



CONSULTING ENGINEERS  
& SCIENTISTS

# FINAL REPORT

## FLAMBOROUGH QUARRY HAUL ROUTE STUDY TRAFFIC NOISE REPORT

Project Number: #W08-5107A

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Flamborough Quarry Haul Route Study

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## INTRODUCTION

St. Marys Cement (Canada) Inc. has proposed to develop a Dolostone Quarry on Part of Lots 1, 2 and 3, Concession 11, Geographic Township of East Flamborough, in the City of Hamilton. The property is located on the north side of 11th Concession, just west of Milborough Line.

In April 2006 Dillon Consulting Limited prepared Terms of Reference for the Quarry Haul Route Evaluation on behalf of the City of Hamilton. Components of the Terms of Reference require that Alternative Haul Routes are identified, the existing baseline conditions of each alternative route are described, and a comparative analysis and evaluation is carried out. iTRANS Consulting Inc. have identified five Alternative Haul Routes that are described and analyzed in the following report in the context of noise.

This report documents the consultant team, describes the environment, defines the analysis criteria and indicators, reports the analysis and results, and offers recommendations and mitigating measures.

RWDI AIR Inc. (RWDI) was retained by St. Marys Cement (St. Marys) and iTRANS Consulting Inc. (iTRANS) to evaluate traffic noise along the potential haul routes. This Traffic Noise Report is designed to support the requirements of the Haul Route Evaluation Study. It documents baseline ambient noise along the potential haul routes, discusses the criteria and indicators of impacts related to the potential haul routes, and discusses the potential for feasible mitigation measures to be applied to the preferred haul route. For a detailed description of transportation sound basics and terminology, please refer to **Appendix A**.

## 1. DESCRIPTION OF THE CONSULTANT TEAM

A study team consisting of RWDI staff undertook the noise assessment and evaluation of route alternatives. The actual individuals and their specific roles are provided as follows:

- Scott Penton, P.Eng., Project Director: Supervised all technical aspects of the study and was responsible for ensuring that all work conformed to RWDI's standards for quality assurance. Mr. Penton is listed as a qualified Noise and Vibration consultant with the Ministry of Transportation and has conducted numerous transportation noise and vibration studies, including studies for quarry and landfill haul routes.
- Nigel Taylor, M.Sc., CCEP., Project Manager: Provided technical direction and was responsible for the day-to-day communication with the Flamborough Quarry Haul Route Study Project Team.
- Kevin Carr, Hon.B.Sc., Project Scientist: Conducted the technical work under the direction of the Project Manager and Project Director.

## 2. DESCRIPTION OF THE ENVIRONMENT

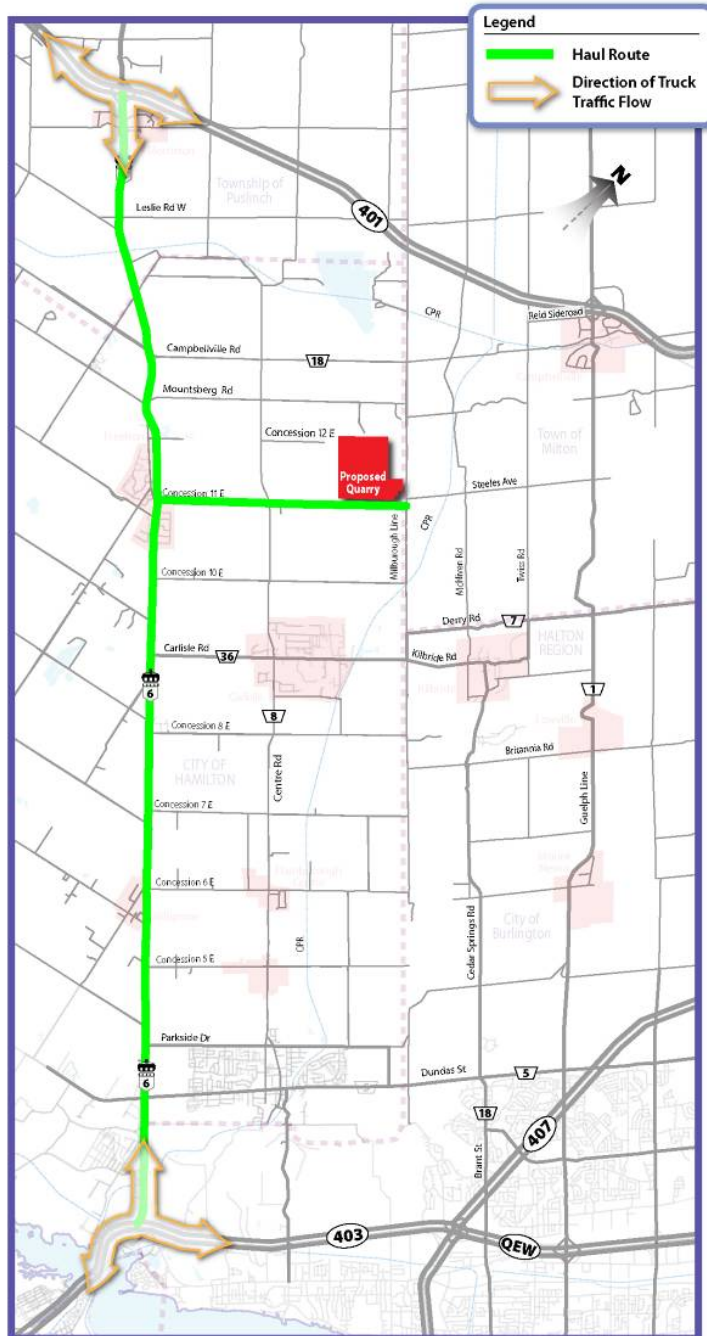
### 2.1 Inventory of Key Features

The proposed St. Marys Flamborough Quarry is located on the north-west corner of the intersection of Concession 11 E and Milborough Line, in the City of Hamilton (see **Figure 1**). The site features a very thick deposit of amabel dolostone formation that is capable of supplying more than three-million tonnes of high quality aggregates annually.

The St. Mary's haul route alternatives are located north of Highway 5 and south of Highway 401 between Highway 6 and Guelph Line (see **Figure 1**). The study area is predominantly rural, with homes and farms along the various roadways. There are also a few villages and some smaller built up areas.

As summarized by iTRANS (2008), a total of five haul route alternatives are being considered which comprise 11 different road segments. Link locations are shown **Figure 1**, and are also discussed below:

**Alternative Haul Route 1:**



In the case of Alternative Haul Route 1, truck traffic destined for Highway 401 east would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 eastbound on-ramp.

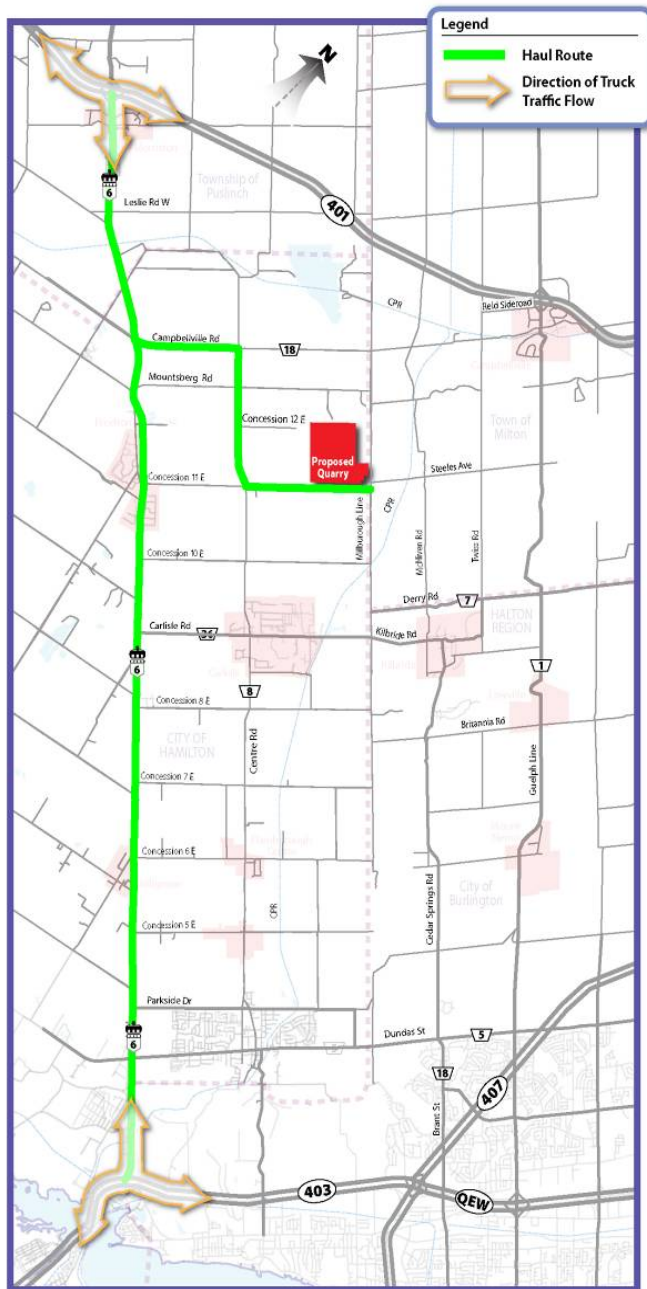
Truck traffic destined for Highway 401 west would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403/QEW westbound on-ramp.

**Alternative Haul Route 1**

## Alternative Haul Route 2:



In the case of Alternative Haul Route 2 truck traffic destined for Highway 401 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and north on Highway 6 to the Highway 401 eastbound on-ramp.

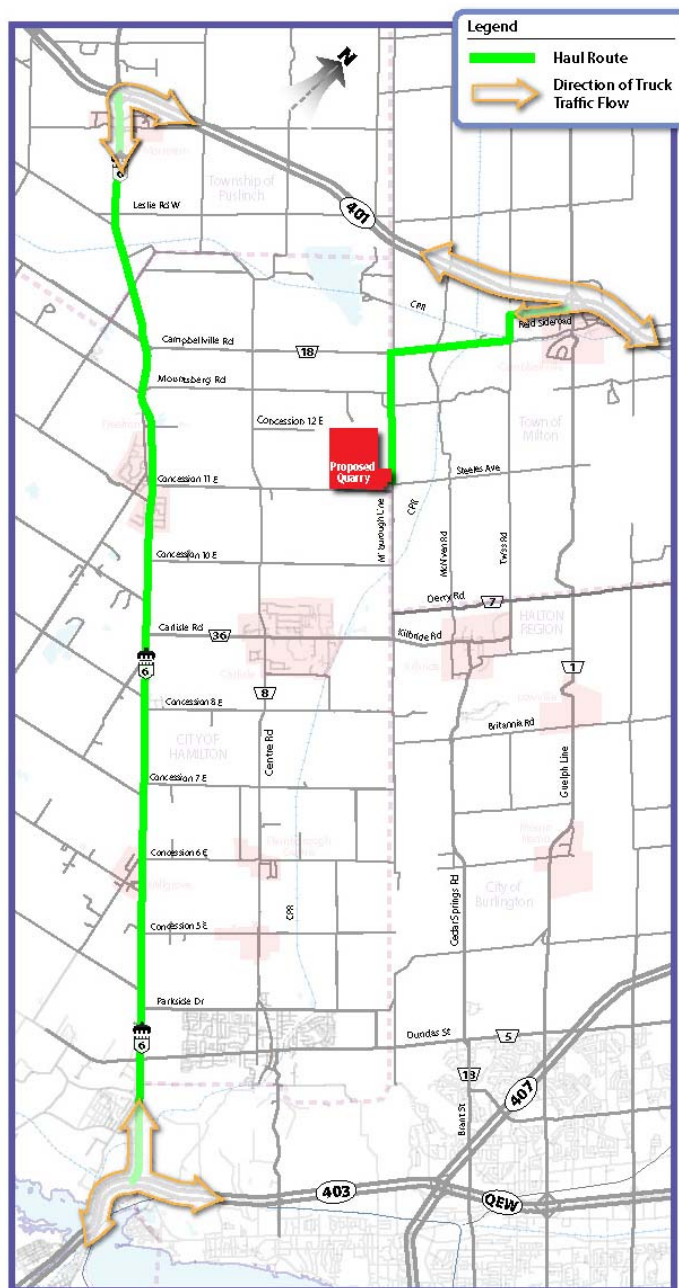
Truck traffic destined for Highway 401 west would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403 /QEW westbound on-ramp.

**Alternative Haul Route 2**

### Alternative Haul Route 3:



In the case of Alternative Haul Route 3, truck traffic destined for Highway 401 east would travel north on Milburgh Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

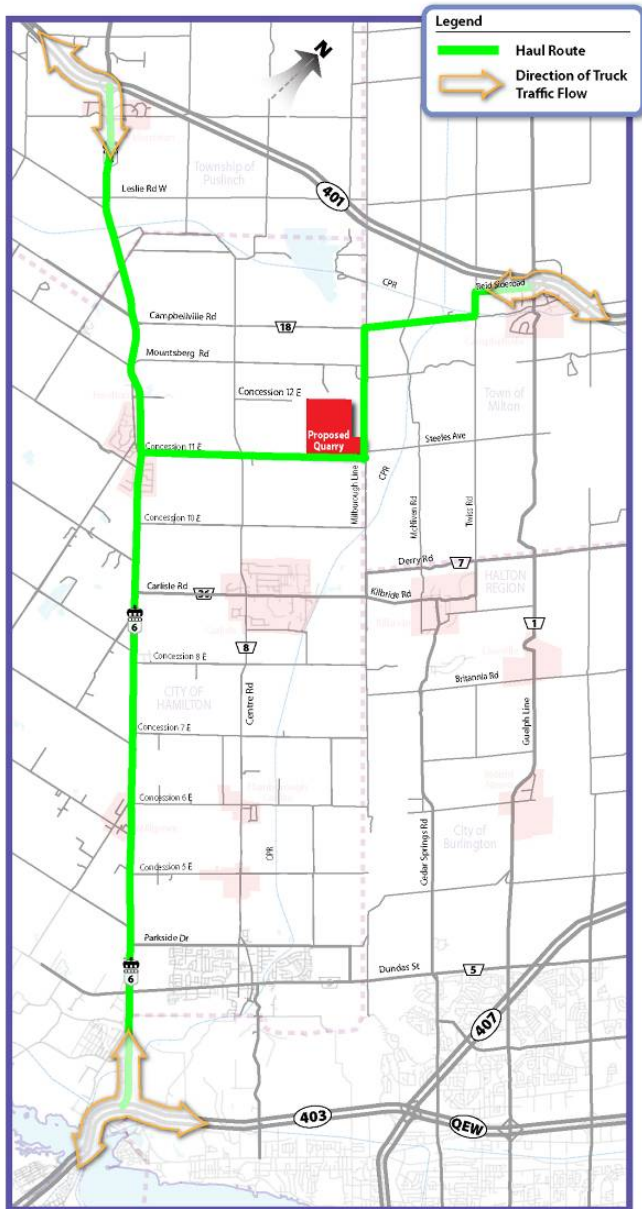
Truck traffic destined for Highway 401 west would travel north on Milburgh Line, then east on Campbellville Road, north on Twiss Road, east on Reid Sideroad and north on Guelph Line to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403/QEW east would travel north on Milburgh Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp. From here, there are several alternatives to reach the destination including taking the 407 ETR south to Highway 403.

Finally, truck traffic destined for Highway 403 west would travel north on Milburgh Line, east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401. From here, there are several alternatives to reach the destination including taking the 407 ETR southwest or Highway 6 south to the 403/QEW.

**Alternative Haul Route 3**

### Alternative Haul Route 4:



In the case of Alternative Haul Route 4, truck traffic destined for Highway 401 east would travel north on Millborough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

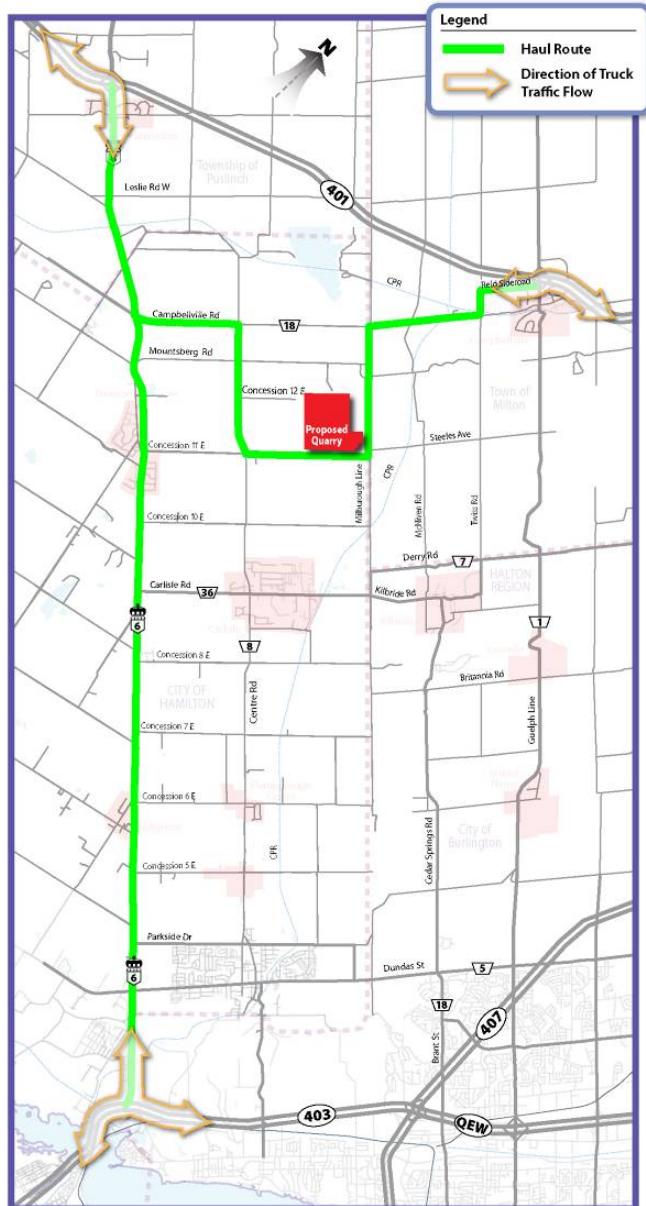
Truck traffic destined for Highway 401 west would travel west on Concession 11 E, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403 eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, and then south on Highway 6 to the Highway 403 westbound on-ramp.

**Alternative Haul Route 4**

## Alternative Haul Route 5:



In the case of Alternative Haul Route 5, truck traffic destined for Highway 401 east would travel north on Milborough Line, then east on Campbellville Road, north on Twiss Road, and east on Reid Sideroad to the Highway 401 eastbound on-ramp.

Truck traffic destined for Highway 401 west would travel west on Concession 11 E, then north on Centre Road, then west on Campbellville, and then north on Highway 6 to the Highway 401 westbound on-ramp.

Truck traffic destined for Highway 403 east would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403/QEW eastbound on-ramp.

Finally, truck traffic destined for Highway 403 west would travel west on Concession 11 E, then north on Centre Road, west on Campbellville, and south on Highway 6 to the Highway 403 /QEW westbound on-ramp.

**Alternative Haul Route 5**

### 2.1.1 Noise Sensitive Receptors

Noise sensitive receptors of interest, as defined in MOE Publication NPC-205 [1], include the following noise sensitive land uses:

- Permanent, seasonal, or rental residences;
- Hotels, motels and campgrounds;
- Schools, universities, libraries and daycare centres;
- Hospitals and clinics, nursing / retirement homes; and
- Churches and places of worship.

For the purposes of this study, Special Receptors are defined to include Schools, Daycares, Seniors Housing, and Places of Worship. For an explanation of how normal noise sensitive receptors and Special Receptors are treated in this assessment, refer to **Section 3**.

Noise sensitive receptors are located along each of the potential haul route links. Noise sensitive receptors are shown in **Figure 2**.

### 2.1.2 Roadway Cross-Sections

For many haul route links, the roadways will require upgrades. For this study two types of cross-sections are proposed: rural (requires property acquisition) and urban (within the existing right-of-way). The final haul route roadway design may be all rural cross-sections, all urban, or some combination. Haul route cross-sections are discussed in **Appendix B**. As the roadway will generally be centered in the right-of-way regardless of the cross-section design, the potential noise impacts will not be affected by whatever cross-section design(s) are selected. Cross-sections are not considered further in this noise analysis.

## 2.2 Existing Baseline Conditions

RWDI predicted the minimum, average, and maximum hourly noise levels related to existing road traffic along the potential haul routes. The predicted existing road traffic levels associated with each of the potential haul route segments are provided in the existing conditions report. The results are summarized in **Table 1**. Calculations are provided in **Appendix C**.

The minimum hourly traffic noise levels shown in the tables are 1-hour energy-average sound exposure ( $L_{eq}$  (1hr) dBA) values, during the hour with the least traffic, typically between 3pm and 4pm for Highway 6, and typically between 10am and 11am for other roads. Correspondingly, the maximum hourly traffic noise levels typically occur between 5pm and 6pm. The average sound level is the energy equivalent average over the entire 12-hour period of haul route activity, between 7am and 7pm (an  $L_{eq}$  (12hr) value).

The acoustic environment in the study area is characterized by three distinct environment types – urban, semi rural, and rural. For each of the following three examples, 25 m setback distances will be used for illustrative purposes:

- Urban acoustic environments exist along major traffic corridors such as Highway 6. Daytime traffic noise levels along Highway 6, north of Campbellville Road at a distance of 25 meters, are predicted to be between 67 dBA and 73 dBA.
- Semi-rural acoustic environments exist along highly travelled minor traffic corridors such as Campbellville Rd. For example, daytime traffic noise levels along Campbellville Rd, from CNR tracks to Guelph Line, at a distance of 25 meters, are predicted to be between 55 dBA and 58 dBA.
- Rural acoustic environments exist along infrequently travelled minor traffic corridors such as Milborough Line. For example, daytime traffic noise levels along Milborough Line, north of Concession 11E and south of Campbellville Rd, at a distance of 25 meters, are predicted to be between 45 dBA and 49 dBA.

### 3. ANALYSIS CRITERIA AND INDICATORS

The quantitative metric used to evaluate noise impacts in this study was the overall change in sound level (“build” minus “no-build”).

There are no specific Provincial guidelines which deal with noise from pit and quarry haul routes. However, the Ministry of the Environment (MOE) does require haul route noise impacts to be considered as part of environmental assessments for landfill sites. The MOE *Noise Guideline for Landfill Sites* [2] are often used in assessing pit and quarry haul route noise, and have been adopted for this assessment.

The MOE *Noise Guideline for Landfill Sites* states that the changes in road traffic noise levels identified above can then be ranked as follows:

*Qualitative Ranking of Changes in Noise Level*

<b>Sound Level Increase (dBA)</b>	<b>Qualitative Rating</b>
0 to 3 inclusive	Insignificant
> 3 to 5 inclusive	Noticeable
> 5 to 10 inclusive	Significant
> 10 and over	Very Significant

The MOE’s qualitative ranking scheme is based on the human perception of changes in sound levels (see Appendix A). Changes in road traffic noise levels of 3 dB or less are generally imperceptible by people, and thus represent an insignificant impact. Greater changes in noise levels have greater degrees of perception, and therefore increasing significance.

The MOE *Noise Guideline for Landfill Sites* requires that hourly average sound exposures be evaluated ( $L_{eq}$  (1h) values, measured in dBA). The greatest impact from the proposed haul routes will occur when there is a combination of high traffic levels from the quarry, and low background traffic volumes along the route. This would produce the greatest increase in noise due to haul route traffic.

The volume of haul route traffic varies throughout the operating day and scenario. Based on information provided by iTRANS, haul route traffic will occur from 7am to 7pm. The maximum haul route hourly traffic was assumed to be approximately 137 truck movements during AM hours, and approximately 114 truck movements during PM hours. This represents full production. For the majority of the proposed haul route links, the minimum (lowest) background traffic volumes occur between 10 am and 11 am. For Highway 6, the minimum background traffic volumes occur between 3pm and 4pm.

For assessing potential impacts, “build” (with the additional haul route traffic) and “no-build” (without the additional haul route traffic) scenarios were considered. For the majority of roadways, the no-build scenario consists of the minimum hourly traffic volumes, which occurs during the morning. The build scenario for these receptors is that minimum volume plus the morning AM peak haul route movements of 137 trucks. Thus, the assessment is conservative in that it assumes the minimum traffic volume occurs at the same time as the maximum haul route movements.<sup>1</sup> For Highway 6 receptors, the no-build scenario consists of the minimum background traffic along the highway, which occurs in the afternoon. Correspondingly, the build scenario is these volumes plus the PM peak of 114 haul truck movements.

Certain haul route links will have lower traffic volumes for some alternatives. Specifically, the following rural road links will only have approximately 230 movements per day:

- Alternative 4: Conc. 11 (Hwy 6 to Milborough)
- Alternative 5: Conc. 11 (Centre to Milborough), Centre Rd (Conc. 11 to Campbellville), and Campbellville (Centre Rd to Hwy 6)
- Alternative 4: Conc. 11 (Hwy 6 to Milborough)
- Alternative 5: Conc. 11 (Centre to Milborough), Centre Rd (Conc. 11 to Campbellville), and Campbellville (Centre Rd to Hwy 6)

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<sup>1</sup> Note that average daily sound levels and maximum daily sound levels are presented in Table 1. Average daily sound levels and maximum daily sound levels are not considered further in the analysis of haul route impacts, as they would be non-conservative (minimizing potential impacts), since the noise from the additional background traffic would mask the effects of the additional haul route trucks..

On these routes, a maximum hourly traffic volume of 137 trucks was still assumed. This would be equivalent to the majority of the traffic (60%) occurring in one hour. This was felt to be a reasonable assumption, as the total volume was relatively low, and such a situation occurring (i.e., a large number of trucks leaving for the same destination during a one hour period) seemed possible. It should be noted, however, that this places a small but insignificant bias against Alternatives 4 and 5, affecting the quantitative evaluation score, but not the relative ranking. Similarly, hourly traffic volumes on some Highway 6 links were also slightly overestimated to simplify the analysis. Highway 6 haul truck volumes for Alternative 3 were so low that they would effectively result in no change in sound levels, and so were ignored.

*Anticipated Haul Route Traffic (Total Movements)*

Link	Volumes	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
23: Highway 6 (Campbellville to Hwy 401)	Anticipated Daily Modelled Hour	970 114	970 114	60 0	110 114	110 114
24: Highway 6 (Conc. 11E to Campbellville)	Anticipated Daily Modelled Hour	970 114	170 114	60 0	110 114	120 114
25: Highway 6 (Conc. 11E to Hwy 403)	Anticipated Daily Modelled Hour	170 114	170 114	60 0	110 114	120 114
18: Conc. 11E (Hwy 6 to Centre)	Anticipated Daily Modelled Hour	1140 137			230 137	
17: Conc. 11E (Centre to Milborough)	Anticipated Daily Modelled Hour	1140 137	1140 137		230 137	230 137
1: Centre Rd	Anticipated Daily Modelled Hour		1140 137			230 137
11: Campbellville (Hwy 6 to Centre)	Anticipated Daily Modelled Hour		1140 137			230 137
13: Campbellville (Milborough to Twiss)	Anticipated Daily Modelled Hour			1140 137	910 137	910 137
5: Milborough Line	Anticipated Daily Modelled Hour			1140 137	910 137	910 137
26: Twiss Road	Anticipated Daily Modelled Hour			1140 114	910 114	910 114
27: Reid Sideroad	Anticipated Daily Modelled Hour			1140 137	910 137	910 137

Notes:

Anticipated Daily – Actually daily volume anticipated on the route from transportation study  
 Modelled Hour – Maximum hourly haul route traffic used in noise modelling

Background traffic levels in the area will increase with time. This would make the change due to haul route traffic less as the years increase. To account for this, three design years were considered: Existing, Year 2021, and Year 2031. Haul route traffic levels represent full production, and therefore do not change with year.

For each scenario, link, and design year, road traffic noise levels were calculated at various distances from the roadway. This was used to establish the setback distances along each route where noise changes were predicted to range from  $\leq 3$  dB, 3 to 5 dB, 5 to 10 dB, or greater than 10 dB (i.e., the qualitative significance categories in the MOE Landfill guideline).

The setback distances calculated above were overlaid on the route alternatives using GIS software, and the number of receptors within each band (i.e., within each significance category) were counted. The ranking of each haul route alternative with respect to noise impacts was then accomplished by examining the receptor counts and weighing them depending on the degree of impact; with receptors that were expected to be most impacted weighted the highest. The greater the overall score, the greater the expected impact. Thus, the route with the lowest score is most preferable in terms of noise. The Quantitative Noise Evaluation Score is calculated as follows:

*Quantitative Noise Evaluation Score System*

<b>Factor</b>	<b>Rationale</b>
Number of Residences in $\leq 3$ change category x 0	Based on imperceptibility of noise change, these receptors receive an insignificant impact
+ Number of Residences in 3 to 5 dB change category x 1	Represent a clearly noticeable change in noise levels
+ Number of Residences in 5 to 10 dB change category x 3	Represents a significant increase in noise levels. A 10 dB change would be perceived as twice as loud
+ Number of Residences in $> 10$ dB change category x 6	Represents a very significant increase in noise levels.
+ Number of Schools, Daycares, and Senior Housings x 100	Receptors with potential for increased sensitivity to noise impacts and greater number of affected people
+ Number of Places of Worship x 50	Receptors with potential for increased sensitivity to noise impacts and greater number of affected people
= Evaluation Score	

Since the lowest background road traffic noise level occurs for existing conditions, the “Existing Levels” build and no-build scenarios have been used to determine the Quantitative Evaluation Score. Again, this is a conservative practice.

Additional details regarding methodology and assumptions are included in **Section 4**.

## 4. ANALYSIS

### 4.1 Data Sources

Traffic data has been used to characterize the local traffic and haul route noise levels in the study area.

#### 4.1.1 Traffic Data

Information related to existing traffic, future traffic, and haul route traffic has been provided by iTRANS. Existing data was provided in the form of tube counts, turning movement counts, average daily counts, speed limits, and car/truck distributions. Data from the tube counts and turning movement counts have been scaled to match more recent overall numbers and distributions as provided in the iTRANS Figure, *Peak Existing Average Daily Traffic (ADT) & Truck Percentages*. For 2021 traffic numbers, the hourly counts resulting from the above analysis were scaled to fit ADTs from the 2021 and 2031 *Average Daily Traffic (ADT) & Truck Percentages* figures, respectively. Assumptions used to supplement this data are described in **Section 4.2**. All traffic numbers used in the analysis as well as the supporting information leading to the assumptions in **Section 4.2** have been provided in **Appendix C**.

### 4.2 Assumptions

To supplement the above-mentioned traffic distribution data, assumptions have been made. The following assumptions have been assessed and accepted by iTRANS:

- Medium / heavy truck volumes are broken down into an approximate 2:3 ratio as per the MTO Environmental Office Manual [3];
- Car / truck breakdowns, were assumed to be as shown in the attached March 2008, iTRANS Figure, *Peak Existing Average Daily Traffic (ADT) & Truck Percentages*;
- Traffic distributions, where unavailable, are assumed to be as shown in the attached December 7, 2007, iTRANS Figure, *Existing Traffic and Truck Volumes*; and
- The hourly traffic distribution for Milborough Line, for which traffic distributions were unavailable, is similar to the hourly distribution for Concession 11E as shown in the attached December 7, 2007, iTRANS Figure, *Existing Traffic and Truck Volumes*.

For Alternative 3, the quantitative analysis does not include the truck movements along Highway 6, as this represents a negligible increase over existing conditions and future conditions (without the quarry). Alternatives 1, 2, 4 and 5 do not include the United Church of Hamilton (1552 Highway 6) as changes are insignificant in this area.

No segments outside of the study area were accounted for in this analysis. Notably, Highway 401 was not modelled. In areas where Highway 401 is the dominant source of noise, the results of the change assessment are conservative, as they do not account for any ambient noise from the highway.

In areas without significant background traffic, a 45 dBA background level was assumed. This value corresponds to a daytime rural environment as defined in NPC-232 [4].

For simplicity, receptor heights were assumed to be 1.5 m (approximately head height). No obstacles or geometrical considerations have factored into the analysis.

### **4.3 Methodology**

Road traffic noise levels were modelled using a spreadsheet model of the Ontario Road Noise Analysis Method for Environmental Transportation (ORNAMENT) algorithms [5]. The algorithms in this spreadsheet form the basis of the STAMSON v5.03 computer program

produced by the MOE [6]. Results from the ORNAMENT calculations and STAMSON are equivalent. Sound levels were predicted using the spreadsheet at setbacks from the centerline of each respective road segment.

In order to assess change in noise levels (build minus no build), a 45 dBA background level was assumed in areas without significant background traffic. This allows for the determination of setbacks corresponding to changes in noise levels of 3 to 5 dB, 5 to 10 dB, and greater than 10 dB, if they exist. The number of receptors within these distances setbacks (corresponding to the number of receptors receiving the various changes in noise level) were counted using GIS software. The quantitative noise scores for each link and route alternative were then calculated using the procedures discussed in **Section 3**. An example calculation for Alternative 1 is provided in **Appendix C**.

#### **4.4 Results**

The predicted changes in road traffic noise levels associated with each of the potential haul route segments are provided in **Table 2**. Since only 60 truck movements per day are expected along Highway 6 under Alternative 3, Highway 6 levels were not included for this alternative. Changes in noise along Highway 6 for Alternative 3 are predicted to be imperceptible, and thus these levels are not shown. The analysis is summarized in **Appendix C**. Results are shown graphically in **Appendix D**.

As noted in **Section 4.2**, impacts from Highway 401 were not considered in this assessment, as they are considered outside of the study area. As a result, in areas where Highway 401 is the dominant source of noise, the results of the change assessment are very conservative. This affects Alternative 3, 4, and 5.

Haul route alternatives have been ranked as outlined in **Section 3**. Since the lowest background road traffic noise level occurs for existing conditions, the “Existing Levels” build and no-build scenarios have been used to determine the Quantitative Evaluation Score. The

results of this ranking are shown in **Table 3**. An example calculation for Alternative 1 is provided in **Appendix C**.

Alternatives 1 and 3 rank similarly. Therefore, Alternative 1 and Alternative 3 are equivalent in terms of noise. Each remaining alternative has a score which is significantly greater than Alternative 1 or 3. Thus, Alternatives 1 and 3 are most preferable from a noise perspective.

The noise analysis is based on the assumption that worst-case haul route traffic (the highest hourly volumes of quarry-related trucks) occurs at the time of minimum background traffic (generally the morning hours of 10 to 11 am). The currently proposed 12-hour operation of the quarry is from between 7 am and 7pm, although this has not been finalized. Considering the traffic volume distributions, it is unlikely that minor changes to operating times, such as a change in operating time to between 6am and 6 pm, for example, would affect the results of the alternative rankings. However, such a move would potentially increase the potential for noise impacts from sleep disturbance, as generally more people are sleeping in the 6am to 7 am hour than are asleep after 7am. Thus, from a noise perspective, maintaining the start time as 7am is preferred. Alternative mitigation measures should be considered to reduce early morning haul route noise if aggregate haulage occurs prior to 7 am.

## 5. RECOMENDATIONS

A preferred route will be selected based on the results of all studies. This section describes the feasibility mitigation feasibility along the routes. In keeping with Provincial practices, only mitigation on publically-owned lands within the roadway rights-of-way has been considered.

The houses and other noise receptors along the haul routes have driveways connecting directly to the roadways; thus barrier or berm installation is not feasible due to the requirements for breaks/interruptions in any installed barriers or berms, as the breaks would make the barriers

ineffective in blocking noise. This is the case for all haul route link segments. Thus barriers or berms are not feasible for any alternative.

Changing speed limits on the selected road segments is not predicted to yield a noticeable change. For example, a 10 km/h decrease in haul route speed (i.e., decreasing the speed limit from 60 km/hr to 50 km/hr) would only result in a decrease in impacts of approximately 1 dB. This reduction is imperceptible (see **Appendix A**). Thus, decreasing speed limits are not a feasible way of reducing noise.

No significant vertical or horizontal alignment changes are feasible for any route, due to the tight roadway cross sections.

Noise reducing asphalt can provide approximately 2 dB of noise reduction. A reduction of this magnitude is imperceptible. Thus, installing noise reducing asphalt is not a feasible way of reducing noise.

Combining noise reducing asphalt and a reduction in speed will lead to an approximate 3 dB reduction in noise. A 3 dB reduction can be considered insignificant. Ontario road traffic noise assessment guidelines generally require a 5 dB minimum reduction in noise before a mitigation alternative may be considered as feasible.

Based on the review above, no specific physical mitigation measures are recommended. Noise mitigation measures will be further examined as part of the required Class Environmental Assessment process, for any roadway improvements which are undertaken.

## 6. REFERENCES

1. Ontario Ministry of the Environment (MOE), 1995, Publication NPC-205, *Sound Level Limits for Stationary Sources in Class 1&2 Areas (Urban)*
2. Ontario Ministry of the Environment (MOE), 1998, *Noise Guidelines for Landfill Sites*
3. Ontario Ministry of Transportation (MTO), 1992, *Environmental Office Manual Technical Areas – Noise*, EO-V-1000-00
4. Ontario Ministry of the Environment (MOE), 1995, Publication NPC-232, *Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)*
5. Ontario Ministry of the Environment (MOE), 1989, *Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT)*
6. Ontario Ministry of the Environment (MOE), 1996, STAMSON v5.03: *Road, Rail and Rapid Transit Noise Prediction Model*

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## **TABLES**

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**Table 1. Summary of Predicted Existing Road Traffic Noise Levels**

W08-5107A Flamborough Quarry Haul Route Study

## Notes:

- When a link has more than one speed limit, the following conditions apply:  
the maximum impact is predicted using the maximum volumes and the highest speed limit,  
the minimum impact is predicted using the minimum volumes and the minimum speed limit, and  
the average impact is the arithmetic average of the impacts predicted using the average volumes and each of the respective speed limits.

Road Segment	Setback (m)	Minimum <sup>[1]</sup> Levels (dBA)	Average <sup>[1]</sup> Levels (dBA)	Maximum <sup>[1]</sup> Levels (dBA)
Link 23 - Highway 6, north of Campbellville Road	25	67	70	73
	50	62	65	68
	100	57	60	63
	200	52	55	58
	300	49	52	55
Link 24 - Highway 6, south of Campbellville Road, north of Concession 10E	25	70	72	73
	50	65	67	68
	100	60	62	63
	200	55	57	58
	300	52	54	55
Link 25a - Highway 6, south of Concession 10E, north of Concession 8E	25	70	72	73
	50	65	67	68
	100	60	62	63
	200	55	57	58
	300	52	54	55
Link 25b - Highway 6, south of Concession 8E, north of Parkside Dr	25	71	73	74
	50	66	68	69
	100	61	63	64
	200	56	58	59
	300	53	55	56
Link 25c - Highway 6, south of Parkside Dr	25	72	74	75
	50	67	69	70
	100	62	64	65
	200	57	59	60
	300	54	56	58
Link 11 - Campbellville Rd, east of HWY 6, west of Centre Rd	25	55	59	62
	50	50	54	57
	100	45	49	52
	200	40	44	47
	300	37	41	44
Link 1 - Centre Rd, south of Campbellville Rd, north of Concession 11E	25	52	56	58
	50	47	51	53
	100	42	46	48
	200	37	41	43
	300	34	38	40
Link 17 / Link 18 - Concession 11E, east of HWY 6, west of Milborough Line	25	46	49	51
	50	41	44	46
	100	36	39	41
	200	31	34	36
	300	28	31	33
Link 5 - Milborough Line, north of Concession 11E, south of Campbellville Rd	25	45	47	49
	50	40	42	44
	100	35	37	39
	200	30	32	34
	300	27	30	31
Link 13a - Campbellville Rd, from Milborough Line to First Line, Nassagaweya	25	54	57	59
	50	49	52	54
	100	44	47	49
	200	39	42	44
	300	36	39	41

<b>Road Segment</b>	<b>Setback (m)</b>	<b>Minimum<sup>[1]</sup> Levels (dBA)</b>	<b>Average<sup>[1]</sup> Levels (dBA)</b>	<b>Maximum<sup>[1]</sup> Levels (dBA)</b>
Link 13b - Campbellville Rd, from First Line, Nassagaweya to CNR tracks	25	55	57	59
	50	50	52	54
	100	45	47	49
	200	40	42	44
	300	37	39	41
Link 13c - Campbellville Rd, from CNR tracks to Guelph Line	25	55	57	58
	50	50	52	53
	100	45	47	48
	200	40	42	43
	300	37	39	40
Link 26 - Twiss Rd, north of Campbellville Rd, south of Reid SDRD	25	51	54	56
	50	46	49	51
	100	41	44	46
	200	36	39	41
	300	33	37	38
Link 27 - Reid SDRD, east of Twiss Rd, west of Guelph Line	25	57	59	62
	50	52	54	57
	100	47	49	52
	200	42	44	47
	300	39	41	44

**Table 2. Summary of Predicted Road Traffic Noise Levels, With and Without Haul Route Traffic**

W08-5107A Flamborough Quarry Haul Route Study

Road Segment	Speed Limit (km/hr)	Setback (m)	No-Build (Excluding Haul Routes)			Build (Including Haul Routes)		
			Existing Levels (dBA)	2021 Levels (dBA)	2031 Levels (dBA)	Existing Levels (dBA)	2021 Levels (dBA)	2031 Levels (dBA)
Link 23 - Highway 6, north of Campbellville Road	60	25	67.2	68.4	69.3	70.0	70.7	71.2
		50	62.2	63.4	64.3	65.0	65.7	66.2
		100	57.3	58.5	59.3	60.1	60.8	61.3
		200	52.3	53.5	54.3	55.1	55.8	56.3
	80	300	49.4	50.6	51.4	52.2	52.9	53.4
		25	69.5	70.7	71.6	72.1	72.8	73.3
		50	64.5	65.7	66.6	67.1	67.8	68.4
		100	59.5	60.8	61.6	62.2	62.9	63.4
Link 24 - Highway 6, south of Campbellville Road, north of Concession 10E	80	200	54.6	55.8	56.6	57.2	57.9	58.5
		300	51.7	52.9	53.7	54.3	55.0	55.6
		25	69.8	71.0	71.8	72.2	73.0	73.5
		50	64.8	66.0	66.9	67.3	68.0	68.6
	80	100	59.8	61.0	61.9	62.3	63.0	63.6
		200	54.8	56.0	56.9	57.4	58.1	58.6
		300	51.9	53.1	54.0	54.5	55.2	55.7
		25	70.1	71.3	72.2	72.4	73.2	73.8
Link 25a - Highway 6, south of Concession 10E, north of Concession 8E	80	50	65.1	66.4	67.2	67.5	68.2	68.8
		100	60.2	61.4	62.2	62.5	63.3	63.8
		200	55.2	56.4	57.3	57.6	58.3	58.9
		300	52.3	53.5	54.3	54.7	55.4	56.0
	80	25	70.7	71.9	72.8	72.8	73.6	74.2
		50	65.7	66.9	67.8	67.8	68.6	69.2
		100	60.7	61.9	62.8	62.9	63.6	64.2
		200	55.7	57.0	57.8	57.9	58.7	59.3
Link 25b - Highway 6, south of Concession 8E, north of Parkside Dr	80	300	52.8	54.0	54.9	55.0	55.8	56.4
		25	72.2	73.4	74.3	73.8	74.6	75.3
		50	67.2	68.4	69.3	68.8	69.7	70.3
		100	62.2	63.4	64.3	63.8	64.7	65.4
	80	200	57.3	58.5	59.3	58.9	59.7	60.4
		300	54.3	55.6	56.4	56.0	56.8	57.5
		25	56.6	57.1	57.6	69.6	69.6	69.7
		50	51.6	52.1	52.6	64.7	64.7	64.7
Link 11 - Campbellville Rd, east of HWY 6, west of Centre Rd	80	100	46.6	47.1	47.6	59.8	59.8	59.8
		200	41.6	42.2	42.6	54.9	54.9	54.9
		300	38.7	39.2	39.7	52.0	52.0	52.0
		25	55.4	55.9	56.4	68.7	68.8	68.8
	70	50	50.4	51.0	51.4	63.8	63.9	63.9
		100	45.4	46.0	46.4	58.9	58.9	59.0
		200	40.4	41.0	41.4	54.0	54.0	54.0
		300	37.5	38.0	38.5	51.1	51.1	51.2
Link 1 - Centre Rd, south of Campbellville Rd, north of Concession 11E	60	25	51.6	52.2	52.6	67.7	67.7	67.7
		50	46.6	47.2	47.6	62.7	62.8	62.8
		100	41.6	42.2	42.6	57.8	57.8	57.9
		200	36.6	37.2	37.6	52.9	52.9	52.9
	80	300	33.6	34.3	34.7	50.0	50.1	50.1
		25	54.3	55.0	55.4	69.5	69.5	69.5
		50	49.4	50.0	50.4	64.6	64.6	64.6
		100	44.4	45.0	45.4	59.7	59.7	59.7
Link 17 / Link 18 - Concession 11E, east of HWY 6, west of Milborough Line	50	200	39.4	40.0	40.4	54.8	54.8	54.8
		300	36.4	37.1	37.5	51.9	51.9	51.9
		25	45.9	46.9	47.2	56.8	56.9	56.9
		50	40.9	41.9	42.2	51.9	51.9	52.0
	60	100	35.9	36.9	37.2	46.9	47.0	47.0
		200	30.9	31.9	32.2	42.0	42.1	42.1
		300	28.0	29.0	29.3	39.2	39.2	39.2
		25	47.5	48.5	48.8	58.0	58.1	58.1
60	50	42.5	43.5	43.9	53.1	53.1	53.2	
	100	37.5	38.5	38.9	48.1	48.2	48.3	
	200	32.5	33.5	33.9	43.2	43.3	43.3	
	300	29.6	30.6	30.9	40.3	40.4	40.4	

Road Segment	Speed Limit (km/hr)	Setback (m)	No-Build (Excluding Haul Routes)			Build (Including Haul Routes)		
			Existing Levels (dBA)	2021 Levels (dBA)	2031 Levels (dBA)	Existing Levels (dBA)	2021 Levels (dBA)	2031 Levels (dBA)
Link 5 - Milborough Line, north of Concession 11E, south of Campbellville Rd	60	25	45.3	46.0	46.4	57.8	57.9	57.9
		50	40.3	41.0	41.4	52.9	52.9	53.0
		100	35.3	36.0	36.4	48.0	48.0	48.0
		200	30.3	31.0	31.4	43.1	43.1	43.1
		300	27.4	28.1	28.5	40.2	40.2	40.3
Link 13a - Campbellville Rd, from Milborough Line to First Line, Nassagaweya	60	25	54.3	54.7	55.1	67.8	67.8	67.8
		50	49.3	49.7	50.1	62.8	62.9	62.9
		100	44.3	44.7	45.1	57.9	57.9	58.0
		200	39.3	39.7	40.1	53.0	53.0	53.0
		300	36.3	36.8	37.2	50.1	50.2	50.2
Link 13b - Campbellville Rd, from First Line, Nassagaweya to CNR tracks	60	25	54.7	55.1	55.5	67.8	67.8	67.8
		50	49.7	50.1	50.5	62.9	62.9	62.9
		100	44.7	45.1	45.6	57.9	58.0	58.0
		200	39.7	40.1	40.6	53.0	53.1	53.1
		300	36.8	37.2	37.6	50.2	50.2	50.2
Link 13c - Campbellville Rd, from CNR tracks to Guelph Line	60	25	55.0	55.4	55.8	67.8	67.8	67.8
		50	50.0	50.4	50.8	62.9	62.9	62.9
		100	45.0	45.4	45.8	58.0	58.0	58.0
		200	40.0	40.4	40.8	53.0	53.1	53.1
		300	37.1	37.5	37.9	50.2	50.2	50.2
Link 26 - Twiss Rd, north of Campbellville Rd, south of Reid SDRD	60	25	51.2	51.8	52.3	66.9	66.9	66.9
		50	46.2	46.9	47.3	62.0	62.0	62.0
		100	41.2	41.9	42.3	57.0	57.1	57.1
		200	36.2	36.9	37.3	52.1	52.1	52.2
		300	33.3	33.9	34.4	49.3	49.3	49.3
Link 27 - Reid SDRD, east of Twiss Rd, west of Guelph Line	80	25	59.1	59.7	60.2	69.8	69.8	69.9
		50	54.1	54.8	55.2	64.9	64.9	65.0
		100	49.1	49.8	50.2	59.9	60.0	60.0
		200	44.1	44.8	45.2	55.0	55.1	55.1
		300	41.2	41.9	42.3	52.1	52.2	52.3
	60	25	56.7	57.4	57.8	67.9	68.0	68.0
		50	51.8	52.4	52.9	63.0	63.0	63.1
		100	46.8	47.5	47.9	58.1	58.1	58.2
		200	41.8	42.5	42.9	53.2	53.2	53.3
		300	38.9	39.6	40.0	50.3	50.3	50.4

**Table 3. Noise Analysis Matrix**

W08-5107A Flamborough Quarry Haul Route Study

Notes:

1. Quantitative Noise Evaluation score is calculated as follows:

- Number of Residences in 3 to 5 dB category x 1
- + Number of Residences in 5 to 10 dB category x 3
- + Number of Residences in > 10 dB category x 6
- + Number of Schools, Daycares, and Senior Housings x 100
- + Number of Places of Worship x 50

Evaluation Score

For Alternative 3, does not include 60 truck movements per day along Highway 6, as this represents an negligible increase over existing conditions

For Alternatives 1, 2, 4 and 5, does not include the United Church of Hamilton (1552 Hwy 6) as changes are insignificant in this area

2. Industrial and agricultural not included.

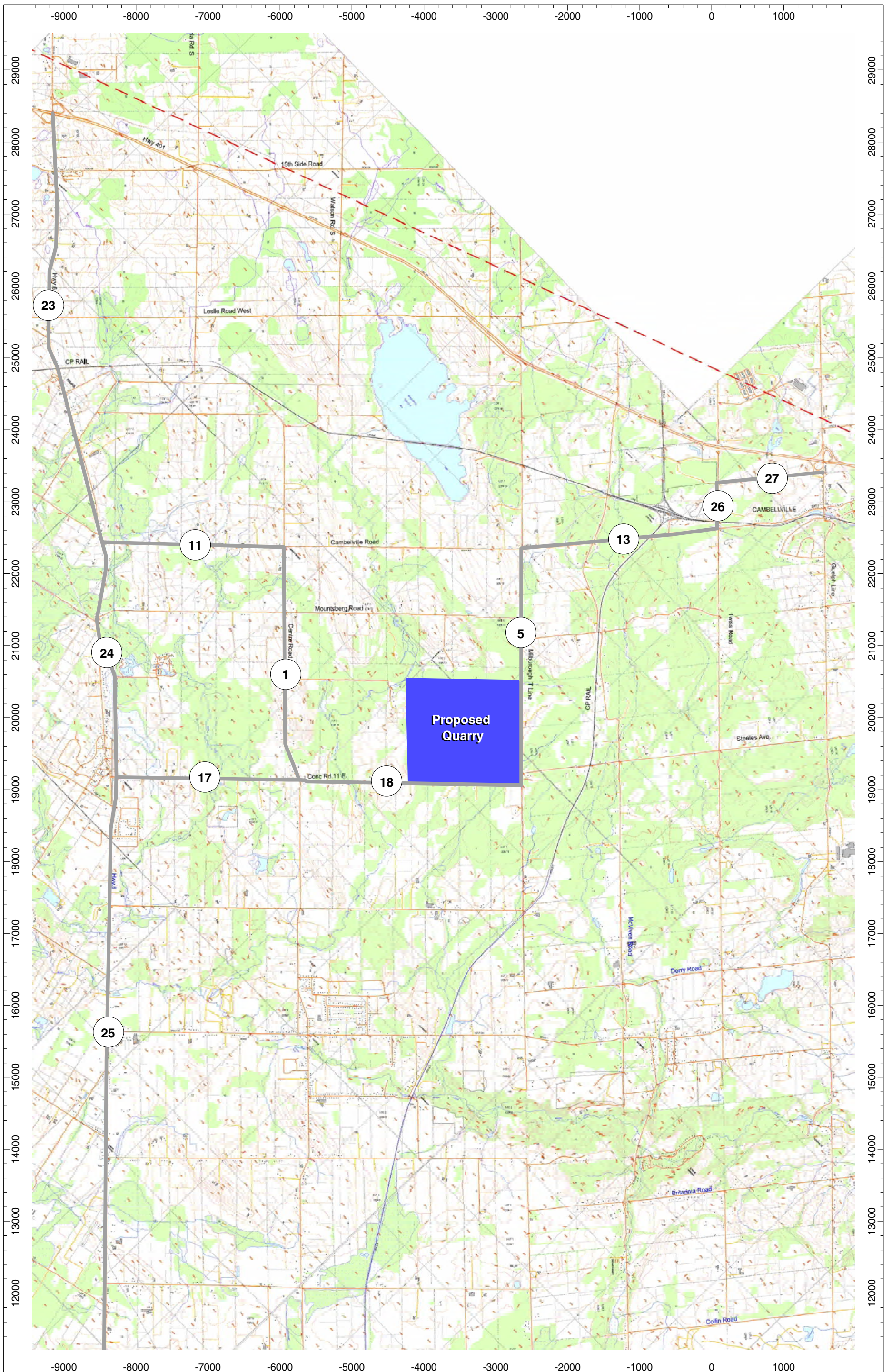
3. Does not include businesses along Highway 6. Due to existing background traffic, changes due to the proposal will be insignificant at all businesses along Highway 6 portions of the haul routes.

Criteria	Indicators	Alternative Haul Route 1	Alternative Haul Route 2	Alternative Haul Route 3	Alternative Haul Route 4	Alternative Haul Route 5
Noise Impacts on Community	Number of residences experiencing changes in noise levels:					
	0 to 3 dB	1037	998	12	809	1085
	> 3 to 5 dB	85	85	0	85	85
	> 5 to 10 dB	30	48	83	107	125
	> 10 dB	57	75	42	99	117
	Number of Schools, Daycares, Senior Housing on route	0	1 Mountsberg Community Centre	0	0	1 Mountsberg Community Centre
	Number of Churches or Places of worship on route <sup>[1]</sup>	1 Seventh Day Adventist	2 Seventh Day Adventist Mountsberg Baptist	1 St. David's Presbyterian	2 St. David's Presbyterian Seventh Day Adventist	3 St. David's Presbyterian Seventh Day Adventist Mountsberg Baptist
	Relative Evaluation Score <sup>[1]</sup>	567	879	551	1100	1412
Noise Impacts on Businesses	Number of businesses expected to experience increases in noise levels over future baseline <sup>[2, 3]</sup>	3	22	8	11	30

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## **FIGURES**

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**Study Area, Showing Potential Haul Route Links**

Flamborough Quarry Haul Route Study - Flamborough, Ontario

True North



Project #W08-5107

Drawn by: KAC

Figure: **1**

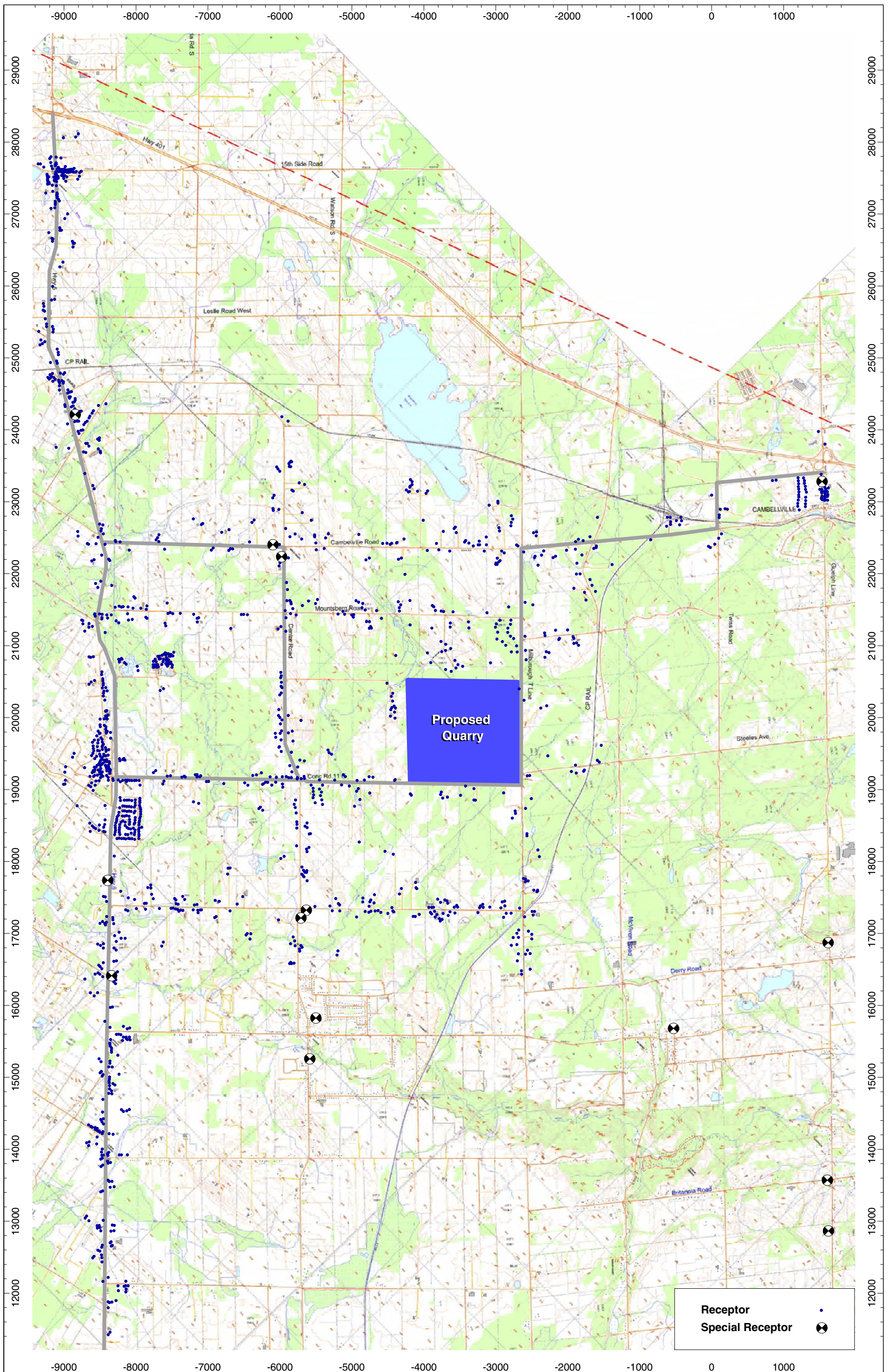
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Date:

July 10, 2008





Receptor •  
 Special Receptor ⊗

**Study Area, Showing Noise Sensitive Receptors**

Flamborough Quarry Haul Route Study - Flamborough, Ontario

True North



Project #W08-5107

Drawn by: KAC	Figure: 2
Scale: 1:50000	
Date: July 10, 2008	



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# **APPENDIX A**

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## **Transportation Sound Basics**

# 1. TRANSPORTATION SOUND BASICS

## 1.1 Sound Levels

Sound is, in its simplest form, a dynamic, fluctuating pressure, in a fluid medium. That medium can be air, other gases, or liquids such as water. These fluctuations are transmitted by pressure waves through the medium from the source to the receiver. For the majority of transportation engineering purposes, the primary interest is with sound waves in air, with human beings as the receptor. Noise is defined as unwanted sound. The standard practice within the acoustical industry is to use these two terms interchangeably.

### 1.1.1 Decibels

A decibel (dB) is a logarithmic ratio of a value to a reference level. The general mathematical format is:

$$\text{Level in dB} = 10 \log (\text{Value} / \text{Reference})$$

Any value can be expressed in decibels. Decibels are very, very useful in performing comparisons where there are huge ranges in levels. For example, an acoustical engineer can expect to deal with acoustical energy values ranging from 0.00001 W to 100 W (sound power), and pressures ranging from 0.002 Pa to 200 Pa (sound pressure).<sup>1</sup> For completeness, decibels should always be stated with their reference level (e.g., 20 dB re: 20  $\mu$ Pa). However, in practice the reference level is often left out.

### 1.1.2 Sound Pressure Level

Sound pressure level is what humans experience as sound. Sound waves create small fluctuations around the normal atmospheric pressure. These pressure fluctuations come into contact with eardrums and create the sensation of sound. Sound pressure is measured in decibels, according to the following equation:

$$\text{Sound Pressure Level, dB} = 10 \log (p^2 / p_0^2)$$

Where:  $p$  = root mean square (r.m.s.) sound pressure, in Pa  
 $p_0$  = reference sound pressure, 20  $\mu$ Pa

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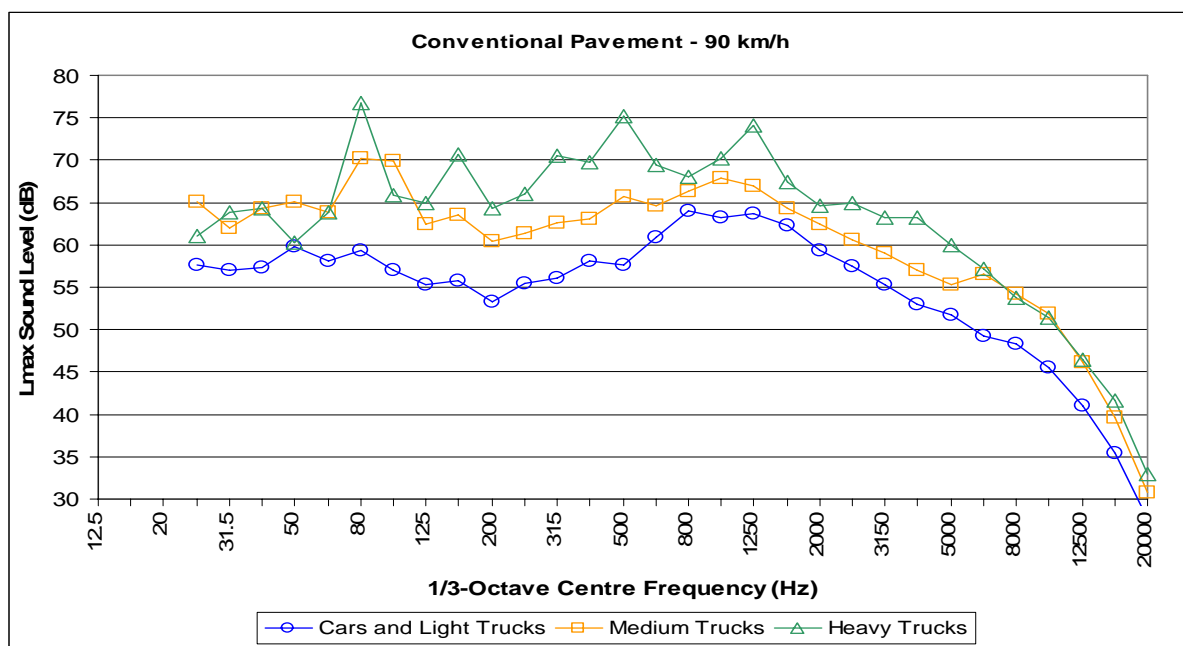
<sup>1</sup> Equivalent to Sound Power Levels ranging from 70 to 140 dB and Sound Pressure Levels ranging from 20 dB to 140 dB

The reference pressure represents the faintest sound that a “typical” human being can hear. The typical abbreviation for sound pressure level is SPL, although  $L_p$  is also often used in equations. “Sound level” or “noise level” are also sometimes used.

## 1.2 Octave Bands

Sounds are composed of varying frequencies or pitches. Human sensitivity to noise varies by frequency, with a greater sensitivity to higher frequency sounds. The propagation of sound also varies by frequency. The unit of frequency is Hertz (Hz), which refers the number of cycles per second (number of wave peaks per second of the propagating sound wave). The typical human hearing response runs from 20 Hz to 20,000 Hz. Frequencies below 20 Hz are generally inaudible, although response is variable, and some individuals may be able to hear or perceive them.

Sound is typically analysed in octave bands or 1/3-octave bands. An octave band is defined as a band or range of sound frequencies where the frequency range doubles for succeeding octave (alternately, the highest frequency in the range is twice the value of the lowest frequency). Octave band and 1/3-octave band frequencies of interest frequencies of interest are shown in the table on the following page. Road and rail transportation noise sources tend to be broadband in nature, having roughly equal sound energy in many octave bands. Heavy rail traffic and heavy truck traffic may produce significant noise in lower frequencies < 200 Hz.



**Figure 1:** Typical Frequency Spectra of Traffic Noise - Vehicle Pass-bys at 90 km/h

**Table 1: Octave Band Frequencies of Interest**

Centre-Frequency (Hz)		Band No.	Frequency Range (Hz)	
1/3-Octave	1/1-Octave			
12.5	16	N/A	11 to 22	
16				
20				
25	31.5	0	22 to 45	
31.5				
40				
50	63	1	45 to 89	
63				
80				
100	125	2	89 to 177	
125				
160				
200	250	3	177 to 345	
250				
315				
400	500	4	345 to 707	
500				
630				
800	1,000	5	707 to 1,414	
1,000				
1,250				
1,600	2,000	6	1,414 to 2,828	
2,000				
2,500				
3,150	4,000	7	2,828 to 5,657	
4,000				
5,000				
6,300	8,000	8	5,657 to 11,314	
8,000				
10,000				
12,500	16,000	N/A	11,314 to 22,627	
16,000				
20,000				

Note: Per ISO 266-1975

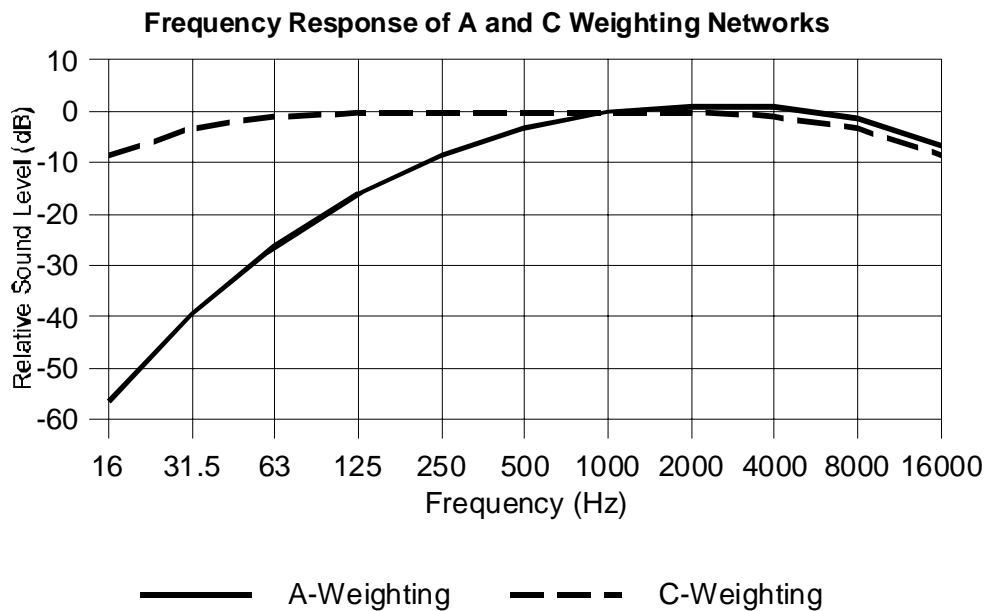
### 1.3 A-Weighting

When the overall sound pressure level is expressed as a single value (i.e., not expressed in frequency band levels) the variation in human frequency response must be accounted for. People do not hear low frequency noise as well as noise in mid or high frequencies. To account for this, frequency-weighting networks have been developed to better account for human hearing response. The most frequently used networks are the A-Weighting and C-Weighting.

The A-Weighting network was developed to correspond to how humans hear low to medium levels of noise. The A-Weighting is the most frequently used scheme, and the majority of noise guidelines are expressed in A-Weighted decibel values, denoted as “dBA” levels. C-Weighted “dBC” values are sometimes used in assessing low-frequency noise impacts, which are generally not of concern in transportation noise impact assessment. The A-Weighting and C-Weighting values are shown in the following table and figure.

**Table 2:** A- and C-Weighting Values

1/1-Octave Frequency (Hz)	A-Weighting Value (dB)	C-Weighting Value (dB)
31.5	-39.4	-3.0
63	-26.2	-0.8
125	-16.1	-0.2
250	-8.6	0
500	-3.2	0
1,000	0	0
2,000	1.2	-0.2
4,000	1.0	-0.8
8,000	-1.1	-3.0



**Figure 2:** A-Weighting and C-Weighting Networks

## 1.4 Ranges of Sound Levels

People experience a wide range of sound levels in their daily activities. The table below presents a graphical comparison of “typical” noise levels which might be encountered, and the general human perception of the level.

**Table 3: Ranges of Sound Levels**

Sound Levels		Sources of Noise
Human Perception	SPL, in dBA	
Deafening	125	Sonic booms
	120	Threshold of Feeling / Pain
	115	Maximum level, hard rock band concert
	110	Accelerating Motorcycle at a few feet away
Very Loud	105	Loud auto horn at 3 m (10 ft) away
	100	Dance club / maximum human vocal output at 1 m (3 ft) distance
	95	Jack hammer at 15 m (50 ft) distance
	90	Indoors in a noisy factory
Loud	85	Heavy truck pass-by at 15 m (50 ft) distance
	80	School cafeteria / noisy bar; Vacuum Cleaner at 1.5 m (5 ft)
	75	Near edge of major Highway
	70	Inside automobile at 60 km/h
	65	Normal human speech (unraised voice) at 1 m (3 ft) distance
Moderate	60	Typical background noise levels in a large department store
	55	General objective for outdoor sound levels; typical urban sound level (24h)
	50	Typical suburban / semi-rural sound level (24h)
	45	Typical noise levels in an office due to HVAC; typical rural levels (24h)
Faint	40	Typical background noise levels in a library
	35	
	30	Broadcast Studio
	25	Average whisper
Very Faint	20	Deep woods on a very calm day
	15	
	10	
	5	Human breathing
	0	Quietest sound that can be heard

Sound levels from 40 to 65 dBA are in the faint to moderate range. The vast majority of the outdoor noise environment, even within the busiest city cores, will lie within this area. Sound levels from 65 to 90 are perceived as loud. This area includes very noisy commercial and industrial spaces. Sound levels greater than 90 dB are very loud to deafening, and may result in hearing damage.

Transportation noise events, which vary with time, can also be considered in terms of their maximum noise level ( $L_{max}$ ) during a vehicle pass-by, as shown in the following table:

**Table 4:** Typical Pass-By Noise Levels at 15 m from Noise Source

Event	Range of Noise Levels (dBA) at 15 m
Semi-Trailer Trucks	75 - 85
Aircraft	69 - 85 <sup>[1]</sup>
Conventional Light Rapid Transit (Streetcars)	72 - 80 <sup>[2]</sup>
Large Trucks	71 - 78
Street Motorcycle	76
Diesel or Natural Gas Bus	70 - 78
Trolley Bus	69 - 73
Small Motorcycle	67
General Busy Auto Traffic	66 - 70
Individual Automobiles	63 - 69

Notes: Source: BKL Consultants Ltd.

[1] Aircraft flyover not at 15 m distance

[2] Based on data provided for the Calgary, Edmonton and Portland LRT systems.

## 1.5 Noise Descriptors – $L_{eq}$ Values

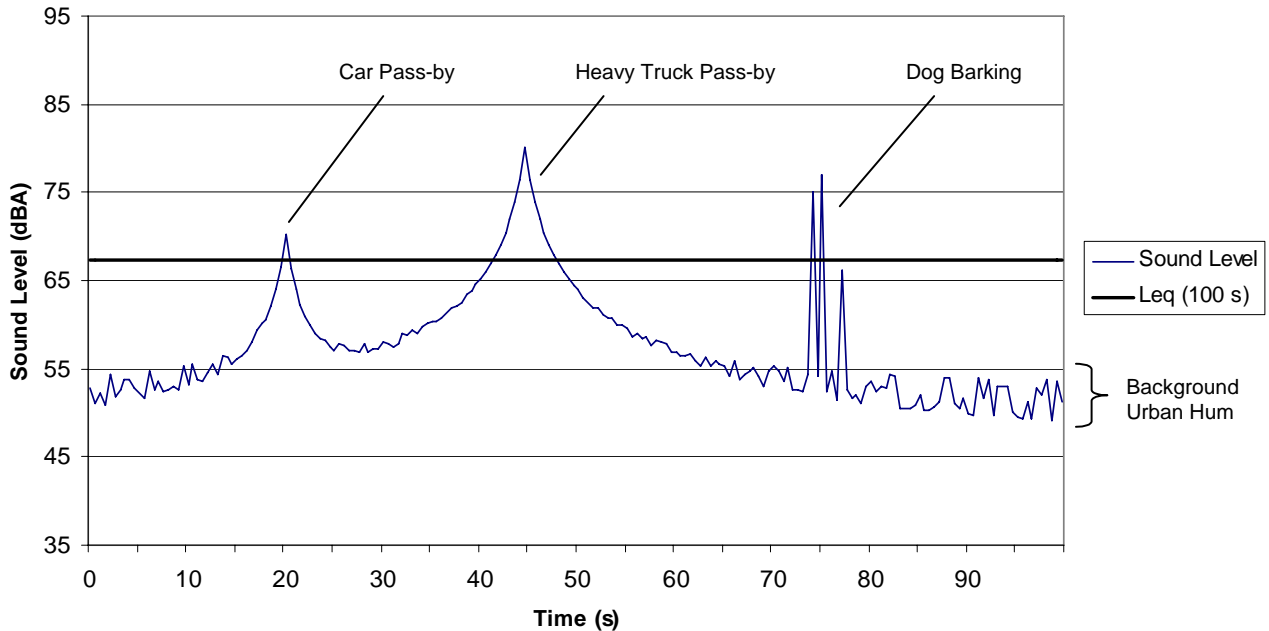
At this time, the best available research indicates that long-term human responses to noise are best evaluated using energy equivalent sound exposure levels ( $L_{eq}$  values), in A-Weighted decibels ( $L_{eq}$  values in dBA)<sup>2, 3</sup> including adjustments to account for particularly annoying characteristics of the sounds being analyzed.

Sound levels in the ambient environment vary each instant. In a downtown urban environment, the background noise is formed by an “urban hum”, composed of noise from distant road traffic and from commercial sources. As traffic passes near a noise receptor, the instantaneous sound level may increase as a vehicle approaches, and then decrease as it passes and travels farther away. The energy equivalent sound exposure level  $L_{eq}$  is the average sound level over the same period of time with same acoustical energy as the actual environment (i.e., it

<sup>2</sup> Berglund and Lindvall, Community Noise, 1995.

<sup>3</sup> ISO 1996:2003(E), *Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures.*

is the average of the sound energy measured over a time period T). As a time-average, all  $L_{eq}$  values must have a time period associated with them. This is typically placed in brackets beside the  $L_{eq}$  tag. For example, a thirty-minute  $L_{eq}$  measurement would be reported as an  $L_{eq}$  (30 min) value. The  $L_{eq}$  concept is illustrated in Figure 3, showing noise levels beside a small roadway, over a 100 second time period, with two vehicle pass-bys:



**Figure 3:** Example of the  $L_{eq}$  Concept

In this example, the background “urban hum” is between 47 and 53 dBA. A car passes by at 20 seconds. As it approaches, the noise level increases to a maximum, and then decreases as it speeds away. At 45 seconds, a heavy truck passes by. Near 75 seconds, a dog barks three times. The maximum sound level ( $L_{max}$ ) over the period is 80 dBA and the minimum is 47 dBA. For almost 50% of the time, the sound level is lower than 55 dBA.

The  $L_{eq}$  (100s) for the above example is 67 dBA, which is much higher than the statistical mean sound level of 55 dBA. This illustrates that the  $L_{eq}$  value is very sensitive to loud noise events, which contain much more sound energy (as sound is ranked on a logarithmic scale) than the normal background. It is also sensitive to the number of events during the time period, and the duration of those events. If only the truck had passed by during the measurement (no car and no dog barks), the  $L_{eq}$  (100s) would be 66 dBA. If only the car and dog barks had occurred, the  $L_{eq}$  (100s) would have been 61 dBA. This shows that the truck pass-by is the dominant event in our example, due to its level and duration.

The ability of the  $L_{eq}$  metric to account for the three factors of level, duration and frequency of events makes it a robust predictor of human response to noise. It is for this reason that the vast majority of noise standards are based on  $L_{eq}$  values.

## 1.6 Typical Durations for $L_{eq}$ Analyses

For transportation noise impact analyses, the following durations are typically used:

$L_{eq}$ (24h)	–	The sound exposure level over then entire 24-hour day
$L_{eq}$ Day	–	Either: $L_{eq}$ (15h), from 7am to 10 pm; or $L_{eq}$ (16h), from 7am to 11 am
$L_{eq}$ Night	–	Either: $L_{eq}$ (9h), from 10 pm to 7 am; or $L_{eq}$ (8h), from 11 pm to 7 am
$L_{dn}$	–	A special $L_{eq}$ (24h) value with a 10 dB night-time penalty applied to overnight sound levels (10pm to 7am)
$L_{eq}$ (1-h)	–	The sound exposure over a 1-hour time period

$L_{eq}$  (24h) values are appropriate for examining impacts of transportation noise sources with small changes in sound exposure levels over the 24-hour day. For example, freeway noise levels are generally consistent over the 24-hour day. Therefore, for freeways, there is little difference between  $L_{eq}$  (24h) values and the corresponding  $L_{eq}$  Day and  $L_{eq}$  Night values.

$L_{eq}$  Day values, covering off the AM-peak and PM-peak travel periods, are generally appropriate for examining the impacts of non-freeway highways and municipal arterial roadways. The vast majority of noise associated with these sources is concentrated in the daytime hours, where typically, 85% to 90% of the daily road traffic will occur.<sup>4</sup> Thus, if reasonable sound levels occur during the daytime (and appropriate guideline limits are met), they will also occur (and be met) at night.

To account for increased annoyance with noise overnight in a single value, the U.S. Environmental Protection Agency (U.S. EPA) developed the  $L_{dn}$  metric. It is a special form of the  $L_{eq}$  (24h) with a +10 dB night-time penalty.  $L_{dn}$  values and a related metric, the day-evening-night level ( $L_{den}$ ) are also used in some European guidelines.  $L_{dn}$  values are not used in Canadian

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<sup>4</sup> Based on research conducted by Ontario Ministry of Transportation, and provided in the *MTO Environmental Office Manual Technical Areas – Noise*. Daytime refers to a 16 hour day from 7am to 11 pm.

Provincial jurisdictions in evaluating transportation noise. Instead, guideline limits for separate  $L_{eq}$  Day and  $L_{eq}$  Night periods are generally used.

$L_{eq}$  (1-h) values are the average sound levels over a one-hour time period. These tend to fluctuate more over the day, as traffic levels can fluctuate significantly hour to hour.  $L_{eq}$  (1-h) values are useful in assessing the impact of transportation sources which also vary hourly, and which may vary in a different manner than the background traffic. These values are often used to assess haul route noise impacts, for example.

Some transportation noise sources may have significant traffic levels occurring over-night. For example, freight rail traffic in heavily used corridors can be shifted to over-night periods, with daytime track use being reserved for freight switcher traffic and passenger traffic. In situations such as this, an assessment of both daytime and night-time noise impacts may be appropriate.

## 1.7 Decibel Addition

Decibels are logarithmic numbers, and therefore have special properties of addition. Decibel values must be added logarithmically. If two sources, each emitting the same amount of sound energy, are placed side-by-side, then the total increase in sound level will only be 3 dB. If the difference in sound energy emitted is greater than 10 dB, then effectively the sound level will be the same as for the loudest unit (i.e., the increase in noise will be less than a decibel). This is shown in Table 5:

**Table 5:** Decibel Addition Chart

dB Difference Of	dB Value to Add to Highest Number
0	3.0
1	2.5
2	2.1
3	1.8
4	1.5
5	1.2
6	1.0
7	0.8
8	0.6
9	0.5
10	0.4

This affects transportation noise from projects, as noise emission is logarithmically related to traffic volume. Doubling the traffic volume (essentially the same as adding a source with the same sound emission) will only result in a 3 dB increase over the original levels. The decibel increase in noise due to the increase in traffic volume, assuming all other factors remain the same, can be estimated by:

$$\text{dB increase} = 10 \log (\text{new volume} / \text{original volume}).$$

## 1.8 Human Response to Changes in Sound Levels

The human ear does not interpret changes in sound level in a linear manner. The general subjective human perception of changes in sound level is shown in the following table.

**Table 6:** Subjective Human Perception of Changes in Sound Level <sup>5,6</sup>

Change in Broadband Sound Level (dB)	Human Perception of Change
< 3	Imperceptible change
3	Just-perceptible change
4 to 5	Clearly noticeable change
6 to 9	Substantial change
> 10 and more	Very substantial change (half or twice as loud)
> 20 and more	Very substantial change (much quieter or louder)

Notes: Adapted from Bies and Hansen, p53, and MOE Noise Guidelines for Landfill Sites, 1998. Applies to changes in broadband noise sources only (i.e., increases or decreases in the same noise or same type of noise only). Changes in frequency content or the addition of tonal or temporal changes would affect the perception of the change.

The above table is directly applicable to changes in sound level where the noise sources are of the same general character. For example, existing road traffic noise levels can be directly compared to future road traffic noise levels, using the above relationships. In comparing road traffic noise to road plus rail traffic noise, the different frequency and temporal nature of the noise means that the rail noise may be more noticeable. Adjustments for the nature of the new sound can be applied to better account for temporal and frequency differences.

<sup>5</sup> Bies, D.A., and C.H. Hansen 1988. *Engineering Noise Control – Theory and Practice*, 2<sup>nd</sup> Ed. E & FN Spon, London, p 53.

<sup>6</sup> Ontario Ministry of the Environment 1998. Noise Guidelines for Landfill Sites. Queen’s Printer for Ontario.

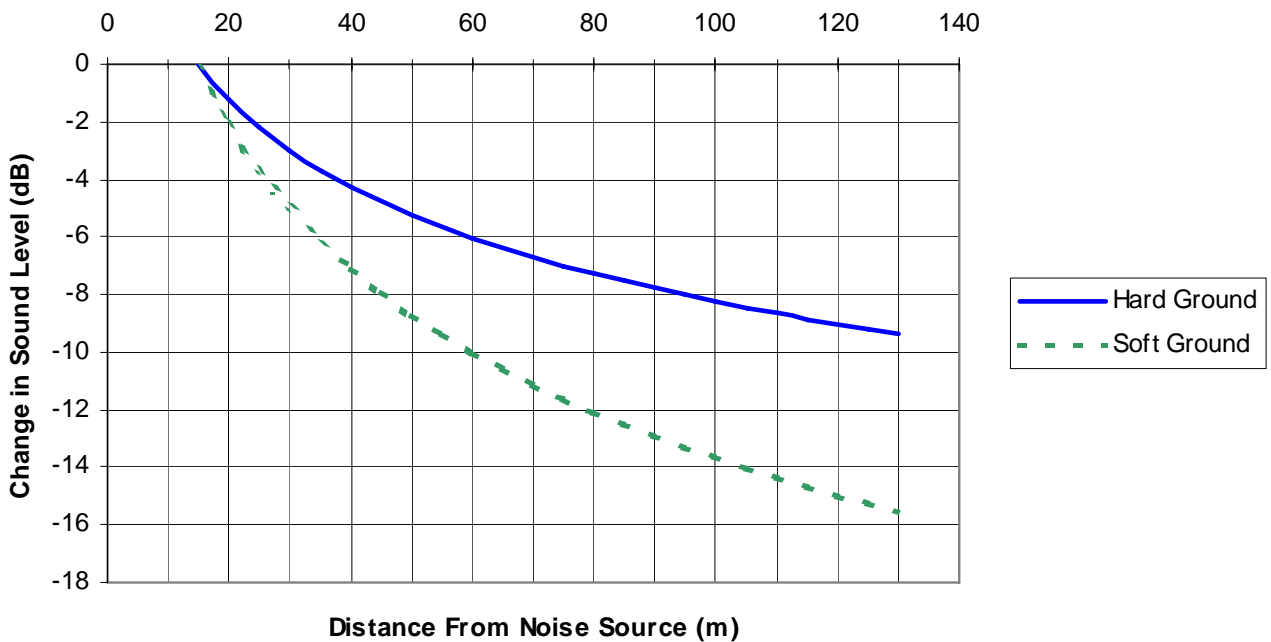
For transportation noise sources, research conducted by the U.S. Environmental Protection Agency indicates that a 5 dB change in sound levels is required to trigger a change in large-scale community response to noise. This correlates to a clearly noticeable increase in noise levels.

### 1.9 Decay of Noise with Distance

Noise levels decrease with increasing distance from a source of noise. The rate of decay is partially dependent on the nature of the ground between the source: whether it is hard (acoustically reflective) or soft (acoustically absorptive). Transportation noise sources in general act as *line sources* of sound. For line sources, the rate of decay is approximately:

- Hard ground: 3 dB for each doubling of distance from the source
- Soft ground: 5 dB for each doubling of distance from the source

This is shown graphically in Figure 6, based on a reference distance of 15 m from the source:



**Figure 4:** Decay of Noise Versus Distance for Line Sources

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## **APPENDIX B**

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### **Cross-Section Design And Analysis**

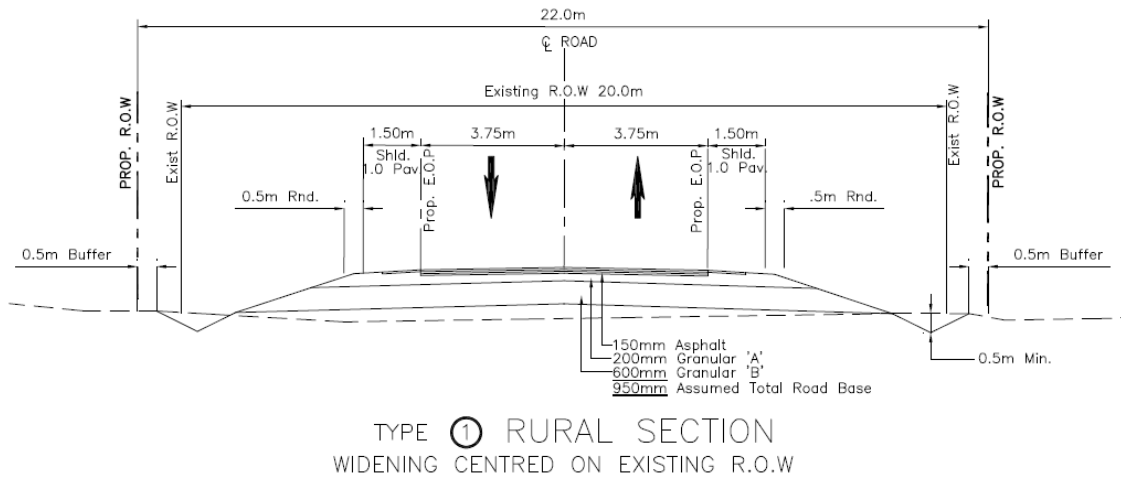
# CROSS-SECTION DESIGN AND ANALYSIS

For this study two types of cross-sections are proposed: rural (requires property acquisition) and urban (within the existing right-of-way). For the purpose of the analysis the rural cross-section was applied as it has the most significant impacts due to property acquisition and was therefore deemed more conservative. However, given the challenges that can be associated with land acquisition, the urban design that fits the existing right-of-way was also given consideration. It was concluded that this design would not require land acquisition however it would have a more significant impact on the existing character of the road and has a higher associated cost of construction.

Figure 1, Figure 2, Figure 3, and Figure 4 illustrate the proposed road bed design and shows rural and urban alternative cross-sections for both Type 1 and Type 3 sections.

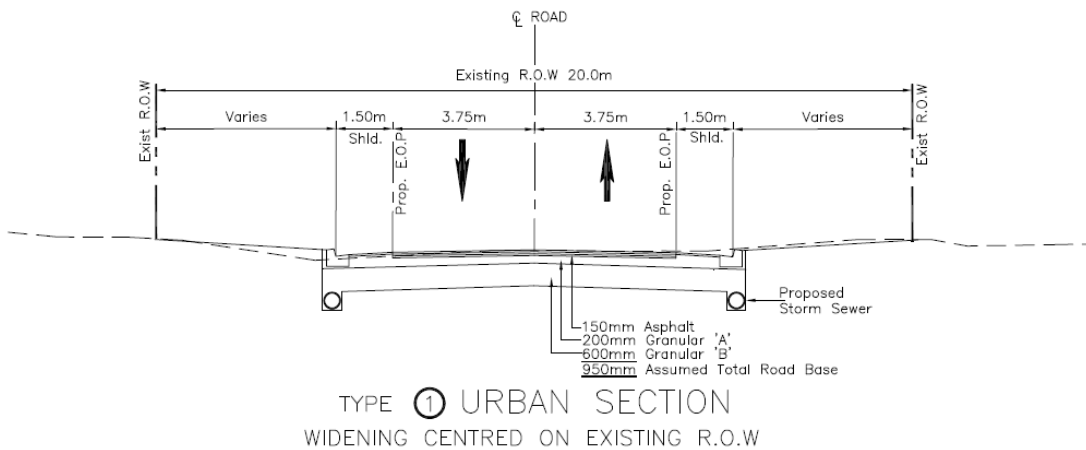
## Type 1

With the rural cross-section the proposed right-of-way is 2.0m greater than the existing 20m right of way. This cross-section allows for 3.75m travel lanes, 1.0m paved shoulder, 0.5m gravel shoulder, 0.5m rounding, and a drainage ditch.



**Figure 1: Type 1 Rural Cross-Section**

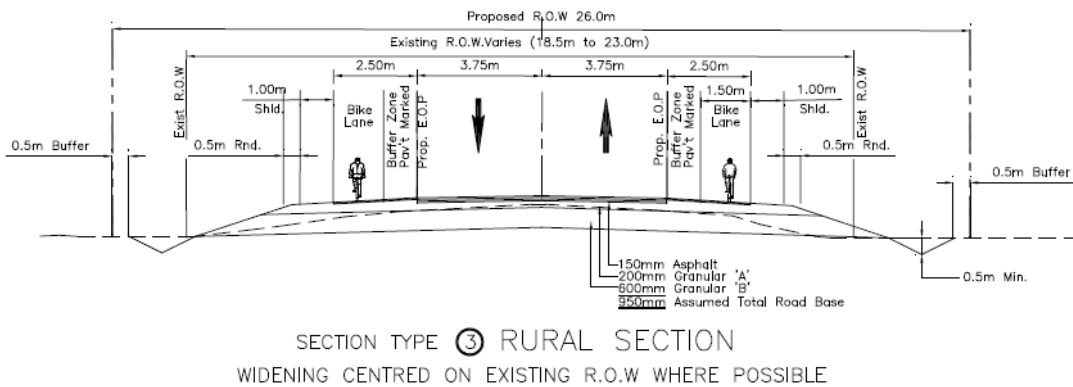
With the urban cross-section the proposed right-of-way fits into the existing 20m right-of-way. The cross-section allows for 3.75m travel lanes, and a 1.5m paved shoulder with curb and gutter.



**Figure 2: Type 1 Urban Cross-Section**

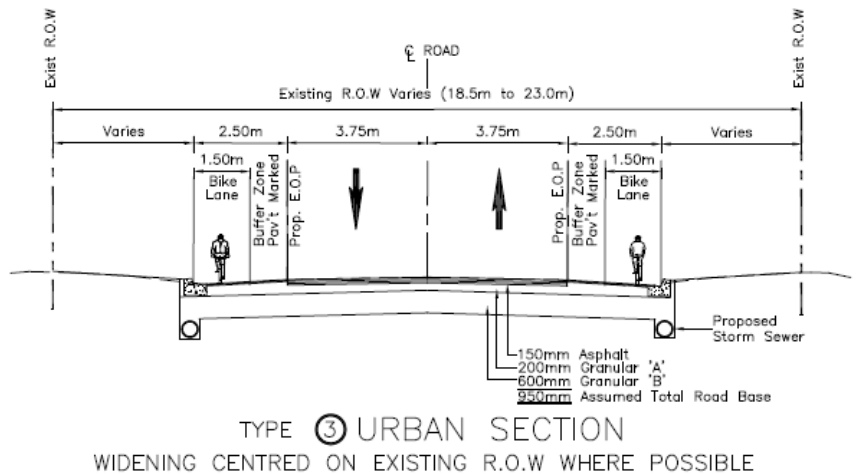
**Type 3**

With the rural cross-section the proposed right-of-way is 3m to 7.5m greater than the existing right-of-way depending on the varying existing cross-section. This cross-section allows for 3.75m travel lanes, 1.0m paved buffer, 1.5m paved bike lane, 1.0m gravel shoulder, 0.5m rounding, a drainage ditch and a 0.5m buffer.



**Figure 3: Type 3 Rural Cross-Section**

With the urban cross-section the proposed right-of-way can be fit into the existing right-of-way that varies from 18.5m to 23m. The cross-section allows for 3.75m travel lanes, a 1.0m paved buffer, a 1.5m paved bike lake, and curb and gutter with a minimum boulevard of 3m.



**Figure 4: Type 3 Urban Cross-Section**

It is important to note that both Type 1 and Type 3 section designs do not account for any changes in the existing profile and assume that widening is at existing profile grade.

While the urban cross-section fits into the existing right-of-ways, the storm sewer infrastructure and appurtenances increase the construction costs approximately 50 percent over the rural design. It is a trade off between the cost (and challenge) of purchasing land and constructing a more expensive infrastructure.

Applying the rural cross-section that would require land acquisition is a conservative approach for haul route comparative evaluation purposes. The decision on which cross-section to move forward with would be decided at the detailed design stage of an Environmental Assessment when pavement recommendations are finalized. Typically, resolution of the design details would occur during the subsequent Municipal Class EA process.

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## **APPENDIX C**

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# **Road Traffic Noise Analysis**

## **Example Calculation of Quantitative Noise Scores**

## Example Calculation of Quantitative Noise Evaluation

The following example shows the calculation of the quantitative noise calculation results shown in Table 3. Haul Route Alternative 1 is shown. Values for the other alternative were calculated in a similar manner.

Alternative 1 consists of the following routes links:

- Alternative Route 1 (Links 17, 18, 23, 24, and 25);

These Links are:

- Link 17: Concession 11 from Highway 6 to Centre Road
- Link 18: Concession 11 from Centre Road to Milborough Line
- Link 23: Highway 6 from Highway 401 to Campbellville Road
- Link 24: Highway 6 from Campbellville Road to Concession 11
- Link 25: Highway 6 from Concession 11 to Highway 403

This is shown graphically on the following page.

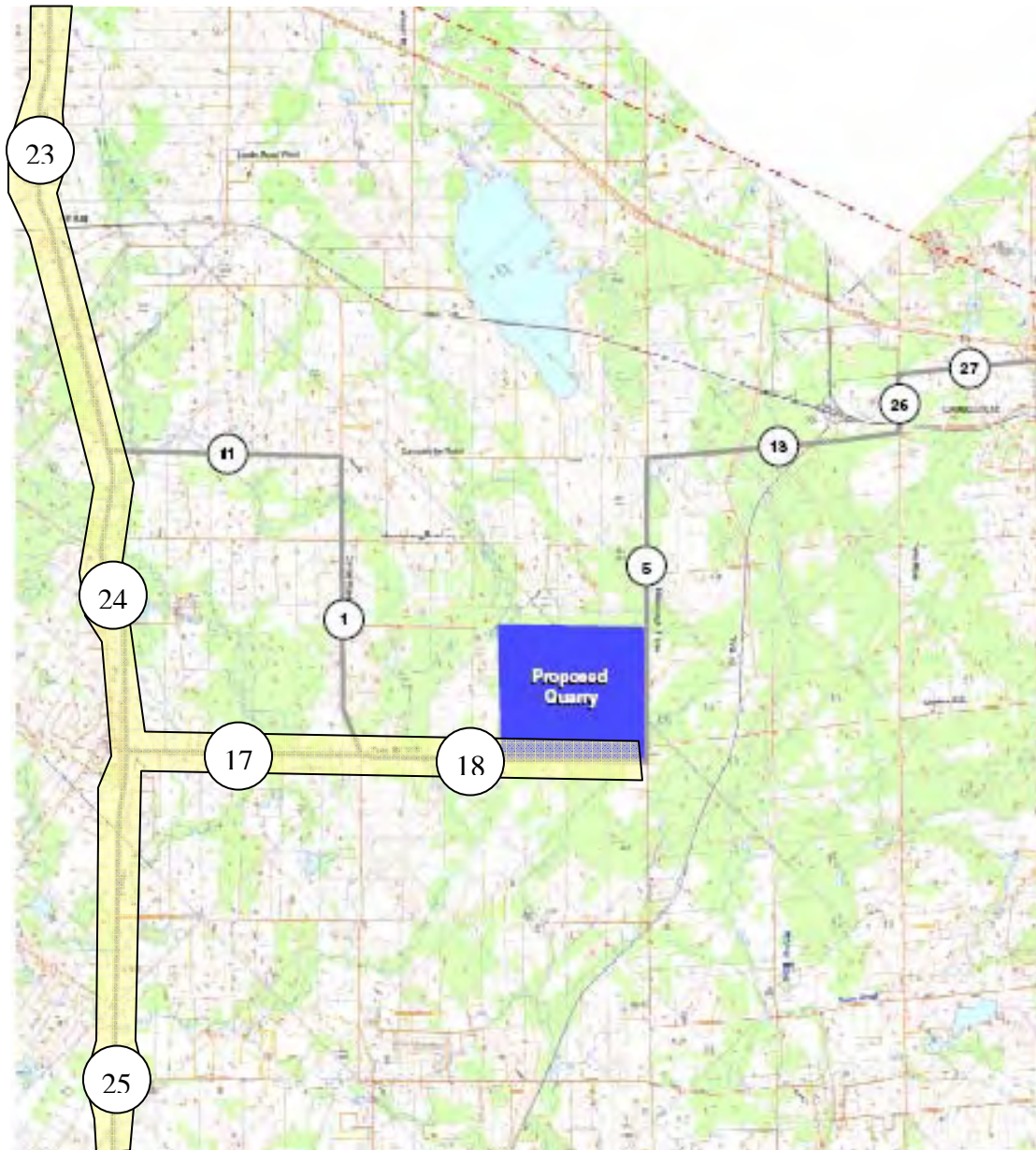
### Noise Modelling

For Links 17 and 18 (Concession 11):

Link	Speed (km/h)	Dist From Roadway (m)	Modelled No-Build Road Traffic Noise [1]	Resulting No-Build (Incl. 45 dBA Ambient) [2]	Modelled Build Road Traffic Noise [3]	Resulting Build (Incl. 45 dBA Ambient) [4]	Difference Build – No-Build [5]
Col. 1	2	3	4	5	6	7	8
17/18	50	25	45.9	45.9	56.8	56.8	10.9
		50	40.9	45	51.5	51.5	6.5
		100	35.9	45	46.9	46.9	1.9
		200	30.9	45	42.0	45	0
		300	28.0	45	39.2	45	0
	60	25	47.5	47.5	58.0	58.0	10.5
		50	42.5	45	53.1	53.1	8.1
		100	37.5	45	48.1	48.1	3.1
		200	32.5	45	43.2	45	0
		300	29.6	45	40.3	45	0

#### Notes:

- [1] Modelled noise due to existing road traffic along the road, at various setback distances and speeds. ORNAMNET modelling results are presented in this Appendix and are summarized in Table 2 of the main report (Table 2 Column 4).
- [2] Higher of 45 dBA (rural background ambient) or the modelled road traffic noise level in Column 1
- [3] Modelled noise due to existing road traffic along the road, plus haul route trucks, at various setback distances and speeds. ORNAMNET modelling results are presented in this Appendix and are summarized in Table 2 of the main report (Table 2 Column 7)
- [4] Higher of 45 dBA (rural background ambient) or the modelled road traffic noise level in Column 3
- [5] Column 2 minus Column 4.



***Links Which Comprise Haul Route Alternative 1***

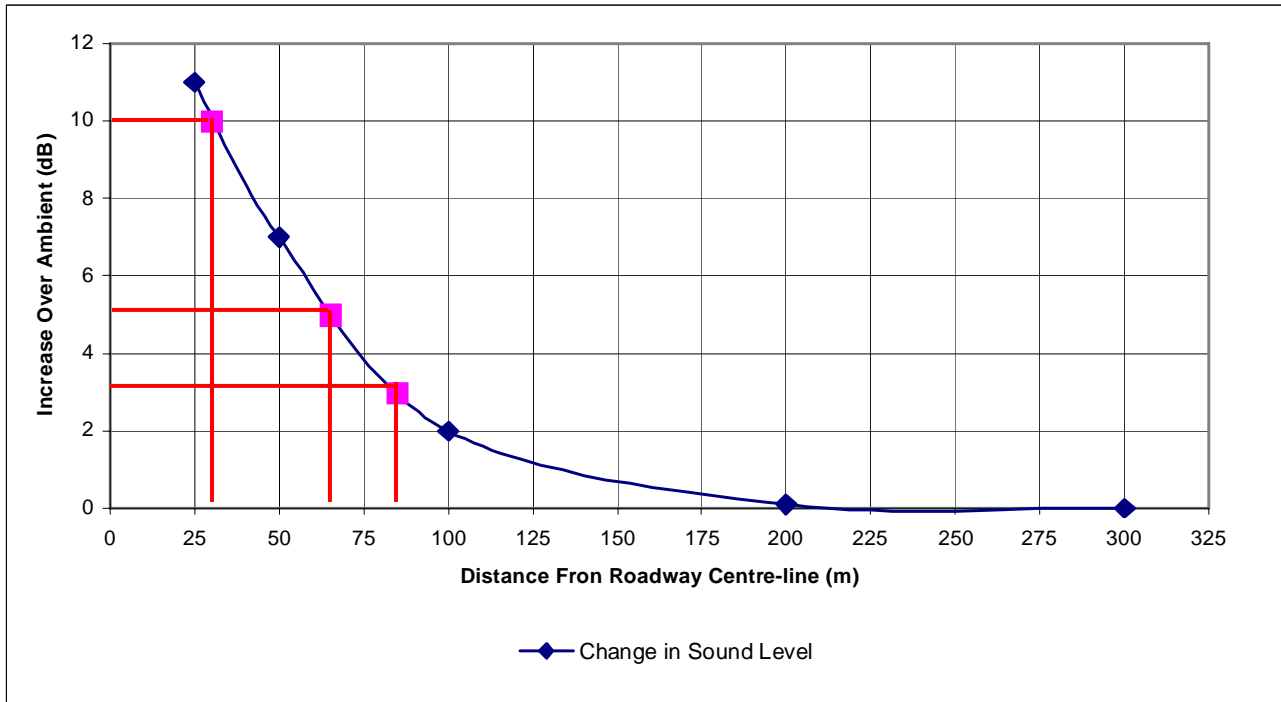
As can be seen from the table, the haul route truck traffic from Links 17 and 18 will increase noise levels:

- at distances of 25 m or less from the roadway, by approximately 11 dB
- at distances of up to 50 m, from the roadway, by approximately 7 dB
- at distances of up to 100 m from the roadway, by approximately 2 dB
- At distances of up to 200 m from the roadway, by approximately 0 dB

Interpolation and varying source-receiver distances in the noise models can be used to determine the distances to reach various dB thresholds in the noise guideline.

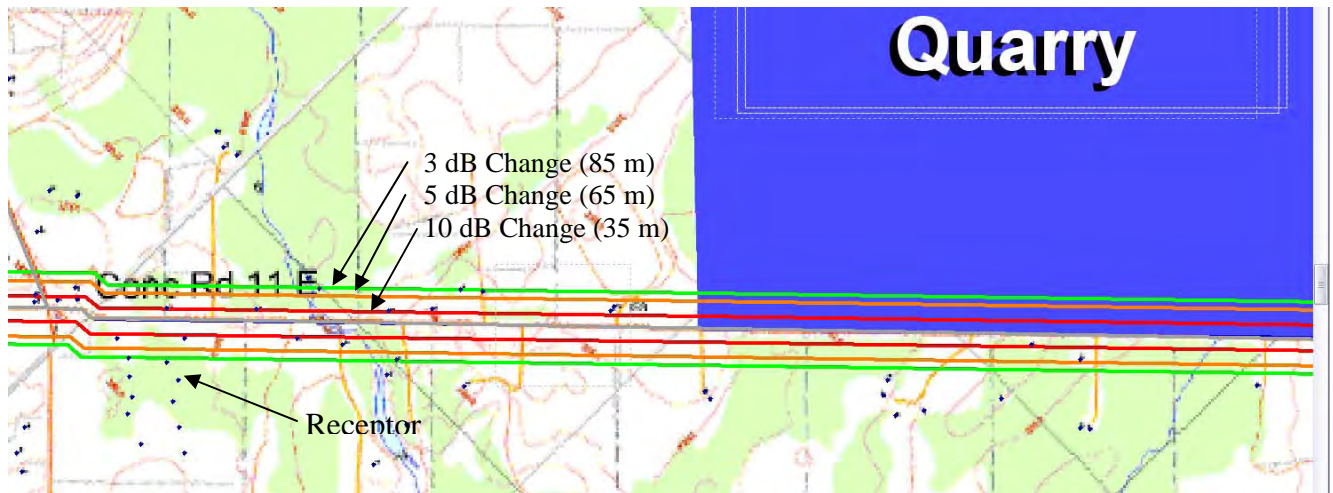
For Links 17/18, the distances are:

- For 0 to 3 dB change: 85 m from the roadway and greater
- For 3 to 5 dB change: 65 m to 85 m
- For 3 to 5 dB change: 30 m to 65 m
- For > 10 dB change: edge of roadway to 30 m



*Change in Sound Level Versus Distance – Link 17/18*

These distances were then overlaid on GIS mapping, and the number of receptors in each band of noise increase were then counted.



*Distances Overlaid on Mapping – Link 18*

The total number of affected receptors in each decibel range for all the links in this alternative are then summed up, and the quantitative factors from **Section 3** of the main report are applied.

### Quantitative Noise Score Calculation for Alternative 1

Decibel Range	No of Residences	Factor	Total	Comment
0 to 3 dB	1037	x 0	= 0	(Sum of receptors from Links 17,18,23,24, and 25 within 500 m of the roadway which receive noise levels of 0 to 3 dB) x factor
> 3 to 5 dB	85	x 1	= 85	(Sum of receptors from Links 17,18,23,24, and 25 within 500 m of the roadway which receive noise levels of >3 dB to 5 dB) x factor
> 5 to 10 dB	30	x 3	= 90	As above.
> 10 dB	57	x 6	= 342	As above.
No of Schools	0	x 100	= 0	There are no schools along this alternative.
No. of churches	1	x 50	= 50	Seventh Day Adventist Church. United church of Hamilton on Highway 6 not included, as changes at it are negligible.
Sum	1210	--	<b>567</b>	<< Quantitative score for route

The above values are summarized in Table 3. Alternative 1 has an evaluation score of 567. This can be compared to the evaluation scores of the other alternatives (calculated in a similar manner as Alternative 1).

**No-Build Scenario  
Existing Conditions  
Noise Modelling and Traffic Data**

Traffic Distribution Summary Table

Road Segment	Speed Limit (kmph)	AADT	Breakdown			Hourly Counts													
			Auto	Med	Heavy	07:00h	08:00h	09:00h	10:00h	11:00h	12:00h	13:00h	14:00h	15:00h	16:00h	17:00h	18:00h		
						08:00h	09:00h	10:00h	11:00h	12:00h	13:00h	14:00h	15:00h	16:00h	17:00h	18:00h	19:00h		
<b>Highway 6, north of Campbellville Road</b>						918	777	650	594	592	575	627	615	747	849	861	575		
NB Day 1 (unscaled)						834	715	700	564	634	629	621	419	16	12	10	87		
NB Day 2 (unscaled)						836	820	736	644	600	651	619	641	845	968	1140	661		
SB Day 1 (unscaled)						841	840	698	588	629	587	596	762	944	1004	1078	877		
SB Day 2 (unscaled)																			
AADT / counts scaled to fit new data	60					2116	1926	1686	1493	1523	1479	1503	1515	1920	2192	2413	1491		
AADT / counts scaled to fit new data	80	27620	0.87	0.05	0.08	2020	1876	1672	1389	1438	1467	1468	1424	1158	1225	1312	1163		
<b>Highway 6, south of Campbellville Road, north of Concession 10E</b>																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						2245	2044	1789	1584	1616	1569	1595	1608	2037	2326	2561	1582		
AADT / counts scaled to fit new data	80	29309	0.87	0.05	0.08	2144	1991	1774	1474	1526	1557	1558	1511	1229	1300	1392	1234		
<b>Highway 6, south of Concession 10E, north of Concession 8E</b>																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						2439	2220	1944	1721	1756	1705	1733	1747	2213	2527	2782	1719		
AADT / counts scaled to fit new data	80	31841	0.87	0.05	0.08	2329	2163	1928	1601	1658	1691	1692	1642	1335	1412	1513	1341		
<b>Highway 6, south of Concession 8E, north of Parkside Dr</b>																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						2772	2523	2209	1956	1995	1938	1969	1985	2515	2872	3161	1953		
AADT / counts scaled to fit new data	80	36183	0.87	0.05	0.08	2646	2458	2190	1820	1884	1922	1923	1865	1517	1605	1719	1524		
<b>Highway 6, south of Parkside Dr</b>																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						3927	3574	3129	2771	2827	2745	2789	2812	3563	4068	4478	2767		
AADT / counts scaled to fit new data	80	51260	0.87	0.05	0.08	3749	3482	3103	2578	2669	2723	2724	2643	2149	2273	2435	2158		
<b>Campbellville Rd, east of HWY 6, west of Centre Rd</b>																			
EB Day 1 (unscaled)						149	113	66	44	54	59	48	62	63	66	59	39		
EB Day 2 (unscaled)						164	129	69	54	48	57	66	54	70	61	72	50		
WB Day 1 (unscaled)						56	47	50	39	51	58	44	88	116	177	182	77		
WB Day 2 (unscaled)						51	43	36	36	50	45	44	81	111	168	201	92		
AADT / counts scaled to fit new data	80					258	207	139	108	126	140	132	180	217	292	328	170		
AADT / counts scaled to fit new data	70	2830	0.94	0.02	0.04	246	192	126	100	118	122	110	162	215	275	289	139		
<b>Centre Rd, south of Campbellville Rd, north of Concession 11E</b>																			
data from Centre Rd bw Cambellville Rd and Mountsberg																			
SB Day 1 (unscaled)						34	44	34	36	33	44	43	50	80	111	104	42		
SB Day 2 (unscaled)						44	50	26	37	39	47	43	52	67	84	98	63		
NB Day 1 (unscaled)						89	64	47	45	53	36	48	27	56	68	55	43		
NB Day 2 (unscaled)						69	58	45	37	41	39	37	49	54	62	69	50		
AADT / counts scaled to fit new data	60					147	129	97	97	103	103	109	121	163	214	200	135		
AADT / counts scaled to fit new data	80	1880	0.97	0.01	0.02	135	129	85	89	96	96	96	92	145	175	191	102		
<b>Concession 11E, east of HWY 6, west of Milborough Line</b>																			
data from Concession 11 between Millborough Townline and Centre Road																			
EB Day 1 (unscaled)						34	29	16	19	7	9	15	10	17	18	6	16		
EB Day 2 (unscaled)						25	26	16	10	8	17	12	12	21	21	15	10		
WB Day 1 (unscaled)						15	13	6	9	14	15	18	16	19	31	34	17		
WB Day 2 (unscaled)						12	10	11	14	15	11	22	12	16	30	30	20		
AADT / counts scaled to fit new data	50					59	50	32	34	28	34	41	31	44	61	54	40		
AADT / counts scaled to fit new data	60	620	0.95	0.02	0.03	44	43	26	29	25	29	40	29	43	59	48	36		
<b>Milborough Line, north of Concession 11E, south of Campbellville Rd</b>																			
data from Derry Rd to Concession 10 (1991)																			
total	60	720	0.96	0.02	0.02	34	31	20	20	17	20	27	20	28	39	33	25		
<b>Campbellville Rd, east of Milborough Line, west of Twiss Rd</b>																			
data from Milborough Line to First Line, Nassagaweya (2002)																			
total		4420	0.97	0.01	0.02	353	292	183	158	207	195	213	231	268	463	432	310		
data from First Line, Nassagaweya to CNR tracks (2002)																			
total		3883	0.96	0.02	0.02	329	252	174	151	179	181	203	223	274	370	360	236		
data from CNR tracks to Guelph Line (2002)																			
total	60	3484	0.95	0.02	0.03	312	222	168	146	158	170	195	217	279	302	307	181		
<b>Twiss Rd, north of Campbellville Rd, south of Reid SDRD</b>																			
SB Day 1 (unscaled)						40	37	26	28	28	11	35	57	60	103	121	59		
SB Day 2 (unscaled)						30	32	32	25	32	39	26	72	57	99	108	77		
NB Day 1 (unscaled)						73	60	51	31	26	38	46	39	22	30	34	26		
NB Day 2 (unscaled)						69	57	48	50	33	41	26	33	32	33	46	26		
AADT / counts scaled to fit new data						136	116	96	90	78	96	97	126	107	160	186	124		
AADT / counts scaled to fit new data	60	1790	0.95	0.02	0.03	119	107	92	71	65	59	62	115	98	158	185	102		
<b>Reid SDRD, east of Twiss Rd, west of Guelph Line</b>																			
data from Second Line, Nassagaweya to 1.35 km east (2002)																			
total	60	2310	0.88	0.05	0.07	167	184	141	111	116	143	123	128	167	187	196	130		
<b>Guelph Line, north of Reid SDRD, South of HWY 401</b>																			
breakdown from Total Count Diagram																			
NB																			
SB																			
total	50	12680	0.91	0.04	0.06	714	701	614	547	495	483	464	740	661	849	962	660.24		













**Kevin Carr - RE: St Mary's Cement Haul Route EA Study - Traffic Confirmations**

---

**From:** Tara Erwin <terwin@itransconsulting.com>  
**To:** Kevin Carr <Kevin.Carr@rwdi.com>  
**Date:** 01/04/2008 4:50 pm  
**Subject:** RE: St Mary's Cement Haul Route EA Study - Traffic Confirmations  
**CC:** Nigel Taylor <Nigel.Taylor@rwdi.com>, Peter VanDelden <Peter.VanDelden@rwdi.com>, Scott Penton <Scott.Penton@rwdi.com>, Tammy Dow <tdow@itransconsulting.com>, Tyrone Gan <tgan@itransconsulting.com>, Chris Philp <cphilp@itransconsulting.com>, David Schleihauf <DSchleihauf@itransconsulting.com>

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Kevin,

Based on your call today with David Schleihauf from our office we understand you are applying the following assumptions.

To get the hourly splits for the ADTs provided, you used tube counts that iTRANS provided in 2007 to factor the recent ADT across the day. In some cases you needed to assume things such as same distribution on the same road. You also mentioned using slide 17 from PIC#2 on a few occasions for hourly distribution.

To split heavy vehicles into medium and heavy, you applied an old MTO Noise Guideline that gives values for highways.

With respect to speed limits and to address how some links have varying speeds along a segment. You explained that in general you use the higher value as its more conservative, however you just located the most recent exhibit that we provided as an email attachment last week and you will check the values again to make sure they are consistent with the most recent data.

It is our opinion that your assumptions seem valid and reasonable. We just want to emphasize the importance of documenting all of these assumptions into the existing conditions report.

I look forward to the receipt of your report on Friday. Please don't hesitate to contact us as anytime to assist with clarification or any other concerns.

Regards,

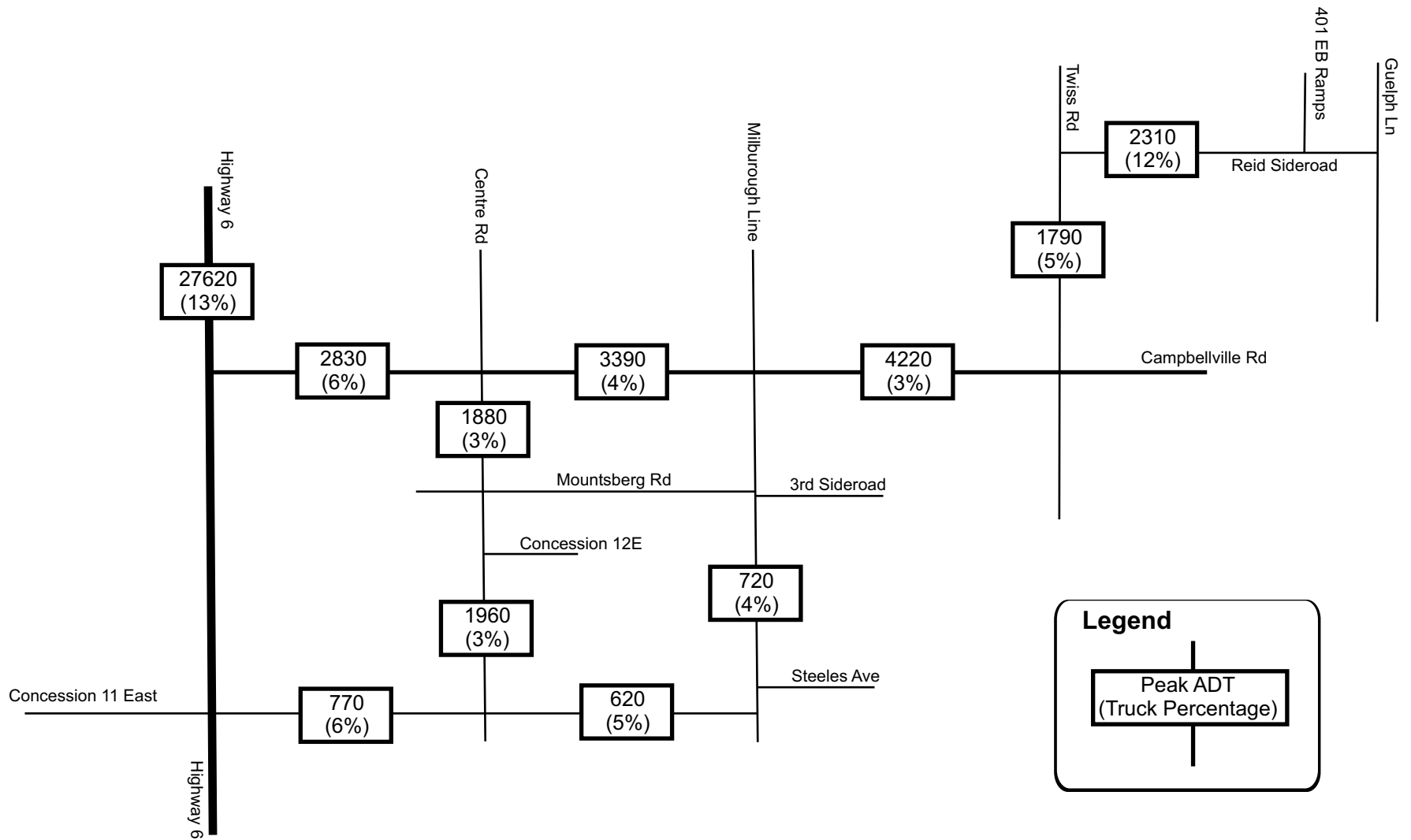
**Tara Erwin, M.A.Sc., E.I.T**  
**iTRANS Consulting Inc.**  
Tel: 905 882-4100 x 5253

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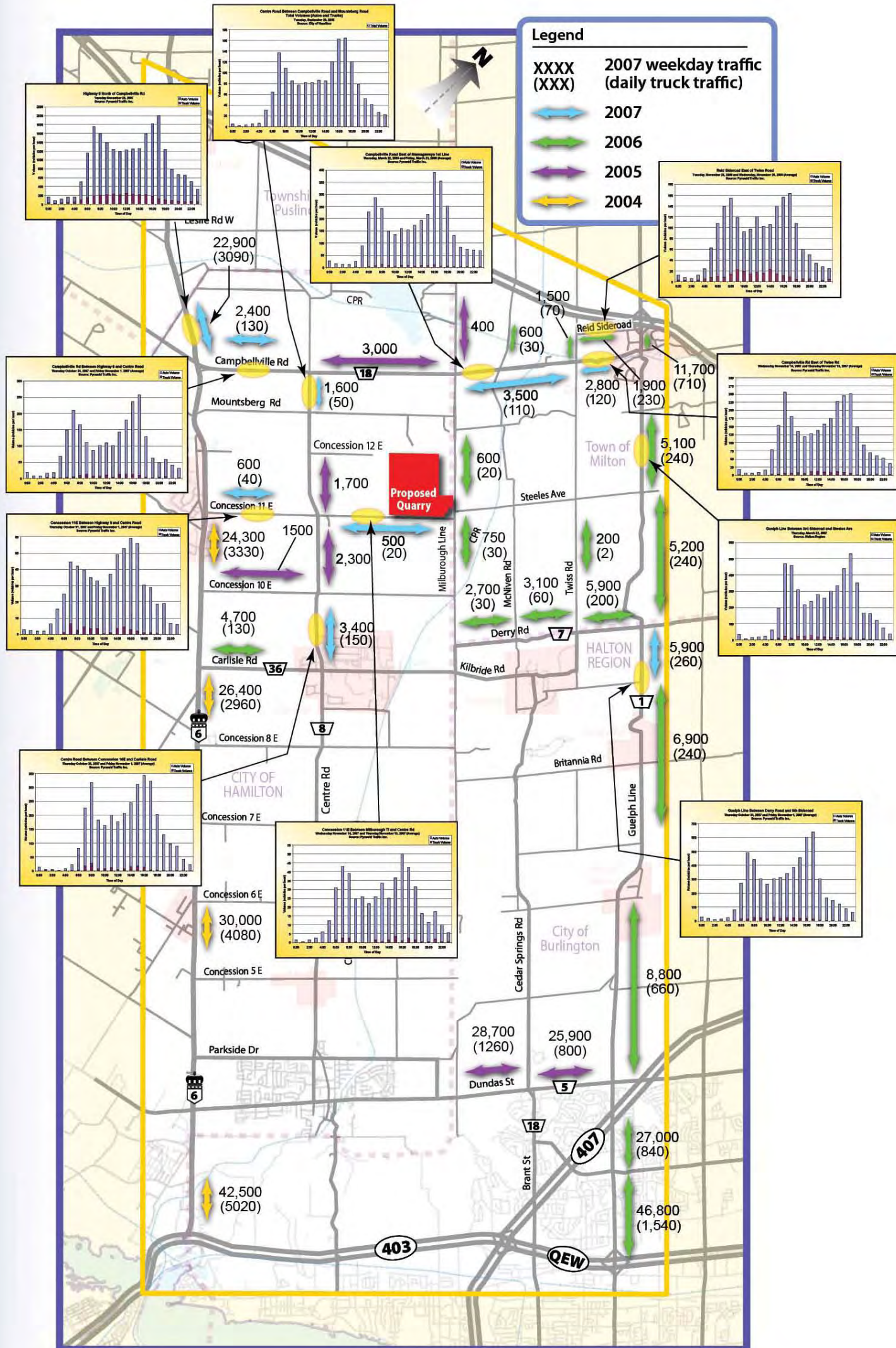
Not To Scale

March 2008

## Peak Existing Average Daily Traffic (ADT) & Truck Percentages

# Existing Traffic and Truck Volumes

The following summarizes existing traffic counts.



\*Contents on this board reflect the most recent information available and the following Traffic Count sources: Pyramid, Hamilton, Halton, MTO, Milton

**Legend**

- Traffic Signals
- Stop Sign (1 way)
- Stop Sign (4 way)

**Rail Crossing Controls**

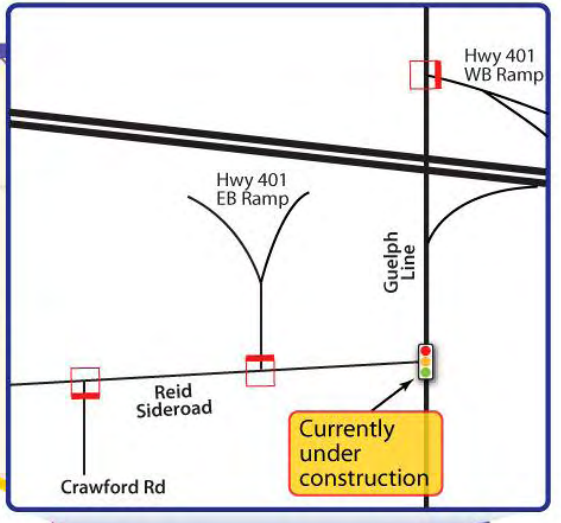
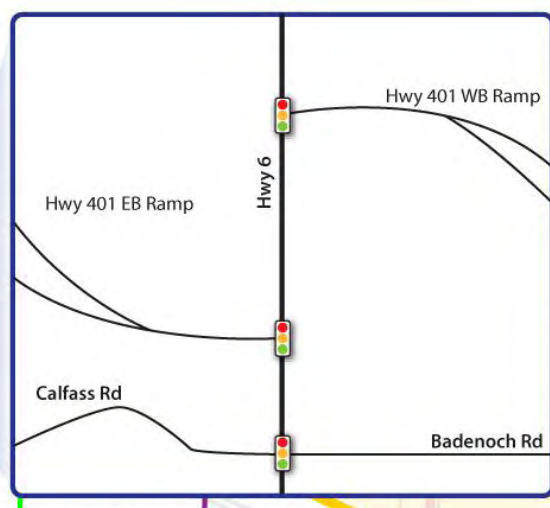
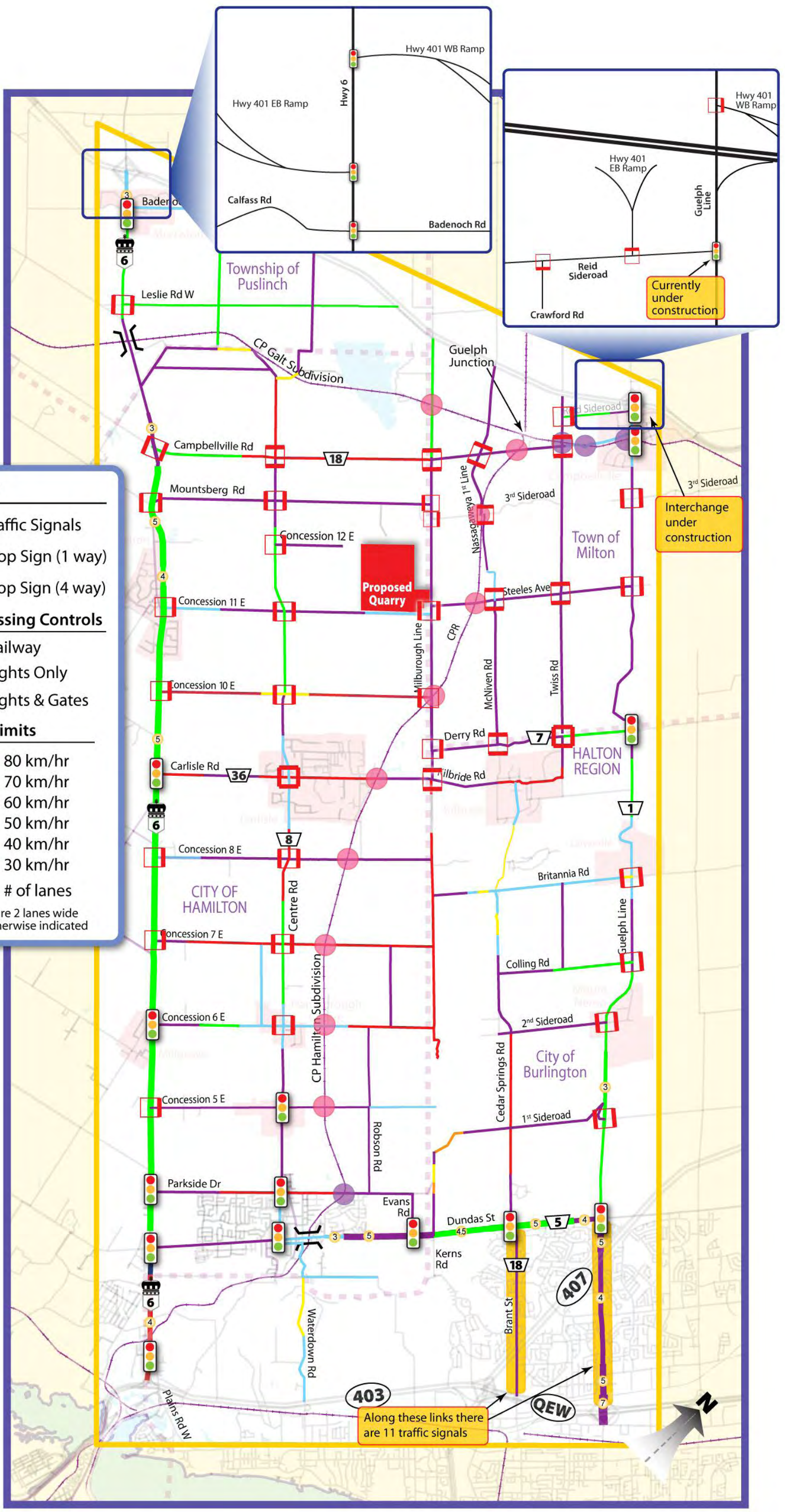
- Railway
- Lights Only
- Lights & Gates

**Speed Limits**

- 80 km/hr
- 70 km/hr
- 60 km/hr
- 50 km/hr
- 40 km/hr
- 30 km/hr

# of lanes

\* all roads are 2 lanes wide unless otherwise indicated



Interchange under construction

Along these links there are 11 traffic signals



Municipal Road Appraisal - Sheet 1

<b>A. IDENTIFICATION</b>			
Control Code	1-S-RM-05	6. Current Section No.	01-1060230 RD01
Municipal Name/Code	14000 - Regional Municipality of Halton	7. Length	0.1480 Km
Road Name	GUELPH LINE	A. Offset From	0 m
4. From	EXIT 312 ON RAMP 401 HIGHWAY	B. Offset To	148 m
5. To	EXIT 312 OFF RAMP 401 HIGHWAY	8. Old Section No.	01-06023 RD01
9. Boundary Road	N	12. Local Municipality	14402
10. Adjacent Municipality Name/Code	-	Code (Upper Tier Only)	
11. Adjacent Road Section Number		13. Special Designation	NSD
16. File System No.		14. Road Maintenance Area	
17. Road Maintenance Section No.		15. Municipal Ward	
<b>B. EXISTING CONDITIONS</b>			
21. Bridges	<b>Horizontal Alignment</b>	32. Roadside Environment	S
	24. Substandard Curves	33A. Existing Class	ART
	25. Substandard S.S.D	33B. Highway Classification	3
	<b>Vertical Alignment</b>	34. Number of Lanes	3
	26. Substandard Grades	35. Surface Type	HCB
22. Culverts	27. Substandard S.S.D.	36. Platform Width	17.0 m
	<b>Right of Way Width</b>	37. Surface Width	11.0 m
	28. Existing	38. Median Width	m
	29. Desirable	39. Shoulder Type	GST
23. Railway Crossings	30. Terrain	40. Shoulder Width	3.0 m
	31. Drainage	41. Curb/Gutter	Left BC Right BC
		42. Sidewalk Width	Left Right
		43. Boulevard Width	Left Right
		44. Crosswalks	
		45. Parking	Left Restricted Right Restricted
46. Utilities	LT RT OH UG Major Local	47a. Existing Hot. Mix. Depth	mm
Hydro		47b. Existing Gran "A". Depth	mm
Phone		47c. Existing Gran "B". Depth	mm
Gas		48. Subdrains	N
Other			

<b>C TRAFFIC DATA</b>			
51. Speed Limit	50 km/hr	<b>Traffic Count</b>	<b>10 Year Traffic Forecast</b>
52. Average Operating Speed	km/hr	56. Year	64. Year
53. Traffic Operation	2W	A-2005-E	2015
54. Route Designation		57. AADT	12680
Bus N Truck N		58. DHV Factor	7.6 %
School Y Bicycle N		59. DHV	964 vph
		60. Trucks	2 %
55. Load Restrictions	SA	61. Count Loc.	100115
		62. Peak Directional Split	%
		63. 10 Yr Growth Factor	1.20
71. Traffic Signals	No Location		<b>Capacity</b>
72. Stop Signs	No Location		69. Midblock
73. Yield Signs	No Location		70. Intersection
74. Existing Traffic			vph
75. Dwelling units dependent upon this road for access	No. 0 Per km	A-2005-E	12680
76. Commercial enterprises dep. upon this road for access	No. 0 Per km		x2
77. Places of public assembly dep. upon this road for access	No. 0 Per km		x4
78. Mail Route	School Bus Route		x6
	Bulk Milk Route		x10
	Truck		Total
			79. Service Rating
			12680

<u>D. POINT RATINGS</u>	MAX. POINTS			RATING
	R	S	U	
81. Horiz. Alignment	10	-	-	
82. Vert. Alignment	10	-	-	
83. Surface Condition	10	10	10	10
84. Shoulder Width	10	10	-	8
85. Surface Width	15	15	25	13
86. Level of Service	20	20	20	20
87. Str. Adequacy	20	20	20	20
88. Drainage	15	15	15	15
89. Maint. Demand	10	10	10	8
90. Condition Rating	100	100	100	94
90a. PCI Index				100

<u>E. NEEDS</u>	Existing Condition	Minimum Tolerable Standard	Time Of Need
91. Geometrics	50		ADEQ
92. Surface Type	HCB	LCB	ADEQ
93. Surface Width	11.0 m	9.0	ADEQ
94. Capacity	A	E	ADEQ
95. Struct. Adequacy		Year 2005	ADEQ
96. Drainage		Year 2005	ADEQ

<u>F. TYPE &amp; TIME OF IMPROVEMENT</u>	
101. Year (Re) Constructed	1974
102. Year Assumed	1974
103. Eligibility for Contribution	MSO
104. Type of Improvement	
105. Design Class	
106a. Surface Design Width	m
106b. Shoulder Design Width	m
106c. Pavement Design Depth	mm
106d. Pavement Resurfacing Depth	mm
106e. Design Gran "A" Depth	mm
106f. Design Gran "B" Depth	mm
106g. Design Concrete Depth	mm
107. Improvement Length	km
108. Costing Category	
109. Time of Improvement	
'0. Bench Mark Cost	(\$ thousand / km)

<u>G. IMPROVEMENT COST (\$ THOUSANDS)</u>	
121. Construction	
122. Resurfacing	
123. Drainage	
124. Small Structures	
125. Sidewalk	
126. Traffic Signals (Existing)	
127. Other	
128. Other	
129. Contingencies	%
130. Total Construction	
131. Utilities	
132. Right of Way	
133. Engineering Environmental Assessment (E/A) Study	
134. Engineering - Design & Supervision	%
135. Total Project Cost	
136. Eligibility for Contribution	NBS
137. Non-Contributable Cost	
138. Contributable Cost	
139. Municipal Percent of Contributable Cost	100 %
140. Municipal Share of Cost	
141. Road System Ratings	N
	Priority Rating cents / Vehicle km Guide Number
150. This appraisal sheet was completed by:	
	TSH

<u>H. CONSTRUCTION / IMPROVEMENT HISTORY</u>					
Year	Type	Length	Offset From	Offset To	Act Improv Cost (\$1000's)
111.					
112.					
113.					
114.					
115.					
116.					
117.					
118.					
119.					
120.					

<u>I. PCI History</u>	
Year	PCI History
161.	0
162.	0
163.	0
164.	0
165.	0
166.	0
167.	0
'68.	0
169.	0
170.	0

<u>J. Remarks</u>

Municipal Road Appraisal - Sheet 1

<b>A. IDENTIFICATION</b>			
Control Code	1-S-RM-05	6. Current Section No.	01-1060240 RD01
2. Municipal Name/Code	14000 - Regional Municipality of Halton	7. Length	0.1840 Km
3. Road Name	GUELPH LINE	A. Offset From	0 m
4. From	EXIT 312 OFF RAMP 401 HIGHWAY	B. Offset To	184 m
5. To	EXIT 312 OFF RAMP 401 HIGHWAY	8. Old Section No.	01-06024 RD01
9. Boundary Road	N	12. Local Municipality	14402
10. Adjacent Municipality Name/Code	-	Code (Upper Tier Only)	
11. Adjacent Road Section Number		13. Special Designation	NSD
16. File System No.		14. Road Maintenance Area	
17. Road Maintenance Section No.		15. Municipal Ward	

<b>B. EXISTING CONDITIONS</b>			
21. Bridges	<b>Horizontal Alignment</b>	32. Roadside Environment	S
	24. Substandard Curves	0	33A. Existing Class
	25. Substandard S.S.D	0	33B. Highway Classification
			3
	<b>Vertical Alignment</b>	34. Number of Lanes	3
	26. Substandard Grades	0	35. Surface Type
	27. Substandard S.S.D.	0	36. Platform Width
22. Culverts			17.0 m
			37. Surface Width
			11.0 m
			38. Median Width
			m
	<b>Right of Way Width</b>	39. Shoulder Type	GST
	28. Existing	20.1 m	40. Shoulder Width
	29. Desirable	35.1 m	3.0 m
			41. Curb/Gutter
			Left BC Right BC
			42. Sidewalk Width
			Left Right
23. Railway Crossings	30. Terrain	NF	43. Boulevard Width
	31. Drainage	OD	Left Right
			44. Crosswalks
			45. Parking
			Left Restricted
			Right Restricted
46. Utilities	LT RT OH UG Major Local	47a. Existing Hot. Mix. Depth	mm
Hydro		47b. Existing Gran "A". Depth	mm
Phone		47c. Existing Gran "B". Depth	mm
Gas		48. Subdrains	N
Other			

<b>C TRAFFIC DATA</b>			
51. Speed Limit	50 km/hr	56. Year	A-2005-E
52. Average Operating Speed	km/hr	57. AADT	12680
53. Traffic Operation	2W	58. DHV Factor	7.6 %
54. Route Designation		59. DHV	964 vph
Bus N Truck N		60. Trucks	2 %
School Y Bicycle N		61. Count Loc.	100115
55. Load Restrictions	SA	62. Peak Directional Split	%
		63. 10 Yr Growth Factor	1.20
71. Traffic Signals	No Location		
72. Stop Signs	No Location		
73. Yield Signs	No Location		
74. Existing Traffic			A-2005-E 12680
75. Dwelling units dependent upon this road for access	No. 0	Per km	x2
76. Commercial enterprises dep. upon this road for access	No. 0	Per km	x4
77. Places of public assembly dep. upon this road for access	No. 0	Per km	x6
78. Mail Route	School Bus Route	Bulk Milk Route	Truck
			Total x10
			79. Service Rating 12680

Municipal Road Appraisal - Sheet 2

D. POINT RATINGS	MAX. POINTS			RATING
	R	S	U	
81. Horiz. Alignment	10	-	-	
82. Vert. Alignment	10	-	-	
83. Surface Condition	10	10	10	10
84. Shoulder Width	10	10	-	8
85. Surface Width	15	15	25	13
86. Level of Service	20	20	20	20
87. Str. Adequacy	20	20	20	20
88. Drainage	15	15	15	15
89. Maint. Demand	10	10	10	8
90. Condition Rating	100	100	100	94
90a. PCI Index				100

E. NEEDS	Existing Condition	Minimum Tolerable Standard	Time Of Need
91. Geometrics	50		ADEQ
92. Surface Type	HCB	LCB	ADEQ
93. Surface Width	11.0 m	9.0	ADEQ
94. Capacity	A	E	ADEQ
95. Struct. Adequacy		Year 2005	ADEQ
96. Drainage		Year 2005	ADEQ

F. TYPE & TIME OF IMPROVEMENT	
101. Year (Re) Constructed	1974
102. Year Assumed	1974
103. Eligibility for Contribution	MSO
104. Type of Improvement	
105. Design Class	
106a. Surface Design Width	m
106b. Shoulder Design Width	m
106c. Pavement Design Depth	mm
106d. Pavement Resurfacing Depth	mm
106e. Design Gran "A" Depth	mm
106f. Design Gran "B" Depth	mm
106g. Design Concrete Depth	mm
107. Improvement Length	km
108. Costing Category	
109. Time of Improvement	
110. Bench Mark Cost	(\$ thousand / km)

G. IMPROVEMENT COST (\$ THOUSANDS)	
121. Construction	
122. Resurfacing	
123. Drainage	
124. Small Structures	
125. Sidewalk	
126. Traffic Signals (Existing)	
127. Other	
128. Other	
129. Contingencies	%
130. Total Construction	
131. Utilities	
132. Right of Way	
133. Engineering Environmental Assessment (E/A) Study	
134. Engineering - Design & Supervision	%
135. Total Project Cost	
136. Eligibility for Contribution	NES
137. Non-Contributable Cost	
138. Contributable Cost	
139. Municipal Percent of Contributable Cost	100 %
140. Municipal Share of Cost	
141. Road System Ratings	N
	Priority Rating cents / Vehicle km Guide Number
150. This appraisal sheet was completed by: TSH	

H. CONSTRUCTION / IMPROVEMENT HISTORY					
Year	Type	Length	Offset From	Offset To	Act Improv Cost (\$1000's)
111.					
112.					
113.					
114.					
115.					
116.					
117.					
118.					
119.					
120.					

I. PCI History	
Year	PCI History
161.	0
162.	0
163.	0
164.	0
165.	0
166.	0
167.	0
'68.	0
169.	0
170.	0

J. Remarks

Municipal Road Appraisal - Sheet 1

<b>A. IDENTIFICATION</b>			
Control Code	1-S-RM-05	6. Current Section No.	01-1060250 RD01
Municipal Name/Code	14000 - Regional Municipality of Halton	7. Length	0.1160 Km
3. Road Name	GUELPH LINE	A. Offset From	0 m
4. From	EXIT 312 OFF RAMP 401 HIGHWAY	B. Offset To	116 m
5. To	CAMPBELLVILLE ROAD	8. Old Section No.	01-06025 RD01
9. Boundary Road	N	12. Local Municipality Code (Upper Tier Only)	14402
10. Adjacent Municipality Name/Code	-	13. Special Designation	NSD
11. Adjacent Road Section Number		14. Road Maintenance Area	
16. File System No.		15. Municipal Ward	
17. Road Maintenance Section No.			
<b>B. EXISTING CONDITIONS</b>			
21. Bridges	<b>Horizontal Alignment</b>	32. Roadside Environment	U
	24. Substandard Curves	0	33A. Existing Class
	25. Substandard S.S.D.	0	33B. Highway Classification
	<b>Vertical Alignment</b>		34. Number of Lanes
	26. Substandard Grades	0	35. Surface Type
	27. Substandard S.S.D.	0	36. Platform Width
22. Culverts	<b>Right of Way Width</b>		37. Surface Width
	28. Existing	20.1 m	38. Median Width
	29. Desirable	20.1 m	39. Shoulder Type
	30. Terrain	NF	40. Shoulder Width
23. Railway Crossings	31. Drainage	SS	41. Curb/Gutter
			42. Sidewalk Width
			43. Boulevard Width
			44. Crosswalks
			45. Parking
			Left Restricted
			Right Restricted
46. Utilities	LT RT OH UG Major Local	47a. Existing Hot. Mix. Depth	mm
Hydro		47b. Existing Gran "A". Depth	mm
Phone		47c. Existing Gran "B". Depth	mm
Gas		48. Subdrains	
Other			

<b>C TRAFFIC DATA</b>			
51. Speed Limit	50 km/hr	<b>Traffic Count</b>	<b>10 Year Traffic Forecast</b>
52. Average Operating Speed	km/hr	56. Year	A-2005-C
53. Traffic Operation	2W	57. AADT	12680
54. Route Designation		58. DHV Factor	7.6 %
Bus N Truck N		59. DHV	964 vph
School Y Bicycle N		60. Trucks	2 %
55. Load Restrictions	SA	61. Count Loc.	100115
		62. Peak Directional Split	%
		63. 10 Yr Growth Factor	1.20
71. Traffic Signals	No Location		<b>Capacity</b>
72. Stop Signs	No Location		69. Midblock
73. Yield Signs	No Location		70. Intersection
74. Existing Traffic			A-2005-C
75. Dwelling units dependent upon this road for access	No. 0	Per km	x2
76. Commercial enterprises dep. upon this road for access	No. 0	Per km	x4
77. Places of public assembly dep. upon this road for access	No. 0	Per km	x6
78. Mail Route School Bus Route Bulk Milk Route Truck		Total	x10
		79. Service Rating	12680

Municipal Road Appraisal - Sheet 2

D. POINT RATINGS	MAX. POINTS			RATING
	R	S	U	
81. Horiz. Alignment	10	-	-	
82. Vert. Alignment	10	-	-	
83. Surface Condition	10	10	10	9
84. Shoulder Width	10	10	-	
85. Surface Width	15	15	25	25
86. Level of Service	20	20	20	20
87. Str. Adequacy	20	20	20	16
88. Drainage	15	15	15	15
89. Maint. Demand	10	10	10	8
90. Condition Rating	100	100	100	93
90a. PCI Index				72

E. NEEDS	Existing Condition	Minimum Tolerable Standard	Time Of Need
92. Surface Type	HCB	LCB	ADEQ
93. Surface Width	12.5 m	9.5	ADEQ
94. Capacity	A	E	ADEQ
95. Struct. Adequacy		Year 2005	ADEQ
96. Drainage		Year 2005	ADEQ

F. TYPE & TIME OF IMPROVEMENT	
101. Year (Re) Constructed	1996
102. Year Assumed	1974
103. Eligibility for Contribution	EFS
104. Type of Improvement	
105. Design Class	
106a. Surface Design Width	m
106b. Shoulder Design Width	m
106c. Pavement Design Depth	mm
106d. Pavement Resurfacing Depth	mm
106e. Design Gran "A" Depth	mm
106f. Design Gran "B" Depth	mm
106g. Design Concrete Depth	mm
107. Improvement Length	km
108. Costing Category	
109. Time of Improvement	
110. Bench Mark Cost	(\$ thousand / km)

G. IMPROVEMENT COST (\$ THOUSANDS)	
121. Construction	
122. Resurfacing	
123. Drainage	
124. Small Structures	
125. Sidewalk	
126. Traffic Signals (Existing)	
127. Other	
128. Other	
129. Contingencies	%
130. Total Construction	
131. Utilities	
132. Right of Way	
133. Engineering Environmental Assessment (E/A) Study	
134. Engineering - Design & Supervision	%
135. Total Project Cost	
136. Eligibility for Contribution	EFS
137. Non-Contributable Cost	
138. Contributable Cost	
139. Municipal Percent of Contributable Cost	100 %
140. Municipal Share of Cost	
141. Road System Ratings	N
	Priority Rating cents / Vehicle km Guide Number
150. This appraisal sheet was completed by:	TSH

H. CONSTRUCTION / IMPROVEMENT HISTORY					
Year	Type	Length	Offset From	Offset To	Act Improv Cost (\$1000's)
111.					
112.					
113.					
114.					
115.					
116.					
117.					
118.					
119.					
120.					

I. PCI History	J. Remarks
Year	PCI History
161.	0
162.	0
163.	0
164.	0
165.	0
166.	0
167.	0
168.	0
169.	0
170.	0

**Build Scenario**  
**Existing Conditions**  
**Noise Modelling and Traffic Data**





## Kevin Carr - RE: Flamborough Quarry - Hourly Truck Traffic

---

**From:** Chris Philp <cphilp@itransconsulting.com>  
**To:** Kevin Carr <Kevin.Carr@rwdi.com>, Wayne Dietrich <wdietrich@pggroup.com>  
**Date:** 12/04/2008 10:36 am  
**Subject:** RE: Flamborough Quarry - Hourly Truck Traffic  
**CC:** Don Richardson <drichardson@gartnerlee.com>, <jshute@gartnerlee.com>, <sgautreau@gartnerlee.com>, Tammy Dow <tdow@itransconsulting.com>, Tara Erwin <terwin@itransconsulting.com>, David Schleihauf <DSchleihauf@itransconsulting.com>, Tyrone Gan <tgan@itransconsulting.com>

---

Hi Kevin

We have recently been communicating with Wayne Dietrich from PGL about this same issue. I thought it important to communicate the same information to you so that all assumptions are aligned.

The highest (design volume) daily total is 570 inbound + 570 outbound.

AM Peak hour – 12% of daily total  
 PM Peak hour – 10% of daily total  
 All other hours 7.8% of daily total

Operating hours (7 AM to 7PM)

May I ask you to communicate with Wayne to ensure the assumptions for hourly distributions are in consideration of one another? He may have made some assumptions on which hours are the peaks for on site noise and environmental.

Thanks.

**Chris Philp, P. Eng.**  
**iTRANS Consulting Inc.**  
 Tel: 905 882-4100 x 5285

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**From:** Kevin Carr [mailto:Kevin.Carr@rwdi.com]  
**Sent:** Friday, April 11, 2008 11:51 AM  
**To:** Tyrone Gan; <David Schleihauf  
**Cc:** Don Richardson; jshute@gartnerlee.com; sgautreau@gartnerlee.com; Chris Philp; Tammy Dow; Tara Erwin  
**Subject:** Flamborough Quarry - Hourly Truck Traffic

Tyrone / David,

We would like to request the hourly distribution of haul trucks to and from the proposed Flamborough Quarry.

In the future conditions assessment, are we assessing 2021, 2031, or existing conditions?

**Build and No-Build Scenario  
Year 2021 Conditions  
Noise Modelling and Traffic Data**

**Traffic Distribution Summary Table**  
scaled to fit 2021 ADT data

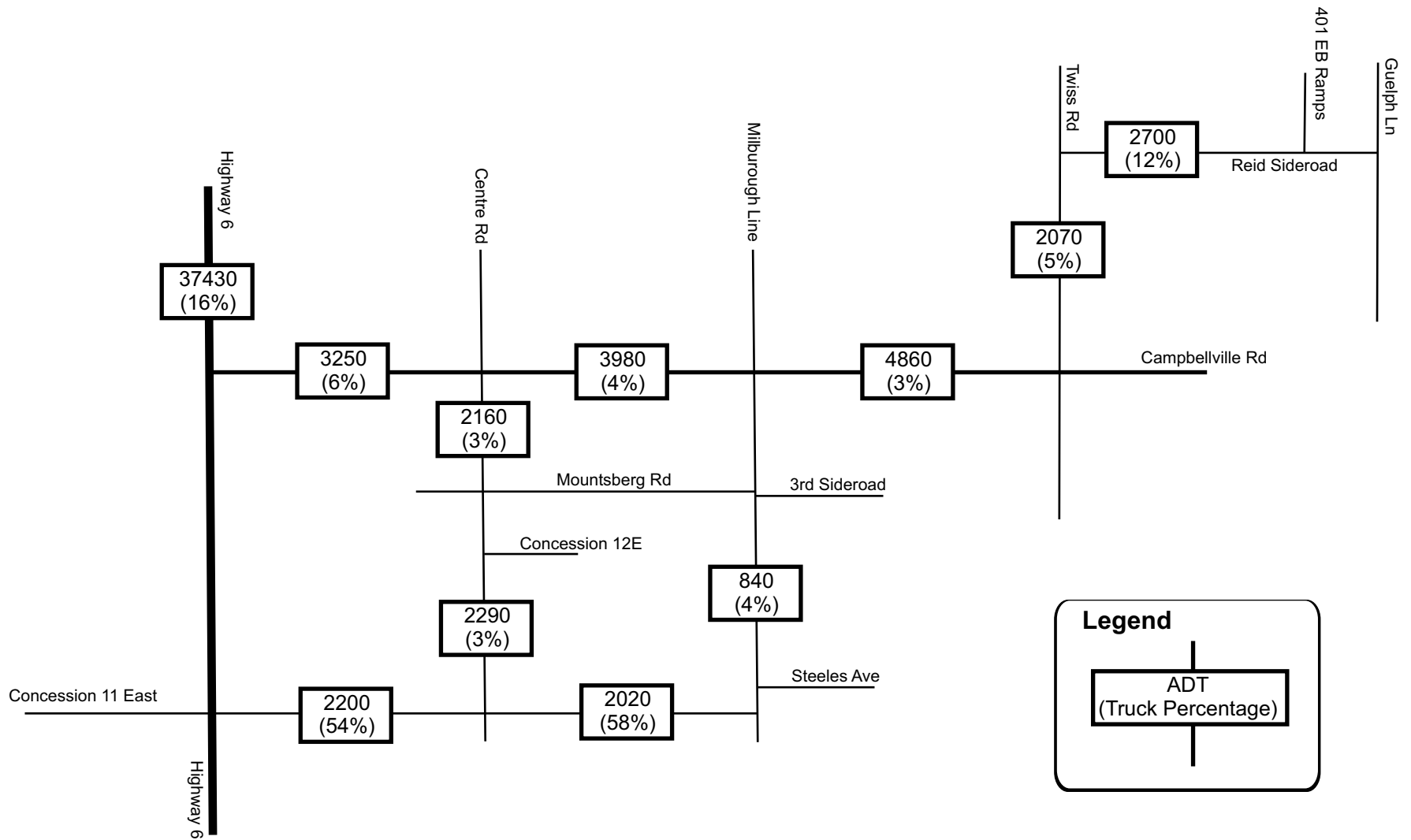
Road Segment	Speed Limit (kmph)	ADT	Breakdown			Hourly Counts													OLD ADT
			Auto	Med	Heavy	07:00h 08:00h	08:00h 09:00h	09:00h 10:00h	10:00h 11:00h	11:00h 12:00h	12:00h 13:00h	13:00h 14:00h	14:00h 15:00h	15:00h 16:00h	16:00h 17:00h	17:00h 18:00h	18:00h 19:00h		
Highway 6, north of Campbellville Road						918	777	650	594	592	575	627	615	747	849	861	575		
	NB Day 1 (unscaled)					834	715	700	564	634	629	621	419	16	12	10	87		
	NB Day 2 (unscaled)					836	820	736	644	600	651	619	641	845	968	1140	661		
	SB Day 1 (unscaled)					841	840	698	588	629	587	596	762	944	1004	1078	877		
	SB Day 2 (unscaled)					2797	2547	2229	1974	2014	1955	1987	2003	2539	2898	3191	1971		
AADT / counts scaled to fit new data	60					2671	2480	2210	1837	1901	1939	1941	1883	1531	1620	1735	1537	22900	
AADT / counts scaled to fit new data	80	36520	0.87	0.05	0.08														
Highway 6, south of Campbellville Road, north of Concession 10E																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						2968	2703	2365	2095	2137	2075	2108	2125	2694	3075	3386	2092		
AADT / counts scaled to fit new data	80	38753	0.87	0.05	0.08	2834	2632	2345	1949	2017	2058	2060	1998	1625	1719	1841	1631	24300	
Highway 6, south of Concession 10E, north of Concession 8E																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						3225	2936	2570	2276	2322	2254	2291	2309	2927	3341	3679	2272		
AADT / counts scaled to fit new data	80	42102	0.87	0.05	0.08	3079	2859	2548	2118	2192	2235	2238	2171	1765	1868	2000	1772	26400	
Highway 6, south of Concession 8E, north of Parkside Dr																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						3664	3337	2920	2586	2638	2561	2603	2624	3326	3797	4180	2582		
AADT / counts scaled to fit new data	80	47843	0.87	0.05	0.08	3499	3249	2895	2407	2490	2540	2543	2467	2006	2122	2273	2014	30000	
Highway 6, south of Parkside Dr																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						5191	4727	4137	3664	3738	3628	3688	3717	4712	5378	5922	3658		
AADT / counts scaled to fit new data	80	67777	0.87	0.05	0.08	4957	4603	4102	3409	3528	3599	3602	3495	2841	3007	3220	2852	42500	
Campbellville Rd, east of HWY 6, west of Centre Rd																			
EB Day 1 (unscaled)						149	113	66	44	54	59	48	62	63	66	59	39		
EB Day 2 (unscaled)						164	129	69	54	48	57	66	54	70	61	72	50		
WB Day 1 (unscaled)						56	47	50	39	51	58	44	88	116	177	182	77		
WB Day 2 (unscaled)						51	43	36	36	50	45	44	81	111	168	201	92		
AADT / counts scaled to fit new data	80					296	237	160	124	145	161	152	207	250	335	376	196		
AADT / counts scaled to fit new data	70	3250	0.94	0.02	0.04	283	221	145	114	135	141	127	186	247	316	332	160	2357	
Centre Rd, south of Campbellville Rd, north of Concession 11E																			
data from Centre Rd bw Cambellville Rd and Mountsberg																			
SB Day 1 (unscaled)						34	44	34	36	33	44	43	50	80	111	104	42		
SB Day 2 (unscaled)						44	50	26	37	39	47	43	52	67	84	98	63		
NB Day 1 (unscaled)						89	64	47	45	53	36	48	27	56	68	55	43		
NB Day 2 (unscaled)						69	58	45	37	41	39	37	49	54	62	69	50		
AADT / counts scaled to fit new data	60					169	149	112	112	118	118	125	139	187	246	230	156		
AADT / counts scaled to fit new data	80	2160	0.97	0.01	0.02	156	149	98	102	110	110	110	106	167	201	219	117	1569	
Concession 11E, east of HWY 6, west of Milborough Line																			
data from Concession 11 between Millborough Townline and Centre Road																			
EB Day 1 (unscaled)						34	29	16	19	7	9	15	10	17	18	6	16		
EB Day 2 (unscaled)						25	26	16	10	8	17	12	12	21	21	15	10		
WB Day 1 (unscaled)						15	13	6	9	14	15	18	16	19	31	34	17		
WB Day 2 (unscaled)						12	10	11	14	15	11	22	12	16	30	30	20		
AADT / counts scaled to fit new data	50					84	72	46	48	39	48	58	44	63	87	77	56		
AADT / counts scaled to fit new data	60	880	0.96	0.02	0.02	63	61	38	41	36	41	56	41	61	84	68	51	516	
Milborough Line, north of Concession 11E, south of Campbellville Rd																			
data from Derry Rd to Concession 10 (1991)																			
total	60	840	0.96	0.02	0.02	39	36	23	24	20	24	31	23	33	46	39	29	915	
Campbellville Rd, east of Milborough Line, west of Twiss Rd																			
data from Milborough Line to First Line, Nassagaweya (2002)																			
total		4860	0.97	0.01	0.02	388	321	201	174	228	214	234	254	294	509	475	341	3631	
data from First Line, Nassagaweya to CNR tracks (2002)																			
total		4270	0.96	0.02	0.02	362	277	192	166	197	199	223	245	301	407	396	260	3190	
data from CNR tracks to Guelph Line (2002)																			
total	60	3831	0.95	0.02	0.03	343	244	185	161	174	187	214	238	307	332	337	199	2862	
Twiss Rd, north of Campbellville Rd, south of Reid SDRD																			
SB Day 1 (unscaled)						40	37	26	28	28	11	35	57	60	103	121	59		
SB Day 2 (unscaled)						30	32	32	25	32	39	26	72	57	99	108	77		
NB Day 1 (unscaled)						73	60	51	31	26	38	46	39	22	30	34	26		
NB Day 2 (unscaled)						69	57	48	50	33	41	26	33	32	33	46	26		
AADT / counts scaled to fit new data						157	135	111	104	90	111	112	146	124	185	215	143		
AADT / counts scaled to fit new data	60	2070	0.95	0.02	0.03	137	124	107	82	75	68	72	133	114	183	214	118	1491	
Reid SDRD, east of Twiss Rd, west of Guelph Line																			
data from Second Line, Nassagaweya to 1.35 km east (2002)																			
total	60	2700	0.88	0.05	0.07	195	215	165	130	135	167	144	149	195	219	229	152	1935	







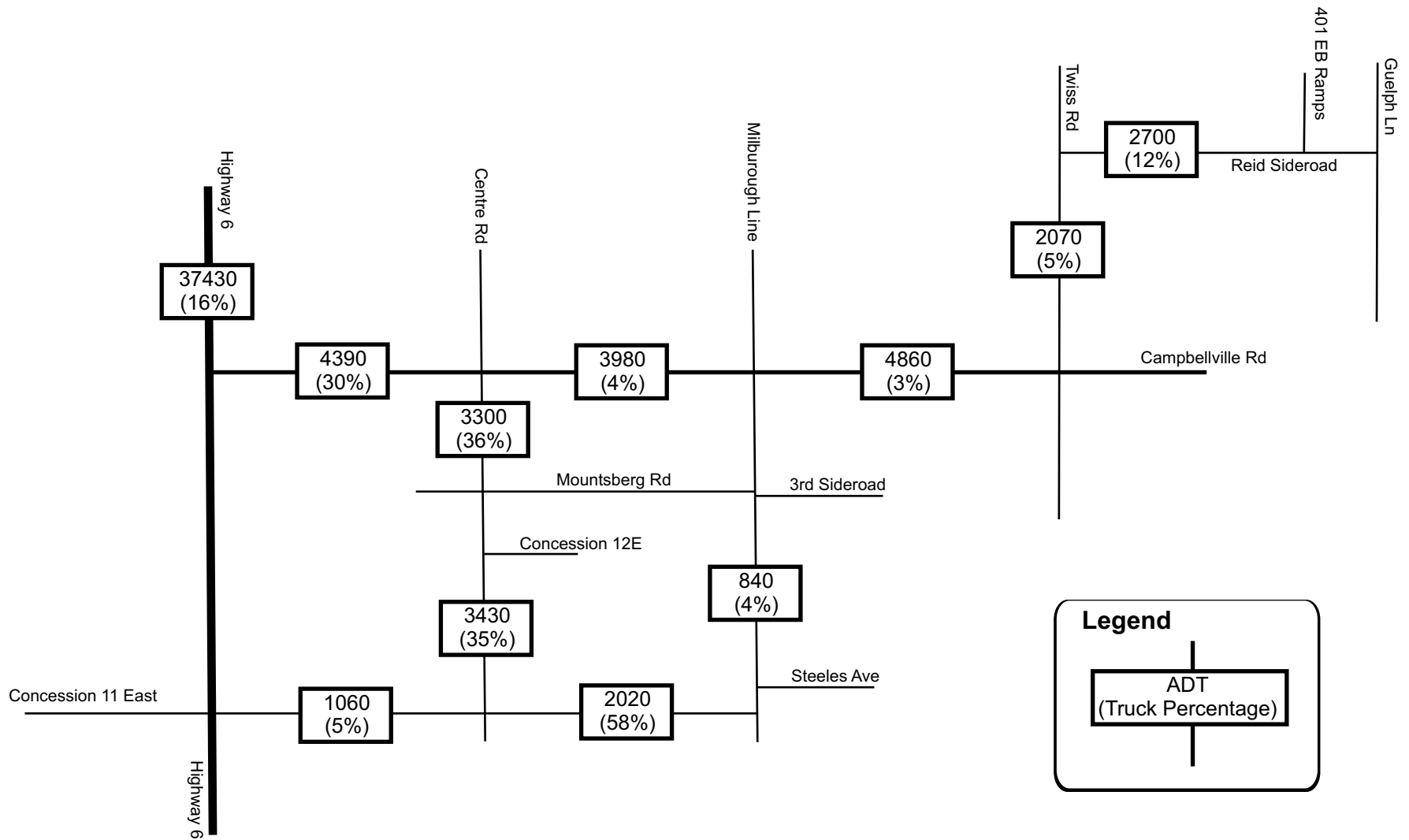




Not To Scale

March 2008

## 2021 Alternative 1 Total Traffic Peak Average Daily Traffic (ADT) & Truck Percentages



**Legend**

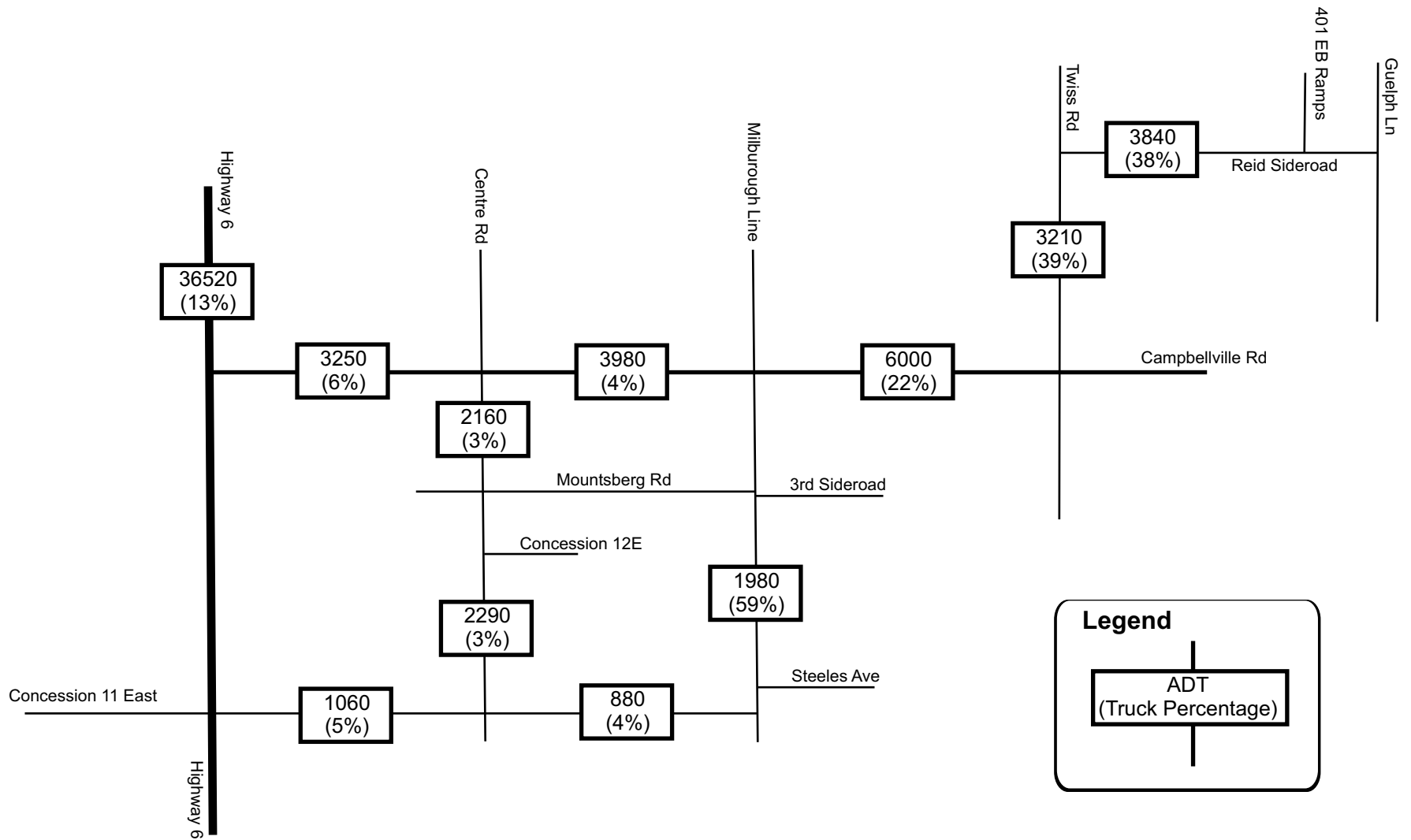
ADT  
(Truck Percentage)



Not To Scale

March 2008

**2021 Alternative 2 Total Traffic  
Peak Average Daily Traffic (ADT) & Truck Percentages**



**Legend**

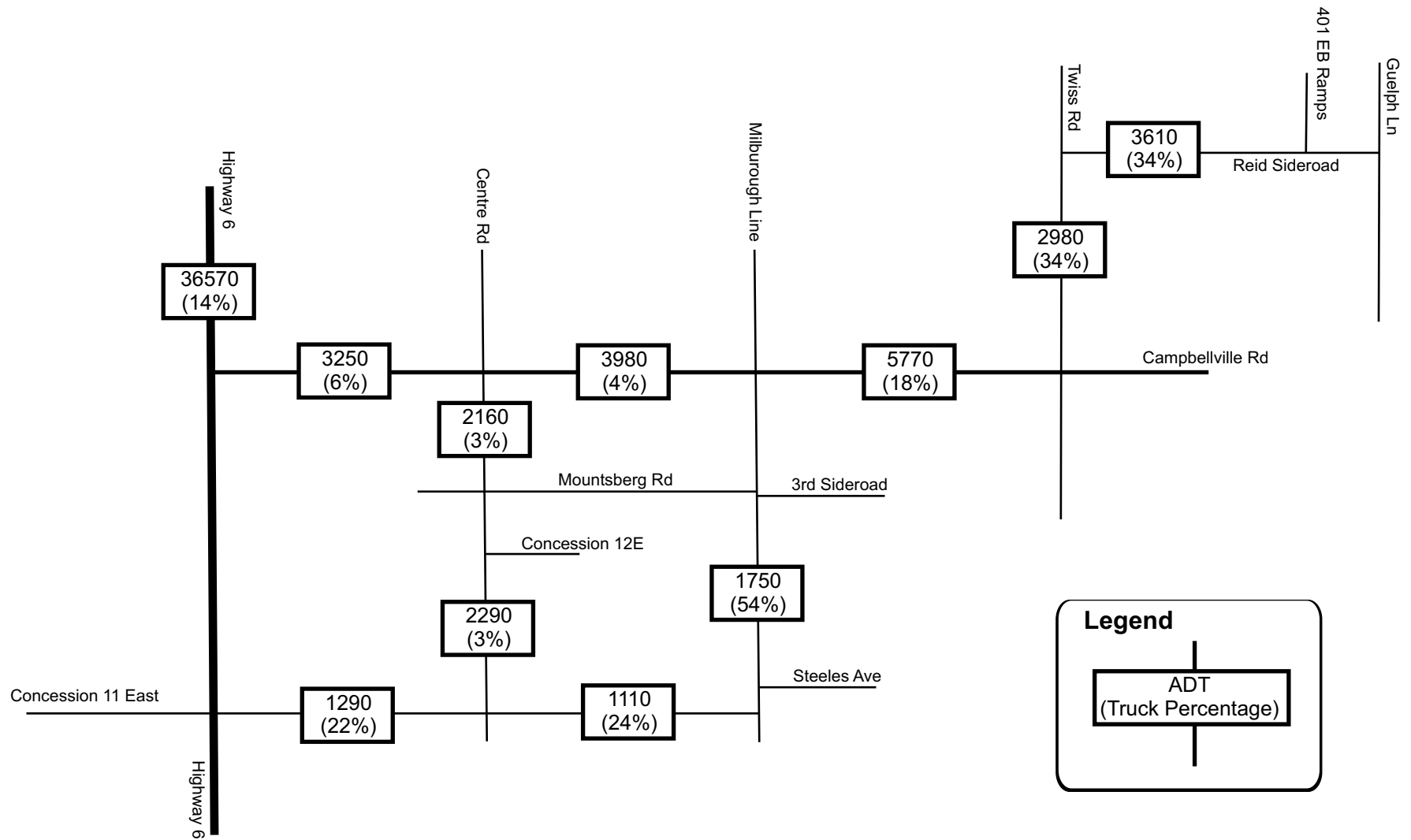
ADT  
(Truck Percentage)



Not To Scale

March 2008

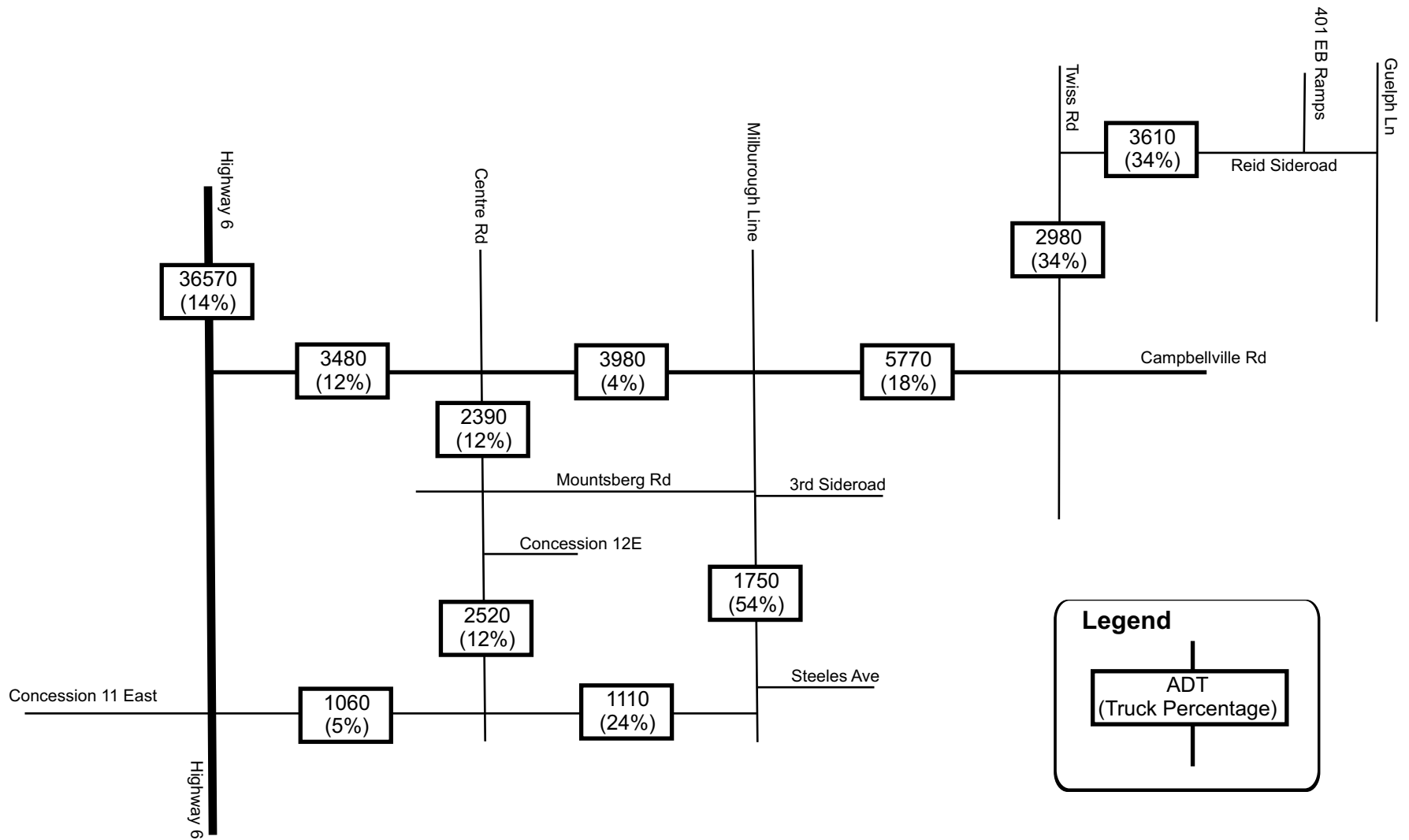
**2021 Alternative 3 Total Traffic  
Peak Average Daily Traffic (ADT) & Truck Percentages**



Not To Scale

March 2008

## 2021 Alternative 4 Total Traffic Peak Average Daily Traffic (ADT) & Truck Percentages



**Legend**

ADT  
(Truck Percentage)



Not To Scale

March 2008

**2021 Alternative 5 Total Traffic  
Peak Average Daily Traffic (ADT) & Truck Percentages**

**Build and No-Build Scenario  
Year 2031 Conditions  
Noise Modelling and Traffic Data**

**Traffic Distribution Summary Table**  
Scaled to fit 2031 ADT data

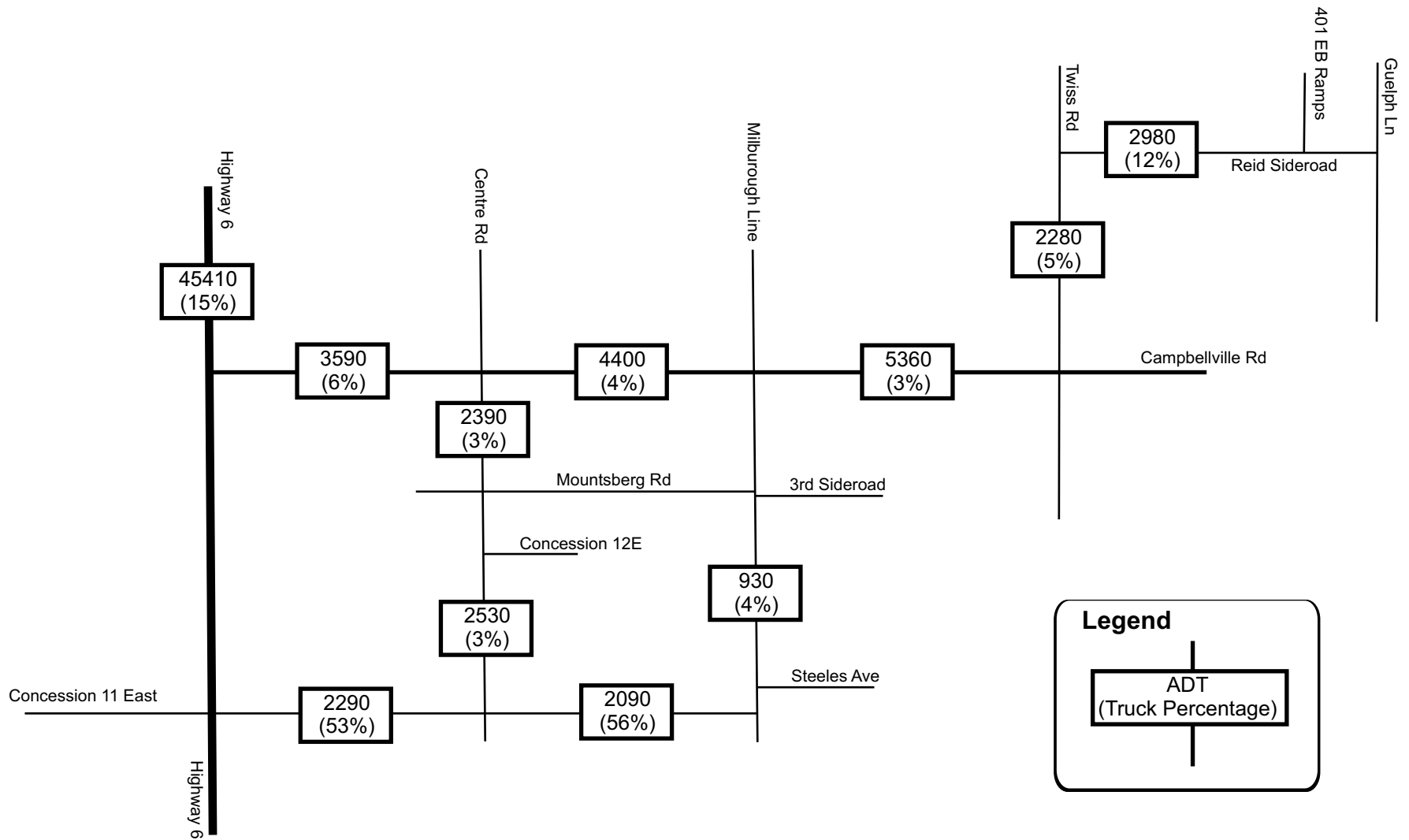
Road Segment	Speed Limit (kmph)	ADT	Breakdown			Hourly Counts													OLD ADT
			Auto	Med	Heavy	07:00h 08:00h	08:00h 09:00h	09:00h 10:00h	10:00h 11:00h	11:00h 12:00h	12:00h 13:00h	13:00h 14:00h	14:00h 15:00h	15:00h 16:00h	16:00h 17:00h	17:00h 18:00h	18:00h 19:00h		
Highway 6, north of Campbellville Road						918	777	650	594	592	575	627	615	747	849	861	575		
	NB Day 1 (unscaled)					834	715	700	564	634	629	621	419	16	12	10	87		
	NB Day 2 (unscaled)					836	820	736	644	600	651	619	641	845	968	1140	661		
	SB Day 1 (unscaled)					841	840	698	588	629	587	596	762	944	1004	1078	877		
	SB Day 2 (unscaled)					3408	3103	2717	2406	2454	2382	2421	2441	3094	3531	3888	2402		
AADT / counts scaled to fit new data	60																		
AADT / counts scaled to fit new data	80	44500	0.87	0.05	0.08	3255	3022	2693	2239	2316	2363	2365	2295	1866	1974	2114	1873	22900	
Highway 6, south of Campbellville Road, north of Concession 10E																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						3616	3293	2883	2553	2604	2528	2569	2590	3283	3747	4126	2549		
AADT / counts scaled to fit new data	80	47221	0.87	0.05	0.08	3454	3207	2858	2376	2458	2507	2510	2435	1980	2095	2243	1988	24300	
Highway 6, south of Concession 10E, north of Concession 8E																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						3929	3577	3132	2774	2829	2746	2791	2814	3567	4071	4482	2769		
AADT / counts scaled to fit new data	80	51301	0.87	0.05	0.08	3752	3484	3105	2581	2670	2724	2726	2646	2151	2276	2437	2159	26400	
Highway 6, south of Concession 8E, north of Parkside Dr																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						4465	4065	3559	3152	3215	3121	3172	3198	4053	4626	5093	3147		
AADT / counts scaled to fit new data	80	58297	0.87	0.05	0.08	4264	3959	3528	2933	3034	3096	3098	3007	2445	2586	2769	2454	30000	
Highway 6, south of Parkside Dr																			
assumed based on the ratio of the daily traffic to the segment north of Campbellville Rd (on the Existing Traffic and Truck Volumes drawing)																			
max 1 day total						6325	5759	5042	4465	4554	4421	4493	4530	5742	6553	7216	4458		
AADT / counts scaled to fit new data	80	82587	0.87	0.05	0.08	6041	5608	4998	4155	4298	4385	4389	4259	3463	3664	3923	3476	42500	
Campbellville Rd, east of HWY 6, west of Centre Rd																			
EB Day 1 (unscaled)						149	113	66	44	54	59	48	62	63	66	59	39		
EB Day 2 (unscaled)						164	129	69	54	48	57	66	54	70	61	72	50		
WB Day 1 (unscaled)						56	47	50	39	51	58	44	88	116	177	182	77		
WB Day 2 (unscaled)						51	43	36	36	50	45	44	81	111	168	201	92		
AADT / counts scaled to fit new data	80					327	262	177	137	160	178	168	228	276	370	416	216		
AADT / counts scaled to fit new data	70	3590	0.94	0.02	0.04	312	244	160	126	149	155	140	206	273	349	367	177	2357	
Centre Rd, south of Campbellville Rd, north of Concession 11E																			
data from Centre Rd bw Cambellville Rd and Mountsberg																			
SB Day 1 (unscaled)						34	44	34	36	33	44	43	50	80	111	104	42		
SB Day 2 (unscaled)						44	50	26	37	39	47	43	52	67	84	98	63		
NB Day 1 (unscaled)						89	64	47	45	53	36	48	27	56	68	55	43		
NB Day 2 (unscaled)						69	58	45	37	41	39	37	49	54	62	69	50		
AADT / counts scaled to fit new data	60					187	165	123	123	131	131	139	154	207	273	254	172		
AADT / counts scaled to fit new data	80	2390	0.97	0.01	0.02	172	165	108	113	122	122	122	117	184	222	242	129	1569	
Concession 11E, east of HWY 6, west of Milborough Line																			
data from Concession 11 between Millborough Townline and Centre Road																			
EB Day 1 (unscaled)						34	29	16	19	7	9	15	10	17	18	6	16		
EB Day 2 (unscaled)						25	26	16	10	8	17	12	12	21	21	15	10		
WB Day 1 (unscaled)						15	13	6	9	14	15	18	16	19	31	34	17		
WB Day 2 (unscaled)						12	10	11	14	15	11	22	12	16	30	30	20		
AADT / counts scaled to fit new data	50					90	77	50	52	42	52	63	48	68	94	83	61		
AADT / counts scaled to fit new data	60	950	0.96	0.02	0.02	68	66	41	44	39	44	61	44	66	90	74	55	516	
Milborough Line, north of Concession 11E, south of Campbellville Rd																			
data from Derry Rd to Concession 10 (1991)																			
total	60	930	0.96	0.02	0.02	44	40	25	26	22	26	35	25	37	51	43	33	915	
Campbellville Rd, east of Milborough Line, west of Twiss Rd																			
data from Milborough Line to First Line, Nassagaweya (2002)																			
total		5360	0.97	0.01	0.02	428	354	221	192	251	236	258	280	325	561	524	376	3631	
data from First Line, Nassagaweya to CNR tracks (2002)																			
total		4709	0.96	0.02	0.02	399	305	211	183	217	219	246	270	332	449	437	287	3190	
data from CNR tracks to Guelph Line (2002)																			
total	60	4225	0.95	0.02	0.03	378	269	204	177	192	207	236	263	338	366	372	220	2862	
Twiss Rd, north of Campbellville Rd, south of Reid SDRD																			
SB Day 1 (unscaled)						40	37	26	28	28	11	35	57	60	103	121	59		
SB Day 2 (unscaled)						30	32	32	25	32	39	26	72	57	99	108	77		
NB Day 1 (unscaled)						73	60	51	31	26	38	46	39	22	30	34	26		
NB Day 2 (unscaled)						69	57	48	50	33	41	26	33	32	33	46	26		
AADT / counts scaled to fit new data						173	148	122	115	99	122	124	161	136	203	237	158		
AADT / counts scaled to fit new data	60	2280	0.95	0.02	0.03	151	136	118	90	83	75	80	147	125	202	235	130	1491	
Reid SDRD, east of Twiss Rd, west of Guelph Line																			
data from Second Line, Nassagaweya to 1.35 km east (2002)																			
total	60	2980	0.88	0.05	0.07	216	237	182	143	149	185	159	165	216	242	253	168	1935	











**Legend**

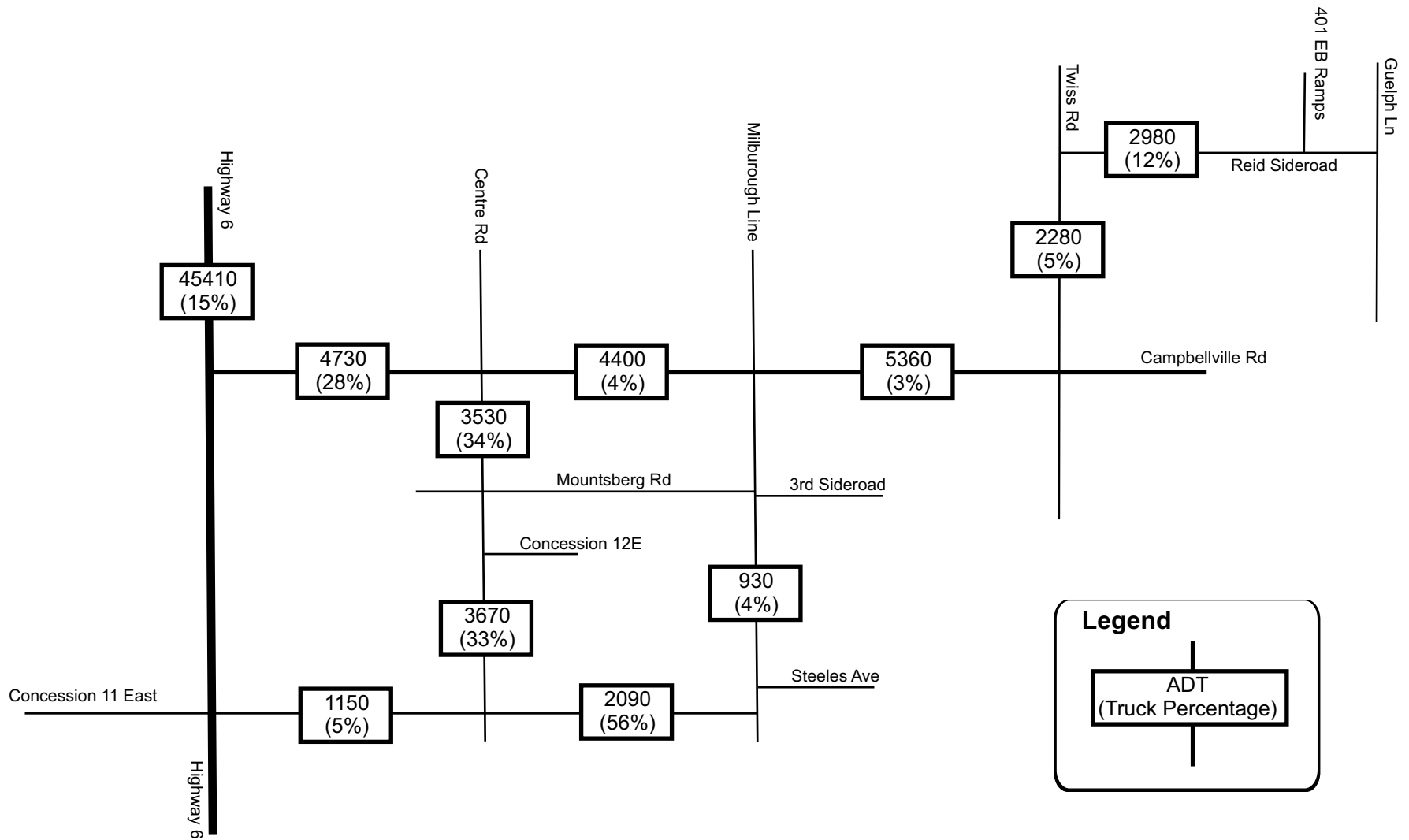
ADT  
(Truck Percentage)



Not To Scale

March 2008

**2031 Alternative 1 Total Traffic  
Peak Average Daily Traffic (ADT) & Truck Percentages**



**Legend**

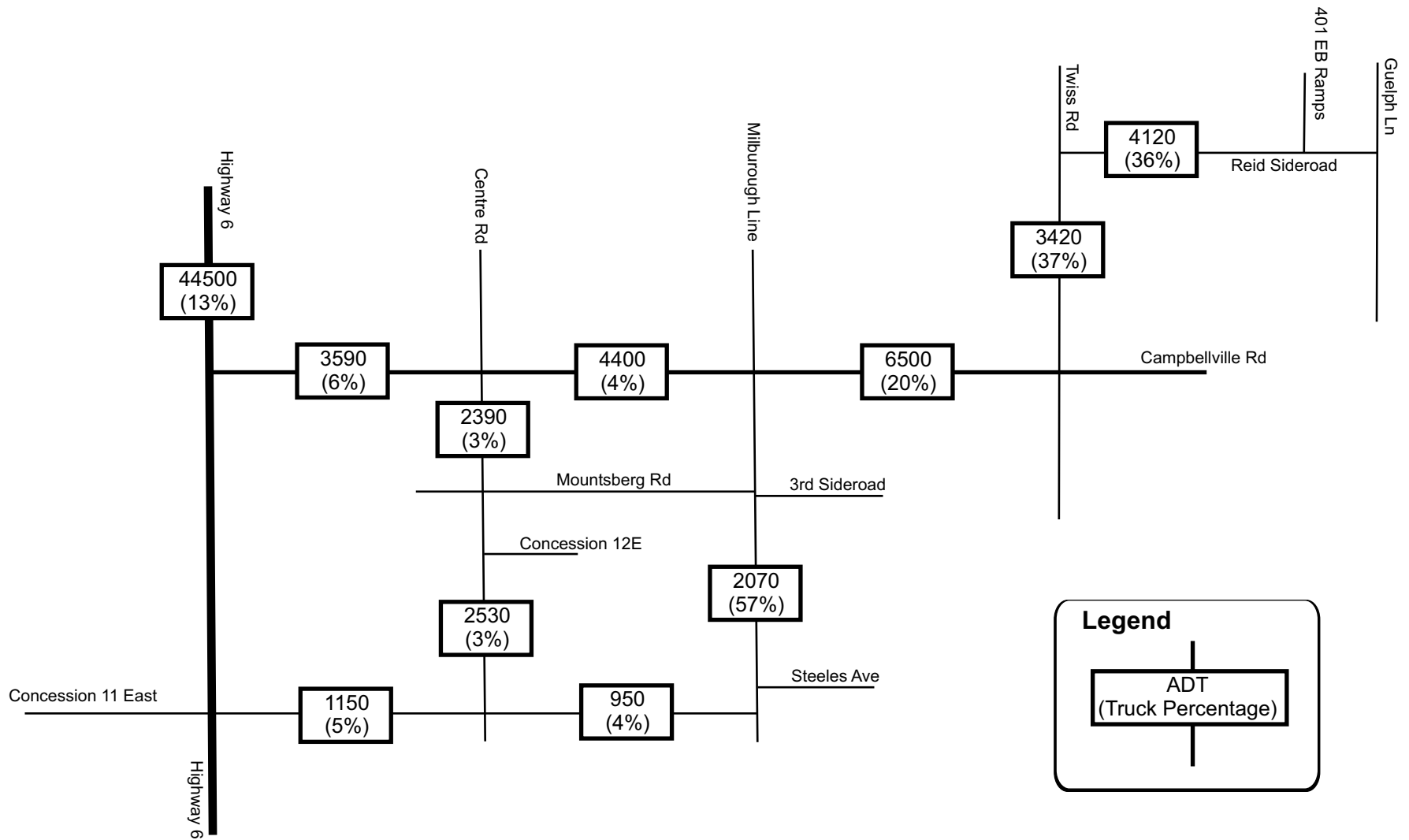
ADT  
(Truck Percentage)



Not To Scale

March 2008

**2031 Alternative 2 Total Traffic  
Peak Average Daily Traffic (ADT) & Truck Percentages**



**Legend**

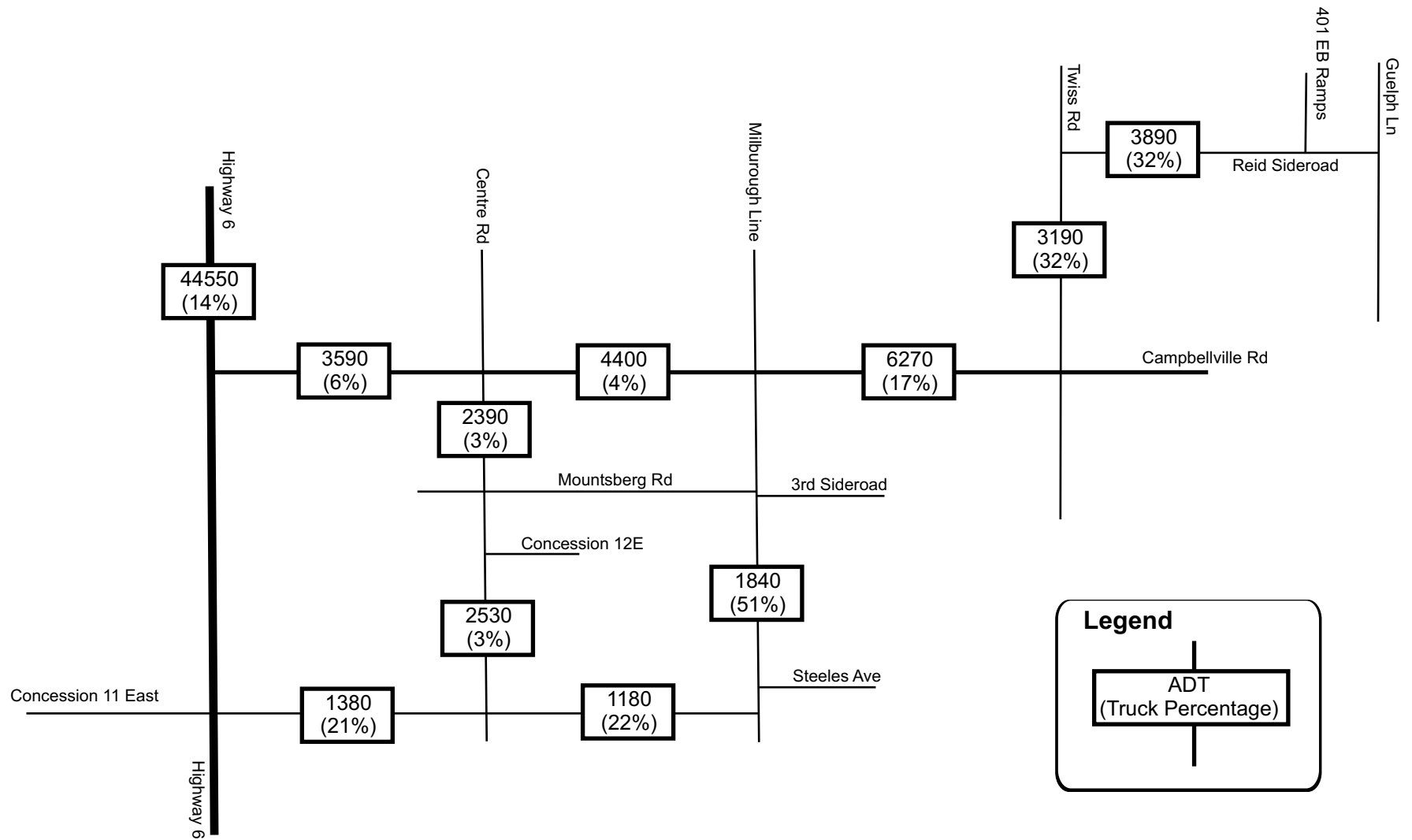
ADT  
(Truck Percentage)



Not To Scale

March 2008

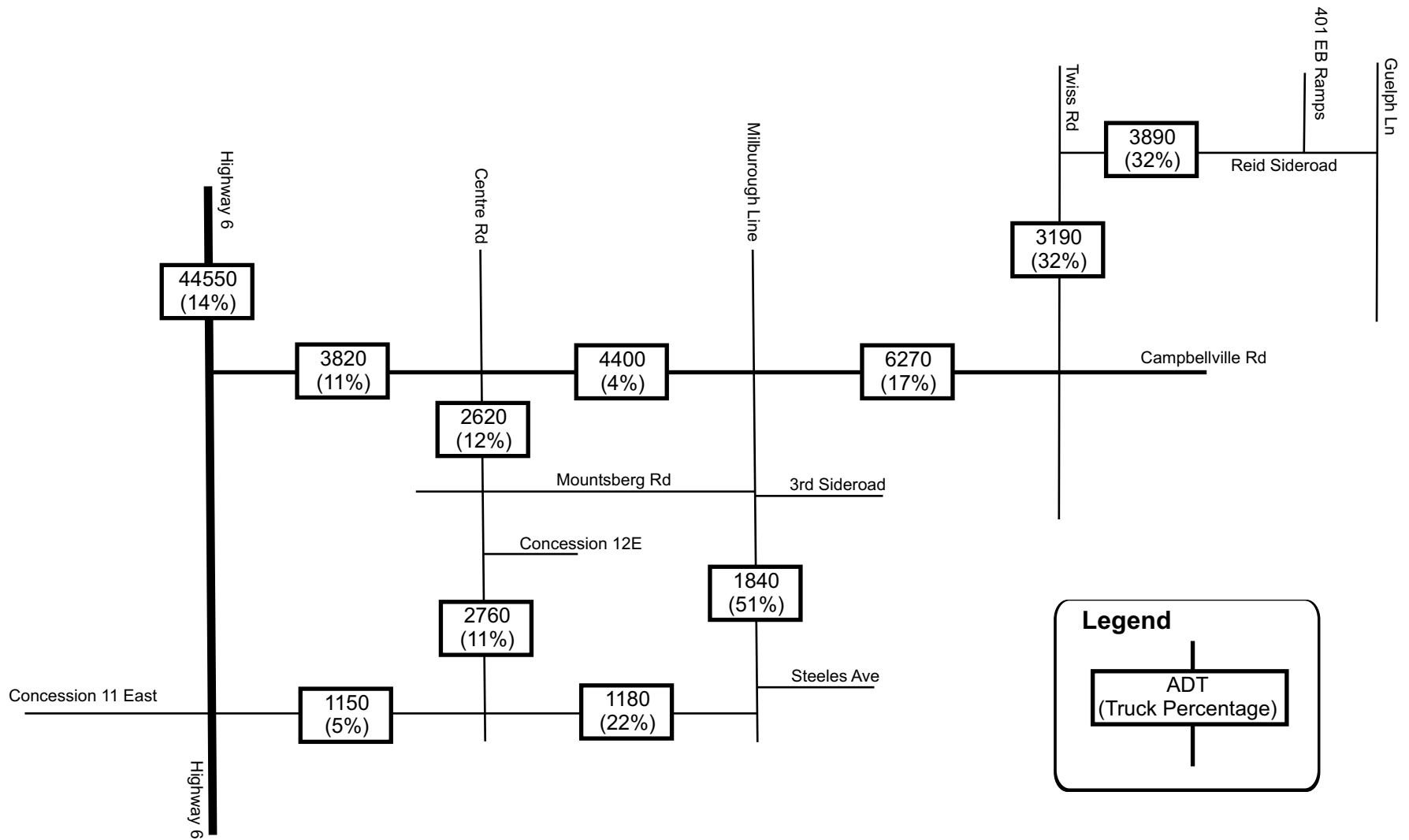
## 2031 Alternative 3 Total Traffic Peak Average Daily Traffic (ADT) & Truck Percentages



Not To Scale

March 2008

## 2031 Alternative 4 Total Traffic Peak Average Daily Traffic (ADT) & Truck Percentages



Not To Scale

March 2008

## 2031 Alternative 5 Total Traffic Peak Average Daily Traffic (ADT) & Truck Percentages

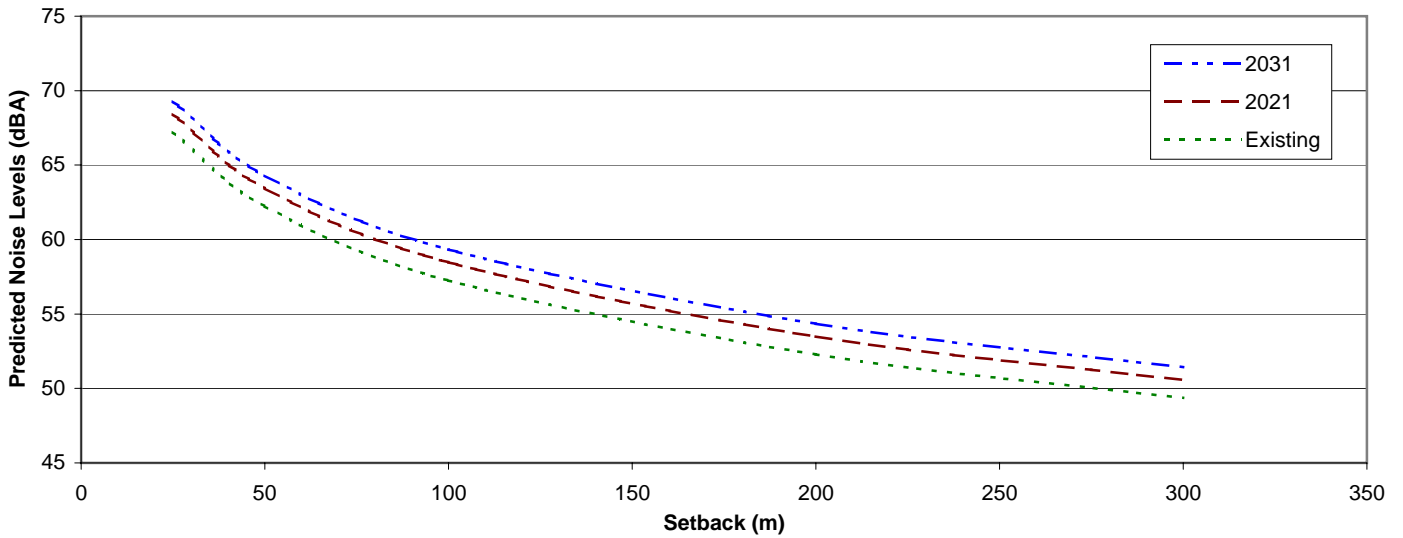
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## **APPENDIX D**

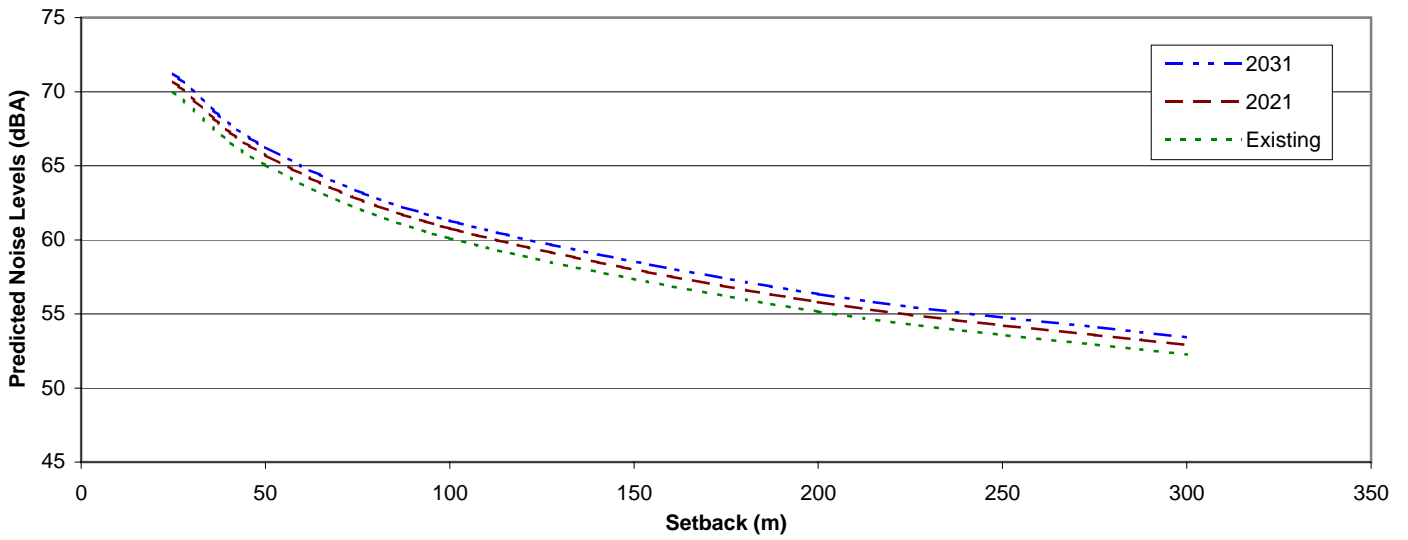
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### **Graphical Presentation Of Noise Levels Versus Distance**

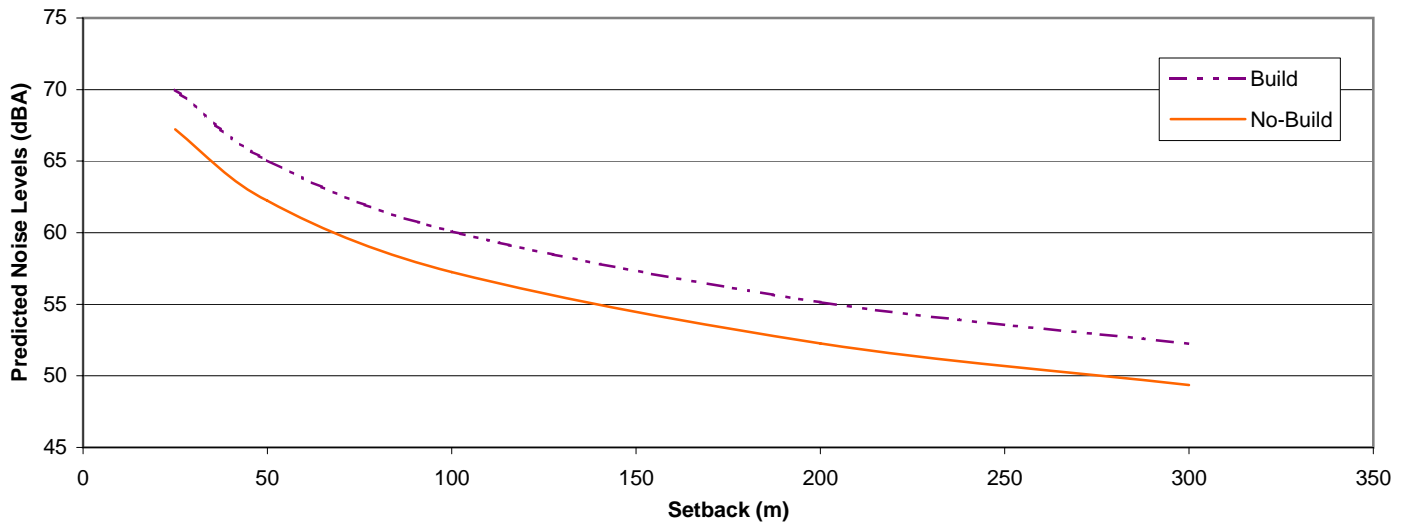
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 23 - Highway 6, north of Campbellville Road

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

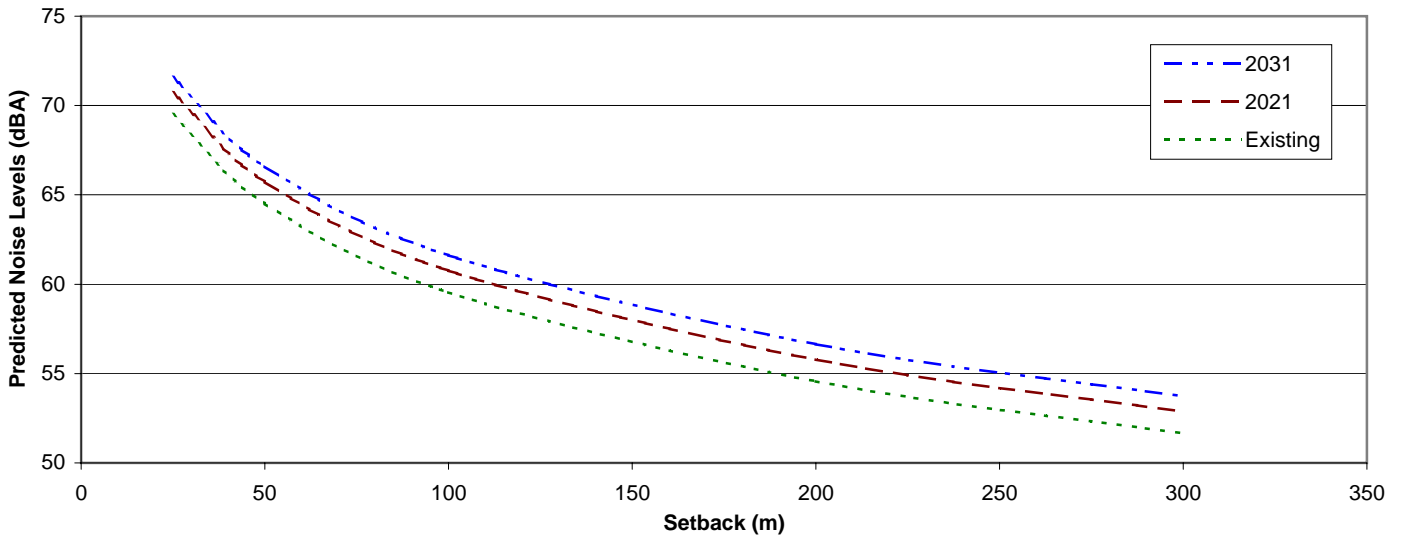
Project # W08-5107A

Figure No. **D.1**

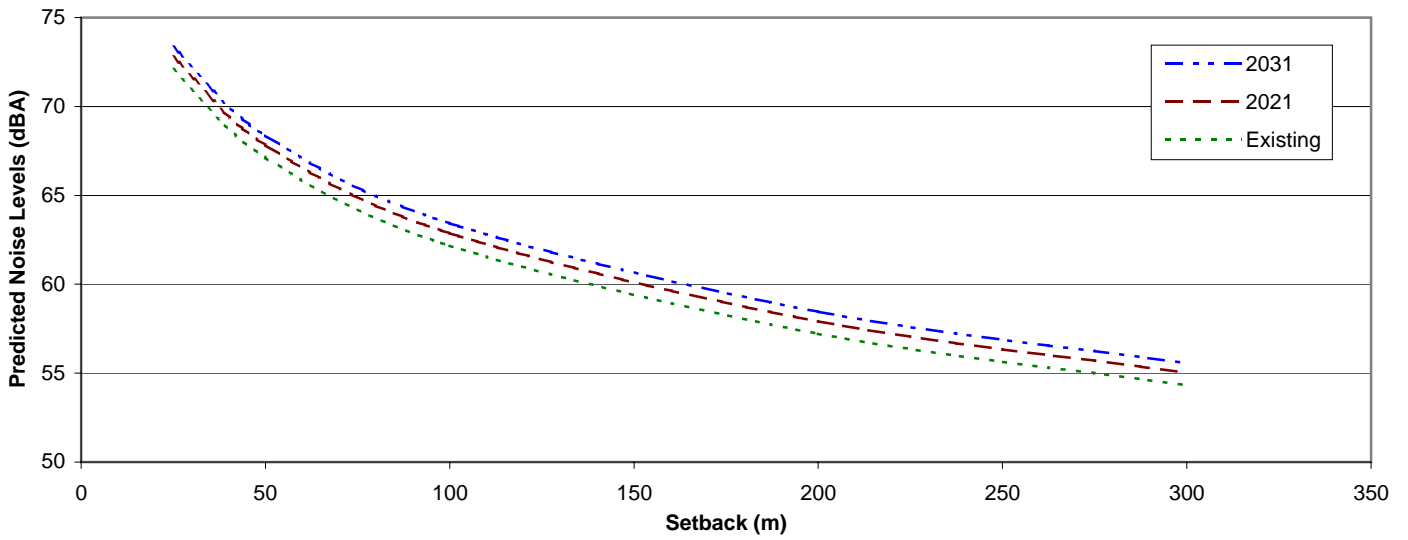
Date: Aug 28, 2008



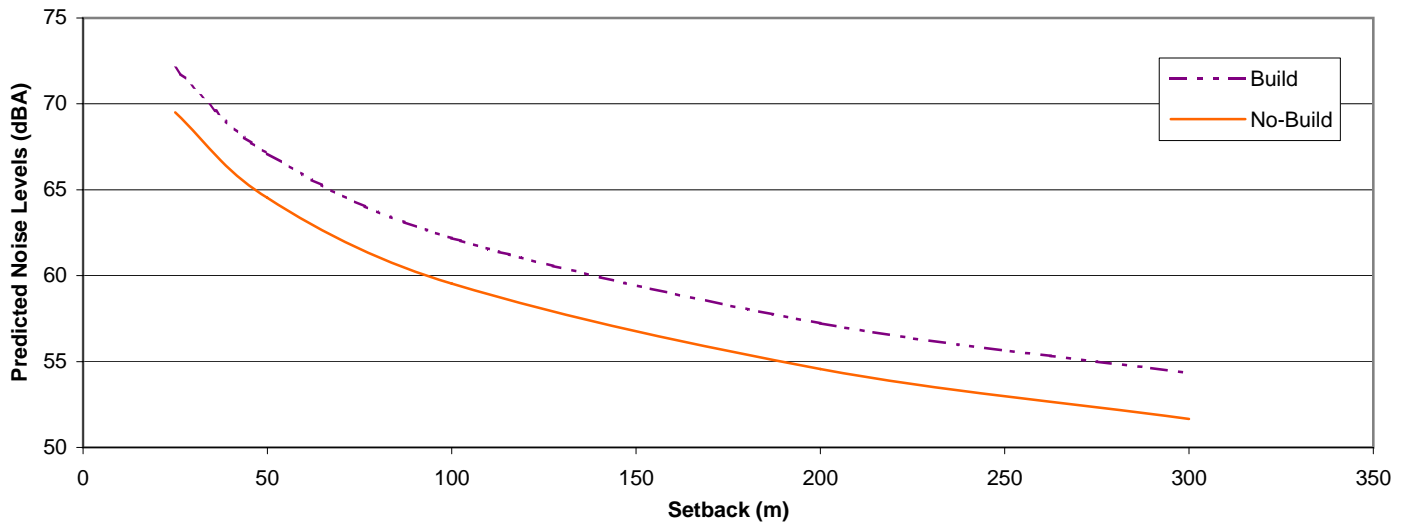
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 23 - Highway 6, north of Campbellville Road

Speed Limit = 80 km/hr

Flamborough Quarry Haul Route Study

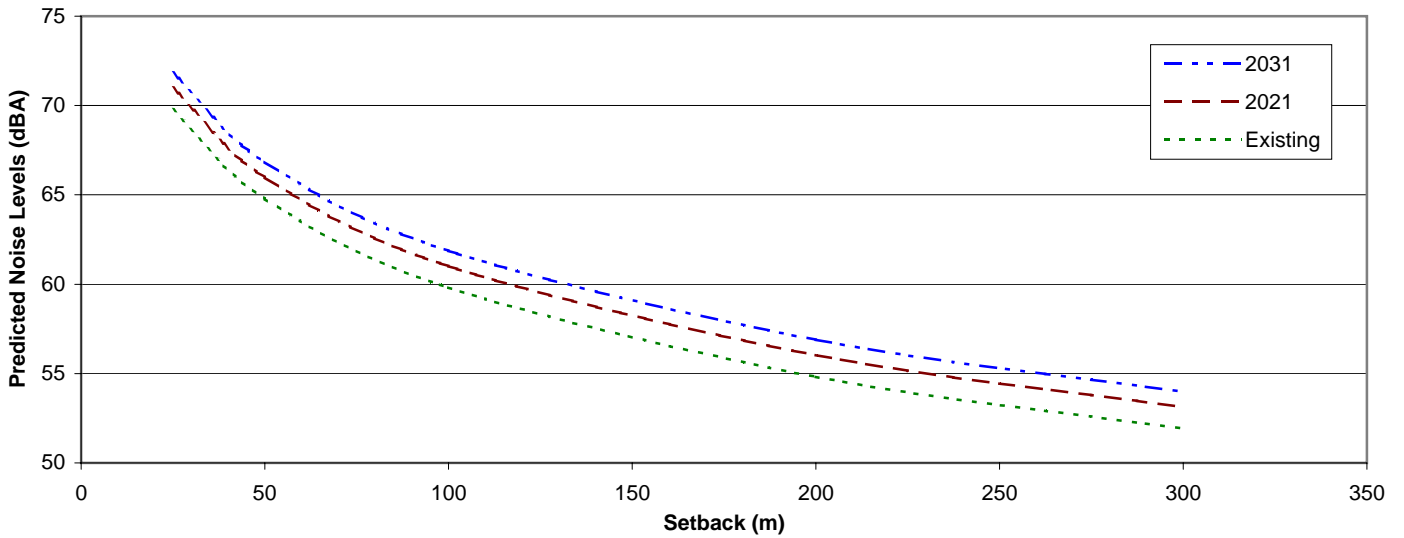
Project # W08-5107A

Figure No. **D.2**

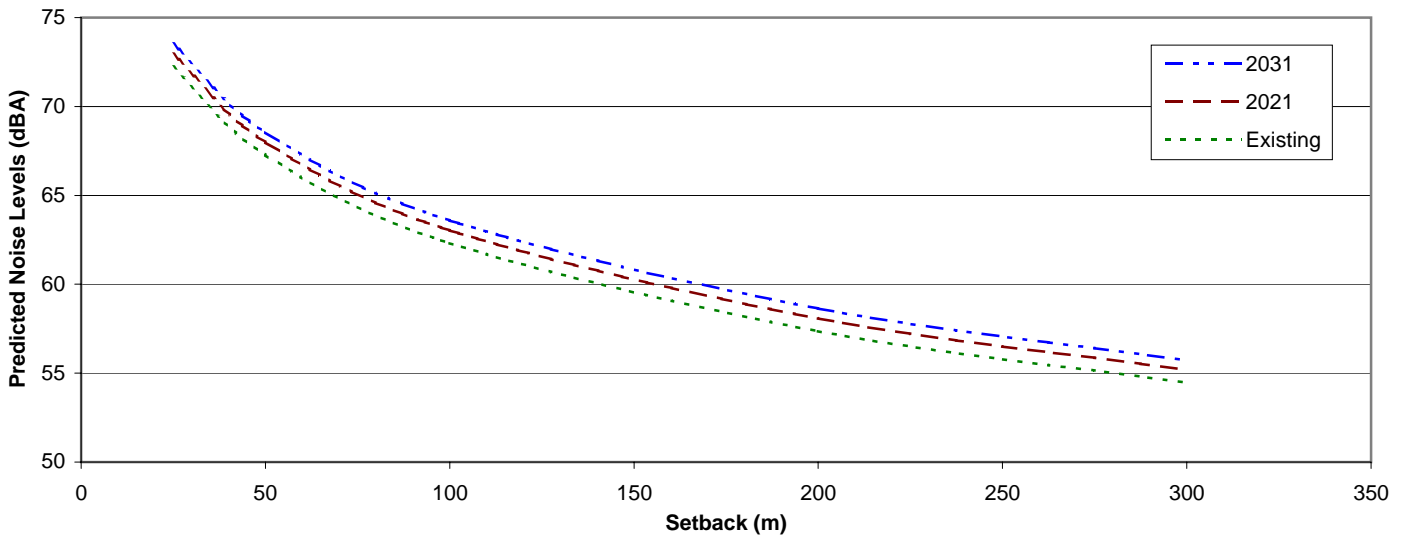
Date: Aug 28, 2008



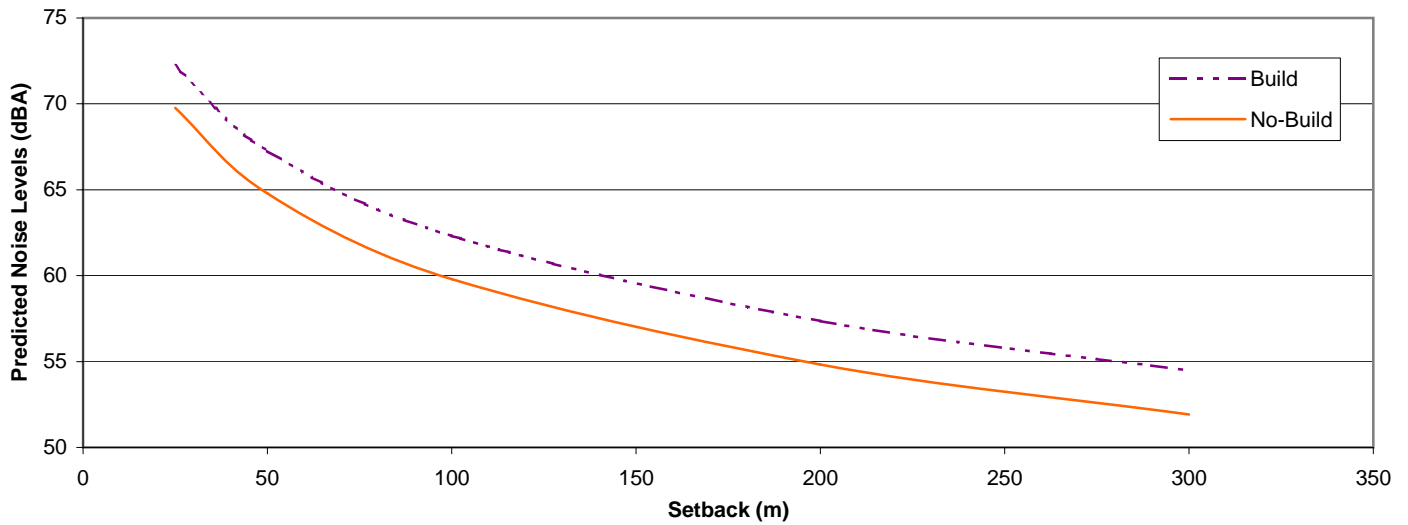
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 24 - Highway 6, south of Campbellville Road, north of Concession 10E

Speed Limit = 80 km/hr

Flamborough Quarry Haul Route Study

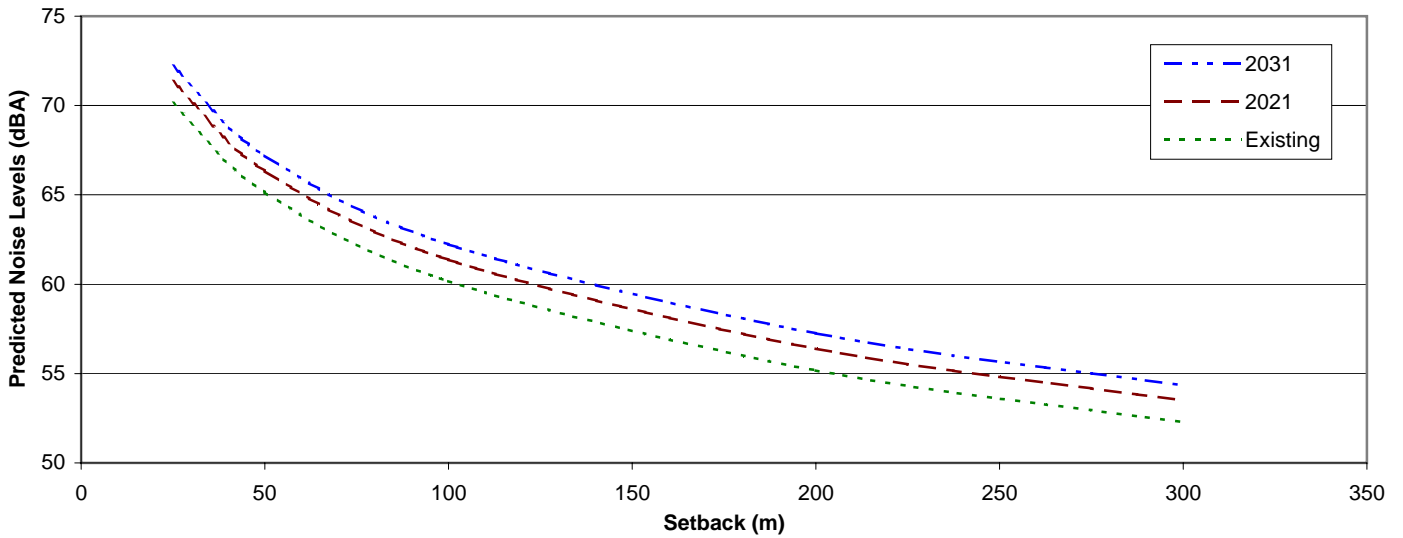
Project # W08-5107A

Figure No. **D.3**

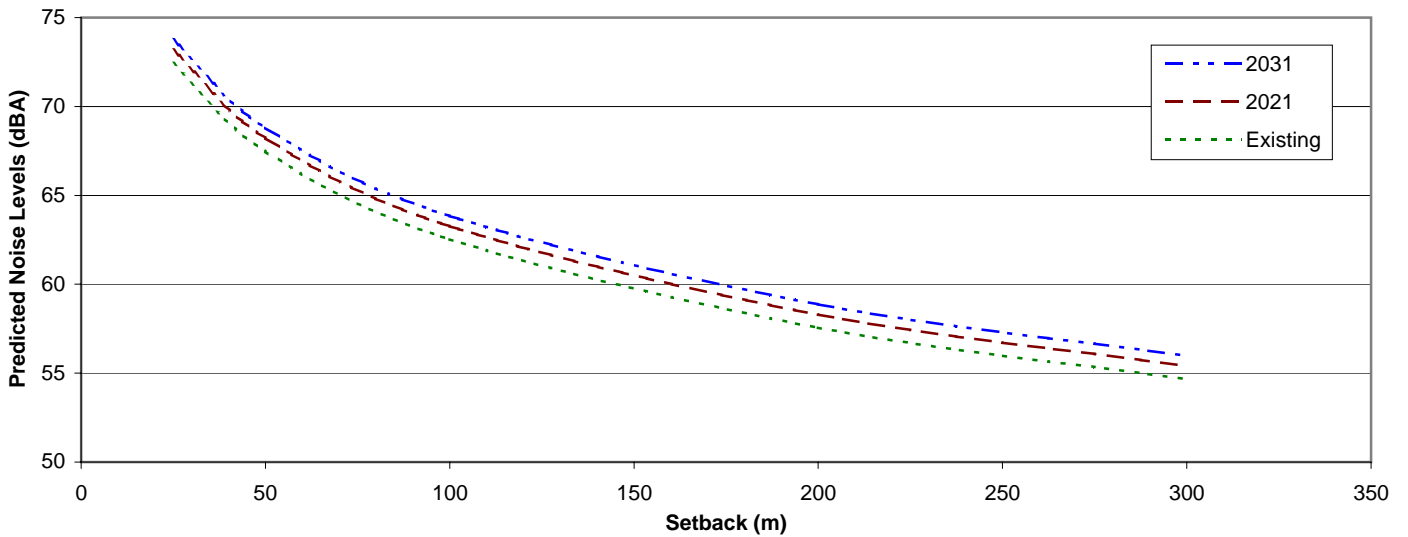
Date: Aug 28, 2008



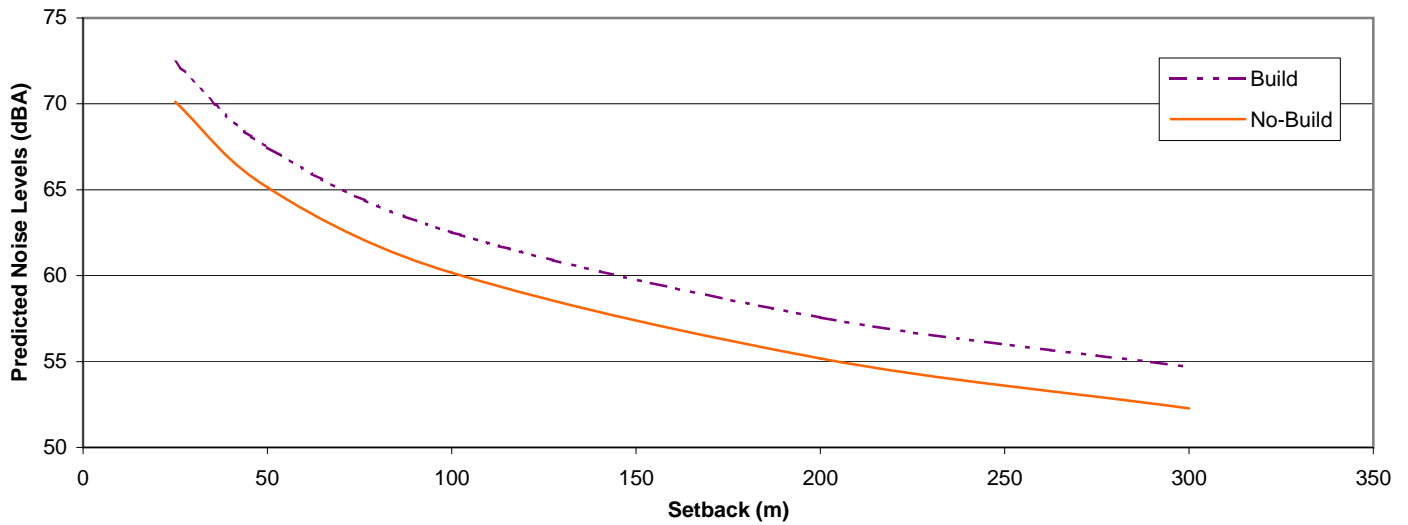
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 25a - Highway 6, south of Concession 10E, north of Concession 8E

Speed Limit = 80 km/hr

Flamborough Quarry Haul Route Study

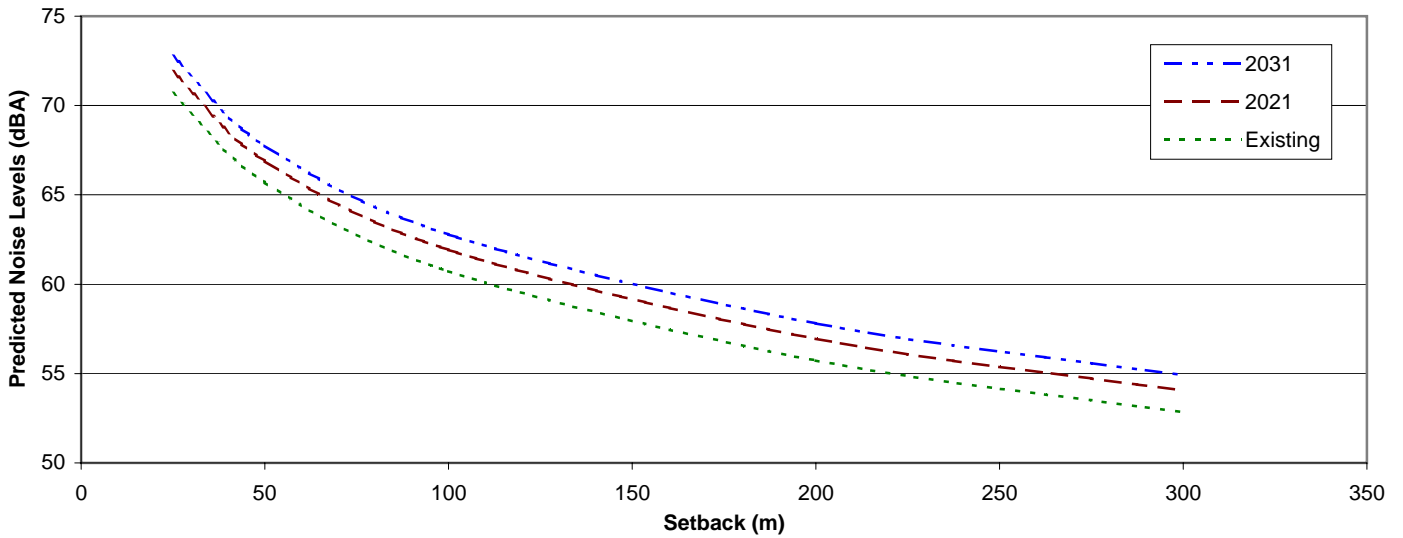
Project # W08-5107A

Figure No. **D.4**

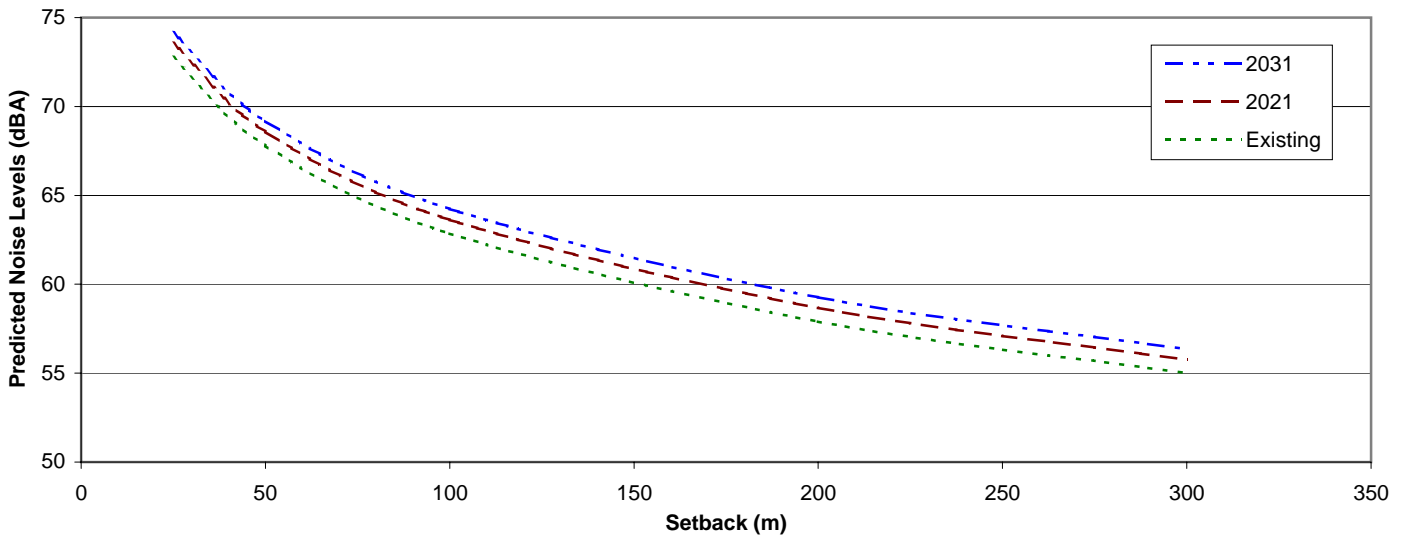
Date: Aug 28, 2008



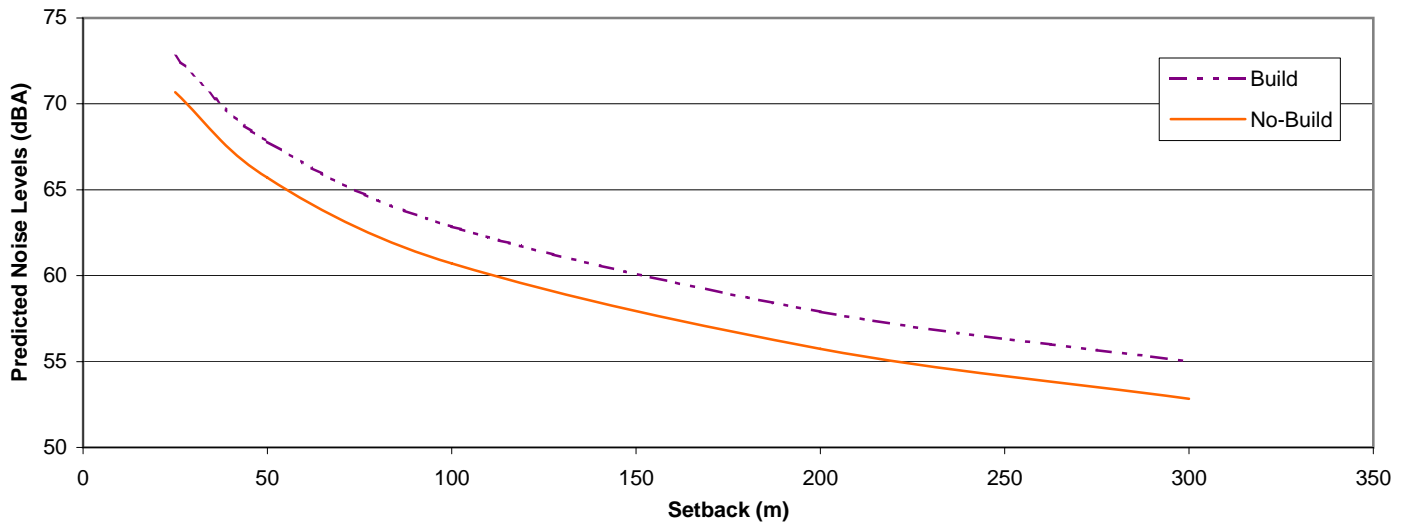
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 25b - Highway 6, south of Concession 8E, north of Parkside Dr

Speed Limit = 80 km/hr

Flamborough Quarry Haul Route Study

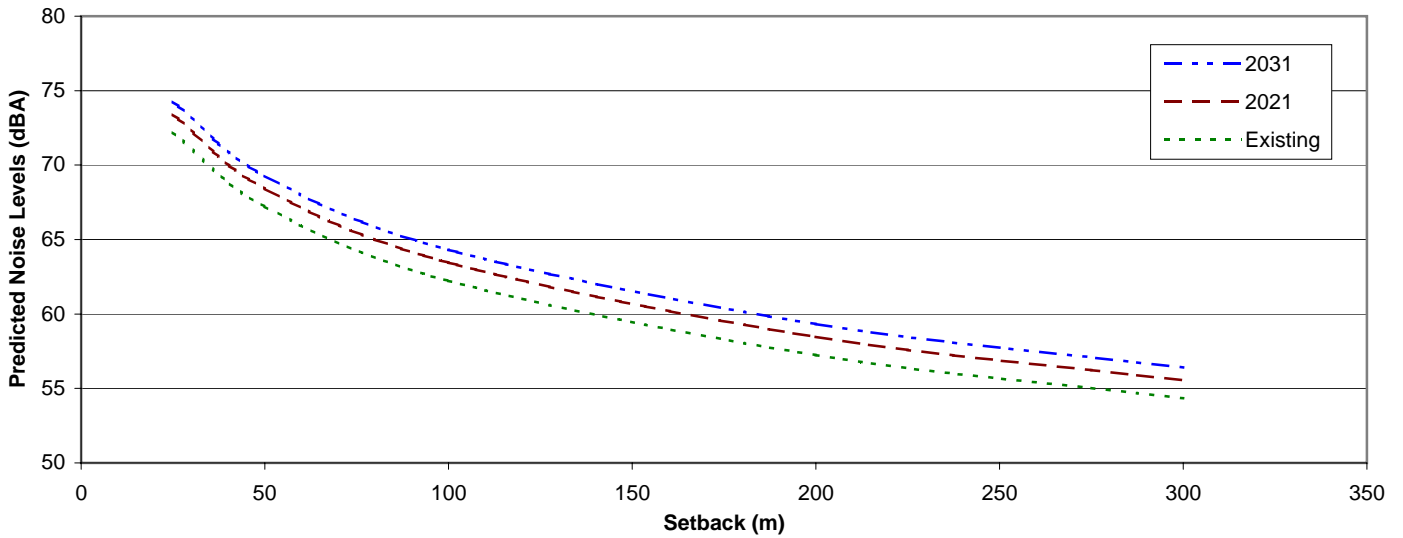
Project # W08-5107A

Figure No. **D.5**

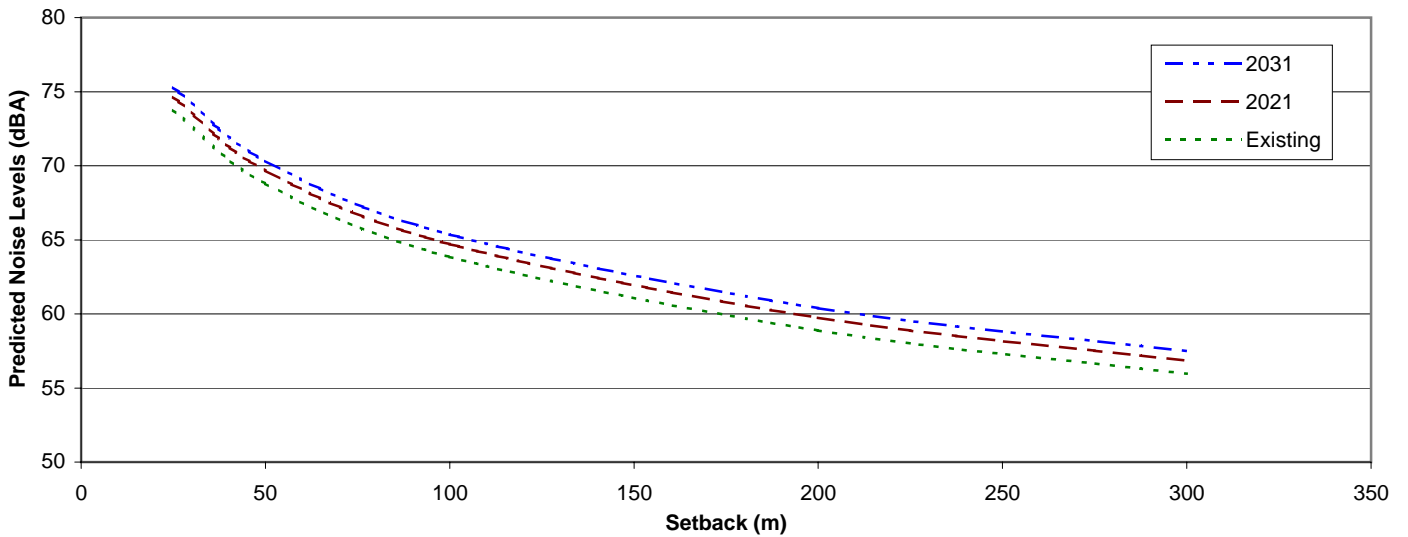
Date: Aug 28, 2008



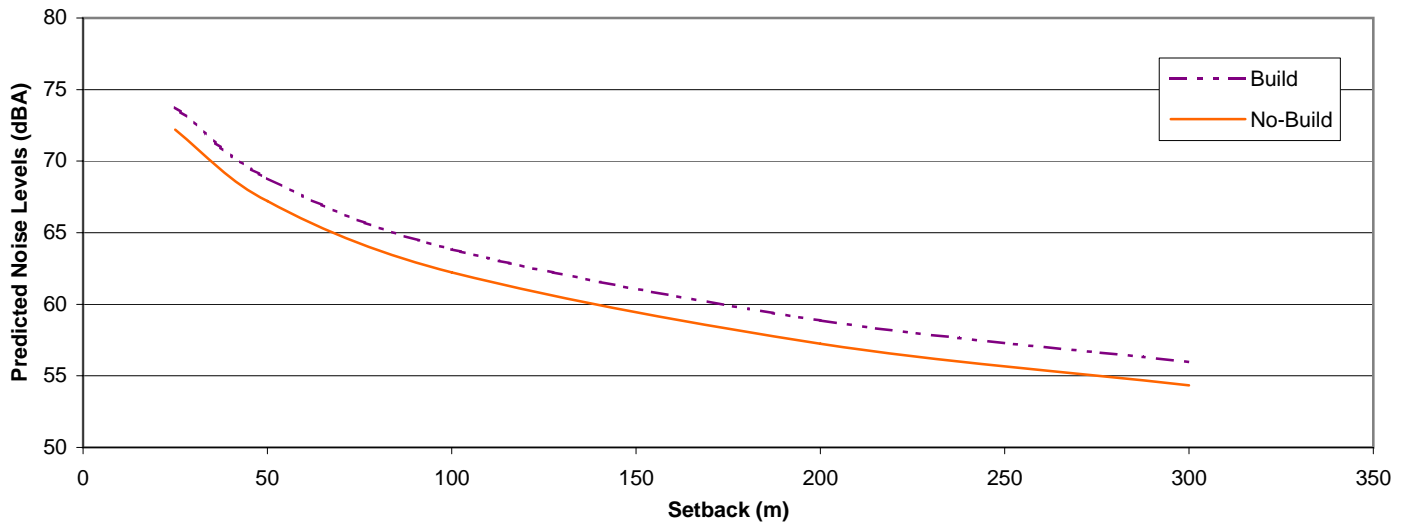
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 25c - Highway 6, south of Parkside Dr

Speed Limit = 80 km/hr

Flamborough Quarry Haul Route Study

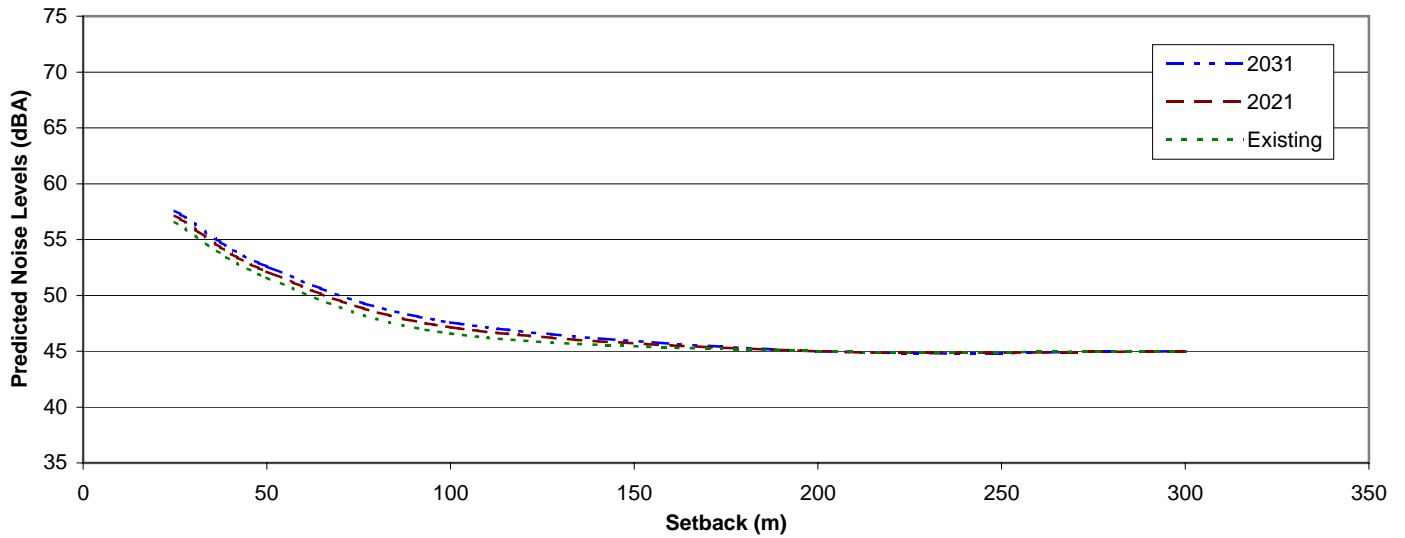
Project # W08-5107A

Figure No. **D.6**

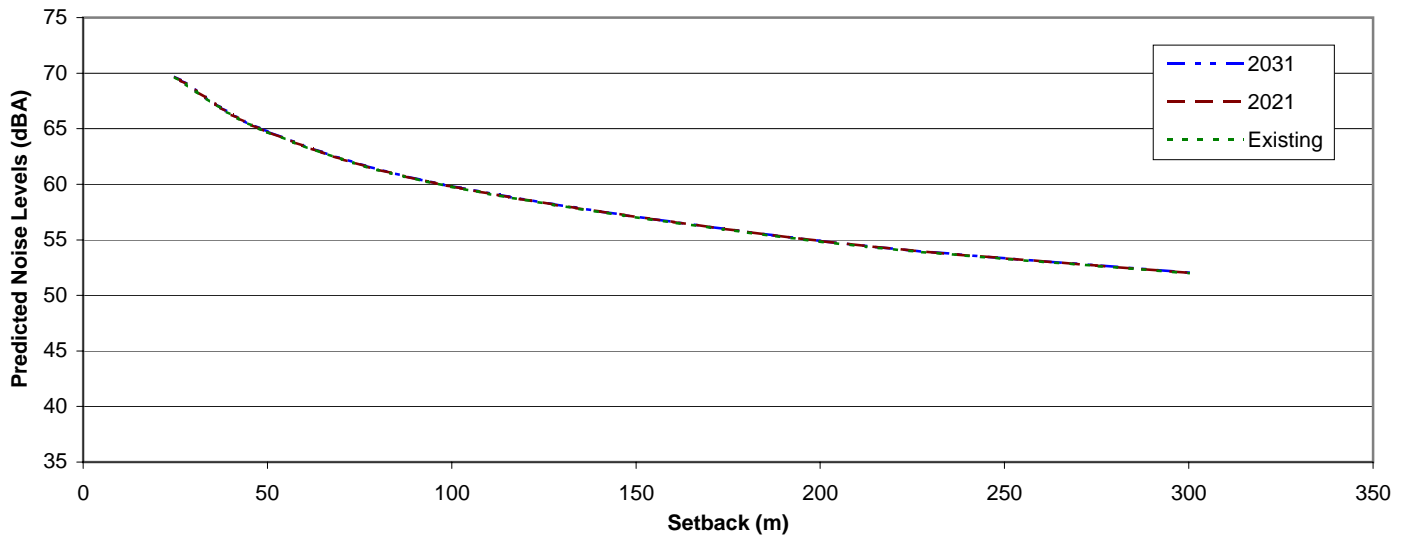
Date: Aug 28, 2008



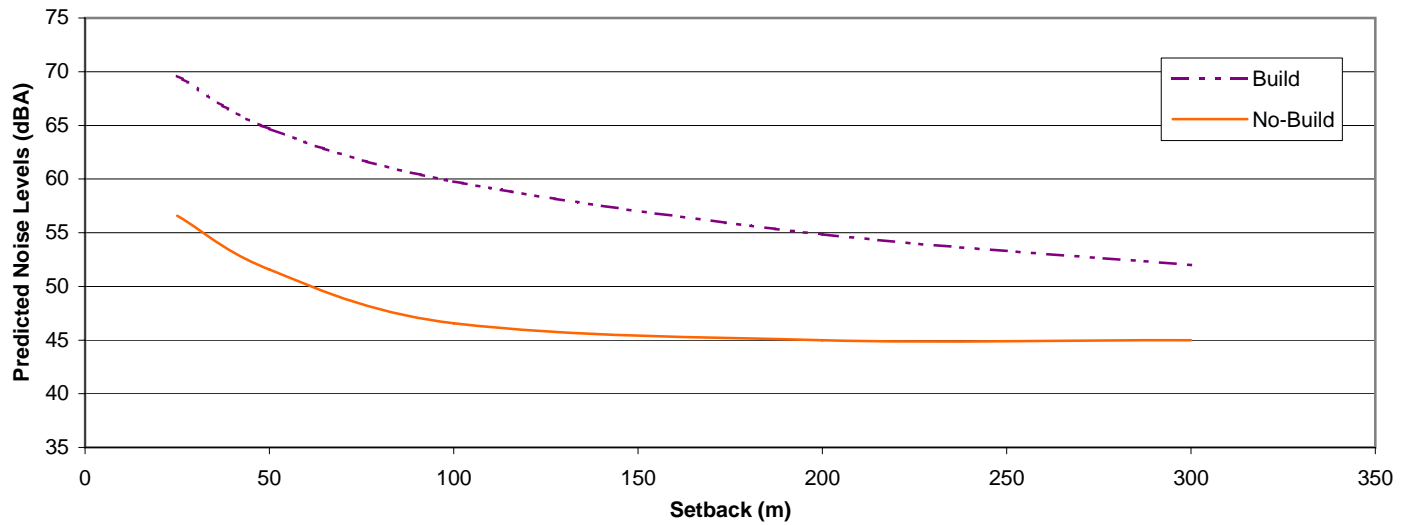
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 11 - Campbellville Rd, east of HWY 6, west of Centre Rd

Speed Limit = 80 km/hr

Flamborough Quarry Haul Route Study

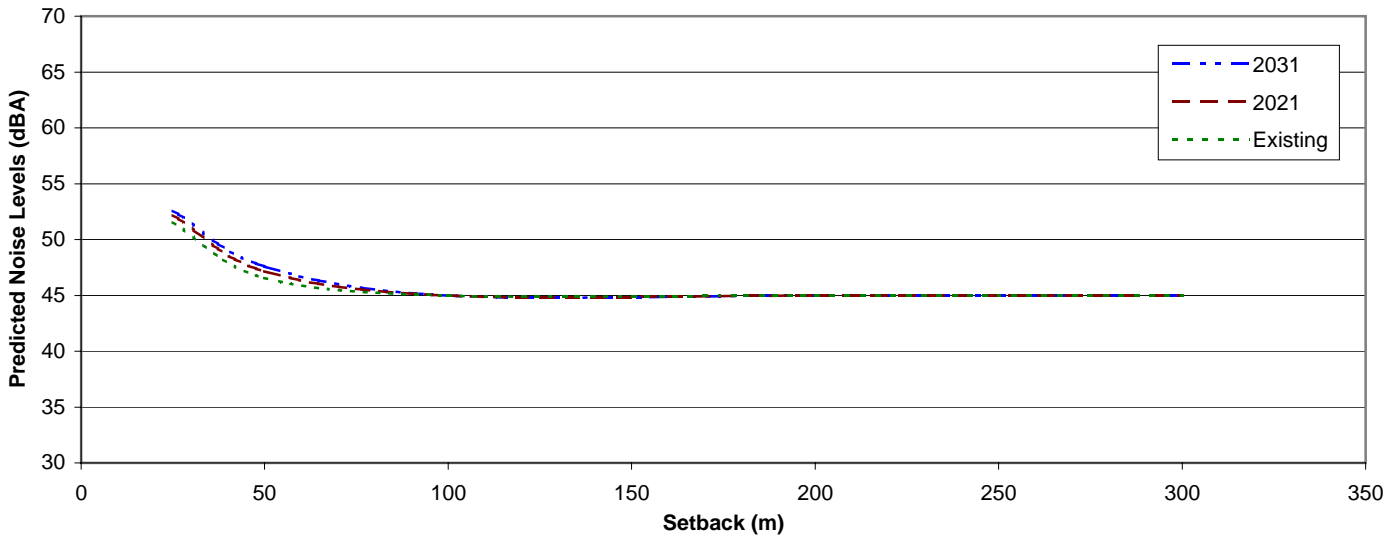
Project # W08-5107A

Figure No. **D.7**

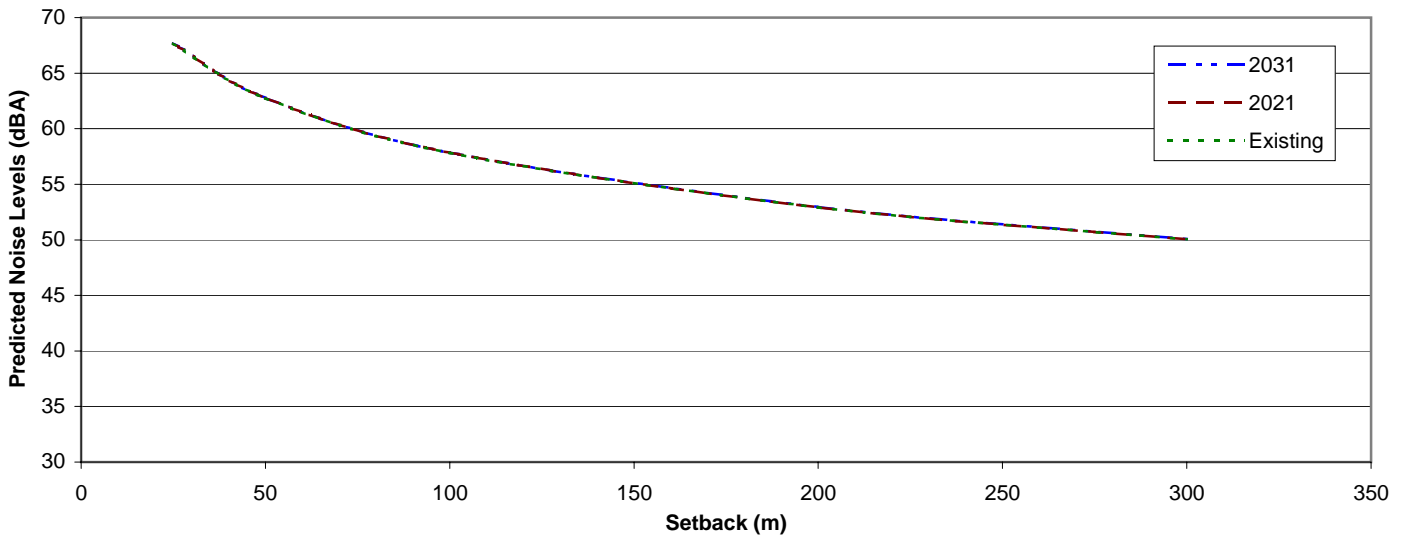
Date: Aug 28, 2008



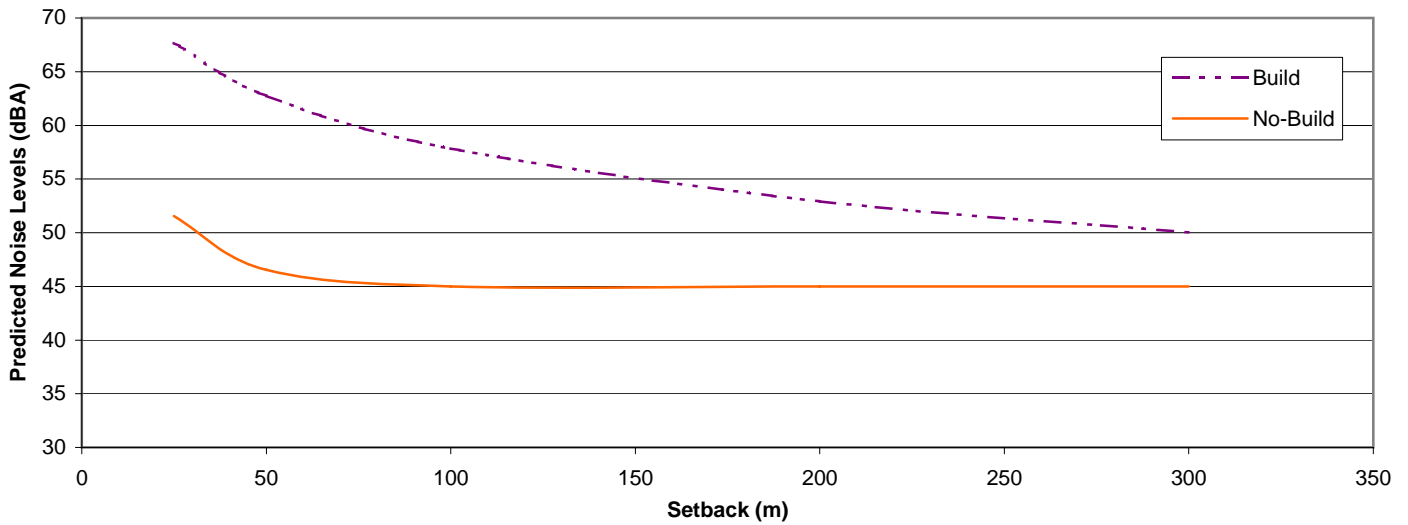
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 1 - Centre Rd, south of Campbellville Rd, north of Concession 11E

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

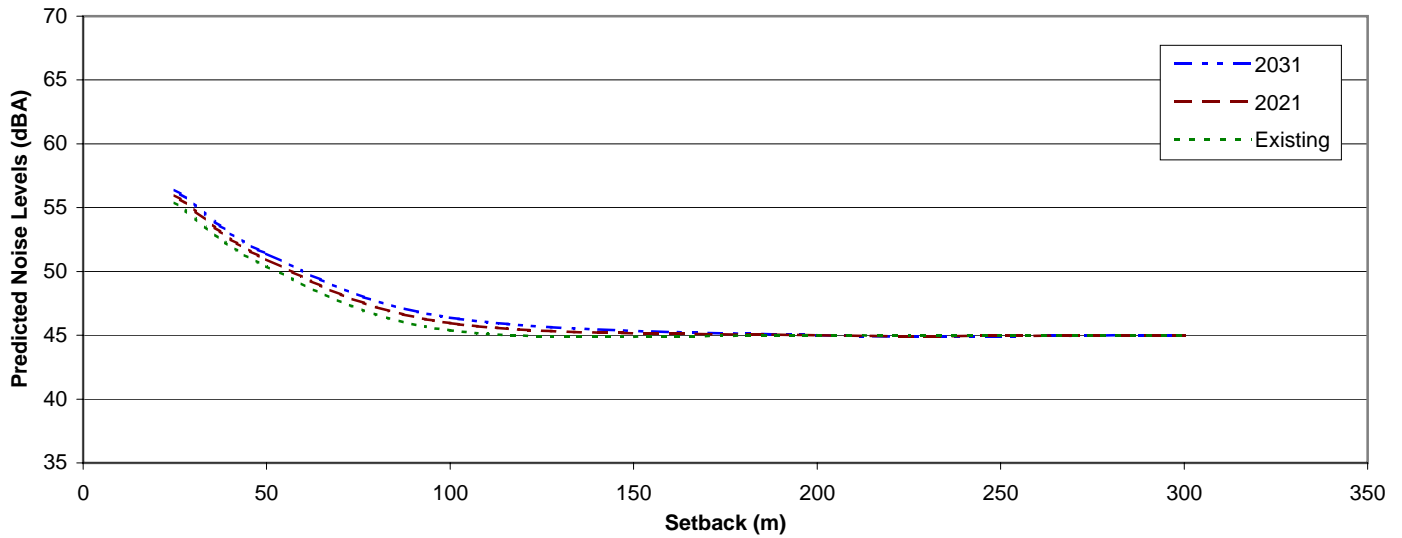
Project # W08-5107A

Figure No. **D.9**

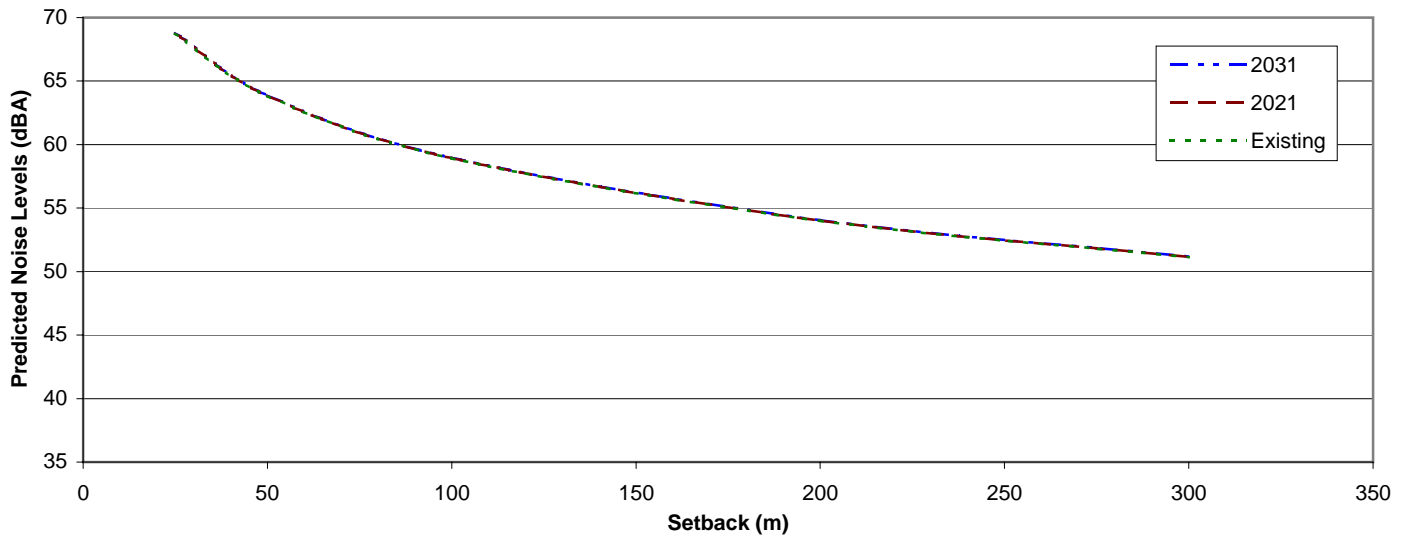
Date: Aug 28, 2008



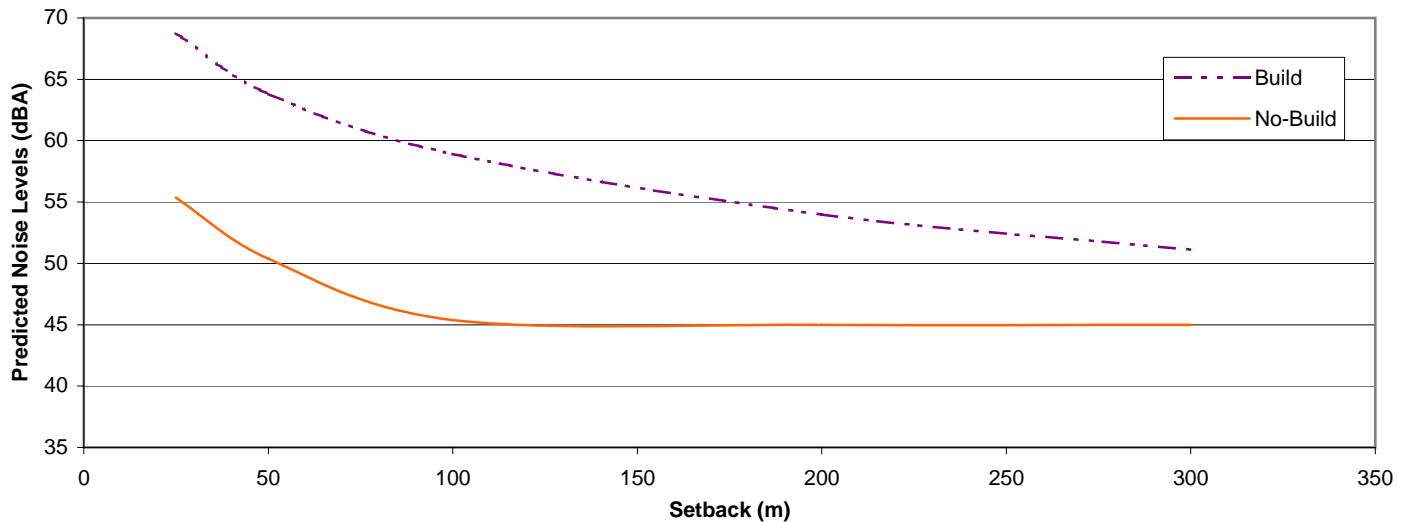
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 11 - Campbellville Rd, east of HWY 6, west of Centre Rd

Speed Limit = 70 km/hr

Flamborough Quarry Haul Route Study

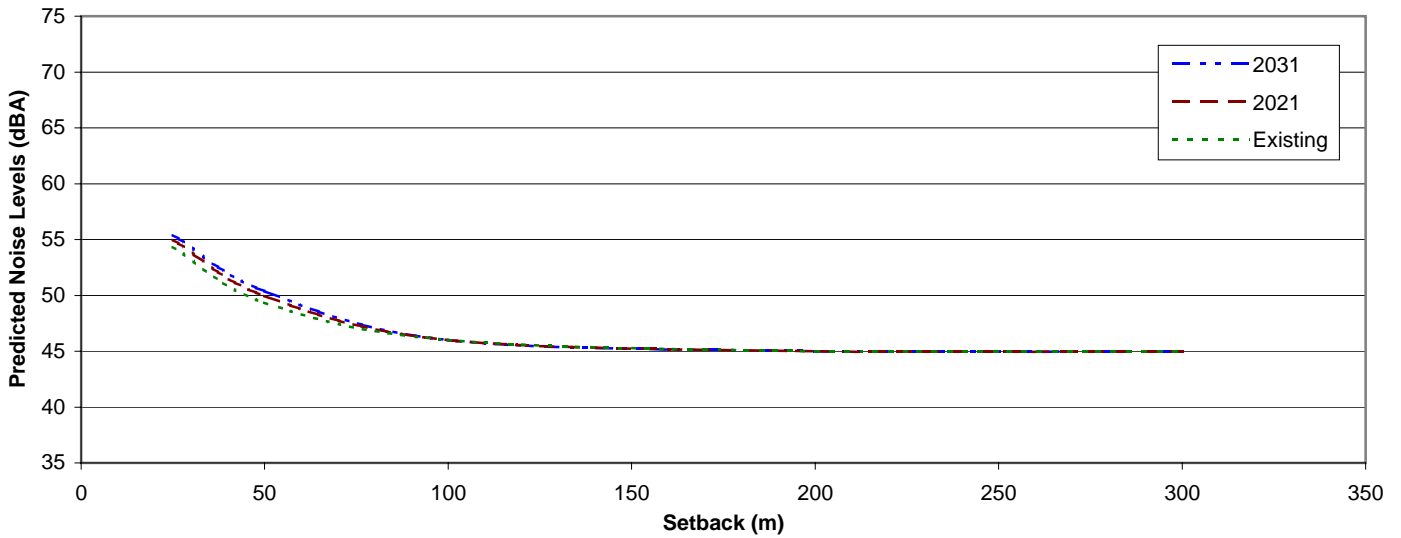
Project # W08-5107A

Figure No. **D.8**

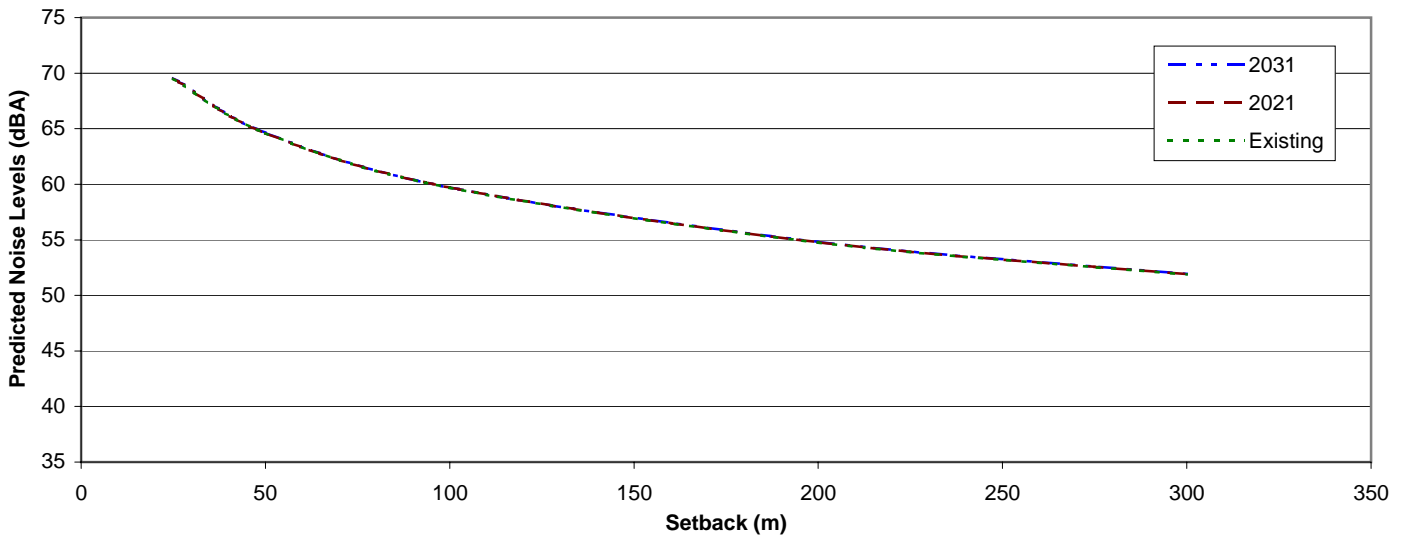
Date: Aug 28, 2008



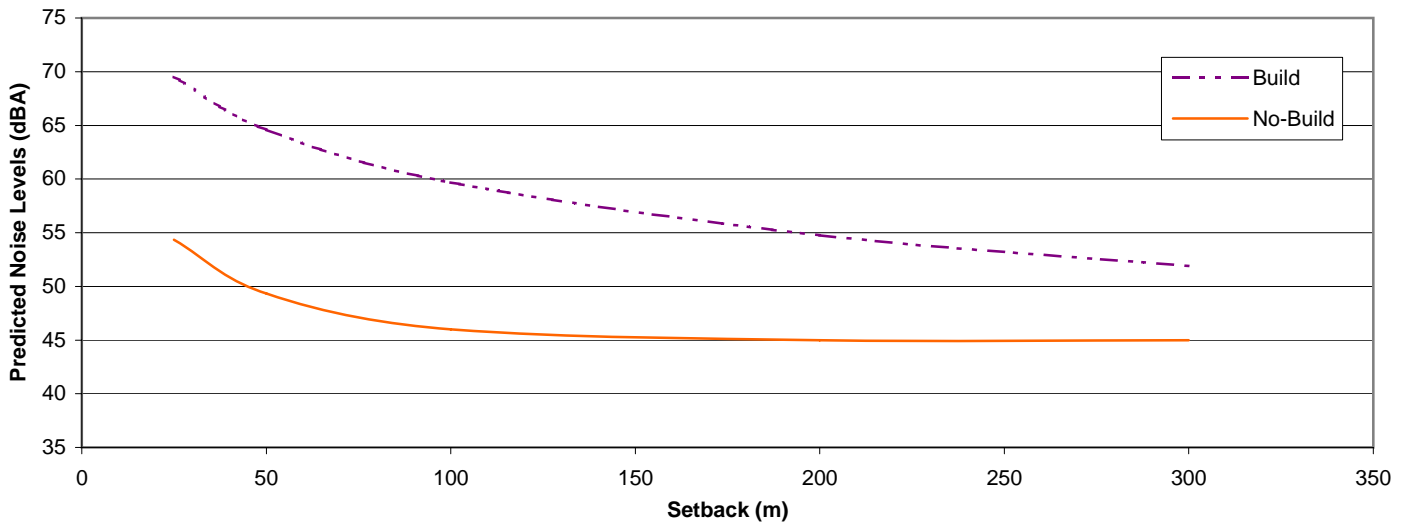
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 1 - Centre Rd, south of Campbellville Rd, north of Concession 11E

Speed Limit = 80 km/hr

Flamborough Quarry Haul Route Study

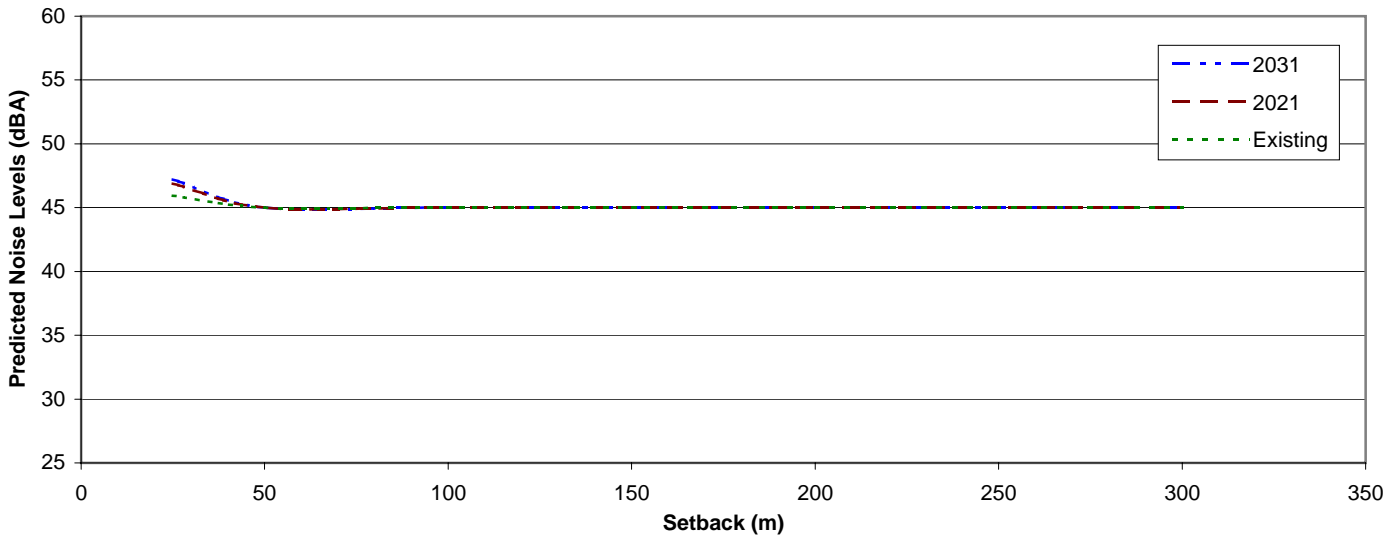
Project # W08-5107A

Figure No. **D.10**

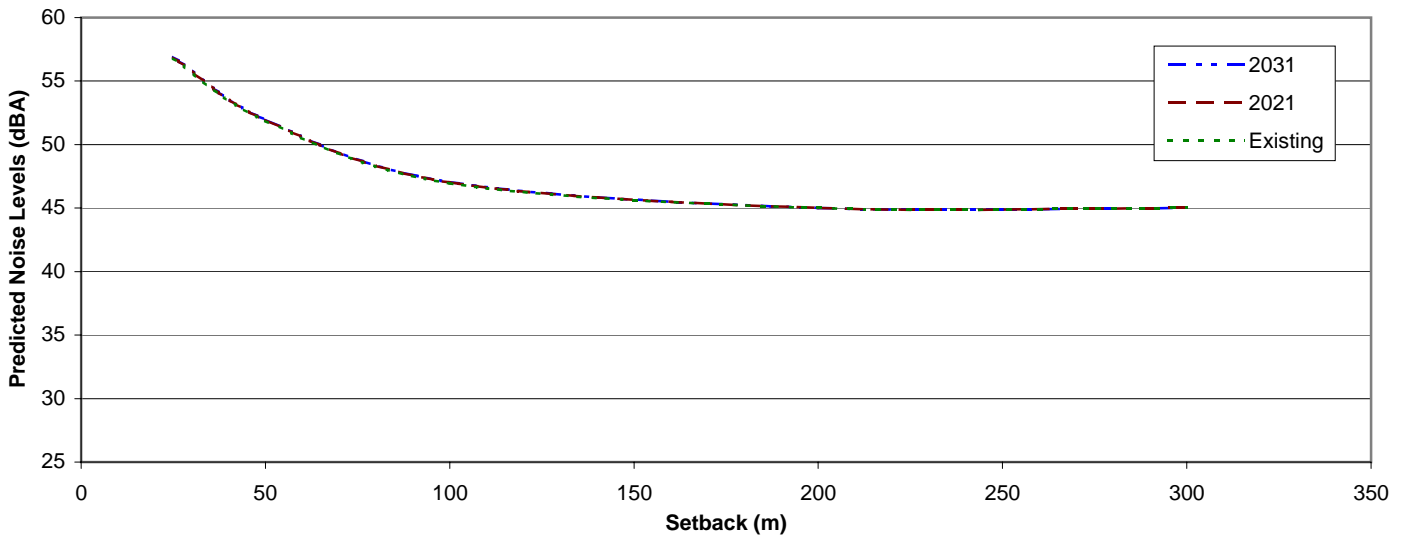
Date: Aug 28, 2008



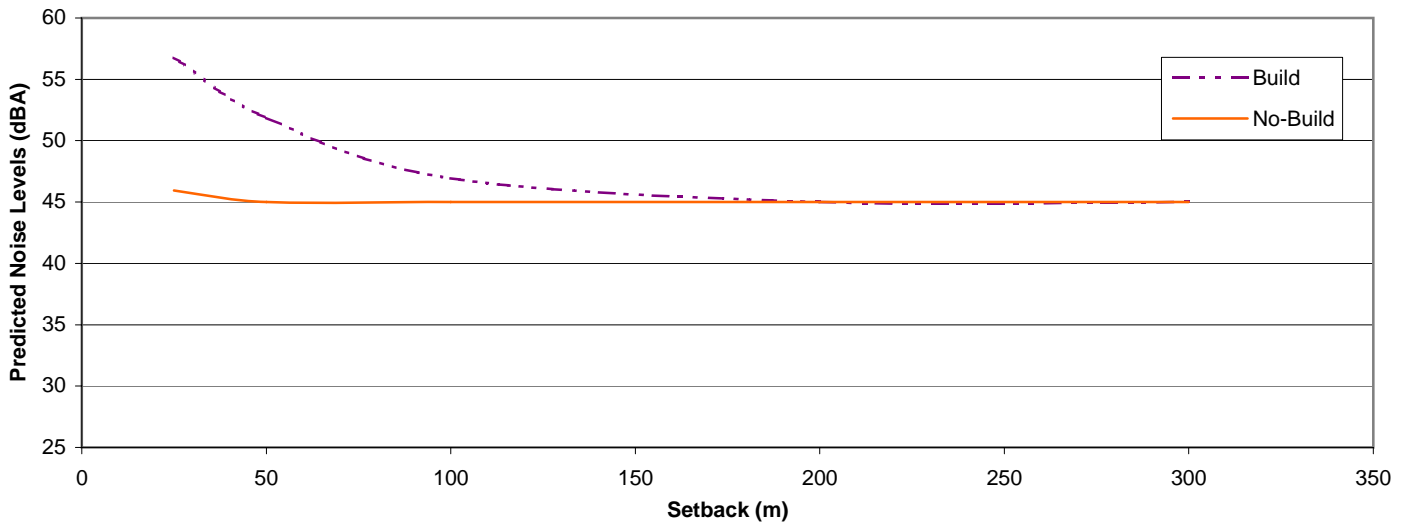
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 17 / Link 18 - Concession 11E, east of HWY 6, west of Millborough Line

Speed Limit = 50 km/hr

Flamborough Quarry Haul Route Study

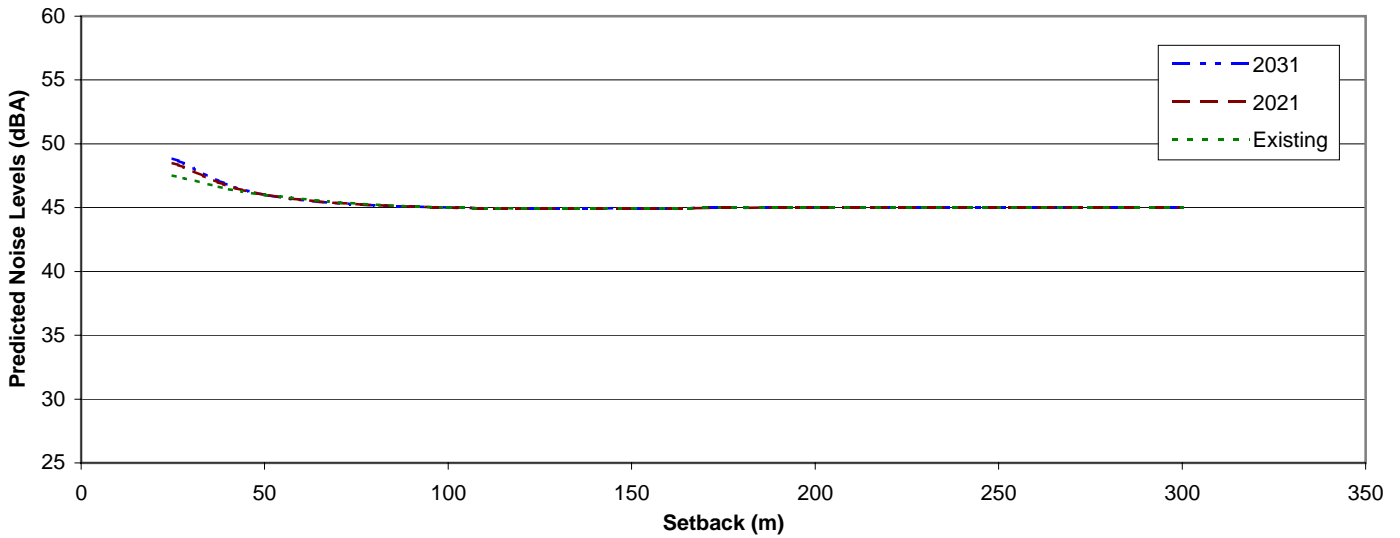
Project # W08-5107A

Figure No. **D.11**

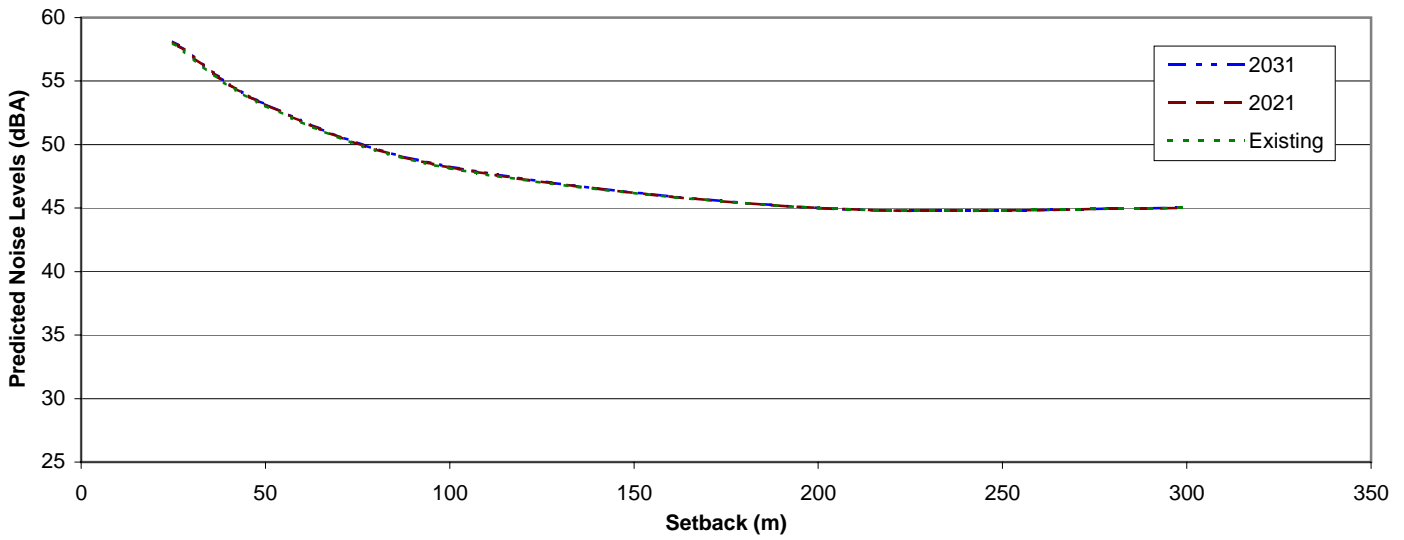
Date: Aug 28, 2008



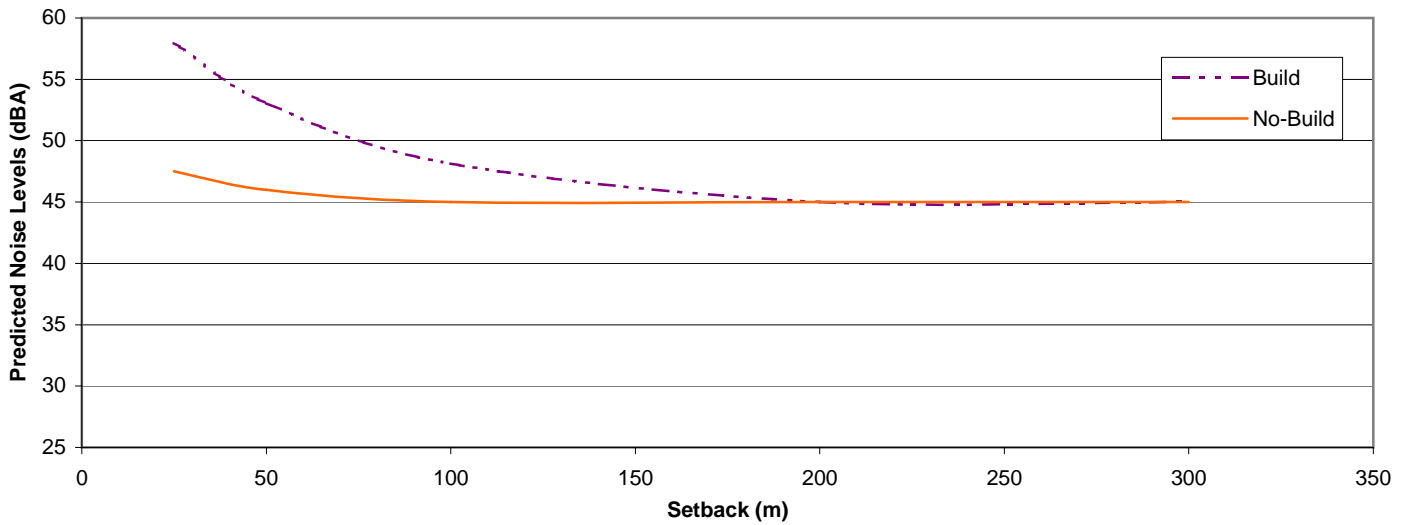
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 17 / Link 18 - Concession 11E, east of HWY 6, west of Millborough Line

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

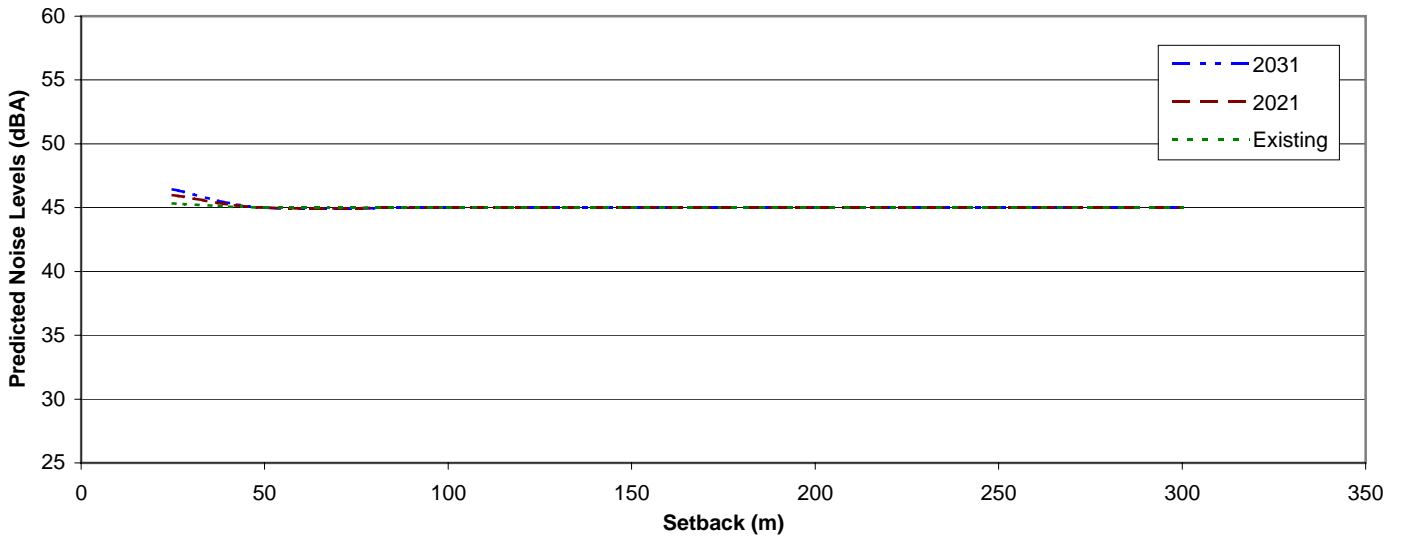
Project # W08-5107A

Figure No. **D.12**

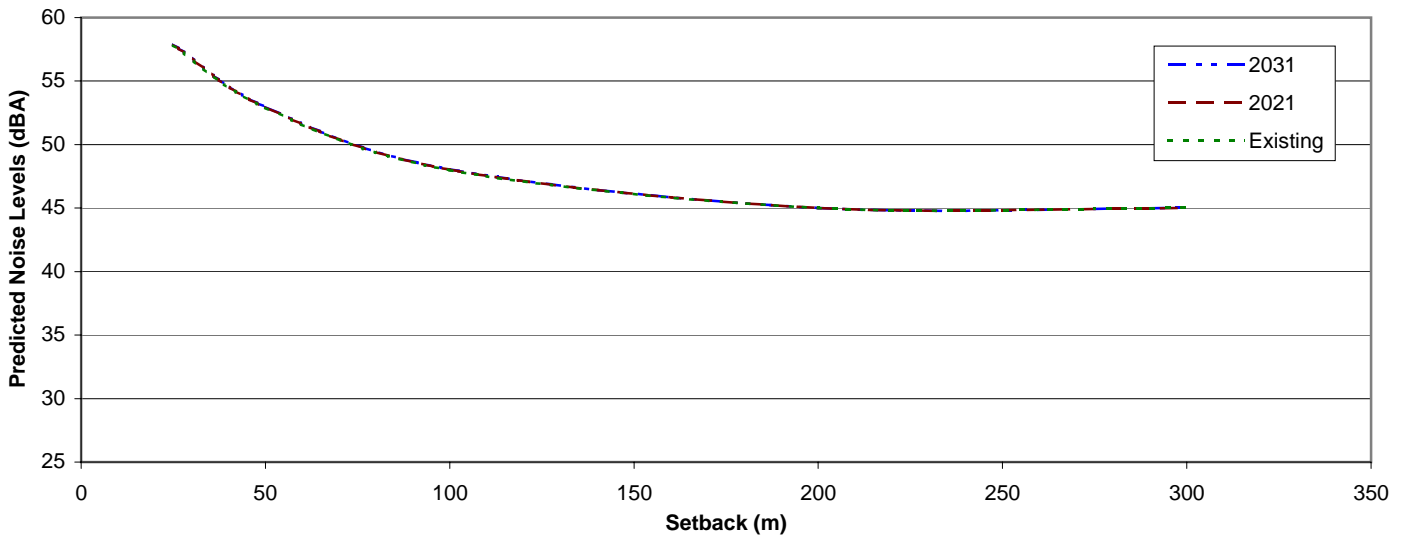
Date: Aug 28, 2008



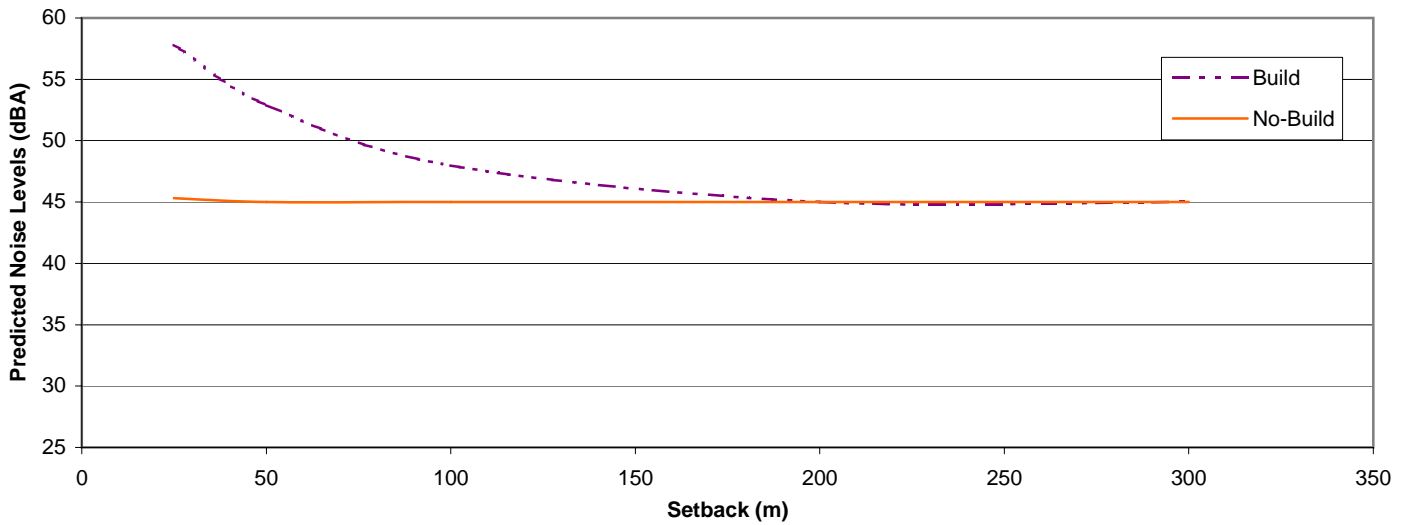
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 5 - Milborough Line, north of Concession 11E, south of Campbellville Rd

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

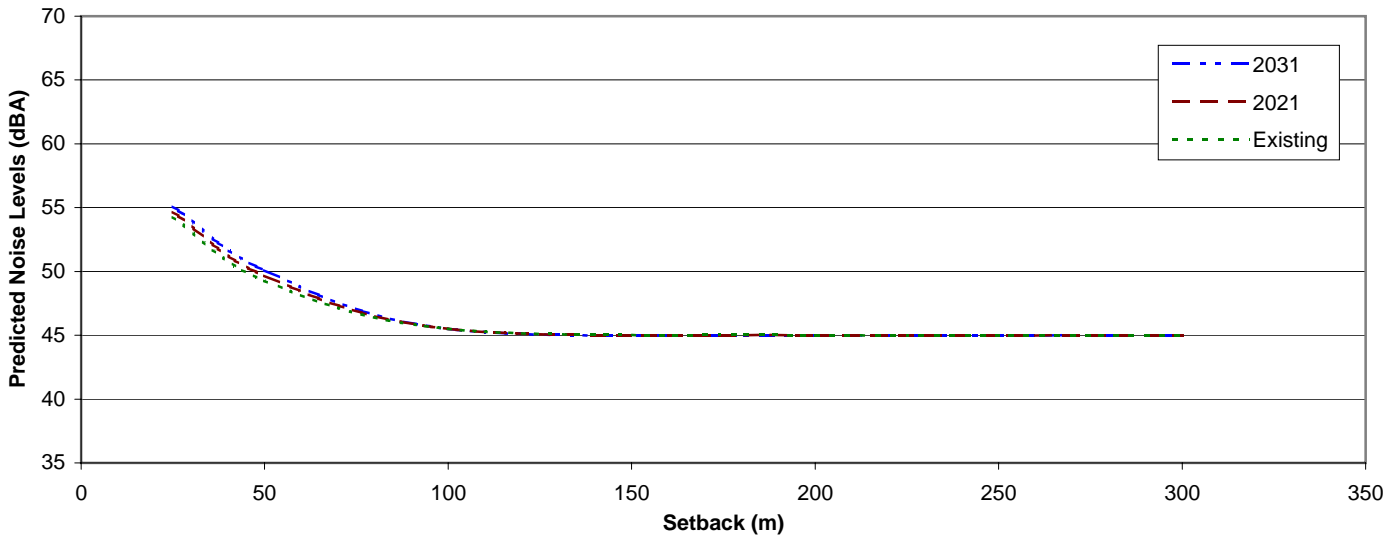
Project # W08-5107A

Figure No. **D.13**

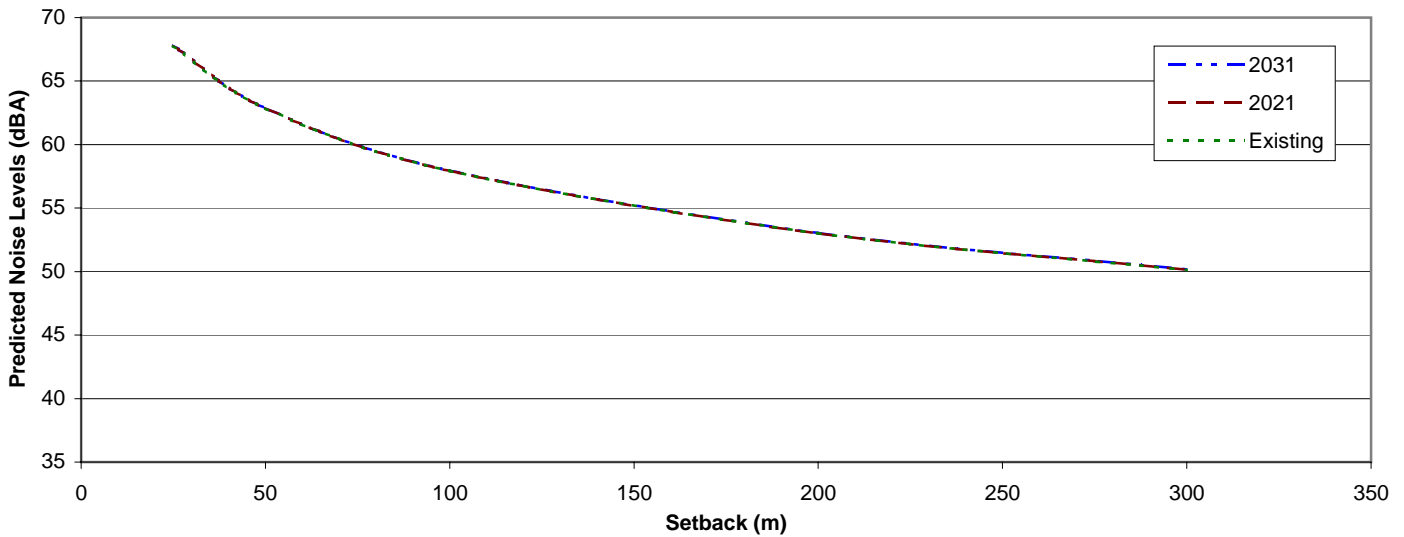
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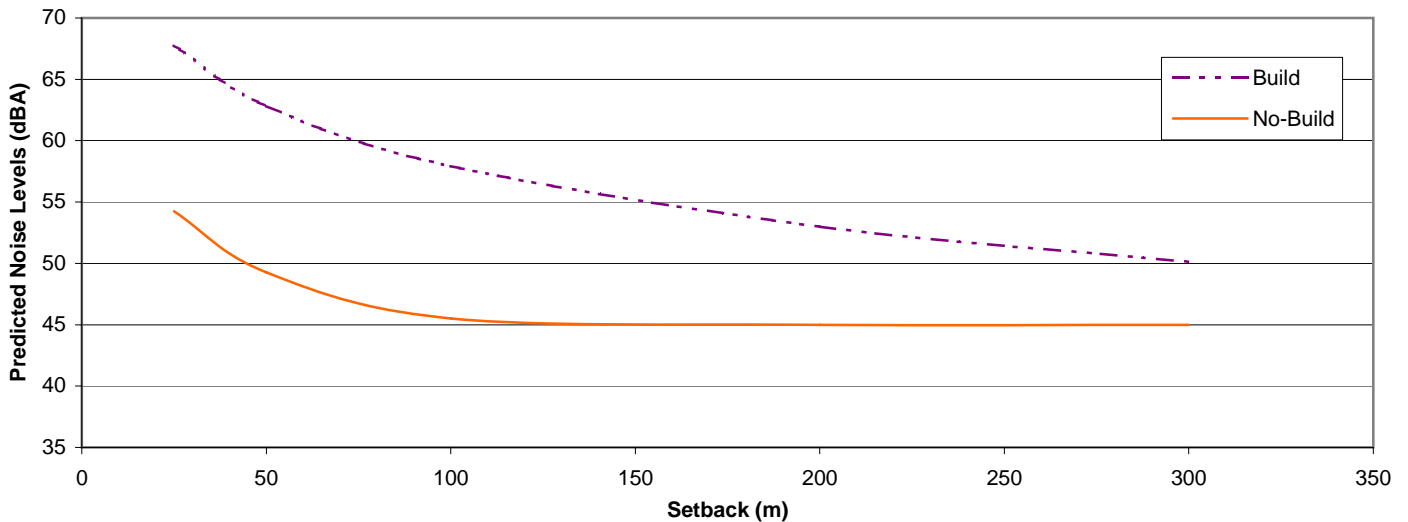
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 13a - Campbellville Rd, from Milborough Line to First Line, Nassagaweya

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

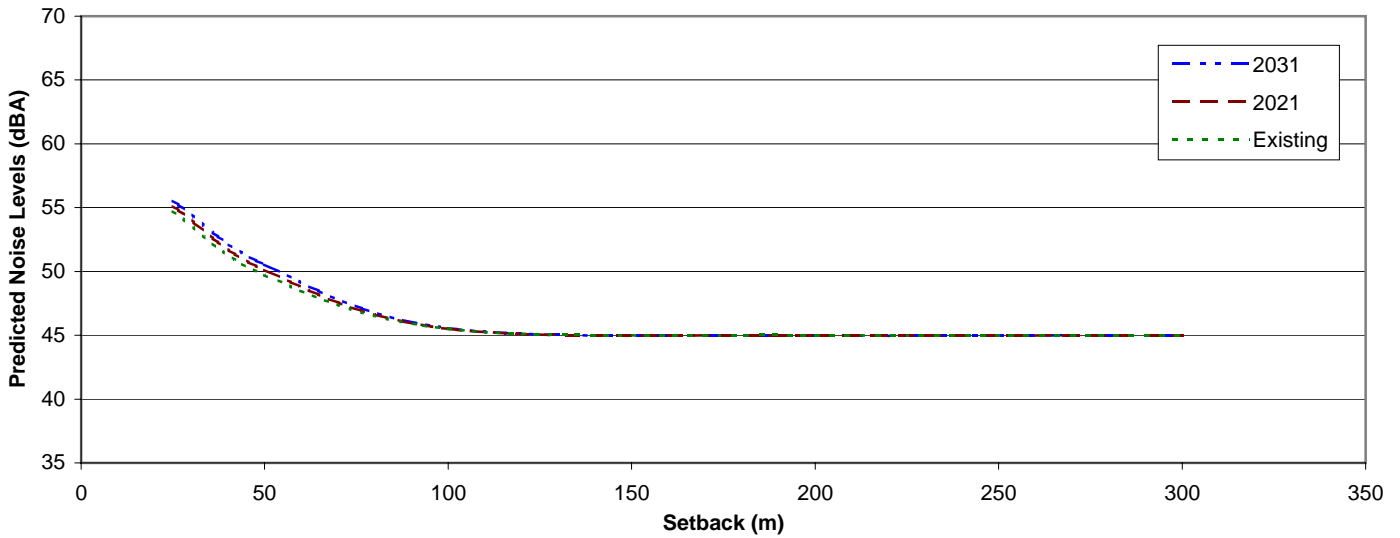
Project # W08-5107A

Figure No. **D.14**

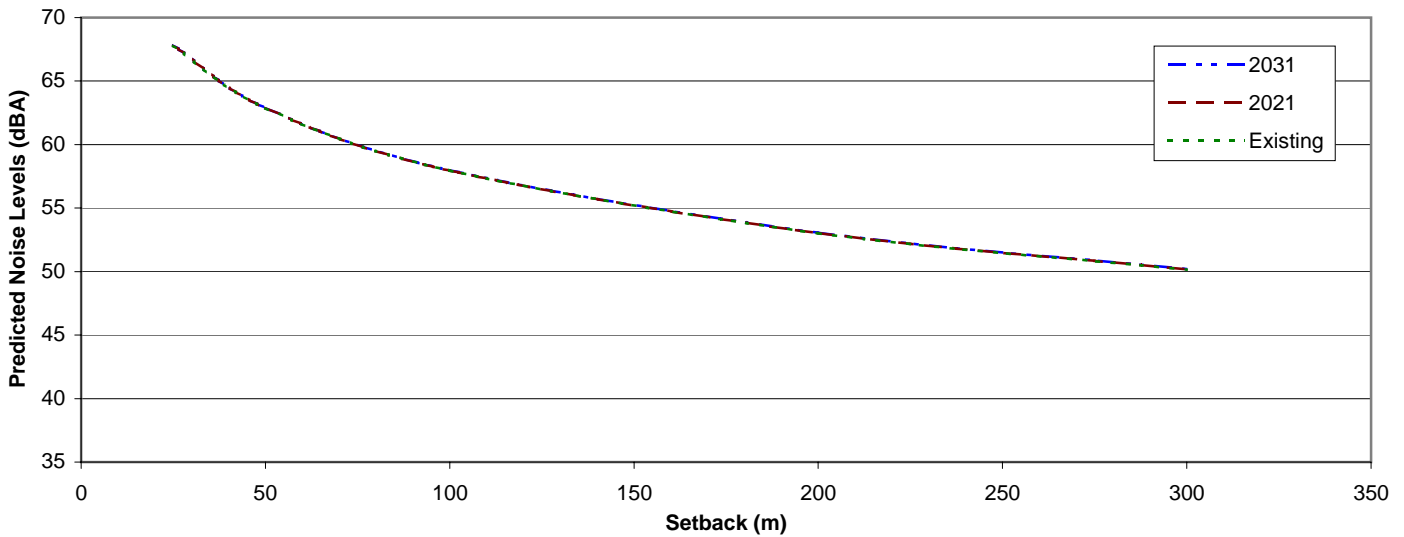
Date: Aug 28, 2008



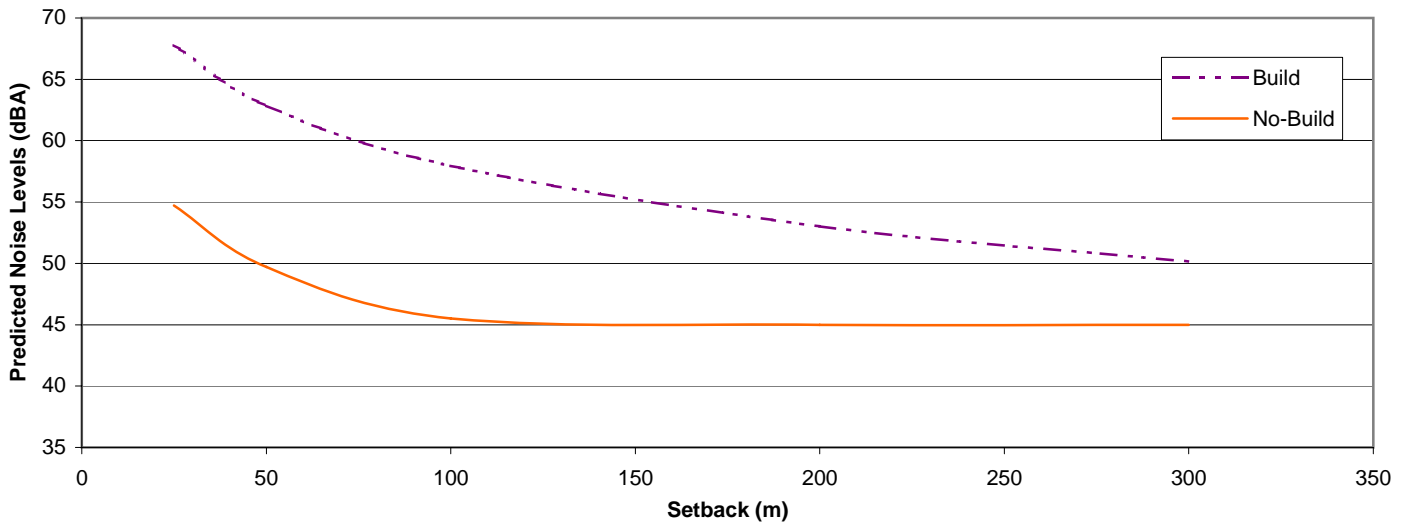
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 13b - Campbellville Rd, from First Line, Nassagaweya to CNR tracks

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

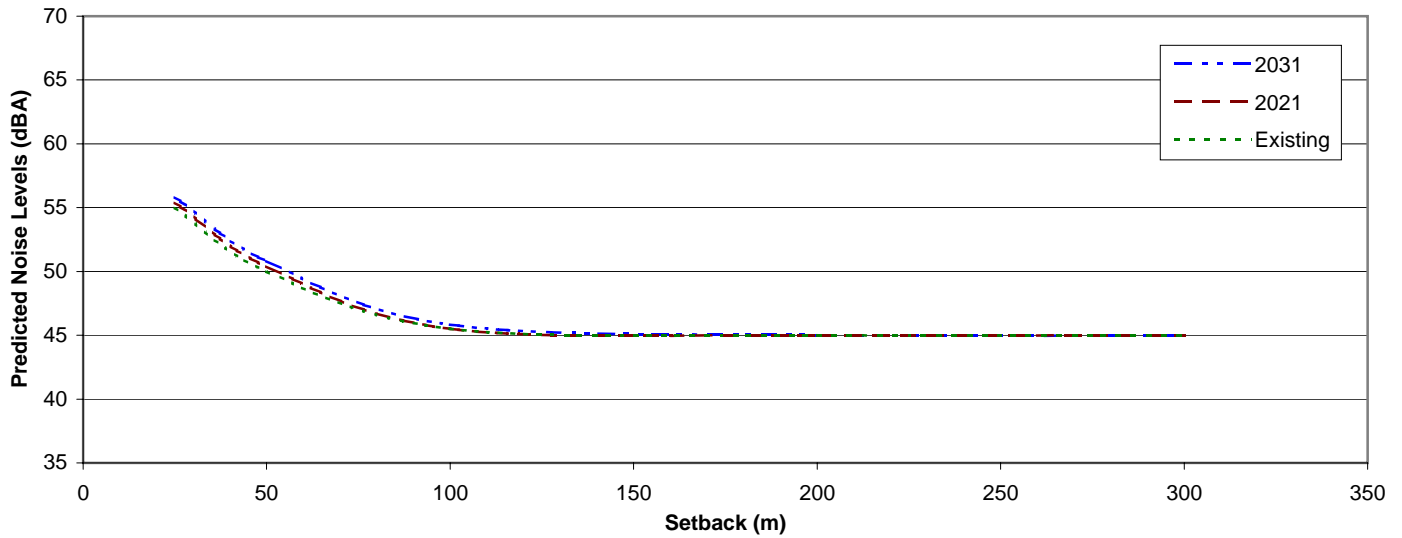
Project # W08-5107A

Figure No. **D.15**

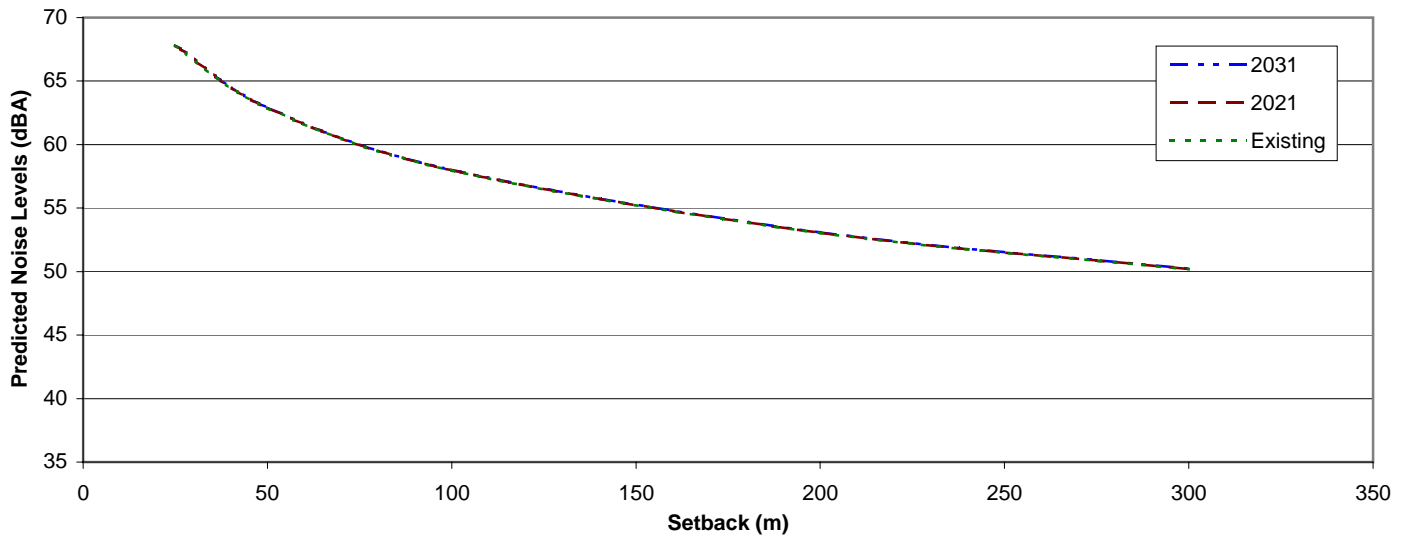
Date: Aug 28, 2008



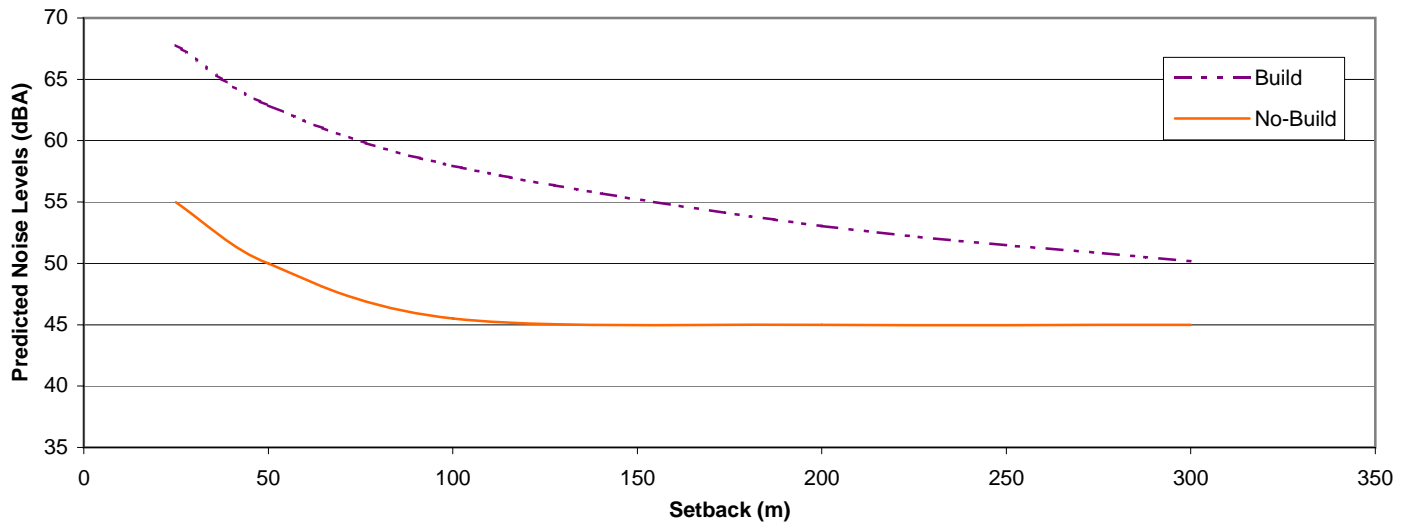
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 13c - Campbellville Rd, from CNR tracks to Guelph Line

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

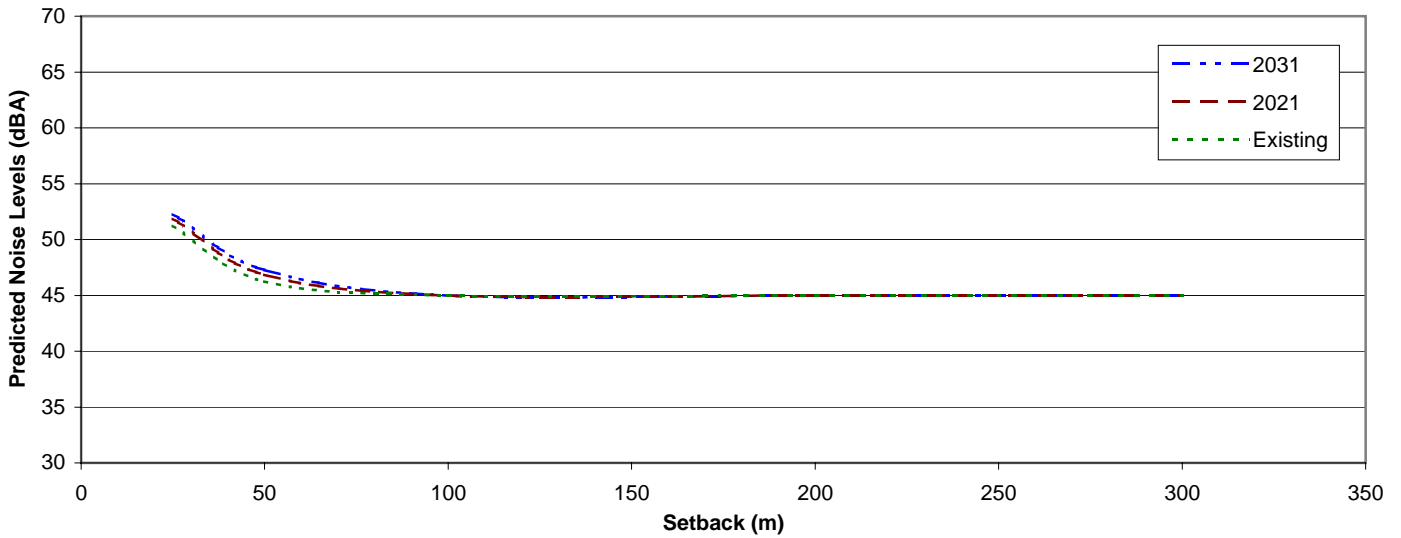
Project # W08-5107A

Figure No. **D.16**

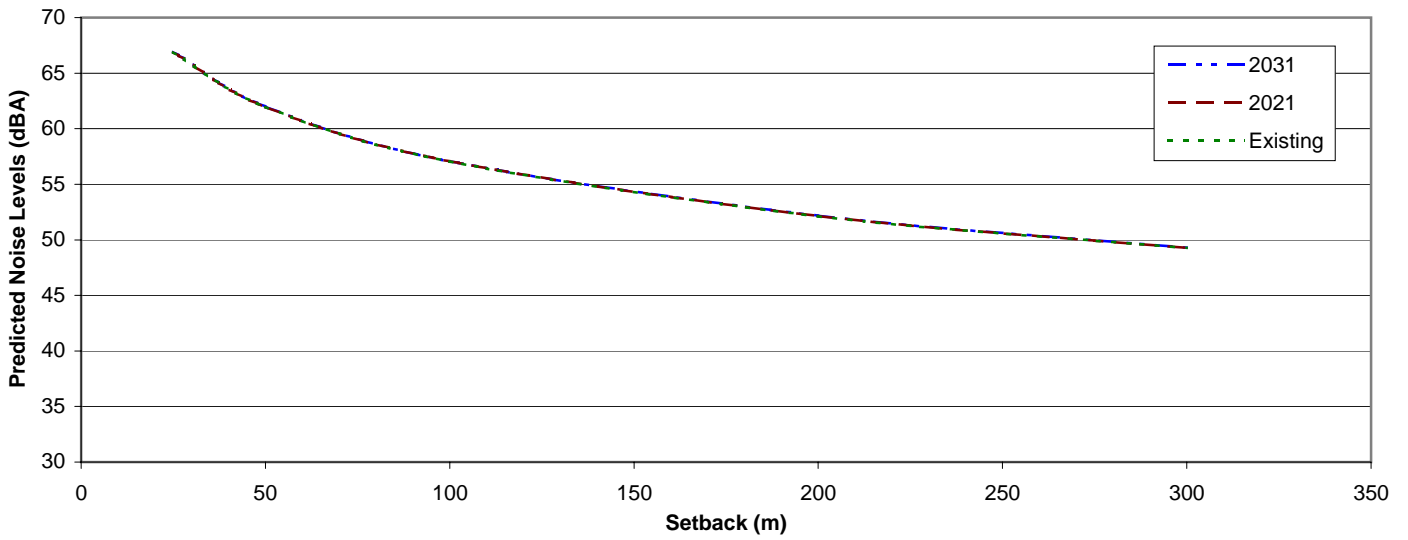
Date: Aug 28, 2008



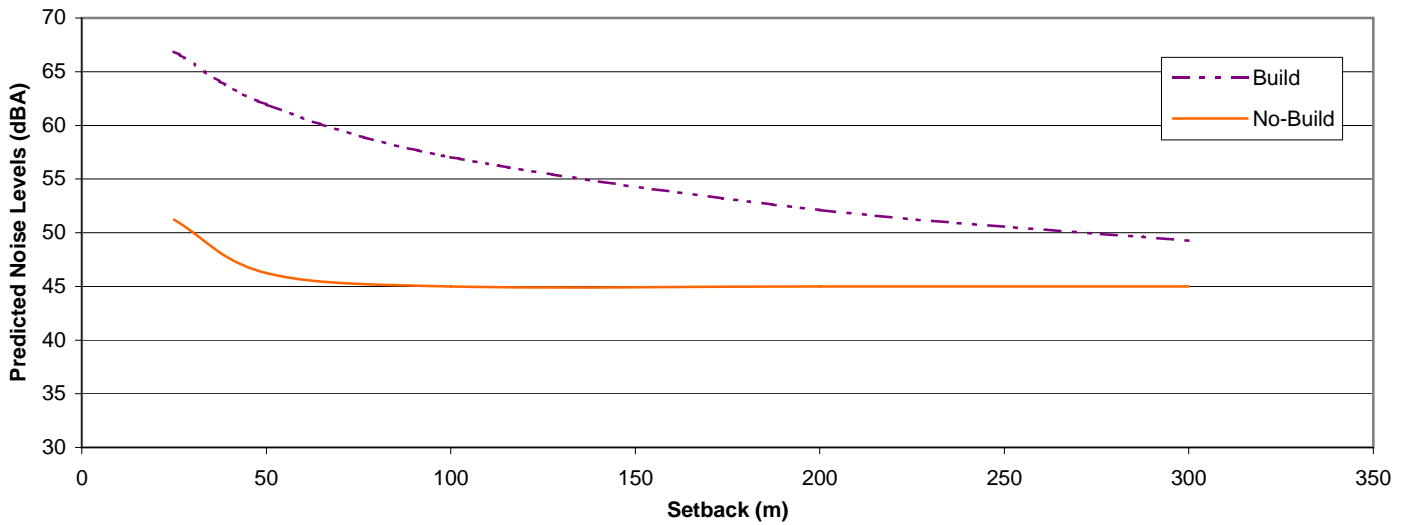
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 26 - Twiss Rd, north of Campbellville Rd, south of Reid SDRD

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

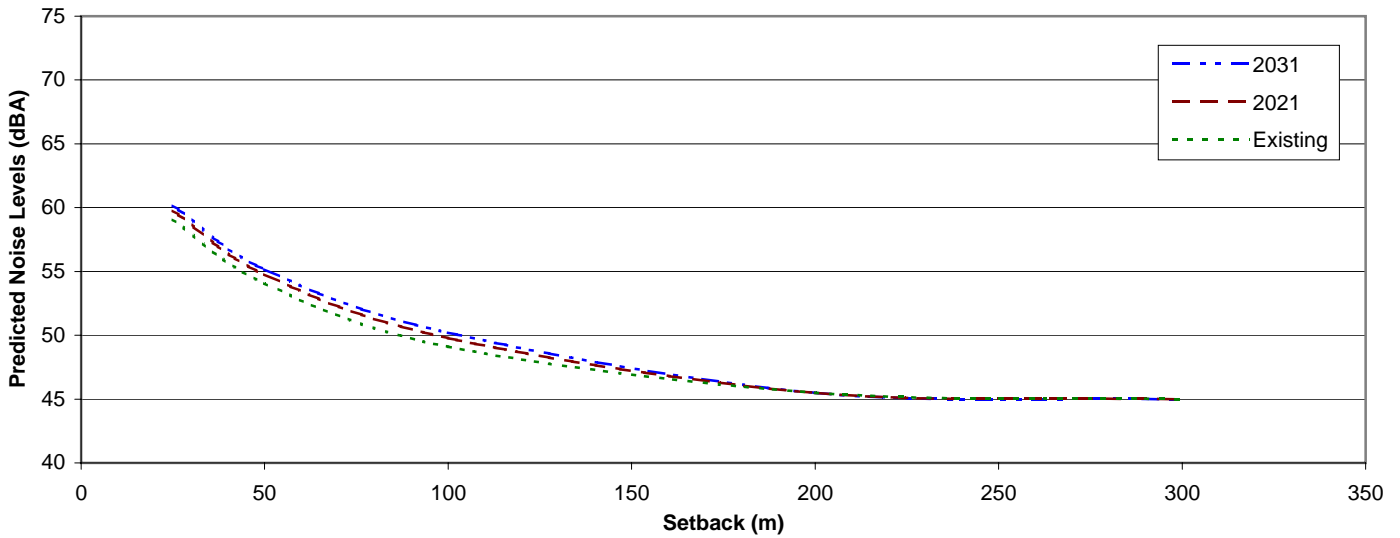
Project # W08-5107A

Figure No. **D.17**

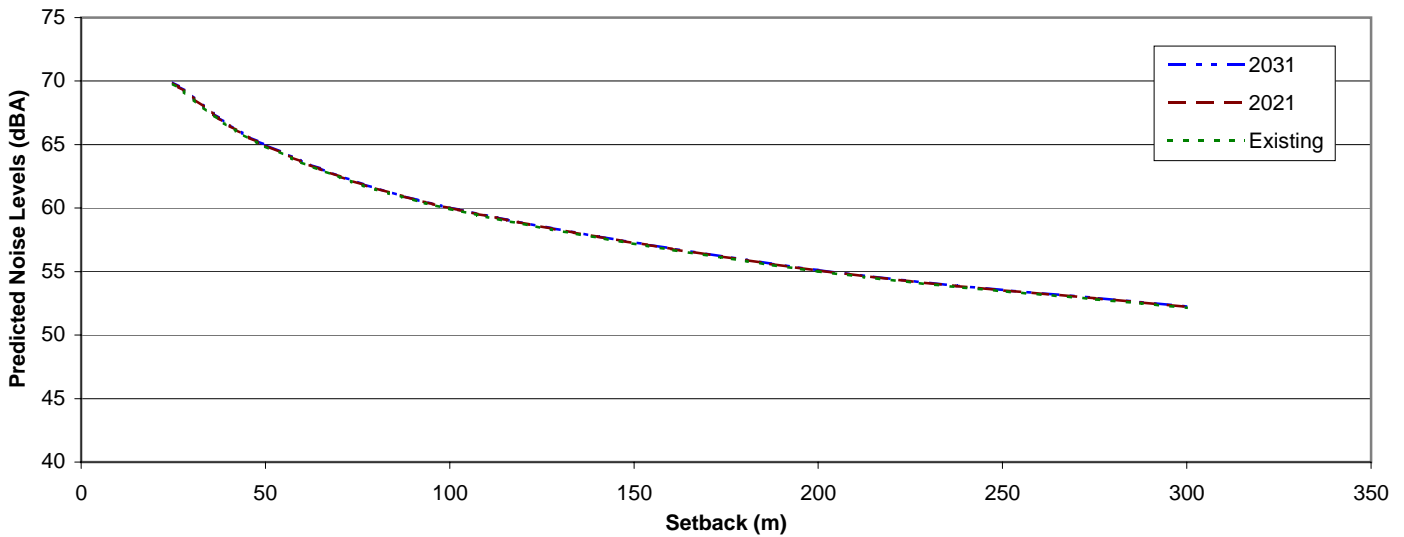
Date: Aug 28, 2008



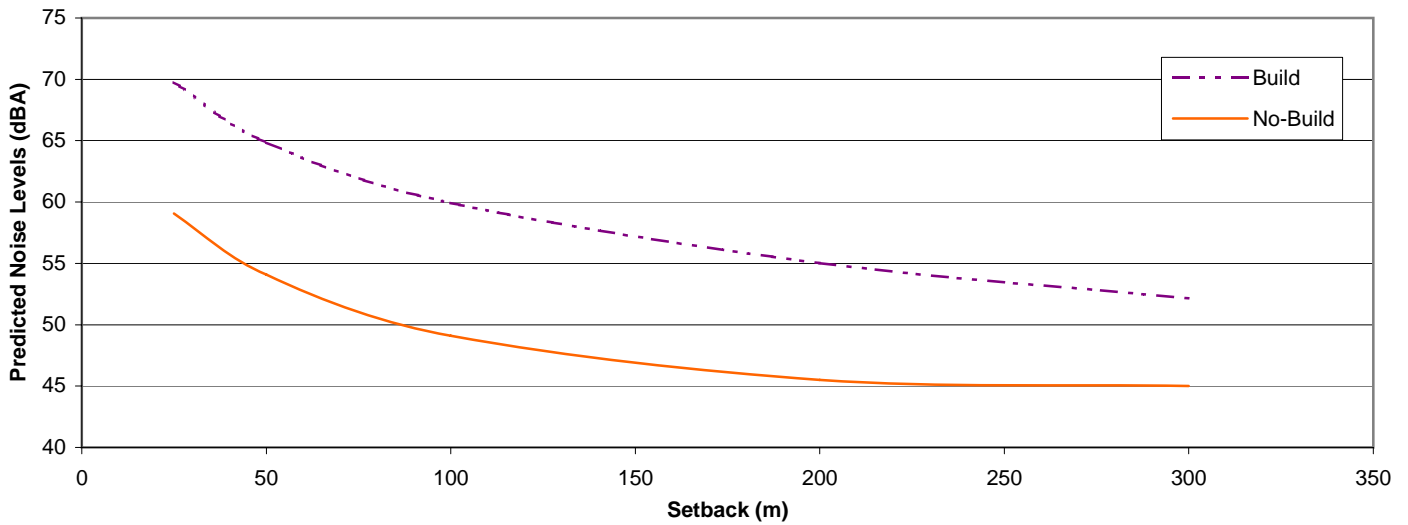
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 27 - Reid SDRD, east of Twiss Rd, west of Guelph Line

Speed Limit = 80 km/hr

Flamborough Quarry Haul Route Study

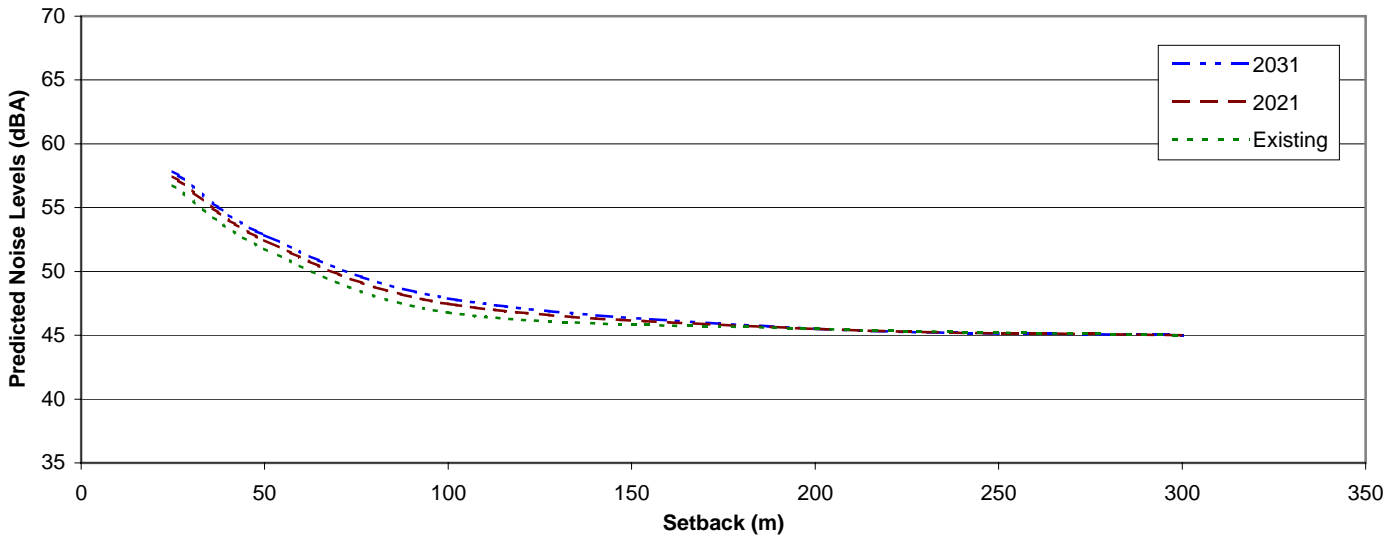
Project # W08-5107A

Figure No. **D.18**

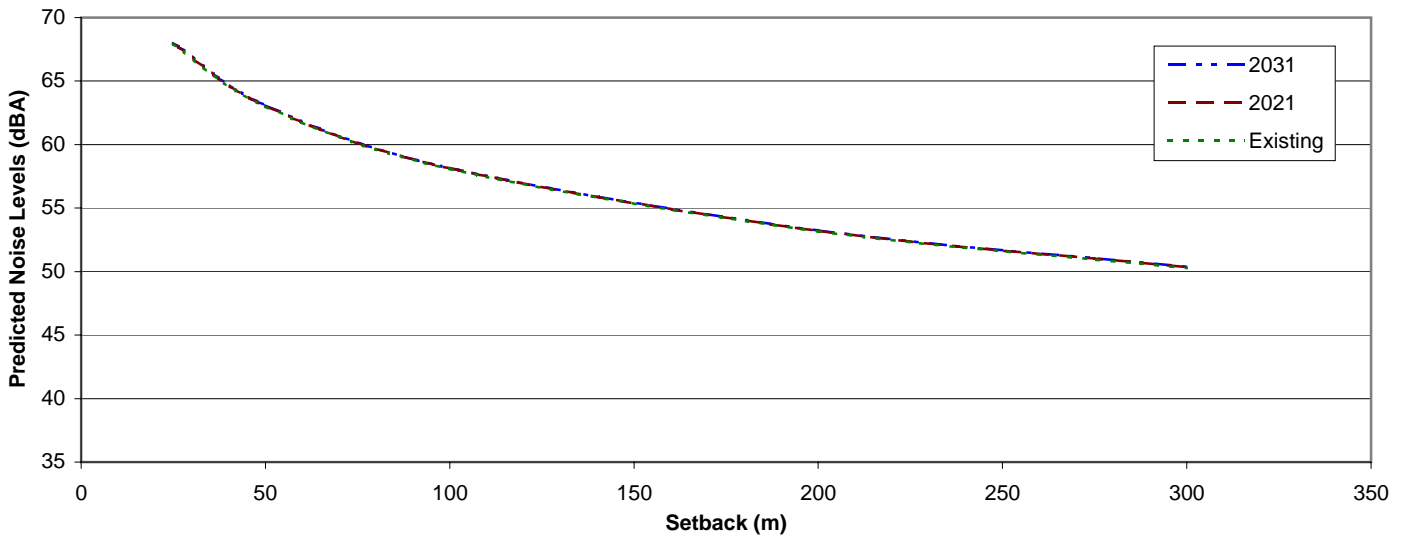
Date: Aug 28, 2008



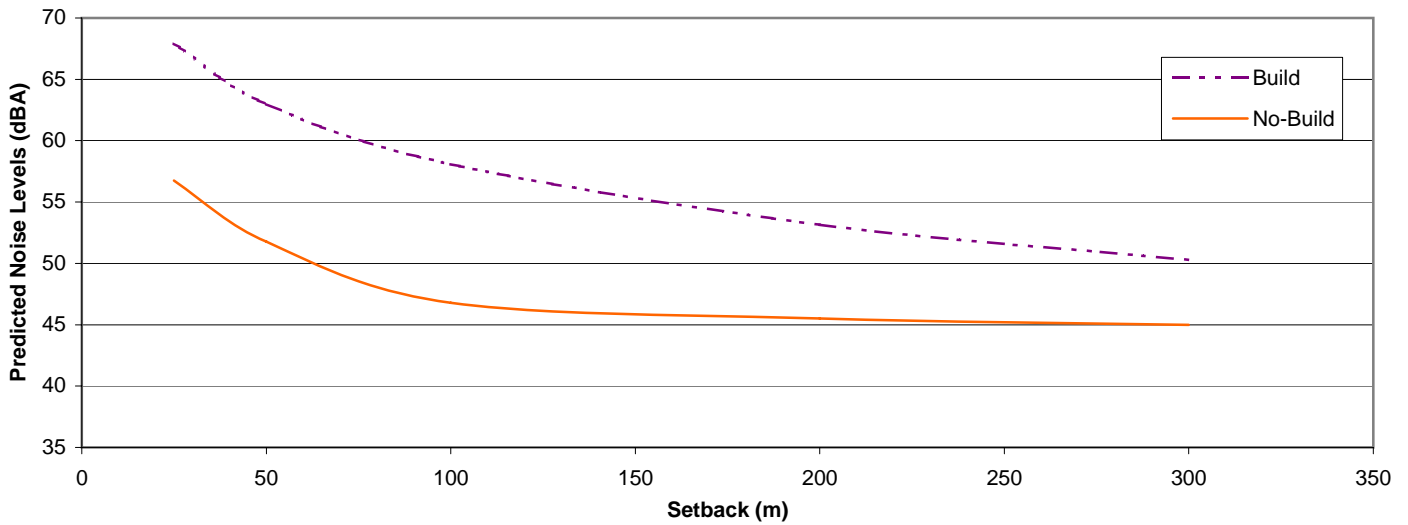
**Predicted Noise Levels (No Build)**



**Predicted Noise Levels (Build)**



**Worst-case Predicted Noise Level Difference**



**Predicted Road Traffic Noise Level Comparison**

Link 27 - Reid SDRD, east of Twiss Rd, west of Guelph Line

Speed Limit = 60 km/hr

Flamborough Quarry Haul Route Study

Project # W08-5107A

Figure No. **D.19**

Date: Aug 28, 2008

