C2. Noise Impact Assessment

FINAL REPORT

ENVIRONMENTAL NOISE ASSESSMENT DIXIE ROAD WIDENING (QUEEN STREET TO 2.0 KM NORTH OF MAYFIELD ROAD) – REGION OF PEEL, BRAMPTON, ONTARIO

Project Number: #0925103A

June 10, 2011

SUBMITTED TO:

Travis Brown, PMP, MITE
Manager - Transportation
Tel: 905-477-8400 ext: 568
travis.brown@aecom.com

AECOM
300-300 Town Centre Blvd
Markham, ON L3R 5Z6
Tel: 905-477-8400
Fax: 905-477-1456

SUBMITTED BY:

RWDI AIR Inc.
Consulting Engineers & Scientists
650 Woodlawn Road West
Guelph, Ontario N1K 1B8

P: (519) 823-1311
F: (519) 823-1316

Project Scientist: Nghi Nguyen
Project Scientist: Aaron Haniff, B.A.Sc., E.I.T.
Project Manager: Sharon Schajnoha, B.Sc., P.Eng.
Project Director: Mike Lepage, M.Sc., ACM, CCM

Companion studies: Air Quality Assessment

TABLE OF CONTENTS

Figures

Appendices

1. INTRODUCTION

RWDI AIR Inc. (RWDI) was retained by AECOM to conduct an environmental noise impact assessment of the proposed Dixie Road Widening (from Queen Street East to 2.0 km north of Mayfield Road) located in the Region of Peel, City of Brampton and Town of Caledon, Ontario. This assessment has been conducted in accordance with the terms of reference outlined in RWDI Proposals. W08-1071P and W08-1071P2, dated 18 February, 2008 and November 4, 2009, respectively.

The objectives of the study are:

- to predict future "build" and future "no-build" sound levels from road traffic noise sources in the area (i.e., noise levels with and without the proposed project taking place);
- to use these predictions to assess potential impacts according to the applicable guidelines;
- to specify mitigation measures where required; and
- to assess the potential for construction noise and provide a Code of Practice to minimize potential impacts.

A glossary of commonly used noise terminology can be found in **Appendix A**.

1.1 Project Description (Nature of the Undertaking)

The proposed improvement consists of widening Dixie Road between Queen Street and 1.4 km north of Mayfield Road (approximately 9 km of road). **Figures 1a to 1f** illustrates the project limits and surrounding receptors. The proposed widening will increase Dixie Road to a six-lane road between Queen Street and Countryside Drive and four-lane road between Countryside Drive to 1.4 km north of Mayfield Road by the year 2016.

1.2 Study Area (Area of Investigation)

In accordance with Ministry of Transportation (MTO) and Ministry of the Environment (MOE) practices, the area of investigation for the project has been determined using screening level modelling to establish a distance from the project to where there is no anticipated increase above future ambient sound levels. The methodology for determining the Area of Investigation is described in **Appendix B**.

For this project, the Area of Investigation is 175 m and 200 m on either side of the roadway (from edge of pavement) from Queen Street East to Countryside Drive and from Countryside Drive to 1.4 km north of Mayfield Road, respectively. The Area of Investigation is illustrated in **Figure 1a**.

2. ROAD TRAFFIC NOISE IMPACTS (OPERATIONAL NOISE)

For surface transportation projects, operation and maintenance noise, following project completion, are of primary importance. This section of the report provides an evaluation of impacts from road traffic noise resulting from the undertaking.

2.1 Applicable Guidelines

There are several transportation noise guidelines that are applicable to this project. Ontario Provincial policies established by the MTO and MOE are directly applicable under the Municipal Class EA process for transportation projects, and are discussed in detail in this report. The Region of Peel (for the City of Brampton) and Town of Caledon noise guidelines are also applicable to this project.

2.1.1 Ontario Provincial Guidelines and Policies

Ontario has a number of guidelines and documents related to assessing road traffic noise impacts. These documents and policies include:

- Ontario MOE/MTO, "Joint Protocol", A Protocol for Dealing With Noise Concerns during the Preparation, Review and Evaluation of Provincial Highway's Environmental Assessments (MTO & MOE, 1986);
- Ontario MTO, Environmental Office Manual Technical Areas – Noise, EO-V-1000-00 (MTO 1992b); and
- Ontario MTO, Environmental Reference for Highway Design (MTO 2009).

These guidelines generally apply to major roadway construction and reconstruction of municipal roads, provincial highways, and freeways.

The MTO has released an official version of the *Environmental Guide for Noise* (MTO 2006, Version 1.1 July 2008). This guideline applies to major roadway construction and reconstruction of provincial highways and freeways. This guideline has not been used in this analysis as it does not apply to this situation.

The *Environmental Office Manual*, *Environmental Reference for Highway Design*, and *Environmental Guide for Noise* are all MTO documents that serve as detailed technical references for assessing vehicular road traffic noise on provincial highways in Ontario.

The Joint Protocol evaluates the impact of a project based on an objective level, as well as on a change in sound level. It sets out an Outdoor Objective sound level of 55 dBA L_{eq} or the existing ambient, whichever is higher. The outdoor objective sound level is used to evaluate cumulative sound levels from a 10-year future horizon year (i.e. on traffic volumes 10 years after the completion of the project). A design year of 2031 applies to this project. Once the outdoor objective sound level is reached, the change in sound level is used to evaluate the need for noise mitigation measures.

Noise mitigation is warranted when increases in sound level over the "no-build" ambients are 5 dB and greater. Mitigation measures can include noise barriers, noise reducing asphalts, changes in vertical profiles, and changes in horizontal alignments. Noise mitigation, where applied, must be administratively, economically and technically feasible, and must provide at least 5 dB of reduction averaged over the first row of noise-sensitive receivers. Mitigation measures are restricted to locations within the roadway right-of-way. Off right-of-way noise mitigation, such as window upgrades and air conditioning are not considered. Noise mitigation requirements are summarized below:

Table 1: Summary of Mitigation Efforts Under Ontario Road Traffic Noise Guidelines

Existing and Future Sound Levels	Change in Noise Level Above Future "No-Build" Ambient (dBA)	Mitigation Effort Required
< 55 dBA	0 to 5	• None
	> 5	• None. Sound levels still below 55 dBA Objective
> 55 dBA	0 to 5	• None
	> 5	• Investigate noise control measures within right-of-way • Noise control measures where used must provide a minimum of 5 dBA of attenuation, averaged over the first row of receivers • Mitigated to as close to ambient as possible, where technically, economically and administratively feasible

Notes: Values are L_{eq} (16h) levels for municipal and Provincial Highways, and L_{eq} (24h) for Freeways.

Under MTO and MOE policies, L_{eq} (24h) sound levels are used to assess impacts from freeways (400-series major highways), and daytime L_{eq} (16h) sound levels are used to assess impacts from all other Provincial highways and Municipal roadways. As this project is a municipal highway, L_{eq} (16h) values have been used in the assessment.

2.1.2 Region of Peel Guideline

The Region of Peel has two documents that apply to this assessment:

- Region of Peel, General Guidelines for the Preparation of Acoustical Reports In the Region of Peel, December 2002; and
- Region of Peel, Corporate Policy Manual – Noise Attenuation Barriers, W30-04, June 1996.

The first document is used for Land Use Planning of new residential receptors that will be located in close proximity to a roadway. The second document is used to deal with residential noise complaints and retrofits of noise barriers to reverse frontage lots. There is currently no policy or guidance for roadway upgrades within the Region of Peel. These documents recommend the use of noise attenuation walls when the future "build" daytime noise level is equivalent to 60 dBA or higher during the daytime hours L_{eq} (16h). Noise mitigation requirements are summarized below:

Table 2: Summary of Mitigation Efforts under Region of Peel Noise Guideline

Future "Build" Ambient Noise Levels (dBA)	Mitigation Effort Required
$\geq$ 60 dBA	• Noise wall where used must provide a minimum of 5 dBA of attenuation • Economical feasibility is based on the ability of the local residence to pay for 50% of the barrier cost

Notes: Values are L_{eq} (16h) levels for Provincial Highways and municipal roadways.

2.1.3 Town of Caledon Guideline

The Town of Caledon has a document that applies to this assessment:

- Town of Caledon, Development Standards, Policies and Guidelines Version 4, January 2009.

This document is used for land development of new and existing Town projects to aid in uniform design throughout the municipality. There is currently no policy or guidance for roadway upgrades within the Town of Caledon. The document recommends the use of noise attenuation walls when the existing and future "build" daytime noise level is equivalent to 55 dBA or higher during the daytime hours L_{eq} (16h). Noise mitigation requirements are summarized below:

Table 3: Summary of Mitigation Efforts under Town of Caledon Guideline

Existing and Future Sound Levels	Change in Noise Level Above Future "No-Build" Ambient (dBA)	Mitigation Effort Required
< 55 dBA	0 to 5	• None
	> 5	• None. Sound levels still below 55 dBA Objective
> 55 dBA	0 to 5	• None
	> 5	• Noise wall where it must provide a minimum of 5 dBA of attenuation • Noise wall to be built by land developers shall be installed entirely on private property • Noise wall to be built by the Region shall be installed within the Public ROW

Notes: Values are L_{eq} (16h) levels for Provincial Highways and municipal roadways.

2.2 Location of Noise Sensitive Areas within the Area of Investigation

2.2.1 Definition of Noise Sensitive Areas

Noise impacts from transportation projects are evaluated at noise sensitive receptors within the area of investigation. Noise receptors are called "Noise Sensitive Areas" (NSAs) in this report, in keeping with MTO practices for Provincial roadways. Under current MOE policies, NSAs include the following land uses:

- Private homes (single family units and townhouses)
- Multiple unit buildings such as apartments, provided they have a communal OLA associated with them
- Hospitals and nursing homes for the aged, provided they have an OLA for use by patients
- Schools, educational facilities and daycare centres where there are OLAs for students
- Campgrounds that provide overnight accommodation
- Hotels and motels with outdoor communal OLAs (e.g., swimming pools) for visitors
- Churches and places of worship

The following land uses are generally not considered by the MOE to qualify as NSAs:

- Apartment balconies
- Cemeteries
- Parks and picnic areas not part of a defined OLA
- All commercial
- All industrial

2.2.2 Future Land Uses

Lands that have been zoned for future noise sensitive uses and which have an approved Plan of Subdivision in place, but where NSAs do not currently exist, must also be considered under MOE policies. A review of the land use zoning within the project Area of Investigation has been conducted. Several new subdivisions are currently under development between Sandalwood Parkway and Countryside Drive. Several active development applications for future land use for areas north of Countryside Drive were not assessed. Assessment of future land use will be completed through the development process. Zoning maps can be found in **Appendix C**.

2.2.3 Location and Number of NSAs within the Area of Investigation

The general locations of NSAs within the Area of Investigation are indicated in **Figures 1a to 1f**. Twenty-one NSAs within the Area of Investigation, meeting the requirements discussed above, are represented by the following:

- 20 existing/future built single family homes or town homes; and
- 1 church.

2.2.4 Representative NSAs for Analysis

A number of NSAs that are representative of potential noise impacts at the noise sensitive land uses in the area have been identified and used in the analysis. These NSA locations are shown in **Figures 1a to 1f** and described in the following table.

The point of reception for impact assessment is the Outdoor Living Area (OLA) of noise sensitive land uses. The OLA may be situated on any side of the receptor, but is generally taken to be the back yard. For assessment purposes, it is taken as a point 3 m from the façade of the receptor, and 1.5 m (approximate head-height) above the ground surface. Where the actual position of the OLA is unknown, the side closest to the proposed roadway has been assumed.

The locations of the points of reception used in the analysis are shown in **Figures 1a to 1f**.

Table 4: Representative NSAs Considered in Analysis

Receptor Location	Description	Distance to Closest Edge of Pavement (m)	Approx. No. of NSAs Represented
NR1	House at 0+200 on Dixie Road	26	1
NR2	House at 0+600 on Dixie Road	38	6
NR3	House at 2+300 on Octillo Blvd.	23	300
NR4	House at 2+850 on Tigerlily Pl.	29	13
NR5	House at 3+150 on Springtown Trail	25	329
NR6	House at 3+500 on Morningmist Street	76	91
NR7	House at 3+850 on Rangeland Road	40	155
NR8	House at 4+000 on Coral Reef Crescent	240	17
NR9	House at 4+450 on Manitou Cres.	63	7
NR10	Town homes at 4+650 on Moregate Cres.	43	219
NR11	House at 5+000 on Nottingham Crescent	36	101
NR12	House at 5+250 on Malcolm Cres.	40	6
NR13	House at 5+450 on Northgate Boulevard	39	135
NR14	House at 5+650 on Mansion St.	30	74
NR15	House at 5+850 on Maidelaine Cres.	32	6
NR16	House at 6+200 on Lascelles Blvd.	31	270
NR17	House at 6+850 on Holloway Ct.	22	6
NR18	House at 7+050 on Homeland Ct.	8	230
NR19	Church at 7+400 on Dixie Road	26	1
NR20	House at 12412 on Dixie Road	30	6
NR21	House at 12423 Dixie Road	46	5

Notes: [1] Distance is with respect to the closest lane of the proposed Dixie Road to the nearest receptor.
[2] NSAs represented are receptors in the area of the modelled receptor.

2.3 Road Traffic Data

Projected future "build" traffic volumes for the Year 2031 design year were provided by AECOM for the existing highway and proposed improvements, and for the surrounding roadway network. Existing traffic volumes for Dixie Road and surrounding roadways were provided by AECOM. Traffic data was provided in the form of Peak hour volumes. Annual Average Daily Traffic (AADT) values were estimated from the PM Peak volumes, assuming that the PM Peak is 10% of the AADT.

Under the Region's "General Guidelines for the Preparation of Acoustical Reports", traffic volumes corresponding to Level of Service "C" are to be used in acoustical studies. For this study, the higher of the calculated AADT (based on PM peak traffic) and the AADT given in the Region's guide, was used for both the future "build" and future "no-build" conditions. Projected volumes for the year 2031 were used for the future "build" condition, while existing volumes were used conservatively as future "no-build" volumes.

The number of commercial vehicles was provided by AECOM as existing counts. The numbers of commercial vehicles for the future "build" were not provided; as such, the existing values were used for the future "build" condition. The breakdown of total commercial vehicles into heavy trucks and medium trucks was assumed to be proportional to the default truck percentages specified by the Region's 2002 document, of 45% / 55% Heavy to medium for local roads, and 55% / 45% for regional roads (e.g., Dixie Road, Mayfield Road, Bovaird Drive, and Queen Street).

The traffic data used in the assessment are summarized in the following tables. Raw traffic data can be found in **Appendix D**.

The guidance documents used for this report state that the posted legal speed shall be used in modelling road traffic noise impacts for the Region of Peel. For both the future "build" and future "no-build" scenarios, the posted speed limits were provided by AECOM.

The *Development Standards, Policies and Guidelines* (Town of Caledon) states that the traffic speed of 10 km/h over the posted legal speed shall be used in assessing the road traffic noise impacts for the Town of Caledon.

Table 5: Future 'No-Build' Traffic Data (Year 2031)

Road	2031 AADT[1]	Day/Night Split [2]	Overall % Commercial Vehicles	Heavy / Medium Truck Split [3]	Posted Speed Limit (km/h)
Dixie Road					
- North of Mayfield Road [4]	13500	85/15	1.8	55 / 45	80
Dixie Road					
- From Mayfield Rd. to Countryside Rd.	13500		4.7		
- From Countryside Rd. to Father Tobin Rd.	27000		3.6		
- From Father Tobin Rd to Octillo Blvd.	27000		8.7		
- From Octillo Blvd. to Sandalwood Pkwy.	27000		8.0		
- From Sandalwood Pkwy. to Springtown Tr.	27000		3.0		
- From Spring Trail to Peter Robertson Blvd.	27000		2.2		
- From Peter Robertson Blvd. to Bovaird Dr.	27000		3.5		
- From Bovaird Dr. to Northcliff St.	27000	85/15	3.4	55 / 45	60
- From Northcliff St. to North Park Dr.	27000		2.3		
- From North Park Dr. to Northampton St.	27000		2.1		
- From Northampton St. to Williams Pkwy.	27000		1.3		
- From Williams Pkwy. to Lascelles Blvd.	27000		2.5		
- From Lascelles Blvd. to Howden Blvd.	27000		2.4		
- From Howden Blvd. to Hazelwood Dr.	27000		2.1		
- From Hazelwood Dr. to Hillside Dr.	27000		2.0		
- From Hillside Dr. to Queen St. E	27000		3.0		
Mayfield Road					
- East of Dixie Road	13500	85/15	8.2	55 / 45	60
- West of Dixie Road			5.6		
Countryside Rd.					
- East of Dixie Road	13500	90/10	0.9	45 / 55	60
- West of Dixie Road			8.2		
Father Tobin Rd.					
- East of Dixie Road	13500	90/10	1.2	45 / 55	60
- West of Dixie Road			0.0		
Octillo Blvd.					
- East of Dixie Road	13500	90/10	13	45 / 55	60
- West of Dixie Road			0.0		
Sandalwood Pkwy.					
- East of Dixie Road	40000	90/10	1.0	45 / 55	60
- West of Dixie Road			0.9		
Springtown Trail					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road			1.5		
Peter Robertson Blvd.					
- East of Dixie Road	13500	90/10	1.5	45 / 55	60
- West of Dixie Road			1.2		
Bovaird Dr.					
- East of Dixie Road	40000	85/15	3.9	55 / 45	60
- West of Dixie Road			4.2		

Road	2031 AADT[1]	Day/Night Split [2]	Overall % Commercial Vehicles	Heavy / Medium Truck Split [3]	Posted Speed Limit (km/h)
Northcliff St.					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road			2.4		
North Park Dr.					
- East of Dixie Road	13500	90/10	0.6	45 / 55	60
- West of Dixie Road			1.1		
Northampton St.					
- East of Dixie Road	13500	90/10	1.5	45 / 55	60
- West of Dixie Road			0.9		
Williams Pkwy.					
- East of Dixie Road	27000	90/10	1.0	45 / 55	60
- West of Dixie Road			0.9		
Lascelles Blvd.					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road			5.9		
Howden Blvd.					
- East of Dixie Road	13500	90/10	4.3	45 / 55	60
- West of Dixie Road			4.5		
Hazelwood Dr.					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road			0.0		
Hillside Dr					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road			1.5		
Queen St. E					
- East of Dixie Road	36390	85/15	7.1	55 / 45	60
- West of Dixie Road	39190		5.2		

Notes: [1] Higher of calculated Annual Average Daily Traffic (AADT) based on PM Peak traffic volume provided by AECOM and level 'C' service AADT as per Region's Guide.

[2] XX / YY is the percentage of vehicle traffic in the 16 daytime and 8 hour night-time respectively.

[3] HH / MM is the percentage of heavy trucks and medium trucks used in the analysis, respectively.

[4] Use 10 km/h over the posted speed limit for the traffic speed for the Town of Caledon; as per Development Standards, Policies and Guidelines Version 4, January 2009 (road traffic analysis used 90 km/h).

Table 6: Future 'Build' Traffic Data (Year 2031)

Road	2031 AADT[1]	Day/Night Split [2]	Overall % Commercial Vehicles	Heavy / Medium Truck Split [3]	Posted Speed Limit (km/h)
Dixie Road					
- North of Mayfield Road [4]	29920	85/15	1.8	55 / 45	80
Dixie Road					
- From Mayfield Rd. to Countryside Rd.	40000		4.7		
- From Countryside Rd. to Father Tobin Rd.	40000		3.7		
- From Father Tobin Rd to Octillo Blvd.	40000		8.7		
- From Octillo Blvd. to Sandalwood Pkwy.	40000		8.2		
- From Sandalwood Pkwy. to Springtown Tr.	40000		3.0		
- From Spring Trail to Peter Robertson Blvd.	40000		2.2		
- From Peter Robertson Blvd. to Bovaird Dr.	40000		3.6		
- From Bovaird Dr. to Northcliff St.	40000		3.4		
- From Northcliff St. to North Park Dr.	40000	85/15	2.3	55 / 45	60
- From North Park Dr. to Northampton St.	40000		2.1		
- From Northampton St. to Williams Pkwy.	40000		1.3		
- From Williams Pkwy. to Lascelles Blvd.	40000		2.5		
- From Lascelles Blvd. to Howden Blvd.	40000		2.4		
- From Howden Blvd. to Hazelwood Dr.	40000		2.1		
- From Hazelwood Dr. to Hillside Dr.	40000		2.0		
- From Hillside Dr. to Queen St. E	40000		3.0		
Mayfield Road					
- East of Dixie Road	50280	85/15	8.2	55 / 45	60
- West of Dixie Road	66390		5.6		
Countryside Rd.					
- East of Dixie Road	34290	90/10	0.9	45 / 55	60
- West of Dixie Road	29250		8.2		
Father Tobin Rd.					
- East of Dixie Road	13500	90/10	1.2	45 / 55	60
- West of Dixie Road	13500		0.0		
Octillo Blvd.					
- East of Dixie Road	13500	90/10	13	45 / 55	60
- West of Dixie Road	13500		0.0		
Sandalwood Pkwy.					
- East of Dixie Road	58650	90/10	1.0	45 / 55	60
- West of Dixie Road	64710		0.9		
Springtown Trail					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road	13500		1.5		
Peter Robertson Blvd.					
- East of Dixie Road	13500	90/10	1.5	45 / 55	60
- West of Dixie Road	13500		1.2		
Bovaird Dr.					
- East of Dixie Road	53190	85/15	3.9	55 / 45	60
- West of Dixie Road	51030		4.2		

Road	2031 AADT[1]	Day/Night Split [2]	Overall % Commercial Vehicles	Heavy / Medium Truck Split [3]	Posted Speed Limit (km/h)
Northcliff St.					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road	13500		2.4		
North Park Dr.					
- East of Dixie Road	13500	90/10	0.6	45 / 55	60
- West of Dixie Road	13500		1.1		
Northampton St.					
- East of Dixie Road	13500	90/10	1.5	45 / 55	60
- West of Dixie Road	13500		0.9		
Williams Pkwy.					
- East of Dixie Road	40000	90/10	1.0	45 / 55	60
- West of Dixie Road	40000		0.9		
Lascelles Blvd.					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road	13500		5.9		
Howden Blvd.					
- East of Dixie Road	13500	90/10	4.3	45 / 55	60
- West of Dixie Road	13500		4.5		
Hazelwood Dr.					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road	13500		0.0		
Hillside Dr					
- East of Dixie Road	13500	90/10	0.0	45 / 55	60
- West of Dixie Road	13500		1.5		
Queen St. E					
- East of Dixie Road	59010	85/15	7.1	55 / 45	60
- West of Dixie Road	63550		5.2		

Notes: [1] Higher of calculated Annual Average Daily Traffic (AADT) based on PM Peak traffic volume provided by AECOM and level 'C' service AADT as per Region's Guide.

[2] XX / YY is the percentage of vehicle traffic in the 16 daytime and 8 hour night-time respectively.

[3] HH / MM is the percentage of heavy trucks and medium trucks used in the analysis, respectively.

[4] Use 10 km/h over the posted speed limit for the traffic speed for the Town of Caledon; as per Development Standards, Policies and Guidelines Version 4, January 2009 (road traffic analysis used 90 km/h).

2.5 Noise Model Applied in the Assessment

Road traffic noise levels were modelled using a computerized spreadsheet model of the "Ontario Road Noise Analysis Method for Environmental Transportation (ORNAMENT)" algorithms (MOE 1989). The algorithms in this spreadsheet form the basis of the STAMSON v5.03 computer program produced by the MOE (MOE 1996). Results from the ORNAMENT calculations and STAMSON are approximately equivalent. Sound levels were predicted using the computerized spreadsheet for both the future "no-build" and future "build"

cases. The ORNAMENT (STAMSON) model was selected as road-receiver geometries and intervening terrain within the Area of Investigation are relatively "simple", and the potential for impacts (sound level increases greater than 5 dBA) to result from the proposed undertaking is small.

The following factors were taken into account in the analysis:

- Horizontal and vertical road-receiver geometry;
- Road gradients;
- Intervening terrain types (ground absorption);
- Traffic volumes and percentage of trucks;
- Vehicle speeds;
- Screening provided by terrain, houses and existing sound barriers.

Distances and receptor locations were obtained from plan drawings supplied by AECOM and aerial photographs.

Land use planning reports for all applicable subdivisions within the study area were provided by the Region of Peel and the City of Brampton. Traffic data for the project study area (including cross roads) were provided by AECOM. RWDI did not use the traffic parameters summarized in the land use studies. We have, however, compared the traffic parameters applied in our assessment, versus those applied in the land use studies. This comparison is provided in Appendix H.

There are minor variations in the parameters that were used in the current study and land use studies approved through the planning process. However, these variations do not warrant any change in the size, location or material of noise walls. This was confirmed by inputting the corresponding parameters from the land use studies into our model. Therefore, parameters used for analyzing noise impacts from the current study and the studies approved through the planning process are essentially the same. A memorandum was issued to the Region of Peel to this effect and is included in Appendix H.

2.5.1 Existing Noise Barriers

Contact was made with both the Region of Peel and the City of Brampton to obtain copies of all applicable land use planning reports for the subdivisions within the study area of this project. The intent of the report reviews was to verify if the fences within the study area were erected for noise mitigation or aesthetic purposes. Several land use planning reports were provided by hard copy to RWDI from AECOM. The residential developments in the reports were included in the analysis for this study. In addition to the reports, RWDI personnel conducted windshield surveys for verification of existing fences and noise barriers within the study area. Barrier heights and locations were recorded and were considered in the study. Existing noise barrier locations are shown in **Figures 1a to 1f** and the barrier heights are listed in **Appendix E**. The acoustical effects of the existing noise barriers have been considered in the analysis.

2.6 Determination of Potential Impacts

Under the Joint Protocol, the assessment of impact is conducted by comparing future "build' sound levels (with the project in place) versus future "no-build" sound levels. As discussed previously, future "no-build" traffic data are not available, and therefore, higher of existing traffic volumes and level "C" service traffic data have been used.

Table 7 presents a comparison of future "build" versus future "no-build" sound levels. Sample calculations can be found in **Appendix E**.

Table 7: Future Noise Levels With and Without the Undertaking - Unmitigated

Receptor Location	No. of NSAs Represented	Future "Build" L_{eq} (16h)	Future "No-Build" L_{eq} (16h)	Change [1] ("Build" – "No-Build")
NR1	1	66	61	5
NR2	6	60	55	5
NR3	300	57	55	2
NR4	13	57	55	2
NR5	329	53	51	2
NR6	91	50	48	2
NR7	155	53	52	1
NR8	17	41	39	2
NR9	7	56	55	1
NR10	219	59	56	2
NR11	101	57	56	2
NR12	6	62	60	2
NR13	135	57	55	2
NR14	74	62	60	2
NR15	6	64	62	2
NR16	270	62	61	2
NR17	6	66	65	2
NR18	230	72	67	4
NR19	1	63	62	2
NR20	6	65	61	3
NR21	5	62	59	3

Notes: – All sound levels are in dBA
– "Unmitigated" includes the effects of existing noise barriers.
[1] Discrepancies in values are due to rounding.

In keeping with MTO, Region of Peel and Town of Caledon requirements, impacts are also ranked in terms of increasing future build sound level (in **Table 8**).

Table 8: Ranking of Absolute Future Noise Levels - Unmitigated

Future Build Sound Level	Receptors in Category	Total No. of Affected NSAs
45 to < 50 dBA	NR8	17
50 to < 55 dBA	NR5 to NR7	575
55 to < 60 dBA	NR2 to NR4, NR9 to NR11, and NR13	781
60 to < 65 dBA	NR12, NR14 to NR16, NR19, and NR21	362
65 to < 70 dBA	NR1, NR17 and NR20	13
70 dBA or greater	NR18	230

Notes: – All sound levels are in dBA
– "Unmitigated" includes the effects of existing noise barriers.

Increasing change in sound level with affected NSAs is provided in **Table 9** as per MTO requirements.

Table 9: Ranking of Change in Sound Levels - Unmitigated

Future Build Sound Level		Receptors in Category	Total No. of Affected NSAs
Increase in Sound Level	> 15 dBA	--	--
	> 10 to 15 dBA	--	--
	> 5 to 10 dBA	NR1 and NR2	7
	0 to 5 dBA	NR3 to NR21	1971
Decrease in Sound Level	-5 to < 0 dBA	--	--
	-10 to < -5 dBA	--	--
	-15 to < -10 dBA	--	--
	> -15 dBA	--	--

Notes: – All sound levels are in dBA
– "Unmitigated" includes the effects of existing noise barriers.

The results show that representative NSA's NR1 and NR2 have potential changes in sound exposures resulting from the proposed project greater than 5 dB. The results also demonstrate that the representative NSA's NR1, NR12, and NR14 to NR21 have potential changes in sound level exposures, resulting from the proposed project, in a future "build" sound level to reach or exceed 60 dBA. In addition, the representative NSA's NR20 and NR21 have the potential to exceed 55 dBA for both the future "no build" and future "build" sound levels; as per the Town of Caledon's policy. As a result, under the Joint Protocol, the Region of Peel and Town of Caledon guidelines, investigation of noise mitigation is required.

2.7 Investigation of Noise Mitigation

Based on the projected increase in sound levels resulting from the project, an investigation of noise mitigation measures is required.

- Noise mitigation should be investigated within the right-of-way. Off- right-of-way noise mitigation measures such as window upgrades and air conditioning are not considered.
- Mitigation measures should achieve at least 5 dB of attenuation over the first row of

affected receivers or 3 dB of attenuation over the first row of affected receivers for upgrading existing measures.

- Mitigation should be implemented where administratively and technically feasible.

2.7.1 Potential Noise Mitigation Measures

Noise mitigation measures that in general can feasibly be implemented within the right-of-way include:

- Changes to vertical and horizontal alignments
- Changes to pavement surface types.
- Acoustical barriers (noise walls and berms)

Acoustic barriers (noise walls and berms) are the only feasible noise mitigation measure that can be implemented not within the right-of-way.

Horizontal and Vertical Alignments

Horizontal changes in alignment can result in increases or decreases in noise levels at noise sensitive receptors, through moving the roadway closer or farther away. However, the changes that result are limited, since the distance to the roadway must be doubled for a 3 to 5 dB decrease in noise level to result. For this particular project, the alignment is constrained by the location and width of the right-of-way, and the location of noise sensitive receptors. Changes to the horizontal alignment within the right-of-way will result in negligible changes in sound levels at NSAs and therefore this mitigation method has not been investigated further.

Vertical changes in alignment can affect noise at NSAs by affecting the line-of-sight between the roadway sources and the receiver. This affects ground attenuation and barrier effects of the surrounding topography. For example, placing the roadway at the bottom of a shallow in-cut can create a natural barrier effect at the edge of the excavation. However, this may create drainage issues or other issues with highway construction and maintenance. Paradoxically, elevated roadways located on embankments or structures may also have reduced noise levels, as the structure/berm can act as a noise barrier for ground level receptors, blocking

the line-of-sight for roadway lanes on the "far side" of the road from the receptor in question. For the project in question, changes in the vertical alignment are constrained by the existing roadway base course and structures, and therefore any changes in vertical profile that can be accommodated will result in negligible acoustical changes off-site. Therefore, this mitigation method has not been investigated further.

Pavement Type

For vehicles travelling at highway speeds, the majority of the noise produced is due to interactions between the tires and pavement surface. The type of pavement surface can therefore substantially affect off-site noise levels. The following table illustrates the relative sound levels produced by different pavement types and the relative cost per tonne for asphalt pavements (concrete pavement costs are subject to more variables in the design of the system).

Table 10: Noise Emission Level from Various Pavement Types (Relative to "Normal")

Pavement Type	Relative Sound Emission Level (dB)	Approximate Costs [1]
Grooved Concrete	+ 1 to + 4	Variable
Normal Dense-graded Friction Course (DFC)	0	$45 / tonne
Open-graded Friction Course (OFC)	- 2.5	$65 / tonne to $100 / tonne
Stone Mastic Asphalt (SMA)	- 2.5	$100 / tonne

Notes: [1] Relative costs based on 2004 noise reducing asphalt studies conducted by the Regional Municipality of Waterloo, and the University of Waterloo – Centre for Pavement and Transportation Technology.

Noise reducing asphalts may cost twice as much as conventional DFC mixes, and by themselves produce noise reductions of only 2.5 dB – half of the 5 dB minimum required for noise mitigation to be considered effective under the Environmental Guide for Noise. Other mitigation measures must therefore be employed in conjunction with noise-reducing pavements to meet the 5 dB requirements (e.g., barriers or alignment changes). As alignment changes have already been ruled out as an effective mitigation measure for this project, and noise barriers by themselves will produce the required 5 dB reduction in noise level, pavement type as a noise mitigation measure has not been investigated further.

Noise Barriers

Noise barriers reduce noise levels at protected receptors through blocking the path of sound waves emanating from the source towards the receiver, and by absorbing or reflecting the incident sound energy away. Therefore, a noise barrier must at least break the line-of-sight between the source (the roadway) and the receptor (the ground-level OLA of the NSA under investigation). Such a barrier will provide at least 5 dB of attenuation.

Noise barriers can be formed of earthen berms, engineered noise walls, or some combination of the two. Where earthen berms are used, side slopes of 3:1 should be used for drainage and erosion control and right-of-way maintenance. Where noise walls are to be used, they should be free of gaps and cracks, and have a minimum surface density (mass per unit of face area) of 20 kg/m^2 (4 lb/ft^2). It is preferable that barriers are absorptive at least on the roadway side, and this is mandatory in situations where parallel walls (e.g., walls on both sides of a roadway) are proposed. Noise walls typically cost around $500 per m^2 of face area ($2000 per running metre length for a 4.0 m high barrier).

Technical Feasibility

The MTO guide defines technical feasibility as "review the constructability of the noise barrier (i.e. design of wall, roadside safety, shadow effect, topography, achieve a 5 dB reduction, ability to provide continuous barrier, etc.).

Barrier Aesthetics

Noise wall colour and surface appearance and other aesthetic features must be considered in the detailed design. Landscaping, including planting of trees, shrubs and ground cover must be considered for noise berms and berm/wall combinations. The Town of Caledon will not allow the use of wood in noise control barriers and the barriers must be constructed of either concrete or vinyl panels.

2.7.2 Recommended Noise Mitigation Measures

Existing Berms/Barriers

There are eight (8) existing berms/barriers within the study area that will require replacement. These berms/barriers have structural issues or have gaps or cracks that need addressing as identified during RWDI's site visit on October 27, 2009. The locations of these berms/barriers are shown in **Figures 1a to 1f**, and have been included in RWDI's assessment of future "no-build" and future "build" conditions. Existing noise barriers needing replacements for noise effectiveness as a result of RWDI's site visit are shown in **Table 11**. These barriers will be replaced simultaneously.

Table 11: Existing Noise Barriers Needing Replacement

Existing Noise Barrier ID	Structural Condition of Barrier
E6	- large structural bracing on sections of barrier
E7	- structural bracing on sections of barrier - small section of barrier is falling over - small gaps between wood planks due to wood warping
E9	- structural bracing on sections of barrier - small section of barrier is leaning over - small gaps between wood planks due to wood warping
E10	- structural bracing on sections of barrier - small section of barrier is leaning over - small gaps between wood planks due to wood warping
E11	- structural bracing on sections of barrier - small section of barrier is leaning over - small gaps between wood planks due to wood warping
E13	- structural bracing on sections of barrier - small section of barrier is leaning over - large gaps at base and small gaps between wood planks due to wood warping
E14	- small section of barrier is leaning over - large gaps at base and small gaps between wood planks due to wood warping
E24	- gaps and knotholes

Proposed Barriers

Multiple individual barriers have been proposed in this study. Proposed noise barrier locations are shown in **Figures 1a to 1f.** Noise barrier characteristics and effectiveness are evaluated in **Table 12** below.

Table 12: Noise Barriers and Summary of Technical Feasibility

Barrier Name	Affected Modelled NSAs *	No of Affected Residences [1]	Average Reduction (dB)	Physical Barrier Height (m) [2]	Barrier Length (m)	Technically Feasible?
Bar1	NR1	1	--	--	--	No
Bar2a-e	NR2	6	--	--	--	No
Bar3	NR12	27	-6	2	410	Yes
	NR14					
Bar4	NR14	12	-7	2	255	Yes
Bar5	NR15	19	-5	2	440	Yes
	NR16					
Bar6	NR16	1	-5	2	135	No
Bar7	NR16	3	-5	2	175	No
Bar8	NR16	1	-5	2	100	Yes
Bar9	NR16	11	-5	2	280	Yes
Bar10	NR17	20	-8	2	240	Yes
	NR18					
Bar11	NR18	2	-8	2	120	Yes
Bar12	NR18	1	-8	2	75	Yes
Bar13	NR19	1	--	--	--	No
Bar20a-b	NR20	6	-5	2	900	No
Bar21a-c	NR21	5	-5	2	565	No

Notes: [1] The number of affected residences in the first of houses which will be protected by the noise barrier

[2] Physical barrier height of the noise wall excluding local terrain or berms. Physical barrier heights shown above may differ from "modelled" barrier heights used in the calculations (Appendix E) which accounted for road, terrain, and receiver conditions.

* Representative NSAs in analysis of different subgroups of receptors

Noise barriers are not expected to be technically feasible options for the following receptors:

- Bar1 – Single family home with a driveway facing Dixie Road;
- Bar2a-e – Homes with driveways facing Dixie Road;
- Bar6 – Single family home with a driveway facing Dixie Road;

- Bar7 – Single family home with a driveway facing Dixie Road;
- Bar13 – Church on the corner of Dixie Road and Queen Street East is a single receptor;
- Bar20a-b – Homes on Dixie Road north of Mayfield has driveways facing Dixie Road; and
- Bar21a-c – Homes on Dixie Road north of Mayfield have driveways facing Dixie Road.

The barriers listed in **Table 12** meet the criteria for technical feasibility with the exception of Bar1, Bar2a-e, Bar6, Bar7, Bar13, Bar20a-b, and Bar21a-c, as listed above. Noise wall selection and administrative feasibility need to be determined by the Region.

2.7.3 Mitigated Noise Levels

Predicted noise levels including the effects of mitigation are shown in **Table 13**.

Table 13: Future Noise Levels With and Without the Undertaking - Mitigated

Receptor Location	No. of NSAs Represented	Future "Build" L_{eq} (16h)	Future "No-Build" L_{eq} (16h)	Change [1] (Build – No-Build)
NR1	1	66	61	5
NR2	6	60	55	5
NR3	300	57	55	2
NR4	13	57	55	2
NR5	329	53	51	2
NR6	91	50	48	2
NR7	155	53	52	2
NR8	17	41	39	2
NR9	7	56	55	1
NR10	219	59	56	2
NR11	101	57	56	2
NR12	6	57	60	-4
NR13	135	57	55	2
NR14	74	56	60	-4
NR15	6	59	62	-3
NR16	270	57	61	-4
NR17	6	60	65	-5

Receptor Location	No. of NSAs Represented	Future "Build" L_{eq} (16h)	Future "No-Build" L_{eq} (16h)	Change [1] (Build – No-Build)
NR18	230	61	67	-6
NR19	1	63	62	2
NR20	6	65	61	3
NR21	5	62	59	3

Notes: – All sound levels are in dBA
– Highlighted cells are mitigated receptors
[1] Discrepancies in values are due to rounding

3. CONSTRUCTION NOISE IMPACTS

Construction noise impacts are temporary in nature, and largely unavoidable. With adequate controls, impacts can be minimized. However, for some periods of time and types of work, construction noise will be noticeable. This section of the report provides an evaluation of noise impacts from construction resulting from the undertaking, and discusses guideline and Code of Practice requirements to minimize impacts.

3.1 Construction Noise Guidelines

3.1.1 Local Noise Control By-laws

The proposed project lies within the following local jurisdictions:

- City Brampton
- Region of Peel
- Town of Caledon

There is no by-law restricting noise from construction activities in the Region of Peel and Town of Caledon. The City of Brampton noise by-law exempts construction noise from road improvements undertaken by or on behalf of MTO or Region of Peel. A copy of the by-laws can be found in **Appendix F**.

3.1.2 MOE Model Municipal Noise Control By-law

The MOE stipulate limits on noise emissions from individual items of equipment, rather than for overall construction noise. In the presence of persistent noise complaints, sound emission standards for the various types of construction equipment used on the project should be checked to ensure that they meet the specified limits contained in MOE Publication NPC-115 "Construction Equipment", as follows (MOE 1977b):

Table 14: NPC-115 Maximum Noise Emission Levels for Typical Construction Equipment

Type of Unit	Maximum Sound Level[1] (dBA)	Distance (m)	Power Rating (kW)
Excavation Equipment[2]	83	15	Less than 75 kW
	85	15	75 kW or Greater
Pneumatic Equipment[3]	85	7	-
Portable Compressors	76	7	-

Notes: [1] Maximum permissible sound levels presented here are for equipment manufactured after Jan. 1, 1981.
[2] Excavation equipment includes bulldozers, backhoes, front end loaders, graders, excavators, steam rollers and other equipment capable of being used for similar applications.
[3] Pneumatic equipment includes pavement breakers.

3.2 Anticipated Construction Activities

The following construction activities are anticipated as part of this project:

- Removing existing surface pavements
- Construction and rehabilitation of the base course
- Addition of new lane(s)
- Paving (and repaving) of the roadway surface

3.3 Anticipated Construction Noise Levels

Construction activities will vary temporally and spatially as the project progresses. Noise levels from construction at a given receptor location will also vary over time as different activities take place, and as those activities change location within the right-of-way.

At this time, detailed construction noise plans are not available. An analysis of potential worst-case construction noise levels has been conducted based on generic data (equipment types and activities). The analysis, including anticipated construction sound levels, is described in **Appendix G**.

3.4 Construction Code of Practice Requirements (Mitigation)

To minimize the potential for construction noise impacts, it is recommended that provisions be written into the contract documentation for the contractor, as outlined below:

- Construction should be limited to the time periods (0600h to 1900h Monday to Saturday and 1000h to 1700h Sundays);
- There should be explicit indication that Contractors are expected to comply with all applicable requirements of the contract and local noise by-laws. Enforcement of noise control by-laws is the responsibility of the Municipality for all work done by Contractors.
- All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order.
- The Contract documents should contain a provision that any initial noise complaint will trigger verification that the general noise control measures agreed to be in effect.
- In the presence of persistent noise complaints, all construction equipment should be verified to comply with MOE NPC-115 guidelines, as outlined in Section 3.
- In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration should be given to the technical and administrative feasibility of the various alternatives.

4. CONCLUSIONS AND RECOMMENDATIONS

The potential environmental noise impacts of the Dixie Road Widening have been assessed. Both operational and construction noise impacts have been considered. The following conclusions and recommendations result:

Unmitigated changes in sound levels at some noise sensitive receptors, resulting from the Dixie Road Widening Project, are greater than 5 dB and are equal to or exceed 55 and/or 60 dBA. Additional noise mitigation at these locations has been investigated, in accordance with MTO/MOE Joint Protocol, Region of Peel, and the Town of Caledon guidelines. Proposed noise mitigation measures, in the form of noise walls, are shown in **Figures 1a to 1f** and discussed in **Section 2.7.2**. It is recommended the existing berms/barriers that were identified with deficiencies in **Figures 1a to 1f**, be replaced.

Noise barrier heights, location, extents, and aesthetic features should be further reviewed during Detail Design, to ensure that the barriers are adequate acoustically and meet MOE's requirements.

Construction noise impacts are temporary in nature but will be noticeable at times at residential NSAs. Methods to minimize construction noise impacts should be included in the Construction Code of Practice, as outlined in the text.

5. REFERENCES

International Organization for Standardization (ISO), 1996, International Standard ISO 9613-2:1996, *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*

International Organization for Standardization (ISO), 2003, International Standard ISO 1996-1:2003, *Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures*, adopted by the Canadian Standards Association (CSA) and National Standard of Canada CAN/CSA-ISO 1996-1:05

Ontario Ministry of the Environment (MOE), 1977a, *Model Municipal Noise Control By-law,* which includes Publication NPC-103 – Procedures

Ontario Ministry of the Environment (MOE), 1977b, *Model Municipal Noise Control By-law,* which includes Publication NPC-115 – Construction Equipment

Ontario Ministry of the Environment (MOE), 1989, *Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT)*

Ontario Ministry of the Environment (MOE), 1995a, Publication NPC-233, *Information to be Submitted for Approval of Stationary Sources of Sound*

Ontario Ministry of the Environment (MOE), 1995b, Publication NPC-205, *Sound Level Limits for Stationary Sources in Class 1&2 Areas (Urban)*

Ontario Ministry of the Environment (MOE), 1996, STAMSON v5.03: Road, Rail and Rapid Transit Noise Prediction Model

Ontario Ministry of the Environment (MOE) / Ontario Ministry of Transportation (MTO), 1986, "Joint Protocol", *A Protocol for Dealing with Noise concerns during the Preparation, Review and Evaluation of Provincial Highway's Environmental Assessments*

Ontario Ministry of Transportation (MTO), 1992a, Quality and Standards Directive QST-A1, *Noise Policy and Acoustic Standards for Provincial Highways*

Ontario Ministry of Transportation (MTO), 1992b, *Environmental Office Manual Technical Areas – Noise*, EO-V-1000-00

Ontario Ministry of Transportation (MTO), 2009, *Environmental Reference for Highway Design*

Ontario Ministry of Transportation (MTO), 2003, Ontario Provincial Standard Specification OPSS 120: *General Specification for the Use of Explosives*

Ontario Ministry of Transportation (MTO), 2006, *Environmental Guide for Noise* Version 1.1 July 2008

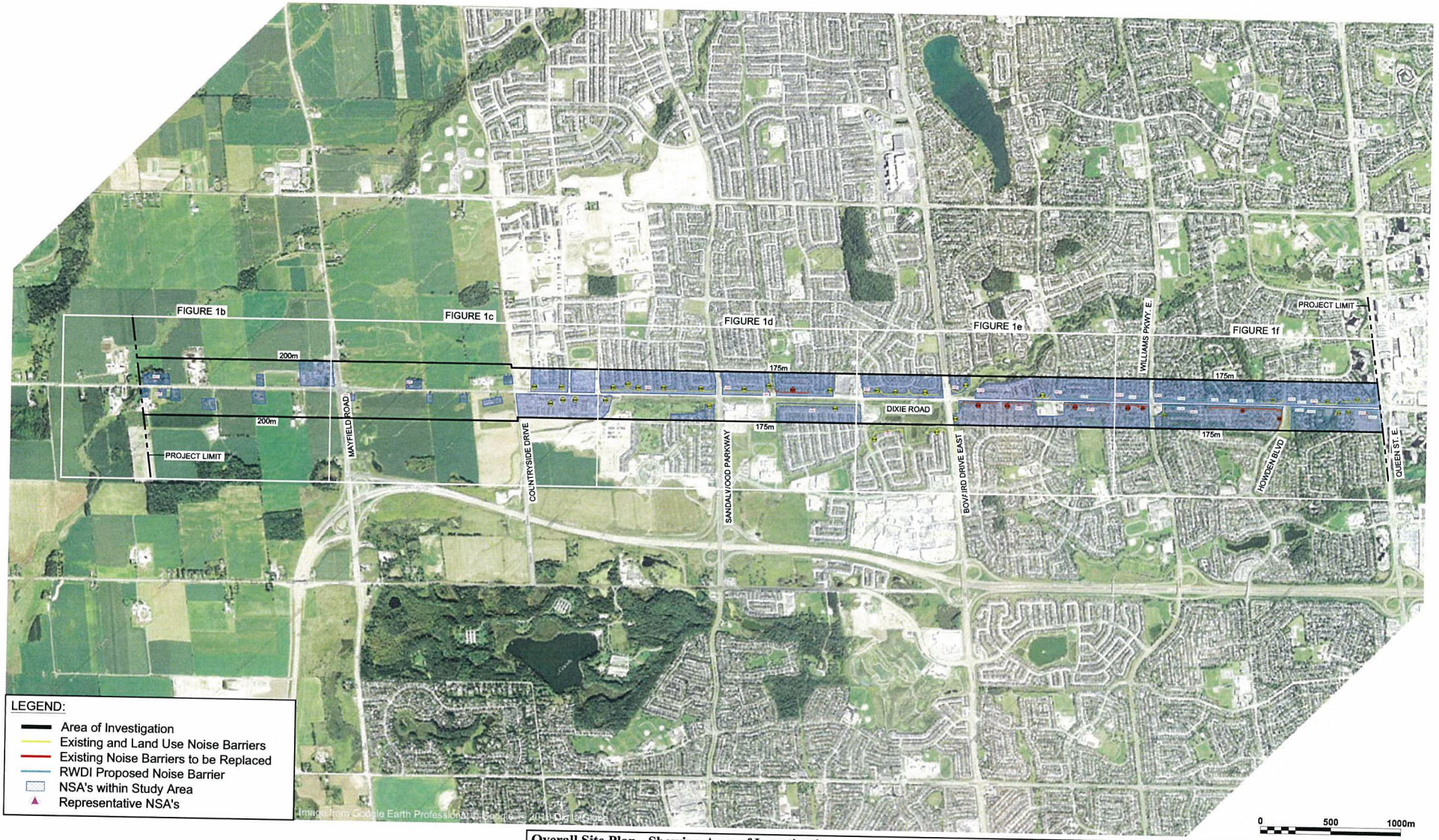
U.S. Department of Transportation – Federal Highway Administration (FHWA), 1982, Traffic Noise Prediction Model, 1978, and STAMINA v2.0 / OPTIMA, 1982 software

Region of Peel, *General Guidelines for the Preparation of Acoustical Reports in the Region of Peel*, December 2002

Region of Peel, *Corporate Policy Manual – Noise Attenuation Barriers*, W30-04, June 1996

Town of Caledon, *Development Standards, Policies and Guidelines* Version 4, January 2009

FIGURES



Overall Site Plan - Showing Area of Investigation
1.4 km North of Mayfield Road to Queen Street East

Dixie Rd Widening EA - Peel Region, Ontario

True North

Project #0925103

Drawn by: NTN	Figure: 1a
Approx. Scale:	1:25 000
Date Revised:	May 17, 2011

RWDI

LEGEND:

- Area of Investigation
- Existing and Land Use Noise Barriers
- Existing Noise Barriers to be Replaced
- RWDI Proposed Noise Barrier
- NSA's within Study Area
- Representative NSA's

Partial Site Plan - Showing Location of Noise Barriers, Noise Sensitive Areas and Representative NSA's

2 km North of Mayfield Road to Mayfield Road

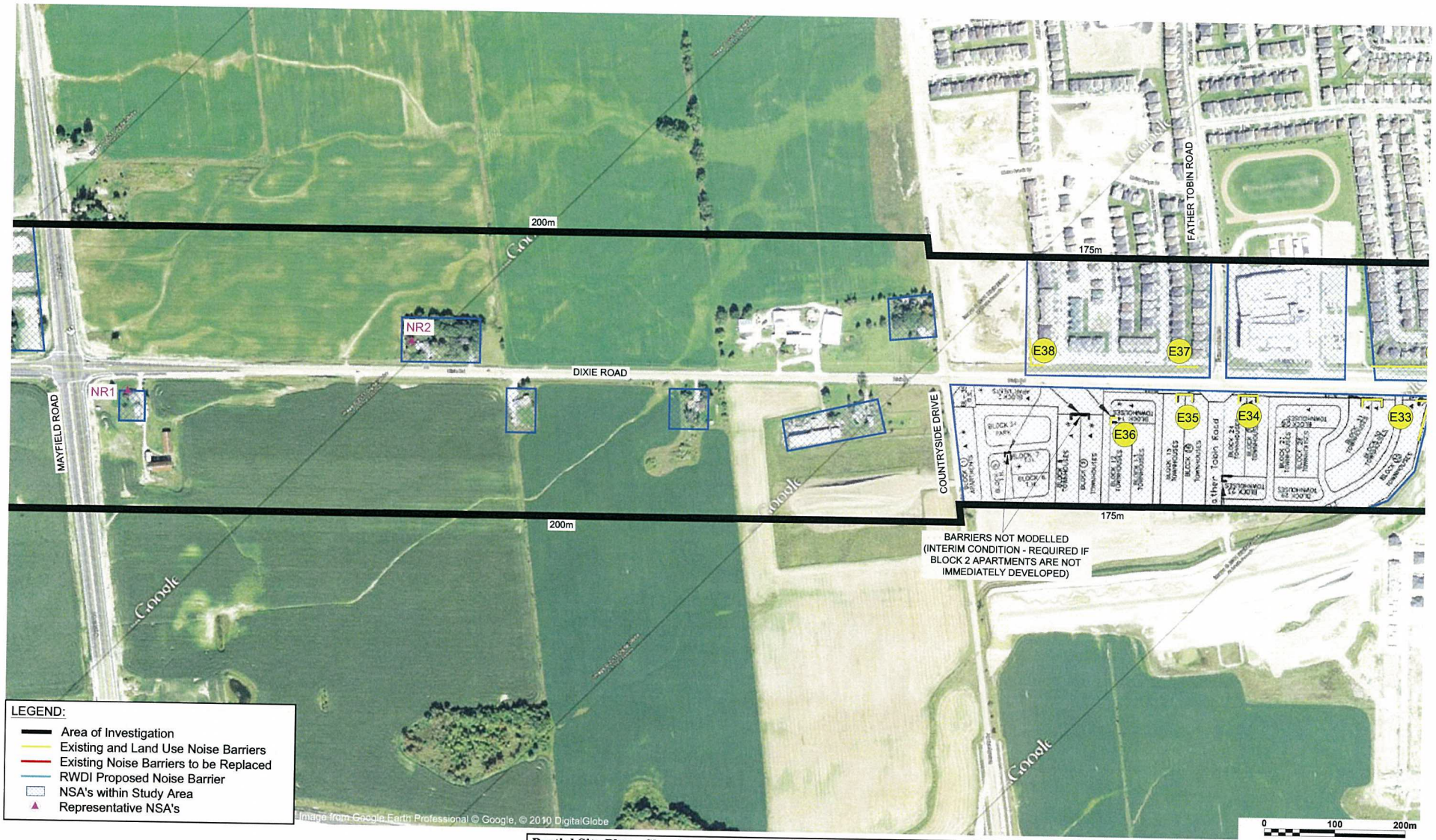
Dixie Rd Widening EA - Peel Region, Ontario

True North

Project #0925103

Drawn by: NTN	Figure: 1b
Approx. Scale:	1:5000
Date Revised:	May 17, 2011

RWDI



Partial Site Plan - Showing Location of Noise Barriers, Noise Sensitive Areas and Representative NSA's

Mayfield Road to Father Tobin Road

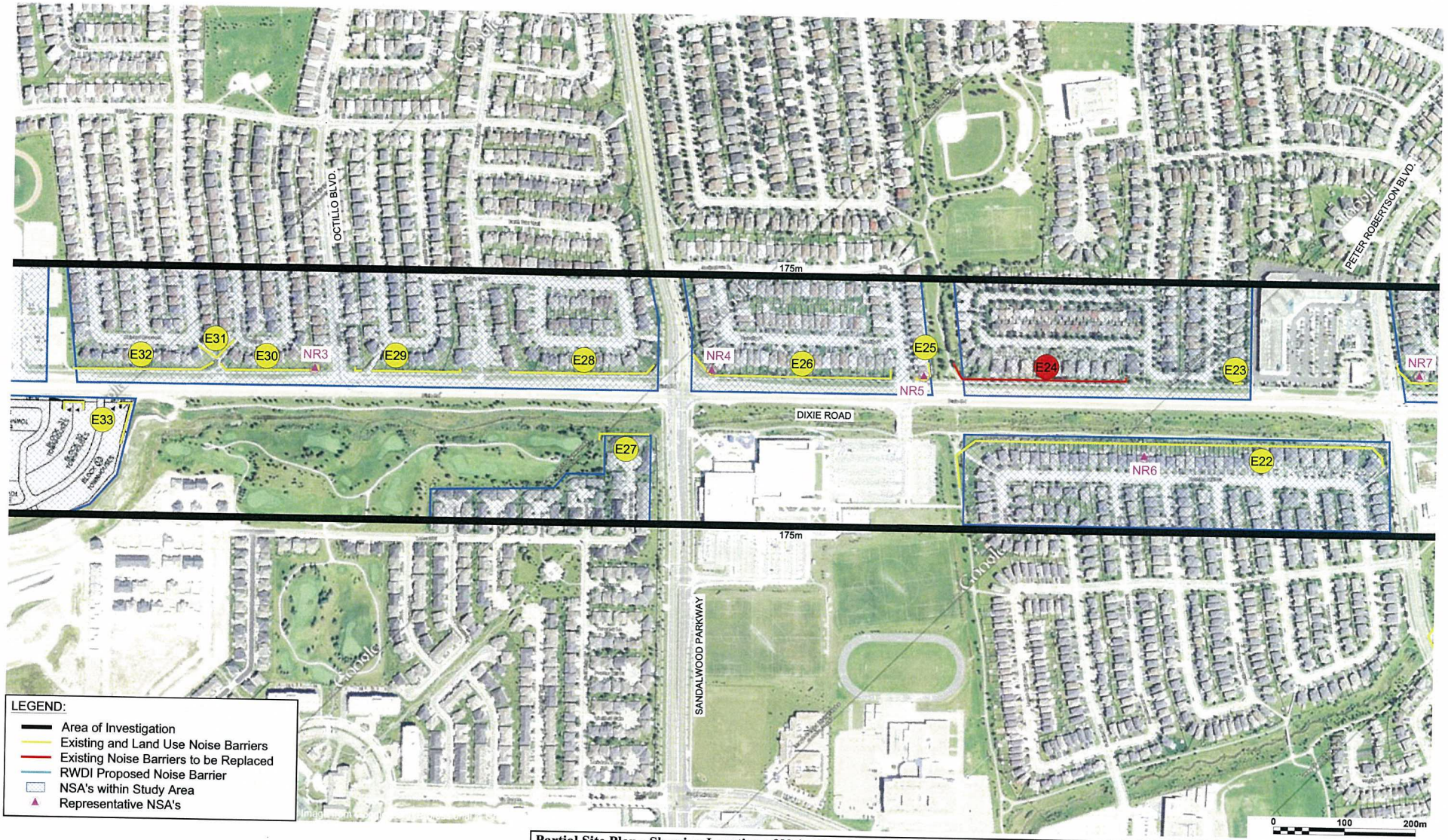
Dixie Rd Widening EA - Peel Region, Ontario

True North

Project #0925103

Drawn by: NTN	Figure: 1c
Approx. Scale:	1:5000
Date Revised:	May 17, 2011

RWDI



Partial Site Plan - Showing Location of Noise Barriers, Noise Sensitive Areas and Representative NSA's

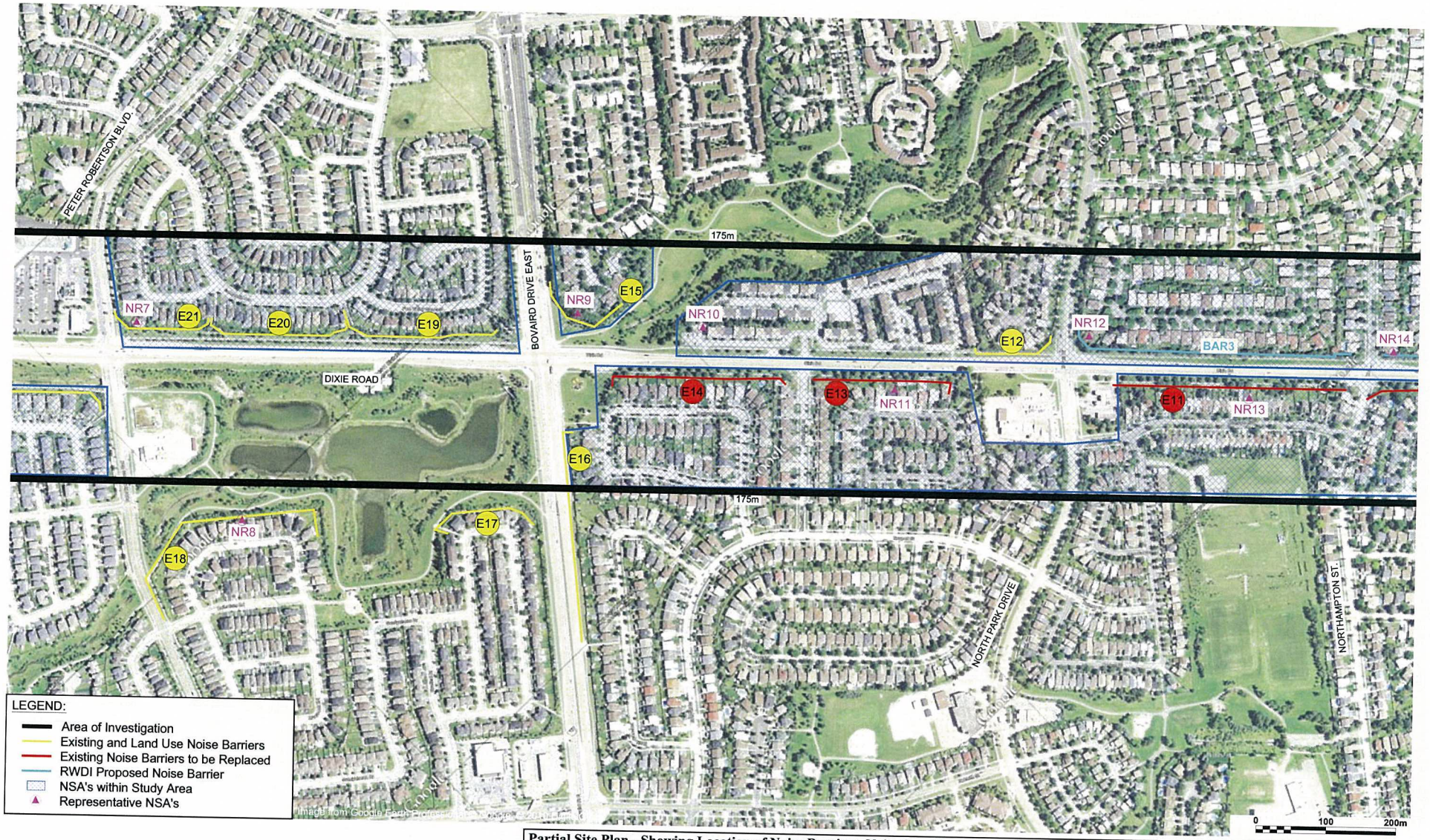
Father Tobin Road to Peter Robertson Boulevard

Dixie Rd Widening EA - Peel Region, Ontario

True North

Project #0925103

Drawn by: NTN	Figure: 1d	RWDI
Approx. Scale:	1:5000	
Date Revised: May 17, 2011		



Partial Site Plan - Showing Location of Noise Barriers, Noise Sensitive Areas and Representative NSA's

Peter Robertson Boulevard to Northampton Street

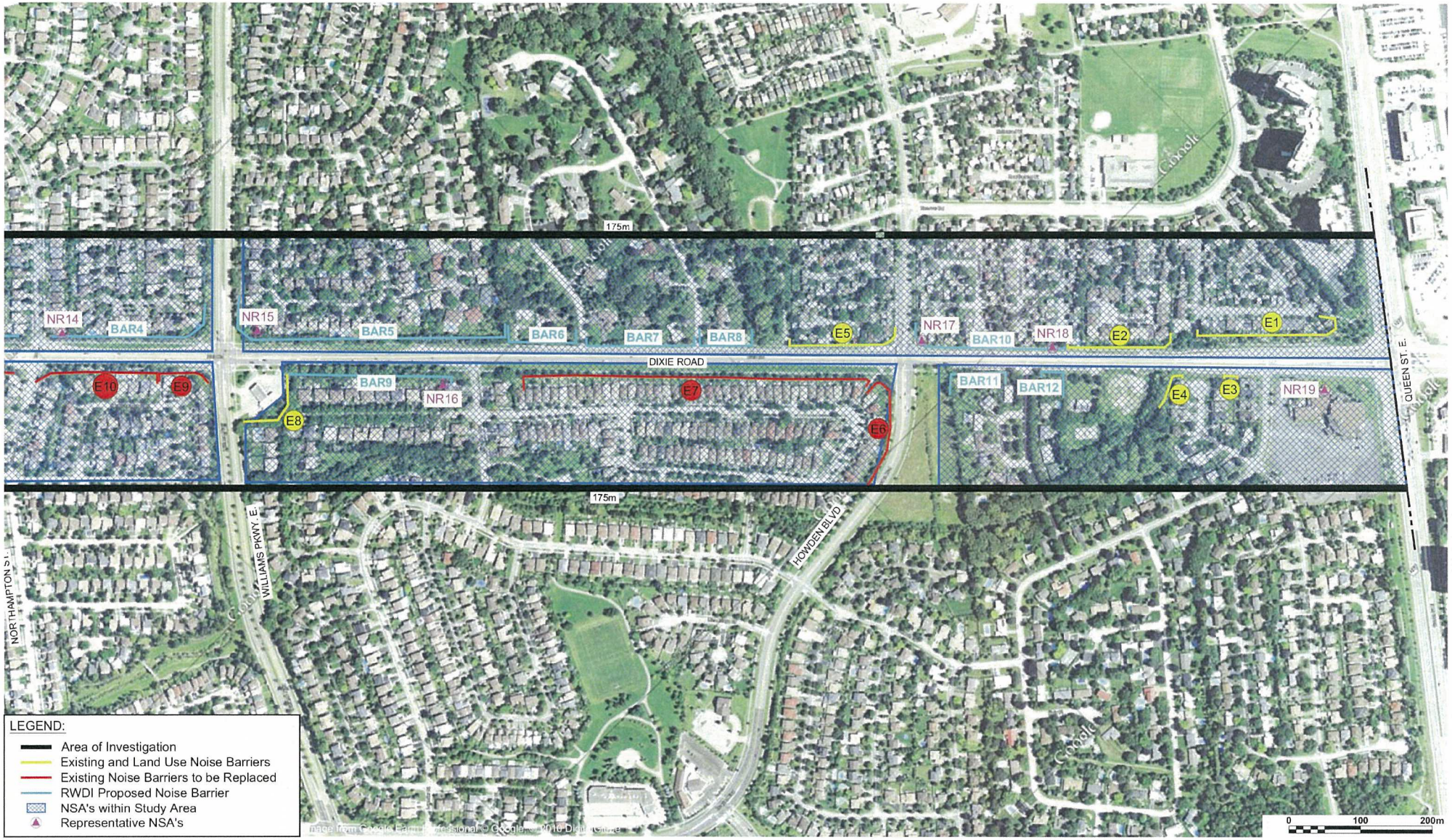
Dixie Rd Widening EA - Peel Region, Ontario

Project #0925103

True North

Drawn by: NTN	Figure: 1e
Approx. Scale:	1:5000
Date Revised:	May 17, 2011

RWDI



Partial Site Plan - Showing Location of Noise Barriers, Noise Sensitive Areas and Representative NSA's

Northampton Street to Queen Street East

Dixie Rd Widening EA - Peel Region, Ontario

Project #0925103

True North

Drawn by: NTN	Figure: 1f
Approx. Scale:	1:5000
Date Revised:	May 17, 2011

RWDI

APPENDIX A

COMMONLY USED NOISE TERMINOLOGY [1]

Airborne Sound*: Sound that reaches the point of interest by propagation through air.

Ambient or Background Noise: The ambient noise from all sources other than the sound of interest (i.e. sound other than that being measured). Under most MOE guidelines, aircraft overflights and train noise, due to their transient nature, are normally excluded from measurements of background noise.

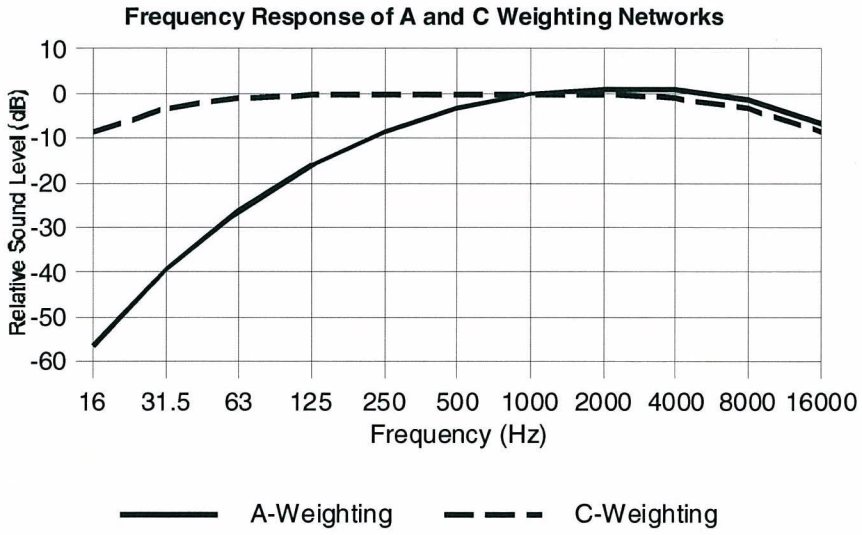
Articulation Index (AI)*: A numerically calculated measure of the intelligibility of transmitted or processed speech. It takes into account the limitations of the transmission path and the background noise. The articulation index can range in magnitude between 0 and 1.0. If the AI is less than 0.1, speech intelligibility is generally low. If it is above 0.6, speech intelligibility is generally high.

Attenuation*: The reduction of sound intensity by various means (e.g., air, humidity, porous materials, etc.).

dB - Decibel: The logarithmic units associated with sound pressure level, sound power level, or acceleration level. See sound pressure level, for example.

dBA - Decibel, A-Weighted: The logarithmic units associated with a sound pressure level, where the sound pressure signal has been filtered using a frequency weighting that mimics the response of the human ear to quiet sound levels. The resultant sound pressure level is therefore representative of the subjective response of the human ear. A-weighted sound pressure levels are denoted by the suffix 'A' (ie. dBA), and the term pressure is normally omitted from the description (i.e., sound level or noise level).

dBC - Decibel, C-Weighted: The logarithmic units associated with a sound pressure level, where the



sound pressure signal has been filtered using a frequency weighting that mimics the response of the human ear to loud sound levels. C-weighted sound pressure levels are denoted by the suffix 'C' (ie.

[1] 1. Definitions with a "*" marker originally from "Noise Control Terms Made Somewhat Easier", by David Kelso (Minnesota Pollution Control Agency), and Al Perez (Northern Sound), Minneapolis, Minnesota May, 1983, as modified on the Noise Pollution Clearinghouse website www.nonoise.org.

dBC). C-weighted levels are often used in low-frequency noise analysis, as the filtering effect is nearly flat at lower frequencies.

dBL or dBLin - Decibel, Linear: The logarithmic units associated with a sound pressure level, where the sound pressure signal is unfiltered, and represents the full spectrum of incoming noise.

Calibrator (Acoustical)*: A device which produces a known sound pressure on the microphone of a sound level measurement system, and is used to adjust the system to standard specifications.

Directivity Factor (Q) (also, **Directional** or **Directionality Factor):** A factor mathematically related to Directivity Index, used in calculating propagated sound levels to account for the effect of reflecting surfaces near to the source. For example, for a source in free space where the sound is radiating spherically, Q = 1. For a source located on or very near to a surface (such as the ground, a wall, rooftop, etc.), where the sound is radiating hemispherically, Q = 2. This accounts for the additional sound energy reflecting off the surface, and translates into a +3 dB add.

Directivity Index*: In a given direction from a sound source, the difference in decibels between (a) the sound pressure level produced by the source in that direction, and (b) the space-average sound pressure level of that source, measured at the same distance.

Effective Perceived Noise Level (EPNdB): A complex measure of perceived noisiness derived by making adjustments to the magnitude of measured sound levels in narrow frequency bands (1/3 octaves) for tonality and rise time of the noise. EPNdB values are the base measure of an individual overflight noise exposure from aircraft under the NEF metric, analogous to the manner in which SEL is used for computing $L_{eq}(24)$.

Energy Equivalent Sound Level (L_{eq}): An energy-average sound level taken over a specified period of time. It represents the average sound pressure encountered for the period. The time period is often added as a suffix to the label (i.e., $L_{eq}(24)$ for the 24-hour equivalent sound level). L_{eq} is usually A-weighted. An L_{eq} value expressed in dBA is a good, single value descriptor of the annoyance of noise.

Exceedance Noise Level (L_N): The noise level exceeded N% of the time. It is a statistical measure of the noise level. For highly varying sounds, the L_{90} represents the background noise level, L_{50} represents the median or typical noise level, and L_{10} represents the short term peak noise levels, such as those due to occasional traffic or a barking dog.

Far Field*: Describes a region in free space where the sound pressure level from a source obeys the inverse-square law (the sound pressure level decreases 6 dB with each doubling of distance from the source). Also, in this region the sound particle velocity is in phase with the sound pressure. Closer to the source where these two conditions do not hold constitutes the "near field" region.

Free Sound Field (Free Field)*: A sound field in which the effects of obstacles or boundaries on sound propagated in that field are negligible.

Frequency*: The number of times per second that the sine wave of sound or of a vibrating object repeats itself. Now expressed in hertz (Hz), formerly in cycles per second (cps).

Hertz (Hz)*: Unit of measurement of frequency, numerically equal to cycles per second.

Human Perception of Sound: The human perception of noise impact is an important consideration in qualifying the noise effects caused by projects. The following table presents a general guideline.

Increase in Noise Level (dBA)	Perception
1 to 3	insignificant due to imperceptibility
4 to 5	just-noticeable difference
6 to 9	marginally significant
10 or more	significant, perceived as a doubling of sound exposure

Impact Insulation Class (IC)*: A single-figure rating that compares the impact sound insulating capabilities of floor-ceiling assemblies to a reference contour.

Impact Sound*: The sound produced by the collision of two solid objects, e.g., footsteps, dropped objects, etc., on an interior surface (wall, floor, or ceiling) of a building. Typical industrial sources include punch presses, forging hammers, etc.

Impulsive Noise*: a) Single or multiple sound pressure peak(s) (with either a rise time less than 200 milliseconds or total duration less than 200 milliseconds) spaced at least by 500 millisecond pauses, b) A sharp sound pressure peak occurring in a short interval of time.

Infrasonic*: Sounds of a frequency lower than 20 hertz.

Insertion Loss (IL): The arithmetic difference between the sound level from a source before and after the installation of a noise mitigation measure, at the same location. Insertion loss is typically presented as a positive number, i.e., the post-mitigation sound level is lower than the pre-mitigation level. Insertion loss is expressed in dB and is usually specified per 1/1 octave band, per 1/3 octave band, or overall.

Intensity*: The sound energy flow through a unit area in a unit time.

Low Frequency Noise (LFN): Noise in the low frequency range, from infrasonic sounds (<20 Hz) up to 100 Hz.

Masking*: a) The process by which the threshold of audibility for a sound is raised by the presence of another (masking) sound, or b) The amount by which the threshold of audibility of a sound is raised by the presence of another (masking) sound.

Near Field*: The sound field very near to a source, where sound pressure does not obey the inverse-square law and the particle velocity is not in phase with the sound pressure.

Noise: Unwanted sound.

Noise Criteria (NC) Curves: A single number rating for noise in 1/1-octave frequency bands which is sensitive to the relative loudness and speech interference properties of a given sound spectrum. The method consists of a family of criteria curves extending from 63 Hz to 8000 Hz, and a tangency rating procedure. Oringinally proposed by Bernanek in 1957. While other more modern criteria curve rating schemes exist (NCB, RC, RC Mark II, RNC, etc.), NC curves are still widely used in determining acceptability of noise levels within spaces. Level of NC 25 to NC 35 are usually considered acceptable for residences, private offices, and schools.

Noise Isolation Class (NIC)*: A single number rating derived in a prescribed manner from the measured values of noise reduction between two areas or rooms. It provides an evaluation of the sound isolation between two enclosed spaces that are acoustically connected by one or more paths.

Noise Reduction (NR)*: The numerical difference, in decibels, of the average sound pressure levels in two areas or rooms. A measurement of "noise reduction" combines the effect of the sound transmission loss performance of structures separating the two areas or rooms, plus the effect of acoustic absorption present in the receiving room.

Noise Reduction Coefficient (NRC)*: A measure of the acoustical absorption performance of a material, calculated by averaging its sound absorption coefficients at 250, 500, 1000 and 2000 Hz, expressed to the nearest multiple of 0.05.

Noise Level: Same as Sound Level, except applied to unwanted sounds.

Noise Exposure Forecast (NEF): A calculated measure of aircraft noise based on the type of aircraft in use, the take-off and landing patterns of the aircraft, and times of operation. It represents the noise exposure over a typical 24 hour period. A penalty is applied to nighttime operation.

Peak Sound Pressure Level: Same as Sound Pressure Level except that peak (not peak-to-peak) sound pressure values are used in place of RMS pressures.

Quasi-Steady Impulsive Noise: Noise composed of a series of short, discrete events, characterized by rapid rise times, but with less than 0.5 seconds elapsing between events.

RMS Sound Pressure: The square-root of the mean-squared pressure of a sound (usually the result of an RMS detector on a microphone signal).

Reverberant Field*: The region in a room where the reflected sound dominates, as opposed to the region close to the noise source where the direct sound dominates.

Reverberation*: The persistence of sound in an enclosed space, as a result of multiple reflections, after the sound source has stopped.

Reverberation Time (RT)*: The reverberation time of a room is the time taken for the sound pressure level to decrease 60 dB from its steady-state value when the source of sound energy is suddenly interrupted. It is a measure of the persistence of an impulsive sound in a room as well as of the amount of acoustical absorption present inside the room. Rooms with long reverberation times are called live rooms.

Sabin*: A measure of the sound absorption of a surface; it is the equivalent of one square metre of a perfectly absorptive surface (or one square foot in imperial units).

Sound: a dynamic (fluctuating) pressure.

Sound Exposure Level (SEL): An L_{eq} referenced to a one second duration. Also known as the Single Event Level. It is a measure of the cumulative noise exposure for a single event. It provides a measure of the accumulation of sound energy over the duration of the event.

Sound Level (SL): The A-weighted Sound Pressure Level expressed in dBA.

Sound Level Meter*: An instrument comprised of a microphone, amplifier, output meter, and frequency-weighting networks which is used for the measurement of noise and sound levels.

Sound Pressure Level (SPL): The logarithmic ratio of the RMS sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is defined by equation (1) where P is the RMS pressure due to a sound and P_0 is the reference pressure. P_0 is usually taken as 2.0×10^{-5} Pascals.

$$\textbf{(1)} \quad \text{SPL (dB)} = 20 \log(P_{RMS}/P_0)$$

Sound Power Level (PWL): The logarithmic ratio of the instantaneous sound power (energy) of a noise source to that of an international standard reference power. The sound power level is defined by equation (2) where W is the sound power of the source in watts, and W_0 is the reference power of 10^{-12} watts.

$$\textbf{(2)} \quad \text{PWL (dB)} = 10 \log(W/W_0)$$

Interrelationships between sound pressure level (SPL) and sound power level (PWL) depend on the location and type of source.

Sound Transmission Class (STC)*: The preferred single figure rating system designed to give an estimate of the sound insulation properties of a structure or a rank ordering of a series of structures.

Sound Transmission Loss (STL)*: A measure of sound insulation provided by a structural configuration. Expressed in decibels, it is 10 times the logarithm to the base 10 of the reciprocal of the sound transmission coefficient of the configuration.

Spectrum*: The description of a sound wave's resolution into its components of frequency and amplitude.

Speech Interference Level (SIL)*: A calculated quantity providing a guide to the interference of a noise with the reception of speech. The speech-interference level is the arithmetic average of the octave band levels of the interfering noise in the most important part of the speech frequency range. The levels in octave bands centered at 500, 1000, and 2000 Hz are commonly averaged to determine the speech-interference level.

Speed (Velocity) of Sound in Air*: 344 m/s (1128 ft/s) at 70°F (21°C) in air at sea level.

Threshold of Audibility (Threshold of Detectability)*: The minimum sound pressure level at which a person can hear a specified frequency of sound over a specified number of trials.

Transmission Loss: A measure of the reduction in sound energy resulting from incident sound waves striking a wall, partition or enclosure, and radiating through to the other side. Mathematically, the transmission coefficient τ is the ratio of transmitted acoustic power to the incident acoustic power, and in decibels, the Transmission Loss (TL) of the wall is:

$$\textbf{(3)} \quad \text{TL} = 10 \log (1 / \tau)$$

The TL of a wall varies by frequency. The associated noise reduction (NR) due to the TL of the wall is a function of the TL and the acoustical parameters of the receiving space. For noise radiating from an enclosure into the outdoors, NR≈(TL + 6).

APPENDIX B

Area of Influence Estimate (Based on ORNAMENT)

Job No. 0925103A
Job Name Dixie Road Widening - from Queen St. E. to Countryside Dr.

Area Class: 2
Ambient: 50 dBA

STEPS

<< 1. Enter MOE Area Classification per NPC-205
<< 2. Resulting assumed Future Ambient per draft MTO Environmental Noise Guide
This value may be changed based on future modelling or measurements of existing

3. Fill in Time period (24h pr 16 h), and traffic volume on the main Project roadway
4. Fill in Road Traffic Data and speeds for Future BUILD conditions
5. Change ground type if applicable

Area of Influence is estimated as the closest setback distance where noise from the future build roadway = future ambient + 5dB
This represents a 5 dB change from future ambient conditions.

ROAD CHARACTERISTICS

Time Period	Number of Vehicles			Speed (km/h)	Road Gradient (%)	Two Way? (y/n)	Pavement Type	Source-Receiver Distance (m)	Ground Type	Topo-graphy Type	**Total Segment L_{eq} (dBA)**
	Autos	Medium	Heavy								
16	31028	1337	1634	60	0	y	1	600.0	2	A	45.3
16	31028	1337	1634	60	0	y	1	550.0	2	A	46.0
16	31028	1337	1634	60	0	y	1	500.0	2	A	46.7
16	31028	1337	1634	60	0	y	1	450.0	2	A	47.4
16	31028	1337	1634	60	0	y	1	400.0	2	A	48.3
16	31028	1337	1634	60	0	y	1	350.0	2	A	49.2
16	31028	1337	1634	60	0	y	1	300.0	2	A	50.3
16	31028	1337	1634	60	0	y	1	275.0	2	A	51.0
16	31028	1337	1634	60	0	y	1	250.0	2	A	51.7
16	31028	1337	1634	60	0	y	1	225.0	2	A	52.4
16	31028	1337	1634	60	0	y	1	200.0	2	A	53.3
16	31028	1337	1634	60	0	y	1	175.0	2	A	54.2
16	31028	1337	1634	60	0	y	1	150.0	2	A	55.3
16	31028	1337	1634	60	0	y	1	130.0	2	A	56.4
16	31028	1337	1634	60	0	y	1	115.0	2	A	57.3
16	31028	1337	1634	60	0	y	1	100.0	2	A	58.3
16	31028	1337	1634	60	0	y	1	90.0	2	A	59.0
16	31028	1337	1634	60	0	y	1	80.0	2	A	59.9
16	31028	1337	1634	60	0	y	1	70.0	2	A	60.8
16	31028	1337	1634	60	0	y	1	60.0	2	A	61.9
16	31028	1337	1634	60	0	y	1	50.0	2	A	63.3
16	31028	1337	1634	60	0	y	1	40.0	2	A	64.9
16	31028	1337	1634	60	0	y	1	30.0	2	A	66.9

Area of Influence = 175 m
(Either side of roadway)

<< RESULTING AREA OF INFLUENCE ON EACH SIDE OF ROAD

Area of Influence Estimate (Based on ORNAMENT)

Job No. 0925103A
Job Name Dixie Road Widening - from Countryside Dr. to 1.4 km North of Mayfield Rd.

Area Class: 2
Ambient: 50 dBA

STEPS

<< 1. Enter MOE Area Classification per NPC-205
<< 2. Resulting assumed Future Ambient per draft MTO Environmental Noise Guide
This value may be changed based on future modelling or measurements of existing

3. Fill in Time period (24h pr 16 h), and traffic volume on the main Project roadway
4. Fill in Road Traffic Data and speeds for Future BUILD conditions
5. Change ground type if applicable

Area of Influence is estimated as the closest setback distance where noise from the future build roadway = future ambient + 5dB
This represents a 5 dB change from future ambient conditions.

ROAD CHARACTERISTICS

Time Period	Number of Vehicles			Speed (km/h)	Road Gradient (%)	Two Way? (y/n)	Pavement Type	Source-Receiver Distance (m)	Ground Type	Topo-graphy Type	**Total Segment L_{eq} (dBA)**
	Autos	Medium	Heavy								
16	32417	712	871	80	0	y	1	600.0	2	A	46.2
16	32417	712	871	80	0	y	1	550.0	2	A	46.8
16	32417	712	871	80	0	y	1	500.0	2	A	47.5
16	32417	712	871	80	0	y	1	450.0	2	A	48.3
16	32417	712	871	80	0	y	1	400.0	2	A	49.1
16	32417	712	871	80	0	y	1	350.0	2	A	50.1
16	32417	712	871	80	0	y	1	300.0	2	A	51.2
16	32417	712	871	80	0	y	1	275.0	2	A	51.8
16	32417	712	871	80	0	y	1	250.0	2	A	52.5
16	32417	712	871	80	0	y	1	225.0	2	A	53.3
16	32417	712	871	80	0	y	1	200.0	2	A	54.1
16	32417	712	871	80	0	y	1	175.0	2	A	55.1
16	32417	712	871	80	0	y	1	150.0	2	A	56.2
16	32417	712	871	80	0	y	1	130.0	2	A	57.2
16	32417	712	871	80	0	y	1	115.0	2	A	58.1
16	32417	712	871	80	0	y	1	100.0	2	A	59.1
16	32417	712	871	80	0	y	1	90.0	2	A	59.9
16	32417	712	871	80	0	y	1	80.0	2	A	60.7
16	32417	712	871	80	0	y	1	70.0	2	A	61.7
16	32417	712	871	80	0	y	1	60.0	2	A	62.8
16	32417	712	871	80	0	y	1	50.0	2	A	64.1
16	32417	712	871	80	0	y	1	40.0	2	A	65.7
16	32417	712	871	80	0	y	1	30.0	2	A	67.8

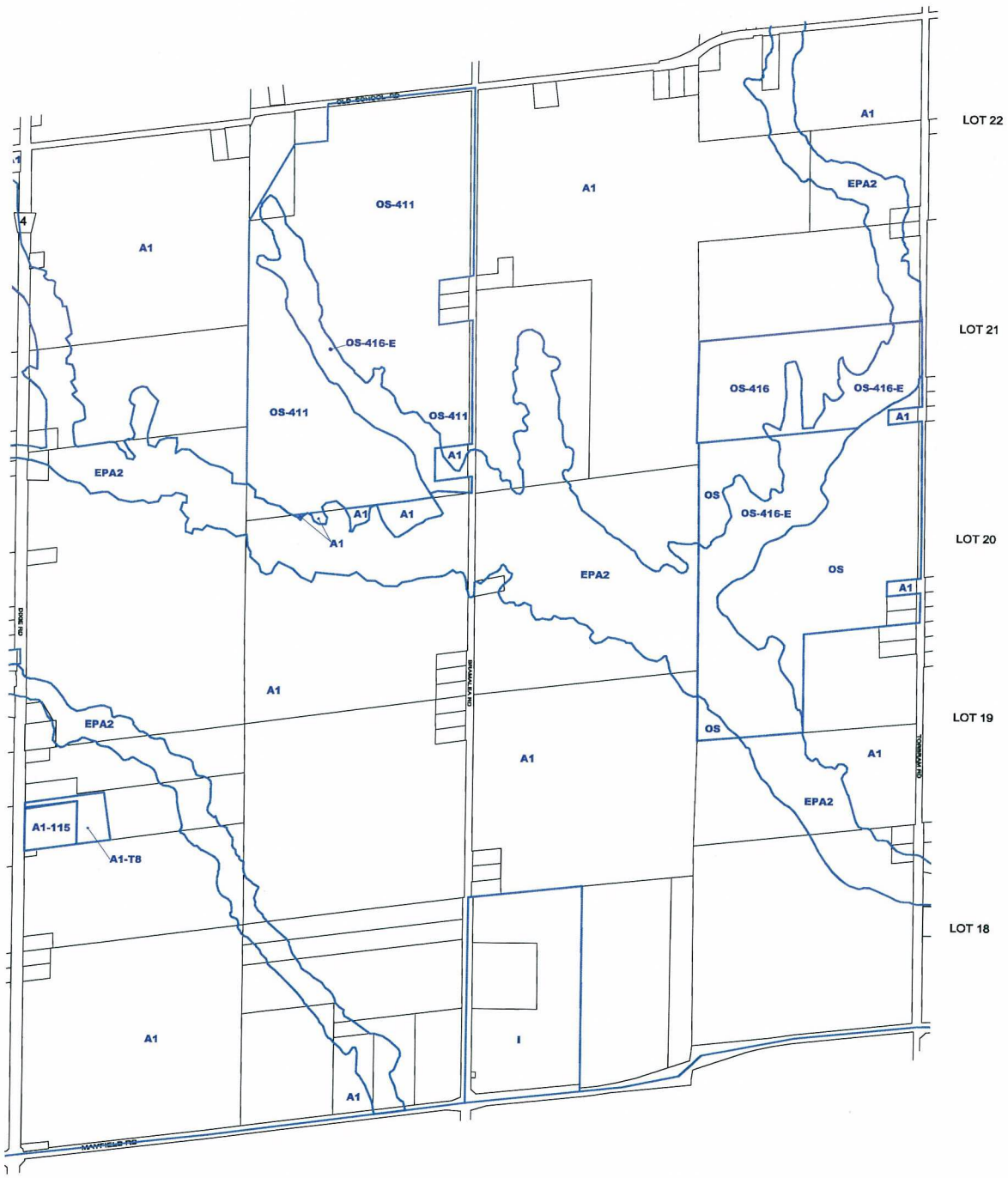
Area of Influence = 200 m
(Either side of roadway)

<< RESULTING AREA OF INFLUENCE ON EACH SIDE OF ROAD

APPENDIX C

CON. 4 E.H.S. (CHING)

CON. 5 E.H.S. (CHING)



This copy is provided for convenience only. If necessary, the original may be referred to in the office of the Town Clerk.

0 50 150 250 350
Scale in Metres

N

INDEX MAP
NOT TO SCALE

LEGEND

A2 ZONE SYMBOL

A2-### ZONE SYMBOL
NOTE: Number suffixes represent Exceptions which can be looked up in the Exceptions section of the By-law.

ZONE BOUNDARY

STRUCTURAL ENVELOPE MAP

NIAGARA ESCARPMENT DEVELOPMENT CONTROL AREA
Lands lying within the Development Control area pursuant to the Niagara Planning and Development Act are subject to permit requirements under Ontario Regulations 685/80, as amended.

OAK RIDGES MORAINE CONSERVATION PLAN AREA BOUNDARY

WELLHEAD PROTECTION AREA BOUNDARY
WP-2 WP-5 WP-10 WP-25
Zone Maps amended to indicate the 2, 5, 10 and 25 year Wellhead Protection Areas.

For applicable zoning see By-law 87-250, as amended.

BY-LAW 2006-50

ZONE MAP 5

SCHEDULE "A"

TOWN OF CALEDON

DATE: April 3, 2006 REVISED: Dec. 9, 2008

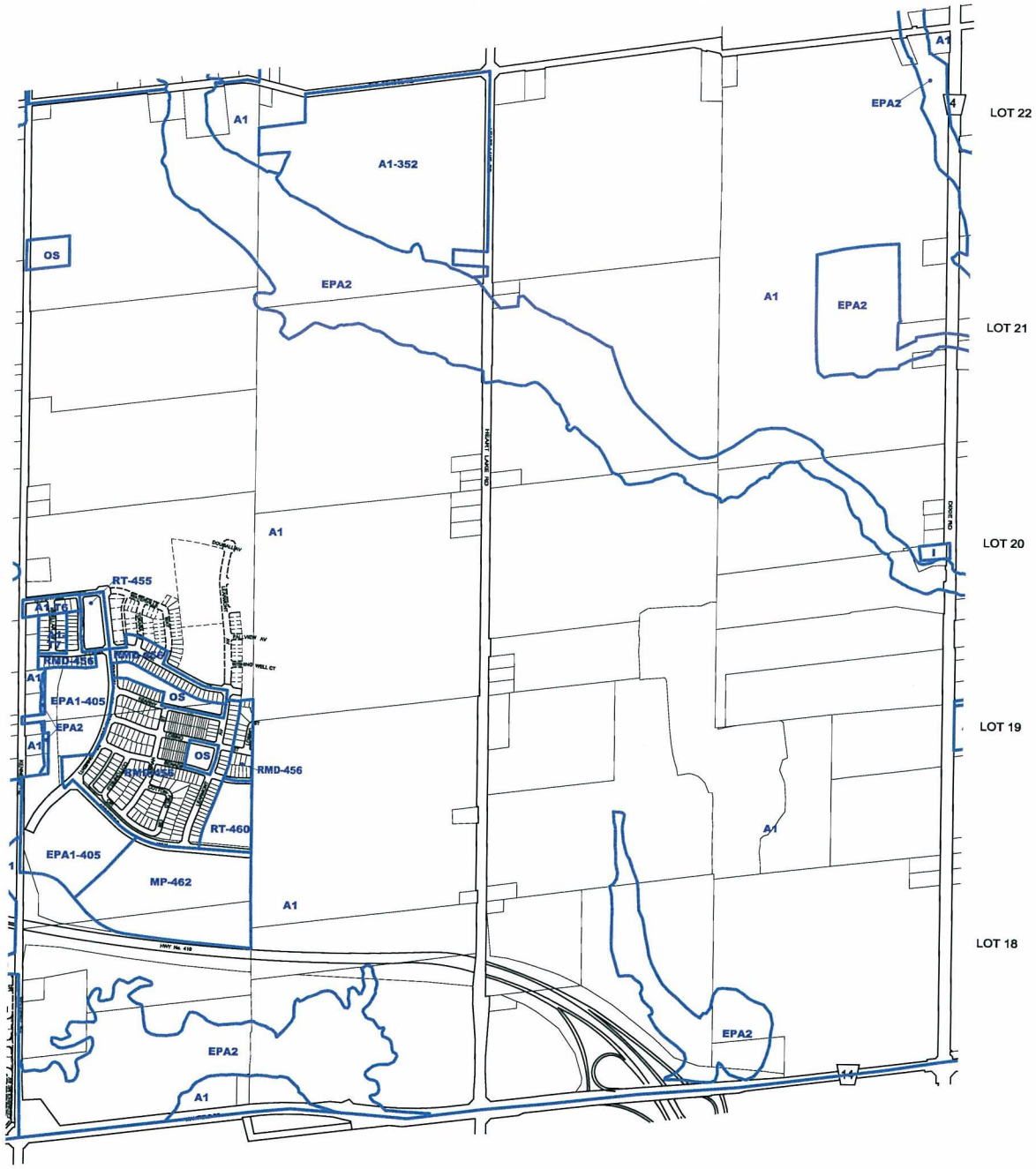
CREATED BY: D.S. CHECKED BY: S.M.

FILE: Zone Maps 2006-50 and 2007-42

5

CON. 2 E.H.S. (CHING)

CON. 3 E.H.S. (CHING)



This copy is provided for convenience only. If necessary, the original may be referred to in the office of the Town Clerk.

0 50 100 200 300
Scale in Metres

N

INDEX MAP
NOT TO SCALE

LEGEND

A2 **ZONE SYMBOL**

A2-### **ZONE SYMBOL**
NOTE: Number suffixes represent Exceptions which can be looked up in the Exceptions section of the By-law.

ZONE BOUNDARY

STRUCTURAL ENVELOPE MAP

NIAGARA ESCARPMENT DEVELOPMENT CONTROL AREA
Lands lying within the Development Control area pursuant to the Niagara Planning and Development Act are subject to permit requirements under Ontario Regulations 685/80, as amended.

OAK RIDGES MORAINE CONSERVATION PLAN AREA BOUNDARY

WELLHEAD PROTECTION AREA BOUNDARY
WP-2 WP-5 WP-10 WP-25
Zone Maps amended to indicate the 2, 5, 10 and 25 year Wellhead Protection Areas.

For applicable zoning see By-law 87-250, as amended.

BY-LAW 2006-50

ZONE MAP 6

SCHEDULE "A"

TOWN OF CALEDON

Date:	April 3, 2006	Revised:	April 7, 2010
Prepared By:	D.S.	Checked By:	S.M.
File:	Zone Maps 2006-50 and 2007-42		6

SECTION 2
ESTABLISHMENT OF ZONES

2.1 ZONES

The Provisions of this By-law apply to all lands within the limits of the Town of Caledon. All lands in the Town, with the exception of those lands within the Niagara Escarpment Plan Area that are subject to Development Control administered by the Niagara Escarpment Commission pursuant to the Niagara Escarpment Planning and Development Act, lands within the Oak Ridges Moraine Conservation Plan and lands designated Environmental Policy Area and Open Space Policy Area within the Town's Official Plan are contained within one or more of the following *Zones*:

ZONE	SYMBOL
Residential Zones	
Estate Residential	**RE**
Rural Residential	**RR**
Residential One	**R1**
Residential Two	**R2**
Residential Townhouse	**RT**
Mixed Density Residential	**RMD**
Multiple Residential	**RM**
Commercial Zones	
Core Commercial	**CC**
General Commercial	**C**
Neighbourhood Commercial	**CN**
Village Commercial	**CV**
Highway Commercial	**CH**
Bolton Highway Commercial	**CHB**
Village Highway Commercial	**CHV**
Tourist Camp Commercial	**CT**
Industrial Zones	
Prestige Industrial	**MP**
Serviced Industrial	**MS**
Unserviced Industrial	**MU**
Airport Industrial	**MA**
Extractive Industrial	**MX**
Waste Management Industrial	**MD**
Institutional Zone	
Institutional	**I**
Agricultural and Rural Zones	
Agricultural	**A1**
Rural	**A2**
Small Agricultural Holdings	**A3**
Environmental Zones	
Environmental Policy Area 1 Zone	**EPA1**
Environmental Policy Area 2 Zone	**EPA2**
Open Space Zones	
Open Space	**OS**

2.2 ZONE SYMBOLS

The *Zone* symbols may be used in this By-law and on the Schedules to this By-law to refer to *lots*, *buildings* and *structures* and to the *use* of *lots*, *buildings* and *structures* permitted by this By-law.

2.3 ZONE SCHEDULES

The *Zones* and *Zone* boundaries are shown in SCHEDULE A, *Zone* Maps 1 through 88 and SCHEDULE B, Structural Envelope "SE" Maps are attached to and form part of this By-law.

2.4 DETERMINING ZONE BOUNDARIES

When determining the location of *zone* boundaries as shown in any Schedule forming part of this By-law, the following provisions shall apply:

i) a boundary indicated as following a highway, *street*, *lane*, railway right-of-way, utility corridor or watercourse shall be the centerline of such highway, *street*, *lane*, railway right-of-way, utility corridor or watercourse unless the context otherwise requires;

ii) a boundary indicated as following a shoreline shall follow such shoreline, and in the event of change in the shoreline, the boundary shall be construed as moving with the actual shoreline;

iii) a boundary indicated as following *lot lines* shown on a registered Plan of Subdivision, or the municipal boundaries of the Town of Caledon shall follow such *lot lines*;

iv) where a boundary is indicated as running parallel to a *street line* and the distance from the *street line* is not indicated, the boundary shall be deemed to be parallel to such a *street line* and the distance from the *street line* shall be determined according to the scale shown in the Schedule(s);

v) where none of the above provisions apply, the *Zone* boundary shall be scaled from the legally approved Schedule(s).

2.5 OVERLAY ZONES

i) Where a *zone* symbol in the Schedules to this By-law is followed by the suffix '**T**' – 'Temporary *Use*', the applicable provisions and regulations of the underlying *zone* shall continue to apply, subject to the additional temporary permitted *uses* and regulations contained in Section 13.4 of this By-law.

ii) Where lands fall within a *Wellhead Protection Area* boundary overlay on the Schedules to this By-law, the applicable provisions and regulations of the underlying *zone* shall continue to apply, subject to the applicable provisions of Subsection 4.36 of this By-law.

iii) Where a *zone* symbol on the Schedules to this By-law is followed by the suffix 'E' – 'Environmental Policy Area', the provisions and regulations applicable to the underlying *zone* shall continue to apply, however the 'E' suffix identifies that such lands are designated Environmental Policy Area within the Caledon Official Plan. Where an approval is required under the Planning Act for the use of land that is subject to an 'E' suffix, such an approval must address environmental matters in accordance with the applicable provisions of the Town of Caledon Official Plan prior to the granting of the Planning Act approval.

2.6 SITE SPECIFIC ZONES

Where a *Zone* symbol in the attached Schedule(s) is followed by a dash and a number, such as **CV-128**, the symbol refers to a site-specific exception that applies to the lands noted. Site-specific exceptions are listed in Section 13 of this By-law. Unless specifically amended by the *Zone* Exception, all other provisions of the Parent *Zone* apply.

2.7 HOLDING ZONES

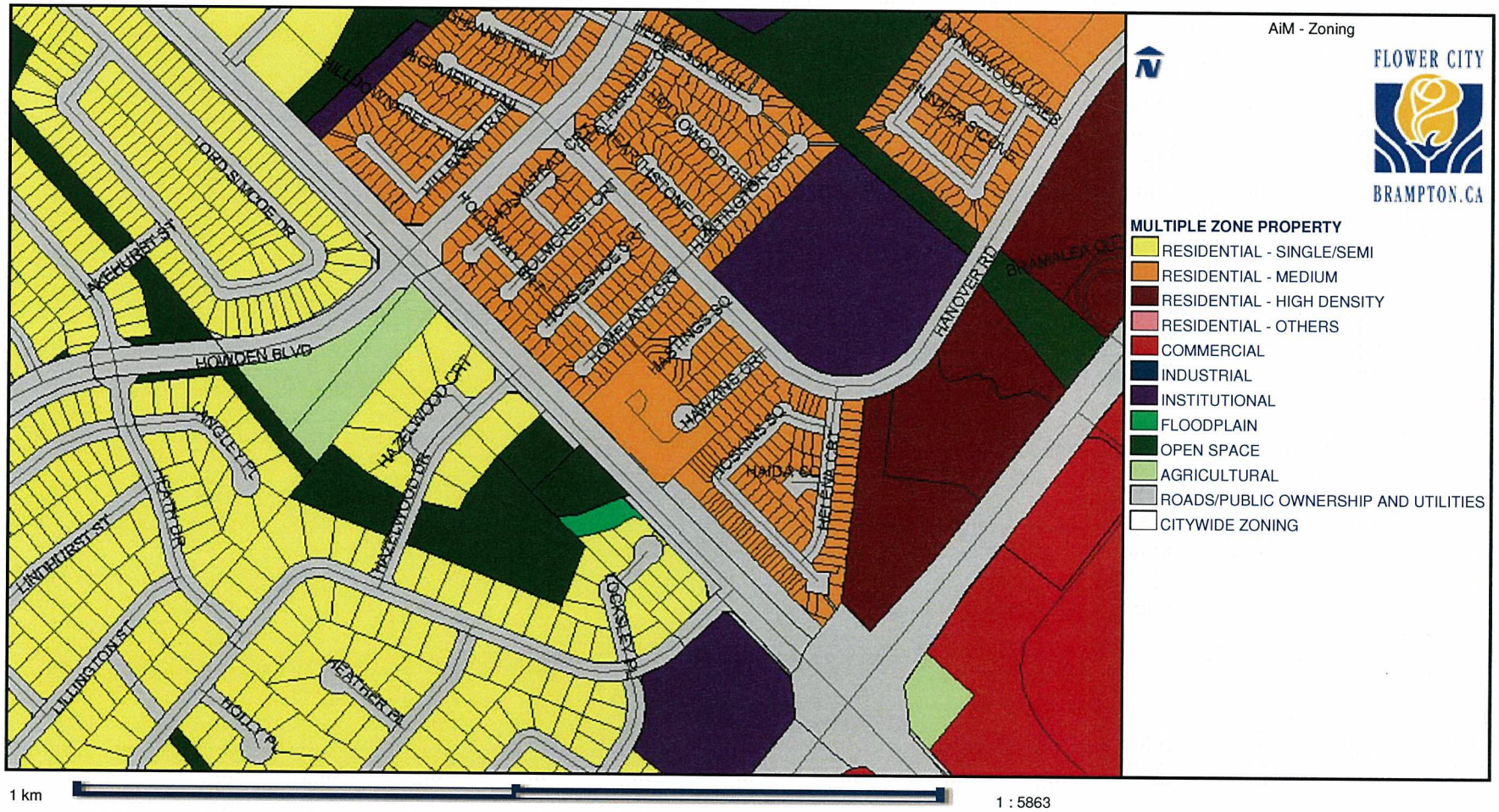
Notwithstanding any other provision in this By-law, where a *Zone* symbol is followed by the letter (**H**), no person shall *use* the land to which the letter (**H**) applies for any *use* other than the *use* which legally existed on the effective date of this By-law, until the (**H**) is removed in accordance with the policies of the Official Plan and the provisions of this By-law, as amended and/or the requirements of any amending By-law and the Planning Act, as amended.

2.8 CONSERVATION AUTHORITY REGULATIONS

No development shall be undertaken on lands that are subject to a regulation made under Subsection 29(1) of the Conservation Authorities Act without the permission of the relevant conservation authority.

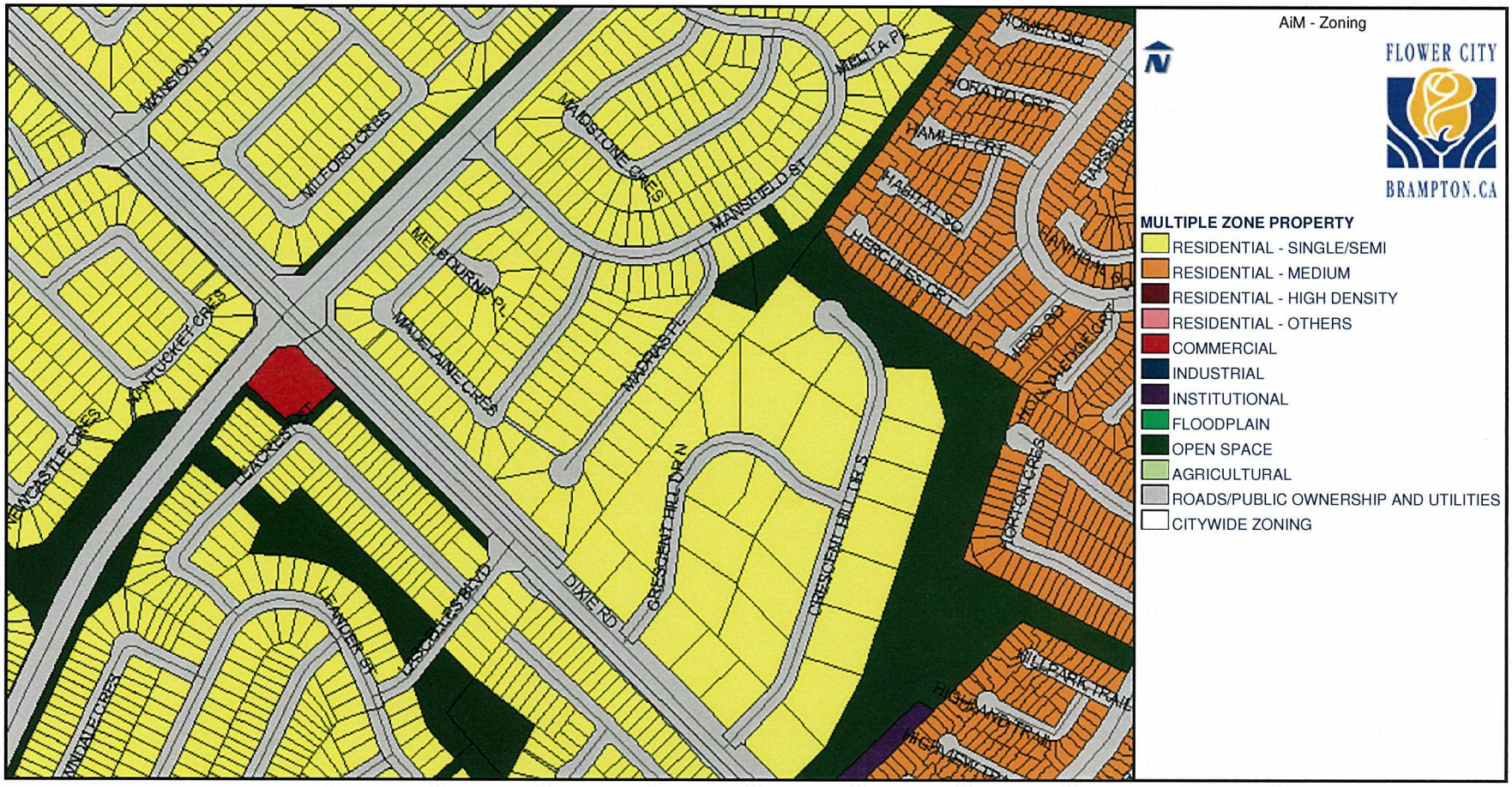
2.9 DEFINITIONS

For the convenience of the reader, all words that are *italicized* are defined in Section 3 of this By-law.



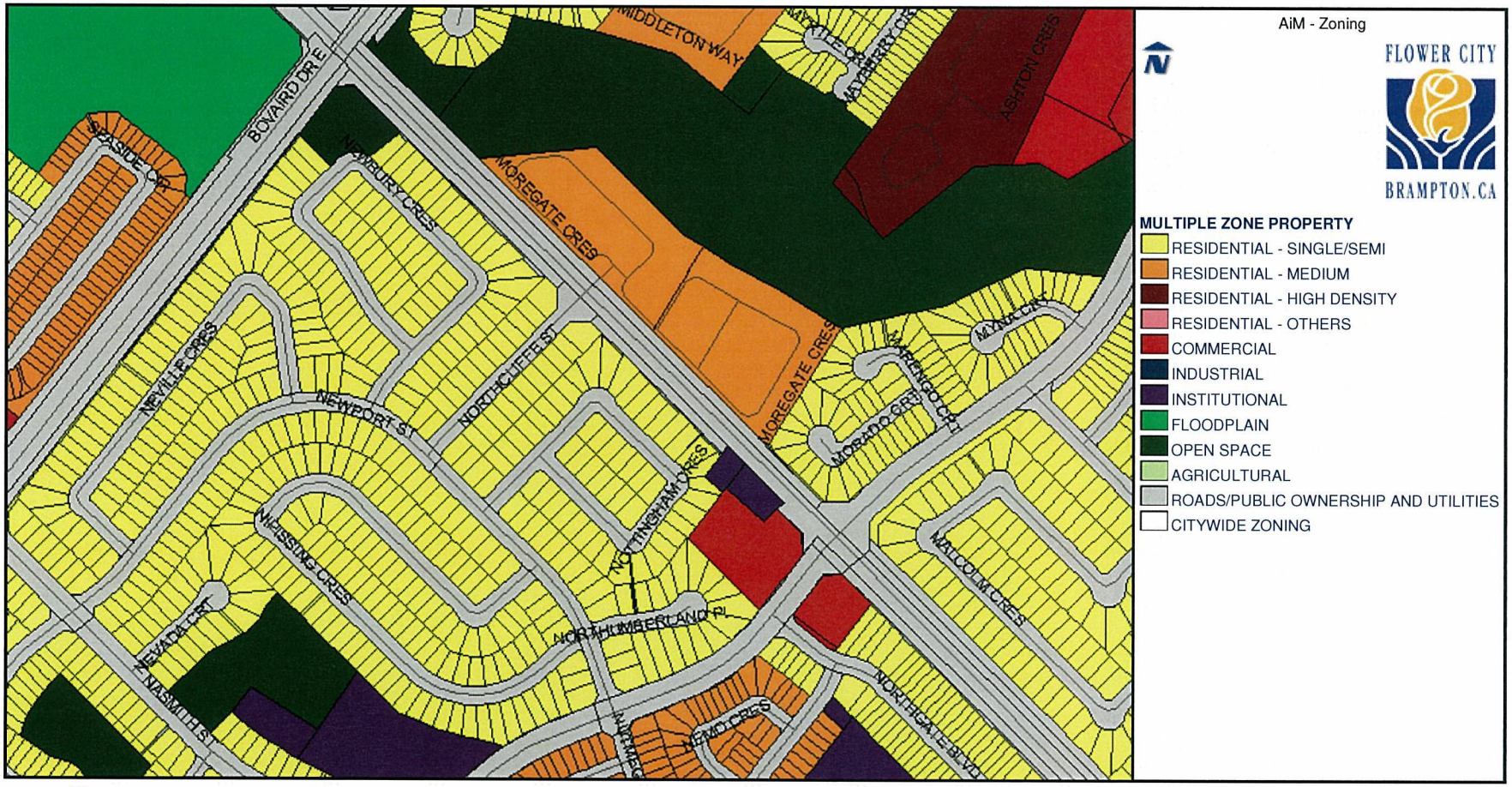
This plan is suitable for information only. The City of Brampton accepts no liability for any error whatsoever. This is not a plan of survey.

Produced by City of Brampton 13:41 5/21/2009



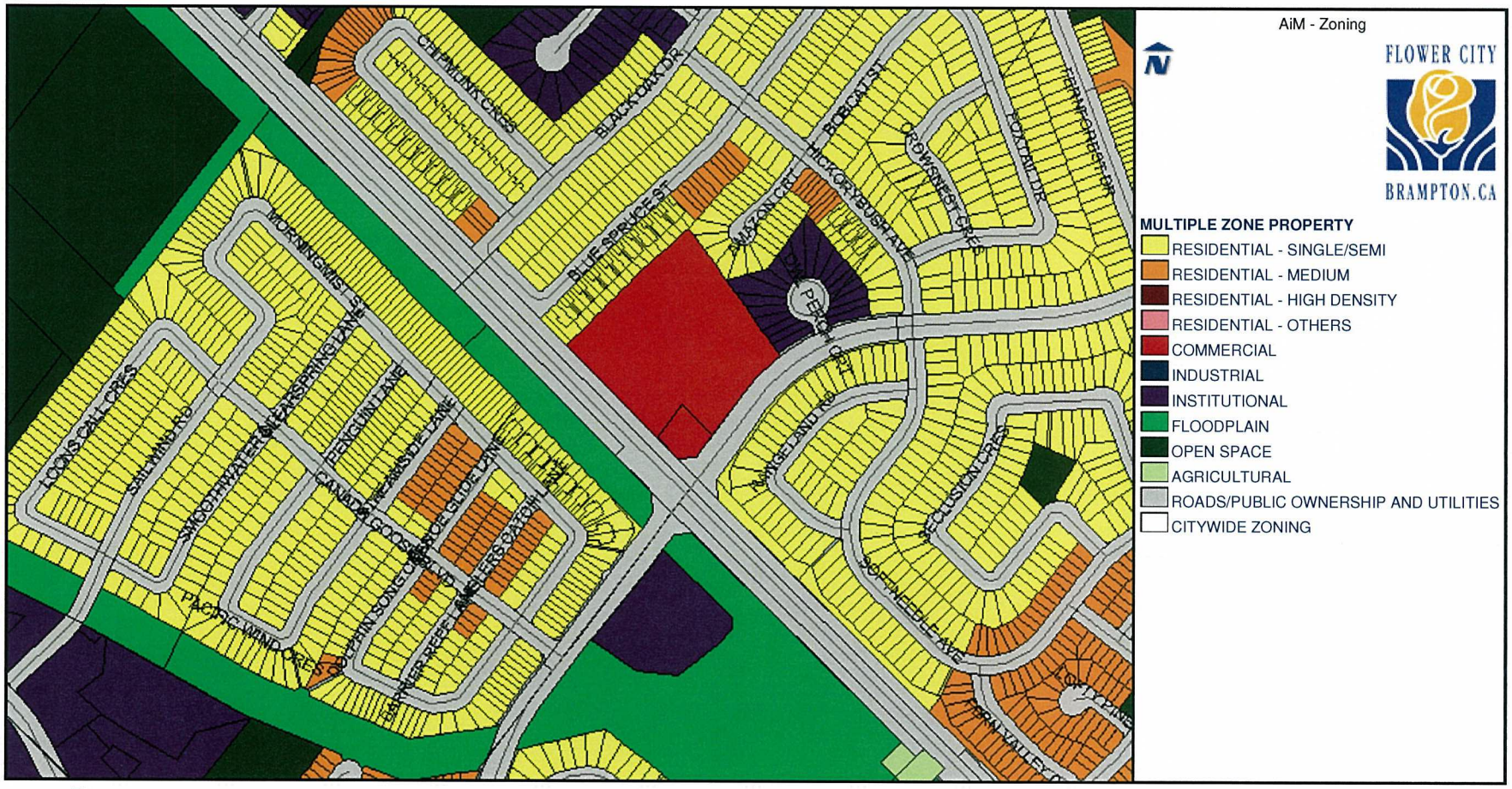
This plan is suitable for information only. The City of Brampton accepts no liability for any error whatsoever.
This is not a plan of survey.

Produced by City of Brampton 13:40
5/21/2009



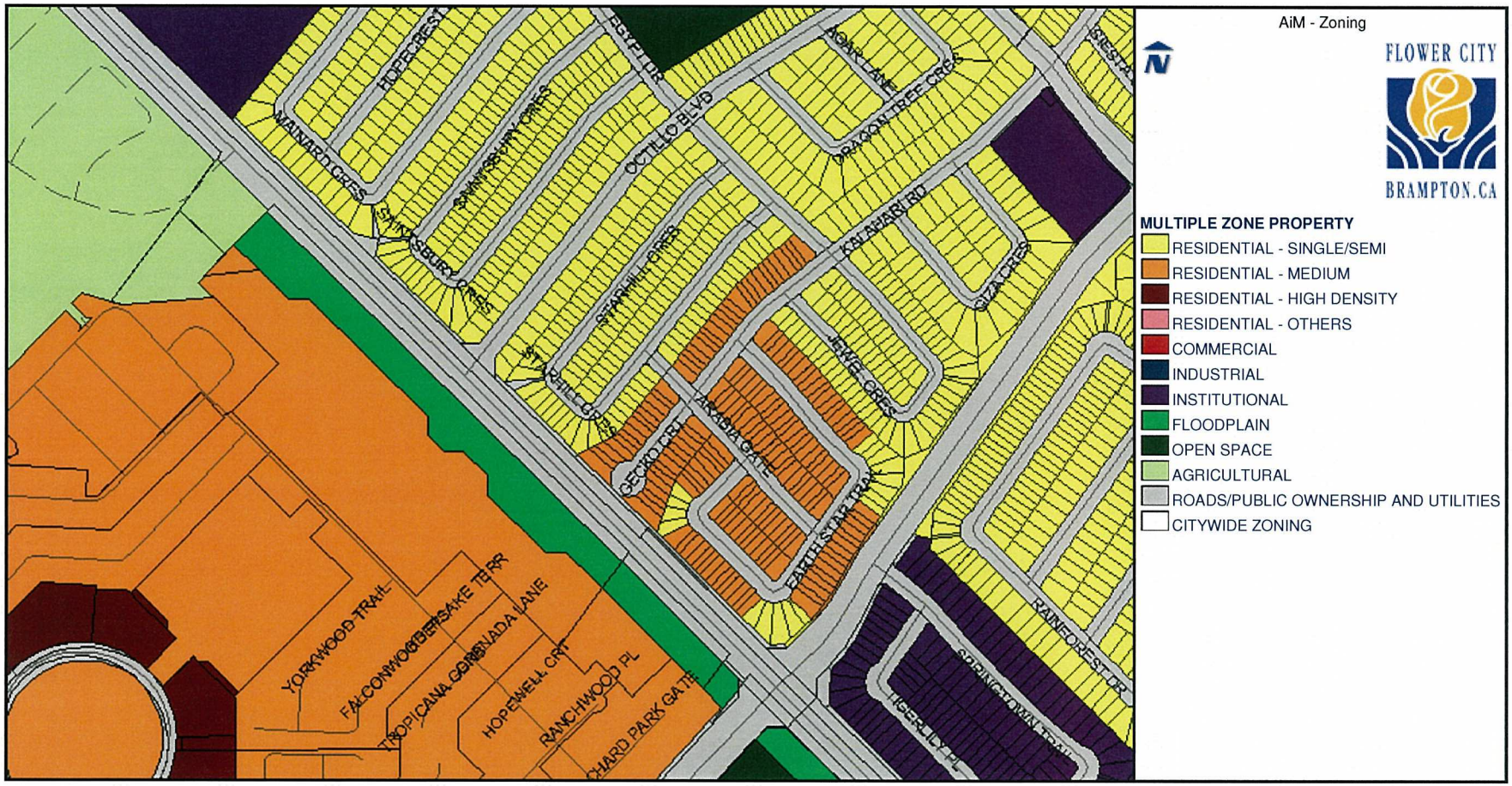
This plan is suitable for information only. The City of Brampton accepts no liability for any error whatsoever. This is not a plan of survey.

Produced by City of Brampton 13:38 5/21/2009



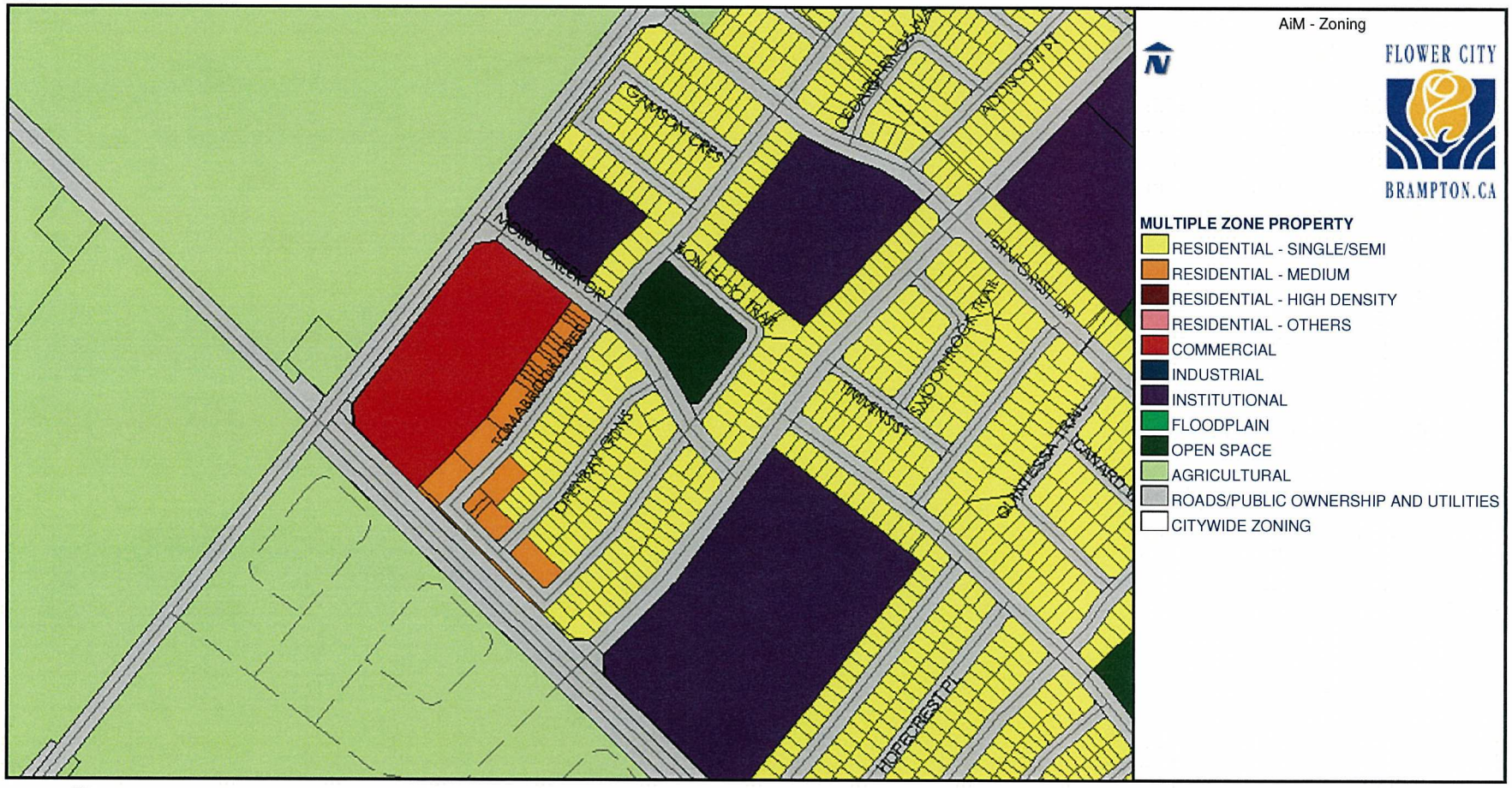
This plan is suitable for information only. The City of Brampton accepts no liability for any error whatsoever.
This is not a plan of survey.

Produced by City of Brampton 13:35
5/21/2009



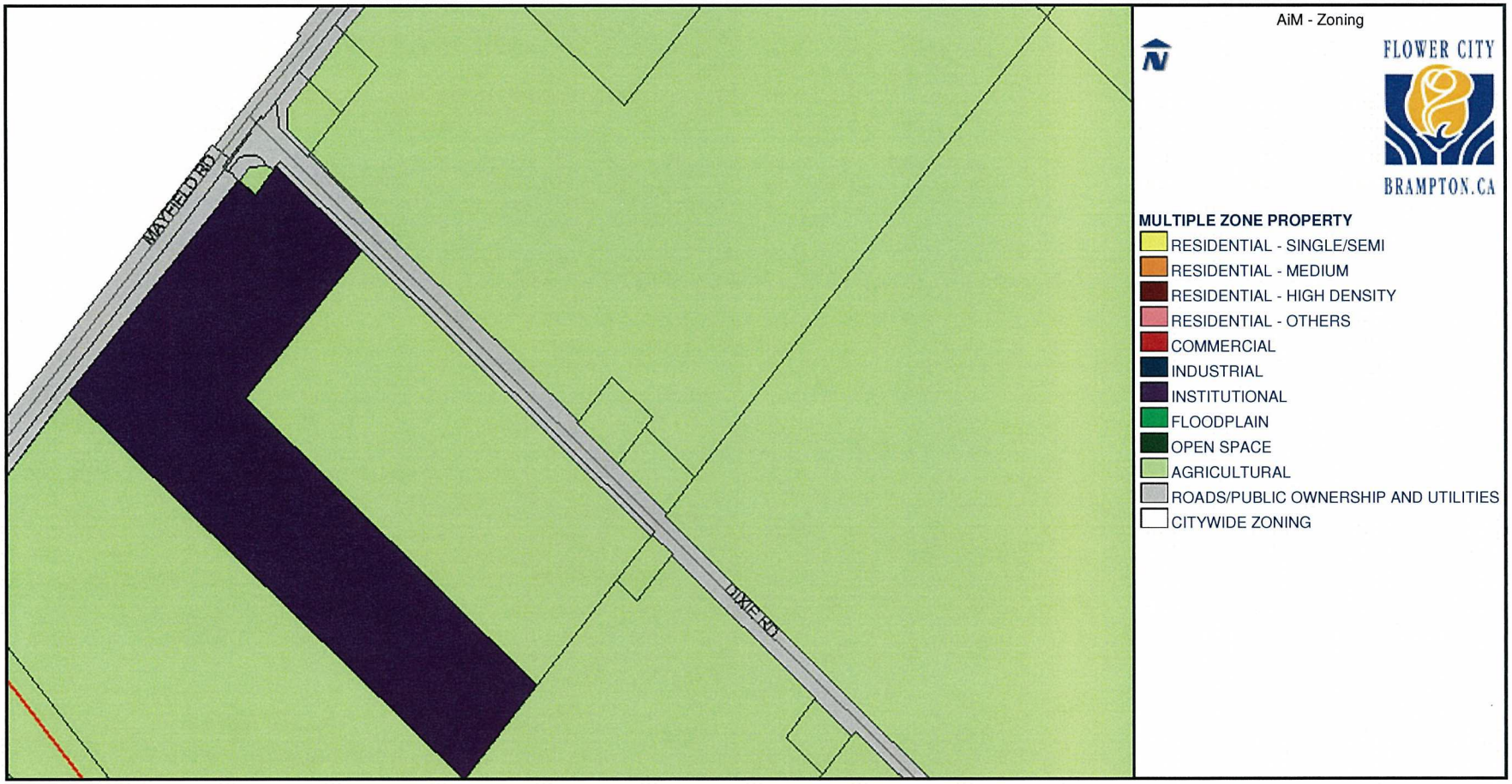
This plan is suitable for information only. The City of Brampton accepts no liability for any error whatsoever.
This is not a plan of survey.

Produced by City of Brampton 13:34
5/21/2009



This plan is suitable for information only. The City of Brampton accepts no liability for any error whatsoever.
This is not a plan of survey.

Produced by City of Brampton 13:30
5/21/2009



This plan is suitable for information only. The City of Brampton accepts no liability for any error whatsoever.
This is not a plan of survey.

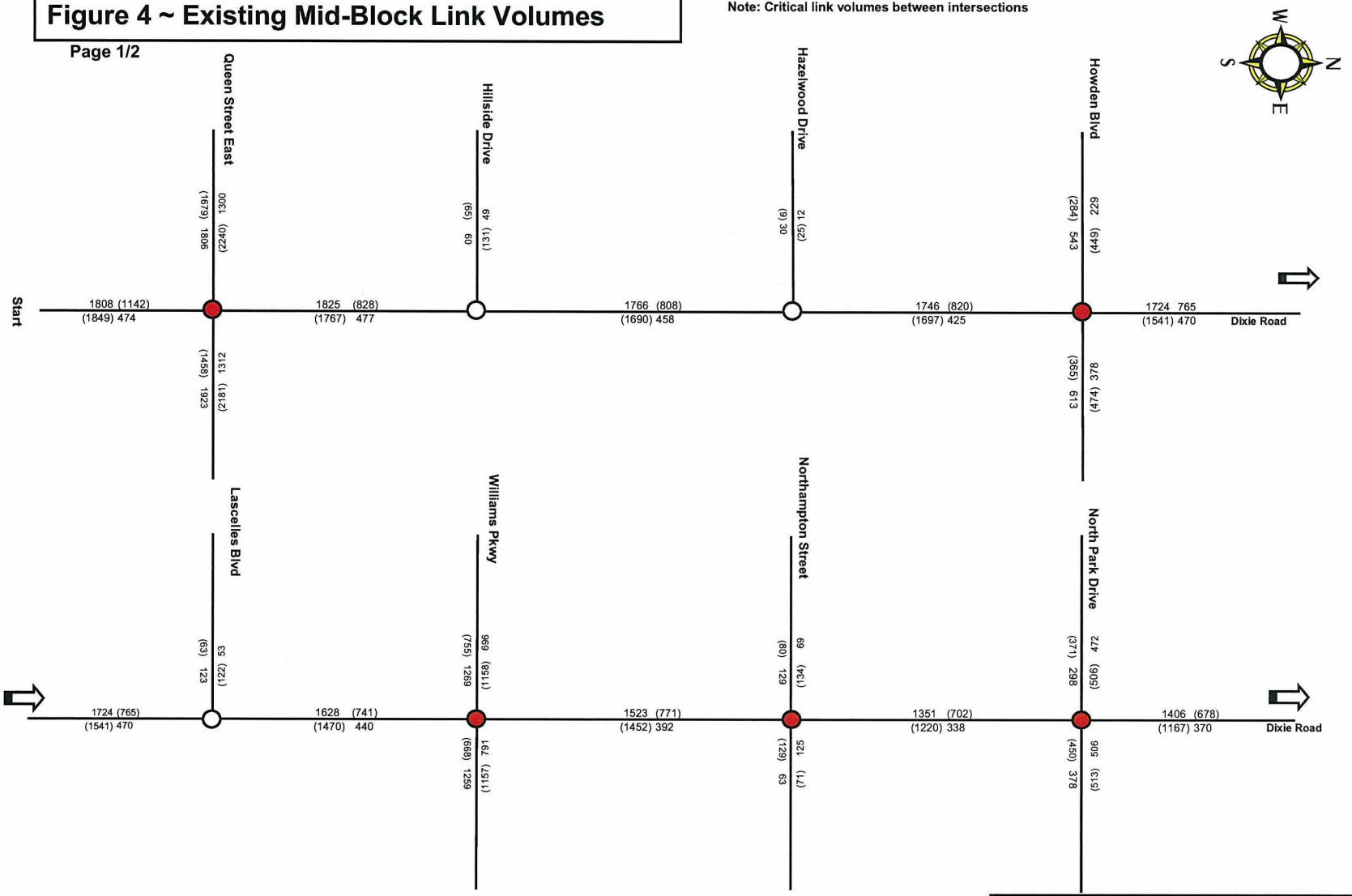
Produced by City of Brampton 13:25
5/21/2009

APPENDIX D

Figure 4 ~ Existing Mid-Block Link Volumes

Page 1/2

Note: Critical link volumes between intersections



LEGEND

XX AM Peak Hour Traffic Volume
(XX) PM Peak Hour Traffic Volume

Signalised Intersection

Unsignalised Intersection

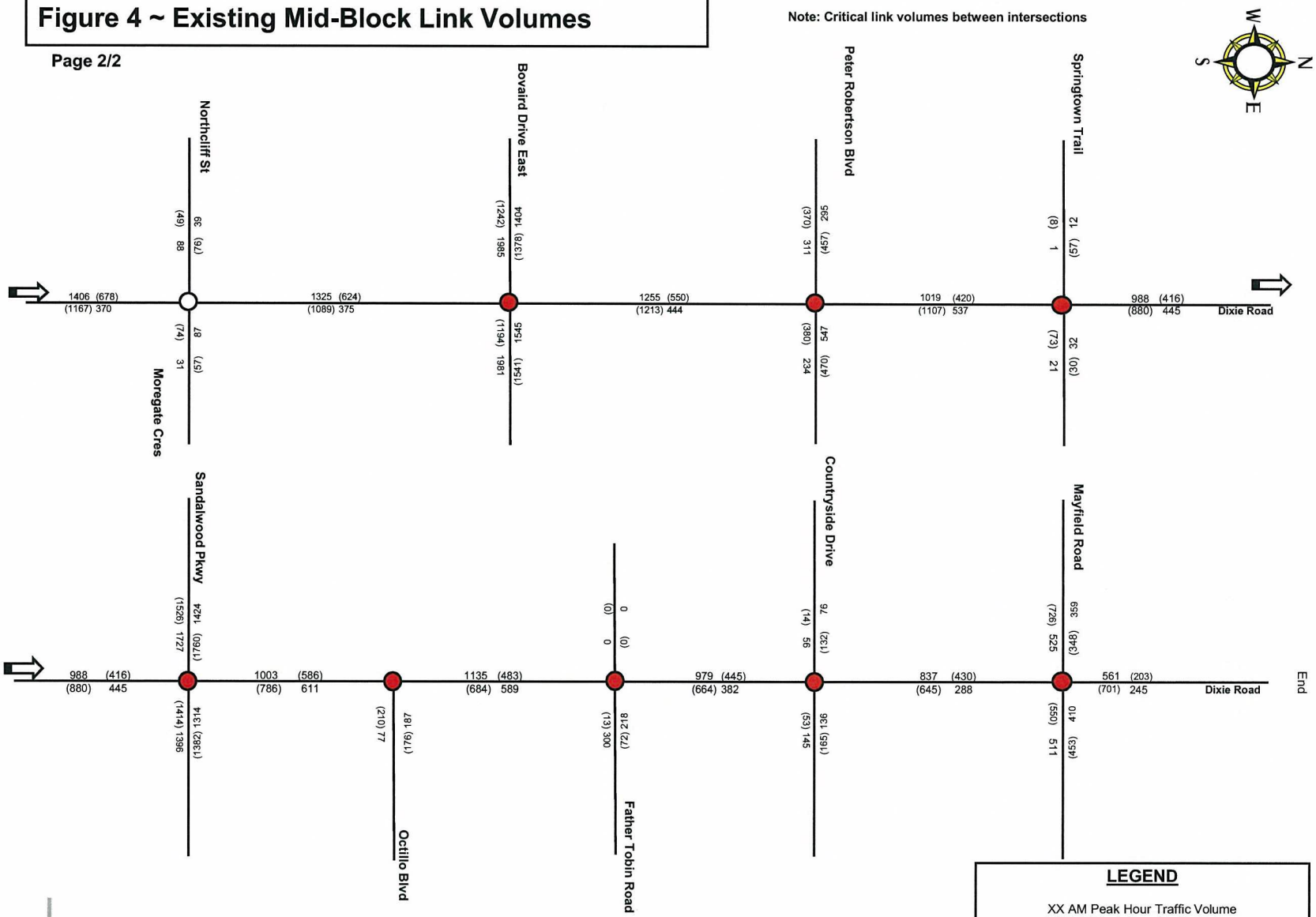
AECOM

Not to Scale

Figure 4 ~ Existing Mid-Block Link Volumes

Page 2/2

Note: Critical link volumes between intersections



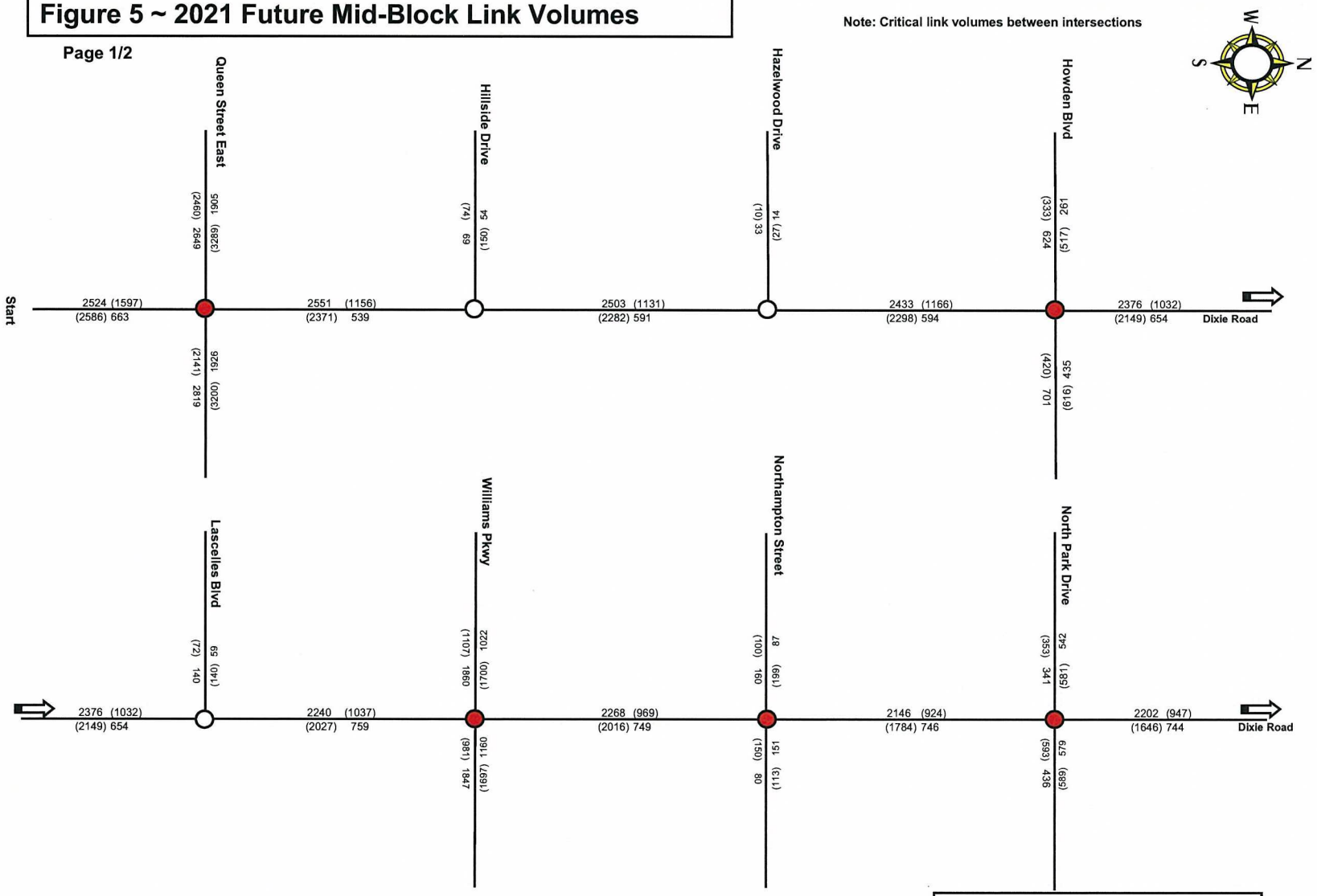
AECOM

Not to Scale

Figure 5 ~ 2021 Future Mid-Block Link Volumes

Page 1/2

Note: Critical link volumes between intersections



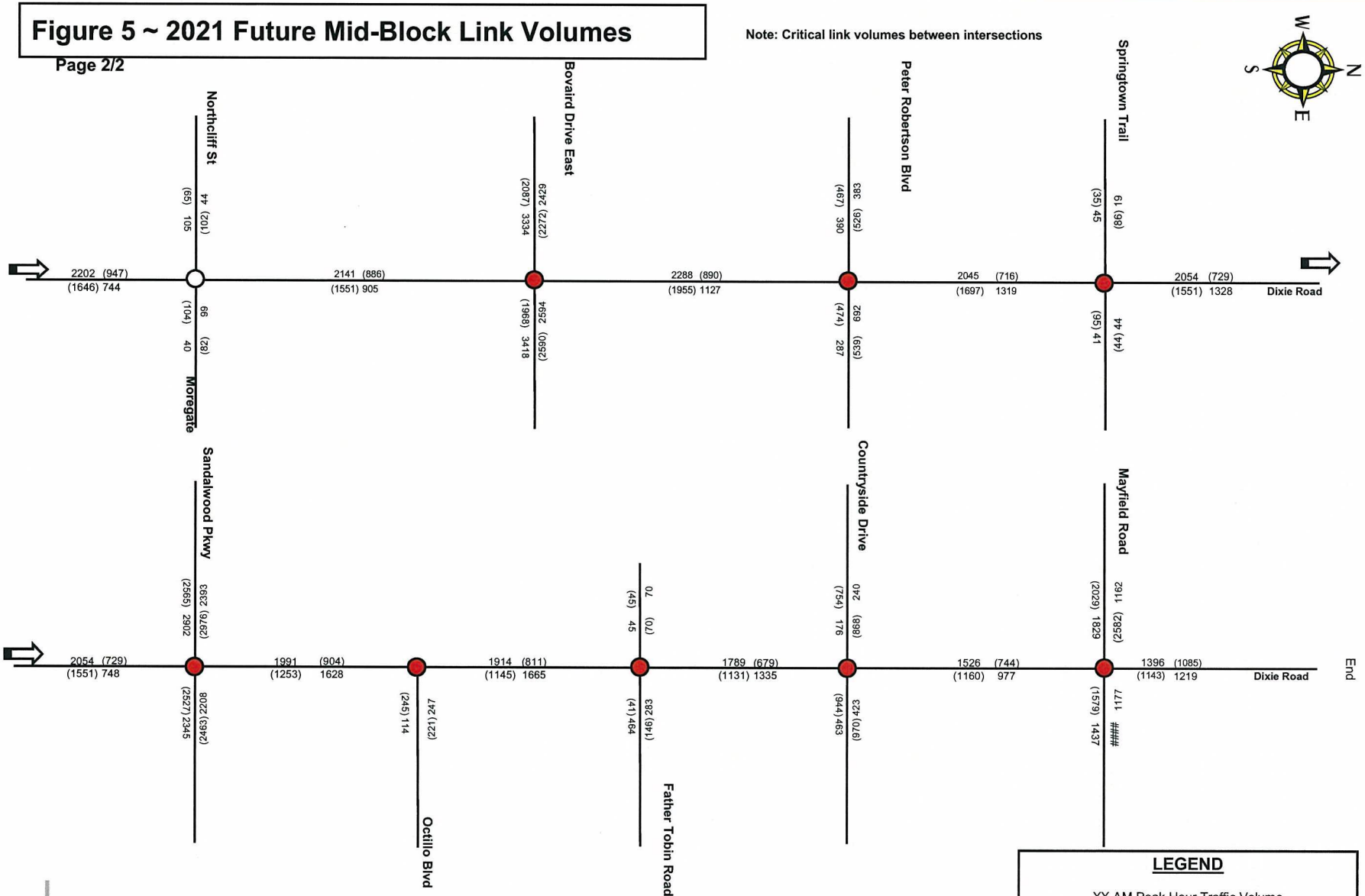
AECOM

Not to Scale

Figure 5 ~ 2021 Future Mid-Block Link Volumes

Page 2/2

Note: Critical link volumes between intersections



LEGEND

XX AM Peak Hour Traffic Volume
(XX) PM Peak Hour Traffic Volume

Signalised Intersection

Unsignalised Intersection

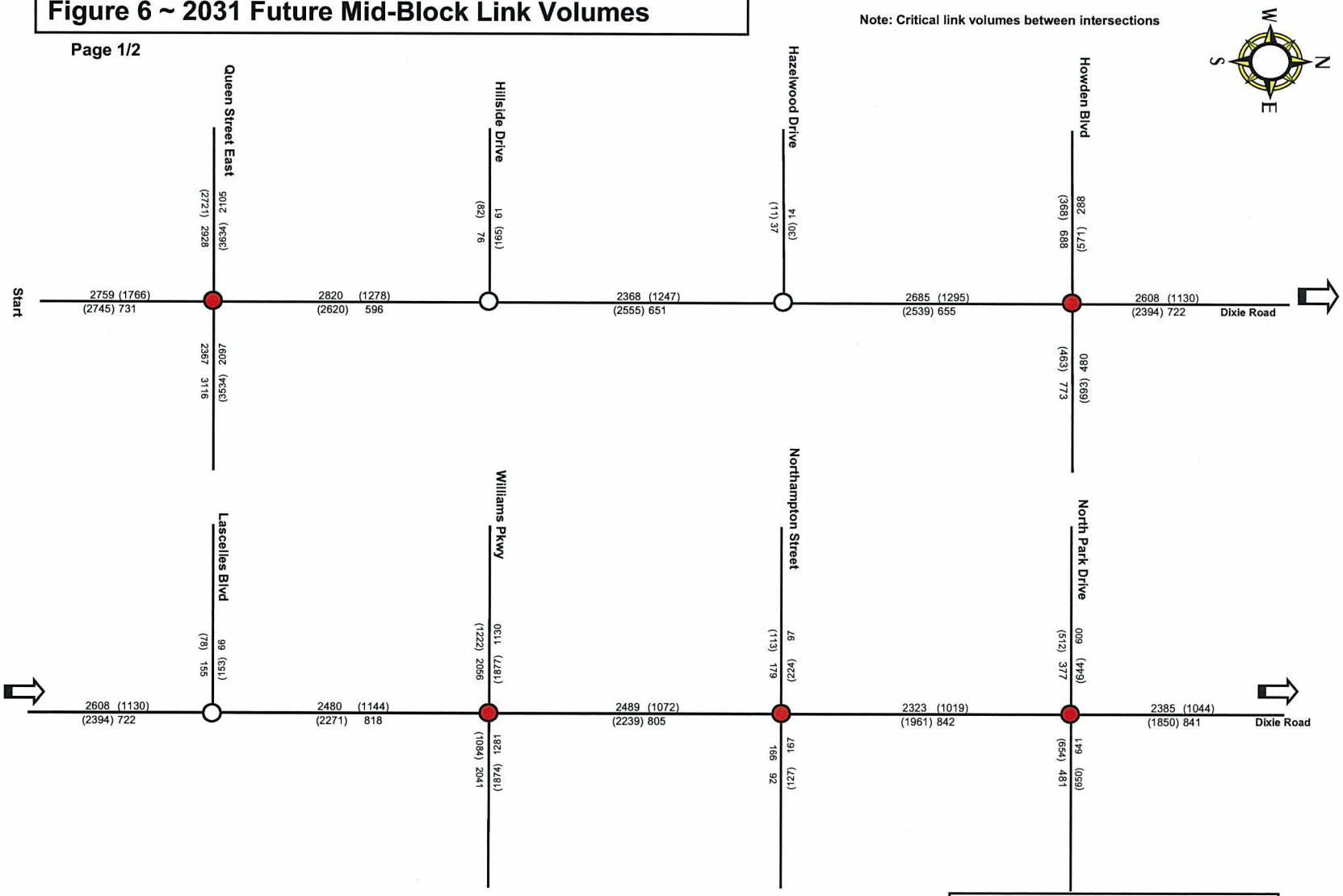
AECOM

Not to Scale

Figure 6 ~ 2031 Future Mid-Block Link Volumes

Page 1/2

Note: Critical link volumes between intersections



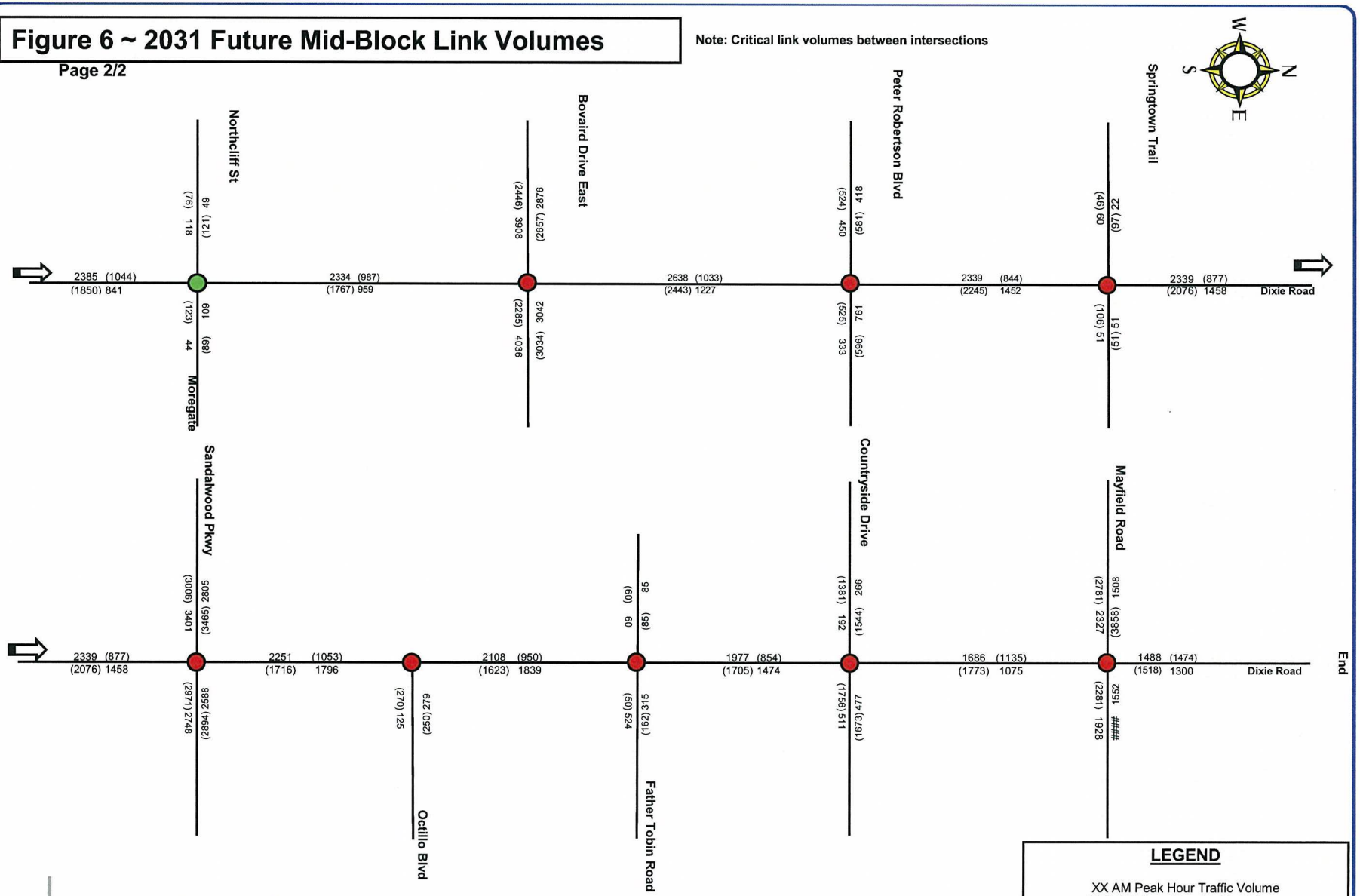
AECOM

Not to Scale

Figure 6 ~ 2031 Future Mid-Block Link Volumes

Page 2/2

Note: Critical link volumes between intersections

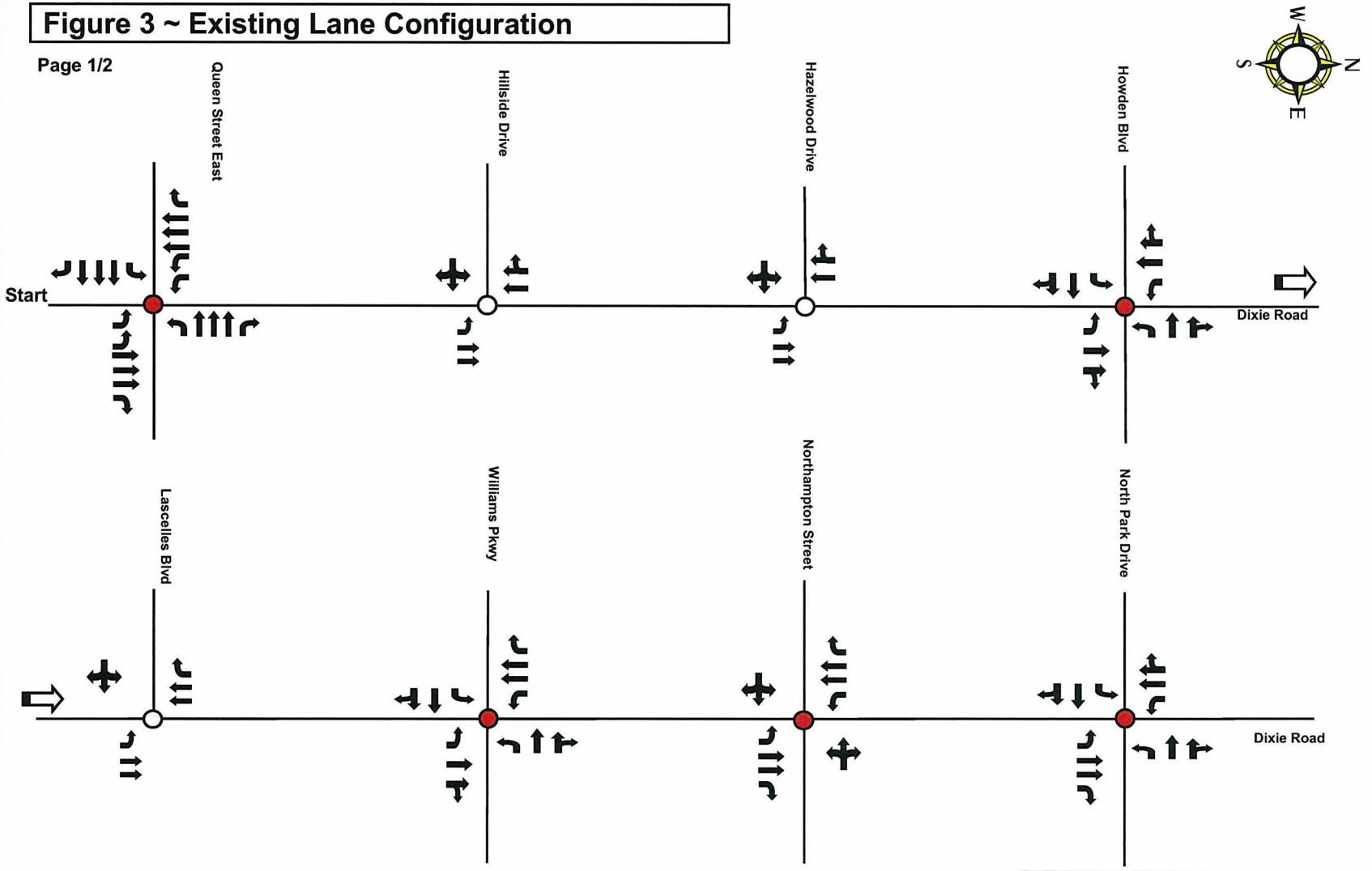


AECOM

Not to Scale

Figure 3 ~ Existing Lane Configuration

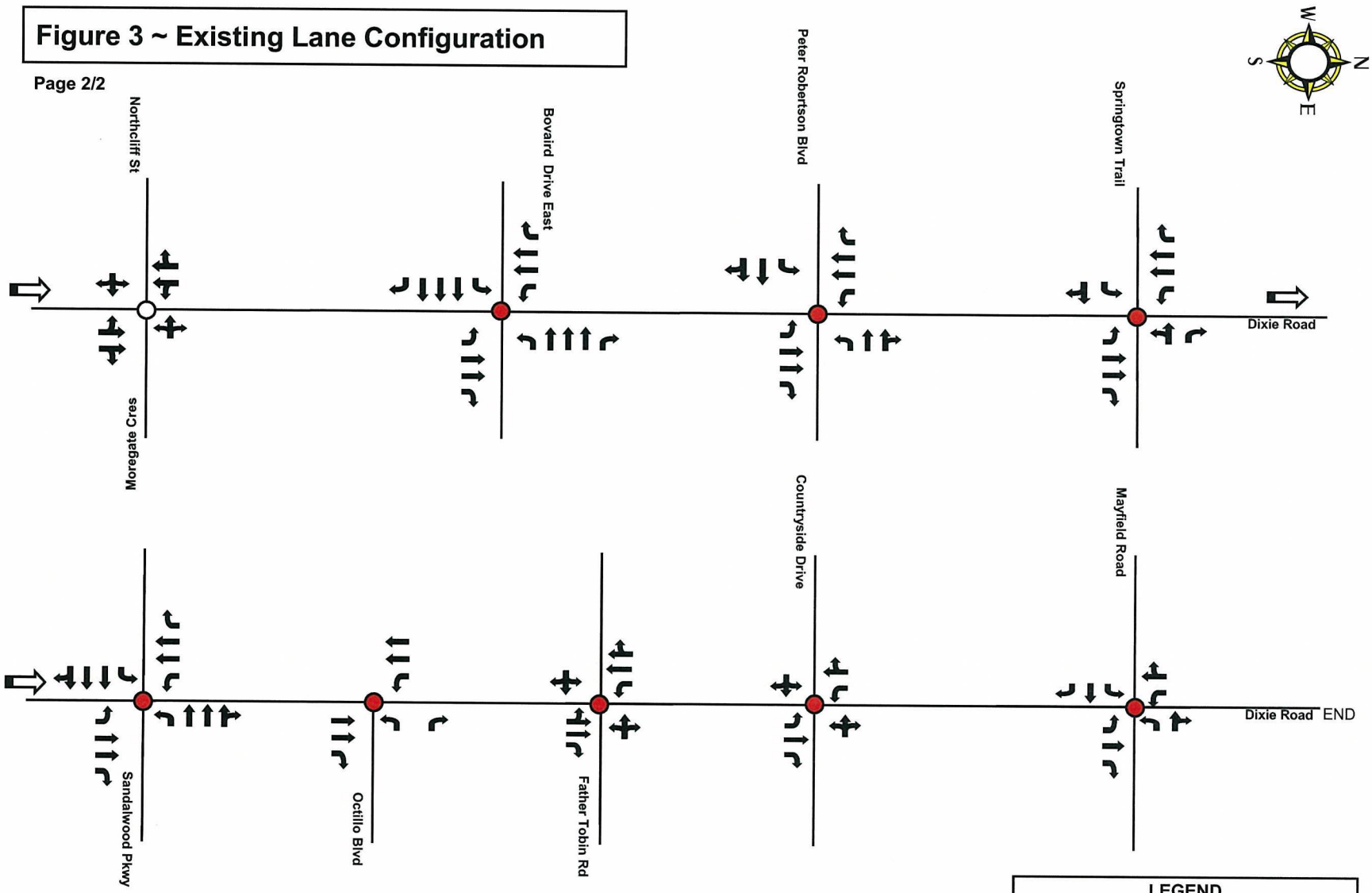
Page 1/2



AECOM

Not to Scale

Figure 3 ~ Existing Lane Configuration

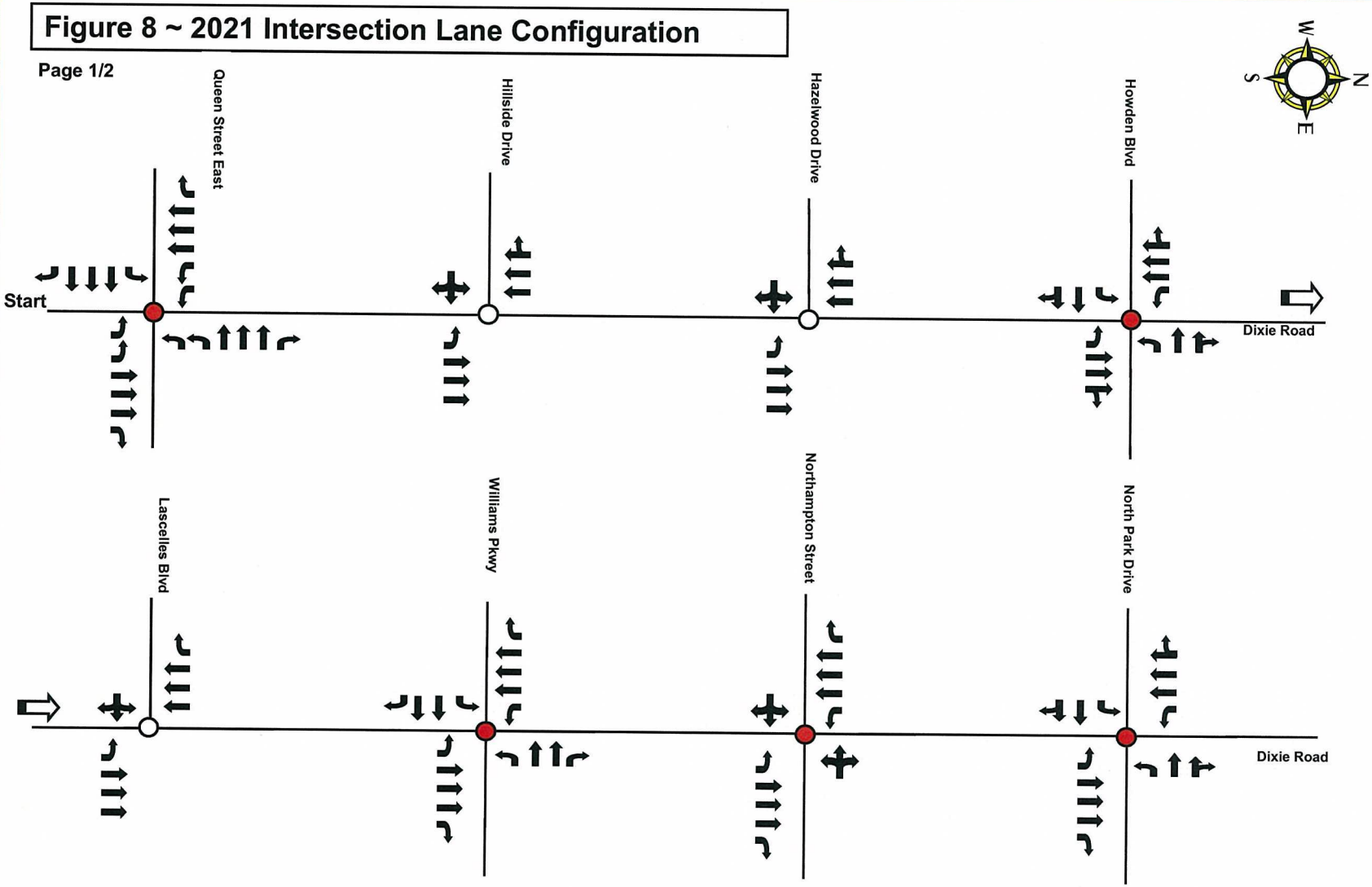


AECOM

Not to Scale

Figure 8 ~ 2021 Intersection Lane Configuration

Page 1/2



AECOM

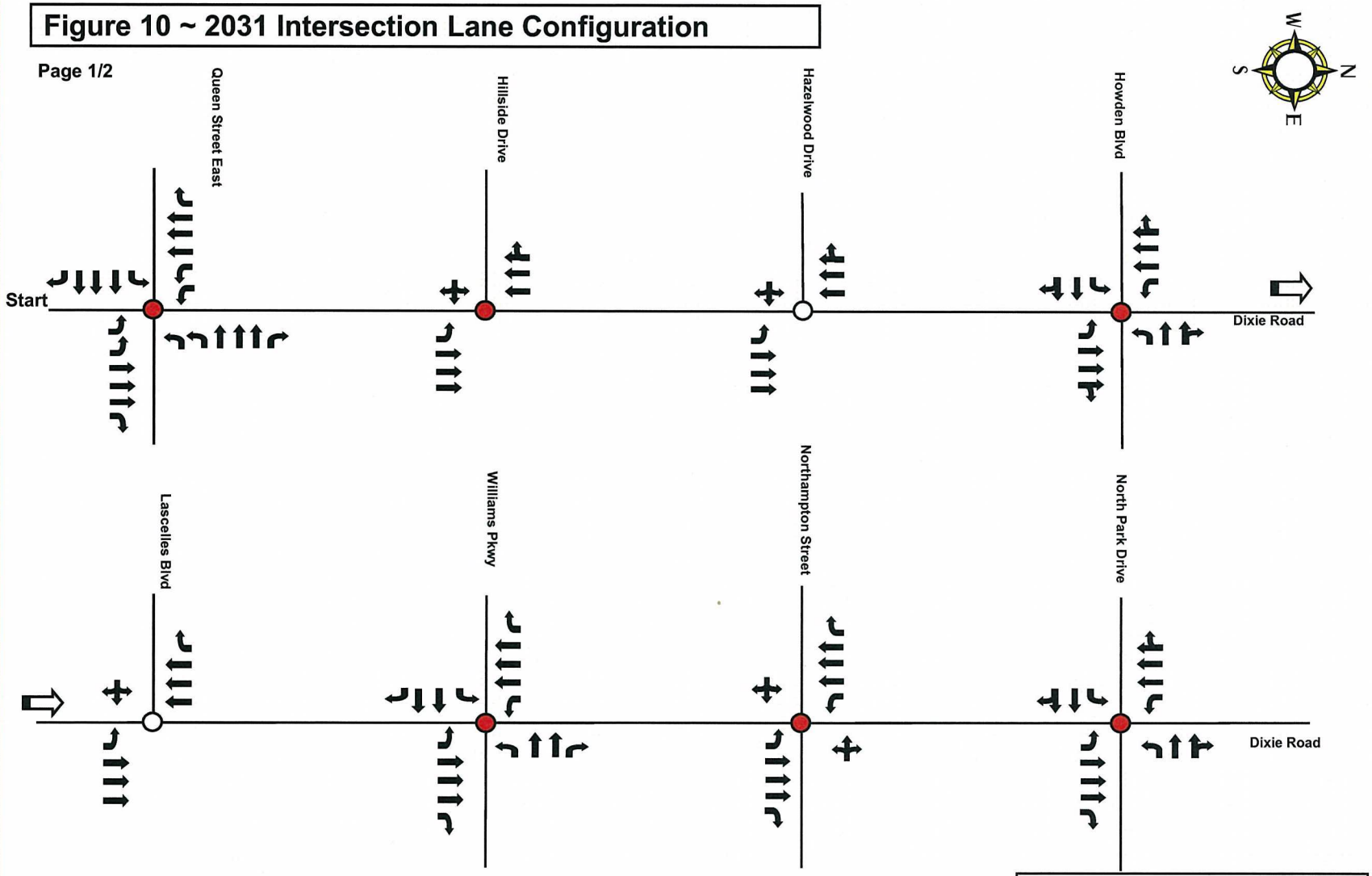
Not to Scale

Figure 8 ~ 2021 Intersection Lane Configuration

Page 2/2

Figure 10 ~ 2031 Intersection Lane Configuration

Page 1/2

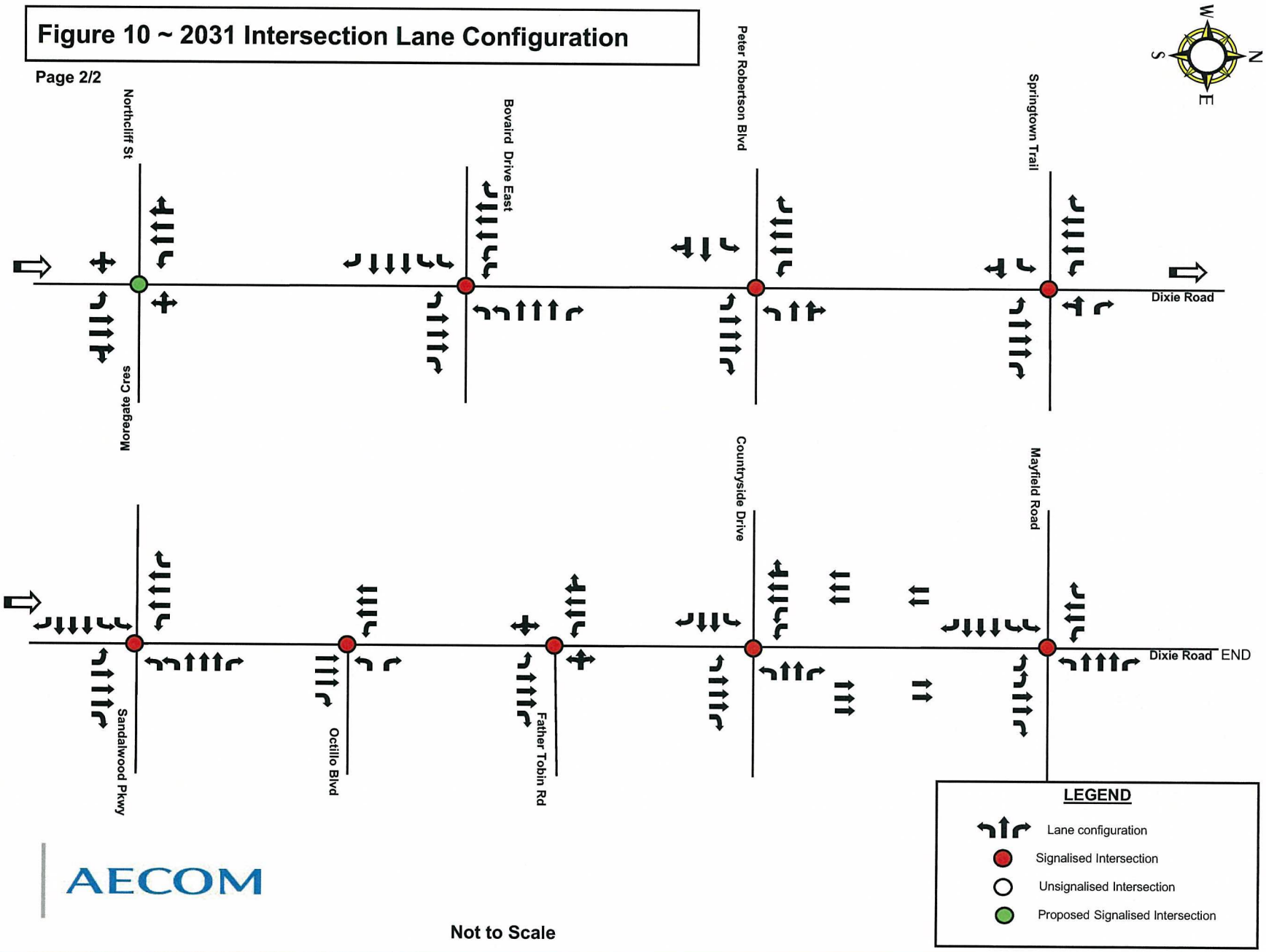


AECOM

Not to Scale

Figure 10 ~ 2031 Intersection Lane Configuration

Page 2/2



AECOM

Not to Scale

APPENDIX E

ORNAMENT

Ontario Road Noise Analysis Method for ENvironment and Transportation

version 2.04

Job No. 0925103A
Job Name Dixie Rd Widening

Scenario Future Build (Mitigated) - Day

ROAD CHARACTERISTICS | **SOURCE-RECEIVER-BARRIER-TOPOGRAPHY CHARACTERISTICS**

ID	Description	Time Period	Number of Vehicles			Speed (km/h)	Road Gradient (%)	Two Way? (y/n)	Pavement Type	Road Viewable Angle		Source-Receiver Distance (m)	Ground Type (Hard/Soft)	Topography Type	Source Height (m)	Road Elevation (m asl)	Receptor Height (m)	Receptor Elevation (m asl)	Ground Elevation Change (m)			"Modelled" Barrier Height (m)	Barrier Elevation (m asl)	Barrier-Reciever Distance (m)	Barrier Viewable Angle		No. of Rows of Houses	Density of Houses (% Houses)	Depth of Woods	Adjustment (dB)	Reason For Adjustment	Total Segment L_{eq} (dBA)
			Autos	Medium	Heavy					O_1	O_2								Elevation Change e (m)	Hor. Dist a (m)	Hor. Dist b (m)				O_1	O_2							
NR1	Mayfield Rd W	16	53279	1419	1734	60	0	y	1	-90	25	85	Soft	A	1.3	0.0	1.5	0.0	0.0													58.8
	Mayfield Rd E	16	39244	1572	1922	60	0	y	1	25	90	85	Soft	A	1.5	0.0	1.5	0.0	0.0													55.3
	Dixie Rd Seg.1	16	24982	203	248	90	0	y	1	-90	-65	32	Soft	A	0.1	0.0	1.5	0.0	0.0													54.4
	Dixie Rd Seg.2 NB	16	19765	434	531	60	0	n	1	-65	90	37	Soft	A	1.3	0.0	1.5	0.0	0.0													61.2
	Dixie Rd Seg.2 SB	16	12652	278	340	60	0	n	1	-65	90	26	Soft	A	1.3	0.0	1.5	0.0	0.0													61.8
NR2																																**66**
	Dixie Rd Seg.2 NB	16	19765	434	531	60	0	n	1	0	90	38	Soft	A	1.3	0.0	1.5	0.0	0.0													58
	Dixie Rd Seg.2 SB	16	12652	278	340	60	0	n	1	0	90	49	Soft	A	1.3	0.0	1.5	0.0	0.0													55
NR3																																**60**
	Dixie Rd Seg.4 NB	16	19572	844	1031	60	0	n	1	-90	90	23	Soft	A	1.5	0.0	1.5	0.0	0.0				3.2	0.0	3.0	-90	90					56
	Dixie Rd Seg.4 SB	16	11456	494	603	60	0	n	1	-90	90	34	Soft	A	1.5	0.0	1.5	0.0	0.0				3.2	0.0	3.0	-90	90					51
NR4																																**57**
	Sandalwood Pkwy E E.bound	16	26481	142	116	60	0	n	1	-35	45	45	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-35	45					44.9
	Sandalwood Pkwy E W.bound	16	25794	138	113	60	0	n	1	-35	45	58	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-35	45					43.4
	Sandalwood Pkwy W E.bound	16	26799	140	115	60	0	n	1	-90	-35	45	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-90	-35					44.4
	Sandalwood Pkwy W W.bound	16	30891	162	132	60	0	n	1	-90	-35	58	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-90	-35					43.5
	Dixie Rd Seg.5 NB	16	19337	780	953	60	0	n	1	55	90	29	Soft	A	1.5	0.0	1.5	0.0	0.0				3.0	0.0	5.5	55	90					49.9
	Dixie Rd Seg.5 SB	16	11866	479	585	60	0	n	1	55	90	40	Soft	A	1.5	0.0	1.5	0.0	0.0				3.0	0.0	5.5	55	90					45.8
	Dixie Rd Seg.6 NB	16	23183	324	396	60	0	n	1	-90	55	29	Soft	A	1.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-90	55					52.7
	Dixie Rd Seg.6 SB	16	9794	137	167	60	0	n	1	-90	55	40	Soft	A	1.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-90	55					47.1
NR5																																**57**
	Dixie Rd Seg.6 NB	16	23183	324	396	60	0	n	1	-90	90	25	Soft	A	1.1	0.0	1.5	0.0	0.0				3.7	0.0	4.0	-90	90					52
	Dixie Rd Seg.6 SB	16	9794	137	167	60	0	n	1	-90	90	37	Soft	A	1.1	0.0	1.5	0.0	0.0				3.7	0.0	4.0	-90	90					46
NR6																																**53**
	Dixie Rd Seg.6 NB	16	23183	324	396	60	0	n	1	-90	90	82	Soft	D	1.1	0.0	1.5	-3.5	5.0	24.0	82.0		0.5	0.0	18.0	-90	90					48
	Dixie Rd Seg.6 SB	16	9794	137	167	60	0	n	1	-90	90	70	Soft	D	1.1	0.0	1.5	-3.5	5.0	24.0	70.0		0.5	0.0	18.0	-90	90					45
NR7																																**50**
	Peter Robertson Blvd. E	16	11964	102	84	60	0	y	1	-35	55	48	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	20.0	-35	55					43.6
	Peter Robertson Blvd. W	16	12003	81	66	60	0	y	1	-90	-35	48	Soft	A	0.1	0.0	1.5	0.0	0.0				3.5	0.0	20.0	-90	-35					41.0
	Dixie Rd Seg.7 NB	16	24164	246	300	60	0	n	1	45	90	40	Soft	A	1.1	0.0	1.5	0.0	0.0				3.0	0.0	7.0	45	90					46.4
	Dixie Rd Seg.7 SB	16	9084	92	113	60	0	n	1	45	90	52	Soft	A	1.1	0.0	1.5	0.0	0.0				3.5	0.0	7.0	45	90					39.9
	Dixie Rd Seg.8 NB	16	23043	384	469	60	0	n	1	-90	45	40	Soft	A	1.2	0.0	1.5	0.0	0.0				3.5	0.0	7.0	-90	45					50.0
	Dixie Rd Seg.8 SB	16	9743	162	198	60	0	n	1	-90	45	52	Soft	A	1.2	0.0	1.5	0.0	0.0				3.5	0.0	7.0	-90	45					44.9
NR8																																**53**
	Dixie Rd Seg.8 NB	16	23043	384	469	60	0	n	1	-90	90	243	Soft	A	1.1	0.0	1.5	0.0	0.0				3.8	0.0	5.0	-90	90					39
	Dixie Rd Seg.8 SB	16	9743	162	198	60	0	n	1	-90	90	231	Soft	A	1.1	0.0	1.5	0.0	0.0				3.8	0.0	5.0	-90	90					36
NR9																																**41**
	Bovaird Dr. E E.bound	16	18656	345	422	60	0	n	1	-90	40	56	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	-90	40					50.0
	Bovaird Dr.E W.bound	16	24771	458	560	60	0	n	1	-90	40	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	-90	40					49.6
	Bovaird Dr.W E.bound	16	19926	389	476	60	0	n	1	40	90	56	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	40	90					46.5
	Bovaird Dr.W W.bound	16	21645	423	517	60	0	n	1	40	90	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	40	90					45.1
	Dixie Rd Seg.8 NB	16	23043	384	469	60	0	n	1	-90	40	63	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	-90	40					49.1
	Dixie Rd Seg.8 SB	16	9743	162	198	60	0	n	1	-90	40	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	-90	40					44.4
	Dixie Rd Seg.9 NB	16	21063	338	413	60	0	n	1	40	90	63	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	40	90					44.9
	Dixie Rd Seg.9 SB	16	11765	189	231	60	0	n	1	40	90	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	40	90					41.4
NR10																																**56**
	Dixie Rd Seg.9 NB	16	21063	338	413	60	0	n	1	0	90	43	Soft	A	1.2	0.0	1.5	0.0	0.0													57
	Dixie Rd Seg.9 SB	16	11765	189	231	60	0	n	1	0	90	54	Soft	A	1.2	0.0	1.5	0.0	0.0													53
																																59

ORNAMENT

Ontario Road Noise Analysis Method for ENvironment and Transportation

version 2.04

Job No. 0925103A
Job Name Dixie Rd Widening

Scenario Future Build (Mitigated) - Day

ROAD CHARACTERISTICS | **SOURCE-RECEIVER-BARRIER-TOPOGRAPHY CHARACTERISTICS**

ID	Description	Time Period	Number of Vehicles			Speed (km/h)	Road Gradient (%)	Two Way? (y/n)	Pavement Type	Road Viewable Angle		Source-Receiver Distance (m)	Ground Type (Hard/Soft)	Topography Type	Source Height (m)	Road Elevation (m asl)	Receptor Height (m)	Receptor Elevation (m asl)	Ground Elevation Change (m)			"Modelled" Barrier Height (m)	Barrier Elevation (m asl)	Barrier-Reciever Distance (m)	Barrier Viewable Angle		No. of Rows of Houses	Density of Houses (% Houses)	Depth of Woods	Adjustment (dB)	Reason For Adjustment	Total Segment L_{eq} (dBA)
			Autos	Medium	Heavy					O_1	O_2								Elevation Change e (m)	Hor. Dist a (m)	Hor. Dist b (m)				O_1	O_2						
NR11	Dixie Rd Seg.10 NB.	16	21240	223	272	60	0	n	1	-90	90	42	Soft	A	1.1	0.0	1.5	0.0	0.0			1.6	0.0	13.0	-90	90						55
	Dixie Rd Seg.10 SB.	16	11986	126	154	60	0	n	1	-90	90	30	Soft	A	1.1	0.0	1.5	0.0	0.0			1.6	0.0	13.0	-90	90						54
																																57
NR 12	North Park Dr. E	16	12074	42	34	60	0	y	1	-50	60	37	Soft	A	0.1	0.0	1.5	0.0	0.0			2.0	0.0	11.0	-50	60						48.2
	North Park Dr. W	16	12011	76	62	60	0	y	1	-90	-50	37	Soft	A	0.1	0.0	1.5	0.0	0.0			2.0	0.0	11.0	-90	-50						42.9
	Dixie Rd Seg.10 NB.	16	21240	223	272	60	0	n	1	40	90	40	Soft	A	1.1	0.0	1.5	0.0	0.0			2.0	0.0	11.0	40	90						48.3
	Dixie Rd Seg.10 SB.	16	11986	126	154	60	0	n	1	40	90	52	Soft	A	1.1	0.0	1.5	0.0	0.0			2.0	0.0	11.0	40	90						44.2
	Dixie Rd Seg.11 NB.	16	21908	210	256	60	0	n	1	-90	40	40	Soft	A	1.0	0.0	1.5	0.0	0.0			2.0	0.0	11.0	-90	40						53.2
	Dixie Rd Seg.11 SB.	16	11384	109	133	60	0	n	1	-90	40	52	Soft	A	1.0	0.0	1.5	0.0	0.0			2.0	0.0	11.0	-90	40						48.8
																																57
NR13	Dixie Rd Seg.11 NB.	16	21908	210	256	60	0	n	1	-90	90	45	Soft	A	1.0	0.0	1.5	0.0	0.0			1.6	0.0	15.0	-90	90						54
	Dixie Rd Seg.11 SB.	16	11384	109	133	60	0	n	1	-90	90	33	Soft	A	1.0	0.0	1.5	0.0	0.0			1.6	0.0	15.0	-90	90						53
																																57
NR14	Dixie Rd Seg.11 NB.	16	21908	210	256	60	0	n	1	55	90	30	Soft	A	1.0	0.0	1.5	0.0	0.0			2.0	0.0	15.0	55	90						48.1
	Dixie Rd Seg.11 SB.	16	11384	109	133	60	0	n	1	55	90	41	Soft	A	1.0	0.0	1.5	0.0	0.0			2.0	0.0	15.0	55	90						43.3
	Dixie Rd Seg.12 NB.	16	22685	138	169	60	0	n	1	-90	55	30	Soft	A	0.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	-90	55						53.1
	Dixie Rd Seg.12 SB.	16	10861	66	81	60	0	n	1	-90	55	41	Soft	A	0.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	-90	55						48.8
																																56
NR15	Williams Pkwy. E	16	35625	206	169	60	0	y	1	-90	-35	47	Soft	A	0.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	-90	-35						47.8
	Williams Pkwy. W	16	35680	176	144	60	0	y	1	-35	55	47	Soft	A	0.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	-35	55						51.0
	Dixie Rd Seg.12 NB.	16	22685	138	169	60	0	n	1	55	90	32	Soft	A	0.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	55	90						46.3
	Dixie Rd Seg.12 SB.	16	10861	66	81	60	0	n	1	55	90	43	Soft	A	0.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	55	90						41.4
	Dixie Rd Seg.13 NB.	16	22053	251	306	60	0	n	1	-90	55	32	Soft	A	1.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	-90	55						55.5
	Dixie Rd Seg.13 SB.	16	11109	126	154	60	0	n	1	-90	55	43	Soft	A	1.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	-90	55						50.7
																																59
NR16	Dixie Rd Seg.13 NB.	16	22053	251	306	60	0	n	1	-90	90	42	Soft	A	1.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	-90	90						54
	Dixie Rd Seg.13 SB.	16	11109	126	154	60	0	n	1	-90	90	31	Soft	A	1.1	0.0	1.5	0.0	0.0			2.0	0.0	15.0	-90	90						53
																																57
NR17	Howden Blvd. E	16	11629	287	235	60	0	y	1	-45	55	24	Soft	A	1.2	0.0	1.5	0.0	0.0			2.0	0.0	16.0	-45	55						53.9
	Howden Blvd. W	16	11603	301	246	60	0	y	1	-90	-45	24	Soft	A	1.2	0.0	1.5	0.0	0.0			2.0	0.0	16.0	-90	-45						49.3
	Dixie Rd Seg.14 NB.	16	22534	254	310	60	0	n	1	45	90	22	Soft	A	1.1	0.0	1.5	0.0	0.0			2.0	0.0	16.0	45	90						51.4
	Dixie Rd Seg.14 SB.	16	10636	120	146	60	0	n	1	45	90	33	Soft	A	1.1	0.0	1.5	0.0	0.0			2.0	0.0	16.0	45	90						46.0
	Dixie Rd Seg.15 NB.	16	22033	217	266	60	0	n	1	-70	45	22	Soft	A	1.0	0.0	1.5	0.0	0.0			2.0	0.0	16.0	-70	45						55.6
	Dixie Rd Seg.15 SB.	16	11238	111	136	60	0	n	1	-70	45	33	Soft	A	1.0	0.0	1.5	0.0	0.0			2.0	0.0	16.0	-70	45						51.3
																																60
NR18	Dixie Rd Seg.16 NB.	16	22400	202	247	60	0	n	1	-90	90	15	Soft	A	1.0	0.0	1.5	0.0	0.0			2.0	0.0	4.0	-90	90						60
	Dixie Rd Seg.16 SB.	16	10933	98	120	60	0	n	1	-90	90	19	Soft	A	1.0	0.0	1.5	0.0	0.0			2.0	0.0	4.0	-90	90						55
																																61
NR19	Dixie Rd Seg.17 NB.	16	22172	306	374	60	0	n	1	-90	70	43	Soft	A	1.0	0.0	1.5	0.0	0.0													60
	Dixie Rd Seg.17 SB.	16	10815	149	183	60	0	n	1	-90	70	32	Soft	A	1.0	0.0	1.5	0.0	0.0													59
	Queen St. E	16	46575	1613	1971	60	0	y	1	-90	-20	102	Soft	A	1.0	0.0	1.5	0.0	0.0													55
	Queen St. W	16	51192	1272	1554	60	0	y	1	-20	25	102	Soft	A	1.0	0.0	1.5	0.0	0.0													54
																																63
NR20	Dixie Rd Seg.1	16	24982	203	248	90	0	y	1	-90	90	36	Soft	A	0.1	0.0	1.5	0.0	0.0													**65**
NR21	Dixie Rd Seg.1	16	24982	203	248	90	0	y	1	-90	90	53	Soft	A	0.1	0.0	1.5	0.0	0.0													**62**

ORNAMENT

Ontario Road Noise Analysis Method for ENvironment and Transportation

version 2.04

Job No. 0925103A
Job Name Dixie Rd Widening

Scenario Future Build - Day

ROAD CHARACTERISTICS | **SOURCE-RECEIVER-BARRIER-TOPOGRAPHY CHARACTERISTICS**

ID	Description	Time Period	Number of Vehicles			Speed (km/h)	Road Gradient (%)	Two Way? (y/n)	Pavement Type	Road Viewable Angle		Source-Receiver Distance (m)	Ground Type (Hard/Soft)	Topography Type	Source Height (m)	Road Elevation (m asl)	Receptor Height (m)	Receptor Elevation (m asl)	Ground Elevation Change (m)			"Modelled" Barrier Height (m)	Barrier Elevation (m asl)	Barrier-Reciever Distance (m)	Barrier Viewable Angle		No. of Rows of Houses	Density of Houses (% Houses)	Depth of Woods	Adjustment (dB)	Reason For Adjustment	Total Segment L_{eq} (dBA)
			Autos	Medium	Heavy					O_1	O_2								Elevation Change e (m)	Hor. Dist a (m)	Hor. Dist b (m)				O_1	O_2						
NR1	Mayfield Rd W	16	53279	1419	1734	60	0	y	1	-90	25	85	Soft	A	1.3	0.0	1.5	0.0	0.0													58.8
	Mayfield Rd E	16	39244	1572	1922	60	0	y	1	25	90	85	Soft	A	1.5	0.0	1.5	0.0	0.0													55.3
	Dixie Rd Seg 1	16	24982	203	248	90	0	y	1	-90	-65	32	Soft	A	0.1	0.0	1.5	0.0	0.0													54.4
	Dixie Rd Seg 2 NB	16	19765	434	531	60	0	n	1	-65	90	37	Soft	A	1.3	0.0	1.5	0.0	0.0													61.2
	Dixie Rd Seg 2 SB	16	12652	278	340	60	0	n	1	-65	90	26	Soft	A	1.3	0.0	1.5	0.0	0.0													61.8
																																66
NR2	Dixie Rd Seg 2 NB	16	19765	434	531	60	0	n	1	0	90	38	Soft	A	1.3	0.0	1.5	0.0	0.0													58
	Dixie Rd Seg 2 SB	16	12652	278	340	60	0	n	1	0	90	49	Soft	A	1.3	0.0	1.5	0.0	0.0													55
																																60
NR3	Dixie Rd Seg 4 NB	16	19572	844	1031	60	0	n	1	-90	90	23	Soft	A	1.5	0.0	1.5	0.0	0.0				3.2	0.0	3.0	-90	90					56
	Dixie Rd Seg 4 SB	16	11456	494	603	60	0	n	1	-90	90	34	Soft	A	1.5	0.0	1.5	0.0	0.0				3.2	0.0	3.0	-90	90					51
																																57
NR4	Sandalwood Pkwy E E.bound	16	26481	142	116	60	0	n	1	-35	45	45	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-35	45					44.9
	Sandalwood Pkwy E W.bound	16	25794	138	113	60	0	n	1	-35	45	58	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-35	45					43.4
	Sandalwood Pkwy W E.bound	16	26799	140	115	60	0	n	1	-90	-35	45	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-90	-35					44.4
	Sandalwood Pkwy W W.bound	16	30891	162	132	60	0	n	1	-90	-35	58	Soft	A	0.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-90	-35					43.5
	Dixie Rd Seg 5 NB	16	19337	780	953	60	0	n	1	55	90	29	Soft	A	1.5	0.0	1.5	0.0	0.0				3.0	0.0	5.5	55	90					49.9
	Dixie Rd Seg 5 SB	16	11866	479	585	60	0	n	1	55	90	40	Soft	A	1.5	0.0	1.5	0.0	0.0				3.0	0.0	5.5	55	90					45.8
	Dixie Rd Seg 6 NB	16	23183	324	396	60	0	n	1	-90	55	29	Soft	A	1.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-90	55					52.7
	Dixie Rd Seg 6 SB	16	9794	137	167	60	0	n	1	-90	55	40	Soft	A	1.1	0.0	1.5	0.0	0.0				3.0	0.0	5.5	-90	55					47.1
																																57
NR5	Dixie Rd Seg 6 NB	16	23183	324	396	60	0	n	1	-90	90	25	Soft	A	1.1	0.0	1.5	0.0	0.0				3.7	0.0	4.0	-90	90					52
	Dixie Rd Seg 6 SB	16	9794	137	167	60	0	n	1	-90	90	37	Soft	A	1.1	0.0	1.5	0.0	0.0				3.7	0.0	4.0	-90	90					46
																																53
NR6	Dixie Rd Seg 6 NB	16	23183	324	396	60	0	n	1	-90	90	82	Soft	D	1.1	0.0	1.5	-3.5	5.0	24.0	82.0	0.5	0.0	18.0	-90	90					48
	Dixie Rd Seg 6 SB	16	9794	137	167	60	0	n	1	-90	90	70	Soft	D	1.1	0.0	1.5	-3.5	5.0	24.0	70.0	0.5	0.0	18.0	-90	90					45
																																50
NR7	Peter Robertson Blvd. E	16	11964	102	84	60	0	y	1	-35	55	48	Soft	A	0.1	0.0	1.5	0.0	0.0				3.5	0.0	20.0	-35	55					42.2
	Peter Robertson Blvd. W	16	12003	81	66	60	0	y	1	-90	-35	48	Soft	A	0.1	0.0	1.5	0.0	0.0				3.5	0.0	20.0	-90	-35					41.0
	Dixie Rd Seg 7 NB	16	24164	246	300	60	0	n	1	45	90	40	Soft	A	1.1	0.0	1.5	0.0	0.0				3.5	0.0	7.0	45	90					45.6
	Dixie Rd Seg 7 SB	16	9084	92	113	60	0	n	1	45	90	52	Soft	A	1.1	0.0	1.5	0.0	0.0				3.5	0.0	7.0	45	90					39.9
	Dixie Rd Seg 8 NB	16	23043	384	469	60	0	n	1	-90	45	40	Soft	A	1.2	0.0	1.5	0.0	0.0				3.5	0.0	7.0	-90	45					50.0
	Dixie Rd Seg 8 SB	16	9743	162	198	60	0	n	1	-90	45	52	Soft	A	1.2	0.0	1.5	0.0	0.0				3.5	0.0	7.0	-90	45					44.9
																																53
NR8	Dixie Rd Seg 8 NB	16	23043	384	469	60	0	n	1	-90	90	243	Soft	A	1.1	0.0	1.5	0.0	0.0				3.8	0.0	5.0	-90	90					39
	Dixie Rd Seg 8 SB	16	9743	162	198	60	0	n	1	-90	90	231	Soft	A	1.1	0.0	1.5	0.0	0.0				3.8	0.0	5.0	-90	90					36
																																41
NR9	Bovaird Dr. E E.bound	16	18656	345	422	60	0	n	1	-90	40	56	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	-90	40					50.0
	Bovaird Dr.E W.bound	16	24771	458	560	60	0	n	1	-90	40	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	-90	40					49.6
	Bovaird Dr.W E.bound	16	19926	389	476	60	0	n	1	40	90	56	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	40	90					46.5
	Bovaird Dr.W W.bound	16	21645	423	517	60	0	n	1	40	90	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	40	90					45.1
	Dixie Rd Seg 8 NB	16	23043	384	469	60	0	n	1	-90	40	63	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	-90	40					49.1
	Dixie Rd Seg 8 SB	16	9743	162	198	60	0	n	1	-90	40	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	-90	40					44.4
	Dixie Rd Seg 9 NB	16	21063	338	413	60	0	n	1	40	90	63	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	40	90					44.9
	Dixie Rd Seg 9 SB	16	11765	189	231	60	0	n	1	40	90	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	40	90					41.4
																																56
NR10	Dixie Rd Seg 9 NB	16	21063	338	413	60	0	n	1	0	90	43	Soft	A	1.2	0.0	1.5	0.0	0.0													57
	Dixie Rd Seg 9 SB	16	11765	189	231	60	0	n	1	0	90	54	Soft	A	1.2	0.0	1.5	0.0	0.0													53
																																59

ORNAMENT

Ontario Road Noise Analysis Method for ENvironment and Transportation

version 2.04

Job No. 0925103A
Job Name Dixie Rd Widening

Scenario Future Build - Day

ROAD CHARACTERISTICS | **SOURCE-RECEIVER-BARRIER-TOPOGRAPHY CHARACTERISTICS**

ID	Description	Time Period	Number of Vehicles			Speed (km/h)	Road Gradient (%)	Two Way? (y/n)	Pavement Type	Road Viewable Angle		Source-Receiver Distance (m)	Ground Type (Hard/Soft)	Topography Type	Source Height (m)	Road Elevation (m asl)	Receptor Height (m)	Receptor Elevation (m asl)	Ground Elevation Change (m)			"Modelled" Barrier Height (m)	Barrier Elevation (m asl)	Barrier-Reciever Distance (m)	Barrier Viewable Angle		No. of Rows of Houses	Density of Houses (% Houses)	Depth of Woods	Adjustment (dB)	Reason For Adjustment	Total Segment L_{eq} (dBA)
			Autos	Medium	Heavy					O_1	O_2								Elevation Change e (m)	Hor. Dist a (m)	Hor. Dist b (m)				O_1	O_2						
NR11	Dixie Rd Seg.10 NB	16	21240	223	272	60	0	n	1	-90	90	42	Soft	A	1.1	0.0	1.5	0.0	0.0			1.6	0.0	13.0	-90	90						55
	Dixie Rd Seg.10 SB	16	11986	126	154	60	0	n	1	-90	90	30	Soft	A	1.1	0.0	1.5	0.0	0.0			1.6	0.0	13.0	-90	90						54
																																57
NR 12	North Park Dr. E	16	12074	42	34	60	0	y	1	-50	60	37	Soft	A	0.1	0.0	1.5	0.0	0.0													54.8
	North Park Dr. W	16	12011	76	62	60	0	y	1	-90	-50	37	Soft	A	0.1	0.0	1.5	0.0	0.0													48.2
	Dixie Rd Seg.10 NB	16	21240	223	272	60	0	n	1	40	90	40	Soft	A	1.1	0.0	1.5	0.0	0.0													52.7
	Dixie Rd Seg.10 SB	16	11986	126	154	60	0	n	1	40	90	52	Soft	A	1.1	0.0	1.5	0.0	0.0													48.5
	Dixie Rd Seg.11 NB	16	21908	210	256	60	0	n	1	-90	40	40	Soft	A	1.0	0.0	1.5	0.0	0.0													58.4
	Dixie Rd Seg.11 SB	16	11384	109	133	60	0	n	1	-90	40	52	Soft	A	1.0	0.0	1.5	0.0	0.0													53.8
																																62
NR13	Dixie Rd Seg.11 NB	16	21908	210	256	60	0	n	1	-90	90	45	Soft	A	1.0	0.0	1.5	0.0	0.0			1.6	0.0	15.0	-90	90						54
	Dixie Rd Seg.11 SB	16	11384	109	133	60	0	n	1	-90	90	33	Soft	A	1.0	0.0	1.5	0.0	0.0			1.6	0.0	15.0	-90	90						53
																																57
NR14	Dixie Rd Seg.11 NB	16	21908	210	256	60	0	n	1	55	90	30	Soft	A	1.0	0.0	1.5	0.0	0.0													52.6
	Dixie Rd Seg.11 SB	16	11384	109	133	60	0	n	1	55	90	41	Soft	A	1.0	0.0	1.5	0.0	0.0													47.4
	Dixie Rd Seg.12 NB	16	22685	138	169	60	0	n	1	-90	55	30	Soft	A	0.1	0.0	1.5	0.0	0.0													60.6
	Dixie Rd Seg.12 SB	16	10861	66	81	60	0	n	1	-90	55	41	Soft	A	0.1	0.0	1.5	0.0	0.0													55.1
																																62
NR15	Williams Pkwy. E	16	35625	206	169	60	0	y	1	-90	-35	47	Soft	A	0.1	0.0	1.5	0.0	0.0													53.2
	Williams Pkwy. W	16	35680	176	144	60	0	y	1	-35	55	47	Soft	A	0.1	0.0	1.5	0.0	0.0													57.3
	Dixie Rd Seg.12 NB	16	22685	138	169	60	0	n	1	55	90	32	Soft	A	0.1	0.0	1.5	0.0	0.0													51.5
	Dixie Rd Seg.12 SB	16	10861	66	81	60	0	n	1	55	90	43	Soft	A	0.1	0.0	1.5	0.0	0.0													46.1
	Dixie Rd Seg.13 NB	16	22053	251	306	60	0	n	1	-90	55	32	Soft	A	1.1	0.0	1.5	0.0	0.0													61.0
	Dixie Rd Seg.13 SB	16	11109	126	154	60	0	n	1	-90	55	43	Soft	A	1.1	0.0	1.5	0.0	0.0													55.9
																																64
NR16	Dixie Rd Seg.13 NB	16	22053	251	306	60	0	n	1	-90	90	42	Soft	A	1.1	0.0	1.5	0.0	0.0													59
	Dixie Rd Seg.13 SB	16	11109	126	154	60	0	n	1	-90	90	31	Soft	A	1.1	0.0	1.5	0.0	0.0													59
																																62
NR17	Howden Blvd. E	16	11629	287	235	60	0	y	1	-45	55	24	Soft	A	1.2	0.0	1.5	0.0	0.0													60.4
	Howden Blvd. W	16	11603	301	246	60	0	y	1	-90	-45	24	Soft	A	1.2	0.0	1.5	0.0	0.0													54.5
	Dixie Rd Seg.14 NB	16	22534	254	310	60	0	n	1	45	90	22	Soft	A	1.1	0.0	1.5	0.0	0.0													56.7
	Dixie Rd Seg.14 SB	16	10636	120	146	60	0	n	1	45	90	33	Soft	A	1.1	0.0	1.5	0.0	0.0													50.5
	Dixie Rd Seg.15 NB	16	22033	217	266	60	0	n	1	-70	45	22	Soft	A	1.0	0.0	1.5	0.0	0.0													62.8
	Dixie Rd Seg.15 SB	16	11238	111	136	60	0	n	1	-70	45	33	Soft	A	1.0	0.0	1.5	0.0	0.0													56.9
																																66
NR18	Dixie Rd Seg.16 NB	16	22400	202	247	60	0	n	1	-90	90	8	Soft	A	1.0	0.0	1.5	0.0	0.0													71
	Dixie Rd Seg.16 SB	16	10933	98	120	60	0	n	1	-90	90	19	Soft	A	1.0	0.0	1.5	0.0	0.0													62
																																72
NR19	Dixie Rd Seg.17 NB	16	22172	306	374	60	0	n	1	-90	70	43	Soft	A	1.0	0.0	1.5	0.0	0.0													60
	Dixie Rd Seg.17 SB	16	10815	149	183	60	0	n	1	-90	70	32	Soft	A	1.0	0.0	1.5	0.0	0.0													59
	Queen St. E	16	46575	1613	1971	60	0	y	1	-90	-20	102	Soft	A	1.0	0.0	1.5	0.0	0.0													55
	Queen St. W	16	51192	1272	1554	60	0	y	1	-20	25	102	Soft	A	1.0	0.0	1.5	0.0	0.0													54
																																63
NR20	Dixie Rd Seg.1	16	24982	203	248	90	0	y	1	-90	90	36	Soft	A	0.1	0.0	1.5	0.0	0.0													**65**
NR21	Dixie Rd Seg.1	16	24982	203	248	90	0	y	1	-90	90	53	Soft	A	0.1	0.0	1.5	0.0	0.0													**62**

ORNAMENT

Ontario Road Noise Analysis Method for ENvironment and Transportation

version 2.04

Job No. 0925103A
Job Name Dixie Rd Widening

Scenario Future No Build - Day

ROAD CHARACTERISTICS | **SOURCE-RECEIVER-BARRIER-TOPOGRAPHY CHARACTERISTICS**

ID	Description	Time Period	Number of Vehicles			Speed (km/h)	Road Gradient (%)	Two Way? (y/n)	Pavement Type	Road Viewable Angle		Source-Receiver Distance (m)	Ground Type (Hard/Soft)	Topo-graphy Type	Source Height (m)	Road Elevation (m asl)	Receptor Height (m)	Receptor Elevation (m asl)	Ground Elevation Change (m)			"Modelled" Barrier Height (m)	Barrier Elevation (m asl)	Barrier-Reciever Distance (m)	Barrier Viewable Angle		No. of Rows of Houses	Density of Houses (% Houses)	Depth of Woods	Adjustment (dB)	Reason For Adjustment	Total Segment L_{eq} (dBA)
			Autos	Medium	Heavy					O_1	O_2								Elevation Change e (m)	Hor. Dist a (m)	Hor. Dist b (m)				O_1	O_2						
NR1	Mayfield Rd W	16	10834	288	353	60	0	y	1	-90	25	85	Soft	A	1.3	0.0	1.5	0.0	0.0													51.8
	Mayfield Rd E	16	10537	422	516	60	0	y	1	25	90	85	Soft	A	1.5	0.0	1.5	0.0	0.0													49.6
	Dixie Rd Seg.1	16	11272	91	112	90	0	y	1	-90	-65	32	Soft	A	0.1	0.0	1.5	0.0	0.0													50.9
	Dixie Rd Seg.2	16	10941	240	294	60	0	y	1	-65	90	32	Soft	A	1.3	0.0	1.5	0.0	0.0													59.8
																																61
NR2	Dixie Rd Seg.2	16	10941	240	294	60	0	y	1	0	90	44	Soft	A	1.3	0.0	1.5	0.0	0.0													55
NR3	Dixie Rd Seg.4	16	20944	903	1103	60	0	y	1	-90	90	28	Soft	A	1.5	0.0	1.5	0.0	0.0				3.2	0.0	3.0	-90	90					55
NR4	Sandalwood Pkwy E E.bound	16	18030	97	79	60	0	N	1	-35	45	45	Soft	A	0.1	0.0	1.5	0.0	0.0				2.9	0.0	5.5	-35	45					43.6
	Sandalwood Pkwy E W.bound	16	17622	95	77	60	0	N	1	-35	45	58	Soft	A	0.1	0.0	1.5	0.0	0.0				2.9	0.0	5.5	-35	45					42.2
	Sandalwood Pkwy W E.bound	16	16560	87	71	60	0	N	1	-90	-35	45	Soft	A	0.1	0.0	1.5	0.0	0.0				2.9	0.0	5.5	-90	-35					42.6
	Sandalwood Pkwy W W.bound	16	19100	100	82	60	0	N	1	-90	-35	58	Soft	A	0.1	0.0	1.5	0.0	0.0				2.9	0.0	5.5	-90	-35					41.7
	Dixie Rd Seg.5	16	21110	828	1012	60	0	y	1	55	90	35	Soft	A	1.4	0.0	1.5	0.0	0.0				2.9	0.0	5.5	55	90					49.3
	Dixie Rd Seg.6	16	22259	311	380	60	0	y	1	-90	55	35	Soft	A	1.1	0.0	1.5	0.0	0.0				2.9	0.0	5.5	-90	55					51.8
																																55
NR5	Dixie Rd Seg.6	16	22259	311	380	60	0	y	1	-90	90	31	Soft	A	1.1	0.0	1.5	0.0	0.0				3.7	0.0	4.0	-90	90					51
NR6	Dixie Rd Seg.6	16	22259	311	380	60	0	y	1	-90	90	76	Soft	D	1.1	0.0	1.5	-3.5	5.0	24.0	76.0		0.5	0.0	18.0	-90	90					48
NR7	Peter Robertson Blvd. E	16	11964	102	84	60	0	y	1	-35	55	48	Soft	A	0.1	0.0	1.5	0.0	0.0				3.5	0.0	20.0	-35	55					42.2
	Peter Robertson Blvd. W	16	12003	81	66	60	0	y	1	-90	-35	48	Soft	A	0.1	0.0	1.5	0.0	0.0				3.5	0.0	20.0	-90	-35					41.0
	Dixie Rd Seg.7	16	22454	223	273	60	0	y	1	45	90	46	Soft	A	1.0	0.0	1.5	0.0	0.0				3.5	0.0	9.0	45	90					44.8
	Dixie Rd Seg.8	16	22143	363	444	60	0	y	1	-90	45	46	Soft	A	1.2	0.0	1.5	0.0	0.0				3.5	0.0	9.0	-90	45					49.6
																																52
NR8	Dixie Rd Seg.8	16	22143	363	444	60	0	y	1	-90	90	237	Soft	A	1.1	0.0	1.5	0.0	0.0				3.8	0.0	5.0	-90	90					39
NR9	Bovaird Dr. E E.bound	16	14257	264	322	60	0	n	1	-90	40	56	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	-90	40					48.8
	Bovaird Dr.E W.bound	16	18400	340	416	60	0	n	1	-90	40	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	-90	40					48.3
	Bovaird Dr.W E.bound	16	15447	302	369	60	0	n	1	40	90	56	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	40	90					45.3
	Bovaird Dr.W W.bound	16	17138	335	409	60	0	n	1	40	90	75	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	15.0	40	90					44.1
	Dixie Rd Seg.8	16	22143	363	444	60	0	y	1	-90	40	69	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	-90	40					48.4
	Dixie Rd Seg.9	16	22160	356	435	60	0	y	1	40	90	69	Soft	A	1.2	0.0	1.5	0.0	0.0				3.0	0.0	9.0	40	90					44.6
																																55
NR10	Dixie Rd Seg.9	16	22160	356	435	60	0	y	1	0	90	49	Soft	A	1.2	0.0	1.5	0.0	0.0													56

ORNAMENT

Ontario Road Noise Analysis Method for ENvironment and Transportation

version 2.04

Job No. 0925103A
Job Name Dixie Rd Widening

Scenario Future No Build - Day

ROAD CHARACTERISTICS | **SOURCE-RECEIVER-BARRIER-TOPOGRAPHY CHARACTERISTICS**

ID	Description	Time Period	Number of Vehicles			Speed (km/h)	Road Gradient (%)	Two Way? (y/n)	Pavement Type	Road Viewable Angle		Source-Receiver Distance (m)	Ground Type (Hard/Soft)	Topo-graphy Type	Source Height (m)	Road Elevation (m asl)	Receptor Height (m)	Receptor Elevation (m asl)	Ground Elevation Change (m)			"Modelled" Barrier Height (m)	Barrier Elevation (m asl)	Barrier-Reciever Distance (m)	Barrier Viewable Angle		No. of Rows of Houses	Density of Houses (% Houses)	Depth of Woods	Adjustment (dB)	Reason For Adjustment	Total Segment L_{eq} (dBA)
			Autos	Medium	Heavy					O_1	O_2								Elevation Change e (m)	Hor. Dist a (m)	Hor. Dist b (m)				O_1	O_2						
NR11	Dixie Rd Seg.10	16	22428	235	287	60	0	y	1	-90	90	36	Soft	A	1.1	0.0	1.5	0.0	0.0			1.6	0.0	13.0	-90	90						**56**
NR12	North Park Dr. E	16	12074	42	34	60	0	y	1	-50	60	37	Soft	A	0.1	0.0	1.5	0.0	0.0													54.8
	North Park Dr. W	16	12011	76	62	60	0	y	1	-90	-50	37	Soft	A	0.1	0.0	1.5	0.0	0.0													48.2
	Dixie Rd Seg.10	16	22428	235	287	60	0	y	1	40	90	46	Soft	A	1.1	0.0	1.5	0.0	0.0													52.0
	Dixie Rd Seg.11	16	22472	215	263	60	0	y	1	-90	40	46	Soft	A	1.0	0.0	1.5	0.0	0.0													57.6
																																60
NR13	Dixie Rd Seg.11	16	22472	215	263	60	0	y	1	-90	90	39	Soft	A	1.0	0.0	1.5	0.0	0.0			1.6	0.0	15.0	-90	90						**55**
NR14	Dixie Rd Seg.11	16	22472	215	263	60	0	y	1	55	90	35	Soft	A	1.0	0.0	1.5	0.0	0.0													51.4
	Dixie Rd Seg.12	16	22651	135	165	60	0	y	1	-90	55	35	Soft	A	0.1	0.0	1.5	0.0	0.0													59.3
																																60
NR15	Williams Pkwy. E	16	24047	139	114	60	0	y	1	-90	-35	47	Soft	A	0.1	0.0	1.5	0.0	0.0													51.5
	Williams Pkwy. W	16	24084	119	97	60	0	y	1	-35	55	47	Soft	A	0.1	0.0	1.5	0.0	0.0													55.6
	Dixie Rd Seg.12	16	22651	135	165	60	0	y	1	55	90	37	Soft	A	0.1	0.0	1.5	0.0	0.0													50.3
	Dixie Rd Seg.13	16	22379	257	314	60	0	y	1	-90	55	37	Soft	A	1.1	0.0	1.5	0.0	0.0													59.9
																																62
NR16	Dixie Rd Seg.13	16	22379	257	314	60	0	y	1	-90	90	36	Soft	A	1.1	0.0	1.5	0.0	0.0													**61**
NR17	Howden Blvd. E	16	11629	287	235	60	0	y	1	-45	55	24	Soft	A	1.2	0.0	1.5	0.0	0.0													60.4
	Howden Blvd. W	16	11603	301	246	60	0	y	1	-90	-45	24	Soft	A	1.2	0.0	1.5	0.0	0.0													54.5
	Dixie Rd Seg.14	16	22393	251	307	60	0	y	1	45	90	28	Soft	A	1.1	0.0	1.5	0.0	0.0													55.1
	Dixie Rd Seg.15	16	22458	222	271	60	0	y	1	-70	45	28	Soft	A	1.0	0.0	1.5	0.0	0.0													61.2
																																65
NR18	Dixie Rd Seg.16	16	22500	203	248	60	0	y	1	-90	90	14	Soft	A	1.0	0.0	1.5	0.0	0.0													**67**
NR19	Dixie Rd Seg.17	16	22269	306	375	60	0	y	1	-90	70	37	Soft	A	1.1	0.0	1.5	0.0	0.0													61
	Queen St. E	16	28722	995	1216	60	0	y	1	-90	-20	102	Soft	A	1.4	0.0	1.5	0.0	0.0													53
	Queen St. W	16	31569	784	958	60	0	y	1	-20	25	102	Soft	A	1.3	0.0	1.5	0.0	0.0													52
																																62
NR20	Dixie Rd Seg.1	16	11272	91	112	90	0	y	1	-90	90	36	Soft	A	0.1	0.0	1.5	0.0	0.0													**61**
NR21	Dixie Rd Seg.1	16	11272	91	112	90	0	y	1	-90	90	53	Soft	A	0.1	0.0	1.5	0.0	0.0													**59**

APPENDIX F

OFFICE CONSOLIDATION

This is a consolidation of the Town's Noise By-law Number 86-110 as amended by By-law Number 95-66 prepared for reference and information purposes only. If there are any discrepancies between this consolidation and By-laws numbered 86-110 and 95-66, the By-laws shall prevail.

THE CORPORATION OF THE TOWN OF CALEDON

BY-LAW NO. 86-110

as amended by By-law 95-66

Being a by-law to control noise

WHEREAS it is expedient to exercise the power conferred upon the Council by the *Environmental Protection Act* and other statutory authority; and

WHEREAS a recognized body of scientific and technological knowledge exists by which sound and vibration may be substantially reduced; and

WHEREAS the people have a right to and should be ensured an environment free from unusual, unnecessary or excessive sound or vibration which may degrade the quality and tranquility of their life or cause nuisance; and

WHEREAS it is the policy of the Council to reduce and control such sound or vibration;

NOW THEREFORE, the council of The Corporation of the Town of Caledon enacts as follows:

1. Interpretation

(1) In this by-law,

(a) Construction

"construction" includes erection, alteration, repair, dismantling, demolition, structural maintenance, painting, moving, land clearing, earth moving, grading, excavating, the laying of pipe and conduit whether above or below ground level, street and highway building, concreting, equipment installation and alteration, and the structural installation of construction components and materials in any form or for any purpose, and includes any work in connection therewith;

(b) Construction Equipment

"construction equipment" means any equipment or device designed and intended for use in construction or material handling, including but not limited to, air compressors, pile drivers, pneumatic or hydraulic tools, bulldozers, tractors, excavators, trenchers, cranes, derricks, loaders, scrapers, pavers, generators, off-highway haulers or trucks, ditchers, compactors and rollers, pumps, concrete mixers, graders, or other material handling equipment;

(c) Conveyance

"conveyance" includes a vehicle and any other device employed to transport a person or persons or goods from place to place but does not include any such device or vehicle if operated only within the premises of a person;

(d) Council

"Council" means the Council of The Corporation of the Town of Caledon;

(e) Highway

"highway" includes a common and public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct or trestle designed and intended for, or used by, the general public for the passage of vehicles;

(f) Motor Vehicle

"motor vehicle" includes an automobile, motorcycle and any other vehicle propelled or driven otherwise than by muscular power, but does not include the cars of electric or steam railways or other motor vehicles running only upon rails, or a motorized snow vehicle, traction engine, farm tractor, self-propelled implement of husbandry or road-building machine within the meaning of the *Highway Traffic Act*;

(g) Motorized Conveyance

"motorized conveyance" means a conveyance propelled or driven otherwise than by muscular, gravitational or wind power;

(h) Municipality

"municipality" means the land within the geographic limit of the Town of Caledon;

(i) Noise

"noise" means unwanted sound;

(j) Point of Reception

"point of reception" means any point on the premises of a person where sound or vibration originating from other than those premises is received.

(2) Residential Area

In this by-law "Residential Area" means those areas of the municipality designated in the Official Plan of the Town of Caledon Planning Area as "Settlement Area".

2. General Prohibitions

No person shall emit or cause or permit the emission of sound resulting from an act listed herein, and which sound is clearly audible at a point of reception:

1. Racing of any motorized conveyance other than in a racing event regulated by law.

2. The operation of a motor vehicle in such a way that the tires squeal.

3. The operation of any combustion engine or pneumatic device without an effective exhaust or intake muffling device in good working order and in constant operation.

4. The operation of a vehicle or a vehicle with a trailer resulting in banging, clanking, squealing or other like sounds due to improperly secured load or equipment, or inadequate maintenance.

5. The operation of an engine or motor in, or on, any motor vehicle or item of attached auxiliary equipment for a continuous period exceeding five minutes, while such vehicle is stationary in a Residential Area unless:

   (i) the original equipment manufacturer specifically recommends a longer idling period for normal and efficient operation of the motor vehicle in which case such recommended period shall not be exceeded; or,

   (ii) operation of such engine or motor is essential to a basic function of the vehicle or equipment, including but not limited to, operation of ready-mixed concrete trucks, lift platforms and refuse compactors; or,

   (iii) weather conditions justify the use of heating or refrigerating systems powered by the motor or engine for the safety and welfare of the operator, passengers or animals, or the preservation of perishable cargo, and the vehicle is stationary for purposes of delivery or loading; or,

   (iv) prevailing low temperatures make longer idling periods necessary immediately after starting the motor or engine; or,

   (v) the idling is for the purpose of cleaning and flushing the radiator and associated circulation system for seasonal change of antifreeze, cleaning of the fuel system, carburetor or the like, when such work is performed other than for profit.

6. The operation of a motor vehicle horn or other warning device except where required or authorized by law or in accordance with good safety practices.

7. The operation of any item of construction equipment in a Residential Area without effective muffling devices in good working order and in constant operation.

3. Prohibitions by Time and Place

No person shall emit or cause or permit the emission of sound resulting from any act listed in Table 3-1 if clearly audible at a point of reception located in a Residential Area within a prohibited time shown in Table 3-1.

TABLE 3-1

PROHIBITIONS BY TIME AND PLACE

Act	Prohibited Period of Time
1. The detonation of fireworks or explosive devices not used in construction	At all times
2. The discharge of firearms	At all times
3. The operation of a combustion engine which, (i) is, or (ii) is used in, or (iii) is intended for use in a toy, or a model or replica of any device, which model or replica has no function other than amusement and which is not a conveyance.	At all times
4. The operation of any electronic device or group of connected electronic devices incorporating one or more loudspeakers or other electro-mechanical transducers, and intended for the production, reproduction or amplification of sound.	11:00 p.m. one day to 7:00 a.m. the next day
5. The operation of any auditory signaling device, including but not limited to the ringing of bells or gongs and the blowing of horns or sirens or whistles, or the production, reproduction or amplification of any similar sounds by electronic means, except where required or authorized by law or in accordance with good safety practices.	11:00 p.m. one day to 7:00 a.m. the next day
6. The operation of any powered rail car, including but not limited to refrigeration cars, locomotives or self-propelled passenger cars, while stationary on property not owned or controlled by a railway governed by the *Canada Railway Act.*	11:00 p.m. one day to 7:00 a.m. the next day
7. The operation of any motorized conveyance other than on a highway or other place intended for its operation.	11:00 p.m. one day to 7:00 a.m. the next day
8. The venting, release or pressure relief of air, steam or other gaseous material, product or compound from any autoclave, boiler, pressure vessel, pipe, valve, machine, device or system.	11:00 p.m. one day to 7:00 a.m. the next day
9. Persistent barking, calling or whining or other similar persistent noise-making by any domestic pet or any other animal kept or used for any purpose other than agriculture.	11:00 p.m. one day to 7:00 a.m. the next day
10. The operation of a commercial car wash with air drying equipment.	11:00 p.m. one day to 7:00 a.m. the next day
11. Yelling, shouting, hooting, whistling or singing	11:00 p.m. one day to 7:00 a.m. the next day

TABLE 3-1

PROHIBITIONS BY TIME AND PLACE (Cont.)

12. The operation of a power assisted hand glider or parafoil.	11:00 p.m. one day to 7:00 a.m. the next day
13. All selling or advertising by shouting or outcry or amplified sound.	11:00 p.m. one day to 7:00 a.m. the next day
14. Loading, unloading, delivering, packing, unpacking, or otherwise handling any containers, products, materials, or refuse, whatsoever, unless necessary for the maintenance of essential services or the moving of private household effects.	11:00 p.m. one day to 7:00 a.m. the next day
15. The operation of any equipment in connection with construction	11:00 p.m. one day to 6:00 a.m. the next day
16. The operation or use of any tool for domestic purposes other than snow removal.	11:00 p.m. one day to 7:00 a.m. the next day
17. The operation of solid waste bulk lift or refuse compacting equipment.	11:00 p.m. one day to 7:00 a.m. the next day
18. The operation of a commercial car wash of a type other than mentioned in item 10.	11:00 p.m. one day to 7:00 a.m. the next day

4. Exemption for Public Safety

Notwithstanding any other provision of this by-law, it shall be lawful to emit or cause or permit the emission of sound or vibration in connection with emergency measures undertaken:

(a) for the immediate health, safety or welfare of the inhabitants or any of them; or,

(b) for the preservation or restoration of property;

unless such sound or vibration is clearly of a longer duration, or nature more disturbing, than is reasonably necessary for the accomplishment of such emergency purpose.

5. Severability

If a court of competent jurisdiction should declare any section or part of a section of this by-law to be invalid, such section or part of a section shall not be construed as having persuaded or influenced Council to pass the remainder of the by-law and it is hereby declared that the remainder of the by-law shall be valid and shall remain in force.

6. Penalty

Every person who contravenes any of the provisions of this by-law is guilty of an offence. *[Amended by By-law 95-66]*

7. Exemptions

The Council, upon application of any person who proposes to emit, or cause or permit the emission of sound not in conformity with the provision of this by-law, may authorize an exemption from the provisions of this by-law provided that, in the opinion of the Council, the general intent and purpose of this by-law are maintained. *[Amended by By-law 95-66]*

8. A person seeking an exemption shall

(1) submit an application to the chief by-law enforcement officer who shall prepare a report in respect of the application,

(2) pay a non-refundable application fee of $50.00, at the time of submitting the application, and

(3) be heard by the Council, or such committee of Council as designated by council, which committee shall recommend to Council whether or not to grant the exemption requested. *[Amended by By-law 95-66]*

9. Effective Date

This by-law shall come into force and take effect from the date it is approved by the Minister of the Environment.

READ A FIRST TIME

THIS 23rd DAY OF JUNE, 1986

"Emil Kolb"
Mayor

"Gary H. Boyce"
Clerk

READ A SECOND AND THIRD TIME

AND FINALLY PASSED

THIS 7TH DAY OF JULY, 1986

"Emil Kolb"
Mayor

"Gary H. Boyce"
Clerk

This By-law is approved pursuant to the Provisions of the Environmental Protection Act at Toronto, This 19th day of August, 1986.

"Jim Bradley"

MINISTER OF THE ENVIRONMENT

Office Consolidation

Noise By-law 93-84
(as amended by By-laws 225-84, 41-95, 253-98 and 202-2006)

To prohibit and regulate noise
and to repeal By-law 15-75

WHEREAS the Municipal Act (R.S.O. 1980, c.320, as amended) provides that by-laws may be passed by the councils of local municipalities for prohibiting or regulating, within the municipality or within any defined area or areas thereof, the ringing of bells, the blowing of horns, shouting and unusual noises, or noises likely to disturb inhabitants;

NOW THEREFORE the Council of The Corporation of the City of Brampton ENACTS as follows:

1. Except as permitted by section 4, a person shall not, within the City of Brampton, make, create, cause, or cause or permit to be made, noises likely to disturb the inhabitants.

2. Except as permitted by section 4, a person shall not, within the City of Brampton, make, create, cause, or cause or permit to be made, unusual noises.

3. Except as permitted by section 4, a person shall not, within the City of Brampton, shout, ring any bell, blow or sound any horn, or cause or permit the ringing of bells or the blowing of horns.

4. The following sounds and noises are specifically permitted by this by-law, and the presence of these sounds and noises is not to be considered a contravention of this by-law:

   (1) the sounding or ringing of church bells and chimes,

(2) the sound of any bell, horn, siren or other signal device from a vehicle when required or permitted by law,

(3) in the areas which are designated for primarily agricultural uses by the Official Plan or by a zoning by-law (but not within any hamlets and villages which may be so designated), the sound of any animal or bird **(225-84)**,

(4) the blowing of any steam or air whistle attached to or used in connection with any stationery boiler or other machine or mechanism, when giving notice to workers of the time to commence or cease work, or warning of danger,

(5) the sound from any apparatus or mechanism used in a reasonable manner for the amplification of the human voice, music, or the sound from any other sound-producing or sound-reproducing instrument or apparatus, by a local organization where funds are being raised for charitable purposes, or in connection with any public election meeting, or for any public celebration or other gathering for which written permission has been obtained from the City,

(6) the sound of any military or other band, or of any parade, for which written permission has been obtained from the City,

(7) the sound of any newsboy, pedlar, hawker or tradesman plying his calling legitimately and moderately,

(8) any sound arising from the operation of any railway or from any plant or work in connection with any such railway,

(9) any sound from the operation of the Salvation Army as heretofore carried on,

(10) any sound arising from road work and road improvements undertaken by or on behalf of the Ministry of Transportation (Ontario) or the Region of Peel **(202-2006)**.

5. Every person who contravenes any provision of this by-law is guilty of an offence and upon conviction is liable to a fine as provided for in the Provincial Offences Act **(253-98)**.

6. By-law 15-75 is hereby repealed.

Read a First, Second and Third Time and Passed in Open Council this 25th day of April, 1984.

THE CORPORATION OF THE CITY OF BRAMPTON
Original Signed by: Kenneth G. Whillans, Mayor
Original Signed by: Ralph A. Everett, Clerk

APPENDIX G

Highway Construction Noise Assessment - Roadway Resurfacing

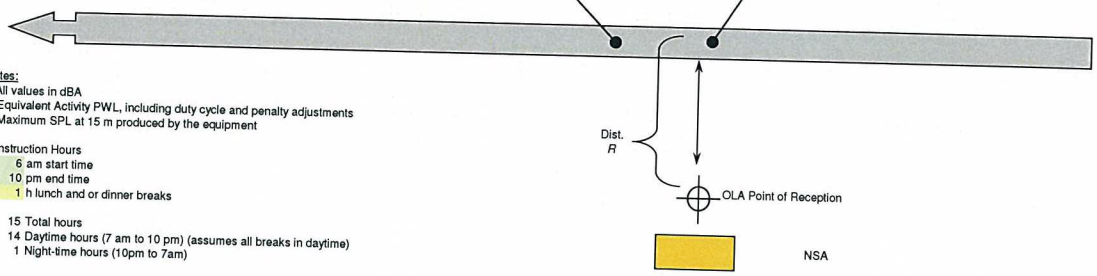
Job No: 0925103A
Job Name: Dixie Road Widening

1. Removal of Original Surface

Type	Amt	Act. PWL[1]	Max. SPL[2]	Equipment
13	1	120	90	Pavement Milling Machines (scarafier)
1	1	107	79	Backhoes / Wheeled Loaders
14	3	108	76	Haul truck (Typical 3-axle)
16	1	120	90	Hoe Ram / Pavement Breaker
		0	0	
		0	0	
		0	0	
		0	0	
TOTAL	6	123		

2. Resurfacing

Type	Amt	Act. PWL[1]	Max. SPL[2]	Equipment
1	2	110	79	Backhoes / Wheeled Loaders
14	3	108	76	Haul truck (Typical 3-axle)
12	1	105	77	Asphalt Spreader
6	1	98	73	Road Roller
		0	0	
		0	0	
		0	0	
		0	0	
TOTAL	7	113		



Notes:
-- All values in dBA
1. Equivalent Activity PWL, including duty cycle and penalty adjustments
2. Maximum SPL at 15 m produced by the equipment

Construction Hours
6 am start time
10 pm end time
1 h lunch and or dinner breaks

15 Total hours
14 Daytime hours (7 am to 10 pm) (assumes all breaks in daytime)
1 Night-time hours (10pm to 7am)

Predicted Construction Noise Levels - Removal of Original Surface

Receptor No.	Description	Distance to Centre-line *R* (m)	Approximate Screening (dBA)	L_{eq} (1h) [1.]	L_{max} [2.]	L_{10} [3.]	L_{dn} [4.]
NR1	House at 0+200 on Dixie Road	26	0	87	87	90	87
NR2	House at 0+600 on Dixie Road	38	0	83	83	86	83
NR3	House at 2+300 on Octillo Blvd.	23	0	88	88	91	88
NR4	House at 2+850 on Tigerlily Pl.	29	0	86	86	89	86
NR5	House at 3+150 on Springtown Trail	25	0	87	87	90	87
NR6	House at 3+500 on Morningmist Street	76	0	77	77	80	77
NR7	House at 3+850 on Rangeland Road	40	0	83	83	86	83
NR8	House at 4+000 on Coral Reef Crescent	240	0	67	67	70	67
NR9	House at 4+450 on Manitou Cres.	63	0	79	79	82	79
NR10	Town homes at 4+650 on Moregate Cres.	43	0	82	82	85	82
NR11	House at 5+000 on Nottingham Crescent	36	0	84	84	87	84
NR12	House at 5+250 on Malcolm Cres.	40	0	83	83	86	83
NR13	House at 5+450 on Northgate Boulevard	39	0	83	83	86	83
NR14	House at 5+650 on Mansion St.	30	0	85	85	88	85
NR15	House at 5+850 on Maidelaine Cres.	32	0	85	85	88	85
NR16	House at 6+200 on Lascelles Blvd.	31	0	85	85	88	85
NR17	House at 6+850 on Holloway Ct.	22	0	88	88	91	88
NR18	House at 7+050 on Homeland Ct.	8	0	97	97	100	97
NR19	Church at 7+400 on Dixie Road	26	0	87	87	90	87
NR20	House at 12412 on Dixie Road	30	0	85	85	88	85
NR21	House at 12423 Dixie Road	46	0	82	82	85	82

Predicted Construction Noise Levels - Resurfacing

Receptor No.	Description	Distance to Centre-line *R* (m)	Approximate Screening	L_{eq} (1h) [1.]	L_{max} [2.]	L_{10} [3.]	L_{dn} [4.]
NR1	House at 0+200 on Dixie Road	26	0	77	77	80	77
NR2	House at 0+600 on Dixie Road	38	0	73	82	76	73
NR3	House at 2+300 on Octillo Blvd.	23	0	78	86	81	78
NR4	House at 2+850 on Tigerlily Pl.	29	0	76	84	79	76
NR5	House at 3+150 on Springtown Trail	25	0	77	86	80	77
NR6	House at 3+500 on Morningmist Street	76	0	67	76	70	67
NR7	House at 3+850 on Rangeland Road	40	0	73	81	76	73
NR8	House at 4+000 on Coral Reef Crescent	240	0	57	66	60	57
NR9	House at 4+450 on Manitou Cres.	63	0	69	78	72	69
NR10	Town homes at 4+650 on Moregate Cres.	43	0	72	81	75	72
NR11	House at 5+000 on Nottingham Crescent	36	0	74	82	77	74
NR12	House at 5+250 on Malcolm Cres.	40	0	73	81	76	73
NR13	House at 5+450 on Northgate Boulevard	39	0	73	82	76	73
NR14	House at 5+650 on Mansion St.	30	0	75	84	78	75
NR15	House at 5+850 on Maidelaine Cres.	32	0	75	83	78	75
NR16	House at 6+200 on Lascelles Blvd.	31	0	75	84	78	75
NR17	House at 6+850 on Holloway Ct.	22	0	78	87	81	78
NR18	House at 7+050 on Homeland Ct.	8	0	87	95	90	87
NR19	Church at 7+400 on Dixie Road	26	0	77	85	80	77
NR20	House at 12412 on Dixie Road	30	0	75	84	78	75
NR21	House at 12423 Dixie Road	46	0	72	80	75	72

Notes:
- All values are in dBA unless otherwise noted
1. Equivalent Activty PWL for the group (includes duty cycle, penalties and no of vehicle adjustments) + 10 log (2 / (4*3.14* S-R dist^2))
2. Higher of L_{eq} (1 h) or (Max of (Max SPL for each group + 20 log (15 / SR- dist))
3. L_{eq} (1 h) + 3 dB, based on typical construction sites, per RCNM
4. Based on L_{eq} (1 h) values and construction hours, includes a 10 dB penalty for night-time operations (10 pm to 7 am)

Highway Construction Noise Assessment - Roadway Construction

Job No: 0925103A
Job Name: Dixie Road Widening

2. Compaction of Subgrade

Type	Amt	Act. PWL[1]	Max. SPL[2]	Equipment
5	2	111	83	Compactor
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
TOTAL	2	111		

4. Compaction of Base Course

Type	Amt	Act. PWL[1]	Max. SPL[2]	Equipment
5	1	108	83	Compactor
11	1	108	80	Graders
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
TOTAL	2	111		

5. Surface Course

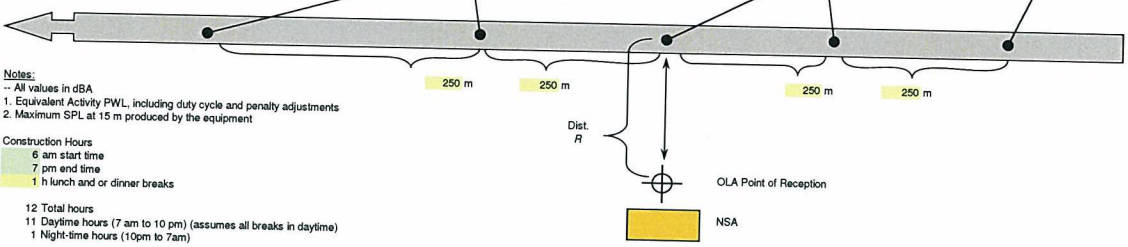
Type	Amt	Act. PWL[1]	Max. SPL[2]	Equipment
1	2	110	79	Backhoes / Wheeled Loaders
14	3	108	76	Haul truck (Typical 3-axle)
12	1	105	77	Asphalt Spreader
6	1	98	73	Road Roller
		0	0	
		0	0	
		0	0	
		0	0	
TOTAL	7	113		

1. Removal of Overburden

Type	Amt	Act. PWL[1]	Max. SPL[2]	Equipment
2	1	109	81	Excavators
14	3	108	76	Haul truck (Typical 3-axle)
3	1	110	82	Bulldozers
4	1	112	84	Scrapers
		0	0	
		0	0	
		0	0	
		0	0	
TOTAL	6	116		

3. Base Course

Type	Amt	Act. PWL[1]	Max. SPL[2]	Equipment
1	2	110	79	Backhoes / Wheeled Loaders
3	1	110	82	Bulldozers
14	4	110	76	Haul truck (Typical 3-axle)
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
TOTAL	7	114		



Notes:
-- All values in dBA
1. Equivalent Activity PWL, including duty cycle and penalty adjustments
2. Maximum SPL at 15 m produced by the equipment

Construction Hours
6 am start time
7 pm end time
1 h lunch and or dinner breaks

12 Total hours
11 Daytime hours (7 am to 10 pm) (assumes all breaks in daytime)
1 Night-time hours (10pm to 7am)

Predicted Construction Noise Levels

Receptor No.	Description	Distance to Centre-line R (m)	Approximate Screening (dBA)	L_{eq} (1h) [1.]	L_{max} [2.]	L_{10} [3.]	L_{dn} [4.]
NR1	House at 0+200 on Dixie Road	26	0	78	78	81	78
NR2	House at 0+600 on Dixie Road	38	0	75	75	78	74
NR3	House at 2+300 on Octillo Blvd.	23	0	79	79	82	79
NR4	House at 2+850 on Tigerlily Pl.	29	0	77	77	80	77
NR5	House at 3+150 on Springtown Trail	25	0	78	78	81	78
NR6	House at 3+500 on Morningmist Street	76	0	69	69	72	69
NR7	House at 3+850 on Rangeland Road	40	0	74	74	77	74
NR8	House at 4+000 on Coral Reef Crescent	240	0	61	61	64	61
NR9	House at 4+450 on Manitou Cres.	63	0	71	71	74	70
NR10	Town homes at 4+650 on Moregate Cre	43	0	74	74	77	73
NR11	House at 5+000 on Nottingham Crescen	36	0	75	75	78	75
NR12	House at 5+250 on Malcolm Cres.	40	0	74	74	77	74
NR13	House at 5+450 on Northgate Boulevard	39	0	75	75	78	74
NR14	House at 5+650 on Mansion St.	30	0	77	77	80	76
NR15	House at 5+850 on Maidelaine Cres.	32	0	76	76	79	76
NR16	House at 6+200 on Lascelles Blvd.	31	0	77	77	80	76
NR17	House at 6+850 on Holloway Ct.	22	0	80	80	83	79
NR18	House at 7+050 on Homeland Ct.	8	0	88	88	91	88
NR19	Church at 7+400 on Dixie Road	26	0	78	78	81	78
NR20	House at 12412 on Dixie Road	30	0	77	77	80	76
NR21	House at 12423 Dixie Road	46	0	73	73	76	73

Notes:
- All values are in dBA unless otherwise noted
1. Equivalent Activty PWL for the group (includes duty cycle, penalties and no of vehicle adjustments) + 10 log (2 / (4*3.14* S-R dist^2))
2. Higher of L_{eq} (1 h) or (Max of (Max SPL for each group + 20 log (15 / SR- dist))
3. L_{eq} (1 h) + 3 dB, based on typical construction sites, per RCNM
4. Based on L_{eq} (1 h) values and construction hours, includes a 10 dB penalty for night-time operations (10 pm to 7 am)

APPENDIX H

RWDI
CONSULTING ENGINEERS & SCIENTISTS

Memorandum

RWDI AIR Inc.
650 Woodlawn Road West
Guelph, Ontario, Canada N1K 1B8
Tel: 519.823.1311
Fax: 519.823.1316
Email: solutions@rwdi.com

To:	Hitesh Topiwala, Region of Peel	**Date:**	3/14/2011
From:	Sharon Schajnoha, RWDI AIR Inc.	**RWDI Reference #:**	0925103
Re:	**Dixie Road Widening (Queen Street to 1.4 km North of Mayfield Road)** **Comparison of Land Use Planning Studies Within the Project Study Area with RWDI's Findings**		

We have compared the traffic parameters and methodology applied in the noise studies approved in the land use process (applicable to the project study area) with those applied by RWDI in current study. Our findings are summarized below.

Land use planning reports for all applicable subdivisions within the study area were provided by the Region of Peel and the City of Brampton. These reports were reviewed in the context of the acoustical effects of the noise barriers. Traffic data for the project study area (including cross roads) were provided by AECOM. RWDI did not use the traffic parameters summarized in the land use studies. We have, however, compared the traffic parameters applied in our assessment, versus those applied in the land use studies. This comparison is provided in Attachment 1.

Based on the comparison of the noise studies approved in the land use studies and the current project, the following points were noted:

- The models used for analyzing the noise impacts for the current study and the studies approved through the planning process are the same. RWDI's road traffic noise levels were modelled using a computerized spreadsheet model of the "Ontario Road Noise Analysis Method for Environmental Transportation (ORNAMENT)" algorithms (MOE 1989). The algorithms in this spreadsheet form the basis of the STAMSON v5.03 computer program produced by the MOE (MOE 1996). The land use studies used either ORNAMENT or STAMSON models to predict road traffic noise levels Results from the ORNAMENT calculations and STAMSON are approximately equivalent.
- There are minor variations in the parameters (as indicated in Attachment 1) that were used in the current study and studies approved through the planning process. However, these variations do not warrant any change in the size, location or material of noise walls. This was confirmed by inputting the corresponding parameters from the land use studies into our model.
- The existing walls identified for repair/replacement are not functioning effectively as noise barriers because of structural deficiencies and must be replaced / repaired.

Please let me know if you have any questions or comments.

ATTACHMENT 1

ATTACHMENT 1: MODEL INPUTS AND COMPARISON OF LAND USE STUDIES AND RWDI REPORT

Consultant	File No./Report Title	Road	2031 AADT [1]	Day/Night Split [2]	Overall % Commercial Vehicles	Heavy / Medium Truck Split [3]	Posted Speed Limit (km/h)	Representative Receptor	Noise Model
AECOM/RWDI	--	Dixie Rd.	40000	85/15	3	55/45	60	NR18	ORNAMENT / STAMSON
		Queen St. E. - east of Dixie Rd.	59010		7.1				
		Queen St. E. - west of Dixie Rd.	63550		5.2				
Jade Acoustics Inc.	21T-03018B / Dixie Rd. and Hillside Dr. (November 14, 2005)	Dixie Rd.	40000	90/10	6	40/60	60		
		Queen St. E.	53000		6				
AECOM/RWDI	--	Dixie Rd.	40000	85/15	3.6	55/45	60	NR8	ORNAMENT / STAMSON
		Bovaird Dr. - east of Dixie Rd.	53190		3.9				
		Bovaird Dr. - west of Dixie Rd.	51030		4.2				
		Peter Robertson Blvd. - east of Dixie Rd.	13500	90/10	1.5	45/55			
		Peter Robertson Blvd. - west of Dixie Rd.			1.2				
J.E. Coulter Associates Ltd.	21T-94001B / Discovery Subdivision (March 27, 1998)	Dixie Rd.	40000	90/10	10	55/45	60		
		Bovaird Dr.	40000		15	55/45	70		
		Peter Robertson Blvd.	18800		5	45/55	50		
AECOM/RWDI	--	Dixie Rd.	40000	90/10	3	45/55	60	NR4/NR5	ORNAMENT / STAMSON
		Sandalwood Pkwy. - east of Dixie Rd.	58650		1				
		Sandalwood Pkwy. - west of Dixie Rd.	64710		0.9				
Jade Acoustics Inc.	21T-94011B / Springdale 301C (September 23, 1997)	Dixie Rd.	40000	90/10	5	40/60	80		
		Sandalwood Pkwy.	28000		5		50		
AECOM/RWDI	--	Dixie Rd.	40000	85/15	3.7	55/45	60	NR3	ORNAMENT / STAMSON
		Countryside Dr. - east of Dixie Rd.	34290	90/10	0.9	45/55			
		Countryside Dr. - west of Dixie Rd.	29250		8.2				
Valcoustics Canada Ltd.	21T-04021B / Sandringham Place Neighbourhood 802 (September 8, 2005)	Dixie Rd.	40000	90/10	6	40/60	80		
		Countryside Dr.	28000		5	63/38	60		
AECOM/RWDI	--	Dixie Rd.	40000	85/15	8.7	55/45	60	NR3	ORNAMENT / STAMSON
Jade Acoustics Inc.	T-07006B / Springdale 702 (September 20, 2007)	Dixie Rd.	40000	90/10	10	75/25	80		
AECOM/RWDI	--	Dixie Rd.	40000	85/15	3	55/45	60	NR3	ORNAMENT / STAMSON
Jade Acoustics Inc.	21T-97006B / Springdale 801, Phase 2 (October 19, 1999)	Dixie Rd.	40000	90/10	5	40/60	80		

Notes: [1] Higher of calculated Annual Average Daily Traffic (AADT) based on PM Peak traffic volume provided by AECOM and level 'C' service AADT, as per Region's Guide.

[2] XX / YY is the percentage of vehicle traffic in the 16 hour daytime and 8 hour night-time respectively.

[3] HH / MM is the percentage of heavy trucks and medium trucks used in the analysis, respectively.