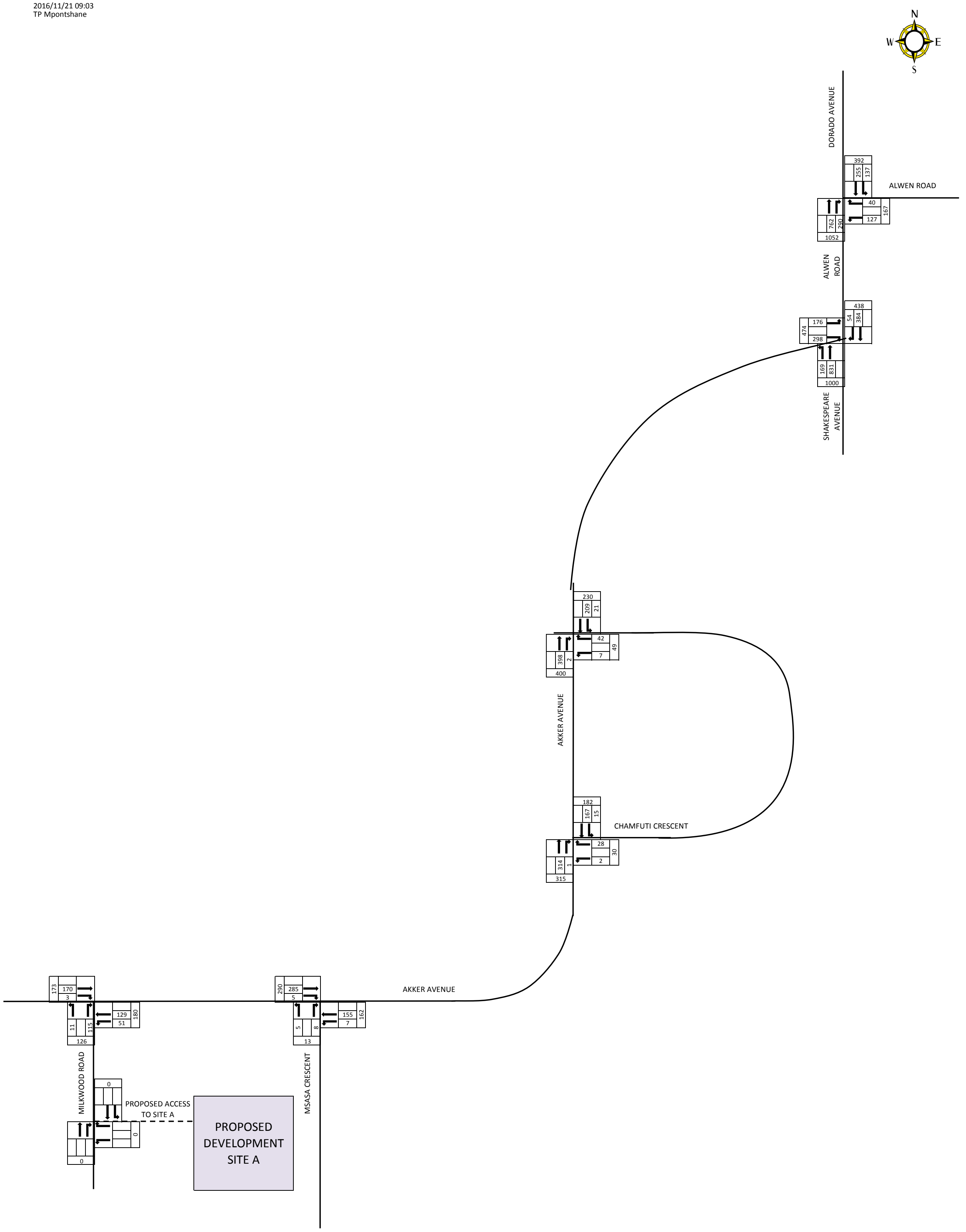
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.2

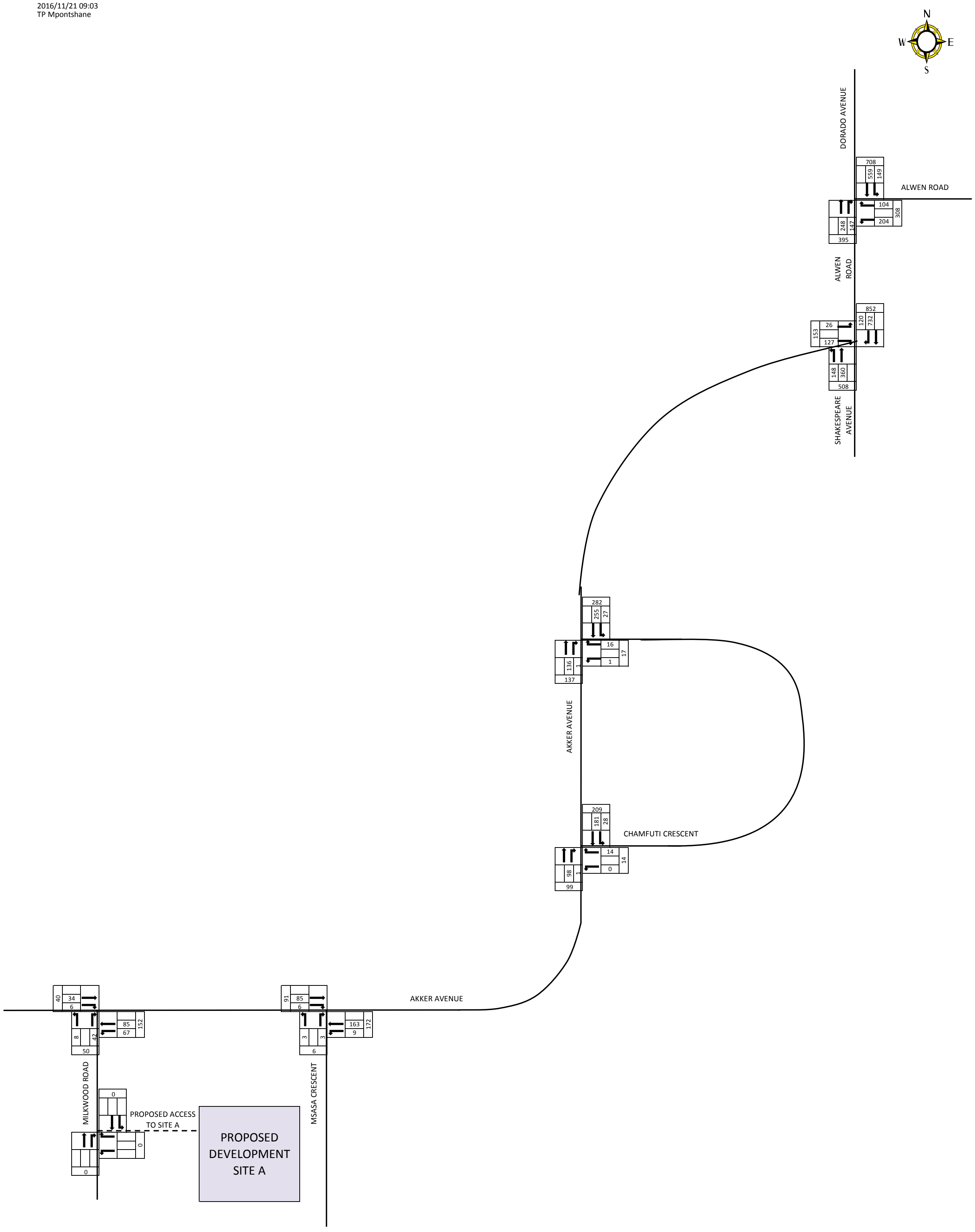
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2016 WEEKDAY MORNING PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.1

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



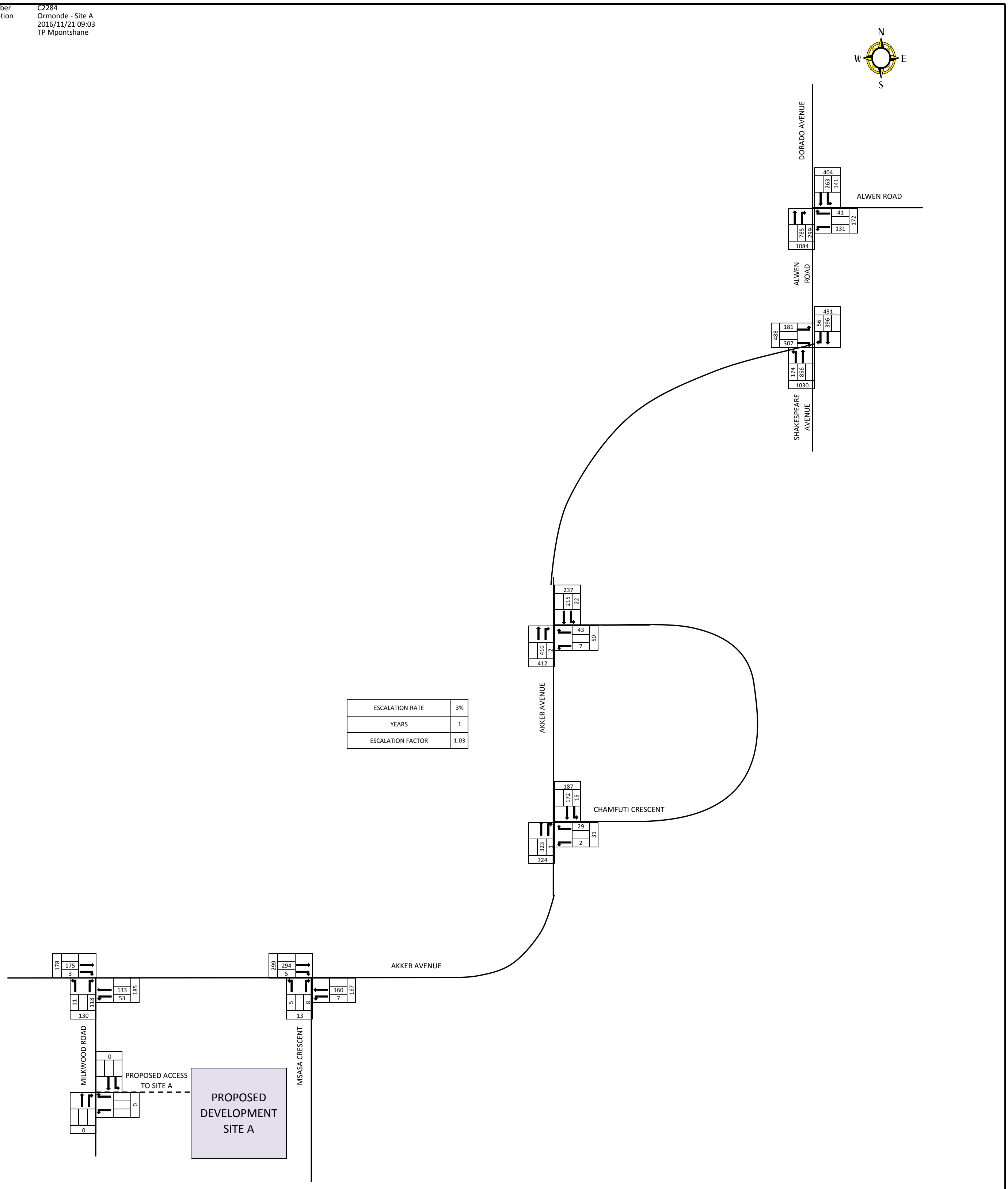
Civil Concepts (Pty) Ltd.

CESA

2016 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.2

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane

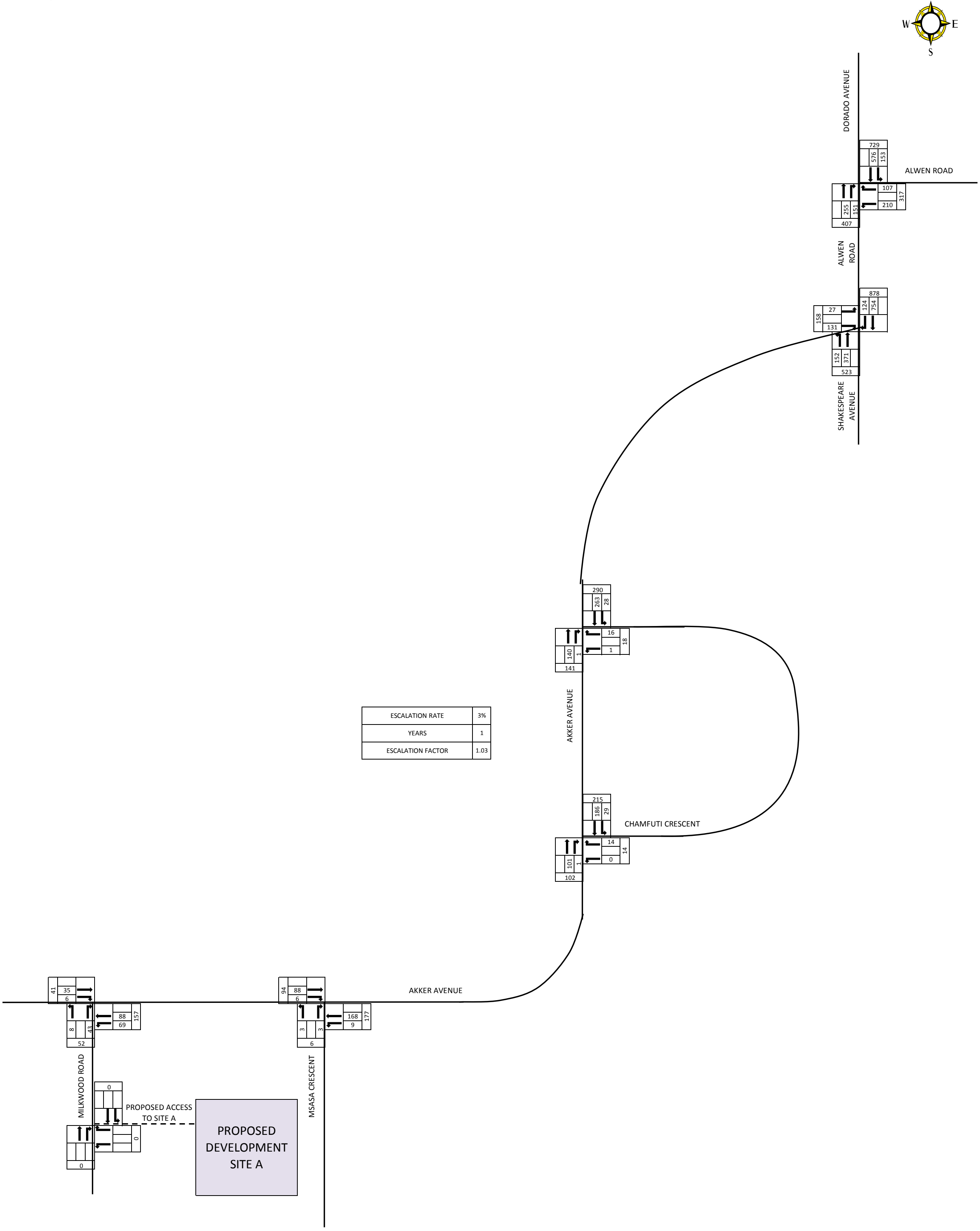


ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

2017 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.3

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane

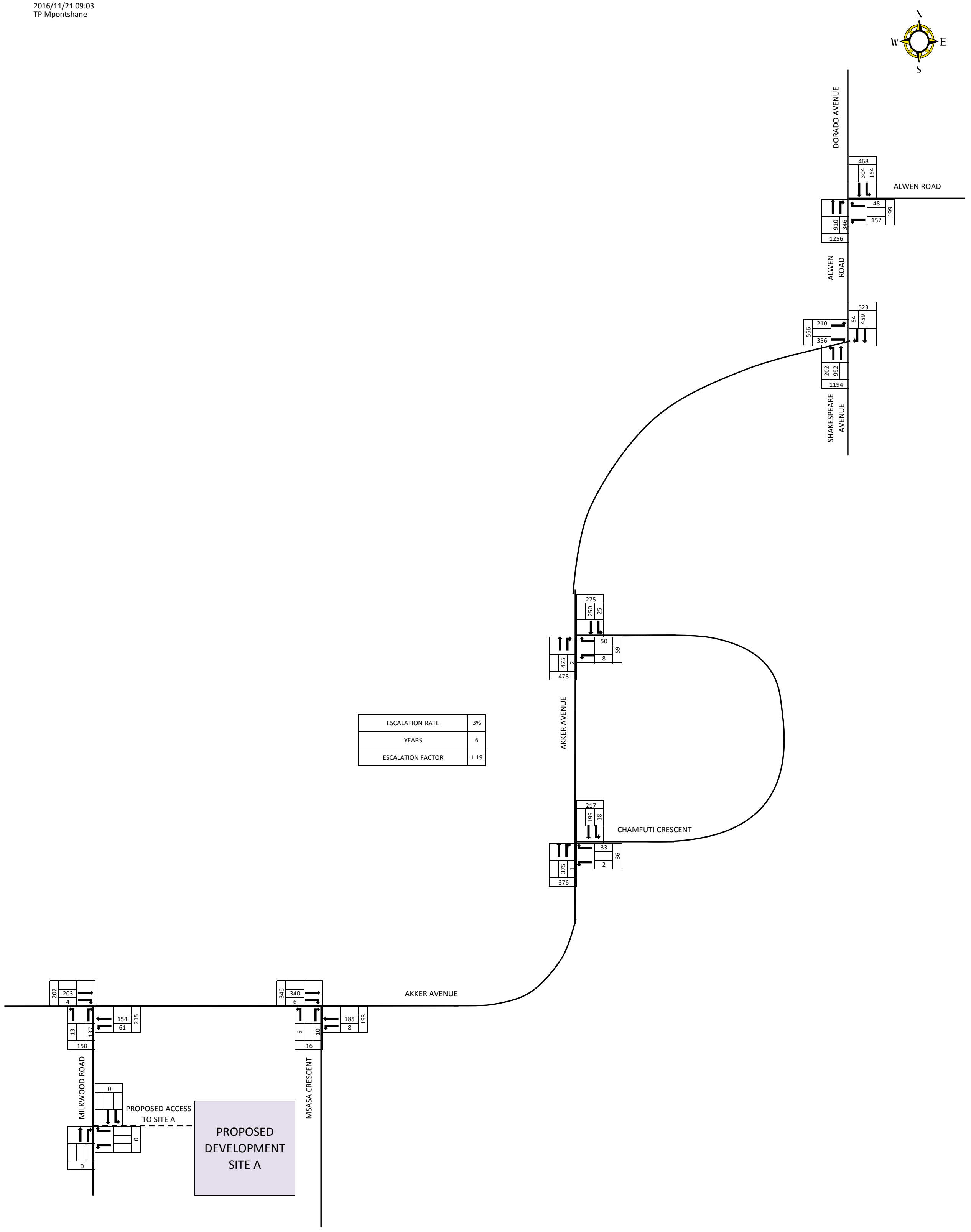


ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

2017 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.4

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane

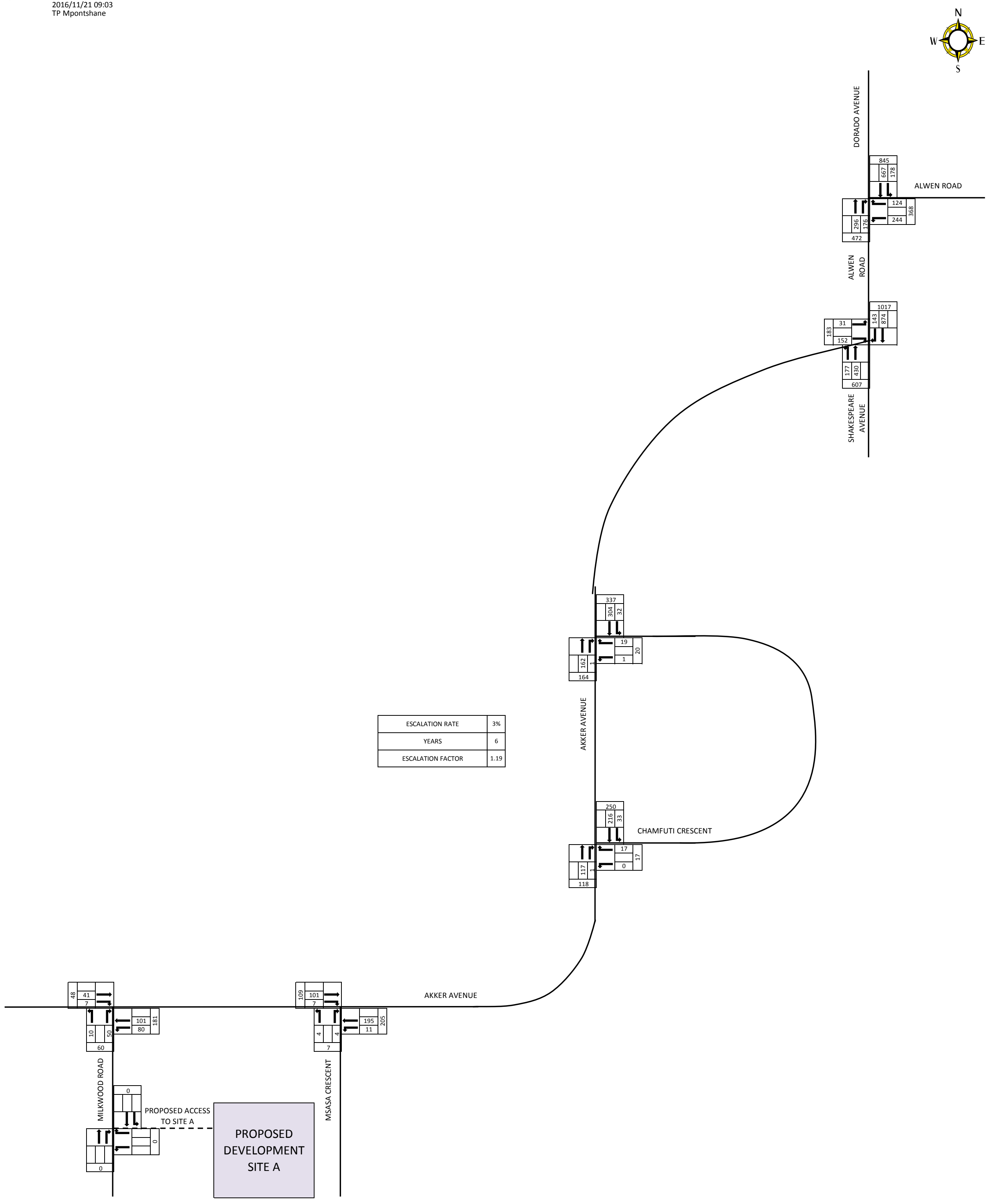


ESCALATION RATE	3%
YEARS	6
ESCALATION FACTOR	1.19

2022 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.5

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane

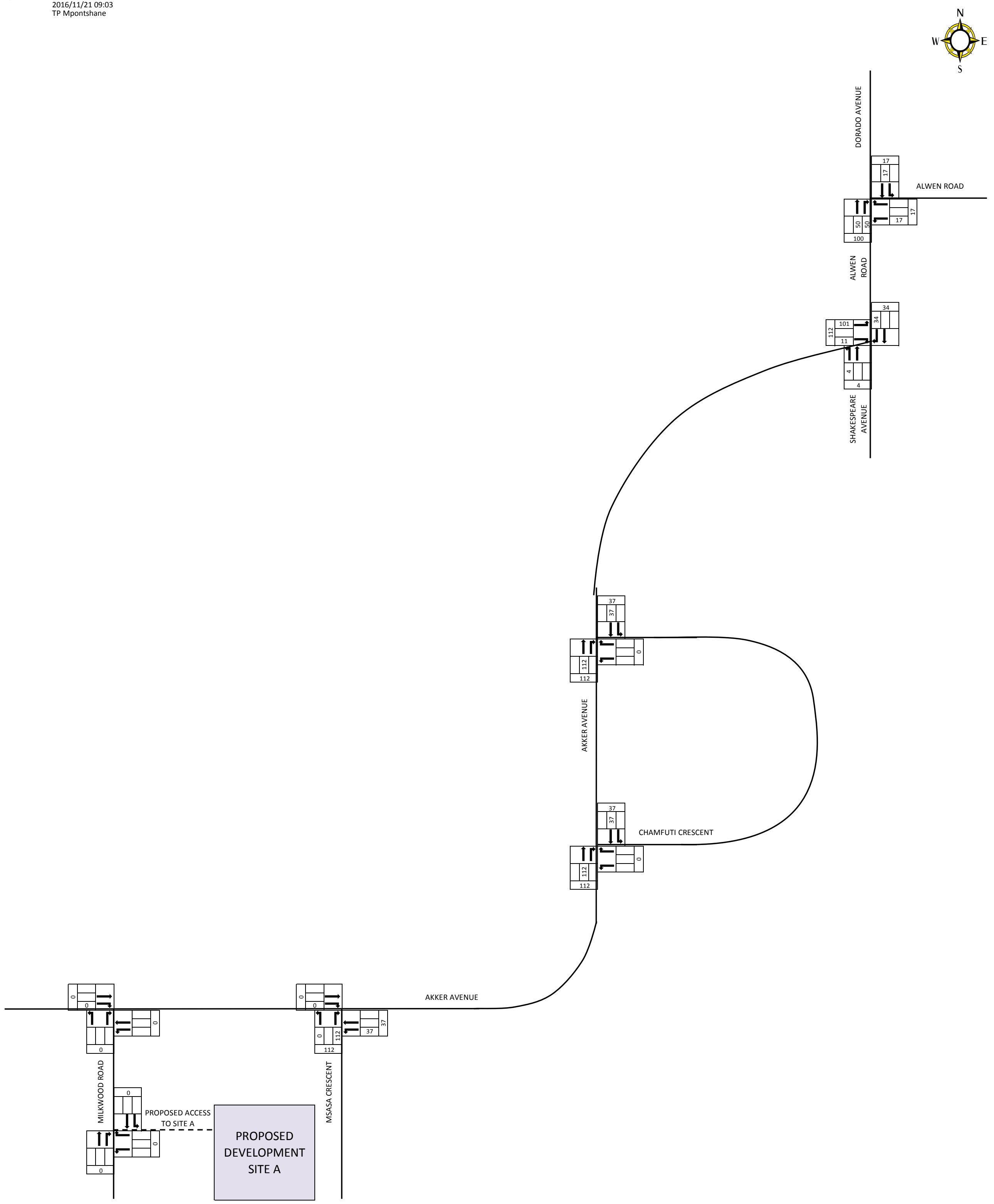


ESCALATION RATE	3%
YEARS	6
ESCALATION FACTOR	1.19

2022 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.6

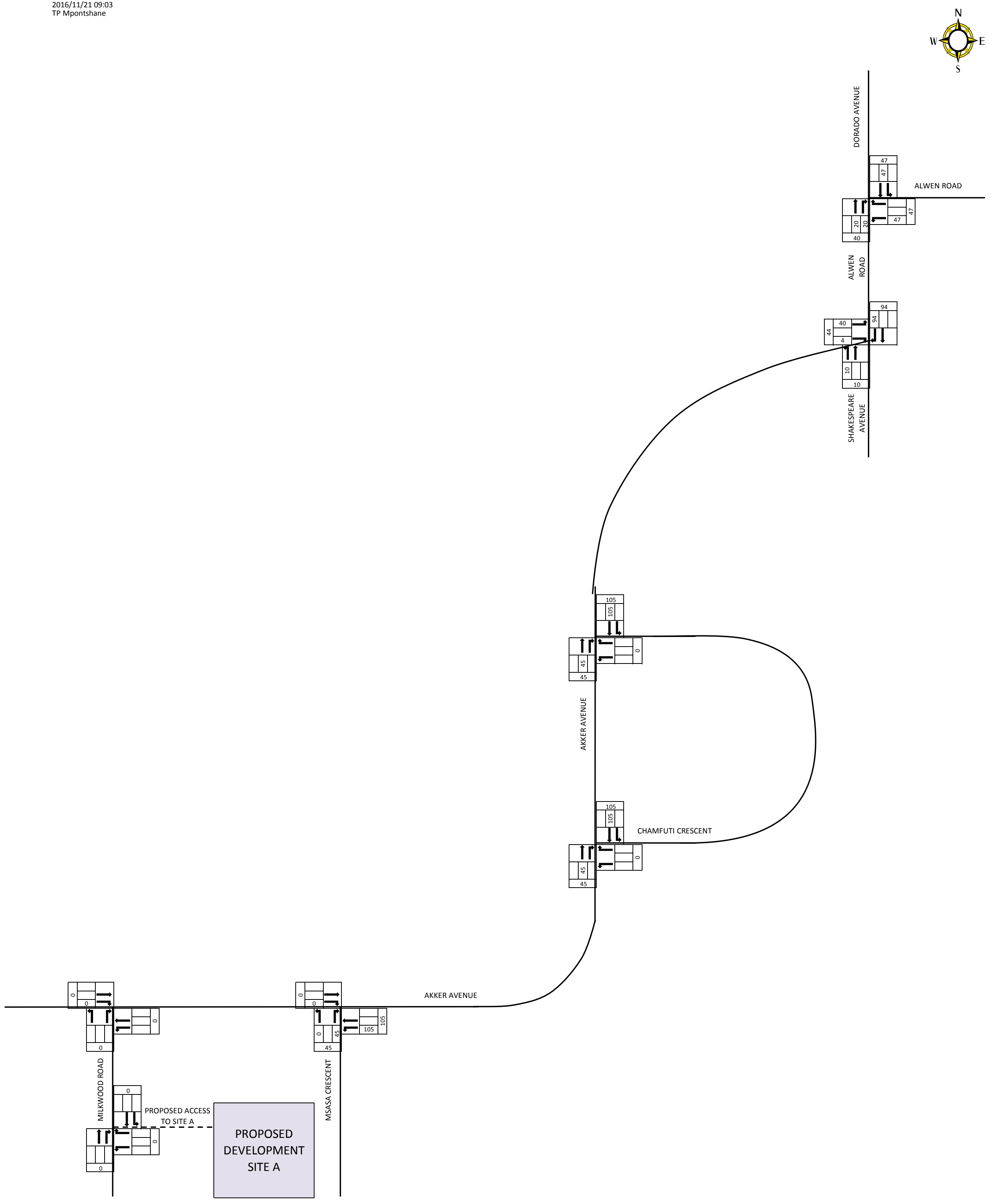
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE EXTENSION 22

FIGURE 3.7

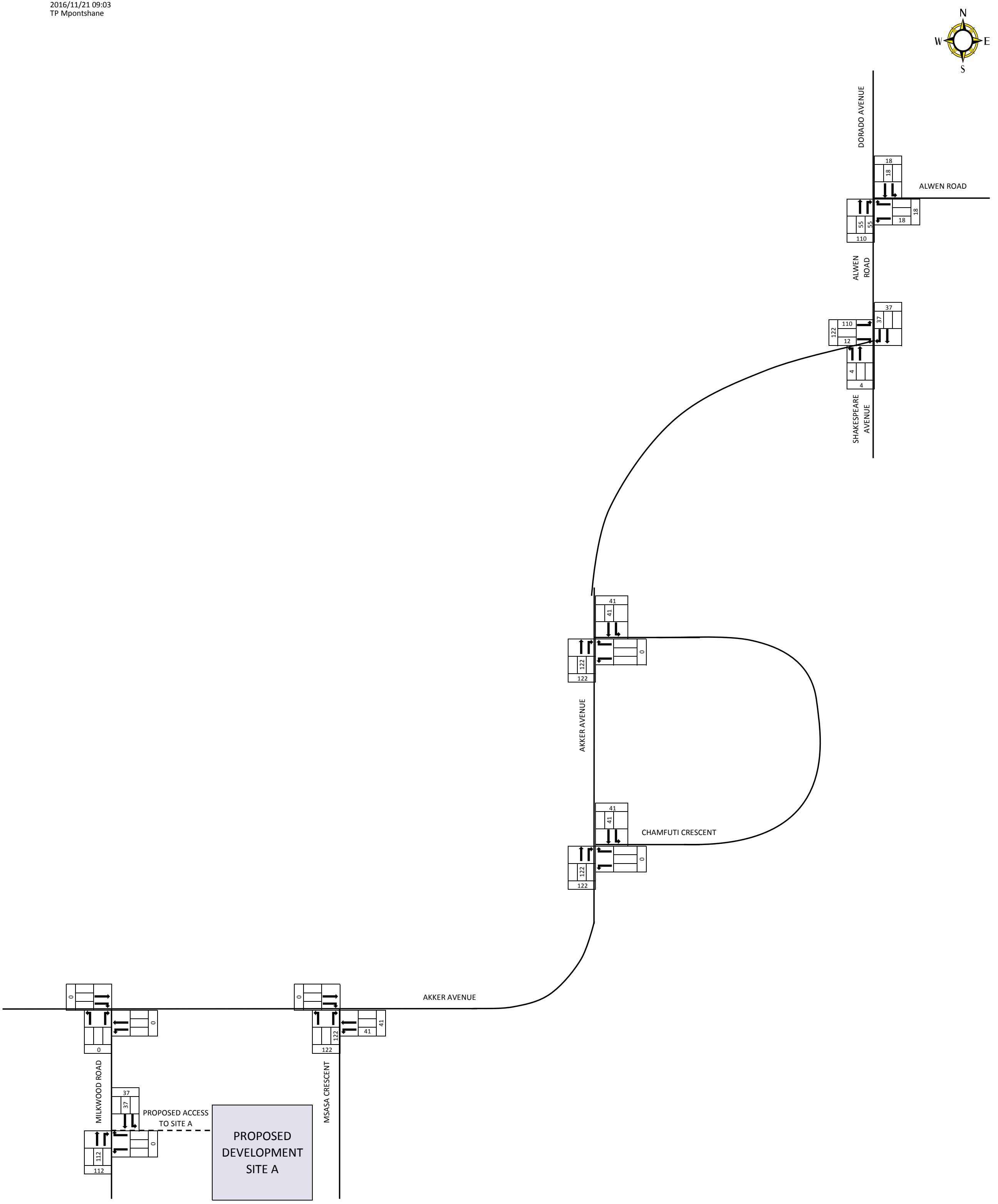
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE EXTENSION 22

FIGURE 3.8

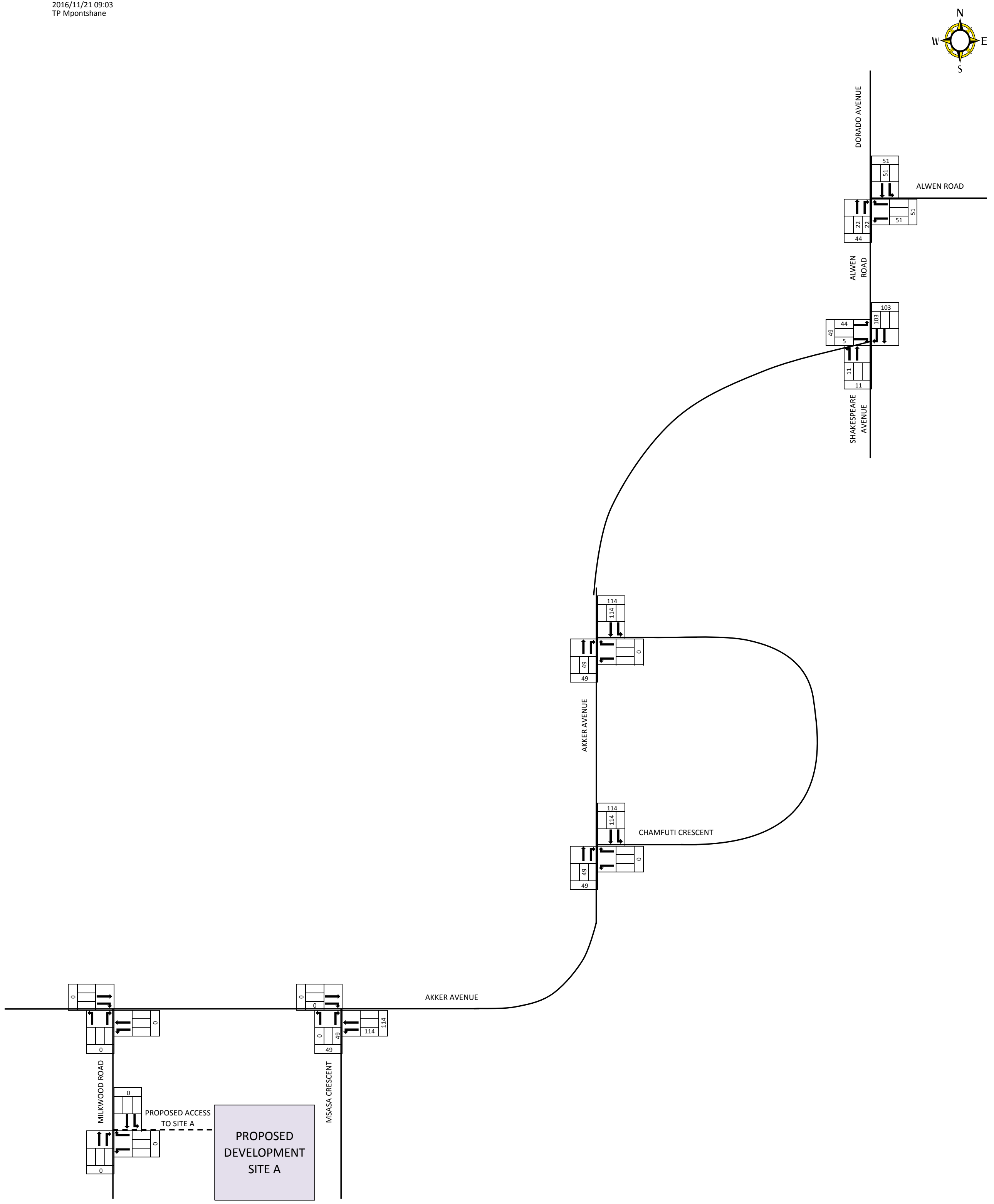
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE EXTENSION 22

FIGURE 3.9

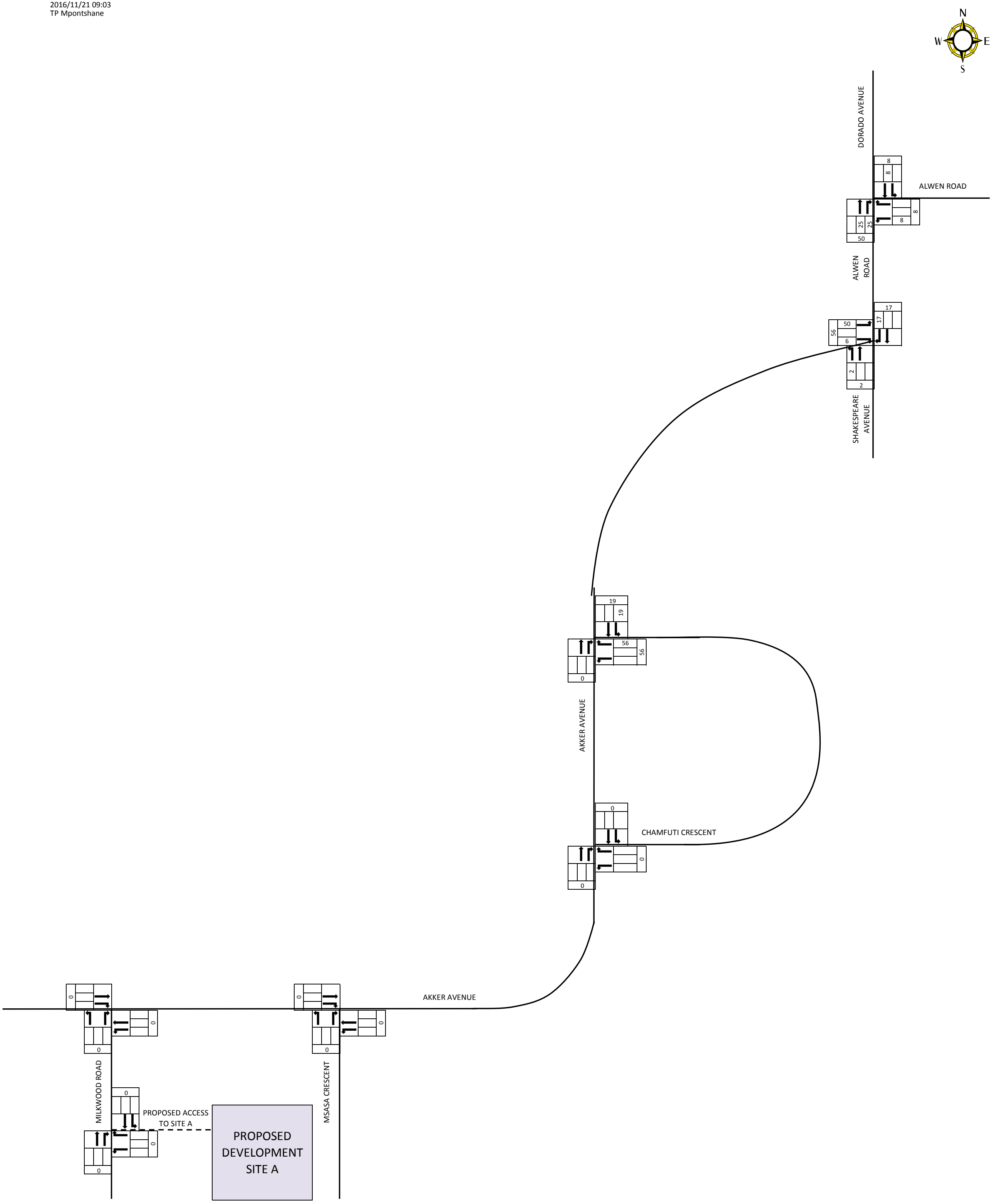
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE EXTENSION 22

FIGURE 3.10

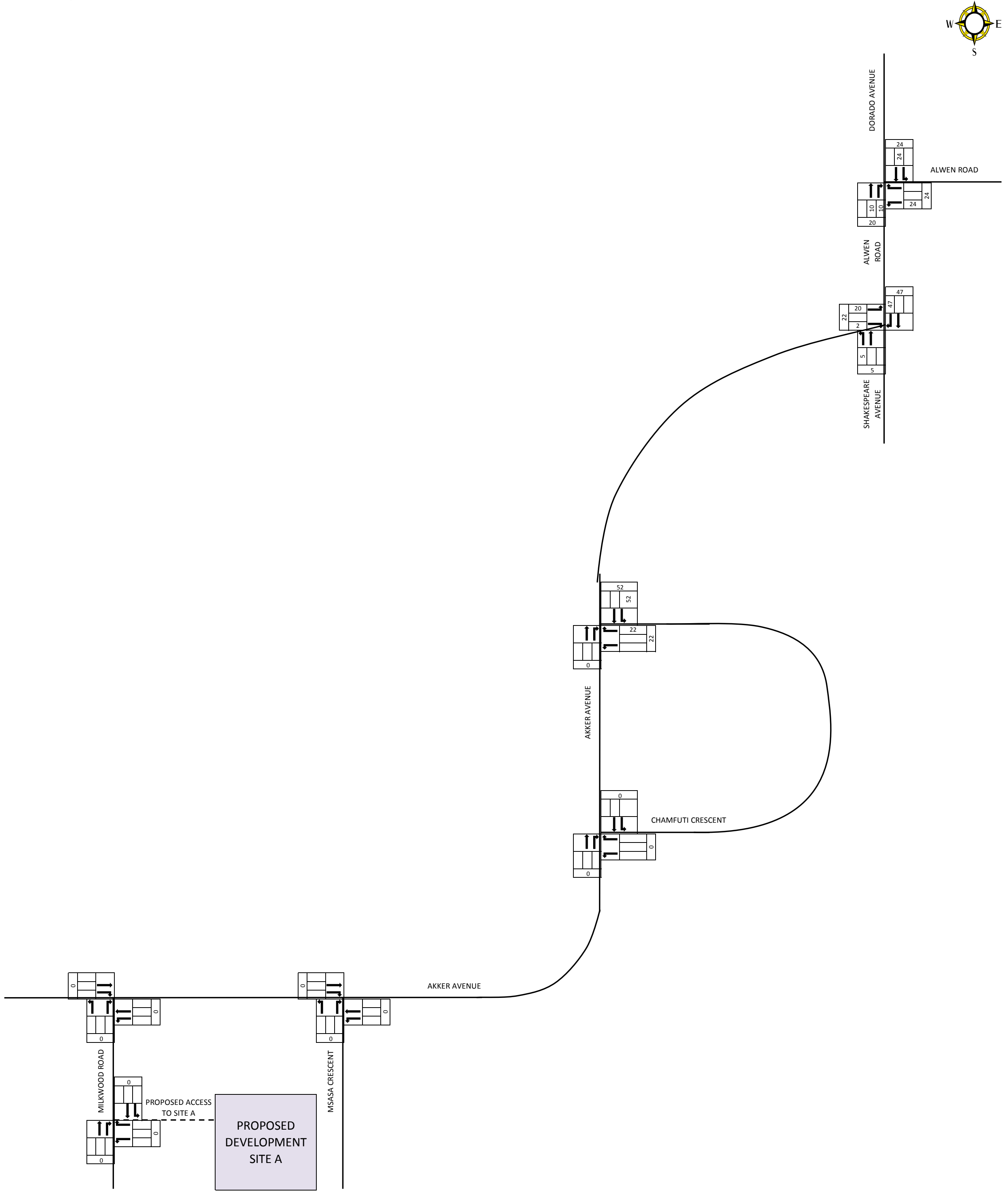
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE EXTENSION 22

FIGURE 3.11

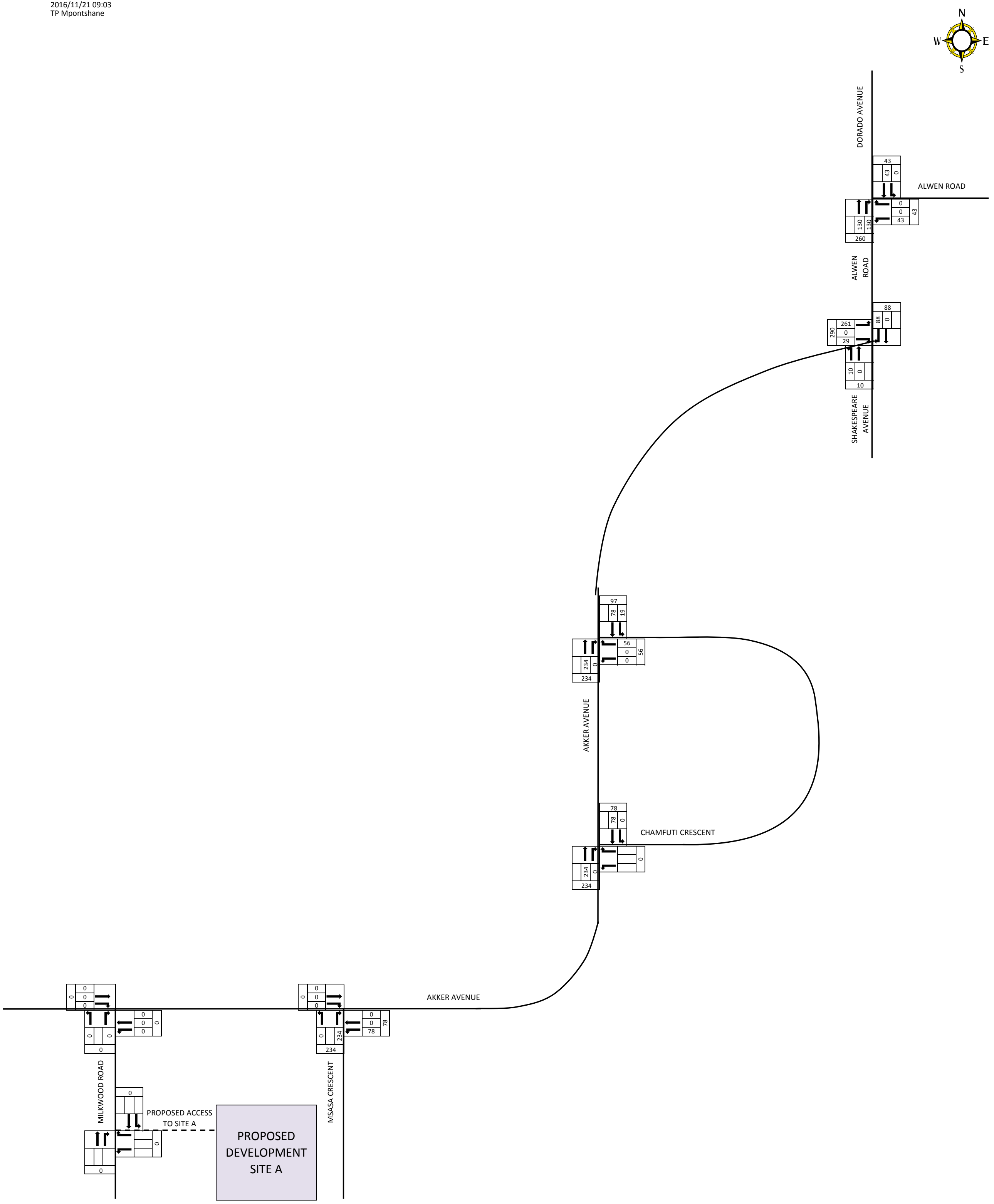
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE EXTENSION 22

FIGURE 3.12

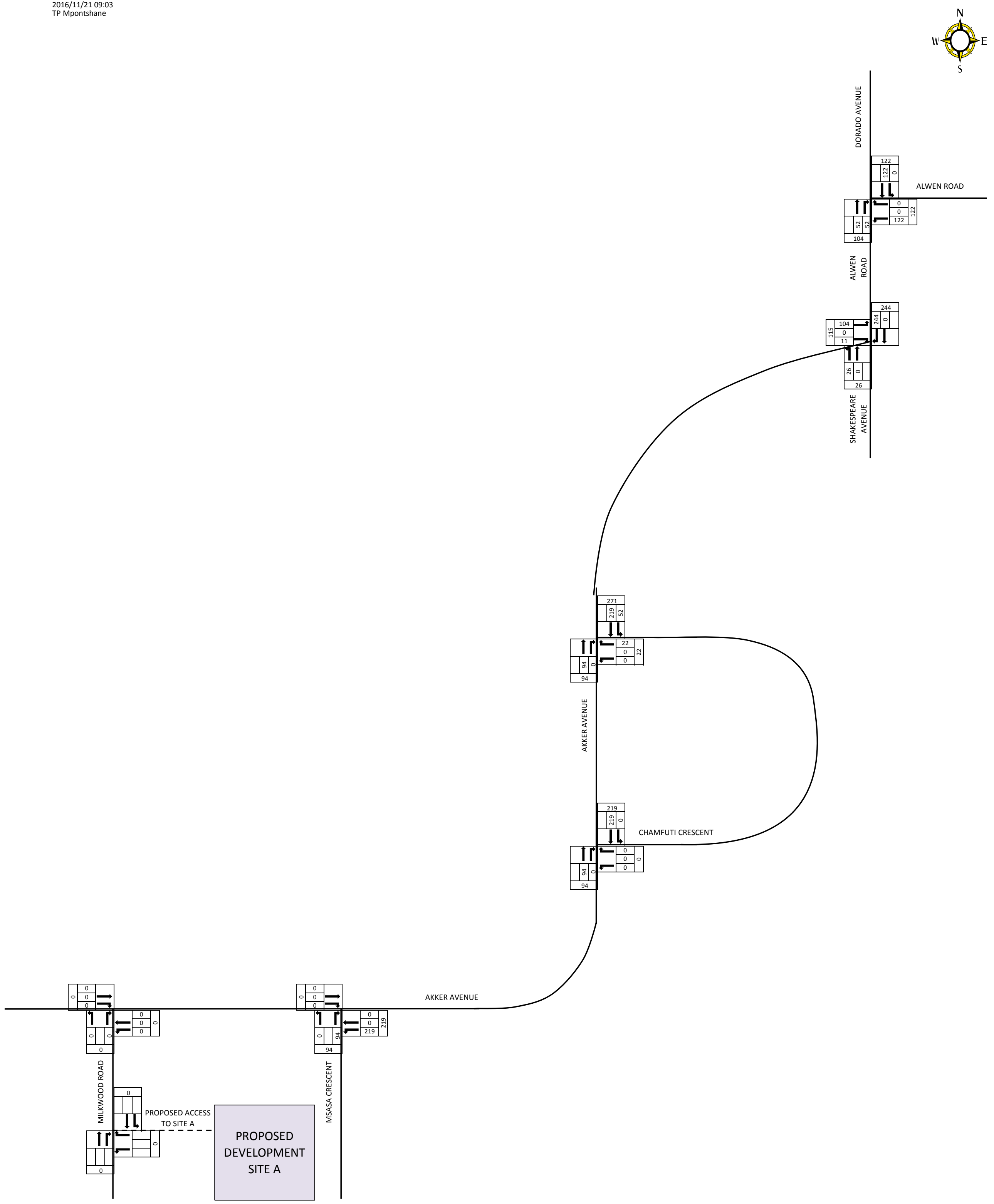
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



WEEKDAY MORNING PEAK HOUR TOTAL LATENT TRIPS
ORMONDE EXTENSION 22

FIGURE 3.13

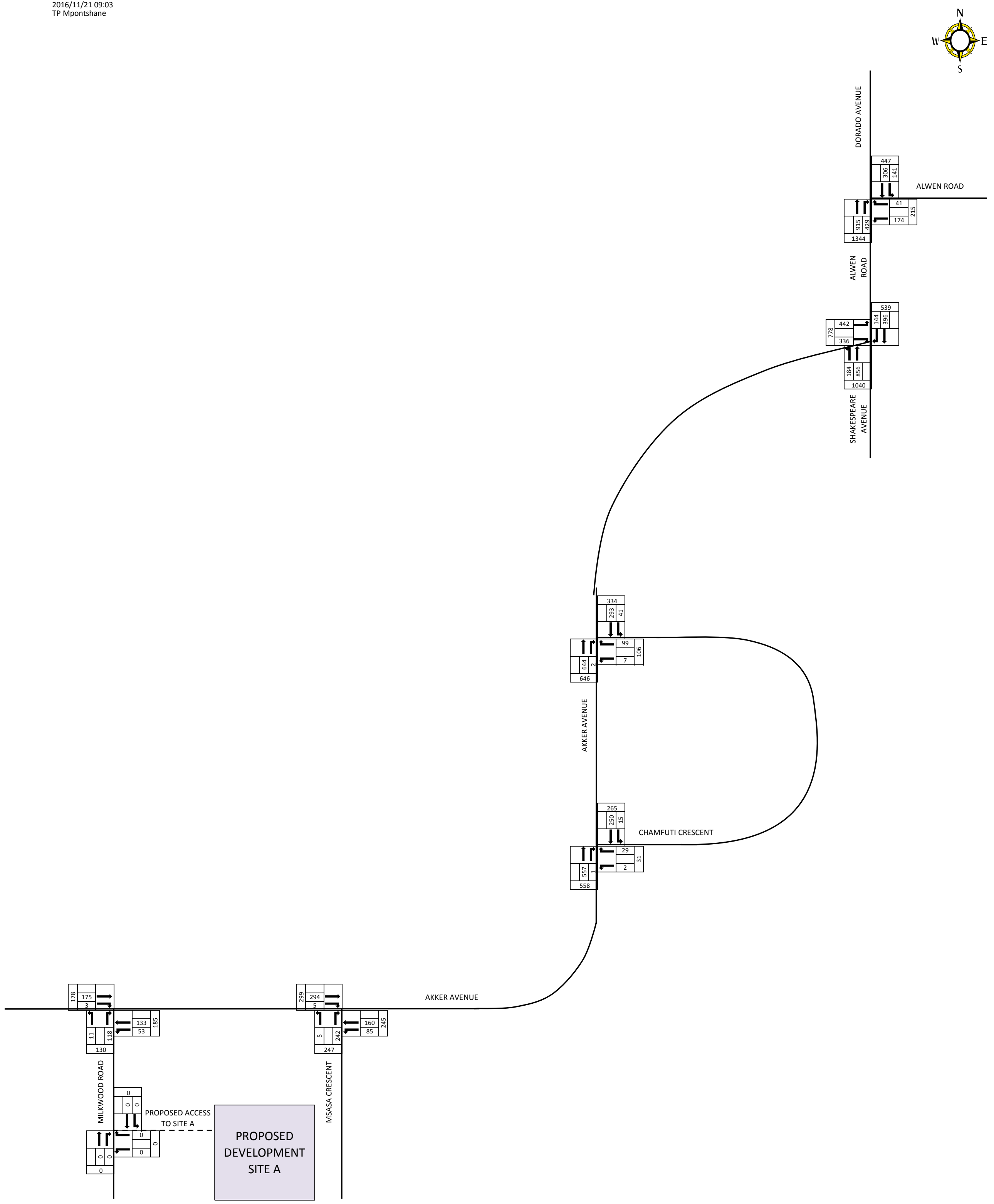
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR TOTAL LATENT TRIPS FOR ORMONDE EXTENSION 22

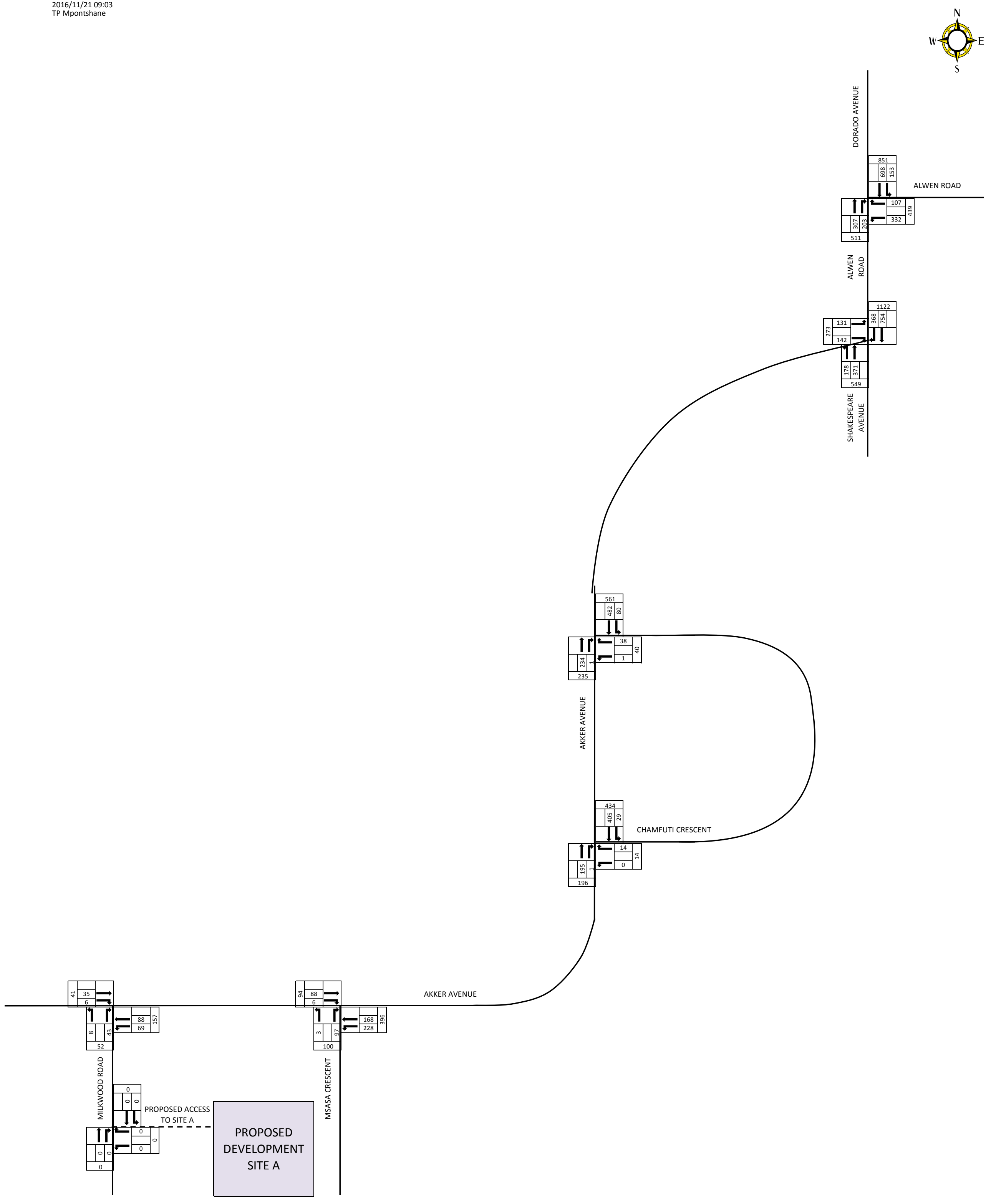
FIGURE 3.14

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



	2017 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES	FIGURE 3.15

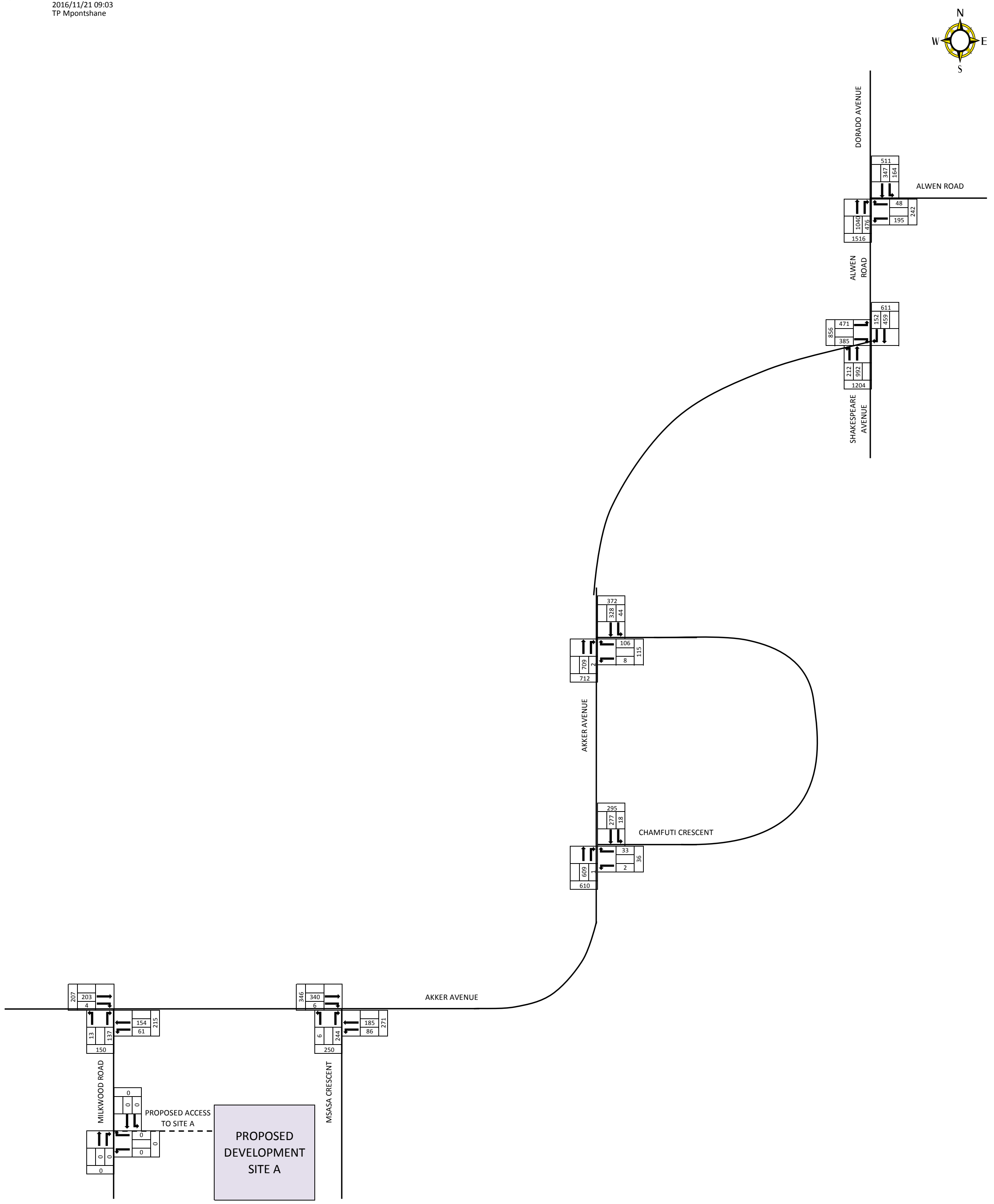
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.16

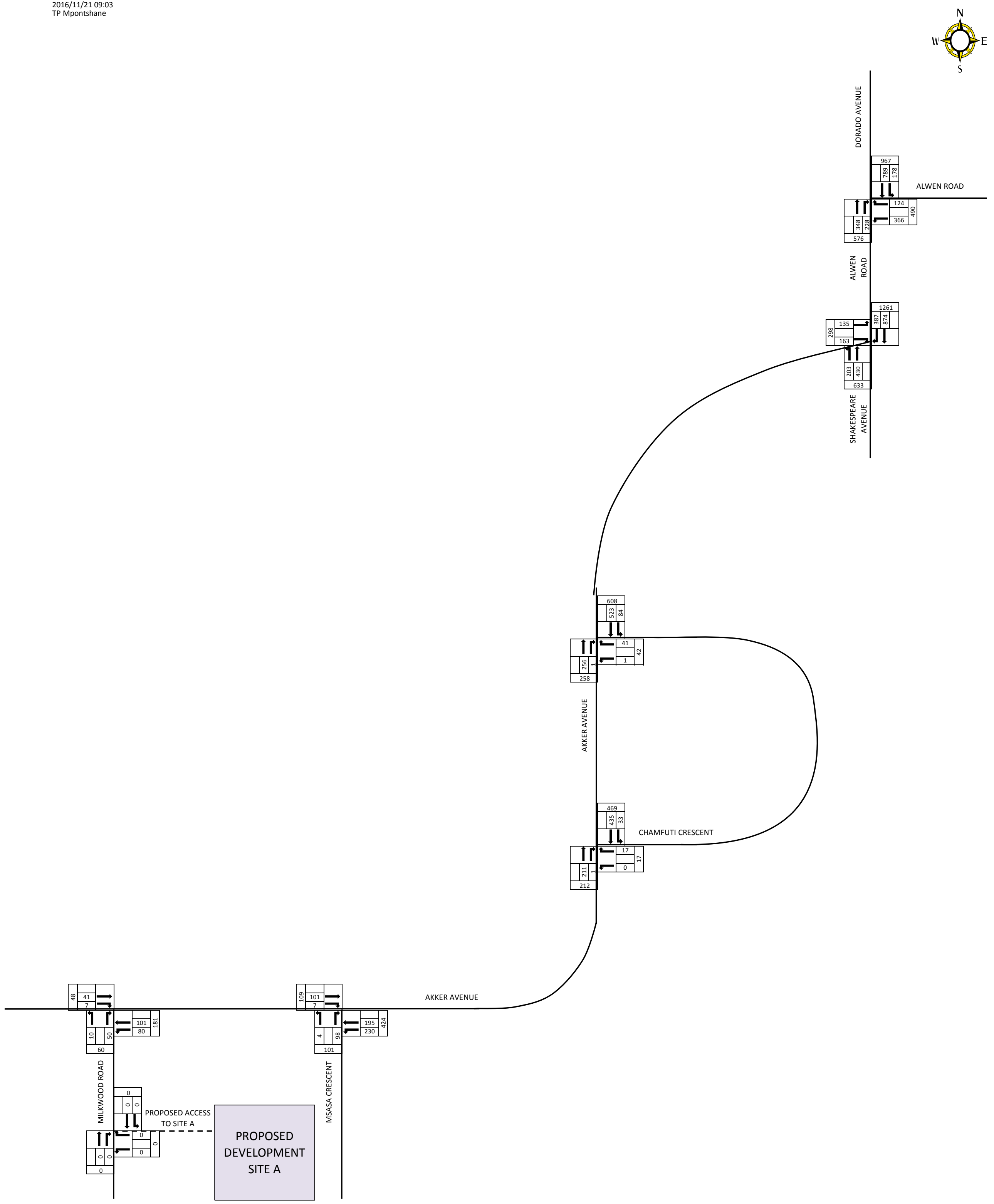
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2022 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.17

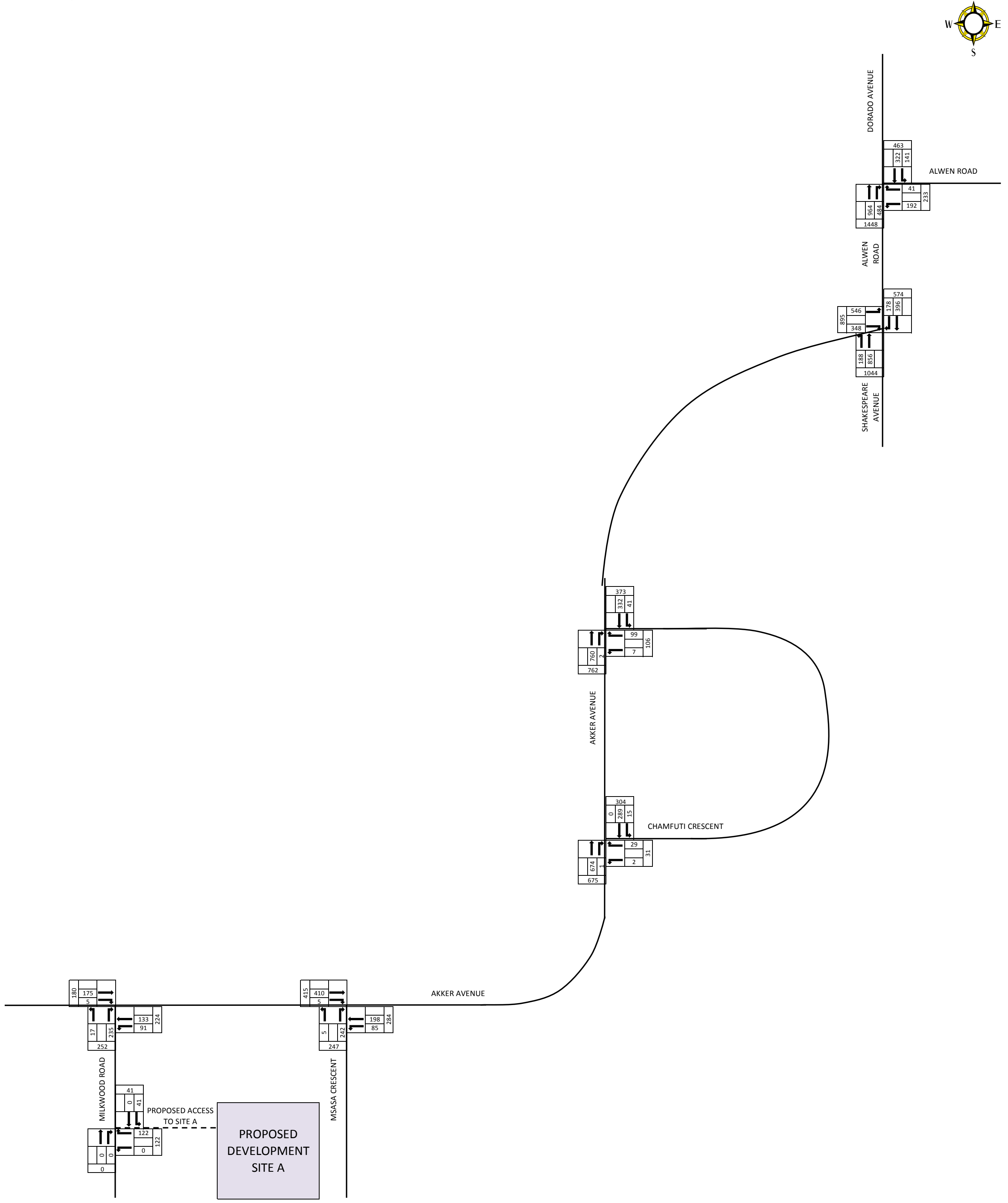
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.18

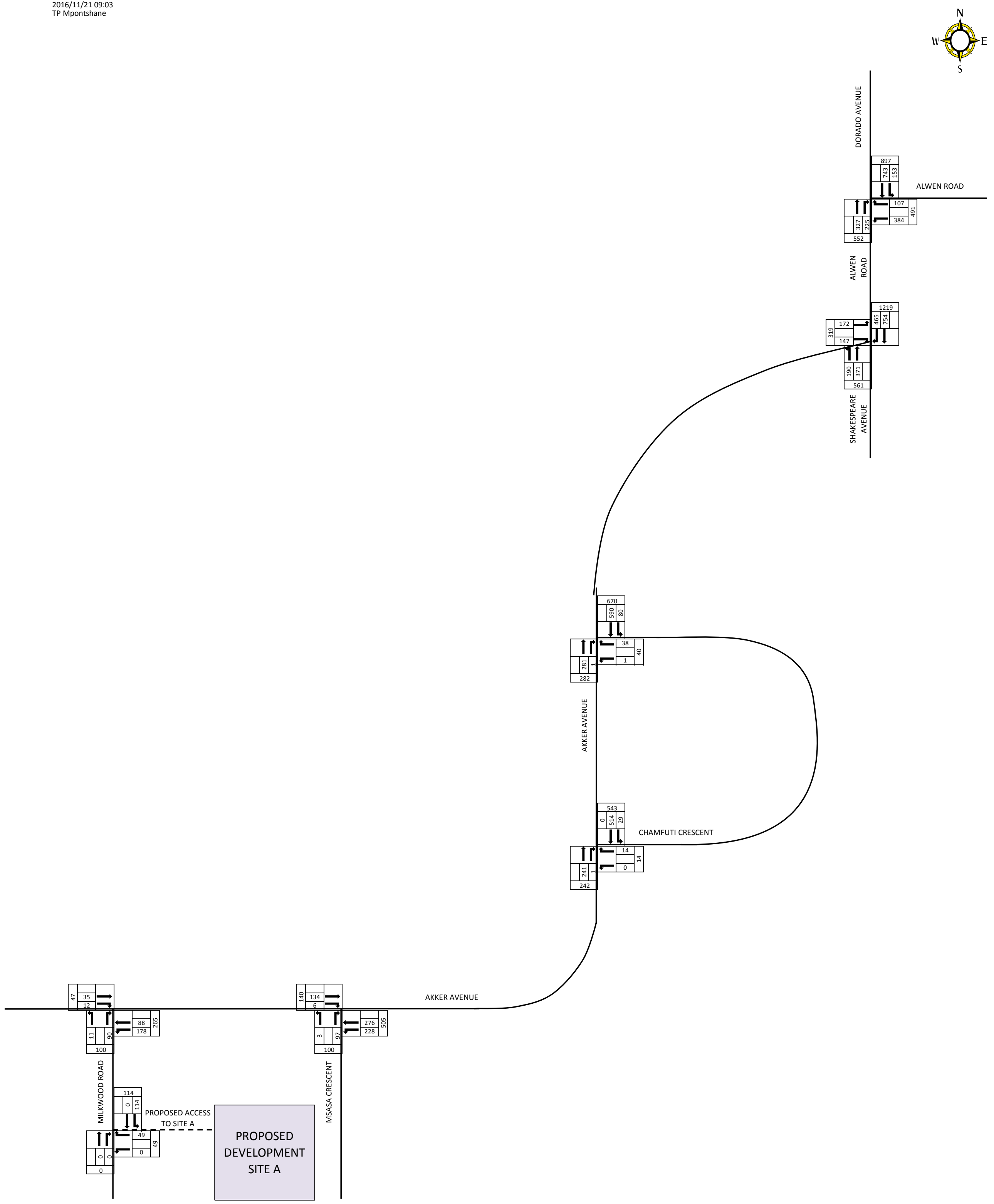
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2017 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.19

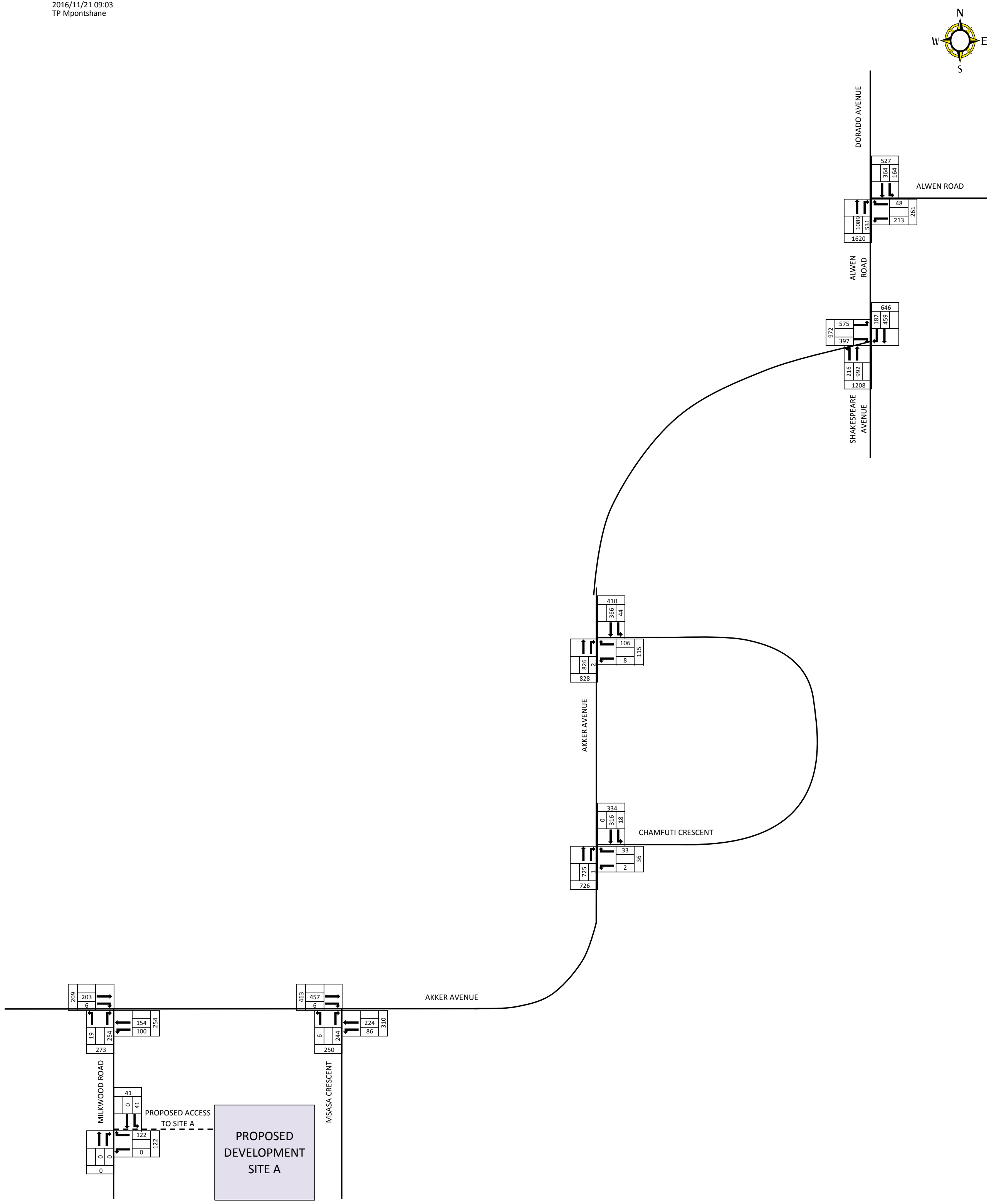
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.20

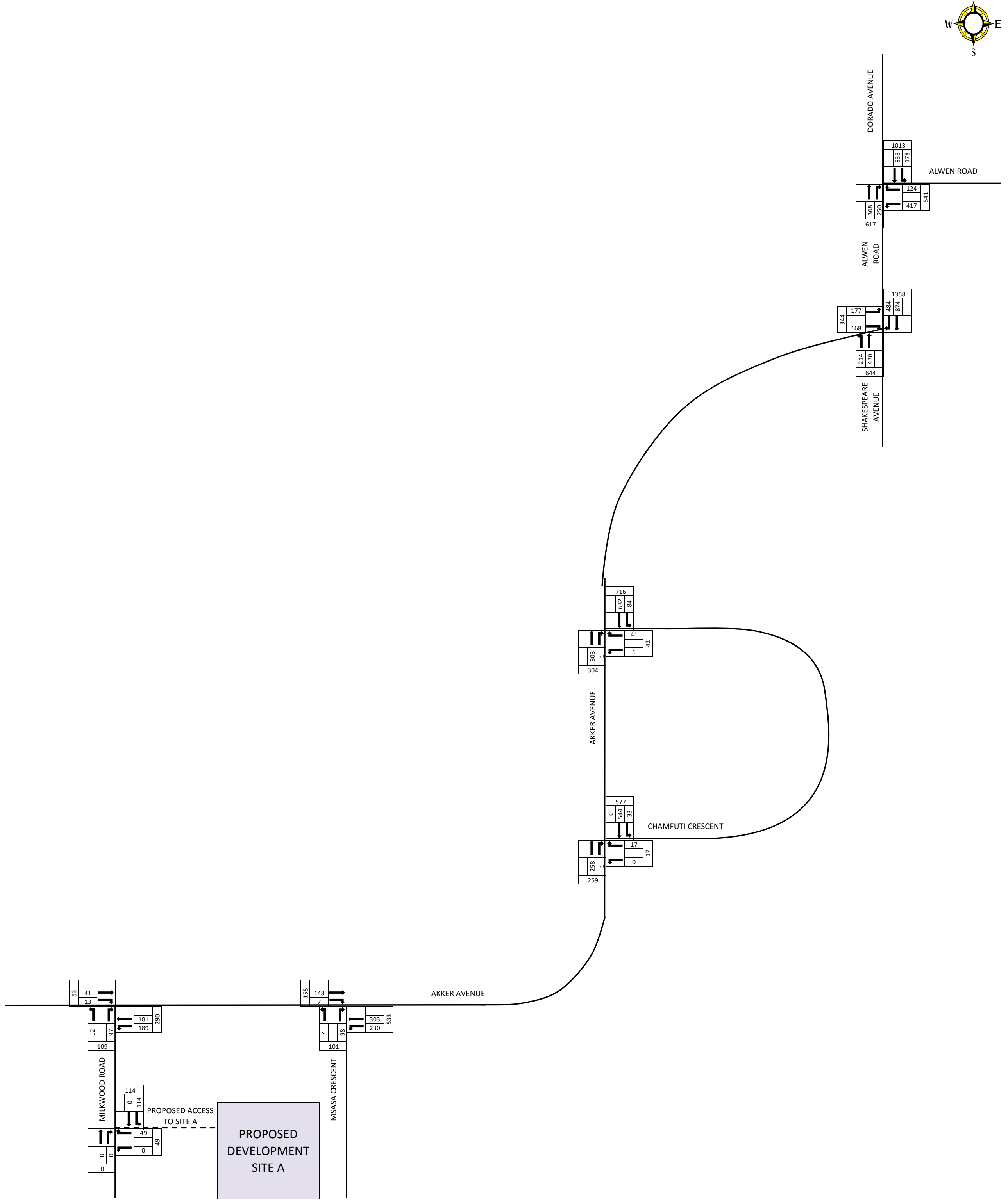
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2022 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.21

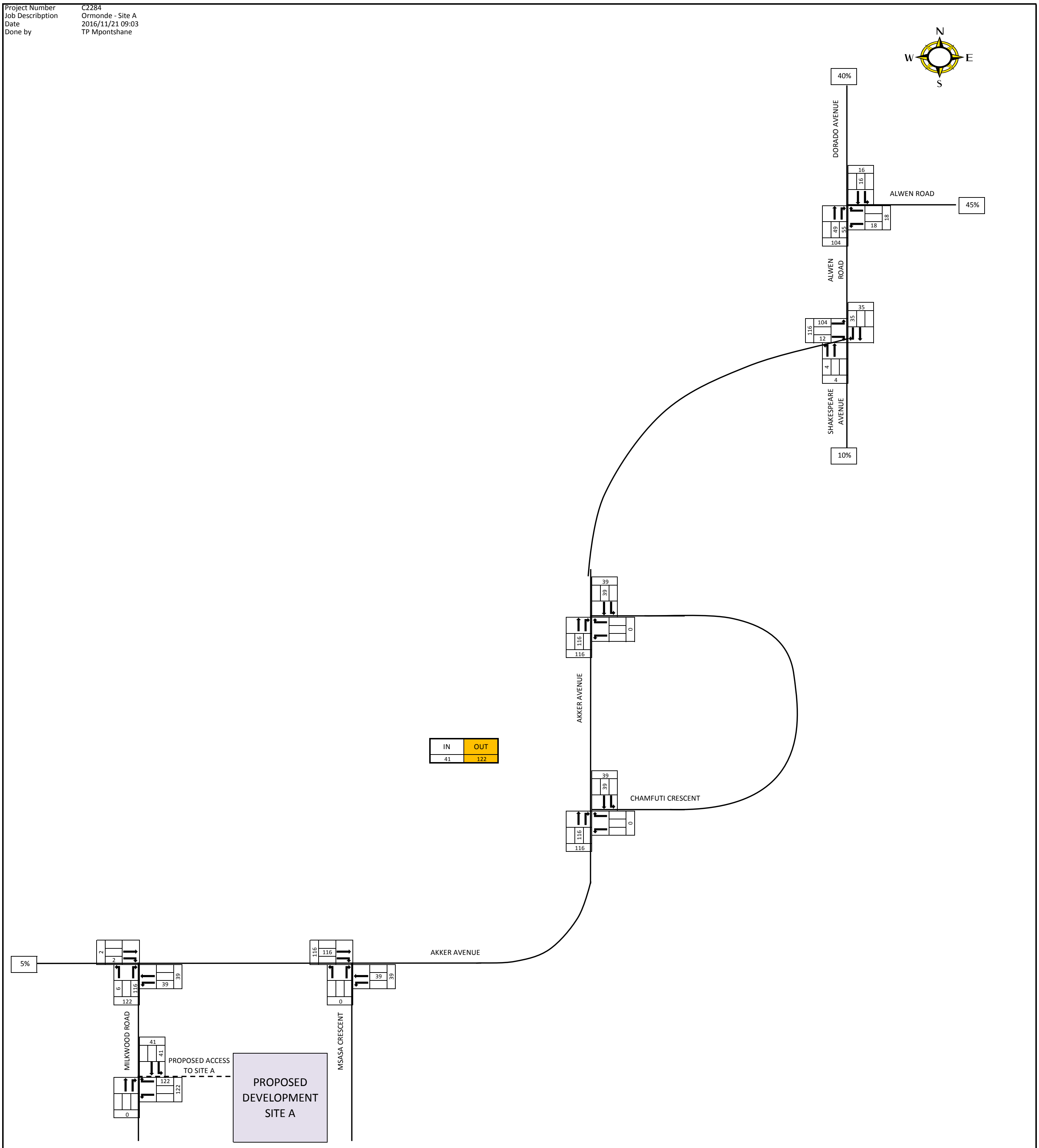
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.22

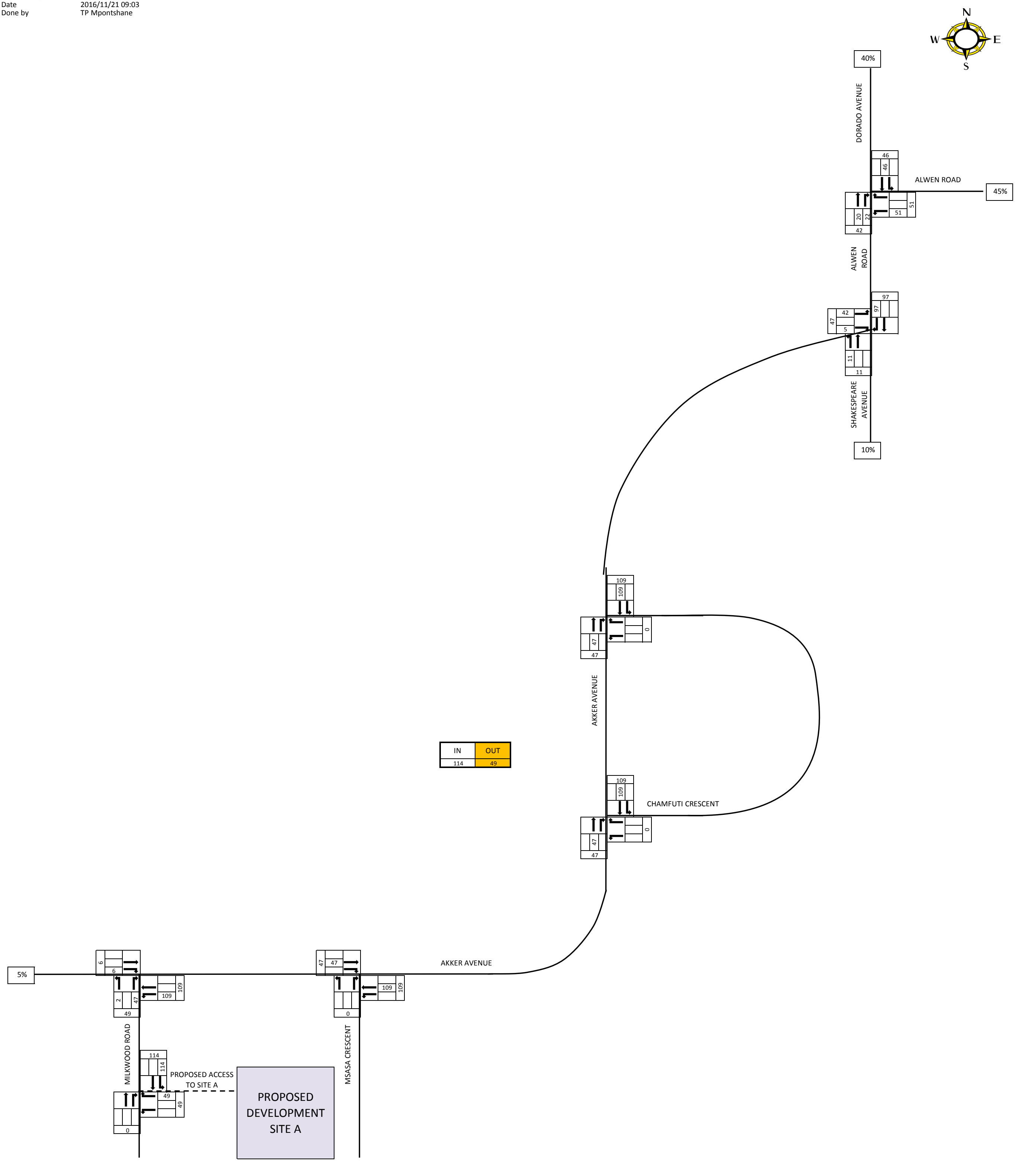
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.1

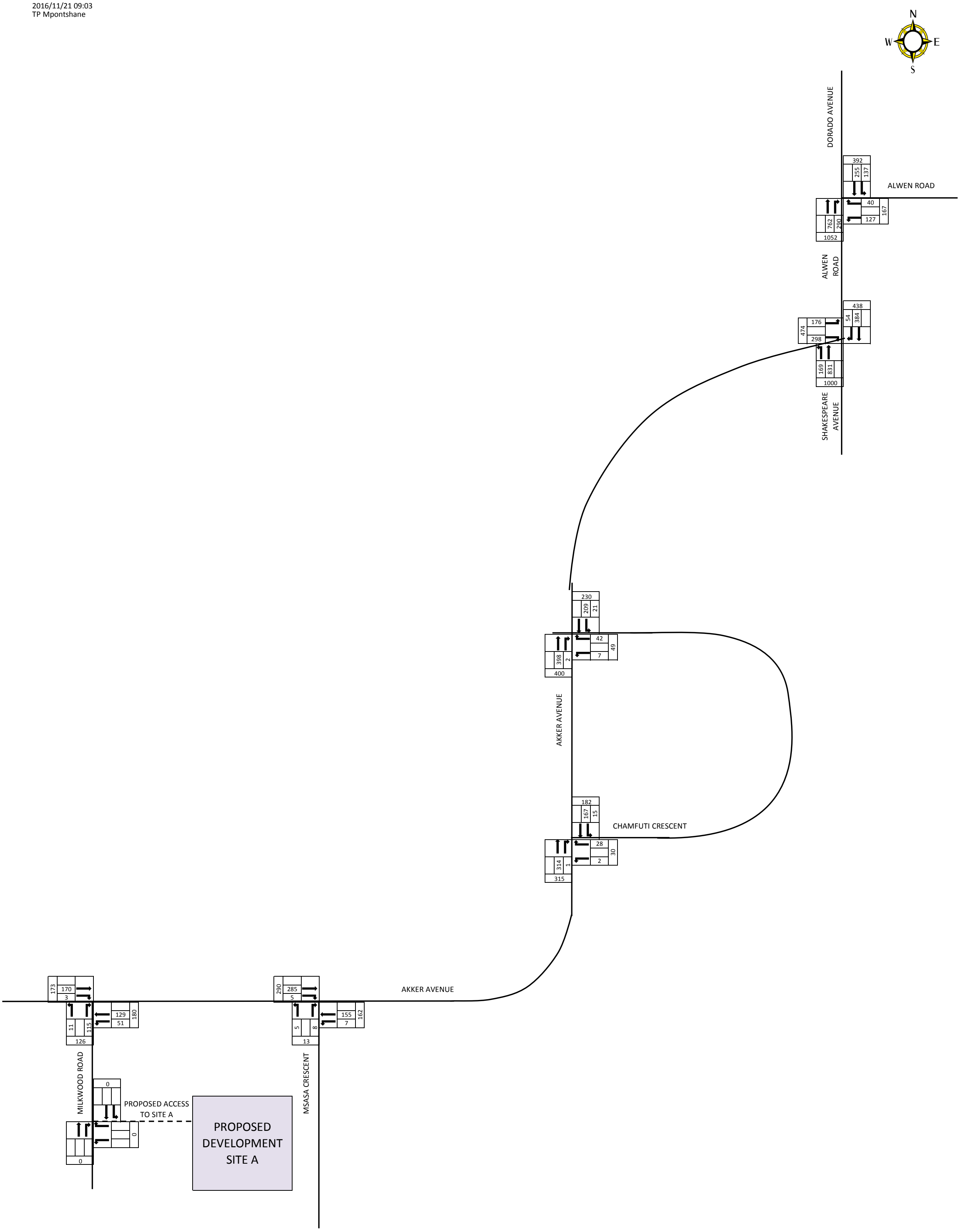
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.2

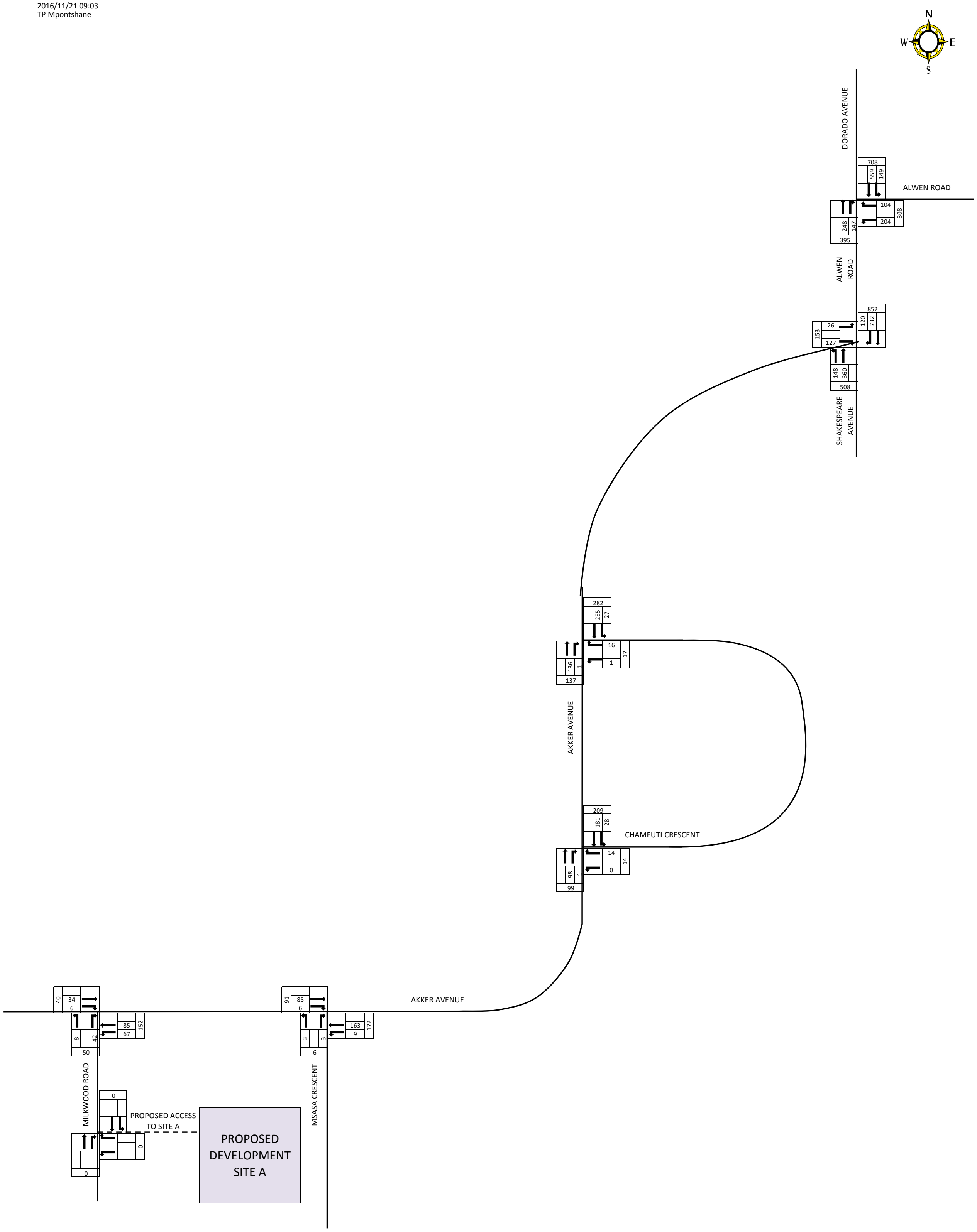
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2016 WEEKDAY MORNING PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.1

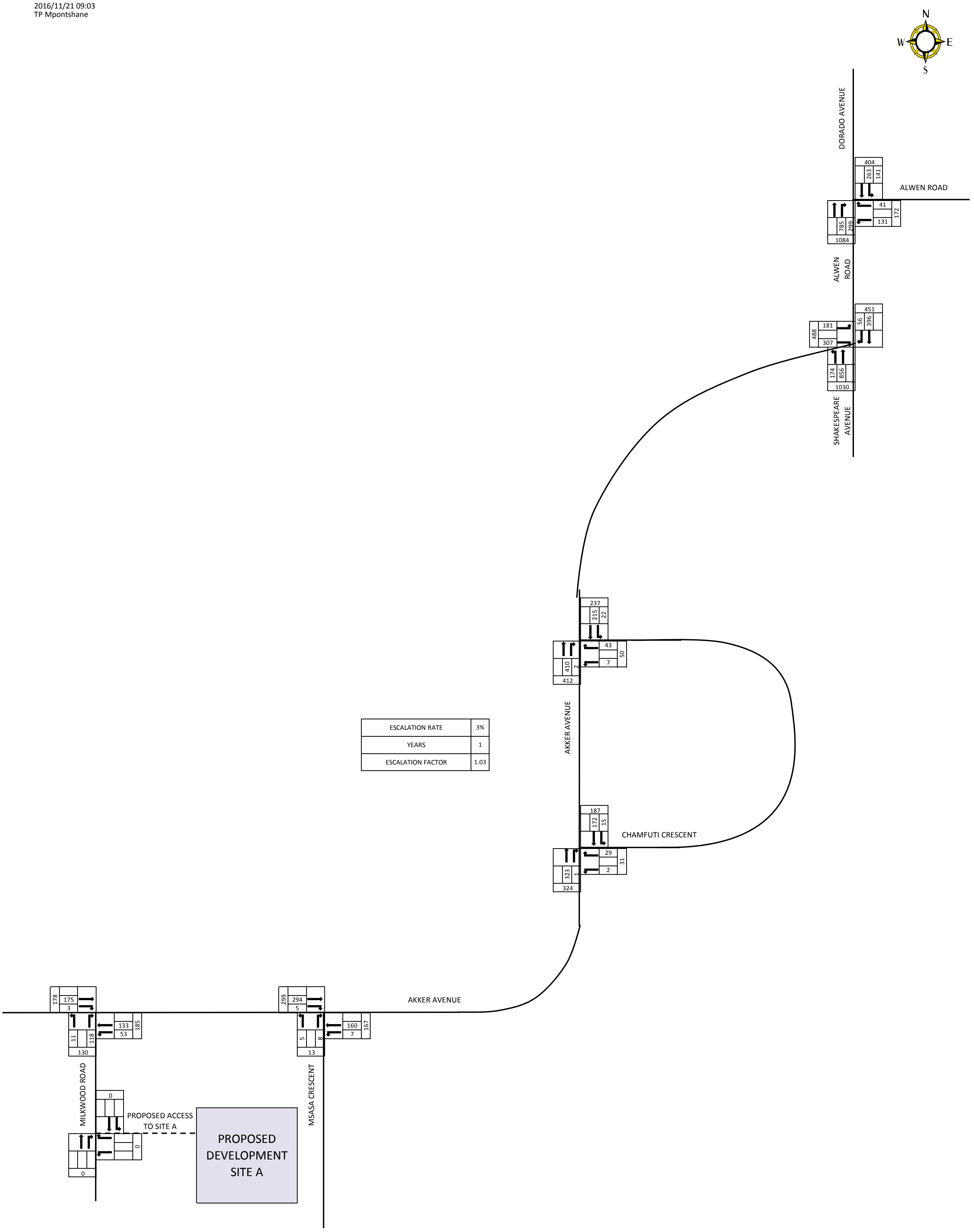
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2016 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.2

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane

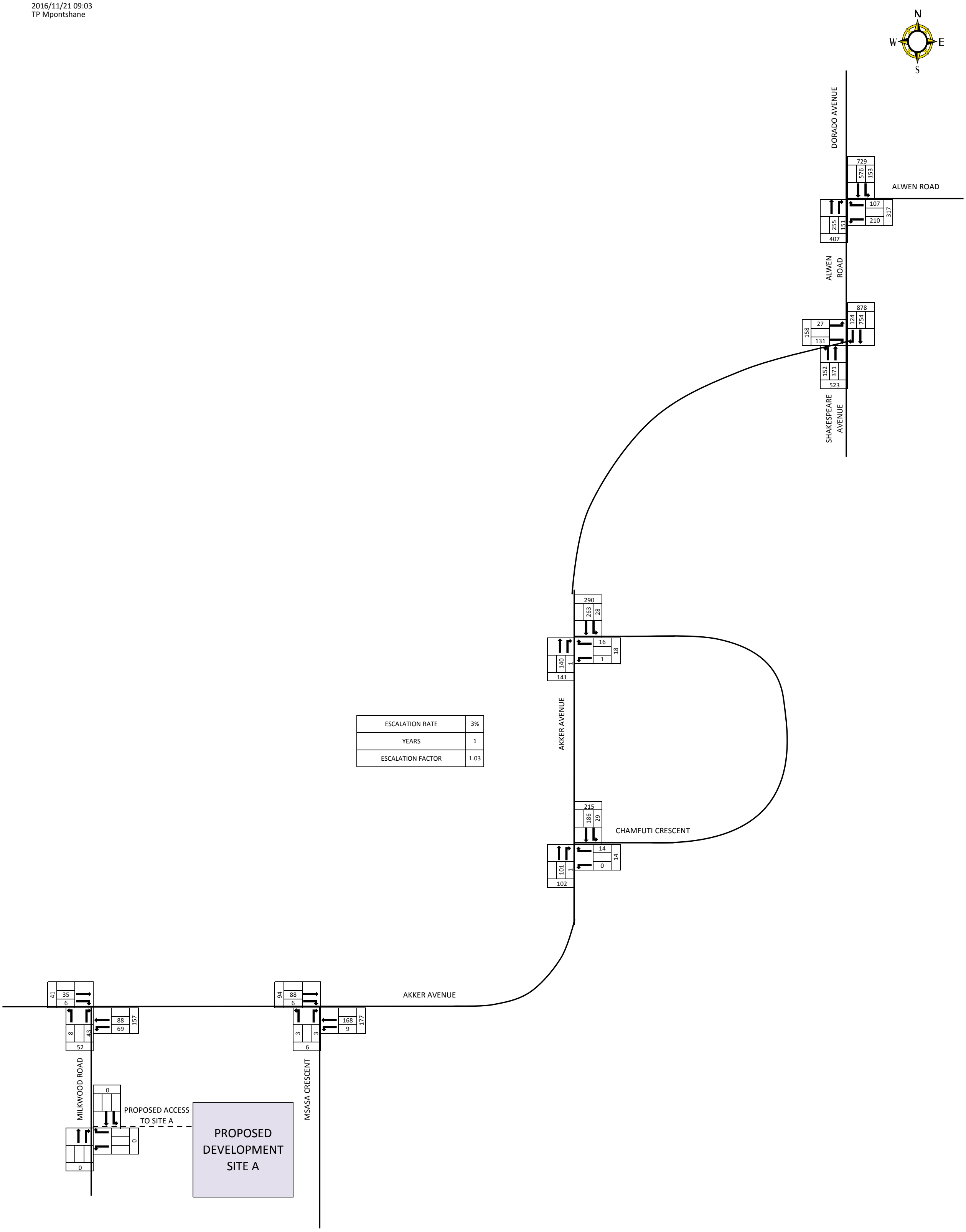


ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

2017 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.3

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane

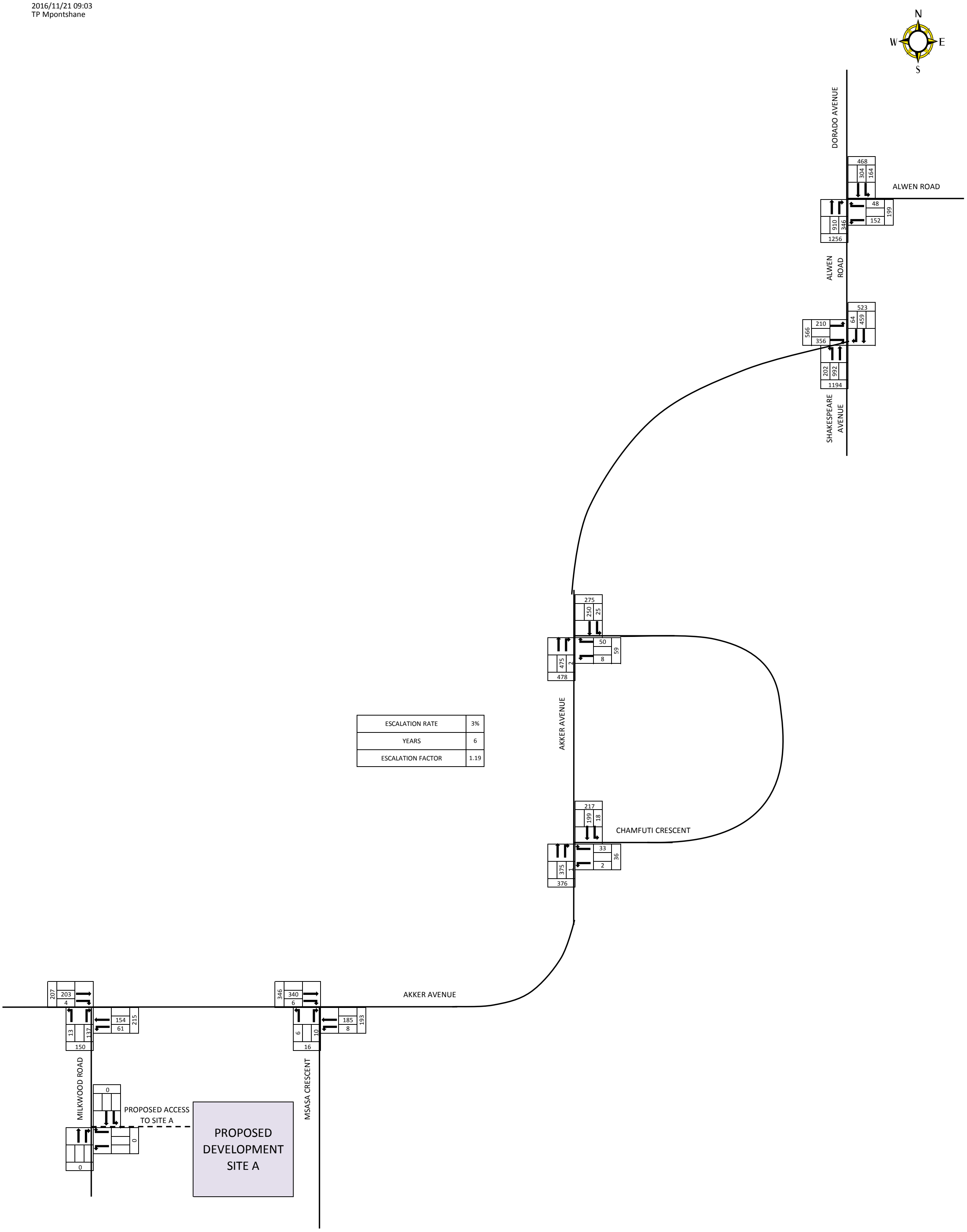


ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

2017 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.4

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane

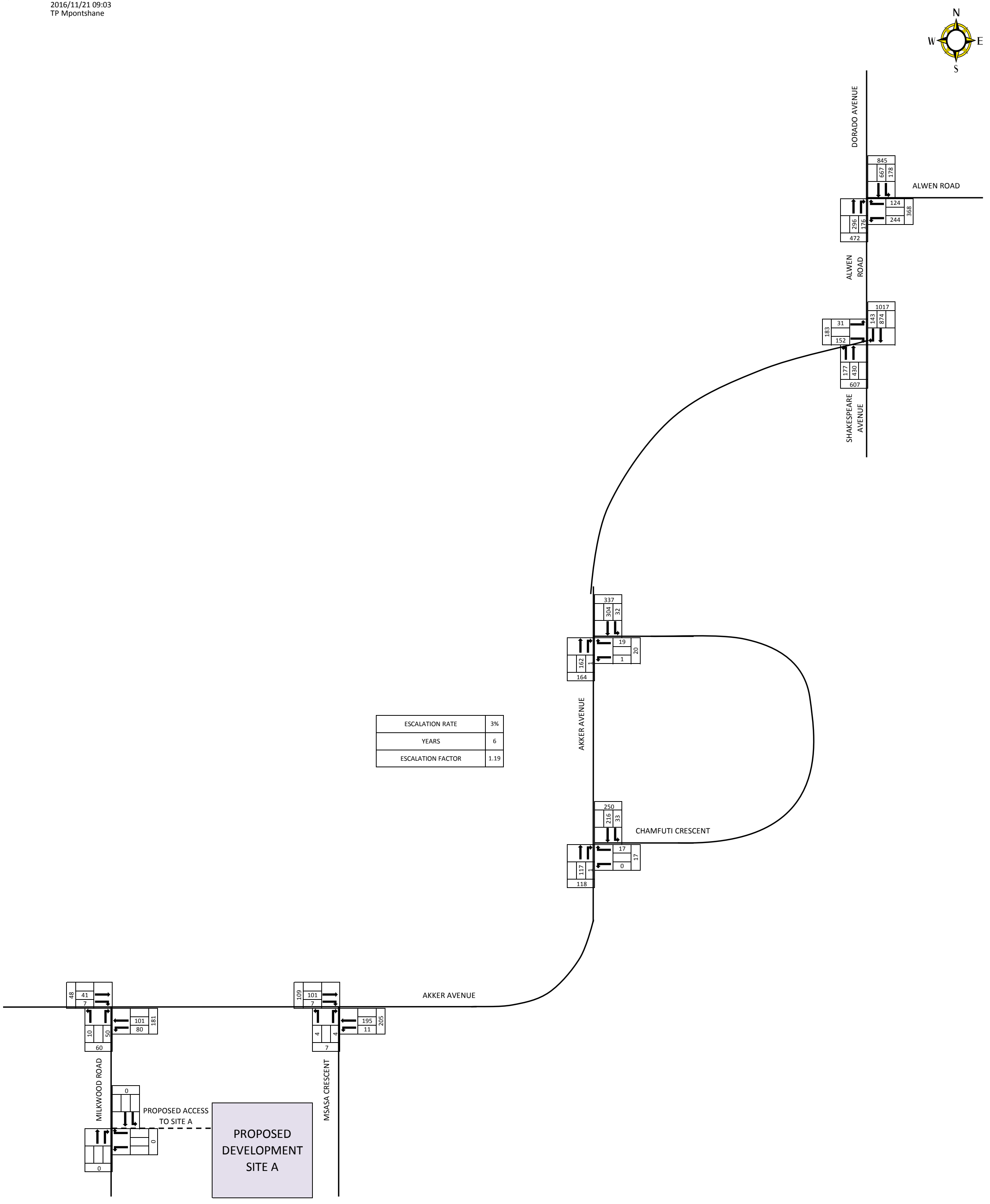


ESCALATION RATE	3%
YEARS	6
ESCALATION FACTOR	1.19

2022 WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.5

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



ESCALATION RATE	3%
YEARS	6
ESCALATION FACTOR	1.19

Civil Concepts (Pty) Ltd. Reg No: [illegible]
[illegible]
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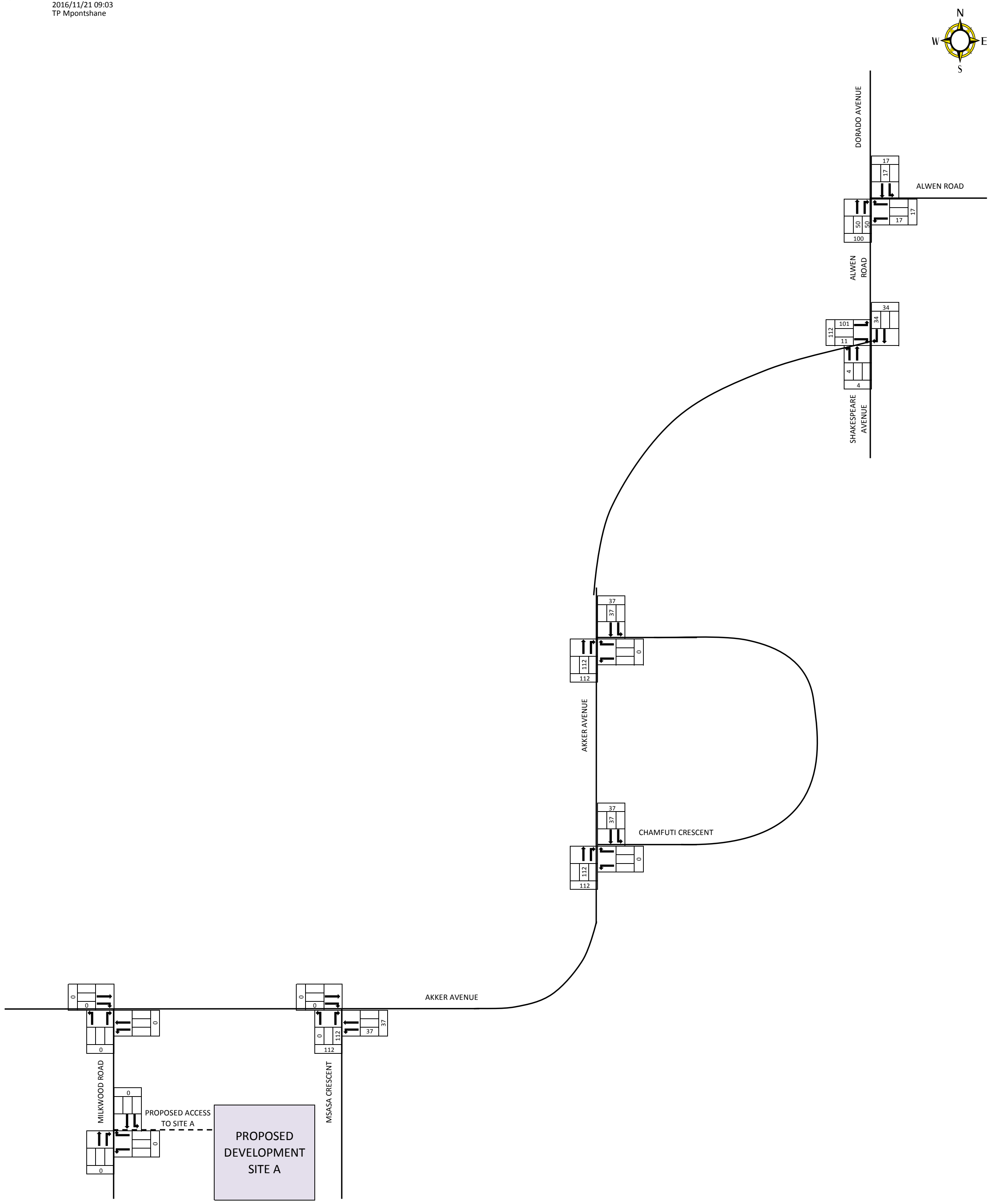
Office: [illegible]
Fax: [illegible]
www.civilconcepts.co.za
CESA

2022 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FIGURE 3.6

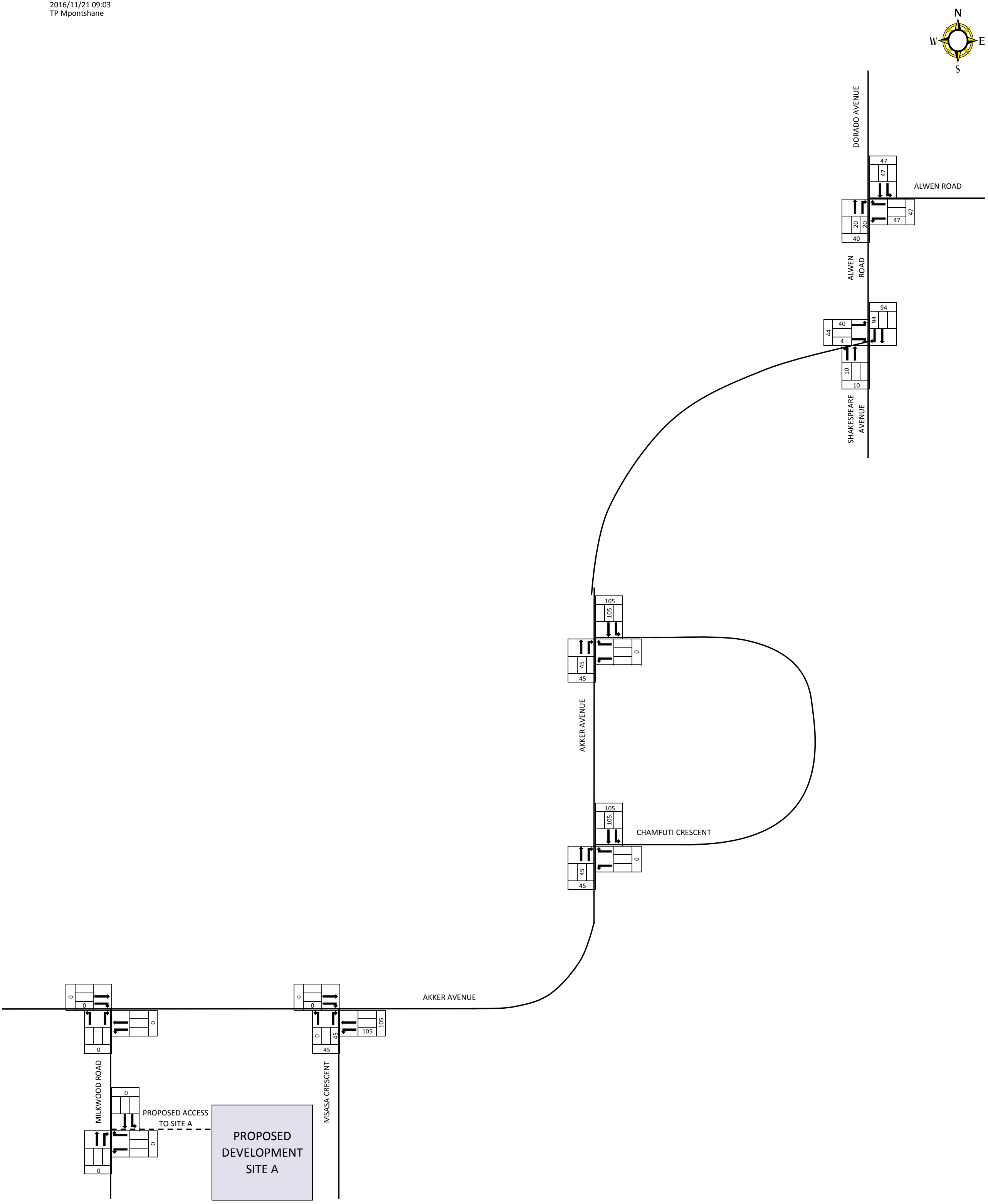
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE EXTENSION 22

FIGURE 3.7

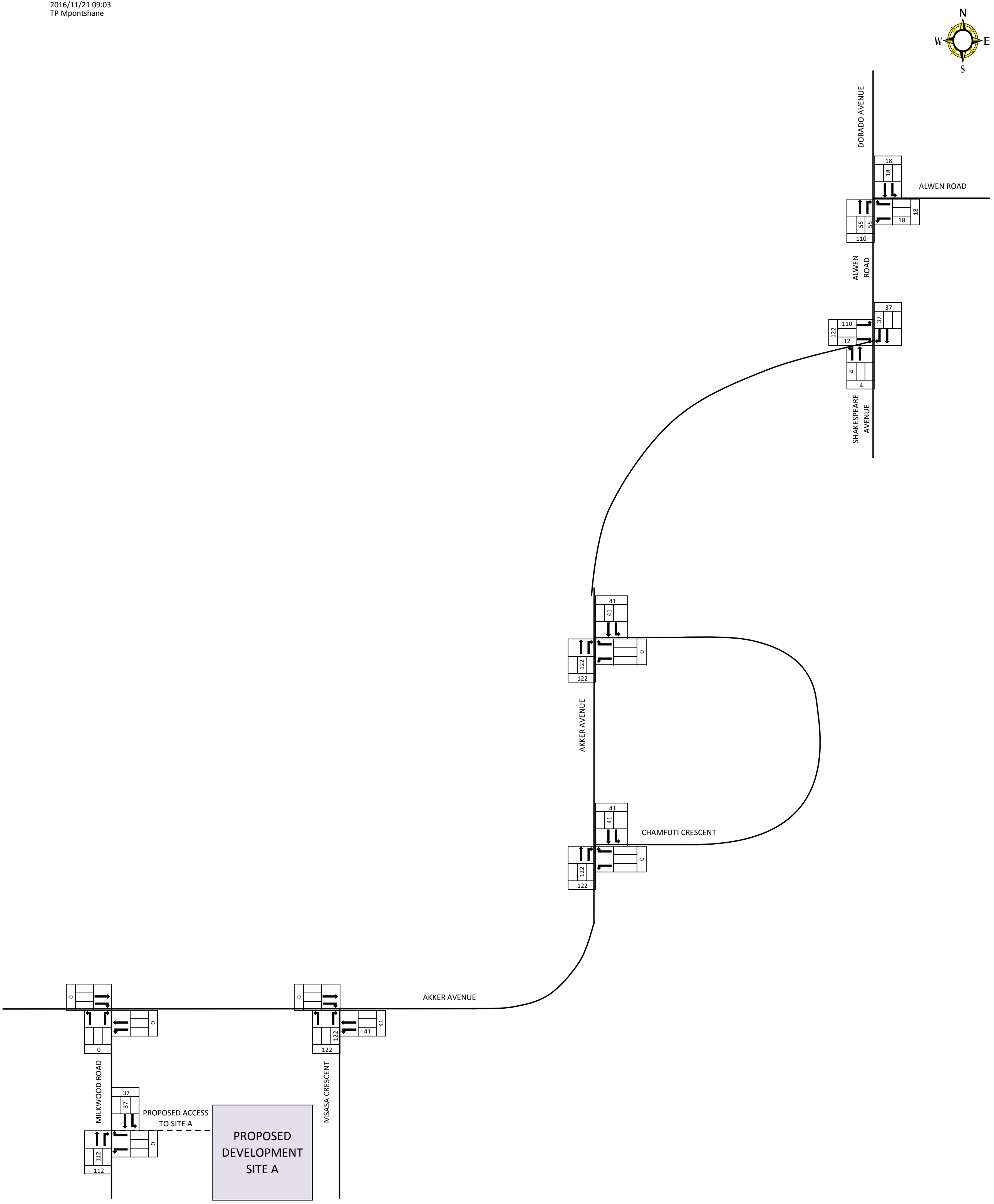
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 962 AND 963, ORMONDE EXTENSION 22

FIGURE 3.8

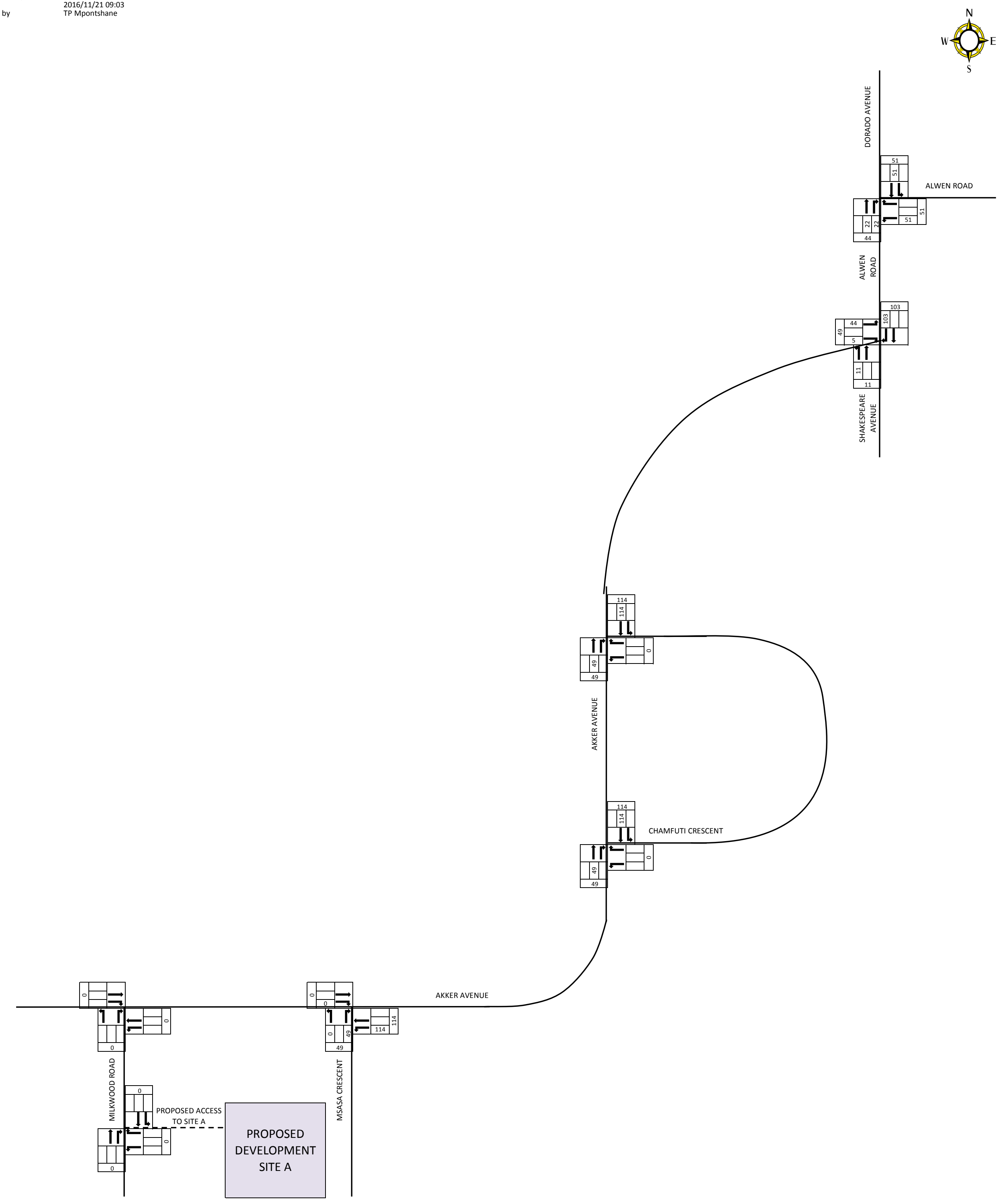
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE EXTENSION 22

FIGURE 3.9

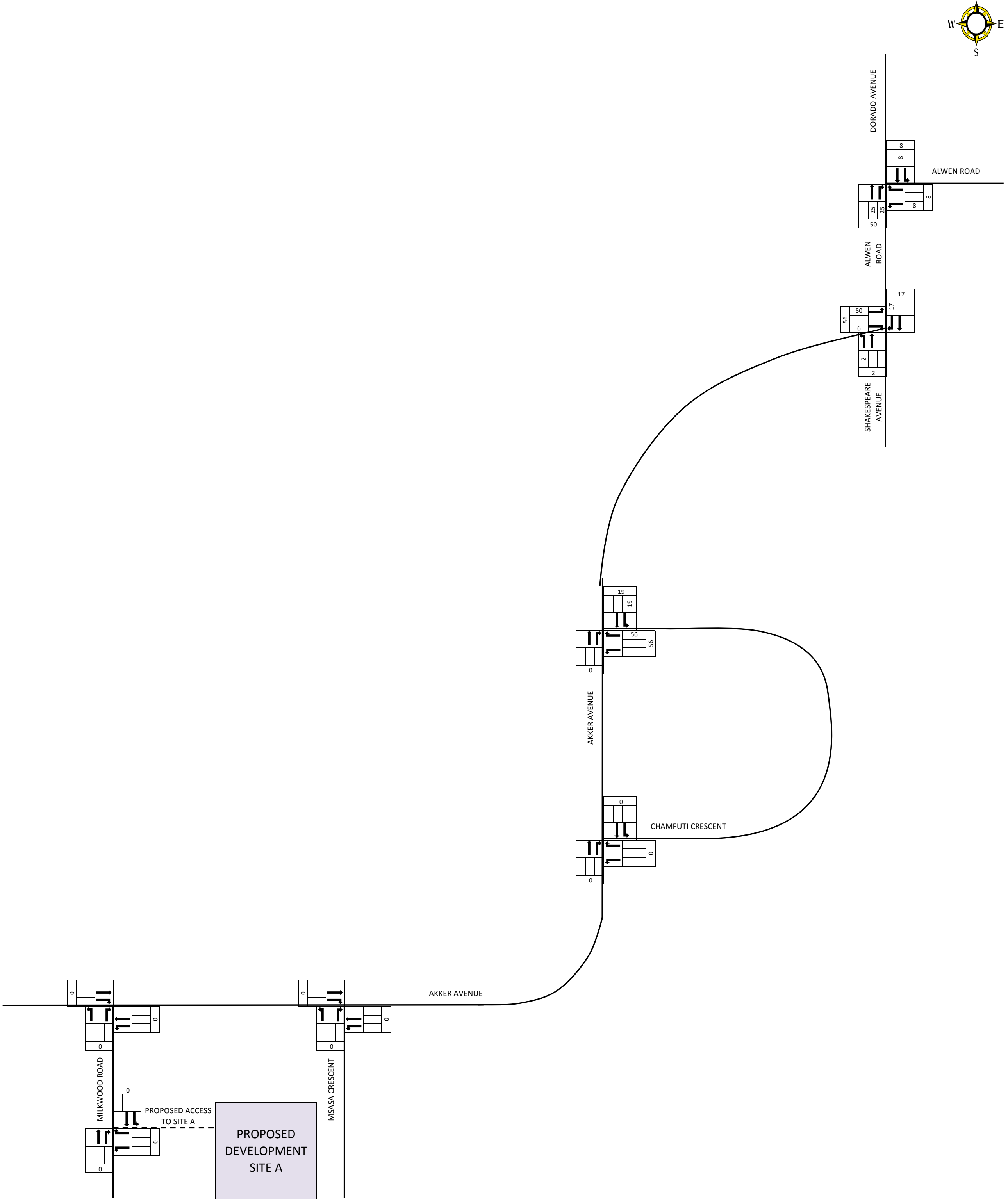
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERVEN 1010 AND 1011, ORMONDE EXTENSION 22

FIGURE 3.10

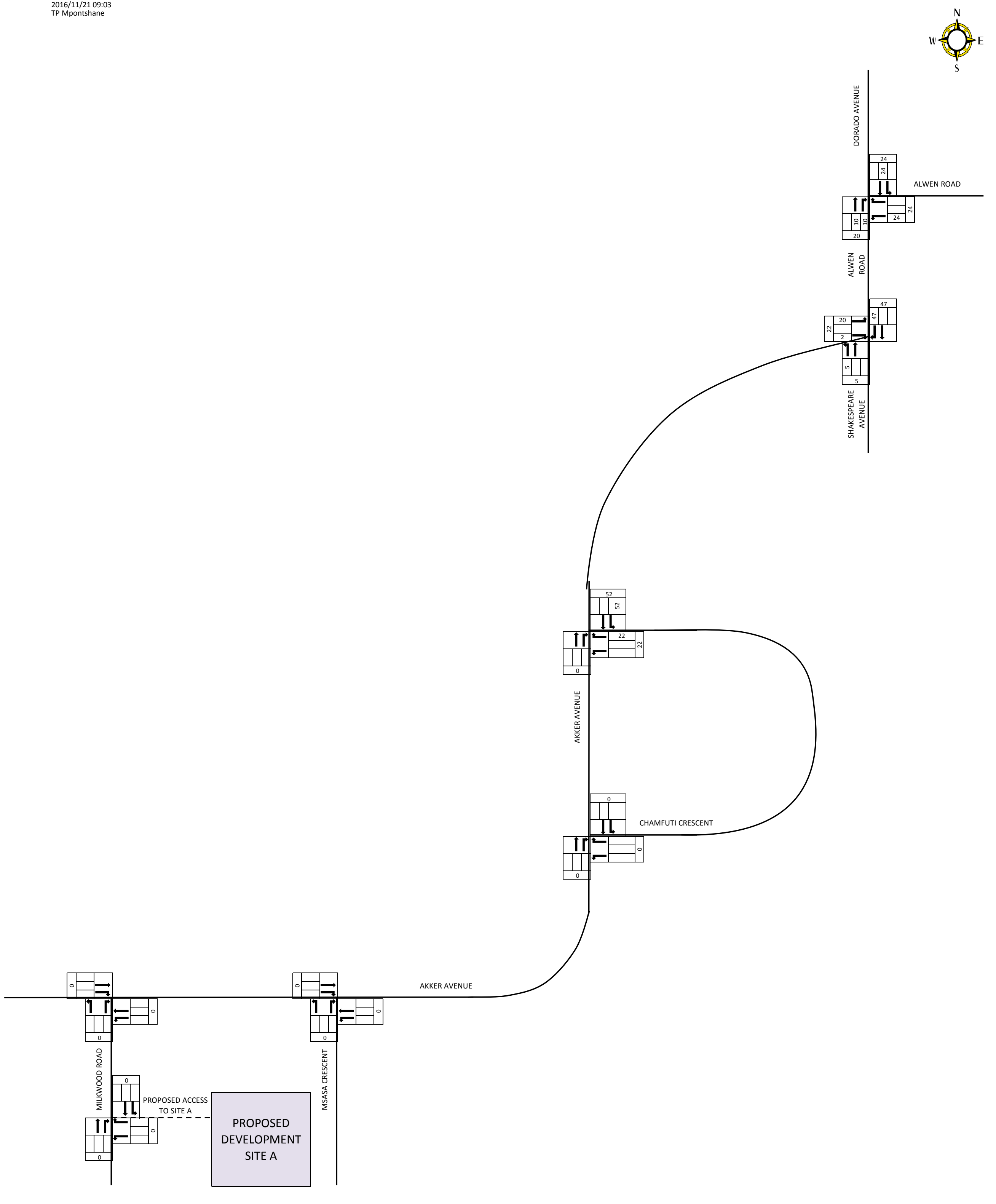
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



WEEKDAY MORNING PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE EXTENSION 22

FIGURE 3.11

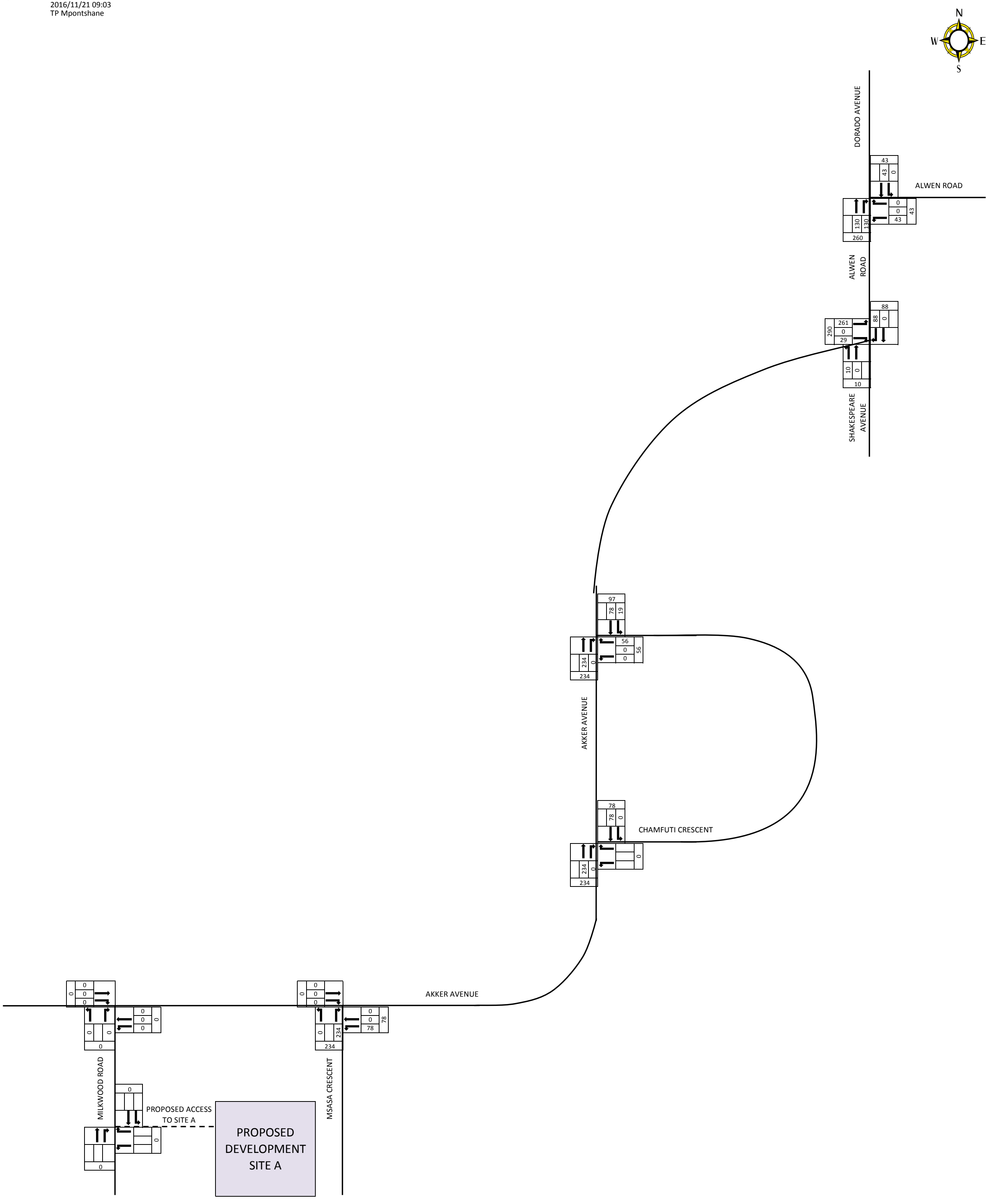
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR LATENT TRIPS FOR ERF 982, ORMONDE EXTENSION 22

FIGURE 3.12

Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



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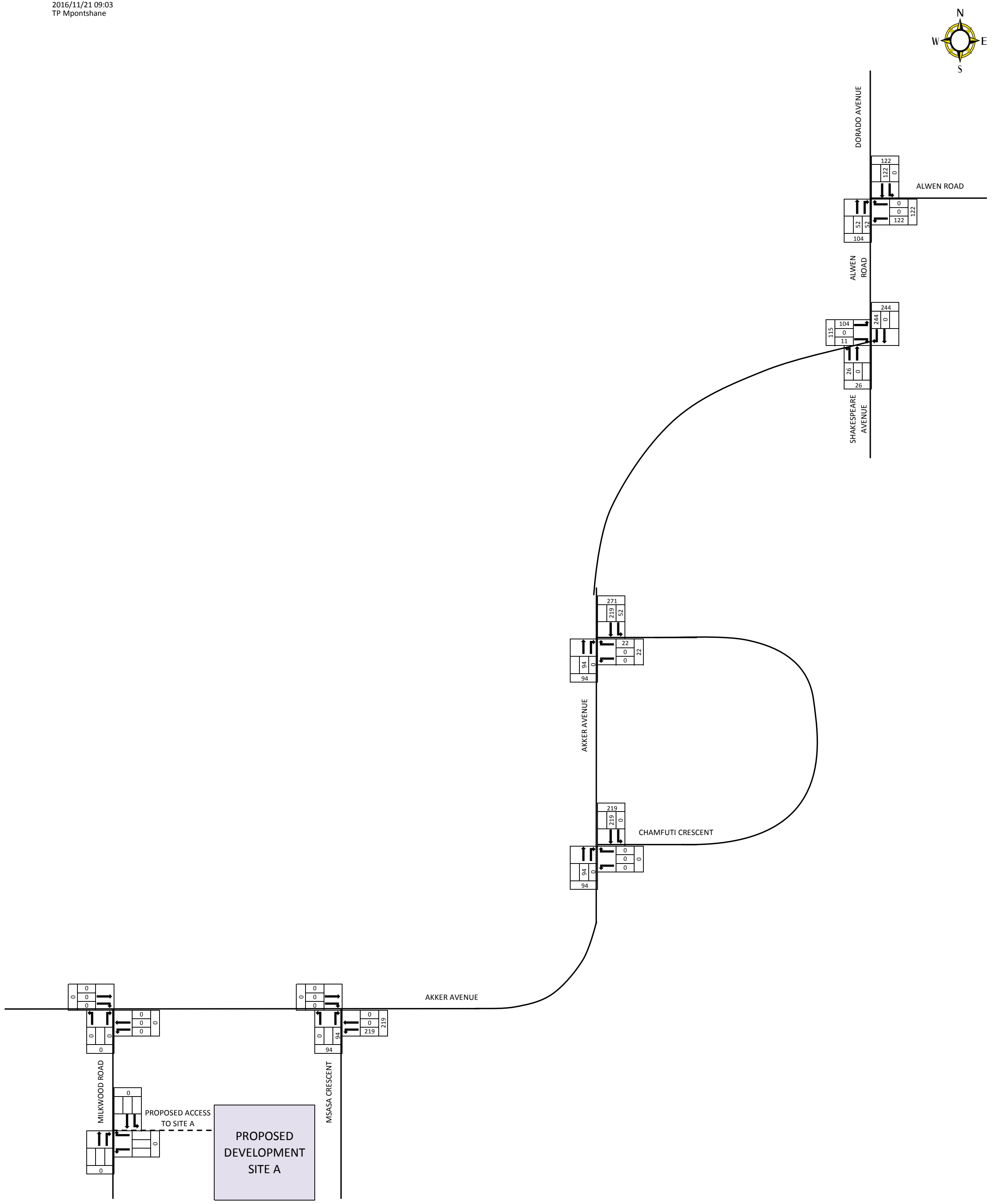
WEEKDAY MORNING PEAK HOUR TOTAL LATENT TRIPS
ORMONDE EXTENSION 22

FIGURE 3.13

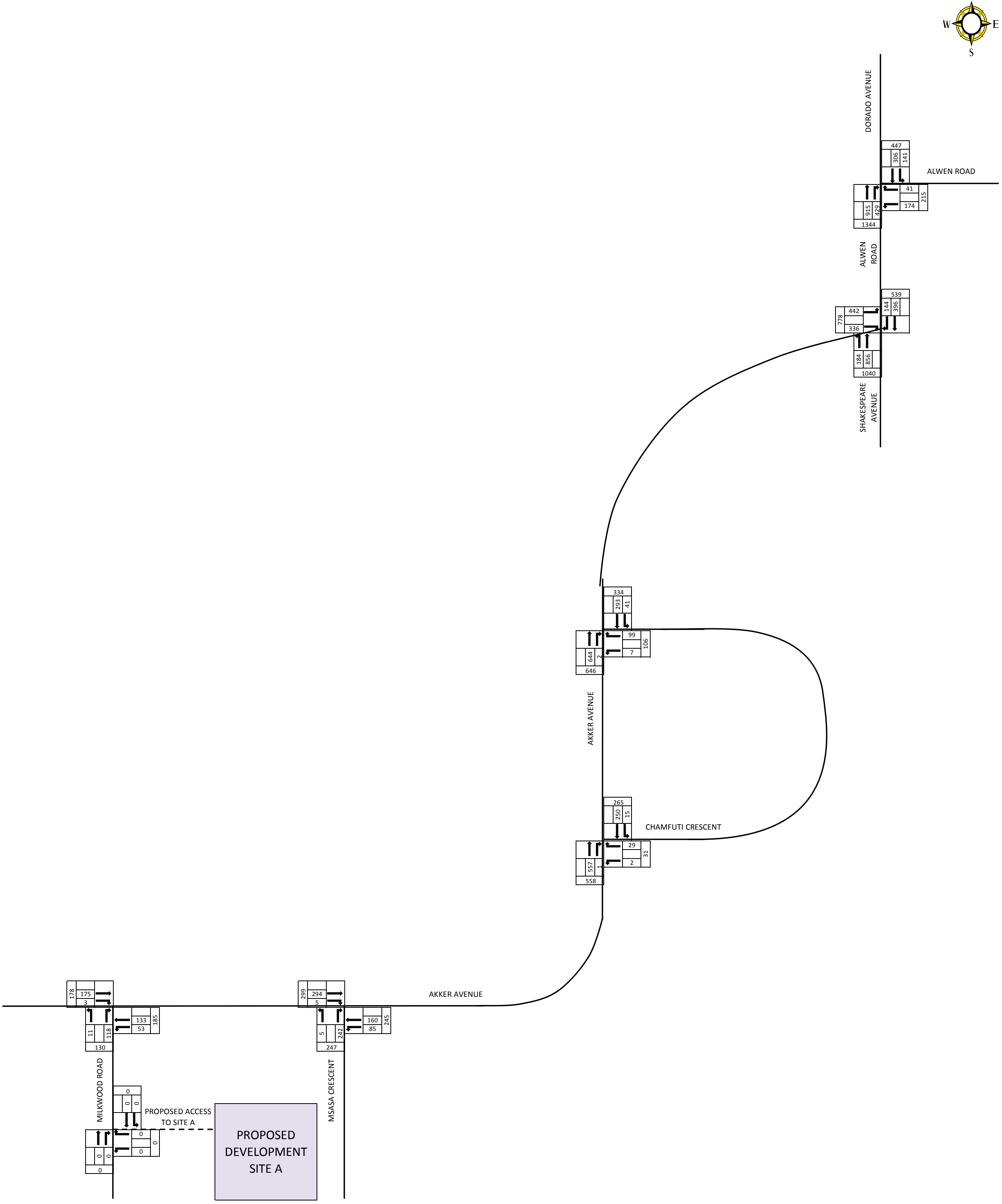
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



WEEKDAY AFTERNOON PEAK HOUR TOTAL LATENT TRIPS FOR ORMONDE EXTENSION 22

FIGURE 3.14

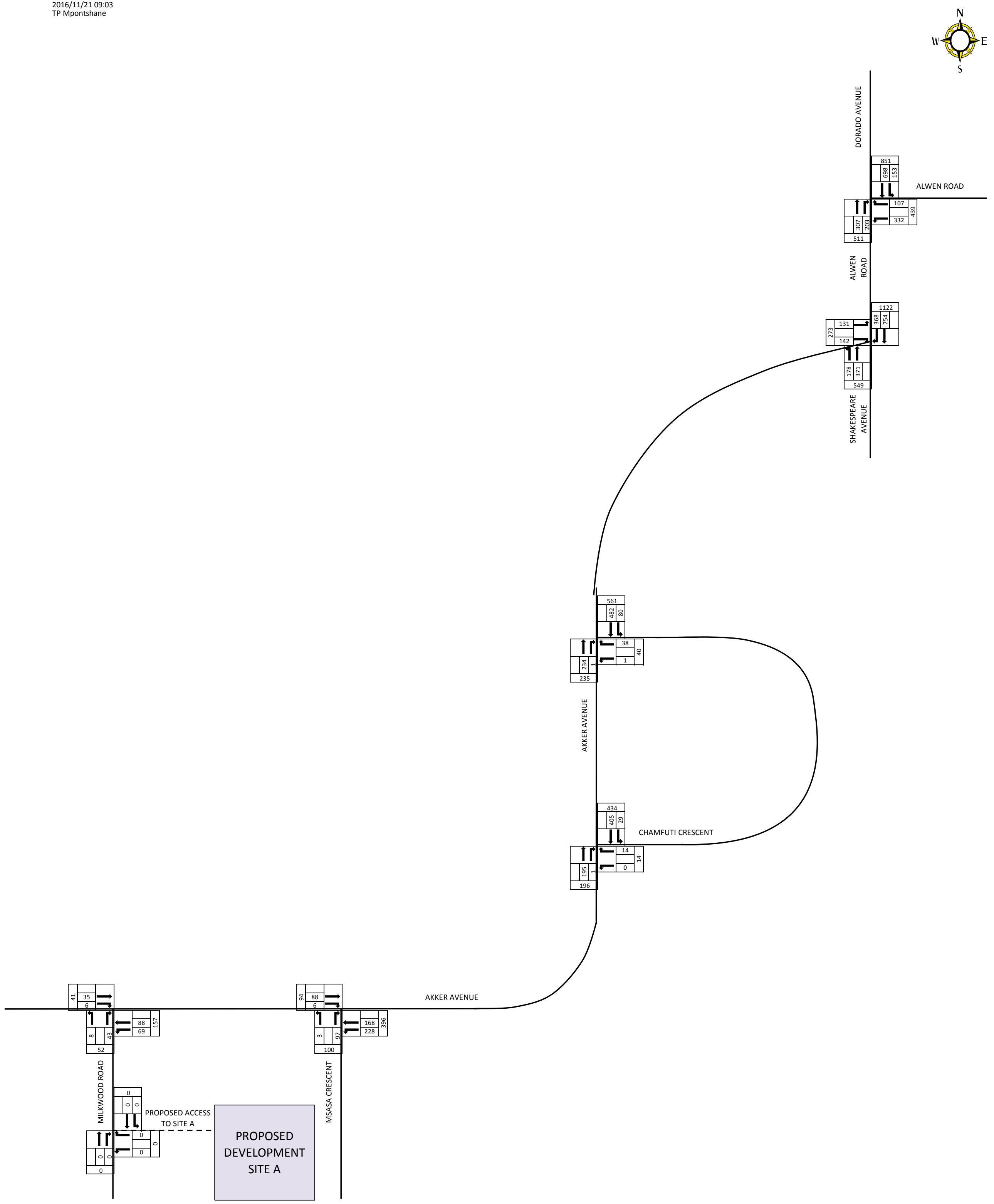
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2017 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.15

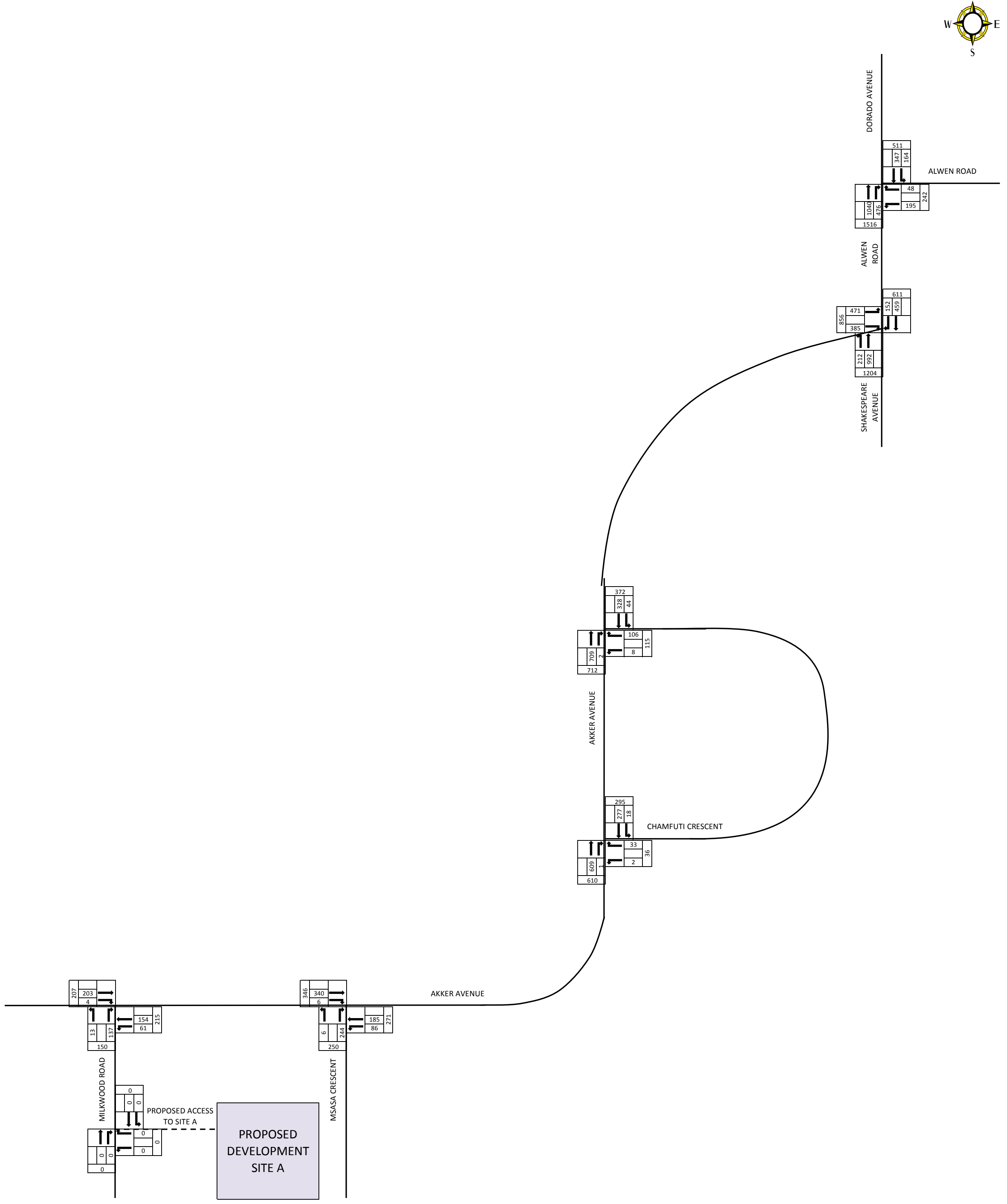
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.16

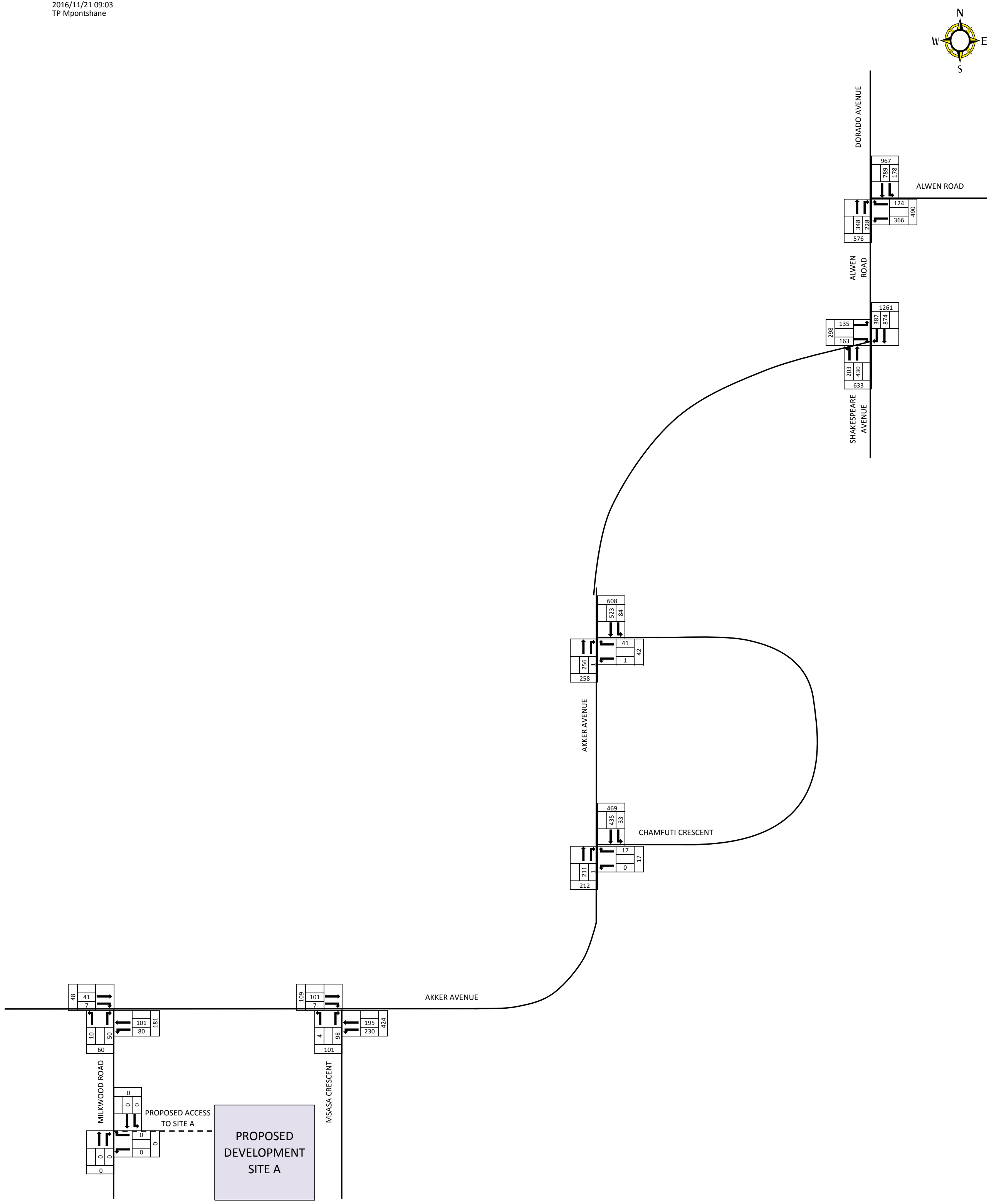
Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



2022 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.17

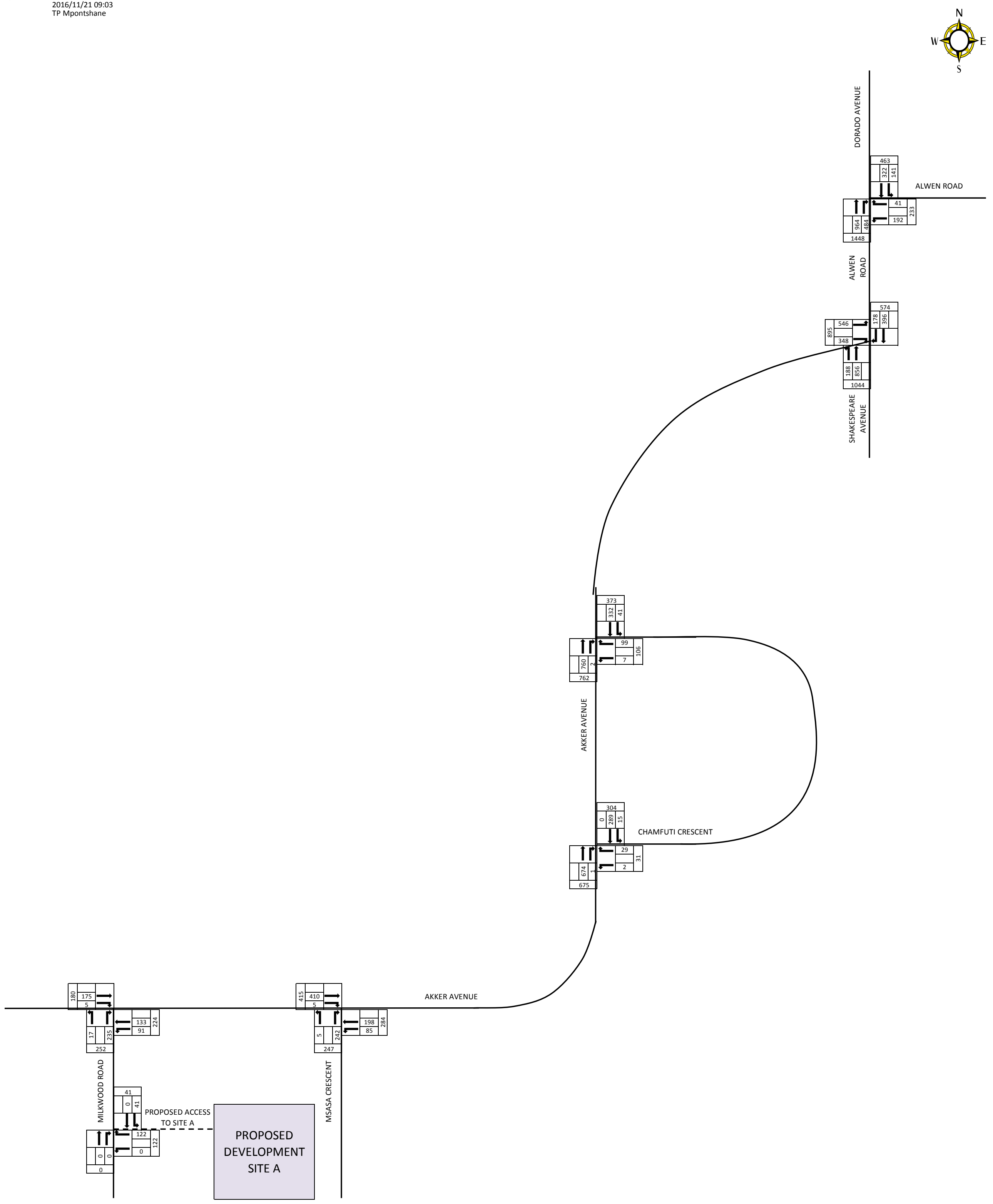
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.18

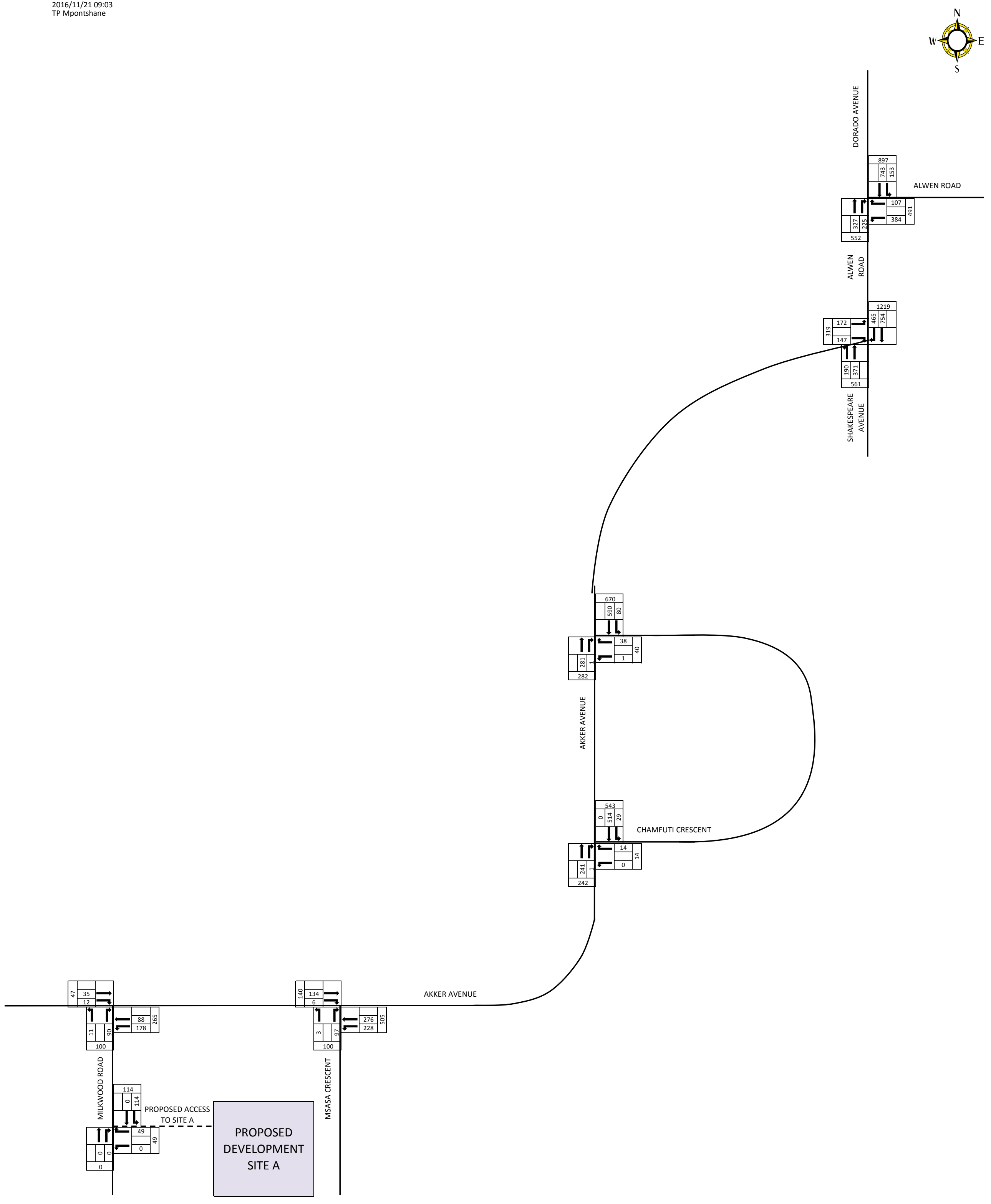
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2017 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.19

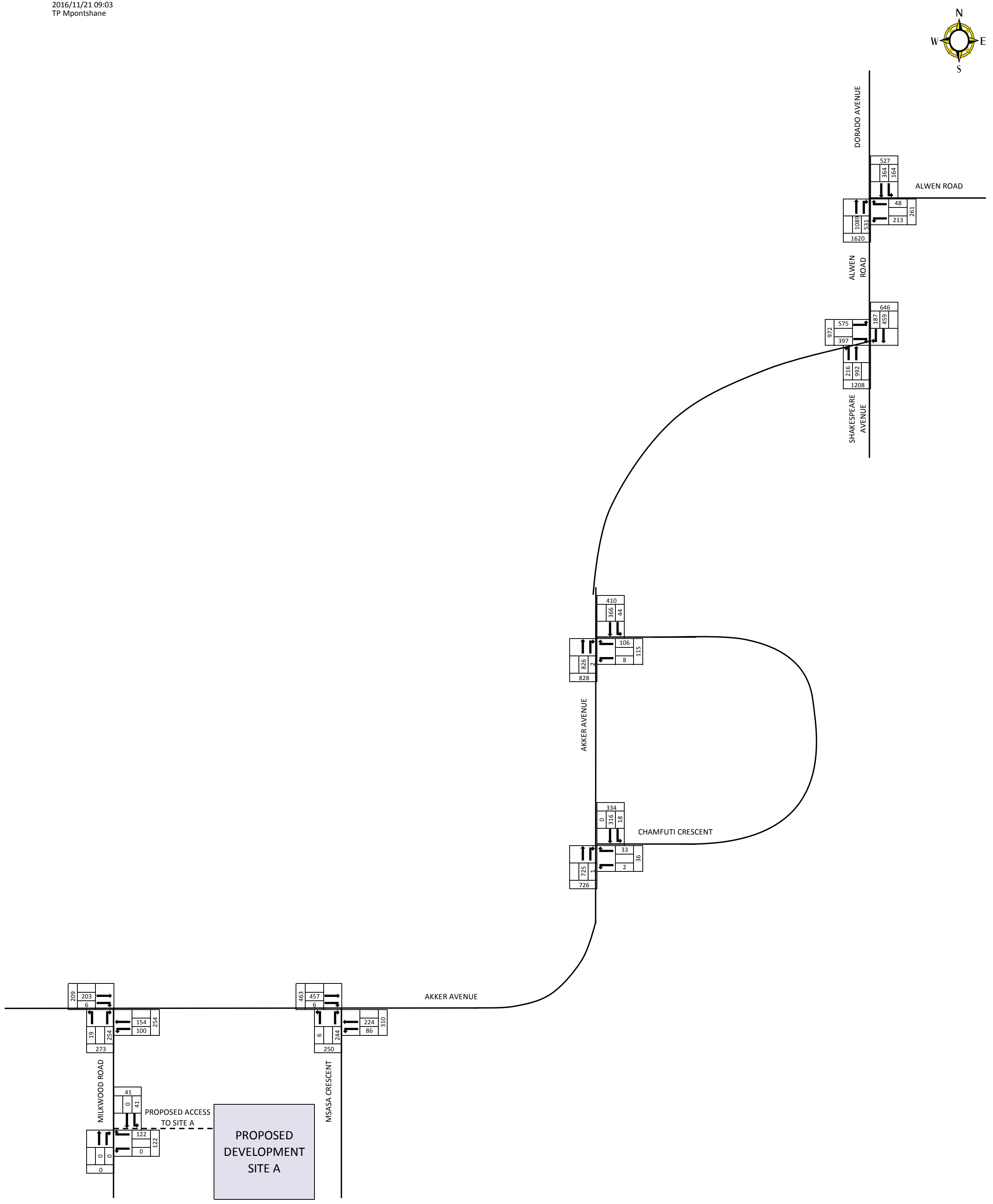
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.20

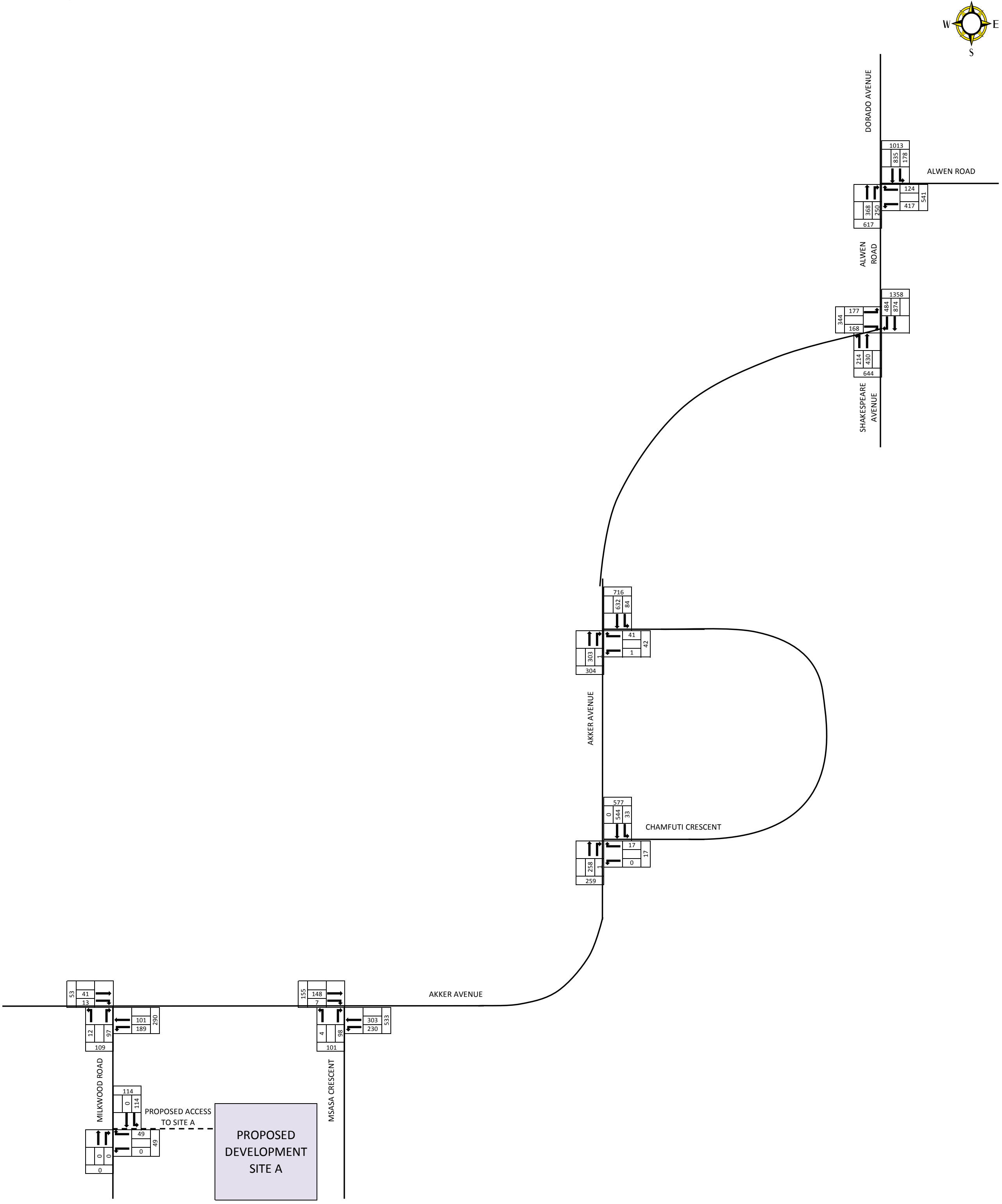
Project Number	C2284
Job Describption	Ormonde - Site A
Date	2016/11/21 09:03
Done by	TP Mpontshane



2022 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.21

Project Number C2284
Job Describption Ormonde - Site A
Date 2016/11/21 09:03
Done by TP Mpontshane



2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.22

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

Kale Developments (Pty) Ltd

C2284/01TIA

Proposed Residential Development on Erven 962 and 963, Ormonde Extension 22 in Johannesburg

Traffic Impact Assessment

November 2016

CIVIL CONCEPTS CONSULTING ENIGINEERS, Civil Concepts (Pty) Ltd 50, 15th Street, Menlo Park (Cnr 17th Street & Justice Mahomed (Charles) Street), PO Box 36148, Menlo Park, 0102 Tel: 012 365 1414, Fax: 012 460 0005, Email: mail@civilconcepts.co.za

REPORT SHEET

PROJECT TITLE:	PROPOSED RESIDENTIAL DEVELOPMENT ON ERVEN 962 AND 963, ORMONDE EXTENSION 22 IN JOHANNESBURG TRAFFIC IMPACT ASSESSMENT
PREPARED FOR:	KALE DEVELOPMENTS (PTY) LTD
PREPARED BY:	CIVIL CONCEPTS (PTY) LTD

PROJECT TEAM:	MM GOUNDEN	TRAFFIC ENGINEER
	JJ POTGIETER	TRAFFIC ENGINEER
	TP MPONTSHANE	STUDENT TECHNICIAN

Copy	Date	Done By	Checked	Approved
V1 DRAFT 1	2016/11/10	TP Mpontshane & JJ Potgieter	JJ Potgieter	MM Gounden
V1	2016/11/18	TP Mpontshane & JJ Potgieter	JJ Potgieter	MM Gounden
V2				

DECLARATION

I certify that this study has been prepared under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.

Signed:

Name: MM Gounden

Qualification: BSc Eng (Civil)

Registration Number: ECSA 2013 0143

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Annexure B - Memorandum Application

Annexure C - Capacity Calculation Results

Annexure D - Existing Traffic Signal Timing Plans obtained from JRA

Annexure E - Traffic Signal Phasings and Timings

Annexure F - Storage Lane Calculations

Annexure G - Proposed Road Upgrades Layout Plans for Erven 962 and 963

Annexure H - Ultimate Proposed Road Upgrades Layout Plans of all Four Sites

Annexure I - Cost Estimates of the Proposed Upgrades

EXECUTIVE SUMMARY

A residential development is proposed on Erven 962 and 963, Ormonde Extension 22, to be located in the south-western part of the City of Johannesburg Metropolitan Municipality (CoJ) comprising of **176** "Residential 3" dwelling units.

The developer has three (3) other development sites in the close proximity of Erven 962 and 963 and form part of the study area. The developer might construct any of the development sites before Erven 962 and 963. Civil Concepts (Pty) Ltd prepared separate traffic studies for each site (three (3) other development sites):

- A residential development on Erven 1010 and 1011;
- A residential development on Erf 982; and
- A residential development on Erven 1130 and 1131.

The Traffic Impact Assessment of Erven 962 and 963 was prepared first. Erven 962 and 963 development site will contribute towards the ultimate road upgrades proposed (refer to **ANNEXURE H** for the ultimate proposed road upgrades layout plans of all four (4) sites).

The road upgrades proposed to accommodate only Erven 962 and 963 are addressed and shown in this report.

This Traffic Impact Assessment (TIA) has been prepared to determine the impact of the development trips on the surrounding road network. This study is prepared in accordance with the Committee of Transport Officials (COTO) TMH17 – Trip Data Manual, COTO TMH16 – Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, Department of Transport's Manual for Traffic Impact Studies (Document RR 93/635), COTO TRH26 – South African Road Classification and Access Management Manual and Requirements Manual and the 2010 Highway Capacity Manual.

The development will generate **150** trips during both the weekday morning and afternoon peak hours, respectively.

The base year (2017) and horizon year (2022) are analysed as part of this study, respectively.

No information on latent rights was received from the local municipality. A 3% annual growth rate was used to escalate the traffic counts (PCUs) to account for any unknown latent rights and account for general growth in traffic within the vicinity of the proposed development site.

Six (6) junctions were analysed in this study using the SIDRA 5.0 and Auto J Intersection software programs. The following junctions were analysed:

- Dorado Avenue / Alwen Road;
- Akker Avenue / Alwen Road / Shakespeare Avenue;
- Akker Avenue / Chamfuti Crescent North;
- Akker Avenue / Chamfuti Crescent South;
- Akker Avenue / Msasa Crescent; and
- Akker Avenue / Proposed Access.

Five (5) of the six (6) junctions analysed will operate satisfactorily during the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place as shown in **Section 9** of this report.

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems during the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades in place. It will however operate better when compared to the 2022 weekday morning peak hour background traffic scenario.

The proposed road upgrades are for the developer’s account.

No public transport facilities are proposed.

Pedestrian walkways have to be provided along the site frontage by the developer to the satisfaction of the Johannesburg Road Agency (JRA) and CoJ.

1. INTRODUCTION

1.1 Background

Civil Concepts (Pty) Ltd was appointed by Kale Developments (Pty) Ltd to prepare a Traffic Impact Assessment (TIA) in support of a proposed residential development on Erven 962 and 963, Ormonde Extension 22 in Johannesburg.

The proposed development will consist of **176** "Residential 3" dwelling units.

The developer has three (3) other development sites in the close proximity of Erven 962 and 963 and form part of the study area. The developer might construct any of the following development sites (three (3) sites) before Erven 962 and 963:

- A residential development on Erven 1010 and 1011;
- A residential development on Erf 982; and
- A residential development on Erven 1130 and 1131.

The Traffic Impact Assessment of Erven 962 and 963 was prepared first.

The site is located to the south of Akker Avenue and it is bordered by Msasa Crescent along the eastern boundary in Ormonde as shown in Figure 1.1.

Figure 1.1: Locality Plan

The objective of this study is to determine the impact of the development trips on the adjacent road network. The land use rights and trip generation are described first. This is followed by a description of the existing and proposed traffic volumes and the road network. The traffic operations at the junctions are calculated and upgrading proposals are made. Conclusions and recommendations are made at the end of the report.

1.2 Definitions

The following definitions from the 2010 Highway Capacity Manual are applicable to this report:

Level of Service (LOS)

Level of Service is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption and lost travel time. The levels of Service for junctions as defined in the 2010 Highway Capacity Manual are shown in Table 1.1.

TABLE 1.1: LEVEL OF SERVICE DEFINITIONS

Level of Service	**Control delay per vehicle (s/veh)**	
	Signalised junctions	**Unsignalised junctions**
A	< 10	< 10
B	10 to 20	10 to 15
C	20 to 35	15 to 25
D	35 to 55	25 to 35
E	55 to 80	35 to 50
F	> 80	> 50

Capacity

The maximum hourly rate at which vehicles can reasonably be expected to traverse a lane or roadway during a given period under prevailing roadway, traffic and control conditions.

Volume

The hourly rate (v/h), the actual flow rate for an approach or lane.

Volume to capacity ratio (V/C)

The ratio of flow to capacity.

1.3 Time Horizon

The base year (2017) and horizon year (2022) are analysed as part of this study.

The weekday morning and afternoon peak hours are analysed.

1.4 Determination of Road Upgrading

The Department of Transport's Manual for Traffic Impact Studies (Document RR 93/635) states:

"The recommended criteria that should be used to measure the level of upgrading/ improvement required, is the LOS and the v/c ratio.

In urban areas it is recommended that either of the following two LOS be used to determine whether an intersection should be upgraded, on condition that the contribution of the proposed development is at least 2% of the sum of the critical volume on a lane basis of the intersection assessed:

All elements of an intersection should operate at LOS D or better and a v/c ratio less than 0.95 during the peak hour of the roadway system.

In areas where the baseline LOS is E or worse, or the v/c ratio is greater than 0.95, this baseline (i.e. prior to development) LOS must be maintained or improved for the situation with the development included. The baseline LOS includes all committed (funded) road improvements and all non-site traffic (including existing site traffic) but exclude the additional traffic that will be generated by the proposed development.

It should, however, be debated whether an application should be approved if the baseline LOS is E or worse and it is not practical to upgrade the intersection any further. Engineering judgement should further be used in the case of the LOS of specifically right turning movements across high opposing traffic volumes at signalised intersections, due to the number of vehicles that are turning during the intergreen period / typically between 1 to 4 vehicles per cycle, depending on the intersection layout. It is not realistic to upgrade an intersection if a small number of right turning vehicles experience a LOS E or F. The same is also true if a level of service E/F is experienced by a small number of vehicles entering a major road from a minor road.

The determination of the necessary upgrading and improvement to the road infrastructure needs to be determined for the "with" and "without-development" scenarios for the opening year and the horizon years(s). The following procedure should be followed to determine the necessary road upgrading:

Calculate the LOS, v/c ratios and the site traffic as a percentage of the critical flows at the intersection for every scenario.
If the LOS is worse than LOS D for the with-development scenario but not for the without-development scenario, the developer is responsible for all the required road upgrading.

If the LOS is worse than D for the with- and without-development scenarios, the developer is only responsible for the incremental upgrading to obtain the same LOS and v/c ratio as for the without-development scenario.”

2. TRIP GENERATION AND ASSIGNMENT

2.1 Introduction

The proposed land use rights of the site are described first. This is followed by the trip generation of the proposed rights. Trip distributions and assignments are then provided.

2.2 Proposed Rights

The proposed land use rights are shown in Table 2.1.

TABLE 2.1: PROPOSED LAND USE RIGHTS

Erven	Land Use	Extent (ha)	Unit/ha	No. Units
962	"Residential 3"	0.5942	110 unit /ha	64
963	"Residential 3"	1.0274		113
Total				**176**

A copy of the Township Layout Plan is included in **ANNEXURE A**.

The memorandum concerning the proposed Erven 962 and 963, Ormonde Extension 22 as per the CoJ Town-Planning Scheme are included in **ANNEXURE B.**

2.3 Trip Generation

2.3.1 Introduction

The trip rates prescribed in the Committee of Transport Officials' (COTO) TMH 17 - Trip Data Manual, Version 1.0 (dated September 2013) were used to calculate the development trips.

No trip reductions were considered in this study.

The weekday morning and afternoon peak hours were analysed.

2.3.2 Trip Generation

The weekday morning and afternoon peak hour trip generations are shown in Tables 2.2 and 2.3, respectively.

TABLE 2.2: WEEKDAY MORNING PEAK HOUR TRIP GENERATION

Land Use	Extent	Trip Rate / Unit	Directional Split		Trips		
			In	Out	In	Out	Total
"Residential 3"	176 Units	0.85	25%	75%	37	112	150
				TOTAL	**37**	**112**	**150**

TABLE 2.3: WEEKDAY AFTERNOON PEAK HOUR TRIP GENERATION

Land Use	Extent	Trip Rate / Unit	Directional Split		Trips		
			In	Out	In	Out	Total
"Residential 3"	176 Units	0.85	70%	30%	105	45	150
				TOTAL	**105**	**45**	**150**

2.4 Trip Distribution and Assignments

The road network, trip distribution, assignment and the development framework information of the study area are shown on schematic diagrams as required in TMH 16 South African Traffic Impact and Site Traffic Assessment Manual, Version 1.0, August 2012 (refer to Figures 2.1 and 2.2 and 3.1 to 3.10 for the schematic diagrams).

The proposed development trips were distributed and assigned to the adjacent road network based on the expected origins and destinations to and from the subject site.

The weekday morning and afternoon peak hour residential development trip distributions and assignments are shown in Figures 2.1 and 2.2, respectively.

3. TRAFFIC AND THE ROAD NETWORK

3.1 Traffic Counts

A weekday morning and afternoon peak hour classified traffic count survey was carried out on 19 October 2016 by Trafsol Data Specialists at the following junctions:

- Dorado Avenue / Alwen Road;
- Akker Avenue / Alwen Road / Shakespeare Avenue;
- Akker Avenue / Chamfuti Crescent North;
- Akker Avenue / Chamfuti Crescent South; and
- Akker Avenue / Msasa Crescent.

The classified traffic counts were converted to Passenger Car Units (PCUs) using the following factors:

- 1 for a car;
- 1.5 for a taxi; and
- 3 for heavies (buses and trucks).

The weekday morning and afternoon peak hour traffic counts (PCUs) are shown in Figures 3.1 and 3.2, respectively.

3.2 Latent Rights

No information on latent rights was received from the local municipality. The traffic counts were therefore escalated at a 3% annual growth rate to account for any unknown latent rights within the vicinity of the proposed development site. The escalated traffic counts (PCUs) were therefore considered as the background traffic volumes.

3.3 Background Traffic

3.3.1 2017 Background Traffic Volumes

The 2016 weekday morning and afternoon peak hour traffic counts (PCUs) were escalated at a 3% annual growth rate over 1 year to obtain the 2017 peak hour background traffic volumes.

The 2017 weekday morning and afternoon peak hour background traffic volumes are shown in Figures 3.3 and 3.4, respectively.

3.3.2 2022 background Traffic Volumes

The 2016 weekday morning and afternoon peak hour traffic counts (PCUs) were escalated at a 3% annual growth rate over 6 years to obtain the 2022 peak background hour traffic volumes.

The 2022 weekday morning and afternoon peak hour background traffic volumes are shown in Figures 3.5 and 3.6, respectively.

3.4 Background and Development Traffic

3.4.1 2017 Background and Development Traffic Volumes

The weekday morning and afternoon peak hour development trips were added to the 2017 background peak hour volumes to obtain the 2017 background and development peak hour traffic volumes.

The 2017 weekday morning and afternoon peak hour background and development traffic volumes are shown in Figures 3.7 and 3.8, respectively.

3.4.2 2022 Background and Development Traffic Volumes

The weekday morning and afternoon peak hour development trips were added to the 2022 background peak hour volumes to obtain the 2022 background and development peak hour traffic volumes.

The 2022 weekday morning and afternoon peak hour background and development volumes are shown in Figures 3.9 and 3.10, respectively.

3.5 Road Network

3.5.1 Existing Road Network – *According to the Gauteng Strategic Major Road Network Master plan and the CoJ Regional Road Master Plan*

- **Shakespeare Avenue** can be assumed to be a class 5b (residential) local street that lies to the north and east of the development site. It runs in a north-south and east-west direction.

- **Alwen Road** can be assumed to be a class 5b (residential) local street that lies to the north of the development site and runs in a north-south direction. It intersects with Shakespeare Avenue and Dorado Avenue to the north-east.

- **Dorado Avenue** can be assumed to be a class 5b (residential) local street that lies to the north of the development site and runs in a north-south direction. This road starts at its intersection with Alwen Road.

- **Akker Avenue** can be assumed to be a class 5b (residential) local street that lies to the north of the development site and runs in an east-west and north-south direction.

- **Chamfuti Crescent** can be assumed to be a class 5b (residential) local street that lies to the north-east of the development.

- **Msasa Crescent** can be assumed to be a class 5b (residential) local street that borders the development site to the east.

3.5.2 Future Road Network

There are no proposed roads within the vicinity of the development site.

3.5.3 Proposed Upgrading of the Road Network

Refer to **Section 9** of this report for the existing and proposed upgraded junction configurations.

4. SITE INVESTIGATION

A site visit was done on 19 October 2016 to determine the existing lane configurations of the junctions analysed in this study and to observe the existing traffic operations. Refer to Figures 4.1 to 4.4 below.

- **Dorado Avenue / Alwen Road**

Figure 4.2: Dorado Avenue / Alwen Road junction configuration

The junction is priority controlled. There are no pedestrian crossings or walkways at this junction which creates an unsafe hazard for pedestrians. The road surface is in good condition and road markings are visible at all approaches to the junction.

- **Akker Avenue / Alwen Road / Shakespeare Avenue**

Figure 4.1: Akker Avenue / Alwen Road / Shakespeare Avenue configuration

The junction is signalised. There are no pedestrian crossings on all approaches. There are existing pedestrian walkways along the western side of Alwen Road at this junction.

The road surface is in good condition and road markings are visible at all approaches to the junction.

- **Akker Avenue / Chamfuti Crescent North and South**

Figure 4.3: Akker Avenue / Chamfuti Crescent North and South configurations

The junctions are priority controlled. There are no pedestrian walkways at both junctions but there is a visible pedestrian crossing sign at the Chamfuti Crescent South junction. The road surface is in good condition and road markings are visible at all approaches to the junction.

- **Akker Avenue / Msasa Crescent**

Figure 4.4: Akker Avenue / Msasa Crescent junction configuration

The junction is priority controlled. There are no pedestrian walkways at the junction which creates an unsafe hazard for pedestrians. The road surface is in good condition and road markings are visible at all approaches to the junction.

5. TRAFFIC OPERATIONS

5.1 Introduction

The SIDRA Intersection 5.0 software program was used for the capacity analysis of the following junctions:

- Akker Avenue / Alwen Road / Shakespeare Avenue;
- Akker Avenue / Chamfuti Crescent North;
- Akker Avenue / Chamfuti Crescent South;
- Akker Avenue / Msasa Crescent; and
- Msasa Crescent / Proposed Access.

The Auto J software program was used for the Dorado Avenue / Alwen Road junction to improve its level of operation.

The average capacity results per junction are given in this section, however in accordance with Section 3.3.2 of the TMH16 Volume 2 – South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual (Version 1.0, August 2012) as published by the Committee of Transport Officials (COTO), detailed capacity analysis results for all individual movements of the junctions are provided in ANNEXURE C of this report.

The pedestrian clearance times were checked at the signalised junction.

5.2 Background Traffic

5.2.1 2017 Background Traffic

The existing traffic signal timing plans of the Akker Avenue / Alwen Road / Shakespeare Avenue junction were obtained from Johan Wilken of the JRA on 31 October 2016 (refer to **ANNEXURE D** for the existing timing plans).

The existing signal timings are shown in Table 5.1.

Detailed phasings and timings of the traffic signals are included in **ANNEXURE E**.

TABLE 5.1 2017 BACKGROUND TRAFFIC PEAK HOUR EXISTING SIGNAL TIMINGS

SIGNALISED JUNCTION	PEAK HOUR	SIGNAL TIMINGS (SEC)												CYCLE LENGTH
		PHASE A			PHASE B			PHASE C			PHASE D			
		G	A	R	G	G	G	G	A	R	G	A	R	
Akker Avenue / Alwen Road / Shakespeare Avenue	AM	53	3	2	17	32	-	-	-	-	-	-	-	80 sec
	PM	38	3	2	10	3	2	7	3	2	-	-	-	70 sec

Legend: G = Green,
A= Amber,
R = Red

The average capacity calculation results are shown in Table 5.2.

Detailed capacity calculation results are included in **ANNEXURE C**.

TABLE 5.2: 2017 BACKGROUND TRAFFIC CAPACITY CALCULATION RESULTS

JUNCTION			**WEEKDAY AM PEAK HOUR**	**WEEKDAY PM PEAK HOUR**
SIGNALISED	Akker Avenue / Alwen Road / Shakespeare Avenue	V/C ratio	**1.225**	0.603
		LOS	**F**	B
		Delay (sec/veh)	**123.5**	11.8
PRIORITY CONTROLLED	Dorado Avenue / Alwen Road	V/C ratio	0.510	0.460
		LOS	A	A
		Delay (sec/veh)	4.0	7.0
	Akker Avenue / Chamfuti Crescent North	V/C ratio	0.212	0.150
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Chamfuti Crescent South	V/C ratio	0.175	0.111
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Msasa Crescent	V/C ratio	0.164	0.091
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

Legend: V/C ratio = Volume to capacity ratio
LOS = Level of Service

N/A = The average junction delay is not a good LOS measure for a priority control junction due to zero delays associated with major road movements.

Only Akker Avenue / Alwen Road / Shakespeare Avenue junction does not operate satisfactorily for the analysed weekday morning peak hour.

5.2.2 2022 Background Traffic

The existing signal timings are shown in Table 5.3.

Detailed phasings and timings of the traffic signals are included in **ANNEXURE E**.

TABLE 5.3: 2022 BACKGROUND TRAFFIC PEAK HOUR EXISTING SIGNAL TIMINGS

SIGNALISED JUNCTION	PEAK HOUR	SIGNAL TIMINGS (SEC)												CYCLE LENGTH
		PHASE A			PHASE B			PHASE C			PHASE D			
		G	A	R	G	G	G	G	A	R	G	A	R	
Akker Avenue / Alwen Road / Shakespeare Avenue	AM	53	3	2	17	32	-	-	-	-	-	-	-	80 sec
	PM	38	3	2	10	3	2	7	3	2	-	-	-	70 sec

Legend: G = Green,
A= Amber,
R = Red

The average capacity calculation results are shown in Table 5.4.

Detailed capacity calculation results are included in **ANNEXURE C**.

TABLE 5.4: 2022 BACKGROUND TRAFFIC CAPACITY CALCULATION RESULTS

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
SIGNALISED	Akker Avenue / Alwen Road / Shakespeare Avenue	V/C ratio	**1.421**	0.698
		LOS	**F**	B
		Delay (sec/veh)	**220.4**	12.5
PRIORITY CONTROLLED	Dorado Avenue / Alwen Road	V/C ratio	0.610	0.570
		LOS	A	**F**
		Delay (sec/veh)	5.0	**79.0**
	Akker Avenue / Chamfuti Crescent North	V/C ratio	0.246	0.246
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Chamfuti Crescent South	V/C ratio	0.2110	0.129
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Msasa Crescent	V/C ratio	0.191	0.106
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

Legend: V/C ratio = Volume to capacity ratio
LOS = Level of Service

N/A = The average junction delay is not a good LOS measure for a priority control junction due to zero delays associated with major road movements.

The following junctions will experience capacity problems:

- Akker Avenue / Alwen Road / Shakespeare Avenue junction during the weekday morning peak hour; and
- Dorado Avenue / Alwen Road during the weekday afternoon peak hour.

5.3 Background and Development Traffic

5.3.1 2017 Background and Development Traffic

The signal timings used for the Akker Avenue / Alwen Road / Shakespeare Avenue junction analysis are optimised signal timings to accommodate the background and development traffic.

The proposed signal timings are shown in Table 5.5.

Detailed phasings and timings of the traffic signals are included in **ANNEXURE E.**

TABLE 5.5: 2017 BACKGROUND AND DEVELOPMENT TRAFFIC PEAK HOUR PROPOSED SIGNAL TIMINGS

SIGNALISED JUNCTION	PEAK HOUR	SIGNAL TIMINGS (SEC)												CYCLE LENGTH
		PHASE A						PHASE C			PHASE D			
		G		R	G	A	R	G	A	R	G	A	R	
Akker Avenue / Alwen Road / Shakespeare Avenue	AM	50	3	2	40	3	2	-	-	-	-	-	-	100 sec
	PM	45	3	2	43	3	2	17	3	2	-	-	-	120 sec

Legend: G = Green,
A= Amber,
R = Red

The average capacity calculation results are shown in Table 5.6.

Detailed capacity calculation results are included in **ANNEXURE C**.

TABLE 5.6: 2017 BACKGROUND AND DEVELOPMENT TRAFFIC CAPACITY CALCULATION RESULTS

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
SIGNALISED	Akker Avenue / Alwen Road / Shakespeare Avenue	V/C ratio	0.870	0.858
		LOS	C	C
		Delay (sec/veh)	31.5	23.3
PRIORITY CONTROLLED	Dorado Avenue / Alwen Road	V/C ratio	0.570	0.430
		LOS	A	A
		Delay (sec/veh)	5.0	4.0
	Akker Avenue / Chamfuti Crescent North	V/C ratio	0.270	0.165
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Chamfuti Crescent South	V/C ratio	0.225	0.165
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Msasa Crescent	V/C ratio	0.329	0.148
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Msasa Crescent / Proposed Access	V/C ratio	0.100	0.077
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

Legend: V/C ratio = Volume to capacity ratio
LOS = Level of Service

N/A = The average junction delay is not a good LOS measure for a priority control junction due to zero delays associated with major road movements.

All six (6) junctions analysed will operate satisfactorily during the 2017 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place (refer to **Section 9** of this report).

5.3.2 2022 Background and Development Traffic

The proposed signal timings are shown in Table 5.7.

Detailed phasings and timings of the traffic signals are included in **ANNEXURE E.**

TABLE 5.7: 2022 BACKGROUND AND DEVELOPMENT TRAFFIC PEAK HOUR PROPOSED SIGNAL TIMINGS

SIGNALISED JUNCTION	PEAK HOUR	SIGNAL TIMINGS (SEC)												CYCLE LENGTH
		PHASE A			PHASE B			PHASE C			PHASE D			
		G	A	R	G	A	R	G	A	R	G	A	R	
Akker Avenue / Alwen Road / Shakespeare Avenue	AM	66	3	2	44	3	2	-	-	-	-	-	-	120 sec
	PM	7	3	2	25	3	2	13	3	2	-	-	-	60 sec

Legend: G = Green,
A= Amber,
R = Red

The average capacity calculation results are shown in Table 5.8.

Detailed capacity calculation results are included in **ANNEXURE C**.

TABLE 5.8: 2022 BACKGROUND AND DEVELOPMENT TRAFFIC CAPACITY CALCULATION RESULTS

JUNCTION			WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
SIGNALISED	Akker Avenue / Alwen Road / Shakespeare Avenue	V/C ratio	**1.001**	0.720
		LOS	D	B
		Delay (sec/veh)	51.9	15.0
PRIORITY CONTROLLED	Dorado Avenue / Alwen Road	V/C ratio	0.670	0.540
		LOS	C	D
		Delay (sec/veh)	21.0	33.0
	Akker Avenue / Chamfuti Crescent North	V/C ratio	0.263	0.182
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Chamfuti Crescent South	V/C ratio	0.263	0.183
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Akker Avenue / Msasa Crescent	V/C ratio	0.381	0.162
		LOS	N/A	N/A
		Delay (sec/veh)	-	-
	Msasa Crescent / Proposed Access	V/C ratio	0.100	0.077
		LOS	N/A	N/A
		Delay (sec/veh)	-	-

Legend: V/C ratio = Volume to capacity ratio
LOS = Level of Service
N/A = Not Applicable

N/A = The average junction delay is not a good LOS measure for a priority control junction due to zero delays associated with major road movements.

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems during the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades in place (refer to **Section 9** of this report). However, it will operate better when compared to the 2022 weekday morning peak hour background traffic scenario.

5.4 Capacity analysis comparison

5.4.1 V/C ratio comparison

The V/C ratio comparisons are shown in Table 5.9.

TABLE 5.9: BACKGROUND AND BACKGROUND WITH DEVELOPMENT V/C RATIO COMPARISON

JUNCTION	2017				2022			
	AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV
Akker Avenue / Alwen Road / Shakespeare Avenue	**1.225**	0.870	0.603	0.858	**1.421**	**1.001**	0.698	0.720
Dorado Avenue / Alwen Road	0.510	0.570	0.460	0.430	0.610	0.670	0.570	0.540
Akker Avenue / Chamfuti Crescent North	0.212	0.270	0.150	0.165	0.246	0.263	0.246	0.182
Akker Avenue / Chamfuti Crescent South	0.175	0.225	0.111	0.165	0.211	0.263	0.129	0.183
Akker Avenue / Msasa Crescent	0.164	0.329	0.091	0.148	0.191	0.381	0.106	0.162
Msasa Crescent / Proposed Access	-	0.100	-	0.077	-	0.100	-	0.077

BG - Background Traffic Scenario

BG+DEV *- Background with Development Traffic Scenario*

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems (v/c ratio>0.95) during the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades (refer to **Section 9** of this report). It will however operate better when compared to the 2022 weekday morning peak hour background traffic scenario

5.4.2 Level of service (LOS) comparison

The level of service (LOS) comparison is shown in Table 5.10.

TABLE 5.10: BACKGROUND AND BACKGROUND WITH DEVELOPMENT LEVEL OF SERVICE (LOS) COMPARISON

JUNCTION	2017				2022			
	AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV
Akker Avenue / Alwen Road / Shakespeare Avenue	**F**	C	B	C	**F**	D	B	B
Dorado Avenue / Alwen Road	A	A	A	A	A	C	**F**	D
Akker Avenue / Chamfuti Crescent North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Akker Avenue / Chamfuti Crescent South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Akker Avenue / Msasa Crescent	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Msasa Crescent / Proposed Access	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

BG	- Background Traffic Scenario
BG+DEV	*- Background with Development Traffic Scenario*
N/A	**-** *Not applicable*

All six (6) junctions analysed will operate satisfactorily (LOS not worse than D) during the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place (refer to **Section 9** of this report).

5.4.3 Delay comparison

The delay comparison is shown in Table 5.11.

TABLE 5.11: BACKGROUND AND BACKGROUND WITH DEVELOPMENT DELAY COMPARISON

JUNCTION	2017				2022			
	AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV	BG	BG+DEV
Akker Avenue / Alwen Road / Shakespeare Avenue	**123.6**	31.5	11.8	23.3	**220.4**	51.9	12.5	15.0
Dorado Avenue / Alwen Road	4.0	5.0	7.0	4.0	5.0	21.0	**79.0**	33.0
Akker Avenue / Chamfuti Crescent North	-	-	-	-	-	-	-	-
Akker Avenue / Chamfuti Crescent South	-	-	-	-	-	-	-	-
Akker Avenue / Msasa Crescent	-	-	-	-	-	-	-	-
Msasa Crescent / Proposed Access	-	-	-	-	-	-	-	-

BG **-** *Background Traffic Scenario*

BG+DEV **-** *Background with Development Traffic Scenario*

All six (6) junctions analysed will operate satisfactorily (delay not longer than 55 seconds) during the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place (refer to **Section 9** of this report).

6. ACCESS

6.1 Introduction

Access to the proposed development site will be provided off Msasa Crescent. The proposed access configuration is described below.

6.2 Access off Msasa Crescent

The access to the proposed development site will be provided off Msasa Crescent as a three-legged priority controlled junction approximately 180 m south of the Akker Avenue / Msasa Crescent junction as shown in Figure 6.1 below.

The access arrangement complies with TRH 26 South African Road Classification and Access Management Manual requirements, dated August 2012, Version 1.0.

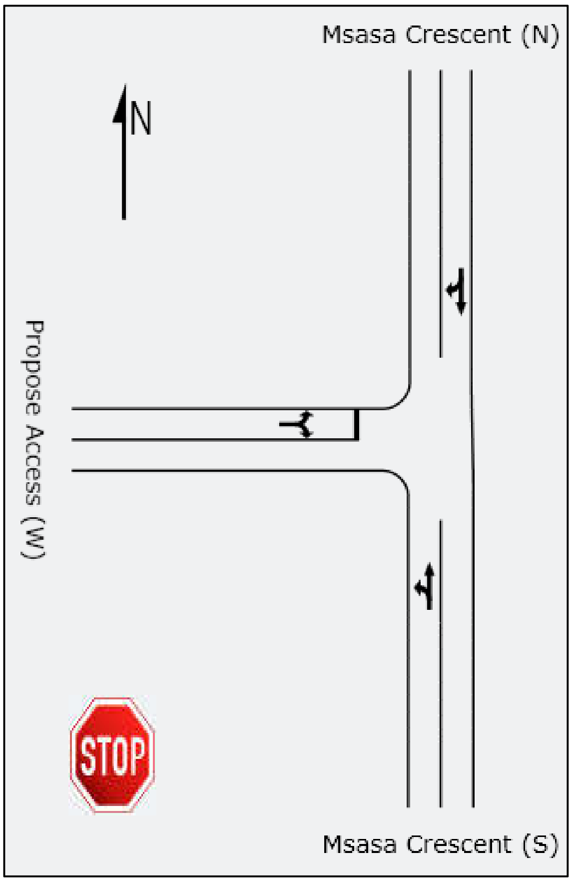


Figure 6.1: Msasa Crescent / Proposed Access Configuration

6.3 Access Control

Storage lane length analysis was done at the proposed access point off Msasa Crescent.

The proposed access to the residential development will be controlled by a coded card reader with a service rate of approximately 350 vehicles/hour.

The queue storage lane length calculations have been done using the anticipated development traffic and coded card reader service rate. The results show that there will be a queue of one (1) vehicle at the Msasa Crescent access control point during the weekday morning or afternoon peak hour, 95% of the time. There is a 5% probability that the queue will exceed one (1) vehicle (refer to **ANNEXURE F** for calculations).

The results show that the number of lanes at the Msasa Crescent access control point have to be provided as one (1) lane entering and one (1) lane exiting the development.

It is recommended that one (1) of the lanes be at least 4.5 m wide to accommodate emergency vehicles.

A summary of the queue storage lane length calculations is shown in Table 6.12 below.

TABLE 6.1: QUEUE STORAGE LANE LENGTH CALCULATION RESULTS

ACCESS	SERVICE RATE	NUMBER OF LANES ENTERING	STORAGE LANE REQUIRED	STORAGE LANE TO BE PROVIDED
Off Msasa Crescent	350 veh/h	1	6 m	Min 10 m

7. PEDESTRIAN AND PUBLIC TRANSPORT ASSESSMENT

7.1 Pedestrian

There are paved pedestrian walkways at the Akker Avenue / Alwen Road / Shakespeare Avenue junction, along the western side of Alwen Road to the north and along the eastern side of Shakespeare Avenue to the south.

There are no other pedestrian crossing facilities that exist at the junctions that form part of this study.

It is recommended that pedestrian walkways be provided along the site frontage in consultation with the CoJ.

7.2 Public Transport

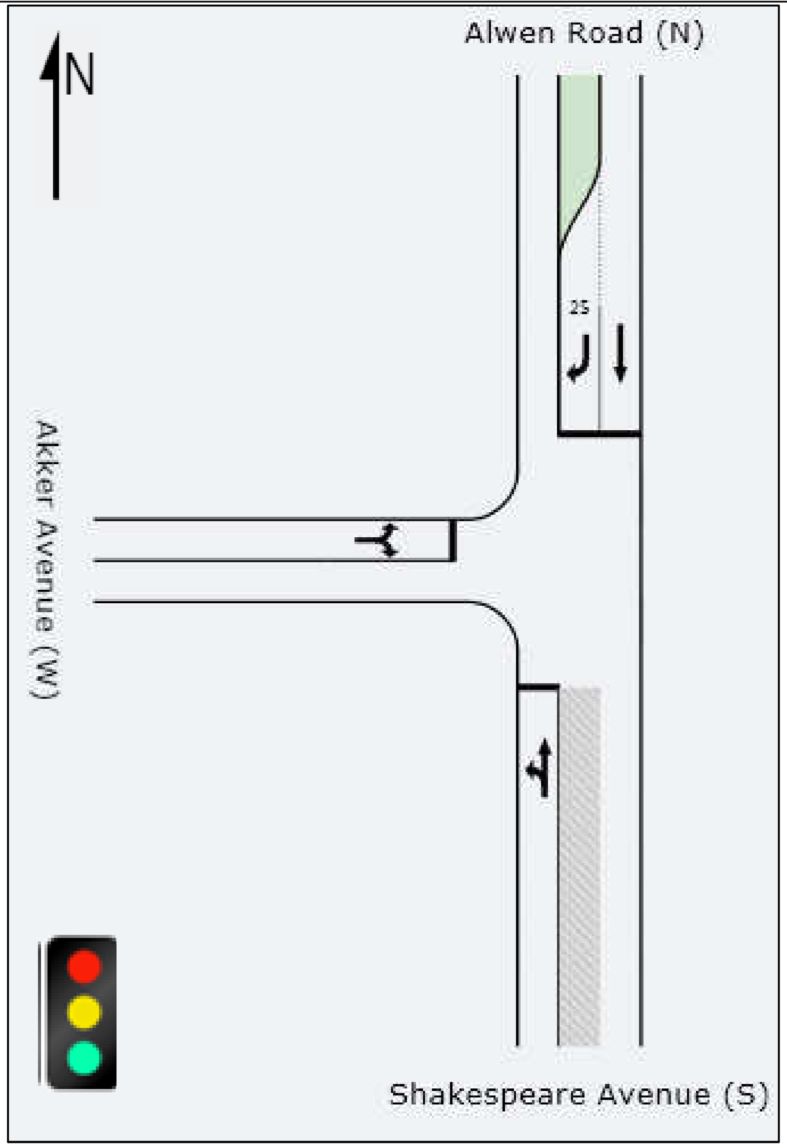
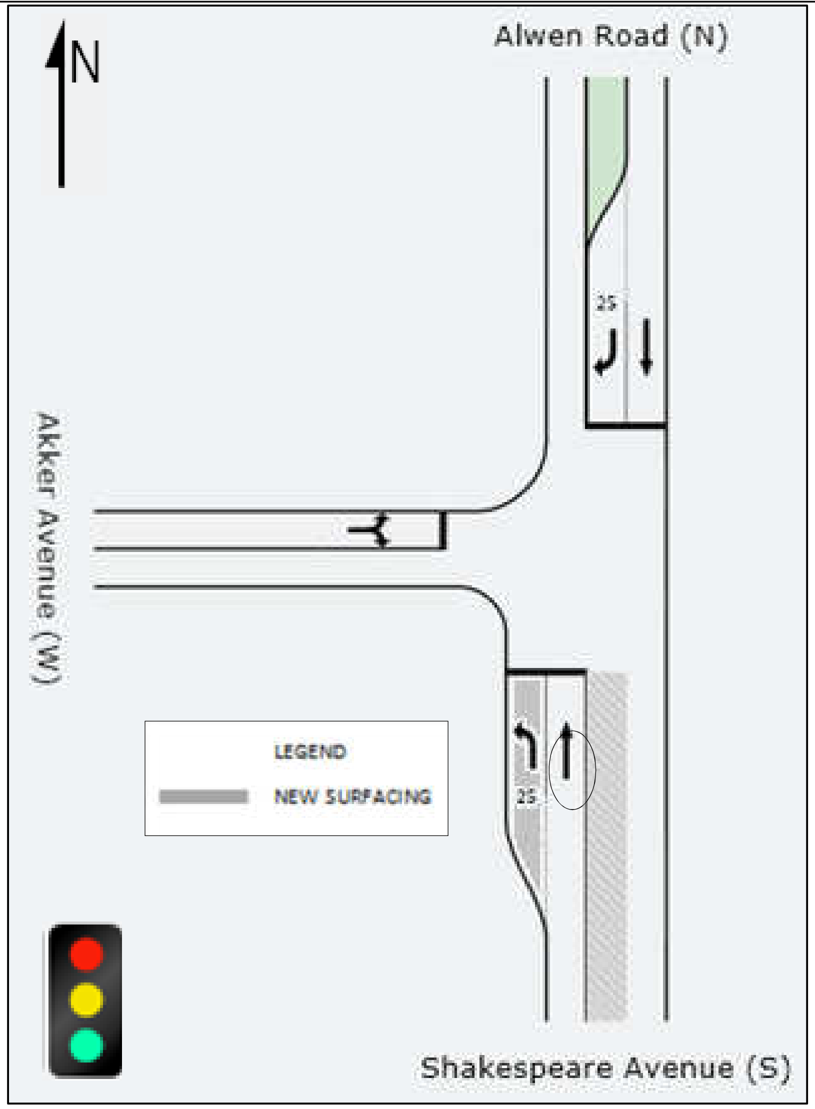
Taxis operate along Alwen Road.

There are no public transport facilities proposed.

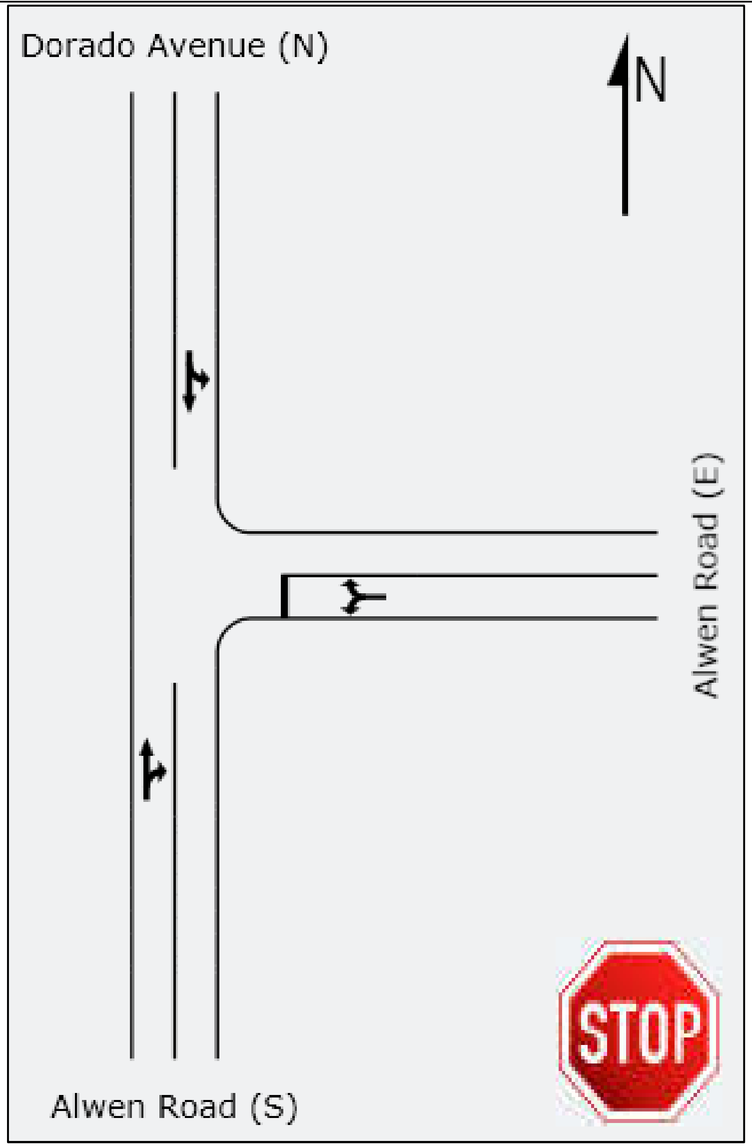
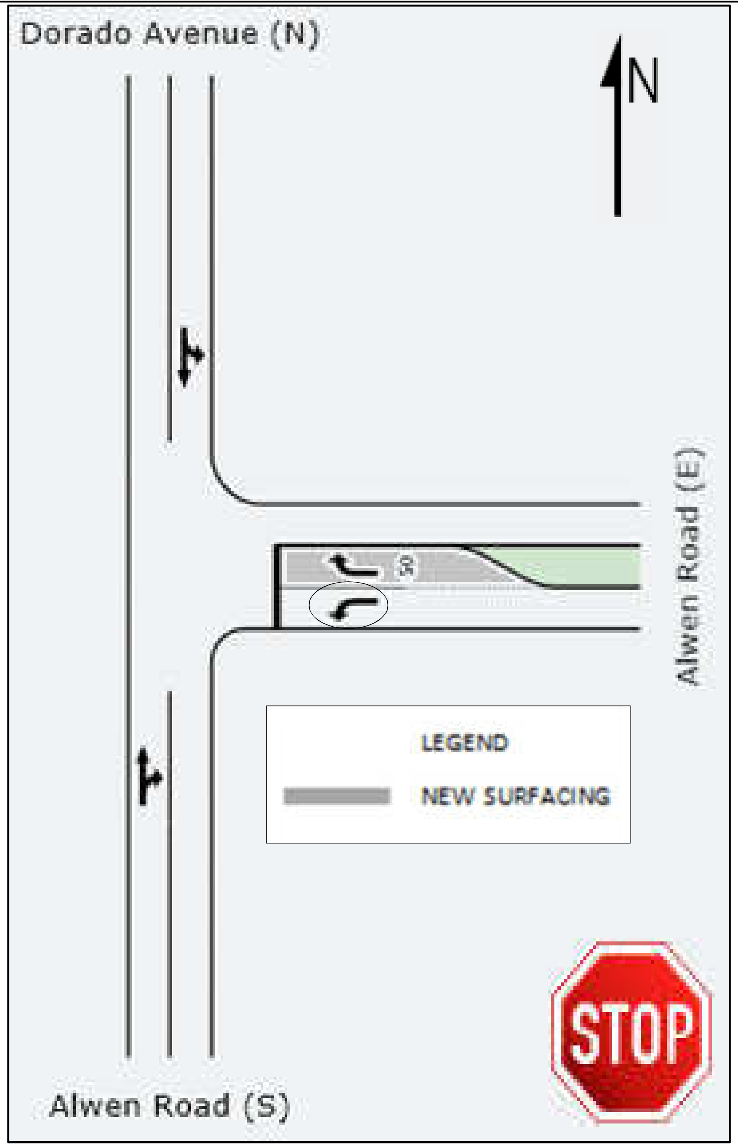
8. PARKING PROVISION

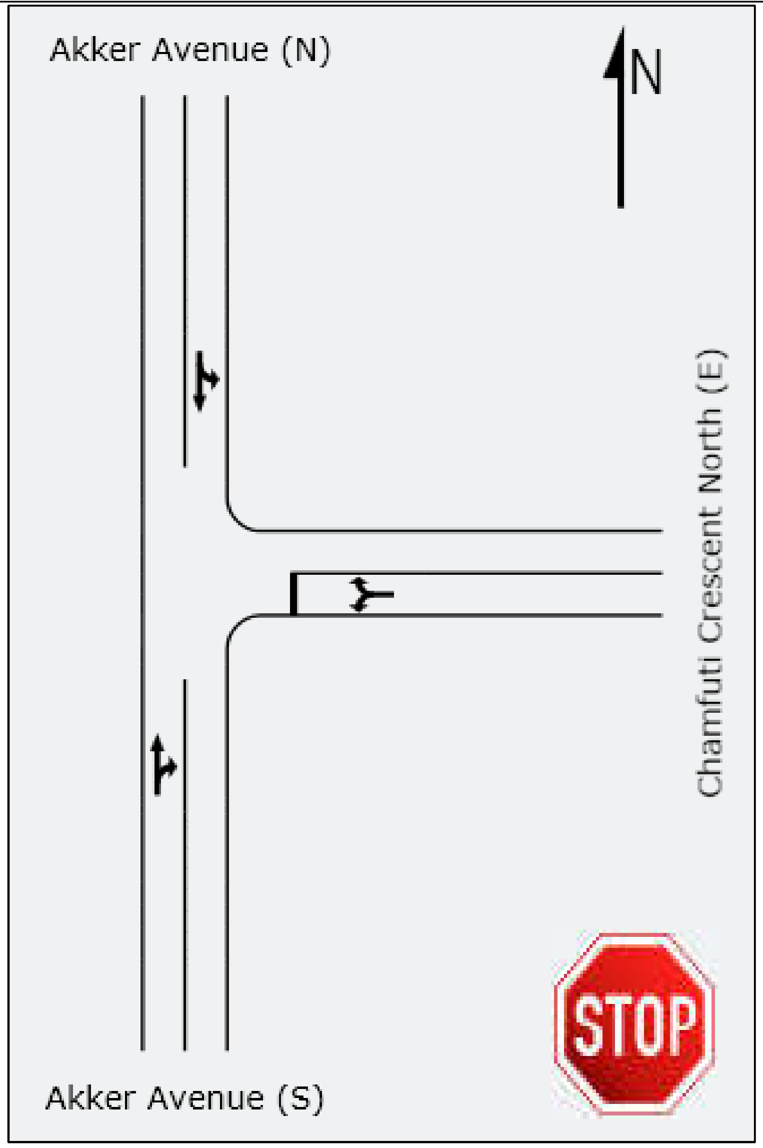
Parking will be provided within the site as required by the City of Johannesburg and in accordance with the Johannesburg Draft Consolidated Town Planning Scheme, 2010.

9. EXISTING AND PROPOSED JUNCTION CONFIGURATIONS

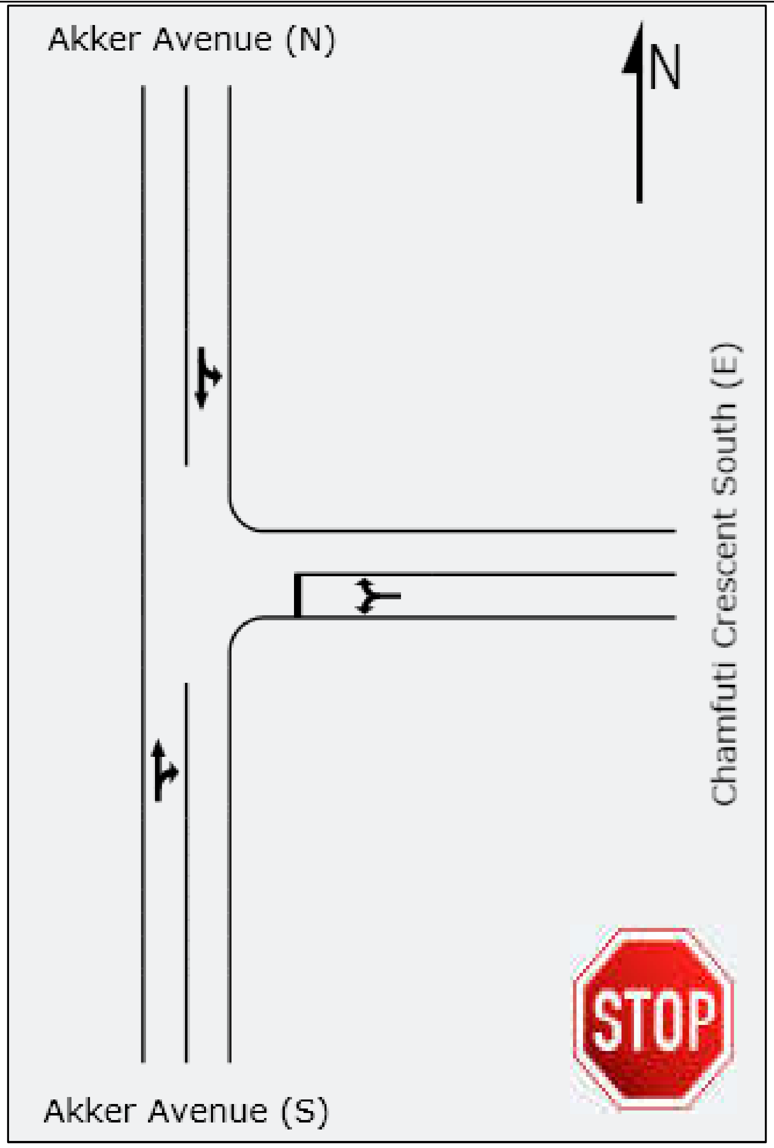
<table>
<tr><th colspan="3">ORMONDE X22 PROPOSED RESIDENTIAL DEVELOPMENT (EXISTING AND PROPOSED CONFIGURATIONS)</th></tr>
<tr><th colspan="3">1. Akker Avenue / Alwen Road / Shakespeare Avenue</th></tr>
<tr><th>EXISTING</th><th>BACKGROUND</th><th>BACKGROUND AND DEVELOPMENT</th></tr>
<tr>
<td>
</td>
<td>NO UPGRADES ARE PROPOSED</td>
<td>

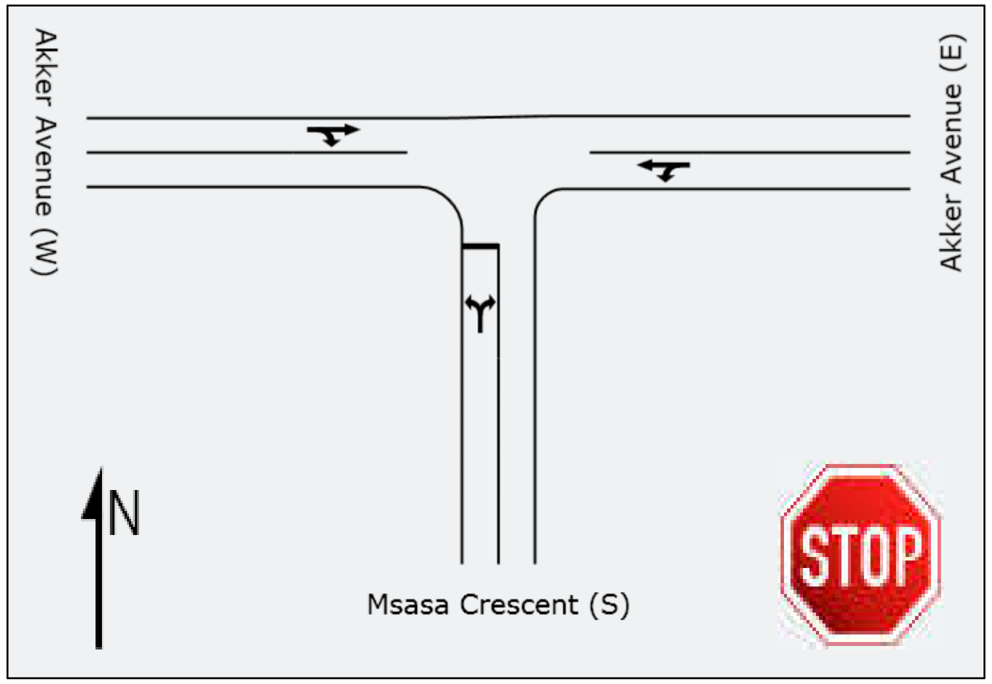
The signal timings must be altered at this junction.
SOUTHERN APPROACH
The road markings must be changed as follows:
The shared through-and-left turn lane must be changed to a through lane.
An exclusive left turn lane must be provided.</td>
</tr>
</table>

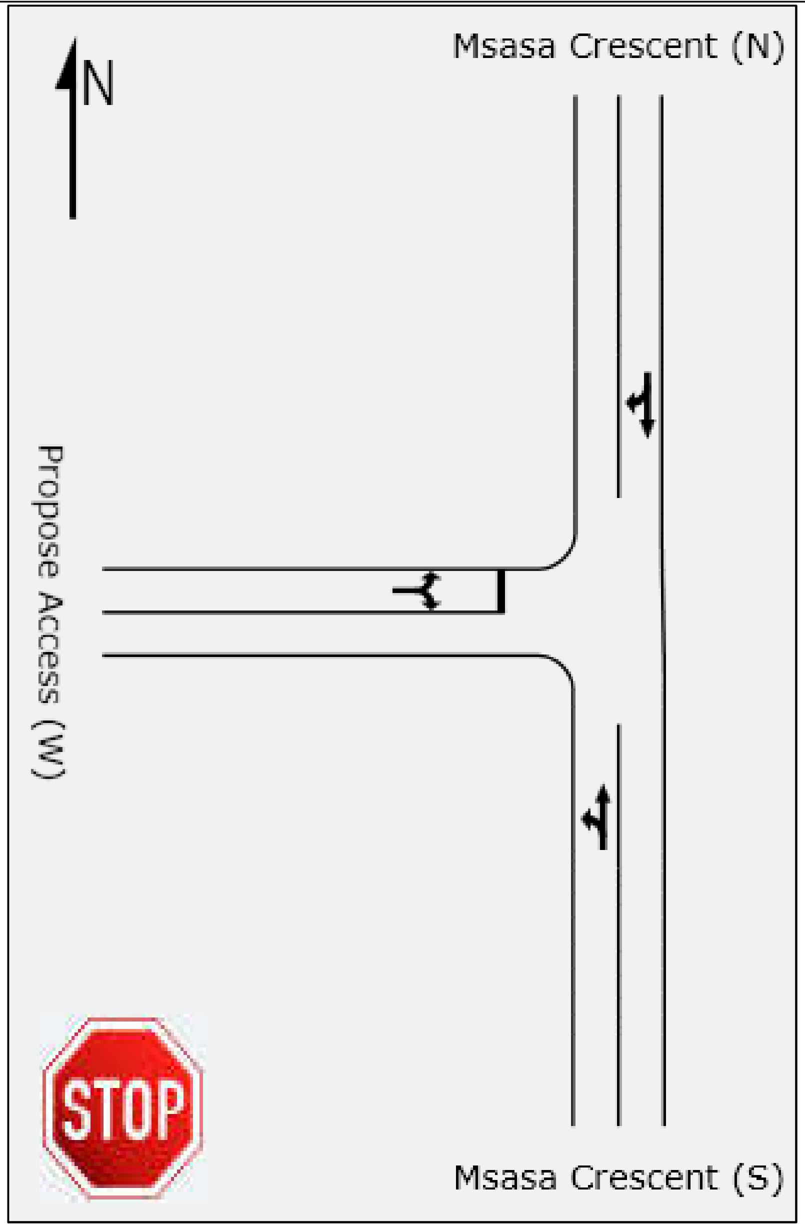
<table>
<tr><th colspan="3">2. Dorado Avenue / Alwen Road</th></tr>
<tr><th>EXISTING</th><th>BACKGROUND</th><th>BACKGROUND AND DEVELOPMENT</th></tr>
<tr>
<td> </td>
<td>NO UPGADES ARE PROPOSED</td>
<td>
EASTERN APPROACH
The road markings must be changed as follows:
The existing shared right-and-left turn lane must be changed to a left turn lane. An exclusive right turn lane must be provided.</td>
</tr>
</table>

<table>
<tr><th colspan="3">3. Akker Avenue / Chamfuti Crescent North</th></tr>
<tr><th>EXISTING</th><th>BACKGROUND</th><th>BACKGROUND AND DEVELOPMENT</th></tr>
<tr><td> </td><td>NO UPGRADES ARE REQUIRED</td><td>NO UPGRADES ARE REQUIRED</td></tr>
</table>

4. Akker Avenue / Chamfuti Crescent South

EXISTING	BACKGROUND	BACKGROUND AND DEVELOPMENT
	**NO UPGRADES ARE REQUIRED**	**NO UPGRADES ARE REQUIRED**

<table>
<tr><th colspan="3">5. Akker Avenue / Msasa Crescent</th></tr>
<tr><th>EXISTING</th><th>BACKGROUND</th><th>BACKGROUND AND DEVELOPMENT</th></tr>
<tr><td> </td><td>NO UPGRADES ARE REQUIRED</td><td>NO UPGRADES ARE REQUIRED</td></tr>
</table>

<table>
<tr><th colspan="3">6. Msasa Crescent / Proposed Access</th></tr>
<tr><th>EXISTING</th><th>BACKGROUND</th><th>BACKGROUND AND DEVELOPMENT</th></tr>
<tr><td>N/A</td><td>N/A</td><td>
</td></tr>
</table>

Refer to **ANNEXURE G** for the proposed road upgrades layout plans for Erven 962 and 963.

10. FINANCE AND COST ESTIMATES

The proposed road upgrades are for the developer's account.

The cost estimate for the proposed physical road upgrades at the following junctions (excluding VAT and professional fees):

- Akker Avenue / Alwen Road / Shakespeare Avenue is ±R764 150.00; and
- Dorado Avenue / Alwen Road is ±R407 720.00.

Refer to **ANNEXURE I** for the cost estimates.

Erven 962 and 963 development site will contribute towards the ultimate road upgrades proposed. The ultimate proposed road upgrades layout plans of all four (4) sites is included in **ANNEXURE H**.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

The proposed residential development site is located on Erven 962 and 963, Ormonde Extension 22 in Johannesburg.

The developer has three (3) other development sites in the close proximity of Erven 962 and 963 and form part of the study area. The developer might construct any of the development sites before Erven 962 and 963. Civil Concepts (Pty) Ltd prepared separate traffic studies for each site (three (3) other development sites):

- A residential development on Erven 1010 and 1011;
- A residential development on Erf 982; and
- A residential development on Erven 1130 and 1131.

The Traffic Impact Assessment of Erven 962 and 963 was prepared first.

The proposed development will consist of **176** "Residential 3" dwelling units.

The development will generate **150** trips during both the weekday morning and afternoon peak hours, respectively.

The base year (2017) and the horizon year (2022) were considered in this study.

Access to the proposed development site will be off Msasa Crescent.

Five (5) of the six (6) junctions analysed will operate satisfactorily for the 2017 and 2022 weekday morning and afternoon peak hour background with development traffic scenario with the proposed road upgrades in place as shown in **Section 9** of this report.

Akker Avenue / Alwen Road / Shakespeare Avenue junction will experience capacity problems for the 2022 weekday morning peak hour background with development traffic scenario with the proposed road upgrades in place as shown in **Section 9** of this report. However, it will operate better when compared to the 2022 weekday morning peak hour background traffic scenario.

The proposed road upgrades are for the developer's account. Erven 962 and 963 development site will contribute towards the ultimate road upgrades proposed.

No public transport facilities are proposed.

Pedestrian walkways have to be provided along the site frontage by the developer to the satisfaction of the CoJ.

11.2 Recommendations

It is recommended that:

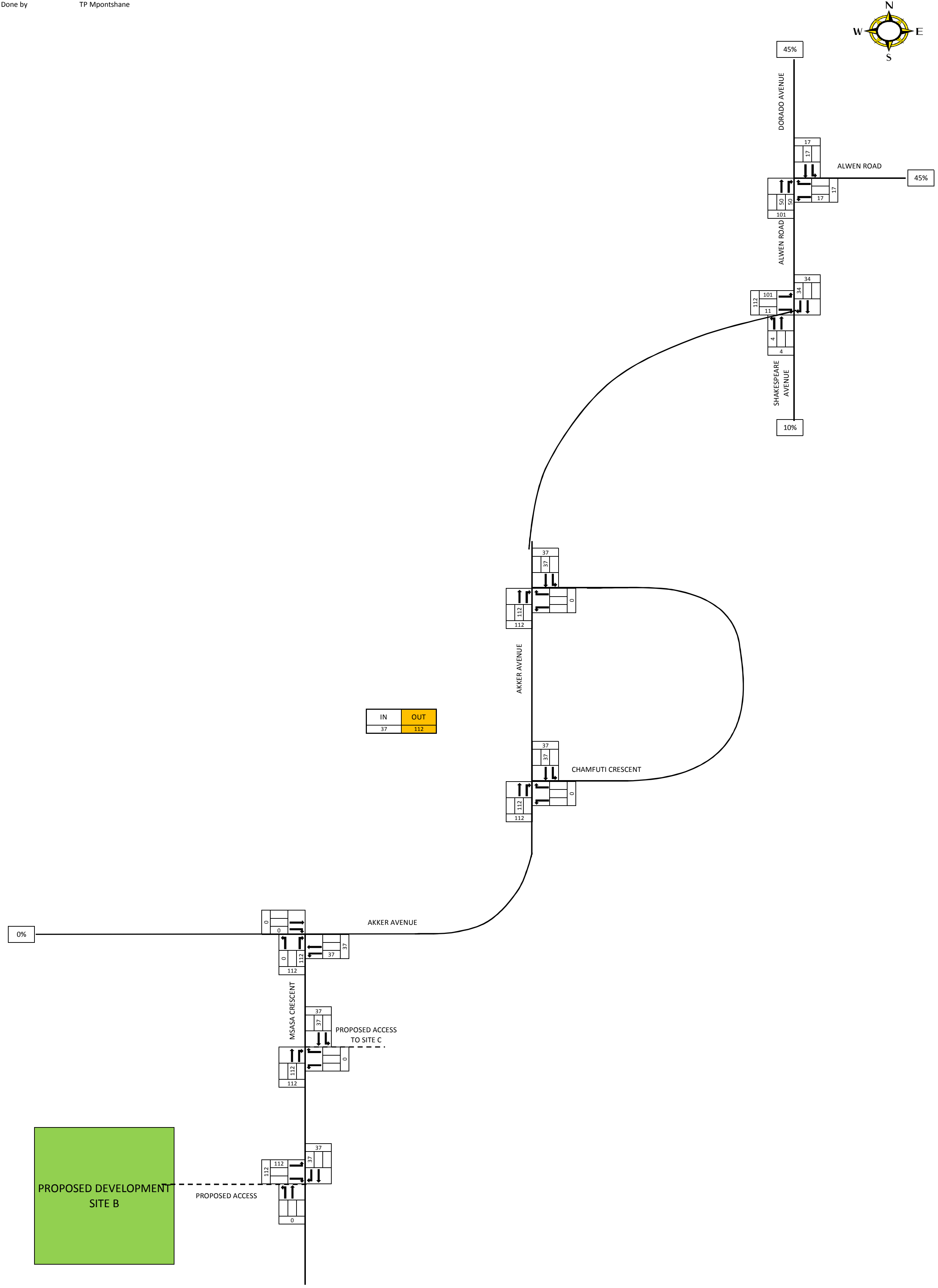
- the developer carry out the proposed road upgrades to mitigate the effect of the development traffic;
- the developer construct pedestrian walkways in consultation with the relevant departments of CoJ; and
- this traffic study be approved.

REFERENCES

1. Akcelik & Associates Pty Ltd, (July 2010) **aaSIDRA 5.0**, Victoria, Australia.
2. Transportation & Traffic Technology Africa (Pty) Ltd, (2013) **AUTO J**, Johannesburg, South Africa.
3. Committee of Transport Officials, (September 2013) **TMH17 - South African Trip Data Manual**, Version 1.01, Pretoria, South Africa.
4. BKS (Pty) Ltd, (October 1995) **Manual for Traffic Impact Studies, Report No. RR93/635, Department of Transport**, Pretoria, South Africa.
5. Transportation Research Board, (2010) **Highway Capacity Manual 2010**, Washington, D.C, USA.
6. Committee of Transport Officials, (August 2012) **THM16 Volume 2 – South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual**, Version 1.0, Pretoria, South Africa.
7. Gauteng Strategic Major Road Network, (May 2010) **Transport Department of Roads and Transport**, Pretoria, South Africa.
8. Committee of Transport Officials (COTO), (August 2012) **TRH26 – South African Road Classification and Access Management Manual**, Version 1.0, SANRAL, South Africa.
9. Trafsol, (October 2016), **Ormonde X22 Traffic Survey**, Johannesburg, South Africa.

FIGURES

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



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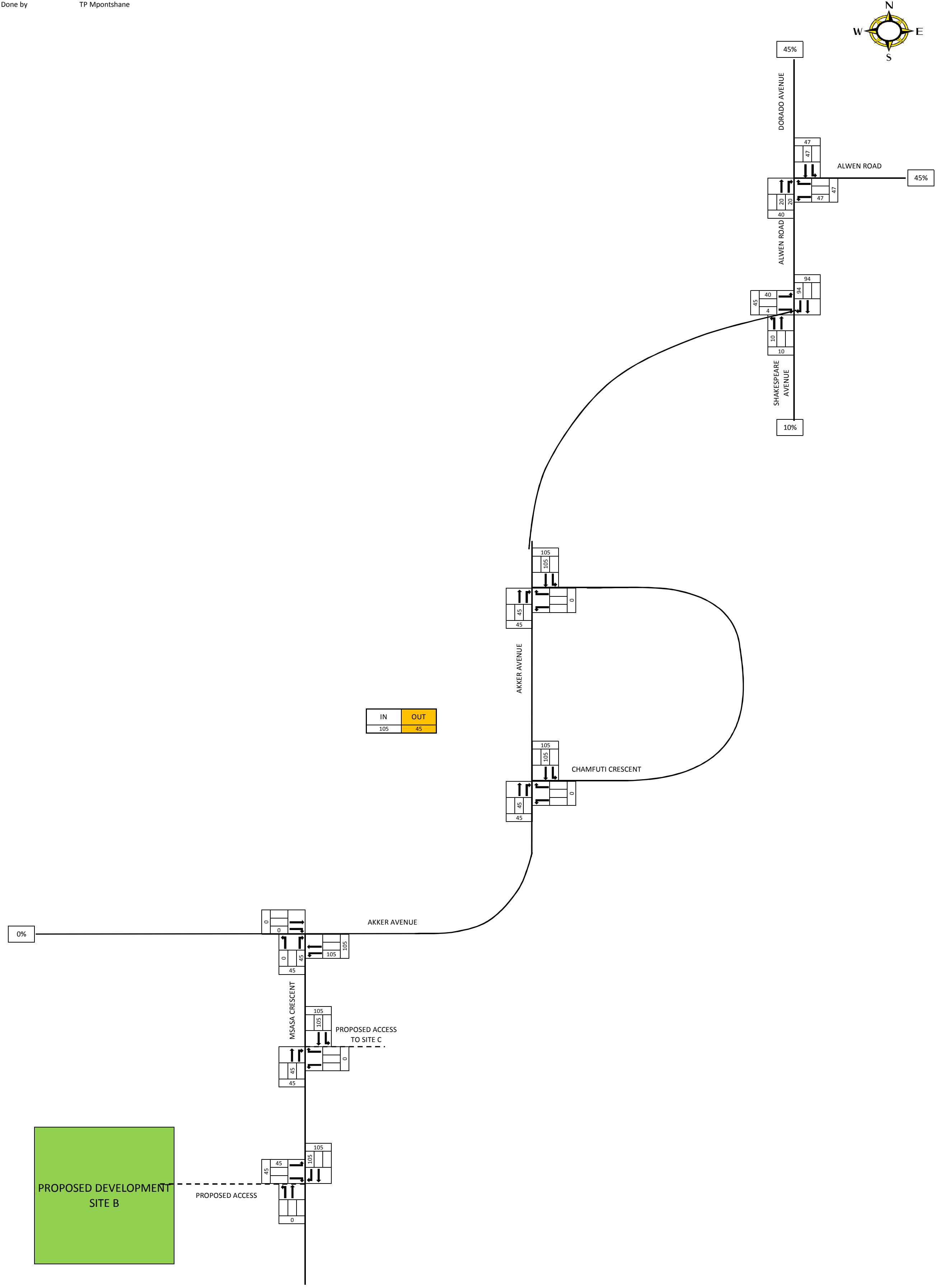
WEEKDAY MORNING PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.1

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



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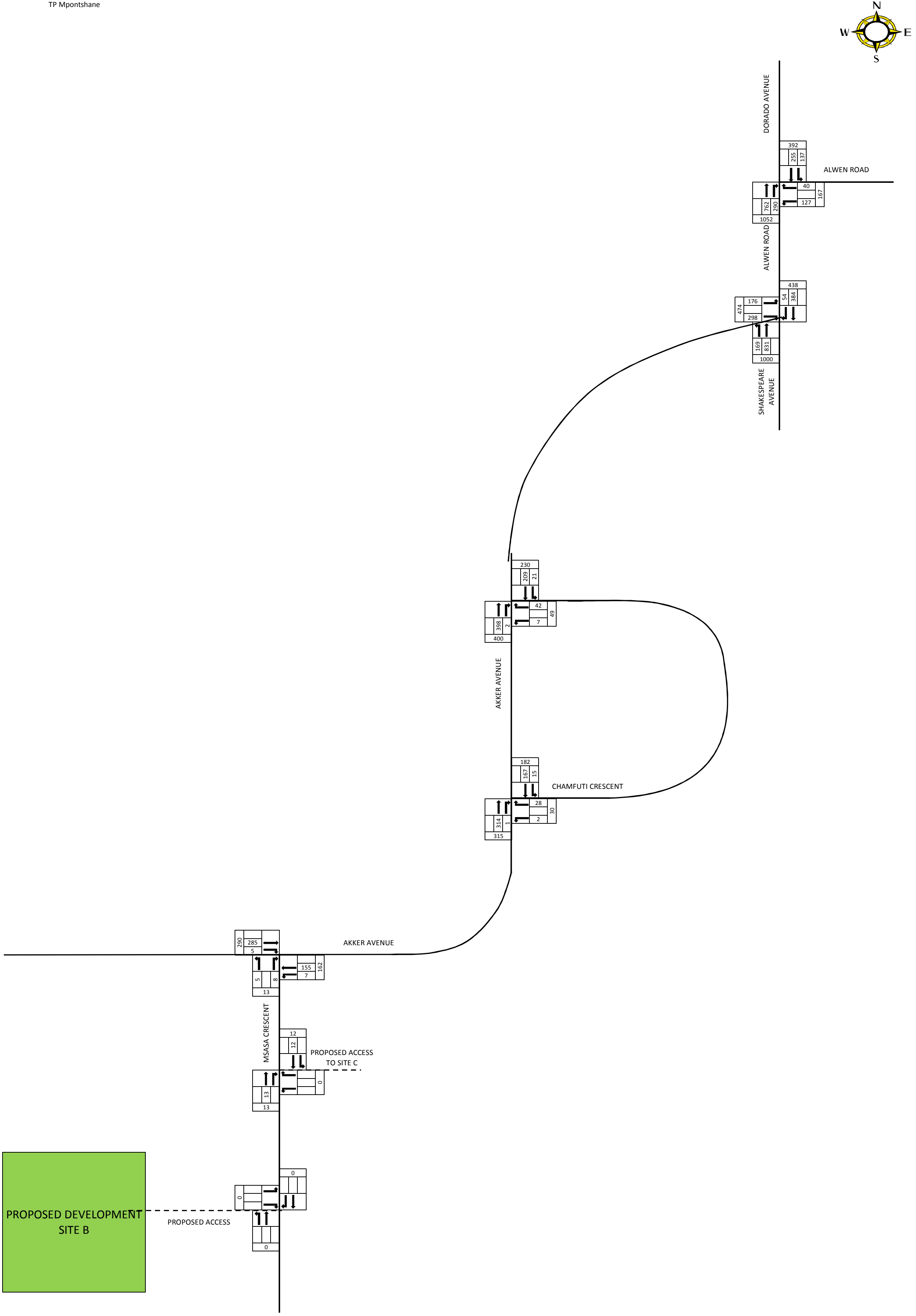
WEEKDAY AFTERNOON PEAK HOUR RESIDENTIAL DEVELOPMENT TRIPS

FIGURE 2.2

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



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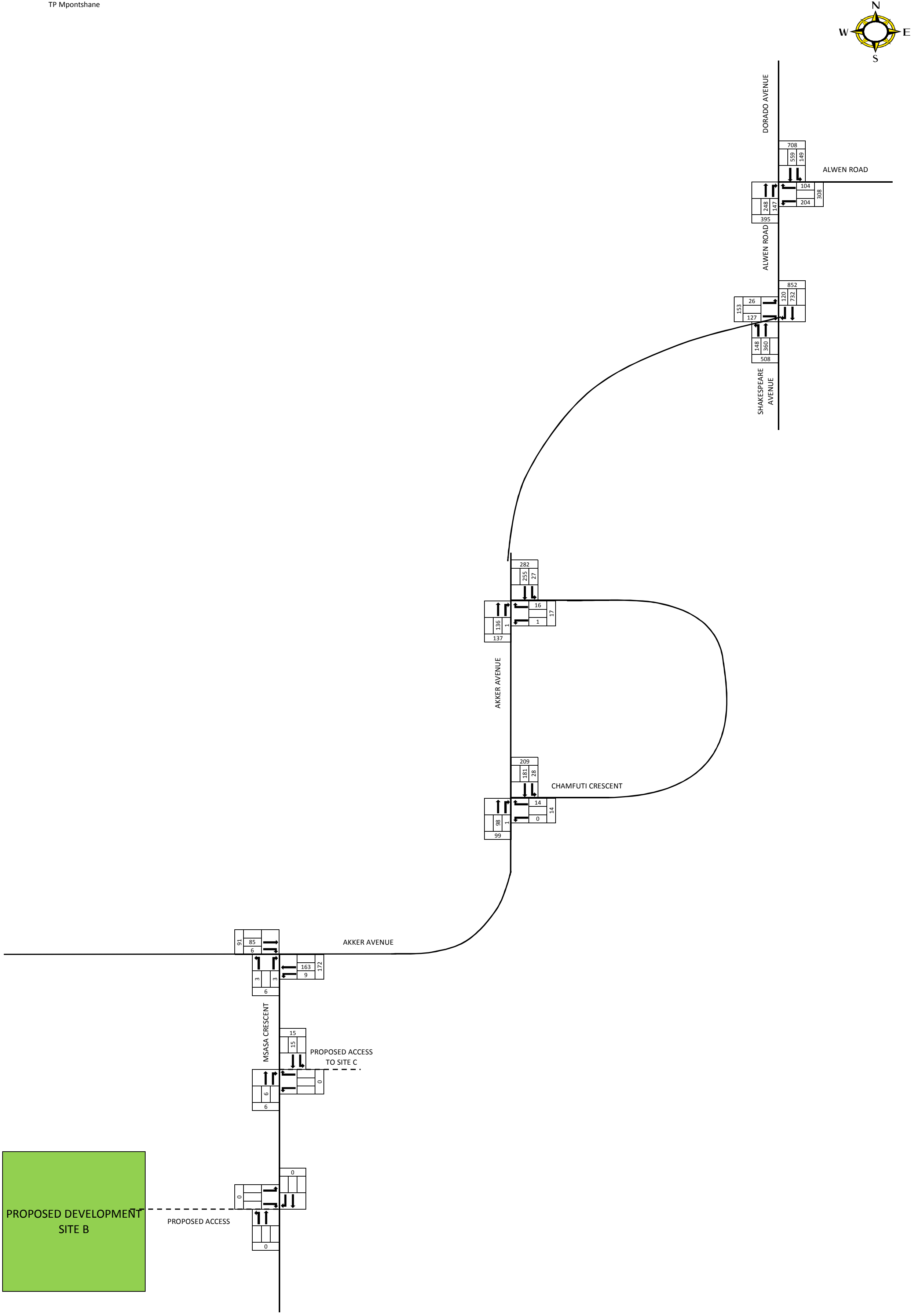
2016 WEEKDAY MORNING PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.1

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



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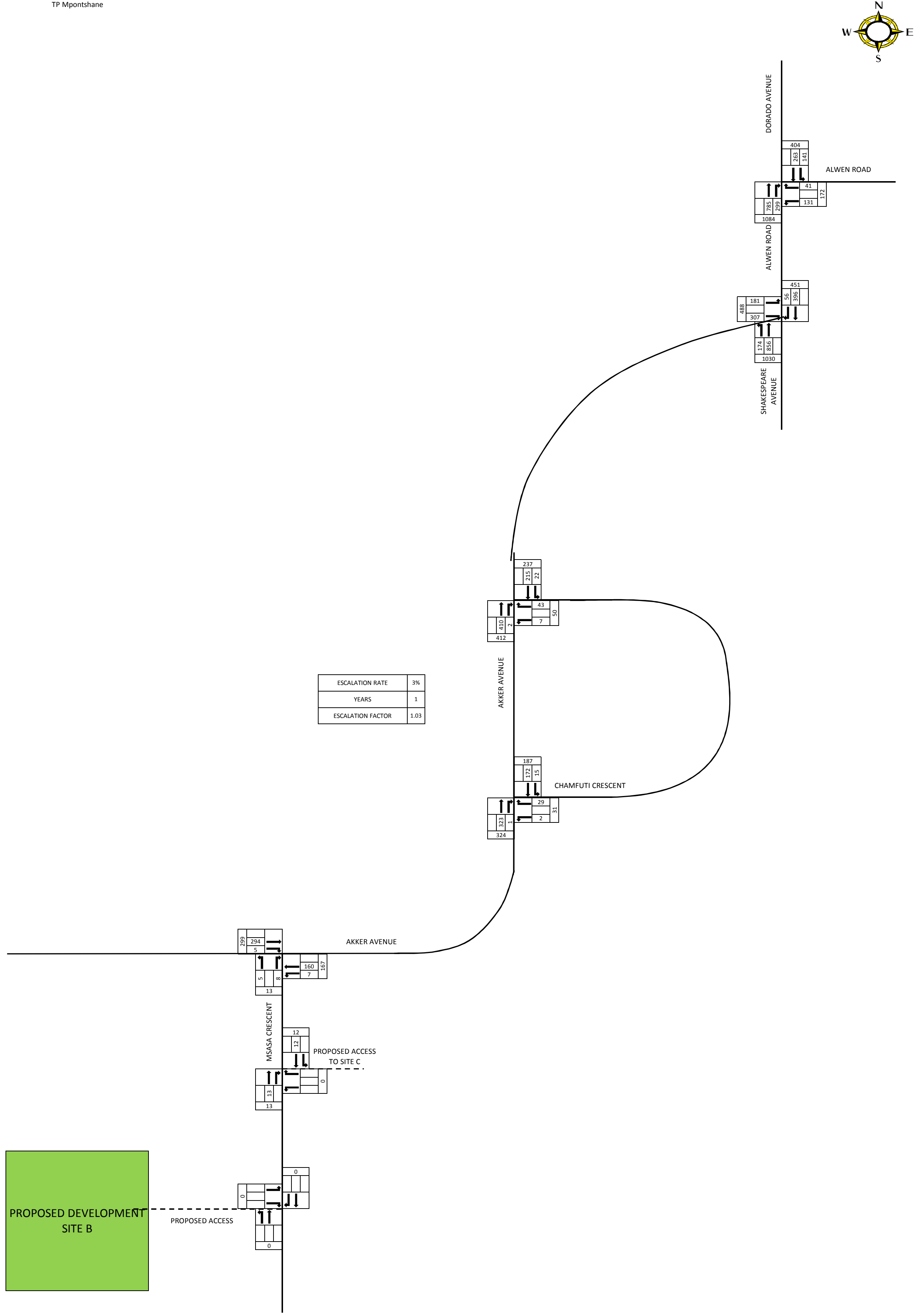
2016 WEEKDAY AFTERNOON PEAK HOUR TRAFFIC COUNTS (PCUs)

FIGURE 3.2

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

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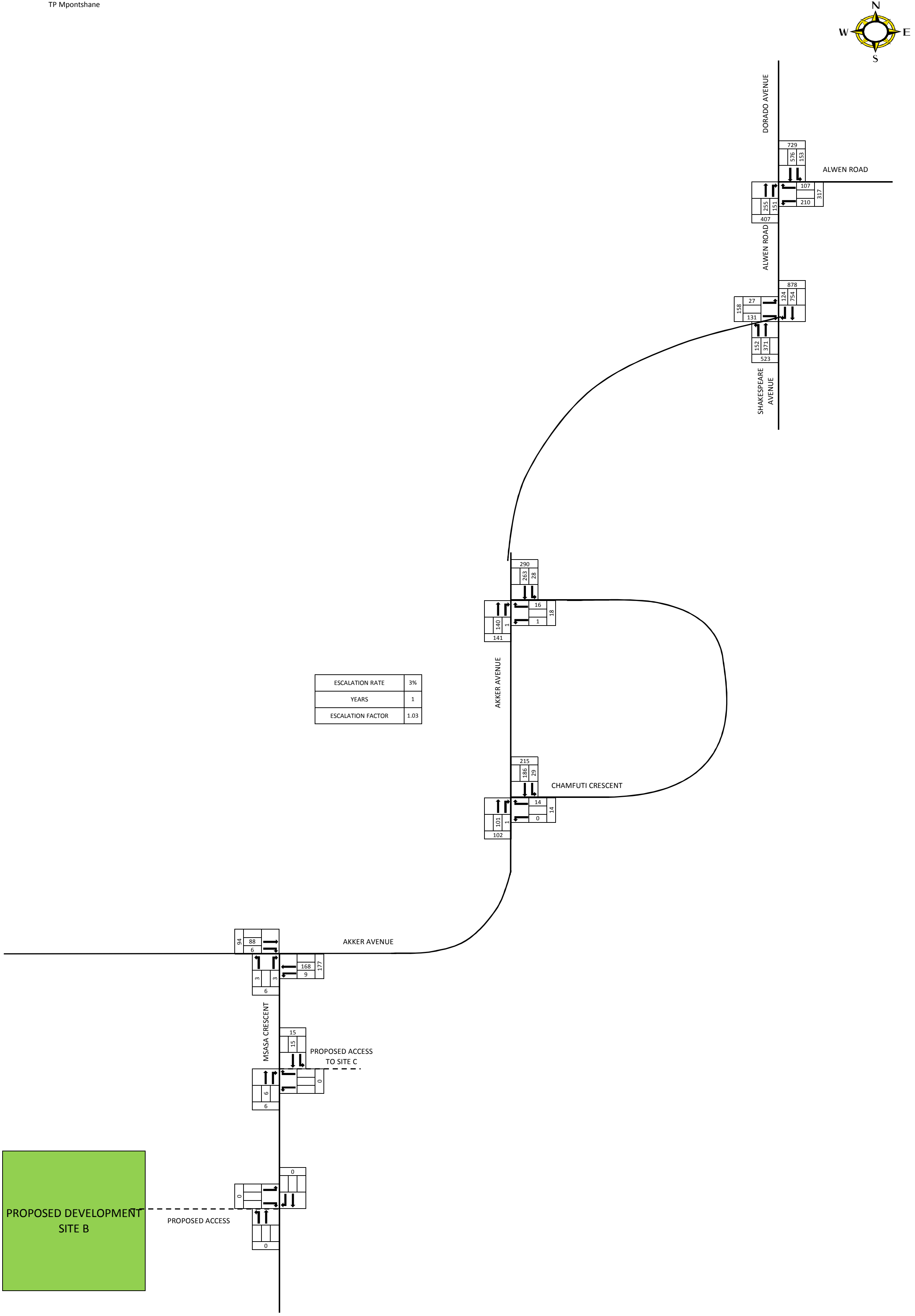
2017 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.3

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



ESCALATION RATE	3%
YEARS	1
ESCALATION FACTOR	1.03

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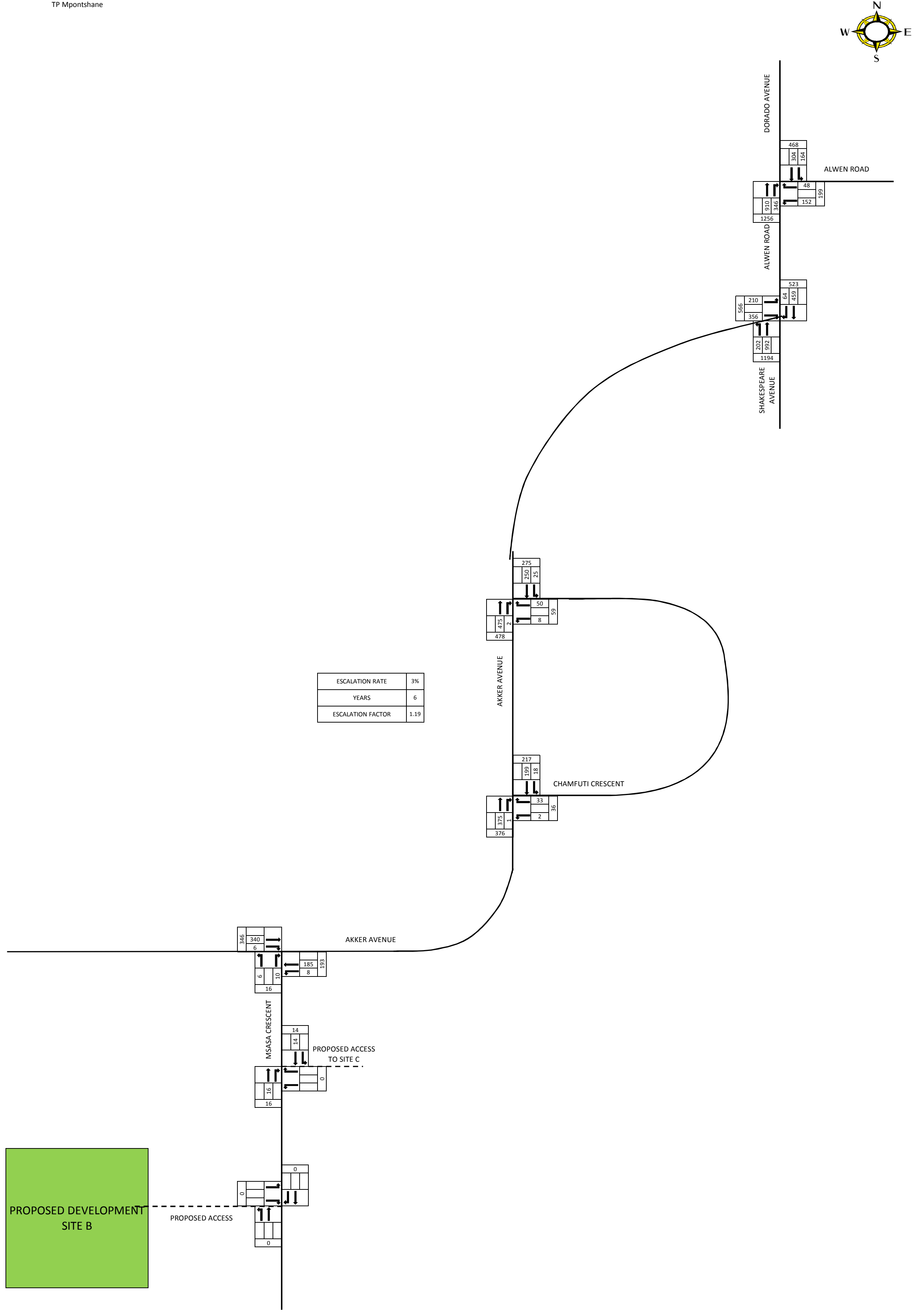
2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.4

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



ESCALATION RATE	3%
YEARS	6
ESCALATION FACTOR	1.19

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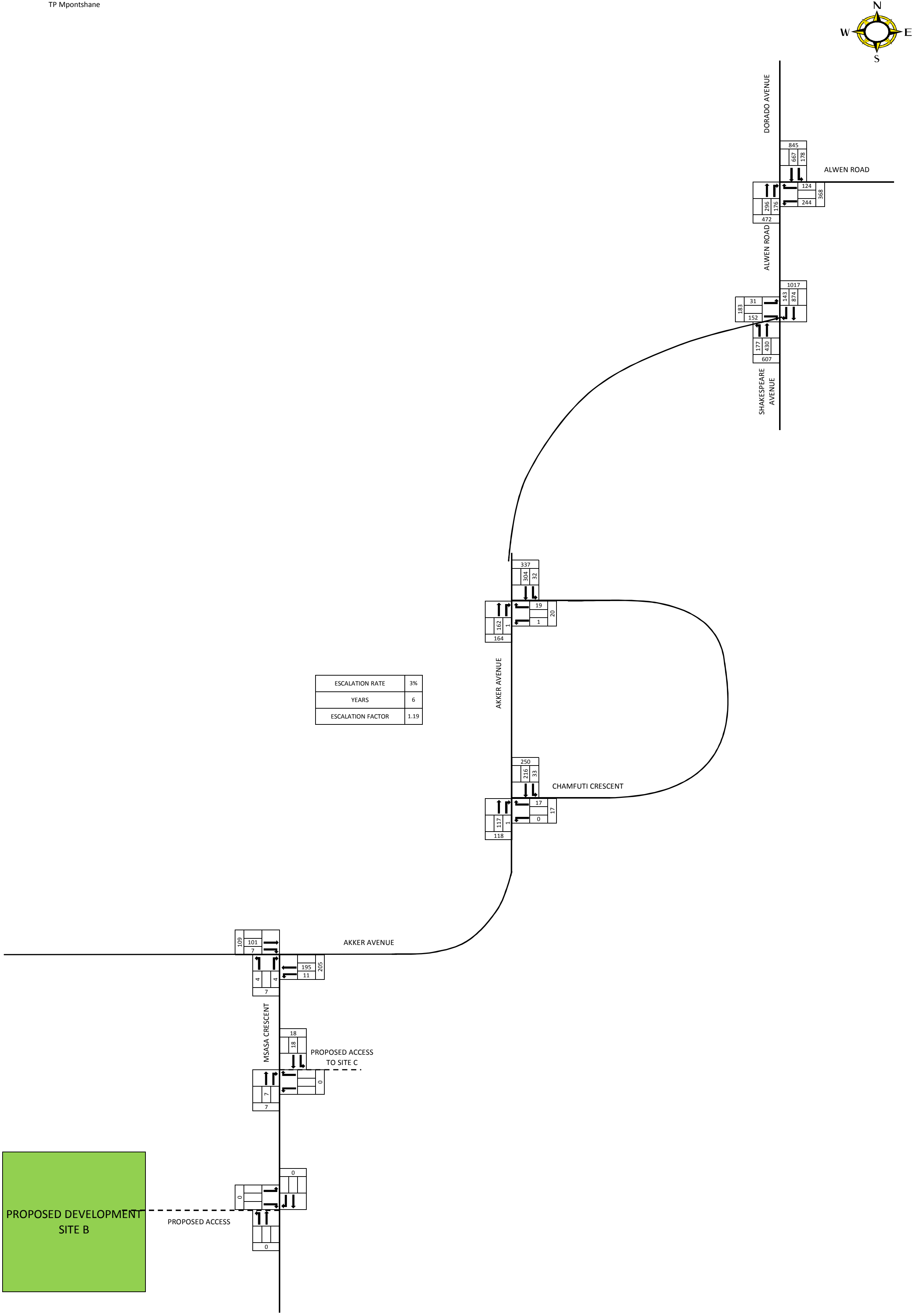
2022 WEEKDAY MORNING PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.5

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



ESCALATION RATE	3%
YEARS	6
ESCALATION FACTOR	1.19

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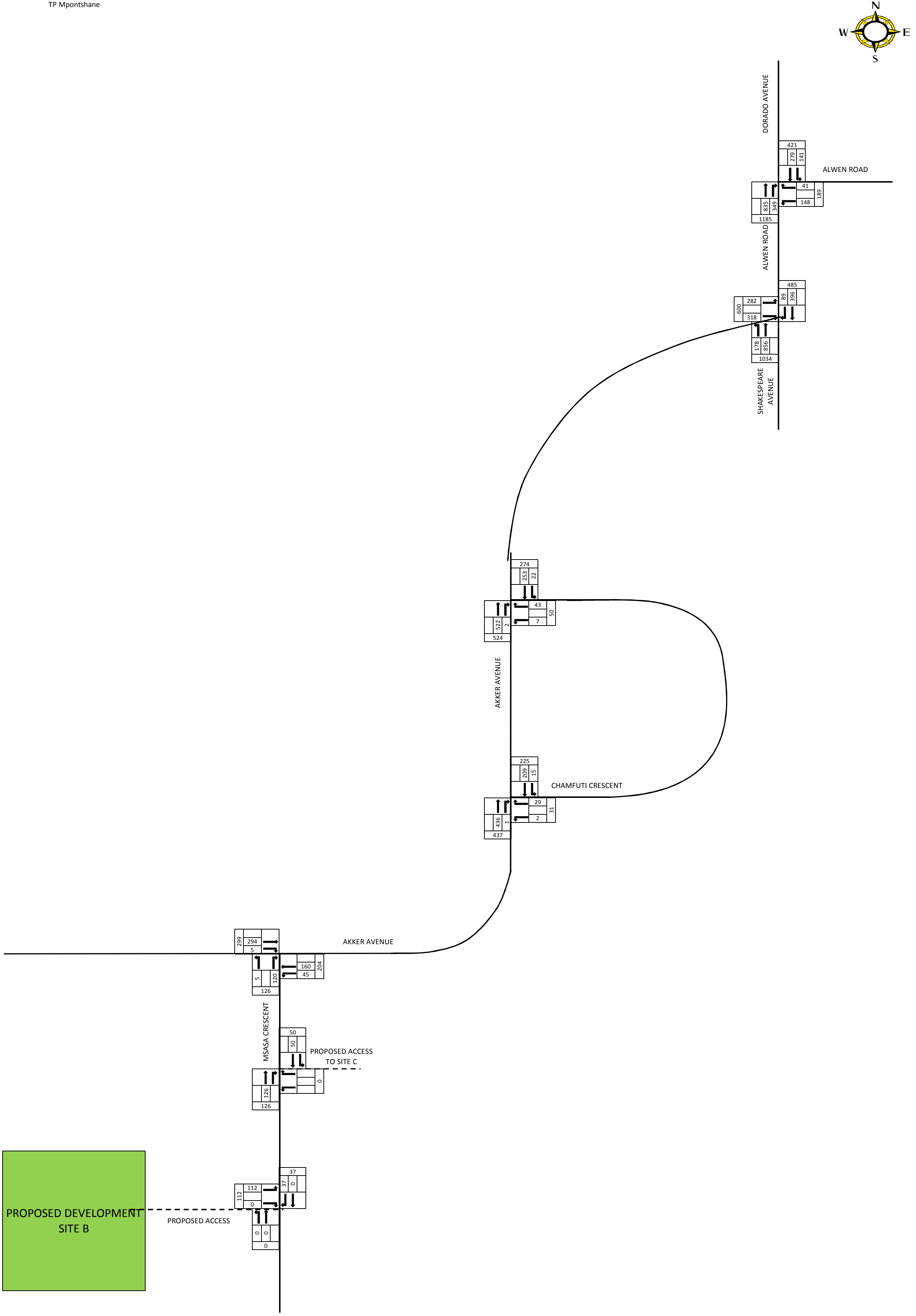
2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND TRAFFIC VOLUMES

FIGURE 3.6

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



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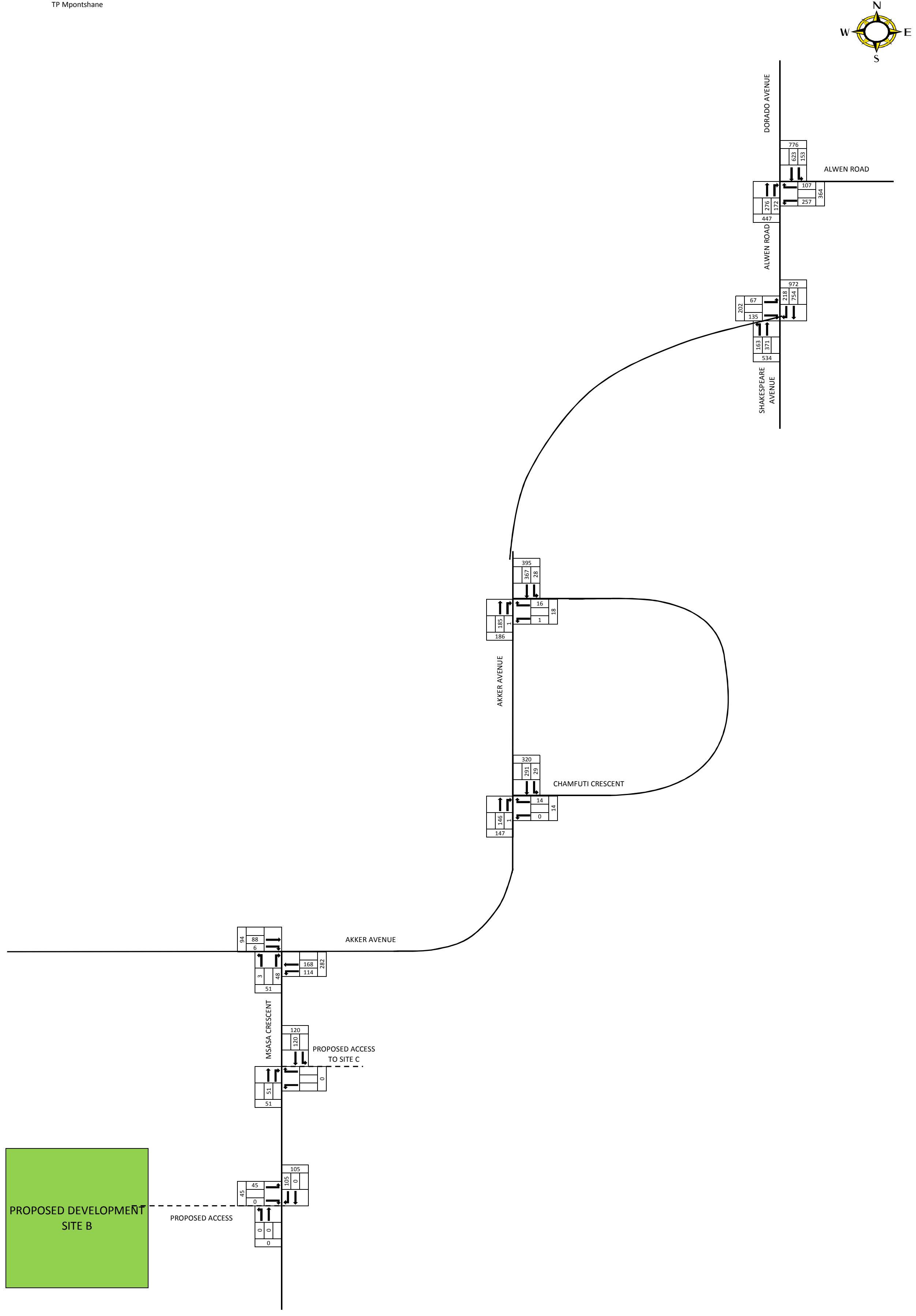
2017 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.7

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



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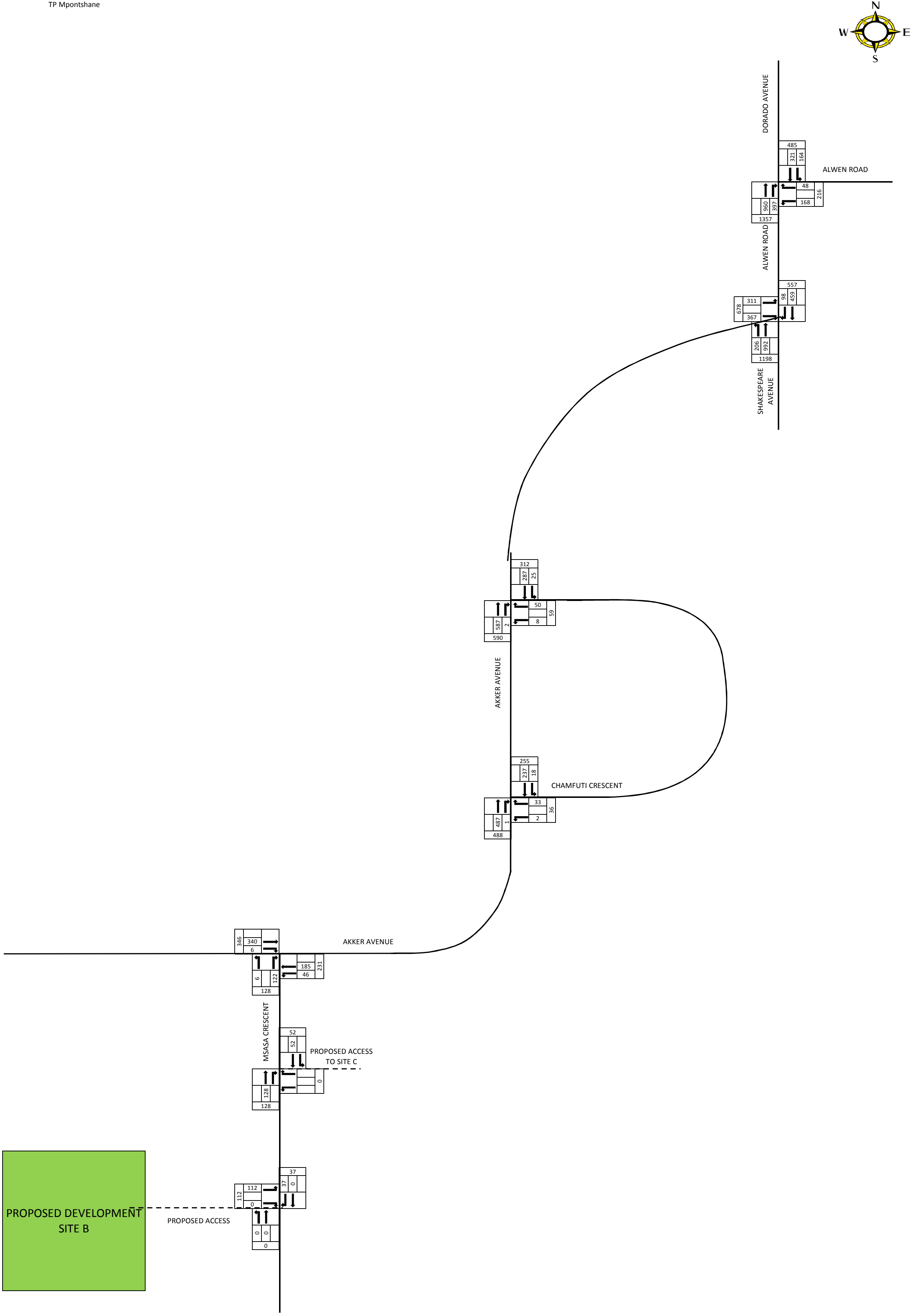
2017 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.8

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



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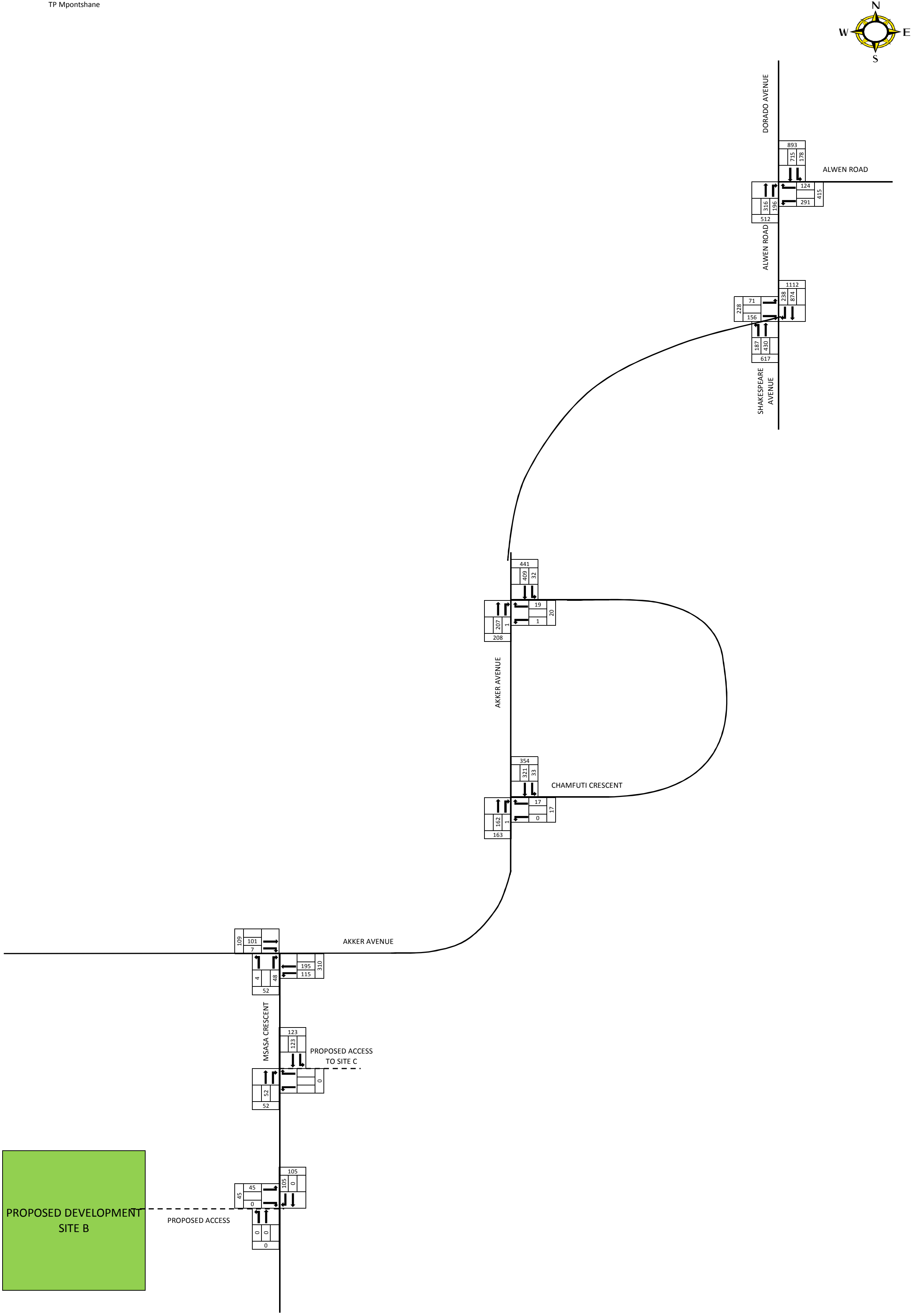
2022 WEEKDAY MORNING PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.9

Project Number	C2284
Job Describption	Ormonde - Site B
Date	2016/11/18 16:12
Done by	TP Mpontshane



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2022 WEEKDAY AFTERNOON PEAK HOUR BACKGROUND AND DEVELOPMENT TRAFFIC VOLUMES

FIGURE 3.10

ANNEXURE A

TOWNSHIP LAYOUT PLAN

DATE	NO	REVISION
OCT 2016	-	ISSUED FOR APPROVAL

CLIENT

Kale Developments

LOCAL AUTHORITY

Joburg
a world class African city

Civil Concepts (Pty) Ltd
Consulting Civil & Structural Engineers
PO Box 36148, Menlo Park, 0102
Office: +27 12 460 0008
www.civilconcepts.co.za

PROJECT

ORMONDE SOUTH

SITE B ON ERF 962 & 963

DRAWING TITLE

SITE LAYOUT PLAN

DRAWING NO C2284-B-201

REV.NO. -

SCALE	1:500	DESIGNED	A.OOSTHUIZEN
		DRAWN	A.OOSTHUIZEN
DATE	OCTOBER 2016	CHECKED	L.ZIETSMAN

ANNEXURE B

MEMORANDUM APPLICATION

1. EXECUTIVE SUMMARY

1.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of The City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the rezoning of Erven 962 & Erf 963, Ormonde Extension 22, subject to certain conditions.

1.2 Application is made for the amendment of the Johannesburg Town-Planning Scheme, 1979, by way of the rezoning of the subject property from *"Residential 3" with a density of "25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%"* to *"Residential 3" with a density of "110 dwelling units per hectare", and* subject to the following conditions:

Floor Area Ratio : 0.7

Coverage : 30%

Height : Four (4) storeys

Parking requirements : 1.3 parking bays per unit

Building lines : In accordance with an approved site development plan

Number of Units : 176 units

1.3 The purpose of this application is to obtain the appropriate land use rights to enable the registered property owner to develop a higher residential development on the erf.

1.4 Note that a separate application for the consolidation of the two properties, in terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

1.5 This memorandum provides the relevant property information, and motivates the merits of the development proposal from a development planning perspective.

1.6 The consolidation application is submitted separately and will be handled as a separate application, but will form part of the rezoning of the erven.

2. PROPERTY INFORMATION

2.1 Locality

The subject property is situated along Msasa Crescent in Ormonde, towards the north of the M1 Freeway and towards the south of Akker Street. A Locality Plan is attached hereto as ***Annexure A***. The site is situated in close proximity to Rand Show Road, Nasrec Road and the M1-Highway.

The figure below gives the context of the application site.

Figure 1: Aerial view of the property

2.2 Property description, ownership and size

Details pertaining to property description, ownership and extent of the subject properties are provided in the table below:

PROPERTY DESCRIPTION	REGISTERED OWNER	DEED OF TRANSFER NUMBER	SIZE
Ormonde X22: Erf 962	Matla Projects (Pty) Ltd	T27309/2009	5 942m^2
Ormonde X22: Erf 963	Matla Projects (Pty) Ltd	T27310/2009	10 274m^2

Deeds of Transfer T27309/2009 and T27310/2009 are attached as ***Annexures B*** to form part of the application documentation.

The signed and completed Company Resolution, Power of Attorney and Proof of Directors are attached as ***Annexure C*** respectively.

2.3 Zoning

The subject properties are currently zoned *"Residential 3"*, in terms of the Johannesburg Town-Planning Scheme, 1979, subject to the following conditions:

Floor Area Ratio	:	0.4
Density	:	25 Dwelling units per ha
Coverage	:	30%
Height	:	Three storeys

The relevant Zoning Certificate is attached hereto as ***Annexure D***.

The zoning regime of the surrounding area includes the following zonings:

"Residential 1"; "Residential 3;" "Business 3"; "Institutional" and "Municipal".

2.4 Land Use

A land use plan, based on a visual survey, is attached as ***Annexure E***. The subject property is currently vacant, while surrounding land uses include:

- Dwelling houses;
- Open Spaces; and
- Public Roads.

It becomes clear that the area is a predominantly residential area. The proposal to develop the subject property for higher density residential uses will contribute to the livelihood of the area and create additional housing opportunities.

The proposed land-use will have no detrimental effect on any of the surround properties on municipal infrastructure.

3. BONDS, CONDITIONS OF TITLE AND SERVITUDES

3.1 Mortgage Bond

There is currently no bond registered over the property. The consent from a bondholder is therefore not required.

3.2 Conditions of title

The subject property is not affected by any conditions of title which may prove to be restrictive to the proposed development. No removal of restrictions is therefore required.

3.3 Servitudes

In terms of Deed of Transfers T27309/2009 and T27310/2009 the properties are subject to the following servitude:

- A servitude for sewer and other municipal services purposes 2 metres wide, in favour of the City Council of Johannesburg along any two boundaries other than a street boundary.

This servitude will be retained and accommodated in the development proposal and on the final Site Development Plan.

4. DEVELOPMENT PROPOSAL

4.1 Application Particulars and Development Proposal

4.1.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the simultaneous rezoning of Erf 962 & Erf 963, Ormonde Extension 22, subject to the following conditions:

Floor Area Ratio : 0.7

Coverage : 30%

Height : Four (4) storeys

Parking requirements : 1.3 parking bays per unit

Building lines : In accordance with an approved site development plan

Number of Units : 176 units

4.1.2 Al parking and manoeuvring space will be provide on-site. No parking within the road reserve will be allowed or will be necessary. The proposed site plan is attached hereto as ***Annexure G.*** Parking will be provided at a ratio of 1.3 parking bays per unit, with a total of 229 parking bays being required. A total of 230 parking bays will be provided on-site, to ensure sufficient parking for residents and visitors. All parking and manoeuvring space will be covered with a permanent dust-free surface.

4.1.3 Access to the development will be obtained via Msasa Crescent. Access will be provided to the satisfaction of the municipality. The current road network is sufficient to accommodate the minimal increase in traffic. If so required by Council, upgrades to the road and services network can be made through a service agreement between the developer and Council.

4.1.3 Sufficient opens space (gardens / lawns) will be provide within the development, as per the minimum requirements from Council.

4.1.4 The privacy of the neighbouring properties will be protected by means of building design, landscaping and building lines. The height of the proposed development will be limited four storeys and building lines will be determined in accordance with an approved site development plan.

4.2 Existing vs Proposed Zoning

4.2.1 The proposed scheme document is attached hereto as ***Annexure F***.

4.2.2 The type of housing unit that is being proposed is IHS C-Type (3-4 levels). The design of the units will be done by Boogertman & Partners Architects. A formal Site Development Plan and Building Plans will be submitted to Council after approval of the rezoning application. A concept plan is attached to form part of the application documentation.

4.2.3 The following table compares the current and proposed land use rights:

CURRENT ZONING	PROPOSED ZONING
Existing Zoning: *"Residential 3"*	**Proposed Zoning:** *"Residential 3"*
Permitted land uses: Residential dwelling units	**Permitted land uses:** Residential dwelling units
Permitted Density: 25 units/ha	**Proposed Density:** 110 units/ha
Number of Units allowed: 40 sectional title units	**Number of Units allowed:** 176 sectional title units
Height Restriction: Three (3) storeys	**Proposed Height Restriction:** Four (4) storeys
Coverage: 30%	**Proposed Coverage:** 30%
Floor Area Ratio: 0.4	**Proposed Floor Area Ratio:** 0.7
Parking: 1 parking space per dwelling unit of 3 or less habitable rooms. 2 parking space per dwelling unit of 4 or more habitable rooms. Plus 0.3 parking spaces per dwelling unit for visitors.	**Parking:** 1.3 parking bays per unit Required: 229 Provided: 230
Building lines: 0m on all street fronts	**Building lines:** In accordance with an approved site development plan

5. MUNICIPAL SERVICES

5.1 The region is generally well provided with civil service infrastructure. Development pressure in this area challenges the rate at which bulk infrastructure can be provided to accommodate expansion. Existing infrastructure will however be capable of accommodating the proposed additional land-use rights.

5.2 During the application stage, the different engineering departments will get an opportunity to indicate whether additional engineering studies will be required before the rezoning application can be approved. If so required, Professional Engineers will be appointed to investigate the civil services and compile an outline scheme document.

5.3 The amount of Bulk Services Contributions for civil services payable to the City of Joburg will be determined with the finalisation of the rezoning application. Rebate will be given for the existing land use rights on the final amounts.

5.4 A formal Traffic Access Study is currently being prepared by the project Engineers. It will be submitted to Council as soon as it is received.

5.5 The electricity connection has been discussed with City Power. Adequate capacity is currently available for the development at the nearby Crown substation and an estimated 2,2 MVA can therefore be made available for planned developments in the Ormonde area, of which this application forms part of.

Capacity can be released by shifting loads between the various distributor areas. A feeder cable from Crown substation is thus not required. A detailed Electrical Report and/or Outline Scheme Report will be submitted to Council in due course.

6. POLICIES

6.1 National Development Guidelines

6.1.1 Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

Section 7 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) confirms that the following principles applies to spatial planning, land development and land use management:

7(a) The principle of spatial justice, whereby-:

(i) Past spatial and other development imbalances must be redressed through improved access to and use of land.

It is our opinion that the greater community of this area will benefit from the development proposal through various new housing opportunities.

The development will enhance the urban environment through the strengthening of the residential character and the creation of economic growth, as required in terms of local policies.

(ii) Spatial development frameworks and policies at all spheres of government must address the inclusion of persons and areas that were previously excluded, with an emphasis on informal settlements, former homeland areas and areas characterised by widespread poverty and deprivation.

(iii) Spatial planning mechanism, including land use schemes, must incorporate provisions that enable redress in access to land by disadvantaged communities and persons.

(iv) Land use management system must include all areas of a municipality and specifically include provisions that are flexible and appropriate for the management of disadvantaged areas, informal settlements and former homeland areas.

(v) Land development procedures must include provisions that accommodate access to secure tenure and incremental upgrading of informal areas.

(vi) A Municipal Planning Tribunal considering an application before it, may not be implemented or restricted in the exercise of its discretion solely on the ground that the value of land or property is affected by the outcome of the application.

Principles (7)(a) (ii) to (vi) relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(b) The principle of spatial sustainability, whereby spatial planning and land use management systems must-:

(i) Promote land development that is within the fiscal, institutional and administrative means of the Republic.

The proposed development, as motivated, complies with the fiscal, institutional and

administrative means of the Republic as well as the Local Authority.

Development Policies, related administration and laws (City of Johannesburg Municipal Planning By-Law, 2016) and the National Environmental Management Act, 1998, do allow for the application, as submitted, to be entertained. The proposal has been discussed with the relevant Town Planners at Council before submission of the application.

(ii) *Ensure that special consideration is given to the protection of prime and unique agricultural land.*

The property is surrounded by existing urban infrastructure, and in terms of Municipal policy, the property is earmarked for higher density residential development.

(iii) *Uphold consistency of land use measures in accordance with environmental management instruments.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iv) *Promote and stimulate the effective and equitable functioning of land markets.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(v) *Consider all current and future cost to all parties for the provision of infrastructure and social services in land developments.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(vi) *Promote land development in locations that are sustainable and limit urban sprawl.*

The subject property is situated within Region F of the City of Johannesburg and will not contribute to urban sprawl. The proposed development will serve as infill development and will ensure the optimisation of developable land and municipal infrastructure and services.

According to relevant policy guidelines of the Municipality (i.e. the Municipal Spatial Development Framework), the subject property is earmarked for purposes of higher density residential development. The proposal is, in principle, supported by Council.

(vii) *Result in communities that are viable.*

The proposed development is in close proximity to other residential, some commercial, lifestyle and educational opportunities. It is furthermore located near public transport facilities and is also ideally situated in terms of the main through routes in the area (i.e. the M1-Highway).

7(c) The principle of efficiency, whereby-:

(i) *Land development optimises the use of existing resources and infrastructure.*

The proposed development will promote efficient land development, as it entails the development of residential housing in close proximity to commercial, lifestyle and educational opportunities. Public transport is also available in close proximity.

The subject property is strategically situated in relation to transportation routes, e.g. M1 Freeway and Shakespeare Avenue.

Civil services are also available in the area for the proposed development.

(ii) *Decision-making procedures are designed to minimise negative financial, social, economic or environmental impacts.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iii) *Development application procedures are efficient and streamlined and timeframes are adhered to by all parties.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(d) ***Principal of spatial resilience*** *whereby flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(e) ***The principle of good administration, whereby-:***

(i) *All spheres of government ensure an integrated approach to land use and land development that is guided by the spatial planning and land use management systems as embodied in this Act.*

This principle relates to obligations imposed on local government. The application will be circulated to relevant internal municipal departments for their comments.

(ii) *All government departments must provide their sector inputs and comply with any other prescribed requirements during the preparation or amendment of spatial planning frameworks.*

This principle relates to obligations imposed on local government.

(iii) *The requirements of any law relating to land development and land use are met timeously.*

This principle relates to obligations imposed on local government.

(iv) *The preparation and amendment of spatial plans, policies, land use schemes as well as procedures for development applications, include transparent processes of public participation that afford all parties the opportunity to provide inputs on matters affecting them.*

This principle relates to obligations imposed on local government. It is also confirmed

that the application will be advertised by the applicant in the prescribed manner.

(v) *Policies, legislation and procedures must be clearly set in order to inform and empower members of the public.*

This principle relates to obligations imposed on local government.

6.1.2 National Development Plan, 2030

The National Development Plan identifies five principles for spatial development: spatial justice, spatial sustainability, spatial resilience, spatial quality and special efficiency.

It confirms that South African cities are highly fragmented, as little has been achieved in reversing apartheid geography. The Plan proposes that the situation be addressed by establishing new norms and standards: amongst others by densifying cities, improving transport and locating jobs where people live.

The containment of urban sprawl is particularly highlighted in the Plan, confirming that sprawl be contained and reversed (if possible), *"… as denser forms of development are more efficient in terms of land usage, infrastructure cost and environmental protection."*

The proposed development aligns with the vision of the National Development Plan, as it will promote compaction of the city and limiting urban sprawl (by means of infill development), by the redevelopment of a property which is currently vacant instead of developing outside the urban edge.

6.2 Provincial Development Guidelines

6.2.1 Gauteng Metropolitan Spatial Development Framework, 2011

The Gauteng Metropolitan Spatial Development Framework (MSDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The MSDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities' spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The MSDF confirms that *"it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system".*

The development proposal will not contribute to urban sprawl and should be regarded as infill development.

6.2.2 Gauteng Spatial Development Framework, 2011

The Gauteng Spatial Development Framework (SDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The SDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities' spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The SDF confirms on page 128 that *"it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system".*

The SDF furthermore identified four critical factors for development in the province, relevant to this development:

- **Contained urban growth:**

  To contain urban growth, an Urban Edge was identified to curb urban sprawl. The idea behind the urban edge is to limit development within certain areas of a city. Only certain types of developments are allowed on the outside of the urban edge. The goal is to curb urban sprawl and thereby protecting the natural environment. One way to do this is to increase the densities of the built environment within the urban edge.

  This edge is however not set in stone and can be amended if development pressure in an area requires the alteration of this "line" or edge. Normally, areas identified for future development or as future development nodes are not included within the urban edge of a municipality. Amendments to the relevant spatial legislation and frameworks of the municipality usually later include these areas within the edge, so the development potential can be unlocked. Approval of net land-use rights and applications in an area indicates that the characteristics of the area have changed over the ears.

- **Resourced based economic development:**

  Resource based economic development should result in identification of the economic core. Development should be encouraged in close proximity to existing resources, which includes infrastructure such as roads, water and electricity.

  The proposed development is situated near existing and adjacent to approved proposed developments and infrastructure networks. Recent similar approved township establishment applications indicate that there is a growing economic base in the area.

- **Re-direction of urban growth:**

  Developments in economically non-viable areas should be limited and thereby achieving growth within the economic growth sphere. This part of the Municipality is a fast growing sector in Joburg and growth should be encouraged in the precinct.

- **Increased access and mobility:**

  The proposed land development area could be regarded as highly accessible.

6.3 Local Development Guidelines

6.3.1 Spatial Development Framework (SDF), 2011

The SDF was compiled to realise the vision of the Municipality through spatial restructuring and to integrate all aspects of spatial planning.

The subject property is earmarked for purposes of residential development. The Ormonde area is situated within a mixed use area, focussing on sporting / entertainment facilities, light industrial with a very large residential component.

In light of the above, it is apparent that the proposed development is consistent with the principles contained in the SDF.

6.3.2 Integrated Development Plan (IDP), 2012/2016

The Municipality has adopted an Integrated Development Plan (IDP) for 2012/2016 in terms of Section 25 of the Local Government, Municipal Systems Act, 2000 (Act No. 32 of 2000), which plan integrates and coordinates plans and aligns the resources and capacity of the Municipality to implement these plans. The compilation of Spatial Development Frameworks forms part of the IDP.

The Johannesburg Municipality seeks to focus its efforts to complement National and Provincial Government to accomplish the following strategic objectives through the IDP:

- Provide quality basic services and infrastructure;
- Facilitate higher and shared economic growth and development;
- To fight poverty, build clean, healthy, safe and sustainable communities;
- Foster participatory democracy through a caring, accessible and accountable service; and
- To ensure good governance, financial viability and optimal institutional transformation with capacity to execute its mandate.

The Strategic Levers emanating from the city's macro and long-term strategy, including the medium-term plan reflect Joburg's attempts in actively working towards achieving the targets set out at national and provincial level

The IDP confirms the status of the Ormonde area which focusses on the residential component as indicated in the SDF. The proposed development therefore finds support in the IDP.

7. MOTIVATION AND BURDEN OF PROOF

7.1 Need

7.1.1 The need for the development of residential units on the property is acknowledged in the land use policies of the Municipality, particularly the SDF which confirms that the property is earmarked for purposes of residential development. This confirms that the need for the development on the property is also acknowledged from a policy perspective.

7.1.2 The proximity of the subject property to important transport routes (e.g. the, M1 freeway and Shakespeare Avenue), public transport, job opportunities and most importantly renders that the property ideal for the intended land use.

7.1.3 Open and vacant, unutilised land within a build-up area can be perceived as a weakness due to the security threat that vacant land imposes, as well as the negative influence it has on the image of a neighbourhood. Unused open or vacant land, which implies lower densities, makes the provision of essential municipal services less viable and more expensive to provide. By developing the existing land, the development of urban fibre can be stimulated through the strengthening of the development node and region. The proposed land use rights of the erf accommodated in this application is in accordance with the proposals of the Integrated Development Plan (IDP), as the IDP earmarks this area for medium to high density residential uses.

7.1.4 The proposed development will positively influence the income base of the Municipality. The income generated by rates is a function of land value, which is in turn a function of the land use. The establishment of the residential townships (which includes a retail erf) broadens the economic base of the area. The

development will also ensure the following:

- Infill development – The application site is a vacant portion of land situated adjacent to an existing and future residential townships, within the Municipality;
- New work opportunities in close proximity to place of residence during construction; and
- Optimal use of existing infrastructure.

7.1.5 The proposed development is also consistent with approved land use policies in Johannesburg. The need for the proposed development is substantiated by the principles of the IDP, i.e. the infill of vacant land and the optimal use of existing infrastructure, as well as from current market forces.

7.2 Desirability

7.2.1 There is a need for more residential units within the Ormonde area and this development will contribute to this need. Mounting development pressure within the municipality is resulting in all available developable land being developed.

7.2.2 The development proposal is also consistent with, and will promote, the land use policy guidelines of the Municipality. The development can be regarded as being desirable and will have several beneficial social and economic impacts on the area, which can be summarised as follow:

- Optimum utilisation of services and infrastructure;
- Increase in property values of surrounding properties;
- Increased security;
- Compatibility with surrounding land uses; and
- Increased housing opportunities

7.2.3 The proposed development will maximize the potential of the subject property and is consistent with the strategic location of the site. The proposed development will additionally contribute to the overall efficiency, sustainability and improved quality of the greater area. The development will have several beneficial social, economic and ecological impacts once the construction thereof is finalised, which can be summarised as follow:

- Reduction of potential dumping areas and informal settlements;
- Optimum utilisation of services and infrastructure;
- Expansion of municipal infrastructure and services;
- Increase in property values of surrounding properties;
- Increased security;
- Eradication of invasive species;
- Compatibility with surrounding land uses; and
- Landscaping could improve fauna numbers and species.

As mentioned above, the proposed development will include community and will be easy accessible through public transport. The need for social and economic facilities in this area is identified in various planning policies and policy frameworks of the Municipality. The development will provide much needed residential and retail facilities for the area, and thus make a positive contribution with regards to social welfare.

7.2.4 The proposed development will align with the existing urban form and character of the area. It will uplift the area economically and might attract other potential developers to the area as well. Thus, in effect, in might have a very positive financial influence to the precinct. Furthermore, the proposed development will contribute to an economic base in the area. Thus, it is argued that the proposed development will have a positive influence to the area.

7.2.5 When considering that the Building Plans and Site Development Plans which must be submitted to the Municipality, will have to comply with the relevant design guidelines and development parameters of land

use policies, the proposed development can be perceived as desirable from a land use perspective.

7.3 Compliance with SPLUMA principles

7.3.1 With reference to Section 7.1.1 of this Memorandum, it is confirmed that the development proposal complies with the principles of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.4 Public interest in terms of Section 47(2) of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.4.1 The proposed development is in the public interest, as the land use rights is consistent with approved policy guidelines on national, provincial and local level.

7.5 Facts and circumstances of application in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.5.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 962 & Erf 963, Ormonde Extension 22, from *"Residential 3"* with 25 dwelling units per hectare to ***"Residential 3"*** with "***110 dwelling units per hectare".***

7.5.2 The proposed development aligns with approved policy guidelines on national, provincial and local level.

7.6 Rights and obligations of affected parties in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.6.1 The rights and obligations of affected parties will be taken into account in the following manner:

- The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, by the publications of notices in the Gauteng Provincial Gazette, Beeld and Citizen during February/ March 2017, and by the simultaneous display of a notice on site for fourteen (14 days). An objection period of 28 days will be afforded to any affected parties; and

- The City Planning Department will circulate the application for comments from internal departments of the Municipality. Any concerns raised will have to be dealt with to the satisfaction of the relevant department.

7.7 Interested persons in terms of Section 45 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.7.1 The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, granting any person the opportunity to register as an interested party.

7.8 Impact on engineering services, social infrastructure and open space in terms of Sections 42 and 49 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013), read with Section 46, 47 and 48 of the City of Johannesburg Municipal Planning By-Law, 2016

7.8.1 The impact of the proposed development will be confirmed by the internal departments of the Municipality who will be afforded an opportunity to comment on the application.

7.8.2 Any adverse impacts will be mitigated and addressed by suitable solutions, which may include service agreements and/or payment of bulk contributions to upgrade existing services infrastructure.

7.9 Reply to objections

7.9.1 The applicant will reply to any valid objections to the application.

7.9.2 The advertisements will comply with the requirements of the relevant sections of the City of Johannesburg Municipal Planning By-Law, 2016. The rights of potential objectors and or interested parties will be brought to the attention of probable objectors and or interested parties in terms of the requirements of Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016.

7.9.3 In submitting this application, applicant has endeavoured to comply with the requirements of the relevant provincial legislation as well as the provisions of the City of Johannesburg Municipal Planning By-Law, 2016, read with the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.9.4 The application clearly indicates the land- use rights, scheme documents, diagrams, layout plans, need and desirability, co-ordinated harmonious development and all other relevant requirements in terms of provincial legislation.

7.9.5 The application further complies with the relevant requirements of the Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013). Specifically, Sections 7, 42, 47 and 49 thereof.

8. CONCLUSION

8.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 962 & Erf 963, Ormonde Extension 22, from *“Residential 3” with a density of “25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%”* to *“Residential 3” with a density of “110 dwelling units per hectare; FAR of 0.7; Height of 4 storeys; and coverage of 30%”,* subject to the following conditions

8.2 The purpose of this application is to obtain the appropriate land use rights to enable higher residential development. The application clearly confirms the need and desirability and compliance with all other relevant requirements in terms of relevant policies and legislation.

8.3 Note that a separate application for the consolidation of the two properties, terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

8.4 We trust that Council will evaluate and consider the application on its merit.

Werner Slabbert B(TRP)
Professional Planner - Pr. Pln A/2190/2015

urban innovate

URBAN INNOVATE CONSULTING CC
CK2007/191853/23

November 2016 R16026

LIST OF ANNEXURES

- ANNEXURE A - LOCALITY PLAN
- ANNEXURE B - DEED OF TRANSFER
- ANNEXURE C - POWER OF ATTORNEY, COMPANY RESOLUTION & PROOF OF DIRECTORS
- ANNEXURE D - ZONING CERTIFICATE AND ZONING MAP
- ANNEXURE E - LAND USE MAP
- ANNEXURE F - PROPOSED SCHEME DOCUMENTATION
- ANNEXURE G - PROPOSED SITE PLAN AND GATEHOUSE DESIGN
- ANNEXURE H - GENERAL PLAN / S.G DIAGRAMS

ANNEXURE C

CAPACITY CALCULATION RESULTS

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MOVEMENT SUMMARY

Site: 2017 AM BG

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	183	0.0	0.791	18.2	LOS B	29.7	207.7	0.77	0.95	42.0
2	T	901	0.0	0.792	10.0	LOS B	29.7	207.7	0.77	0.72	43.9
Approach		1084	0.0	0.792	11.4	LOS B	29.7	207.7	0.77	0.76	43.5
North: Alwen Road (N)											
8	T	417	0.0	0.304	6.1	LOS A	8.5	59.3	0.45	0.40	49.6
9	R	59	0.0	0.407	34.0	LOS C	2.9	20.1	0.82	0.79	30.9
Approach		476	0.0	0.407	9.5	LOS A	8.5	59.3	0.50	0.44	46.1
West: Akker Avenue (W)											
10	L	191	0.0	1.225	465.9	LOS F	102.2	715.7	1.00	2.58	4.3
12	R	323	0.0	1.225	466.2	LOS F	102.2	715.7	1.00	2.58	4.3
Approach		514	0.0	1.226	466.1	LOS F	102.2	715.7	1.00	2.58	4.3
All Vehicles		2074	0.0	1.225	123.6	LOS F	102.2	715.7	0.76	1.14	13.5

Level of Service (Aver. Int. Delay): LOS F. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2017 PM BG

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	160	0.0	0.488	18.3	LOS B	13.0	90.8	0.65	0.90	41.3
2	T	391	0.0	0.487	10.1	LOS B	13.0	90.8	0.65	0.58	43.9
Approach		551	0.0	0.487	12.5	LOS B	13.0	90.8	0.65	0.67	43.1
North: Alwen Road (N)											
8	T	794	0.0	0.537	4.9	LOS A	13.9	97.6	0.50	0.45	50.6
9	R	131	0.0	0.322	14.4	LOS B	2.2	15.4	0.60	0.76	42.9
Approach		924	0.0	0.537	6.3	LOS A	13.9	97.6	0.51	0.50	49.4
West: Akker Avenue (W)											
10	L	28	0.0	0.603	39.7	LOS D	7.3	50.8	0.98	0.82	28.5
12	R	138	0.0	0.603	39.9	LOS D	7.3	50.8	0.98	0.82	28.5
Approach		166	0.0	0.603	39.9	LOS D	7.3	50.8	0.98	0.82	28.5
All Vehicles		1641	0.0	0.603	11.8	LOS B	13.9	97.6	0.61	0.59	44.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 AM BG

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	213	0.0	0.918	36.4	LOS D	57.1	400.0	0.93	1.10	31.4
2	T	1044	0.0	0.917	28.2	LOS C	57.1	400.0	0.93	1.03	31.8
Approach		1257	0.0	0.918	29.6	LOS C	57.1	400.0	0.93	1.04	31.7
North: Alwen Road (N)											
8	T	483	0.0	0.352	6.3	LOS A	9.9	69.3	0.47	0.42	49.2
9	R	67	0.0	0.589	47.1	LOS D	3.9	27.6	0.98	0.83	26.0
Approach		551	0.0	0.589	11.3	LOS B	9.9	69.3	0.53	0.47	44.4
West: Akker Avenue (W)											
10	L	221	0.0	1.421	815.9	LOS F	171.9	1203.2	1.00	3.50	2.6
12	R	375	0.0	1.421	816.1	LOS F	171.9	1203.2	1.00	3.50	2.5
Approach		596	0.0	1.421	816.0	LOS F	171.9	1203.2	1.00	3.50	2.5
All Vehicles		2403	0.0	1.421	220.4	LOS F	171.9	1203.2	0.86	1.52	8.4

Level of Service (Aver. Int. Delay): LOS F. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

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MOVEMENT SUMMARY

Site: 2022 PM BG

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	186	0.0	0.566	19.0	LOS B	15.5	108.3	0.70	0.90	40.9
2	T	453	0.0	0.566	10.8	LOS B	15.5	108.3	0.70	0.62	43.1
Approach		639	0.0	0.566	13.2	LOS B	15.5	108.3	0.70	0.70	42.5
North: Alwen Road (N)											
8	T	920	0.0	0.622	5.5	LOS A	17.2	120.7	0.56	0.51	49.8
9	R	151	0.0	0.422	15.5	LOS B	2.6	18.4	0.67	0.77	41.9
Approach		1071	0.0	0.622	6.9	LOS A	17.2	120.7	0.57	0.55	48.5
West: Akker Avenue (W)											
10	L	33	0.0	0.697	41.3	LOS D	8.5	59.4	1.00	0.86	27.9
12	R	160	0.0	0.698	41.5	LOS D	8.5	59.4	1.00	0.86	27.9
Approach		193	0.0	0.698	41.5	LOS D	8.5	59.4	1.00	0.86	27.9
All Vehicles		1902	0.0	0.698	12.5	LOS B	17.2	120.7	0.66	0.63	43.2

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

Processed: 01 November 2016 10:56:26 AM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG\Existing\Akker_Alwen_shakespeare_REV1(C).sip
Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background and Developement Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 100 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	187	0.0	0.173	8.5	LOS A	0.8	5.5	0.12	0.69	48.4
2	T	901	0.0	0.870	30.4	LOS C	43.9	307.0	0.96	0.96	31.1
Approach		1088	0.0	0.870	26.6	LOS C	43.9	307.0	0.81	0.91	33.2
North: Alwen Road (N)											
8	T	417	0.0	0.403	16.6	LOS B	14.1	98.4	0.67	0.59	39.4
9	R	94	0.0	0.842	68.1	LOS E	7.1	49.4	1.00	1.00	20.8
Approach		511	0.0	0.842	26.1	LOS C	14.1	98.4	0.73	0.66	33.9
West: Akker Avenue (W)											
10	L	297	0.0	0.850	44.3	LOS D	31.9	223.4	0.98	0.94	27.0
12	R	335	0.0	0.850	44.4	LOS D	31.9	223.4	0.98	0.94	27.0
Approach		632	0.0	0.850	44.4	LOS D	31.9	223.4	0.98	0.94	27.0
All Vehicles		2231	0.0	0.870	31.5	LOS C	43.9	307.0	0.84	0.86	31.3

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background and Developement Traffic Volumes
Proposed Configuration
Signals - Fixed Time Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	172	0.0	0.858	39.2	LOS D	7.5	52.3	0.85	0.83	28.8
2	T	391	0.0	0.526	32.5	LOS C	19.0	132.9	0.85	0.73	30.4
Approach		562	0.0	0.859	34.5	LOS C	19.0	132.9	0.85	0.76	29.9
North: Alwen Road (N)											
8	T	794	0.0	0.494	5.2	LOS A	17.7	123.8	0.40	0.36	50.8
9	R	229	0.0	0.680	16.9	LOS B	5.1	35.6	0.56	0.79	40.8
Approach		1023	0.0	0.679	7.8	LOS A	17.7	123.8	0.43	0.46	48.2
West: Akker Avenue (W)											
10	L	71	0.0	0.808	67.8	LOS E	14.6	102.0	1.00	0.90	20.9
12	R	142	0.0	0.808	67.9	LOS E	14.6	102.0	1.00	0.90	20.9
Approach		213	0.0	0.808	67.9	LOS E	14.6	102.0	1.00	0.90	20.9
All Vehicles		1798	0.0	0.858	23.3	LOS C	19.0	132.9	0.63	0.61	35.8

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background and Developement Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	217	0.0	0.200	8.4	LOS A	0.9	6.4	0.10	0.68	48.5
2	T	1044	0.0	0.917	39.1	LOS D	65.8	460.8	0.99	1.02	27.6
Approach		1261	0.0	0.917	33.9	LOS C	65.8	460.8	0.83	0.96	29.8
North: Alwen Road (N)											
8	T	501	0.0	0.441	16.9	LOS B	18.2	127.6	0.64	0.57	39.2
9	R	85	0.0	1.001[3]	80.5	LOS F	7.5	52.3	1.00	0.86	18.6
Approach		586	0.0	1.000	26.2	LOS C	18.2	127.6	0.69	0.61	33.8
West: Akker Avenue (W)											
10	L	327	0.0	0.987	104.7	LOS F	65.6	459.2	1.00	1.14	15.4
12	R	386	0.0	0.987	104.8	LOS F	65.6	459.2	1.00	1.14	15.4
Approach		714	0.0	0.987	104.8	LOS F	65.6	459.2	1.00	1.14	15.4
All Vehicles		2561	0.0	1.001	51.9	LOS D	65.8	460.8	0.85	0.93	24.2

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

[3] x = 1.00 due to short lane

Processed: 21 November 2016 07:25:35 AM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip
Unlicensed Trial Version

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MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background and Developement Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shakespeare Avenue (S)											
1	L	197	0.0	0.682	23.1	LOS C	5.7	39.7	0.69	0.83	36.6
2	T	453	0.0	0.525	14.2	LOS B	11.7	81.7	0.80	0.69	40.8
Approach		649	0.0	0.682	16.9	LOS B	11.7	81.7	0.76	0.73	39.5
North: Alwen Road (N)											
8	T	920	0.0	0.720	8.6	LOS A	19.6	137.4	0.75	0.68	45.9
9	R	251	0.0	0.648	17.8	LOS B	5.1	35.7	0.79	0.82	40.2
Approach		1171	0.0	0.720	10.5	LOS B	19.6	137.4	0.75	0.71	44.5
West: Akker Avenue (W)											
10	L	75	0.0	0.588	31.9	LOS C	8.3	57.8	0.95	0.82	31.9
12	R	164	0.0	0.588	32.0	LOS C	8.3	57.8	0.95	0.82	31.9
Approach		239	0.0	0.588	32.0	LOS C	8.3	57.8	0.95	0.82	31.9
All Vehicles		2059	0.0	0.720	15.0	LOS B	19.6	137.4	0.78	0.73	41.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on average delay for all vehicle movements.

Processed: 21 November 2016 07:25:46 AM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip
Unlicensed Trial Version

AutoJ

DoradO **Alwen** **Ormonde**

V/C, delay and queue **Xwe**

Stop street on west and east approaches

&AutoJ1308 horak-civilconcepts

	control	Q 3hr	V/C	% optim
this control	Xwe	4.6	0.86	73%
best possible	Xwe	4.6	0.86	73%

Volume (incl HV)

	vol/hr North approach						
	left slip	left	str	right		L+S+R	Peds
AM		141	263	0		**404**	
		0	0	0		**0**	
PM		153	576	0		**729**	
~lanes		0.5	0.5			1.0	

	vol/hr South approach						
	left slip	left	str	right		L+S+R	Peds
AM			785	299		**1 084**	
			0	0		**0**	
PM			255	151		**406**	
~lanes			0.5	0.5		1.0	

	vol/hr West approach						
	left slip	left	str	right		L+S+R	Peds
AM			0	0		**0**	
			0	0		**0**	
PM			0	0		**0**	
~lanes							

	vol/hr East approach						
	left slip	left	str	right		L+S+R	Peds
AM		131	0	41		**172**	
		0	0	0		**0**	
PM		210	0	107		**317**	
~lanes		0.3	0.4	0.3		1.0	

	veh vol Total
AM	**1 660**
	0
PM	**1 452**
	10 726

Control

North approach			
L slip	L	S	R

South approach			
L slip	L	S	R

West approach			
L slip	L	S	R
		Stop	Stop

East approach			
L slip	L	S	R
	Stop	Stop	Stop

approx. capacity
3 230
#DIV/0!
3 177

Volume to Capacity ratio

LOS A<0.5, B<0.8, C<0.9, D<0.95, E<0.99

LOS	A-B	C-D	E	F

	V/C North approach						
	L slip	L	S	R		all	Peds
AM		0.21	0.21			**0.21**	
PM		0.38	0.38			**0.38**	

	V/C South approach						
	L slip	L	S	R		all	Peds
AM			0.66	0.66		**0.66**	
PM			0.28	0.28		**0.28**	

	V/C West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	V/C East approach						
	L slip	L	S	R		all	Peds
AM		0.31		0.31		**0.31**	
PM		0.86		0.86		**0.86**	

	V/C i/section
AM	0.51
PM	0.46

max V/C; movement, approach, pedestrian, i/s				
	0.86	0.86		0.51

Average Delay per vehicle (seconds)

LOS A<10, B<15, C<25, D<35, E<50

LOS	A-B	C-D	E	F

	Ave Delay North approach						
	L slip	L	S	R		all	Peds
AM		0	0			**0**	*0*
PM		1	1			**1**	*1*

	Ave Delay South approach						
	L slip	L	S	R		all	Peds
AM			3	5		**4**	*3*
PM			1	3		**1**	*1*

	Ave Delay West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	Ave Delay East approach						
	L slip	L	S	R		all	Peds
AM		10		10		**10**	*10*
PM		28		29		**28**	*29*

	ave. del i/section
AM	4
PM	7

Average Queue Length (= Total Delay in veh-hrs/hr)

	Q North approach						
	L slip	L	S	R		all	Peds
AM		0.0	0.0			**0.1**	
PM		0.0	0.2			**0.2**	
max		0.0	0.2				

	Q South approach						
	L slip	L	S	R		all	Peds
AM			0.7	0.4		**1.2**	
PM			0.0	0.1		**0.2**	
max			0.7	0.4			

	Q West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	Q East approach						
	L slip	L	S	R		all	Peds
AM		0.4		0.1		**0.5**	
PM		1.6		0.9		**2.5**	
max		1.6		0.9			

	Q Total
AM	**1.7**
PM	**2.9**
max	**4.6**

Professional:
Date:

Dorado_ Alwen 2017 BG REV1 (C)
Print: 2016/11/18

registered to:
Dr John Sampson

AutoJ

V/C, delay and queue Xwe

&AutoJ1308 horak-civilconcepts

DoradO **Alwen** **Ormonde**

Stop street on west and east approaches

	control	Q 3hr	V/C	% optim
this control	Xwe	39.8	1.18	40%
best possible	RR	8.8	0.81	70%

Volume (incl HV)

vol/hr North approach

	left slip	left	str	right		L+S+R	Peds
AM		164	304	0		**468**	
		0	0	0		**0**	
PM		178	667	0		**845**	
~lanes		0.5	0.5			1.0	

vol/hr South approach

	left slip	left	str	right		L+S+R	Peds
AM			910	346		**1 256**	
			0	0		**0**	
PM			296	176		**472**	
~lanes			0.5	0.5		1.0	

vol/hr West approach

	left slip	left	str	right		L+S+R	Peds
AM			0	0		**0**	
			0	0		**0**	
PM			0	0		**0**	
~lanes							

vol/hr East approach

	left slip	left	str	right		L+S+R	Peds
AM		152	0	48		**200**	
		0	0	0		**0**	
PM		244	0	124		**368**	
~lanes		0.3	0.4	0.3		1.0	

veh vol Total
1 924
0
1 685
12 439

Control

North approach			
L slip	L	S	R

South approach			
L slip	L	S	R

West approach			
L slip	L	S	R
		Stop	Stop

East approach			
L slip	L	S	R
	Stop	Stop	Stop

approx. capacity
3 180
#DIV/0!
2 954

Volume to Capacity ratio

LOS A<0.5, B<0.8, C<0.9, D<0.95, E<0.99

LOS | A-B | C-D | E | F

V/C North approach

	L slip	L	S	R		all	Peds
AM		0.24	0.24			**0.24**	
PM		0.44	0.44			**0.44**	

V/C South approach

	L slip	L	S	R		all	Peds
AM			0.77	0.77		**0.77**	
PM			0.33	0.33		**0.33**	

V/C West approach

	L slip	L	S	R		all	Peds
AM							
PM							

V/C East approach

	L slip	L	S	R		all	Peds
AM		0.39		0.39		**0.39**	
PM		1.18		1.18		**1.18**	

V/C i/section
0.61
0.57
0.61

max V/C; movement, approach, pedestrian, i/s **1.18** **1.18**

Average Delay per vehicle (seconds)

LOS A<10, B<15, C<25, D<35, E<50

LOS | A-B | C-D | E | F

Ave Delay North approach

	L slip	L	S	R		all	Peds
AM		1	1			**1**	*1*
PM		1	1			**1**	*1*

Ave Delay South approach

	L slip	L	S	R		all	Peds
AM			6	8		**7**	*6*
PM			1	3		**2**	*1*

Ave Delay West approach

	L slip	L	S	R		all	Peds
AM							
PM							

Ave Delay East approach

	L slip	L	S	R		all	Peds
AM		10		11		**10**	*11*
PM		354		357		**355**	*357*

ave. del i/section
5
79

Average Queue Length (= Total Delay in veh-hrs/hr)

Q North approach

	L slip	L	S	R		all	Peds
AM		0.0	0.0			**0.1**	
PM		0.1	0.3			**0.3**	
max		*0.1*	*0.3*				

Q South approach

	L slip	L	S	R		all	Peds
AM			1.5	0.8		**2.3**	
PM			0.1	0.1		**0.2**	
max			*1.5*	*0.8*			

Q West approach

	L slip	L	S	R		all	Peds
AM							
PM							

Q East approach

	L slip	L	S	R		all	Peds
AM		0.4		0.1		**0.6**	
PM		24.0		12.3		**36.3**	
max		*24.0*		*12.3*			

Q Total
2.9
36.8
39.8

Professional:
Date:

Dorado_ Alwen 2022 BG REV1 (C)
Print: 2016/11/18

registered to:
Dr John Sampson

AutoJ

V/C, delay and queue Xwe

&AutoJ1308 horak-civilconcepts

DoradO

Alwen

Ormonde

Stop street on west and east approaches

	control	Q 3hr	V/C		% optim
this control	Xwe	4.4	0.78		79%
best possible	Xwe	4.4	0.78		79%

Volume (incl HV)

	vol/hr North approach						
	left slip	left	str	right		L+S+R	Peds
AM		141	279	0		**420**	
		0	0	0		**0**	
PM		153	623	0		**776**	
~lanes		0.5	0.5			1.0	

	vol/hr South approach						
	left slip	left	str	right		L+S+R	Peds
AM			835	349		**1 184**	
			0	0		**0**	
PM			276	172		**448**	
~lanes			0.5	0.5		1.0	

	vol/hr West approach						
	left slip	left	str	right		L+S+R	Peds
AM			0	0		**0**	
			0	0		**0**	
PM			0	0		**0**	
~lanes							

	vol/hr East approach							veh vol Total
	left slip	left	str	right		L+S+R	Peds	
AM		148	0	41		**189**		**1 793**
		0	0	0		**0**		**0**
PM		257	0	107		**364**		**1 588**
~lanes		1.0		1.0		2.0		**11 654**

Control

North approach			
L slip	L	S	R

South approach			
L slip	L	S	R

West approach			
L slip	L	S	R
		Stop	Stop

East approach			
L slip	L	S	R
	Stop	Stop	Stop

approx.
capacity
3 156
#DIV/0!
3 670

Volume to Capacity ratio

LOS A<0.5, B<0.8, C<0.9, D<0.95, E<0.99

LOS | A-B | C-D | E | F

	V/C North approach						
	L slip	L	S	R		all	Peds
AM		0.22	0.22			**0.22**	
PM		0.40	0.40			**0.40**	

	V/C South approach						
	L slip	L	S	R		all	Peds
AM			0.73	0.73		**0.73**	
PM			0.32	0.32		**0.32**	

	V/C West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	V/C East approach							V/C i/section
	L slip	L	S	R		all	Peds	
AM		0.21		0.74		**0.33**		0.57
PM		0.58		0.78		**0.64**		0.43
max V/C; movement, approach, pedestrian, i/s				0.78		0.73		**0.57**

Average Delay per vehicle (seconds)

LOS A<10, B<15, C<25, D<35, E<50

LOS | A-B | C-D | E | F

	Ave Delay North approach						
	L slip	L	S	R		all	Peds
AM		1	0			**1**	*0*
PM		1	1			**1**	*1*

	Ave Delay South approach						
	L slip	L	S	R		all	Peds
AM			5	7		**5**	*5*
PM			1	3		**2**	*1*

	Ave Delay West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	Ave Delay East approach							ave. del i/section
	L slip	L	S	R		all	Peds	
AM		9		18		**11**	*18*	5
PM		13		21		**15**	*21*	4

Average Queue Length (= Total Delay in veh-hrs/hr)

	Q North approach						
	L slip	L	S	R		all	Peds
AM		0.0	0.0			**0.1**	
PM		0.1	0.2			**0.3**	
max		0.1	0.2				

	Q South approach						
	L slip	L	S	R		all	Peds
AM			1.1	0.7		**1.8**	
PM			0.1	0.1		**0.2**	
max			1.1	0.7			

	Q West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	Q East approach							Q Total
	L slip	L	S	R		all	Peds	
AM		0.4		0.2		**0.6**		**2.4**
PM		0.9		0.6		**1.5**		**2.0**
max		0.9		0.6				**4.4**

Professional:
Date:

Dorado_ Alwen 2017 BGD REV1 (C)
Print: 2016/11/18

registered to:
Dr John Sampson

AutoJ

DoradO | **Alwen** | **Ormonde**

V/C, delay and queue **Xwe**

Stop street on west and east approaches

&AutoJ1308 horak-civilconcepts

	control	Q 3hr	V/C	% optim
this control	Xwe	28.5	1.35	40%
best possible	RR	11.9	0.87	80%

Volume (incl HV)

	vol/hr North approach						
	left slip	left	str	right		L+S+R	Peds
AM		164	321	0		**485**	
		0	0	0		**0**	
PM		178	715	0		**893**	
~lanes		0.5	0.5			1.0	

	vol/hr South approach						
	left slip	left	str	right		L+S+R	Peds
AM			960	397		**1 357**	
			0	0		**0**	
PM			316	196		**512**	
~lanes			0.5	0.5		1.0	

	vol/hr West approach						
	left slip	left	str	right		L+S+R	Peds
AM			0	0		**0**	
			0	0		**0**	
PM			0	0		**0**	
~lanes							

	vol/hr East approach							veh vol Total
	left slip	left	str	right		L+S+R	Peds	
AM		168	0	48		**216**		**2 058**
		0	0	0		**0**		**0**
PM		291	0	124		**415**		**1 820**
~lanes		1.0		1.0		2.0		**13 367**

Control

North approach			
L slip	L	S	R

South approach			
L slip	L	S	R

West approach			
L slip	L	S	R
		Stop	Stop

East approach			
L slip	L	S	R
	Stop	Stop	Stop

approx. capacity
3 065
#DIV/0!
3 396

Volume to Capacity ratio

LOS A<0.5, B<0.8, C<0.9, D<0.95, E<0.99

LOS	A-B	C-D	E	F

	V/C North approach						
	L slip	L	S	R		all	Peds
AM		0.25	0.25			**0.25**	
PM		0.46	0.46			**0.46**	

	V/C South approach						
	L slip	L	S	R		all	Peds
AM			0.85	0.85		**0.85**	
PM			0.37	0.37		**0.37**	

	V/C West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	V/C East approach							V/C i/section
	L slip	L	S	R		all	Peds	
AM		0.26		1.35		**0.50**		0.67
PM		0.75		1.23		**0.90**		0.54
max V/C; movement, approach, pedestrian, i/s								
					1.35	0.90		**0.67**

Average Delay per vehicle (seconds)

LOS A<10, B<15, C<25, D<35, E<50

LOS	A-B	C-D	E	F

	Ave Delay North approach						
	L slip	L	S	R		all	Peds
AM		1	1			**1**	*1*
PM		2	2			**2**	*2*

	Ave Delay South approach						
	L slip	L	S	R		all	Peds
AM			9	12		**10**	*9*
PM			1	3		**2**	*1*

	Ave Delay West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	Ave Delay East approach							ave. del i/section
	L slip	L	S	R		all	Peds	
AM		9		554		**130**	*554*	21
PM		18		425		**140**	*425*	33

Average Queue Length (= Total Delay in veh-hrs/hr)

	Q North approach						
	L slip	L	S	R		all	Peds
AM		0.0	0.1			**0.1**	
PM		0.1	0.3			**0.4**	
max		*0.1*	*0.3*				

	Q South approach						
	L slip	L	S	R		all	Peds
AM			2.5	1.3		**3.8**	
PM			0.1	0.2		**0.3**	
max			*2.5*	*1.3*			

	Q West approach						
	L slip	L	S	R		all	Peds
AM							
PM							

	Q East approach							Q Total
	L slip	L	S	R		all	Peds	
AM		0.4		7.4		**7.8**		**11.7**
PM		1.5		14.6		**16.1**		**16.7**
max		*1.5*		*14.6*				**28.5**

MOVEMENT SUMMARY

Site: 2017 AM BG

Akker Avenue / Chamfuti Crescent North Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	432	0.0	0.212	1.3	LOS A	2.2	15.3	0.46	0.00	52.0
3	R	2	0.0	0.211	9.7	LOS A	2.2	15.3	0.46	0.97	49.3
Approach		434	0.0	0.212	1.4	LOS A	2.2	15.3	0.46	0.00	52.0
East: Chamfuti Crescent North (E)											
4	L	7	0.0	0.164	20.6	LOS C	0.7	5.2	0.66	0.80	39.0
6	R	45	0.0	0.165	20.4	LOS C	0.7	5.2	0.66	1.00	39.2
Approach		53	0.0	0.165	20.4	LOS C	0.7	5.2	0.66	0.97	39.2
North: Akker Avenue (N)											
7	L	23	0.0	0.123	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	226	0.0	0.122	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		249	0.0	0.122	0.8	LOS A	0.0	0.0	0.00	0.10	58.8
All Vehicles		736	0.0	0.212	2.5	NA	2.2	15.3	0.32	0.10	52.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 PM BG

Akker Avenue / Chamfuti Crescent North Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	147	0.0	0.073	1.4	LOS A	0.7	4.9	0.45	0.00	52.1
3	R	1	0.0	0.075	9.8	LOS A	0.7	4.9	0.45	0.96	49.3
Approach		148	0.0	0.073	1.4	LOS A	0.7	4.9	0.45	0.01	52.1
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.039	15.7	LOS C	0.2	1.2	0.53	0.81	42.6
6	R	17	0.0	0.039	15.5	LOS C	0.2	1.2	0.53	0.92	42.8
Approach		18	0.0	0.039	15.5	LOS C	0.2	1.2	0.53	0.91	42.8
North: Akker Avenue (N)											
7	L	29	0.0	0.150	8.2	LOS A	0.0	0.0	0.00	1.02	49.0
8	T	277	0.0	0.150	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		306	0.0	0.150	0.8	LOS A	0.0	0.0	0.00	0.10	58.7
All Vehicles		473	0.0	0.150	1.6	NA	0.7	4.9	0.16	0.10	55.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: 2022 AM BG

Akker Avenue / Chamfuti Crescent North Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	500	0.0	0.246	1.7	LOS A	2.7	19.0	0.52	0.00	51.2
3	R	2	0.0	0.234	10.1	LOS B	2.7	19.0	0.52	0.97	49.4
Approach		502	0.0	0.246	1.7	LOS B	2.7	19.0	0.52	0.00	51.2
East: Chamfuti Crescent North (E)											
4	L	8	0.0	0.241	24.9	LOS C	1.1	7.7	0.74	0.86	36.3
6	R	53	0.0	0.238	24.8	LOS C	1.1	7.7	0.74	1.02	36.4
Approach		61	0.0	0.239	24.8	LOS C	1.1	7.7	0.74	1.00	36.4
North: Akker Avenue (N)											
7	L	26	0.0	0.141	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	263	0.0	0.142	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		289	0.0	0.142	0.7	LOS A	0.0	0.0	0.00	0.09	58.8
All Vehicles		853	0.0	0.246	3.0	NA	2.7	19.0	0.36	0.11	52.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:41:49 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\03 Akker_Chamfuti N\BG\Existing\Akker_Chamfuti N_REV1(C).sip

MOVEMENT SUMMARY

Site: 2022 PM BG

Akker Avenue / Chamfuti Crescent North Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	171	0.0	0.084	1.7	LOS A	0.9	6.0	0.50	0.00	51.5
3	R	1	0.0	0.088	10.1	LOS B	0.9	6.0	0.50	0.97	49.4
Approach		172	0.0	0.084	1.8	LOS B	0.9	6.0	0.50	0.01	51.5
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.053	17.1	LOS C	0.2	1.6	0.57	0.83	41.6
6	R	20	0.0	0.052	16.9	LOS C	0.2	1.6	0.57	0.95	41.7
Approach		21	0.0	0.052	16.9	LOS C	0.2	1.6	0.57	0.95	41.7
North: Akker Avenue (N)											
7	L	34	0.0	0.174	8.2	LOS A	0.0	0.0	0.00	1.02	49.0
8	T	320	0.0	0.173	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		354	0.0	0.173	0.8	LOS A	0.0	0.0	0.00	0.10	58.7
All Vehicles		546	0.0	0.174	1.7	NA	0.9	6.0	0.18	0.10	55.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

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SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\03 Akker_Chamfuti N\BG\Existing\Akker_Chamfuti N_REV1(C).sip

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 AM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	549	0.0	0.270	1.7	LOS A	3.1	21.4	0.53	0.00	51.0
3	R	2	0.0	0.263	10.1	LOS B	3.1	21.4	0.53	0.97	49.4
Approach		552	0.0	0.270	1.7	LOS B	3.1	21.4	0.53	0.00	51.0
East: Chamfuti Crescent North (E)											
4	L	7	0.0	0.230	26.6	LOS D	1.0	7.2	0.76	0.86	35.3
6	R	45	0.0	0.229	26.5	LOS D	1.0	7.2	0.76	1.02	35.4
Approach		53	0.0	0.229	26.5	LOS D	1.0	7.2	0.76	1.00	35.4
North: Akker Avenue (N)											
7	L	23	0.0	0.142	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	266	0.0	0.142	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		289	0.0	0.142	0.7	LOS A	0.0	0.0	0.00	0.08	58.9
All Vehicles		894	0.0	0.270	2.9	NA	3.1	21.4	0.37	0.09	51.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:38:29 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\03 Akker_Chamfuti N\BG+D\Existing\Akker_Chamfuti N_REV1(C).sip

SIDRA INTERSECTION

Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
2017 AM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	154	0.0	0.076	1.6	LOS A	0.8	5.3	0.48	0.00	51.7
3	R	1	0.0	0.075	10.0	LOS A	0.8	5.3	0.48	0.96	49.4
Approach		155	0.0	0.076	1.6	LOS A	0.8	5.3	0.48	0.01	51.7
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.042	16.4	LOS C	0.2	1.3	0.55	0.82	42.1
6	R	17	0.0	0.041	16.2	LOS C	0.2	1.3	0.55	0.93	42.3
Approach		18	0.0	0.041	16.2	LOS C	0.2	1.3	0.55	0.92	42.3
North: Akker Avenue (N)											
7	L	29	0.0	0.165	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	306	0.0	0.165	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		336	0.0	0.165	0.7	LOS A	0.0	0.0	0.00	0.09	58.8
All Vehicles		508	0.0	0.165	1.5	NA	0.8	5.3	0.17	0.09	55.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:38:37 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\03 Akker_Chamfuti N\BG+D\Existing\Akker_Chamfuti N_REV1(C).sip
Unlicensed Trial Version

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent North Junction
2022 AM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	513	0.0	0.252	1.6	LOS A	2.8	19.3	0.50	0.00	51.4
3	R	2	0.0	0.263	10.0	LOS A	2.8	19.3	0.50	0.97	49.4
Approach		515	0.0	0.252	1.6	LOS A	2.8	19.3	0.50	0.00	51.3
East: Chamfuti Crescent North (E)											
4	L	8	0.0	0.241	24.9	LOS C	1.1	7.7	0.74	0.85	36.4
6	R	53	0.0	0.238	24.7	LOS C	1.1	7.7	0.74	1.02	36.5
Approach		61	0.0	0.238	24.7	LOS C	1.1	7.7	0.74	1.00	36.5
North: Akker Avenue (N)											
7	L	26	0.0	0.135	8.2	LOS A	0.0	0.0	0.00	1.02	49.0
8	T	249	0.0	0.135	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		276	0.0	0.135	0.8	LOS A	0.0	0.0	0.00	0.10	58.7
All Vehicles		852	0.0	0.263	3.0	NA	2.8	19.3	0.36	0.11	52.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:38:49 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\03 Akker_Chamfuti N\BG+D\Existing\Akker_Chamfuti N_REV1(C).sip
Unlicensed Trial Version

Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent North Junction
2022 PM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	171	0.0	0.084	1.8	LOS A	0.9	6.1	0.51	0.00	51.3
3	R	1	0.0	0.088	10.2	LOS B	0.9	6.1	0.51	0.97	49.3
Approach		172	0.0	0.084	1.9	LOS B	0.9	6.1	0.51	0.01	51.3
East: Chamfuti Crescent North (E)											
4	L	1	0.0	0.053	17.4	LOS C	0.2	1.7	0.58	0.84	41.3
6	R	20	0.0	0.054	17.2	LOS C	0.2	1.7	0.58	0.96	41.4
Approach		21	0.0	0.054	17.3	LOS C	0.2	1.7	0.58	0.95	41.4
North: Akker Avenue (N)											
7	L	34	0.0	0.182	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	338	0.0	0.182	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		372	0.0	0.182	0.7	LOS A	0.0	0.0	0.00	0.09	58.8
All Vehicles		564	0.0	0.182	1.7	NA	0.9	6.1	0.18	0.10	55.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:39:07 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\03 Akker_Chamfuti N\BG+D\Existing\Akker_Chamfuti N_REV1(C).sip
Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 AM BG

Akker Avenue / Chamfuti Crescent South Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	340	0.0	0.167	0.9	LOS A	1.6	11.0	0.38	0.00	53.2
3	R	1	0.0	0.175	9.3	LOS A	1.6	11.0	0.38	0.97	49.2
Approach		341	0.0	0.167	1.0	LOS A	1.6	11.0	0.38	0.00	53.2
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.081	17.5	LOS C	0.4	2.6	0.57	0.76	41.2
6	R	31	0.0	0.083	17.3	LOS C	0.4	2.6	0.57	0.98	41.4
Approach		33	0.0	0.082	17.3	LOS C	0.4	2.6	0.57	0.97	41.3
North: Akker Avenue (N)											
7	L	16	0.0	0.096	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	181	0.0	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		197	0.0	0.096	0.7	LOS A	0.0	0.0	0.00	0.08	58.9
All Vehicles		571	0.0	0.175	1.8	NA	1.6	11.0	0.26	0.09	54.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 31 October 2016 04:31:05 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\04 Akker_Chamfuti S\BG\Existing\Akker_Chamfuti S_REV1(C).sip

MOVEMENT SUMMARY

Site: 2017 PM BG

Akker Avenue / Chamfuti Crescent South Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	106	0.0	0.053	0.9	LOS A	0.5	3.2	0.38	0.00	53.3
3	R	1	0.0	0.053	9.3	LOS A	0.5	3.2	0.38	0.96	49.2
Approach		107	0.0	0.053	1.0	LOS A	0.5	3.2	0.38	0.01	53.3
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.028	13.8	LOS B	0.1	0.9	0.45	0.78	44.1
6	R	15	0.0	0.028	13.7	LOS B	0.1	0.9	0.45	0.88	44.3
Approach		16	0.0	0.028	13.7	LOS B	0.1	0.9	0.45	0.87	44.3
North: Akker Avenue (N)											
7	L	31	0.0	0.111	8.2	LOS A	0.0	0.0	0.00	1.00	49.0
8	T	196	0.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		226	0.0	0.111	1.1	LOS A	0.0	0.0	0.00	0.13	58.2
All Vehicles		349	0.0	0.111	1.6	NA	0.5	3.2	0.14	0.13	55.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 31 October 2016 04:34:25 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\04 Akker_Chamfuti S\BG\Existing\Akker_Chamfuti S_REV1(C).sip

MOVEMENT SUMMARY

Site: 2022 AM BG

Akker Avenue / Chamfuti Crescent South Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	395	0.0	0.193	1.1	LOS A	1.9	13.4	0.43	0.00	52.5
3	R	1	0.0	0.211	9.6	LOS A	1.9	13.4	0.43	0.97	49.3
Approach		396	0.0	0.193	1.2	LOS A	1.9	13.4	0.43	0.00	52.5
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.111	19.6	LOS C	0.5	3.4	0.64	0.77	39.7
6	R	35	0.0	0.110	19.4	LOS C	0.5	3.4	0.64	1.00	39.9
Approach		37	0.0	0.110	19.4	LOS C	0.5	3.4	0.64	0.99	39.9
North: Akker Avenue (N)											
7	L	19	0.0	0.112	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	209	0.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		228	0.0	0.112	0.7	LOS A	0.0	0.0	0.00	0.09	58.9
All Vehicles		661	0.0	0.211	2.0	NA	1.9	13.4	0.29	0.09	53.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 31 October 2016 04:34:32 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\04 Akker_Chamfuti S\BG\Existing\Akker_Chamfuti S_REV1(C).sip
Unlicensed Trial Version

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2022 PM BG

Akker Avenue / Chamfuti Crescent South Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	123	0.0	0.061	1.1	LOS A	0.6	3.9	0.41	0.00	52.7
3	R	1	0.0	0.062	9.5	LOS A	0.6	3.9	0.41	0.96	49.2
Approach		124	0.0	0.061	1.2	LOS A	0.6	3.9	0.41	0.01	52.7
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.036	14.6	LOS B	0.2	1.2	0.49	0.79	43.5
6	R	18	0.0	0.036	14.4	LOS B	0.2	1.2	0.49	0.90	43.7
Approach		19	0.0	0.036	14.4	LOS B	0.2	1.2	0.49	0.89	43.6
North: Akker Avenue (N)											
7	L	35	0.0	0.129	8.2	LOS A	0.0	0.0	0.00	1.00	49.0
8	T	227	0.0	0.129	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		262	0.0	0.129	1.1	LOS A	0.0	0.0	0.00	0.13	58.3
All Vehicles		405	0.0	0.129	1.7	NA	0.6	3.9	0.15	0.13	55.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 31 October 2016 04:34:42 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\04 Akker_Chamfuti S\BG\Existing\Akker_Chamfuti S_REV1(C).sip
Unlicensed Trial Version

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 AM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	459	0.0	0.225	1.2	LOS A	2.3	16.2	0.45	0.00	52.2
3	R	1	0.0	0.211	9.7	LOS A	2.3	16.2	0.45	0.97	49.3
Approach		460	0.0	0.225	1.3	LOS A	2.3	16.2	0.45	0.00	52.2
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.111	21.5	LOS C	0.5	3.4	0.69	0.77	38.5
6	R	31	0.0	0.112	21.3	LOS C	0.5	3.4	0.69	1.00	38.6
Approach		33	0.0	0.112	21.3	LOS C	0.5	3.4	0.69	0.99	38.6
North: Akker Avenue (N)											
7	L	16	0.0	0.115	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
8	T	220	0.0	0.115	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		236	0.0	0.115	0.5	LOS A	0.0	0.0	0.00	0.07	59.1
All Vehicles		728	0.0	0.225	1.9	NA	2.3	16.2	0.31	0.07	53.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2017 PM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	154	0.0	0.076	1.6	LOS A	0.8	5.3	0.48	0.00	51.7
3	R	1	0.0	0.075	10.0	LOS A	0.8	5.3	0.48	0.96	49.4
Approach		155	0.0	0.076	1.6	LOS A	0.8	5.3	0.48	0.01	51.7
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.036	16.3	LOS C	0.2	1.1	0.55	0.82	42.2
6	R	15	0.0	0.036	16.1	LOS C	0.2	1.1	0.55	0.93	42.3
Approach		16	0.0	0.036	16.1	LOS C	0.2	1.1	0.55	0.92	42.3
North: Akker Avenue (N)											
7	L	31	0.0	0.165	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	306	0.0	0.165	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		337	0.0	0.165	0.7	LOS A	0.0	0.0	0.00	0.09	58.8
All Vehicles		507	0.0	0.165	1.5	NA	0.8	5.3	0.16	0.09	55.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:45:28 PM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\04 Akker_Chamfuti S\BG+D\Existing\Akker_Chamfuti S_REV1(C).sip

Unlicensed Trial Version
MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 AM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	513	0.0	0.251	1.5	LOS A	2.7	19.1	0.50	0.00	51.5
3	R	1	0.0	0.263	9.9	LOS A	2.7	19.1	0.50	0.97	49.4
Approach		514	0.0	0.251	1.5	LOS A	2.7	19.1	0.50	0.00	51.5
East: Chamfuti Crescent South (E)											
4	L	2	0.0	0.150	24.5	LOS C	0.6	4.5	0.75	0.79	36.6
6	R	35	0.0	0.152	24.3	LOS C	0.6	4.5	0.75	1.00	36.7
Approach		37	0.0	0.152	24.3	LOS C	0.6	4.5	0.75	0.99	36.7
North: Akker Avenue (N)											
7	L	19	0.0	0.132	8.2	LOS A	0.0	0.0	0.00	1.04	49.0
8	T	249	0.0	0.131	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		268	0.0	0.131	0.6	LOS A	0.0	0.0	0.00	0.07	59.1
All Vehicles		819	0.0	0.263	2.2	NA	2.7	19.1	0.35	0.07	52.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:45:37 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\04 Akker_Chamfuti S\BG+D\Existing\Akker_Chamfuti S_REV1(C).sip
Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Chamfuti Crescent South Junction
2022 PM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Akker Avenue (S)											
2	T	171	0.0	0.084	1.8	LOS A	0.9	6.1	0.51	0.00	51.3
3	R	1	0.0	0.088	10.2	LOS B	0.9	6.1	0.51	0.97	49.3
Approach		172	0.0	0.084	1.9	LOS B	0.9	6.1	0.51	0.01	51.2
East: Chamfuti Crescent South (E)											
4	L	1	0.0	0.048	17.4	LOS C	0.2	1.5	0.58	0.84	41.3
6	R	18	0.0	0.048	17.2	LOS C	0.2	1.5	0.58	0.95	41.5
Approach		19	0.0	0.048	17.2	LOS C	0.2	1.5	0.58	0.95	41.5
North: Akker Avenue (N)											
7	L	35	0.0	0.183	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
8	T	338	0.0	0.183	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		373	0.0	0.183	0.8	LOS A	0.0	0.0	0.00	0.10	58.8
All Vehicles		563	0.0	0.183	1.7	NA	0.9	6.1	0.18	0.10	55.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: 2017 AM BG

Akker Avenue / Msasa Crescent Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	5	0.0	0.026	14.7	LOS B	0.1	0.8	0.43	0.78	43.4
3	R	8	0.0	0.026	14.5	LOS B	0.1	0.8	0.43	0.94	43.5
Approach		14	0.0	0.026	14.6	LOS B	0.1	0.8	0.43	0.88	43.5
East: Akker Avenue (E)											
4	L	7	0.0	0.086	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
5	T	168	0.0	0.086	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		176	0.0	0.086	0.3	LOS A	0.0	0.0	0.00	0.04	59.4
West: Akker Avenue (W)											
11	T	309	0.0	0.163	0.8	LOS A	1.4	10.0	0.35	0.00	53.7
12	R	5	0.0	0.164	9.2	LOS A	1.4	10.0	0.35	0.98	49.1
Approach		315	0.0	0.163	1.0	LOS A	1.4	10.0	0.35	0.02	53.6
All Vehicles		504	0.0	0.164	1.1	NA	1.4	10.0	0.23	0.05	55.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: 2017 PM BG

Akker Avenue / Msasa Crescent Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	3	0.0	0.009	12.4	LOS B	0.0	0.3	0.35	0.80	45.3
3	R	3	0.0	0.009	12.3	LOS B	0.0	0.3	0.35	0.88	45.5
Approach		6	0.0	0.009	12.3	LOS B	0.0	0.3	0.35	0.84	45.4
East: Akker Avenue (E)											
4	L	9	0.0	0.091	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
5	T	177	0.0	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		186	0.0	0.091	0.4	LOS A	0.0	0.0	0.00	0.05	59.3
West: Akker Avenue (W)											
11	T	93	0.0	0.053	0.7	LOS A	0.4	2.9	0.32	0.00	54.0
12	R	6	0.0	0.053	9.2	LOS A	0.4	2.9	0.32	0.95	49.0
Approach		99	0.0	0.053	1.3	LOS A	0.4	2.9	0.32	0.06	53.7
All Vehicles		292	0.0	0.091	1.0	NA	0.4	2.9	0.12	0.07	56.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 01 November 2016 08:34:09 AM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\05 Akker_Msasa\BG\Existing\Akker_Msasa_REV1(C).sip
Unlicensed Trial Version

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2022 AM BG

Akker Avenue / Msasa Crescent Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: Msasa Crescent (S)											
1	L	6	0.0	0.036	15.8	LOS C	0.2	1.1	0.48	0.78	42.5
3	R	11	0.0	0.036	15.7	LOS C	0.2	1.1	0.48	0.97	42.6
Approach		17	0.0	0.036	15.7	LOS C	0.2	1.1	0.48	0.90	42.6
East: Akker Avenue (E)											
4	L	8	0.0	0.099	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
5	T	195	0.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		203	0.0	0.099	0.3	LOS A	0.0	0.0	0.00	0.04	59.4
West: Akker Avenue (W)											
11	T	358	0.0	0.189	1.0	LOS A	1.7	12.1	0.39	0.00	53.0
12	R	6	0.0	0.191	9.4	LOS A	1.7	12.1	0.39	0.97	49.2
Approach		364	0.0	0.189	1.1	LOS A	1.7	12.1	0.39	0.02	53.0
All Vehicles		584	0.0	0.191	1.3	NA	1.7	12.1	0.26	0.05	54.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2022 PM BG

Akker Avenue / Msasa Crescent Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	4	0.0	0.012	12.8	LOS B	0.1	0.4	0.39	0.80	45.0
3	R	4	0.0	0.012	12.6	LOS B	0.1	0.4	0.39	0.89	45.2
Approach		8	0.0	0.012	12.7	LOS B	0.1	0.4	0.39	0.85	45.1
East: Akker Avenue (E)											
4	L	12	0.0	0.106	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
5	T	205	0.0	0.106	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		217	0.0	0.106	0.4	LOS A	0.0	0.0	0.00	0.06	59.3
West: Akker Avenue (W)											
11	T	106	0.0	0.061	0.9	LOS A	0.5	3.4	0.36	0.00	53.5
12	R	7	0.0	0.061	9.3	LOS A	0.5	3.4	0.36	0.94	49.0
Approach		114	0.0	0.061	1.4	LOS A	0.5	3.4	0.36	0.06	53.2
All Vehicles		339	0.0	0.106	1.1	NA	0.5	3.4	0.13	0.08	56.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 01 November 2016 08:33:53 AM
SIDRA INTERSECTION 5.0.0.1354
Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\05 Akker_Msasa\BG\Existing\Akker_Msasa_REV1(C).sip
Unlicensed Trial Version

MOVEMENT SUMMARY

Site: 2017 AM BGD

Akker Avenue / Msasa Crescent Junction
2017 AM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	5	0.0	0.329	19.3	LOS C	1.9	13.0	0.64	0.85	39.9
3	R	126	0.0	0.324	19.1	LOS C	1.9	13.0	0.64	1.04	40.1
Approach		132	0.0	0.324	19.1	LOS C	1.9	13.0	0.64	1.04	40.1
East: Akker Avenue (E)											
4	L	47	0.0	0.106	8.2	LOS A	0.0	0.0	0.00	0.95	49.0
5	T	168	0.0	0.106	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		216	0.0	0.106	1.8	LOS A	0.0	0.0	0.00	0.21	57.2
West: Akker Avenue (W)											
11	T	309	0.0	0.163	1.0	LOS A	1.5	10.3	0.39	0.00	53.0
12	R	5	0.0	0.164	9.5	LOS A	1.5	10.3	0.39	0.97	49.2
Approach		315	0.0	0.163	1.2	LOS A	1.5	10.3	0.39	0.02	52.9
All Vehicles		662	0.0	0.329	4.9	NA	1.9	13.0	0.31	0.28	50.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:49:30 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\05 Akker_Msasa\BG+D\Existing\Akker_Msasa_REV1(C).sip

MOVEMENT SUMMARY

Site: 2017 PM BGD

Akker Avenue / Msasa Crescent Junction
2017 PM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	3	0.0	0.099	14.4	LOS B	0.5	3.3	0.49	0.82	43.7
3	R	51	0.0	0.097	14.2	LOS B	0.5	3.3	0.49	0.92	43.9
Approach		54	0.0	0.097	14.2	LOS B	0.5	3.3	0.49	0.92	43.8
East: Akker Avenue (E)											
4	L	120	0.0	0.148	8.2	LOS A	0.0	0.0	0.00	0.86	49.0
5	T	177	0.0	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		297	0.0	0.148	3.3	LOS A	0.0	0.0	0.00	0.35	55.0
West: Akker Avenue (W)											
11	T	93	0.0	0.053	1.3	LOS A	0.5	3.2	0.42	0.00	52.4
12	R	6	0.0	0.054	9.7	LOS A	0.5	3.2	0.42	0.94	49.1
Approach		99	0.0	0.053	1.8	LOS A	0.5	3.2	0.42	0.06	52.2
All Vehicles		449	0.0	0.148	4.3	NA	0.5	3.3	0.15	0.35	52.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:49:46 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\05 Akker_Msasa\BG+D\Existing\Akker_Msasa_REV1(C).sip

MOVEMENT SUMMARY

Site: 2022 AM BGD

Akker Avenue / Msasa Crescent Junction
2022 AM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	6	0.0	0.372	22.1	LOS C	2.3	15.8	0.70	0.90	38.1
3	R	128	0.0	0.381	21.9	LOS C	2.3	15.8	0.70	1.07	38.2
Approach		135	0.0	0.381	21.9	LOS C	2.3	15.8	0.70	1.06	38.2
East: Akker Avenue (E)											
4	L	48	0.0	0.120	8.2	LOS A	0.0	0.0	0.00	0.96	49.0
5	T	195	0.0	0.120	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		243	0.0	0.120	1.6	LOS A	0.0	0.0	0.00	0.19	57.4
West: Akker Avenue (W)											
11	T	358	0.0	0.189	1.2	LOS A	1.8	12.6	0.43	0.00	52.4
12	R	6	0.0	0.191	9.7	LOS A	1.8	12.6	0.43	0.97	49.3
Approach		364	0.0	0.189	1.4	LOS A	1.8	12.6	0.43	0.02	52.3
All Vehicles		742	0.0	0.381	5.2	NA	2.3	15.8	0.34	0.26	50.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:49:56 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\05 Akker_Msasa\BG+D\Existing\Akker_Msasa_REV1(C).sip

MOVEMENT SUMMARY

Site: 2022 PM BGD

Akker Avenue / Msasa Crescent Junction
2022 PM Peak Hour Background and Developement Traffic Volumes
Existing Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	4	0.0	0.105	15.0	LOS B	0.5	3.5	0.52	0.84	43.2
3	R	51	0.0	0.106	14.8	LOS B	0.5	3.5	0.52	0.94	43.4
Approach		55	0.0	0.106	14.8	LOS B	0.5	3.5	0.52	0.94	43.3
East: Akker Avenue (E)											
4	L	121	0.0	0.162	8.2	LOS A	0.0	0.0	0.00	0.88	49.0
5	T	205	0.0	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		326	0.0	0.162	3.0	LOS A	0.0	0.0	0.00	0.32	55.4
West: Akker Avenue (W)											
11	T	106	0.0	0.062	1.5	LOS A	0.5	3.8	0.45	0.00	52.0
12	R	7	0.0	0.062	9.9	LOS A	0.5	3.8	0.45	0.94	49.1
Approach		114	0.0	0.062	2.0	LOS A	0.5	3.8	0.45	0.06	51.8
All Vehicles		495	0.0	0.162	4.1	NA	0.5	3.8	0.16	0.33	52.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: 2017 AM BGD

Msasa Crescent / Proposed Access Junction
2017 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	1	0.0	0.001	8.2	LOS A	0.0	0.0	0.00	0.82	49.0
2	T	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2	0.0	0.001	4.1	LOS A	0.0	0.0	0.00	0.41	53.9
North: Msasa Crescent (N)											
8	T	1	0.0	0.028	0.0	LOS A	0.1	1.0	0.02	0.00	59.5
9	R	39	0.0	0.028	8.5	LOS A	0.1	1.0	0.02	0.70	48.5
Approach		40	0.0	0.028	8.2	LOS A	0.1	1.0	0.02	0.68	48.8
West: Propose Access (W)											
10	L	118	0.0	0.100	10.7	LOS B	0.5	3.4	0.02	0.98	46.4
12	R	1	0.0	0.096	10.5	LOS B	0.5	3.4	0.02	1.04	46.5
Approach		119	0.0	0.100	10.7	LOS B	0.5	3.4	0.02	0.99	46.4
All Vehicles		161	0.0	0.100	10.0	NA	0.5	3.4	0.02	0.90	47.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:55:07 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\06 Msasa_Access\BG+D\Proposed\Msasa_Access_REV1(C).sip

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2017 PM BGD

Msasa Crescent / Proposed Access Junction
2017 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	1	0.0	0.001	8.2	LOS A	0.0	0.0	0.00	0.82	49.0
2	T	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2	0.0	0.001	4.1	LOS A	0.0	0.0	0.00	0.41	53.9
North: Msasa Crescent (N)											
8	T	1	0.0	0.075	0.0	LOS A	0.4	2.8	0.02	0.00	59.4
9	R	111	0.0	0.077	8.5	LOS A	0.4	2.8	0.02	0.69	48.5
Approach		112	0.0	0.077	8.4	LOS A	0.4	2.8	0.02	0.68	48.6
West: Propose Access (W)											
10	L	47	0.0	0.041	10.7	LOS B	0.2	1.3	0.01	0.99	46.4
12	R	1	0.0	0.040	10.5	LOS B	0.2	1.3	0.01	1.04	46.5
Approach		48	0.0	0.041	10.7	LOS B	0.2	1.3	0.01	0.99	46.4
All Vehicles		162	0.0	0.077	9.0	NA	0.4	2.8	0.02	0.77	48.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:55:46 PM
SIDRA INTERSECTION 5.0.0.1354
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Unlicensed Trial Version

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2022 AM BGD

Msasa Crescent / Proposed Access Junction
2022 AM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	1	0.0	0.001	8.2	LOS A	0.0	0.0	0.00	0.82	49.0
2	T	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2	0.0	0.001	4.1	LOS A	0.0	0.0	0.00	0.41	53.9
North: Msasa Crescent (N)											
8	T	1	0.0	0.028	0.0	LOS A	0.1	1.0	0.02	0.00	59.5
9	R	39	0.0	0.028	8.5	LOS A	0.1	1.0	0.02	0.70	48.5
Approach		40	0.0	0.028	8.2	LOS A	0.1	1.0	0.02	0.68	48.8
West: Propose Access (W)											
10	L	118	0.0	0.100	10.7	LOS B	0.5	3.4	0.02	0.98	46.4
12	R	1	0.0	0.096	10.5	LOS B	0.5	3.4	0.02	1.04	46.5
Approach		119	0.0	0.100	10.7	LOS B	0.5	3.4	0.02	0.99	46.4
All Vehicles		161	0.0	0.100	10.0	NA	0.5	3.4	0.02	0.90	47.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:56:11 PM
SIDRA INTERSECTION 5.0.0.1354
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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: 2022 PM BGD

Msasa Crescent / Proposed Access Junction
2022 PM Peak Hour Background and Development Traffic Volumes
Proposed Configuration
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Msasa Crescent (S)											
1	L	1	0.0	0.001	8.2	LOS A	0.0	0.0	0.00	0.82	49.0
2	T	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2	0.0	0.001	4.1	LOS A	0.0	0.0	0.00	0.41	53.9
North: Msasa Crescent (N)											
8	T	1	0.0	0.075	0.0	LOS A	0.4	2.8	0.02	0.00	59.4
9	R	111	0.0	0.077	8.5	LOS A	0.4	2.8	0.02	0.69	48.5
Approach		112	0.0	0.077	8.4	LOS A	0.4	2.8	0.02	0.68	48.6
West: Propose Access (W)											
10	L	47	0.0	0.041	10.7	LOS B	0.2	1.3	0.01	0.99	46.4
12	R	1	0.0	0.040	10.5	LOS B	0.2	1.3	0.01	1.04	46.5
Approach		48	0.0	0.041	10.7	LOS B	0.2	1.3	0.01	0.99	46.4
All Vehicles		162	0.0	0.077	9.0	NA	0.4	2.8	0.02	0.77	48.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (HCM).

Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 18 November 2016 01:56:35 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\06 Msasa_Access\BG+D\Proposed\Msasa_Access_REV1(C).sip

ANNEXURE D

EXISTING TRAFFIC SIGNAL TIMING PLANS

OBTAINED FROM JRA

Yellow cells require input

1

Intersection	Shakespeare and Akker/ Alwen Rd West	
Draughting	M.Erasmus	Engineer
Designed by	M.Erasmus	Engineer
Checked by	A du Toit	Senior Traffic Engineer
Date	14-Apr-08	
Intersection nr	R2046	
Version	Version 1	
Version	1	

VERSION (Revise timings, offset, loops added? All plans etc?)

	Description	**Version to use**
AM peak		
Off Peak		
PM peak		
Night Peak		
Sat Peak		

2 **Clearance Distances**

		Straight	**Right**
Street Name N	Alwen Rd West	14.9	
Street Name E			
Street Name S	Shakespeare	22.9	
Street Name W	Akker		14.6

3

		Approach Speed [km/hr]	**Grade [%]**	**Clearance Distance**	**Yellow interval required [sec]**
Street Name N	Alwen Rd West	60	-2%	14.9	3.0
Street Name E	0			0.0	
Street Name S	Shakespeare	60	2%	22.9	3.0
Street Name W	Akker	60	4%	14.6	3.0

Use this table to determine Yellow interval

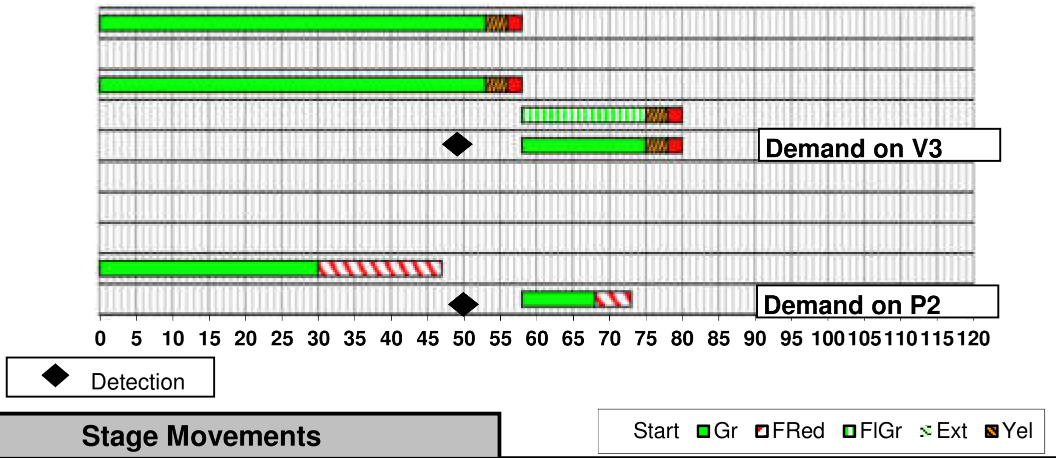
Speed	**Gradiant**		
	downhill	**downhill**	**flat/uphill**
	<-8	-8to-4	>-4
60	4	3.5	3
70	4.5	4	3.5
80	5	4.5	4

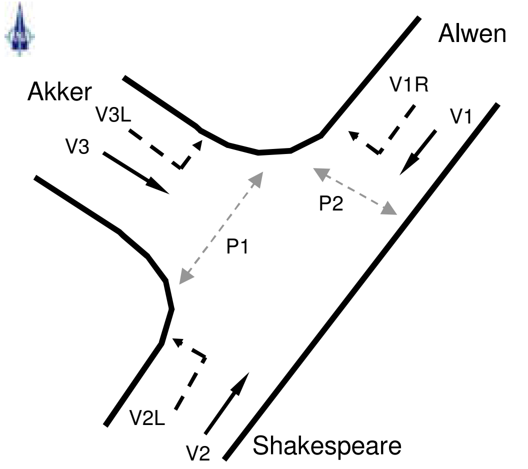
Shakespeare and Akker/ Alwen Rd West

Version 1

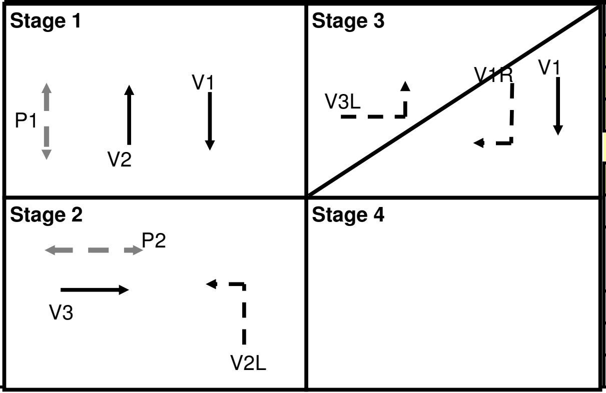
	Time							
Stage	**Start**	**Gr**	**FRed**	**FlGr**	**Ext**	**Yel**	**AR**	**Total**
V1	**0**	53.0				3.0	2.0	*58.0*
V1R								*0.0*
V2	**0**	53.0				3.0	2.0	*58.0*
V2L	**58**			17.0		3.0	2.0	*22.0*
V3	**58**	17.0				3.0	2.0	*22.0*
V3L								*0.0*
								0.0
								0.0
P1	**0**	30.0	17.0					*47.0*
P2	**58**	10.0	5.0					*15.0*
CYCLE								***80***

Semi VA Time Plan





Stage Movements



NOTES

Signal to rest in stage 1 until either V3 or P2 is called

P2 to operate on demand only

Version 1

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed:

Name: M.Erasmus

Position: Engineer

Date: 14-Apr-08

Johannesburg Roads Agency

Signed:

Name: A du Toit

Position: Senior Traffic Engineer

Date: 14-Apr-08

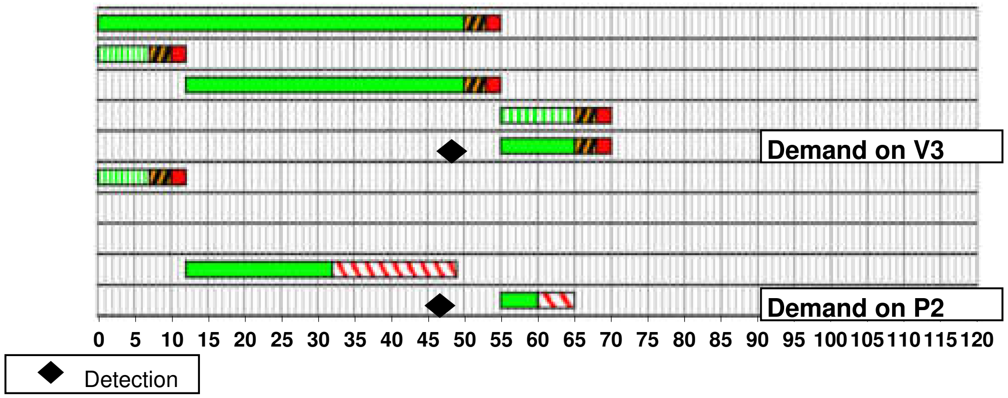
In operation		
Time Plan :	AM Peak	Plan 1
Cycle :	80	
From-To:	05:30-09:00	
Operation:	Semi VA Time Plan	
Offset:	0 "	
Version:	1	

Intersection Name:
Shakespeare and Akker/ Alwen Rd West

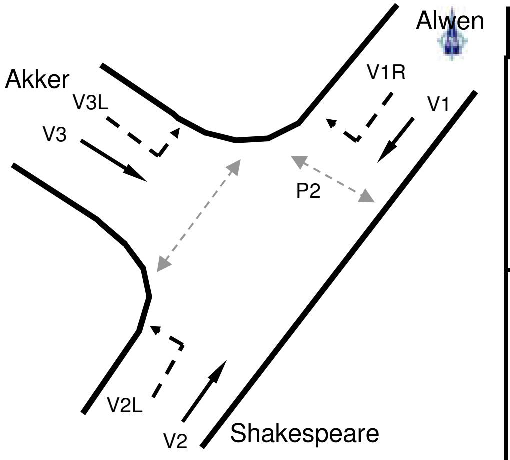
Intersection No.
R2046

Time								
Stage	Start	Gr	FRed	FlGr	Ext	Yel	AR	Total
V1	**0**	50.0				3.0	2.0	*55.0*
V1R	**0**			7.0		3.0	2.0	*12.0*
V2	**12**	38.0				3.0	2.0	*43.0*
V2L	**55**			10.0		3.0	2.0	*15.0*
V3	**55**	10.0				3.0	2.0	*15.0*
V3L	**0**			7.0		3.0	2.0	*12.0*
								0.0
								0.0
P1	**12**	20.0	17.0					*37.0*
P2	**55**	5.0	5.0					*10.0*
CYCLE								***70***

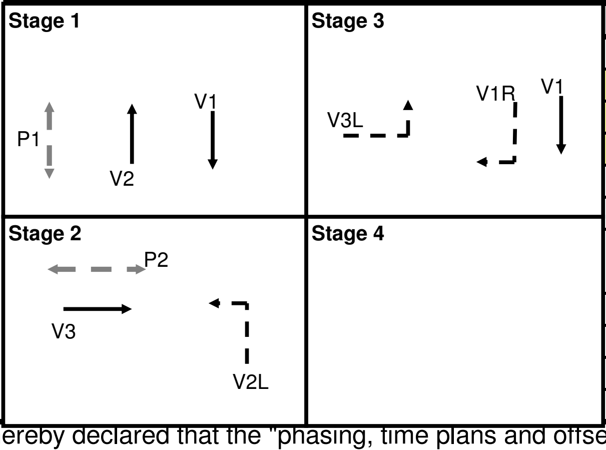
Semi VA Time Plan



Start 🟩Gr 🟥FRed 🟩FlGr ⚡Ext ▨Yel



Stage Movements



NOTES

Signal to rest in stage 1 until either V3 or P2 is called

P2 to operate on demand only

P2 Clearance time has been incorporated in to the IG period.

Version 1

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed:

Name: M.Erasmus

Position: Engineer

Date: 14-Apr-08

Johannesburg Roads Agency

Signed:

Name: A du Toit

Position: Senior Traffic Engineer

Date: 14-Apr-08

In operation	
Time Plan :	PM Peak Plan 2
Cycle :	70
From-To:	15:45-18:30
Operation:	Semi VA Time Plan
Offset:	0"
Version:	1

Intersection Name:
Shakespeare and Akker/ Alwen Rd West

Intersection No.
R2046

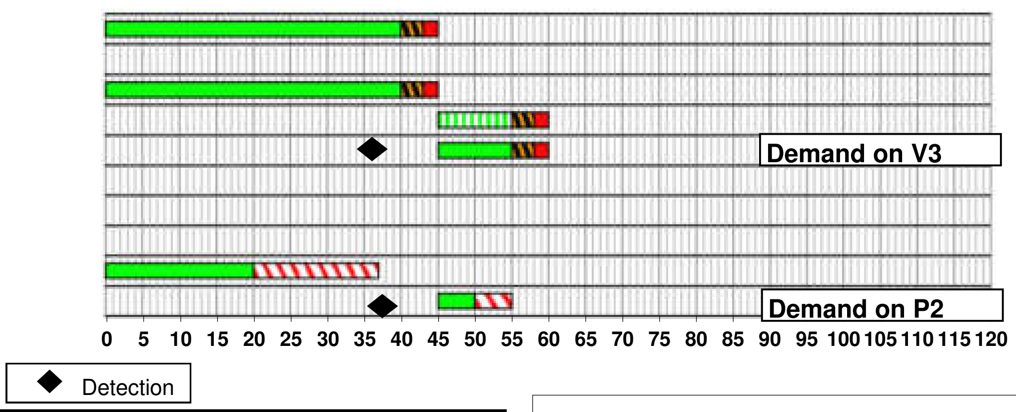
Shakespeare and Akker/ Alwen Rd West

Version 1

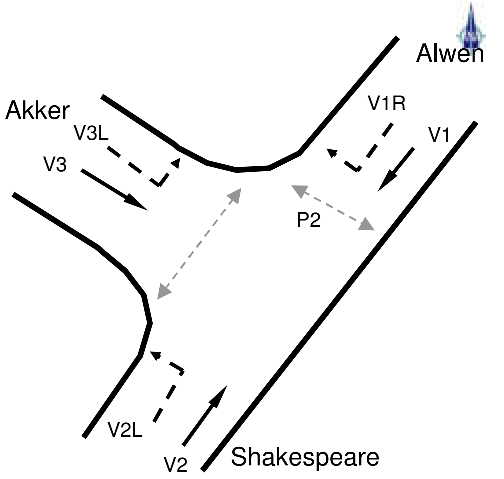
1. Signal Identification
2. Intersection Layout
3. Signal Layout
4. Signal Plans
5. Traffic Counts
6. Signal Timing Calculations
7. Other
8. Check-Lists

	Time							
Stage	**Start**	**Gr**	**FRed**	**FlGr**	**Ext**	**Yel**	**AR**	**Total**
V1	**0**	40.0				3.0	2.0	*45.0*
V1R								*0.0*
V2	**0**	40.0				3.0	2.0	*45.0*
V2L	**45**			10.0		3.0	2.0	*15.0*
V3	**45**	10.0				3.0	2.0	*15.0*
V3L								*0.0*
								0.0
								0.0
P1	**0**	20.0	17.0					*37.0*
P2	**45**	5.0	5.0					*10.0*
CYCLE								***60***

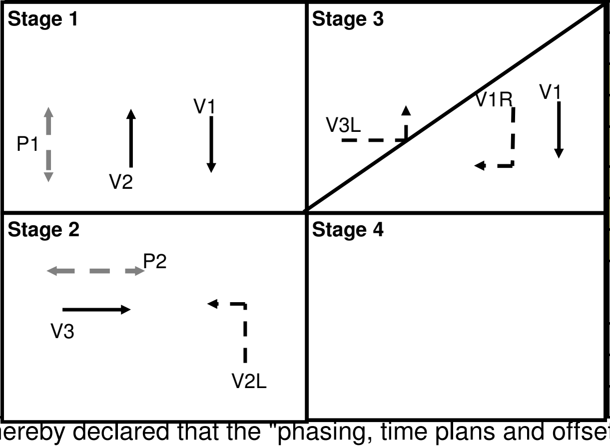
Semi VA Time Plan



Start 🟩Gr 🟥FRed 🟩FlGr ≈Ext ■Yel



Stage Movements



NOTES

Plan also to run on:

Weekday: 09:00-15:45, 18:30 - 24:00, 00:00 - 05:30

Saturday: 00:00 - 24:00

Sunday: 00:00-24:00

Signal to rest in stage 1 until either V3 or P2 is called

P2 to operate on demand only

P2 Clearance time has been incorporated in to the IG period.

National Road Traffic Regulation 287A. It is hereby declared that the "phasing, time plans and offset settings of the junction" is approved.

Signed:

Name: M.Erasmus

Position: Engineer

Date: 14-Apr-08

Johannesburg Roads Agency

Signed:

Name: A du Toit

Position: Senior Traffic Engineer

Date: 14-Apr-08

In operation

Time Plan :	Off Peak	Plan 3
Cycle :	60	
From-To:	09:00-15:45, 18:30-05:30	
Operation:	Semi VA Time Plan	
Offset:	0 "	
Version:	1	

Intersection Name:
Shakespeare and Akker/ Alwen Rd West

Intersection No.
R2046

Shakespeare and Akker/ Alwen Rd West

Version 1

1. Signal Identification
2. Intersection Layout
3. Signal Layout
4. Signal Plans
5. Traffic Counts
6. Signal Timing Calculations
7. Other
8. Check-Lists

Shakespeare and Akker/ Alwen Rd West

EVENTS TABLE

Day of the Week	Start Time	End Time	Plan No.	Cycle	Offset
Weekday	00:00	05:30	3 (OFF)	60	0
Weekday	05:30	09:00	1 (AM)	80	0
Weekday	09:00	15:45	3 (OFF)	60	0
Weekday	15:45	18:30	2 (PM)	70	0
Weekday	18:30	24:00	3 (OFF)	60	0
Saturday	00:00	24:00	3 (OFF)	60	0
Sunday	00:00	24:00	3 (OFF)	60	0

Signed:
Name: M.Erasmus
Positior Engineer
Date: 14-Apr-08

Johannesburg Roads Agency

Signed:
Name: A du Toit
Position: Senior Traffic Engineer
Date: 14-Apr-08

Intersection Name:
Shakespeare and Akker/ Alwen Rd West

Intersection No.:
R2046

ANNEXURE E

TRAFFIC SIGNAL PHASINGS AND TIMINGS

PHASING SUMMARY

Site: 2017 AM BG

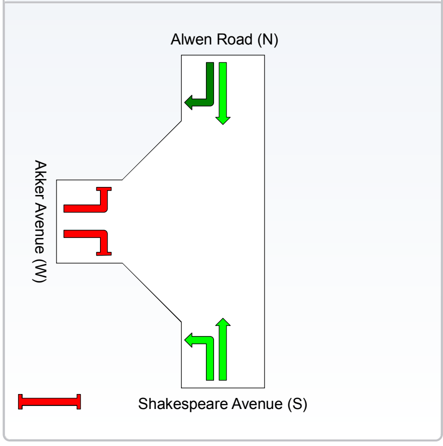
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background Traffic Volumes
Existing Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B
Output Sequence: A, B

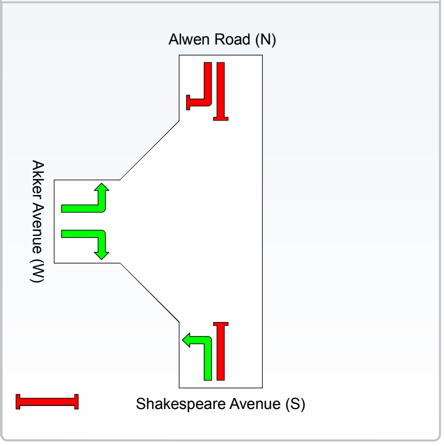
Phase Timing Results

Phase	**A**	**B**
Green Time (sec)	53	17
Yellow Time (sec)	3	3
All-Red Time (sec)	2	2
Phase Time (sec)	58	22
Phase Split	73%	28%

Phase A



Phase B



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 01 November 2016 10:55:21 AM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG\Existing\Akker_Alwen_shakespeare_REV1(C).sip

PHASING SUMMARY

Site: 2017 PM BG

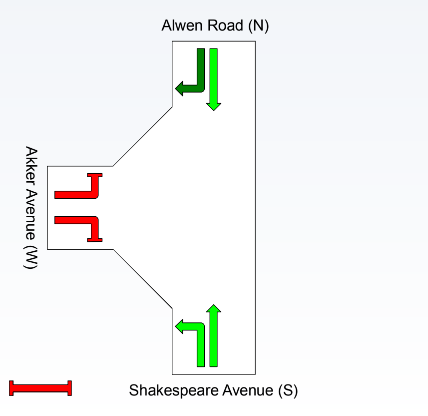
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background Traffic Volumes
Existing Configuration
Signals - Fixed Time   Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

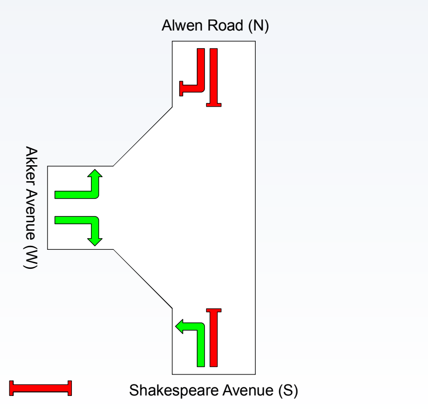
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	38	10	7
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	43	15	12
Phase Split	61%	21%	17%

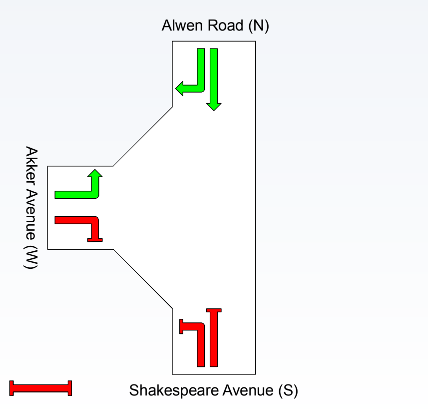
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	▬	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 01:29:23 PM
SIDRA INTERSECTION 5.0.0.1354

SIDRA INTERSECTION

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG\Existing\Akker_Alwen_shakespeare_REV1(C).sip
Unlicensed Trial Version

PHASING SUMMARY

Site: 2022 AM BG

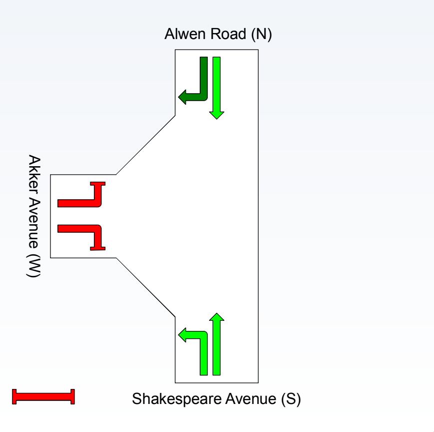
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background Traffic Volumes
Existing Configuration
Signals - Fixed Time   Cycle Time = 80 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B
Output Sequence: A, B

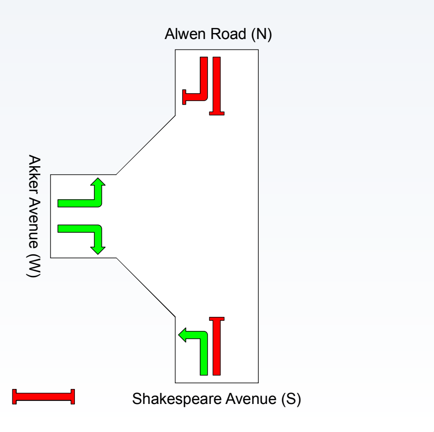
Phase Timing Results

Phase	**A**	**B**
Green Time (sec)	53	17
Yellow Time (sec)	3	3
All-Red Time (sec)	2	2
Phase Time (sec)	58	22
Phase Split	73%	28%

Phase A



Phase B



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 18 November 2016 01:29:47 PM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG\Existing\Akker_Alwen_shakespeare_REV1(C).sip

Unlicensed Trial Version
PHASING SUMMARY

Site: 2022 PM BG

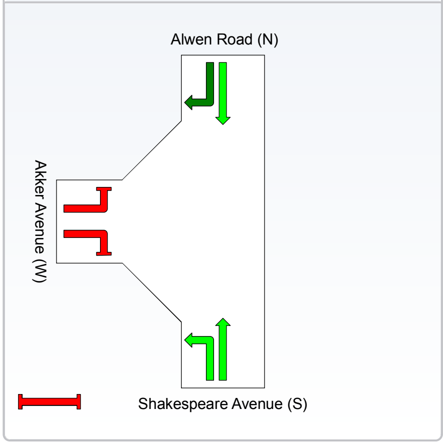
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background Traffic Volumes
Existing Configuration
Signals - Fixed Time Cycle Time = 70 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

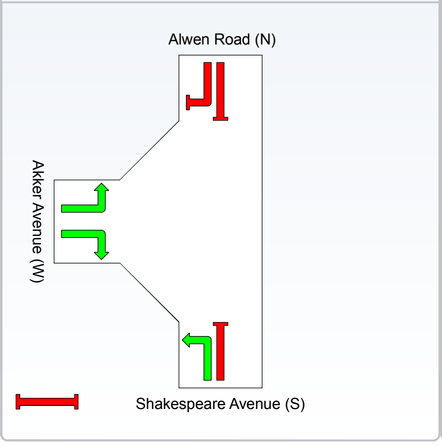
Phase Timing Results

Phase	A	B	C
Green Time (sec)	38	10	7
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	43	15	12
Phase Split	61%	21%	17%

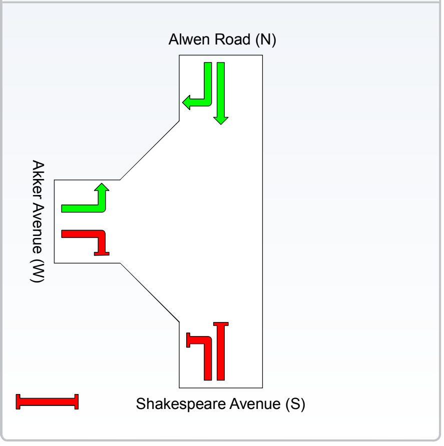
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 01 November 2016 10:56:26 AM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG\Existing\Akker_Alwen_shakespeare_REV1(C).sip
Unlicensed Trial Version

PHASING SUMMARY

Site: 2017 AM BGD

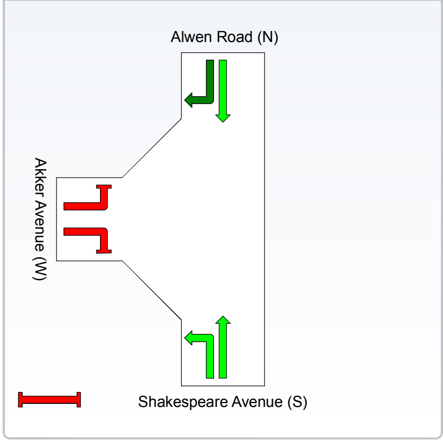
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 AM Peak Hour Background and Developement Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 100 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B
Output Sequence: A, B

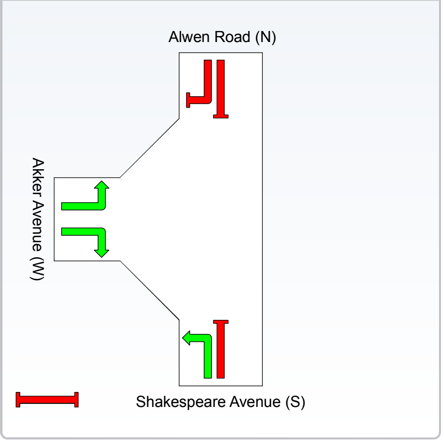
Phase Timing Results

Phase	**A**	**B**
Green Time (sec)	50	40
Yellow Time (sec)	3	3
All-Red Time (sec)	2	2
Phase Time (sec)	55	45
Phase Split	55%	45%

Phase A



Phase B



🟩 Normal Movement
🟪 Slip-Lane Movement
🟥 Stopped Movement
▬ Turn On Red

🟩 Permitted/Opposed
🟪 Opposed Slip-Lane
🟦 Continuous Movement
▭ Undetected Movement
● Phase Transition Applied

Processed: 21 November 2016 07:25:06 AM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip

PHASING SUMMARY

Site: 2017 PM BGD

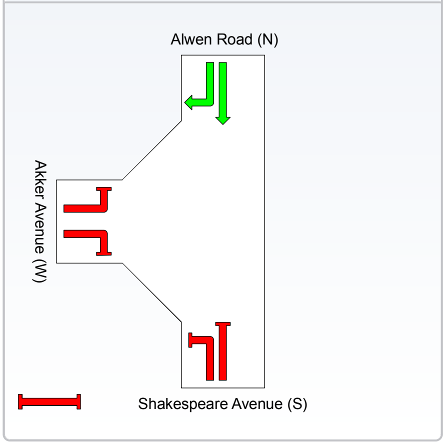
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2017 PM Peak Hour Background and Developement Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 120 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

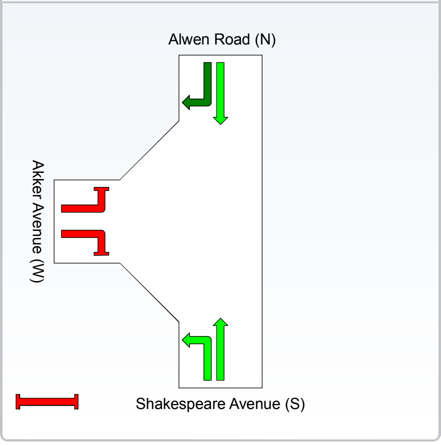
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	45	43	17
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	50	48	22
Phase Split	42%	40%	18%

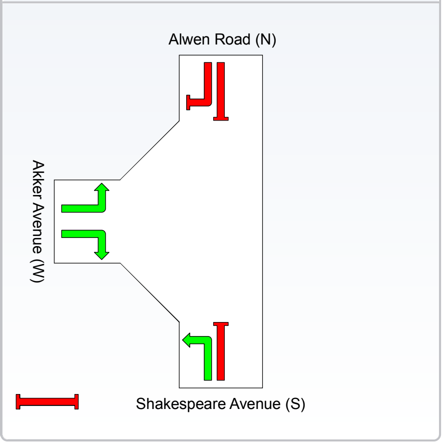
Phase A



Phase B



Phase C



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	▬	Undetected Movement
		●	Phase Transition Applied

Processed: 21 November 2016 07:25:22 AM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip

PHASING SUMMARY

Site: 2022 AM BGD

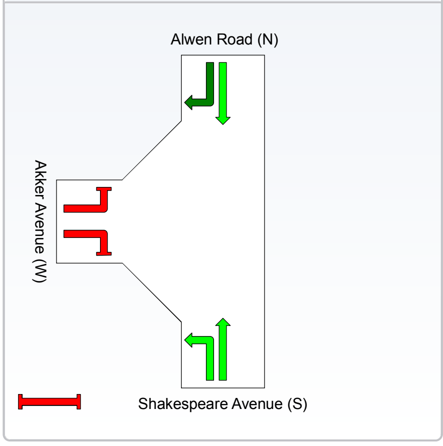
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 AM Peak Hour Background and Developement Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 120 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B
Output Sequence: A, B

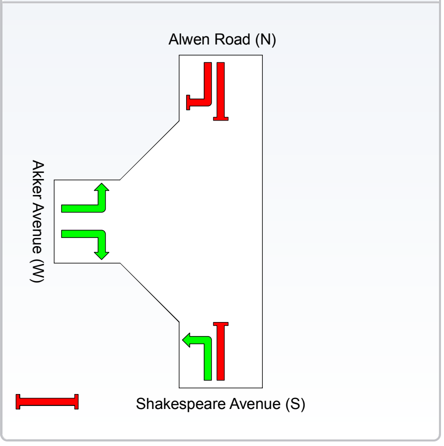
Phase Timing Results

Phase	**A**	**B**
Green Time (sec)	66	44
Yellow Time (sec)	3	3
All-Red Time (sec)	2	2
Phase Time (sec)	71	49
Phase Split	59%	41%

Phase A



Phase B



🟩	Normal Movement	🟩	Permitted/Opposed
🟪	Slip-Lane Movement	🟪	Opposed Slip-Lane
🟥	Stopped Movement	🟦	Continuous Movement
🟥	Turn On Red	🟦	Undetected Movement
		●	Phase Transition Applied

Processed: 21 November 2016 07:25:35 AM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip

PHASING SUMMARY

Site: 2022 PM BGD

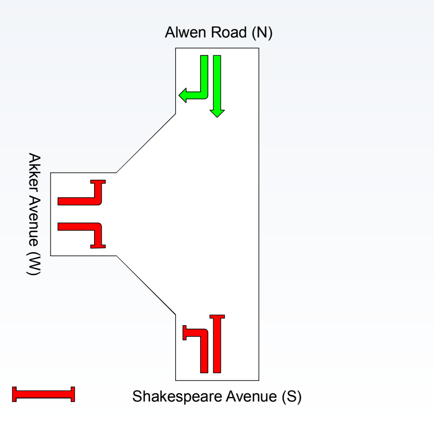
Akker Avenue / Alwen Road / Shakespeare Avenue Junction
2022 PM Peak Hour Background and Developement Traffic Volumes
Proposed Configuration
Signals - Fixed Time   Cycle Time = 60 seconds

Cycle Time Option: **User-specified Cycle Time**
Phase times specified by the user
Sequence: Opposed Turns
Input Sequence: A, B, C
Output Sequence: A, B, C

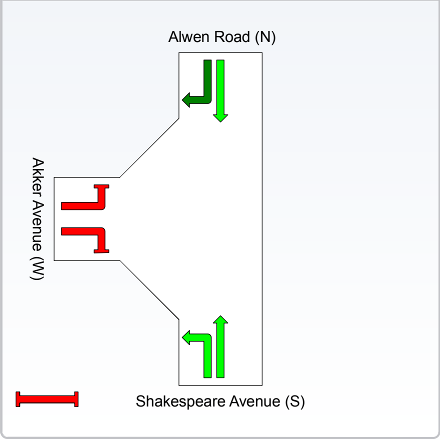
Phase Timing Results

Phase	**A**	**B**	**C**
Green Time (sec)	7	25	13
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	30	18
Phase Split	20%	50%	30%

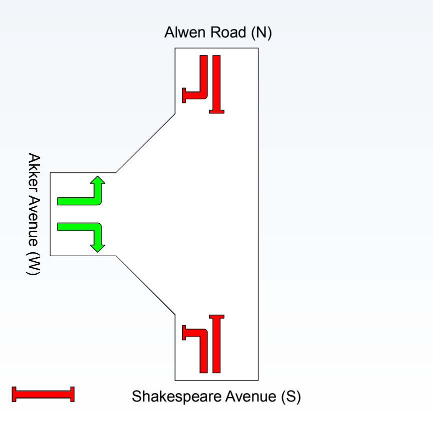
Phase A



Phase B



Phase C



🟩 Normal Movement
🟪 Slip-Lane Movement
🟥 Stopped Movement
🟥 Turn On Red
🟩 Permitted/Opposed
🟪 Opposed Slip-Lane
🟦 Continuous Movement
▭ Undetected Movement
● Phase Transition Applied

Processed: 21 November 2016 07:25:46 AM
SIDRA INTERSECTION 5.0.0.1354

Project: W:\Traffic\PROJECTS\C PROJECTS\C2284 - Ormonde TIS\05 Calculations\01 SITE B\02 Sidras\02 Akker_Alwen_shakespeare\BG+D\Proposed\Akker_Alwen_hakespeare_REV1(C).sip
Unlicensed Trial Version

ANNEXURE F

STORAGE LANE CALCULATIONS

Required Storage Lane Calculation

18-Nov-16

ORMONDE EXTENSION 22 - SITE B DEVELOPMENT

AM PEAK HOUR TRIP ASSIGMENT
(ACCESS OFF MSASA CRESCENT)

Input Values:

Trips

	Development IN	37	/h
	Development OUT	112	/h

from: Guidelines for traffic Impact Studies - Table 5.2: Typical parking control service rates per lane

Security gate	max. service rate: Coded Card Reader	350	/hour
Number of channels (IN)	**N**:	1	lanes
Number of channels (OUT)	**N**:	1	lanes
Exceed Probability:	M (queue L) could be exceeded	5%	of the time

Output values:
Trips Generated:

Peak hour:	Primary direction (demand/arrival rate) **q1**:	37	
	Secondary direction (demand/arrival rate) **q2**:	112	
		149	v/h (100%)

Queue length (M) *(ref. Transport & Land Development By Stover / Koepke Eq 8-9b)*

Utilization factor (ρ): ***ρ = q(1,2) / NQ*** *= arrival rate [demand] / (number of channels x service rate per channel)*

ρ =demand (arrive) rate / (**N** x max. service rate)

= 37 / (1 x 350) = 0.1057

= 112 / (1 x 350) = 0.3200

Qm1 (from Table 8-11) = 0.1057

Qm2 (from Table 8-11) = 0.2400

Queue length (M)1 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1
= ((LN[0.05]-LN[0.106]) / LN[0.106]) - 1
= (-0.749 / -2.247) - 1 = **-0.7** **Zero queue**
-6 *m*

Queue length (M)2 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1
= ((LN[0.05]-LN[0.240]) / LN[0.320]) - 1
= (-1.569 / -1.139) - 1 = **0.7** **Vehicles**
6 *m*

Required Storage Lane Calculation

18-Nov-16

ORMONDE EXTENSION 22 - SITE B DEVELOPMENT

PM PEAK HOUR TRIP ASSIGMENT (ACCESS OFF MSASA CRESCENT)

Input Values:

Trips

	Development IN	105	/h
	Development OUT	45	/h

from: Guidelines for traffic Impact Studies - Table 5.2: Typical parking control service rates per lane

Security gate	max. service rate: Coded Card Reader	350	/hour
Number of channels (IN)	**N**:	1	lanes
Number of channels (OUT)	**N**:	1	lanes
Exceed Probability:	M (queue L) could be exceeded	5%	of the time

Output values:
Trips Generated:

Peak hour:	Primary direction (demand/arrival rate) **q1**:	105	
	Secondary direction (demand/arrival rate) **q2**:	45	
		150	v/h (100%)

Queue length (M) *(ref. Transport & Land Development By Stover / Koepke Eq 8-9b)*

Utilization factor (ρ): ***ρ = q(1,2) / NQ*** *= arrival rate [demand] / (number of channels x service rate per channel)*

ρ =demand (arrive) rate / (**N** x max. service rate)

= 105 / (1 x 350) = 0.3000

= 45 / (1 x 350) = 0.1286

Qm1 (from Table 8-11) = 0.2000

Qm2 (from Table 8-11) = 0.1286

Queue length (M)1 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1
= ((LN[0.05]-LN[0.200]) / LN[0.300]) - 1
= (-1.386 / -1.204) - 1 = **0.5** **Vehicles**
6 *m*

Queue length (M)2 = ((LN[**Probability**]-LN[**Qm**]) / LN[**ρ**]) - 1
= ((LN[0.05]-LN[0.129]) / LN[0.129]) - 1
= (-0.944 / -2.051) - 1 = **-0.6** **Zero queue**
-6 *m*

ANNEXURE G

PROPOSED ROAD UPGRADES LAYOUT PLANS FOR ERVEN 962 AND 963

CIVIL CONCEPTS

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVE. / ALWEN RD / SHAKESPEARE AVE INTERSECTION

DATE
2016/11/10

SCALE
1:500

CIVIL CONCEPTS

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
ALWEN ROAD / DORADO AVENUE INTERSECTION

DATE
2016/11/10

SCALE
1:500

ANNEXURE H

ULTIMATE PROPOSED ROAD UPGRADES

LAYOUT PLANS OF ALL FOUR SITES

LEGEND:

▭	NEW SURFACED ROADWAY
—	NEW ROAD EDGE
—	NEW ROAD MARKINGS

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / ALWEN ROAD / SHAKESPEARE AVENUE INTERSECTION

DATE
2016/11/17

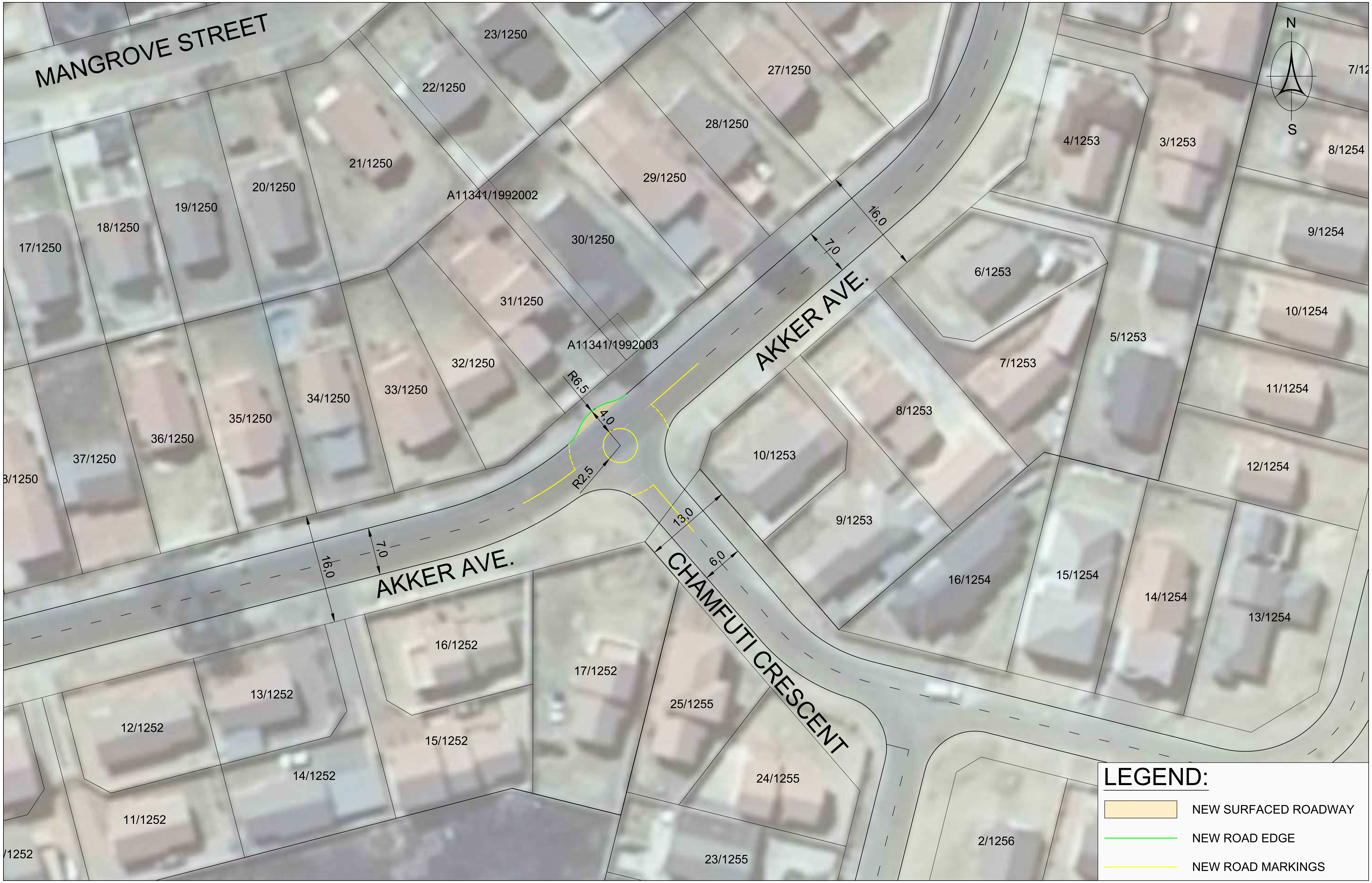
SCALE
1:1000

CIVIL CONCEPTS

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
ALWEN ROAD / DORADO AVENUE INTERSECTION

DATE
2016/11/17

SCALE
1:1000



CIVIL CONCEPTS

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / CHAMFUTI CRESCENT INTERSECTION

DATE
2016/11/17

SCALE
1:500

ORMONDE X22: PROPOSED EXTERNAL ROAD UPGRADES
AKKER AVENUE / MSASA CRESCENT INTERSECTION

DATE
2016/11/17

SCALE
1:500

No	INTERSECTION	CONSTRUCTION TYPE	ROADWAY	EARTH WORKS	KERBING	REMOVE KERBS	PAINT LINES	PAINT SYMBOL	REMOVE & REPLACE GUARDRAIL	RELOCATE KERB INLET	RELOCATE STREET LIGHT	RELOCATE SIGN	REMOVE TREE	TRAFFIC SIGNALS	TOTAL PER UPGRADE (RANDS)
		UNIT	m²	m²	m	m	m	m²	m	No.	No.		No.	COMPLETE	
		RANDS / UNIT	***1200***	***120***	***170***	***60***	***80***	***150***	***700***	***15000***	***7500***	***3500***	***3500***	***1000000***	
1	AKKER AVE / ALWEN RD / SHAKESPEARE AVE		840	1150	360	365	650	65	100	2	3	2	11	0.5	**R 1 958 850.00**
2	ALWEN ROAD / DORADO AVE		625		280	285	505	65		1	6	3	2	1	**R 1 942 350.00**
3	AKKER AVE / MSASA CRESCENT		15		12	11	60	10							**R 27 000.00**
4	AKKER AVE / CHAMFUTI CRESCENT		15		12	11	60	10			1				**R 34 500.00**
5															
6															
	SUB-TOTAL UNITS		1495	1150	664	672	1275	150	100	3	10	5	13		
	SUB-TOTAL PRICE (RANDS)		**R 1 794 000**	**R 138 000**	**R 112 880**	**R 40 320**	**R 102 000**	**R 22 500**	**R 70 000**	**R 45 000**	**R 75 000**	**R 17 500**	**R 45 500**		
												TOTAL			**R 3 962 700.00**
												Add: Contingencies	**10%**		R 396 270.00
															R 4 358 970.00
												VAT	**14%**		R 610 255.80
												AMOUNT			**R 4 969 225.80**

ANNEXURE I

COST ESTIMATES OF THE PROPOSED UPGRADES

No	INTERSECTION	CONSTRUCTION TYPE	ROADWAY	EARTH WORKS	KERBING	REMOVE KERBS	PAINT LINES	PAINT SYMBOL	REMOVE & REPLACE GUARDRAIL	RELOCATE STREET LIGHT	RELOCATE OH LINE POLE	RELOCATE SIGN	REMOVE TREE	TRAFFIC SIGNALS	TOTAL PER UPGRADE (RANDS)
		UNIT	m²	m²	m	m	m	m²	m	No.	No.		No.	COMPLETE	
		RANDS / UNIT	***1200***	***120***	***170***	***60***	***80***	***150***	***700***	***7500***	***12000***	***3500***	***3500***	***1000000***	
1	AKKER AVE / ALWEN RD / SHAKESPEARE AVE		200	1000	90	90	90	15	100	3		1	8	0.25	**R 764 150.00**
2	ALWEN ROAD / DORADO AVE		300		117	118	150	35				1			**R 407 720.00**
	SUB-TOTAL UNITS		650	1000	252	235	260	50	100	3	0	2	10		
	SUB-TOTAL PRICE (RANDS)		**R 780 000**	**R 120 000**	**R 42 840**	**R 14 100**	**R 20 800**	**R 7 500**	**R 70 000**	**R 22 500**	**R 0**	**R 7 000**	**R 35 000**		
												TOTAL			**R 1 369 740.00**
												Add: Contingencies	**10%**		R 136 974.00
															R 1 506 714.00
												VAT	**14%**		R 210 939.96
												AMOUNT			**R 1 717 653.96**

Appendix G7

Town Planning Memorandum

1. EXECUTIVE SUMMARY

1.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of The City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the rezoning of Erven 1130 & Erf 1131, Ormonde Extension 24, subject to certain conditions.

1.2 Application is made for the amendment of the Johannesburg Town-Planning Scheme, 1979, by way of the rezoning of the subject property from `Residential 3_with a density of `25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%_to `Residential 3_with a density of `113 dwelling units per hectare_, and subject to the following conditions:

Floor Area Ratio : 0.7

Coverage : 30%

Height : Four (4) storeys

Parking requirements : 1.3 parking bays per unit

Building lines : In accordance with an approved site development plan

Number of Units : 192 units

1.3 The purpose of this application is to obtain the appropriate land use rights to enable the registered property owner to develop a higher residential development on the erf.

1.4 Note that a separate application for the consolidation of the two properties, in terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

1.5 This memorandum provides the relevant property information, and motivates the merits of the development proposal from a development planning perspective.

1.6 The consolidation application is submitted separately and will be handled as a separate application, but will form part of the rezoning of the erven.

2. PROPERTY INFORMATION

2.1 Locality

The subject property is situated along Milkwood Road in Ormonde, to the north of the M1 Freeway and to the south of Akker Street. A Locality Plan is attached hereto as Annexure A. The site is situated in close proximity to Rand Show Road, Nasrec Road and the M1-Highway.

The figure below gives the context of the application site.

Figure 1: Aerial view of the property

2.2 Property description, ownership and size

Details pertaining to property description, ownership and extent of the subject properties are provided in the table below:

PROPERTY DESCRIPTION	REGISTERED OWNER	DEED OF TRANSFER NUMBER	SIZE
Ormonde X24: Erf 1130	Matla Projects (Pty) Ltd	T46456/2013	1.0615 ha
Ormonde X24: Erf 1131	Matla Projects (Pty) Ltd	T27313/2009	1.0429 ha

Deeds of Transfer T46456/2013 and T27313/2009 are attached as Annexures B to form part of the application documentation.

The signed and completed Company Resolution, Power of Attorney and Proof of Directors are attached as Annexure C respectively.

2.3 Zoning

The subject properties are currently zoned `Residential 3‚ in terms of the Johannesburg Town-Planning Scheme, 1979, subject to the following conditions:

Floor Area Ratio	:	0.4
Density	:	25 Dwelling units per ha
Coverage	:	30%
Height	:	Three storeys

The relevant Zoning Certificate is attached hereto as Annexure D.

The zoning regime of the surrounding area includes the following zonings:

`Residential 1_; `Residential 3;_ `Business 3_; `Institutional_and `Municipal_.

2.4 Land Use

A land use plan, based on a visual survey, is attached as Annexure E. The subject property is currently vacant, while surrounding land uses include:

¿ Dwelling houses;
¿ Open Spaces; and
¿ Public Roads.

It becomes clear that the area is a predominantly residential area. The proposal to develop the subject property for higher density residential uses will contribute to the livelihood of the area and create additional housing opportunities.

The proposed land-use will have no detrimental effect on any of the surround properties on municipal infrastructure.

3. BONDS, CONDITIONS OF TITLE AND SERVITUDES

3.1 Mortgage Bond

There is currently no bond registered over the property. The consent from a bondholder is therefore not required.

3.2 Conditions of title

The subject property is not affected by any conditions of title which may prove to be restrictive to the proposed development. No removal of restrictions is therefore required.

3.3 Servitudes

In terms of Deed of Transfers T46456/2013 and T27313/2009 the properties are subject to the following servitude:

é A servitude for sewer and other municipal services purposes 2 metres wide, in favour of the City Council of Johannesburg along any two boundaries other than a street boundary.

This servitude will be retained and accommodated in the development proposal and on the final Site Development Plan.

4. DEVELOPMENT PROPOSAL

4.1 Application Particulars and Development Proposal

4.1.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the simultaneous rezoning of Erf 1130 & Erf 1131, Ormonde Extension 24, subject to the following conditions:

Floor Area Ratio : 0.7

Coverage : 30%

Height : Four (4) storeys

Parking requirements : 1.3 parking bays per unit

Building lines : In accordance with an approved site development plan

Number of Units : 192 units

4.1.2 Al parking and manoeuvring space will be provide on-site. No parking within the road reserve will be allowed or will be necessary. The proposed site plan is attached hereto as Annexure G. Parking will be provided at a ratio of 1.3 parking bays per unit, with a total of 250 parking bays being required. A total of 250 parking bays will be provided on-site, to ensure sufficient parking for residents and visitors. All parking and manoeuvring space will be covered with a permanent dust-free surface.

4.1.3 Access to the development will be obtained via Milkwood Road. Access will be provided to the satisfaction of the municipality. The current road network is sufficient to accommodate the minimal increase in traffic. If so required by Council, upgrades to the road and services network can be made through a service agreement between the developer and Council.

4.1.3 Sufficient opens space (gardens / lawns) will be provide within the development, as per the minimum requirements from Council.

4.1.4 The privacy of the neighbouring properties will be protected by means of building design, landscaping and building lines. The height of the proposed development will be limited four storeys and building lines will be determined in accordance with an approved site development plan.

4.2 Existing vs Proposed Zoning

4.2.1 The proposed scheme document is attached hereto as Annexure F.

4.2.2 The type of housing unit that is being proposed is IHS C-Type (3-4 levels). The design of the units will be done by Boogertman & Partners Architects. A formal Site Development Plan and Building Plans will be submitted to Council after approval of the rezoning application. A concept plan is attached to form part of the application documentation.

4.2.3 The following table compares the current and proposed land use rights:

CURRENT ZONING (ERVEN 1130 & 1131)	PROPOSED ZONING (ERVEN 1130 & 1131)
Existing Zoning: `Residential 3_	Proposed Zoning: `Residential 3_
Permitted land uses: Residential dwelling units	Permitted land uses: Residential dwelling units
Permitted Density: 25 units/ha	Proposed Density: 113 units/ha
Number of Units allowed: 52 sectional title units	Number of Units allowed: 192 sectional title units
Height Restriction: Three (3) storeys	Proposed Height Restriction: Four (4) storeys
Coverage: 30%	Proposed Coverage: 30%
Floor Area Ratio: 0.4	Proposed Floor Area Ratio: 0.7
Parking: 1 parking space per dwelling unit of 3 or less habitable rooms. 2 parking space per dwelling unit of 4 or more habitable rooms. Plus 0.3 parking spaces per dwelling unit for visitors.	Parking: 1.3 parking bays per unit Required: 250 Provided: 250
Building lines: 0m on all street fronts	Building lines: In accordance with an approved site development plan

5. MUNICIPAL SERVICES

5.1 The region is generally well provided with civil service infrastructure. Development pressure in this area challenges the rate at which bulk infrastructure can be provided to accommodate expansion. Existing infrastructure will however be capable of accommodating the proposed additional land-use rights.

5.2 During the application stage, the different engineering departments will get an opportunity to indicate whether additional engineering studies will be required before the rezoning application can be approved. If so required, Professional Engineers will be appointed to investigate the civil services and compile an outline scheme document.

5.3 The amount of Bulk Services Contributions for civil services payable to the City of Joburg will be determined with the finalisation of the rezoning application. Rebate will be given for the existing land use rights on the final amounts.

5.4 A formal Traffic Access Study is currently being prepared by the project Engineers. It will be submitted to Council as soon as it is received.

5.5 The electricity connection has been discussed with City Power. Adequate capacity is currently available for the development at the nearby Crown substation and an estimated 2,2 MVA can therefore be made available for planned developments in the Ormonde area, of which this application forms part of.

Capacity can be released by shifting loads between the various distributor areas. A feeder cable from Crown substation is thus not required. A detailed Electrical Report and/or Outline Scheme Report will be submitted to Council in due course.

6. POLICIES

6.1 National Development Guidelines

6.1.1 Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

Section 7 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) confirms that the following principles applies to spatial planning, land development and land use management:

7(a) The principle of spatial justice, whereby-:

(i) Past spatial and other development imbalances must be redressed through improved access to and use of land.

It is our opinion that the greater community of this area will benefit from the development proposal through various new housing opportunities.

The development will enhance the urban environment through the strengthening of the residential character and the creation of economic growth, as required in terms of local policies.

(ii) Spatial development frameworks and policies at all spheres of government must address the inclusion of persons and areas that were previously excluded, with an emphasis on informal settlements, former homeland areas and areas characterised by widespread poverty and deprivation.

(iii) Spatial planning mechanism, including land use schemes, must incorporate provisions that enable redress in access to land by disadvantaged communities and persons.

(iv) Land use management system must include all areas of a municipality and specifically include provisions that are flexible and appropriate for the management of disadvantaged areas, informal settlements and former homeland areas.

(v) Land development procedures must include provisions that accommodate access to secure tenure and incremental upgrading of informal areas.

(vi) A Municipal Planning Tribunal considering an application before it, may not be implemented or restricted in the exercise of its discretion solely on the ground that the value of land or property is affected by the outcome of the application.

Principles (7)(a) (ii) to (vi) relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(b) The principle of spatial sustainability, whereby spatial planning and land use management systems must-:

(i) Promote land development that is within the fiscal, institutional and administrative means of the Republic.

The proposed development, as motivated, complies with the fiscal, institutional and

administrative means of the Republic as well as the Local Authority.

Development Policies, related administration and laws (City of Johannesburg Municipal Planning By-Law, 2016) and the National Environmental Management Act, 1998, do allow for the application, as submitted, to be entertained. The proposal has been discussed with the relevant Town Planners at Council before submission of the application.

(ii) Ensure that special consideration is given to the protection of prime and unique agricultural land.

The property is surrounded by existing urban infrastructure, and in terms of Municipal policy, the property is earmarked for higher density residential development.

(iii) Uphold consistency of land use measures in accordance with environmental management instruments.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iv) Promote and stimulate the effective and equitable functioning of land markets.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(v) Consider all current and future cost to all parties for the provision of infrastructure and social services in land developments.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(vi) Promote land development in locations that are sustainable and limit urban sprawl.

The subject property is situated within Region F of the City of Johannesburg and will not contribute to urban sprawl. The proposed development will serve as infill development and will ensure the optimisation of developable land and municipal infrastructure and services.

According to relevant policy guidelines of the Municipality (i.e. the Municipal Spatial Development Framework), the subject property is earmarked for purposes of higher density residential development. The proposal is, in principle, supported by Council.

(vii) Result in communities that are viable.

The proposed development is in close proximity to other residential, some commercial, lifestyle and educational opportunities. It is furthermore located near public transport facilities and is also ideally situated in terms of the main through routes in the area (i.e. the M1-Highway).

7(c) The principle of efficiency, whereby-:

(i) Land development optimises the use of existing resources and infrastructure.

The proposed development will promote efficient land development, as it entails the development of residential housing in close proximity to commercial, lifestyle and educational opportunities. Public transport is also available in close proximity.

The subject property is strategically situated in relation to transportation routes, e.g. M1 Freeway and Shakespeare Avenue.

Civil services are also available in the area for the proposed development.

(ii) Decision-making procedures are designed to minimise negative financial, social, economic or environmental impacts.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iii) Development application procedures are efficient and streamlined and timeframes are adhered to by all parties.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(d) Principal of spatial resilience whereby flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks.

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(e) The principle of good administration, whereby-:

(i) All spheres of government ensure an integrated approach to land use and land development that is guided by the spatial planning and land use management systems as embodied in this Act.

This principle relates to obligations imposed on local government. The application will be circulated to relevant internal municipal departments for their comments.

(ii) All government departments must provide their sector inputs and comply with any other prescribed requirements during the preparation or amendment of spatial planning frameworks.

This principle relates to obligations imposed on local government.

(iii) The requirements of any law relating to land development and land use are met timeously.

This principle relates to obligations imposed on local government.

(iv) The preparation and amendment of spatial plans, policies, land use schemes as well as procedures for development applications, include transparent processes of public participation that afford all parties the opportunity to provide inputs on matters affecting them.

This principle relates to obligations imposed on local government. It is also confirmed

that the application will be advertised by the applicant in the prescribed manner.

(v) Policies, legislation and procedures must be clearly set in order to inform and empower members of the public.

This principle relates to obligations imposed on local government.

6.1.2 National Development Plan, 2030

The National Development Plan identifies five principles for spatial development: spatial justice, spatial sustainability, spatial resilience, spatial quality and special efficiency.

It confirms that South African cities are highly fragmented, as little has been achieved in reversing apartheid geography. The Plan proposes that the situation be addressed by establishing new norms and standards: amongst others by densifying cities, improving transport and locating jobs where people live.

The containment of urban sprawl is particularly highlighted in the Plan, confirming that sprawl be contained and reversed (if possible), ˋŭ as denser forms of development are more efficient in terms of land usage, infrastructure cost and environmental protection._

The proposed development aligns with the vision of the National Development Plan, as it will promote compaction of the city and limiting urban sprawl (by means of infill development), by the redevelopment of a property which is currently vacant instead of developing outside the urban edge.

6.2 Provincial Development Guidelines

6.2.1 Gauteng Metropolitan Spatial Development Framework, 2011

The Gauteng Metropolitan Spatial Development Framework (MSDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The MSDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities˘spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The MSDF confirms that ˋit remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system_.

The development proposal will not contribute to urban sprawl and should be regarded as infill development.

6.2.2 Gauteng Spatial Development Framework, 2011

The Gauteng Spatial Development Framework (SDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The SDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities˘spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

¿ Promotion of densification in specific areas to utilise resources more efficiently;
¿ Establishment of a hierarchy of nodes and supporting existing development nodes.

The SDF confirms on page 128 that `it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system_.

The SDF furthermore identified four critical factors for development in the province, relevant to this development:

¿ Contained urban growth:

To contain urban growth, an Urban Edge was identified to curb urban sprawl. The idea behind the urban edge is to limit development within certain areas of a city. Only certain types of developments are allowed on the outside of the urban edge. The goal is to curb urban sprawl and thereby protecting the natural environment. One way to do this is to increase the densities of the built environment within the urban edge.

This edge is however not set in stone and can be amended if development pressure in an area requires the alteration of this `line_ or edge. Normally, areas identified for future development or as future development nodes are not included within the urban edge of a municipality. Amendments to the relevant spatial legislation and frameworks of the municipality usually later include these areas within the edge, so the development potential can be unlocked. Approval of net land-use rights and applications in an area indicates that the characteristics of the area have changed over the ears.

¿ Resourced based economic development:

Resource based economic development should result in identification of the economic core. Development should be encouraged in close proximity to existing resources, which includes infrastructure such as roads, water and electricity.

The proposed development is situated near existing and adjacent to approved proposed developments and infrastructure networks. Recent similar approved township establishment applications indicate that there is a growing economic base in the area.

¿ Re-direction of urban growth:

Developments in economically non-viable areas should be limited and thereby achieving growth within the economic growth sphere. This part of the Municipality is a fast growing sector in Joburg and growth should be encouraged in the precinct.

¿ Increased access and mobility:

The proposed land development area could be regarded as highly accessible.

6.3 Local Development Guidelines

6.3.1 Spatial Development Framework (SDF), 2011

The SDF was compiled to realise the vision of the Municipality through spatial restructuring and to integrate all aspects of spatial planning.

The subject property is earmarked for purposes of residential development. The Ormonde area is situated within a mixed use area, focussing on sporting / entertainment facilities, light industrial with a very large residential component.

In light of the above, it is apparent that the proposed development is consistent with the principles contained in the SDF.

6.3.2 Integrated Development Plan (IDP), 2012/2016

The Municipality has adopted an Integrated Development Plan (IDP) for 2012/2016 in terms of Section 25 of the Local Government, Municipal Systems Act, 2000 (Act No. 32 of 2000), which plan integrates and coordinates plans and aligns the resources and capacity of the Municipality to implement these plans. The compilation of Spatial Development Frameworks forms part of the IDP.

The Johannesburg Municipality seeks to focus its efforts to complement National and Provincial Government to accomplish the following strategic objectives through the IDP:

¿ Provide quality basic services and infrastructure;
¿ Facilitate higher and shared economic growth and development;
¿ To fight poverty, build clean, healthy, safe and sustainable communities;
¿ Foster participatory democracy through a caring, accessible and accountable service; and
¿ To ensure good governance, financial viability and optimal institutional transformation with capacity to execute its mandate.

The Strategic Levers emanating from the cityˇs macro and long-term strategy, including the medium-term plan reflect Joburgˇs attempts in actively working towards achieving the targets set out at national and provincial level

The IDP confirms the status of the Ormonde area which focusses on the residential component as indicated in the SDF. The proposed development therefore finds support in the IDP.

7. MOTIVATION AND BURDEN OF PROOF

7.1 Need

7.1.1 The need for the development of residential units on the property is acknowledged in the land use policies of the Municipality, particularly the SDF which confirms that the property is earmarked for purposes of residential development. This confirms that the need for the development on the property is also acknowledged from a policy perspective.

7.1.2 The proximity of the subject property to important transport routes (e.g. the, M1 freeway and Shakespeare Avenue), public transport, job opportunities and most importantly renders that the property ideal for the intended land use.

7.1.3 Open and vacant, unutilised land within a build-up area can be perceived as a weakness due to the security threat that vacant land imposes, as well as the negative influence it has on the image of a neighbourhood. Unused open or vacant land, which implies lower densities, makes the provision of essential municipal services less viable and more expensive to provide. By developing the existing land, the development of urban fibre can be stimulated through the strengthening of the development node and region. The proposed land use rights of the erf accommodated in this application is in accordance with the proposals of the Integrated Development Plan (IDP), as the IDP earmarks this area for medium to high density residential uses.

7.1.4 The proposed development will positively influence the income base of the Municipality. The income generated by rates is a function of land value, which is in turn a function of the land use. The establishment of the residential townships (which includes a retail erf) broadens the economic base of the area. The development will also ensure the following:

¿ Infill development ¯ The application site is a vacant portion of land situated adjacent to an existing and future residential townships, within the Municipality;
¿ New work opportunities in close proximity to place of residence during construction; and
¿ Optimal use of existing infrastructure.

7.1.5 The proposed development is also consistent with approved land use policies in Johannesburg. The need for the proposed development is substantiated by the principles of the IDP, i.e. the infill of vacant land and the optimal use of existing infrastructure, as well as from current market forces.

7.2 Desirability

7.2.1 There is a need for more residential units within the Ormonde area and this development will contribute to this need. Mounting development pressure within the municipality is resulting in all available developable land being developed.

7.2.2 The development proposal is also consistent with, and will promote, the land use policy guidelines of the Municipality. The development can be regarded as being desirable and will have several beneficial social and economic impacts on the area, which can be summarised as follow:

¿ Optimum utilisation of services and infrastructure;
¿ Increase in property values of surrounding properties;
¿ Increased security;
¿ Compatibility with surrounding land uses; and
¿ Increased housing opportunities

7.2.3 The proposed development will maximize the potential of the subject property and is consistent with the strategic location of the site. The proposed development will additionally contribute to the overall efficiency, sustainability and improved quality of the greater area. The development will have several beneficial social, economic and ecological impacts once the construction thereof is finalised, which can be summarised as follow:

¿ Reduction of potential dumping areas and informal settlements;
¿ Optimum utilisation of services and infrastructure;
¿ Expansion of municipal infrastructure and services;
¿ Increase in property values of surrounding properties;
¿ Increased security;
¿ Eradication of invasive species;
¿ Compatibility with surrounding land uses; and
¿ Landscaping could improve fauna numbers and species.

As mentioned above, the proposed development will include community and will be easy accessible through public transport. The need for social and economic facilities in this area is identified in various planning policies and policy frameworks of the Municipality. The development will provide much needed residential and retail facilities for the area, and thus make a positive contribution with regards to social welfare.

7.2.4 The proposed development will align with the existing urban form and character of the area. It will uplift the area economically and might attract other potential developers to the area as well. Thus, in effect, in might have a very positive financial influence to the precinct. Furthermore, the proposed development will contribute to an economic base in the area. Thus, it is argued that the proposed development will have a positive influence to the area.

7.2.5 When considering that the Building Plans and Site Development Plans which must be submitted to the Municipality, will have to comply with the relevant design guidelines and development parameters of land use policies, the proposed development can be perceived as desirable from a land use perspective.

7.3 Compliance with SPLUMA principles

7.3.1 With reference to Section 7.1.1 of this Memorandum, it is confirmed that the development proposal complies with the principles of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.4 Public interest in terms of Section 47(2) of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.4.1 The proposed development is in the public interest, as the land use rights is consistent with approved policy guidelines on national, provincial and local level.

7.5 Facts and circumstances of application in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.5.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 1130 & Erf 1131, Ormonde Extension 24, from `Residential 3_ with 25 dwelling units per hectare to `Residential 3: with `113 dwelling units per hectare_.

7.5.2 The proposed development aligns with approved policy guidelines on national, provincial and local level.

7.6 Rights and obligations of affected parties in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.6.1 The rights and obligations of affected parties will be taken into account in the following manner:

- ¿ The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, by the publications of notices in the Gauteng Provincial Gazette, Beeld and Citizen during February/ March 2017, and by the simultaneous display of a notice on site for fourteen (14 days). An objection period of 28 days will be afforded to any affected parties; and

- ¿ The City Planning Department will circulate the application for comments from internal departments of the Municipality. Any concerns raised will have to be dealt with to the satisfaction of the relevant department.

7.7 Interested persons in terms of Section 45 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.7.1 The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, granting any person the opportunity to register as an interested party.

7.8 Impact on engineering services, social infrastructure and open space in terms of Sections 42 and 49 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013), read with Section 46, 47 and 48 of the City of Johannesburg Municipal Planning By-Law, 2016

7.8.1 The impact of the proposed development will be confirmed by the internal departments of the Municipality who will be afforded an opportunity to comment on the application.

7.8.2 Any adverse impacts will be mitigated and addressed by suitable solutions, which may include service agreements and/or payment of bulk contributions to upgrade existing services infrastructure.

7.9 Reply to objections

7.9.1 The applicant will reply to any valid objections to the application.

7.9.2 The advertisements will comply with the requirements of the relevant sections of the City of Johannesburg Municipal Planning By-Law, 2016. The rights of potential objectors and or interested parties will be brought to the attention of probable objectors and or interested parties in terms of the requirements of Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016.

7.9.3 In submitting this application, applicant has endeavoured to comply with the requirements of the relevant provincial legislation as well as the provisions of the City of Johannesburg Municipal Planning By-Law, 2016, read with the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.9.4 The application clearly indicates the land- use rights, scheme documents, diagrams, layout plans, need and desirability, co-ordinated harmonious development and all other relevant requirements in terms of provincial legislation.

7.9.5 The application further complies with the relevant requirements of the Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013). Specifically, Sections 7, 42, 47 and 49 thereof.

8. CONCLUSION

8.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 1130 & Erf 1131, Ormonde Extension 24, from `Residential 3_ with a density of `25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%_to `Residential 3_with a density of `113 dwelling units per hectare; FAR of 0.7; Height of 4 storeys; and coverage of 30%_, subject to the following conditions

8.2 The purpose of this application is to obtain the appropriate land use rights to enable higher residential development. The application clearly confirms the need and desirability and compliance with all other relevant requirements in terms of relevant policies and legislation.

8.3 Note that a separate application for the consolidation of the two properties, terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

8.4 We trust that Council will evaluate and consider the application on its merit.

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Werner Slabbert B(TRP)
Professional Planner - Pr. Pln A/2190/2015

URBAN INNOVATE CONSULTING CC
CK2007/191853/23

November 2016 R16027

LIST OF ANNEXURES

- ANNEXURE A - LOCALITY PLAN
- ANNEXURE B - DEED OF TRANSFER
- ANNEXURE C - POWER OF ATTORNEY, COMPANY RESOLUTION & PROOF OF DIRECTORS
- ANNEXURE D - ZONING CERTIFICATE AND ZONING MAP
- ANNEXURE E - LAND USE MAP
- ANNEXURE F - PROPOSED SCHEME DOCUMENTATION
- ANNEXURE G - PROPOSED SITE PLAN AND GATEHOUSE DESIGN
- ANNEXURE H - GENERAL PLAN / S.G DIAGRAMS

1. EXECUTIVE SUMMARY

1.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of The City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the rezoning of Erven 962 & Erf 963, Ormonde Extension 22, subject to certain conditions.

1.2 Application is made for the amendment of the Johannesburg Town-Planning Scheme, 1979, by way of the rezoning of the subject property from *"Residential 3" with a density of "25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%"* to *"Residential 3" with a density of "110 dwelling units per hectare", and* subject to the following conditions:

Floor Area Ratio	:	0.7
Coverage	:	30%
Height	:	Four (4) storeys
Parking requirements	:	1.3 parking bays per unit
Building lines	:	In accordance with an approved site development plan
Number of Units	:	176 units

1.3 The purpose of this application is to obtain the appropriate land use rights to enable the registered property owner to develop a higher residential development on the erf.

1.4 Note that a separate application for the consolidation of the two properties, in terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

1.5 This memorandum provides the relevant property information, and motivates the merits of the development proposal from a development planning perspective.

1.6 The consolidation application is submitted separately and will be handled as a separate application, but will form part of the rezoning of the erven.

2. PROPERTY INFORMATION

2.1 Locality

The subject property is situated along Msasa Crescent in Ormonde, towards the north of the M1 Freeway and towards the south of Akker Street. A Locality Plan is attached hereto as ***Annexure A***. The site is situated in close proximity to Rand Show Road, Nasrec Road and the M1-Highway.

The figure below gives the context of the application site.

Figure 1: Aerial view of the property

2.2 Property description, ownership and size

Details pertaining to property description, ownership and extent of the subject properties are provided in the table below:

PROPERTY DESCRIPTION	REGISTERED OWNER	DEED OF TRANSFER NUMBER	SIZE
Ormonde X22: Erf 962	Matla Projects (Pty) Ltd	T27309/2009	5 942m^2
Ormonde X22: Erf 963	Matla Projects (Pty) Ltd	T27310/2009	10 274m^2

Deeds of Transfer T27309/2009 and T27310/2009 are attached as ***Annexures B*** to form part of the application documentation.

The signed and completed Company Resolution, Power of Attorney and Proof of Directors are attached as ***Annexure C*** respectively.

2.3 Zoning

The subject properties are currently zoned *"Residential 3"*, in terms of the Johannesburg Town-Planning Scheme, 1979, subject to the following conditions:

Floor Area Ratio : 0.4

Density : 25 Dwelling units per ha

Coverage : 30%

Height : Three storeys

The relevant Zoning Certificate is attached hereto as ***Annexure D***.

The zoning regime of the surrounding area includes the following zonings:

"Residential 1"; "Residential 3;" "Business 3"; "Institutional" and "Municipal".

2.4 Land Use

A land use plan, based on a visual survey, is attached as ***Annexure E***. The subject property is currently vacant, while surrounding land uses include:

- Dwelling houses;
- Open Spaces; and
- Public Roads.

It becomes clear that the area is a predominantly residential area. The proposal to develop the subject property for higher density residential uses will contribute to the livelihood of the area and create additional housing opportunities.

The proposed land-use will have no detrimental effect on any of the surround properties on municipal infrastructure.

3. BONDS, CONDITIONS OF TITLE AND SERVITUDES

3.1 Mortgage Bond

There is currently no bond registered over the property. The consent from a bondholder is therefore not required.

3.2 Conditions of title

The subject property is not affected by any conditions of title which may prove to be restrictive to the proposed development. No removal of restrictions is therefore required.

3.3 Servitudes

In terms of Deed of Transfers T27309/2009 and T27310/2009 the properties are subject to the following servitude:

- A servitude for sewer and other municipal services purposes 2 metres wide, in favour of the City Council of Johannesburg along any two boundaries other than a street boundary.

This servitude will be retained and accommodated in the development proposal and on the final Site Development Plan.

4. DEVELOPMENT PROPOSAL

4.1 Application Particulars and Development Proposal

4.1.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the amendment of the Johannesburg Town-Planning Scheme, 1979, by the simultaneous rezoning of Erf 962 & Erf 963, Ormonde Extension 22, subject to the following conditions:

Floor Area Ratio : 0.7

Coverage : 30%

Height : Four (4) storeys

Parking requirements : 1.3 parking bays per unit

Building lines : In accordance with an approved site development plan

Number of Units : 176 units

4.1.2 Al parking and manoeuvring space will be provide on-site. No parking within the road reserve will be allowed or will be necessary. The proposed site plan is attached hereto as ***Annexure G.*** Parking will be provided at a ratio of 1.3 parking bays per unit, with a total of 229 parking bays being required. A total of 230 parking bays will be provided on-site, to ensure sufficient parking for residents and visitors. All parking and manoeuvring space will be covered with a permanent dust-free surface.

4.1.3 Access to the development will be obtained via Msasa Crescent. Access will be provided to the satisfaction of the municipality. The current road network is sufficient to accommodate the minimal increase in traffic. If so required by Council, upgrades to the road and services network can be made through a service agreement between the developer and Council.

4.1.3 Sufficient opens space (gardens / lawns) will be provide within the development, as per the minimum requirements from Council.

4.1.4 The privacy of the neighbouring properties will be protected by means of building design, landscaping and building lines. The height of the proposed development will be limited four storeys and building lines will be determined in accordance with an approved site development plan.

4.2 Existing vs Proposed Zoning

4.2.1 The proposed scheme document is attached hereto as ***Annexure F***.

4.2.2 The type of housing unit that is being proposed is IHS C-Type (3-4 levels). The design of the units will be done by Boogertman & Partners Architects. A formal Site Development Plan and Building Plans will be submitted to Council after approval of the rezoning application. A concept plan is attached to form part of the application documentation.

4.2.3 The following table compares the current and proposed land use rights:

CURRENT ZONING	PROPOSED ZONING
Existing Zoning: *"Residential 3"*	**Proposed Zoning:** *"Residential 3"*
Permitted land uses: Residential dwelling units	**Permitted land uses:** Residential dwelling units
Permitted Density: 25 units/ha	**Proposed Density:** 110 units/ha
Number of Units allowed: 40 sectional title units	**Number of Units allowed:** 176 sectional title units
Height Restriction: Three (3) storeys	**Proposed Height Restriction:** Four (4) storeys
Coverage: 30%	**Proposed Coverage:** 30%
Floor Area Ratio: 0.4	**Proposed Floor Area Ratio:** 0.7
Parking: 1 parking space per dwelling unit of 3 or less habitable rooms. 2 parking space per dwelling unit of 4 or more habitable rooms. Plus 0.3 parking spaces per dwelling unit for visitors.	**Parking:** 1.3 parking bays per unit Required: 229 Provided: 230
Building lines: 0m on all street fronts	**Building lines:** In accordance with an approved site development plan

5. MUNICIPAL SERVICES

5.1 The region is generally well provided with civil service infrastructure. Development pressure in this area challenges the rate at which bulk infrastructure can be provided to accommodate expansion. Existing infrastructure will however be capable of accommodating the proposed additional land-use rights.

5.2 During the application stage, the different engineering departments will get an opportunity to indicate whether additional engineering studies will be required before the rezoning application can be approved. If so required, Professional Engineers will be appointed to investigate the civil services and compile an outline scheme document.

5.3 The amount of Bulk Services Contributions for civil services payable to the City of Joburg will be determined with the finalisation of the rezoning application. Rebate will be given for the existing land use rights on the final amounts.

5.4 A formal Traffic Access Study is currently being prepared by the project Engineers. It will be submitted to Council as soon as it is received.

5.5 The electricity connection has been discussed with City Power. Adequate capacity is currently available for the development at the nearby Crown substation and an estimated 2,2 MVA can therefore be made available for planned developments in the Ormonde area, of which this application forms part of.

Capacity can be released by shifting loads between the various distributor areas. A feeder cable from Crown substation is thus not required. A detailed Electrical Report and/or Outline Scheme Report will be submitted to Council in due course.

6. POLICIES

6.1 National Development Guidelines

6.1.1 Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

Section 7 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) confirms that the following principles applies to spatial planning, land development and land use management:

7(a) The principle of spatial justice, whereby-:

(i) Past spatial and other development imbalances must be redressed through improved access to and use of land.

It is our opinion that the greater community of this area will benefit from the development proposal through various new housing opportunities.

The development will enhance the urban environment through the strengthening of the residential character and the creation of economic growth, as required in terms of local policies.

(ii) Spatial development frameworks and policies at all spheres of government must address the inclusion of persons and areas that were previously excluded, with an emphasis on informal settlements, former homeland areas and areas characterised by widespread poverty and deprivation.

(iii) Spatial planning mechanism, including land use schemes, must incorporate provisions that enable redress in access to land by disadvantaged communities and persons.

(iv) Land use management system must include all areas of a municipality and specifically include provisions that are flexible and appropriate for the management of disadvantaged areas, informal settlements and former homeland areas.

(v) Land development procedures must include provisions that accommodate access to secure tenure and incremental upgrading of informal areas.

(vi) A Municipal Planning Tribunal considering an application before it, may not be implemented or restricted in the exercise of its discretion solely on the ground that the value of land or property is affected by the outcome of the application.

Principles (7)(a) (ii) to (vi) relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(b) The principle of spatial sustainability, whereby spatial planning and land use management systems must-:

(i) Promote land development that is within the fiscal, institutional and administrative means of the Republic.

The proposed development, as motivated, complies with the fiscal, institutional and

administrative means of the Republic as well as the Local Authority.

Development Policies, related administration and laws (City of Johannesburg Municipal Planning By-Law, 2016) and the National Environmental Management Act, 1998, do allow for the application, as submitted, to be entertained. The proposal has been discussed with the relevant Town Planners at Council before submission of the application.

(ii) *Ensure that special consideration is given to the protection of prime and unique agricultural land.*

The property is surrounded by existing urban infrastructure, and in terms of Municipal policy, the property is earmarked for higher density residential development.

(iii) *Uphold consistency of land use measures in accordance with environmental management instruments.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iv) *Promote and stimulate the effective and equitable functioning of land markets.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(v) *Consider all current and future cost to all parties for the provision of infrastructure and social services in land developments.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(vi) *Promote land development in locations that are sustainable and limit urban sprawl.*

The subject property is situated within Region F of the City of Johannesburg and will not contribute to urban sprawl. The proposed development will serve as infill development and will ensure the optimisation of developable land and municipal infrastructure and services.

According to relevant policy guidelines of the Municipality (i.e. the Municipal Spatial Development Framework), the subject property is earmarked for purposes of higher density residential development. The proposal is, in principle, supported by Council.

(vii) *Result in communities that are viable.*

The proposed development is in close proximity to other residential, some commercial, lifestyle and educational opportunities. It is furthermore located near public transport facilities and is also ideally situated in terms of the main through routes in the area (i.e. the M1-Highway).

7(c) The principle of efficiency, whereby-:

(i) *Land development optimises the use of existing resources and infrastructure.*

The proposed development will promote efficient land development, as it entails the development of residential housing in close proximity to commercial, lifestyle and educational opportunities. Public transport is also available in close proximity.

The subject property is strategically situated in relation to transportation routes, e.g. M1 Freeway and Shakespeare Avenue.

Civil services are also available in the area for the proposed development.

(ii) *Decision-making procedures are designed to minimise negative financial, social, economic or environmental impacts.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

(iii) *Development application procedures are efficient and streamlined and timeframes are adhered to by all parties.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(d) ***Principal of spatial resilience*** *whereby flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks.*

This principle relates to obligations imposed on local government, and in this regard the legislation is clear in respect of the procedures to facilitate the development to the property.

7(e) ***The principle of good administration, whereby-:***

(i) *All spheres of government ensure an integrated approach to land use and land development that is guided by the spatial planning and land use management systems as embodied in this Act.*

This principle relates to obligations imposed on local government. The application will be circulated to relevant internal municipal departments for their comments.

(ii) *All government departments must provide their sector inputs and comply with any other prescribed requirements during the preparation or amendment of spatial planning frameworks.*

This principle relates to obligations imposed on local government.

(iii) *The requirements of any law relating to land development and land use are met timeously.*

This principle relates to obligations imposed on local government.

(iv) *The preparation and amendment of spatial plans, policies, land use schemes as well as procedures for development applications, include transparent processes of public participation that afford all parties the opportunity to provide inputs on matters affecting them.*

This principle relates to obligations imposed on local government. It is also confirmed

that the application will be advertised by the applicant in the prescribed manner.

(v) *Policies, legislation and procedures must be clearly set in order to inform and empower members of the public.*

This principle relates to obligations imposed on local government.

6.1.2 National Development Plan, 2030

The National Development Plan identifies five principles for spatial development: spatial justice, spatial sustainability, spatial resilience, spatial quality and special efficiency.

It confirms that South African cities are highly fragmented, as little has been achieved in reversing apartheid geography. The Plan proposes that the situation be addressed by establishing new norms and standards: amongst others by densifying cities, improving transport and locating jobs where people live.

The containment of urban sprawl is particularly highlighted in the Plan, confirming that sprawl be contained and reversed (if possible), *"… as denser forms of development are more efficient in terms of land usage, infrastructure cost and environmental protection."*

The proposed development aligns with the vision of the National Development Plan, as it will promote compaction of the city and limiting urban sprawl (by means of infill development), by the redevelopment of a property which is currently vacant instead of developing outside the urban edge.

6.2 Provincial Development Guidelines

6.2.1 Gauteng Metropolitan Spatial Development Framework, 2011

The Gauteng Metropolitan Spatial Development Framework (MSDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The MSDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities' spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The MSDF confirms that *"it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system".*

The development proposal will not contribute to urban sprawl and should be regarded as infill development.

6.2.2 Gauteng Spatial Development Framework, 2011

The Gauteng Spatial Development Framework (SDF), 2011, was, amongst others, compiled to specify a clear set of spatial objectives for municipalities to achieve in order to ensure realisation of the future provincial spatial infrastructure; and to enable and direct growth.

The SDF aims to articulate the spatial objectives of the Gauteng region to assist the alignment of neighbouring municipalities' spatial plans. It is proposed that key principles in local municipality SDFs should include (applicable to this application):

- Promotion of densification in specific areas to utilise resources more efficiently;
- Establishment of a hierarchy of nodes and supporting existing development nodes.

The SDF confirms on page 128 that *"it remains the intension to limit urban sprawl as a fundamental tenet or urban growth policy and to promote the intentions of intensification and densification, together with a transformed urban structure that de-emphasises the need for outward expansion of the urban system".*

The SDF furthermore identified four critical factors for development in the province, relevant to this development:

- **Contained urban growth:**

  To contain urban growth, an Urban Edge was identified to curb urban sprawl. The idea behind the urban edge is to limit development within certain areas of a city. Only certain types of developments are allowed on the outside of the urban edge. The goal is to curb urban sprawl and thereby protecting the natural environment. One way to do this is to increase the densities of the built environment within the urban edge.

  This edge is however not set in stone and can be amended if development pressure in an area requires the alteration of this "line" or edge. Normally, areas identified for future development or as future development nodes are not included within the urban edge of a municipality. Amendments to the relevant spatial legislation and frameworks of the municipality usually later include these areas within the edge, so the development potential can be unlocked. Approval of net land-use rights and applications in an area indicates that the characteristics of the area have changed over the ears.

- **Resourced based economic development:**

  Resource based economic development should result in identification of the economic core. Development should be encouraged in close proximity to existing resources, which includes infrastructure such as roads, water and electricity.

  The proposed development is situated near existing and adjacent to approved proposed developments and infrastructure networks. Recent similar approved township establishment applications indicate that there is a growing economic base in the area.

- **Re-direction of urban growth:**

  Developments in economically non-viable areas should be limited and thereby achieving growth within the economic growth sphere. This part of the Municipality is a fast growing sector in Joburg and growth should be encouraged in the precinct.

- **Increased access and mobility:**

  The proposed land development area could be regarded as highly accessible.

6.3 Local Development Guidelines

6.3.1 Spatial Development Framework (SDF), 2011

The SDF was compiled to realise the vision of the Municipality through spatial restructuring and to integrate all aspects of spatial planning.

The subject property is earmarked for purposes of residential development. The Ormonde area is situated within a mixed use area, focussing on sporting / entertainment facilities, light industrial with a very large residential component.

In light of the above, it is apparent that the proposed development is consistent with the principles contained in the SDF.

6.3.2 Integrated Development Plan (IDP), 2012/2016

The Municipality has adopted an Integrated Development Plan (IDP) for 2012/2016 in terms of Section 25 of the Local Government, Municipal Systems Act, 2000 (Act No. 32 of 2000), which plan integrates and coordinates plans and aligns the resources and capacity of the Municipality to implement these plans. The compilation of Spatial Development Frameworks forms part of the IDP.

The Johannesburg Municipality seeks to focus its efforts to complement National and Provincial Government to accomplish the following strategic objectives through the IDP:

- Provide quality basic services and infrastructure;
- Facilitate higher and shared economic growth and development;
- To fight poverty, build clean, healthy, safe and sustainable communities;
- Foster participatory democracy through a caring, accessible and accountable service; and
- To ensure good governance, financial viability and optimal institutional transformation with capacity to execute its mandate.

The Strategic Levers emanating from the city's macro and long-term strategy, including the medium-term plan reflect Joburg's attempts in actively working towards achieving the targets set out at national and provincial level

The IDP confirms the status of the Ormonde area which focusses on the residential component as indicated in the SDF. The proposed development therefore finds support in the IDP.

7. MOTIVATION AND BURDEN OF PROOF

7.1 Need

7.1.1 The need for the development of residential units on the property is acknowledged in the land use policies of the Municipality, particularly the SDF which confirms that the property is earmarked for purposes of residential development. This confirms that the need for the development on the property is also acknowledged from a policy perspective.

7.1.2 The proximity of the subject property to important transport routes (e.g. the, M1 freeway and Shakespeare Avenue), public transport, job opportunities and most importantly renders that the property ideal for the intended land use.

7.1.3 Open and vacant, unutilised land within a build-up area can be perceived as a weakness due to the security threat that vacant land imposes, as well as the negative influence it has on the image of a neighbourhood. Unused open or vacant land, which implies lower densities, makes the provision of essential municipal services less viable and more expensive to provide. By developing the existing land, the development of urban fibre can be stimulated through the strengthening of the development node and region. The proposed land use rights of the erf accommodated in this application is in accordance with the proposals of the Integrated Development Plan (IDP), as the IDP earmarks this area for medium to high density residential uses.

7.1.4 The proposed development will positively influence the income base of the Municipality. The income generated by rates is a function of land value, which is in turn a function of the land use. The establishment of the residential townships (which includes a retail erf) broadens the economic base of the area. The

development will also ensure the following:

- Infill development – The application site is a vacant portion of land situated adjacent to an existing and future residential townships, within the Municipality;
- New work opportunities in close proximity to place of residence during construction; and
- Optimal use of existing infrastructure.

7.1.5 The proposed development is also consistent with approved land use policies in Johannesburg. The need for the proposed development is substantiated by the principles of the IDP, i.e. the infill of vacant land and the optimal use of existing infrastructure, as well as from current market forces.

7.2 Desirability

7.2.1 There is a need for more residential units within the Ormonde area and this development will contribute to this need. Mounting development pressure within the municipality is resulting in all available developable land being developed.

7.2.2 The development proposal is also consistent with, and will promote, the land use policy guidelines of the Municipality. The development can be regarded as being desirable and will have several beneficial social and economic impacts on the area, which can be summarised as follow:

- Optimum utilisation of services and infrastructure;
- Increase in property values of surrounding properties;
- Increased security;
- Compatibility with surrounding land uses; and
- Increased housing opportunities

7.2.3 The proposed development will maximize the potential of the subject property and is consistent with the strategic location of the site. The proposed development will additionally contribute to the overall efficiency, sustainability and improved quality of the greater area. The development will have several beneficial social, economic and ecological impacts once the construction thereof is finalised, which can be summarised as follow:

- Reduction of potential dumping areas and informal settlements;
- Optimum utilisation of services and infrastructure;
- Expansion of municipal infrastructure and services;
- Increase in property values of surrounding properties;
- Increased security;
- Eradication of invasive species;
- Compatibility with surrounding land uses; and
- Landscaping could improve fauna numbers and species.

As mentioned above, the proposed development will include community and will be easy accessible through public transport. The need for social and economic facilities in this area is identified in various planning policies and policy frameworks of the Municipality. The development will provide much needed residential and retail facilities for the area, and thus make a positive contribution with regards to social welfare.

7.2.4 The proposed development will align with the existing urban form and character of the area. It will uplift the area economically and might attract other potential developers to the area as well. Thus, in effect, in might have a very positive financial influence to the precinct. Furthermore, the proposed development will contribute to an economic base in the area. Thus, it is argued that the proposed development will have a positive influence to the area.

7.2.5 When considering that the Building Plans and Site Development Plans which must be submitted to the Municipality, will have to comply with the relevant design guidelines and development parameters of land

use policies, the proposed development can be perceived as desirable from a land use perspective.

7.3 Compliance with SPLUMA principles

7.3.1 With reference to Section 7.1.1 of this Memorandum, it is confirmed that the development proposal complies with the principles of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.4 Public interest in terms of Section 47(2) of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.4.1 The proposed development is in the public interest, as the land use rights is consistent with approved policy guidelines on national, provincial and local level.

7.5 Facts and circumstances of application in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.5.1 This memorandum is submitted in support of an application in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 962 & Erf 963, Ormonde Extension 22, from *"Residential 3"* with 25 dwelling units per hectare to ***"Residential 3"*** with "***110 dwelling units per hectare".***

7.5.2 The proposed development aligns with approved policy guidelines on national, provincial and local level.

7.6 Rights and obligations of affected parties in terms of Section 42 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.6.1 The rights and obligations of affected parties will be taken into account in the following manner:

- The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, by the publications of notices in the Gauteng Provincial Gazette, Beeld and Citizen during February/ March 2017, and by the simultaneous display of a notice on site for fourteen (14 days). An objection period of 28 days will be afforded to any affected parties; and

- The City Planning Department will circulate the application for comments from internal departments of the Municipality. Any concerns raised will have to be dealt with to the satisfaction of the relevant department.

7.7 Interested persons in terms of Section 45 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

7.7.1 The application will be advertised as prescribed in Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016, granting any person the opportunity to register as an interested party.

7.8 Impact on engineering services, social infrastructure and open space in terms of Sections 42 and 49 of the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013), read with Section 46, 47 and 48 of the City of Johannesburg Municipal Planning By-Law, 2016

7.8.1 The impact of the proposed development will be confirmed by the internal departments of the Municipality who will be afforded an opportunity to comment on the application.

7.8.2 Any adverse impacts will be mitigated and addressed by suitable solutions, which may include service agreements and/or payment of bulk contributions to upgrade existing services infrastructure.

7.9 Reply to objections

7.9.1 The applicant will reply to any valid objections to the application.

7.9.2 The advertisements will comply with the requirements of the relevant sections of the City of Johannesburg Municipal Planning By-Law, 2016. The rights of potential objectors and or interested parties will be brought to the attention of probable objectors and or interested parties in terms of the requirements of Section 21(2) of the City of Johannesburg Municipal Planning By-Law, 2016.

7.9.3 In submitting this application, applicant has endeavoured to comply with the requirements of the relevant provincial legislation as well as the provisions of the City of Johannesburg Municipal Planning By-Law, 2016, read with the Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013).

7.9.4 The application clearly indicates the land- use rights, scheme documents, diagrams, layout plans, need and desirability, co-ordinated harmonious development and all other relevant requirements in terms of provincial legislation.

7.9.5 The application further complies with the relevant requirements of the Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013). Specifically, Sections 7, 42, 47 and 49 thereof.

8. CONCLUSION

8.1 Application is made in terms of the provisions of Section 21 of the City of Johannesburg Municipal Planning By-Law, 2016 for the rezoning of Erf 962 & Erf 963, Ormonde Extension 22, from *"Residential 3" with a density of "25 dwelling units per hectare; FAR of 0.4; Height of 3 storeys; and coverage of 30%"* to *"Residential 3" with a density of "110 dwelling units per hectare; FAR of 0.7; Height of 4 storeys; and coverage of 30%"*, subject to the following conditions

8.2 The purpose of this application is to obtain the appropriate land use rights to enable higher residential development. The application clearly confirms the need and desirability and compliance with all other relevant requirements in terms of relevant policies and legislation.

8.3 Note that a separate application for the consolidation of the two properties, terms of the provisions of Section 33 of the City of Johannesburg Municipal Planning By-Law, 2016, was also submitted to the Municipality. Even though the rezoning and consolidation applications are submitted separately, approval of both applications will be required before submission of any building plans to Council and before construction can commence.

8.4 We trust that Council will evaluate and consider the application on its merit.

Werner Slabbert B(TRP)
Professional Planner - Pr. Pln A/2190/2015

urban innovate

URBAN INNOVATE CONSULTING CC
CK2007/191853/23

LIST OF ANNEXURES

- ANNEXURE A - LOCALITY PLAN
- ANNEXURE B - DEED OF TRANSFER
- ANNEXURE C - POWER OF ATTORNEY, COMPANY RESOLUTION & PROOF OF DIRECTORS
- ANNEXURE D - ZONING CERTIFICATE AND ZONING MAP
- ANNEXURE E - LAND USE MAP
- ANNEXURE F - PROPOSED SCHEME DOCUMENTATION
- ANNEXURE G - PROPOSED SITE PLAN AND GATEHOUSE DESIGN
- ANNEXURE H - GENERAL PLAN / S.G DIAGRAMS

Appendix G8

Storm Water Management Plan

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

ORMONDE EXT 24 – ERVEN (1130 & 1131)
ORMONDE EXT 22 – ERVEN (962 & 963)

STORMWATER MANAGEMENT REPORT

C2284-SMP-REPORT

OCTOBER 2016

CIVIL CONCEPTS CONSULTING ENGINEERS, Civil Concepts (Pty) Ltd, 50 15th Street, Menlo Park, Pretoria, PO Box 36148, Menlo Park, Pretoria, 0102 Tel: 012 460 0008, Fax 012 460 0005, Email: Mail@civilconcepts.co.za

1. INTRODUCTION

Civil Concepts (Pty) Ltd was appointed to conduct a stormwater management investigation of the Erven 1130 & 1131 Ormonde Ext 24 as well as Erven 962 & 963 Ormonde Ext 22. Both properties are currently zoned as residential 3 and it is proposed to consolidate the property and increase the density from 25 units per hectare to 112.94 units per hectare and 110 units per hectare respectively.

This report contains the details of the proposed Stormwater Management for consolidation of Erven 1130 & 1131 Ormonde Ext 24 and Erven 962 & 963 Ormonde Ext 22, Johannesburg.

2. RELEVANT INFORMATION

The owner has launched an application for consolidation and increase the density for Residential 3.

2.1 Owner Information

Name : Matla Projects (Pty) Ltd
Contact Person : Mr J Pienaar
Physical Address : 470 Killarney Road, Bredell, 1623
Postal Address : P O Box 14152, Bredell, 1623
Telephone : (011) 571 3906
Fax Number : (011) 396 2708

2.2 Consultant Details

Name : Civil Concepts (Pty) Ltd
Postal Address : P.O. Box 36148, Menlo Park, 0102

Contact person : Werner Stander
Prof. Reg. No. : 20060017
Telephone : (012) 460 0008
Fax Number : (012) 460 0005
Cell Phone : (084) 619 5838
E-mail : werner@civilconcepts.co.za

2.3 Locality

The development is situated in Ormonde Ext 24 on Erven 1130 & 1131 and Ormonde Ext 22 on Erven 962 & 963, Johannesburg, also refer to the attached locality map in **Annexure A**.

De Villiers Graaf Motorway forms the southern boundary with Milkwood Road on the western side. The tributary of the Bloubos Spruit forms the eastern boundary.

2.4 Zoning

The existing zoning for Erven 1130 & 1131 includes for two Residential 3 Erven. It is the intention to consolidate and increase the zoning of the two erven from 25 units per hectare to 112.94 units per hectare. The total size of the consolidated erven will be 1.7 ha with approximately 192 units. Refer to **Annexure B** for the layout of consolidated erven, and building layout.

The existing zoning for Erven 962 & 963includes for two Residential 3 Erven. It is the intention to consolidate and increase the zoning of the two erven from 25 units per hectare to 110 units per hectare. The total size of the consolidated erven will be 1.62 ha with approximately 176 units. Refer to **Annexure B** for the layout of consolidated erven, and building layout.

2.5 Servitudes

No Servitudes are registered over the property.

2.6 Professional Engineer

Mr. W. Stander is a registered professional engineer, Professional Registration Number 20060017. He has over 14 years' experience in Stormwater Master Planning and have completed several projects of similar nature.

3. SOFTWARE AND PARAMETERS

HydroCube software is used for simulating the Stormwater Master Plan and to determine the runoff values.

The parameters used are provided in Table 3 below.

Table 3

SUMMARY OF SIMULATION PARAMETERS : 5 AND 25 YEAR STORMS	
Infiltration routine	HORTON
Decay constant	0,00115/s
Routing methodology	Time-Shift
Rainfall distribution type	Triangular
Aerial reduction factor applied	No
Manning's 'n' concrete pipes and culverts	0.012
Manning's 'n' paved streets	0.015
Shortest duration	20 min for 5 year, 30 min for 25 year
Longest duration	120 min
Storm duration increment	10 min
Storm recurrence interval	5 and 25 years
Number of Sub-Catchments	42
Number of Routes + Channels	36
Number of Attenuation Structures	2
Total Study Area	3.81
REGIONALISED TRIANGULAR SYNTHETIC DISTRIBUTION PARAMETERS	
Mean annual precipitation	750 mm
Time to peak ratio	0.35
Simulation duration	240 min
Simulation time step	1 min

Please note that the MAP value of 750 mm is prescribed in the JRA Stormwater Management Policy statement.

4. PRE-DEVELOPMENT CATCHMENT CHARACTERISTICS

The total size of the study area is 3.81 ha and the pre-developed scenario is considered as an open field.

Table 4.1

Sub-Catchment	Area (ha)	Length (m)	Slope (m/m)	% Imp	Dpr Per	Dpr Imp	Inf i	Inf f	'n' Per	'n' Imp
					(mm)		(mm/hr)			
Pre-Developed Combined Property (Erven 1130 & 1131)	2.19	260	.034	5	3	1	45	6	0.1	0.032
Pre-Developed Combined Property (Erven 962 & 963	1.62	142	.057	5	3	1	45	6	0.1	0.032

Catchment Parameters:

- Depression Storage
    - Medium Slope
    - Pervious – 3.0 mm
    - Impervious – 1.0 mm
- Terrain Infiltration Settings – Loamy Soil (Damp)
    - Initial – 45
    - Final – 6
- Overland Manning Factors – Existing Open Field
    - Pervious Fraction – 0.1
    - Impervious Fraction –0.032

The calculated Pre-Development Runoff values determined by the HydroCube simulation are summarised below:

Sub Catchment	Q5 (m^3/s)	Q25 (m^3/s)
Pre-Developed Combined Property (Erven 1130 & 1131)	0.279	0.552
Pre-Developed Combined Property (Erven 962 & 963	0.311	0.585

These values will be used as the target values for the Stormwater Management Plan at the outlet position.

5. EXTERNAL SERVICES

The Bloubos Spruit borders Erven 1130 & 1131 on the eastern side and Erven 962 & 963 on the western side.

Both sites currently drains overland to the Bloubos Spruit.

The proposed attenuation the pre-developed scenario will be simulated and subsequently will not increase the runoff draining towards the Bloubos Spruit.

6. STORMWATER MANAGEMENT PLAN

6.1 New Development Layout

The consolidated erven and building layout entails housing units, open areas, parking and road surfacing, etc. A SDP Layout is included in C2284-SDP-A-001 and C2284-SDP-B-001 for Erven 1130 & 1131 and Erven 962 & 963 respectively, **Annexure B**.

6.2 Development Areas and Characteristics

The catchment will consist of pervious areas for example lawns and general open areas. Impervious areas are combinations of paved and roof areas.

The catchment sizes, parameters and route data are given in **Annexure C**.

Some important assumptions are:

- Each sub-catchment's used an impervious factor of 80%,
- Parking areas are constructed with asphalt and concrete pavers, hence no infiltration is assumed;
- In most cases drainage from catchments are overland to pervious areas. The HydroCube model was built accordingly.

6.3 Design Principles

The JRA Stormwater Management Policy Statement dated 21 June 2006 is used as basis for the management plan. In addition WSUD principles will be incorporated, if not already used.

Certain assumptions and design principles were used to compile the management plan and are listed below:

- Roof runoff is mostly discharged onto pervious areas increasing possible infiltration.
- Existing systems will be utilised to maximum capacity.
- One attenuation structure is planned along the north eastern corner. Volume will be created by excavating the structure with an average depth of 1.5m deep with the embankment side slopes of 1:2. The basin and side slopes will be grassy areas to allow for infiltration and a pipe outlet.
- Emergency overflow will also be provided and is planned along the northern boundaries of each site at the Bloubos Spruit. Refer to the SMP Plan for details.
- All external runoff is diverted from the site and no external runoff has to be accommodated in the internal network.
- The storm water management measures to be implemented in this development must accommodate all the additional storm water to be generated and the post-construction flow from the study area to the adjacent property must remain similar to the pre-construction flow.
- The storm water and rehabilitation was designed to function fully within its core and without a need to buffer, because the internal engineered system can more than accommodate the 1:100-year flood events and ecological systems to be established.

6.4 Internal Stormwater Network Layout

The SMP is briefly described below. Refer to **Annexure D** for a detailed layout of the SMP (Plan SMP/ORM/2/001).

Catchment 1 – Erven 1130 & 1130

The sub catchment mainly consists of residential dwellings. The following drainage principles will apply:

- Roof down pipes discharge onto grass areas;
- Drainage occurs overland in a north eastern direction towards an attenuation structure from which it will outlet to Bloubos Spruit.
- A cut-off grass swale must be provided along the eastern boundary of the catchment to drain towards the attenuation structure.
- The southern portion of the catchment drains directly towards the Natural Stream. Sufficient attenuation has been provided at the attenuated areas plus the direct runoff to the Natural Stream is still below the Pre-Developed runoff.

Catchment 2 – Erven 962 & 963

The sub catchment mainly consists of residential dwellings. The following drainage principles will apply:

- An earth berm will be provided along the southern boundary of the development to prevent drainage of the De Villiers Graaf Motorway to the development.
- Roof down pipes discharge onto grass areas;
- Drainage occurs overland in a north western direction towards an attenuation structure from which it will outlet to Bloubos Spruit.
- A cut-off grass swale must be provided along the western boundary of the catchment to drain towards the attenuation structure.
- The southern portion of the catchment drains directly towards the Natural Stream. Sufficient attenuation has been provided at the attenuated areas plus the direct runoff to the Natural Stream is still below the Pre-Developed runoff.

WSUD principles will be discussed later in the report, but typically the downpipe outlets will drain runoff to garden or grass areas.

Drainage will occur overland to the downstream grass swale and the proposed attenuation structure in the north eastern corner of the catchment.

The Catchment is a combination of buildings, hard surfaces and grass areas.

A final outlet pipe and structure has to be installed from the attenuation structure in the north eastern corner to discharge into the Bloubos Spruit.

6.5 Attenuation Structures

One attenuation structures is proposed per catchment. It is the intention to utilise existing open grass areas as attenuation areas. Volume will be created by excavating the structure with an average depth of 1.5m deep with the embankment side slopes of 1:2. The basin and side slopes will be grassy areas.

The outlets will consist of pipe outlets according to the sizing indicated from the HydroCube Results.

Table 6.5 below summarises the attenuation structures data.

Table 6.5

Structure	Plan Area	Max Depth	Volume	Pipe Outlet Size
RES0001	≈ 508 m²	1 m	740 m³	450 mm ø
RES0002	≈ 915 m²	1 m	525 m³	450 mm ø

Refer to typical detail of Attenuation Structure on SDP Plans.

7 RESULTS OF SIMMULATION

7.1 Pipe Sizing

The HydroCube output results with indicated flows, pipe diameters, etc are included in **Annexure E**. Minimum pipe diameters of 450 mm were used. All diameters were determined for both 1:5 and 1:25 year recurrence periods.

7.2 Comparison with Pre Developed Flow Values

The result of the proposed attenuation is compared with the Pre Developed flow values in Table 7.2.

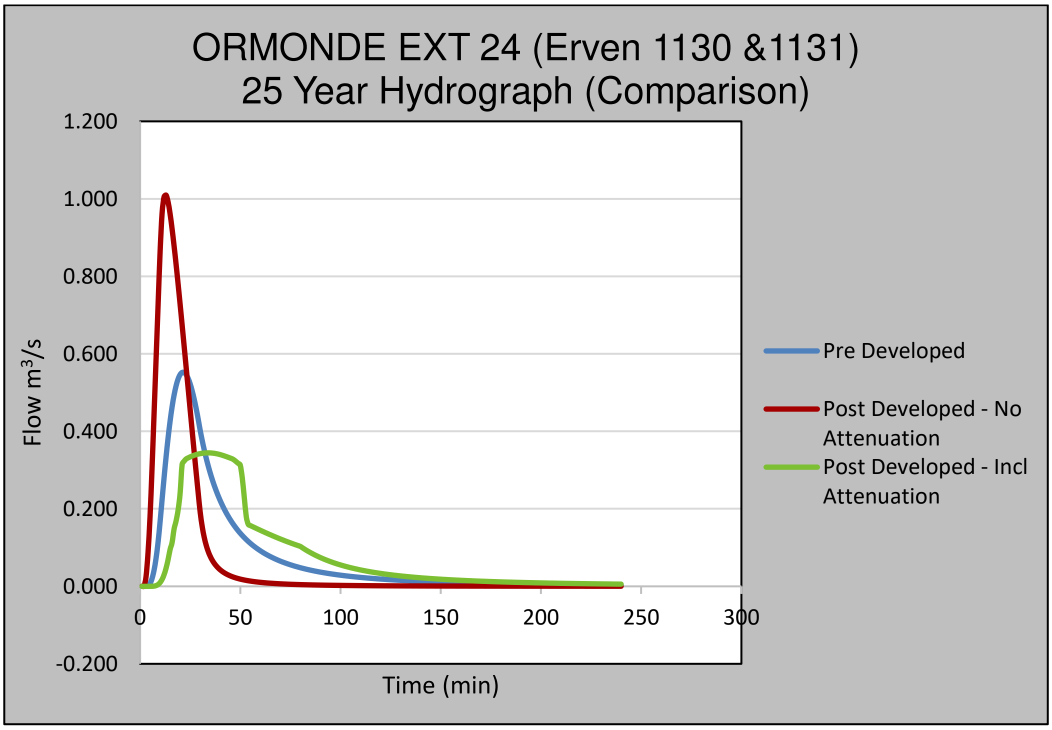
Table 7.2

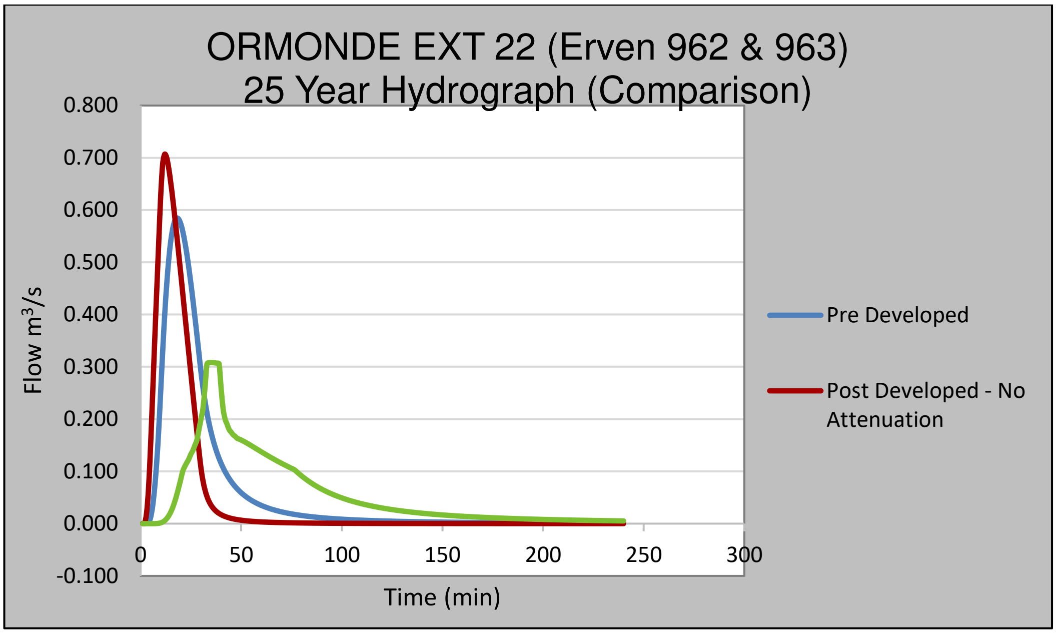
PRE DEVELOPMENT RUNOFF			POST DEVELOPMENT RUNOFF		
	Q5	Q25		Q5	Q25
D1-1 + D1-2	0.59 m³/s	1.137 m³	R1-1 + R2-1 + R2-17 + D1-19 + D1-20 + D1-21	0.468 m³/s	0.93 m³
Q5 PRE > Q5 POST **Q25 PRE > Q25 POST**					

The total outflow to the municipal system from the development site is less to the pre-developed scenarios. The final outflow to the Natural stream is 0.122 m³/s less for the 1:5 year recurrence period and 0.207 m³/s less for the 1:25 recurrence period than the pre developed scenario.

The final attenuation structure RES0001 equals 740 m³ / 2.19 ha = 337 m³/ha and 525 m³ / 1.62 ha = 324 m³/ha for RES0002.

Please refer to the graphs below of the final outlet node comparing Pre-Development runoff with Post Non-Attenuated Flow and Post Attenuated Flow. It can be seen that the Post Attenuated Flow is less than the Pre Development flow.





8. WSUD PRINCIPLES

In general, existing drainage patterns comply with WSUD principle. Almost all roof drainage is directed to gardens or lawns resulting in infiltration.

The main outlet pipes and channels will be diverted to the attenuation structure that will not only attenuate, but infiltrate runoff.

Where possible all drainage routes will be constructed with grass swales or grass ditches shaped to convey runoff. By implementing these measure maximum infiltration will be achieved.

The proposals above with further reference to other infiltration methods in the report maximise on the WSUD drainage principles.

9. FLOODLINES

There are floodlines affecting the development as shown on the SDP and SMP Plans

10. STORMWATER MANAGEMENT DURING CONSTRUCTION

Stormwater systems or routes will not be affected during any construction. If necessary diversions to grass areas will be implemented.

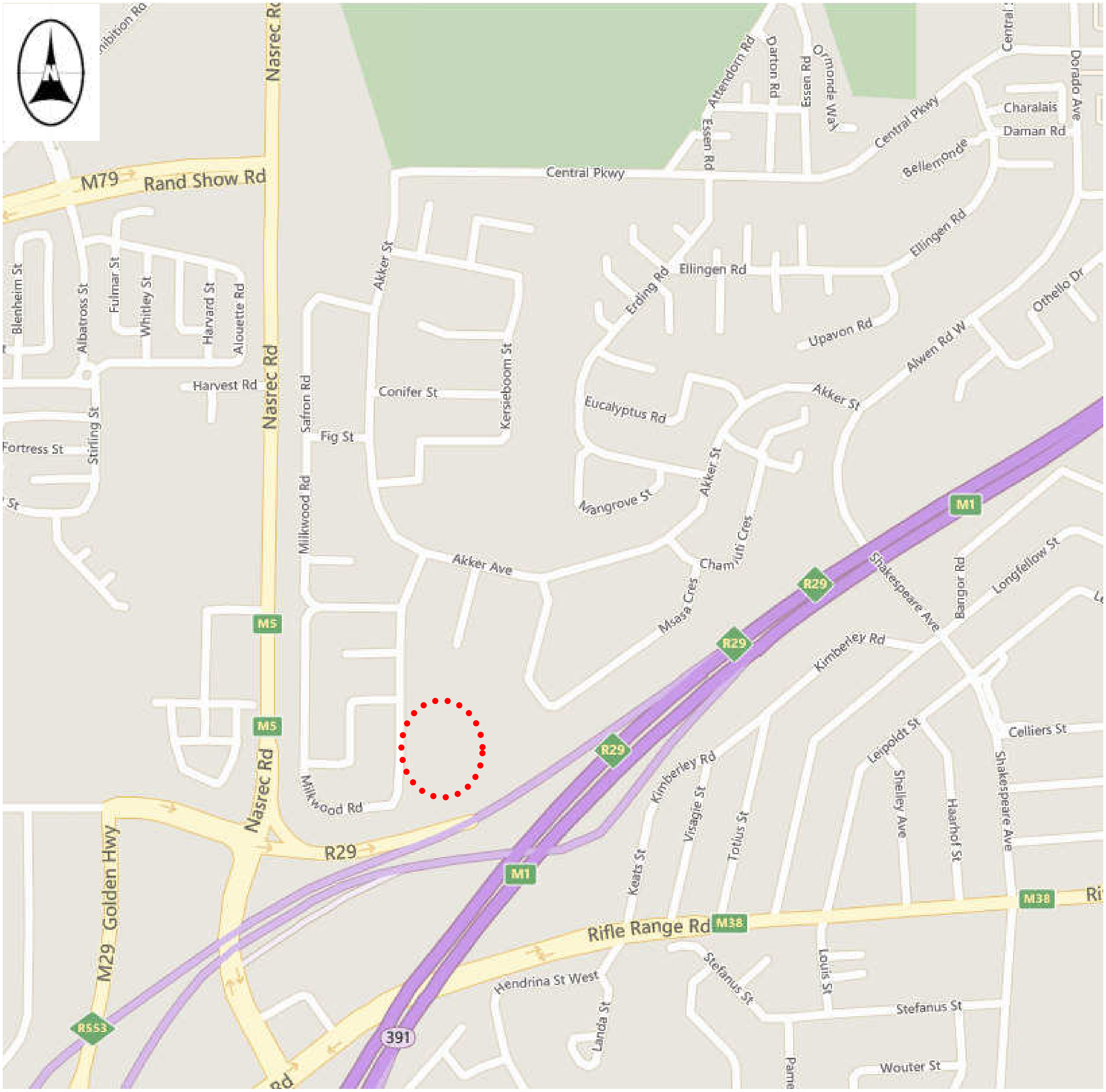
11. CONCLUSION

We trust the report addresses the requirements for Stormwater Management of the intended rezoning and consolidation of Erven 1130 & 1131 Ormonde Ext 24 and Erven 962 & 963 Ormonde Ext 22, Johannesburg.

Yours faithfully

W STANDER Pr Eng
For CIVIL CONCEPTS (PTY) LTD

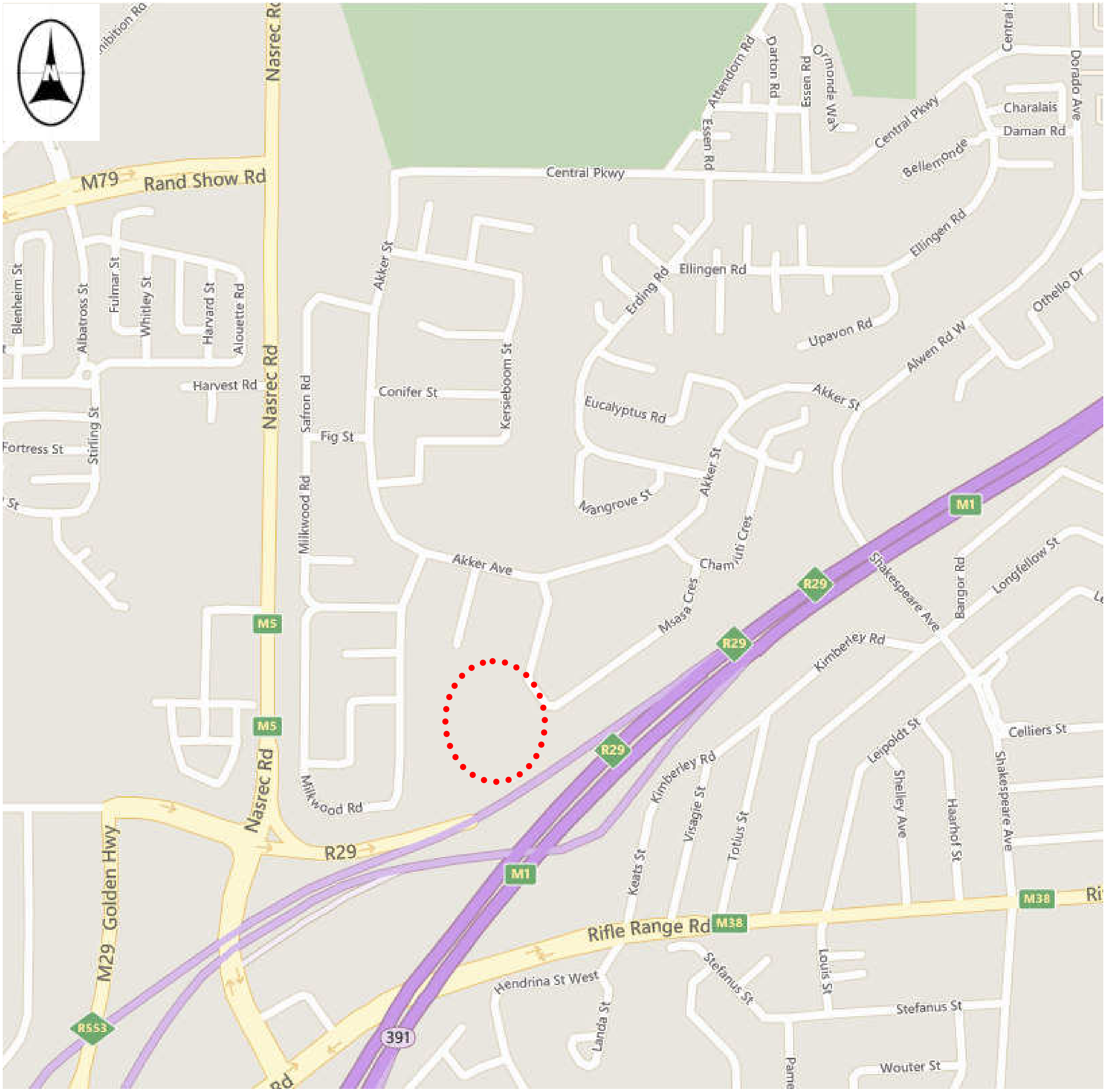
ANNEXURE A
LOCALITY PLAN



LOCALITY PLAN
ORMONDE EXT 24 ERVEN 1130 &1131

CIVIL CONCEPTS
Consulting Civil and Structural Engineers

Joburg
a world class African city



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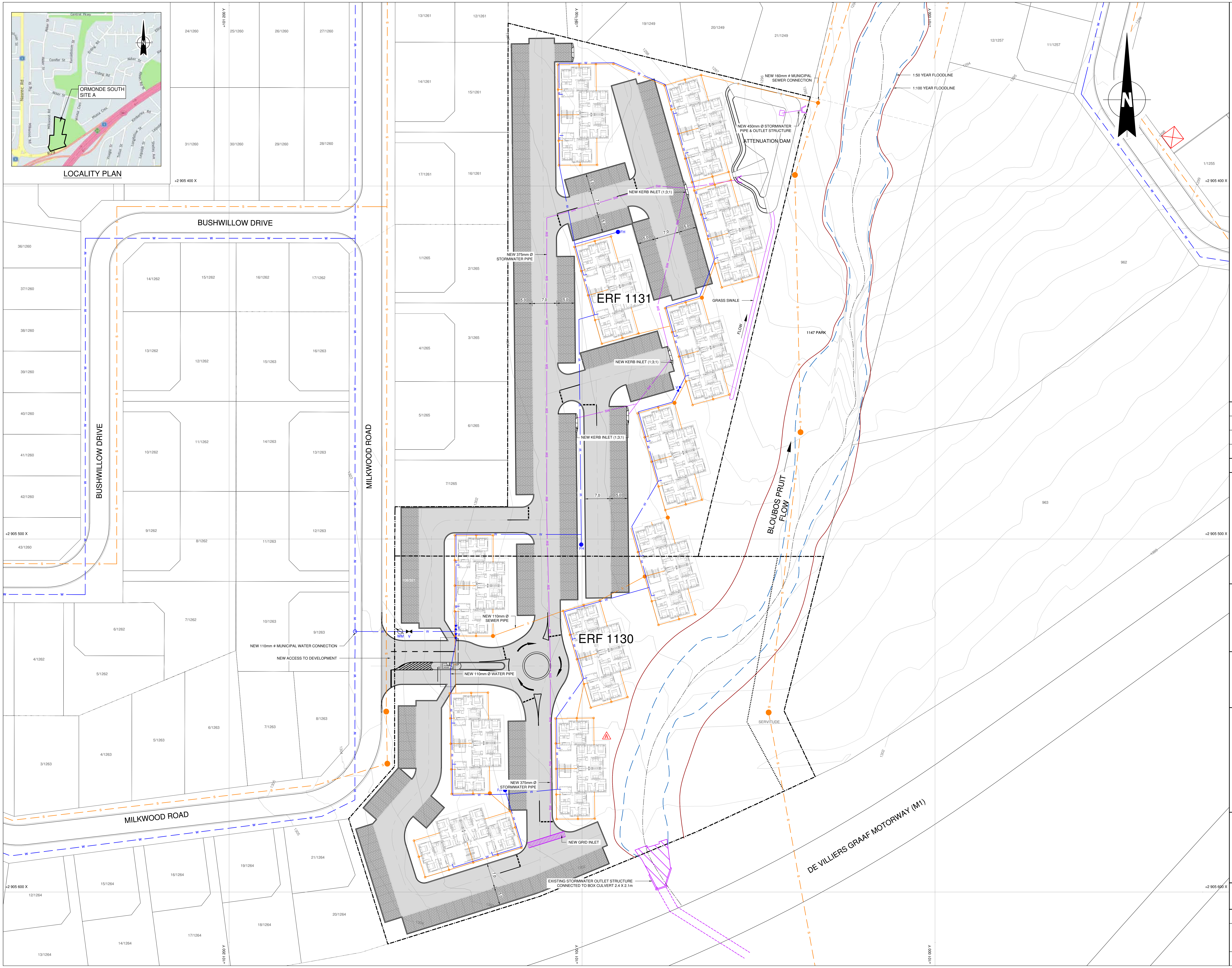
LOCALITY PLAN
ORMONDE EXT 22 ERVEN 962 & 963

Jo'burg
a world class African city

ANNEXURE B
SDP / LAYOUT PLANS

C2284-SDP-A-001
C2284-SDP-B-001



GENERAL:

1. ALL MATERIAL AND WORKMANSHIP MUST COMPLY WITH THE REQUIREMENTS OF THE LATEST RELEVANT SABS REQUIREMENTS.
2. DO NOT SCALE FROM THESE DRAWINGS.
3. ALL DIMENSIONS MUST BE CHECKED AND APPROVED ON SITE.
4. THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH THE STANDARD DRAWINGS.(IF APPLICABLE).
5. THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE STANDARD SPECIFICATIONS FOR MUNICIPAL CIVIL ENGINEERING WORKS, SERIES 4.
6. THE SIGNATURE OR INITIALS ON THIS DRAWING, OF ANY DIRECTOR OF THE PUBLIC WORKS AND INFRASTRUCTURE DEVELOPMENT DEPARTMENT, IN NO WAY REMOVES ANY RESPONSIBILITY WHATSOEVER FROM THE CONSULTANT.
7. THE CONSULTANT REMAINS RESPONSIBLE TO ENSURE THAT ALL THE GUIDELINES, STANDARD DRAWINGS, STANDARDS AND SPECIFICATIONS OF THE PUBLIC WORKS AND INFRASTRUCTURE DEVELOPMENT DEPARTMENT HAVE BEEN MET AND ARE COMPLIED WITH.
8. FINAL POSITION OF SERVICES TO BE DETERMINED ON SITE.
9. ALL AREAS AND DIMENSIONS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY.

ROADS:

1. KERBING TO BE AS PER STANDARD DETAIL PLANS A AND B AND SECTION 10 OF VOLUME 1 OF CONTRACT DOCUMENT.
2. TRAFFIC CONTROL MUST COMPLY WITH THE REQUIREMENTS OF THE SOUTH AFRICAN ROAD TRAFFIC SIGNS MANUAL (THIRD EDITION).
3. VERTICAL AND HORIZONTAL ALIGNMENT TO FOLLOW THE EXISTING ROAD SURFACE, WITH A MINIMUM CROSS FALL OF 2 % (IF APPLICABLE)
4. DRIVEWAYS TO BE FINISHED AS PER ARCHITECTS DETAILS

LEGEND:

▬ ▬ · ▬ ▬	ERF BOUNDARY
═	EXISTING ROADS
▨	NEW ACCESS
═	NEW FIG. 7 KERB
═	NEW 300mm MOUNTABLE KERB
— — —	50 YEAR FLOODLINE
——	100 YEAR FLOODLINE
—— S ——	SEWER
——●——	SEWER MANHOLE
——○——	SEWER CLEANING EYE
—— W ——	WATER
——⋈——	WATER VALVE
—— SW ——	STORMWATER

DATE	NO	REVISION
MAY 2017	A	PLATFORM LOCATION AMENDED

CLIENT

LOCAL AUTHORITY

Civil Concepts (Pty) Ltd
Consulting Civil & Structural Engineers
PO Box 36148, Menlo Park, 0102
Office: +27 12 460 0008
www.civilconcepts.co.za

PROJECT

ORMONDE SOUTH

SITE A ON ERF 1130 & 1131

DRAWING TITLE

SITE DEVELOPMENT PLAN

DRAWING NO C2284-SDP-A-001

REV.NO. A

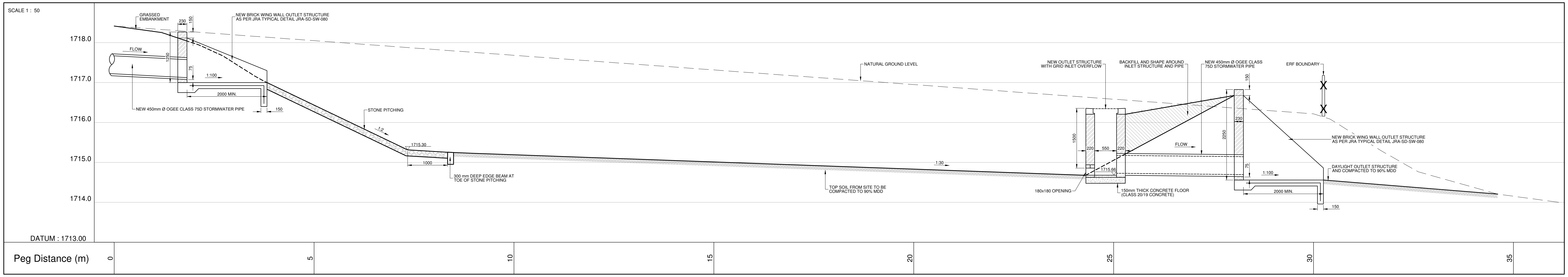
SCALE 1:500

DATE OCTOBER 2016

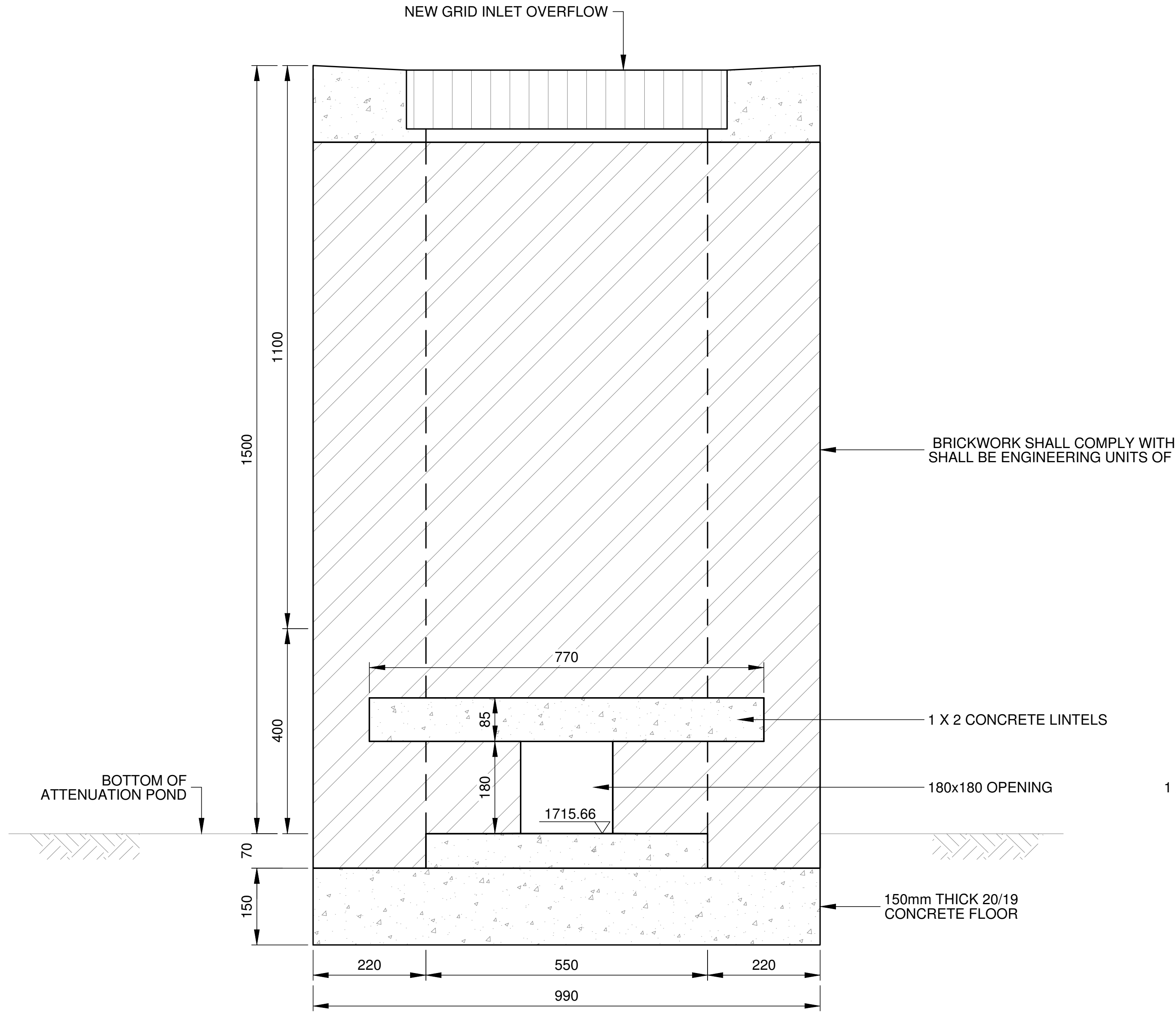
DESIGNED A.OOSTHUIZEN

DRAWN A.OOSTHUIZEN

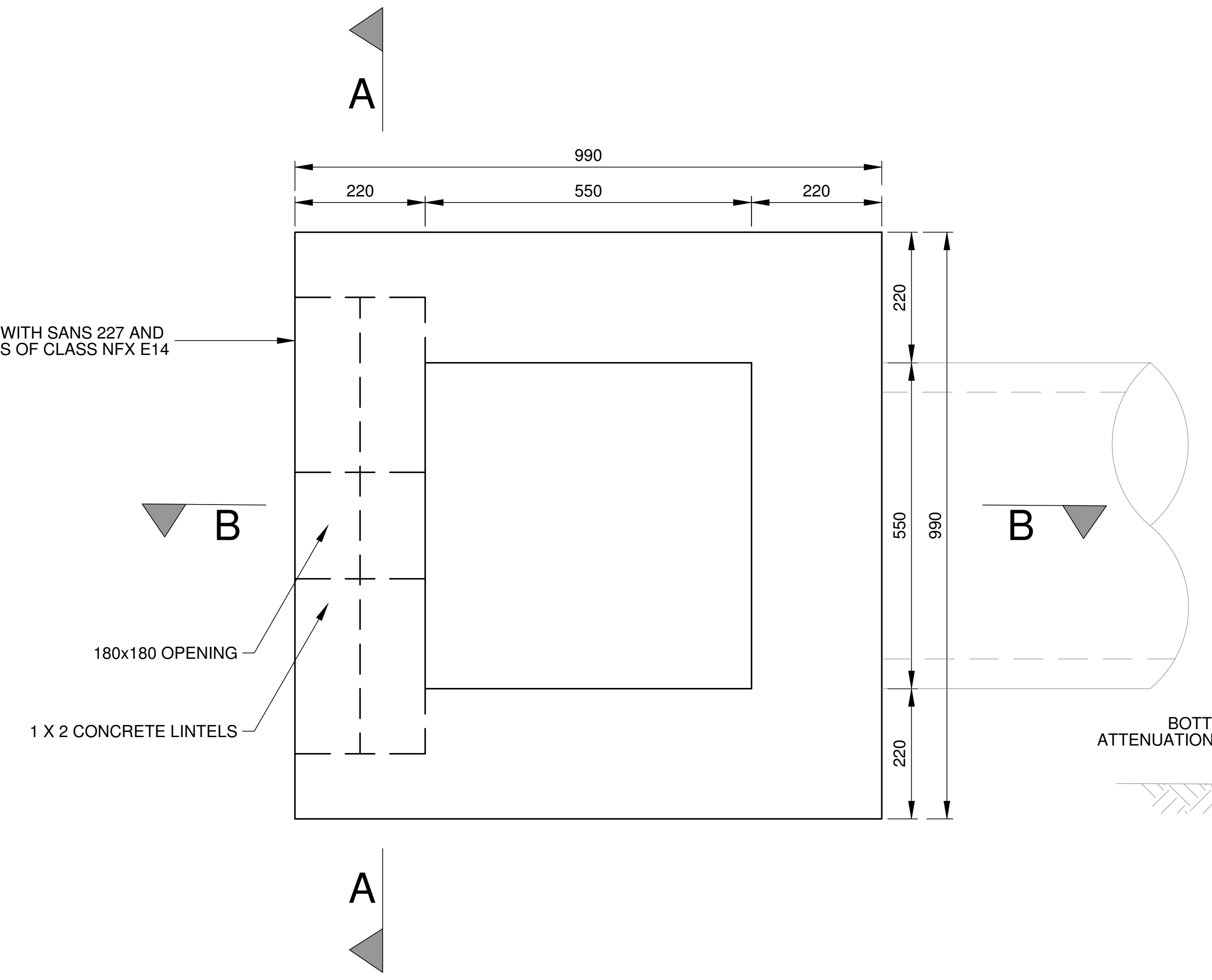
CHECKED L.ZIETSMAN



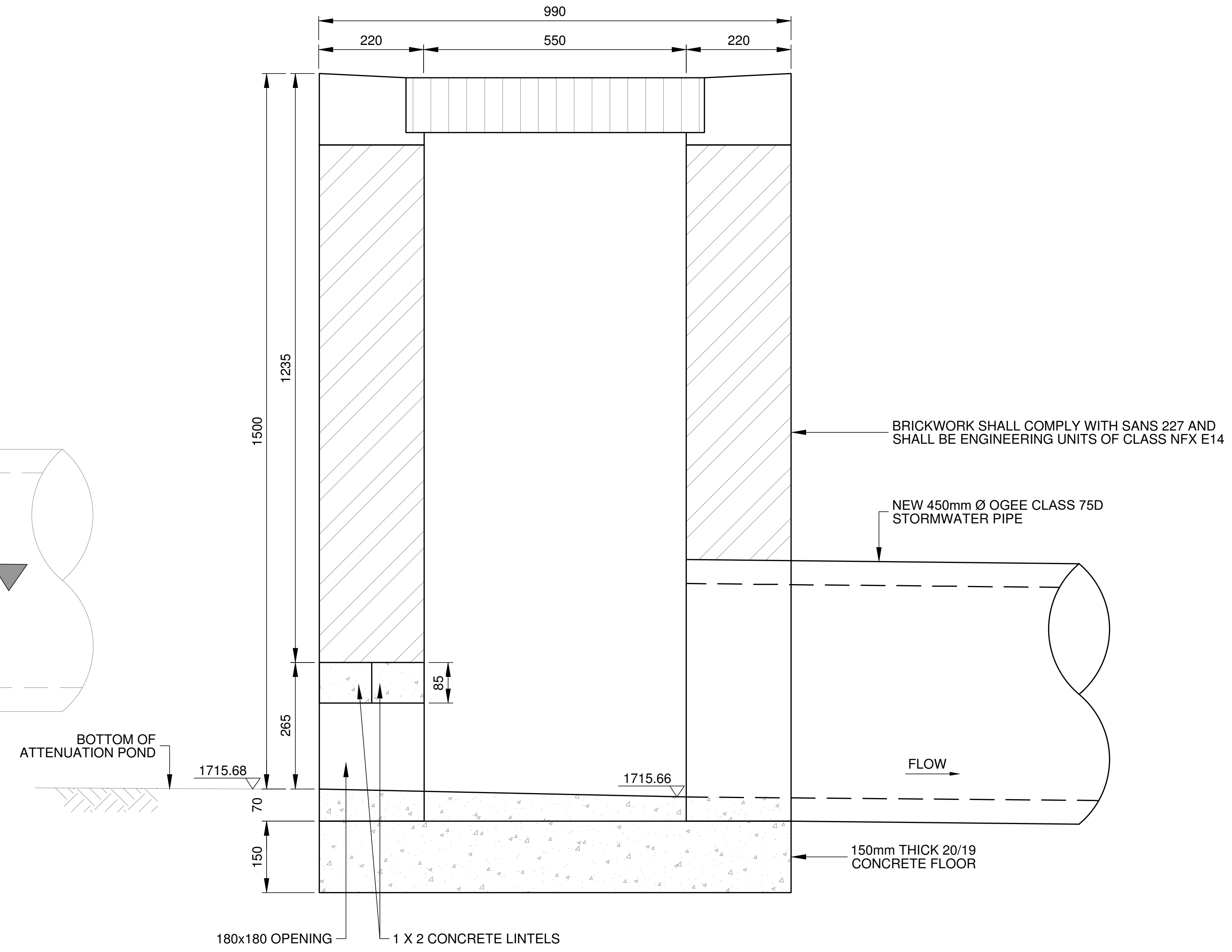
CROSS SECTION OF
STORMWATER ATTENUATION POND



SECTION A-A
SCALE 1 : 10



PLAN OF
OUTLET STRUCTURE
PLAN
SCALE 1 : 10



SECTION B-B
SCALE 1 : 10

DATE	NO	REVISION

CLIENT

LOCAL AUTHORITY

Civil Concepts (Pty) Ltd
Consulting Civil & Structural Engineers
PO Box 36148, Menlo Park, 0102
Office: +27 12 460 0008
www.civilconcepts.co.za

PROJECT

ORMONDE SOUTH

SITE A ON ERF
1130 & 1131

DRAWING TITLE

STORMWATER ATTENUATION
POND SECTION

DRAWING NO C2284-SDP-A-002

REV.NO.

SCALE	AS SHOWN	DESIGNED	A.OOSTHUIZEN
		DRAWN	A.OOSTHUIZEN
DATE	MAY 2017	CHECKED	L.ZIETSMAN

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LEGEND:

━ ━ ╷ ━ ━	ERF BOUNDARY
═	EXISTING ROADS
▨	NEW ACCESS
═	NEW FIG. 7 KERB
═	NEW 300mm MOUNTABLE KERB
—	50 YEAR FLOODLINE
—	100 YEAR FLOODLINE
— S —	SEWER
—●—	SEWER MANHOLE
—○—	SEWER CLEANING EYE
— W —	WATER
—▶◀—	WATER VALVE
— SW —	STORMWATER

DATE	NO	REVISION

CLIENT

LOCAL AUTHORITY

a world class African city

Civil Concepts (Pty) Ltd
Consulting Civil & Structural Engineers
PO Box 36148, Menlo Park, 0102
Office: +27 12 460 0008
www.civilconcepts.co.za

PROJECT

ORMONDE SOUTH

SITE B ON ERF
962 & 963

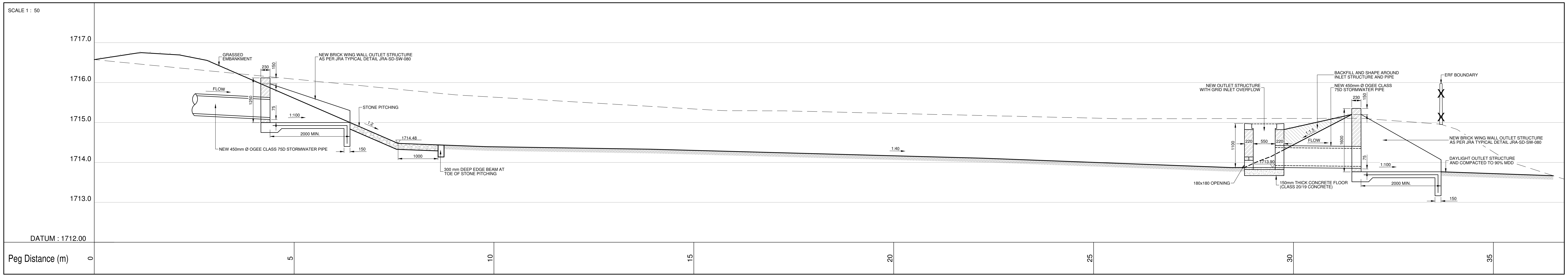
DRAWING TITLE

SITE DEVELOPMENT PLAN

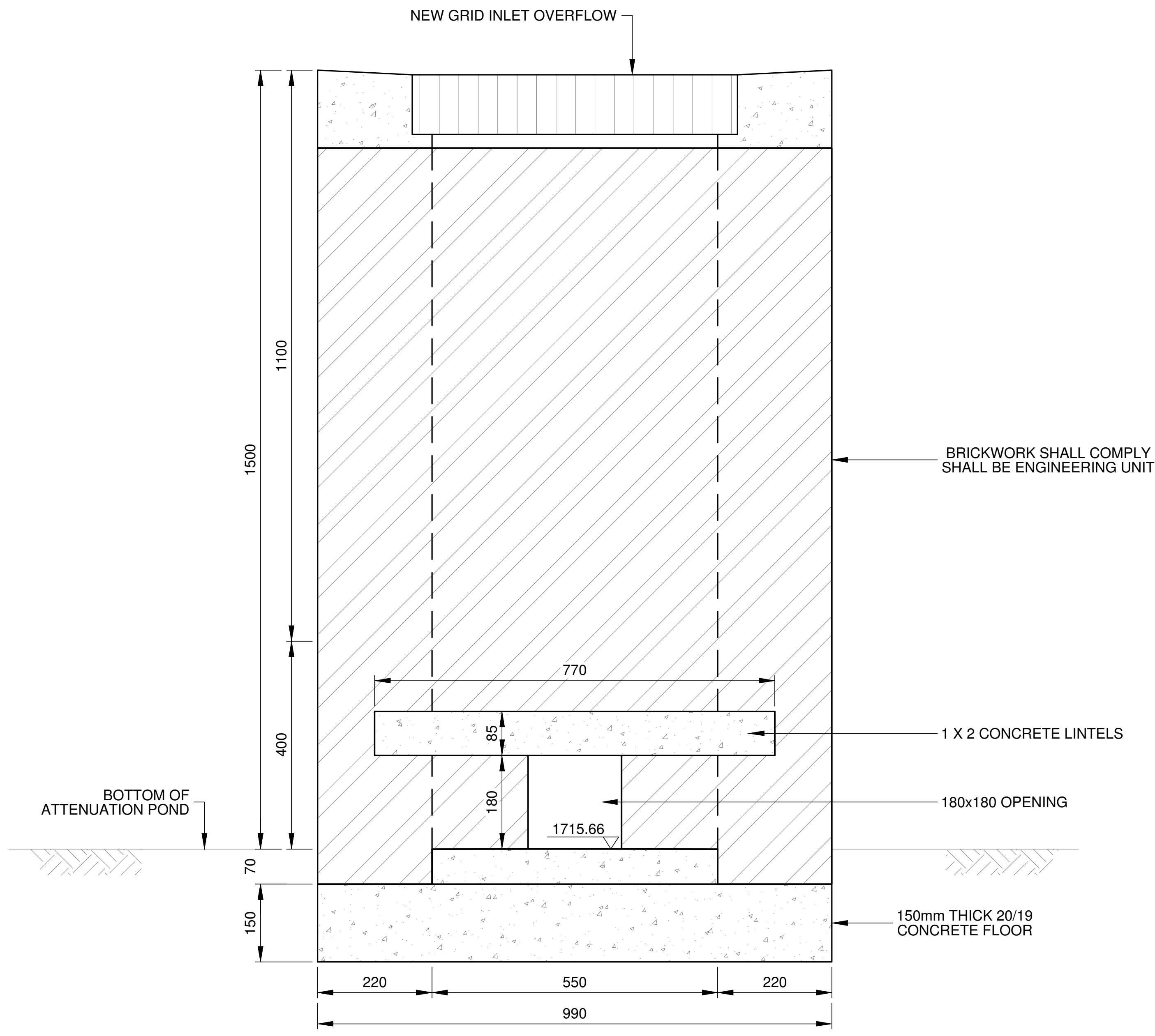
DRAWING NO C2284-SDP-B-001

REV.NO.

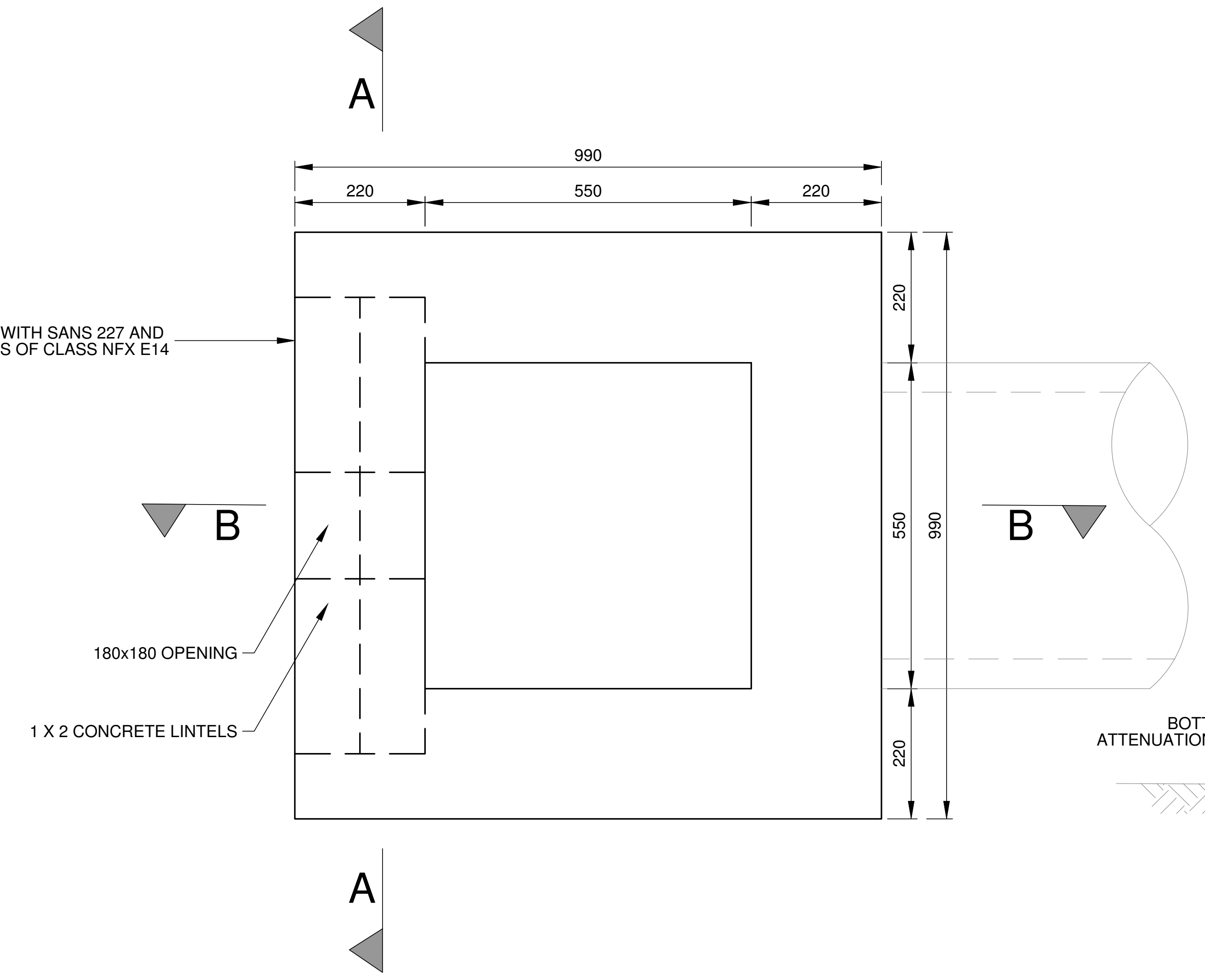
SCALE	1:500	DESIGNED	A.OOSTHUIZEN
		DRAWN	A.OOSTHUIZEN
DATE	MAY 2017	CHECKED	L.ZIETSMAN



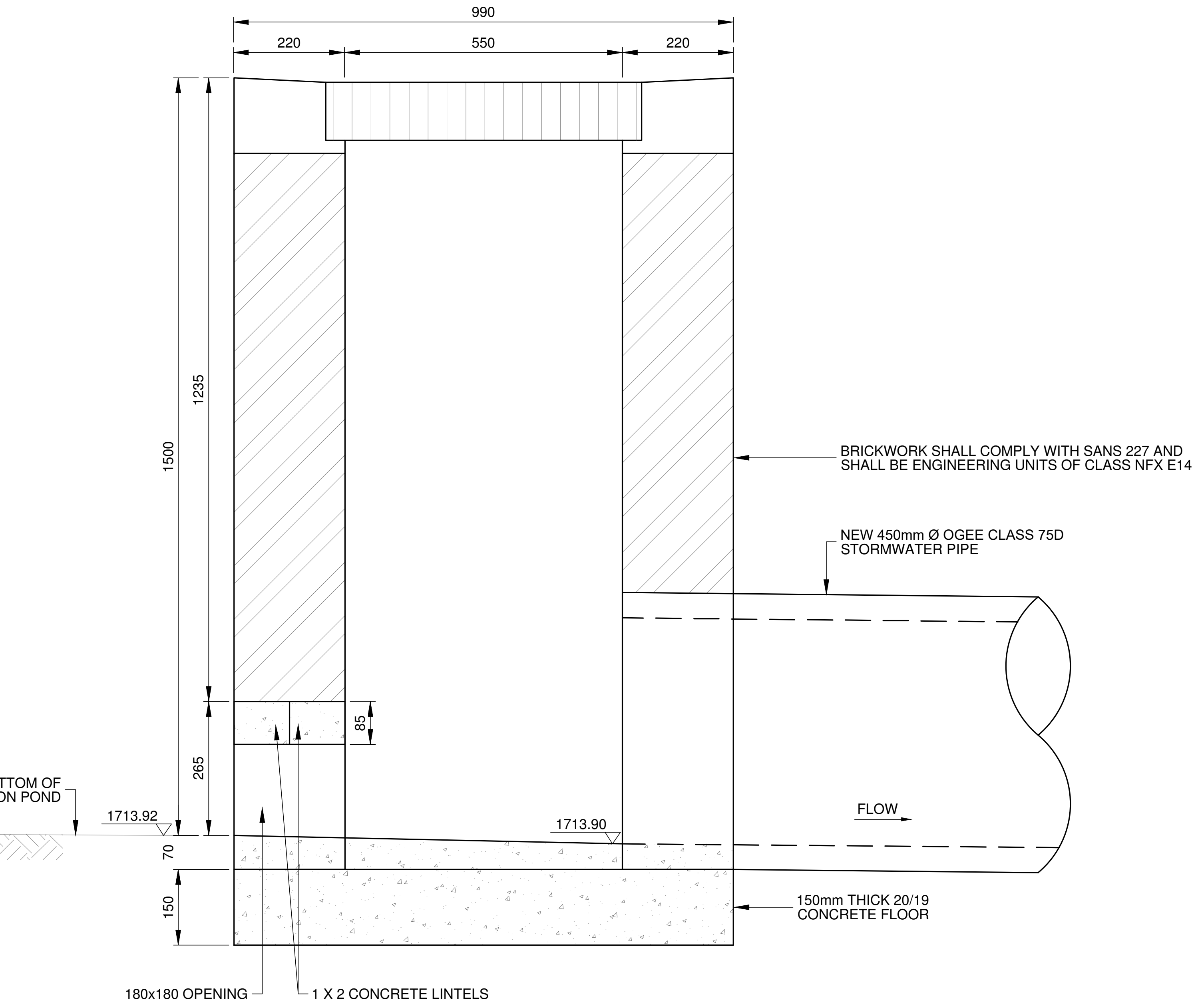
CROSS SECTION OF
STORMWATER ATTENUATION POND



SECTION A-A
SCALE 1 : 10



PLAN OF
OUTLET STRUCTURE
PLAN
SCALE 1 : 10



SECTION B-B
SCALE 1 : 10

DATE	NO	REVISION

CLIENT

LOCAL AUTHORITY

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PROJECT

ORMONDE SOUTH

SITE B ON ERF 962
& 963

DRAWING TITLE

STORMWATER ATTENUATION
POND SECTION

DRAWING NO C2284-SDP-B-002

REV.NO.

SCALE	AS SHOWN	DESIGNED	A.OOSTHUIZEN
		DRAWN	A.OOSTHUIZEN
DATE	MAY 2017	CHECKED	L.ZIETSMAN

ANNEXURE C
CATCHMENT, PIPE AND CHANNEL DATA

Project: ORMONDE

Total Area: 3.81 **StormShape: Triangular**

M.A.P:750

Catchment	Drain To	Area	Length	Slope	% Imp	% FutImp	Depr	Depr	Infilt i	Infilt f	n	n
		(Ha)	(M)	(m/m)			Imp	Per	(mm/hr)	(mm/hr)	Per	Imp
D1-1	RES0001	0.06	29.00	0.0760	80	80	1.0	3.0	45	6	0.150	0.020
D1-10	R1-10	0.18	61.00	0.0320	80	80	1.0	3.0	45	6	0.150	0.020
D1-11	R1-11	0.10	51.00	0.0420	80	80	1.0	3.0	45	6	0.150	0.020
D1-12	D1-9	0.06	40.00	0.0360	80	80	1.0	3.0	45	6	0.150	0.020
D1-13	R1-13	0.05	29.00	0.0540	80	80	1.0	3.0	45	6	0.150	0.020
D1-14	R1-14	0.08	54.00	0.0170	80	80	1.0	3.0	45	6	0.150	0.020
D1-15	R1-6	0.26	84.00	0.0120	80	80	1.0	3.0	45	6	0.150	0.020
D1-16	D1-3	0.17	59.00	0.0350	80	80	1.0	3.0	45	6	0.150	0.020
D1-17	R1-17	0.08	29.00	0.0550	80	80	1.0	3.0	45	6	0.150	0.020
D1-18	R1-18	0.09	18.00	0.0360	80	80	1.0	3.0	45	6	0.150	0.020
D1-19	<END>	0.10	59.00	0.0220	80	80	1.0	3.0	45	6	0.150	0.020
D1-2	D1-1	0.07	42.00	0.0480	80	80	1.0	3.0	45	6	0.150	0.020
D1-20	<END>	0.09	57.00	0.0310	80	80	1.0	3.0	45	6	0.150	0.020
D1-21	<END>	0.02	17.00	0.0400	80	80	1.0	3.0	45	6	0.150	0.020
D1-3	R1-3	0.06	43.00	0.0310	80	80	1.0	3.0	45	6	0.150	0.020
D1-4	D1-1	0.06	28.00	0.0340	80	80	1.0	3.0	45	6	0.150	0.020
D1-5	R1-5	0.25	34.00	0.0520	80	80	1.0	3.0	45	6	0.150	0.020
D1-6	R1-6	0.16	82.00	0.0130	80	80	1.0	3.0	45	6	0.150	0.020
D1-7	R1-7	0.11	41.00	0.0320	80	80	1.0	3.0	45	6	0.150	0.020
D1-8	R1-8	0.04	35.00	0.0320	80	80	1.0	3.0	45	6	0.150	0.020
D1-9	R1-9	0.11	42.00	0.0370	80	80	1.0	3.0	45	6	0.150	0.020
D2-1	RES0002	0.12	36.00	0.0620	80	80	1.0	3.0	45	6	0.150	0.020
D2-10	R2-10	0.03	30.00	0.0510	80	80	1.0	3.0	45	6	0.150	0.020
D2-11	R2-11	0.15	49.00	0.0380	80	80	1.0	3.0	45	6	0.150	0.020
D2-12	R2-12	0.14	49.00	0.0580	80	80	1.0	3.0	45	6	0.150	0.020
D2-13	R2-13	0.03	31.00	0.0480	80	80	1.0	3.0	45	6	0.150	0.020
D2-14	R2-14	0.08	30.00	0.0550	80	80	1.0	3.0	45	6	0.150	0.020
D2-15	R2-15	0.11	30.00	0.0640	80	80	1.0	3.0	45	6	0.150	0.020
D2-16	D2-1	0.06	30.00	0.0620	80	80	1.0	3.0	45	6	0.150	0.020
D2-17	R2-17	0.10	48.00	0.0220	80	80	1.0	3.0	45	6	0.150	0.020
D2-18	R2-18	0.05	32.00	0.0300	80	80	1.0	3.0	45	6	0.150	0.020
D2-19	R2-18	0.06	28.00	0.0310	80	80	1.0	3.0	45	6	0.150	0.020
D2-2	R2-2	0.12	38.00	0.0780	80	80	1.0	3.0	45	6	0.150	0.020
D2-20	R2-20	0.06	31.00	0.0380	80	80	1.0	3.0	45	6	0.150	0.020
D2-21	R2-21	0.05	30.00	0.0400	80	80	1.0	3.0	45	6	0.150	0.020
D2-3	R2-3	0.07	31.00	0.0430	80	80	1.0	3.0	45	6	0.150	0.020
D2-4	R2-4	0.07	27.00	0.0580	80	80	1.0	3.0	45	6	0.150	0.020
D2-5	R2-5	0.07	27.00	0.0450	80	80	1.0	3.0	45	6	0.150	0.020
D2-6	R2-6	0.09	40.00	0.0370	80	80	1.0	3.0	45	6	0.150	0.020
D2-7	R2-7	0.04	25.00	0.0710	80	80	1.0	3.0	45	6	0.150	0.020
D2-8	R2-8	0.08	40.00	0.0450	80	80	1.0	3.0	45	6	0.150	0.020
D2-9	R2-9	0.05	26.00	0.0410	80	80	1.0	3.0	45	6	0.150	0.020

Project: ORMONDE

Total Area: 3.81 **StormShape: Triangular**

M.A.P:750

Pipe	**Drain**	**Overflow**	**Diameter**	**Length**	**Slope**	**Mannings**	**Kerb Eff**	**Max Cap**
			(m)	**(m)**	**(m/m)**		**(m3/s)**	**(m3/s)**
R1-1	<END>	<NONE>	0.450	19	0.1110	0.0120	100	1.11
R1-10	R1-9	<NONE>	0.450	11	0.0080	0.0120	100	0.30
R1-11	R1-10	<NONE>	0.450	38	0.0200	0.0120	100	0.47
R1-13	R1-5	<NONE>	0.450	49	0.0190	0.0120	100	0.46
R1-14	R1-13	<NONE>	0.450	20	0.0430	0.0120	100	0.69
R1-5	RES0001	<NONE>	0.450	16	0.0680	0.0120	100	0.87
R1-6	R1-5	<NONE>	0.450	40	0.0550	0.0120	100	0.78
R1-7	R1-6	<NONE>	0.450	85	0.0080	0.0120	100	0.30
R1-8	R1-7	<NONE>	0.450	9	0.0480	0.0120	100	0.73
R1-9	R1-7	<NONE>	0.450	40	0.0080	0.0120	100	0.30
R2-0	RES0002	<NONE>	0.450	10	0.0900	0.0120	100	1.00
R2-1	<END>	<NONE>	0.450	24	0.0680	0.0120	100	0.87
R2-10	R2-8-1	<NONE>	0.450	13	0.0580	0.0120	100	0.80
R2-11	R2-8-1	<NONE>	0.450	8	0.0550	0.0120	100	0.78
R2-12	R2-0	<NONE>	0.450	5	0.0560	0.0120	100	0.79
R2-13	R2-0	<NONE>	0.450	26	0.0760	0.0120	100	0.92
R2-17	<END>	<NONE>	0.450	9	0.0210	0.0120	100	0.48
R2-18	R2-17	<NONE>	0.450	52	0.0150	0.0120	100	0.41
R2-19	R2-18	<NONE>	0.450	36	0.0150	0.0120	100	0.41
R2-2	RES0002	<NONE>	0.450	5	0.0450	0.0120	100	0.70
R2-2-1	R2-2	<NONE>	0.450	18	0.0480	0.0120	100	0.73
R2-20	R2-19	<NONE>	0.450	31	0.0120	0.0120	100	0.36
R2-21	R2-20	<NONE>	0.450	33	0.0120	0.0120	100	0.36
R2-3	R2-2-1	<NONE>	0.450	29	0.0470	0.0120	100	0.72
R2-8	R2-3	<NONE>	0.450	21	0.0430	0.0120	100	0.69
R2-8-1	R2-8	<NONE>	0.450	20	0.0650	0.0120	100	0.85

Project: ORMONDE

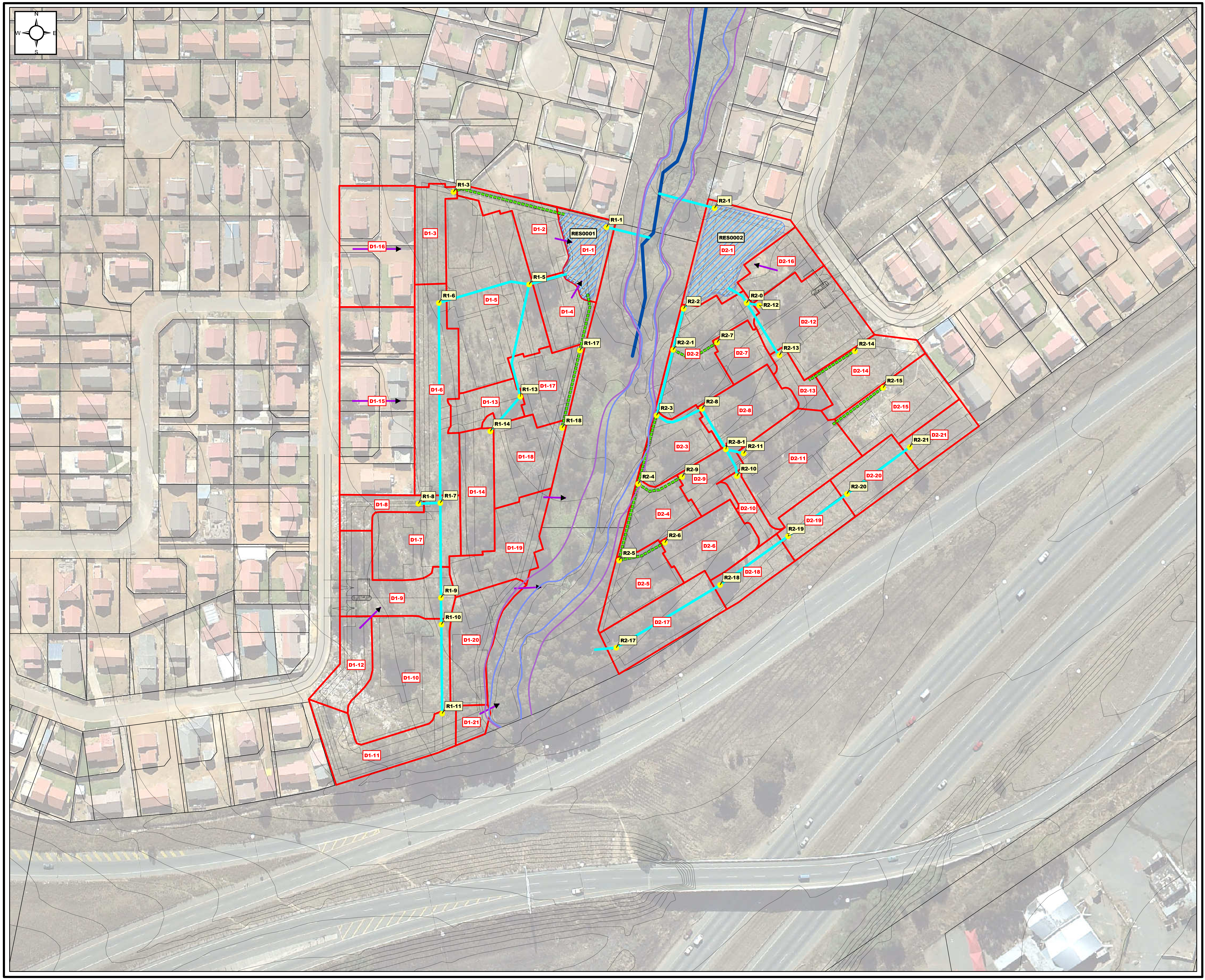
Total Area: 3.81 **StormShape: Triangular**

M.A.P:750

Channel	Drain To	Overflow to	Bottom Width	L-Slope	R-Slope	Height	Length	Slope	Manning	KerbInflow Rate	KerbInflow Eff	Max Cap
			(m)	(m/m)	(m/m)	(m)	(m)	(m/m)		(m3/s)		(m3/s)
R1-17	RES0001	<NONE>	0.30	1.0000	1.0000	0.50	25	0.0340	0.070	0.399	100	0.40
R1-18	R1-17	<NONE>	0.30	1.0000	1.0000	0.50	34	0.0340	0.070	0.399	100	0.40
R1-3	RES0001	<NONE>	0.30	1.0000	1.0000	0.50	49	0.0560	0.070	0.513	100	0.51
R2-14	D2-13	<NONE>	0.30	1.0000	1.0000	0.50	24	0.0180	0.070	0.291	100	0.29
R2-15	D2-11	<NONE>	0.30	1.0000	1.0000	0.50	26	0.0100	0.070	0.217	100	0.22
R2-4	R2-3	<NONE>	0.30	1.0000	1.0000	0.50	30	0.0340	0.070	0.399	100	0.40
R2-5	R2-4	<NONE>	0.30	1.0000	1.0000	0.50	34	0.0300	0.070	0.375	100	0.38
R2-6	R2-5	<NONE>	0.30	1.0000	1.0000	0.50	21	0.0340	0.070	0.399	100	0.40
R2-7	R2-2-1	<NONE>	0.30	1.0000	1.0000	0.50	21	0.0250	0.070	0.342	100	0.34
R2-9	R2-4	<NONE>	0.30	1.0000	1.0000	0.50	21	0.0250	0.070	0.342	100	0.34

ANNEXURE D
SMP PLAN

SMP/ORM/2/001



NOTES:

1. RUN-OFF CALCULATION PERFORMED WITH HYDROCUBE COMPUTER PROGRAM, USING THE FOLLOWING CONSTANTS:

a) RETURN PERIOD:
- MAJOR SYSTEM : 25 YR
- MINOR SYSTEM : 5 YR

b) MAP = 750 mm

c) % IMPERVIOUSNESS:
- RESIDENTIAL : 80%
- ROADS : 80%

LEGEND

50 YEAR FLOODLINE
100 YEAR FLOODLINE
RIVER
STORMWATER NODES
STORMWATER ROUTES
GRASS SWALES
SUB CATCHMENTS
ATTENUATION POND

0	10/2016	FIRST ISSUE

REVISION

CLIENT

MATLA PROJECTS (PTY) LTD
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PROJECT

STORMWATER MASTER PLANNING

TOWNSHIP

ERVEN 962 & 963 ORMONDE EXT 22
ERVEN 1130 & 1131 ORMONDE EXT 24

DRAWING NO

SMP/ORM/2/001

SCALE 1 : 1 000	DESIGNED	W STANDER
	DRAWN	T VAN NIEKERK
	CHECKED	W STANDER

ANNEXURE E
5 / 25 YEAR RUNOFF DATA

Project :ORMONDE SMP

Total Area: 3.81 **StormShape:Triangular**

M.A.P:750 **Recurrence Interval:5(yrs)**

Pipe_____	InletPeak	Peakflow	Capacity	Auto	Required	Velocity	Storage	Excess-Q	Storm
No	(m3/sec)	(m3/sec)	(m3/sec)		Diameter(m)	(m/sec)	(m3)	(m3/sec)	Duration(min)
R1-1	0.000	0.166	1.107	Y	0.450	4.75	0	0.00	60
R1-10	0.060	0.098	0.297	Y	0.450	1.57	0	0.00	20
R1-11	0.037	0.037	0.470	Y	0.450	1.67	0	0.00	20
R1-13	0.019	0.044	0.458	Y	0.450	1.71	0	0.00	20
R1-14	0.025	0.025	0.689	Y	0.450	1.95	0	0.00	20
R1-5	0.099	0.463	0.866	Y	0.450	5.18	0	0.00	20
R1-6	0.117	0.325	0.779	Y	0.450	4.42	0	0.00	20
R1-7	0.040	0.213	0.297	Y	0.450	1.90	0	0.00	20
R1-8	0.014	0.014	0.728	Y	0.450	1.73	0	0.00	20
R1-9	0.062	0.160	0.297	Y	0.450	1.79	0	0.00	20
R2-0	0.000	0.097	0.997	Y	0.450	3.76	0	0.00	20
R2-1	0.000	0.117	0.866	Y	0.450	3.60	0	0.00	60
R2-10	0.010	0.010	0.014	Y	0.100	1.86	0	0.00	20
R2-11	0.095	0.095	0.779	Y	0.450	3.12	0	0.00	20
R2-12	0.053	0.053	0.786	Y	0.450	2.67	0	0.00	20
R2-13	0.044	0.044	0.916	Y	0.450	2.79	0	0.00	20
R2-17	0.035	0.116	0.481	Y	0.450	2.36	0	0.00	20
R2-18	0.041	0.082	0.407	Y	0.450	1.86	0	0.00	20
R2-19	0.000	0.042	0.407	Y	0.450	1.53	0	0.00	20
R2-2	0.047	0.323	0.705	Y	0.450	4.06	0	0.00	20
R2-2-1	0.000	0.277	0.728	Y	0.450	3.99	0	0.00	20
R2-20	0.024	0.042	0.364	Y	0.450	1.42	0	0.00	20
R2-21	0.018	0.018	0.364	Y	0.450	1.10	0	0.00	20
R2-3	0.028	0.261	0.720	Y	0.450	3.89	0	0.00	20
R2-8	0.032	0.136	0.689	Y	0.450	3.18	0	0.00	20
R2-8-1	0.000	0.105	0.847	Y	0.450	3.41	0	0.00	20

Project :ORMONDE SMP

Total Area: 3.81 **StormShape:Triangular**

M.A.P:750 **Recurrence Interval:5(yrs)**

Channel No	Peakflow (m3/sec)	Capacity (m3/sec)	Auto	HR-Factor	Rating	Chan-Depth (m)	Flow-Depth (m)	Chan-Width (m)	Velocity (m/sec)	Storage (m3)	Excess-Q (m3/sec)	Storm Duration(Min)
R1-17	0.065	0.066	Y	9	Low	0.21	0.205	0.30	0.44	0.00	0.00	20
R1-18	0.037	0.038	Y	5	Low	0.15	0.153	0.30	0.41	0.00	0.00	20
R1-3	0.077	0.078	Y	11	Low	0.20	0.198	0.30	0.57	0.00	0.00	20
R2-14	0.032	0.033	Y	5	Low	0.17	0.168	0.30	0.30	0.00	0.00	20
R2-15	0.041	0.044	Y	6	Low	0.23	0.229	0.30	0.25	0.00	0.00	20
R2-4	0.100	0.101	Y	13	Low	0.26	0.257	0.30	0.48	0.00	0.00	20
R2-5	0.057	0.058	Y	8	Low	0.20	0.199	0.30	0.42	0.00	0.00	20
R2-6	0.031	0.031	Y	5	Low	0.14	0.138	0.30	0.39	0.00	0.00	20
R2-7	0.016	0.017	Y	2	Low	0.11	0.106	0.30	0.31	0.00	0.00	20
R2-9	0.019	0.020	Y	3	Low	0.12	0.116	0.30	0.32	0.00	0.00	20

Project :ORMONDE SMP

Total Area: 3.81 **StormShape:Triangular**

M.A.P:750 **Recurrence Interval:25(yrs)**

Pipe_____	InletPeak	Peakflow	Capacity	Auto	Required	Velocity	Storage	Excess-Q	Storm
No	(m3/sec)	(m3/sec)	(m3/sec)		Diameter(m)	(m/sec)	(m3)	(m3/sec)	Duration(min)
R1-1	0.00	0.34	1.107	Y	0.450	5.82	0	0.00	40
R1-10	0.09	0.14	0.297	Y	0.450	1.74	0	0.00	30
R1-11	0.05	0.05	0.470	Y	0.450	1.86	0	0.00	30
R1-13	0.03	0.07	0.458	Y	0.450	1.92	0	0.00	30
R1-14	0.04	0.04	0.689	Y	0.450	2.21	0	0.00	30
R1-5	0.14	0.70	0.866	Y	0.450	5.70	0	0.00	30
R1-6	0.19	0.50	0.779	Y	0.450	4.89	0	0.00	30
R1-7	0.06	0.31	0.448	Y	0.525	2.10	0	0.00	30
R1-8	0.02	0.02	0.728	Y	0.450	1.89	0	0.00	30
R1-9	0.09	0.24	0.297	Y	0.450	1.94	0	0.00	30
R2-0	0.00	0.14	0.997	Y	0.450	4.18	0	0.00	30
R2-1	0.00	0.31	0.866	Y	0.450	4.73	0	0.00	50
R2-10	0.01	0.01	0.014	Y	0.100	1.96	0	0.00	30
R2-11	0.14	0.14	0.779	Y	0.450	3.48	0	0.00	30
R2-12	0.08	0.08	0.786	Y	0.450	2.98	0	0.00	30
R2-13	0.06	0.06	0.916	Y	0.450	3.11	0	0.00	30
R2-17	0.05	0.17	0.481	Y	0.450	2.61	0	0.00	30
R2-18	0.06	0.12	0.407	Y	0.450	2.10	0	0.00	30
R2-19	0.00	0.06	0.407	Y	0.450	1.73	0	0.00	30
R2-2	0.07	0.47	0.705	Y	0.450	4.46	0	0.00	30
R2-2-1	0.00	0.41	0.728	Y	0.450	4.41	0	0.00	30
R2-20	0.03	0.06	0.364	Y	0.450	1.60	0	0.00	30
R2-21	0.02	0.02	0.364	Y	0.450	1.24	0	0.00	30
R2-3	0.04	0.38	0.720	Y	0.450	4.31	0	0.00	30
R2-8	0.05	0.20	0.689	Y	0.450	3.53	0	0.00	30
R2-8-1	0.00	0.15	0.847	Y	0.450	3.80	0	0.00	30

Project :ORMONDE SMP

Total Area: 3.81 **StormShape:Triangular**

M.A.P:750 **Recurrence Interval:25(yrs)**

Channel No	Peakflow (m3/sec)	Capacity (m3/sec)	Auto	HR-Factor	Rating	Chan-Depth (m)	Flow-Depth (m)	Chan-Width (m)	Velocity (m/sec)	Storage (m3)	Excess-Q (m3/sec)	Storm Duration(Min)
R1-17	0.093	0.095	Y	12	Low	0.25	0.248	0.30	0.47	0.00	0.00	30
R1-18	0.052	0.054	Y	7	Low	0.18	0.184	0.30	0.43	0.00	0.00	30
R1-3	0.115	0.116	Y	15	Low	0.24	0.242	0.30	0.61	0.00	0.00	30
R2-14	0.046	0.046	Y	6	Low	0.20	0.202	0.30	0.32	0.00	0.00	30
R2-15	0.060	0.062	Y	8	Low	0.27	0.273	0.30	0.26	0.00	0.00	30
R2-4	0.147	0.148	Y	17	Low	0.31	0.311	0.30	0.51	0.00	0.00	30
R2-5	0.083	0.085	Y	11	Low	0.24	0.242	0.30	0.45	0.00	0.00	30
R2-6	0.045	0.046	Y	6	Low	0.17	0.169	0.30	0.42	0.00	0.00	30
R2-7	0.023	0.024	Y	3	Low	0.13	0.129	0.30	0.33	0.00	0.00	30
R2-9	0.027	0.028	Y	4	Low	0.14	0.140	0.30	0.34	0.00	0.00	30

Appendix G9

Heritage Impact Assessment

PHASE 1 HERITAGE IMPACT ASSESSMENT (HIA) FOR THE PROPOSED ORMONDE SOUTH RESIDENTIAL (ERVEN 1130 & 1131, ORMONDE EXT 24 AND ERVEN 962 & 963, ORMONDE EXT 22)

Leonie Marais-Botes
Heritage Practitioner

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Pretoria
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BA (Cultural History and Archaeology) (UP), BA (Hons) Cultural History (UP), Post Grad Dip Museology (UP), Cert Conservation of Traditional Buildings (Univ of Canberra) Post Grad Dip: Heritage (Wits)

Accredited member: SA Society for Cultural History (CH002)

For:

Bokamoso Landscape Architects and Environmental Consultants CC
PO Box 11375
MAROELANA
0161

March 2017

DISCLAIMER:

Although all possible care is taken to identify/find all sites of cultural importance during the initial survey of the study area, the nature of archaeological and historical sites are as such that it is always possible that hidden or sub-surface sites could be overlooked during the study. Leonie Marais-Botes Heritage Practitioner will not be held liable will not be held liable for such oversights or for the costs incurred as a result thereof.

ACKNOWLEDGEMENTS

Australia ICOMOS. *The Burra Charter*.

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Human Tissues Act (Act 65 of 1983 as amended)

Government Printers. 1: 50 000

National Heritage Resources Act (Act 25 of 1999)

National Environmental Management Act (Act 107 of 1998)

Ordinance on Exhumations (no 12 of 1980)

Potgieter, D.J. (editor-in-chief) Standard Encyclopaedia of Southern Africa. London 1971.

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The National Archives of South Africa databases.

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ABOUT THIS REPORT

The heritage report must reflect that consideration has been given to the history and heritage significance of the study area and that the proposed activities is sensitive towards the heritage resources and does not significantly alter or destroy the heritage significance of the study area.

The heritage report must refer to the heritage resources currently in the study area.

The opinion of an independent heritage consultant is required to evaluate if the proposed work generally follows a good approach that will ensure the conservation of the heritage resources.

The National Heritage Resources Act (Act 25 of 1999), the National Environmental Management Act (Act 107 of 1998), Ordinance on Exhumations (no 12 of 1980) and the Human Tissues Act (Act 65 of 1983 as amended) are the guideline documents for a report of this nature.

Leonie Marais-Botes was appointed by Bokamoso Landscape Architects and Environmental Consultants CC to carry out a Phase 1 Heritage Impact Assessment (HIA) for the proposed Ormonde South Residential Development, Gauteng Province.

DEFINITION OF TERMS:

“alter” means any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or other decoration or any other means.

“archaeological” means—
(a) material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
(b) rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
(c) wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; and
(d) features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

“conservation”, in relation to heritage resources, includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance.

“cultural significance” means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

“development” means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including—
(a) construction, alteration, demolition, removal or change of use of a place or a structure at a place;
(b) carrying out any works on or over or under a place;
(c) subdivision or consolidation of land comprising, a place, including the structures or airspace of a place;
(d) constructing or putting up for display signs or hoardings;
(e) any change to the natural or existing condition or topography of land; and
(f) any removal or destruction of trees, or removal of vegetation or topsoil; object that is specifically designated by that state as being of importance.

“grave” means a place of interment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place.

“heritage resource” means any place or object of cultural significance.

“heritage resources authority” means the South African Heritage Resources Agency, or in respect of a province, a provincial heritage resources authority.

“heritage site” means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority.

“improvement”, in relation to heritage resources, includes the repair,
restoration and rehabilitation of a place protected in terms of Act 25 of 1999.
“living heritage” means the intangible aspects of inherited culture, and may include—
(a) cultural tradition;

(b) oral history;
(c) performance;
(d) ritual;
(e) popular memory;
(f) skills and techniques;
(g) indigenous knowledge systems; and
(h) the holistic approach to nature, society and social relationships.

“local authority” means a municipality as defined in section 10B of the Local Government Transition Act, 1993 (Act No. 209 of 1993).

“management”, in relation to heritage resources, includes the conservation, presentation and improvement of a place protected in terms of Act 25 of 1999.

“meteorite” means any naturally-occurring object of extraterrestrial origin.

“object” means any movable property of cultural significance which may be protected in terms of any provisions of Act 25 of 1999, including—
(a) any archaeological artefact;
(b) palaeontological and rare geological specimens;
(c) meteorites; and
(d) other objects.

“palaeontological” means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trance.

“place” includes—
(a) a site, area or region;
(b) a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;
(c) a group of buildings or other structures which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures;
(d) an open space, including a public square, street or park; and
(e) in relation to the management of a place, includes the immediate surroundings of a place.

“presentation” includes—
(a) the exhibition or display of;
(b) the provision of access and guidance to;
(c) the provision, publication or display of information in relation to; and
(d) performances or oral presentations related to, heritage resources protected in terms of Act 25 of 1999.

“public monuments and memorials” means all monuments and memorials—
(a) erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government; or
(b) which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual.

“site” means any area of land, including land covered by water, and including any structures or objects thereon.
“structure” means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.
“victims of conflict” means—

(a) certain persons who died in any area now included in the Republic as a direct result of any war or conflict as specified in the regulations, but excluding victims of conflict covered by the Commonwealth War Graves
Act, 1992 (Act No. 8 of 1992);
(b) members of the forces of Great Britain and the former British Empire who died in active service in any area now included in the Republic prior to 4 August 1914;
(c) persons who, during the Anglo-Boer War (1899-1902) were removed as prisoners of war from any place now included in the Republic to any place outside South Africa and who died there; and
(d) certain categories of persons who died in the "liberation struggle" as defined in the regulations, and in areas included in the Republic as well as outside the Republic.

EXECUTIVE SUMMARY

Leonie Marais-Botes Heritage Practitioner was requested by Bokamoso Landscape Architects and Environmental Consultants CC to carry out a Phase 1 Heritage Impact Assessment (HIA) for the proposed Ormonde South Residential Development, GautengProvince.

A field survey was conducted after which a survey of literature was undertaken.

No heritage sites are situated on the site earmarked for development.

It should be noted that the sub-surface archaeological and/or historical deposits and graves are always a possibility. Care should be taken during any work in the entire area and if any of the above is discovered, an archaeologist/heritage practitioner should be commissioned to investigate.

1. INTRODUCTION

The proposed project is for the establishment of an industrial township development.

1.1 WHY A PHASE 1 HERITAGE IMPACT ASSESSMENT IS REQUIRED?

This project may potentially impact on any types and ranges of heritage resources that are outlined in Section 3 of the National Heritage Resources Act (Act 25 of 1999). Subsequently a Phase 1 Heritage Impact Assessment (HIA) was commissioned by Bokamoso Landscape Architects and Environmental Consultants CC and conducted by Leonie Marais-Botes.

1.1.1 METHOD

The objective of this Phase 1 Heritage Impact Assessment (HIA) was to gain an overall understanding of the heritage sensitivities of the area and indicate how they may be impacted on through development activities.

In order to establish heritage significance the following method was followed:

- Investigation of primary resources (archival information)
- Investigation of secondary resources (literature and maps)
- Physical evidence (site investigation)
- Determining Heritage Significance.

1.2 HISTORY OF THE STUDY AREA

Ormonde cannot be described as an area rich in history.

1.3 LOCATION AND PHOTOGRAPHIC RECORD OF STUDY AREA

Figure 1: Location map

Figure 2: Site earmarked for development: Photograph taken towards the north

Figure 3: Site earmarked for development: Photograph taken towards the east

Figure: 4 Site earmarked for development: Photograph taken towards the northwest

2. FINDINGS

2.1 PRE-COLONIAL HERITAGE SITES

Possibilities: Greater study area taken into account.

Stone Age

The Stone Age is the period in human history when stone material was mainly used to produce tools[1]. In South Africa the Stone Age can be divided in three periods[2];

- Early Stone Age 2 000 000 – 150 000 years ago
- Middle Stone Age 150 000 – 30 000 years ago
- Late Stone Age 40 000 years ago - +/- 1850 AD

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[1] P. J. Coertze & R.D. Coertze, Verklarende vakwoordeboek vir Antropologie en Argeologie.

[2] S.A. Korsman & A. Meyer, *Die Steentydperk en rotskuns* in J.S. Bergh (red) Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies.

Iron Age

The Iron Age is the period in human history when metal was mainly used to produce artefacts[3]. In South Africa the Iron Age can be divided in three periods;

- Early Iron Age 250-900 AD
- Middle Iron Age 900-1300 AD
- Late Iron Age 1300-1840 AD[4]

There are no pre-colonial heritage sites evident in the study area. This can be attributed to previous development activities in the study area.

2.2 HISTORICAL PERIOD HERITAGE SITES

Possibilities: Greater study area taken into account.

- Pioneer sites;
- Sites associated with early mining;
- Structures older than 60 years;
- Graves (Graves younger than 60 years, graves older than 60 years, but younger than 100 years, graves older than 100 years, graves of victims of conflict or of individuals of royal descent).

None of the above evident in study area.

2.3 ORIGINAL LANDSCAPE

Infrastructure development has altered the original landscape in the study area.

2.4 INTANGIBLE HERITAGE

The intangible heritage of the greater study area can be found in the stories of past and present inhabitants.

3 CATEGORIES OF HERITAGE VALUE (ACT 25 OF 1999)

The National Heritage Resources Act (Act 25 of 1999) identifies the following categories of value under section 3(1) and (2) of the Act under the heading "National Estate":

"3 (1) For the purpose of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.

(2) Without limiting the generality of subsection (1), the national estate may include-

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[3] P.J. Coertze & R.D. Coertze, Verklarende vakwoordeboek vir Antropologie en Argeologie.

[4] M.M. van der Ryst & A Meyer. *Die Ystertydperk* in J.S. Bergh (red) Geskidenisatlas van Suid-Afrika. Die vier noordelike provinsies and T.N Huffman, A Handbook to the Iron Age: The Archaeology of Pre-Colonial Farming Societies in Southern Africa.

- (a) places, buildings, structures and equipment of cultural significance;
- (b) places which oral traditions are attached or which are associated with living heritage;
- (c) historical settlements and townscapes;
- (d) landscapes and natural features of cultural significance;
- (e) geological sites of scientific or cultural importance;
- (f) archaeological and palaeontological sites;
- (g) graves and burial grounds, including-
  - (i) ancestral graves;
  - (ii) royal graves and graves of traditional leaders;
  - (iii) graves of victims of conflict;
  - (iv) graves of individuals designated by the Minister by notice in the Gazette
  - (v) historical graves and cemeteries; and
  - (vi) other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
- (h) sites of significance relating to the history in South Africa;
- (i) movable objects, including-
  - (i) objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
  - (ii) objects to which oral traditions are attached or which are associated with living heritage;
  - (iii) ethnographic art and objects;
  - (iv) military objects
  - (v) objects of decorative or fine art;
  - (vi) objects of scientific or technological interests; and
  - (vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section I (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

(3) Without limiting the generality of the subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of-

- (a) It is importance in the community, or pattern of South Africa's history;
- (b) Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- (c) Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- (d) Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural objects;
- (e) Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- (f) Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- (g) Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- (h) Its strong or special association with the life and work of a person, group or organisation of importance in the history of South Africa; and
- (i) Sites of significance relating to the history of slavery in South Africa."

3.1 HERITAGE VALUE OF WEIGHED AGAINST CULTURAL SIGNIFICANCE CATEGORIES

3.1.1 Spiritual value

During the site visit/field work no indication of any spiritual activity was observed on/near the proposed site. Thus no sites of spiritual value will be impacted on by the proposed project.

3.1.2 Scientific value

No sites of scientific value were observed on or near the site earmarked for development.

3.1.3 Historical value

No historical value associated with the site could be found in primary and secondary sources.

3.1.4 Aesthetic value

No heritage item with exceptional aesthetic (architectural) value was identified in the study area.

3.1.5 Social value

Social value is attributed to sites that are used by the community for recreation and formal and informal meetings regarding matters that are important to the community. These sites include parks, community halls, sport fields etc. None of the said evident in the immediate study area.

3.2 SPECIFIC CATEGORIES INVESTIGATED AS PER SECTION 3 (1) AND (2) OF THE NATIONAL HERITAGE LEGISLATION (ACT 25 OF 1999)

3.2.1 Does the site/s provide the context for a wider number of places, buildings, structures and equipment of cultural significance?

The study area does not provide context for a wider number of places, buildings, structures and equipment of cultural significance. The reason being the low density of heritage items in the study area.

3.2.2 Does the site/s contain places to which oral traditions are attached or which are associated with living heritage?

Places to which oral traditions are attached or associated with living heritage are usually find in conjunction with traditional settlements and villages which still practises age old traditions. None of these are evident near or on the proposed site.

3.2.3 Does the site/s contain historical settlements?

No historical settlements are located on or near the proposed site.

3.2.4 Does the site/s contain landscapes and natural features of cultural significance?

Due to infra-structure development and farming activities the original character of the landscape has been altered significantly in the study area. There the site does not contain natural features of cultural significance.

3.2.5 Does the site/s contain geological sites of cultural importance?

Geological sites of cultural importance include meteorite sites (Tswaing Crater and Vredefort Dome), fossil sites (Karoo and Krugersdorp area), important mountain ranges or ridges (Magaliesburg, Drakensberg etc.). The proposed site is not located in an area known for sites of this importance.

3.2.6 Does the site/s contain a wide range of archaeological sites?

The proposed site does not contain any surface archaeological deposits, a possible reason is previous infra-structure development and farming activities in the greater study area.

The possibility of sub-surface findings always exists and should be taken into consideration in the Environmental Management Programme.

If sub-surface archaeological material is discovered work must stop and a heritage practitioner preferably an archaeologist contacted to assess the find and make recommendations.

3.2.7 Does the site/s contain any marked graves and burial grounds?

The site does not contain any marked graves or burial grounds.

The possibility of graves not visible to the human eye always exists and this should be taken into consideration in the Environmental Management Plan.

It is important to note that all graves and cemeteries are of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (Act 25 of 1999) whenever graves are 60 years and older. Other legislation with regard to graves includes those when graves are exhumed and relocated, namely the Ordinance on Exhumations (no 12 of 1980) and the Human Tissues Act (Act 65 of 1983 as amended).

If sub-surface graves are discovered work should stop and a professional preferably an archaeologist contacted to assess the age of the grave/graves and to advice on the way forward.

3.2.8 Does the site/s contain aspects that relate to the history of slavery?

This is not an area associated with the history of slavery like the Western Cape Province.

3.2.9 Can the place be considered as a place that is important to the community or in the pattern of South African history?

In primary and secondary sources the proposed site is not described as important to the community or in the pattern of South African history.[5]

3.2.10 Does the site/s embody the quality of a place possessing uncommon or rare endangered aspects of South Africa's natural and cultural heritage?

The proposed site does not possess uncommon, rare or endangered aspects of South Africa's natural and cultural heritage. These sites are usually regarded as Grade 1 or World Heritage Sites.

3.2.11 Does the site/s demonstrate the principal characteristics of South Africa's natural or cultural places?

The proposed site does not demonstrate the principal characteristics of South Africa's natural or cultural places. These characteristics are usually associated with aesthetic significance.

3.2.12 Does the site/s exhibit particular aesthetic characteristics valued by the community or cultural groups?

This part of the greater study area does not exhibit particular aesthetic characteristics valued by the community or cultural groups. The reason being the low density of heritage buildings and structures located in the greater study area.

3.2.13 Does the site/s contain elements, which are important in demonstrating a high degree of creative technical achievement?

The site does not contain elements which are important in demonstrating a high degree of creative technical achievement. Reason being none of the above are evident on site.

3.2.14 Does the site/s have strong and special associations with particular communities and cultural groups for social, cultural and spiritual reasons?

The proposed site does not have a strong or special association with particular communities and cultural groups for social, cultural and spiritual reasons. No comment in this regard was received during the public participation period.

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[5] Standard Encyclopaedia of Southern Africa and the TAB database at the National Archives of South Africa;
J.S. Bergh (red), Geskiedenisatlas van Suid-Afrika. Die Vier Noordelike Provinsies.

3.2.15 Does the site/s have a strong and special association with the life or work of a person, group or organisation?

No indication of the above could be found in primary and secondary research sources.[6]

4. PUBLIC PARTICIPATION

NOTICE OF A BASIC ASSESSMENT PROCESS

Figure 5: Site notice

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[6] Dictionary of South African Biography (vol I-V) and the TAB database at the National Archives of South Africa

NOTICE OF A BASIC ASSESSMENT PROCESS

Notice is given of an application for a **Basic Assessment Process** that is to be submitted to the Gauteng Department of Agriculture and Rural Development, in terms of Regulation No. R982 published in the Government Notice No. 38282 of 4 December 2014 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing **Basic Assessment Procedures (Listing Notice: 1 and 3 – Government Notice R983 & R985)** for the following activity:

Project Name: Ormonde South Residential.

Proponent Name: Matla Projects (Pty) Ltd.

Project & Property Description: This application for Environmental Authorisation is for the proposed residential development on Erven 1130 & 1131, Ormonde Ext 24 and Erven 962 & 963, Ormonde Ext 22.

Location: The site is situated north of the M1 highway and east of Nasrec Road. The southern boundary is next to the onramp from Nasrec Road to the M1 highway in Ormonde.

Listing Activities Applied for in terms of NEMA Regulations, 4 December 2014:
GNR 983 (Listing Notice 1) – Activity 9, 10, 12, 19 & 27.
GNR 985 (Listing Notice 3) – Activity 4, 12 & 14.
(Listed Activities triggered will be confirmed during the Application process)

Date of Notice: 13 October 2016 – 14 November 2016.

The aforementioned proposed development requires applications subject to a Basic Assessment. Representations with respect to this application may be made by phone, fax or e-mail within 30 days of the date of the notice. Please note that in order to continue to receive information regarding this project, you must register as an I&AP with the contact person listed below.

Queries regarding this matter should be referred to:
Bokamoso Landscape Architects and Environmental Consultants CC
Public Participation registration and Enquiries: **Juanita De Beer**
Project Enquiries: **Mary-Lee van Zyl**
P.O. Box 11375
Maroelana 0161
www.bokamoso.net

Tel: (012) 346 3810
Fax: (086) 570 5659
E-mail: reception@bokamoso.net

Figure 6: Basic Assessment Advertisement

5. RECOMMENDATIONS

- There are no visible restrictions or negative impacts in terms of heritage associated with the site.
- In terms of heritage this project can proceed.
- The discovery of subsurface archaeological and/or historical material as well as graves must be taken into account in the Environmental Management Programme. See 3.2.6 and 3.2.7.

6. WAY FORWARD

Submit this report as a Section 38 application in term of the National Heritage Resources Act (Act 25 of 1999) to the Provincial Heritage Resources Authority of Gauteng (PHRAG) for comment/approval.

Appendix H

Environmental Management Programme

Environmental Management Programme (EMPr)

For the Proposed Ormonde South Residential

on Erven 1130 & 1131, Ormonde Ext 24 and Erven 962 & 963, Ormonde Ext 22 and Bloubos Spruit (Erf 1147)

City of Johannesburg Metropolitan Municipality, Gauteng Province.

June 2017

BOKAMOSO

LANDSCAPE ARCHITECTS AND ENVIRONMENTAL CONSULTANTS CC

Tel: 012 346 3810
Fax: 086 570 5659
E-Mail: reception@bokamoso.net
P.O. Box 11375
Maroelana
0161

1 Project Outline

1.1 Background

Bokamoso Landscape Architects and Environmental Consultants CC were appointed by Matla Projects (Pty) Ltd to conduct a Basic Assessment Application to obtain Environmental Authorisation for the proposed Ormonde South Residential development.

1.2 Project description

The proposed Ormonde South Residential development will be situated on Erven 1130 & 1131, Ormonde Ext 24 and Erven 962 & 963, Ormonde Ext 22 and Bloubos Spruit (Erf 1147), City of Johannesburg Metropolitan Municipality, Gauteng Province.

An Environmental Authorisation process is underway in order to obtain authorisation to develop a residential development.

Timeframe for construction:
Will be provided when Environmental Authorisation is received. Therefore the timeframe for construction is still unknown.

The developer will be responsible for the on-site activities. The EMPr will be a binding document for purposes of compliance.

1.3 Receiving Environment

Biodiversity:

- The proposed study area falls within the Ecological Support Area which is dominated by the Soweto Highveld Grassland. However, the site has been heavily invaded by alien invasive trees.

EMPr context

This EMPr fits into the overall planning process of the project by carrying out the conditions of consent set out by the Gauteng Department of Agriculture and Rural Development.

This EMPr addresses the following three phases of the development:

- Pre-construction planning phase;
- Construction phase; and
- Operational phase.

3 Monitoring

In order for the EMPr to be successfully implemented all the role players involved must have a clear understanding of their roles and responsibilities in the project.

These role players may include the Authorities (A), other Authorities (OA), Developer/ Proponent (D), Environmental Control Officer (ECO), Construction Manager (CM), Contractors (Principal)(C), Environmental Assessment Practitioner (EAP) and Environmental Site Officer (ESO). Landowners, Interested and Affected Parties (I&APs) and the relevant environmental and project specialists are also important role players.

3.1 Roles and responsibilities

Developer (D)

The developer is ultimately accountable for ensuring compliance with the EMPr and conditions contained in the Environmental Authorisation. The developer must appoint an independent Environmental Control Officer (ECO), for the duration of the pre-construction and construction phases, to ensure compliance with the requirements of this EMPr. The developer must ensure that the ECO is integrated as part of the project team.

Construction Manager (CM)

The Construction Manager is responsible for the coordination of various activities and ensures compliance with this EMPr through delegation of the EMPr to the contractors and monitoring of performance as per the Environmental Control Officer's monthly reports.

Environmental Control Officer (ECO)

An independent Environmental Control Officer (ECO) shall be appointed, for the duration of the pre-construction and construction phases of the development, by the developer to ensure compliance with the requirements of this EMPr.

- The Environmental Control Officer shall ensure that the contractor is aware of all the specifications pertaining to the project.
- Any damage to the environment must be repaired as soon as possible after consultation between the Environmental Control Officer, Consulting Engineer and Contractor.
- The Environmental Control Officer shall ensure that the developer staff and/or contractor are adhering to all stipulations of the EMPr.
- The Environmental Control Officer shall be responsible for monitoring the EMP throughout the project by means of site visits and meetings. This should be documented as part of the site meeting minutes.
- The Environmental Control Officer shall be responsible for the environmental training program.
- The Environmental Control Officer shall ensure that all clean up and rehabilitation or any remedial action required, are completed prior to transfer of properties.

- A post construction environmental audit is to be conducted to ensure that all conditions in the EMPr have been adhered to.

Principal Contractor (C):

The Principal contractor shall be responsible for ensuring that all activities on site are undertaken in accordance with the environmental provisions detailed in this document and that the sub-contractors and laborers are duly informed of their roles and responsibilities in this regard.

The Principal Contractor will be required, where specified to provide method statements setting out in detail how the management actions contained in the EMPr will be implemented.

The Principal Contractors will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the environmental regulations.

Environmental Site Officer (ESO):

The ESO is appointed by the developer and then finally the home owner as his/her environmental representative to monitor, review and verify compliance with the EMPr by the contractor. The ESO is not an independent appointment but must be a member of the contractor’s management team. The ESO must ensure that he/she is involved at all phases of the construction (from site clearance to rehabilitation). These duties can be taken up by another officer on the construction site. This individual should convey any queries or concerns the ECO has.

Authority (A):

The authorities are the relevant environmental department that has issued the Environmental Authorisation. The authorities are responsible for ensuring that the monitoring of the EMPr and other authorisation documentation is carried out by means of reviewing audit reports submitted by the ECO and conducting regular site visits.

Other Authorities (OA):

Other authorities are those that may be involved in the approval process of the EMPr.

Environmental Assessment Practitioner (EAP):

According to Section 1 of NEMA the definition of an Environmental Assessment Practitioner is "the individual responsible for the planning, management and coordination of Environmental Impact Assessments, Strategic Environmental Assessments, Environmental Management Programmes or any other appropriate environmental instruments through regulations".

3.2 Lines of Communication

The Environmental Control Officer in writing should immediately report any breach of the EMPr to the Project Manager. The Project Manager should then be responsible for rectifying the problem on-site after discussion with the contractor. Should this require additional cost, then the developer should be notified immediately before any additional steps are taken.

3.3 Reporting Procedures to the Developer

Any pollution incidents must be reported to the Environmental Control Officer immediately (within 12 hours). The Environmental Control Officer shall report to the Developer on a regular basis (site meetings).

3.4 Site Instruction Entries

The site instruction book entries will be used for the recording of general site instructions as they relate to the works on site. There should be issuing of stop work order for the purposes of immediately halting any activities of the contractor that may pose environmental risk.

3.5 ESA/ESO (Environmental Site Officer) Diary Entries

Each of these books must be available in duplicate, with copies for the Engineer and Environmental Site Officer. These books should be available to the authorities for inspection or on request. All spills are to be recorded in the ESA/Environmental Site Officer's dairy.

3.6 Methods Statements

Methods statements from the contractor will be required for specific sensitive actions on request of the authorities or ESA/ESO (Environmental Site Officer). All method statements will form part of the EMPr documentation and are subject to all terms and conditions contained within the EMPr document. For each instance wherein it is requested that the contractor submit a method statement to the satisfaction of ESA/ESO, the format should clearly indicate the following:

- What – a brief description of the work to be undertaken;
- How – a detailed description of the process of work, methods and materials;
- Where – a description / sketch map of the locality of work; and

- When – the sequencing of actions with due commencement dates and completion date estimate.

The contractor must submit the method statement before any particular construction activity is due to start. Work may not commence until the method statement has been approved by the ESA/ESO.

3.7 Record Keeping

All records related to the implementation of this Management Programme (e.g. site instruction book, ESA/ESO dairy, methods statements etc.) must be kept together in an office where it is safe and can be retrieved easily. These records should be kept for two years at any time be available for scrutiny by any relevant authorities.

3.8 Acts

3.8.1. The National Water Act, 1998 (Act No: 36 of 1998)

The purpose of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways that take into account, amongst other factors, the following:

- ❑ Meeting the basic human needs of present and future generations;
- ❑ Promoting equitable access to water;
- ❑ Promoting the efficient, sustainable and beneficial use of water in the public interest;
- ❑ Reducing and preventing pollution and degradation of water resources;
- ❑ Facilitating social and economic development; and
- ❑ Providing for the growing demand for water use.

Impact on proposed Development:

There is a possibility of a Water Use License Application or General Authorisation Application that need to be submitted to the Department of Water and Sanitation for the rehabilitation works in the watercourse that traverses the site. The Department of Water and Sanitation will however need to confirm whether such application will be required and which process to be followed. Discussions will be held with them.

3.8.2. Atmospheric Pollution Prevention Act (Act 45 of 1965)

The NEM: AQA serves to repeal the Atmospheric Pollution Prevention Act (45 of 1965) and various other laws dealing with air pollution and it provides a more comprehensive framework within which the critical question of air quality can be addressed.

The purpose of the Act is to set norms and standards that relate to:

- Institutional frameworks, roles and responsibilities
- Air quality management planning
- Air quality monitoring and information management
- Air quality management measures
- General compliance and enforcement

Amongst other things, it is intended that the setting of norms and standards will achieve the following:

- The protection, restoration and enhancement of air quality in South Africa;
- Increased public participation in the protection of air quality and improved public access to relevant and meaningful information about air quality;
- The reduction of risks to human health and the prevention of the degradation of air quality.

The Act describes various regulatory tools that should be developed to ensure the implementation and enforcement of air quality management plans. These include:

- Priority Areas, which are air pollution ‘hot spots’;
- Listed Activities, which are ‘problem’ processes that require an Atmospheric Emission License;
- Controlled Emitters, which includes the setting of emission standards for ‘classes’ of emitters, such as motor vehicles, incinerators, etc.;
- Control of Noise;
- Control of Odours.

Impact on proposed Development:

The act have relevance to the proposed residential development during the construction phase. Dust pollution could be a concern primarily during the construction phase of the proposed project. Dust control would be adequately minimised during this phase by way of water spraying and possible dust-nets, when working close to existing residential dwellings or roads/highways. It is not forseen that the proposed residential development would contribute significantly to pollution in terms of emissions and noise during its operational phase.

3.8.3 National Environmental Management Act (Act 107 of 1998)(as amended)

The NEMA is primarily an enabling Act in that it provides for the development of environmental implementation plans and environmental management plans. The principles listed in the act serve as a general framework within which environmental management and implementation plans must be formulated.

The principles in essence state that environmental management must place people and their needs at the forefront of its concern and that development must be socially, environmentally and economically sustainable.

Impact on proposed Development:

Section 28 (1) of NEMA stated that every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, as far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

The EMPr is compiled in terms of Section 28 of NEMA.

3.8.4. The National Environmental Management: Waste Act (Act 59 of 2008)(as amended)

This Act came into effect on 11 June 2009. It aims to consolidate waste management in South Africa, and contains a number of commendable provisions, including:

- The establishment of a national waste management strategy, and national and provincial norms and standards for, amongst others, the classification of waste, waste service delivery, and tariffs for such waste services;
- Addressing reduction, reuse, recycling and recovery of waste;
- The requirement for industry and local government to prepare integrated waste management plans;
- The establishment of control over contaminated land;
- Identifying waste management activities that requires a licence, which currently include facilities for the storage, transfer, recycling, recovery, treatment and disposal of waste on land;
- Co-operative governance in issuing licenses for waste management facilities, by means of which a licensing authority can issue an integrated or consolidated license jointly with other organs of state that has legislative control over the activity; and
- The establishment of a national waste information system.

On 3 July 2009 the Minister of Environmental Affairs and Tourism promulgated a list of waste management activities that might have a detrimental effect on the environment. These listed activities provide the activities that require a Waste Management License. Two Categories is specified: Category A and Category B. As part of a Category A: Waste Management License application, a Basic Assessment in terms of Section 24(5) of the National Environmental Management Act (Act 107 of 1998) must be submitted to the relevant Authority. As part of a Category B: Waste Management License application, a Scoping and EIA process in terms of Section 24(5) of the National Environmental Management Act (Act 107 of 1998) must be followed and submitted to the relevant Authority.

On 29 November 2013 the Minister of Environmental Affairs and Tourism amended the list of waste activities that might be detrimental to the environment and this was published under Government Notice 921. On 7 April 2017 the NEMA EIA Regulations have been amended.

Impact on proposed Development:
No Waste Management License is expected to be required during the construction or operational phase of the proposed residential development.

3.8.5. The Municipal Systems Act (Act 32 of 2000)

This Act was introduced to provide for the core principles, mechanisms and processes that are necessary to enable municipalities to move progressively towards the social and economic upliftment of local communities, and ensure universal access to essential services that are affordable to all.

The proposed development will support the local authority in complying with the principles of the Municipal Systems Act, by assisting in providing the community with essential services, such as water and sewage infrastructure.

Impact on proposed Development:

The proposed development will contribute to the municipal services to an extent through paying of the municipal rates.

3.8.6 National Veld and Forest Fire Act, 1998 (Act No. 101, 1998)

The purpose of this Act is to prevent and combat veld, forest and mountain fires throughout the Republic. Furthermore the Act provides for a variety of institutions, methods and practices for achieving the prevention of fires.

Impact on proposed Development:

Fires of construction workers may only be lit in the designated site camp as indicated in assistance with the ECO. It is important that a site development camp be located on a part of the application site that is already disturbed.

3.8.7 National Heritage Resources Act, 1999 (Act No. 25 of 1999)

The National Heritage Resources Act legislates the necesity and heritage impact assessment in areas earmarked for development, which exceed 0.5ha. The Act makes provision for the potential destruction to existing sites, pending the archaelogist’s recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA).

Impact on proposed Development:

No features of Heritage importance are expected to be found on the proposed study area. If any such features are discovered during construction activities and clearing of the application site, the correct “procedures for an Environmental incident” (at the end of the EMPr) must be followed.

3.8.8. Conservation of Agricultural Resources Act (Act No. 43 of 1983)

This Act provides for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

Impact on proposed Development:
According to the Gauteng Agriculture Potential Atlas (GAPA 3) the study area has mostly a low to a very low agricultural potential.

3.8.9. National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004)

The purpose of the Biodiversity Act is to provide for the management of South Africa's biodiversity within the Framework of the NEMA and the protection of species and ecosystems that warrant National protection. As part of the implementation strategy, the National Spatial Biodiversity Assessment was developed.

Impact on proposed Development:
Majority of the study area is regarded as degraded with some illegal dumping taking place. The proposed study area falls within the Ecological Support Area which is dominated by the Soweto Highveld Grassland. However, the site has been heavily invaded by alien invasive trees.

3.8.10. National Spatial Biodiversity assessment

The National Spatial Biodiversity Assessment (NSBA) classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels.

Impact on proposed Development:

The proposed study area falls within the Ecological Support Area which is dominated by the Soweto Highveld Grassland. However, the site has been heavily invaded by alien invasive trees.

3.8.11. Protected Species – Provincial Ordinances

Provincial ordinances were developed to protect particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the Provincial Departments of Environmental Affairs.

Impact on proposed Development:

Majority of the study area is regarded as degraded with some illegal dumping taking place. The proposed study area falls within the Ecological Support Area which is dominated by the Soweto Highveld Grassland. However, the site has been heavily invaded by alien invasive trees.

3.8.12. National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)

The purpose of this Act is to provide for the protection, conservation and management of ecologically viable areas representative of South Africa's biological biodiversity and its natural landscapes.

Impact on proposed Development:

The site is not situated near any Protected Areas.

4 Project activities

4.1 Pre-Construction Phase

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
General	**Project contract**	To make the EMPr enforceable under the general conditions of the contract.	The EMPr document must be included as part of the tender documentation	The EMPr is included as part of the tender documentation	Developer	-
Design and planning	**Stability of structures and restriction of land use due to geology**	To ensure stability of structures	The layout and land uses must correspond to the stability zonation and development types recommended by the geotechnical engineer.	The land uses and layout corresponds to the recommended stability zonation and development types.	Individual Developer Engineer	-
			Deep strip footings or other alternatives approved by the engineer should be used for the foundations of construction.	Excavations and foundations remain stable	Engineer Individual Developer	
			More detailed foundation investigation shall be done for each of the structures.	More detailed foundation investigations done.	Engineer Individual Developer	-
	Stability of excavations due to geology	To ensure stability of excavations	Sides of excavations should be either shored or else battered back.	Excavations remain stable.	Engineer Individual Developer	
	Storm water design	Erosion of drainage lines	1) Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place in areas where soil may be exposed to high levels of erosion due to steep slopes etc. 2) Any damage, displacement or loss of soil resulting from unforeseen events is to be recorded and remediated immediately. Should this occur due to negligence on the contractor's behalf, the contractor shall carry remediation costs.			

TYPE	***Environmental risk or issue***	***Objective or requirement***	***Mitigation measure***	***Performance indicator***	***Responsibility***	***Frequency of Action***
			3) Storm water at the site camp must be managed so as to reduce/ minimise the silt loads in the watercourse channel. 4) Construction on steep slopes and in soft or erodible material will require erosion control measures and appropriate grassing/ hydroseeding measures. 5) All construction areas should be suitably top-soiled and vegetated as soon as it is possible after construction; and disturbed areas to be rehabilitated must be ripped and the area must be backfilled with topsoil. Storm water structure design should block amphibians from entering the road surface.			
		Watercourse – increased sediment input	1) To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area. 2) All topsoil within the area to be developed must be removed and stockpiled on site. 3) The temporary storage of topsoil must be above the 100yr floodline or at least 20m from the top of any bank or drainage lines. 4) An earth bank is to be constructed around the upslope portion of any stockpiles in order to direct runoff and prevent scouring of stockpiles. 5) A silt fence is to be erected around any stockpiles in order to trap sediment and prevent stockpile sediment loss.			
	Light pollution	To minimise light pollution	The generation of light by night events, security lighting and other lighting shall be effectively designed so as not to spill	Lighting effectively designed	Architect/ Landscape Architect	-

TYPE	***Environmental risk or issue***	***Objective or requirement***	***Mitigation measure***	***Performance indicator***	***Responsibility***	***Frequency of Action***
			unnecessary outward into the oncoming traffic, or into the yards of the neighbouring properties, oncoming traffic on highway or open spaces.			
	Visual impact	To minimise the visual impact of the proposed development.	Architectural guidelines to minimize the visual impact: 1) Roof colour will blend in tastefully with the surrounding environment. Building design must be aesthetically pleasing. 2) Suitable plant materials should be used at strategic points to screen off impacts caused by roofs, cars in large parking areas. 3) Mature existing trees (not alien and invasive trees) should be retained as far as possible. The trees will soften the impact of the proposed development. 4) Rubble and litter must be removed on a weekly basis and be disposed of at a suitably registered landfill site.	Architectural guidelines minimise visual impact	Architect	-
Climate	**Extreme change in micro climate temperatures**	To prevent the extreme change in micro climate temperatures	Where open parking bays are involved, one tree for every two parking bays shall be indicated on the Landscape Development Plan which shall be approved by the Design Review Committee/ Local Authority.	Landscape Development Plan complies	Landscape Architect	-
Fauna and flora	**Floral biodiversity and ecological health**	To ensure that the species introduced to the area, are compatible with the current and future quality of the ecological processes.	1) The Landscape Development Plan for the proposed development shall be submitted to the local authority for approval. 2) It is important that all the plant positions, quantities and coverage per m² be indicated on a plan. 3) The proposed planting materials for the areas to be landscaped shall be non-invasive, and preferably indigenous and/ or endemic. Indigenous tree species will	The landscape development plan submitted to the local authority for approval.	Landscape Architect	-

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			aid in habitat creation that will attract indigenous faunal species into the area. 4) Where possible, trees naturally growing on the site should be retained as part of the landscaping.			
Preparing Site Access	**Environmental integrity**	To avoid erosion and disturbance to indigenous vegetation	1) Designated routes shall be determined for the construction vehicles and designated areas for storage of equipment. 2) Clearly mark the site access point and routes on site to be used by construction vehicles and pedestrians. 3) Provide an access map to all contractors whom in turn must provide copies to the construction workers. Instruct all drivers to use access point and determined route.	Access to site is erosion free. Minimum disturbance to surrounding vegetation. Vehicles make use of established access routes.	Contractor	Continuous
		Entrance of Vehicles	Entrance by vehicles, especially off-road cars and bakkies, off-road bicycles and quad bikes and construction staff should be prohibited, both during the construction phase and during the lifespan of the project.			
	Waste storage	To control the temporary storage of waste.	Temporary waste storage points on site shall be determined. These storage points shall be accessible by waste removal trucks and these points should not be located in sensitive areas/areas highly visible from the properties of the surrounding land-owners/tenants/in areas where the wind direction will carry bad odours across the properties of adjacent tenants or landowners.		Contractor ESO	-
		Ensure waste storage area does not generate	Build a bund around waste storage area to stop overflow into storm water.		Contractor	-

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
		pollution				

4.2 Construction Phase

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
Contractors Camp	**Vegetation and topsoil**	To minimize damage to and loss of vegetation and retain quality of topsoil	1) Site to be established under supervision of ECO. 2) Clearing and relocation of plants to be undertaken in accordance with site specific requirements.	Minimal vegetation removed/ damaged during site activities.	Contractor	As and when required
	Surface and ground water pollution	To minimize pollution of surface and Groundwater resources.	1) Sufficient and temporary facilities including ablution facilities must be provided for construction workers operating on the site. 2) A minimum of one chemical toilet shall be provided per 10 persons. The contractor shall keep the toilets in a clean, neat and hygienic condition. Toilets provided by the contractor must be easily accessible and a maximum of 50m from the works area to ensure they are utilized. The contractor (who must use reputable toilet-servicing company) shall be responsible for the cleaning, maintenance and servicing of the toilets. The contractor (using reputable toilet-servicing company) shall ensure that all toilets are cleaned and emptied before the builders' or other public holidays. 3) No person is allowed to use any other area than chemical toilets. 4) No French drain systems may be installed. 5) No chemical or waste water must be allowed to contaminate the run-off on site. 6) Avoid the clearing of the site camp (of specific phase) or paved surfaces with soap.	Effluents managed Effectively. No pollution of water resources from site. Workforce use toilets provided.	Contractor ESO	As and when required
		To minimize pollution of surface	1) Drip trays and/ or lined earth bunds must be provided under vehicles and equipment,	No pollution of the environment	Contractor ESO	Daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		and Groundwater resources due to spilling of materials.	to contain spills of hazardous materials such as fuel, oil and cement. 2) Repair and storage of vehicles only within the demarcated site area. 3) Spill kits must be available on site. 4) Oils and chemicals must be confined to specific secured areas within the site camp. These areas must be bunded with adequate containment (at least 1.5 times the volume of the fuel) for potential spills or leaks. 5) All spilled hazardous substances must be contained in impermeable containers for removal to a licensed hazardous waste site. 6) No leaking vehicle shall be allowed on site. The mechanic/ the mechanic of the appointed contractor must supply the environmental officer with a letter of confirmation that the vehicles and equipment are leak proof. 7) No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site.			
		To minimize pollution of surface and groundwater resources by cement	The mixing of concrete shall only be done at specifically selected sites, as close as possible to the entrance, on mortar boards or similar structures to prevent run-off into drainage lines, watercourses and natural vegetation.	No evidence of contaminated soil on the construction site.	Contractor ESO	Daily
		To minimize pollution of surface and Groundwater resources due to effluent.	No effluent (including effluent from any storage areas) may be discharged into any water surface or ground water resource.	No evidence of contaminated water resources.	Contractor ESO	Daily
	Pollution of the environment	To prevent unhygienic usage on the site and	1) Weather proof waste bins must be provided and emptied regularly. 2) The contractor shall provide laborers to	No waste bins overflowing	Contractor ESO	Daily Weekly

TYPE	***Environmental risk or issue***	***Objective or requirement***	***Mitigation measure***	***Performance indicator***	***Responsibility***	***Frequency of Action***
		pollution of the natural assets.	clean up the contractor's camp and construction site on a daily basis. 3) Temporary waste storage points on the site should be determined. THESE AREAS SHALL BE PREDETERMINED AND LOCATED IN AREAS THAT IS ALREADY DISTURBED. These storage points should be accessible by waste removal trucks and these points should be located in already disturbed areas /areas not highly visible from the properties of the surrounding land-owners/ in areas where the wind direction will not carry bad odours across the properties of adjacent landowners. This site should comply with the following: • Skips for the containment and disposal of waste that could cause soil and water pollution, i.e. paint, lubricants, etc.; • Small lightweight waste items should be contained in skips with lids to prevent wind littering; • Bunded areas for containment and holding of dry building waste. 4) No solid waste may be disposed of on the site. 5) No waste materials shall at any stage be disposed of in the open veld of adjacent properties. 6) The storage of solid waste on the site, until such time as it may be disposed of, must be in a manner acceptable to the local authority and DWS. 7) Cover any wastes that are likely to wash away or contaminate storm water.	No litter or building waste lying in or around the site		
		Recycle material where possible and	1) Waste shall be separated into recyclable and non-recyclable waste, and shall	Sufficient containers	Contractor ESO	Daily Weekly

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
		correctly dispose of unusable wastes	be separated as follows: • General waste: including (but not limited to) construction rubble, • Reusable construction material. 2) Recyclable waste shall preferably be deposited in separate bins. 3) All solid waste including excess spoil (soil, rock, rubble etc) must be removed to a permitted waste disposal site on a weekly basis. 4) No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site. 5) Keep records of waste reuse, recycling and disposal for future reference. Provide information to ECO.	available on site No visible signs of pollution		
	Waste	To keep the site clean and tidy. To ensure waste enters the appropriate waste Watercourse in order to optimize recycling opportunities.	1) Rubble must be removed from the construction site frequently and be disposed of at an approved dumping site. 2) Sufficient and covered containers must be available on the construction site. 3) Such containers are to be emptied frequently. 4) All liquid effluent is to be disposed of in a manner approved of by the Local Authority. 5) Material to be used as backfill during a later stage of the building construction must be covered with a layer of soil to prevent litter from being blown over the site and to prevent unhygienic conditions. 6) Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site. 7) The burning of waste is prohibited. 8) Where possible, waste must be separated into clearly marked containers and		Contractor	Monitor daily

TYPE	***Environmental risk or issue***	***Objective or requirement***	***Mitigation measure***	***Performance indicator***	***Responsibility***	***Frequency of Action***
			subsequent recycling thereof must be a priority. The site camp should not be located in a highly visual area on the study area, or a screen or barrier should be erected as to not have a negative impact on the sense of place. The site camp and the rest of the study area should appear neat at all times; A temporary waste storage point shall be determined and established on site by means of demarcation. This storage points shall be accessible by waste removal vehicles. The temporary storage site may not be highly visible from the properties of the surrounding residents. Waste materials should be removed from the site on a regular basis (at least weekly), to a registered landfill site. All the waste generated by the proposed residential development construction must be temporarily stored at a preselected area on site to be carted to a registered landfill site allowed to take building rubble; Waste storage should occur in areas that have already been disturbed. These small waste receptacles must be emptied at the temporary waste storage area on a weekly basis for removal. All waste must be removed to a registered landfill site on a weekly basis. No waste materials may be disposed of on or adjacent to the site; The storage of solid waste on site, until such time that it may be disposed of, must be in the manner acceptable to the local authority; and Records of waste reused, recycled, and			

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			disposed must be kept for future reference or inspection by authorities.			
	Increased fire risk to site and surrounding areas	To decrease fire risk.	1) Fires shall only be permitted in specifically designated areas and under controlled circumstances. 2) Food vendors shall be allowed within specified areas. 3) No wood may be collected from the site for fires. 4) Fire extinguishers to be provided in all vehicles and fire beaters must be available on site. 5) Emergency numbers/ contact details must be available on site, where applicable. • No fires are allowed on the construction site. • Smoking only allowed in designated areas away from vegetation which could possibly catch fire. • Cigarette disposal facilities should be catered for in the designated smoking areas.	No open fires on site that have been left unattended	Contractor	Monitor daily
Construction site	**Geology and soils**	To protect underground services from alkaline or corrosive attack.	Underground services should be treated appropriately prior to installation.	Underground services are not being corroded	Contractor	Monitor regularly/ as required
		To prevent the damage of the existing soils and geology.	1) The top layer of all areas to be excavated for the purposes of construction shall be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. 2) All surfaces that are susceptible to erosion, shall be protected either by cladding with biodegradable material or with the top layer of soil being seeded with grass seed/planted	Excavated materials correctly stockpiled No signs of erosion	Contractor	Monitor daily

TYPE	***Environmental risk or issue***	***Objective or requirement***	***Mitigation measure***	***Performance indicator***	***Responsibility***	***Frequency of Action***
			with a suitable groundcover.			
		To prevent the loss of topsoil To prevent siltation & water pollution.	1) Stockpiling will only be done in designated places where it will not interfere with the natural drainage paths of the environment. 2) In order to minimize erosion and siltation and disturbance to existing vegetation, it is recommended that stockpiling be done/ equipment is stored in already disturbed/ exposed areas. 3) Cover stockpiles and surround downhill sides with a sediment fence to stop materials washing away. 4) Remove vegetation only in areas designated during the planning stage. 5) Rehabilitation/ landscaping are to be done immediately after the involved works are completed. 6) All compacted areas should be ripped prior to them being rehabilitated/ landscaped by the contractor as appointed by the developer/ individual erf owner. 7) The top layer of all areas to be excavated must be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. This stockpiled material should be used for the rehabilitation of the site and for landscaping purposes. 8) Strip topsoil at start of works and store in stockpiles no more than 1,5 m high in designated materials storage area. 9) During the laying of any cables, pipelines or infrastructure (on or adjacent to the site) topsoil shall be kept aside to cover the disturbed areas immediately after such activities are completed.	Excavated materials correctly stockpiled No visible signs of erosion and sedimentation Minimal invasive weed growth Vegetation only removed in designated areas	Contractor of the Individual Developer/ Engineer	Monitor daily

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			Recommendations made by engineers to be incorporated into design and constructed as per design.			
	Erosion and siltation	To prevent erosion and siltation	1) It is recommended that the construction of the development be done in phases. 2) Each phase should be rehabilitated immediately after the construction for that phase has been completed. The rehabilitated areas should be maintained by the appointed rehabilitation contractor until a vegetative coverage of at least 80% has been achieved as appointed by the developer/ individual erf owner. 3) Mark out the areas to be excavated. 4) Large exposed areas during the construction phases should be limited. Where possible areas earmarked for construction during later phases should remain covered with vegetation coverage until the actual construction phase. This will prevent unnecessary erosion and siltation in these areas. 5) Unnecessary clearing of flora resulting in exposed soil prone to erosive conditions should be avoided. 6) All embankments must be adequately compacted and planted with grass to stop any excessive soils erosion and scouring of the landscape if required. 7) The eradication of alien vegetation should be followed up as soon as possible by replacement with indigenous vegetation to ensure quick and sufficient coverage of exposed areas by the individual erf owner. 8) Storm water outlets shall be correctly designed to prevent any possible soil erosion.	No erosion scars No loss of topsoil All damaged areas successfully rehabilitated	Contractor ESO	Monitor daily

TYPE	***Environmental risk or issue***	***Objective or requirement***	***Mitigation measure***	***Performance indicator***	***Responsibility***	***Frequency of Action***
			9) All surface run-offs shall be managed in such a way so as to ensure erosion of soil does not occur. 10) Implementation of temporary storm water management measures that will help to reduce the speed of surface water by the individual erf owner / developer. 11) All surfaces that are susceptible to erosion shall be covered with a suitable vegetative cover as soon as construction is completed by the individual erf owner / developer.			
	Stability of structures due to geology	To ensure stability of structures	Preventative foundation designs shall be done. Detailed foundation inspections should be carried out at the time of construction to identify any variances and adjust foundation designs accordingly if need be. The foundation recommendations from the geotechnical engineers must be adhered to.		Engineers / Contractor / Individual Developer	When required
	Seepage of groundwater into excavations	To ensure that excavations do not become flooded	Provision should be made for the removal of groundwater from excavations.		Contractor	Monitor daily
	Cracking of structures	To ensure that built structures do not crack due to collapsible soils and settlement	1)The floors of foundation excavations should be compacted by a hand-operated vibratory roller or else by a machine equivalent to a Wacker Rammer (a mechanised tamping device); a test section should firstly be compacted under supervision of the Engineer in order to determine the number of roller passes. The structures may then be constructed by conventional means. Additional precautionary measures that can be employed are:	Built structures show no sign of cracks	Engineer/ Contractor	As required

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			2) The provision of expansion joints in the walls of structures; 3) A concrete walkway of 1,0m in width around the perimeter of each structure; and 4) The shaping of the walkway and the ground surface in the vicinity of the structures so as to drain water away from each structure so that no ponding of surface water can take place in the vicinity of the structures.			
	Hydrology	To minimise pollution of soil, surface and groundwater	1) Increased run-off during construction must be managed using berms and other suitable structures as required to ensure flow velocities are reduced. 2) The contractor shall ensure that excessive quantities of sand, silt and silted water do not enter the storm water system.	No visible signs of erosion. No visible signs of pollution	Contractor	Monitor daily
		To minimise pollution of soil, surface and groundwater.	1) Containment of run-off from construction areas should be implemented and the Watercourses closed off from access by construction workers. 2) Cut-off drains should be trenched between the Watercourses and the construction activities and hay bales should be stacked along the trenches where possible to contain siltation. 3) All spillages must be cleaned up and contaminated soil removed as hazardous waste. 5) Affected soil must be treated with DRIZIT or similar product.	No visible signs of erosion. No visible signs of pollution.	Contractor	
	Wetland	Preserving Wetland areas.	A wetland/ watercourse that runs from south to north on the site must be protected by using bio-swales to filter storm water before it enters the wetland. 1) The delineated wetland area should be	No visible signs of pollution	Contractor	

TYPE	***Environmental risk or issue***	***Objective or requirement***	***Mitigation measure***	***Performance indicator***	***Responsibility***	***Frequency of Action***
			clearly marked prior to construction. These areas are strictly excluded from development and should remain open space during the proposed development activities. 2) Construction of water control structures to prevent and control any erosion on the site. 3) Prevent contamination of wetland areas from polluted runoff/ seepage/ drainage water by utilizing relevant control measures. 4) During the construction phase, no dumping and no stockpiling of materials within the wetland areas should take place. 5) No construction or dumping of activities should take place within the floodline/ wetland or a horizontal distance of 100m from a water resource unless authorized by DWS. 6) No vehicles should be allowed to indiscriminately drive through the wetland areas. Fence-off sensitive areas prior to construction and apply temporary storm water management measures outside the watercourse to prevent entry into the wetland areas and drainage line by construction vehicles and prevent storing or dumping of topsoil, construction material and other waste in the wetland/drainage line. 7) The area should be prepared with sandbags or other applicable measures to avoid siltation into the wetland area. This wetland area must be rehabilitated and must be left as natural areas which will contribute to the aesthetics of the approved development.			

TYPE	***Environmental risk or issue***	***Objective or requirement***	***Mitigation measure***	***Performance indicator***	***Responsibility***	***Frequency of Action***
		To minimise impacts on wetland system	1) Compacted earth berms should be constructed at suitable intervals to reduce the volume and speed of runoff from construction areas into the storm water and wetland systems for the duration of the construction phase of the pipeline. The following guidelines should be used: - Where the area has a slope of less than 2%, berms every 50m should be installed. - Where the area slopes between 2% and 10% berms every 25m should be installed. - Where the area slopes between 10% - 15%, berms every 20m should be installed. - Where the area has a slope greater than 15% berms every 10m should be installed. 2) Reduce runoff from surface areas as far as possible. The storm water should be introduced into the system at a shallow angle to prevent erosion of the opposite bank of the system. 3) No vehicles should be allowed to indiscriminately drive through the wetland areas. A fence should be erected to prevent entry into the wetland areas and drainage line by construction vehicles and prevent storing or dumping of topsoil, construction material and other waste in the wetland / drainage line. 4) All areas affected by construction should be rehabilitated upon completion of the construction phase of the pipeline. Areas should be reseeded with indigenous grasses as required. 5) Upon completion of the construction in the area, the area should be rehabilitated to a level that will ensure that wetland vegetation can become re-established. In	Berms constructed. Fence erected Affected areas continuously rehabilitated.	Contractor / Engineer	

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			this regard special mention of the following is made: ♦ All areas of disturbed and compacted soils need to be compacted and reprofiled. ♦ Ongoing removal of alien vegetation from the area must take place after the completion of the structure to prevent the uncontrollable species. 6) Care must be taken to ensure that construction activities remain within the boundary of the planned sewer pipeline. 7) Limited access to the water of the wetland should be given to construction vehicles by fencing off all access points to the water, except at the predetermined water-intake point.			
	Fauna and flora	To protect the existing fauna and flora.	1) All exotic invaders and weeds must be eradicated on a continuous basis. 2) Exotic invaders must be included in an alien management program for the site. Eradication must occur every 3 months. 3) No plants not indigenous to the area, or exotic plant species, especially lawn grasses and other ground-covering plants, should be introduced in the communal landscaping of the proposed site, as they will drastically interfere with the nature of the area. 4) Where possible, trees naturally growing on the site should be retained as part of the landscaping.	No exotic plants used for landscaping	Contractor ESO / Home Owners Association / Design Review Committee	As and when required Every 6 months
		To protect the existing fauna and flora.	1) Trees that are intended to be retained shall be clearly marked on site. 2) Snaring and hunting of fauna by construction workers on or adjacent to the study area are strictly prohibited and the Council shall prosecute offenders. 3) All mitigation measures for impacts on the	No measurable signs of habitat destruction	Contractor ESO	As and when required

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			indigenous flora of the area should be implemented in order to limit habitat loss as far as possible and maintain and improve available habitat, in order to maintain and possibly increase numbers and species of indigenous fauna. 4) Wood harvesting of any trees or shrubs on the study area or adjacent areas shall be prohibited. 5) Where possible, work should be restricted to one area at a time. 6) Noise should be kept to a minimum and the development should be done in phases to allow faunal species to temporarily migrate into the conservation areas in the vicinity. 7) The integrity of remaining wildlife should be upheld, and no trapping or hunting by construction personnel should be allowed. Caught animals should be relocated to the conservation areas in the vicinity. 8) Entrance by vehicles, especially off-road cars and bakkies, off-road bicycles and quad bikes and construction staff into the application site should be prohibited, both during the construction phase and during the lifespan of the project.			
		To protect the existing fauna and flora.	1) Retain natural habitat elements such as tree stumps, termite mounds, etc. where possible. 2) Preserve, maintain and construct biological corridors where possible, as well as retaining green belts interconnected with these corridors.	No measurable signs of habitat destruction	Contractor ESO	As and when required
Social	**Noise impact**	To maintain noise levels below "disturbing" as	1) Site workers must comply with the Provincial noise requirements as outlined in Provincial Notice No. 5479 of 1999: Gauteng	No complaints from surrounding residents and I &	Contractor	Monitored daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		defined in the national Noise Regulations.	Noise Control Regulations. 2) Noise activities shall only take place during working hours.	APs		
	Dust impact	Minimise dust from the site	1) Dust pollution could occur during the construction works, especially during the dry months. Regular and effective damping down of working areas (especially during the dry and windy periods) must be carried out to avoid dust pollution that will have a negative impact on the surrounding environment. 2) When necessary, these working areas should be damped down in the mornings and afternoons.	No visible signs of dust pollution No complaints from surrounding residents and I & APs	Contractor	Monitored daily
	Safety and security	To ensure the safety and security of the public.	1) Although regarded as a normal practice, it is important to erect proper signs indicating the operations of heavy vehicles in the vicinity of dangerous crossings and access roads or even in the development site if necessary. 2) Construction vehicles and activities to avoid peak hour traffic times 3) Presence of law enforcement officials at strategic places must be ensured 4) Following actions would assist in management of safety along the road ▪ Adequate road marking ▪ Adequate roadside recovery areas ▪ Allowance for pedestrians and cyclists where necessary ▪ Although regarded as a normal practice, it is important to erect proper signs indicating the danger of the excavation in and around the development site. Putting temporary fencing around excavations where possible.	No incidences reported	Contractor ESO	Monitored daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		Management of workers staying on the site.	It is important to note that the construction workers stay on the site and is provided with temporary accommodation facilities. There are also ablution facilities that need to be approved by the Health and Safety Officer. There will be a designated area at the accommodation facilities where fire can be made for food and/or warmth. There will be a shop/cafeteria on the site where food can be bought. There should also be bins for general waste. It is also important to take cognisance of the fact that as construction activities increase on site, the amount of workers and accommodation facilities will also increase. Due to the aforementioned it will be essential to monitor this area carefully and have the Health and Safety Officer to daily checks to ensure that all is compliant.	No incidences reported and the environment is not degraded.	Contractor Developer ESO Health and Safety Officer	Monitored daily
	Blasting	To ensure safety during blasting operations.	1) Surrounding residents must be informed of blasting exercises at least one week in advance. 2) Blasting operations should be carefully controlled and the necessary safety precautions must be implemented.	Surrounding residents informed. Safety precautions in place.	Engineer Project Manager	
	Infrastructure and services	Installation of services	Discuss possible disruptions with affected parties to determine most convenient times for service disruptions and warn affected parties well in advance of dates that service disruptions will take place.	No complaints from I & AP	Contractor ESO	When required
		To reduce the traffic of the affected main roads	1) Construction vehicles and activities to avoid peak hour traffic times i.e. between 7am. and 9 am. and again between 4 pm. and 6 pm. On weekdays. 2) It is important to erect warning signs on existing routes when impacted on by the construction of the pipeline (i.e. construction of intersections / bridges).			

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			3) Traffic on existing routes should be controlled during construction activities impacting on these routes (i.e. construction works at intersections, construction of bridges). 4) Heavy vehicles must be instructed to only use the main roads during off-peak hours. 5) These vehicles should use only specific roads and strictly keep within the speed limits and abide to all traffic laws. No speeding or reckless driving should be allowed. Access to the site for construction vehicles should be planned to minimize the impact on the surrounding network.			
	Cultural Resources		If any graves or archaeological sites are exposed during construction work it should immediately be reported to a museum. The report from the archaeologist must be provided to GDARD if any graves are recovered.	No destruction of or damage to graves or known archaeological sites	Contractor ESO	Monitor daily
	Visual impact	In order to minimise the visual impact.	1) The disturbed areas shall be rehabilitated immediately after the involved construction works are completed. 2) Shade cloth must be used to conceal and minimise the visual impact of the site camps and storage areas.	Visual impacts minimized	Contractor ESO	Monitor daily
	Vegetation	Landscaping	1) When planting trees, care should be taken to avoid the incorrect positioning of trees and other plants, to prevent the roots of trees planted in close proximity to the line of water-bearing services from causing leaking in, or malfunctioning of the services. 2) The proposed planting materials for the areas to be landscaped should preferably be endemic and indigenous. 3) All new trees and shrubs to be planted on the study area shall be inspected for pests	Landscaping done according to landscape development plan	Landscape architect Contractor / Individual Developer	When required

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			and diseases prior to them being planted. 4) The inspection shall be carried out by the maintenance contractor at the property of the supplier and not on the study area. 5) All trees to be planted shall be in minimum 100L containers with a height of approximately 3 metres and a main stem diameter of approximately 80 mm.			
		Loss of plants	1) Aerate compacted soil and check and correct pH for soils affected by construction activities. 2) Make sure plant material will be matured enough and hardened off ready for planting. Water in plants immediately as planting proceeds. 3) Apply mulch to conserve moisture. Plant according to the layout and planting techniques specified by the Landscape Architect in the Landscape Development plans for the site.	Landscaping done according to landscape development plan	Landscape architect Contractor / Individual Developer	When required
		Spread of weeds	Ensure that materials used for mulching and topsoil/ fertilisers are certified weed free. Collect certifications where available. Control weeds growth that appears during construction.	Weed growth controlled	Landscape architect Contractor	When required
		To ensure rehabilitation of the site	1) Compacted soils shall be ripped at least 200mm. 2) All clumps and rocks larger than 30mm diameter shall be removed from the soil to be rehabilitated. 3) The soil shall be leveled before seeding 4) Hydroseed the soil with Potch mixture 5) Watering shall take place at least once per day for the first 14 days until germination of seeds have taken place 6) Thereafter watering should take place at least for 20 minutes every 4 days until grass	Grass have hardened off	Landscape architect Contractor	Once a day Then every 4 days

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Performance indicator*	*Responsibility*	*Frequency of Action*
			have hardened off.			
		Rehabilitation of area directly surrounding Watercourse	1) Vehicles and workers associated with construction should not have free access to the watercourse and unnecessary disturbance to the watercourse should be avoided. 2) No vegetation may be removed from the wetland area unless stipulated in a Water Use License granted to the owner of the site. 3) Erosion control measures should be implemented on all open soils and steep slopes. 4) Upon completion of the construction in the area, the area should be rehabilitated to a level that will ensure that wetland vegetation can become re-established. In this regard special mention of the following is made: • All areas of disturbed and compacted soils need to be compacted and reprofiled. • Ongoing removal of alien vegetation from the area must take place after the completion of the structure to prevent the uncontrollable recruitment of these species.	No erosion surrounding wetland and attenuation ponds	Landscape architect Contractor	Immediately after construction

4.3 Operational Phase

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Responsibility*	*Frequency of Action*
Site cleanup and preparation for use	**Storm water pollution**	Do not allow any materials to wash into the storm water system.	Remove erosion and sediment controls only if all bare soil is sealed, covered or re-vegetate. Sweep roadways clean and remove all debris from kerb and gutter areas. Do not wash into	Contractor	-

TYPE	*Environmental risk or issue*	*Objective or requirement*	*Mitigation measure*	*Responsibility*	*Frequency of Action*
			drains.		
		Minimise waste	Decontaminate and collect waste in storage area ready for off-site recycling or disposal Arrange for final collection and removal of excess and waste materials.	Contractor	-
Establishing plants	**Slow or no re-vegetation to stabilise soil; loss or degradation of habitat**	To ensure re-vegetation to stabilize soil	Agreed schedule for regular follow-up watering, weed control, mulch supplements and amenity pruning, if needed. Replace all plant failures within three month period after planting.	Contractor	To be agreed
Materials failure	**Structural damage. Loss of site materials.**		Inspect all structures monthly to detect any cracking or structural problems. Confirm with designer if there are design problems. Rectify with materials to match, or other agreed solution.	Contractor	-
Drainage failure	**On-site and down watercourse drainage pollution or flooding**	Storm water management plan	Inspect all site drainage works and repair any failures. Confer with design engineer and to correct site problems.	Contractor	-
Site audit	**Eventual project failure**	Successful project establishment	Routinely audit the works and adjust maintenance schedule accordingly.	Contractor	-
General			Open fires and smoking during maintenance works are strictly prohibited.	Contractor	-
	Degradation of the wetland systems.	Protecting the wetland systems and attenuation ponds	People should not litter to the wetlands. People may not remove any fauna or flora species. Children should not be allowed to play on the wetland and attenuation ponds areas.	Developer	
	Water pollution	To prevent water pollution of wetland systems	1) All spillages must be cleaned up and contaminated soil removed as hazardous waste. 2) Affected soil must be treated with DRIZIT or similar product.	Contractor	

5 Procedures for environmental incidents

5.1 Leakages & spills

- Identify source of problem.
- Stop goods leaking, if safe to do so.
- Contain spilt material, using spills kit or sand.
- Notify Environmental Control Officer
- Remove spilt material and place in sealed container for disposal (if possible).
- Environmental Control Officer to follow Incident Management Plan.

5.2 Failure of erosion/sediment control devices

- Prevent further escape of sediment.
- Contain escaped material using silt fence, hay bales, pipes, etc.
- Notify ECO.
- Repair or replace failed device as appropriate.
- Dig/scrape up escaped material; take care not to damage vegetation.
- Remove escaped material from site.
- ECO to follow Incident Management plan.
- Monitor for effectiveness until re-establishment.

5.3 Bank/slope failure

- Stabilize toe of slope to prevent sediment escape using aggregate bags, silt fence, logs, hay bales, pipes, etc.
- Notify ECO.
- ECO to follow Incident Management plan.
- Divert water upslope from failed fence.
- Protect area from further collapse as appropriate.
- Restore as advised by ECO.
- Monitor for effectiveness until stabilized.

5.4 Discovery of rare or endangered species

- Stop work.
- Notify ECO.
- If a plant is found, mark location of plants.
- If an animal, mark location where sighted.
- ECO to identify or arrange for identification of species and or the relocation of the species if possible.
- If confirmed significant, ECO to liaise with Endangered Wildlife Trust.
- Recommence work when cleared by ECO.

5.5 Discovery of archeological or heritage items

- Stop work.
- Do not further disturb the area.

- Notify ECO.
- ECO to arrange appraisal of specimen.
- If confirmed significant, ECO to liaise with National, Cultural and History
  Museum
  P.O. Box 28088
  SUNNYSIDE
  0132
  Contact Mr. J. van Schalkwyk
  or
  Mr. Naude
- Recommence work when cleared by ECO.

6 EMP review

1. The Site Supervisor is responsible for ensuring the work crew is complying with procedures, and for informing the work crew of any changes. The site supervisor is responsible for ensuring the work crew is aware of changes that may have been implemented by GDARD before starting any works.

2. If the contractor cannot comply with any of the activities as described above, they should inform the ECO with reasons within 7 working days.

Appendix I

Other information

Appendix Ii

Company Profile and EAP CV

Bokamoso

Landscape Architects &
Environmental consultants

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0161

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Fax: (086) 570 5559

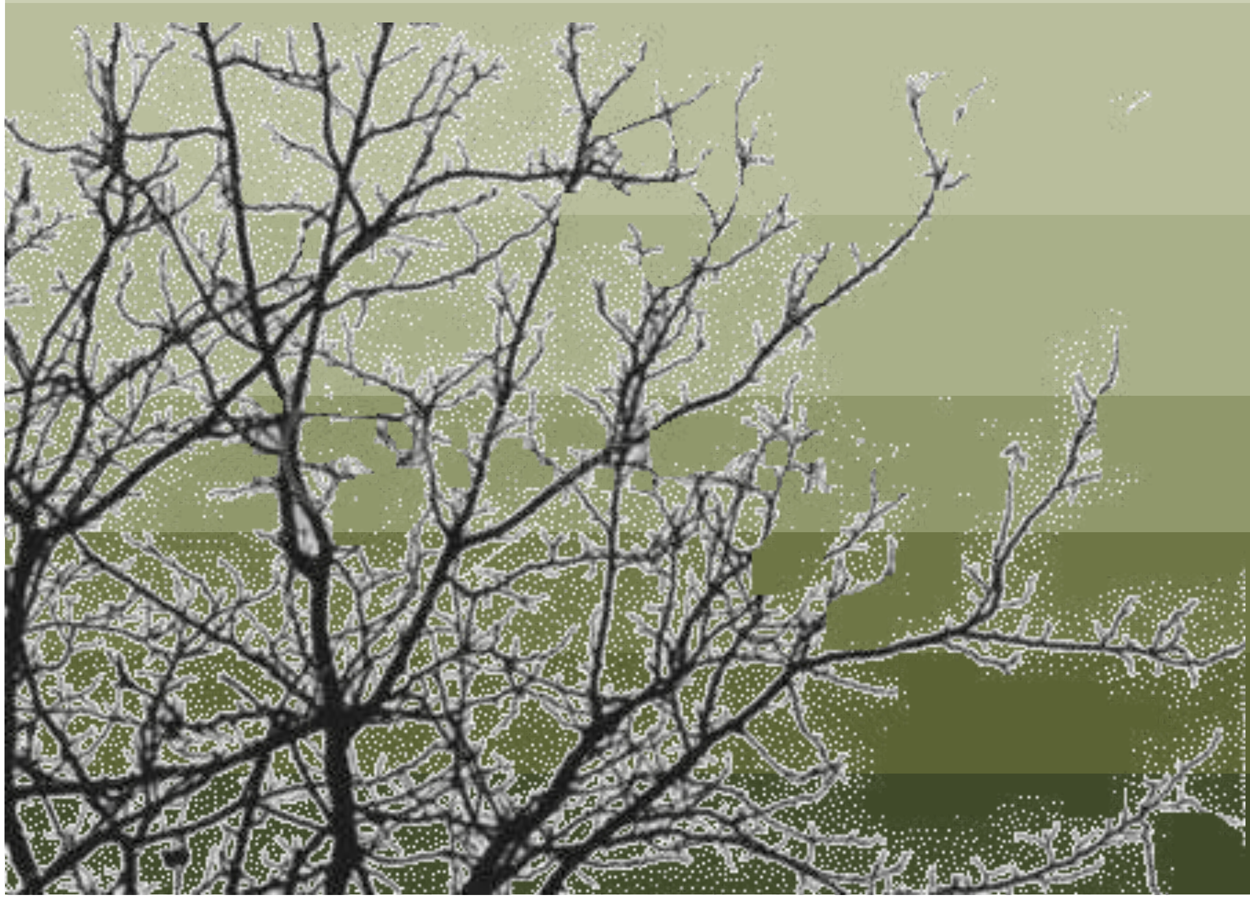
E-mail: lizelle@bokamoso.net
reception@bokamoso.net
Website: www.bokamoso.net

Table of Contents

Bokamoso

Bokamoso specialises in the fields of Landscape Architecture and all aspects of Environmental Management and Planning. Bokamoso was founded in 1992 and has shown growth by continually meeting the needs of our clients. Our area of expertise stretches throughout the whole of South Africa. Our projects reflect the competence of our well compiled team. The diversity of our members enables us to tend to a variety of needs. Our integrated approach establishes a basis for outstanding quality. We are well known to clients in the private, commercial as well as governmental sector.

At Bokamoso we stand on a firm basis of environmental investigation in order to find unique solutions to the requirements of our clients and add value to their operations.



01 Executive Summary

011 Company Overview

Vision:

At Bokamoso we strive to find the best planning solutions by taking into account the functions of a healthy ecosystem. Man and nature should be in balance with each other.

Mission:

We design according to our ethical responsibility, take responsibility for successful completion of projects and constitute a landscape that contributes to a sustainable environment. We add value to the operations of our clients and build long term relationships that are mutually beneficial.

Values:

Integrity

Respect

Bokamoso

02 Vision, Mission & Values

Bokamoso stands on the basis of fairness. This include respect within our multicultural team and equal opportunities in terms of gender, nationality and race.

We have a wide variety of projects to tend to, from complicated reports to landscape installation. This wide range of projects enables us to combine a variety of professionals and skilled employees in our team.

Bokamoso further aids in the development of proficiency within the working environment. Each project, whether in need of skilled or unskilled tasks has its own variety of facets to bring to the table.

We are currently in the process of receiving our BEE scorecard. We support transformation in all areas of our company dynamics.

03 Human Resources

031 Employment Equity

Lizelle Gregory (100% interest)

Lizelle Gregory obtained a degree in Landscape Architecture from the University of Pretoria in 1992 and passed her board exam in 1995.
Her professional practice number is PrLArch 97078.

Ms. Gregory has been a member of both the Institute for Landscape Architecture in South Africa (ILASA) and South African Council for the Landscape Architecture Profession (SACLAP), since 1995.

Although the existing Environmental Legislation doesn't yet stipulate the academic requirements of an Environmental Assessment Practitioner (EAP), it is recommended that the Environmental Consultant be registered at the International Association of Impact Assessments (IAIA). Ms. Gregory has been registered as a member of IAIA in 2007.

Ms. Gregory attended and passed an International Environmental Auditing course in 2008.
She is a registered member of the International Environmental Management and Assessment Council (IEMA).

She has lectured at the Tshwane University of Technology (TUT) and the University of Pretoria (UP). The lecturing included fields of Landscape Architecture and Environmental Management.

Ms. Gregory has more than 20 years experience in the compilation of Environmental Evaluation Reports:
Environmental Management Plans (EMP);
Strategic Environmental Assessments;
All stages of Environmental input ;
EIA under ECA and the new and amended NEMA regulations and various other Environmental reports and documents.

Ms. Gregory has compiled and submitted more than 600 Impact Assessments within the last 5-6 years. Furthermore, Ms. L. Gregory is also familiar with all the GDARD/Provincial Environmental policies and guidelines. She assisted and supplied GAUTRANS/former PWV Consortium with Environmental input and reports regarding road network plans, road determinations, preliminary and detailed designs for the past 12 years.

Consulting

Anè Agenbacht	**Introduction to Sustainable Environmental Management—An overview of Principles, Tools,& Issues (Potch 2006)** **Leadership Training School (Lewende Woord 2010)** **BA Environmental Management (UNISA 2011)** **PGCE Education (Unisa 2013) - CUM LAUDE** Project Manager More than 10 years experience in the compilation of various environmental reports
Mary-Lee Van Zyl	**MSc Plant Science (UP)** **BSc (Hons) Plant Science (UP)** **BSc Ecology (UP)** More than 3 years working experience in the Environmental field Specialises in ECO works, Basic Assessments, EIA's, and Flora Reports Compilation of various Environmental Reports
Dashentha Moodley	**BA (Hons) Degree in Environmental Management (UNISA) - CUM LAUDE** **Bachelor of Social Science in Geography & Environmental Management (UKZN)** More than 6 years experience in WUL Applications & Integrated Environmental Management within water resource management. Senior Environmental Practitioner & Water Use Licence Consultant Specialises in Water Use License & Compilation of various Env. Reports
Adéle Drake	**BA Geography & History (UP)** **NQF Level 7 Air Quality Management (UJ)** More than 15 years experience in the field of Environmental Management within Mining Industry (surface and underground), Forestry Industry, Renewable Energy Industry (WEF), and Environmental Consulting. Also ISO 14000, ISO 9000, and Safety Management Auditor.
Ronell Kuppen	**BSc (Hons) in Geography (UNISA)** **BA Environmental and Development (UKZN)** More than 5 years experience in Environmental Consulting Specializing in WUL Applications, Waste License Applications, EIAs, Basic Assessments, Public Participations, Borrow Pits

Ben Bhukwana	**BSc Landscape Architecture (UP)** More than 6 years experience in the field of Landscape Architecture (Design, Construction, Implementation, and Management). Specialises in landscape design, ECO, rehabilitation plans and compilation various environmental reports and compilation of tender documents
Juanita de Beer	**Diploma Events Management and Marketing (Damelin)** Specializes in Public relations and Public Participation Processes (4 years experience) Specialises in compiling various environmental reports
Alfred Thomas	**CIW Foundation& Internet Marketing (IT Academy)** 12 years experience in GIS and IT in general. GIS Operator and Multimedia Specialist.
Bianca Reyneke	**Applying SHE Principles and Procedures (NOSA)** **Intro to SAMTRAC Course (NOSA)** SHEQ Coordinator and compilation of environmental reports Specialises in compiling various environmental reports
A.E. van Wyk	**BSc Environmental Sciences (Zoology and Geography)** Specialises in compiling various environmental reports

03 Human Resources

Elsa Viviers	**Interior Decorating (Centurion College)** (Accounting/ Receptionist) and Secretary to Lizelle Gregory
Loura du Toit	N. Dip. Professional Teacher (Heidelberg Teachers Training College) Librarian and PA to the Project Manager
Merriam Mogalaki	Administration Assistant with in-house training in bookkeeping

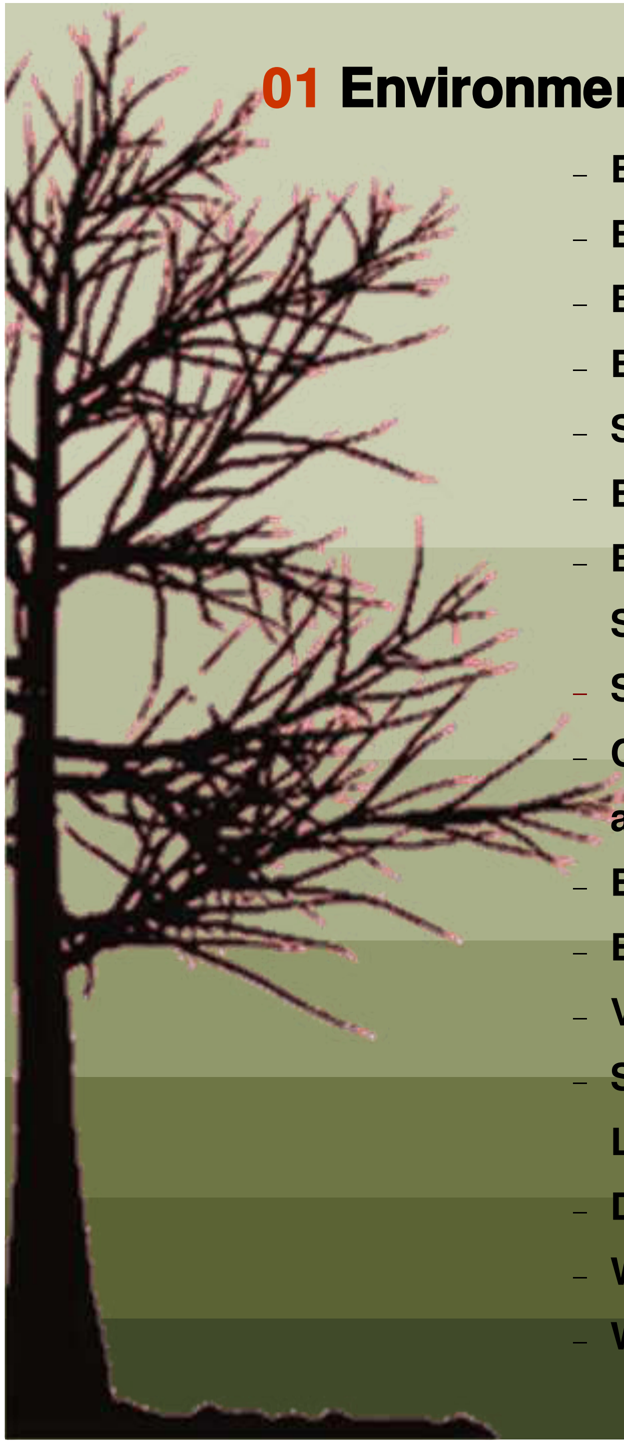
Landscape Contracting

Elias Maloka	Assisting with Public Participations and Office Admin Site manager overseeing landscape installations. Irrigation design and implementation. Landscape maintenance More than 18 years experience in landscape construction works.

The contracting section compromises of six permanently employed black male workers.
In many cases the team consists of up to 12 workers, depending on the quantity of work.

In-house Specialists

Corné Niemandt	**MSc Plant Science (UP 2015) – Cum Laude** **BSc (Hons) Zoology (UP 2012)** **BSc Ecology (UP 2011)** Specialises in ecological surveys and report writing Compilation of fauna and flora specialist reports GIS: Generating maps
Garth van Rooyen	**BSc (Hons) Environmental Soil Science** **BSc Geology** Soil and Wetland Specialist



01 Environmental Management Services

- Basic Assessment Reports
- EIA & Scoping Reports
- Environmental Management Plans
- Environmental Scans
- Strategic Environmental Assessments
- EMP for Mines
- Environmental Input and Evaluation of Spatial Development Frameworks
- State of Environmental Reports
- Compilation of Environmental Legislation and Policy Documents
- Environmental Auditing and Monitoring
- Environmental Control Officer (ECO)
- Visual Impact assessments
- Specialist Assistance with Environmental Legislation Issues and Appeals
- Development Process Management
- Water Use License applications to DWA
- Waste License Application

04 Services

041 Consulting Services

02 Landscape Architecture

- Master Planning
- Sketch Plans
- Planting Plans
- Working Drawings
- Furniture Design
- Detail Design
- Landscape Development Frameworks
- Landscape Development Plans (LDP)
- Contract and Tender Documentation
- Landscape Rehabilitation Works

03 Landscape Contracting

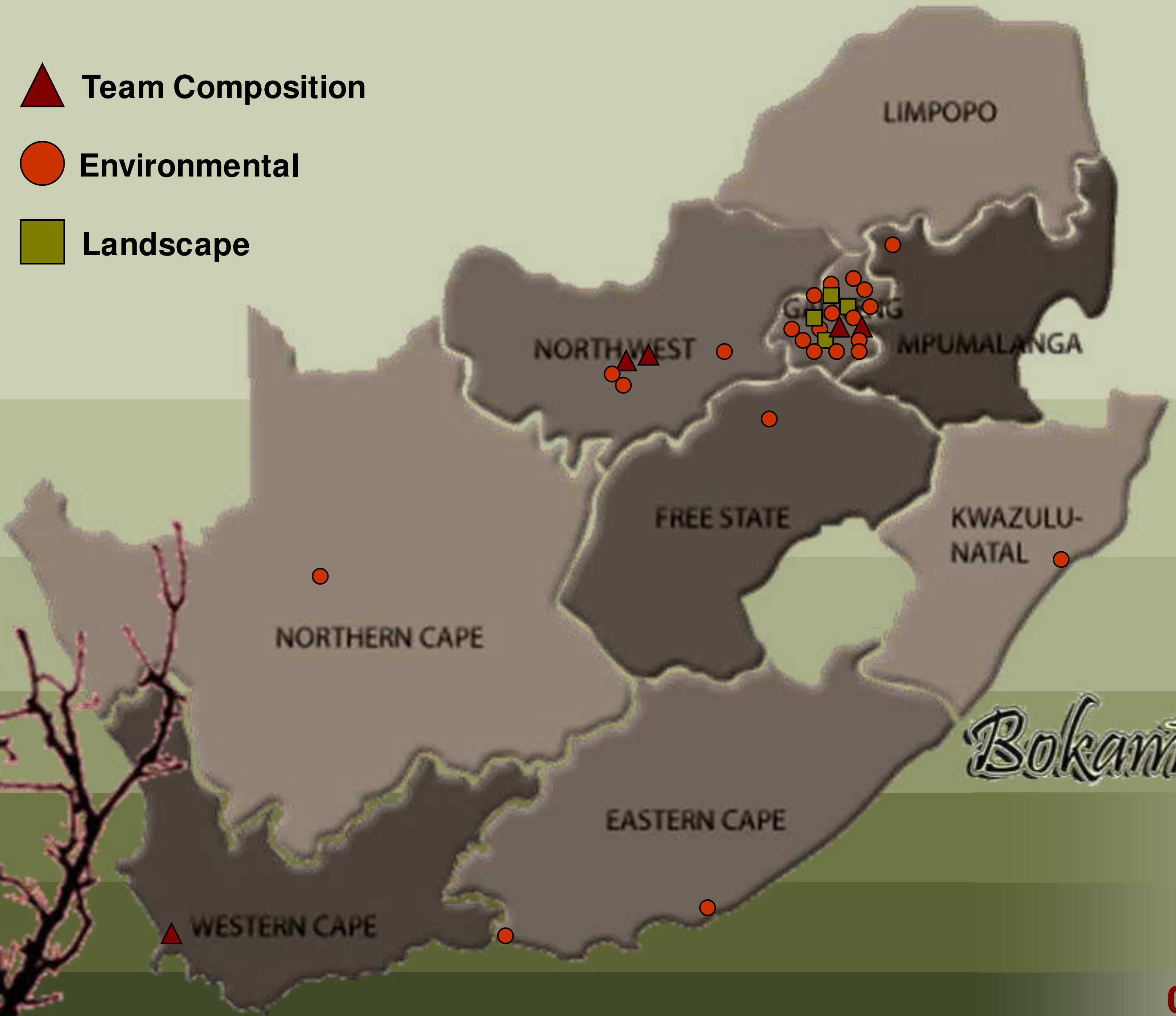
Implementation of Plans for:

- Office Parks
- Commercial/ Retail / Recreational Development
- Residential Complexes
- Private Residential Gardens
- Implementation of irrigation systems

Bokamoso

04 Services

042 Contracting Services



Bokamoso

04 Services

043 Orientation

01 Valpre Bottling Plant, Heidelberg


project site layout


project landscape areas


project rehabilitation


project wetlands

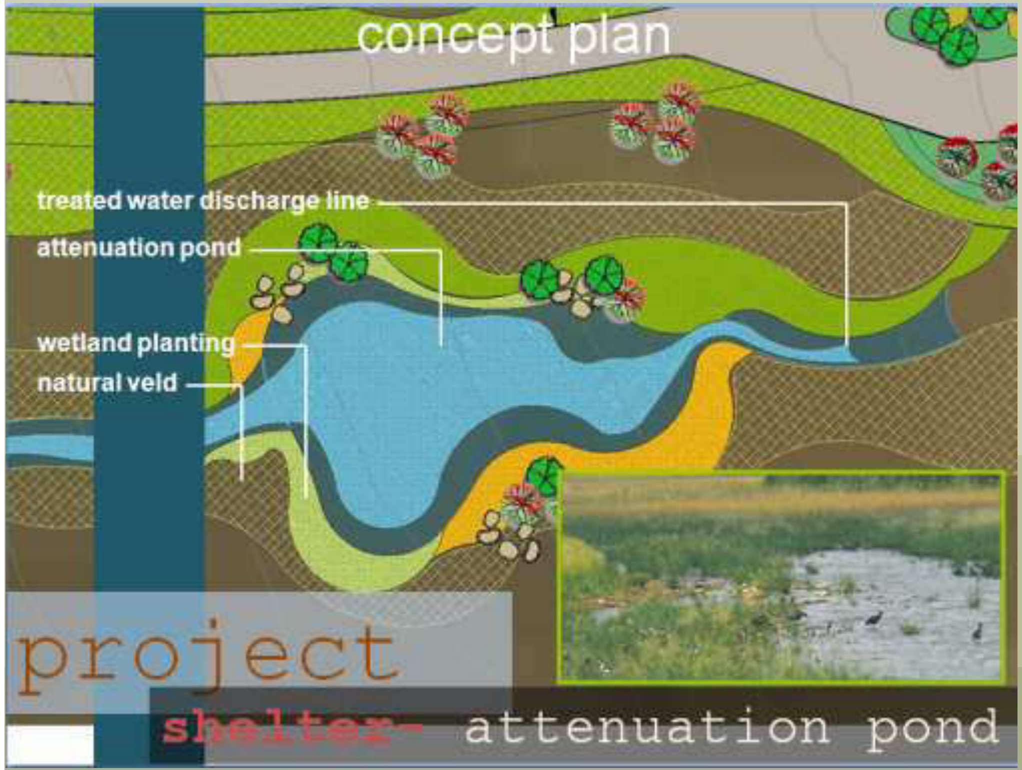

project

shelter- site plan

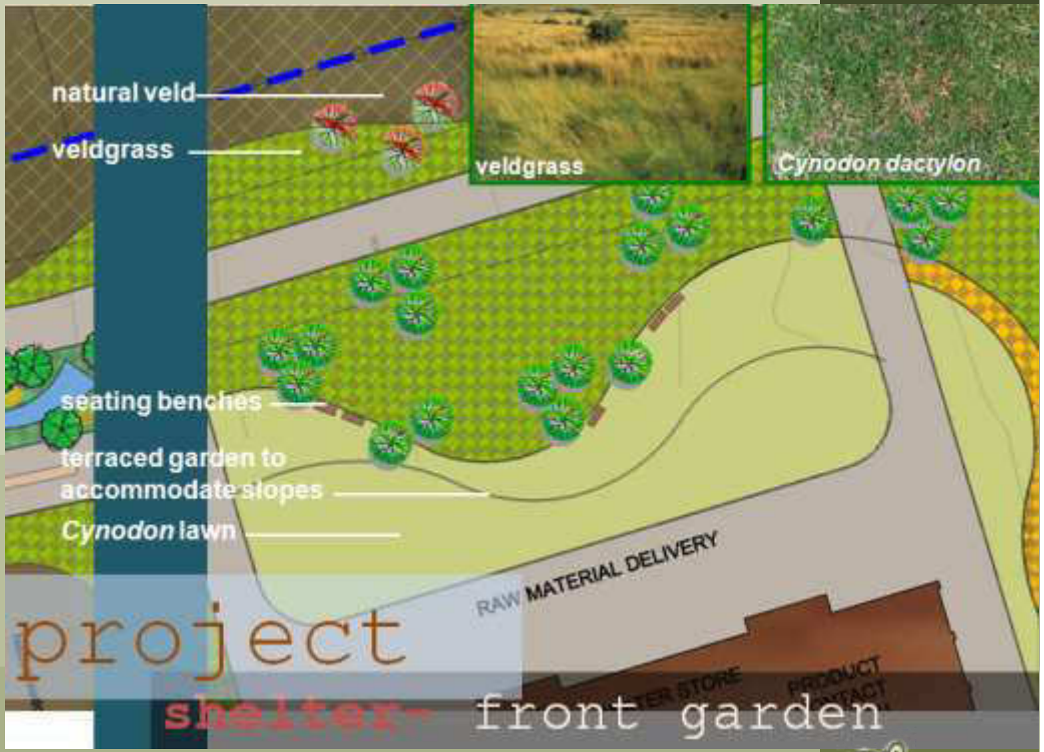
05 Landscape Projects– Current

051 Commercial

01 Valpre Bottling Plant, Heidelberg

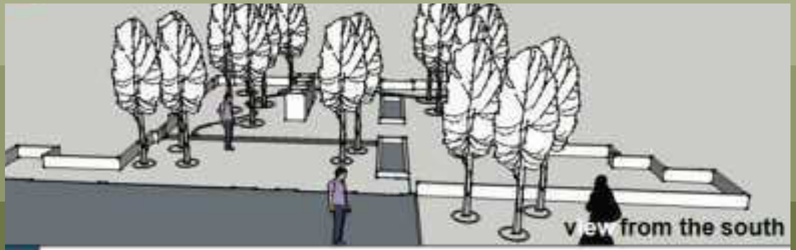


01 Valpre Bottling Plant, Heidelberg

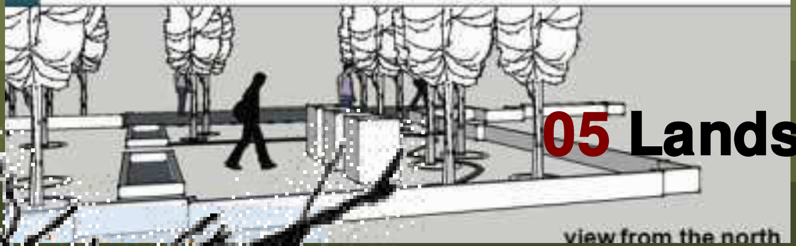


Bokamoso

01 Valpre Bottling Plant, Heidelberg



view from the south



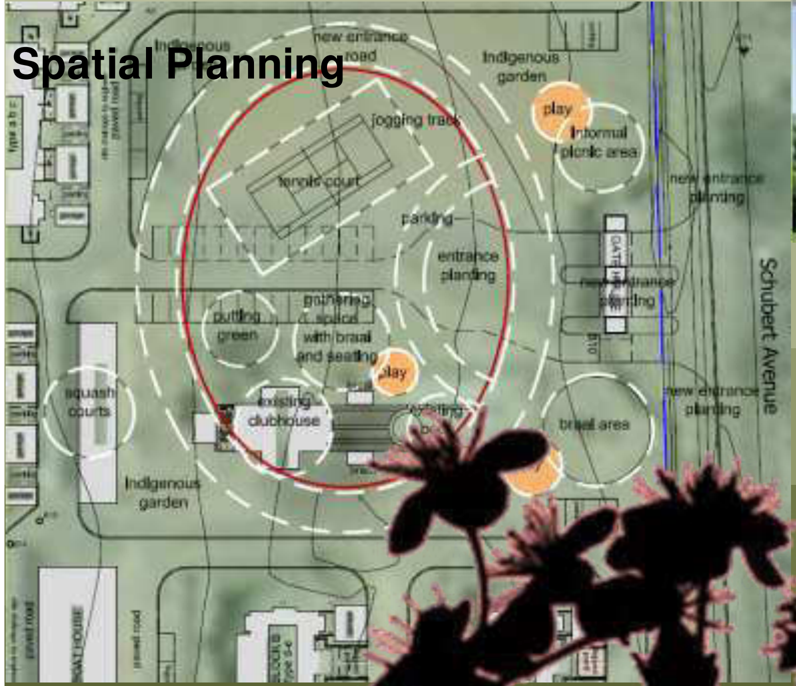
view from the north

Bokamoso

02 Melodie Waters, Hartebeespoortdam

Streetscape

Spatial Planning



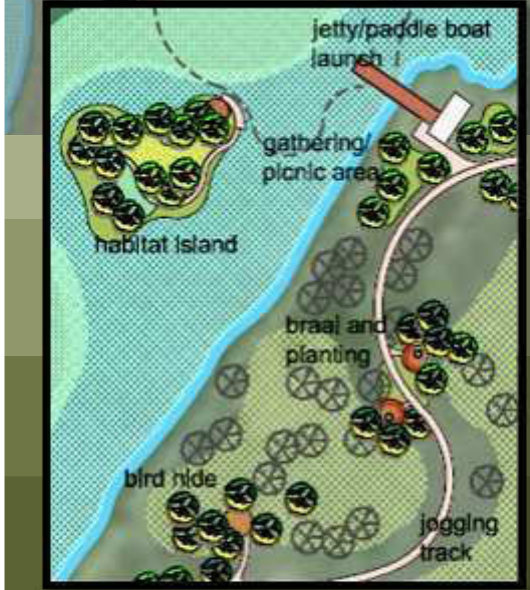
Indigenous Planting

05 Landscape Projects – Current

052 Commercial/Recreational

02 Melodie waters, Hartebeestpoortdam

Development Framework



Rehabilitation

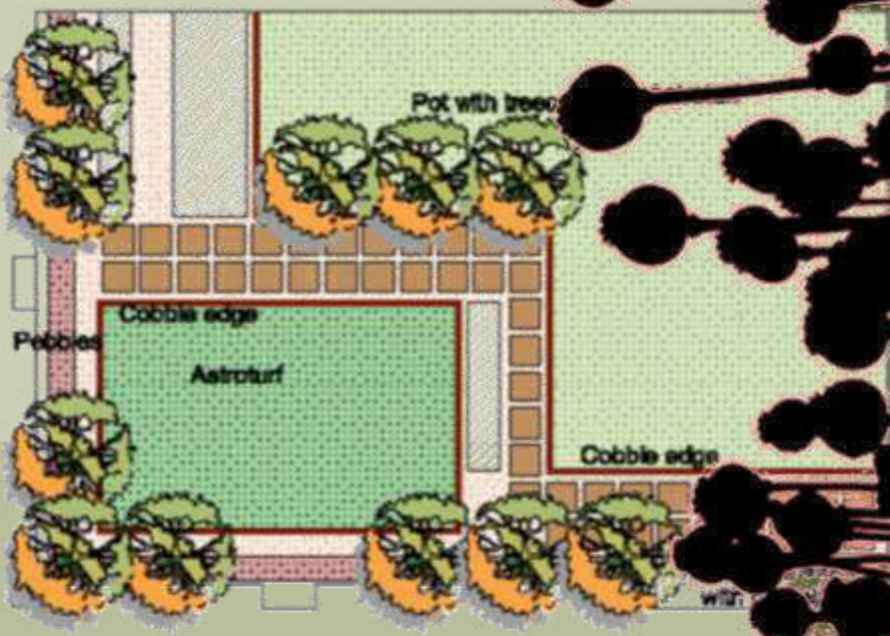
Area Layout

Bokamoso

05 Landscape Projects– Current

052 Commercial/Recreational

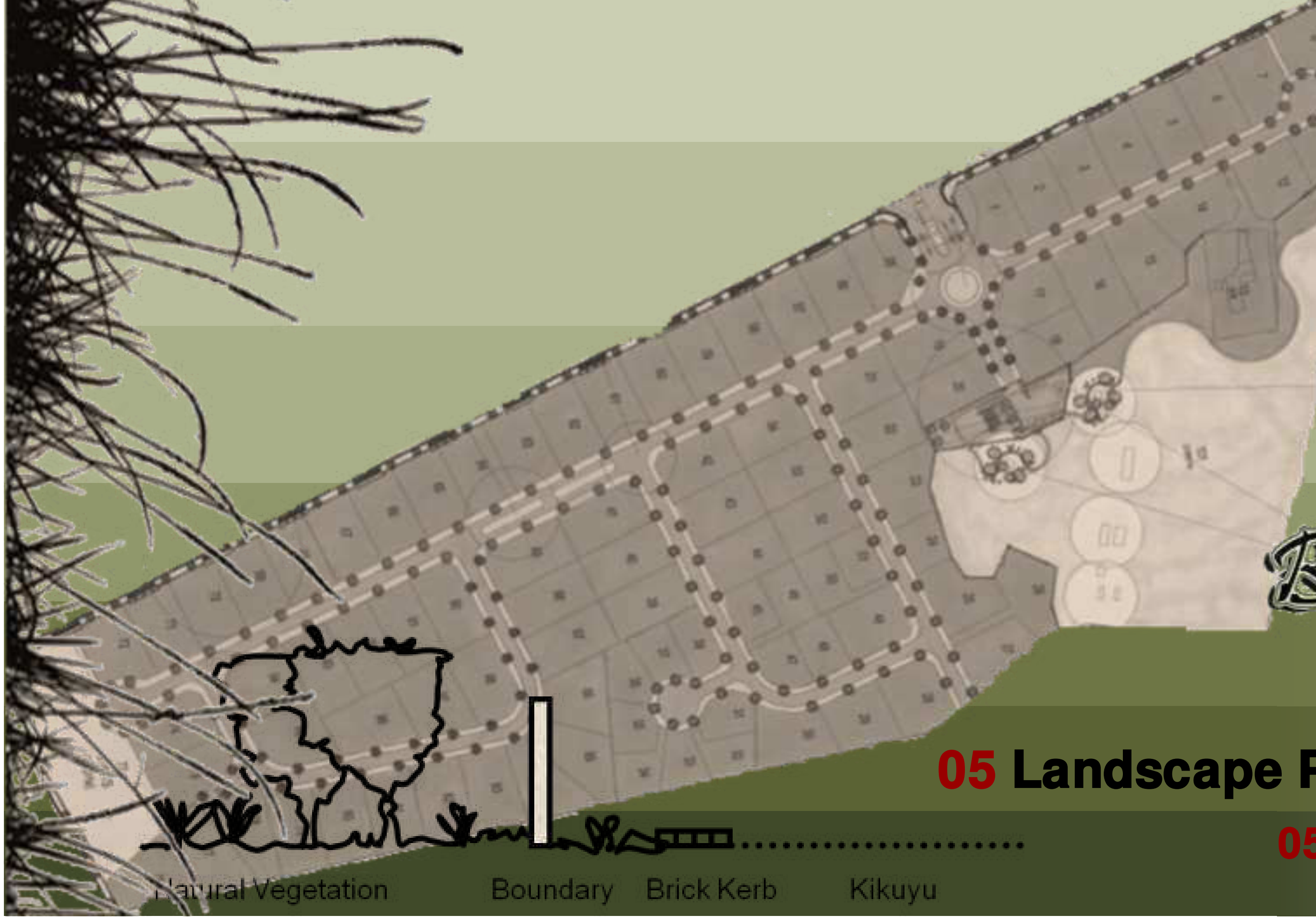
03 Grain Building, Pretoria



04 Ismail Dawson offices, Pretoria

Bokamoso

05 Celtic Manor, Pretoria



06 The Wilds, Pretoria

05 Landscape Projects – Completed

054 Complex Development

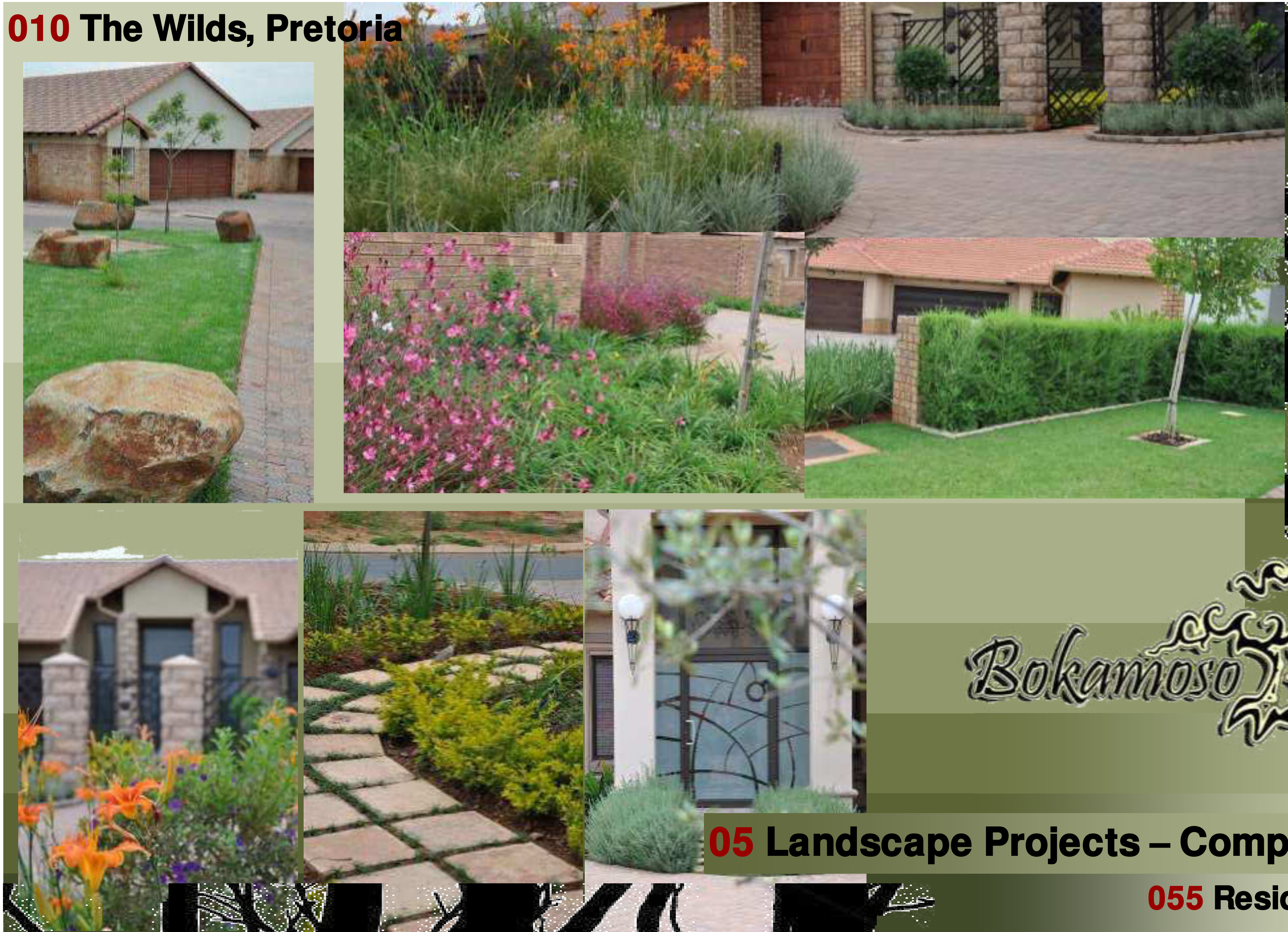
07 The Wilds, Pretoria

08 The Wilds, Pretoria

09 The Wilds, Pretoria

Bokamoso

010 The Wilds, Pretoria



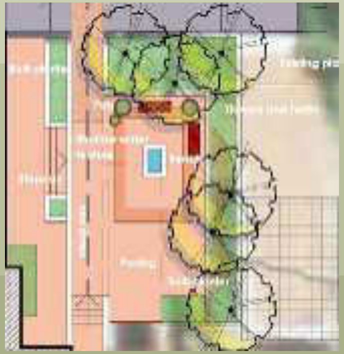
05 Landscape Projects – Completed

055 Residential

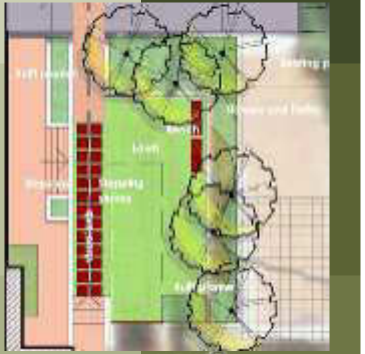
011 Governor of Reserve Bank's Residence, Pretoria

Plant Palette

Option 1



Option 2

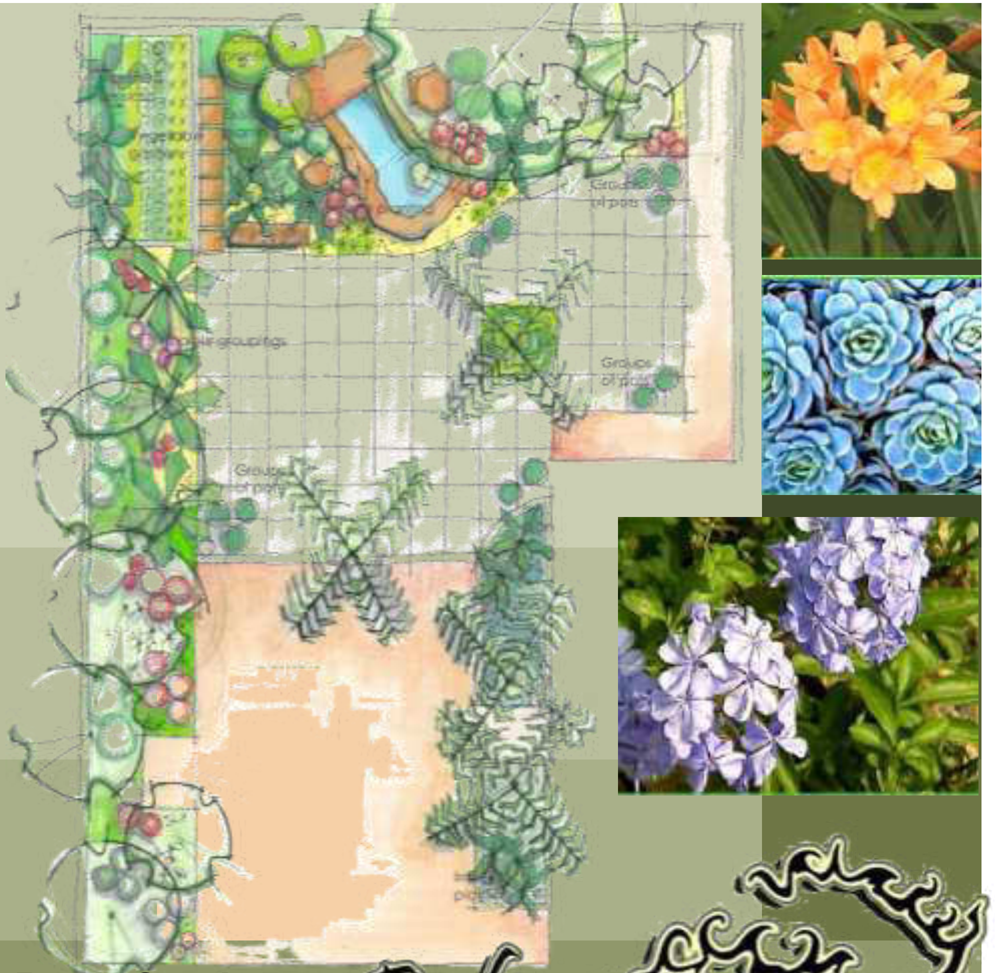


05 Landscape Projects – Conceptual

055 Residential

012 House Ismail, Pretoria

Front Garden



Back Garden

05 Landscape Projects - Conceptual

055 Residential

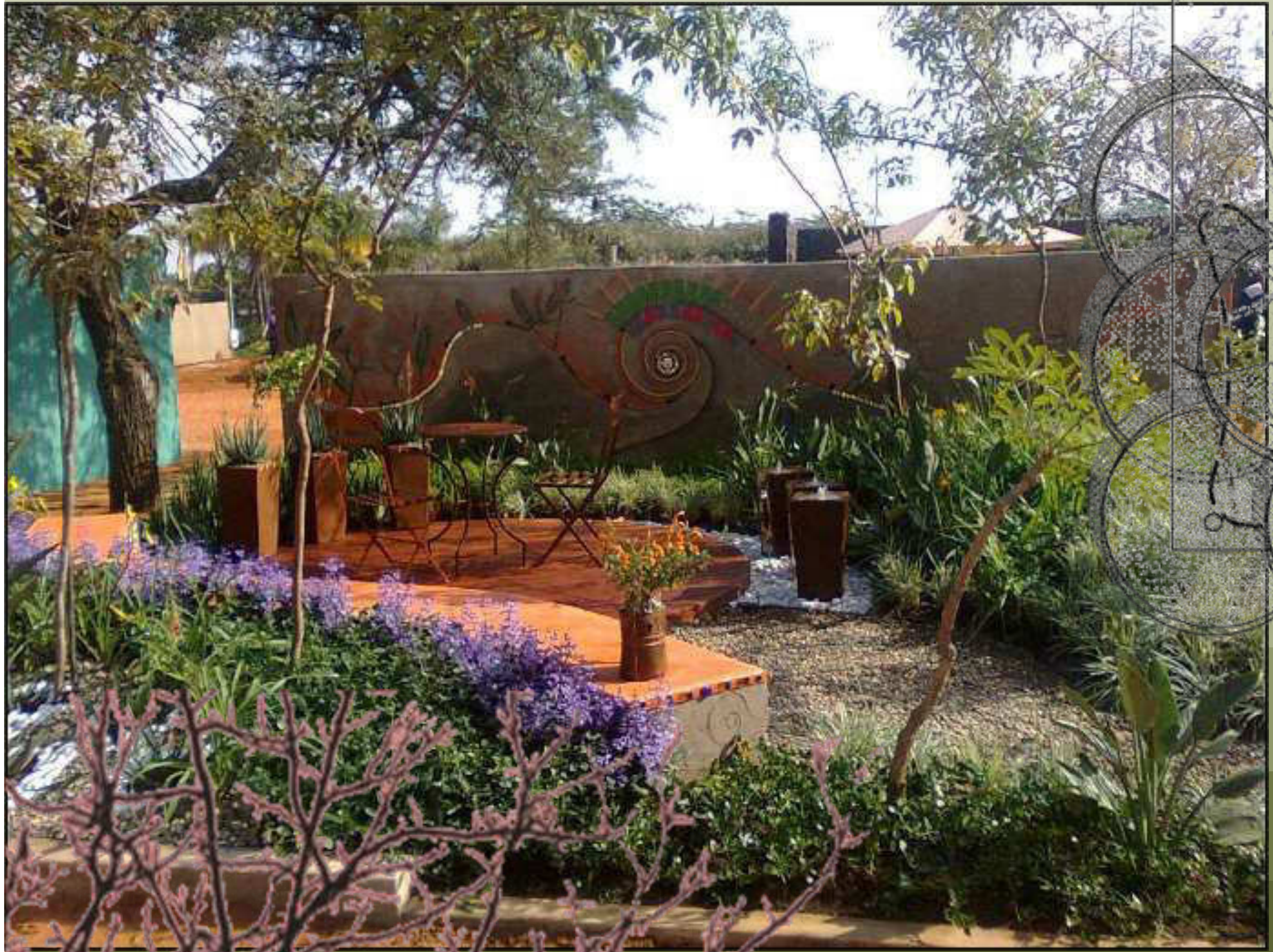
013 Forest Garden, Pretoria

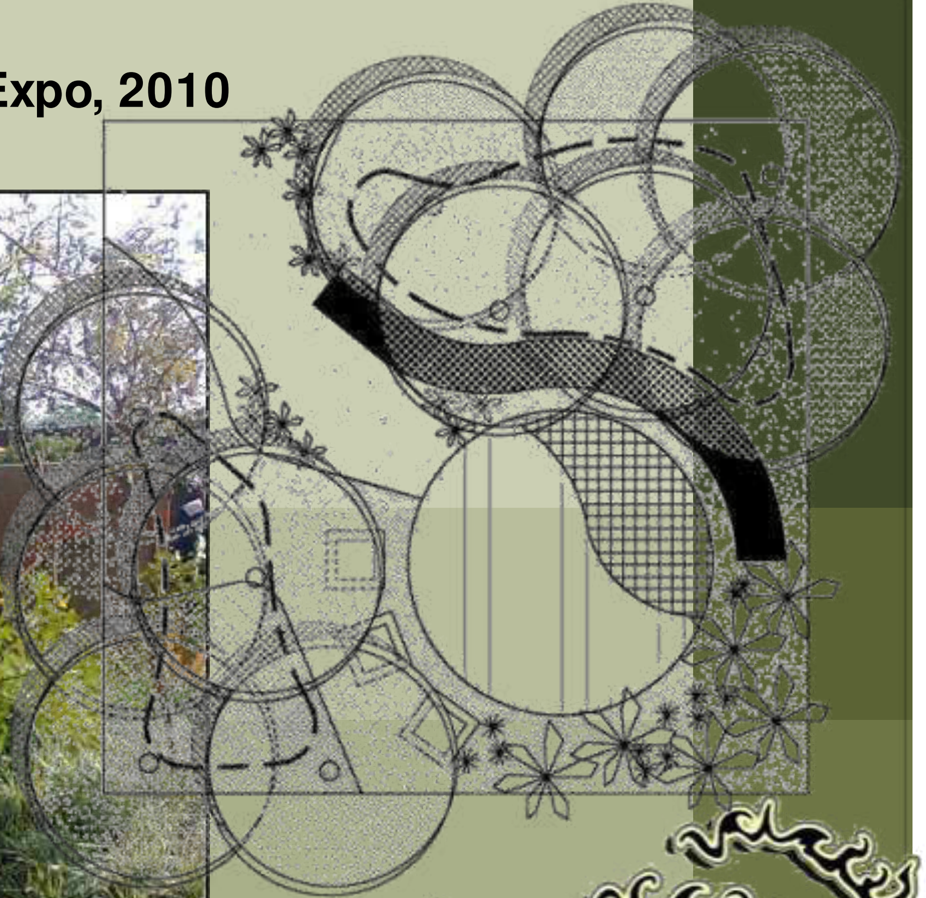
015 Forest Garden, Pretoria

Bokamoso

01 Safari Garden Expo

Received a Silver Certificate at the Safari Garden Expo, 2010





Bokamoso

06 Corporate Highlights

061 Awards

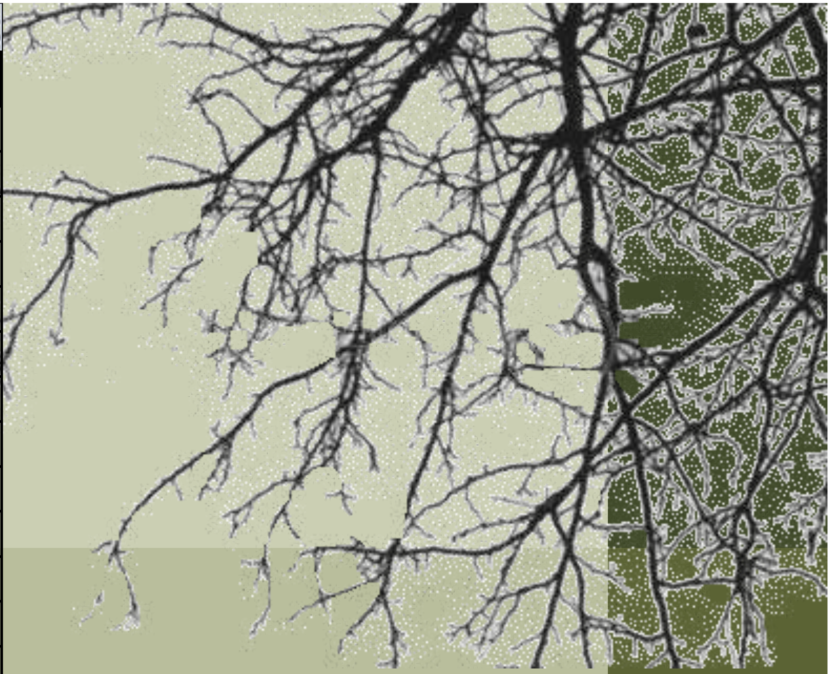
02 UNISA Sunnyside Campus, Pretoria

Best Commercial Paving Plan in Gauteng, 1997

07 Current Environmental Projects

071 EIA, Scoping& Opinion

Project Name	Status	Project
Environmental Impact Assessment(EIA) and Scoping Report		
Junction 21	ROD	EIA
5 O'clock site access	In Progress	EIA
Bokamoso X 1	In Progress	Scoping & EIA
Doornvallei Phase 6 & 7	In Progress	EIA
Engen Interchange	In Progress	Scoping & EIA
Erasmia X15	In Progress	EIA
Franschkloof	In Progress	EIA
K113	Amendment of ROD	EIA
K220 East	ROD	EIA
K220 West	ROD	EIA
K54 ROD conditions	In Progress	EIA
Knopjeslaagte 95/Peachtree	ROD	EIA
Knopjeslaagte portion 20 & 21	ROD	EIA
Lillieslief/Nooitgedacht	In Progress	EIA
Mooiplaats 70 (Sutherland)	In Progress	EIA
Naauwpoort 1 - 12/Valley View	In Progress	EIA
PeachTree X5	In Progress	EIA
Strydfontein 60	In Progress	EIA
Thabe Motswere	In Progress	Scoping & EIA
Vlakplaats	In Progress	EIA
Waterval Valley	In Progress	EIA
Environmental Opinion		
Doornkloof 68 (Ross)	In Progress	Opinion
Monavoni X 53	In Progress	BA & Opinion
Mooikloof (USN)	In Progress	Opinion
Norwood Mall/Sandspruit	In Progress	Opinion
Riversong X 9	In Progress	Opinion
Sud Chemie	In Progress	Opinion
USN Benjoh Fishing Resort	In Progress	Opinion



The adjacent list host the status of our current projects. Only a selected amount of projects are displayed.

07 Current Environmental Projects

072 BA, ECO & S24 G

Project Name	Status	Project
Basic Assessment(BA)		
Annlin X 138	In Progress	BA
Clubview X 29	ROD	BA
Darrenwood Dam	In Progress	BA
Durley Holding 90 & 91	In Progress	BA
Elim	In Progress	BA
Fochville X 3	In Progress	BA
Hartebeeshoek 251	In Progress	BA
Klerksdorp (Matlosana Mall)	In Progress	BA
Monavoni External Services	ROD	BA
Monavoni X 45	Amendment of ROD	BA
Montana X 146	In Progress	BA
Rooihuiskraal X29	In Progress	BA
Thorntree Mall	In Progress	BA
Environmental control officer (ECO)		
Grace Point Church	In Progress	ECO
R 81	In Progress	ECO
Highveld X 61	In Progress	ECO
Mall of the North	In Progress	ECO
Olievenhoutbosch Road	In Progress	ECO
Orchards 39	In Progress	ECO
Pierre van Ryneveld Reservoir	In Progress	ECO
Project Shelter	In Progress	ECO
S24 G		
Wonderboom	In Progress	S24 G
Mogwasi Guest houses	Completed	S24 G

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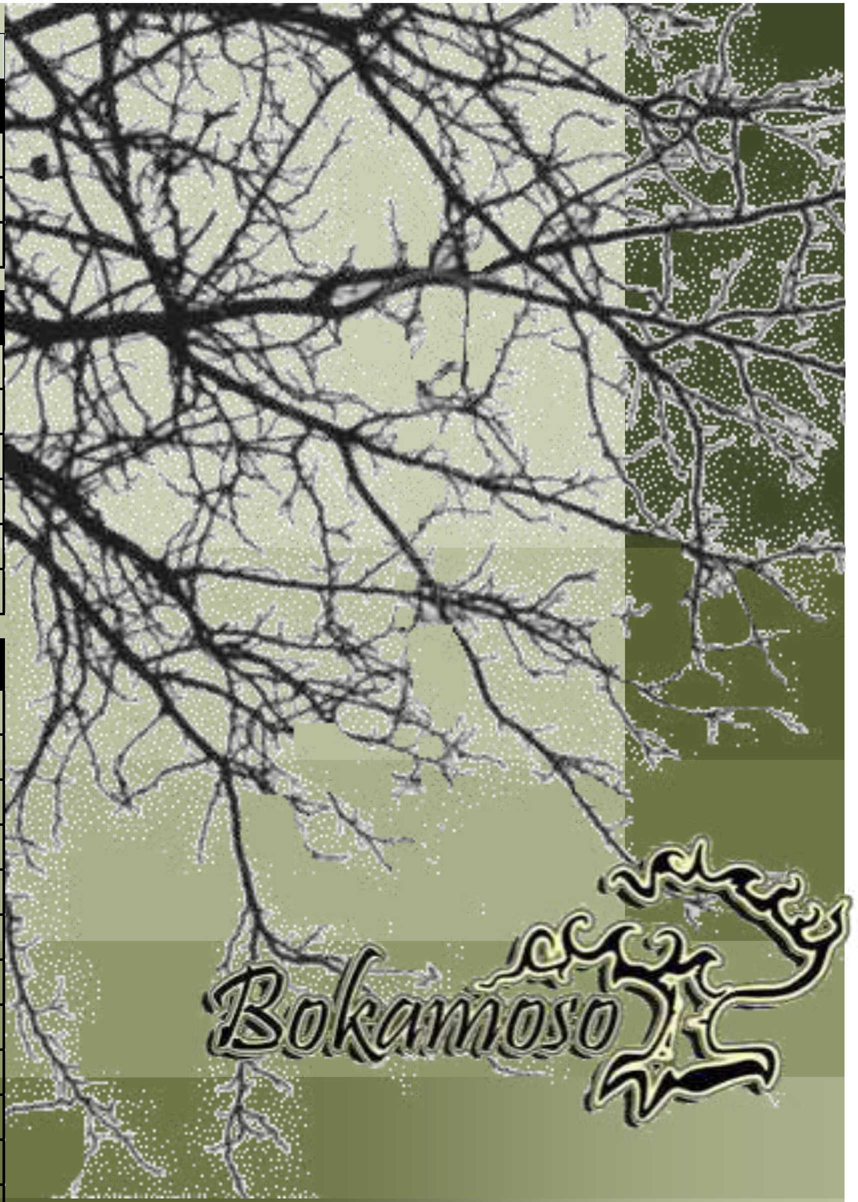
Project Name	Status	Project
Objection		
Colesberg WWTW	In Progress	Objection
Nigel Steelmill	Completed	Objection
Chantilly Waters	Completed	Objection
Development facilitation Act- Input (DFA)		
Burgersfort	In Progress	DFA & BA
Doornpoort Filling Station	In Progress	DFA & EIA & Scoping
Eastwood Junction	In Progress	DFA
Ingersol Road (Erf 78, 81 - 83)	In Progress	DFA
Roos Senekal	In Progress	DFA & EIA & Scoping
Thaba Meetse 1	In Progress	DFA & EIA & Scoping
Water Use License Act (WULA)		
Britstown Bulk Water Supply	In Progress	WULA
Celery Road / Green Channel	In Progress	WULA
Clayville X 46	In Progress	WULA
Dindingwe Lodge	In Progress	WULA
Doornpoort Filling Station	In Progress	WULA+DFA+EIA+SC
Eco Park Dam	In Progress	WULA
Groote Drift Potch	In Progress	WULA
Jozini Shopping Centre	In Progress	WULA+BA
K60	Completed	WULA
Maloto Roads	In Progress	WULA
Kwazele Sewage Works	In Progress	WULA
Monavoni External Services	In Progress	WULA+BA
Nyathi Eco Estate	In Progress	WULA
Prairie Giants X 3	In Progress	WULA
Waveside Water Bottling Plant	Completed	WULA



07 Current Environmental Projects

073 Objection, DFA & WULA

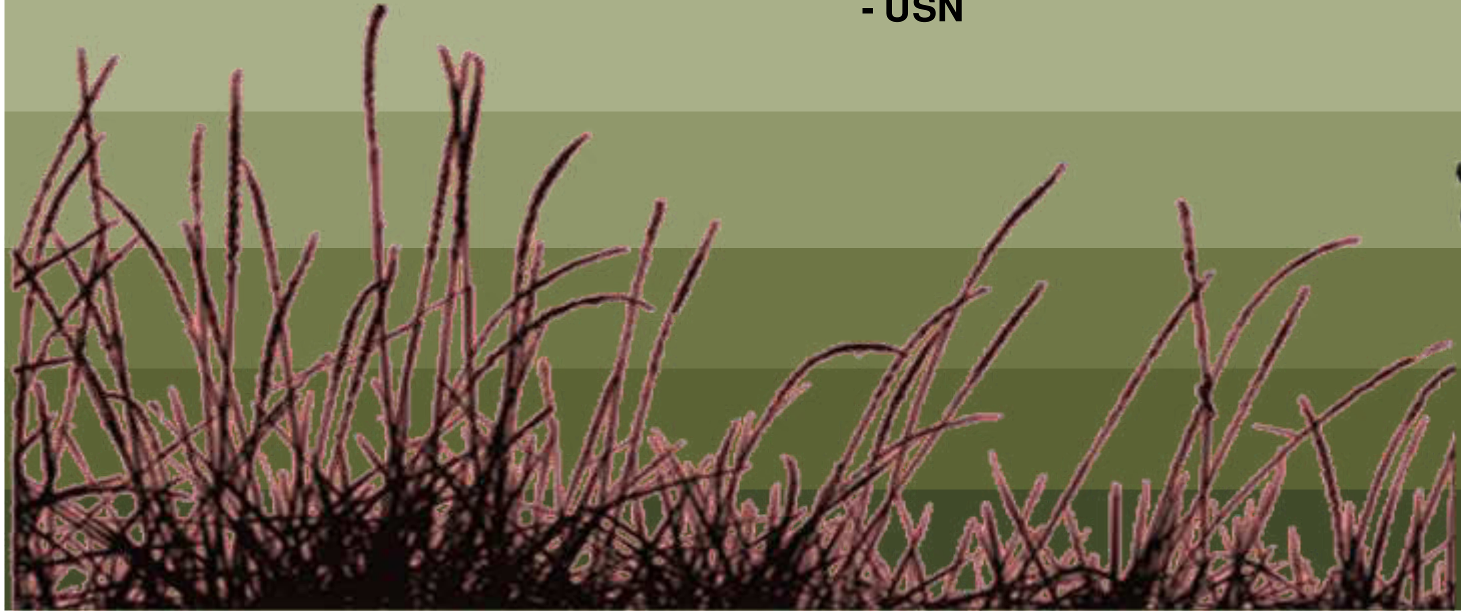
Project Name	Status	Project
Environmental Management Plan(EMP)		
Heidelberg X 12	ROD	EMP
Monavoni Shopping Centre	Completed	EMP
Forest Hill Development	Completed	EMP
Weltevreden Farm 105KQ	Completed	EMP+EIA
Raslouw Holding 93	Completed	EMP+BA
Durley Development	Completed	EMP+BA
Rooihuiskraal North X 28	Completed	EMP
Rehabilitation Plan		
Norwood Mall/Sandspruit	In Progress	Rehabilitation
Project Shelter Heidelberg	In Progress	Rehabilitation
Sagewood Attenuation Pond	ROD	Rehabilitation
Velmore Hotel	Completed	Rehabilitation
Grace Point Church	Completed	Rehabilitation
Mmamelodi Pipeline	Completed	Rehabilitation
Visual Impact Assessment		
Swatzkop Industrial Developme	Completed	Assessment +DFA
Erasmia	Completed	Assessment
Signage Application		
Menlyn Advertising	Completed	Signage
The Villa Mall	Completed	Signage+EMP+BA

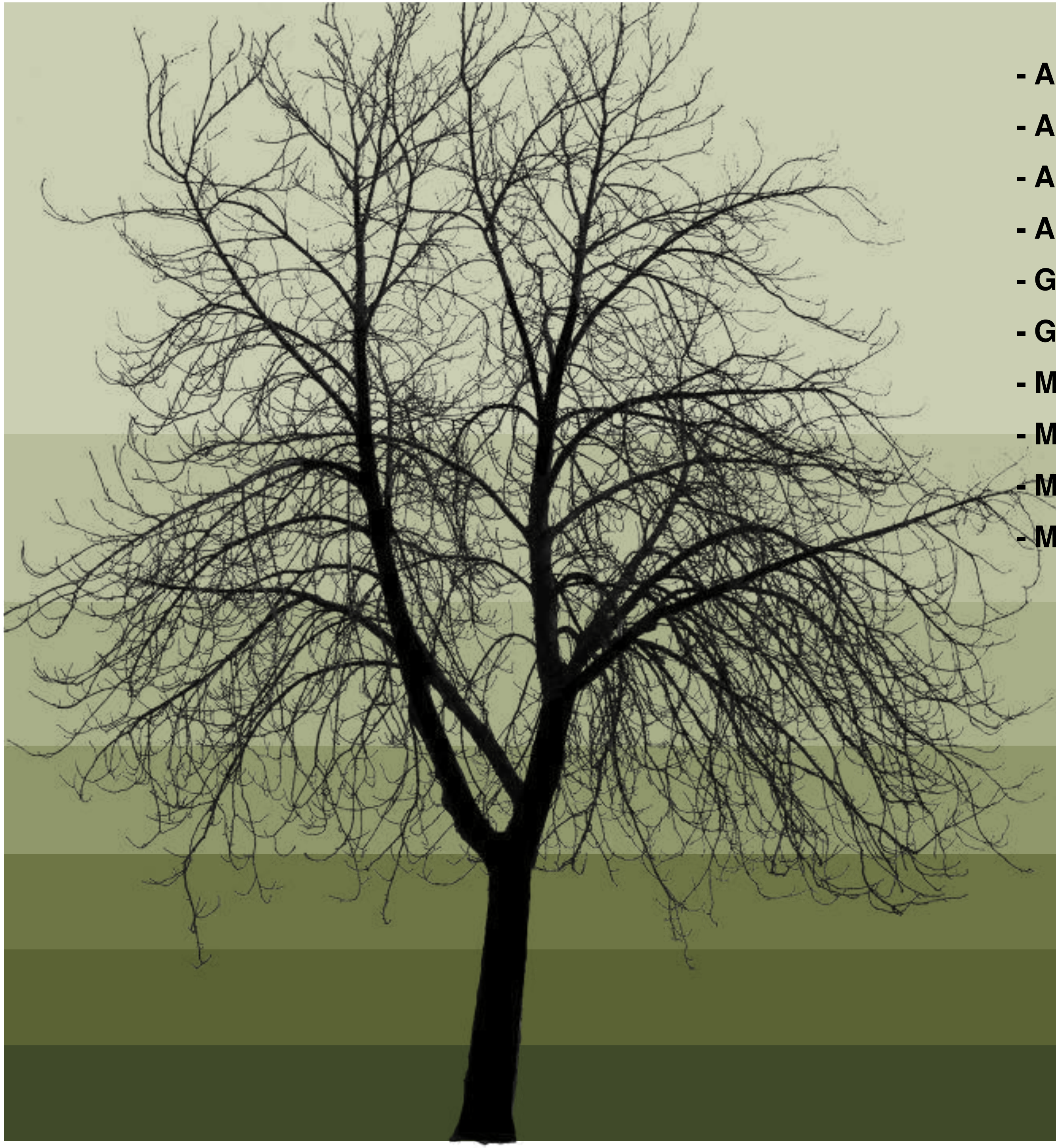
07 Current Environmental Projects

074 EMP, Rehabilitation , Waste Management & Signage Application

08 Indicative Clients

- Billion Property Group
- Cavaleros Developments
- Centro Developers
- Chaimberlains
- Chieftain
- Century Property Group
- Coca Cola
- Elmado Property Development
- Flanagan & Gerard
- Gautrans
- Hartland Property Group
- Moolman Group
- MTN
- M&T Development
- Old Mutual
- Property Investment Company
- Petroland Developments
- RSD Construction
- SAND
- Stephan Parsons
- Twin City Developments
- Urban Construction
- USN





- Adobe Illustrator CS3
- Adobe Photoshop CS3
- Adobe InDesign CS3
- AutoCAD
- Google SketchUP
- GIS
- Microsoft Office Word
- Microsoft Office Excel
- Microsoft Office Publisher
- Microsoft Office Power Point

Bokamoso

09 Tools

Qualifications And Experience In The Field Of Environmental Planning And Management (Lizelle Gregory (Member Bokamoso)):

Qualifications:

-Qualified as ***Landscape Architect*** *at UP 1991;*
-Qualified as ***Professional Landscape Architect in 1997****;*
-A Registered Member at The ***South African Council for the Landscape Architect Profession (SACLAP)*** *with Practise Number:* ***PrLArch97078****;*
- A Registered Member at the ***International Association for Impact Assessment Practitioners (IAIA)****;*
- Qualified as an ***Environmental Auditor in July 2008*** *and also became a Member of the International Environmental Management Association (IEMAS) in 2008.*

Working Experience:

-Worked part time at Eco-Consult – 1988-1990;
-Worked part time at ***Plan Associates as Landscape Architect in training*** *– 1990-1991;*
-Worked as Landscape Architect at ***Environmental Design Partnership (EDP)*** *from 1992 - 1994*
-Practised under ***Lizelle Gregory Landscape Architects*** *from 1994 until 1999;*
*-****Lectured*** *at Part-Time at* ***UP*** *(1999) – Landscape Architecture and* ***TUT*** *(1998- 1999)- Environmental Planning and Plant Material Studies;*
-Worked as ***part time Landscape Architect and Environmental Consultant at Plan Associates*** *and* ***managed their environmental division for more that 10 years*** *– 1993 – 2008 (assisted the* ***PWV Consortium*** *with various road planning matters which amongst others included environmental Scans, EIA's, Scoping reports etc.)*
-Renamed business as ***Bokamoso in 2000*** *and is the only member of Bokamoso Landscape Architects and Environmental Consultants CC;*
*-****More than 20 years experience in the compilation of Environmental Reports,*** *which amongst others included the compilation of various* ***DFA Regulation 31 Scoping Reports****, EIA's for EIA applications in terms of the applicable environmental legislation, Environmental Management Plans, Inputs for Spatial Development Frameworks, DP's, EMF's etc. Also included EIA Application on and adjacent to mining land and slimes dams (i.e. Brahm Fisherville, Doornkop)*