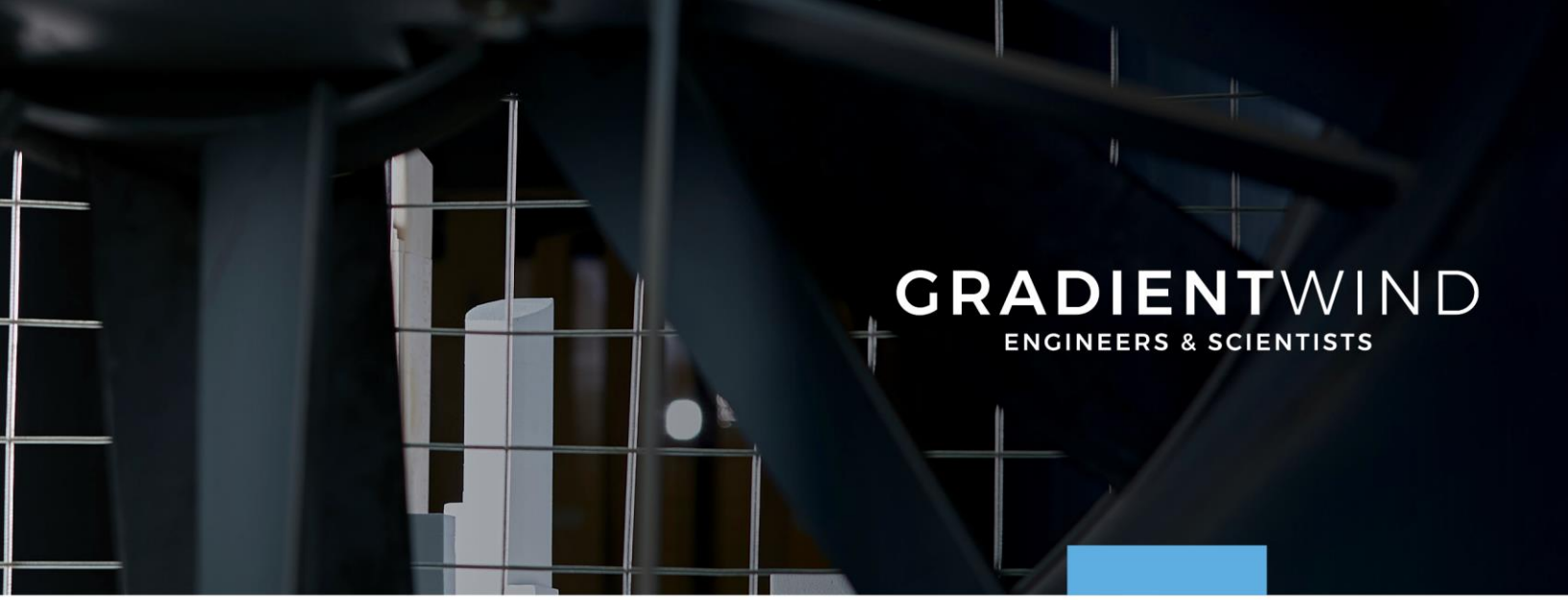
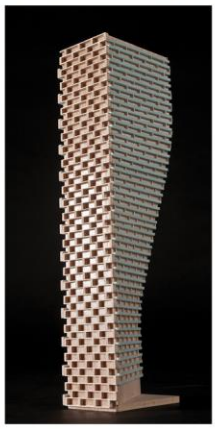


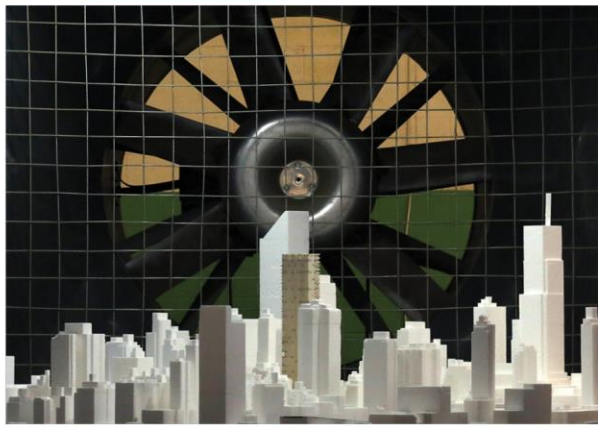
GRADIENTWIND
ENGINEERS & SCIENTISTS

ENVIRONMENTAL NOISE ASSESSMENT

5986 - 5992 Hazeldean Road
Ottawa, Ontario

GRADIENT WIND REPORT: 19-125 - Environmental Noise





September 4, 2019

PREPARED FOR

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PREPARED BY

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EXECUTIVE SUMMARY

This report describes an environmental noise assessment undertaken in support of site plan application for a proposed three (3) storey mixed-use development located at 5986–5992 Hazeldean Road in Ottawa, Ontario. The development comprises commercial office units on the first two floors and residential space on the third floor containing balconies for each unit on the west façade. Parking is located at the southeast corner of the study site and the entrances are located parallel to Hazeldean road and Springbrook Drive. The primary sources of roadway traffic noise are Hazeldean Road to the north of the site, and Springbrook Drive to the west. Furthermore, the nearby residential buildings are identified as noise sensitive receivers and are the subject of a stationary noise impact assessment arising from the mechanical equipment serving the proposed building. The primary sources of stationary noise include mechanical equipment such as the air handling units located on the rooftop. Figure 1 illustrates a complete site plan with surrounding context.

The environmental noise assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; (iv) preliminary mechanical information provided August 2019; and (v) site plan drawings provided by Peter Mansfield, Architect in August 2019.

For road noise, the results of the current analysis indicate that noise levels will range between 53 and 71 dBA during the daytime period (07:00-23:00) and between 46 and 63 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the north façade, which is nearest and most exposed to Hazeldean Road. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 7.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause will also be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Results of the stationary noise analysis indicate that stationary noise levels from the development's mechanical equipment will fall below ENCG criteria during all hours of the day, given the assumptions

specified in Section 4.3.2 are honoured. As such, the proposed development is expected to be compatible with the existing and future noise sensitive land uses. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Argue Construction Ltd. to undertake an environmental noise assessment in support of site plan application for the proposed mixed-use three (3) storey development at 5986 – 5992 Hazeldean Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local transportation sources, as well as consideration of stationary impacts from proposed mechanical equipment onto the surrounding area.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on architectural drawings provided by Peter Mansfield, Architect in August 2019, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications, as well as preliminary mechanical information received in August, 2019.

2. TERMS OF REFERENCE

The focus of this environmental noise assessment is a proposed three (3) storey mixed-use development at 5986–5992 Hazeldean Road in Ottawa, Ontario on a square parcel of land. The development is bounded by Hazeldean Road to the north, Springbrook Drive to the west, an existing commercial building to the east, and existing residential buildings to the south. Beyond the commercial building to the east are existing residential buildings.

The development will comprise commercial office units on the first two floors and residential space on the third floor containing balconies for each unit on the west façade. The balconies are not considered noise sensitive spaces as they will be less than 4 meters in depth. Parking is located at the southeast corner of the study site and the entrances are located parallel to Hazeldean Road and Springbrook Drive.

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

The primary sources of roadway traffic noise are Hazeldean Road to the north and Springbrook Drive to the west. The primary sources of stationary noise include mechanical equipment such as the air handling units located on the rooftop. Figure 1 illustrates a complete site plan with surrounding context.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building produced by local roadway traffic, (ii) calculate future noise levels on surrounding noise sensitive properties produced by stationary noise sources associated with the development, and (iii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines, as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Transportation Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's

Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range (that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters respectively for roadway as listed in Table 1. However, to account for deficiencies in building construction and to control peak noise, these levels should be targeted toward 42 and 37 dBA respectively.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [3]

Type of Space	Time Period	Leq (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
Living/dining/den areas of **residences**, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[4]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[5]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[6].

[3] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be absorptive due to the presence of grassy lands (soft) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Receptor height was taken to be 7.5 metres at Level 3 for the three-storey mixed use building (height to 3rd floor slab + 1.5 metres) for Receptors 1 - 4.
- Noise receptors were strategically placed at 4 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 3-6.

4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[7] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

[7] City of Ottawa Transportation Master Plan, November 2013

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Hazeldean Road	4 – Lane Urban Arterial Undivided	60	**30,000**
Springbrook Drive	2 – Lane Urban Collector	40	**8,000**

4.2.4 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2012) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

As per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[8] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

[8] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

Based on published research[9], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

4.3 Stationary Noise

4.3.1 Criteria for Stationary Noise

For stationary sources, the L_{eq} is commonly calculated on an hourly interval, while for roadways, the L_{eq} is calculated on the basis of a 16-hour daytime/8-hour nighttime split as previously mentioned in Section 4.2.1.

Noise criteria taken from the ENCG apply to outdoor points of reception (POR). A POR is defined under NPC-300 as "any location on a noise sensitive land use where noise from a stationary source is received"[10]. This applies to the plane of window and outdoor amenity spaces serving the development. A POR can be located on an existing or zoned for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, camp grounds, and noise sensitive buildings such as schools, places of worship and daycare facilities. According to the ENCG, the recommended maximum noise level for a suburban (Class 1) environment at a POR is either the lowest one-hour background noise level due to other sources, or the exclusionary limits outlined in Table 3, whichever is higher.

[9] CMHC, Road & Rail Noise: Effects on Housing
[10] NPC – 300, page 14

TABLE 3: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

Time of Day	Class 1	
	Outdoor Points of Reception	Plane of Window
07:00 – 19:00	50	50
19:00 – 23:00	50	50
23:00 – 07:00	N/A	45

4.3.2 Assumptions

The calculations for the development have been based on preliminary mechanical information, as well as Gradient Wind's experience with similar developments. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment. The following assumptions have been made in the analysis:

(i) Tonnage of the rooftop air handling units (RTU) were based on preliminary mechanical information provided in August 2019 by Argue Construction.

(ii) The air handling units are assumed to operate continuously over a 1-hour period during the daytime and at 50% operation during the nighttime period.

(iii) Sound data for the units was assumed based on Gradient Wind's past experience with similar developments.

(iv) Screening effects of a 0.5 metre parapet have been included in the analysis.

(v) The units are located on the roof toward the north and south ends of the building, as outlined in Figure 8.

(vi) The ground was modelled as being soft (absorptive) ground, with the exclusion of the roadways and parking lots which were modelled as hard (reflective) ground.

4.3.3 Determination of Noise Source Power Levels

Preliminary mechanical information for the development was provided in August 2019. Sound data was assumed for the roof top units based on experience with similar developments. Table 4 summarizes the unmitigated sound power used for each source in the analysis.

TABLE 4: EQUIPMENT SOUND POWER LEVELS, UNMITIGATED (dBA)

Source ID	Description	Height Above Grade (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1, S2	RTU	11.9	65	76	77	79	79	77	73	74	85

4.3.4 Stationary Source Noise Predictions

The impact of the surrounding stationary noise sources on the development was determined by computer modelling. Stationary noise source modelling is based on the software program *Predictor-Lima* developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2. This computer program is capable of representing three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. The methodology has been used on numerous assignments and has been accepted by the MECP as part of Environmental Compliance Approvals applications.

Eight individual noise sensor locations were selected in the *Predictor-Lima* model to measure the noise impact at points of reception (POR) and plane of window (POW) during the daytime (07:00 – 19:00) and nighttime (19:00 – 07:00) periods (see Figure 8). POR locations included Outdoor Points of Reception (OPOR) for blocks designated for unknown, future developments and Plane of Windows (POW) of the proposed nearby noise sensitive buildings. All mechanical equipment was represented as point sources in the model. Air temperature, pressure and humidity were set to 10°C, 101.3 kPA and 70%, respectively. Ground absorption over the study area was determined based on topographical features (such as water, concrete, grassland, etc.). A coefficient of 0 was used for hard surfaces, such as concrete and paved areas, and 1 for soft surfaces, such as grass and vegetative areas. Existing and proposed buildings were added to the model to account for screening and reflection effects from building façades. Modelling data can be provided upon request.

5. RESULTS AND DISCUSSION

5.1 Transportation Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 5 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

TABLE 5: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	7.5	POW – 3 Storey Building (North Façade)	71	63
2	7.5	POW – 3 Storey Building (East Façade)	66	59
3	7.5	POW – 3 Storey Building (South Façade)	53	46
4	7.5	POW – 3 Storey Building (West Façade)	67	60

The results of the current analysis indicate that noise levels will range between 53 and 71 dBA during the daytime period (07:00-23:00) and between 46 and 63 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the north façade, which is nearest and most exposed to Hazeldean Road.

5.1.1 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per city of Ottawa requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 7):

- **Bedroom Windows**

(i) Bedroom windows facing north will require a minimum STC of 34

(ii) Bedroom windows facing east and west will require a minimum STC 30

(iii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Living Room Windows**

(i) Living room windows facing north will require a minimum STC of 29

(ii) Living room windows facing east and west will require a minimum STC 25

(iii) All other living room windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Retail Windows**

(i) Retail windows facing north will require a minimum STC of 25

(ii) All other retail windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Exterior Walls**

(i) Exterior wall components on the north, east and west façades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[11]

The STC requirements apply to windows, doors, spandrel panels and curtainwall elements. Exterior wall components on these façades are recommended to have a minimum STC of 45, where a window/wall system is used. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have specified an example window configuration, however several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

[11] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

5.2 Stationary Noise Levels

Noise levels produced by the mechanical equipment are presented Table 6. Noise levels at all outdoor points of reception and plane of window receptors fall below ENCG criteria provided our assumptions for in Section 4.3.2 are honoured. Noise contours along the building facades can be seen in Figure 9 and 10 for daytime and nighttime conditions respectively.

TABLE 6: NOISE LEVELS FROM HVAC SOURCES

Receptor Number	Height Above Grade (m)	Receptor Location	Noise Level (dBA)		Exclusionary Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R1	1.5	POW – 6 Oyster bay Court	34	31	50	45	**Yes**	**Yes**
R2	1.5	OPOR – 6 Oyster bay Court	34	N/A	50	N/A	**Yes**	N/A
R3	1.5	POW – 4 Oyster bay Court	35	32	50	45	**Yes**	**Yes**
R4	1.5	OPOR – 4 Oyster bay Court	36	N/A	50	N/A	**Yes**	N/A
R5	1.5	POW – 18 Meadowmist Court	33	30	50	45	**Yes**	**Yes**
R6	1.5	OPOR – 18 Meadowmist Court	34	N/A	50	N/A	**Yes**	N/A
R7	1.5	POW – 15 Heather Glen Court	35	32	50	45	**Yes**	**Yes**
R8	1.5	OPOR – 15 Heather Glen Court	37	N/A	50	N/A	**Yes**	N/A

N/A = sound levels during the nighttime are not considered as per ENCG

6. CONCLUSIONS AND RECOMMENDATIONS

For road noise, the results of the current analysis indicate that noise levels will range between 53 and 71 dBA during the daytime period (07:00-23:00) and between 46 and 63 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the north façade, which is nearest and most exposed to Hazeldean Road. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 7.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause[12] will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below:

> *"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 roadway traffic may, on occasion, interfere with some activities of the dwelling occupants, as the sound levels exceed the sound level limits of the City and the Ministry of the Environment and Climate Change. To help address the need for sound attenuation, this development includes:*
>
> - *STC rated multi-pane glazing elements and spandrel panels*
> - *North façade bedroom/living room: STC 34/29*
> - *East and west façade bedroom/living room: STC 30/25*
> - *North façade retail: STC 25*
> - *STC rated exterior walls*
> - *North, east and west façade: STC 45*
>
> *This dwelling unit has also been designed with air conditioning. Air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment and Climate Change.*

[12] City of Ottawa Environmental Noise Control Guidelines, January 2016

To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."

Results of the stationary noise analysis indicate that stationary noise levels from the development's mechanical equipment will fall below ENCG criteria during all hours of the day, given the assumptions specified in Section 4.3.2 are honoured. As such, the proposed development is expected to be compatible with the existing and future noise sensitive land uses. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment.

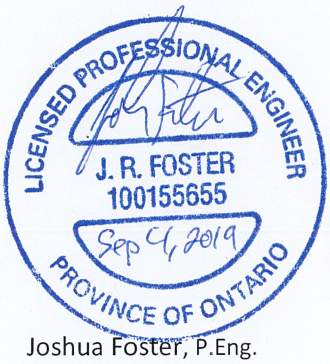
This concludes our traffic noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

D.P.

Cindy Hachem
Junior Environmental Scientist



Joshua Foster, P.Eng.
Principal

Giuseppe Garro, MASc.
Junior Environmental Scientist

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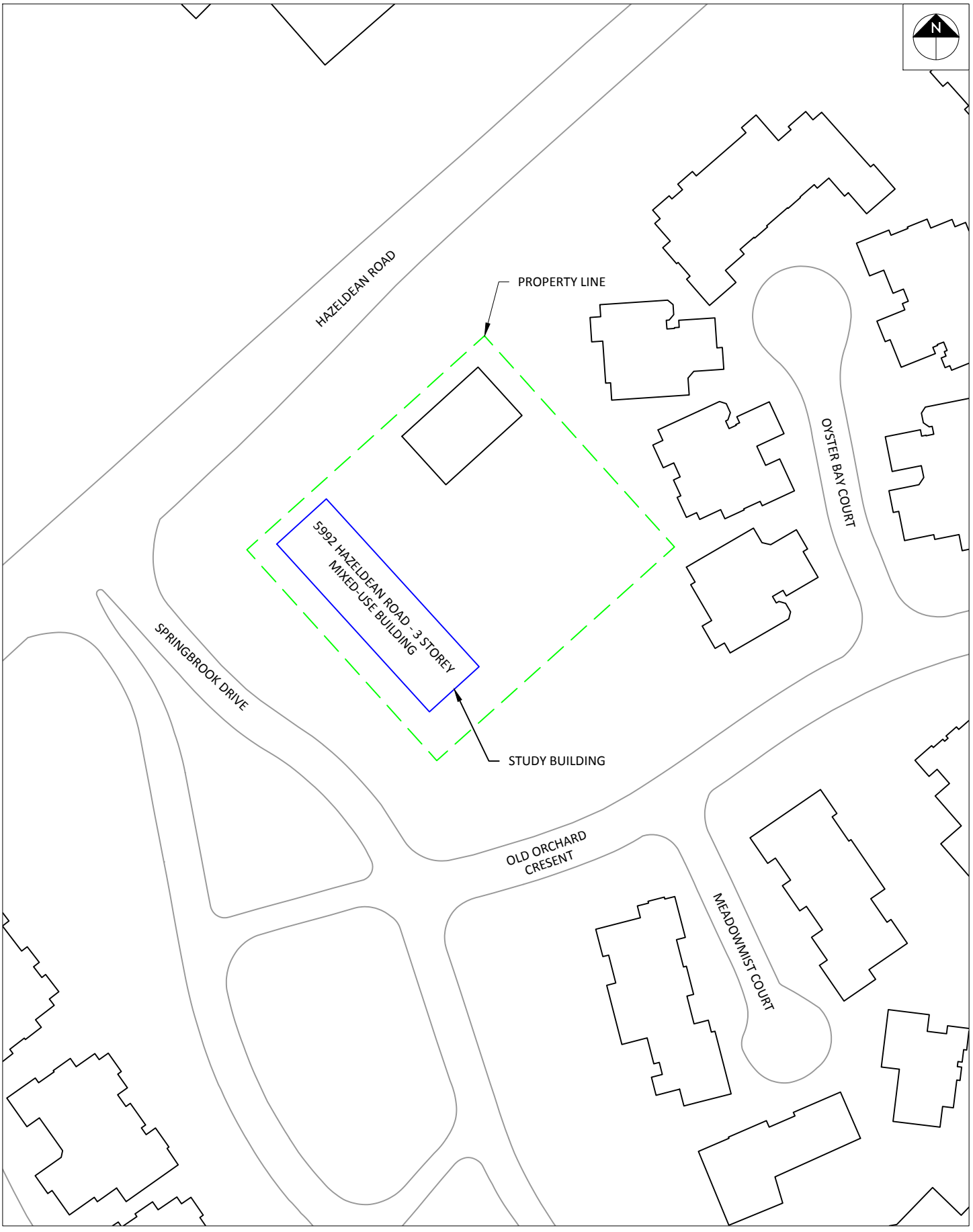

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PROJECT	5986-5992 HAZELDEAN ROAD - ENVIRONMENTAL NOISE STUDY
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE19-125-1
DATE	AUGUST 27, 2019
DRAWN BY	C.H.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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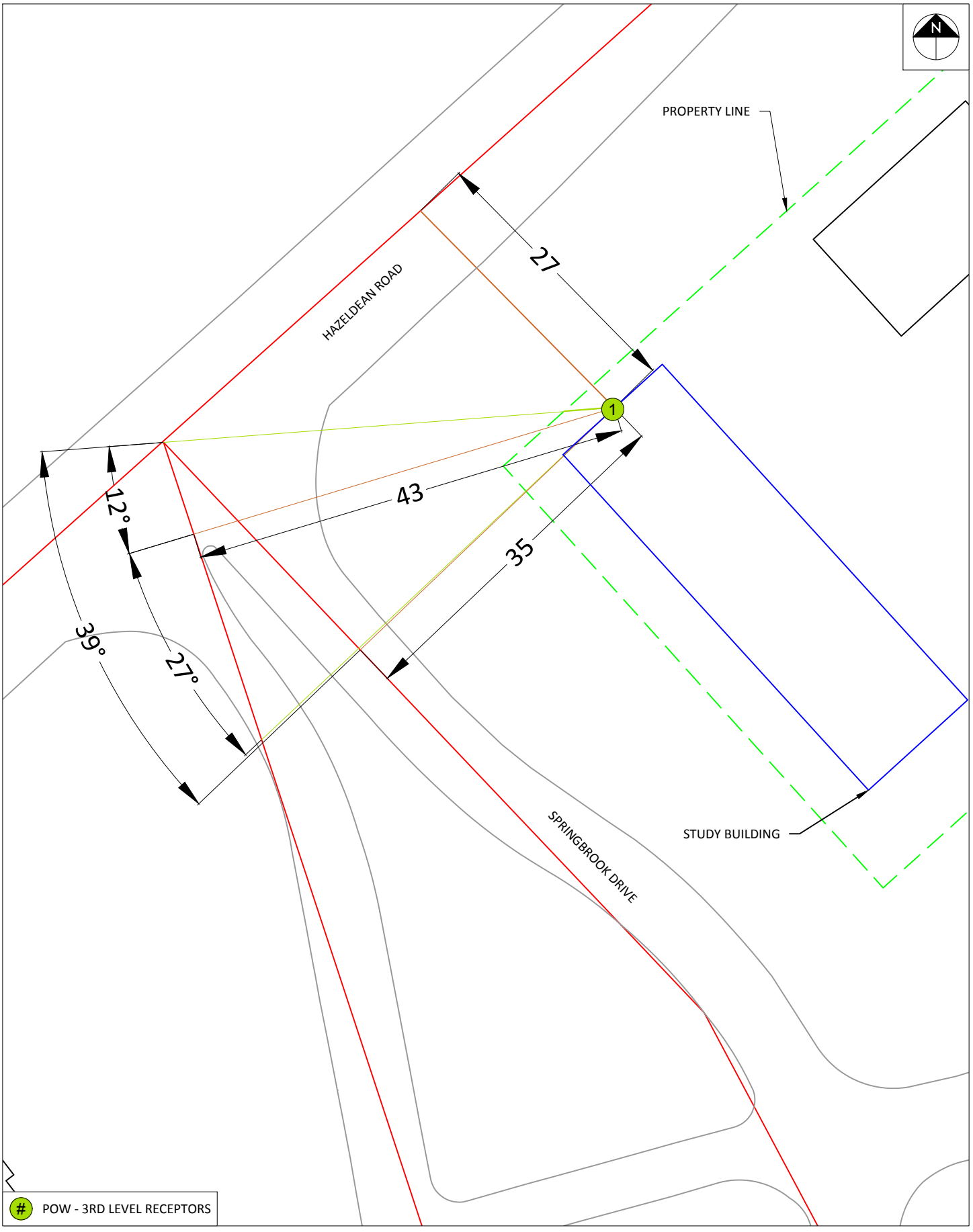
DRAWING NO.	GWE19-125-2
DATE	AUGUST 27, 2019
DRAWN BY	C.H.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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DATE	AUGUST 27, 2019
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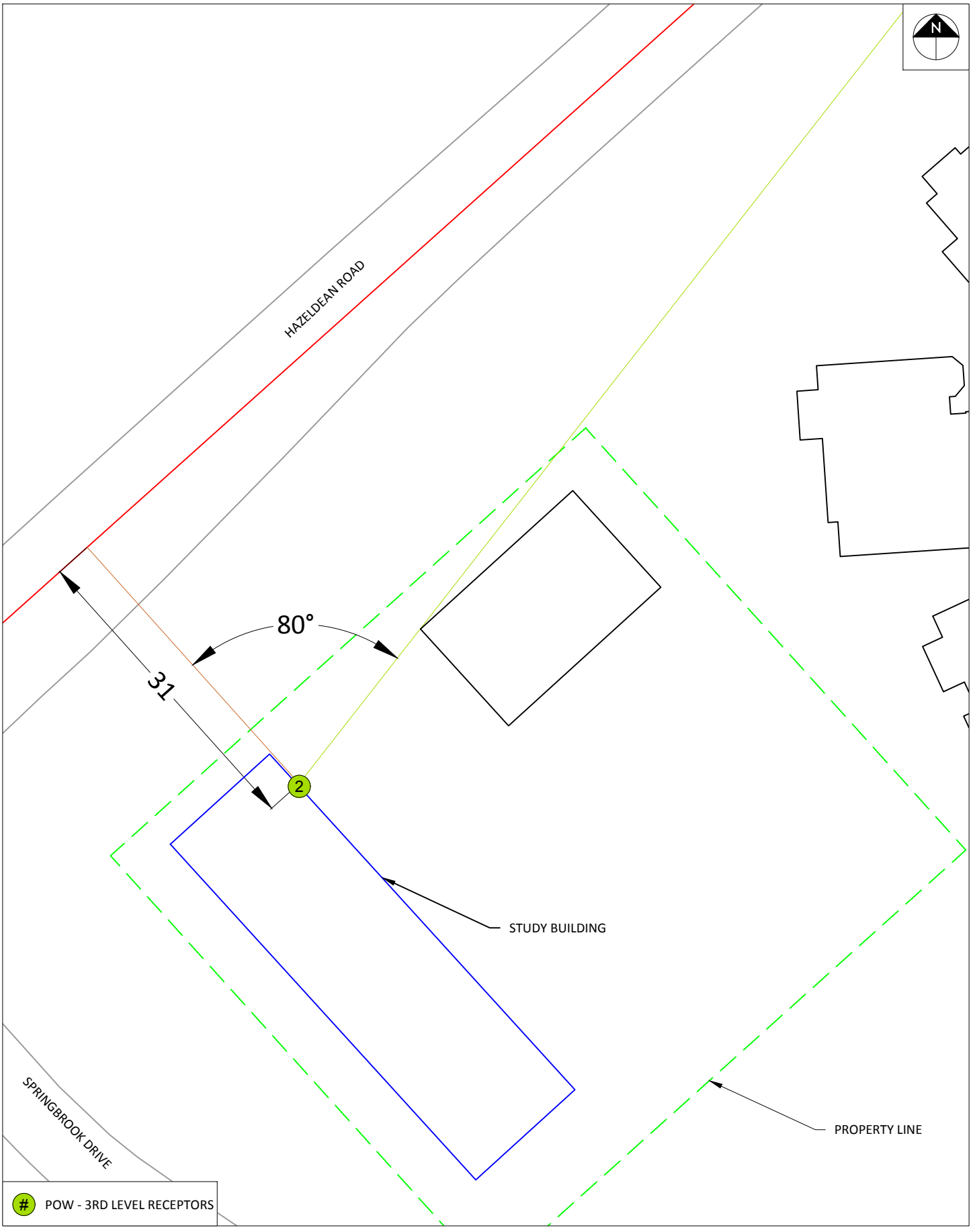
DESCRIPTION

FIGURE 3:
RECEPTOR 1 - STAMSON INPUT PARAMETERS



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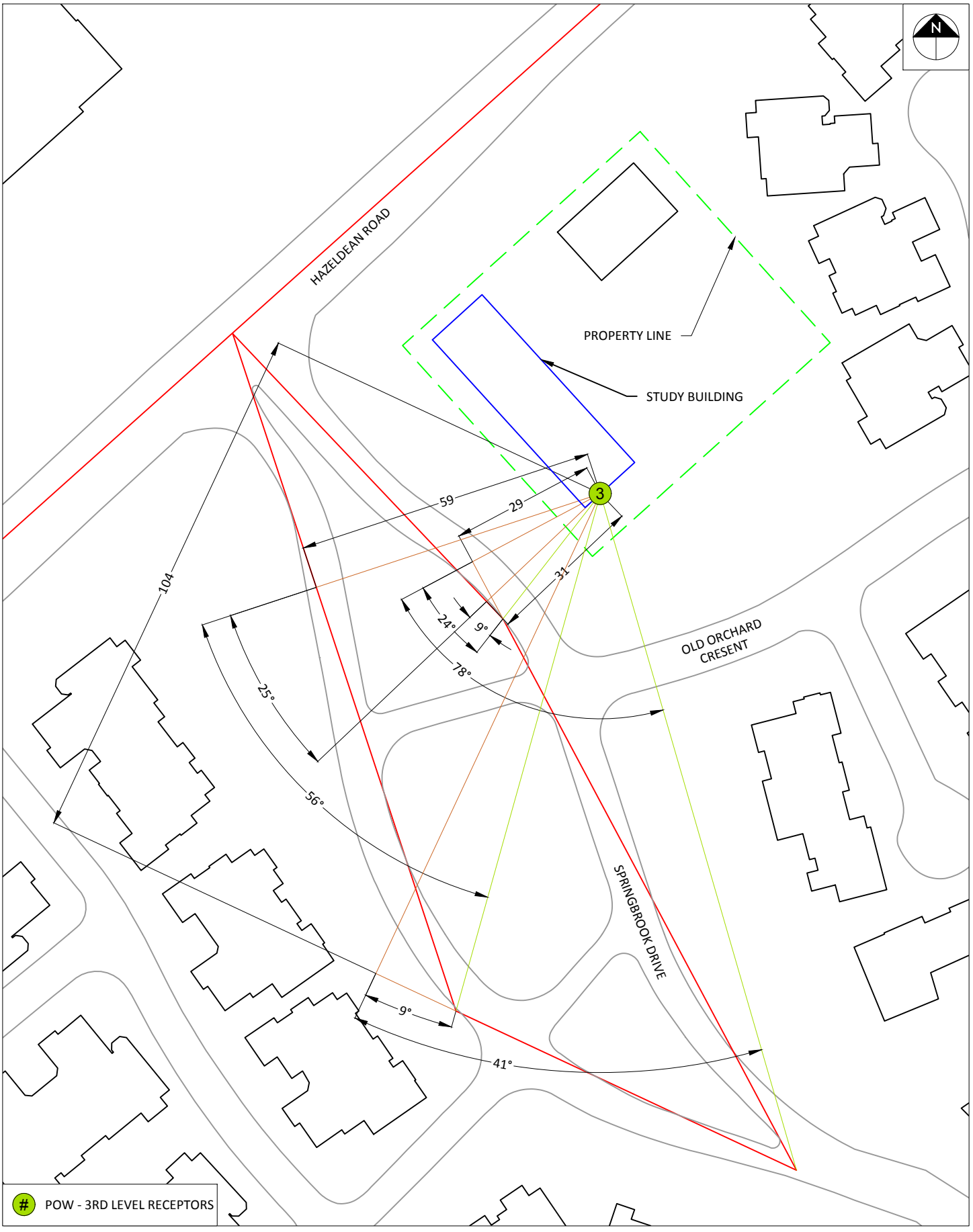
SCALE	1:500 (APPROX.)	DRAWING NO.	GWE19-125-4
DATE	AUGUST 27, 2019	DRAWN BY	C.H.

DESCRIPTION

FIGURE 4:
RECEPTOR 2 - STAMSON INPUT PARAMETERS



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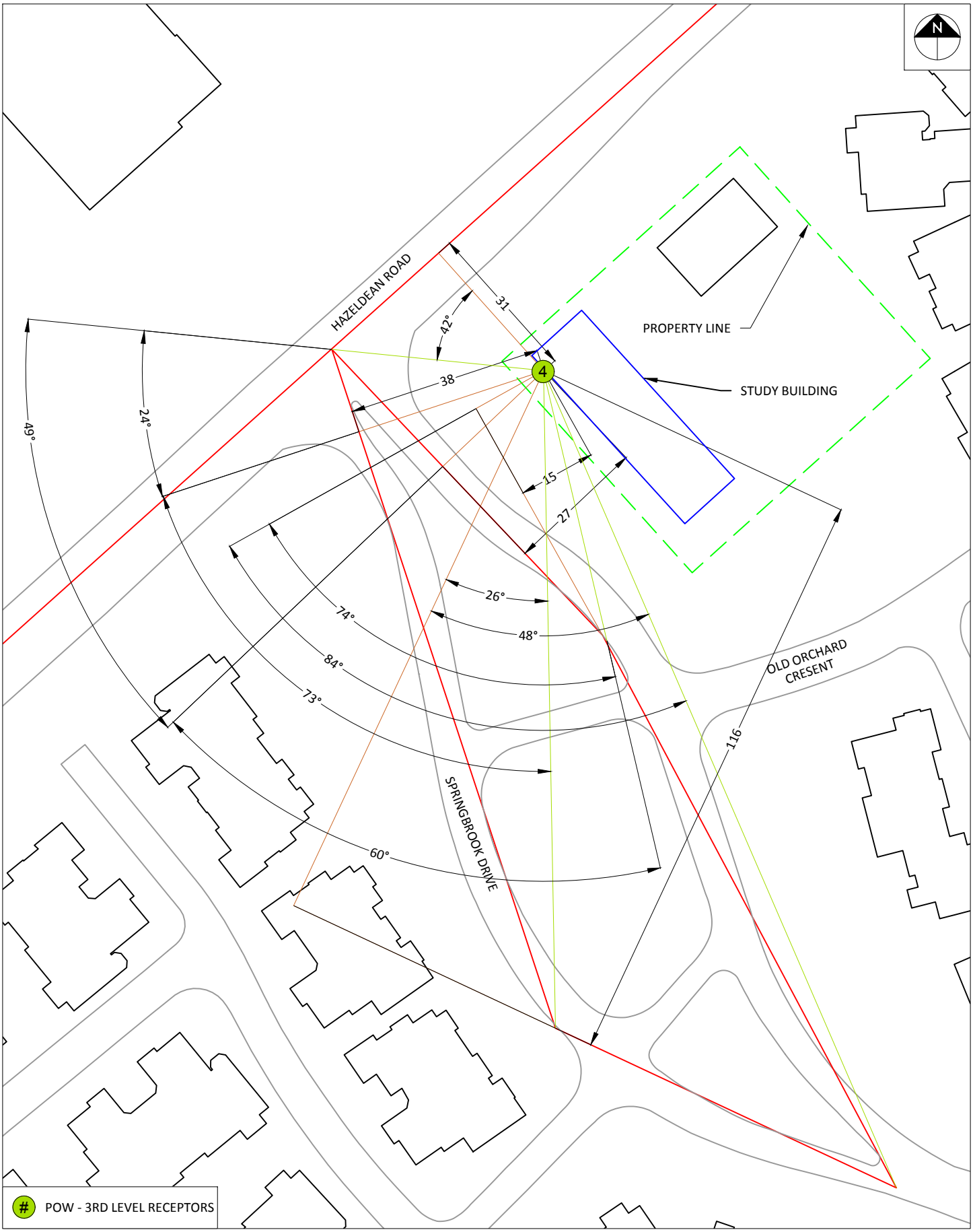
DRAWING NO.	GWE19-125-5
DATE	AUGUST 27, 2019
DRAWN BY	C.H.

DESCRIPTION

FIGURE 5:
RECEPTOR 3 - STAMSON INPUT PARAMETERS



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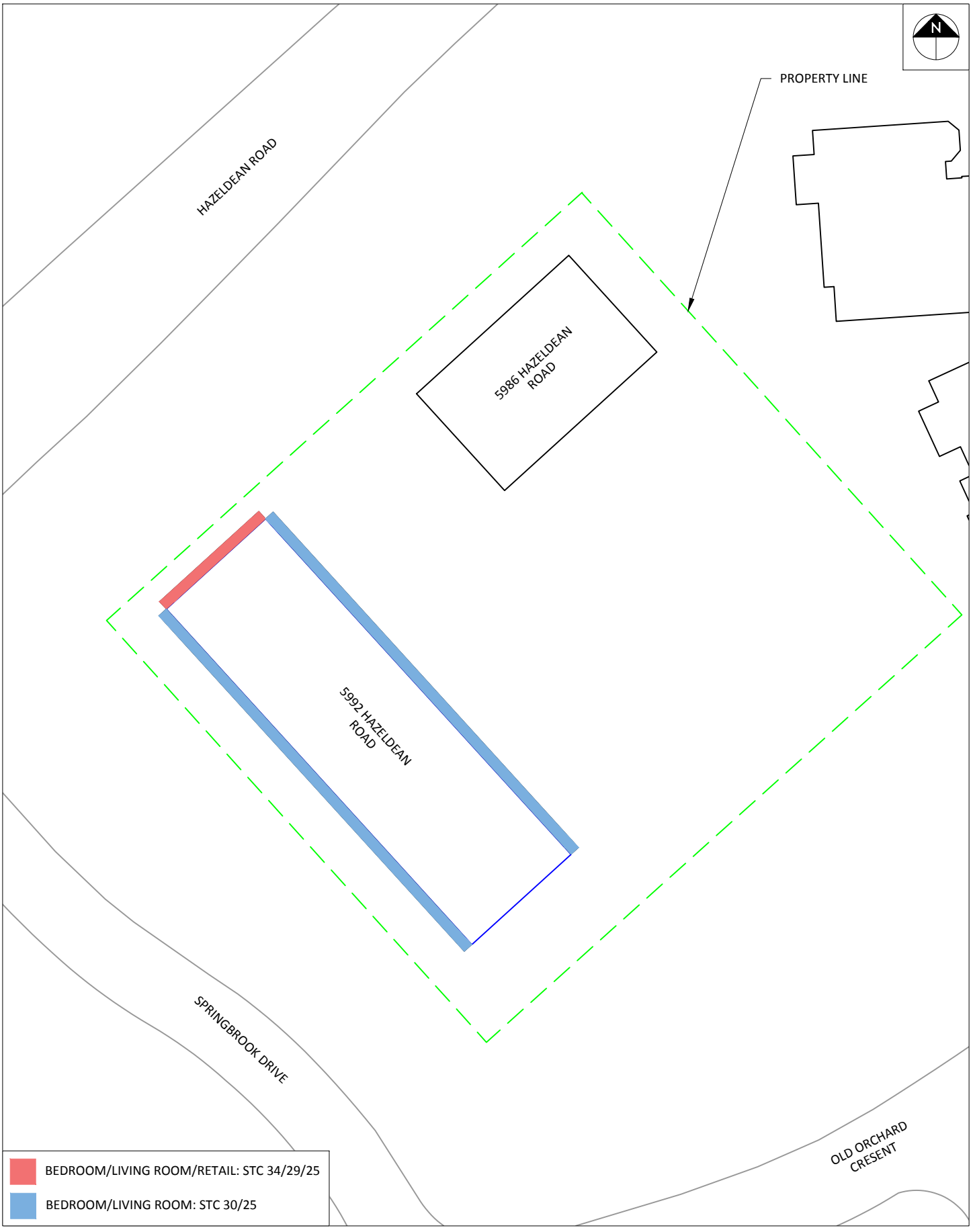
PROJECT	5986-5992 HAZELDEAN ROAD - ENVIRONMENTAL NOISE STUDY
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE19-125-6
DATE	AUGUST 27, 2019
DRAWN BY	C.H.

DESCRIPTION

FIGURE 6:
RECEPTOR 4 - STAMSON INPUT PARAMETERS



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PROJECT	5986-5992 HAZELDEAN ROAD - ENVIRONMENTAL NOISE STUDY
SCALE	1:500 (APPROX.)
DRAWING NO.	GWE19-125-7
DATE	AUGUST 27, 2019
DRAWN BY	C.H.

DESCRIPTION

FIGURE 7:
WINDOW STC REQUIREMENTS

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PROJECT	5986-5992 HAZELDEAN ROAD - ENVIRONMENTAL NOISE STUDY
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE19-125-8
DATE	AUGUST 27, 2019
DRAWN BY	G.G.

DESCRIPTION

FIGURE 8:
STATIONARY NOISE SOURCE AND RECEPTOR LOCATIONS

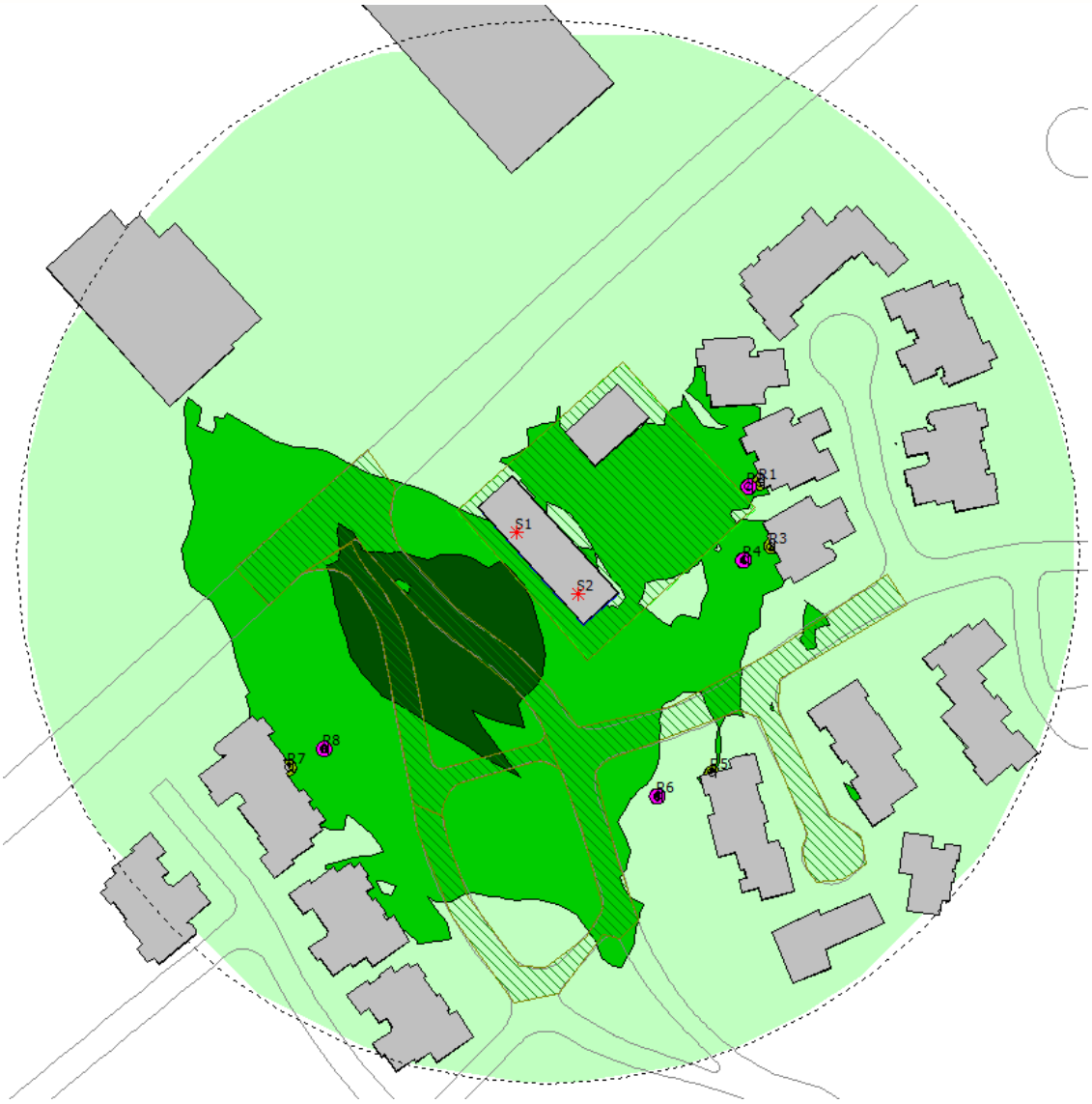

FIGURE 9: STATIONARY NOISE CONTOURS 1.5 METERS ABOVE GRADE (DAYTIME PERIOD)

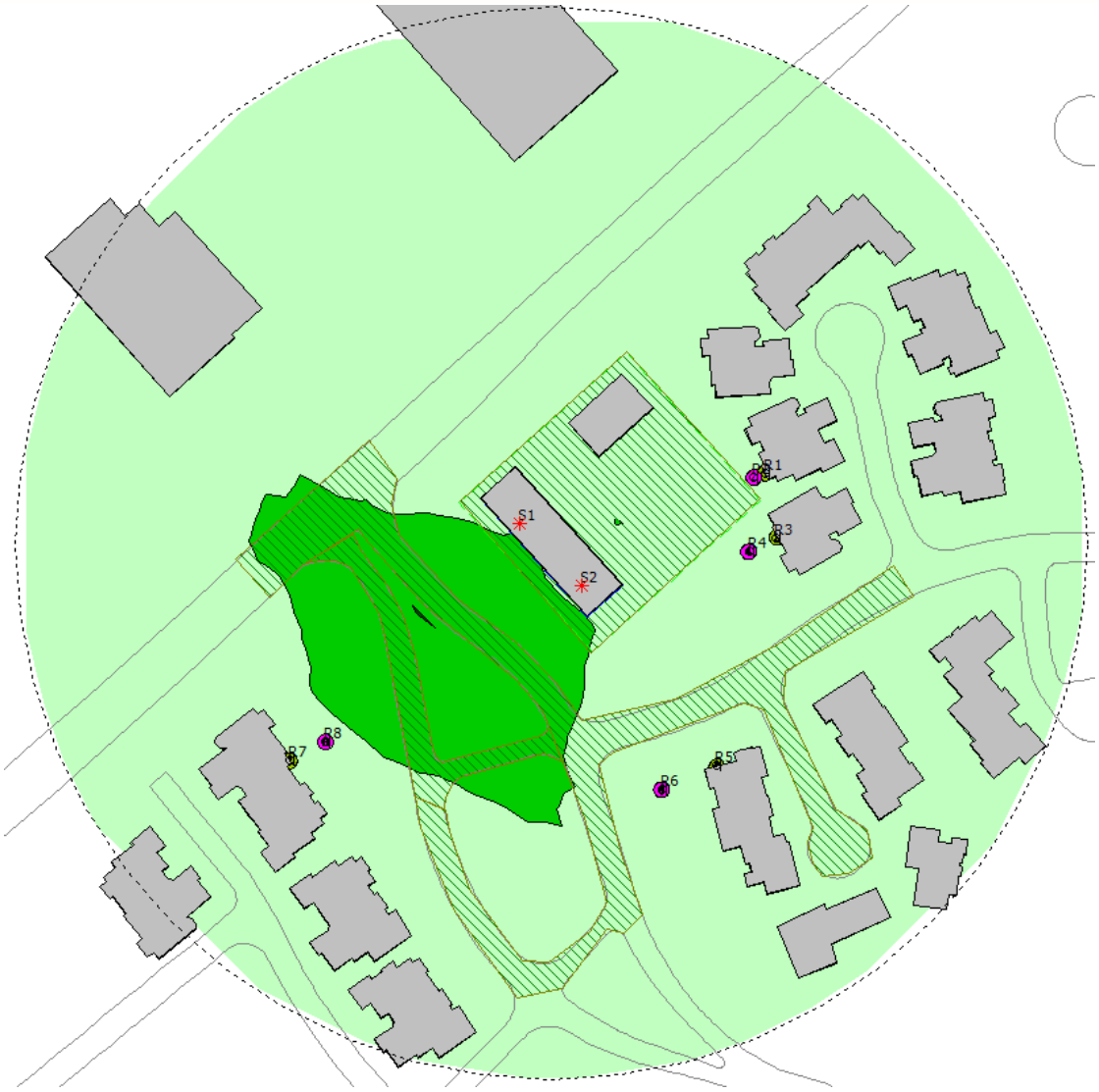

FIGURE 10: STATIONARY NOISE CONTOURS 1.5 METERS ABOVE GRADE (NIGHTTIME PERIOD)

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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```
STAMSON 5.0         NORMAL REPORT         Date: 15-08-2019 11:39:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te                 Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hazeldean (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    60 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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Hazeldean (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  :  27.00 / 27.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Spring A (day/night)
-------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Spring A (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   39.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  35.00 / 35.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Spring B (day/night)
-------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Spring B (day/night)
-----------------------------------------
Angle1   Angle2           : -27.00 deg   12.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  43.00 / 43.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Hazeldean (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 70.45 + 0.00) = 70.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  73.01   0.00  -2.55   0.00   0.00   0.00   0.00  70.45
-------------------------------------------------------------------------------

Segment Leq : 70.45 dBA


Results segment # 2: Spring A (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.62 + 0.00) = 50.62 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     39   0.00  60.95   0.00  -3.68  -6.64   0.00   0.00   0.00  50.62
-------------------------------------------------------------------------------

Segment Leq : 50.62 dBA


Results segment # 3: Spring B (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 49.73 + 0.00) = 49.73 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -27     12   0.00  60.95   0.00  -4.57  -6.64   0.00   0.00   0.00  49.73
-------------------------------------------------------------------------------

Segment Leq : 49.73 dBA

Total Leq All Segments: 70.53 dBA


Results segment # 1: Hazeldean (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.86 + 0.00) = 62.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  65.41   0.00  -2.55   0.00   0.00   0.00   0.00  62.86
-------------------------------------------------------------------------------

Segment Leq : 62.86 dBA
```

```
Results segment # 2: Spring A (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 43.01 + 0.00) = 43.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
     0     39   0.00  53.34   0.00  -3.68  -6.64   0.00   0.00   0.00  43.01
--------------------------------------------------------------------------------

Segment Leq : 43.01 dBA


Results segment # 3: Spring B (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 42.12 + 0.00) = 42.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -27     12   0.00  53.34   0.00  -4.57  -6.64   0.00   0.00   0.00  42.12
--------------------------------------------------------------------------------

Segment Leq : 42.12 dBA

Total Leq All Segments: 62.94 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 70.53
                           (NIGHT): 62.94
```

```
STAMSON 5.0         NORMAL REPORT         Date: 15-08-2019 11:39:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2.te                 Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hazeldean (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    60 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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Hazeldean (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   80.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  31.00 / 31.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Hazeldean (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 66.33 + 0.00) = 66.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     80   0.00  73.01   0.00  -3.15  -3.52   0.00   0.00   0.00  66.33
-------------------------------------------------------------------------------

Segment Leq : 66.33 dBA

Total Leq All Segments: 66.33 dBA


Results segment # 1: Hazeldean (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.74 + 0.00) = 58.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     80   0.00  65.41   0.00  -3.15  -3.52   0.00   0.00   0.00  58.74
-------------------------------------------------------------------------------

Segment Leq : 58.74 dBA

Total Leq All Segments: 58.74 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 66.33
                           (NIGHT): 58.74
```

```
STAMSON 5.0         NORMAL REPORT         Date: 15-08-2019 11:39:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3.te                 Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Spring A1 (day/night)
----------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Spring A1 (day/night)
-------------------------------------------
Angle1   Angle2           :  -9.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  31.00 / 31.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Spring A2 (day/night)
----------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 2: Spring A2 (day/night)
-------------------------------------------
Angle1   Angle2           : -78.00 deg   -24.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  29.00 / 29.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Spring B1 (day/night)
-----------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 3: Spring B1 (day/night)
-------------------------------------------
Angle1   Angle2           : -56.00 deg   -25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  59.00 / 59.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 4: Spring B2 (day/night)
----------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 4: Spring B2 (day/night)
-------------------------------------------
Angle1   Angle2           : -41.00 deg   -9.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 104.00 / 104.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Spring A1 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 44.78 + 0.00) = 44.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
    -9      0   0.00  60.95   0.00  -3.15 -13.01   0.00   0.00   0.00  44.78
--------------------------------------------------------------------------------

Segment Leq : 44.78 dBA


Results segment # 2: Spring A2 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.36 + 0.00) = 50.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -78    -24   0.48  60.95   0.00  -4.24  -6.35   0.00   0.00   0.00  50.36
--------------------------------------------------------------------------------

Segment Leq : 50.36 dBA


Results segment # 3: Spring B1 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 47.36 + 0.00) = 47.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -56    -25   0.00  60.95   0.00  -5.95  -7.64   0.00   0.00   0.00  47.36
--------------------------------------------------------------------------------

Segment Leq : 47.36 dBA


Results segment # 4: Spring B2 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 40.76 + 0.00) = 40.76 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -41     -9   0.48  60.95   0.00 -12.45  -7.74   0.00   0.00   0.00  40.76
--------------------------------------------------------------------------------

Segment Leq : 40.76 dBA

Total Leq All Segments: 53.12 dBA
```

```
Results segment # 1: Spring A1 (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 37.17 + 0.00) = 37.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -9      0   0.00  53.34   0.00  -3.15 -13.01   0.00   0.00   0.00  37.17
-------------------------------------------------------------------------------

Segment Leq : 37.17 dBA


Results segment # 2: Spring A2 (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 42.75 + 0.00) = 42.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -78    -24   0.48  53.34   0.00  -4.24  -6.35   0.00   0.00   0.00  42.75
-------------------------------------------------------------------------------

Segment Leq : 42.75 dBA


Results segment # 3: Spring B1 (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 39.75 + 0.00) = 39.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -56    -25   0.00  53.34   0.00  -5.95  -7.64   0.00   0.00   0.00  39.75
-------------------------------------------------------------------------------

Segment Leq : 39.75 dBA


Results segment # 4: Spring B2 (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 33.15 + 0.00) = 33.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -41     -9   0.48  53.34   0.00 -12.45  -7.74   0.00   0.00   0.00  33.15
-------------------------------------------------------------------------------

Segment Leq : 33.15 dBA

Total Leq All Segments: 45.51 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 53.12
                           (NIGHT): 45.51
```

```
STAMSON 5.0         NORMAL REPORT         Date: 15-08-2019 11:39:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4.te                 Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hazeldean (day/night)
----------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   veh/TimePeriod  *
Posted speed limit  :    60 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):  30000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Hazeldean (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  31.00 / 31.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Spring A1 (day/night)
-----------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 2: Spring A1 (day/night)
-------------------------------------------
Angle1   Angle2           : -60.00 deg   49.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  27.00 / 27.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Spring A2 (day/night)
----------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: Spring A2 (day/night)
-------------------------------------------
Angle1   Angle2           : -84.00 deg   -74.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 4: Spring B1 (day/night)
----------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 4: Spring B1 (day/night)
-------------------------------------------
Angle1   Angle2           : -73.00 deg   24.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 5: Spring B2 (day/night)
-----------------------------------------------
Car traffic volume  :  3239/282   veh/TimePeriod  *
Medium truck volume :   258/22    veh/TimePeriod  *
Heavy truck volume  :   184/16    veh/TimePeriod  *
Posted speed limit  :    40 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):   4001
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 5: Spring B2 (day/night)
-------------------------------------------
Angle1   Angle2           : -48.00 deg   -26.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 116.00 / 116.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Hazeldean (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 66.84 + 0.00) = 66.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      0   0.00  73.01   0.00  -3.15  -3.01   0.00   0.00   0.00  66.84
--------------------------------------------------------------------------------

Segment Leq : 66.84 dBA


Results segment # 2: Spring A1 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.22 + 0.00) = 56.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -60     49   0.00  60.95   0.00  -2.55  -2.18   0.00   0.00   0.00  56.22
--------------------------------------------------------------------------------

Segment Leq : 56.22 dBA


Results segment # 3: Spring A2 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 44.90 + 0.00) = 44.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -84    -74   0.48  60.95   0.00   0.00 -16.05   0.00   0.00   0.00  44.90
--------------------------------------------------------------------------------

Segment Leq : 44.90 dBA


Results segment # 4: Spring B1 (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.22 + 0.00) = 54.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -73     24   0.00  60.95   0.00  -4.04  -2.69   0.00   0.00   0.00  54.22
--------------------------------------------------------------------------------

Segment Leq : 54.22 dBA
```

```
Results segment # 5: Spring B2 (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 38.18 + 0.00) = 38.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -48    -26   0.48  60.95   0.00 -13.15  -9.61   0.00   0.00   0.00  38.18
-------------------------------------------------------------------------------

Segment Leq : 38.18 dBA

Total Leq All Segments: 67.44 dBA


Results segment # 1: Hazeldean (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.25 + 0.00) = 59.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  65.41   0.00  -3.15  -3.01   0.00   0.00   0.00  59.25
-------------------------------------------------------------------------------

Segment Leq : 59.25 dBA


Results segment # 2: Spring A1 (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.60 + 0.00) = 48.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -60     49   0.00  53.34   0.00  -2.55  -2.18   0.00   0.00   0.00  48.60
-------------------------------------------------------------------------------

Segment Leq : 48.60 dBA


Results segment # 3: Spring A2 (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 37.29 + 0.00) = 37.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -84    -74   0.48  53.34   0.00   0.00 -16.05   0.00   0.00   0.00  37.29
-------------------------------------------------------------------------------

Segment Leq : 37.29 dBA
```

```
Results segment # 4: Spring B1 (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.61 + 0.00) = 46.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -73     24   0.00  53.34   0.00  -4.04  -2.69   0.00   0.00   0.00  46.61
-------------------------------------------------------------------------------

Segment Leq : 46.61 dBA


Results segment # 5: Spring B2 (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 30.57 + 0.00) = 30.57 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -48    -26   0.48  53.34   0.00 -13.15  -9.61   0.00   0.00   0.00  30.57
-------------------------------------------------------------------------------

Segment Leq : 30.57 dBA

Total Leq All Segments: 59.85 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 67.44
                           (NIGHT): 59.85
```