Grant A. Bacchus *limited*

Consultants in Transportation Planning

September 9, 2011 *Our File; 2006-03 (08045)*

Ms. Melanie Horton
VCSMC
c/o MHBC
7050 Weston Road, Suite 230
Woodbridge, Ontario
L4L 8G7

Dear Ms. Horton:

Re: Traffic Impact and Site Access Operational Review
Proposed Tonnage Limit Increase and Pit Expansion
St. Mary's CBM – Hillsburgh Pit
County Road 24, Hillsburgh, Ontario

Introduction

St Mary's CBM proposes to increase the existing annual extraction license approved for their Hillsburgh Pit from the current 750,000 tonnes to 1,000,000 tonnes. Grant A. Bacchus Limited in consultation with Transtech (a member of The Sernas Group Inc.) was retained to conduct a Traffic Impact Study Update to review and confirm the extent of traffic-related impacts on the abutting roadway system generated by the proposed Hillsburgh Pit expansion. The subject site is located on the east side of County Road No. 24 north of Hillsburgh, in the County of Wellington, as illustrated on **Figure 1**.

We have reviewed our previous traffic impact analyses (attached in **Appendix A**) dated July 2006 for the then proposed tonnage limit increase from 500,000 tonnes to 1,000,000 tonnes (then known as the CBM Huxley Pit) and have utilized relevant information contained therein for the enclosed report and analyses. It should be noted that in 2007, subsequent to our 2006 traffic study, the operator was granted an increase to their license to extract up to 750,000 tonnes annually. The existing access was in place prior to the tonnage increase in 2007 and we understand has remained unchanged throughout the Pit's history (there is a very short taper for northbound inbound trucks, but there are no separate turn lanes from the County Road).

Haul Route

We have been advised that with the exception of sporadic local deliveries of material to the north, the major movement is to/from the south (upwards of 95%). The recent traffic surveys confirmed that the predominant movement of extracted material is to the south along County Road No. 24. The extracted material has historically been destined, in part, to another CBM facility in Limehouse for further processing and/or to other market destinations. The operator does not envision any change to this haulage pattern in the foreseeable future, so we have adopted this distribution pattern for our future analyses.

County Road No. 24 is the first part of a route eventually connecting to Highway No. 401 near Hornby, so that material from the subject site can then be transported to market via the Provincial Highway system. County Road No. 24 / Trafalgar Road is one of the only continuous north-south arterial roadways available as a haul route in this part of Wellington County and being a County Road it is designed and constructed to accommodate high volumes of goods movement vehicles (including aggregate haulage. As such, traffic along this route passes through a number of urban areas, which have reduced speed limits established. The standard speed limit on this route is 80 kph and this is reduced to 40 kph in Hillsburgh, 60 kph in Brisbane, and 50 kph in Ballinafad (all within Wellington County). Other reduced speed zones are also in place further south in Halton Region.

As part of our 2006 review we followed a number of trucks leaving the subject site to ascertain general compliance by drivers of the various reduced speed zones along the haul route. We reported then that we did not observe any significant disobedience of the reduced speed zones by gravel truck drivers as they travelled through the aforementioned urban areas. These observations were especially important in Hillsburgh's 40 kph speed zone as this is the closest urban area to the subject site. It was evident then that the pit operator has properly informed his truck drivers (and non-CBM drivers hauling aggregate from the Pit) in the matter of speed limit observance.

We conducted more recent site visits to examine the current operations and confirmed that the existing site access has been positioned to ensure good visibility to both the north and south. This access location was approved by County roadway officials at the time the Pit was first opened many years ago and we noted that it operates quite well in terms of site entry/exit movements with no significant interference to other users of County Road No. 24.

Baseline (2011) Traffic Conditions

Traffic surveys were originally conducted in June 2006 at the site entrance. A more recent weekday 12-hour turning movement count (06:30 – 18:00) was conducted on August 16, 2011. This updated traffic data is provided in **Appendix B**.

Based on a review of the recent traffic count, the peak of the site generated truck traffic (3 entry and 7 exit trucks) occurred in the early morning. It should be noted that the peak of the site truck traffic and the peak of County Road 24 traffic occurred during different peak hours. However, in order to provide a conservative analysis, the study *combined* the peak of the site traffic and the peak of the County Road 24 traffic to provide a worst case scenario for the a.m. and p.m. peak hour baseline traffic conditions.

Since the original 2006 traffic counts were conducted in June, and our recent 2011 traffic surveys were conducted in August, we rationalized the potential monthly variation based on available MTO Seasonal Variation Curves (see **Appendix B**) for the closest north-south Ministry facility (Highway 10). The MTO has classified Highway 10 as a 'Commuter' facility (see also **Appendix B**), and this parallel route was utilized as a proxy for County Road 24 seasonal variation. The standard variation factor between June and August according to the MTO is 1.032 and this upward factor was applied to our August 2011 peak hour volumes to more accurately compare the recent counts to our 2006 data and to portray more representative estimates of 2011 baseline traffic flows. Emulating a June period is also advantageous since it covers an overlapping period of school traffic (i.e., buses) without 'summer vacation' (lower) traffic flows, while still including

peak extraction activity at Pits and Quarries during the traditionally busy summertime construction season.

For the purpose of the site impact analyses, we have also employed Passenger Car Equivalent (PCE) factors to account for the additional time it takes a heavy vehicle (in this case, the loaded and empty site gravel trucks) to travel through the site access. Based on our experience, we have adopted a PCE of 3.5 for outbound loaded trucks and a PCE of 2.0 for inbound empty trucks. Non-site related gravel trucks observed in the field were handled in the more traditional sense, represented in the analyses as percentage of Heavy Trucks contained within the traffic flow.

The adjusted baseline (2011) a.m. and p.m. peak hour vehicular movements (non-PCE volumes) are illustrated in **Figure 2**. Note that this adjusted baseline condition provides a conservative basis for projecting non-pit related background growth for the selected future horizon year of 2021.

Utilizing this conservative analysis approach, the adjusted baseline (2011) a.m. and p.m. peak hour traffic (using the PCE-adjusted site-related flows) were then subject to intersection capacity analyses using the methodologies prescribed in the Highway Capacity Manual, using Synchro 7 micro-analysis software. The baseline (2011) PCE traffic volumes are illustrated in a figure contained in **Appendix C**.

Table 1 summarizes the results of the intersection capacity analyses, while **Appendix C** contains the detailed 2011 baseline intersection capacity / summaries.

TABLE 1
BASELINE (2011) TRAFFIC CONDITIONS

Unsignalized Intersection	Weekday AM Peak Hour				Weekday PM Peak Hour			
	LOS	V/C Ratio	Delay (sec.)	95th %ile Queues (m)	LOS	V/C Ratio	Delay (sec.)	95th %ile Queues (m)
County Road 24 / Site Access								
Northbound Left-Through-Right	A	0.00	0	0	A	0.00	0	0
Southbound Left-Through-Right	A	0.00	0	0	A	0.00	0	0
Westbound Left-Through-Right	B	0.06	13	2	B	0.04	14	1
Eastbound Left-Through-Right	A	0.00	0	0	A	0.00	0	0

Under 2011 baseline conditions, the intersection of County Road 24 and the site access has excellent operating characteristics and substantial reserve capacity with no 'critical' movements (i.e., no long delays, very good volume to capacity – v/c – ratios, and very efficient Levels of Service – 'LoS' definitions are contained in **Appendix C**). Further, the westbound shared left-through-right turn movement (minor approach) is operating at LOS 'B' during the both a.m. and p.m. peak hours with small v/c ratios (less than 0.06). Outbound turning movements are not experiencing significant delays (less than 14 seconds) and no queuing issues were calculated (or reported) during either peak hours.

Hillsburgh Pit Truck Traffic Generation

As mentioned, St. Marys CBM proposes to increase the permitted annual extraction tonnage currently approved for the existing Hillsburgh Pit from 750,000 to 1,000,000 tonnes.

In order to generate the estimated truck traffic associated with the application of the pit expansion, the following assumptions and base data have been adopted based on the current pit operations:

- Annual Extraction Limit (License application) = 1,000,000 tonnes
- Proposed haulage activity (same as existing operations):
    - Number of shipping days per year (after deduction for holidays) = 298 days (248 weekdays and 50 Saturdays),
    - Weekday operating hours of 7:00 a.m. to 6:00 p.m. (11 hours),
    - Saturday operating hours of 8:00 a.m. to 12:00 noon (4 hours),
        - Resulting in up to 2,928 operating hours
- Gravel truck capacities = 35 tonnes
- 1,000,000 / 2,928 = 341.5 tonnes per hour / average 35 tonne truck capacity = 10 truck loads per hour

Notwithstanding the above 'average' haulage calculations, it is likely that occasional periods of higher-volume trucking will occur during high-construction activity (typically between June and September). Therefore, the 'average' level of shipping / trucking activity is likely to understate the operations during the busy summer time construction season.

Based on our 2006 study and other similar pit projects undertaken by the consultant team, we have elected to use the peak summer condition (50% greater than the typical calculated hourly average) as this represents the period of greatest impact from the Hillsburgh Pit trucking activity. With the proposed new annual tonnage level, this peaking adjustment results in an increase from the projected hourly average 10 trucks to 15 outbound loaded truck trips per hour (plus a commensurate volume of returning empty trucks). This will result in a more conservative estimate in terms of potential effects on the operations of County Road 24.

The calculated estimates of the peak hourly truck trips and the resultant truck traffic volume assignments (after pit expansion) are illustrated on **Figure 3** (non-PCE factors). Note that we have also retained the current non-truck traffic volumes observed at the site access during our counts to account for employees and other non-heavy truck traffic flows.

Future 2021 Traffic Conditions

We have been advised that the Pit life could be at least 10 years so we have examined site access operations for the year 2021 (present day operations in 2011, plus 10 years). This is a typical analysis approach used in the preparation of traffic impact studies.

The original 2006 study adopted an annual growth rate of 3% to simulate the future traffic scenarios. Based on the available traffic count data (June 2006 and August 2011 – the latter adjusted for seasonal variation to emulate a June condition) for County Road 24, the estimated annual average growth rate has climbed to 5.0% based on the a.m. two-way peak hour volumes. Therefore, we adopted the higher-than-previous future growth rate of 5.0% per year and applied

it to the 2011 baseline traffic conditions to estimate the background traffic growth along County Road 24 (northbound and southbound two-way traffic) for the 2021 horizon selected for study. **Appendix D** contains our growth rate calculations.

The estimated pit-expansion truck trip assignments (**Figure 3**) have been combined with the 2021 future background traffic (northbound and southbound through traffic) to produce the estimated 2021 Total Future Traffic illustrated in **Figure 4** (non-PCE factors).

The total volumes were then subject to intersection capacity analyses based on the same methodologies utilized previously herein, but using the PCE flows for the Hillsburgh Pit truck traffic. The total (2021) PCE traffic volumes are illustrated in a figure contained in **Appendix D**. According to the County of Wellington, there are no proximate road improvements programmed for County Road 24 within the time horizons selected for this study, so for the analysis we have adopted the present-day road configurations.

Table 2 summarizes the future 2021 total future traffic operations. Detailed 2021 total future intersection capacity analysis reports are included in **Appendix D**.

TABLE 2
TOTAL (2021) TRAFFIC CONDITIONS (WITH PIT EXPANSION)

Unsignalized Intersection	Weekday AM Peak Hour				Weekday PM Peak Hour			
	LOS	V/C Ratio	Delay (sec.)	95th %ile Queues (m)	LOS	V/C Ratio	Delay (sec.)	95th %ile Queues (m)
County Road 24 / Site Access								
Northbound Left-Through-Right	A	0.00	0	0	A	0.00	0	0
Southbound Left-Through-Right	A	0.00	1	1	A	0.00	1	1
Westbound Left-Through-Right	C	0.17	18	5	C	0.25	24	8
Eastbound Left-Through-Right	A	0.00	0	0	A	0.00	0	0

Under the 2021 total future scenario, the intersection of County Road 24 and the site access is expected to continue to have excellent operating characteristics and substantial reserve capacity with no 'critical' movements. The westbound shared left-right turn movement (minor approach) is expected to continue to operate at LOS 'C' during the both a.m. and p.m. peak hours with low v/c ratios (less than 0.25). Drivers performing turning movements are not expected to experience significant delays and no queuing issues are anticipated during either peak hour periods.

Further, the projected peak hour traffic volumes along County Road 24 are well within the operating capacity of a two-lane highway (two-way peak hour traffic volumes are in the range of 500 to 670 vehicles per hour, while the typical capacity of a roadway facility with County Road 24 characteristics is in excess of 1,800 two-way vehicles per hour).

Summary

The results of our revised analysis of future 2021 conditions have concluded there will not be any significant site-related impact on roadway operations should the annual tonnage limit be increased to 1,000,000 tonnes.

Peak site entry/exit movements are expected to increase to 15 trucks per hour during portions of the summer peak construction activity, but this increase can be easily accommodated by the present access/egress system without measurably impacting the good site access operations.

As concluded in 2006, based upon our haul route observations and the calculations contained in this update, we do not envisage any undue impacts through the population settlements along the haul route and the proposed expansion of the Pit license's annual tonnage limit to 1,000,000 tonnes is not expected to change the generally good operating conditions at the existing Pit access or along County Road 24.

Yours very truly,

GRANT A. BACCHUS LIMITED

Grant A. Bacchus, P.Eng.
President

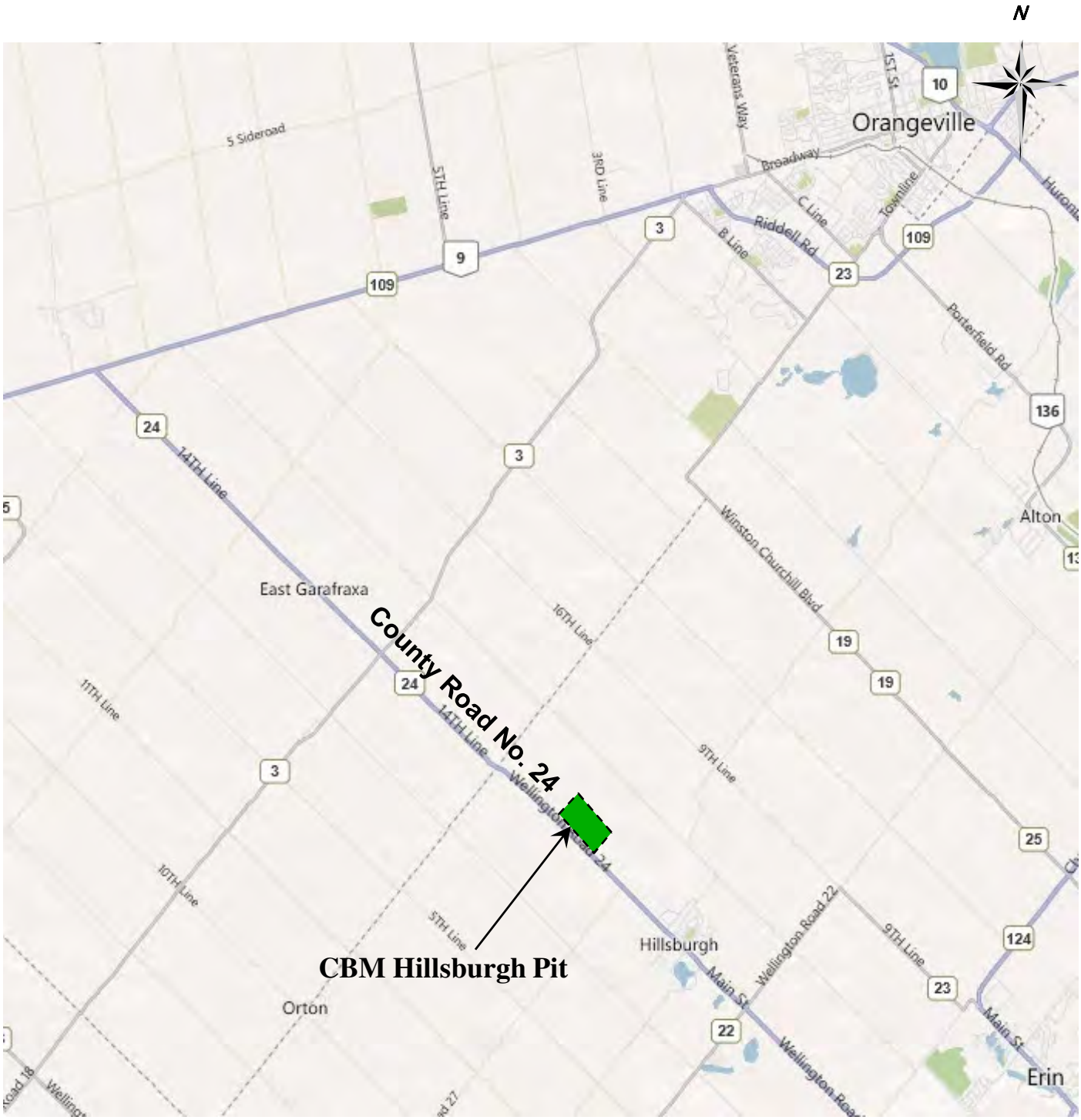
In consultation with,

TRANSTECH
(a member of The Sernas Group Inc.)

J. A. (Jim) Bacchus, B.A.
Principal, General Manager

.../gab:jab

Encl.

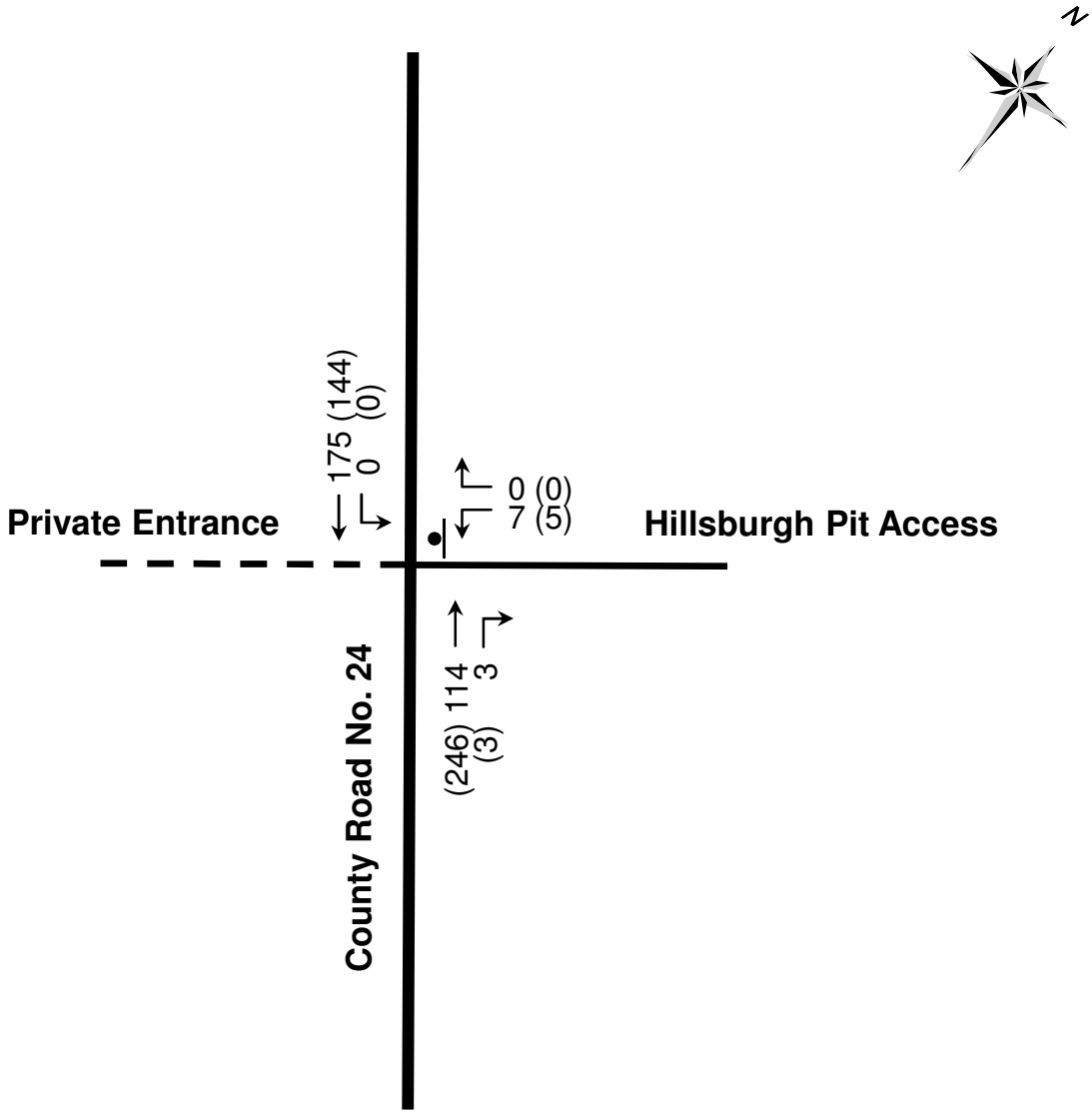


Not to Scale

Figure 1

ST. MARYS CBM HILLSBURGH PIT

Pit Location



Legend:

XX (XX) – AM (PM) Peak Hour Traffic Movements

- Stop Sign Control

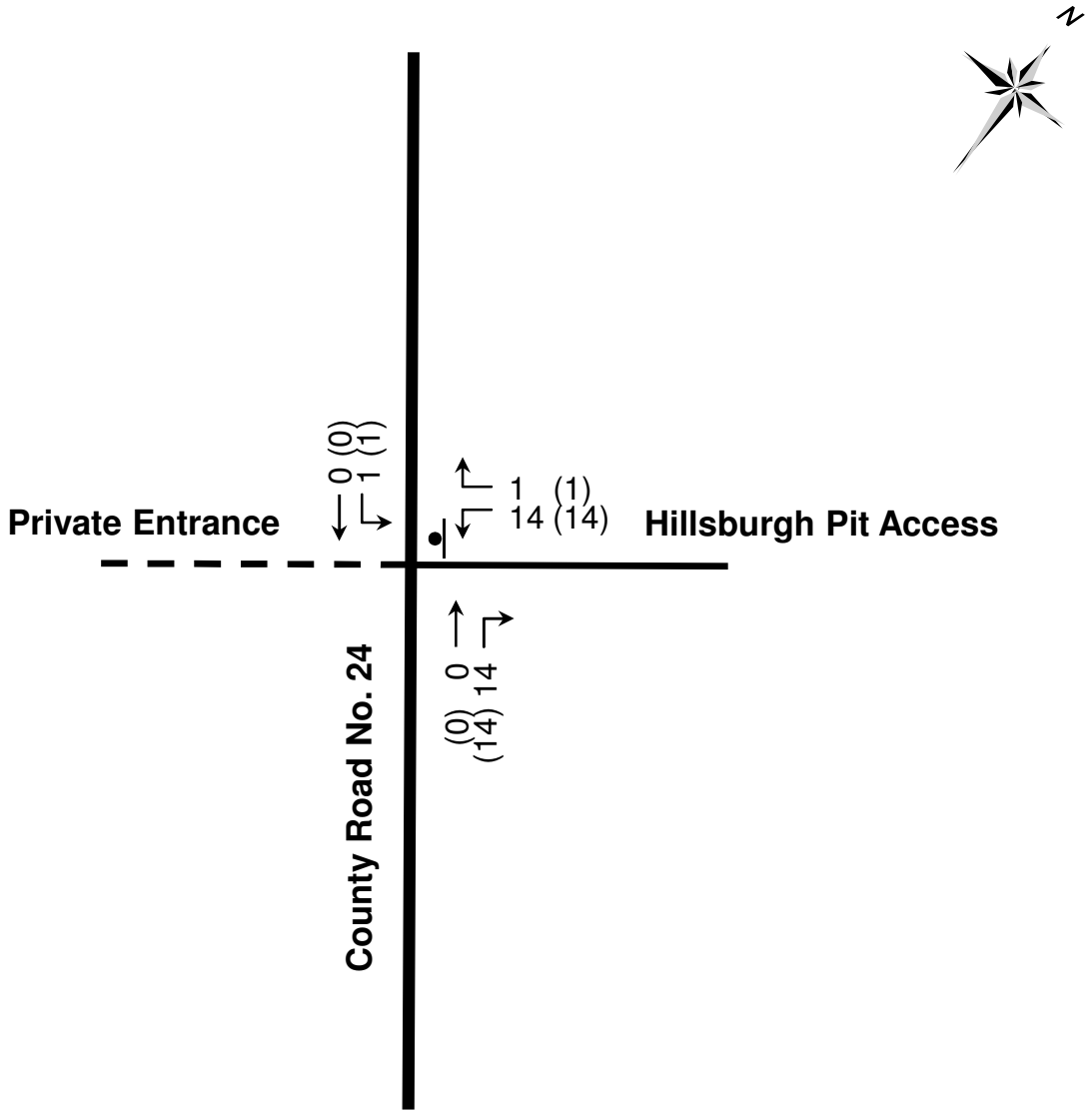
Not to Scale

Figure 2

ST. MARYS CBM HILLSBURGH PIT

2011 Baseline Traffic Volumes

(Seasonally Adjusted to June 2011)



Legend:

XX (XX) – AM (PM) Peak Hour Traffic Movements

- Stop Sign Control

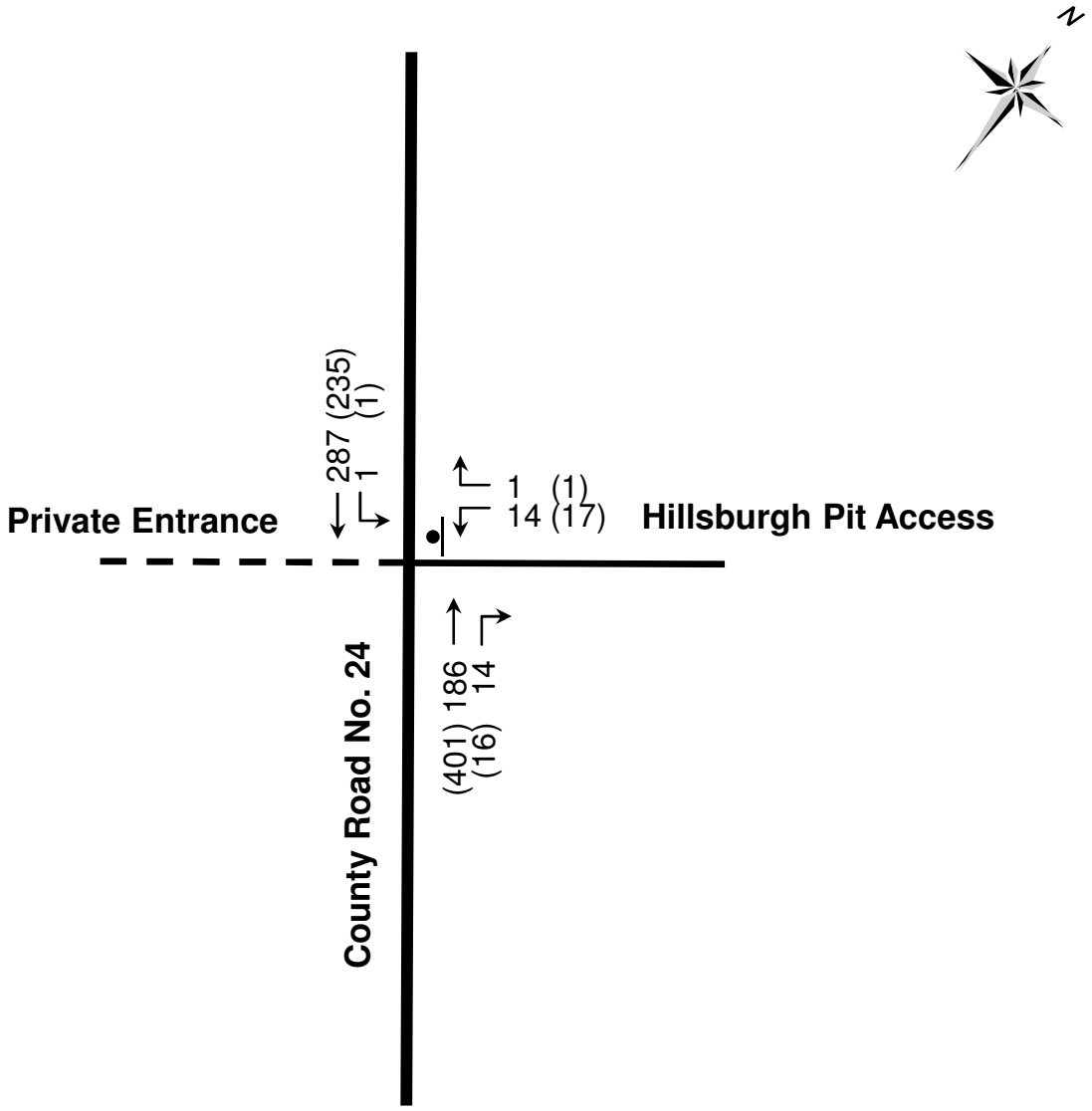
Figure 3

Not to Scale

ST. MARYS CBM HILLSBURGH PIT

Summertime Peak Site Truck Traffic Volumes

(1,000,000 tonnes per annum)



Legend:

XX (XX) – AM (PM) Peak Hour Traffic Movements

- Stop Sign Control

Not to Scale

Figure 4

ST. MARYS CBM HILLSBURGH PIT

2021 Total Peak Summertime Traffic Volumes

APPENDIX A: Original 2006 Traffic Study

Grant A. Bacchus *limited*

Consultants in Transportation Planning

July 14, 2006 File No. 2006-03 (C0386-R01)

Mr. James D. Parkin
MHBC
171 Victoria Street North
Kitchener, ON N2H 5C5

Dear Sir:

Re: Proposed Tonnage Limit Increase
CBM Huxley Pit

Further to your request, we have examined current traffic operations at the CBM Huxley Pit on the east side of County Road No. 24 north of Hillsburgh, Ontario. This examination has been done to form a basis for an analysis of any possible traffic impacts on the site access and the abutting County Road No. 24 should the annual tonnage limit be increased from the current 500,000 tonnes to the proposed 1,000,000 tonnes.

We have conducted a site visit to examine the current operations and note that the existing site access point has been positioned to ensure good visibility to both the north and south. We assume that this access location was selected by County roadway officials at the time the Pit was first opened many years ago. We noted that it is operating quite well in terms of site entry/exit movements with no significant interference to other users of County Road No. 24.

We have been advised that except for sporadic local deliveries of material to the north, the major movement is to the south. In order to check this advice, we conducted traffic surveys at the site entrance on June 20, 2006. Site peak movements occurred during the mid-morning (11 entry and 11 exit movements per hour) and these traffic movements are shown on **Figure 1** (attached). We used these traffic volumes to calculate the current level of service at the site entrance and found it to be operating at an excellent level. The overall intersection is operating at level A while the exiting driveway movements at level B (calculation sheets and Level of Service definitions are attached).

As mentioned, the predominant movement of extracted material has been to the south along County Road No. 24. It has been destined, in part, to another CBM facility in Limehouse for further processing and/or to other market destinations. County Road No. 24 is part of the "Trafalgar Road" route eventually connecting to Highway No. 401 near Hornby so that material from the subject site can then be transported on the Provincial freeway system.

County Road No. 24./Trafalgar Road appears to be the only continuous north-south major road system available as a haul route in this part of Wellington County. As such, all traffic must pass through a number of urban areas which have reduced speed limits established along the route. The standard speed limit on this route is 80 kph and this is reduced to 40 kph in Hillsburgh, 60 kph in Brisbane and 50 kph in Ballinafad (all within Wellington County). Other reduced speed zones are also in place further south in Halton Region.

As part of our review we followed a number of trucks leaving the subject site to ascertain general observance by drivers of the various reduced speed zones along the haul route. We can report that we did not observe any significant disobedience of the reduced speed zones by gravel truck drivers as they travelled through the aforementioned urban areas. These observations were especially important in Hillsburgh's 40 kph speed zone as this is the closest urban area to the subject site. It is evident that the pit operator has properly trained his truck drivers in the matter of speed limit observance and we assume that such conditions will continue through the life of the pit. An expansion of the annual tonnage limit to 1,000,000 tonnes should not change these good traffic operating conditions throughout the haul route.

We have examined the shipping records for the subject site for the 8 year period 1998 to 2005 inclusive. For the first years (1998 – 2003) operations were for a 10 month period (March to December) while for 2004 and 2005 some extraction and material movement also took place during January and February. It is noted that during the April to November period the average hourly truck movement ranged from 3.5 to 6.0 while in the January – March period and in December the average hourly movement was 2.0 or less. We understand that the pit operator plans a more intensive extraction and material movement during the winter month for which an increase in the annual tonnage limit is needed. There is plenty of roadway capacity available for this expansion of operations.

We have been advised that the planned future operations are to be year round, Mondays to Fridays, and 11 hours per day (7 a.m. to 6 p.m.). There could also be some Saturday operations (8 a.m. to 12 noon). Truck capacities are 40 tonnes with some use of 12-tonne pup trailers. In order to prepare a "conservative" analysis (i.e., worse-case) we have assumed only weekday operations and only 40 tonne trucks (thus, overestimating the truck traffic volume).

During a normal year (allowing for eight statutory holidays) there would be 253 operating days containing 3036 operating hours. If the annual tonnage limit is increased to 1,000,000 tonnes and is achieved this would produce an average 330 tonnes per hour in eight to nine 40-tonne trucks. (It is noted that should Saturday operations be commenced this would add 260 operating hours per year and reduce the average truck movement to seven or eight per hour.

We have been advised that the Pit life could be at least 10 years so have examined site access operations for the year 2016 (2006 plus 10 years). Background (or, non-site related) traffic has been expanded with an annual compounded growth rate of 3 percent (i.e. 34 percent increase over 10 years). These future background traffic volumes are shown on **Figure 2** (attached).

We have tested two site traffic activity levels for the 2016 condition. Scenario A assumes the current peaking level of 11 entry and exit hourly movements which is slightly higher than the projected hourly average for the proposed new annual tonnage level. To allow for higher peaking with the proposed new level we have also tested for 15 entry and 15 exit hourly movements. This is shown as Scenario B on **Figure 2**.

Levels of Service calculations have been undertaken for these two future conditions and the resulting levels continue at level A for the overall intersection and level B for the site exit movement. Calculation sheets are attached. The Level of Service calculation results are summarized in the following table:

Intersection Movements & Measures of Performance	2006 (Current Operations)	2016 (Scenario A)	2016 (Scenario B)
Overall Intersection: • Level of Service	A	A	A
Site Exit • Delay • Level of Service	11.3 sec B	12.0 sec B	12.2 sec B

The results of our site review and analysis of future conditions have produced a conclusion that there will not likely be any significant effect on roadway operations should the annual tonnage limit be increased to 1,000,000 tonnes. Peak site entry/exit movements are likely to increase up to 15 trucks per hour during portions of the work day but this increase can be accommodated by the present access/egress system without measurably impacting the good site access operations. Based upon our haul route observations, we do not envisage any impacts upon the urban portions of the haul route such as Hillsburgh, etc.

Yours very truly,

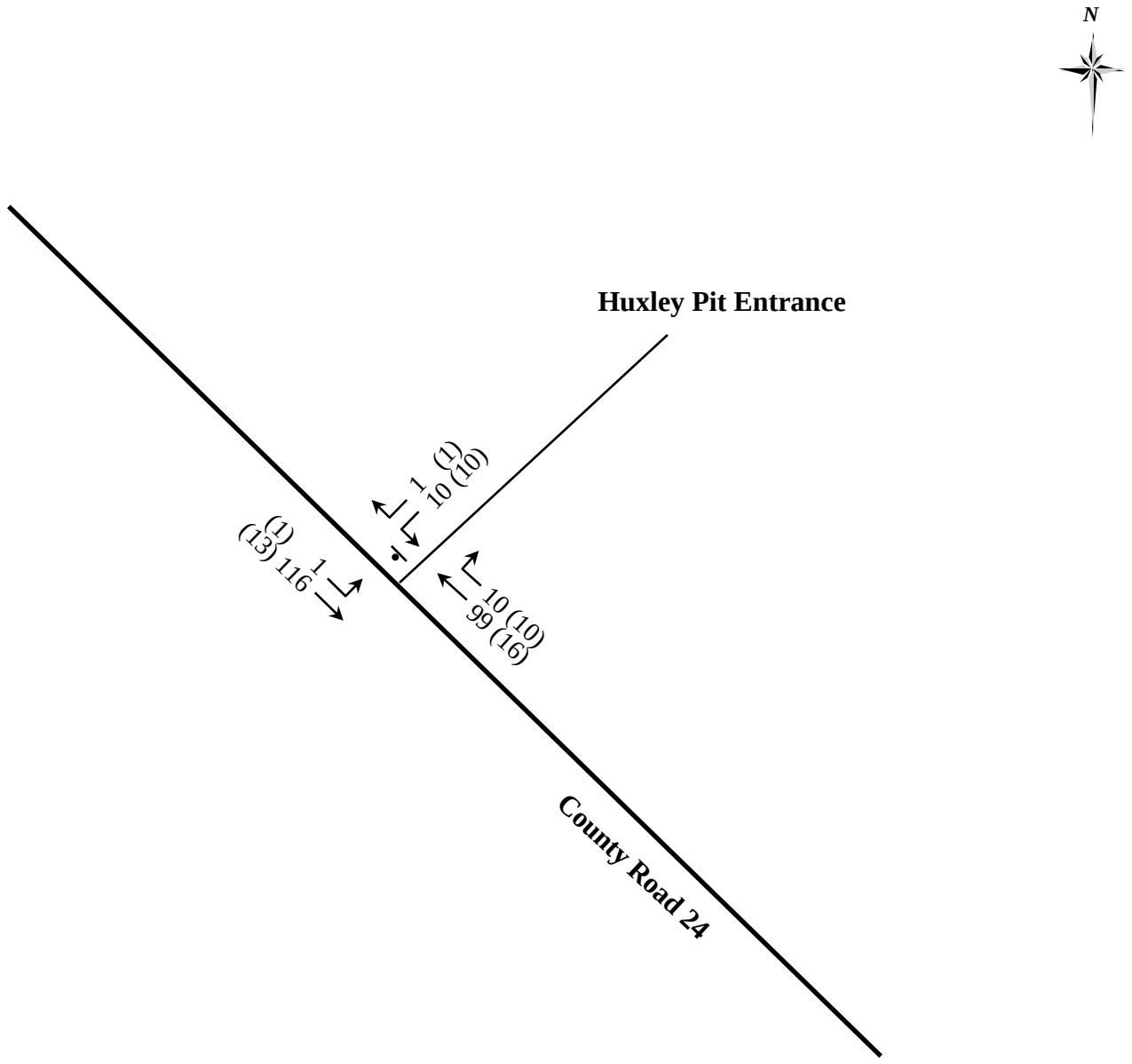
GRANT A. BACCHUS LIMITED

Grant A. Bacchus, P.Eng.
President

GAB/jh:jb

P:\C0000 - Trans Planning Open\C0386 CBM Huxley Pit\Correspondence\060714rep final.doc

encl.



Summertime Weekday AM Peak Hour Traffic Volumes

xx (xx) – Total Vehicle Volume (Heavy Truck Volume)

- Stop Sign Control

Not to Scale

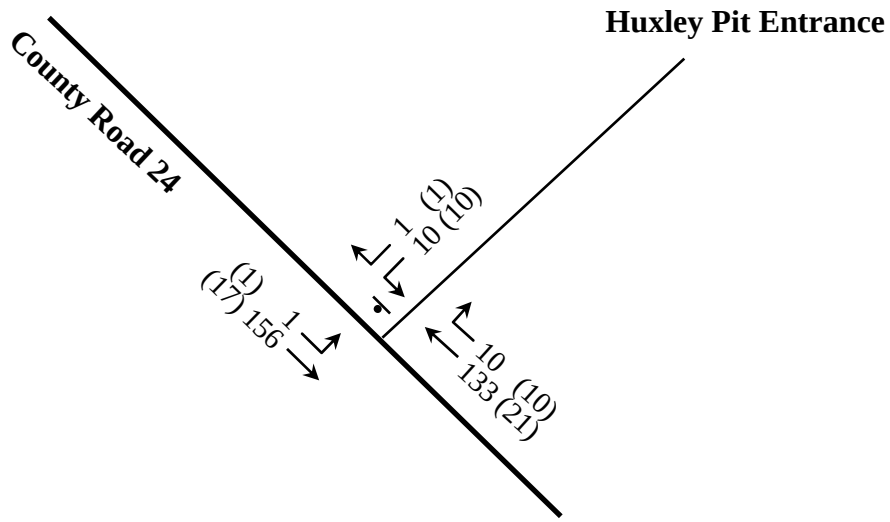
Figure 1

PROPOSED HUXLEY PIT

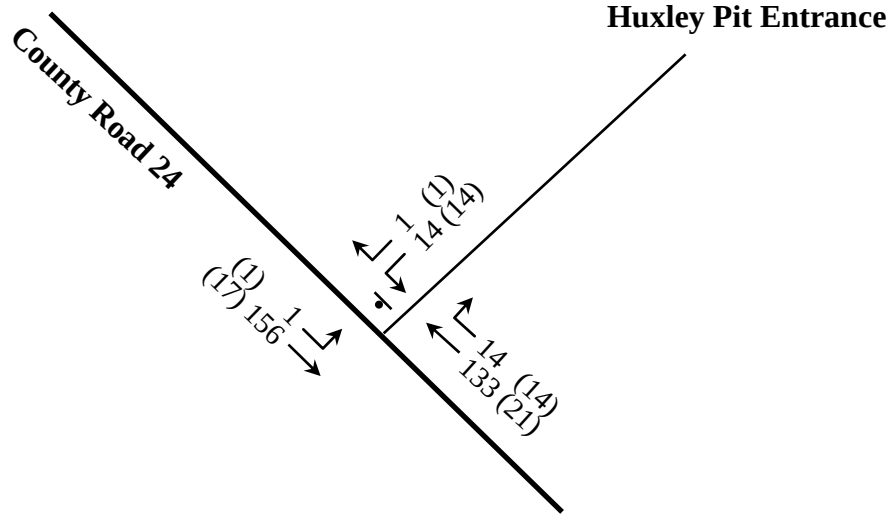
2006 Existing Traffic Volumes

N

Total Future – Scenario A:



Total Future – Scenario B:



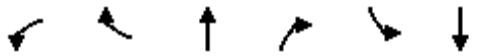
Summertime Weekday AM Peak Hour Traffic Volumes
xx (xx) – Total Vehicle Volume (Heavy Truck Volume)

Not to Scale **- Stop Sign Control**

Figure 2

PROPOSED HUXLEY PIT

2016 Total Future Traffic Volumes



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	1	99	10	1	116
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	1	110	11	1	129
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	247	116			121	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	247	116			121	
tC, single (s)	7.4	7.2			5.1	
tC, 2 stage (s)						
tF (s)	4.4	4.2			3.1	
p0 queue free %	98	100			100	
cM capacity (veh/h)	570	727			1030	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	12	121	130
Volume Left	11	0	1
Volume Right	1	11	0
cSH	582	1700	1030
Volume to Capacity	0.02	0.07	0.00
Queue Length 95th (m)	0.5	0.0	0.0
Control Delay (s)	11.3	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	11.3	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	16.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	1	133	10	1	156
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	1	148	11	1	173
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	329	153			159	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	329	153			159	
tC, single (s)	7.4	7.2			5.1	
tC, 2 stage (s)						
tF (s)	4.4	4.2			3.1	
p0 queue free %	98	100			100	
cM capacity (veh/h)	505	689			992	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	12	159	174
Volume Left	11	0	1
Volume Right	1	11	0
cSH	517	1700	992
Volume to Capacity	0.02	0.09	0.00
Queue Length 95th (m)	0.6	0.0	0.0
Control Delay (s)	12.1	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	12.1	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		19.0%	ICU Level of Service A
Analysis Period (min)		15	

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	14	1	133	14	1	156
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	16	1	148	16	1	173
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	331	156			163	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	331	156			163	
tC, single (s)	7.4	7.2			5.1	
tC, 2 stage (s)						
tF (s)	4.4	4.2			3.1	
p0 queue free %	97	100			100	
cM capacity (veh/h)	503	687			988	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	163	174
Volume Left	16	0	1
Volume Right	1	16	0
cSH	512	1700	988
Volume to Capacity	0.03	0.10	0.00
Queue Length 95th (m)	0.8	0.0	0.0
Control Delay (s)	12.3	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	12.3	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		19.0%	ICU Level of Service
Analysis Period (min)		15	

APPENDIX B: Traffic Data

COUNTY ROAD 24 @ HILLSBURGH PIT DRIVEWAY - AUGUST 16, 2011

Start Time	NORTHBOUND								SOUTHBOUND								WESTBOUND							
	THROUGH				RIGHT				LEFT				THROUGH				LEFT				RIGHT			
	Cars	Buses	Gravel Trucks	Other Trucks	Cars	Buses	Gravel Trucks	Other Trucks	Cars	Buses	Gravel Trucks	Other Trucks	Cars	Buses	Gravel Trucks	Other Trucks	Cars	Buses	Gravel Trucks	Other Trucks	Cars	Buses	Gravel Trucks	Other Trucks
630	9		1	2			1						32		3	2			3					
645	4		2				2						41			2			1					
700	15		1	1									36		3				3					
715	15		1										39		4	2								
730	26		3	2			1						43		4									
745	25		2	1									37		3	5			1				1	
800	32		2	1			1						26		4	4								
815	15		1	2			2						34		4	1			1					
830	17		5	4									31		1	4			2					
845	24		3	4			2						34		5	6			1					
900	26		4	1									29		6	3			1					
915	24		2	3			1						33			2								
930	21		5	3	2								23		2	2	1		1		1			
945	18	1	3	2									17		4	4								
BREAK																								
1030	23		6	2			1						17		6	3								
1045	14			1			1					1	22		5	2			1					
1100	29		6	1									24		1				1					
1115	15		4	2	1		1						22		2	4				1	1			
1130	29		3	3									24		4	3			1					
1145	27		3										21		2	2			1					
1200	17		5	4									29		3	1								
1215	25		3	10									18		4	2								
1230	15		3	1									21		2	2								
1245	29		2	4			2						27		6	5								
1300	24		6	1									22		4	1			2					
1315	28		3	1									16		4	4								
1330	24		6	4									26		6	7								
1345	26		4	3									25		4	5								
BREAK																								
1500	37		5	3			1	1					17		2	4				1				
1515	23		5	1									32		3	1	1		1					
1530	25		3	5									30		4	5	1							
1545	35		2	4	1								19		5	4			1					
1600	36			5									20		5		1							
1615	33		4	3									22			1								
1630	40		3	6									31		3									
1645	32			3									19		3	2					2			
1700	53		1	1				1					41								1			
1715	59			2									36			1								
1730	60			2									29			3				1				
1745	57			3									28			2								

Ontario

Ministry of Transportation | Highway Standards Branch | Traffic Office

Provincial Highways — Traffic Volumes 1988-2007

King's Highways / Secondary Highways / Tertiary Roads

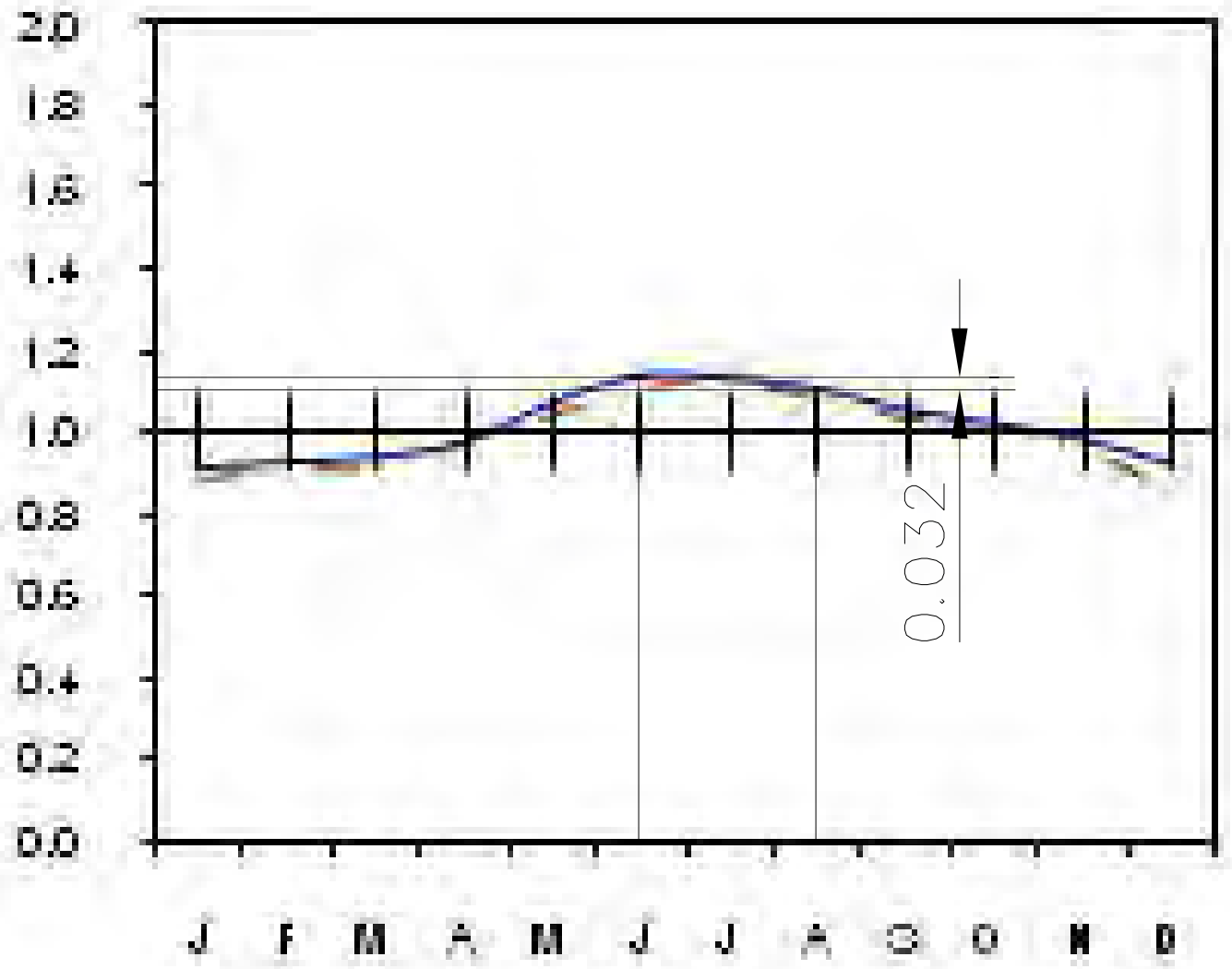
Ministry Contact:
Traffic Office (905)-704-2960

Abstract:
This annual publication contains averaged traffic volume information and accident rate information for each of the sections of highway under MTO jurisdiction.

Key Words:
Annual Average Daily Traffic volume (AADT), Summer Average Daily Traffic volume (SADT), Summer Average Weekday Traffic volume (SAWDT), Winter Average Daily Traffic volume (WADT), Accident Rate (AR)

MTO 2007 SEASONAL VARIATION CURVE

Commuter



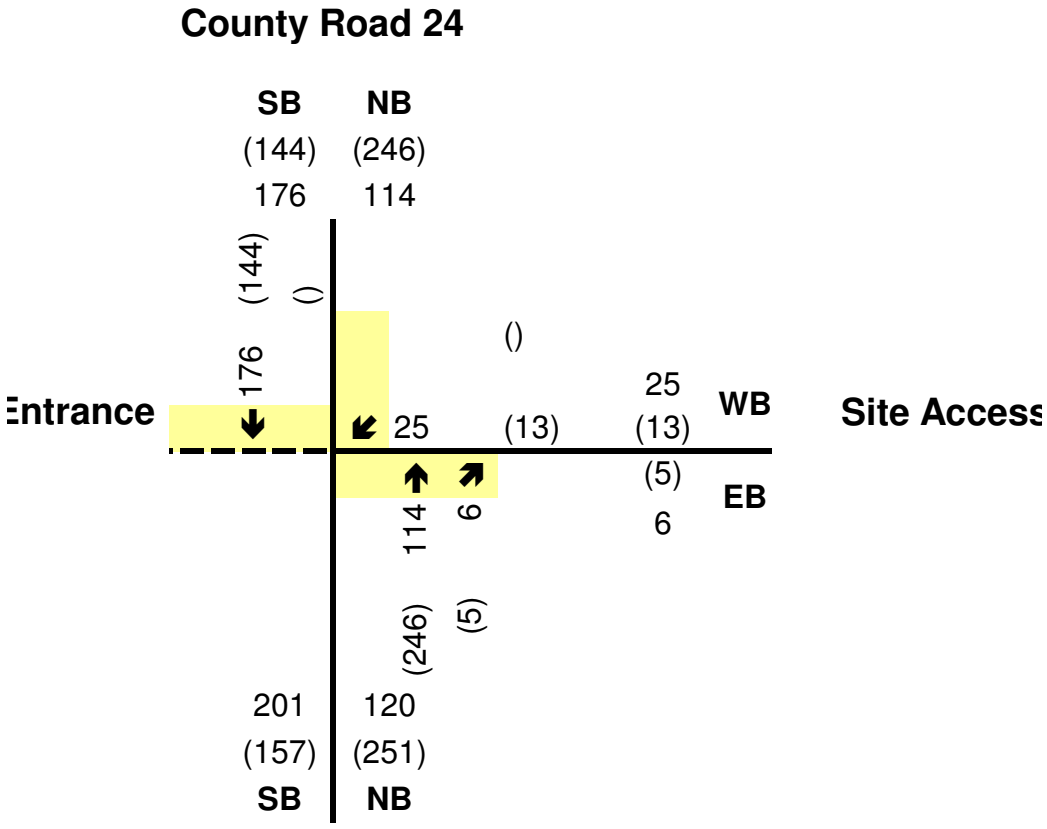
Highway	Location Description	Dist	Year	Patt Type	AADT	SADT	SAWDT	WADT	AR
			2000	C	21200	23900	23900	19100	0.6
			2001	C	21500	24300	24300	19400	0.5
			2002	C	22200	24900	25100	20000	0.7
			2003	C	22700	25400	25700	20400	0.8
			2004	C	23200	25900	26100	20900	0.7
			2005	C	23600	26300	26500	21200	0.5
			2006	C	20700	23000	23200	18600	1.0
			2007	C	21700	24100	24400	19500	0.5
10	A POINT 0.8 KM S OF HWY 24	1.2	1988	C	14050	15500	15500	12600	1.0
			1989	C	15400	17000	17200	13800	2.1
			1990	C	16250	18000	18000	14600	1.4
			1991	C	16600	18200	18400	15100	1.7
			1992	C	16800	18600	18400	15200	1.5
			1993	C	17150	18500	19000	15700	1.3
			1994	C	17800	19400	19900	16000	1.2
			1995	C	18500	20000	20700	17000	1.6
			1996	C	18300	20600	20900	16500	0.6
			1997	C	19800	22300	22600	17800	0.6
			1998	C	20500	23100	23100	18500	1.2
			1999	C	19500	22000	22000	17600	0.9
			2000	C	20900	23500	23600	18800	0.5
			2001	C	19500	22000	22000	17600	0.8
			2002	C	19700	22100	22200	17700	0.6
			2003	C	19000	21300	21500	17100	1.3
			2004	C	20000	22300	22500	18100	0.8
			2005	IR	19200	21800	20800	17400	1.2
			2006	IR	20100	24200	22000	17100	1.8
			2007	IR	20200	24500	24400	17100	0.9
10	S JCT HWY 24-MAIN ST	9.4	1988	C	12900	14300	14300	11600	1.1
			1989	C	13700	15200	15300	12300	1.3
			1990	C	14550	16100	16100	13000	0.9
			1991	C	14850	16300	16400	13500	0.6
			1992	C	14300	15800	15700	13000	0.9
			1993	IC	14550	16100	16000	13200	0.9
			1994	IC	15800	17600	17800	14000	0.7
			1995	IC	16400	18300	18500	14500	1.0
			1996	C	16400	18500	18700	14800	1.0
			1997	C	17600	19800	20100	15900	0.7
			1998	C	18200	20500	20500	16400	0.9
			1999	C	17200	19400	19400	15500	0.4
			2000	C	17000	19100	19200	15300	0.6
			2001	C	17500	19800	19800	15800	1.0
			2002	C	17700	19800	20000	15900	0.9
			2003	C	17400	19500	19700	15700	0.8

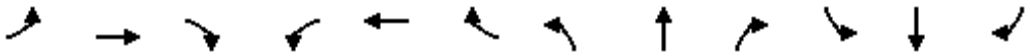
Highway	Location Description	Dist	Year	Patt Type	AADT	SADT	SAWDT	WADT	AR
			2004	C	18000	20100	20200	16200	0.8
			2005	C	18200	20300	20400	16300	0.8
			2006	C	18300	20300	20500	16500	0.6
			2007	C	18500	20600	20800	16600	1.1
10	HWY 9	0.6	1994	C	26200	28600	29300	23600	3.0
			1995	C	26400	28500	29600	24300	1.0
			1996	C	26900	30300	30700	24200	1.9
			1997	C	27500	30900	31400	24800	2.3
			1998	C	28000	31500	31600	25200	1.1
			1999	C	29100	32900	32900	26200	1.1
			2000	C	29000	32600	32700	26100	2.0
			2001	C	29300	33100	33100	26400	0.5
			2002	C	29600	33100	33400	26600	1.1
			2003	C	30000	33600	33900	27000	2.6
			2004	C	32300	36100	36300	29200	1.7
			2005	C	30600	34100	34400	27500	3.1
			2006	C	29200	32400	32700	26300	2.2
			2007	C	29200	32400	32900	26200	0.6
10	DUFFERIN ROAD 109	1.9	1988	IR	9800	12700	10700	7800	1.8
			1989	IR	10200	13100	11300	8300	0.8
			1990	IR	10500	13300	11600	8600	1.9
			1991	IR	11100	13900	12300	9200	1.9
			1992	IR	11750	14400	12900	9900	0.7
			1993	IR	12650	14400	13500	11100	0.9
			1994	IR	13000	14800	14200	11400	2.1
			1995	IR	13600	15200	14600	12100	1.3
			1996	CR	14700	18200	17200	12500	1.7
			1997	IR	14800	16800	15800	13300	2.5
			1998	IR	15300	17300	16400	13700	1.3
			1999	IR	15300	17300	16400	13600	2.3
			2000	IR	16300	18500	17600	14600	2.1
			2001	IR	16800	19200	18100	15000	2.0
			2002	IR	17100	19400	18400	15400	2.3
			2003	IR	18600	21200	20100	16700	2.1
			2004	IR	18600	22200	19800	16400	2.1
			2005	IR	18600	22200	19700	16300	1.7
			2006	IR	18700	22600	20400	15900	2.2
			2007	IR	18700	22700	22600	15800	2.3
10	CEMETERYRD-FIRST ST	1.4	1988	CR	12700	16500	15200	10500	1.5
			1989	CR	13200	16800	15700	11000	1.6
			1990	LT	13400	19500	18700	9700	0.9
			1991	LT	14450	20200	19500	10600	0.9
			1992	LT	15600	21600	21000	12000	1.4
			1993	IR	16750	19000	17900	14700	1.6

APPENDIX C: Baseline PCE Traffic Volumes, Synchro Reports - 2011

Baseline Conditions & Level of Service Definitions

2011 Baseline (PCE)

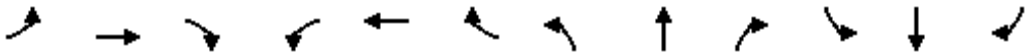




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	25	0	0	0	114	6	0	176	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	28	0	0	0	127	7	0	196	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	326	329	196	326	326	130	196			133		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	326	329	196	326	326	130	196			133		
tC, single (s)	7.1	6.5	6.2	8.1	6.5	7.2	4.1			5.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.4	4.0	4.2	2.2			3.1		
p0 queue free %	100	100	100	94	100	100	100			100		
cM capacity (veh/h)	628	590	846	477	593	712	1377			1018		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	28	133	196
Volume Left	0	28	0	0
Volume Right	0	0	7	0
cSH	1700	477	1377	1018
Volume to Capacity	0.00	0.06	0.00	0.00
Queue Length 95th (m)	0.0	1.4	0.0	0.0
Control Delay (s)	0.0	13.0	0.0	0.0
Lane LOS	A	B		
Approach Delay (s)	0.0	13.0	0.0	0.0
Approach LOS	A	B		

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	20.4%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	13	0	0	0	246	5	0	144	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	14	0	0	0	273	6	0	160	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	436	439	160	436	436	276	160			279		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	436	439	160	436	436	276	160			279		
tC, single (s)	7.1	6.5	6.2	8.1	6.5	7.2	4.1			5.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.4	4.0	4.2	2.2			3.1		
p0 queue free %	100	100	100	96	100	100	100			100		
cM capacity (veh/h)	530	512	885	396	514	577	1419			880		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	14	279	160
Volume Left	0	14	0	0
Volume Right	0	0	6	0
cSH	1700	396	1419	880
Volume to Capacity	0.00	0.04	0.00	0.00
Queue Length 95th (m)	0.0	0.9	0.0	0.0
Control Delay (s)	0.0	14.4	0.0	0.0
Lane LOS	A	B		
Approach Delay (s)	0.0	14.4	0.0	0.0
Approach LOS	A	B		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

LEVEL OF SERVICE
FOR
UNSIGNALIZED INTERSECTIONS
(TWO–WAY AND ALL–WAY STOP CONTROL)
(Highway Capacity Manual, 2000)

The assessment of operations at unsignalized intersections is based on the methodology in the Highway Capacity Manual, 2000. Typical software providers, such as Trafficware and McTrans, have developed industry-accepted analysis programs (SYNCHRO and HCS2000) which incorporate these methodologies.

Level of service for two-way stop controlled intersections is defined in terms of delay, which is a measure of drivers discomfort and frustration, fuel consumption, and lost travel time. Specifically, level of service (LOS) criteria is stated in terms of average control delay per vehicle for a 15-minute analysis period.

Level of Service	Delay (Seconds / Vehicle)
A	≤ 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

APPENDIX D: Growth Rate Calculation, Total (2021) PCE Traffic

Volumes & Synchro Reports – Total (2021) Conditions

AM Traffic - *Annual Growth rate from Total Growth*

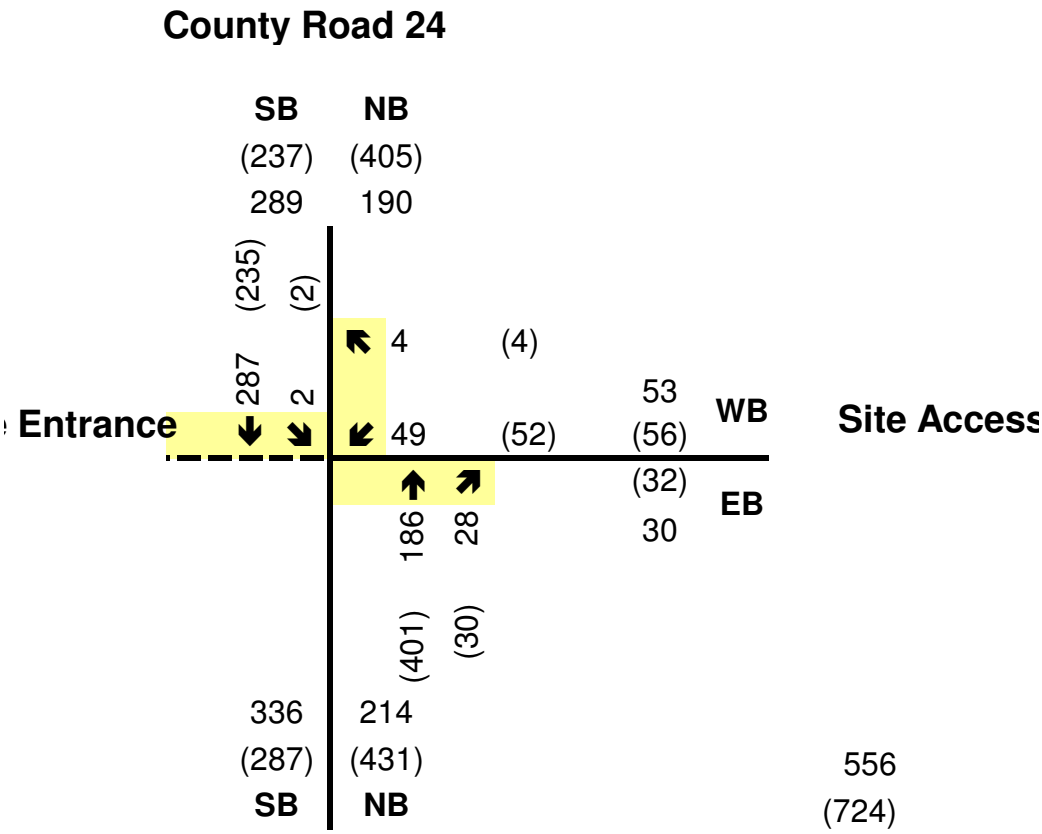
First Year;	*2006*	Horizon;	*2011*	Overall Growth;	1.277
Volume	*235*	Volume	*300*		
Span in Years;	*5*			**Annual Growth Rate;**	**5.0%**

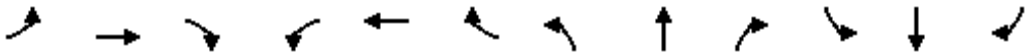
Calculation Check (should = Overall Growth): 1.276595745

Formulae: **=10^(LOG(overall growth)/number of years)-1**

=(1+annual growth)^no of years

2021 Total (PCE)

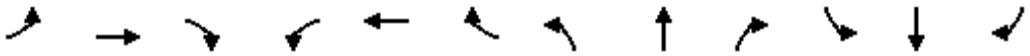




Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	49	0	4	0	186	28	2	287	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	54	0	4	0	207	31	2	319	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	550	561	319	546	546	222	319			238		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	550	561	319	546	546	222	319			238		
tC, single (s)	7.1	6.5	6.2	8.1	6.5	7.2	4.1			5.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.4	4.0	4.2	2.2			3.1		
p0 queue free %	100	100	100	83	100	99	100			100		
cM capacity (veh/h)	442	435	722	328	444	624	1241			917		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	59	238	321
Volume Left	0	54	0	2
Volume Right	0	4	31	0
cSH	1700	340	1241	917
Volume to Capacity	0.00	0.17	0.00	0.00
Queue Length 95th (m)	0.0	4.7	0.0	0.1
Control Delay (s)	0.0	17.8	0.0	0.1
Lane LOS	A	C		A
Approach Delay (s)	0.0	17.8	0.0	0.1
Approach LOS	A	C		

Intersection Summary				
Average Delay	1.7			
Intersection Capacity Utilization	28.7%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	52	0	4	0	401	30	2	235	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	0	0	58	0	4	0	446	33	2	261	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	732	744	261	728	728	462	261			479		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	732	744	261	728	728	462	261			479		
tC, single (s)	7.1	6.5	6.2	8.1	6.5	7.2	4.1			5.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.4	4.0	4.2	2.2			3.1		
p0 queue free %	100	100	100	76	100	99	100			100		
cM capacity (veh/h)	332	342	778	240	349	440	1303			719		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	62	479	263
Volume Left	0	58	0	2
Volume Right	0	4	33	0
cSH	1700	248	1303	719
Volume to Capacity	0.00	0.25	0.00	0.00
Queue Length 95th (m)	0.0	7.3	0.0	0.1
Control Delay (s)	0.0	24.3	0.0	0.1
Lane LOS	A	C		A
Approach Delay (s)	0.0	24.3	0.0	0.1
Approach LOS	A	C		

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	35.8%	ICU Level of Service	A	
Analysis Period (min)	15			