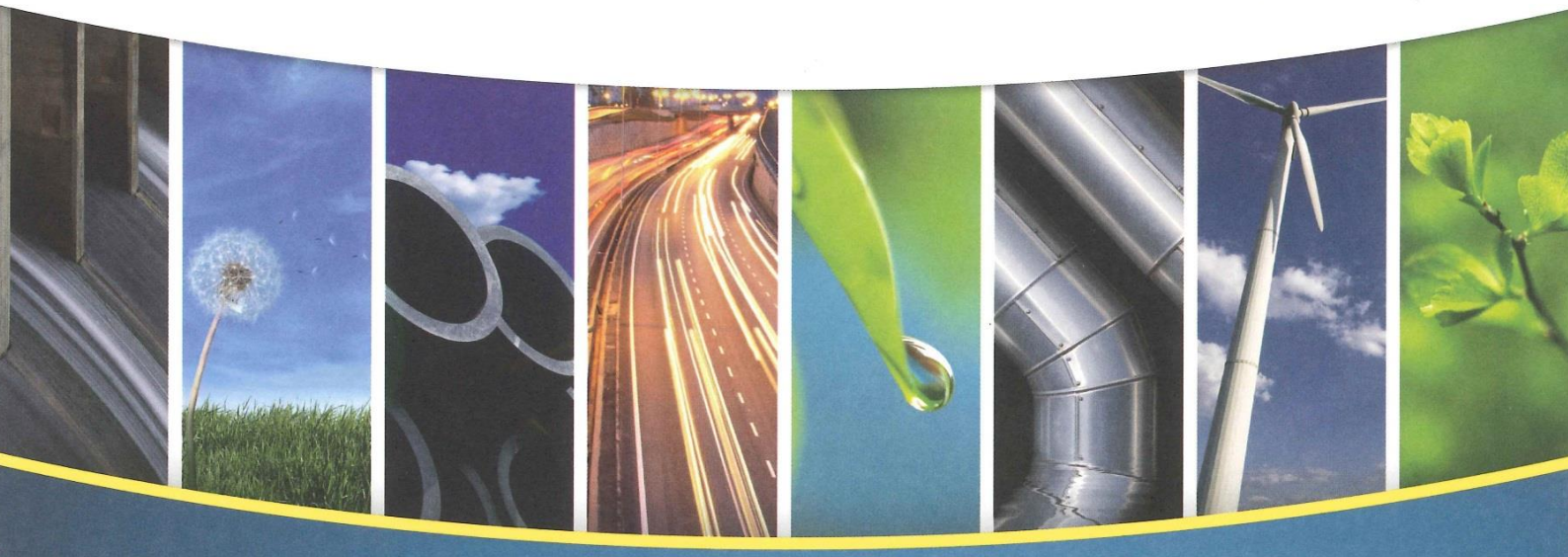
MIDDLE ROAD/IONA ROAD GROWTH AREA – TRANSPORT ASSESSMENT

Prepared for Hastings District Council

April 2016



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Hastings District Council

Middle Road/Iona Road Growth Area - Transport Assessment

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1 Introduction

Background

Hastings District Council (HDC) are currently preparing a structure plan for an area which encompasses both the Iona Triangle[1] and land parcels south of Iona Road, referred to as the Middle Road/Iona Road growth area. Ultimately the area may provide up to 448 residential dwellings[2]. MWH have been commissioned by (HDC) to undertake a high-level traffic impact assessment for this area.

The primary objective of the assessment is to establish the traffic generation of the development and to undertake an initial evaluation of the alternative road network options. HDC have indicated that the development will be staged, with the precise nature of the staging to be determined at a later date and informed in part by this assessment.

Development

HDC have broken the Middle Road/Iona Road growth area into the following zones:

- **Deferred Zone.** This area covers approximately 7.5 hectares and will provide between 90 and 110 dwellings. Access to this area will be provided from Middle Road, Reynolds Road and Iona Road. This zone is currently undeveloped aside from a small number of rural residential lots in the south-east corner and includes a small knoll (approximately 10m in height) which HDC have suggested may be retained as a feature within a reserve area.
- **Character Zone.** This area covers approximately 9.2 hectares and will provide between 110 and 138 dwellings. The area is located adjacent to the Deferred Zone, with future access provided via Middle Road, Iona Road and Reynolds Road.
- **Iona Hill.** This area covers approximately 27.1 hectares and will provide between 90 and 160 dwellings. The area is located immediately south of Iona Road. Development plans include the construction of a cycleway/walkway (and limited vehicle access) to Lane Road.
- **Remaining HPUDS Land.** This remaining area covers approximately 32.8 hectares and is earmarked to provide an additional 25 to 40 dwellings.

All zones are either currently zoned as residential areas or included within the Hastings Proposed Urban Development Strategy (HPUDS) as future growth areas.

Project Area

This traffic assessment is limited to the evaluation of the impact of the future development to the immediately surrounding roads; namely Gilpin Road, Middle Road and Iona Road. A satellite image of the project area, inclusive of the proposed development zones, is provided as Figure 1-1. The figure also includes further zone boundaries as defined by the landowners (i.e. the Iona I-III areas):

Landowners Vision

The landowners of the Character Zone, the Deferred Zone and the Iona Hill area are:

- Graeme Lowe Properties Ltd;
- J E Lowe; and
- Lowe Family Holdings Limited.

At present, the main landowner (Graeme Lowe Properties Ltd) is in the process of subdividing the Deferred Zone, Character Zone and Iona Hill areas. An earthworks consent for re-contouring the southern end of the Iona Hills area (Iona III) is already in place, which identifies the intent to 'smooth' off the steeper sections of the block rather than 'flattening'.

[1] The Iona Triangle refers to the area of land bound by Iona Road, Middle Road and Breadalbane Road

[2] HDC high density estimate

The most recent information relating to the landowners intentions is detailed within the *'Iona Road – Design Concept and Principles Report (Isthmus, February 2016)'*. The key points to this report are as follows:

- Proposed realignment of Iona Road to Middle Road as a means of improving safety and enhancing the layout.
- The retention of the existing main waterway, located within the southern end (Iona III) of the Iona Hills area, as a 'green corridor'.
- Introduction of two 'spine' roads. The first being the continuation of Reynolds Road, terminating at the aforementioned knoll and the second from Iona Road running south along the existing gully and terminating at the end of the Iona III area.
- The proposed internal 'spine' roads are noted as being fixed with the configuration of the east-west 'side' streets being flexible.

There are various owners of the remaining HPUDS areas and the existing pocket of residential land located along on Middle Road.

Purpose of this Report

This report provides an outline of the required changes to existing intersections and HDC's roads as a means of facilitating the development. To adhere to the project objective, the following information is presented within this report:

- A review of relevant local planning and design guidelines;
- A summary of the existing road network conditions;
- A review of the crash data;
- A trip generation estimate for the Middle Road/Iona Road growth area;
- An assessment of alternative external road network options that could potentially facilitate the development; and
- Identification of potential internal road networks.

This report will form part of an overarching infrastructure options report that will assist HDC in planning for the future residential expansion within this Havelock North area.

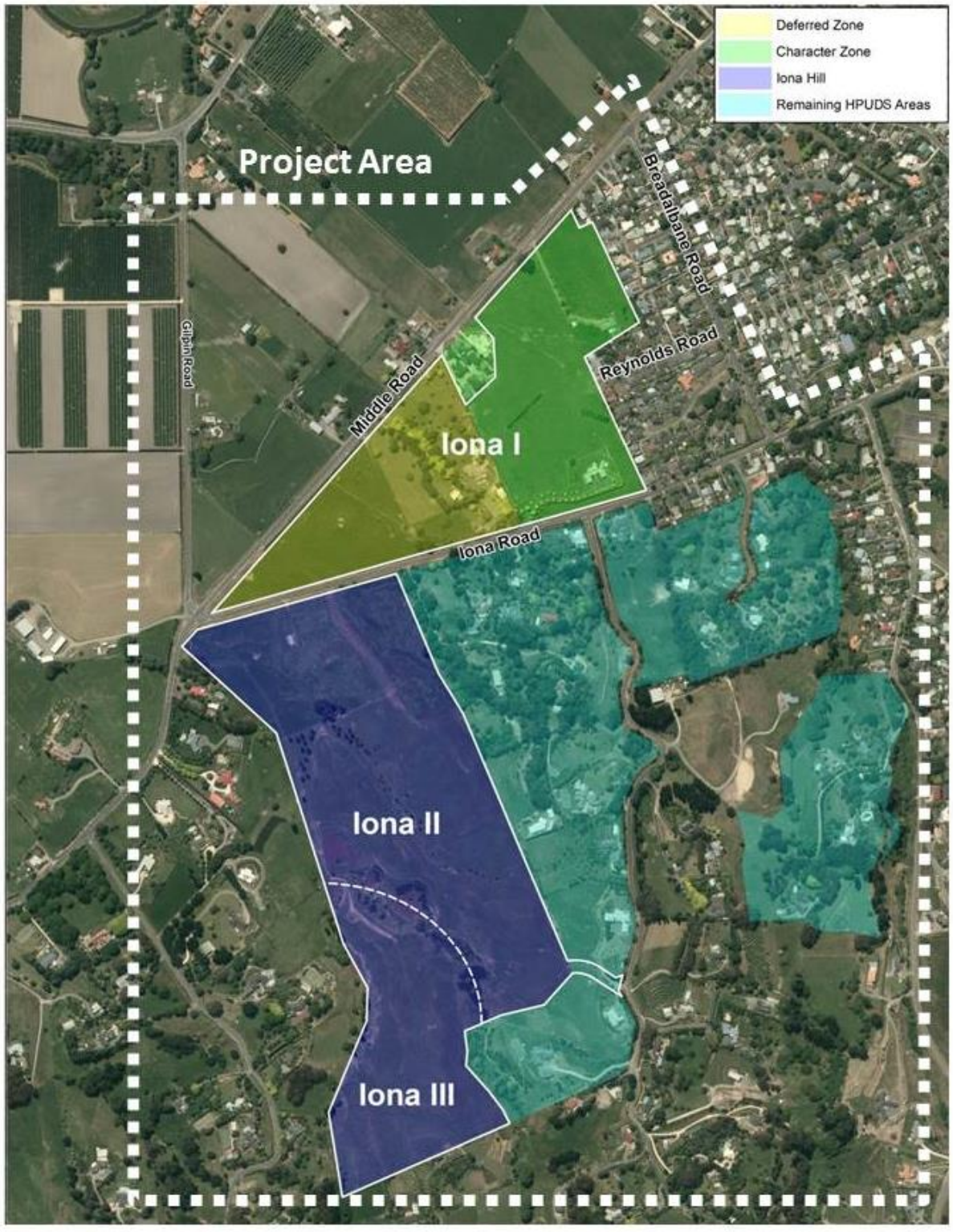


Figure 1-1 : Project Area

2 Policy Context

This section of the report provides a review of the local and regional strategies which relate to transport infrastructure and sub-division developments.

2.1 Local Planning Policy

This sub-section provides an overview of the relevant information from the following regional planning documents:

- 'Proposed Hastings District Plan', HDC, November 2013.
- Regional Land Transport Plan 2015-2025, Hawkes Bay Regional Council (HBRC), 2015.
- Regional Public Transport Plan 2015-2025, HBRC, 2015.

Proposed Hastings District Plan (PHDP)

The PHDP outlines the means for managing the effects of the use, development and protection of the local natural and physical resources. Figure 2-1 provides the PHDP land use zoning for an area south-west of Havelock North, encompassing the project area. The map identifies that the Iona Hills area is zoned as Rural Residential.

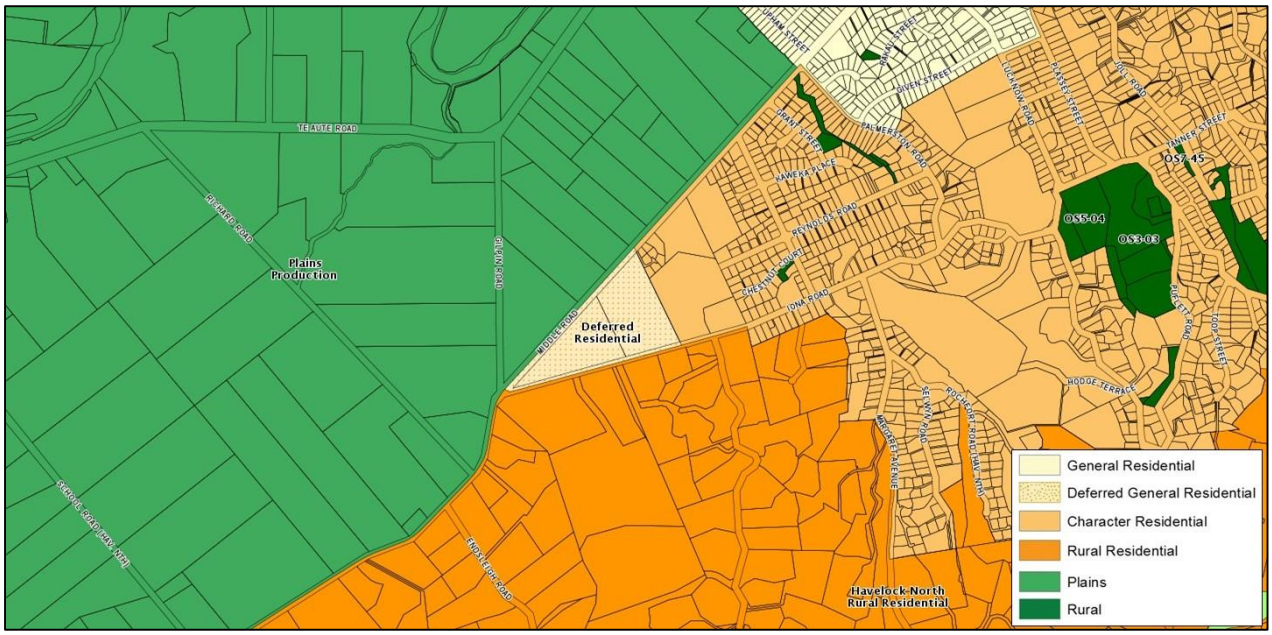


Figure 2-1 : Proposed Hastings District Plan – Zoning Map

Appendix 1 of the PHPD identifies the project to be within a residential urban growth area. A map of the growth areas for both Havelock North and the wider Hastings District are provided in Appendix A.

The PHPD also outlines the roading hierarchy across the district, identifying Middle Road as an arterial, Iona Road as a collector and Gilpin Road as a local road. The Plan notes[3] that the adoption of the hierarchy is important as it enables landowners and other users to identify road function, likely traffic volumes and any associated environmental effects that will be accepted for different roads within the hierarchy.

[3] PHDP, Section 2.5.2.1

Transport Strategy

The PHDP provides specific information in regard to the transportation strategy for the district and emphasises the importance of how an effective transportation network plays a key role in facilitating mobility and helping the local economy grow. The Plan also notes that inappropriate levels of development and poor access to and from the road network can compromise the functional efficiency and safety of the network.

The transport strategy is anticipated to achieve the following outcomes:

- Reduced intrusion of unnecessary vehicular traffic into residential streets.
- Establishment of an effective arterial and collector roading system to manage vehicle flow and provide attractive routes for heavy vehicles and inter-regional traffic.
- Improved use and integration of environmentally sustainable transportation forms through the urban area and cross the Heretaunga Plains.

Regional Land Transport Plan 2015-2025 (RLTP)

The RLTP describes Hawkes Bay's strategic objectives for the transport system over the next ten years and sets out the funding request from HBRC to the New Zealand Transport Agency (NZTA). One of the main objectives of the plan is to achieve a resilient and efficient transport system that supports economic development and wellbeing.

The Plan includes the following points that are relevant to the development of subdivisions:

- Cycle numbers have increased where network improvements have been made. One of the main priorities of the Plan is to ensure that the region becomes a major centre for cycling.
- The Hawkes Bay region (in particular rural areas) sees a disproportionate number of crashes per vehicle km travelled on local roads when compared to many other regions.
- Other than at peak times, road traffic congestion is minimal.

Regional Public Transport Plan 2015-2025 (RPTP)

The RPTP aims to promote a modal shift to public transport by lessening the reliance on private motor vehicle travel and contributing to reduced congestion and carbon emissions on the road network.

The report identifies that bus patronage across the region has risen steadily, with total passenger trips rising from 480,244 in 2009/10 to 799,845 in 2013-14 (an increase of just over 66%). This rise is likely to be heavily associated with the substantial investment into public transport improvements the HBRC have made over recent years. As such, the Plan outlines that Council is unlikely to provide any additional funding for further improvements over the next three years.

Currently no bus routes pass by the proposed subdivisions. The closest service is Route 21 (operating from 6.50am till 5.30pm) which runs every 30 minutes during peak periods and every hour during the off-peak.

2.2 Relevant Design Guidelines

This sub-section provides a summary of the relevant information from the following standards which are applicable to a residential subdivision development within Havelock North:

- 'Hastings District Council Engineering Code of Practice', HDC, 2011.
- 'Subdivision and Infrastructure Development in Hastings District – Best Practice Design Guide', HDC, 2009.

Hastings District Council Engineering Code of Practice

The HDC Engineering Code of Practice acts as a guideline for the engineering of subdivision and land developments within the Hastings District. Part 3, Section 3 of the document outlines the general transportation requirements. Of particular relevance, the document notes:

- Provide all lots in the land development or subdivision with safe, sustainable and stable road access;
- Provide effective and sustainable linkages and connectivity; and
- Provide safe and sustainable transport systems, compatible with the surrounding environment.

Schedule C of the document outlines the requirements for urban and rural roads[4] in the Hastings District. The schedule notes that where additional traffic from a new development is likely to have an adverse effect on the agreed Level of Service (LOS) of the network, Council may require a traffic study to determine the effects and possible mitigation options. Appendix B provides the minimum road design standards for urban and rural roads for the Hastings District.

Subdivision and Infrastructure Development in Hastings District – Best Practice Design Guide

The purpose of the document is to give developers and subdivision designers best practice design guidance. Potential outcomes of implementing the guidelines are considered to be provision of street calming through narrower carriageways, the implementation of low impact urban design techniques and potentially reduced costs of construction and long term maintenance. The document outlines the following guidelines in regard to subdivision connectivity and street design:

- The creation of direct connections between roads and pathways exponentially increases the number of route choices available when compared to what is possible with a traditional cul-de-sac design.
- By creating a dense network of roads, typically using an 80-100m grid (with variations for topography, waterways, orientation, nodes and destinations), travel distances are greatly reduced.
- Desirable elements of collector roads (such as Iona Road) are:
    - A carriageway wide enough to allow oncoming vehicles to pass without having to yield/slow;
    - Separate 2.0m wide (minimum 1.5m wide for a 50kmph zone) cycle lanes; and
    - In residential areas, footpaths on both sides of the road to be separated from traffic by a minimum 2m wide grassed / landscape berm.

2.3 Local Transport Strategies

This sub-section provides an overview of the local transport policies:

- 'Towards Better Cycling – The Hastings Cycling Strategy', HDC, 2001.
- 'Hastings Walking Strategy', HDC, 2004.

Towards Better Cycling – The Hastings Cycling Strategy

This document sets out a five year plan aimed at achieving its vision of making Hastings a safe, convenient and accessible district for cycling. The plan includes the proposed Hastings Cycle Network[5], which identifies Middle Road and Gilpin Road as secondary cycle routes.

It is acknowledged that this document is out-of-date and therefore may not necessarily reflect the current views of HDC. The 2015 Hawkes Bay Regional Cycle Plan does not include any of the roads within the project area as part of the long term regional cycle network.

[4] Rural roads are those which have posted speed limits greater than 70 km/hr

[5] As at September 2008

Hastings Walking Strategy

The Hastings Walking Strategy was developed alongside the Cycling Strategy, with the same objectives of encouraging and promoting healthy and alternative travel. Relevant goals of the strategy include:

- Ensure new subdivisions provide recreational reserves and direct walking tracks that are well connected and visible.
- Subdivision roads to be constructed with minimum footpath widths of 1.5m.
- Ensure that all Council roading projects and road upgrades consider and provide for pedestrians, and that all new pedestrian facilities are designed and constructed to best practice and recognised standards.
- Ensure new subdivisions are planned in a manner that integrates walking paths that lead to destination points, particularly schools, shopping centres and recreation areas.

As per the Hastings Cycling Strategy, it is acknowledged that HDC may consider the Hastings Walking Strategy to be out of date. HDC have indicated to MWH that there are no current walking or cycling projects proposed for roads within the close vicinity of the project.

3 Existing Conditions

3.1 Overview

Land Use

Havelock North is a primarily residential suburb of Hastings, with only a relatively small industrial and commercial centre. As such, the majority of the approximate 13,000[6] residents commute into either Hastings or Napier. Similar travel patterns would be expected for future residents of the Middle Road/Iona Road growth area.

Road Network

Iona Road and Middle Road are two lane (two-way) roads with posted speed limits of 100kph. Neither road provides footpaths along sections adjacent to the proposed development areas. During site visits a number of pedestrians were observed walking/jogging along the grass berms of each road. All intersections within the vicinity of the proposed subdivision operate with give-way controls. On-road cycle lanes are currently in place along Middle Road, between Palmerston Road and Porter Drive[7].

Appendix C provides site visit photographs which highlight the existing road conditions.

Traffic Volumes

In order to gain an understanding of the historical traffic conditions and growth within the vicinity of the proposed subdivisions, historical traffic data has been sourced from the RAMM database. Table 3-1 provides a summary of the available combined two-direction peak hour and average daily traffic (ADT) counts.

Table 3-1: Historical Traffic Data

Road	Location	Year	Volume	
			Peak Hour[8]	ADT
Middle Road	NE of Iona Road/Gilpin Road intersection.	2010	140	1,220
		2009	146	1,240
		2007	137	1,293
		2006	158	1,264
Middle Road	SW of Iona Road/Gilpin Road intersection.	2009	88	580
Iona Road	Between Middle Road and Lane Road.	2009	143	1,160
Gilpin Road	Between Middle Road and Te Aute Road.	2014	109	738
		2011	99	713
		2009	101	663

The RAMM data has identified that volumes along each of the roads that bound the development areas have been low and relatively consistent over the past 10 years. This reflects the stagnant nature of development within the local area during that time.

2016 Counts

MWH undertook a traffic count at the Iona Road/Middle Road/Gilpin Road intersection on the 28th January 2016 as a means of understanding the latest conditions and for informing the traffic assessments. The survey covered a total of 9 hours, encompassing the morning (06:00-09:00), middle of the day (10:00-13:00) and afternoon / evening (15:00-18:00) peak periods. Appendix D provides volume diagrams for the 2016 AM and PM peak periods.

[6] 2013 census

[7] http://www.havelocknorthnz.com/wp-content/uploads/2010/05/Havelock-North-Map-and-Trails.pdf

[8] Peak hour consistently 16:00-17:00 for all roads

The traffic surveys correlate closely with the historical counts (identified from the RAMM data), with combined two-direction volumes in the order of 160 and 100 vehicles for Middle Road and Gilpin Road respectively.

Analysis Requirement

The Austroads Guide to Traffic Management[9] sets out thresholds for intersection volumes below which capacity analysis is unnecessary. These thresholds are provided in Table 3-2 below alongside the corresponding volumes for the Iona Road/Middle Road/Gilpin Road intersection. Major and/or minor road volumes for an intersection which are higher than those outlined within the table correspond to a need for traffic analysis.

Table 3-2: Intersection Analysis Threshold

Approach	Peak Hour Volume (Two-Way)			
	Threshold #1	Threshold #2	Threshold #3	Iona Road/Middle Road/Gilpin Road Intersection
Two-Lane Major Road	400	500	650	164
Minor Road	250	200	100	102

*Middle Road (SW approach) = major road; Gilpin Road = minor road.

The table above identifies that given the low volume on both the minor and major approaches, analysis of the Iona Road/Middle Road/Gilpin Road intersection is not required based upon the existing (2016) volumes. It can therefore be inferred that the intersection is currently operating with an acceptable level of service (likely to be overall LOS A or B).

Mode Choice

A review of 2001, 2006 and 2013 census analysis has identified that within Havelock North around 91% of people used a private car to travel to work. The remaining proportion of employees either walked (5%) or cycled (4%).

3.2 Safety

Crash data for all roads within the project area has been obtained for the most recent five year period (2011-2015) using NZTA's Crash Analysis System (CAS). A summary of the accident data is presented within Table 3-3 below, whilst a diagram highlighting the location and type of each crash is provided as Figure 3-1 on the next page.

Table 3-3: Historical Crash Data

Severity	2011	2012	2013	2014	2015	Total
Fatal	0	0	0	0	0	0
Serious	0	0	0	0	0	0
Minor	1	0	0	0	3	4
Non-Injury	0	2	1	1	2	6
TOTAL	**1**	**2**	**1**	**1**	**5**	**10**

The data has identified that between 2011 and 2015 there were a total of 10 crashes, of which four resulted in minor injury. One of the minor injury crashes occurred at the Middle Road/Gilpin Road intersection and was due to a vehicle failing to give way to through traffic. The other three minor injury crashes occurred at the Te Aute Road/Gilpin Road intersection. The most common cause of accidents was due to error caused by a driver under the influence of alcohol (40%).

As identified by Figure 3-1 the most common crash site was at the Te Aute Road/Gilpin Road intersection, where four of the total of 10 crashes occurred. Furthermore, six out of the total 10 crashes occurred during the evening (dark conditions) which potential suggests a need for improved lighting; particularly once the subdivisions are developed.

[9] Part 3: Traffic Studies and Analysis, Table 6.1

In accordance with NZTA's 'High-Risk Rural Roads Guide', as only one serious injury accident occurred over the five years, it is not appropriate to calculate the collective or personal risk for the area immediately surrounding the proposed development[10].

Overall the risk at the Gilpin Road/Iona Road/Middle Road intersection is considered to be low as only one crash has occurred at this intersection in the last five years which wasn't as a result of alcohol intoxication of a driver.

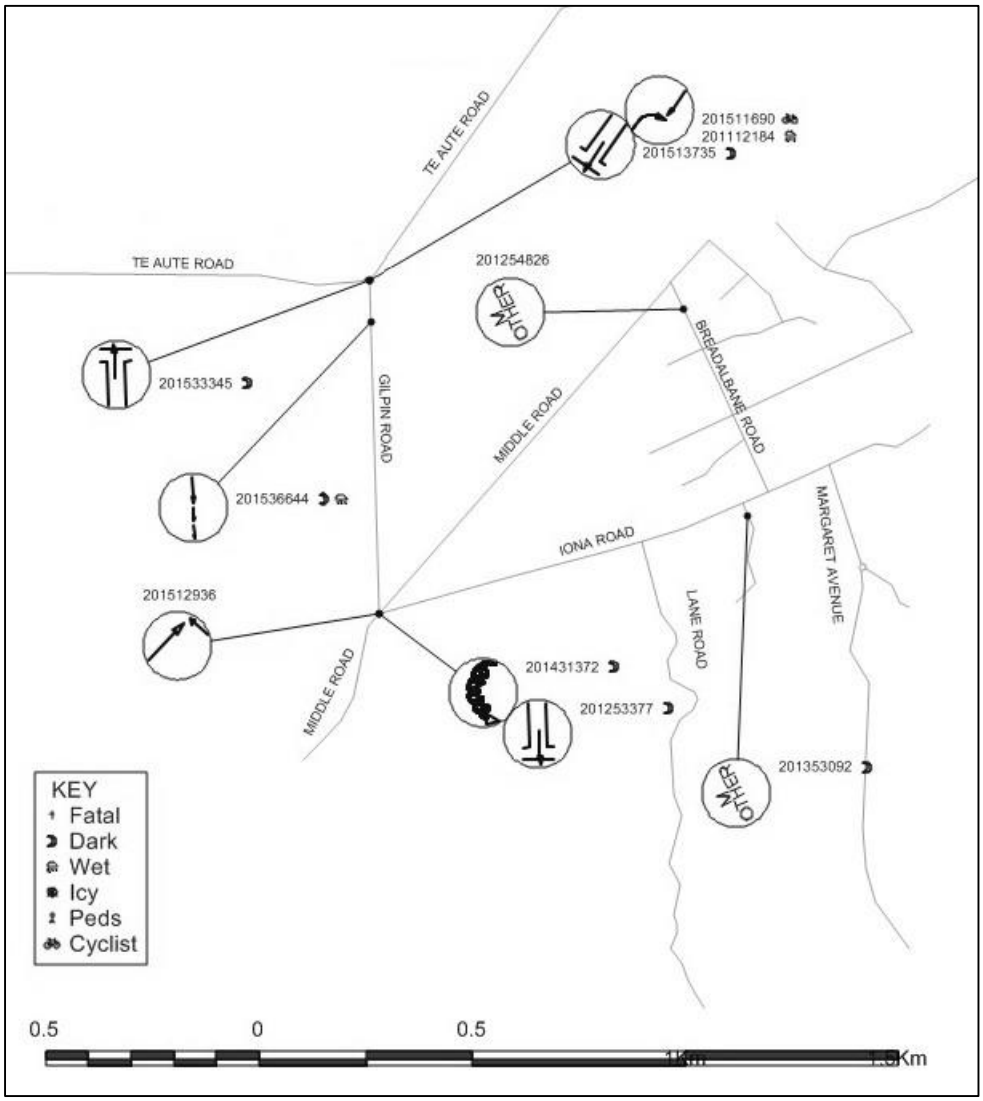


Figure 3-1: 2011-2015 Crash Locations

[10] To be defined as a high-risk rural road there must be 3 or more high-severity crashes over a 5-year period or 5 or more high-severity crashes over a 10-year period.

4 Future Conditions

This section of the report provides an overview of the expected background traffic growth and development trip generation. Estimations have been undertaken for the five year (2021) and ten year (2026) horizons.

4.1 Traffic Growth

As referenced previously, the RAMM data has indicated that within the immediate surrounds of the project area, the volume of traffic has remained relatively consistent. However, a review of population data (from the NZ Census) has identified that usual residential population has risen by around 1.7% per annum since 2001. Therefore, for robustness of assessment, a 2.0% growth rate has been applied to the background traffic volumes[11]. Where applicable, an uplift factor has been applied based upon the RAMM data as a means of representing peak traffic conditions.

HDC have confirmed that there are no other known proposed developments (residential or otherwise) within the vicinity of the proposed subdivisions.

4.2 Trip Generation

Trip Rates

The 'Transit New Zealand Planning Policy Manual (2007)' and 'NZTA Trips and Parking Related to Land Use Research Report (2011)' provide standard trip rates for residential dwellings. These guidelines identify rates of 10.1-10.4 daily trips per dwelling unit (1.2-1.4 for peak periods). However these rates may not be appropriate given that the standard rates are typically determined from surveys within more urbanised areas (such as Auckland). These rates may therefore not be applicable for rural residential developments.

A more representative trip rate for the area was therefore established using historical count data for local roads[12] which provide only one access point with the external road network. Table 4-1 provides a summary of the traffic volumes, the number of dwellings[13] and inferred trip generation rate for each road.

Table 4-1: Local Residential Trip Rate

Road	Dwellings	Volume[14]		Trip Rate	
		Peak Hour	ADT	Peak	Daily
Margaret Avenue	187	188	1,563	1.0	8.4
Busby Hill	65	76	555	1.2	8.5
Kingsgate Avenue	74	62	532	0.8	7.2
Palmbrook Avenue	81	67	540	0.8	6.7
Average	**-**	**-**	**-**	**1.0**	**7.7**

As identified within Table 4-1, a peak hour rate of 1.0 vehicle trip per dwelling is currently observed. This rate has therefore been applied for the purpose of the traffic assessment. The inbound/outbound distribution of trips has been taken from the standard rates from the ITE Trip Generation Manual (9th Edition) for single family homes.

[11] The 2016 survey counts represent the baseline background volumes.

[12] Margaret Avenue, Busby Hill, Kingsgate Avenue and Palmbrook Avenue.

[13] Determined from aerial photography.

[14] Average volume for all available counts between 2006 and 2015. It has been assumed that the total number of dwellings has remained consistent during this period.

Development Rate

HDC have indicated that should the Middle Road/Iona Road growth area be utilised as the next greenfield development site in Havelock North, then the area is likely to be fully developed within four years (from the start of construction). This premise is based upon existing data for the Greenfield areas of Arataki, Northwood and Lyndhurst, which identifies an average development construction rate of 70 dwellings per year.

Trip Generation

The yields for infrastructure modelling were provided by HDC. A summary of the trip generation (based upon the maximum number of total dwellings less the existing number of dwellings) is summarised within Table 4-2.

Table 4-2: Trip Generation Estimates

Zone	New Dwellings	Trip Generation			
		AM Peak		PM Peak	
		Inbound	Outbound	Inbound	Outbound
Character Zone	128	31	92	77	45
Deferred Zone	108	26	78	65	38
Iona Hill	160	38	115	97	57
Remaining HPUDS Land	18	4	13	11	6
Total	**414**	**99**	**298**	**250**	**147**

The development trips as above have been assigned to various parts of the road network in accordance with the diagram provided within Appendix E.

4.3 Future Year Trips

A summary of the turning movement volumes for the Iona Road/Middle Road/Gilpin Road intersection for the existing (2016) and future year (2021 and 2026) scenarios is provided within Table 4-3 below. The volumes are inclusive of the application of background growth and development trips. The turning movement reference ID can be identified within Figure 4-1 on the next page.

Table 4-3: Iona Road/Middle Road/Gilpin Road intersection – Forecast Turning Volumes

Scenario	Peak Hour	Movement												
		A	B	C	D	E	F	G	H	I	J	K	L	Total
2016	AM	16	44	1	1	55	13	7	58	5	2	11	4	**217**
	PM	10	62	4	1	6	9	17	56	11	9	50	16	**251**
2021 (inc. development)	AM	28	54	39	113	80	25	12	66	5	3	19	8	**452**
	PM	17	71	99	57	17	14	28	67	12	9	72	26	**489**
2026 (inc. development)	AM	30	59	39	113	87	26	13	73	6	3	20	8	**477**
	PM	18	79	99	57	17	15	30	73	13	10	78	28	**517**

The analysis has identified that, inclusive of the development trip generation, the 2026 forecast volumes for Iona Road/Middle Road/Gilpin Road intersection still do not satisfy the minimum threshold for intersection assessment (as per Table 3-2)[15]. Therefore, from an operational perspective the existing intersection would be expected to operate to an acceptable level once the Middle Road/Iona Road growth area has been fully developed. One of the main reasons for this is because a large proportion of the trips from the new developments will be heading to/from Hastings and Havelock North and will not need to negotiate the intersection.

[15] Maximum two-way volume for the major road = 354 (2026 PM scenario).

Notwithstanding this, the realignment of Iona Road or an upgrade of the intersection may still be desirable as a means of addressing perceived safety risks and/or for providing effective integration with the new internal road layouts.

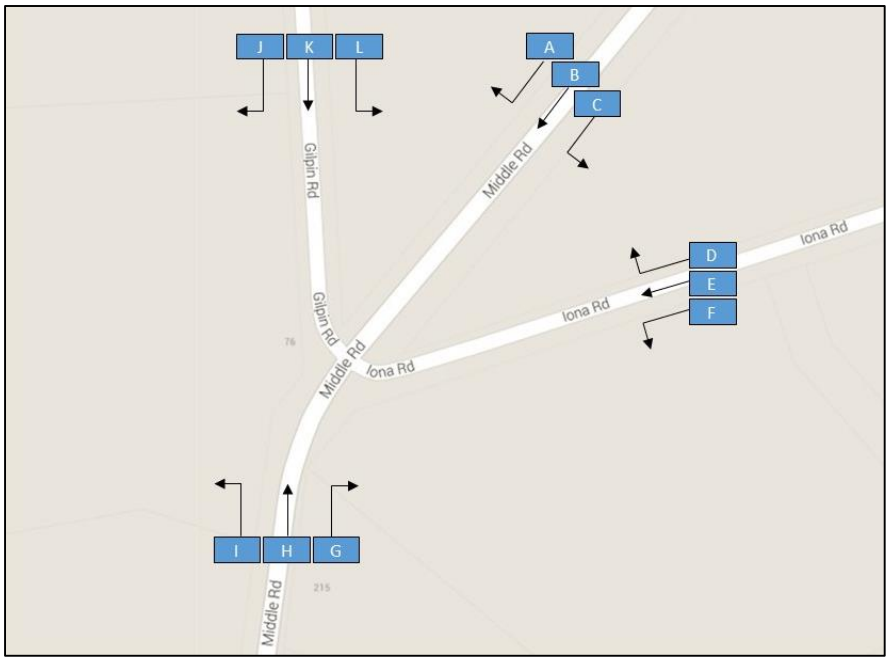


Figure 4-1: Iona Road/Middle Road/Gilpin Road - Turning Movement ID

Sensitivity Analysis

For robustness, an assessment of the Iona Road/Middle Road/Gilpin Road intersection has been undertaken based upon the application of the higher New Zealand standard trip rates – namely 1.4 peak hour trips per dwelling house. An operational assessment of the intersection has been undertaken using the SIDRA 6.1 analysis tool. Level of Service (LOS) has been used as a guide to assess the performance at both the overall intersection and worst movement levels. The definitions of LOS, as defined by the Highways Capacity Manual (2010), are provided within Appendix D.

The assessment has been undertaken for the scenario with the highest estimates for traffic volumes, namely '2026 inc. Development – PM peak'. Table 4-4 provides a summary of the forecast volumes for the aforementioned scenario based upon the standard[16] and local[17] trip rates.

Table 4-4: Iona Road/Middle Road/Gilpin Road intersection – Sensitivity Test Volumes

Scenario	Trip Rate	Movement												
		A	B	C	D	E	F	G	H	I	J	K	L	Total
2026 PM (inc. development)	Local	18	79	99	57	17	15	30	73	13	10	78	28	**517**
	NZ Standard	20	80	142	82	22	18	34	75	13	10	86	32	**614**

The SIDRA analysis identifies that, even with the application of the higher trip rates, that the Iona Road/Middle Road/Gilpin Road intersection would be expected to operate with LOS A (average delay = 4.6 seconds) during the 2026 peak hour (including development trips).

Note the impact of the development upon traffic along Gilpin Road is likely to be minimal.

[16] 1.4 peak hour trips per dwelling.

[17] 1.0 peak hour trips per dwelling.

5 External Road Network Optioneering

This section of the report provides an assessment of five alternative road network options, covering Gilpin Road, Middle Road and Iona Road. The assessment (summarised within Table 5-1) has considered the implications in terms of road safety, accessibility and constructability/cost.

Figure 5-1 diagrammatically identifies the five alternative options under consideration, noting that Options 1 to 4 were developed at the project inception with HDC. The potential impacts of each option have been colour coded to identify whether they are likely to have a positive (green), neutral (amber) or negative (red) effect when compared with the existing road network.

Given the low level of forecast future year traffic, negligible levels of queuing and delay across the local road network would be expected for each option.

Table 5-1: Transport Options Assessment

Opt	Safety	Accessibility	Constructability / Cost
1	Roundabout acts to slow vehicles upon approach to the intersection. A roundabout will also reduce the number of conflict points for vehicles approaching from Gilpin Road and Iona Road.	No change from the existing situation.	Additional land take may be required. Considering the low volume to traffic, the cost of construction may outweigh the safety benefits. Slight realignment of approaches may be required.
			Retaining a triangular shape may be considered as a less efficient use of space when developing the residential area.
2	Reduced number of conflict points at the Gilpin Road/Middle Road/Iona Road intersection.	Reduced accessibility as vehicles travelling between Gilpin Road and Iona Road would have to negotiate two intersections. Vehicles travelling from Gilpin Road to the Iona Hills will have to negotiate three intersections.	Additional cost of realigning Iona Road (although likely to be relatively minimal).
	Creation of an additional intersection with Middle Road creates another area for vehicle conflict.		Aids the more efficient use of land for the construction of residential dwellings.
			Integrates effectively with internal roads that follow gullies.
3	Reduced number of conflicts at the Gilpin Road/Middle Road/Iona Road intersection.	Enhances accessibility through both areas and between the Iona Hills and Middle Road.	May be difficult to align connections with an internal road network that follows gullies.
	Creation of an additional intersection with Middle Road. However, regardless of the external network configuration, this would be required to provide access to the Deferred Zone.	Reduced accessibility as vehicles travelling between Gilpin Road and Iona Road would have to negotiate two intersections.	Removal of a section of Iona Road. New link between the areas could be considered as part of the internal road network.
		Iona Road will act as a minor approach. However, this will effectively see Iona Road (collector road) give-way to a local road and create discontinuity for the road hierarchy.	Similar cost to Option 2.

Opt	Safety		Accessibility		Constructability / Cost	
4		Roundabout acts to slow all drivers down upon approach and reduce the potential conflict points for vehicles approaching from Gilpin Road and Iona Road.		Enhances accessibility through both areas and between the Iona Hills and Middle Road and through to Te Aute Road.		Retaining triangular shapes may be considered as a less efficient use of space when developing the residential area
						Additional land take may be required to construct the roundabout and realign Gilpin Road.
						May provide stormwater benefits for primary and secondary conveyance. This will depend on the road design and levels; especially at the roundabout for the secondary flow to be effective.
5		Reduced number of conflict points at the Gilpin Road/Middle Road/Iona Road intersection.		Vehicle travelling between the Iona Hills and Middle Road would be required to divert around the Deferred Zone and negotiate both the Iona Road/Middle Road and Gilpin Road/Middle Road intersections.		Retaining triangular shapes may be considered as a less efficient use of space when developing the residential area
		Creation of an additional intersection with Middle Road creates another area for vehicle conflict.		A similar diversion is required for vehicle travelling between Iona Road and Gilpin Road.		Integrates effectively with internal roads that follow gullies.
						Additional land take may be required to realign Gilpin Road.

Recommendations

One of the key considerations is the ease for which the internal road layout can be aligned with an external network. From an engineering perspective, providing roads along gullies (low spots) lends support to associated drainage works and introducing secondary flow paths. For this reason, Option 3 has been excluded from consideration at this stage.

Option 5 is not desirable primarily from an accessibility stand point, as vehicles travelling from the Iona Hills area heading towards Middle Road or Gilpin Road will have to negotiate an additional intersection and take a more convoluted route (when compared to other options).

With reference to the above, we recommend that the following options should be further considered and evaluated as part of the development of the subdivisions:

- Retention of the existing network;
- Option 1;
- Option 2; and
- Option 4.

We consider that one of the distinct advantages of Options 2 and 4 is that the realignment of Iona Road helps to create a gateway entrance to the area which could incorporate some additional recreational green space.

Existing

Option 1

Option 2

Option 3

Option 4

Option 5

Figure 5-1: External Road Network Options

Design

Minimum road design standards are outlined within the HDC Engineering Code of Practice (provided within Appendix B alongside potential cross-sections). The standards outline that for a rural local road serving fewer than 150 dwellings a minimum road reserve of 15m is required (without provision for a cycle lane). For a rural collector road, such as Middle Road and Iona Road, the standard minimum road reserve width is 20m (including cycle lanes). In practice, the preferred cross-section for roads across the development may be a hybrid of the cross sections and road widths outlined within the HDC Engineering Code of Practice.

6 Subdivision Road Network

This section of the report outlines the process undertaken to identify indicative internal road layouts for the Middle Road/Iona Road growth area.

6.1 Opportunities

The indicative internal road layouts have focussed on utilising existing topography with the key internal collector roads following valleys and low-lying land (excluding major watercourses).

Beneficially, the majority of these low-lying areas run north to south, which ties in with HDC's Best Practise Design Guide. Internal connectivity is not seen as a significant issue in the Deferred Zone or Character Zone as the topography of the land is reasonably gentle. Development of an internal road layout for the Iona Hills area is however more challenging, but achievable with re-contouring.

There are no major barriers to internal connectivity for walking (besides some water features), although roads and cycle routes are slightly more restrained by the topography of the Iona Hills area. However, sympathetic re-contouring through earthworks would likely solve most issues relating to vehicular internal connectivity[18].

6.2 Constraints

Deferred Zone

The topography and shape of the proposed triangle shaped area between Iona and Middle Road is considered to have the following constraints to development:

- The narrow shape of the triangle at the junction of Middle Road and Iona Road is likely to be difficult to develop for access, noise and shape reasons.
- It has been assumed that the mound, central within the block, will be retained by way of reserve which will further reduce the land area.
- The area is currently subject to overland flows from the catchment above.

Aside from the mound, much of the area has gentle relief and so has the potential to be intensively developed. However the constraints identified are likely to reduce the yield from the block.

Character Zone

The area slopes steadily to the north and is similar in relief to neighbouring developed residential land. There are no obvious or significant constraints for servicing. Typically back lots in this area are accessed via a right of way rather than an extensive internal road network. This has a tendency to reduce the intensity of development and is reflected in the average lot size of 700m^2.

Iona Hill

The southern end of the Iona Hills area (Iona III) is characterized by a series of small gullies and ridge features, with steeper slopes and sharper relief than for the northern end of the area. Key constraints impacting on the scope for significant further residential development include:

- The steeper relief and slopes restricts the availability of suitable building platforms.
- Many existing lots have long, narrow access ways with some shared rights of way.
- Existing amenity ponds and planted areas have been constructed within the gullies.

[18] It is noted that the Isthmus report also has a flexible approach to the 'side' roads.

6.3 Indicative Road Layouts

Internal Layout

Three indicative road layouts (presented as Figure 6-1 to Figure 6-3) have been developed in line with the recommendations of the external connections optioneering assessment – namely forward consideration of the Existing, Option 1, Option 2 and Option 4 road networks. Note that Figure 6-1 integrates with both the "Existing" and "Option 1" external network options.

The options presented within this section are intended as a starting point for discussion only.

Further details regarding the decision making process for developing the road networks are provided within Table 6-1. Details listed are applicable for all potential internal road layouts.

Table 6-1: Internal Road Layout Details

Link	Details
C6 – D1	• The alignment predominantly follows a natural gully. • Alignment not ideal for creating regular rectangular shaped lots unless neighbouring land to the east is developed in conjunction. • Multiple options to connect internally to other roads.
C7 – D2	• Follows a natural gully to intersection and then another gully into a high area. • Would require some re-contouring to achieve suitable grades.
C7 – D3	• Follows a natural low gully to the intersection and then up a small saddle before crossing a creek and up a second gully before ending in a high area. • Would require some earthworks to achieve suitable gradient to the high area (Iona III).
B1 – A3	• To become, in effect, a continuation of Reynolds Road. • No grade issues. • Position of the A3 junction can be moved without issue.
B1 – A1	• Road follows a small gully to Middle Road. • To avoid following the gully, the watercourse could probably be re-directed or piped to Middle Road and the land re-contoured.
B1 – A2	• The A2 junction could be positioned in a number of locations (dependent on existing driveways, and landowner's discretion). • Indeed, the A2 connection may be considered to be non-essential.
B1 – C5	• Position of C5 highly dependent upon the existing building and driveways.

It should be noted that the final internal road layout for the Deferred and Character Zones will in part be at the discretion of the landowner, as ultimately they will need to decide how the internal road network integrates with existing trees, dwellings and other structures. The development of the Iona Hills area is partly dependent upon whether the landowner carries out the earthworks that have already been consented.

External Connections

Physically, there appear to be no major obstacles (such as grade/visibility) in regard to connection between the Deferred and Character zones and the external road network. The exact locations of the connections will be a function of the internal road layout and traffic design requirements.

In line with HDC's 'Best Practice Design Guide' four potential external connections have been identified for the Iona Hills area with Lane Road and Endsleigh Road. Table 6-2 provides further details in regard to the decision making process for the external connections.

Table 6-2: External Road Connection Details

Connection	Details
D1	The basis for D1 is to connect the internal road to an existing right-of-way (ROW) which in turn connects onto Lane Road. From a physical perspective, it is likely that the existing ROW would need to be widened and re-graded to produce a gentler gradient that would be more suitable for a local connector road. From a legal perspective some, or all, of the following would be required in order to introduce this connection: • Landowner's agreement (including ROW users); • Council 'buy-out' of the land; • 'Land acquisition' utilising the Public Works Act or Local Government Act.
D2	The D2 connection onto Lane Road already exists and is on land which is partly owned by the Lowe family. Physically there would appear to be few obstacles in constructing this connection besides some re-contouring. However, from a legal perspective, some or all of the constraints listed for D1 (see above) would apply.
D3	D3 is similar to D1 in terms of concept and the legal perspective. Physically, it is likely that the existing ROW would have to be widened and re-graded to produce a gentler gradient suitable for a local connector.
D4	Physically, D4 would likely require either a bridge or culvert and an embankment. Legally, there would be only one landowner to deal with.

From a connectivity point of view the introductions of the D2, D3 and D4 external connections would be desirable for the following reasons:

- They act as natural endpoints (D1 could still be connected internally); and
- They create direct connections to other roads providing additional route choices, reduced impact at the major intersection with Iona Road and reduction in the need for cul-de-sacs.

In terms of physical access, D2 would appear to be the easiest to construct. It is likely the existing carriageways for D1 and D3 would have to be widened and re-graded. D4 would likely require a structure or culvert embankment to span the existing gully. In terms of legalities, the D4 connection would have the fewest number of interested parties, followed by D2, then D1 and D3.

It should also be noted that Endsleigh Road, Lane Road and Margaret Avenue adjacent to the study area are all 'dead-ends'. The landowners plan also appears to be developing 'dead-end' spine roads. This is not consistent with the planning objectives and guidelines.

The provision of external connections such as D1 and D2 enhances the accessibility of the area, not only for vehicles, but for pedestrians and cyclists. This would be particularly beneficial given the presence of schools (Iona College and Woodford House Girls High School) to the east of the proposed development area. Indeed some external linkages may be provided for pedestrians and cyclists only.

Comparison with the Landowners Vision

With reference to the landowners vision for the area (provided within Appendix G), the indicative internal road layouts identified by MWH present the following similarities and differences:

Similarities

- Position and extension on Reynolds Road;
- Position of the spine Road through the Iona Hills area; and
- Layout largely dictated by topography of the area.

Differences

- External connections.

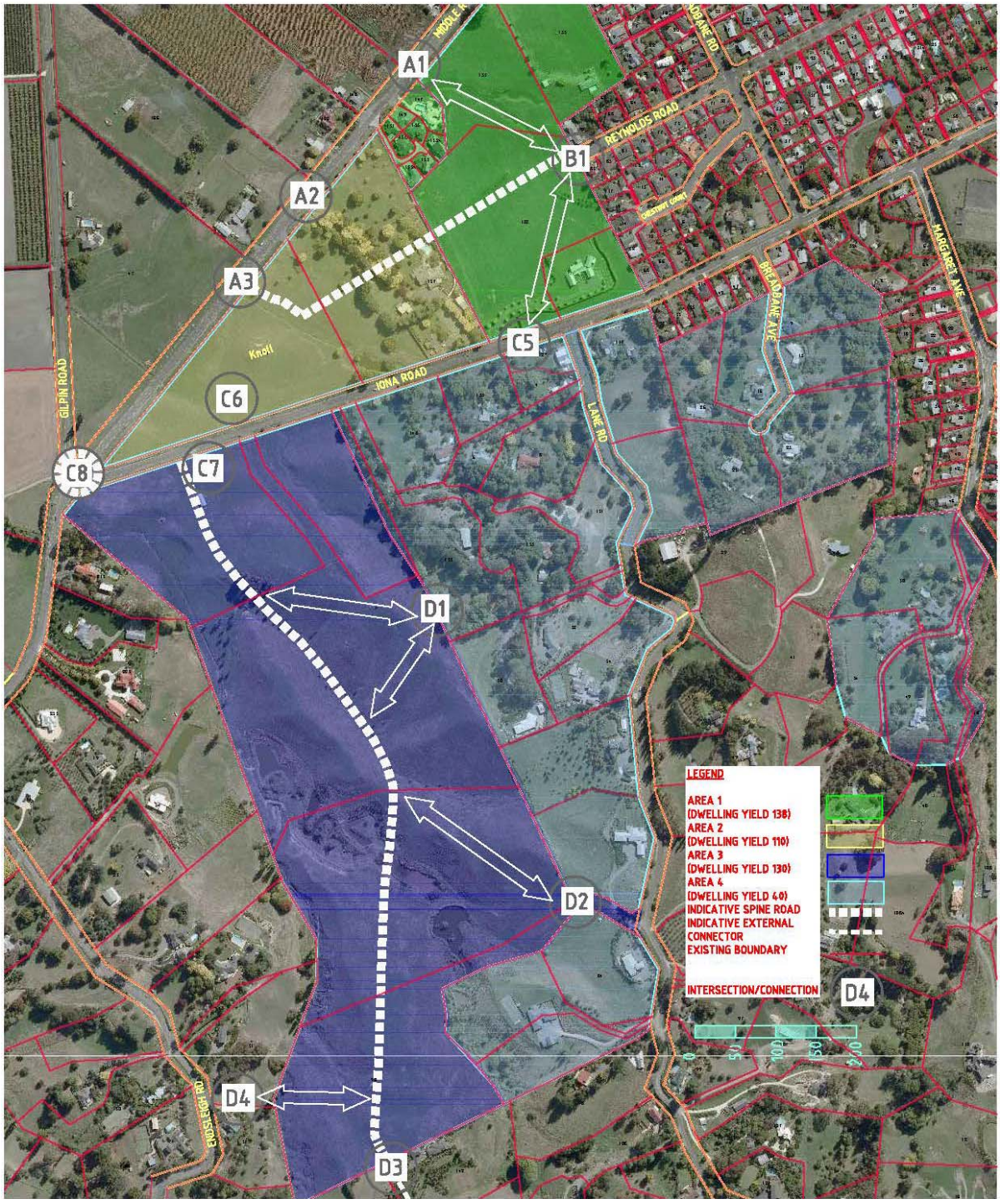


Figure 6-1: Existing/Option 1 - Indicative Road Network No.1

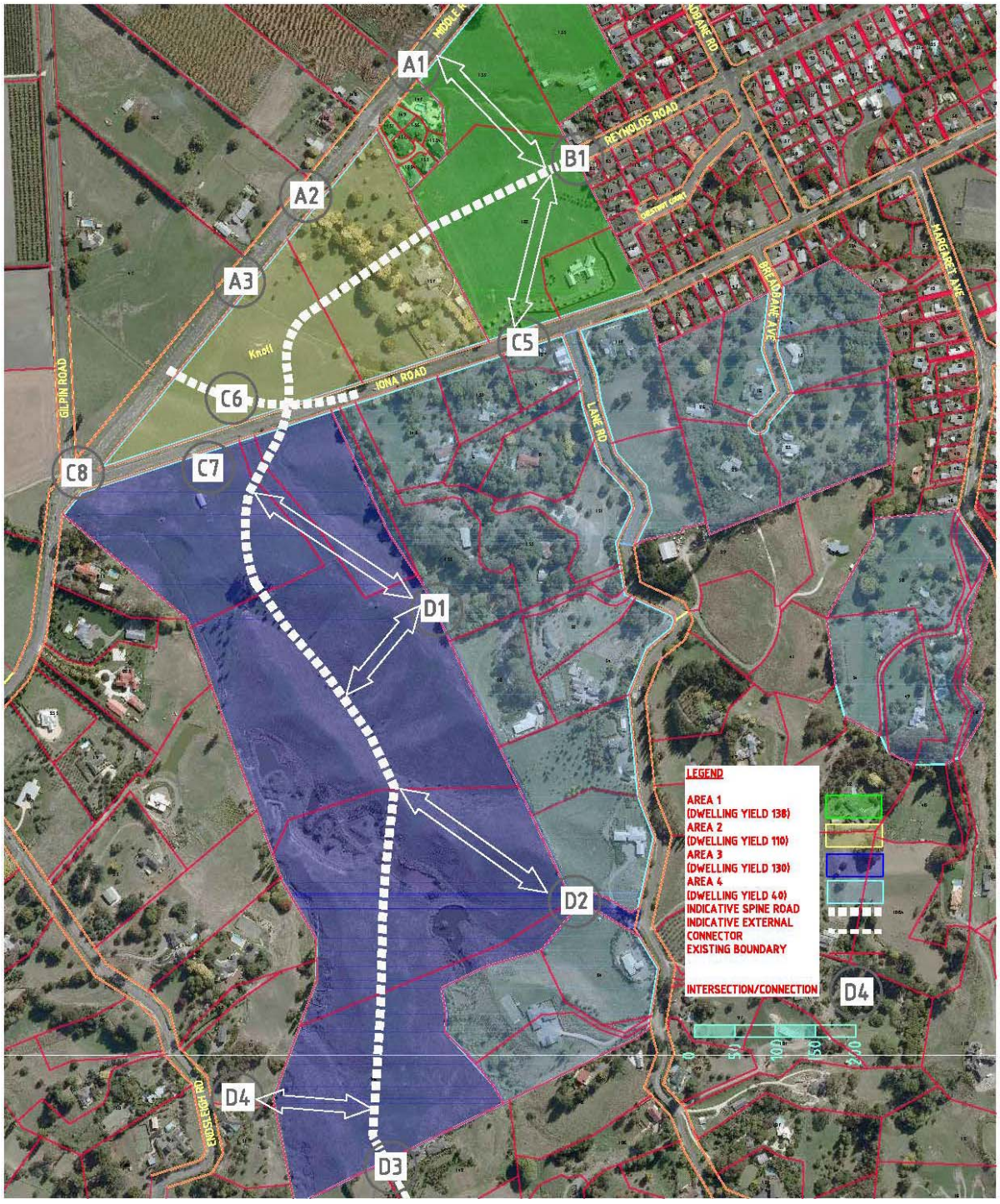


Figure 6-2: Option 2 - Indicative Road Network

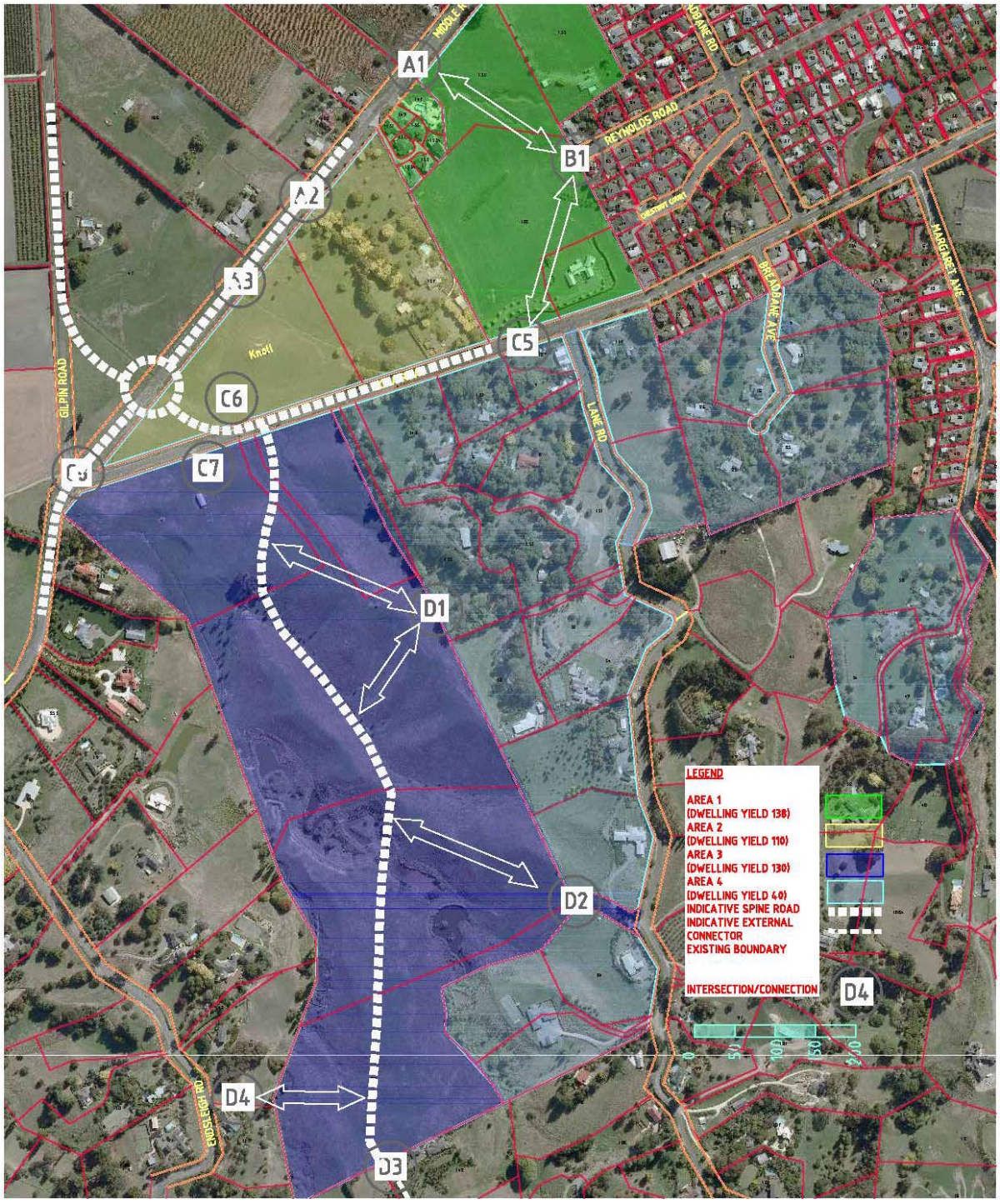


Figure 6-3: Option 4 - Indicative Road Network

7 Summary

This report provides an overview of the likely traffic impact of the proposed Middle Road/Iona Road growth area and outlines the process undertaken for developing initial road network options which could facilitate the introduction of the development.

Given the rural setting on the outskirts of Havelock North, the local road network carries only a relatively low volume of traffic during peak morning and afternoon periods. Although the introduction of the proposed residential development will bring additional trips, the impact in terms of traffic operation at a mid-block and intersection level is expected to be minimal. The design of the road network therefore does not need to be driven by any need to provide additional intersection capacity.

In terms of the external network, the following options are considered to be the most suitable:

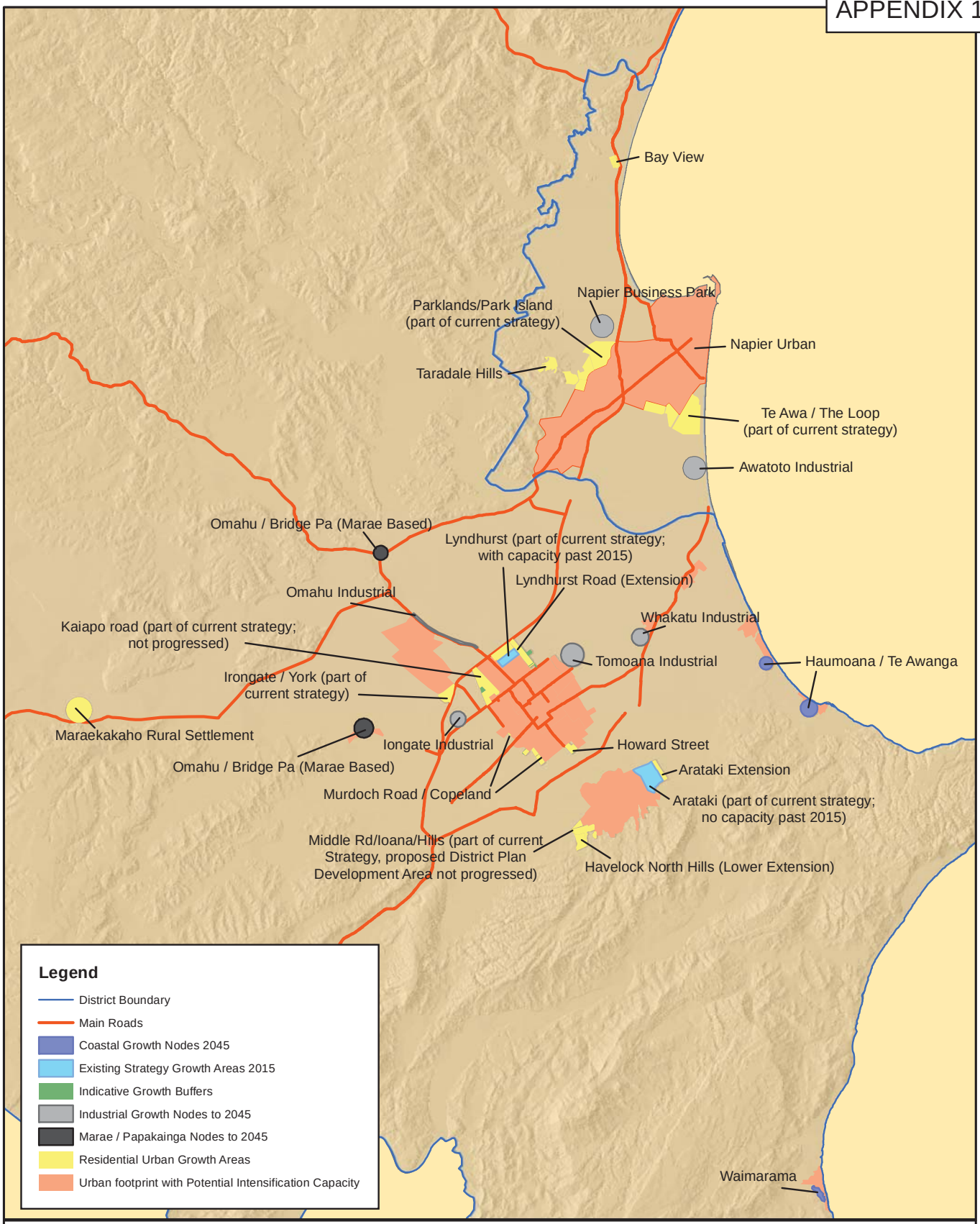
- **Existing:** Retention of the existing road network.
- **Option 1:** Introduction of a roundabout at the Middle Road/Iona Road/Gilpin Road intersection.
- **Option 2:** Realignment of Iona Road to create a T-intersection with Middle Road.
- **Option 4:** Realignment of Iona Road and Gilpin Road plus the introduction of a roundabout at the Middle Road/Iona Road/Gilpin Road intersection.

Three indicative road layouts have been developed in line with the recommendations of the external connections optioneering assessment and have been focussed upon the utilisation of existing topography, with the key internal collector roads following valleys and low-lying land (excluding major watercourses).

The options presented within this report are intended as a starting point for discussion with the key project stakeholders including HDC and the landowners. The options should be developed further during the next stage of the design process, with consideration given to factors such as amenity and visual impact.

Appendix A HDC District Planning Maps

APPENDIX 1



Heretaunga Plains Urban Development Strategy (HPUDS)
Figure 1: Identified Growth Areas

HASTINGS DISTRICT COUNCIL

Map Produced using ArcMap

Version: As Adopted Date: 19 Sept 2013

Scale 1:219,000

Projection: NZTM
Datum: D_NZGD_2000

Date PDF: Monday, 9 September 2013

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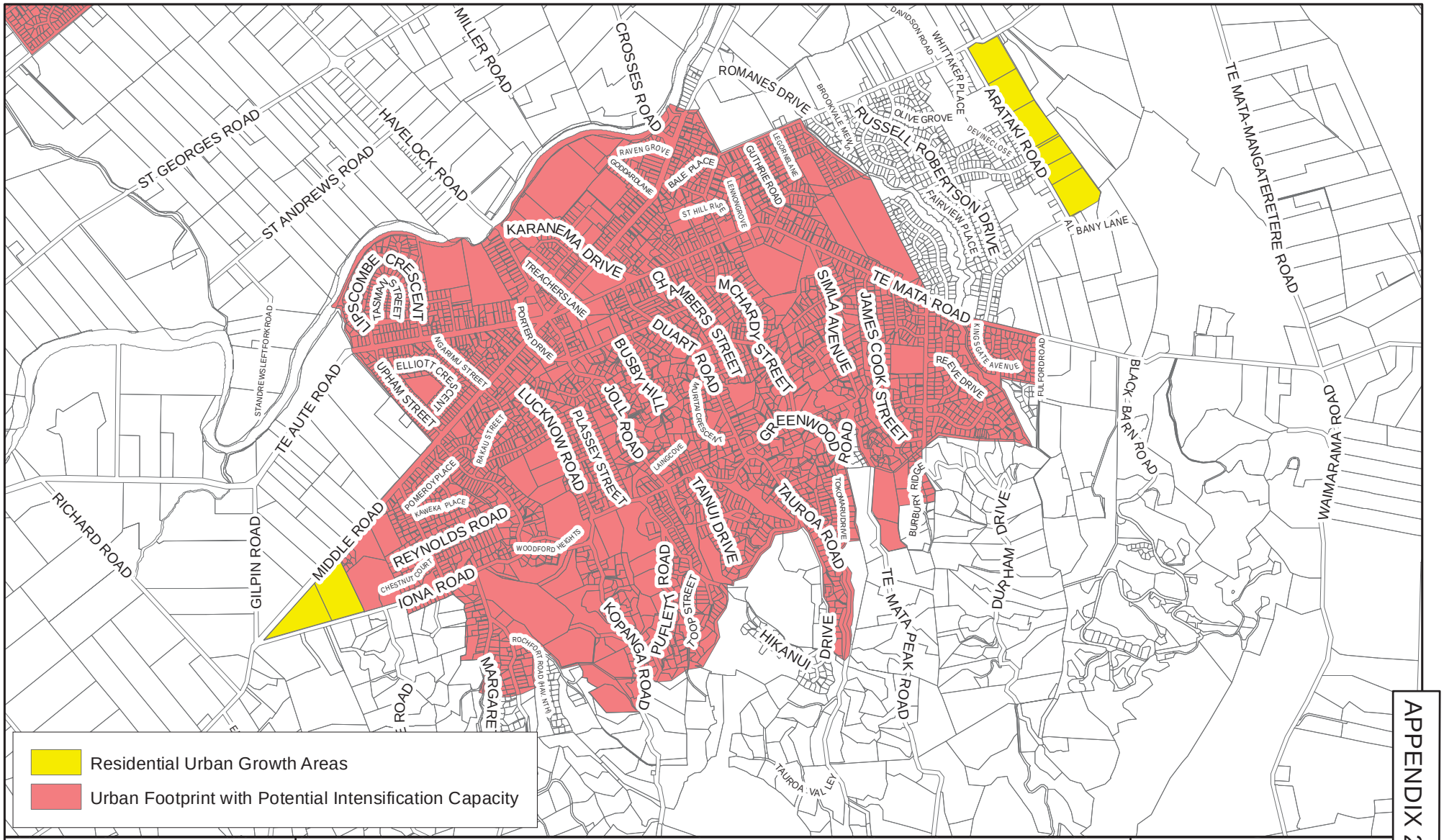

APPENDIX 2

HASTINGS DISTRICT COUNCIL

Map Produced using ArcMap

Areas that may meet Greenfield Needs within the Life of the Plan
Figure 2: Havelock North

Version: As Adopted

Date: 19 Sept 2013

Projection: NZTM
Datum: D_NZGD_2000

Scale 1:25,000

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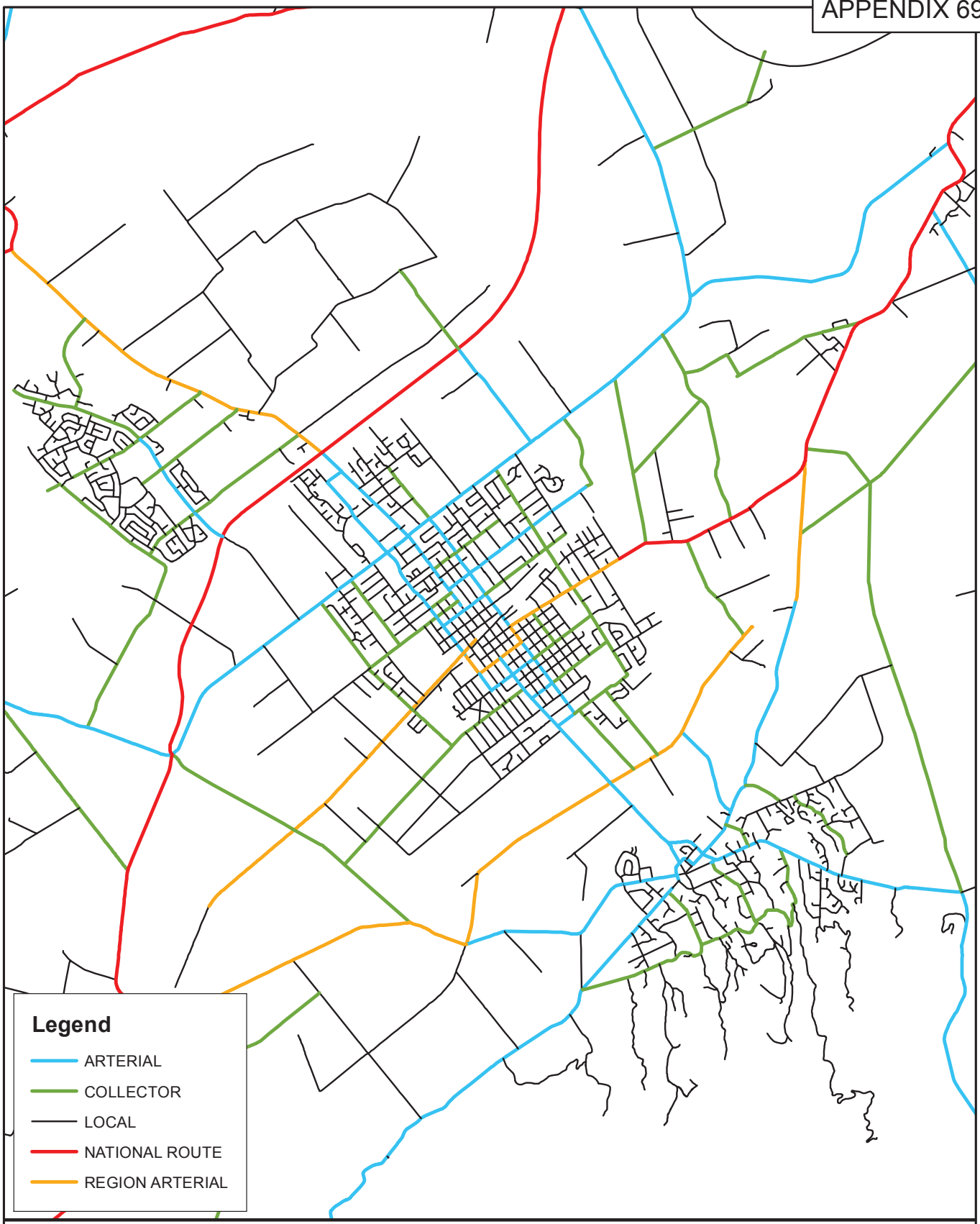
APPENDIX 69



Hastings District Roading Hierarchy
Figure 2: Urban Areas

HASTINGS DISTRICT COUNCIL

Map Produced using ArcMap

Version: As Adopted Date: 19 Sept 2013

Scale 1:70,000

Projection: NZTM
Datum: D_NZGD_2000

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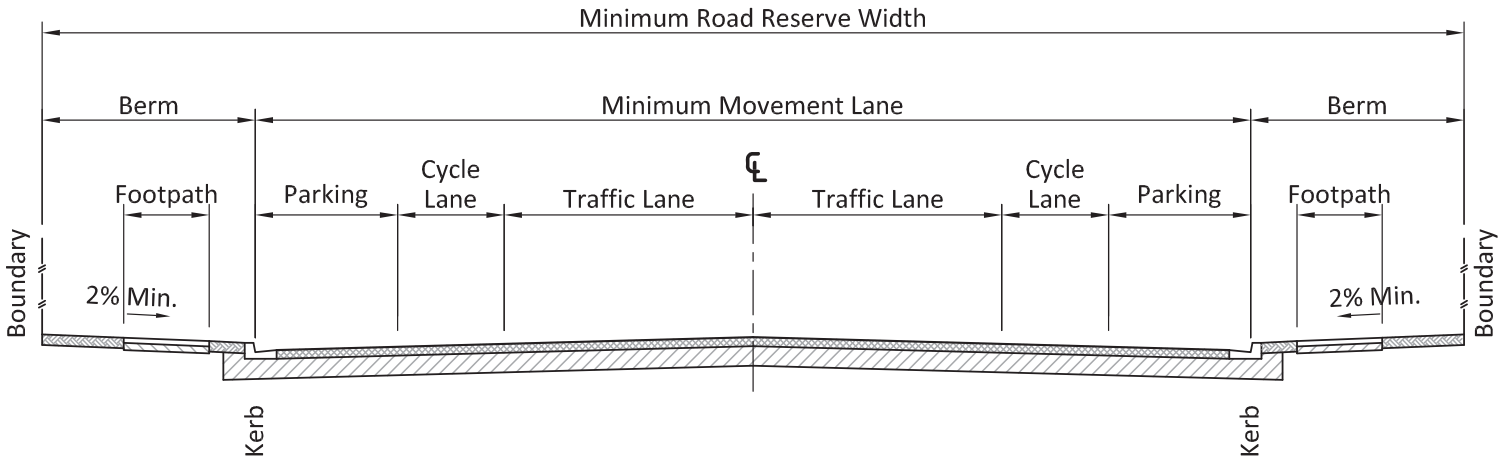
Appendix B HDC Road Design Standards



Refer To Table C4 For Dimensions

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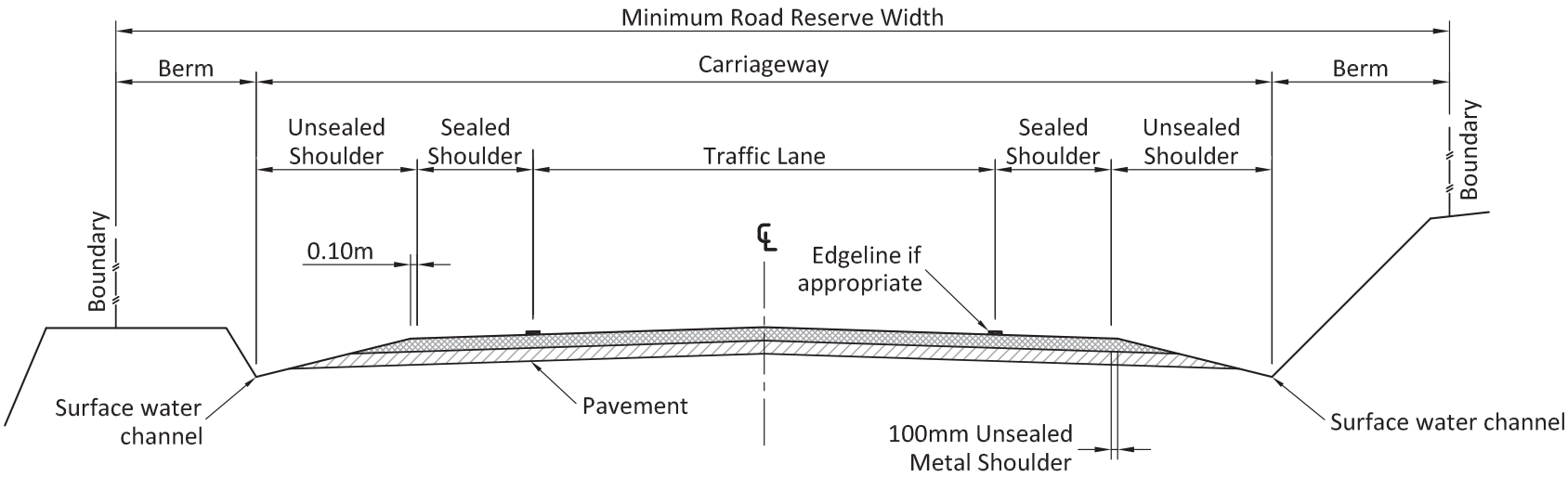
ROAD CONTROLLING AUTHORITY

SEALED URBAN ROAD
TYPICAL CROSS SECTION

Scale	Drawing No.
N.T.S	C 1

Issue July 2011

Trim Reference
Manuals\CoP



Refer To Table C4 For Dimensions

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ROAD CONTROLLING AUTHORITY

SEALED RURAL ROAD
TYPICAL CROSS SECTION

Scale	Drawing No.
N.T.S	C 2

Issue July 2011

Trim Reference
Manuals\CoP

Table C4: Minimum Road Design Standards – Urban and Rural Roads

Place Context		Typical Classification		Design Environment				Link Content			
Area	Land Use	Hierarchy	Traffic Volume (Max vpd)	Locality Served	Target operating speed	Minimum Road Reserve Width (m)	Max Grade	Pedestrians (See Note A)	Passing, Parking, Loading & Shoulder	Cyclists (See Note A)	Minimum movement lane (excluding shoulder) (See Note E)
Urban	Live & Play (Residential & Home Occupation)	**Lane**	**100vpd**	1 -10 du (Public) or 1-6 du (Private)	10	4.5	20%	Shared (in movement lane)	Allow for passing every 50m,	Shared (in movement lane)	2.75
		Lane	**200vpd**	Side or rear service access, up to 100m in length, (1 - 20 lots)	10	6	12.5%	Shared (in movement lane)	shared parking in the movement lane	Shared (in movement lane)	2 x 2.75
		Lane	**200vpd**	1-20 du	20	12	16%	1.5m one side where more than 100m in length	shared parking in the movement lane	Shared (in movement lane)	2 x 2.75
		Local	**2000vpd**	1 - 200 du	40	15	12.5%	1.5m one side or 1.5m each side where more than 20 du or more than 100m in length	shared parking in the movement lane up to 100 du. Separate parking required over 100 du	Shared (in movement lane)	2 x 2.75
		Collector /Arterial	**8000vpd**	All other integrated activities in this land use not specified in this table	40	20	10%	1.5m each side	Parking, Public Transport, Turning	1.5m Network in accordance with cycle network strategy	2 x 3.0
	Shop and Trade (Commercial & Industrial)	**Lane**	**200vpd**	Side or rear service access, (1 - 20 lots)	10	6	12.5%	Shared (in movement lane)	loading bays	Shared (in movement lane)	2.75
		Lane	**200vpd**	1 to 20 Lots	10	15	10%	1.5m one side or 1.5m each side	parking	Shared (in movement lane)	2 x 2.5
		Local	**2000vpd**	1-200 lots	30	20	10%	3m each side	parking + loading bays.	Shared (in movement lane)	2 x 2.75

Place Context		Typical Classification		Design Environment				Link Content			
Area	Land Use	Hierarchy	Traffic Volume (Max vpd)	Locality Served	Target operating speed	Minimum Road Reserve Width (m)	Max Grade	Pedestrians (See Note A)	Passing, Parking, Loading & Shoulder	Cyclists (See Note A)	Minimum movement lane (excluding shoulder) (See Note E)
Urban continued	Work and Learn	**Lane**	**200vpd**	Side or rear service access, (1 - 20 lots)	10	6	12.5%	Shared (in movement lane)	loading bays	Shared (in movement lane)	2 x 2.75
		Lane	**200vpd**	1 to 20 Lots	10	15	10%	1.5m one side or 1.5m each side where more than 100m in length	parking	Shared (in movement lane)	2 x 2.75
		Local	**2000vpd**	1-200 lots	30	20	10%	1.5m each side	loading bays.	Shared (in movement lane)	2 x 2.75
	Mixed Use	**Local**	**2000vpd**	1 -200 lots	30	20	10%	1.5m each side	parking	Shared (in movement lane)	2 x 2.75
		Collector/Arterial	**8000vpd**	Neighbourhood Centre, 200 - 800 lots	50	20	10%	2.0m each side	Parking, Public Transport, Turning	1.5m Network in accordance with cycle network strategy	2 x 3.5
Centre	Mixed Use	**Lane**	**200vpd**	Side or rear service access, (1 - 20 lots)	10	6	10%	Shared (in movement lane)	Loading bays (shared in movement lane)	Shared (in movement lane)	5
		Lane	**200vpd**	1 to 20 Lots	20	15	10%	2 x 2.5	Parking	Shared (in movement lane)	2 x 2.5
		Local	**2000vpd**	1-200 lots	30	20	10%	3m each side	Parking	Shared (in movement lane)	2 x 2.75
		Collector/Arterial	**8000vpd**	Urban Street, 200 - 800 lots	40	20	10%	3.0-3.5m each side	parking	1.5m Network in accordance with cycle network strategy	2 x 3.0

Table C4: Minimum Road Design Standards – Urban and Rural Roads Continued.

Place Context		Typical Classification		Design Environment				Link Content			
Area	Land Use	Hierarchy	Traffic Volume (Max vpd)	Locality Served	Target operating speed	Minimum Road Reserve Width (m)	Max Grade	Pedestrians (See Note A)	Passing, Parking, Loading & Shoulder	Cyclists (See Note A)	Minimum movement lane (excluding shoulder) (See Note E)
Rural	Live & Play - (Residential & Home Occupation)	**Lane**	**100vpd**	1 -10 du (Public) or 1-6 du (Private)	20	6	20%	Shared (on shoulder & Berm)	Allow for passing every 50m, total shoulder 0.5m, sealed	Shared (in movement lane)	3
		Lane	**200vpd**	1-20du	30	9	16%	Shared (on shoulder & Berm)	Total shoulder 0.5m, sealed	Shared (in movement lane)	2 x 2.75
		Local Road	**1000vpd**	1-150du	70	15	12.5%	Shared (on shoulder & Berm)	Total shoulder 1.0m, sealed shoulder 0.5m	Shared (in movement lane)	2 x 2.75
	Make and Move	**Local**	**500vpd**	Low level agricultural activity	up to 100	20	10%	Shared (on shoulder & Berm)	Total shoulder 1.0m,	Shared (in movement lane)	2 x 2.75
		Collector	**1000vpd**	Medium level agricultural activity	up to 100	20	10%	Shared (on shoulder & Berm)	Total shoulder 1.0m, sealed shoulder 0.5m	Shared (in movement lane)	2 x 3.0
		Minor Arterial	**2500vpd**	Medium / high level agricultural activity + medium through traffic	up to 100	20	10%	Shared (on shoulder & Berm)	Total shoulder 1.5m, sealed shoulder 0.5m	Preferred on sealed shoulder.	2 x 3.5
		Major Arterial	**>2500vpd**	High/medium level agricultural activity + high level through traffic	up to 100	20	10%	Shared (on shoulder & Berm)	Parking and loading. Total shoulder 1.0m, sealed shoulder 1.0m	Preferred on sealed shoulder.	2 x 3.5

Appendix C Site Visit Photographs

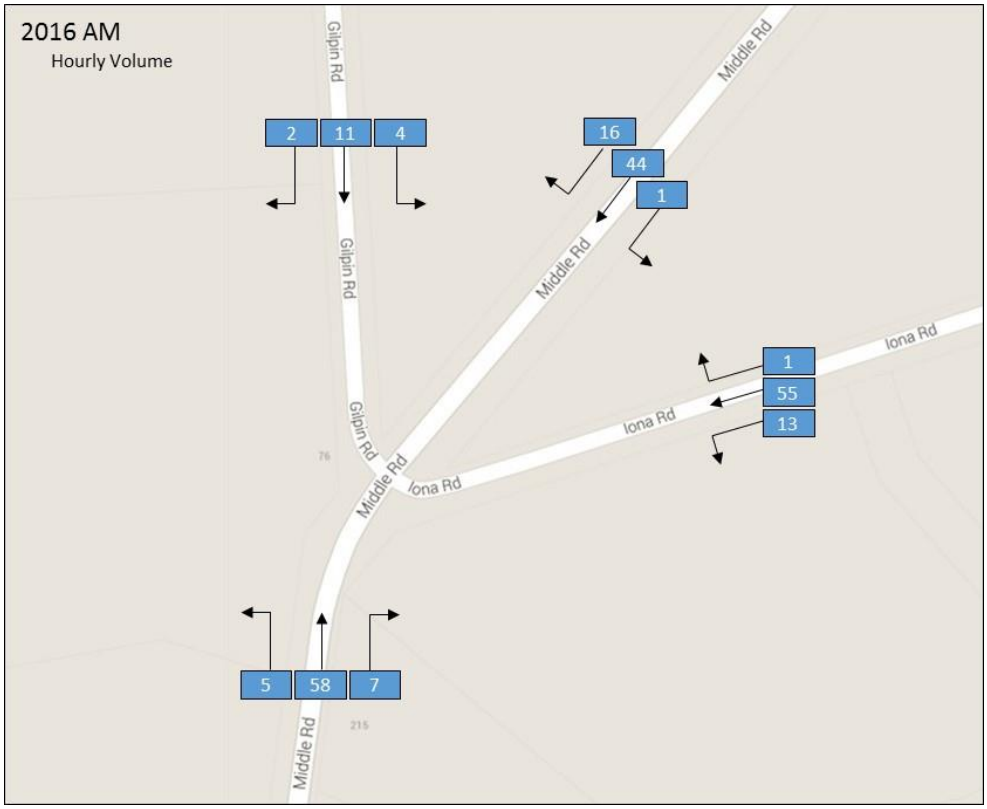
Iona II Development Area

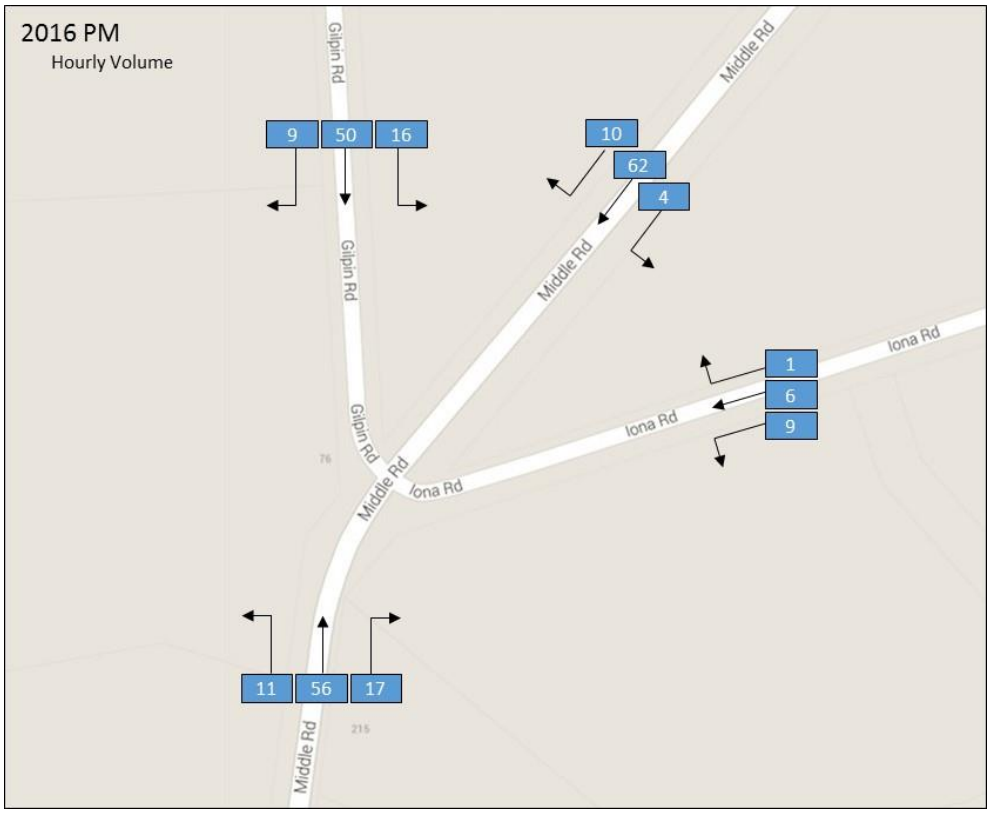
Iona Road

Iona Road/Gilpin Road/Middle Road Intersection (Looking North-East)

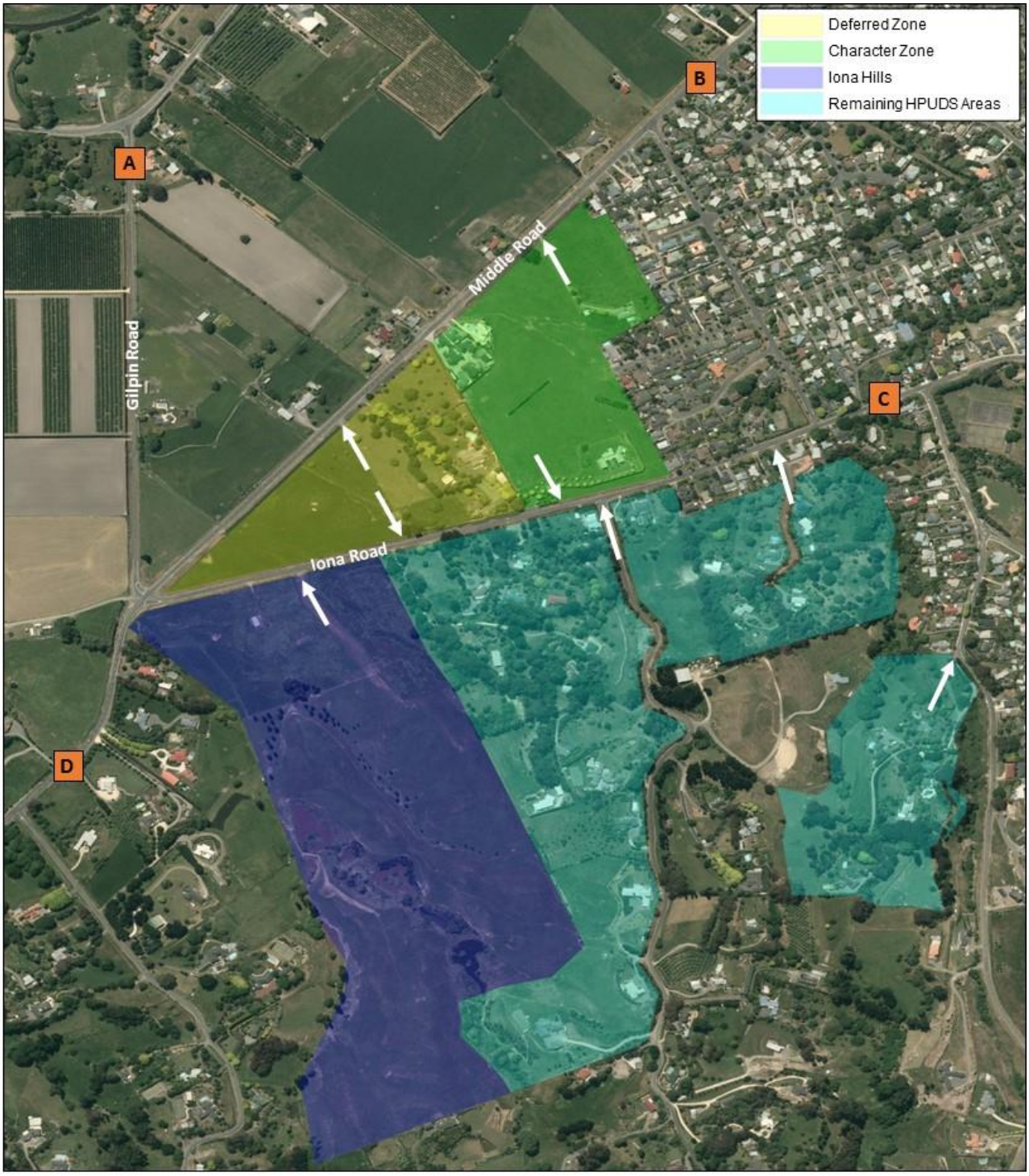
Iona Road/Gilpin Road/Middle Road Intersection (Looking South-West)

Appendix D 2016 Traffic Survey Data


2016 AM
Hourly Volume
Gilpin Rd
Middle Rd
Iona Rd
2
11
4
16
44
1
1
55
13
5
58
7


2016 PM
Hourly Volume
Gilpin Rd
Middle Rd
Iona Rd
9
50
16
10
62
4
1
6
9
11
56
17

Appendix E Trip Distribution Assumptions



Trip Distribution Ratio

	Zone A	Zone B	Zone C	Zone D
Character Zone	10%	60%	25%	5%
Deferred Zone	10%	60%	25%	5%
Iona Hill	10%	60%	25%	5%
Remaining HPUDS Land	10%	50%	35%	5%

Appendix F Level of Service Criteria

Definitions of Level of Service

LOS	Delay (sec)		Definition
	Roundabout	Priority	
A	d<=10	d<=10	Free-flow conditions with unimpeded manoeuvrability. Stopped delay at signalised intersection is minimal.
B	10<d<=20	10<d<=15	Reasonably unimpeded operations with slightly restricted manoeuvrability. Stopped delays are not bothersome.
C	20<d<=35	15<d<=25	Stable operations with somewhat more restrictions in making mid-block lane changes than LOS B. Motorists will experience appreciable tension while driving.
D	35<d<=55	25<d<=35	Approaching unstable operations where small increases in volume produce substantial increases in delay and decreases in speed.
E	55<d<=80	35<d<=50	Operations with significant intersection approach delays and low average speeds.
F	80<d	50<d	Operations with extremely low speeds caused by intersection congestion, high delay, and adverse signal progression.

Appendix G Landowner's Vision

LOCAL AUTHORITY	:	HASTINGS DISTRICT
ZONING	:	MIXED ZONES
TOTAL AREA	:	48.8155 HA

LEGEND:

- STORMWATER
- WALKING/ CYCLEWAYS
- DEVELOPMENT BLOCKS FOR YIELD ASSESSMENT
- INITIAL STAGE
- KEY CONNECTIONS

GILPIN ROAD

MIDDLE ROAD

DETENTION

INITIAL STAGE

BREADALBANE ROAD

REYNOLDS ROAD

N

I

DETENTION

RESERVE

NEW ROAD ALIGNMENT

IONA ROAD

SUBURBAN COMMERCIAL

ROAD TO BE CLOSED

SW

SW

INITIAL STAGE

DETENTION

II

DETENTION

MIDDLE ROAD

ENDSLEIGH ROAD

LANE ROAD

500
400
300
200
100
0
100

METRES

III

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HAWKES BAY | NEW ZEALAND
PO Box 611, Hastings, NZ
Phone: +64 6 870 4048 or 0800 787 842
Fax: +64 6 870 4042

LOWE FAMILY

MIDDLE ROAD AND IONA ROAD
HAVELOCK HPUDS

TITLE: DRAFT CONCEPT PLAN
SCALE: 1: 4,000 @ A3
DATE: DECEMBER 2015
DRAWN BY: PT
DRAWING NO: 3858-10 | SHEET: 1/1

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1st Floor, 100 Warren Street South, Hastings 4122
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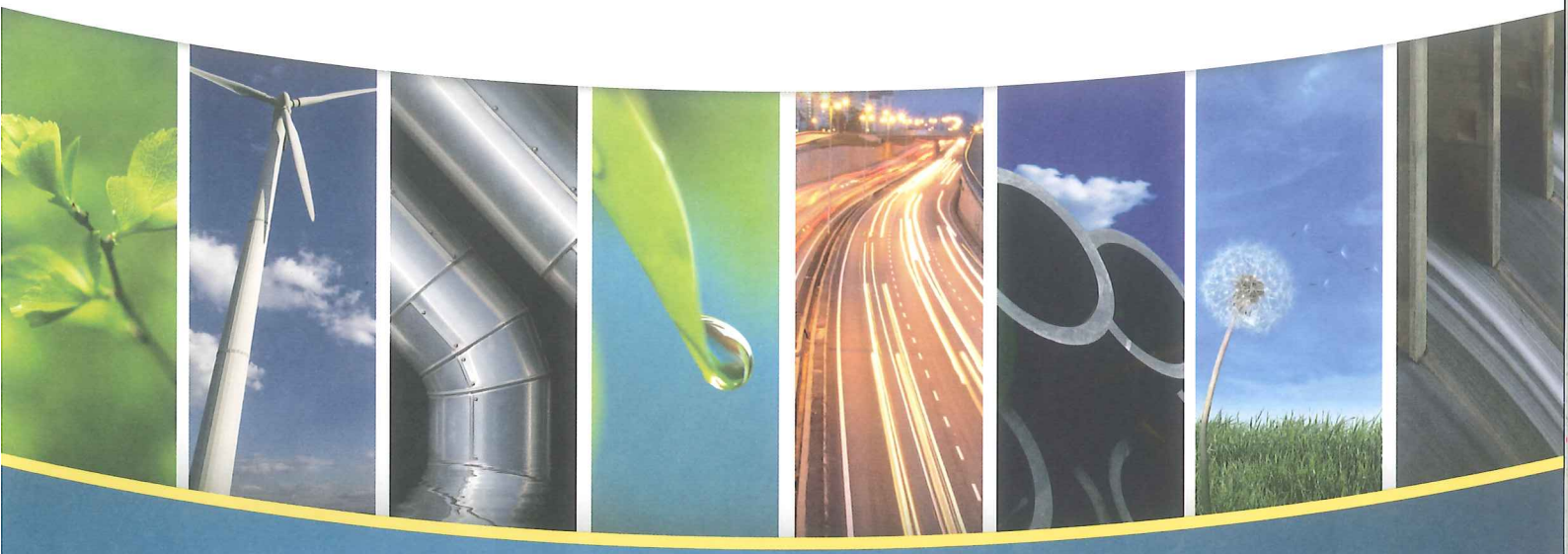

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TE KAUNIHERA O HERETAUNGA

MEMORANDUM

File Ref TR-8-18-9303

To: **Anna Sanders**

From: **Sarath Kuruwita**

Copy to: Rowan Wallis

Date: 5 February 2018

Subject: Iona/ Middle Road Development – Traffic Impact on the Havelock North CBD

In response to your query about whether additional traffic from the Iona/ Middle development, arriving in the village centre at peak hours will result in a lower level of service (LoS), the following information is provided.

Trip generation estimates and the trip distribution pattern indicated in the MWH April 2016 Report on Middle/ Iona Road Growth Area – Transport Assessment are used to determine the arrivals at the Havelock North City Centre. The traffic from the development is likely to feed the centre of Havelock North via Middle Road and Iona Road. The impact of the extra arrivals at the Porter Drive/ Middle Road intersection will form the answer to your query. The RAMM database provided information on the pre development (current) traffic on the three approaches of the Porter Drive/ Middle Road intersection.

To analyse the worst case scenario, all the traffic generated by the development is assumed to arrive at the city centre without any dispersal. By following the normal tendency of the traffic to follow the shortest route, all traffic generated would be expected to arrive at the Porter Drive/ Middle Road intersection (See figure 1 in appendix 1 for likely routes from Development to the City Centre).

An extract from the MWH April 2016 Report on Middle/ Iona Road Growth Area – Transport Assessment showing the trip generation estimates and the trip distribution pattern is reproduced below:

Trip Generation

The yields for infrastructure modelling were provided by HDC. A summary of the trip generation (based upon the maximum number of total dwellings less the existing number of dwellings) is summarised within Table 4-2.

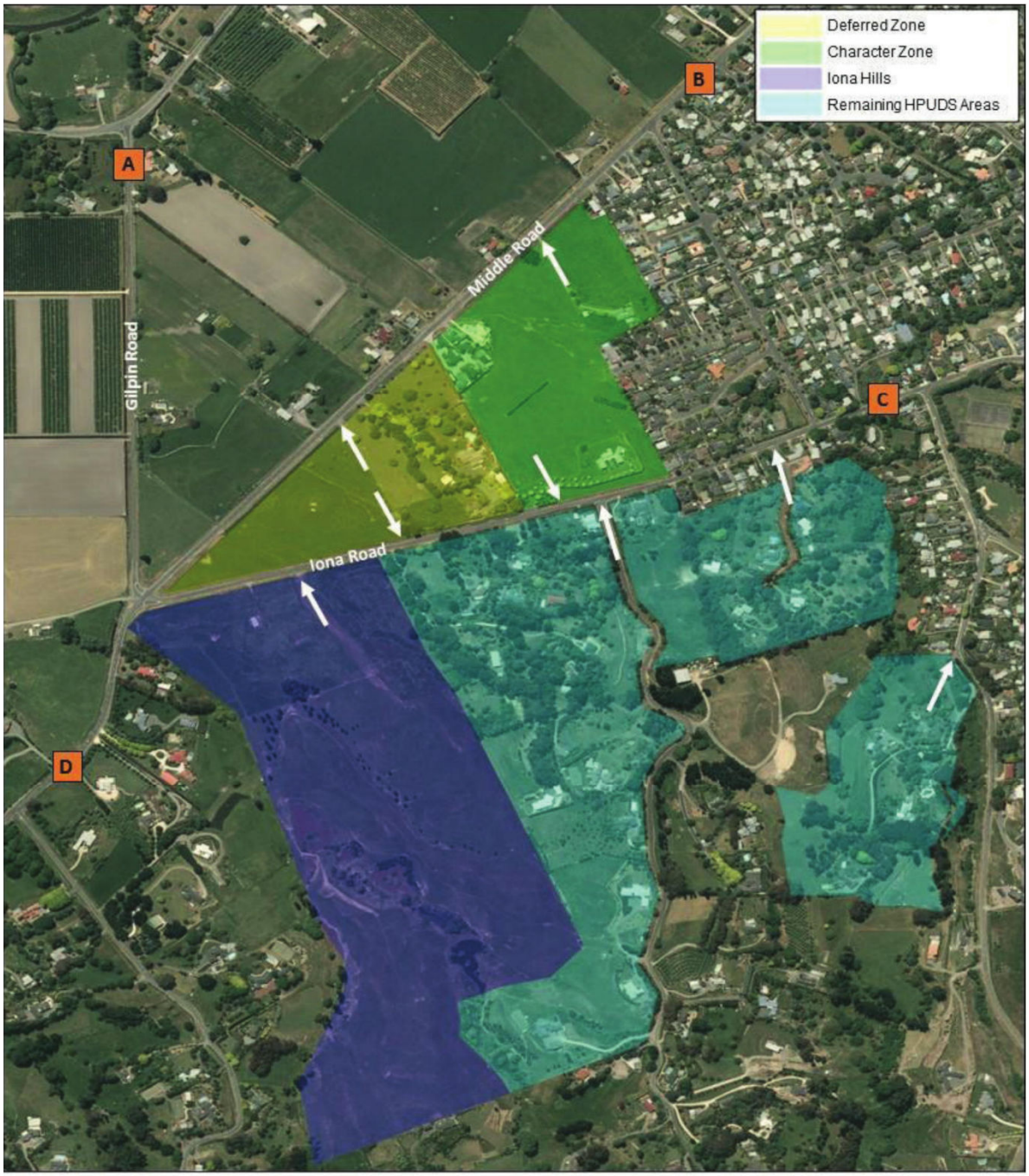
Table 4-2: Trip Generation Estimates

Zone	New Dwellings	Trip Generation			
		AM Peak		PM Peak	
		Inbound	Outbound	Inbound	Outbound
Character Zone	128	31	92	77	45
Deferred Zone	108	26	78	65	38
Iona Hill	160	38	115	97	57
Remaining HPUDS Land	18	4	13	11	6
Total	**414**	**99**	**298**	**250**	**147**

The development trips as above have been assigned to various parts of the road network in accordance with the Trip matrix provided below.

Trip Distribution Ratio

	Zone A	Zone B	Zone C	Zone D
Character Zone	10%	60%	25%	5%
Deferred Zone	10%	60%	25%	5%
Iona Hill	10%	60%	25%	5%
Remaining HPUDS Land	10%	50%	35%	5%



Using the above diagram and the Trip distribution matrix, the traffic generated by the new dwellings into various zones can be calculated. The zones B and C traffic levels are of particular interest because they feed the centre of Havelock North via Middle Road and Iona Road respectively. When the trip distribution matrix is applied to the Daily traffic generated by each of the zones to the table 4.2 above the traffic on Middle Road and Iona Road from the Development can be obtained.

Table 1 Daily Trips generated by the Iona/ Middle Development on Iona Road and Middle Road

	Generated Trips on Middle Road (Vehicles/Day)	Generated Trips on Iona Road (Vehicles/ Day)
From Character Zone	768	320
From Deferred Zone	648	270
From Iona Hills Zone	960	400
From Remaining HPUDS Land	90	63
Total	**2466**	**1053**

Peak hour traffic could be approximated to 8-10% of the daily traffic. Consequently, the Peak hour traffic from the development is:

Table 2 Peak hour Traffic generated by the Iona/ Middle Development on Iona Road and Middle Road

Peak hour Traffic (veh./hr.)	**247**	**105**

SIDRA analysis (details provided in Appendix 1) is carried out for the Porter Drive/ Middle Road Intersection. The LoS and the delays (rounded values) expected from the analysis inclusive of the development traffic are tabulated below:

Table 3: Comparison of Level of Service and Delay at Porter Drive/ Middle Road Intersection

	Pre Development			Post Development		
	Porter Drive W	Porter Drive E	Middle Road	Porter Drive W	Porter Drive E	Middle Road
Average Delay (sec.)	5	1	5	5	4	5
Level of Service (LoS)	A	A	A	A	A	A*

Note: A - Los A for the approach but LoS B for right turners.*

The worst LoS is predicted for the right turners from the Middle Road Approach (LoS B). This indicates that the intersection does not suffer any appreciable reduction in the Level of Service it provides even with the development traffic. Therefore, the impact from the development traffic does not warrant any interventions/ improvements to the Porter Drive/ Middle Road intersection.

Transportation Development Engineer
sarathk@hdc.govt.nz

APPENDIX 1

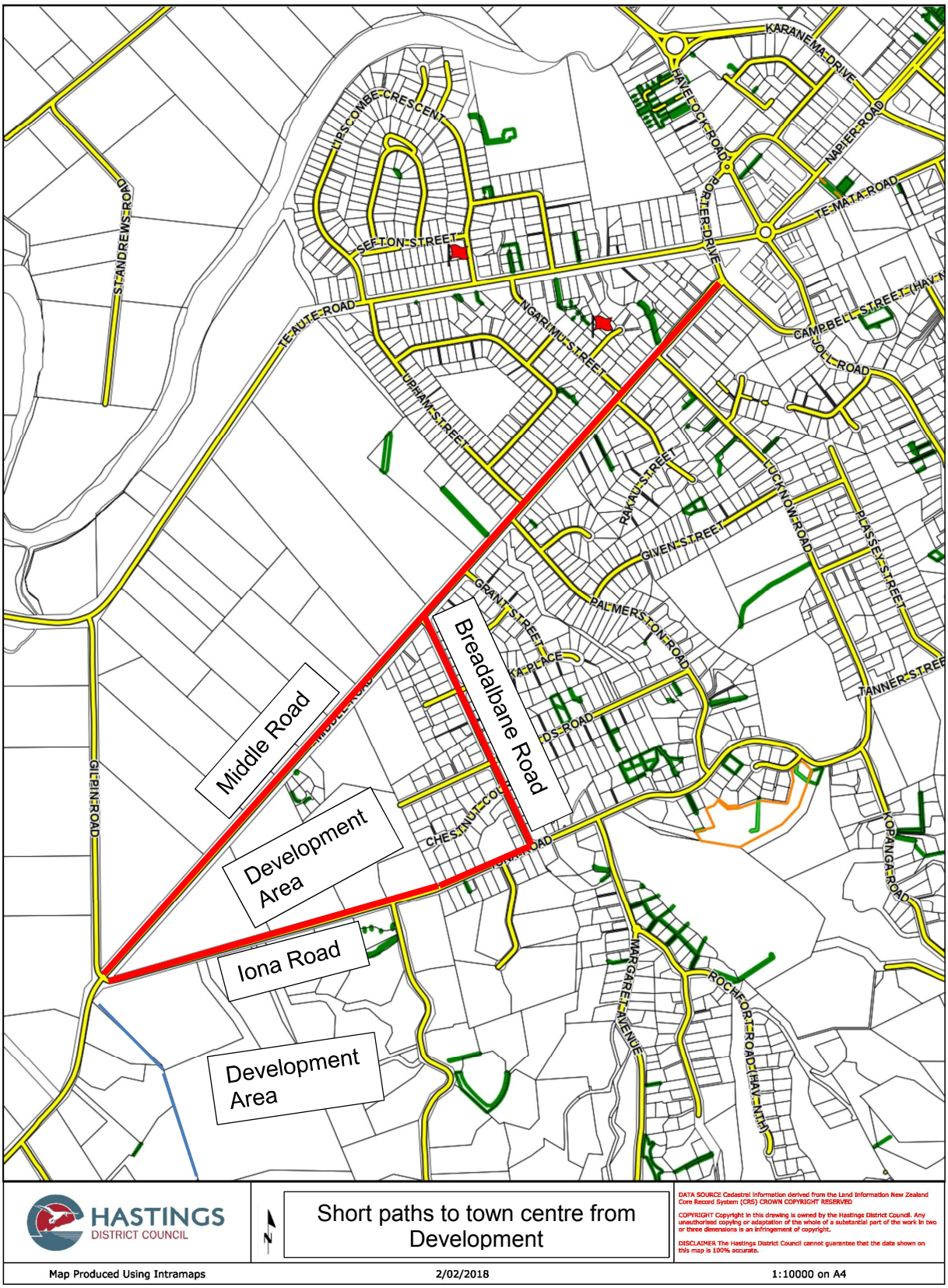


Figure 1 Short paths to town Centre

SIDRA Results

Porter Drive/ Middle Road Intersection without development

Levels of Service

LANE LEVEL OF SERVICE

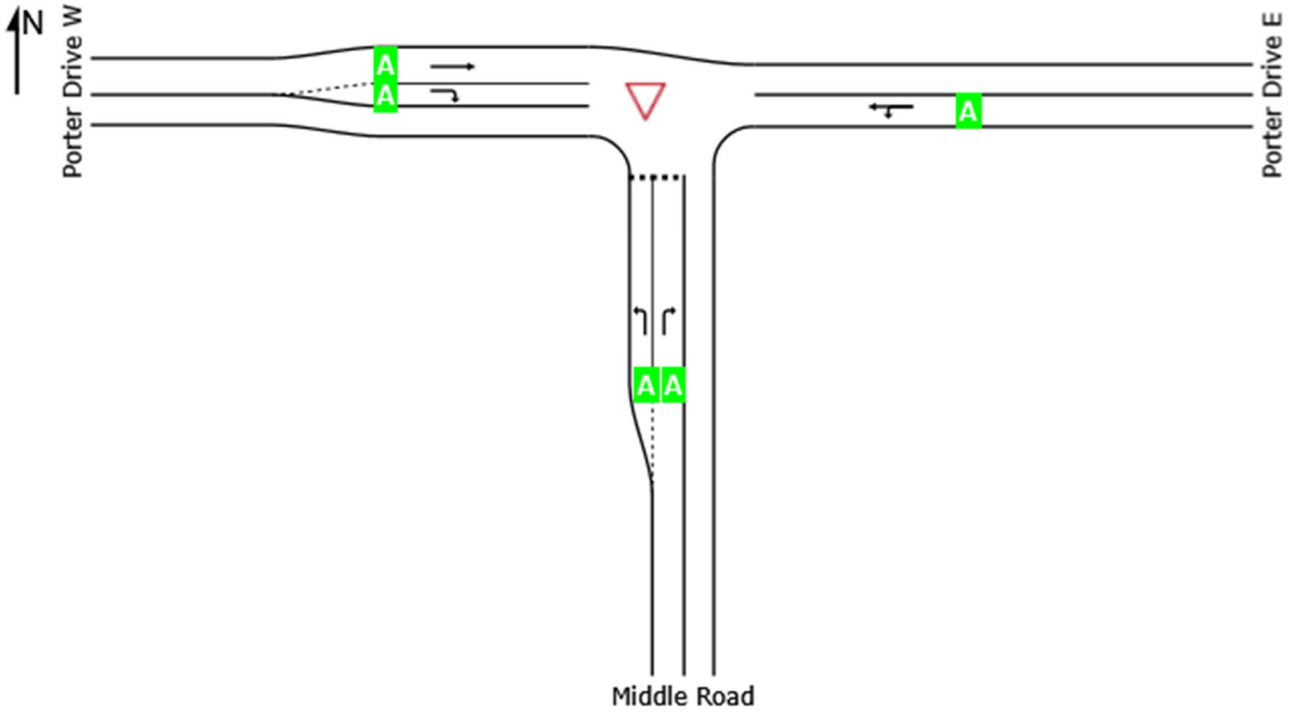
Lane Level of Service

Site: 101 [Middle Porter]

Middle Porter
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	West	Intersection
LOS	A	NA	NA	NA



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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Porter Drive/ Middle Road Intersection without development
Lane Flows

LANE FLOWS

Site: 101 [Middle Porter]

Middle Porter Existing
Giveway / Yield (Two-Way)

Approach Lane Flows (veh/h)									
South: Middle Road									
Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	481	-	481	2.0	1398	0.344	100	0.0	2
Lane 2	-	67	67	2.0	385	0.175	100	NA	NA
Approach	481	67	548	2.0		0.344			
East: Porter Drive E									
Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	166	185	4.0	1910	0.097	100	NA	NA
Approach	19	166	185	4.0		0.097			
West: Porter Drive W									
Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	120	-	120	4.0	1693	0.071	100	NA	NA
Lane 2	-	527	527	4.0	1485	0.355	100	9.3	1
Approach	120	527	647	4.0		0.355			
	Total	%HV	Deg.Satn (v/c)						
Intersection	1381	3.2	0.355						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

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Porter Drive/ Middle Road Intersection without development
Movement Summary

MOVEMENT SUMMARY

Site: 101 [Middle Porter]

Middle Porter Existing
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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: Middle Road											
1	L2	481	2.0	0.344	3.7	LOS A	1.8	12.7	0.34	0.53	29.9
3	R2	67	2.0	0.175	11.4	LOS B	0.6	4.5	0.72	0.86	26.4
Approach		548	2.0	0.344	4.7	LOS A	1.8	12.7	0.38	0.57	29.4
East: Porter Drive E											
4	L2	19	4.0	0.097	4.6	LOS A	0.0	0.0	0.00	0.06	47.5
5	T1	166	4.0	0.097	0.0	LOS A	0.0	0.0	0.00	0.06	49.7
Approach		185	4.0	0.097	0.5	NA	0.0	0.0	0.00	0.06	49.5
West: Porter Drive W											
11	T1	120	4.0	0.071	0.2	LOS A	2.2	15.8	1.00	0.00	47.2
12	R2	527	4.0	0.355	5.5	LOS A	2.1	15.0	0.38	0.57	41.6
Approach		647	4.0	0.355	4.5	NA	2.2	15.8	0.50	0.46	43.1
All Vehicles		1381	3.2	0.355	4.0	NA	2.2	15.8	0.39	0.45	38.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Porter Drive/ Middle Road Intersection with development
Levels of Service
LANE LEVEL OF SERVICE

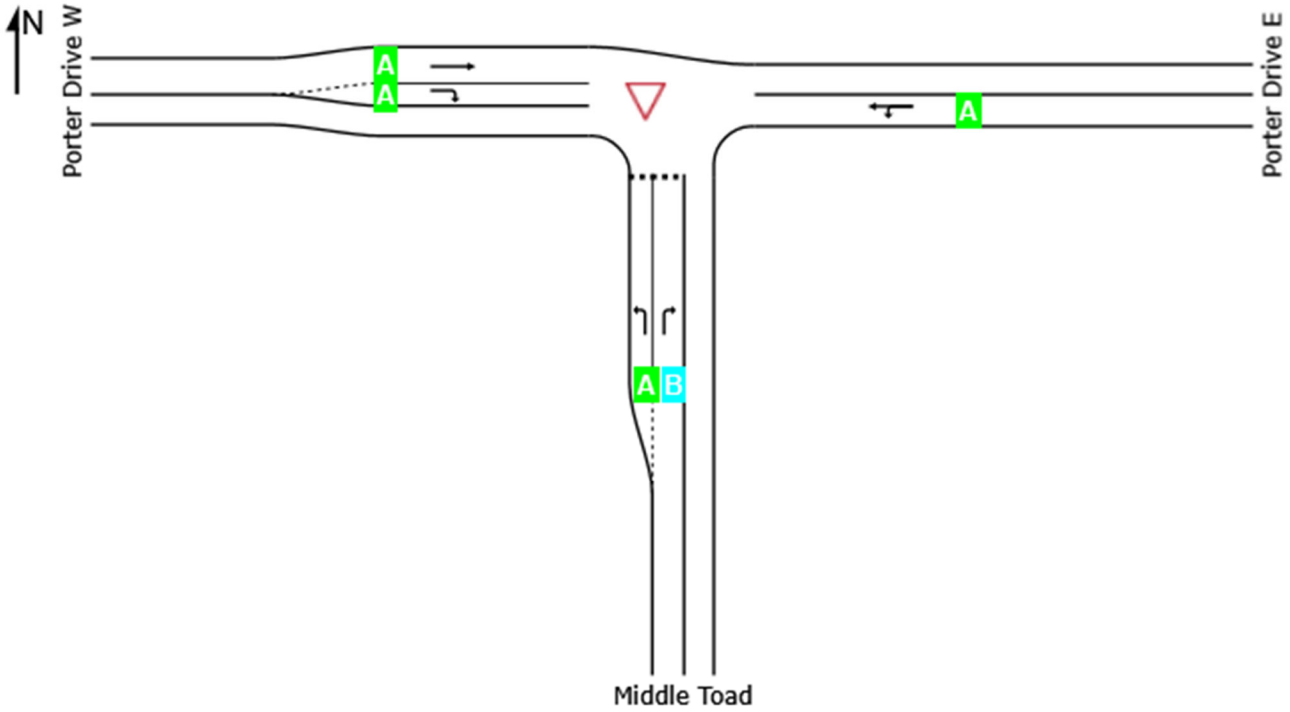
Lane Level of Service

Site: 101 [Middle Porter]

Middle Porter With Development
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	West	Intersection
LOS	A	NA	NA	NA



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Minor Road Approach LOS values are based on average delay for all lanes.
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SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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Porter Drive/ Middle Road Intersection with development
Lane Flows

LANE FLOWS

Site: 101 [Middle Porter]

Middle Porter With Development
Giveway / Yield (Two-Way)

Approach Lane Flows (veh/h)									
South: Middle Toad									
Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	601	-	601	2.0	1558	0.386	100	0.0	2
Lane 2	-	133	133	2.0	412	0.322	100	NA	NA
Approach	601	133	734	2.0		0.386			
East: Porter Drive E									
Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	139	46	185	4.0	1848	0.100	100	NA	NA
Approach	139	46	185	4.0		0.100			
West: Porter Drive W									
Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	55	-	55	4.0	1673	0.033	100	NA	NA
Lane 2	-	593	593	4.0	1485	0.399	100	14.8	1
Approach	55	593	647	4.0		0.399			

	Total	%HV	Deg.Satn (v/c)
Intersection	1566	3.1	0.399

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Porter Drive/ Middle Road Intersection with development
Movement Summary

MOVEMENT SUMMARY

Site: 101 [Middle Porter]

Middle Porter With Development
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total 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: Middle Toad											
1	L2	601	2.0	0.386	3.2	LOS A	2.2	16.0	0.17	0.48	30.1
3	R2	133	2.0	0.322	12.3	LOS B	1.4	9.9	0.74	0.93	26.1
Approach		734	2.0	0.386	4.8	LOS A	2.2	16.0	0.27	0.56	29.3
East: Porter Drive E											
4	L2	139	4.0	0.100	4.6	LOS A	0.0	0.0	0.00	0.40	44.3
5	T1	46	4.0	0.100	0.0	LOS A	0.0	0.0	0.00	0.40	47.8
Approach		185	4.0	0.100	3.5	NA	0.0	0.0	0.00	0.40	45.6
West: Porter Drive W											
11	T1	55	4.0	0.033	0.3	LOS A	1.0	7.2	1.00	0.00	47.2
12	R2	593	4.0	0.399	5.5	LOS A	2.4	17.6	0.40	0.57	41.6
Approach		647	4.0	0.399	5.1	NA	2.4	17.6	0.45	0.53	42.3
All Vehicles		1566	3.1	0.399	4.8	NA	2.4	17.6	0.31	0.53	35.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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