HGC ENGINEERING

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Noise Feasibility Study
Proposed Residential Development
4527 Montrose Road
Niagara Falls, ON

Prepared for:

Frank Constantino Construction Ltd
6496 January Drive
Niagara Falls, Ontario
L2J 4J4

Prepared by

Harry Cai, PEng

Reviewed by

Sheeba Paul, MEng, PEng

January 31, 2023

HGC Project No: 02200527

VERSION CONTROL

Noise Feasibility Study, Proposed Residential Development, 4527 Montrose Road, Niagara Falls, Ontario

Ver.	Date	Version Description	Prepared By
1.0	31-Jan-23	Noise Feasibility Study to support plannings and approvals process	H. Cai

Limitations

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Table of Contents

1 Introduction and Summary

HGC Engineering was retained by Frank Constantino Construction Ltd. to conduct a noise feasibility study for a proposed residential development located at 4257 Montrose Road in the City of Niagara Falls, Ontario. The residential development will consist of 10 lots of single storey residences. The study is required by the Region of Niagara as part of the planning and approvals process.

The primary source of noise is road traffic noise on Montrose Road. A secondary source of noise is road traffic noise on the Queen Elizabeth Way (QEW) further to the east. Road traffic data was obtained from the Region of Niagara and from the Ontario Ministry of Transportation (MTO), and was used to predict future traffic sound levels at the proposed building façades and outdoor living areas. The predicted sound levels were compared to the guidelines of the Region of Niagara and the Ministry of Environment, Conservation and Parks (MECP) to develop noise control recommendations.

The results of the study indicate that the proposed development is feasible with the noise control measures described in this report. Central air conditioning and acoustic barriers are required for the two units adjacent to Montrose Road. Forced air ventilation systems with ductwork sized for the future installation of central air conditioning by the occupant are required for all other units. For all units, building construction meeting the minimum requirements of the Ontario Building Code will provide sufficient acoustical insulation for indoor spaces. Noise warning clauses are required for the dwelling units to inform future occupants of traffic noise impacts, to address sound level excesses, and proximity to existing commercial facilities.

2 Site Description and Noise Sources

Figure 1 is a key plan indicating the location of the proposed site. The site is located west of Montrose Road, in the City of Niagara Falls, Ontario. Figure 2 shows the draft plan by J.D. Barnes Ltd, dated February 18, 2022. The proposed development will consist of 10 lots of single storey residences.

HGC Engineering personnel visited the site on January 17, 2023 to make observations of the acoustical environment. During the site visit, it was noted that the primary source of noise was road

traffic on Montrose Road. The site is currently vacant. The area around the site is mostly flat and residential. There are existing single detached dwellings west and south of the site area, and existing multi-family dwellings north of the site. To the east of the site area and across Montrose Road are commercial office buildings. To the further northeast is a car dealership (AutoValue Hyundai), located approximately 220 m away, and to the further southeast is a building supplies store (The Landscape Depot), located approximately 100 m away. There are existing residential dwellings closer to the car dealership and the building supplies store than the subject site. Montrose Road is approximately 27 m wide and acts as a buffer between the commercial site and the subject site.

Sound emissions from the commercial facilities to the east and southeast of the subject site were not audible at the site area. Nevertheless, it is recommended that a noise warning clause to identify that such commercial uses may be audible at times be included in the property and tenancy agreements.

3 Noise Level Criteria

3.1 Road Traffic Noise

Guidelines for acceptable levels of road traffic noise impacting residential developments are given in the MECP publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", release date October 21, 2013, and are listed in Table I below.

The values in Table I are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA].

Table I: MECP Road Traffic Noise Criteria (dBA)

Area	Daytime $L_{EQ\ (16\ hour)}$ Road	Nighttime $L_{EQ(8\ hour)}$ Road
Outdoor Living Area	55 dBA	--
Inside Living/Dining Rooms	45 dBA	45 dBA
Inside Bedrooms	45 dBA	40 dBA

Daytime refers to the period between 07:00 and 23:00. Nighttime refers to the time period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace, or other area where passive recreation is expected to occur. Small balconies are

not considered OLAs for the purposes of assessment. Terraces greater than 4 m in depth (measured perpendicular to the building façade) are considered to be OLAs.

The guidelines in the MECP publication allow the daytime sound levels in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property. Where OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically, and administratively practical.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels outside bedroom or living/dining room windows exceed 60 dBA or daytime sound levels outside bedroom or living/dining room windows exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning is required when nighttime sound levels at bedroom or living/dining room windows are in the range of 51 to 60 dBA or when daytime sound levels at bedroom or living/dining room windows are in the range of 56 to 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of window nighttime sound level is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise.

4 Traffic Noise Assessment

4.1 Road Traffic Data

Traffic data for Montrose Road was obtained from the Region of Niagara in the form of vehicle turning movement counts, and is provided in Appendix A. The road data was projected to the year 2043 at an annual growth rate of 2.5 %, as per Region of Niagara Falls guidelines. A projected volume of 33 506 vehicles per day at a posted limit of 50 km/h was applied for the analysis. A commercial vehicle percentage of 3.6 % was calculated, and was further split into 1.4 % for medium trucks and 2.2 % for heavy trucks as per MTO guidelines. A day/night split of 90 % / 10 % was used.

Traffic data for the QEW was obtained from the MTO in the form of summer average daily traffic values, and is provided in Appendix A. The road data was projected to the year 2033 at an annual

growth rate of 2.5 %. A projected volume of 102 557 vehicles per day at a posted speed limit of 100 km/h was applied for the analysis. A commercial vehicle percentage of 11 % was applied, further split into 4 % for medium trucks and 7 % for heavy trucks was applied as per MTO guidelines. A day/night split of 67 % / 33 % was used.

Table II summarizes the traffic volume data used in this study.

Table II: Projected Road Traffic Data

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Montrose Road *Projected to year 2043*	Daytime	29 070	422	663	30 155
	Nighttime	3 230	47	74	3 351
	Total	**32 300**	**469**	**737**	**33 506**
QEW *Projected to year 2033*	Daytime	60 854	2 735	4 786	68 375
	Nighttime	30 422	1 367	2 393	34 182
	Total	**91 276**	**4 102**	**7 179**	**102 557**

4.2 Road Traffic Noise Predictions

To assess the levels of road traffic noise which will impact the study area in the future, sound level predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. Sample STAMSON output is included in Appendix B.

Predictions of the traffic sound levels were chosen around the proposed residential buildings to obtain an appropriate representation of future sound levels at various façades. Sound levels were predicted at the plane of the bedroom and/or living/dining room windows during daytime and nighttime hours to investigate ventilation and façade construction requirements. Sound levels were also predicted in rear yard OLA's to investigate the need for noise barriers. Figure 2 shows the draft plan with prediction locations. The results of these predictions are summarized in Table III.

Table III: Predicted Road Traffic Sound Levels [dBA], Without Mitigation

Prediction Location	Description	Daytime – in the OLA $L_{EQ-16\ hr}$	Daytime – at the Façade $L_{EQ-16\ hr}$	Nighttime – at the Facade $L_{EQ-8\ hr}$
[A]	Unit 10, east façade facing Montrose Road	62	68	62
[B]	Unit 6, south façade with flanking exposure to Montrose Road	55	55	52

5 Discussions and Recommendations

The sound level predictions indicate that the future traffic sound levels will exceed MECP guidelines at the proposed development. The following discussion outlines the recommendations for acoustic barrier requirements, ventilation requirements, upgraded building façade construction, and warning clauses to achieve the noise criteria stated in Table I.

5.1 Outdoor Living Areas

The predicted daytime sound levels in the rear yards of the units closest to Montrose Road will be up to 62 dBA, which is in excess of the MECP's limit of 55 dBA by 7 dBA. Physical mitigation in the form of an acoustic barrier is required to address these excesses. The various barrier heights required to achieve MECP's OLA requirements are provided in Table IV.

Table IV: Required Barrier Heights to Achieve Various Sound Levels

	Location	Sound Level in OLA [dBA]					
		55	56	57	58	59	60
Barrier Height [m]	Units 5, 10	2.7	2.5	2.1	1.8	--	--

An acoustic barrier height of 2.1 m is recommended for the rear yards of units 5 and 10, which are adjacent to Montrose Road, to reduce the sound level to 57 dBA. This is within the 5 dBA allowable exceedance range of the MECP guidelines, provided that a warning clause is included in the property and tenancy agreements and the municipality finds the mitigation acceptable. The barrier at the rear yards of units 5 and 10 will provide adequate sound attenuation for the other rear yards to the west. Figure 3 shows the location of the required barriers.

Acoustic barriers can be any combination of an earth berm and an acoustic wall on top. The wall component of the barrier should be of a solid construction with a surface density of no less than 20 kg/m^2. The walls may be constructed from a variety of materials such as wood, brick, pre-cast concrete or other concrete/wood composite systems provided that it is free of gaps or cracks within or below its extent.

5.2 Indoor Living Areas and Ventilation Requirements

Air Conditioning

The predicted future sound levels outside the windows of the future dwellings on the two units adjacent to Montrose Road will be greater than 60 dBA during nighttime hours and 65 dBA during daytime hours. To address these excesses, these units need to be equipped with central air conditioning systems so that windows may remain closed. All dwelling units are expected to have central air conditioning. Window or through-the-wall air conditioning units are typically not recommended because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall sound insulating properties of the envelope.

Provision for Air Conditioning

The predicted future sound levels outside the windows of the future dwellings of the other units will be between 51 to 60 dBA during the nighttime hours. To address these excesses, these dwelling units require provisions for the future installation of central air conditioning systems so that windows may be kept closed. This requirement is typically satisfied through the installation of forced air ventilation systems with ductwork sized for the future installation of central air conditioning by the occupant. All dwelling units are expected to have central air conditioning. The installation of central air conditioning for all units will satisfy and exceed ventilation requirements.

The ventilation requirements are indicated in Figure 3. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MECP publication NPC-300, as applicable.

5.3 Building Façade Constructions

The predicted sound levels at the two units adjacent to Montrose Road will exceed 65 dBA during daytime and 60 dBA during nighttime. MECP guidelines stipulate that in such cases, building

components including windows, walls, and doors be designed so that the indoor sound levels comply with the noise criteria in Table I.

Calculations were performed to determine the acoustical insulation factors (AIF) to maintain indoor sound levels within MECP guidelines. The calculation methods were developed by the National Research Council (NRC). They are based on the predicted future sound levels at the building facades, and the anticipated area ratios of the facade components (walls, windows and doors) and the floor area of the adjacent room.

Acoustical Requirements for Glazing

The required building components are selected based on the AIF value for road traffic. A summary of the Sound Transmission Class (STC) requirements is given in Table V for the building façades, based on the possibility of sound entering the building through windows and doors for all of the dwellings. Floor plans and building elevations dated January 25, 2023, attached as Appendix C, were reviewed to determine window STC ratings required to mitigate road traffic noise levels. A window to floor ratio of up to 18% for living/dining room and 15% for bedrooms were measured.

Table V: Window STC Requirements

Prediction Location	Description	Space	STC Glazing Requirements
[A]	Units 5 and 10	+Living/Dining	OBC
		+Bedroom	OBC
[B], --	Other units	+Living/Dining	OBC
		+Bedroom	OBC

Notes: OBC – Ontario Building Code
+ Sound entering through windows only since elevation drawings show a brick and stone exterior wall façade.

The results show that any double-paned windows conforming to the Ontario Building Code will provide sufficient acoustical insulation for indoor spaces. The glazing requirements can be met using fairly standard sealed units. Operable sections, including doors and operable windows, must be well-fitted and weather-stripped,

If floor plans and building elevations are changed significantly, an acoustical consultant should provide revised glazing recommendations.

6 Warning Clauses

The MECP guidelines recommend that warning clauses be included in the property and tenancy agreements and offers of purchase and sale for all units with anticipated traffic sound level excesses. The following noise warning clauses are required for specific dwellings as indicated in Table VI.

Suggested wording for future dwellings which have minor sound level excesses is given below.

A):

Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks.

Suggested wording for future dwellings with daytime OLA sound levels exceeding the MECP criteria for which physical mitigation has been provided is given below.

B):

Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the Municipality's and the Ministry of the Environment, Conservation and Parks noise criteria.

Suggested wording for future dwellings which have physical noise mitigation provided on site is given below.

C):

That the acoustical berm and/or barrier as installed, shall be maintained, repaired or replaced by the owner. Any maintenance, repair or replacement shall be with the same material, or to the same standards, and having the same colour and appearance of the original.

Suggest wording for future dwellings which will have central air conditioning units to be installed is given below.

D):

This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks.

Suggested wording for future dwellings which have provisions for central air conditioning to be installed is given below.

E):

This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks.

Suggested wording for future dwelling units in close proximity to commercial buildings is given below.

F):

Purchasers are advised that due to the proximity of the existing commercial buildings, sound levels from the facilities may be at times be audible.

These sample clauses are provided by the MECP as examples, and can be modified by the Municipality as required.

7 Summary and Recommendations

The following list and Table VI summarize the recommendations made in this report. The reader is referred to Figure 3 and previous sections of the report where these recommendations are applied and discussed in more detail.

1. Acoustic barriers are required for the rear yards of units 5 and 10, which are closest and adjacent to Montrose Road.

2. Central air conditioning will be required for units 5 and 10, which are closest and adjacent to Montrose Road.

3. Forced air ventilation systems with ductwork sized for future installation of central air conditioning systems will be required for the other units.

4. Building constructions meeting the minimum requirements of the Ontario Building Code will provide sufficient acoustical insulation for indoors spaces.

5. The use of warning clauses in the property and tenancy agreements is recommended to inform future residents of traffic noise issues and proximity to commercial facilities.

Table VI: Summary of Noise Control Requirements and Noise Warning Clauses

Unit	Acoustic Barrier	Ventilation Requirements*	Type of Warning Clause	Upgraded Building Constructions
Units 5 & 10	✓	Central A/C	B, C, D, F	OBC
All other units	--	Forced Air	A, E	OBC

Notes:
* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300, as applicable.
✓ Outdoor living areas require acoustic barriers. Refer to Section 5.1
OBC – Ontario Building Code

7.1 Implementation

To ensure that the noise control recommendations outlined above are properly implemented, it is recommended that:

1. Prior to the issuance of occupancy permits for this development, the Municipality's building inspector or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario should certify that the noise control measures have been properly incorporated, installed, and constructed.

Figure 1: Key Plan

DRAFT PLAN OF VACANT LAND CONDOMINIUM OF

PART OF STAMFORD TOWNSHIP LOT 80

CITY OF NIAGARA FALLS

REGIONAL MUNICIPALITY OF NIAGARA

SCALE 1 : 250

5 0 5 10 15 metres

J.D. BARNES LIMITED

2022

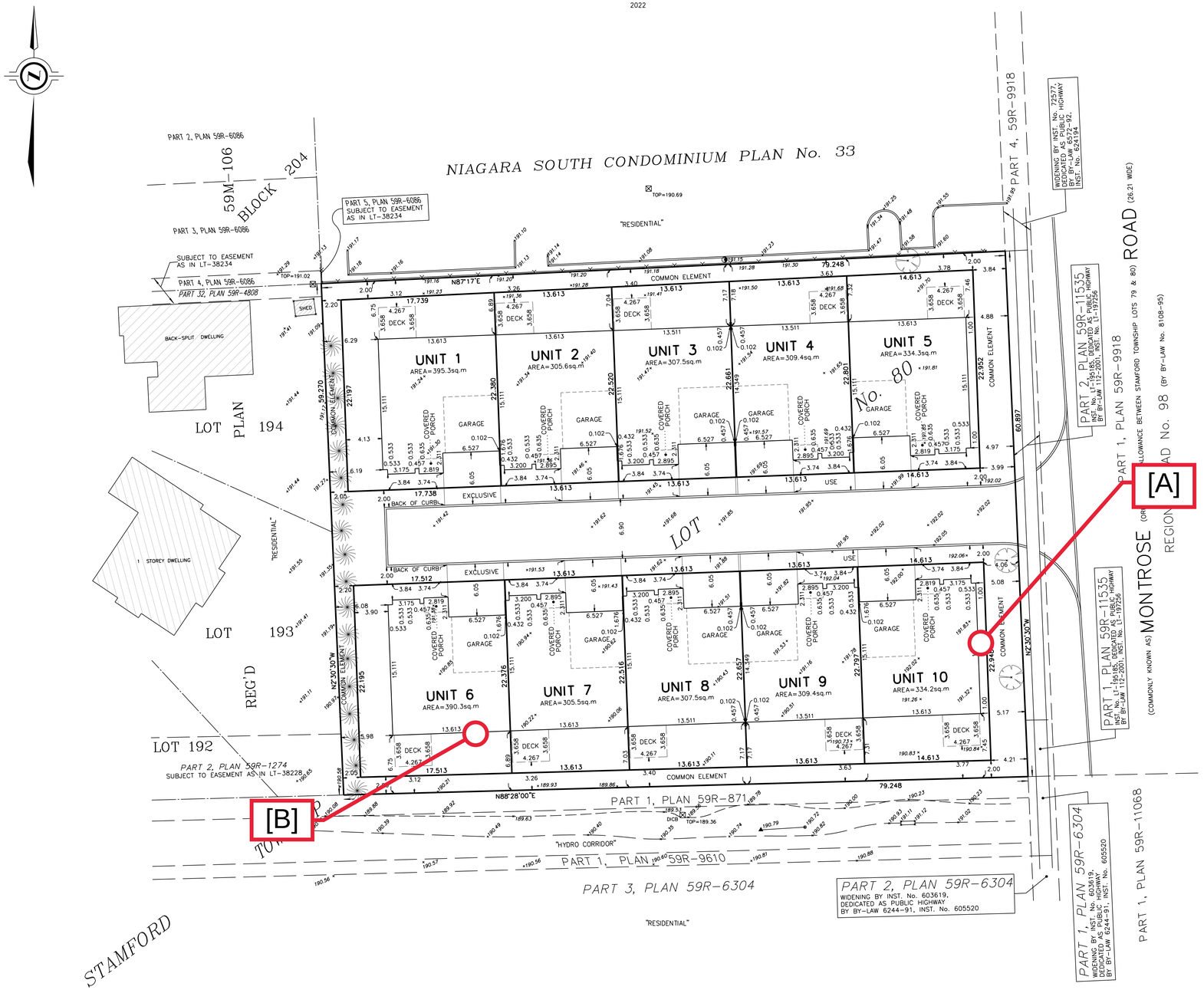
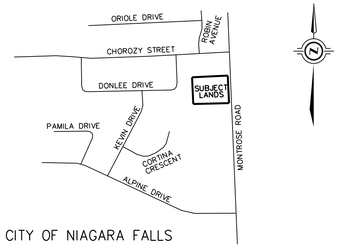


Figure 2: Draft Plan Showing Prediction Locations

KEY PLAN (NOT TO SCALE)



ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT AND UNDER SECTION 9 OF THE CONDOMINIUM ACT 1998

(A)-AS SHOWN ON DRAFT PLAN
(B)-AS SHOWN ON DRAFT PLAN
(C)-AS SHOWN ON DRAFT AND KEY PLANS
(D)-PROPOSED VACANT LAND CONDOMINIUM - 10 UNITS
(E)-AS SHOWN ON DRAFT PLAN
(F)-AS SHOWN ON DRAFT PLAN
(G)-AS SHOWN ON DRAFT PLAN
(H)-MUNICIPAL
(I)-SANDY LOAM
(J)-AS SHOWN ON DRAFT PLAN
(K)-ALL SERVICES AVAILABLE
(L)-NONE

LAND USE ANALYSIS

LOT AREA	4758.7 sq.m
BUILDING AREA (INCLUDING DECKS)	2138.3 sq.m
BUILDING COVERAGE	44.9%
OPEN SPACE AREA	1725.1 sq.m
LANDSCAPE COVERAGE	36.3%
NUMBER OF UNITS	10 TOWNHOMES
PARKING	20 GARAGE SPACES
	20 DRIVEWAY SPACES
	40 TOTAL SPACES

——— DENOTES BOUNDARY OF SUBDIVISION

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE MATTHEWS, CAMERON, HEYWOOD - KERRY T. HOWE SURVEYING LTD. TO SUBMIT THIS PLAN TO THE CITY OF NIAGARA FALLS FOR THEIR APPROVAL.

DATE

FRANK COSTANTINO
PRESIDENT
(I HAVE THE AUTHORITY TO BIND THE CORPORATION)
FRANK COSTANTINO CONSTRUCTION LTD.

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ARE CORRECTLY SHOWN.

FEBRUARY 18, 2022
DATE

ALLAN J. HEYWOOD
ONTARIO LAND SURVEYOR

J.D.BARNES LIMITED
SURVEYING MAPPING GIS
LAND INFORMATION SPECIALISTS
4318 PORTAGE ROAD, UNIT 2, NIAGARA FALLS, ON L2E 6A4
T: (905) 358-3693 F: (905) 358-6224 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
JN/AT	AH	18-16-468-00

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PLOTTED: 2/18/2022

DRAFT PLAN OF VACANT LAND CONDOMINIUM OF

PART OF STAMFORD TOWNSHIP LOT 80

CITY OF NIAGARA FALLS

REGIONAL MUNICIPALITY OF NIAGARA

SCALE 1 : 250

5 0 5 10 15 metres

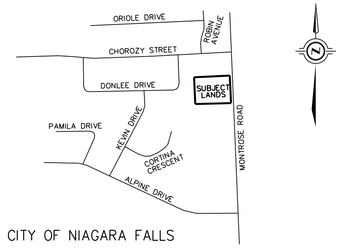
J.D. BARNES LIMITED

2022

LEGEND

- Central A/C is required
- Forced air ventilation systems with ductwork sized for the future installation of central air conditioning by the occupant is required
- Acoustic barrier required. See Section 5.1

KEY PLAN (NOT TO SCALE)



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FEBRUARY 18, 2022
DATE

ALLAN H. HEYWOOD
ONTARIO LAND SURVEYOR

Figure 3: Draft Plan Showing Ventilation and Barrier Requirements

J.D.BARNES LIMITED — SURVEYING MAPPING GIS
LAND INFORMATION SPECIALISTS
4318 PORTAGE ROAD, UNIT 2, NIAGARA FALLS, ON L2E 6A4
T: (905) 358-3693 F: (905) 358-6224 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
JN/AT	AH	18-16-468-00

FILE: G:\2018\18-16-468\00\Drawing\18-16-468 DRAFT CONDO.dgn

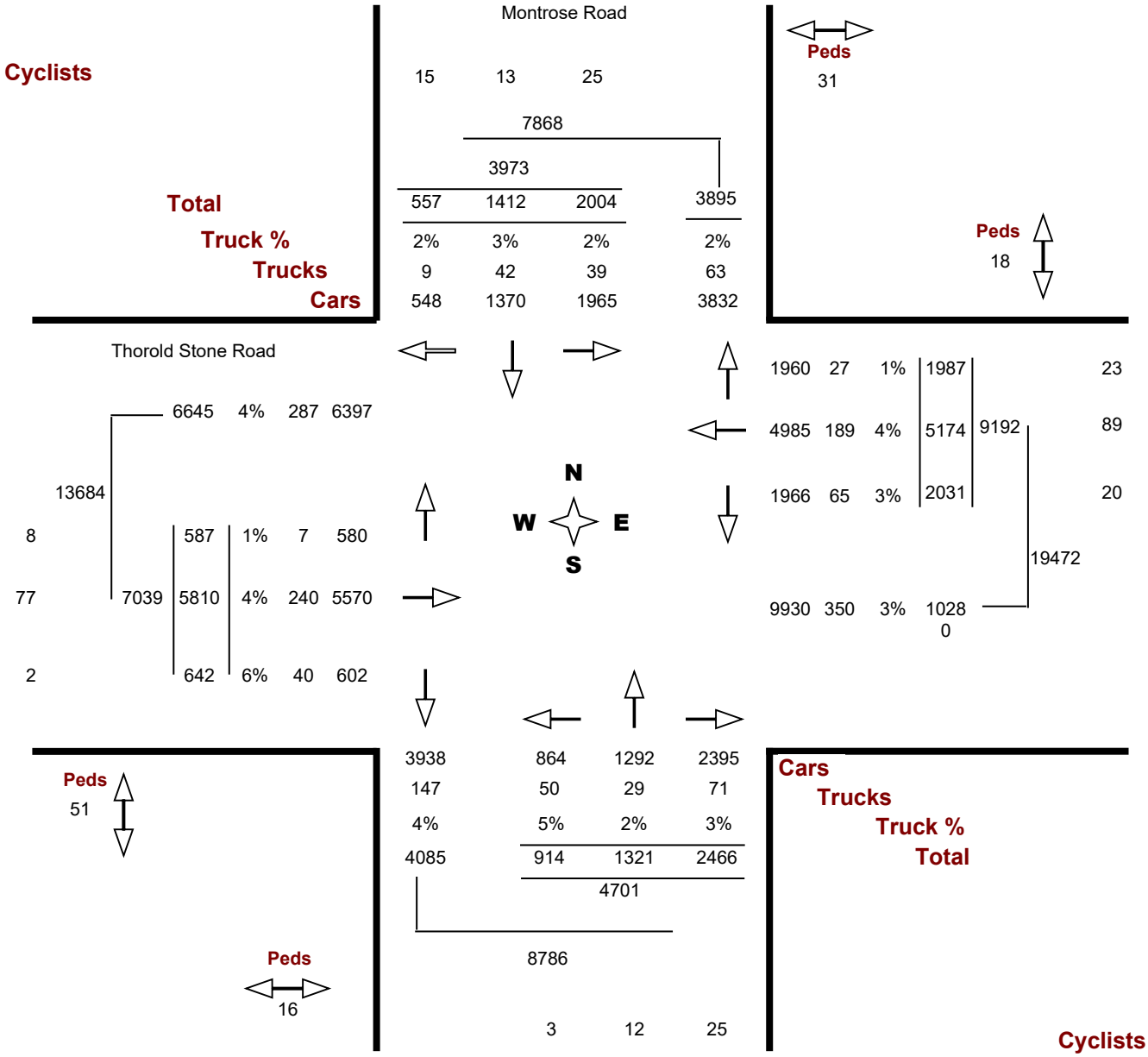
PLOTTED: 2/18/2022

Appendix A

Road Traffic Information

Turning Movement Count Report
Full Study

Location..... Montrose Road @ Thorold Stone Road
Municipality..... NIAGARA FALLS
GeoID..... 01421
Count Date..... Tuesday, 13 June, 2017



Highway	Location Description	Dist. (KM)	Year	Pattern Type	AADT	SADT	SAWDT	WADT	AR
			1995	UC	43,800	47,300	49,100	40,300	0.5
			1996	UC	46,100	51,900	52,600	41,500	0.8
			1997	UC	48,200	61,700	59,300	40,600	0.5
			1998	UC	51,200	65,000	62,500	43,200	0.3
			1999	UC	50,200	63,300	60,800	42,300	0.5
			2000	UC	51,600	65,000	62,500	43,500	0.7
			2001	UC	51,300	58,000	58,000	46,200	0.6
			2002	UC	54,500	61,000	61,500	49,000	0.4
			2003	UC	56,000	62,700	63,300	50,400	0.5
			2004	UC	57,400	64,100	64,500	51,800	0.5
			2005	UC	56,200	62,600	63,100	50,500	0.4
			2006	UC	57,500	63,900	64,400	51,700	0.3
			2007	UC	58,800	65,300	66,200	52,800	0.5
			2008	UC	60,200	66,400	65,500	54,000	0.5
			2009	UC	61,500	67,900	68,500	55,300	0.3
			2010	UC	62,800	69,200	69,800	56,500	0.4
			2011	UC	64,300	70,700	71,300	57,800	N/A
			2012	UC	66,000	72,600	71,300	59,400	N/A
			2013	UC	66,800	73,500	72,800	60,100	N/A
			2014	UC	68,100	68,100	65,400	64,700	N/A
			2015	UC	69,200	69,200	66,400	65,700	N/A
			2016	UC	70,400	70,400	67,600	66,900	N/A
QEW	THOROLD STONE RD IC-32	2.5	1988	UC	39,200	50,800	47,700	32,800	0.6
			1989	UC	41,100	52,100	49,700	35,300	0.9
			1990	UC	43,000	53,600	50,600	37,300	0.8
			1991	UC	40,400	50,900	50,500	35,100	1.1
			1992	UC	40,300	50,700	48,700	34,200	0.7
			1993	UC	40,800	50,100	48,500	35,400	1.0
			1994	UC	40,500	51,800	49,400	34,200	1.0
			1995	UC	44,500	57,000	54,700	37,500	0.8
			1996	UC	45,500	58,200	56,000	38,400	1.1
			1997	UC	46,500	59,500	57,200	39,200	0.5
			1998	UC	47,500	60,300	58,000	40,100	0.3

Highway	Location Description	Dist. (KM)	Year	Pattern Type	AADT	SADT	SAWDT	WADT	AR
			1999	UC	48,700	61,400	59,000	41,100	0.6
			2000	UC	50,100	63,100	60,700	42,200	0.6
			2001	UC	50,800	64,000	61,500	42,700	0.3
			2002	UC	52,700	66,500	63,800	44,500	0.4
			2003	UC	53,500	67,400	64,700	45,500	0.6
			2004	UC	55,300	68,700	66,100	46,900	0.5
			2005	UC	54,900	68,000	65,300	46,600	0.7
			2006	UC	57,300	70,900	68,000	48,600	0.5
			2007	UC	58,500	72,500	71,800	49,600	0.7
			2008	UC	59,700	73,900	72,400	50,700	0.5
			2009	UC	61,000	74,600	71,700	51,800	0.3
			2010	UC	62,200	75,700	72,800	52,800	0.4
			2011	UC	56,400	68,800	66,000	47,900	N/A
			2012	UC	63,100	76,400	75,700	53,700	N/A
			2013	UC	63,500	63,500	64,100	60,300	N/A
			2014	UC	65,200	65,200	62,600	61,900	N/A
			2015	UC	66,300	66,300	63,600	63,000	N/A
			2016	UC	67,400	67,400	64,700	64,000	N/A
QEW	MOUNTAIN RD IC-34	2.4	1988	IC	39,900	51,800	48,600	33,400	0.7
			1989	IC	42,000	53,300	50,800	36,100	1.1
			1990	IC	44,100	55,000	51,900	38,300	0.6
			1991	IC	44,300	55,700	55,300	38,400	1.0
			1992	IC	44,200	55,600	53,400	37,500	0.8
			1993	IC	44,800	55,100	53,300	38,900	0.9
			1994	IC	43,200	55,300	52,700	36,400	1.1
			1995	IC	58,000	74,200	71,300	48,900	0.6
			1996	IC	61,800	79,100	76,000	52,100	1.0
			1997	IC	62,100	79,500	76,400	52,400	0.5
			1998	IC	63,900	81,200	78,000	53,900	0.8
			1999	IC	65,900	83,100	79,800	55,600	0.5
			2000	IC	67,900	85,600	82,200	57,300	0.6
			2001	IC	73,500	92,600	88,900	61,700	0.6
			2002	IC	76,800	96,900	92,900	64,800	0.5

Appendix B

Sample STAMSON 5.04 Output

STAMSON 5.0 NORMAL REPORT Date: 31-01-2023 11:52:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: a.te Time Period: Day/Night 16/8 hours
Description: Pred. Loc. [A], Unit 10 east facade

Road data, segment # 1: Montrose (day/night)

Car traffic volume : 29070/3230 veh/TimePeriod *
Medium truck volume : 422/47 veh/TimePeriod *
Heavy truck volume : 663/74 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 33506
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.40
Heavy Truck % of Total Volume : 2.20
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Montrose (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 19.00 / 19.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: QEW SB (day/night)

Car traffic volume : 30427/15211 veh/TimePeriod *
Medium truck volume : 1367/684 veh/TimePeriod *
Heavy truck volume : 2393/1196 veh/TimePeriod *
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 33700
Percentage of Annual Growth : 2.50
Number of Years of Growth : 17.00
Medium Truck % of Total Volume : 4.00
Heavy Truck % of Total Volume : 7.00

Day (16 hrs) % of Total Volume : 66.67

Data for Segment # 2: QEW SB (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 30 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 360.00 / 360.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 3: QEW NB (day/night)

Car traffic volume : 30427/15211 veh/TimePeriod *
Medium truck volume : 1367/684 veh/TimePeriod *
Heavy truck volume : 2393/1196 veh/TimePeriod *
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 33700
Percentage of Annual Growth : 2.50
Number of Years of Growth : 17.00
Medium Truck % of Total Volume : 4.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 66.67

Data for Segment # 3: QEW NB (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1 / 1
House density : 30 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 380.00 / 380.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Montrose (day)

Source height = 1.22 m

ROAD (0.00 + 67.88 + 0.00) = 67.88 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---

-90 90 0.00 68.91 0.00 -1.03 0.00 0.00 0.00 0.00 67.88

Segment Leq : 67.88 dBA

Results segment # 2: QEW SB (day)

Source height = 1.63 m

ROAD (0.00 + 53.09 + 0.00) = 53.09 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 78.70 0.00 -22.86 -1.45 0.00 -1.30 0.00 53.09

Segment Leq : 53.09 dBA

Results segment # 3: QEW NB (day)

Source height = 1.63 m

ROAD (0.00 + 52.70 + 0.00) = 52.70 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 78.70 0.00 -23.25 -1.45 0.00 -1.30 0.00 52.70

Segment Leq : 52.70 dBA

Total Leq All Segments: 68.15 dBA

Results segment # 1: Montrose (night)

Source height = 1.22 m

ROAD (0.00 + 61.36 + 0.00) = 61.36 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 62.39 0.00 -1.03 0.00 0.00 0.00 0.00 61.36

Segment Leq : 61.36 dBA

Results segment # 2: QEW SB (night)

Source height = 1.63 m

ROAD (0.00 + 53.09 + 0.00) = 53.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	78.70	0.00	-22.86	-1.45	0.00	-1.30	0.00	53.09

Segment Leq : 53.09 dBA

Results segment # 3: QEW NB (night)

Source height = 1.63 m

ROAD (0.00 + 52.70 + 0.00) = 52.70 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	78.70	0.00	-23.25	-1.45	0.00	-1.30	0.00	52.70

Segment Leq : 52.70 dBA

Total Leq All Segments: 62.45 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.15
(NIGHT): 62.45

STAMSON 5.0 NORMAL REPORT Date: 31-01-2023 11:54:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: aola.te Time Period: 16 hours
Description: OLA of Pred. Loc. [A], rear yard, unmitigated

Road data, segment # 1: Montrose

Car traffic volume : 29070 veh/TimePeriod *
Medium truck volume : 422 veh/TimePeriod *
Heavy truck volume : 663 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Montrose

Angle1 Angle2 : -23.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 26.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: QEW SB

Car traffic volume : 30427 veh/TimePeriod *
Medium truck volume : 1367 veh/TimePeriod *
Heavy truck volume : 2393 veh/TimePeriod *
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: QEW SB

Angle1 Angle2 : -23.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1
House density : 30 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 367.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 3: QEW NB

Car traffic volume : 30427 veh/TimePeriod *

Medium truck volume : 1367 veh/TimePeriod *
Heavy truck volume : 2393 veh/TimePeriod *
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: QEW NB

Angle1 Angle2 : -23.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1
House density : 30 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 387.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Montrose

Source height = 1.22 m

ROAD (0.00 + 61.79 + 0.00) = 61.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-23	90	0.66	68.91	0.00	-3.97	-3.16	0.00	0.00	0.00	61.79

Segment Leq : 61.79 dBA

Results segment # 2: QEW SB

Source height = 1.63 m

ROAD (0.00 + 51.24 + 0.00) = 51.24 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-23	90	0.66	78.70	0.00	-23.00	-3.16	0.00	-1.30	0.00	51.24

Segment Leq : 51.24 dBA

Results segment # 3: QEW NB

Source height = 1.63 m

ROAD (0.00 + 50.86 + 0.00) = 50.86 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq

---

-23	90	0.66	78.70	0.00	-23.38	-3.16	0.00	-1.30	0.00	50.86

Segment Leq : 50.86 dBA

Total Leq All Segments: 62.47 dBA

TOTAL Leq FROM ALL SOURCES: 62.47

STAMSON 5.0 NORMAL REPORT Date: 31-01-2023 11:54:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: aola_m.te Time Period: 16 hours
Description: OLA of Pred. Loc. [A], rear yard, mitigated

Road data, segment # 1: Montrose

Car traffic volume : 29070 veh/TimePeriod *
Medium truck volume : 422 veh/TimePeriod *
Heavy truck volume : 663 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Montrose

Angle1 Angle2 : -23.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 26.00 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -23.00 deg Angle2 : 90.00 deg
Barrier height : 2.70 m
Barrier receiver distance : 7.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 2: QEW SB

Car traffic volume : 30427 veh/TimePeriod *
Medium truck volume : 1367 veh/TimePeriod *
Heavy truck volume : 2393 veh/TimePeriod *
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: QEW SB

Angle1 Angle2 : -23.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1
House density : 30 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 367.00 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)

Barrier angle1 : -23.00 deg Angle2 : 90.00 deg
Barrier height : 2.70 m
Barrier receiver distance : 7.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 3: QEW NB

Car traffic volume : 30427 veh/TimePeriod *
Medium truck volume : 1367 veh/TimePeriod *
Heavy truck volume : 2393 veh/TimePeriod *
Posted speed limit : 100 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 3: QEW NB

Angle1 Angle2 : -23.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 1
House density : 30 %
Surface : 1 (Absorptive ground surface)
Receiver source distance : 387.00 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -23.00 deg Angle2 : 90.00 deg
Barrier height : 2.70 m
Barrier receiver distance : 7.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Montrose

Source height = 1.22 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
1.22 ! 1.50 ! 1.42 ! 1.42

ROAD (0.00 + 53.71 + 0.00) = 53.71 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-23 90 0.51 68.91 0.00 -3.60 -2.95 0.00 0.00 -8.65 53.71

Segment Leq : 53.71 dBA

Results segment # 2: QEW SB

Source height = 1.63 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.63	1.50	1.50	1.50

ROAD (0.00 + 47.28 + 0.00) = 47.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-23	90	0.66	78.70	0.00	-23.00	-3.16	0.00	-1.30	0.00	51.24
-23	90	0.49	78.70	0.00	-20.75	-2.94	0.00	0.00	-7.73	47.28

Segment Leq : 47.28 dBA

Results segment # 3: QEW NB

Source height = 1.63 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.63	1.50	1.50	1.50

ROAD (0.00 + 46.94 + 0.00) = 46.94 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-23	90	0.66	78.70	0.00	-23.38	-3.16	0.00	-1.30	0.00	50.86
-23	90	0.49	78.70	0.00	-21.09	-2.94	0.00	0.00	-7.73	46.94

Segment Leq : 46.94 dBA

Total Leq All Segments: 55.29 dBA

TOTAL Leq FROM ALL SOURCES: 55.29

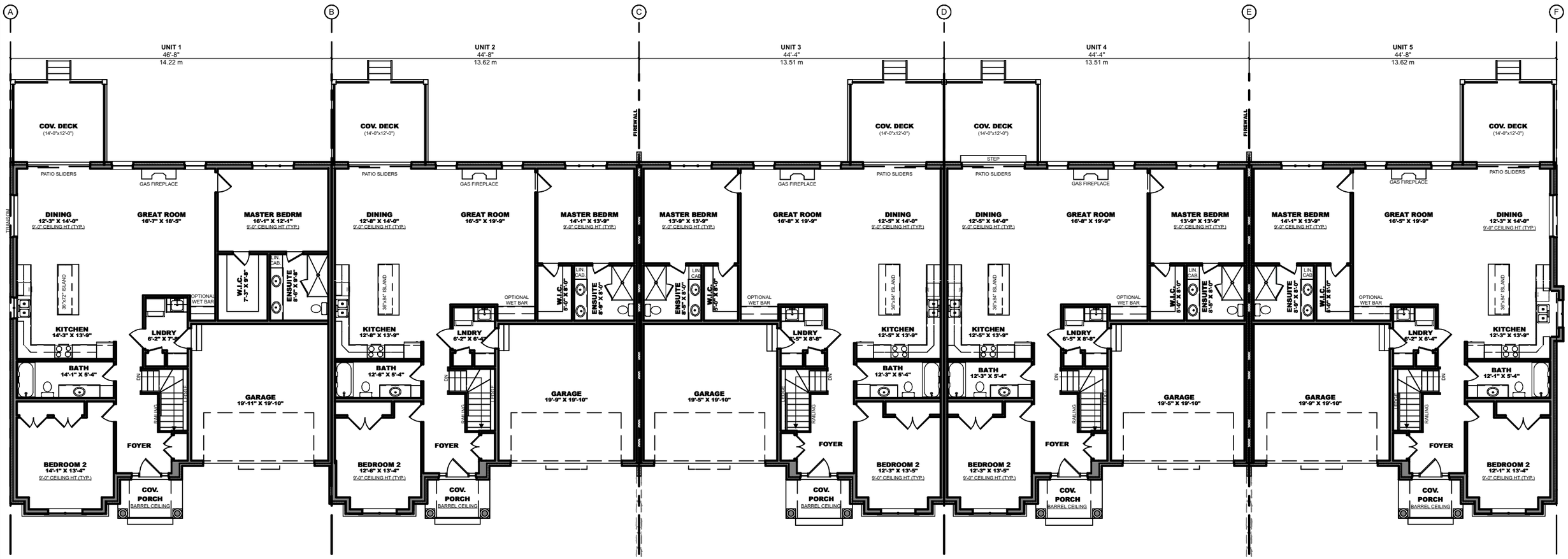
Appendix C

Supporting Drawings

COSTANTINO CONSTRUCTION

PROPOSED 5 UNIT TOWNHOUSE
4257 MONTROSE ROAD

BLOCK 1 - UNITS 1 TO 5



SQUARE FOOTAGES
UNIT 1
LIVING AREA - 1,764 sq. ft

SQUARE FOOTAGES
UNIT 2
LIVING AREA - 1,662 sq. ft

SQUARE FOOTAGES
UNIT 3
LIVING AREA - 1,655 sq. ft

SQUARE FOOTAGES
UNIT 4
LIVING AREA - 1,655 sq. ft

SQUARE FOOTAGES
UNIT 5
LIVING AREA - 1,662 sq. ft

MAIN FLOOR PLAN

	Sizes, dimensions, materials and specifications are subject to change without notice. Elevations or renderings are artists concepts. Actual usable floor area may vary from that stated. E & OE.	PLAN #: 2022-53	DATE: 2023-01-25	PAGE: 1 OF 3

COSTANTINO CONSTRUCTION

PROPOSED 5 UNIT TOWNHOUSE
4257 MONTROSE ROAD

BLOCK 1 - UNITS 1 TO 5

FRONT ELEVATION

REAR ELEVATION

	Sizes, dimensions, materials and specifications are subject to change without notice. Elevations or renderings are artists concepts. Actual usable floor area may vary from that stated. E & OE.	PLAN #: 2022-53	DATE: 2023-01-25	PAGE: 2 OF 3

COSTANTINO CONSTRUCTION

PROPOSED 5 UNIT TOWNHOUSE
4257 MONTROSE ROAD

BLOCK 1 - UNITS 1 TO 5

RIGHT ELEVATION

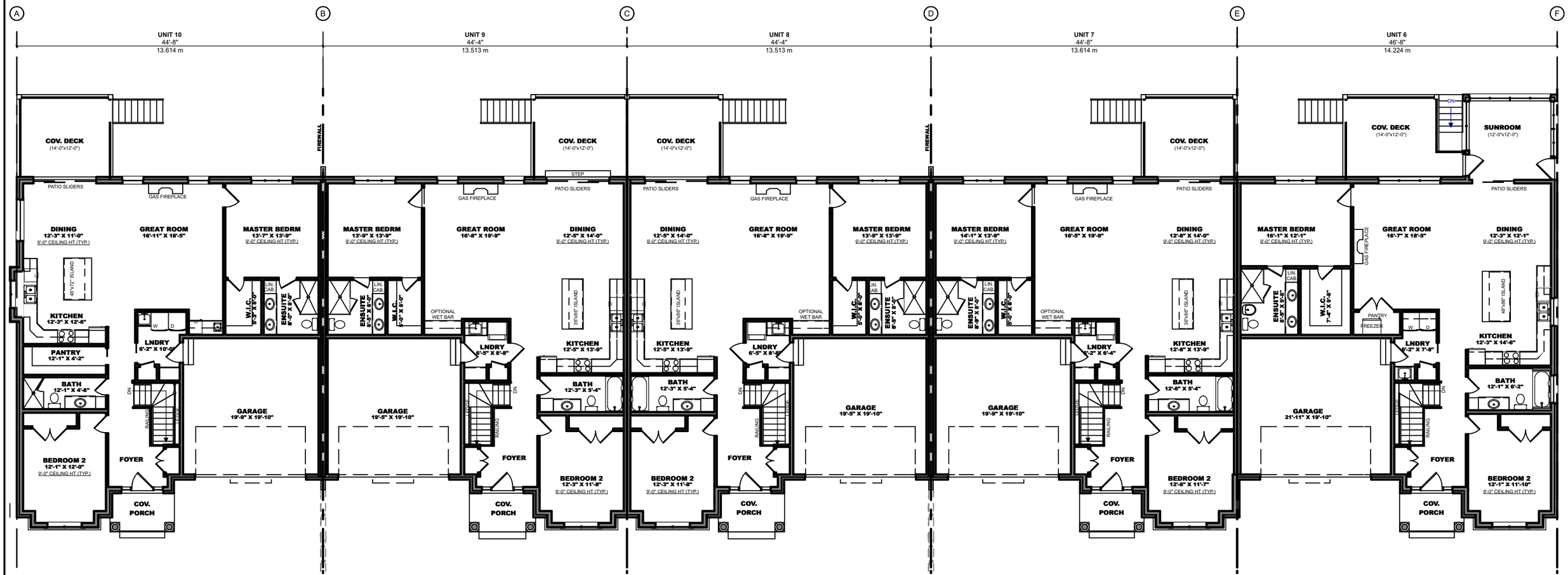
LEFT ELEVATION
(FACING MONTROSE ROAD)

	Sizes, dimensions, materials and specifications are subject to change without notice. Elevations or renderings are artists concepts. Actual usable floor area may vary from that stated. E & OE.	PLAN #: 2022-53	DATE: 2023-01-25	PAGE: 3 OF 3

COSTANTINO CONSTRUCTION

PROPOSED 5 UNIT TOWNHOUSE
4257 MONTROSE ROAD

BLOCK 2 - UNITS 6 TO 10



SQUARE FOOTAGES
UNIT 10
LIVING AREA - 1,662 sq. ft

SQUARE FOOTAGES
UNIT 9
LIVING AREA - 1,655 sq. ft

SQUARE FOOTAGES
UNIT 8
LIVING AREA - 1,655 sq. ft

SQUARE FOOTAGES
UNIT 7
LIVING AREA - 1,662 sq. ft

SQUARE FOOTAGES
UNIT 6
LIVING AREA - 1,709 sq. ft

MAIN FLOOR PLAN

Sizes, dimensions, materials and specifications are subject to change without notice. Elevations or renderings are artists concepts. Actual usable floor area may vary from that stated. E & OE.

PLAN #: 2022-53

DATE: 2023-01-25

COSTANTINO CONSTRUCTION

PROPOSED 5 UNIT TOWNHOUSE
4257 MONTROSE ROAD

BLOCK 2 - UNITS 6 TO 10

FRONT ELEVATION

REAR ELEVATION

	Sizes, dimensions, materials and specifications are subject to change without notice. Elevations or renderings are artists concepts. Actual usable floor area may vary from that stated. E & OE.	PLAN #: 2022-53	DATE: 2023-01-25	PAGE: 2 OF 3

COSTANTINO CONSTRUCTION

PROPOSED 5 UNIT TOWNHOUSE
4257 MONTROSE ROAD

BLOCK 2 - UNITS 6 TO 10

LEFT ELEVATION
(FACING MONTROSE ROAD)

RIGHT ELEVATION

	Sizes, dimensions, materials and specifications are subject to change without notice. Elevations or renderings are artists concepts. Actual usable floor area may vary from that stated. E & OE.	PLAN #: 2022-53	DATE: 2023-01-25	PAGE: 3 OF 3