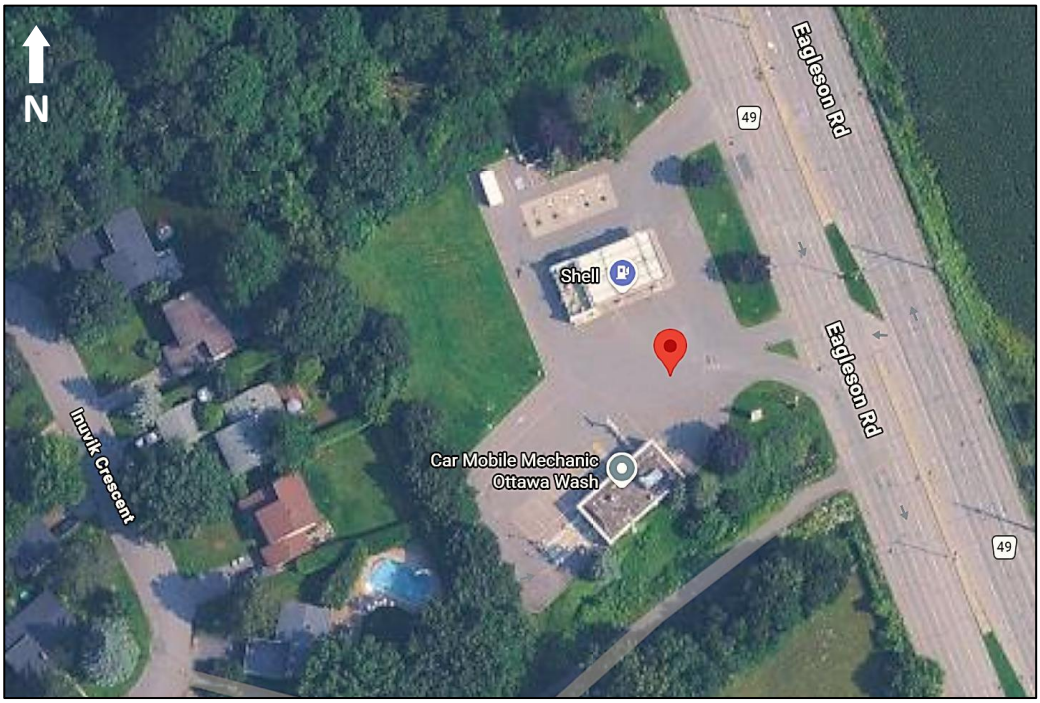
Noise Impact Assessment

CTM Design Services Ltd.

Shell Canada Gas Station
106 Eagleson Road, Kanata, ON



Prepared For:
Ms. Amina Oyakhilome
CTM Design Services Ltd.

Prepared By:
Mr. Hossein Mehravaran, P.L. (Eng.), Ph.D., INCE
Mr. James Farquharson, C.E.T., INCE
FDI Acoustics Inc.

Reviewed By:
Ms. Lydia Comley, P. Eng., C.R.M.
Misener Engineering

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Sound Advice • Sound Delivery

Executive Summary

CTM Design Services Ltd. (CTM) sought to determine the environmental noise impact of the proposed re-development of the Shell Canada Limited (Shell) Gas Station at 106 Eagleson Road, Kanata in the City of Ottawa, Ontario. CTM retained the services of FDI Acoustics to complete a Noise Impact Assessment for the proposed development to determine compliance with the Exclusion Limit Values of the Environmental Noise Guideline NPC-300 prepared by Ontario Ministry of the Environment (NPC-300)[1], City of Ottawa Environmental Noise Control Guidelines (ENCG)[2], and City of Ottawa Noise By-Law No. 2017 – 255 (Ottawa Noise By-Law)[3]. The assessment also provides the foundation to develop noise control measures for the equipment and operations assessed should the predicted sound levels exceed the Exclusion Limit Values of NPC-300 and ENCG.

Octave band sound pressure levels related to the significant noise sources identified with the existing car wash and proposed filling station equipment operations were assigned from a combination of manufacturer's data, FDI Acoustics' sound pressure level measurement library, or values were calculated following schemes as presented in texts[4,5]. Following accepted acoustic evaluation practices, the sound pressure level data was used to calculate octave band sound power level values for the significant noise sources associated with the gas station and car wash operations. The sound power levels were entered in the Softnoise GmbH Predictor™ Type 7810 noise propagation modelling software. The environmental noise propagation computer model calculates the sound level contribution of the filling station operations at the most impacted point of reception and at reception points of interest following the requirements of the ENCG and NPC-300. The nearest residences are west of the development site.

Table ES-1 provided below presents the results of the modeling along with the exclusion limit values for the receiver locations at the most impacted reception point and the reception points of interest.

[1] *Ontario Ministry of the Environment (MOE), Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication (NPC-300), August 2013.*

[2] *City of Ottawa, Environmental Noise Control Guidelines (ENCG), Introduction and Glossary, prepared for Planning and Growth Management, January 2016.*

[3] *City of Ottawa, Noise By-Law No. 2017 - 255, Effective Date, September 30, 2017.*

Table ES-1: Predicted Sound Level Summary – Gas Station Re-Development at 109 Eagleson Road.

Receiver Location & Sound Level Description	07:00 – 23:00 Sound Level (L_{eq} dBA)	23:00 – 07:00 Sound Level (L_{eq} dBA)
	Proposed Development	
Plane of Window of Noise Sensitive Spaces		
R1 (23 Inuvik Crescent, Kanata) – 2nd Floor	45	28
R2 (21 Inuvik Crescent, Kanata) – 2nd Floor	46	30
R3 (19 Inuvik Crescent, Kanata) – 2nd Floor	45	31
R4 (17 Inuvik Crescent, Kanata) – 2nd Floor	45	37
R5 (15 Inuvik Crescent, Kanata) – 2nd Floor	45	41
R6 (186 Barrow Crescent, Kanata) – 1st Floor	28	16
Exclusion Limit Values of One-Hour Equivalent Sound Level / Class 1 Area (Noise Sensitive Space)	**50**	45
Outdoor Points of Reception of Noise Sensitive Spaces / Property Line		
R1 (23 Inuvik Crescent, Kanata)	50	-
R2 (21 Inuvik Crescent, Kanata)	49	-
R3 (19 Inuvik Crescent, Kanata)	48	-
R4 (17 Inuvik Crescent, Kanata)	48	-
R5 (15 Inuvik Crescent, Kanata)	49	-
R6 (186 Barrow Crescent, Kanata)	37	-
Exclusion Limit Values of One-Hour Equivalent Sound Level / Class 1 Area (Noise Sensitive Space)	**50**	-

The results of the environmental noise propagation model indicate the predicted sound levels from the Shell Gas Station re-development and existing car wash comply with the daytime and nighttime exclusion limit value of the ENCG and NPC-300 at the plane of windows of the assessed noise sensitive reception points. The results also indicate the predicted sound levels from the Shell Gas Station re-development and existing car wash comply with the daytime exclusion limit values of the ENCG and NPC-300 at the property line of the assessed noise sensitive reception points.

Shell Canada is advised to limit the carwash operations to the defined daytime and evening hours of 07:00 to 23:00 and to operate all associated equipment as described in this Report in order to ensure ongoing compliance the requirements of the exclusion limit values of the ENCG and NPC-300.

Signatures & Seals

Report Prepared By:

Hossein Mehravaran, P.L.(Eng), Ph.D., INCE

James Farquharson, C.E.T., INCE
FDI Acoustics Inc.

Report Review By:

Lydia Comley, P.Eng., C.R.M.
Misener Engineering

This Report is intended solely for CTM Design Services Ltd (the Client). The scope of work and related responsibilities are defined in the Conditions of Assignment between FDI Acoustics and CTM Design Services Ltd. Any use which a third party makes of the work, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Decisions made or actions taken as a result of our work shall be the responsibility of the parties directly involved in the decisions or actions.

In no event shall the Client copy or use any of the concepts, plans, drawings, specifications, designs, models, reports, photographs, computer software, surveys, calculations, construction and other data, documents, and processes produced by FDI Acoustics in connection with the 106 Eagleson Road Shell (the Project) for any purpose other than those noted within this Report or in relation to any project other than the Project without the prior written permission of FDI Acoustics. FDI Acoustics shall not unreasonably withhold or deny such consent but shall be entitled to receive additional equitable remuneration in connection with its grant of consent.

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Scope of Work

CTM Design Services Ltd. (CTM) sought to determine the environmental noise impact of the proposed re-development of the existing Shell Canada Limited (Shell) Gas Station at 106 Eagleson Road, Kanata in the City of Ottawa, Ontario. CTM retained the services of FDI Acoustics to complete a Noise Impact Assessment for the proposed development to determine compliance with the Exclusion Limit Values of the Environmental Noise Guideline NPC-300 prepared by Ontario Ministry of the Environment (NPC-300)[1], City of Ottawa Environmental Noise Control Guidelines (ENCG)[2], and City of Ottawa Noise By-Law No. 2017-255 (Ottawa Noise By-Law)[3]. The assessment also provides the foundation to develop noise control measures for the equipment and operations assessed should the predicted sound levels exceed the Exclusion Limit Values of NPC-300 and ENCG.

Methodology

Octave band sound pressure levels related to the significant noise sources identified with the car wash, proposed gas station equipment, and development operations were assigned from a combination of manufacturer's data, FDI Acoustics' sound pressure level measurement library, or values calculated following schemes presented in relevant technical references[4,5]. Following accepted acoustic evaluation practices, the sound pressure level data was used to calculate octave band sound power level values for the significant noise sources associated with the gas station and car wash operations.

Plans for the development were provided by CTM. The development area information supplied by CTM was supplemented with information from government and commercial sources.

This information formed the input for an environmental noise propagation computer model that calculated the sound level contribution of the gas station at the noise sensitive zones near the gas station development site. The results of the model are presented as the individual component sound levels of the gas station and car wash equipment, the overall gas station sound level contribution, the predicted sound levels for the receiver locations under assessment, and a study area noise contour map. The results are reviewed by comparing the predicted sound levels against the applicable exclusion limit values to determine compliance.

Should the results of the model exceed either the daytime or nighttime exclusion limit values, noise control measures may be developed and evaluated within the noise propagation model. The predicted sound level contribution reduction for each noise control measure implemented

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[4] *Crocker, M.J., Handbook of Noise and Vibration Control, John Wiley & Sons. New York, NY, 2007.*

[5] *Bies, D.A. and Hansen, C.H., Engineering Noise Control Theory and Practice, Third Edition, Spon Press. New York, NY, 2003.*

may be reported for the point of interest. Acoustical specifications related to recommended noise control measures are included this Report.

Environmental Noise Regulation Criteria

City of Ottawa Noise By-Law No. 2017-255

City of Ottawa By-Law No. 2017 – 255 (City By-Law), is a City By-Law respecting the public interest to reduce the noise levels with the City's boundaries in order to preserve, protect and promote public health, safety, welfare, as well as peace and quiet, for the inhabitants of the City.

The City By-Law includes several definitions, sound level limits, prohibitions, enforcement rules, and exemptions that are applicable to this Report. Reference to the specific By-Law provisions applicable to this Report are listed below for brevity:

- Section 1 – Definitions: Definition of "point of reception".
- Section 4 – Sound Reproduction or Amplification Devices: Subsections (1), (2), (6), (7) & (10).
- Section 5 – Air Conditioners, Heat Pumps, Compressors, Chillers, Cooling Towers and Similar Devices: Subsection (1).
- Section 6 – Exhaust Fan, Exhaust System, Intake Fan Generators, Commercial Dryers and Similar Devices: Subsection (1).
- Section 11 – Deliveries: Subsection (1).
- Section 12 – Loading and Unloading: Subsection (1).
- Section 16 – Idling Motor Vehicles: Subsection (1).
- Section 26 – Enforcement.

As the outdoor and indoor sound level limits, formally referred to as exclusion limit values, included in the City By-Law are less stringent than those specified in the ENCG and NPC-300, they are not applicable and therefore have been intentionally omitted from this Report.

A link to the full City By-Law document, including the listed applicable provisions, has been provided in Appendix D for this Report.

City of Ottawa Environmental Noise Control Guidelines

The Environmental Noise Control Guidelines (ENCG) are the City of Ottawa's technical guidelines for assessing and managing environmental noise during land use and transportation planning and development, and as such, they serve as an important tool for the implementation of the environmental noise policies contained in the City's Official Plan. The ENCG define specific sound level limits used by City staff, planners, developers, engineers, acoustical consultants alike when designing and evaluating new developments with the City

limits. The outdoor and indoor sound level limits and associated criteria applicable to this Report can be found in the following part and sections of the ENCG:

- Part 1 – Environmental Noise Control Guidelines for Land Use Planning, Section 3.0 – Stationary Sources of Noise

  This section of the ENCG specifically applies to new developments in proximity to existing stationary sources of noise, as well as to the development of new stationary noise sources in proximity to noise sensitive land uses, such as residential areas.

  For information, stationary sources of noise, either fixed or mobile, represent the combined sound and vibration levels emitted beyond the property boundary. Stationary source noise can be generated by individual or multiple sources (facilities). Examples of individual noise sources include generators, fans and commercial air conditioners, while examples of multiple sources include manufacturing facilities, car dealerships and vehicle maintenance facilities, snow disposal sites, car washes and transit stations.

  For additional information, noise sensitive land use means a land use that is sensitive to noise, whether inside and/or outside the building and that must be planned and/or designed using appropriate land use compatibility principles. Examples of sensitive land uses include, but are not limited to, residential developments, hospitals, nursing or retirement homes, schools, and day-care centres.

  As the new proposed gas station and existing car wash on the subject property are considered stationary sources of noise located adjacent to sensitive land use (residential development), the provisions of Section 3.0 of the ENCG are relevant to this Report.

- Part 1 – Environmental Noise Control Guidelines for Land Use Planning, Section 3.0, Table 3.0 – Area Classes for Definition of Stationary Noise Ambient Sound Level

  The impact of stationary noise on the community is largely dependent on its location in the City. Within the ENCG, there are four (4) separate community classification areas (Classes 1 to 4) defined according to their typical ambient sound levels. These classifications, defined in Table 3.0 of the ENCG, are used to determine the stationary source noise limits applicable to a specific development.

  The development that is the subject of this Report is considered Class 1 as it is located within Ottawa's urban area as defined in Table 3.0 of the ENCG.

- Part 1 – Environmental Noise Control Guidelines for Land Use Planning, Section 3.1 – When a Study is Required for Stationary Noise

  Noise impacts from proposed equipment and facilities that are expanded or intensified are considered by the Province during the approval processes under the Environmental Protection Act. Whether or not an updated or new approval is required from the Province, the City may request that a Noise Study or Acoustical Audit be prepared and that a certification of final construction be submitted. Although the development that is the

subject of this Report is limited to the re-development of an existing site for the same use, the City of Ottawa has specifically requested that a Noise Study be completed.

- Part 1 – Environmental Noise Control Guidelines for Land Use Planning, Section 3.2 – Applicable Guidelines for Stationary Noise, Table 3.2a – Steady and Varying Sound for Class 1 Area.

  The outdoor and indoor sound level limits, formally referred to as exclusion limit values, applicable to this Report can be found in Table 3.2a of the ENCG. The ENCG exclusion limit values in Table 3.2a are equivalent (the same) as the exclusion limit values defined in Table 1 of NPC-300.

- Part 4 – Noise Control Studies and Implementation, Section 3.0 – Study Requirements

  When required, an environmental noise study should be prepared as early as possible in the development application process. In most cases, the Official Plan requires the study as part of a complete application under the Planning Act. The reason that the study is required early in the process is because the outcome of the study is intended to contribute directly to site design and consequent decisions of decision makers in the planning application process. As with other technical studies prepared in support of an application, pre-consultation with the City of Ottawa is required. During the pre-consultation phase, the source(s) and point(s) of reception applicable to the prosed development are to be defined by the applicant and the City will indicate the level of study required.

  For information, point of inception means any location on a noise sensitive land use where noise from a stationary source is received. Noise sensitive land uses may have one (1) or more point of reception.

  For the purposes of this Report, the following points of reception are applicable to the sensitive land use (residential development) adjacent to the subject property:

  i. An outdoor location within thirty (30) metres of a façade of a dwelling, typically in backyards and rear yard terraces or patios, at a height of one and a half (1.5) metres above ground.
  ii. A location on a balcony and elevated terrace provided they are the only outdoor living area for the occupant, have a minimum depth of four (4) metres, and are not enclosed.

A link to the full ENCG document, including the listed applicable provisions, has been provided in Appendix D for this Report.

Environmental Noise Guideline for Stationary and Transportation Sources – Approval and Planning Publication NPC-300

The Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication NPC-300 (NPC-300) prepared by the Ontario Ministry of the Environment, Conservation and Parks (MECP) dated August 2013, is the Province of Ontario's principal

technical guideline for assessing and controlling environmental noise from stationary sources and for addressing transportation noise during in land-use planning. The NPC-300 includes noise assessment framework used to protect people from the adverse effects of environmental noise by setting sound limits for industrial, commercial and institutional facilities, as well as transportation projects (roads, airports, and railways).
The outdoor and indoor sound level limits (exclusion limit values) and associated criteria applicable to this Report can be found in *Table 1* of the NPC-300 provided below.

Table 1: Exclusion Limit Values of One-Hour Equivalent Sound Level (NPC-300 Class 1 Area).

Time of Day / Class 1 Area	Outdoor Point of Reception One-Hour Sound Level L_{eq} (dBA)	Plane of Window One-Hour Sound Level L_{eq} (dBA)
Daytime 07:00 – 19:00	50	50
Evening 19:00 – 23:00	50	50
Nighttime 23:00 – 07:00	-	45

The exclusion limit values in *Table 1* above exceed those specified in the City By-Law but are equivalent to (the same as) the values included in Table 3.2a of the ENCG.
Following a conservative approach, FDI Acoustics has considered the NPC-300 sound level limits noted in *Table 1* above as appropriate for the assessment included this Report.

A link to the full NPC-300 document, including the listed applicable provisions, has been provided in Appendix D for this Report.

Ottawa Zoning By-Law

The portion of the City of Ottawa's new Zoning By-Law 2026-50 Map applicable to the development and noise study area is provided in Figure 1 below. Per Draft 2 of the City's new Zoning Map, the proposed development site is considered to be a "MS2 H (6)" area (Mainstreet and Minor Corridor Zone).

As shown in Figure 1 below, the most impacted noise sensitive area located to the west of the proposed development site is designated as a "N1D" area (Neighbourhood Zone). The "N1D" area is a residential area and is therefore considered a noise sensitive land use. The other noise sensitive land use nearby is the "INZ" area (Institutional Zone) located to the south of the development area as shown in Figure 1 below.

The other areas surrounding the proposed development are considered "GRN" area (Greenspace Zone), "EP" area (Environmental Zones), and "AG" and "AG2" areas (both Agricultural Zones); these areas are not considered noise sensitive land uses.

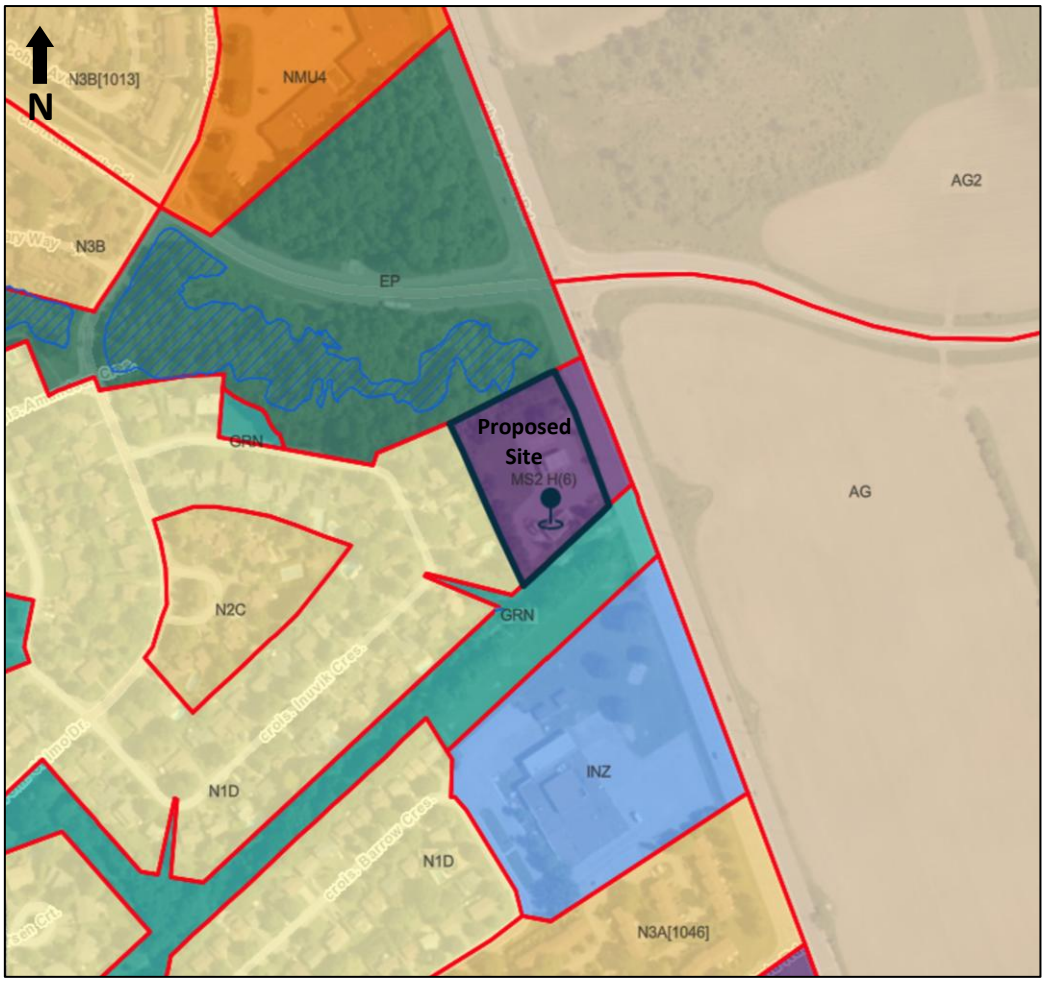

Figure 1: City of Ottawa New Zoning By-Law Map – Draft 2.

Study Area & Site Plan

As shown in *Figure 2*, the proposed Shell Gas Station is located at 106 Eagleson Road, Kanata in Ottawa, Ontario. As shown in *Figure 3 and 4*, the site is currently home to an existing car wash, a convenience store, and a gas station with two (2) fuel pumps and an overhead canopy.

Figure 2: Site Location – 106 Eagleson Road, Kanata, ON.

Figure 3: Existing Car Wash, Vacuums & Tire Fill.

Figure 4: Existing Convenience Store & Gas Station.

The existing car wash, two (2) vacuums and single (1) tire fill station, located at the south side of the property, will remain, while the existing convenience store and gas pump canopy will be demolished.

As shown in *Figure 5 below*, the proposed new development on the property will include the following:

- A new, stand-alone convenience store building on the north side of the site.
- A new overhead canopy over six (6) fuel pumps – two (2) new and four (4) existing in the middle of the site.
- The existing car wash on the south site of the site.

The nearest and most impacted residences, designated as noise-sensitive receivers, are located at 15, 17, 19, 21, and 23 Inuvik Crescent, adjacent to the west side the proposed gas station development. Another noise sensitive receiver, an elementary school, is located at 186 Barrow Crescent, approximately one hundred and twenty (120) metres south of the existing car wash building.

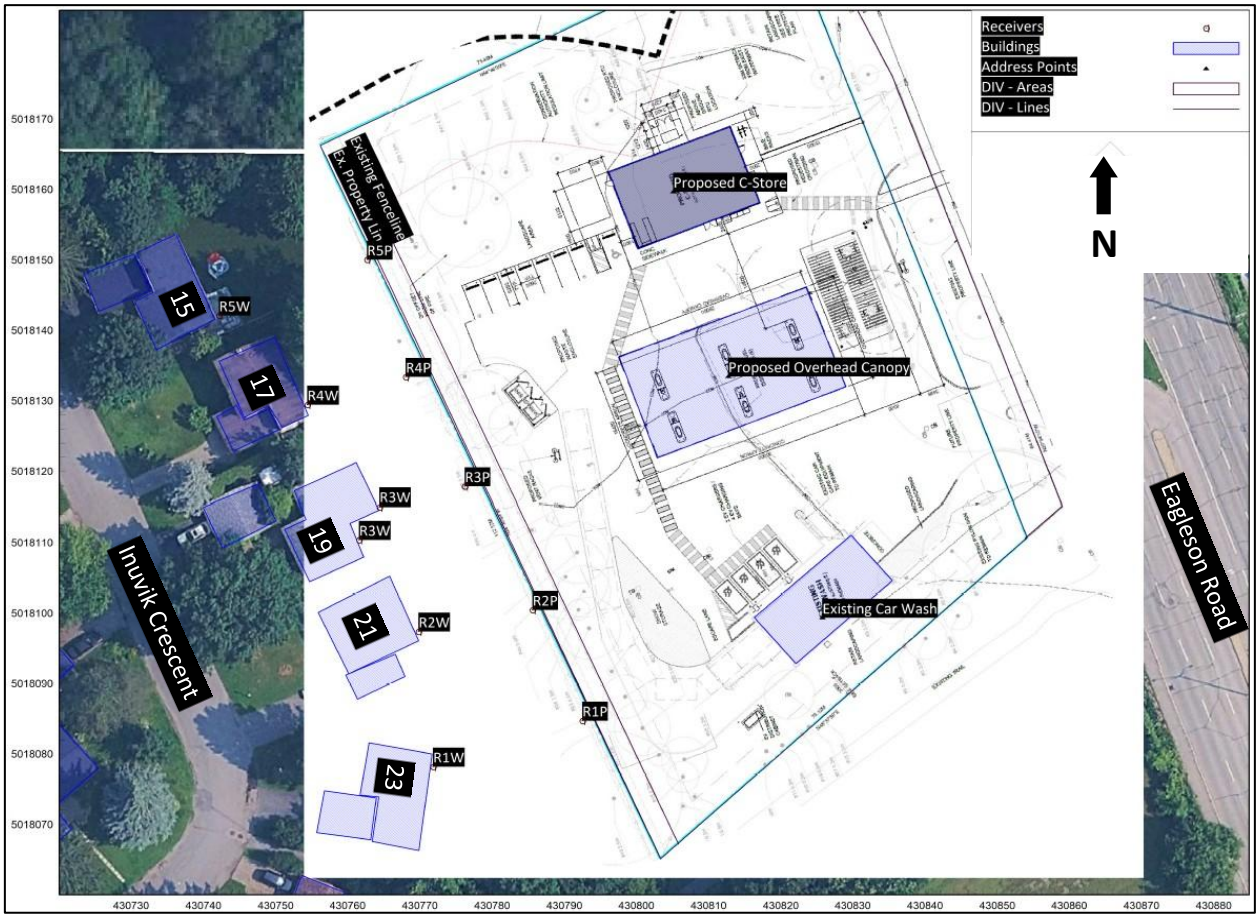

Figure 5: Proposed Site Plan – Shell Gas Station at 106 Eagleson Road, Kanata, ON.

Available online information sources generally describe the topography of the area as flat and the landscape as urban/sub-urban with a mix of paved and green surfaces, agricultural land use, asphalt, lawn, and trees.

Larger, higher resolution copies of *Figures 2* and *5* are provided in Appendix A and B, respectively, for reference.

Description of Equipment & Operation

The significant noise sources associated with the proposed gas station development include the rooftop mounted heating and air conditioning unit (RTU) on the north side of the proposed convenience store building, idling vehicles along the southwest side of the site awaiting entry to the car wash or waiting in the parking stalls west of the proposed convenience store, and an idling delivery truck (fuel and goods deliveries).

Convenience Store & Gas Station

Based on discussions with CTM, FDI Acoustics has assumed that the new convenience store RTU will be a Trane 5-ton Precedent model or equivalent. FDI Acoustics has also assumed that the new convenience store building will be equipped with two (2) exhaust fans. The RTU and exhaust fans are assumed to operate continuously during the daytime, evening, and nighttime periods, although actual operation may be less.

Fuel and goods deliveries are assumed to occur only during the daytime and evening periods (07:00 to 23:00), with truck engines turned off while on site.

Vacuums & Tire Inflator

There are two (2) vacuum cleaners and one (1) tire inflator air compressor near the existing car wash building. Based on discussions with CTM, FDI Acoustics has assumed that only one (1) vacuum cleaner and the one (1) tire inflator air compressor will operate simultaneously during the daytime and evening periods (07:00 to 23:00), for a total duration of 1.5 hours or less.

Car Wash

The significant noise sources associated with the existing car wash include dryers and high-pressure sprayers. CTM has indicated that the existing dryer is an Aerodry Model A45 unit driven by a forty-five (45) horsepower electric motor. According to the manufacturer's specifications, the dryer emits a sound pressure level of 82 dBA at one (1) metres from the exterior door opening of the car wash.

Based on information provided by CTM, the following assumptions have been made by FDI Acoustics in regard to the typical operation of the existing car wash:

- The exit door of the car wash is open for twenty-five percent (25%) of the operating time.
- The car wash's drying cycle is sixty (60) seconds in duration, with the exit door remaining open and the entrance door remaining closed throughout the drying cycle.
- The existing car wash building is comprised of concrete walls, triple pane windows along the north side, and roll up entrance and exit doors on the east and west ends.
- A total of two (2) vehicles will be continuously idling at the car wash during the daytime and evening periods only.

Source Sound Power Levels

FDI Acoustics completed calculations to determine octave band sound power level values for the significant noise sources associated with the equipment described in the previous section. The completion of the calculations followed accepted techniques and practices for the determination of sound power levels from sound pressure levels for large machinery. The sound power values presented in *Table 2* are order-ranked from highest to lowest by the overall sum (dBA) per source group.

Table 2: Source Sound Power Levels – Gas Station Re-Development at 109 Eagleson Road.

Sound Source Description	Sound Power Level (dBA re: 10^{-12} W)									
	Octave Band Frequency (Hertz)									Sum (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
Vacuum Cleaner										
Vacuum Cleaner	32.6	44.4	64.2	73.7	86.3	86.6	90.9	87.5	82.5	94.6
Rooftop Air Conditioner Unit (RTU) – 5 Ton										
Rooftop Air Conditioner Unit	45.6	58.8	69.9	75.4	81.8	83.0	80.2	74.1	65.9	87.2
Exhaust Fan										
Exhaust Fan	43.6	56.8	64.9	66.4	67.8	69.0	66.2	62.1	56.9	74.5
Gas Station Tire Inflator Air Compressor										
Air Compressor Sum	35.2	62.0	64.1	69.9	73.6	75.6	73.9	72.2	69.0	81.0
Vehicle at Idle										
Vehicle at Idle	55.2	62.4	69.6	71.9	74.8	77.6	77.4	71.8	64.6	82.7
Automatic Car Wash with Time Adjustment										
Car Wash Exit Door	49.3	65.0	69.9	75.9	88.6	76.8	78.1	74.3	67.1	89.7
Car Wash Entrance Door – Closed	46.5	60.5	63.6	68.5	77.8	66.8	68.4	70.1	61.4	79.8
Car Wash Building Roof	54.2	65.6	66.4	63.4	74.4	68.1	64.2	71.6	66.7	78.2
Car Wash Building Walls	47.9	57.0	57.8	63.1	73.0	57.8	59.3	66.6	61.6	74.9

Noise Propagation Model

The Predictor™ 7810 version 2024, is an environmental noise assessment software package from Softnoise GmbH. The algorithms used by the software are consistent with international standards, including International Organization for Standardization (ISO) *9613-2:1996 Acoustics – Attenuation of Sound During Propagation Outdoors – Part 1: Calculation of the Absorption of Sound by the Atmosphere*[6]*, Part 2: General method of calculation*[7,8], and *Part 3: Recommendations for Quality Assured Implementation of ISO 9613-2 in Software According to ISO 17534-1*[9].

The Predictor software was used to model the environmental noise impact of the proposed onsite equipment. The calculated individual source sound power level, complete with information regarding the facility location, equipment layout and the reception locations, were all entered in the software model.

The Predictor software completed complex sound propagation calculations based on the effects of the surrounding environment, terrain, and topography. The propagation algorithms included in the software package considered the downwind condition from each noise source to each receiver, coupled with a mild temperature inversion per the ISO 9613 method.

The ground absorption coefficient used in the model ranged between 0.0 and 1.0, where a value of 0.0 (the lowest) depicts reflective (hard) ground and a value of 1.0 (the highest) depicting porous (absorptive) ground.

The model was further structured to reflect favourable conditions for the propagation of sound from the source to the receiver locations.

A list of the modelled environmental parameters included in the noise propagation model is provided in *Table 3* below.

[6] International Organization for Standardization (ISO 9613-1), Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere, Approved 1993.
[7] International Organization for Standardization (ISO 9613-2:2024), Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors, Published 2024.
[8] International Organization for Standardization (ISO 1996-2:2017), Description, measurement, and assessment of environmental noise - Part 2: Determination of sound pressure levels, Published 2017.
[9] International Organization for Standardization (ISO/TR 17534-3), Acoustics – Software for the calculation of sound outdoors – Part 3: Recommendations for quality assured implementation of ISO 9613-2 in software according to ISO 17534-1, Approved 2015.

Table 3: Noise Model Environmental Parameters – Gas Station Re-Development at 109 Eagleson Road.

Environmental Parameter	Model Input Value
Ground Attenuation (between development and receiver)	0 (suitable value for concrete, asphalt and pool)
Ground Attenuation (Lawn)	1 (suitable value for vegetation and porous ground)
Receiver Height Above Ground (1st floor, 2nd floor)	1.5m, 4.5m
Relative Humidity	70%
Temperature	+15°C
Wind Conditions	1 to 5 m/s (default ISO 9613 – moderate inversion condition, downwind in all directions)
Topography	DEM (Digital Elevation Model) 30m x 43m height points

Result Summary

Table 4 summarizes the overall predicted sound pressure level and the source sound pressure level contributions values for the most impacted receiver locations at the property line during daytime and evening and overall plane of window during daytime and nighttime for the residence at 23 Inuvik Crescent, Kanata, indicated as R1W in *Figure 5* above. The source sound level contribution values in *Table 4* are order ranked based on the "A" weighted contribution level.

Table 4: Order Ranked Sound Pressure Levels for Most Impacted Residence (R1) – West Property Line.

Source Description	Source Sound Level Contribution (dBA)
Vehicle #1	46.4
Vacuum Cleaner	43.4
Car Wash Entrance Door/Closed	40.7
Vehicle #2	36.9
Car Wash Building NW Wall	33.7
Car Wash Building Roof	31.5
Car Wash Exit Door	31.1
Gas Station Tire Inflator Air Compressor	29.7
Exhaust Fan #1	27.0
Rooftop Air Conditioners Unit	23.6
Car Wash Building SW Wall	23.1
Exhaust Fan #2	16.1
Car Wash Building SE Wall	12.1
Car Wash Building NE Wall	4.3
Predicted Facility Contribution Sum (Day and Evening) – Property Line	**49.5**
Predicted Facility Contribution Sum (Day and Evening) – Plane of Window	**45.4**
Predicted Facility Contribution Sum (Night) – Plane of Window	**27.9**

Note that the order ranked sound pressure levels included in *Table 4* may differ from the equipment order ranked sound power levels in *Table 2* at a distant point of reception. This can occur due to the frequency composition of each noise source, the physical height of the noise source above the ground, acoustical shielding at the site, and/or the topography between the site and the receiver.

Table 5 summarized both the overall predicted sound level contribution values from the proposed gas station and existing car wash operations, and the exclusion limit values for the locations assessed at the most impacted receiver points. The development sound level contributions are used for determining compliance with the applicable exclusion limit values.

Table 5: Predicted Sound Levels Summary – Gas Station Re-Development at 109 Eagleson Road.

Receiver Location & Sound Level Description	**07:00 – 23:00 Sound Level (L_{eq} dBA)**	**23:00 – 07:00 Sound Level (L_{eq} dBA)**
Plane of Window of Noise Sensitive Spaces		
R1 (23 Inuvik Crescent, Kanata) – 2nd Floor	45	28
R2 (21 Inuvik Crescent, Kanata) – 2nd Floor	46	30
R3 (19 Inuvik Crescent, Kanata) – 2nd Floor	45	31
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Exclusion Limit Values of One-Hour Equivalent Sound Level / Class 1 Area (Noise Sensitive Space)	**50**	45
Outdoor Points of Reception of Noise Sensitive Spaces / Property Line		
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R5 (15 Inuvik Crescent, Kanata)	49	-
R6 (186 Barrow Crescent, Kanata)	37	-
Exclusion Limit Values of One-Hour Equivalent Sound Level / Class 1 Area (Noise Sensitive Space)	**50**	-

All predicted sound levels included in *Table 5* shown in green are less than or equal to the exclusion limit values of the ENCG and NPC-300 shown in red, indicating compliance.
Two (2) noise contour maps overlaid on the site plan and surrounding area aerial are provided in Appendix C for visual representation of the software model results. These maps illustrate the sound level contributions from the proposed gas station re-development and existing car wash during daytime/evening (07:00–23:00) and nighttime (23:00–07:00) periods. Sound levels represented on the maps were calculated at a receiver height of one and a half (1.5) metres. Note that the sound levels at the plane of the windows may differ from those shown in the noise contour maps, as the reported results do not account for reflections from the associated building façade to the receiver. All coordinate data on the noted maps is referenced to the NAD 1983 datum, using the Universal Transverse Mercator (UTM) projection in Zone 18, latitude band T.

Conclusion

The results of the environmental noise propagation software model indicate that the predicted sound levels from the Shell Gas Station re-development and existing car wash comply with the daytime and nighttime exclusion limit values of the ENCG and NPC-300 at the plane of windows of the assessed noise sensitive reception points. The results also indicate the predicted sound levels from the Shell Gas Station re-development and existing car wash comply with the daytime exclusion limit values of the ENCG and NPC-300 at the property line of the assessed noise sensitive reception points.

Shell Canada is advised to limit the carwash operations to the defined daytime and evening hours of 07:00 to 23:00 and to operate all associated equipment as described in this Report in order to ensure ongoing compliance the requirements of the exclusion limit values of the ENCG and NPC-300.

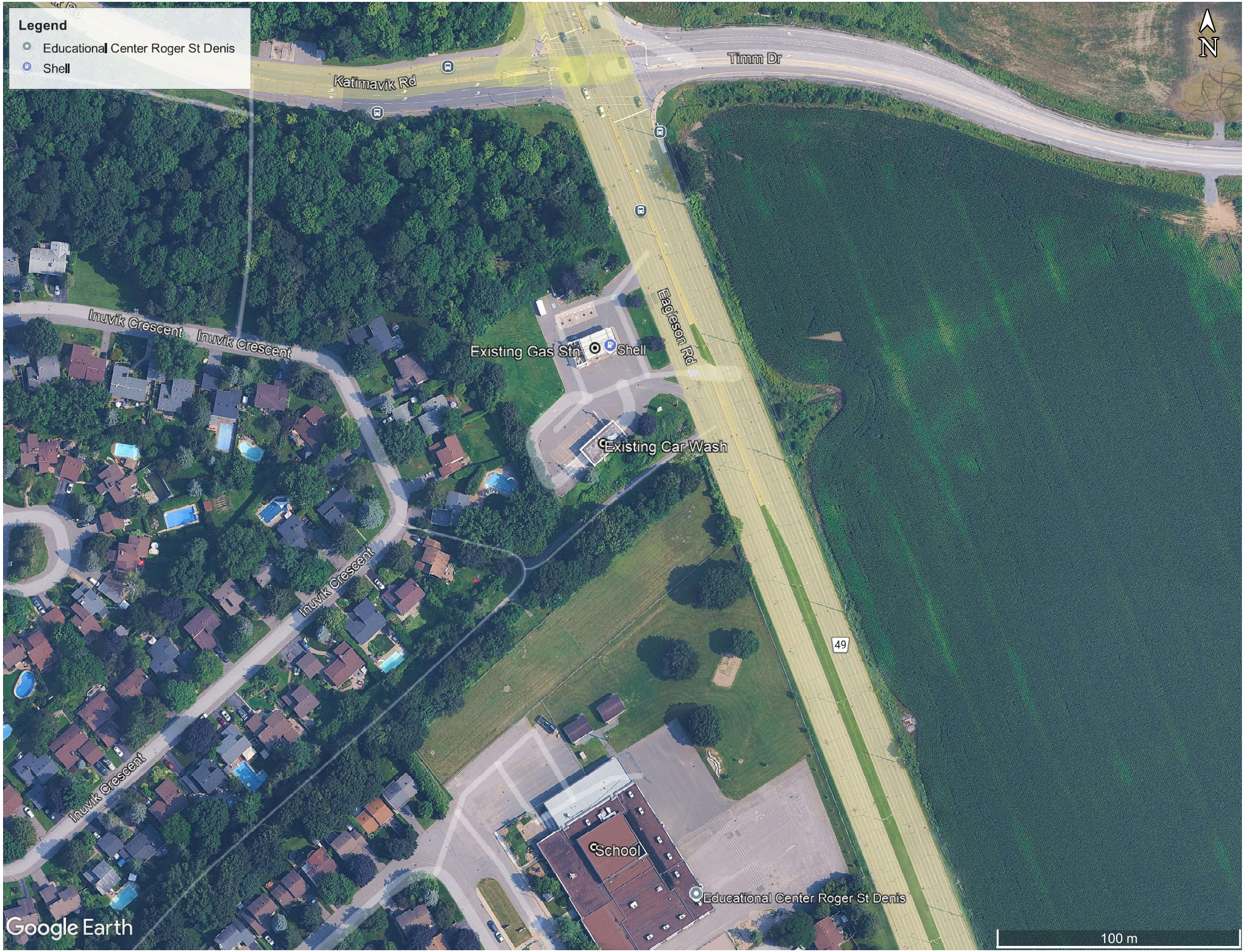
Glossary

Ambient Sound Level	All noises that exist in an area and are not related to a facility covered by the applicable regulation. Ambient noise includes sound from other industrial noise not subject to either regulation for example; transportation sources, animals and nature.
A-Weighted Sound Level	The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear.
C-Weighted Sound Level	The C-weighting approximates the sensitivity of human hearing at industrial noise levels (above about 85 dBA). The C-weightings sound level (i.e., measured with the C-weightings) is more sensitive to sounds at low frequencies than the A-weighted sound level and is sometimes used to assess the low frequency content of complex sound environments.
Calibration	A procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.
Comprehensive Sound Level (CSL)	The measured sound level that is a composite of different airborne sounds from many sources both far away and near the point of measurement as measured during a valid comprehensive sound survey. The CSL does include industrial components and must be measured with them, but it should exclude abnormal noise events.
Daytime	Defined as the hours from 07:00 to 22:00 or as defined by the applicable regulation.
dB (decibel) or dBZ	The decibel (dB) is a logarithmic unit of measurement that expresses the magnitude of a physical quantity (usually power or intensity) relative to a specified or

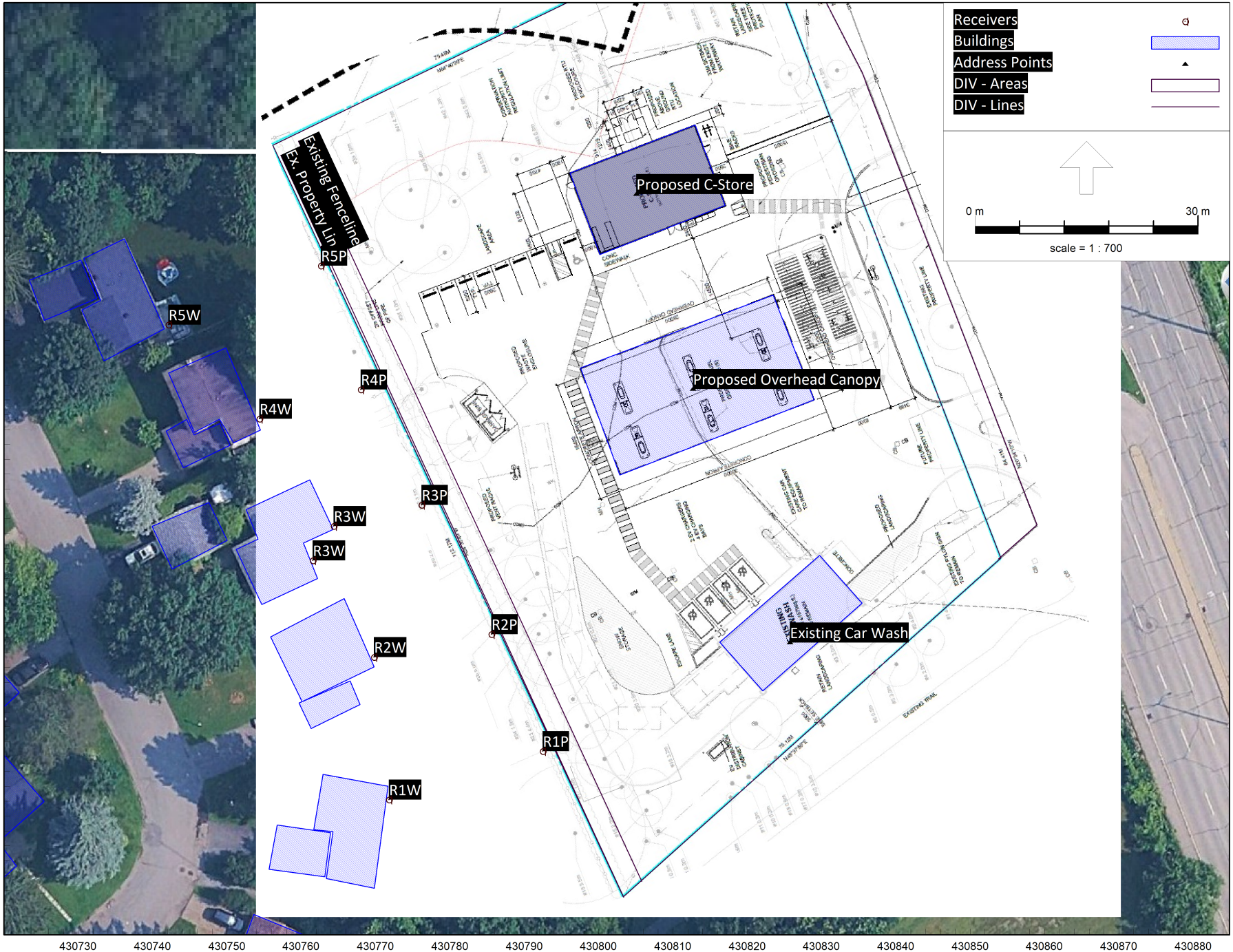
	implied reference level. Since it expresses a ratio of two quantities with the same unit, it is a dimensionless unit. A decibel is one tenth of a bel (B). A reference pressure of 20 microPascals (µPa) is used because sounds in air at a frequency of 1000 Hz and with a pressure of 20 microPascals (µPa) can just barely be heard by most people.
dBA	The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response. See dB and "A" weighted sound level.
dBC	The decibel (dB) sound pressure level is adjusted to include the low frequency end of the spectrum. Although less consistent with human hearing than dBA, dBC can be used to discern the impact of low frequency sound emissions from industrial operations.
Energy Equivalent Sound Level (L_{eq})	The L_{eq} is a single-number average, A-weighted sound level that represents cumulative acoustical energy as measured over a specified time interval. This interval should be specified in brackets following the L_{eq} (e.g.: L_{eq} (9) is a nine-hour L_{eq}).
ISO 9613-2:1996	Acoustics- Attenuation of sound during propagation outdoors- Part 2: General method of calculation (International Organization for Standardization).
Nighttime	Defined as the hours from 22:00 to 07:00 or as defined by the applicable regulation.
Noise	Generally understood as unwanted sound.
Octave	A series of electronic filters separate sound into discrete frequency bands, making it possible to know how sound energy is distributed as a function of frequency. The octave band has a centre frequency that is double the centre frequency of the octave band preceding it.

1/3 Octave	The 1/3 octave band analysis provides a finer breakdown of sound distribution as a function of frequency.
Representative Conditions	Those conditions typical for an area and/or the nature of a complaint. Sound levels must be taken only when representative conditions exist; this may necessitate a survey of extensive duration (two or more consecutive nights).
Sound Monitoring Survey	The measurement and recording of sound levels and pertinent related information over a given time period.
Sound Level Meter	An instrument designed and calibrated to respond to sound and to give objective, reproducible measurements of sound pressure levels. It normally has several features that enable its frequency response and averaging times to be changed.
Sound Pressure Level	A measurement of the local pressure deviation from the ambient (average, or equilibrium) pressure caused by a sound wave.
Sound Power Level	Expressed in decibels (dB), it is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to a reference sound power level, typically 10^{-12} watts.
Spectrum	A wide range or sequence of frequencies.
Windscreen	A specialized piece of porous sponge that fits over the microphone to reduce the noise generated by the wind blowing across the microphone.

Appendix A – Area Map


Legend
Educational Center Roger St Denis
Shell
Katimavik Rd
Timm Dr
Eagleson Rd
Inuvik Crescent
Inuvik Crescent
Existing Gas Stn
Shell
Existing Car Wash
Inuvik Crescent
Inuvik Crescent
49
School
Educational Center Roger St Denis
N
Google Earth
100 m

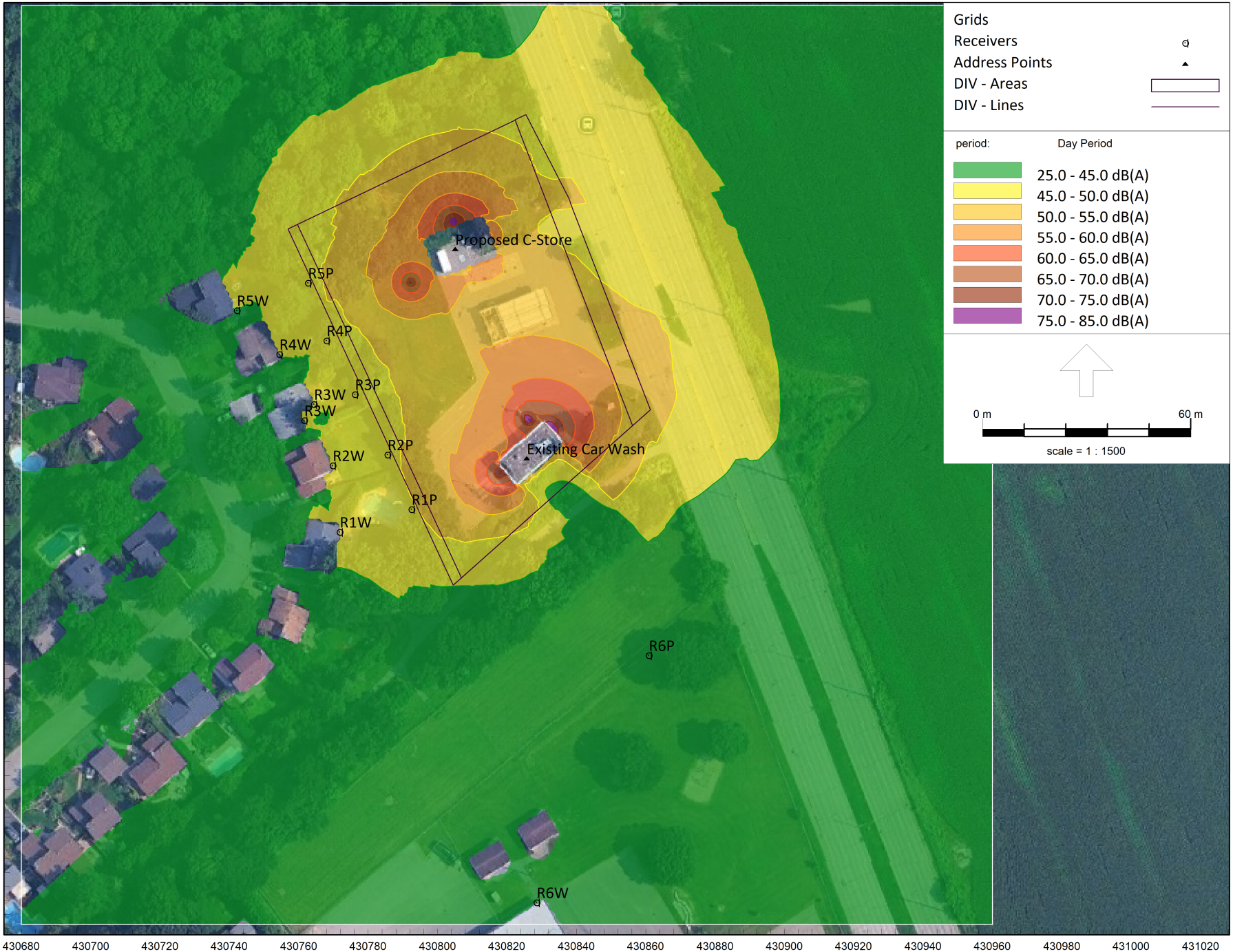
Appendix B – Site Plan Layout



Shell Gas Station 106 Eagleson Road, Kanata, ON / Existing and Proposed Site Plan View / Receiver Locations

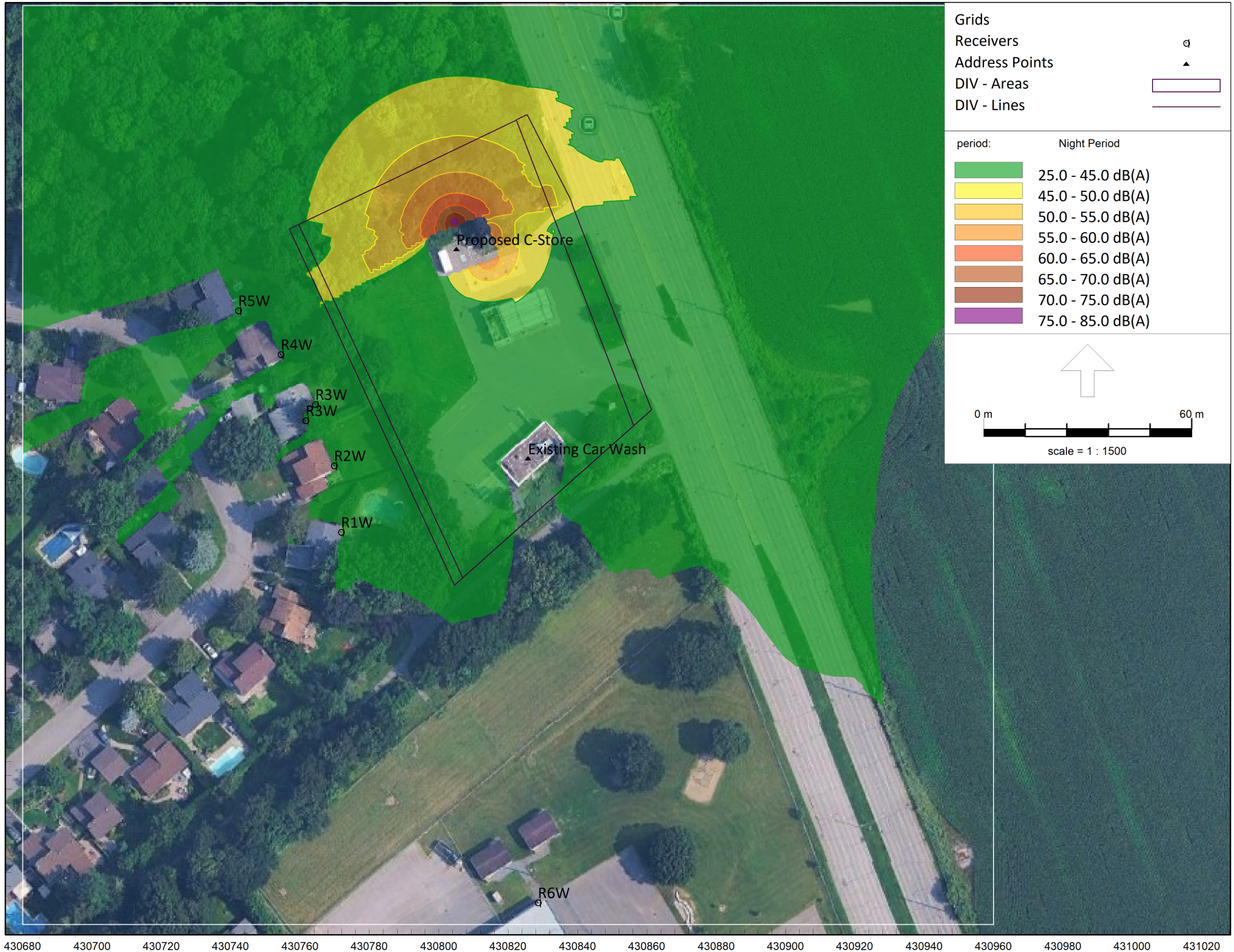
ISO 9613, [V2 106 Eagleson Road - Site Plan View] , Predictor V2024 Licensed to FDI Acoustics Inc., Canada

Appendix C – Noise Contour Maps



ISO 9613, [V2 106 Eagleson Road - V2 - Daytime and Evening Noise Contour Map] , Predictor V2024 Licensed to FDI Acoustics Inc., Canada

Shell Canada Proposed Gas Station and Existing Car Wash Sound Level Contributions @ 1.5m Height / 106 Eagleson Road, Kanata, ON / Daytime



ISO 9613, [V2 106 Eagleson Road - V2 - Nighttime Noise Contour Map] , Predictor V2024 Licensed to FDI Acoustics Inc., Canada

Shell Canada Proposed Gas Station and Existing Car Wash Sound Level Contributions @ 1.5m Height / 106 Eagleson Road, Kanata, ON / Nighttime

Appendix D – References

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