HGC ENGINEERING

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Noise Feasibility Study for a Category 1 – Class "A" Pit below Water Maes Pit

Part Lots 1 & 2, Concession 2 Municipality of Middlesex Centre (Lobo) County of Middlesex, Ontario

Prepared for:

Johnston Bros. (Bothwell) Ltd.
21220 Johnston Line, R.R #2
Wardsville, Ontario N0L 2N0

Prepared by:

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Reviewed by:

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July 25, 2017

Project No. 01700382

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1 INTRODUCTION AND SUMMARY

HGC Engineering was retained by Johnston Bros. (Bothwell) Ltd. to undertake an analysis of the potential impact of noise from a proposed gravel pit at neighbouring noise sensitive receptors (residential dwellings) in accordance with the Ministry of Natural Resources and Forestry (MNRF) and the Ministry of the Environment and Climate Change (MOECC) Guidelines.

This assessment was conducted in accordance with MNRF and MOECC guidelines and considered the potential effects of noise from extraction, processing and transportation sources with regard to neighbouring noise sensitive receptors.

This assessment is also based on a review of the operational plans prepared by W.L Bradshaw dated July 2017, sound levels taken from our files based on measurements of similar aggregate processing equipment to be used in the pit.

There are noise sensitive receptors located to the north and south of the proposed pit. The equipment and activities which are potential sound sources are outlined in Section 4. This assessment is based on a scenario representing the worst case operations located closest to the receptors. The results of our analysis indicate that the sound levels produced by the operations in the pit under the worst case operational scenario are expected to comply with MOECC Guideline limits with the implementation of noise control measures.

2 SITE DESCRIPTION

The existing features plan attached as Figure 1 and aerial plan attached as Figure 2 show the location of the proposed site, the neighbouring residences and nearby roadways.

The proposed gravel pit is located east of Amiens Road, south of the CN railway and north of Glendon Drive (County Road 14) in the Municipality of Middlesex Centre (Lobo). The proposed licence area is ±24.7 hectares with a maximum annual tonnage of excavation of 200,000 tonnes. There are existing residential and agricultural land uses surrounding the site.

3 CRITERIA

3.1 Receptors

The Provincial Standards – Aggregate Resources of Ontario (Category 1 – Class "A" Pit below Water) state: "If extraction and / or processing facilities are located within 150 meters of a sensitive receptor, a noise assessment report is required to determine whether or not provincial guidelines can be satisfied" and "Sensitive receptors include residences or facilities where people sleep (nursing homes, hospitals, trailer parks, camping grounds, etc); schools; day-care centres."

One residential home is located within 150 m of the site boundaries, on the north side of the railway tracks, and is considered a sensitive receptor in this report (R1). There are residences located along Glendon Road which are located just outside the 150 m limit from the site boundaries. Due to that proximity, the closest residences have also been studied as sensitive points of reception in this study (R2 to R4).

R1 is a 2-storey high dwelling and R2 to R4 are 1-storey dwellings. Any useable locations on the residential property, within 30 m of the building facade and outside the plane of the residential windows are considered to be points of reception. In this case, the worst case point of reception is generally considered to be outside the upper storey windows due to the potentially increased exposure to activities in the pit. The receptor heights are 4.5 m for R1 and 2.5 m for R2 to R4 above existing grade. The receptor locations are shown on the Figures.

3.2 Noise Criteria

Appropriate sound level limits used in the assessment of sound from aggregate operations are provided in MOECC publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", Part C release date October 21, 2013". Under MOECC guidelines, the acoustical environment at the sensitive receptors is classified as semi-urban as the background sound is dominated by traffic noise from Glendon Drive which is a County Road connecting to Highway 402 to the west. The gravel pit will operate during daytime hours only. NPC-300 specifies that the sound level limit at any receptors in a semi-urban acoustic environment due to the operation of a stationary source is the higher of the background one hour energy equivalent sound level (L_{EQ-1Hr}) or 50 dBA during daytime hours.

To ensure a conservative analysis, since road traffic sound levels may be relatively low during some daytime hours, the minimum daytime sound level of 50 dBA is used in the following sections of this report as the criterion by which the potential noise impact of the proposed aggregate extraction and processing operations are assessed.

Compliance with MOECC criteria generally results in acceptable levels of sound at residential receptors, although there may be residual audibility during periods of low background sound. The guidelines of NPC-300 apply to sound from the ongoing day-to-day operations of the subject site. They do not apply to the temporary sound produced during the preparation and rehabilitation of extraction sites, or to the sound produced by road trucks on public roadways. The initial operations of building access roadways, stripping top soil, and building localized shielding and perimeter berms, as well as the final operations of rehabilitation and removal of localized shielding and perimeter berms) are defined as construction activity. In order to satisfy Provincial Standards, the sound levels emitted by the equipment involved in those construction activities must comply with MOECC Guideline NPC-115, "Sound Levels due to Construction Equipment" [3].

4 NOISE ASSESSMENT

4.1 Description of Noise Sources and Aggregate Operations

The following details the future above and below water extraction and processing operations in the pit as indicated on the Operational Plan.

1. The gravel pit will typically operate from 07:00 to 18:00 on Monday to Friday, and from 08:00 to 12:00 on Saturday. No other evening or night time operations are anticipated.

2. The entrance to the pit is located in the northwest corner of the site.

3. Above and below water pit operations will begin in the east end of Area 1 and proceed in a westerly direction into Areas 2 and 3.

4. The aggregate excavation, processing and loading equipment consists of a screening plant with an associated loader, and an excavator or dragline. The loader and excavator can operate in each area for extraction at the working face or loading of trucks. An excavator or a dragline will be

used for below water excavation.

5. All operations including excavation, processing, and loading will typically occur on the floor of the pit at an elevation of approximately 236 mASL.

6. Processing equipment will not be located within 90 m of any boundary of the site that abuts residential land uses as per "The Provincial Standards – Aggregate Resources of Ontario", Operational Standards for Licences, Section 5.13.

7. The peak number of trucks expected to arrive and depart in a typical busy hour is 10.

MOECC guidelines require that a worst case hourly scenario be used in the evaluation. This scenario is discussed below.

4.2 Acoustical Modelling

Predictive modeling was used to assess the potential sound emissions of the worst case gravel pit activities. The prediction model is based on established engineering methods from the MOECC and ISO Standard 9613 for the prediction of outdoor sound propagation.

To consider a worst case operational scenario, the following assumptions were made:

- All extraction, processing, and loading could occur simultaneously at the closest possible location to the receptor;
- All equipment will be located on the pit floor at an elevation of approximately 236 mASL.
- 10 haul trucks pick up a load of aggregate (arrive and depart) for shipment off-site.

The calculations consider the acoustical effects of distance, foliage, topography and shielding by the excavation face where applicable. The noise reducing effect of foliage is included for the existing woodlot located north of the site. Using the sound level data and the assumptions outlined above and the details contained in the operational plan, the sound levels at the receptors were predicted.

5 RECOMMENDATIONS

Using the predictive model and assumptions described in the previous section, the following noise control requirements were developed for the site and should be included as notes on the Operational Plans:

1. The following table presents the reference sound levels used for the acoustic modeling presented herein. These sound levels were based on site measurements of the processing equipment to be used in this pit.

Table 2 – Reference Sound Power Levels of Processing Equipment

Equipment	Sound Power Level dBA re: 10^{-12} W	Sound Pressure Level dBA at 50 m
A Screening Plant with an associated loader	114	70
Excavator/Dragline	107	65
Trucks	104	62

If other equipment is proposed for operation in the gravel pit, it shall be confirmed through measurement to produce sound levels consistent with the above referenced sound levels or additional mitigation measures may be required.

2. A minimum 2.5 m high perimeter berm (above existing grade) shall be constructed along the southern boundary of the pit adjacent to an active working area prior to the commencement of extraction or processing activities in Areas 1 and 2. Once processing and extraction is complete in Area 1 and all activities are moved into Area 2, the berm adjacent to Area 1 shall no longer be required.

3. A minimum 7.0 m high acoustical barrier shall be constructed and maintained on the pit floor beside the screening plant in the direction of all receptors.

4. The screening plant shall not be operated within 250 m of R1, as shown on the Operational Plan.

5. A minimum 4.0 m acoustical barrier shall be constructed and maintained on the pit floor beside the excavator/dragline in the direction of R1 when extraction activities are within 250 m of R1. The top of this barrier shall be located within 15 m of the excavator/dragline.

6. The acoustical barrier mentioned above could be comprised of an earth berm, a noise wall, aggregate stockpiles or any other construction with a minimum surface density of 20 kg/m^2.

7. Activities used to prepare the site for excavation, such as the stripping of topsoil and construction of berms, or activities related to the remediation of the site after the extraction is completed are considered to be construction activities. They are regulated under municipal bylaws and NPC-115 "Sound Level Limits for Motorized Construction Equipment".

6 CONCLUSIONS

In summary, HGC Engineering has reviewed the operational plan, prepared an acoustical model of the proposed activities in the pit and conducted an analysis of those operations based on a worst case operational scenario. Using the modeling assumptions detailed in Section 4, along with incorporation of the noise control recommendations detailed in Section 5 and Figure 3, sound levels were predicted at each of the selected receptors as summarized in Table 3. Sample calculations are provided in Appendix A.

Table 3: Predicted Sound Levels at the Residential Receptors [dBA] During Worst-Case Operational Scenarios (With Noise Mitigation)

Receptor	Daytime Criteria (dBA)	Predicted Sound Level (dBA)
R1	50	50
R2		42
R3		42
R4		45

The results summarized indicate that the sound emissions from the proposed pit operations, with the noise control measures in place, are expected to comply with MOECC guideline limits at the neighbouring noise sensitive receptors under worst case operating scenarios.

7 REFERENCES

1. Ontario Ministry of the Natural Resources and Forestry, *Aggregate Resources of Ontario – Provincial Standards*, 1997.

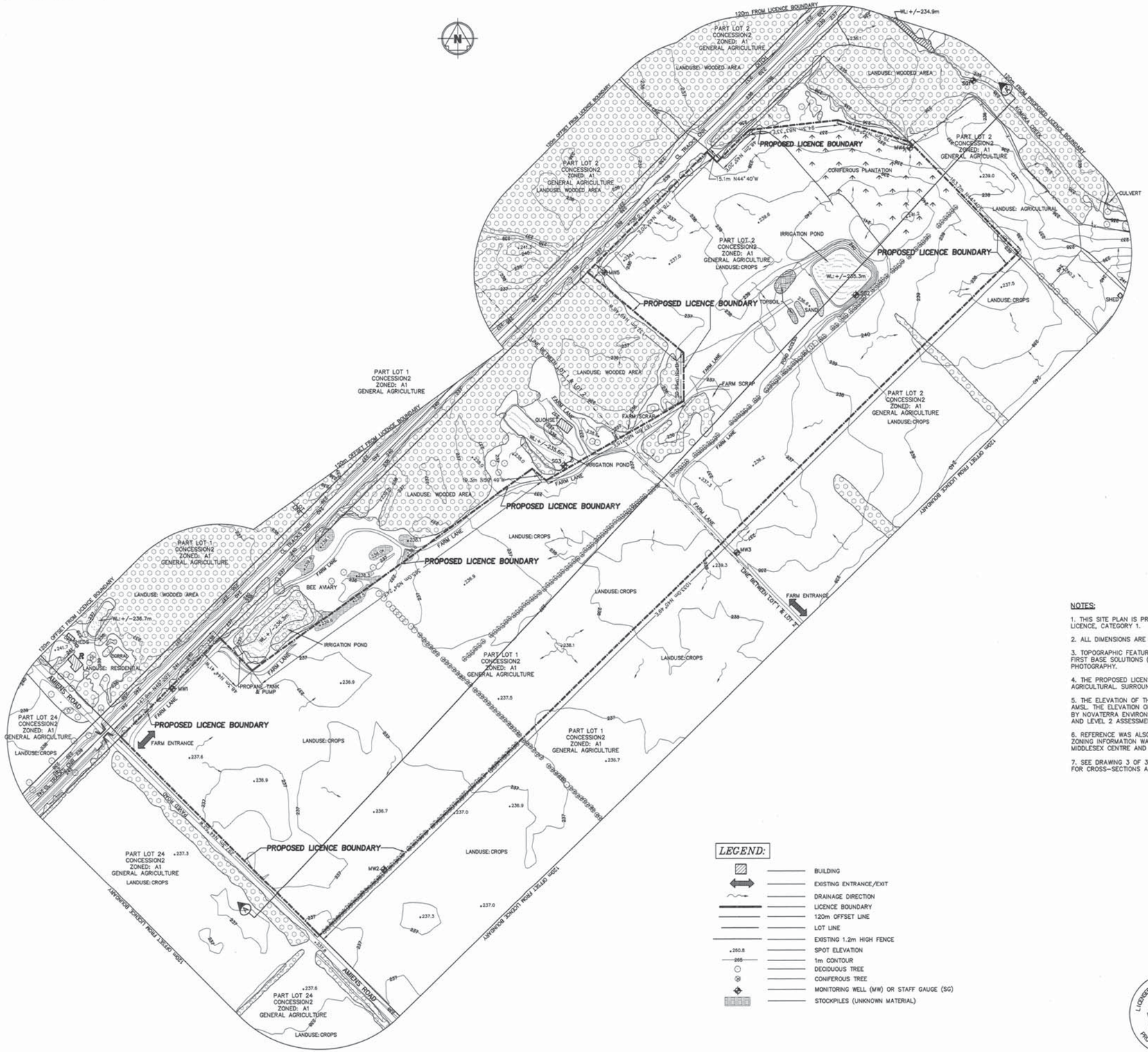
2. Ontario Ministry of the Environment and Climate Change Publication NPC-300, *Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning*, August 2013.

3. Ontario Ministry of the Environment and Climate Change Publication NPC-115, *Sound Level Limits for Motorized Construction Equipment"*.

4. International Organization for Standardization, *Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation*, ISO-9613-2, Switzerland, 1996.

5. Google Maps Aerial Imagery, Internet application: *maps.google.com*.

KEYMAP (not to scale)



NOTES:

1. THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR A CLASS A LICENCE, CATEGORY 1.
2. ALL DIMENSIONS ARE IN METRIC UNITS. ELEVATIONS ARE GEODETIC, ASL.
3. TOPOGRAPHIC FEATURES & PARCEL INFORMATION FROM PHOTOGRAMMETRIC MAPPING BY FIRST BASE SOLUTIONS (JD BARNES), BRAMPTON, ONTARIO, UTILIZING 2015 AIR PHOTOGRAPHY.
4. THE PROPOSED LICENSED AREA IS 24.7 HECTARES AND IS ZONED A1, GENERAL AGRICULTURAL. SURROUNDING ZONING DESIGNATIONS ARE SHOWN ON THE PLAN.
5. THE ELEVATION OF THE WATER TABLE VARIES FROM _____m AMSL TO _____m AMSL. THE ELEVATION OF THE WATER TABLE WAS TAKEN FROM FIGURE ___ IN THE REPORT BY NOVATERRA ENVIRONMENTAL LTD. (MONTH DAY, 2016) TITLED: HYDROGEOLOGICAL LEVEL 1 AND LEVEL 2 ASSESSMENTS, PROPOSED MAES PIT.
6. REFERENCE WAS ALSO MADE TO MAPPING FROM THE COUNTY OF MIDDLESEX WEBSITE. ZONING INFORMATION WAS OBTAINED FROM THE WEBSITES OF THE MUNICIPALITY OF MIDDLESEX CENTRE AND THE MUNICIPALITY OF STRATHROY-CARADOC.
7. SEE DRAWING 3 OF 3, PROGRESSIVE REHABILITATION AND FINAL REHABILITATION PLANS FOR CROSS-SECTIONS A-A' & B-B'.

JOHNSTON BROTHERS (BOTHWELL) LIMITED
21220 JOHNSTON LINE, RR1, WARDSVILLE, ONTARIO, N0L 2N0

MAES PIT
PART LOTS 1 & 2, CONCESSION 2
TOWNSHIP OF MIDDLESEX CENTRE
(FORMERLY THE TOWNSHIP OF LOBO)
COUNTY OF MIDDLESEX

EXISTING FEATURES
DRAWING 1 of 4

SCALE 1:2000
50 0 50 100 150

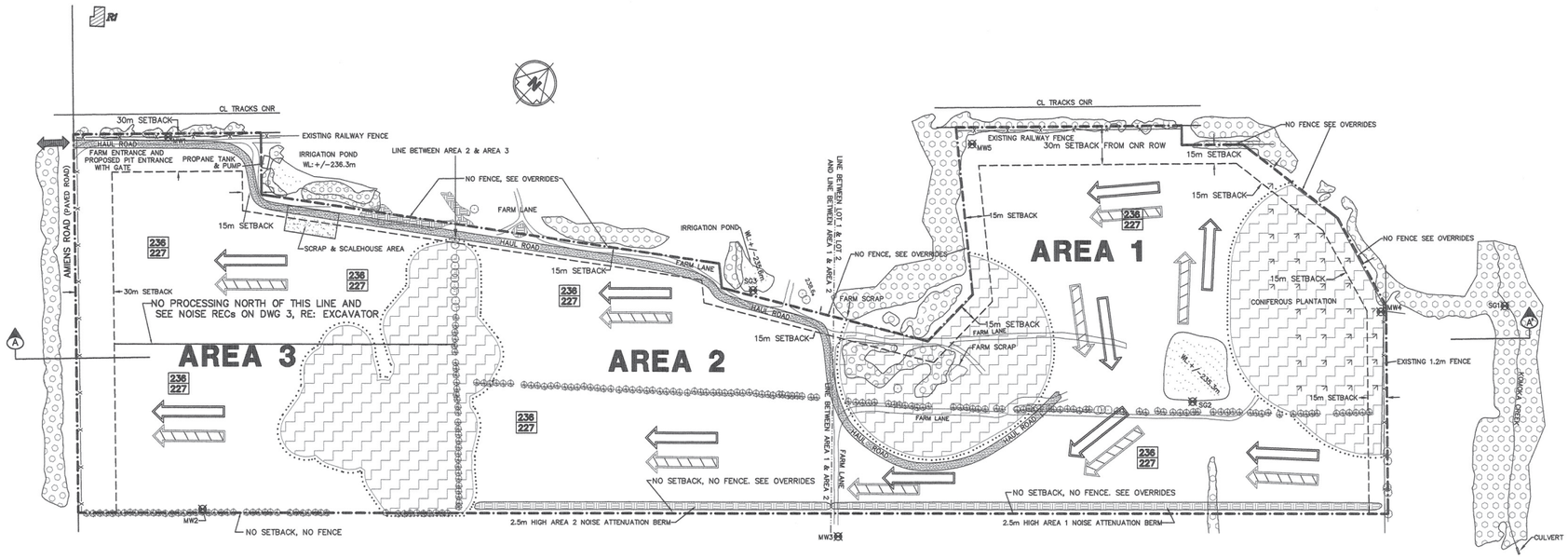
LICENSED PROFESSIONAL ENGINEER
W.L. BRADSHAW
PROVINCE OF ONTARIO

No.	AMENDMENT	DATE

December 17, 2016

Figure 1: Existing Features Plan

Figure 2: Aerial Photo Showing Site and Surrounding Areas



LEGEND:

- BUILDING
- 236 / 227 — ABOVE WATER EXCAVATION DEPTH / BELOW WATER EXCAVATION DEPTH
- EXCAVATION DIRECTION ABOVE WATER
- EXCAVATION DIRECTION BELOW WATER
- 15/30m SETBACK LINE
- LICENCE BOUNDARY
- ENTRANCE/EXIT
- 1.2m HIGH FENCE
- LOT LINE
- POSSIBLE BERM
- WATER
- DECIDUOUS TREE
- CONIFEROUS TREE
- WATER MONITORING LOCATION
- ARCHAEOLOGICAL AVOIDANCE AREA
- ARCHAEOLOGICAL FENCING
- NOISE ATTENUATION BERMS
- HAUL ROAD
- WOODED AREA

SEQUENCE OF OPERATIONS & PROGRESSIVE REHABILITATION

In General:

1. Phases do not represent any specific or equal time period.

2. Prior to stripping in any area, archaeological avoidance areas shall be fenced as indicated in the "Archaeological Area Protection Notes".

3. The setbacks in any current working Area shall be marked with posts every +/-60m.

4. Rehabilitation will be progressive and proceed as outlined below. The current agricultural uses shall continue on this site as long as possible during pit operations.

5. This pit shall be operated in three areas with one bench above water varying across the site from approximately 1 to 4 metres and one bench below water of approximately 9 metres.

6. Operations shall proceed in the directions of the arrows shown.

7. As the limit of extraction is reached the perimeter areas shall be rehabilitated as outlined on the Progressive Rehabilitation and Final Rehabilitation Plan.

8. Notwithstanding the operational and rehabilitation notes, demand for certain products or blending of materials may require minor deviations in the extraction and rehabilitation sequence. Any other major deviations shall require written MNRF approval.

Phase 1 (Start up):

1. The entrance shall be constructed where shown and fencing shall be erected where required.

2. Archaeological avoidance areas shall be fenced in Area 1.

3. Area 1 setbacks shall be marked as noted in the General notes above.

4. Silt fencing shall be installed where required. See the Natural Environment Recommendations on Drawing 3 of 4, Consultant Recommendations.

5. Area 1 shall be stripped and the material shall be used to construct the Area 1, 2.5m noise attenuation berm. If there are insufficient materials in Area 1 strippings to construct berms, then the east side of the Area 2 archaeological avoidance area shall be fenced and stripped material from Area 2 shall also be used to construct Area 1 noise attenuation berms.

6. If required the scale and scale house area shall be prepared in the northwest corner of Area2 approximately where shown

Phase 2:

1. Above water extraction shall commence in the vicinity of the existing pond in Area 1 and shall proceed in the directions of the arrows.

2. Below water extraction shall follow above water extraction.

3. If any archaeological avoidance areas in Area 1 are cleared in writing by the Ministry of Tourism, Culture and Sports (MTCS). The fencing around the cleared area may be removed and the area may be stripped and extracted. Stripped materials from these areas shall be used immediately for progressive rehabilitation if practical or stored in berms and stockpiles.

4. Progressive and final rehabilitation of the pond edges shall take place where possible as extraction moves westerly.

Phase 3:

1. Archaeological avoidance areas shall be fenced on the Area 2 sides as required.

2. Area 2 shall be progressively stripped starting on the easterly side and the material shall be used to construct the Area 2 noise attenuation berm. When no longer required for noise attenuation, the Area 1 berm shall be used for progressive rehabilitation and/or construction of the noise attenuation berm in Area 2.

3. Above and below water extraction shall transition from Area 1 into the east side of Area 2 and shall continue westerly.

4. If any aArchaeological avoidance areas in Area 2 and/or Area 1 are cleared in writing by MTCS, the fencing around the cleared area may be removed and the area may be stripped and extracted. Stripped materials from these areas shall be used immediately for progressive rehabilitation if practical or stored in berms and stockpiles.

5. Progressive and final rehabilitation of Areas 1 & 2 shall continue as the limits of below water extraction are reached.

Phase 4:

1. Archaeological avoidance areas shall be fenced on the Area 3 side as required.

2. Area 3 shall be progressively stripped starting on the easterly side and the material shall be used for rehalitation in other areas or stored in berms and stockpiles. When no longer required for noise attenuation, the Area 2 berm shall be used for progressive rehabilitation or stored in stockpiles and /or berms.

3. Above and below water extraction shall transition from Area 2 into the east side of Area 3 and shall continue westerly.

4. If any archaeological avoidance areas in Area 3, Area 2 or Area 1 are cleared in writing by MTCS, the fencing around the cleared area may be removed and the area may be stripped and extracted. Stripped materials from these areas shall be used immediately for progressive rehabilitation if practical or stored in berms and stockpiles.

5. Progressive and final rehabilitation of Areas 1, 2 & 3 shall continue as the limits of below water extraction are reached.

Phase 5:

At this point in the operations, any archaeological areas that have been cleared, have been extracted. Any remaining archaeological areas that have not been cleared will have been protected with no further extraction plans.

1. Any remaining product stockpiles shall be removed. Any remaining parts of the haul road or the scale house area shall be extracted where allowable and hauled off site. The areas within the setback that were used for the haul road or the scalehouse area shall be rehabilitated.

2. Berms shall be removed and used to enhance perimeter rehabilitation, to sculpt shorelines and to create islands and aquatic benches.

3. Final rehabilitation shall be completed on the entire site.

OPERATIONAL NOTES

1. **SETBACKS:** Extraction setbacks shall be 30m along the roadside boundary with Amiens Road. 30m along the north boundary where the boundary is adjacent to the railway and 15m along all other boundaries with the exception of the south boundary. The setback along the south boundary has been reduced to 0m by adjacent landowner agreement. See Site Plan Override 2.

2. **MAXIMUM DEPTH OF EXTRACTION:** The maximum depth of extraction shall be approximately to the 236m elevation above water in one lift. The maximum depth of extraction below water shall be to the 227m level.

3. **SIDESLOPES:** Final perimeter slopes above water shall be constructed no steeper than 3(horizontal) to 1(vertical) and shall be created by backfilling with onsite materials. Final 3:1 slopes shall be spread with a minimum of 0.15 metres of topsoil and shall be seeded and vegetated as outlined in the Natural Environment Recommendations. Below water slopes and shoreline zones (within 5m of the water line) shall vary from 1:1 to 10:1 to enhance shoreline diversity. See Site Plan Override

4. **ENTRANCE/EXIT/GATE:** The entrance to Amiens Road shall be constructed where shown. An entrance permit shall be required from the Municipality. A 1.2m gate shall be installed at the entrance and shall be kept closed when the pit is not operating.

5. **FENCING:** Post & wire fencing (minimum height 1.2 metres) shall be maintained on the roadside boundary and on the easterly boundary. There shall be no fencing on the southerly boundary or on the northerly boundaries where shown by landowner agreement. See Site Plan Override 1. Sedimentation and erosion control fencing shall be installed as outlined in the NER recommendations. Unfenced boundaries shall be delineated with highly visible marker posts, minimum height 1.2m, at the corners and every +/- 60m.

6. **TOPSOIL/OVERBURDEN STORAGE:**

a) All topsoil and overburden shall be stripped and stored separately.

b) At the commencement of stripping, stripped topsoil and overburden shall be used to construct the noise attenuation berms as shown in the Noise Feasibility Study Recommendations on Drawing 3 of 4, "Consultant Recommendations". Also see the Sequence of Operations notes on this page.

c) As operations proceed, future topsoil and overburden shall be used to construct noise attenuation berms or stored on the pit floor in stockpiles or utilized for progressive rehabilitation.

d) Prior to operations proceeding in any Area, a noise attenuation berm shall be constructed in in that Area as outlined in the Noise Feasibility Study Recommendations. Also see the Sequence of Operations notes on this page.

e) Stockpiles shall not be located within 30m of the roadside boundary except in the form of berms. Also see Site Plan Override 3.

f) All topsoil, subsoil and overburden stockpiles shall be a maximum of 6 metres in height, graded to stable slopes and seeded to prevent erosion.

g) Berms shall be constructed and maintained as shown in the Berm Detail.

h) All topsoil stripped in the operation of this site shall remain on site and shall be used for the rehabilitation of this site.

9. **EXCAVATION EQUIPMENT:** Equipment to be utilised on this site shall include scrapers, bulldozers, loaders, dump trucks, excavators and portable screening equipment. No equipment shall be parked, stored or installed within 30m of the roadside boundary. See overrides.

10. **DUST CONTROL:** Dust control shall be maintained through the application of water. Dust shall be mitigated on site.

11. **NOISE, DUST OR GROUNDWATER INTERFERENCE PROBLEMS:** Should noise, dust or groundwater interference complaints be received, the licensee shall take appropriate measures as deemed necessary by the Ministry of the Environment and Climate Change to rectify the problem(s).

12. **DEWATERING/WASHING:** No dewatering shall take place on this site. No washing of aggregate materials shall take place on this site.

13. **SCRAP STORAGE:** All scrap on the site shall be collected and stored in the scale house area. All scrap shall be removed from the site on an ongoing basis.

14. **PETROLEUM STORAGE:** Petroleum products may be stored in the scale house area on an impervious pad and shall meet the requirements of the Technical Standards and Safety Act. Any spills shall be removed and disposed of at a facility approved by the Ministry of the Environment and Climate Change. See the Spills Plan on this page. Mobile fuel tanks shall be the new generation engineered double-tanked variety with vacuum sealed valves.

15. **BUILDINGS:** A scale, scale house and an accessory building may be constructed within the scale and scale house area shown.

16. **DRAINAGE:** Surface drainage initially shall be by percolation into the pit floor. As rehabilitation is completed the site shall be graded to drain towards the pond as shown on drawing 4 of 4, "Progressive Rehabilitation & Final Rehabilitation Plan". There will be no offsite drainage from operational areas.

17. **EXTRACTION AREA:** The extraction area is 21.3 hectares.

18. **TONNAGE CONDITION:** The maximum amount of aggregate that may be removed in any calendar year is 200,000 tonnes.

19. **WATER TABLE ELEVATION:** The elevation of the water table varies from 234.79m ASL to 235.92m ASL. The elevation of the water table was taken from Figure 10 in the report by Novaterra Environmental Ltd. (May 24, 2017) titled: "Hydrogeological Level 1 and Level 2 Assessments – Proposed Maes Pit" prepared for this application.

20. **HOURS OF OPERATION:** The hours of operation shall be from 7a.m. to 6p.m. from Monday to Friday and from 8am to noon on Saturdays. There shall be no operations on Sundays or civic holidays.

21. **TREE REMOVAL:** Any trees removed as part of the operation of this site shall be utilized as firewood or shall be ground into mulch.

22. **CONSULTANT RECOMMENDATIONS:** Consultant Recommendations for Noise, Natural Environment, Hydrogeology and Archaeology are shown on Drawing 3 of 4, "Consultant Recommendations" and have been implemented on this plan where applicable.

Site Plan Overrides of the Operational Standards

1. **STANDARD 5.1** – Fencing is not required on adjacent lands that are also owned by the landowner with whom the licensee has an extraction agreement and a boundary agreement.

2. **STANDARD 5.10.1** – Excavation setbacks have been reduced to zero metres adjacent to the south boundary. These adjacent lands are also owned by the landowner with whom the licensee has an extraction agreement and a boundary agreement.

3. **STANDARD 5.13.1** – Stockpiles and processing equipment may be located within 30m of the south boundary and on northerly boundaries that are not adjacent to CN lands. These adjacent lands are also owned by the landowner with whom the licensee has an extraction agreement and a boundary agreement.

4. **STANDARD 5.19.1** – Rehabilitated shoreline zones (within 5m of the edge of the water) and below water slopes may vary from 1:1 to 10:1 to enhance shoreline diversity.

SPILLS PLAN

In case of an accidental spill of petroleum products, the following contingency plan will be activated:

a) The Ministry of Environment (See address & phone number below) and surrounding landowners will be notified.
b) For a leakage or spill immediate action will be taken to stop it. At the same time measures will be taken to prevent spreading. These measures may include building or a berm or construction of a ditch, for instance.
c) The pit operator shall commence recovery procedures by collecting the spilled substance into containers.
d) The soil in the area affected by the spill or leak shall be removed and disposed of at a location prescribed by the Ministry of the Environment.

Ministry of Environment Southwest Regional Office
733 Exeter Road, 2nd Floor
London, Ontario, N6E 1L3
Spills Action Centre: 1-800-268-6060

JOHNSTON BROS. (BOTHWELL) LIMITED
21220 JOHNSTON LINE, RR1, WARDSVILLE, ONTARIO, N0L 2N0

MAES PIT

PART LOTS 1 & 2, CONCESSION 2
TOWNSHIP OF MIDDLESEX CENTRE
(FORMERLY THE TOWNSHIP OF LOBO)
COUNTY OF MIDDLESEX

OPERATIONAL PLAN

DRAWING 2 of 4

SCALE 1:2000

50 0 50 100 150

No.	AMENDMENT	DATE

Figure 3: Operational Plan

July 17, 2017

APPENDIX A

Sample Calculations

HGC Engineering **Environmental Noise Prediction Summary Sheet**

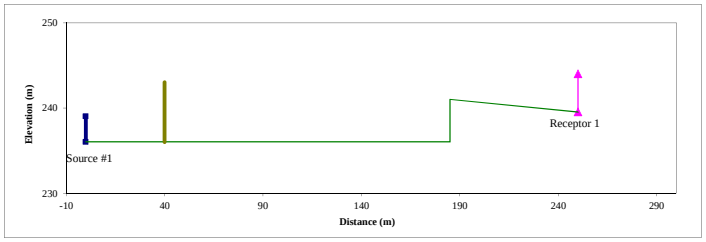
Project Name: Maes Pit
Receptor: Receptor 1, Area 3 - With Mitigation

Source #	Description	Distances			Elevations				Height			
		S-R	S-SB	S-RB	S Elev	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Screener, Stacker, Loader	250	40	185	236	239.5	241	236	3	4.5		7
Source #2	Excavator	100	15	35	236	239.5	241	236	2	4.5		4
Source #3	Truck at Entrance	90		25	236	239.5	241		2	4.5		
Source #4	Haul Truck (Passby)	90		25	236	239.5	241		2	4.5		

Output Summary

	Description	SPL at Receiver	
Source #1	Screener, Stacker, Loader	40	
Source #2	Excavator	49	
Source #3	Truck at Entrance	38	
Source #4	Haul Truck (Passby)	41	
		0.0	
	Total	50	dBA
	Criteria	50	dBA

Barrier for Source #1



For general information purposes only

TOP

	Description	S-R	S-SB	S-RB	S Ele	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Screener, Stacker, Loader	250	40	185	236	239.5	241	236	3	4.5	0	7

Number of Sources	1	
Time Duration	60	(minutes per hour)
Tonality Penalty	0	dB
Measurement Distance	25	m

	Frequency	63	125	250	500	1000	2000	4000	8000	dBA
	Meas SPL	81.4	75.3	71.8	68.0	67.8	65.5	59.9	56.7	72.7
	# Srcs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Time Dur	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Tonality	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Directivity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Air Abs	0.0	-0.1	-0.2	-0.6	-1.1	-2.0	-5.2	-17.2	
	Gnd Atten	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Other	0.0	0.0	-1.0	-1.0	-1.0	-1.0	-2.0	-3.0	
	Dist Atten	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	
	Barr. Att.	-5.9	-6.7	-8.1	-10.1	-12.6	-15.5	-18.5	-21.5	
	SPL @ Rec	55.5	48.5	42.5	36.3	33.1	27.0	14.3	-5.0	39.9

Barrier Calculations

Is there a source barrier:	Y	Source barrier BRIGHT ZONE:	N	SB Intercept Height	0.80
Is there a receiver barrier:	Y	Receiver barrier BRIGHT ZONE:	Y	RB Intercept Height	3.70
		S->RB BRIGHT ZONE:	N	S-RB Intercept Height	0.43
		SB->RB BRIGHT ZONE:	Y	SB-RB Intercept Height	0.69

|S->SB|	40.20	|S->RB|	185.01
|SB->R|	210.00	|RB->R|	65.07
|SB->RB|	145.01	|S->R|	250.05

Max Attentuation	-5.936851248	-6.73544094	-8.07372896	-10.0527588	-12.5980294	-15.4742625	-18.46376648	-21.47268917	
Combined									
PLD	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.1519	0
N	0.05563355	0.110384028	0.220768056	0.441536112	0.883072223	1.766144446	3.532288892	7.064577785	
Combined Attentuation	-5.936851248	-6.73544094	-8.07372896	-10.0527588	-12.5980294	-15.4742625	-18.46376648	-21.47268917	
Source Barrier									
PLD	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	1
N	0.05563355	0.110384028	0.220768056	0.441536112	0.883072223	1.766144446	3.532288892	7.064577785	
Source Barrier Attentuation	-5.936851248	-6.73544094	-8.07372896	-10.0527588	-12.5980294	-15.4742625	-18.46376648	-21.47268917	
Receiver Barrier									
PLD	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0
N	0.010991828	0.021809182	0.043618363	0.087236727	0.174473453	0.348946906	0.697893813	1.395787625	
Source Barrier Attentuation	-5.196798812	-5.38452931	-5.74635723	-6.41082079	-7.55002337	-9.30910769	-11.68333692	-14.4765069	

HGC Engineering **Environmental Noise Prediction Summary Sheet**

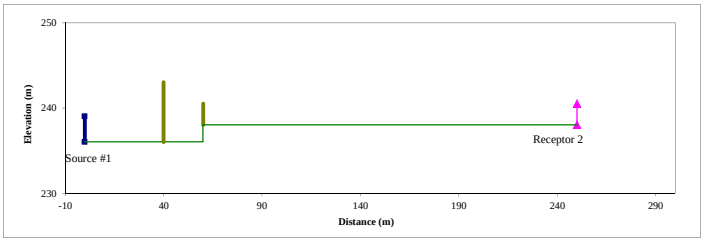
Project Name: Maes Pit
Receptor: Receptor 2, Area 2 - With Mitigation

Source #	Description	Distances			Elevations				Height			
		S-R	S-SB	S-RB	S Elev	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Screener, Stacker, Loader	250	40	60	236	238	238	236	3	2.5	2.5	7
Source #2	Excavator	210		20	236	238	238	236	2	2.5	2.5	
Source #3	Truck at Entrance	600		410	236	238	238		2	2.5	2.5	
Source #4	Haul Truck (Passby)	210		20	236	238	238		2	2.5	2.5	

Output Summary

	Description	SPL at Receiver	
Source #1	Screener, Stacker, Loader	40	
Source #2	Excavator	38	
Source #3	Truck at Entrance	22	
Source #4	Haul Truck (Passby)	30	
		0.0	
	Total	42	dBA
	Criteria	50	dBA

Barrier for Source #1



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	Description	S-R	S-SB	S-RB	S Ele	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Screener, Stacker, Loader	250	40	60	236	238	238	236	3	2.5	2.5	7

Number of Sources	1	
Time Duration	60	(minutes per hour)
Tonality Penalty	0	dB
Measurement Distance	25	m

	Frequency	63	125	250	500	1000	2000	4000	8000	dBA
	Meas SPL	81.4	75.3	71.8	68.0	67.8	65.5	59.9	56.7	72.7
	# Srcs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Time Dur	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Tonality	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Directivity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Air Abs	0.0	-0.1	-0.2	-0.6	-1.1	-2.0	-5.2	-17.2	
	Gnd Atten	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Dist Atten	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	
	Barr. Att.	-6.3	-7.3	-8.9	-11.2	-13.9	-16.9	-19.9	-22.9	
	SPL @ Rec	55.1	48.0	42.6	36.2	32.7	26.6	14.9	-3.4	39.7

Barrier Calculations

Is there a source barrier:	Y	Source barrier BRIGHT ZONE:	N	SB Intercept Height	0.24	
Is there a receiver barrier:	Y	Receiver barrier BRIGHT ZONE:	N	RB Intercept Height	0.36	
		S->RB BRIGHT ZONE:	N	S-RB Intercept Height	1.00	
		SB->RB BRIGHT ZONE:	Y	SB-RB Intercept Height	-0.24	

|S->SB|	40.20	|S->RB|	60.02
|SB->R|	210.01	|RB->R|	190.00
|SB->RB|	20.16	|S->R|	250.00

Max Attentuation	-6.25953954	-7.2838755	-8.91681835	-11.18213	-13.914641	-16.8634811	-19.86715469	-22.87718842	
Combined									
PLD	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.2099	1
N	0.076875732	0.152531214	0.305062428	0.610124855	1.22024971	2.44049942	4.880998841	9.761997682	
Combined Attentuation	-6.25953954	-7.2838755	-8.91681835	-11.18213	-13.914641	-16.8634811	-19.86715469	-22.87718842	
Source Barrier									
PLD	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	1
N	0.076875732	0.152531214	0.305062428	0.610124855	1.22024971	2.44049942	4.880998841	9.761997682	
Source Barrier Attentuation	-6.25953954	-7.2838755	-8.91681835	-11.18213	-13.914641	-16.8634811	-19.86715469	-22.87718842	
Receiver Barrier									
PLD	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1
N	0.005218419	0.010354006	0.020708011	0.041416022	0.082832045	0.16566409	0.33132818	0.662656359	
Source Barrier Attentuation	-5.094212174	-5.18554887	-5.36567913	-5.71078033	-6.34697788	-7.44465184	-9.155022663	-11.48813633	

HGC Engineering **Environmental Noise Prediction Summary Sheet**

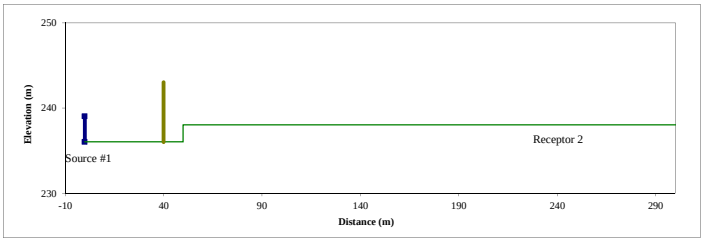
Project Name: Maes Pit
Receptor: Receptor 4, Area 2 - With Mitigation, Area 1 Berm Removed

Source #	Description	Distances			Elevations				Height			
		S-R	S-SB	S-RB	S Elev	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Screener, Stacker, Loader	450	40	50	236	238	238	236	3	2.5		7
Source #2	Excavator	420		20	236	238	238		2	2.5		
Source #3	Truck at Entrance	1000		600	236	238	238		2	2.5		
Source #4	Haul Truck (Passby)	420		20	236	238	238		2	2.5		

Output Summary

	Description	SPL at Receiver
Source #1	Screener, Stacker, Loader	34
Source #2	Excavator	44
Source #3	Truck at Entrance	22
Source #4	Haul Truck (Passby)	34
		0.0
	Total	44 dBA
	Criteria	50 dBA

Barrier for Source #1



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	Description	S-R	S-SB	S-RB	S Ele	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Screener, Stacker, Loader	450	40	50	236	238	238	236	3	2.5	0	7

Number of Sources	1	
Time Duration	60	(minutes per hour)
Tonality Penalty	0	dB
Measurement Distance	25	m

	Frequency	63	125	250	500	1000	2000	4000	8000	dBA
	Meas SPL	81.4	75.3	71.8	68.0	67.8	65.5	59.9	56.7	72.7
	# Srcs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Time Dur	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Tonality	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Directivity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Air Abs	0.0	-0.1	-0.5	-1.2	-2.1	-3.8	-9.7	-32.6	
	Gnd Atten	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Dist Atten	-25.1	-25.1	-25.1	-25.1	-25.1	-25.1	-25.1	-25.1	
	Barr. Att.	-6.2	-7.2	-8.8	-11.1	-13.8	-16.8	-19.8	-22.8	
	SPL @ Rec	50.1	42.9	37.4	30.6	26.7	19.8	5.3	-23.7	34.2

Barrier Calculations

Is there a source barrier:	Y	Source barrier BRIGHT ZONE:	N	SB Intercept Height	0.13	
Is there a receiver barrier:	Y	Receiver barrier BRIGHT ZONE:	Y	RB Intercept Height	0.17	
		S->RB BRIGHT ZONE:	N	S-RB Intercept Height	-0.80	
		SB->RB BRIGHT ZONE:	Y	SB-RB Intercept Height	-0.06	

|S->SB|	40.20	|S->RB|	50.01
|SB->R|	410.01	|RB->R|	400.01
|SB->RB|	11.18	|S->R|	450.00

Max Attentuation	-6.230987425	-7.23623249	-8.84548946	-11.0894539	-13.8093859	-16.7539986	-19.75699699	-22.76699101	
Combined									
PLD	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.2046	0
N	0.074949625	0.148709573	0.297419145	0.59483829	1.18967658	2.37935316	4.758706321	9.517412642	
Combined Attentuation	-6.230987425	-7.23623249	-8.84548946	-11.0894539	-13.8093859	-16.7539986	-19.75699699	-22.76699101	
Source Barrier									
PLD	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1
N	0.074949625	0.148709573	0.297419145	0.59483829	1.18967658	2.37935316	4.758706321	9.517412642	
Source Barrier Attentuation	-6.230987425	-7.23623249	-8.84548946	-11.0894539	-13.8093859	-16.7539986	-19.75699699	-22.76699101	
Receiver Barrier									
PLD	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0
N	0.005608257	0.011127493	0.022254987	0.044509973	0.089019947	0.178039894	0.356079787	0.712159575	
Source Barrier Attentuation	-5.101193007	-5.19918905	-5.39214429	-5.76070124	-6.43647321	-7.59213547	-9.370251336	-11.76022265	

APPENDIX B

Consultant Curriculum Vitae

HGC ENGINEERING

Howe Gastmeier Chapnik Limited
2000 Argentia Road, Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
t: 905.826.4044

William J. Gastmeier, Principal, MASc, PEng

Education:

BSc, Honours Physics, University of Waterloo, May 1974.
MASc, Electrical Engineering (Acoustics) University of Waterloo, May 1976.
"Preparing & Presenting Evidence", York University, 1991
"Noise Control in Land Use Planning", Ministry of the Environment, 1987

Memberships:

Designated Consulting Engineer, Province of Ontario
Registered Professional Engineer, Association of Professional Engineers of Ontario (PEO)
Acoustical Society of America (ASA)
Canadian Acoustical Association (CAA), Member, Board of Directors
Canadian Environmental Industries Association (CEIA)

Professional Experience:

1993 to Present
Principal, Howe Gastmeier Chapnik Limited Mississauga, ON

Assess environmental noise and vibration from transportation and industrial sources, mining operations race tracks and gun ranges. Provide expert testimony with regard to noise and vibration in land use planning and land use compatibility. Gained extensive experience with noise control in Land Use Planning including Official Plan and Secondary Plan Amendments and Zone Change Applications across Ontario.

Design architectural acoustics and noise control for council chambers, performance spaces, worship spaces, studios, music rooms, offices, laboratories, museums and public spaces.

Provide third party expert peer review and certification services for clients across North America.

Specify and design noise control measures to ensure compliance with Ministry of the Environment Guidelines and the Occupational Health and Safety Act.

1987 to 1993
Project Coordinator, Vibron Limited, Mississauga, ON, Consulting Engineering Division

Supervised engineering staff in consulting engineering projects in acoustics, noise and vibration. Provided client liason, technical expertise, attended public meetings and hearings.

1981 to 1987
Manager, Unitron Industries, Electroacoustic Design

Hired and supervised staff in the acoustical and electronic design of hearing aids.

Researched the physiology of hearing, hearing loss, psychoacoustics, speech intelligibilty and audiology to design the electroacoustic performance of hearing assistive devices.

1976 to 1978

Project Engineer, Turner Division of Conrac Corporation

Developed a vibration sensor to detect engine knock, designed high intelligibility paging microphones and other new microphone products.

Selected Significant Projects & Studies:

Transportation

- Blue Water Bridge Twinning, Sarnia, Ontario
- Ambassador Bridge Enhancement Project (twinning), Windsor, Ontario
- Highway Widening and Alignments in Sudbury, Port Colborne, Brantford and Thunder Bay
- Winnipeg International Airport
- Layover/Expansion Facilities for Go Transit and CPR
- Golf Links Road Widening, Thunder Bay, 2010
- Pavement Rehabilitation, Highway 140, Port Colborne, 2009
- Highway 11/17, Sault Ste. Marie, 2009
- Ambassador Bridge Twinning, Windsor, 2007 and 2011
- Road Widening/Realignment, RR 35, Sudbury, 2006
- Kingsway Road Widening, Sudbury, 2005
- Fischer Hallman Road Widening, Waterloo, 2003
- Southwest Bypass Extension, Brantford, 2001
- The Kingsway Realignment, Sudbury, 2000
- Blue Water Bridge Twinning, Sarnia, 1995
- Many Noise Impact Studies for Subdivisions (Road, Rail & Air traffic sources) in Ontario

Noise Studies for Expropriation Proceedings:

- Highway 6 South, Puslinch
- Derry Road Mississauga
- Highway 403, Ancaster
- Highway 407, Markham
- Leslie Street, Newmarket

Acoustics

- Lecture and performance theatres, studios and classrooms at McMaster University, Western University, University of Windsor, University of Alberta, University of Waterloo, Upper Canada College, Ryerson University and Fanshawe, Mohawk and Niagara Colleges
- Performance Theatres for Drayton Entertainment in Kitchener and St. Jacobs, Ontario and the Toronto District School Board
- The Carlu (Eaton's Theatre), College Park, Toronto
- Design and Certification of Acoustical Test Facilities across North America

- Acoustical Design of Worship Spaces for many faiths across Canada including 1000+ seat sanctuaries for the Metropolitan Bible Church in Ottawa, Richmond Hill Chinese Community Church and St. Thomas the Apostle Roman Catholic Church in Waterdown.
- Recreational, Library and Civic Facilities in Kitchener, Welland, Ingersoll and Brantford

Land Use Planning and Compatibility

- Transmetro Properties 1500 Unit Residential Development, Scarborough, ON
- Peer Reviews for Toronto, Waterloo Region, Simcoe, Oxford and Wellington Counties
- Hundreds of Road and Rail Traffic Noise and Vibration Impact Studies for new Residential Developments
- Noise Compatibility Studies for Official Plan Amendments and Zone Change Applications for Adjacent Proposed Residential/Industrial Land Uses.

Mines, Pits and Quarries

- Scores of Ministry of Natural Resources applications for licences for pits and quarries across Ontario, above and below water.
- De Beers Diamond Mine, Attawapiskat, Gold Mines in Red Lake, Timmins and Matheson ON
- Vale Inco in Sudbury and Port Colborne.

Power Plants, Pipelines and Utilities

- Combined Cycle Peaking Power Plant, Eastern Power, Missisauga
- Compressor Station Noise Assessments at TransCanada PipeLines Facilities across Canada
- Union Gas Province Wide Certificate of Approval Application and Environmental Noise Management
- Electrical/Steam Cogeneration Facilities, York University and Brock University

Teaching Experience:

1998 to 2010
Lecturer, Dalhousie University, School of Architecture: "Architectural Acoustics Module of ARB 211 Environment"

1988 to 2014
Adjunct Professor, University of Waterloo, Dept of Environmental Studies, School Of Architecture: "Architectural Acoustics, Noise Control, Sound Systems"

1988 to 1990
Lecturer, Ontario Ministry of the Environment: "Noise Control in Land Use Planning"

1982 to 1993
Guest lecturer, Physics Department, University of Waterloo: "Science of Hi-Fidelity"

Expert Testimony:

OMB Hearing, Aggregate License Application, Zoning and OP Amendment, Brant County, 2015
OMB Hearing, Aggregate License Application, Zoning and OP Amendment, Galway Cavendish, 2014
Provincial Court, Prosecution under the Environmental Protection Act, Race Track, Seguin Twp., 2014
OMB Hearing, Aggregate License, Zone Change Application, Woolwich Township, 2013

OMB Hearing, Aggregate Licence Application, Ashfield- Colborne-Wawanosh, ON, 2011
OMB Hearing, Aggregate Licence Application, Thames Centre ON, 2010
OMB Hearing, Proposed Golf Driving Range, Markham ON, 2010
OMB Hearing, Proposed Commercial Development near a Recycling Facility, Newmarket ON, 2010
OMB Hearing, proposed Quarry, Michipicoten Harbour, Wawa ON, 2009
OMB Hearing, proposed Residential Development near existing Industrial Land Use, Listowel, ON, 2009
OMB Hearing, proposed Mixed Use Development near Industrial Uses, Brampton ON, 2008
OMB Hearing, proposed Power Plant, Mississauga, Ontario, 2007
OMB Hearing, proposed Retirement Complex in Scarborough, 2007
OMB Hearing, compatibility of Residential Development near Feed Mill, Ingersoll, Ontario, 2006
OMB Hearing, proposed gravel pit, Simcoe, Ontario, 2005.
Ontario Superior Court of Justice, matter relating to noise from the St.Thomas Dragway, 2004
OMB Hearing, proposed aviary, Scotland, Ontario, 2004
OMB Hearing, proposed warehousing facility near existing residential neighbourhood, Oakville, 2004
OMB Hearing, proposed gravel pit, Oro-Medonte Township, 2004
OMB Hearing, high-rise residential development near industry and Highway 401, 2002
Provincial Court, Brantford Ontario, Prosecution under the Municipal Noise Bylaw, 2000
OMB Hearing, residential development adjacent to a CPR Classification Yard, Scarborough, 1999
OMB Hearing, Aggregate Extraction Facility, Windy Lake, Ontario, 1998
OMB Hearing, residential development adjacent to railway, Norwood Road, Toronto, 1996
OMB Hearing, proposed rail transfer facility, Shakespeare, Ontario, 1995
OMB Hearing, residential development, Rogers Road, City of Toronto, 1993
Consolidated Board Hearing, residential development in the City of York, 1992
NEC Hearing, Cogeneration Plant, Brock University, St. Catharines, 1992

Patents:

U.S. Patent 4,553,627 "Hearing Aid Wax Guard"

U.S. Patent 4,349,082 "Acoustical Damping Element and Method of Forming Same"

U.S. Patent 4,193,647 "Piezoelectric Ceramic Transducers with uniform Resonant Frequency"

Publications:

"Advances in Acoustic Monitoring" with Corey Kinart, Proceedings of Acoustics Week in Canada, Canadian Acoustics, October 2016

"Monitoring Road Traffic Sound Levels" with Sheeba Paul, Proceedings of Acoustics Week in Canada, Canadian Acoustics, October 2016

"Predicting Exhaust Sound Power Levels of General Purpose Boilers" with Rob Stevens, Proceedings of Acoustics Week in Canada, Canadian Acoustics, October 2016

"Selecting Suitable Noise Control for Mine Return Air Raise Systems" with Andrew Dobson, Proceedings of Acoustics Week in Canada, Canadian Acoustics, October 2016

"Considerations in the Acoustical Design of Black Box Theatres" with Mandy Chan, Proceedings of Acoustics Week in Canada, Canadian Acoustics, October 2015

"Recent Trends in the Acoustical Design of Institutional Facilities" with Brian Chapnik, Proceedings of Acoustics Week in Canada, Canadian Acoustics, September 2014

"Architectural Personality" Perspectives, Fall 2010

"Occupational Noise Exposure in Nightclubs" with Andrew Dobson, Proceedings of Acoustics Week in Canada, Canadian Acoustics, September 2010.

"The Consumer Handbook on Hearing Loss and Noise - Chapter 11 - Architectural Strategies to Minimize Noise" Edited by Marshall Chasin, Auricle Ink Publishers, 2010

"Acoustical Performance Criteria and Treatment Protocols for Learning Spaces at a Large Institutional Teaching Facility" Proceedings of Acoustics Week in Canada, Canadian Acoustics, September 2009.

"Hearing Loss in Musicians – Prevention and Management - Chapter 8 - Room and Stage Acoustics for Optimal Listening and Playing" Edited by Marshall Chasin, Plural Publishing Inc., 2009

"Acoustical Performance Criteria, Treatment and Guidelines for Multifunctional School Gymnasia" with Kana A. Ananthaganeshan, Canadian Acoustics, December 2007

"Room Acoustics and Modifications for Performing Artists" Hearing Review, March 2006

"The Use of Environmental Noise Standards and Guidelines in Canada", Canadian Acoustics, Sept. 2005

"ISO-1996 'Acoustics-Description and Measurement of Environmental Noise' Round Robin Testing", Canadian Acoustics, December 2001

"Reverberation in Public School Gymnasia" Canadian Acoustics, December, 1999

"Air Traffic Noise", Ontario Planning Journal, Spring, 1998

"Musicians and the Prevention of Hearing Loss, Chapter 7, Room Acoustics" Edited by Marshall Chasin, Singular Publishing Group, San Diego, 1996

"Applying Sound Intensity Methods In-situ to Measure Exhaust Noise levels and Estimate Silencer Performance" Proceedings of the Alberta Energy & Utilities Board 1996 Conference on Environmental Noise Control Engineering

"The Assessment of Rail Traffic Noise and Vibration in Land Use Planning" Ontario Planning Journal, March /April, 1996

"Acoustical Materials" The Canadian Architect, April, 1995

"Environmental Noise & Vibration Part 2" Ontario Planning Journal, Jan/Feb, 1995

"Noise Control & the Building Envelope" Ontario Building Envelope Council Newsletter, 1995

"Environmental Noise & Vibration Part 1" Ontario Planning Journal, Nov/Dec, 1994.

"Occupational Noise Exposure in the High School Music Practice Room" 1994 Congress of the Canadian Acoustical Association.

"Field Sound Transmission Loss of Demising Walls and Floor/Ceiling Assemblies". Proceedings of the 1992 International Congress on Noise Control Engineering.

"The Control of Bus Noise and Vibration in Mixed Use Urban Construction". Proceedings of the 1992 International Congress on Noise Control Engineering, Toronto,1992, pp.857-860.

"Noise Complaints in Residential Condominiums" Proceedings of Noise Control, 1990.

"Noise Control of Underground Bus Stations - A Case Study" Canadian Acoustical Association Conference, Toronto, 1988.

"The Acoustically Damped Earhook" Hearing Instruments No. 10, October 1981

Standardization and Professional Committees:

Canadian Standards Association Member of Occupational Hearing Technical Committee, 2010 to Present

Canadian Standards Association Member of Technical Committee S251 “Acoustics and Noise Control” 2005 to 2010

Canadian Standards Association “Chair of Environmental Noise Subcommittee of Technical Committee S251 “Acoustics and Noise Control” 2005 to 2010

Canadian Standards Association ISO 9613 / CSA Z107.55 Working Group on Industrial Noise Propagation, 2002 to 2010

Canadian Standards Association - Working Group for the Adoption of “ISO-1996 ‘Acoustics-Description and Measurement of Environmental Noise’, 2000 – 2007

Acoustical Society of America – Member of Noise Control Technical Committee, 1999 – Present

Association of Professional Engineers of Ontario - Committee for the Establishment of Guidelines for Professional Engineers Providing Acoustical Services in Land Use Planning, 1997

Mandy Chan, PEng.

Education

University of Waterloo, Bachelor of Applied Science, 2006

Professional Memberships

Professional Engineers of Ontario (PEO)
Canadian Acoustical Association (CAA)

Professional History

2006 to Present Senior Engineer, Associate, HGC Engineering, Mississauga

Experience

Ms. Chan has been involved in a wide variety of projects related to acoustics, noise and vibration. She has experience with the measurement and analysis of traffic noise and stationary noise sources, architectural acoustic design of learning spaces, office spaces and churches. She has a broad familiarity with Ministry of Environment guidelines regarding noise and vibration and an understanding of Ministry criteria and methods for prediction of noise due to roadway, railway, aircraft traffic, industrial and aggregate facilities. Additionally, Ms. Chan has analysis experience using computer aided modelling and prediction software.

Selected Projects

Banner Pit, *Thamesford, Ontario*
Bremont Homes, *Mississauga, Ontario*
Daniels City Centre Condominiums, *Mississauga, Ontario*
Edmonton Clinic, *Edmonton, Alberta*
Farmer's Mutual Insurance Office Building, *Cambridge, Ontario*
Greensborough Subdivision, *Markham, Ontario*
Gurney Sands and Gravel, *Brantford, Ontario*
Knox Presbyterian Church, *Waterloo, Ontario*
Inland West Pit, *Warwick, Ontario*
Johnson Bros. Gravel Pits, *Southern Ontario*
Mattamy Homes, *Milton, Ontario*
Liberty Village Condominiums, *Toronto, Ontario*
Linamar Tech Centre, *Guelph, Ontario*
Nelson Granite Quarries, *Kenora, Ontario*
St. Leonard's Boys' Secondary School, *Bermuda*
Tisdale Mining Lands, *Timmins, Ontario*
Waterloo Christian Reformed Church, *Waterloo, Ontario*
Warren Stewart Limestone Quarry, *Cockburn Island, Ontario*
West Village at Stratford, *Stratford, Ontario*