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# **THE POTENTIAL FINANCIAL IMPACTS OF THE PROPOSED ROCKFORT QUARRY**

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**FEBRUARY 26, 2009**



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 <i>W.E. Upjohn Institute Report</i>	

## THE POTENTIAL FINANCIAL IMPACTS OF THE PROPOSED ROCKFORT QUARRY

### Section 1 INTRODUCTION

This report was prepared by the Centre for Spatial Economics (C4SE) at the request of the Town of Caledon. It provides estimates of the potential financial impacts of the Rockfort Quarry on the people living, and the businesses operating, near the proposed site. It also provides estimates of the quarry's potential financial impacts on the Town of Caledon and the Region of Peel.

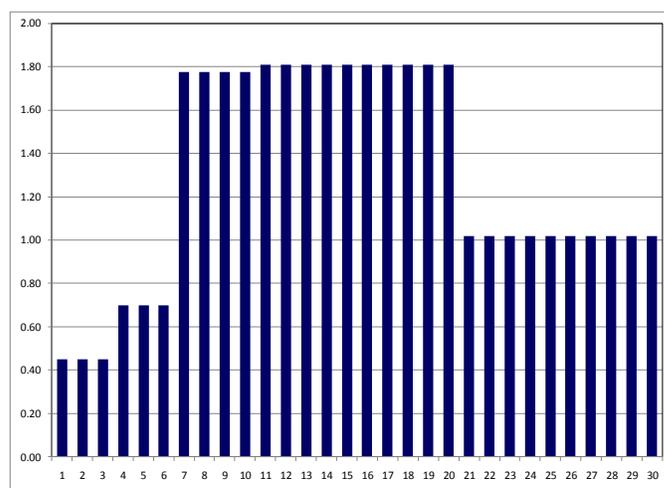
The financial impacts are significant and include the reduction of property values in nearby communities and the cost of providing additional municipal services. The financial impacts are especially significant if the procedures chosen by the proponent to mitigate the negative impacts of its operations on the surrounding groundwater system fail to do so.

Two financial impact scenarios are provided. The first assesses the potential financial impacts assuming the quarry is economically viable over its 30 year operating period, and that the proponent succeeds in mitigating the negative impacts of its operations on the surrounding groundwater system over the 30 year operating period and over the subsequent 50 year rehabilitation period. The second assesses the potential financial impacts assuming the mitigation procedures fail.

### Section 2 THE CONTEXT OF THIS EVALUATION

The proposed quarry excavation is to occur at an 89 hectare site located at the northeast corner of the intersection of Old Base Line Road and Winston Churchill Boulevard in the south west corner of the Town of Caledon. The proponent intends to excavate 47 hectares within this area and to use another 11 hectares for setbacks and buffer to extract 39 million tonnes of aggregates in 5 phases over a period of 30 years and, on completion of its operations, to remediate the site. Exhibit 1 shows the implied annual excavation phasing of the quarry over the 30 year period of operations.

**Exhibit 1**  
**Proposed Phasing of Excavation of Rockfort Quarry**  
**Implied Annual Production in Million Tonnes (Vertical Axis) by Year (Horizontal Axis)**



Source: James Dick Construction Limited and C4SE

Exhibit 1 reveals that the quarry's annual production rate is expected to gradually increase over the first 6 years to reach a peak in year 7 at about 1.8 million tonnes per year. It is expected to remain at that level for 14 years through to year 20. From years 21 to 30 the production rate is expected to fall to an average of about 1.0 tonne per year.

Aggregate products are currently sold by operators at a price of between \$10 and \$12 per tonne. Some experts suggest the price in real terms will increase over time reflecting the expectation that aggregate product supplies will become increasingly scarce in the Greater Toronto Area in the decades ahead. Assuming a price of \$12 per tonne in constant 2009 dollars the proponent can expect to generate revenues of \$468 million in constant 2009 dollars over the 30 years of operation, or an average of some \$15.6 million in constant 2009 dollars per year.

Questions have been raised about the impacts the proposed quarry is likely to have on people and property in the immediate area, on the quality of life the neighbourhood provides, and on the additional resources the Town and Region will be required to provide to support the quarry's activities.

The first scenario addresses the financial implications of these concerns.

The proposed site is a highly unusual one in that, in the absence of appropriate mitigating procedures and mechanisms, the Rockfort Quarry would negatively impact the supply and quality of groundwater in the immediate area. It is proposed that a grout curtain system be implemented to prevent these negative impacts. A grout curtain system has never been used in a quarry situation before. The proponent seeks an "adaptive management plan" approach to implement the grout curtain system and has not specified either the scale of the system that will be required or its potential cost. Preliminary estimates from other experts indicate such a system is likely to cost at least \$45 million, and could cost as much as \$270 million, depending on whether a 10 Lugeon or 1 Lugeon curtain is built, and on whether the curtain is built under no-flow or flow conditions. The proponent proposes to build a 5 or 6 Lugeon system which, presumably, will cost \$110 million or more (half way between the costs of a 1 Lugeon and 10 Lugeon system). Resolving the scale issue is beyond the scope of this report. It is important to note, however, that these estimates mean the grout curtain system could devour anywhere from 24 percent to 60 percent of the total revenues the site can reasonably expect to generate over the 30 years of operation. Furthermore, the grout system needs to continue to function successfully over the subsequent 50 year rehabilitation period.

In a just released report Credit Valley Conservation states that "the consequences of partial or substantive failure [of the proposed mitigation system] will create unacceptable impacts. . . CVC takes the position that there is a great deal of uncertainty and risk with the project even after several years of review and modifications."<sup>1</sup>

In view of the significant cost of the grout curtain system, the 80 year period over which it must successfully operate, and the uncertainties related to its effectiveness, the economic viability of the entire operation must be challenged. The Town of Caledon and Peel Region are concerned that if the proponent's adaptive management plan fails to mitigate the impacts of the quarry's operations on the groundwater system, the people and businesses negatively impacted are likely to seek retribution from the Town and Region.

The second scenario addresses the financial implications of these concerns.

The financial impacts in this report were developed to establish an order of magnitude of the financial risk faced by Caledon and Peel if the mitigation procedures fail.

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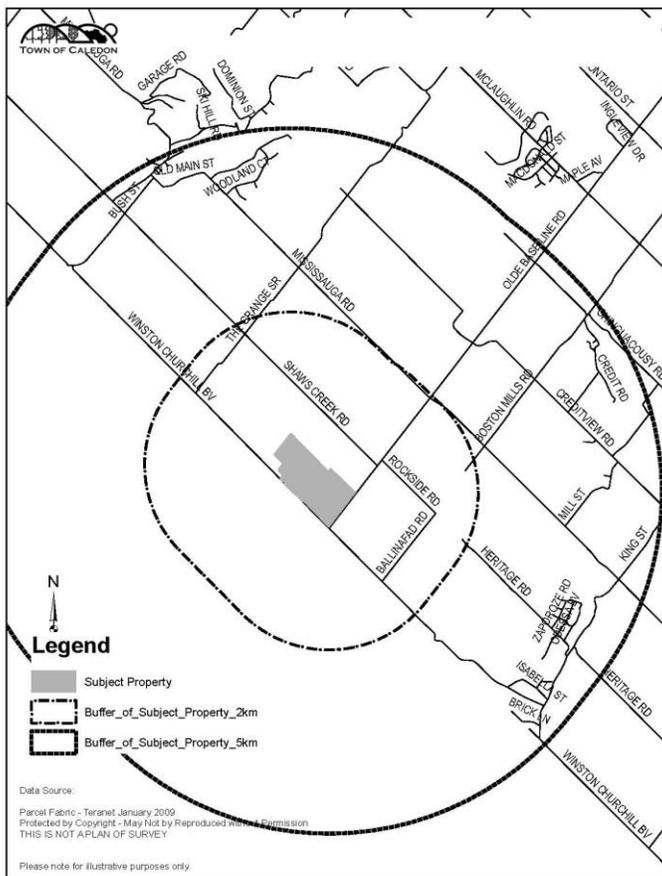
<sup>1</sup> CVC *Position on Rockfort Quarry* (February 20, 2009).

### Section 3 THE STUDY AREA

As noted above, the proposed quarry site is located at the northeast corner of the intersection of Old Base Line Road and Winston Churchill Boulevard. For the purposes of this report a primary study area and a secondary study area are defined.

The primary study area includes all lands within about a 2 kilometre radius of the site. Specifically the primary study area is bounded on the northeast by Mississauga Road; on the southeast by Wellington Road 42 - Ballinafad Road (and by a straight line extended through to Boston Mills Road); on the northwest by The Grange Sideroad; on the southwest by 10<sup>th</sup> Line (including an area within an imaginary line extended northwest along 10<sup>th</sup> Line and an imaginary line extended southwest along The Grange Sideroad) (see Exhibit 2). This area covers a total of 1,981 hectares of which 1,144 hectares (most of the northeastern portion of the study area) are in the Town of Caledon, and 837 hectares (the portion southwest of Winston Churchill Boulevard) are in the Township of Erin in Wellington County.

#### Exhibit 2 Map of the Primary and Secondary Study Areas



Source: Town of Caledon

The secondary study area broadens the assessment to include all lands within a 5 kilometre radius of the proposed site. The secondary study area is equal to the broader area minus the primary area.

According to Census data the primary study area was home to 382 people in 2006 (251 in Caledon and 131 in Erin). There were 156 dwellings in the area (95 in Caledon and 61 in Erin) of which 145 were occupied (91 in Caledon and 54 in Erin). The unoccupied dwellings presumably reflect seasonal residences (a total of 9, 4 in Caledon and 7 in Erin).<sup>2</sup>

Property tax data for the Town of Caledon indicate that there are 114 properties in the Caledon portion of the primary study area of which 94 are properties on which a residence can be found (close to the Census estimate of 95); 18 are properties designated as residential, farm or managed forest sites but on which no residence exists; 1 property is occupied by a club; and 1 is occupied by a place of worship (see Exhibit 3). The properties within the primary study area on which a residence can be found – 69 percent are single-family detached units while the remainder are residences (likely single-family detached) on farm or managed forest properties – have an average assessed value of just over \$526,000. The properties on which no residence can be found (mostly vacant) have an average assessed value of almost \$227,000.

Collectively the 114 properties have a total value of \$54.0 million of which \$49.4 million represents properties on which residences can be found.

**Exhibit 3**  
**Properties in the Caledon Portion of the Primary Study Area by Type**  
**Assessed Values in 2005 and Property Taxes in 2008**

Property categories	Number of Properties	Average Assessed Value	Total Value (\$000,000s)	Total Value (% Share)	Property Taxes (\$000s)	Property Taxes (% Share)
Total properties	114	\$473,797	\$54.01	100	\$472.17	100
Occupied by people	94	\$526,368	\$49.48	92	\$442.62	94
Single-family detached not on water	68	\$545,239	\$37.08	69	\$347.11	74
Duplex	1	\$357,000	\$0.36	1	\$3.51	1
Farm with residence - with or without secondary structures; with farm outbuildings	6	\$407,667	\$2.45	5	\$16.32	3
Land owned by a non-farmer improved with a non-farm residence, part farmed	11	\$535,557	\$5.89	11	\$46.64	10
Managed forest property, residence not on water	8	\$463,528	\$3.71	7	\$29.04	6
Not occupied by people	20	\$226,715	\$4.53	8	\$29.55	6
Vacant residential land not on water	10	\$210,203	\$2.10	4	\$16.77	4
Vacant residential/commercial/industrial land owned by a non-farmer, part farmed	2	\$246,413	\$0.49	1	\$3.28	1
Farm without residence - with secondary structures; with farm outbuildings	1	\$37,750	\$0.04	0	\$0.09	0
Farm property without any buildings/structures	1	\$462,750	\$0.46	1	\$1.04	0
Managed forest property, vacant land not on water	4	\$203,488	\$0.81	2	\$4.64	1
Clubs, private and fraternal	1	\$456,500	\$0.46	1	\$3.72	1
Place of worship - without a clergy residence	1	\$168,500	\$0.17	0	\$0.00	0

Source: Town of Caledon and C4SE

The 114 properties in the study area collectively generated property taxes of about \$472,000 dollars. Those funds were allocated as follows: Caledon received \$145,000, Peel received \$203,000 and the boards of education received the remaining \$124,000.

Census data reveal that for the Town as a whole the average value of all owned dwellings in 2006 was \$457,586. Thus the average value of residences in the primary study area exceeds the Town average by just over 15 percent. By way of comparison the average value of owned dwellings across the province in 2006 was \$297,479. Thus the average dwelling price in Caledon exceeded that of the province by almost 54 percent, while the average value in the study area exceeded the provincial average by 77 percent.

<sup>2</sup> The data for Caledon reflect a summation of Dissemination Blocks 3521001706, 3521001709, 3521163204 and 3521163205. The data for Erin are for Dissemination Blocks 3523035006 and 3523035902.

At the time of writing of this report Census data for the secondary study area were not available. Town of Caledon property tax data, however, indicate that there are 400 properties in the Caledon portion of the secondary study area of which 327 are properties on which a residence can be found. The remaining 73 properties are primarily designated as vacant (56) or accommodating a variety of non-residential uses such as gravel pits, quarries and sand pits (3), conservation areas (3), campgrounds (2), etc. (see Exhibit 4).

**Exhibit 4**  
**Properties in the Caledon Portion of the Secondary Study Area by Type**  
**Assessed Values in 2005 and Property Taxes in 2008**

Property categories	Number of Properties	Average Assessed Value	Total Value (\$000,000s)	Total Value (% Share)	Property Taxes (\$000s)	Property Taxes (% Share)
Total properties	400	\$502,812	\$201.12	100	\$1,734.81	100
Occupied by people	327	\$503,393	\$164.61	82	\$1,453.18	84
Single-family detached not on water	274	\$496,975	\$136.17	68	\$1,258.48	73
Farm with residence - with or without secondary structures; with farm outbuildings	15	\$545,667	\$8.19	4	\$42.21	2
Farm with residence - with or without secondary structures; no farm outbuildings	2	\$610,863	\$1.22	1	\$3.34	0
Land owned by a non-farmer improved with a non-farm residence, part farmed	17	\$505,535	\$8.59	4	\$62.44	4
Managed forest property, residence not on water	6	\$615,713	\$3.69	2	\$22.91	1
Managed forest property, seasonal residence not on water	3	\$720,167	\$2.16	1	\$17.13	1
More than one structure used for residential purposes with a least one occupied	2	\$632,750	\$1.27	1	\$12.16	1
Multi-residential, with small commercial unit(s)	1	\$610,443	\$0.61	0	\$10.01	1
Residence with a commercial unit	4	\$376,750	\$1.51	1	\$8.82	1
Residence with a commercial/industrial use building	1	\$472,000	\$0.47	0	\$4.02	0
Retail or office with residential unit(s)above or behind - less than 10,000 sq ft GBA	1	\$388,000	\$0.39	0	\$8.36	0
Semi-detached with both units under one ownership	1	\$339,750	\$0.34	0	\$3.29	0
Not occupied by people	73	\$500,210	\$36.52	18	\$281.64	16
Vacant residential land not on water	41	\$193,775	\$7.94	4	\$53.82	3
Vacant residential/commercial/industrial land owned by a non-farmer, part farmed	4	\$611,625	\$2.45	1	\$9.21	1
Vacant commercial land	2	\$301,000	\$0.60	0	\$5.03	0
Farm property without any buildings/structures	6	\$160,642	\$0.96	0	\$2.98	0
Managed forest property, vacant land not on water	3	\$164,333	\$0.49	0	\$1.20	0
Clubs, private and fraternal	1	\$10,259,500	\$10.26	5	\$91.68	5
Place of worship - without a clergy residence	2	\$407,500	\$0.82	0	\$0.00	0
Fire Hall	1	\$707,000	\$0.71	0	\$0.00	0
Non-buildable land (walkways, buffer/berm, storm water management pond, etc)	1	\$9,950	\$0.01	0	\$0.00	0
School (elementary or secondary, including private	1	\$1,162,750	\$1.16	1	\$0.00	0
Railway buildings and lands describes as assessable in the Assessment Act	1	\$97,000	\$0.10	0	\$1.60	0
Assembly hall, community hall	2	\$336,375	\$0.67	0	\$0.00	0
Campground	2	\$942,376	\$1.88	1	\$12.02	1
Conservation Authority Land	3	\$374,492	\$1.12	1	\$0.90	0
Gravel pit, quarry, sand pit	3	\$2,444,333	\$7.33	4	\$103.21	6

Source: Town of Caledon and C4SE

The properties within the secondary study area in Caledon on which a residence can be found have an average assessed value of just over \$503,000, a bit lower than the average in the primary study area. The properties on which no residence can be found have an average assessed value of almost \$500,000, more than double the average value of such properties in the primary area.

Collectively the 400 properties have a total value of \$201.1 million of which \$164.6 million represents properties on which residences can be found.

The 400 properties in the secondary study area in Caledon collectively generated property taxes of about \$1.7 million dollars. Those funds were allocated as follows: Caledon received \$519,000, Peel received \$723,000 and the boards of education received the remaining \$493,000.

Administrative data regarding assessment values and property taxes for the properties in the Erin portion of the primary and secondary study areas were not available at the time of writing. Given the likely similarity of these properties to those in the Caledon portions it can be assumed the average property value and average property tax liability in the Erin portions closely matched those in the Caledon portion in 2007. Based on that assumption, therefore, the average value of the 155 dwellings in the primary study area (including both the Caledon and Erin portions) is estimated at just over \$526,000. This means the total value of the residential properties in the primary study area was about \$81.5 million in 2007.<sup>3</sup>

Assuming the ratio of non-residential to residential properties is the same in Erin in both the primary and secondary portions as it is in Caledon means that, in addition to the 61 residential properties in Erin's portion of the primary study area, there are another 13 non-residential properties. Thus there are likely about 33 non-residential properties in the primary study area in total (20 in Caledon, 13 in Erin). Assuming an average value for each of about \$227,000 (the average in Caledon), the non-residential properties in the primary study area likely had a total value of \$7.5 million in 2007.

Assuming the secondary to primary area ratio of properties by type in Erin is the same as that for Caledon there are likely 212 residential and 60 non-residential properties in Erin's secondary study area. Assuming average property values by type and taxes collected per assessed value in Erin's secondary study area equal those in Caledon's leads to the conclusion that the total value of all properties in the secondary study area (both Caledon and Erin) is \$331.4 million.

Thus the value of all properties in the primary and secondary study areas combined – including residential and non-residential – is likely about \$420.5 million. Exhibit 5 summarizes the results of these calculations.

**Exhibit 5**  
**Properties in the Primary and Secondary Study Area in Caledon and Erin by Type**  
**Assessed Values in 2006**

	Residential			Non-Residential			All Properties		
	Number	Average Value	Total Value	Number	Average Value	Total Value	Number	Average Value	Total Value
Primary	155	\$526,000	\$81.5	33	\$227,000	\$7.5	188	\$473,500	\$89.0
Caledon	94	\$526,000	\$49.4	20	\$227,000	\$4.5	114	\$473,500	\$54.0
Erin	61	\$526,000	\$32.1	13	\$227,000	\$3.0	74	\$473,500	\$35.0
Secondary	539	\$503,000	\$271.2	120	\$500,000	\$60.2	660	\$502,500	\$331.4
Caledon	327	\$503,000	\$164.5	73	\$500,000	\$36.5	400	\$502,500	\$201.0
Erin	212	\$503,000	\$106.7	47	\$500,000	\$23.7	260	\$502,500	\$130.5
Total	694	\$508,100	\$352.7	153	\$441,300	\$67.7	848	\$496,000	\$420.5
Caledon	421	\$508,100	\$213.9	93	\$441,300	\$41.0	514	\$496,000	\$255.0
Erin	273	\$508,100	\$138.8	60	\$441,300	\$26.7	334	\$496,000	\$165.5

Source: Town of Caledon and estimates for Erin by C4SE

<sup>3</sup> Note that 7 of these properties are within the area on which the proposed quarry is to be built. They have an average assessed value of \$393,000 and therefore a total value of 2.8 million. Three are occupied by residences while the remaining three are non-residential. The 7 account for less than 3 percent of the value of all properties in the primary study area and less than 0.5 percent of the value of all properties in both the primary and secondary areas.

#### **Section 4**

### **THE IMPACT OF QUARRIES ON THE QUALITY OF LIFE**

People worldwide oppose proposals for the development of new quarries or the expansion of existing facilities in their neighbourhoods. The opposition is understandable. As the Pembina Institute<sup>4</sup> recently pointed out:

*Operators of pits and quarries remove virtually all vegetation, topsoil and subsoil to access the resource. In so doing, they remove any natural habitat that may have been on site, and disrupt pre-existing stream flows . . . The extraction of aggregate resources changes the slope of the land and alters water drainage patterns . . . Once the aggregate is extracted . . . water storage capacity is lost. Aggregate operations . . . are characterized by the release of significant amounts of particular matter (i.e. dust) and noise pollution from extraction and processing activities as well as smog precursors and greenhouse gases from the operation of heavy equipment and machinery. The heavy truck traffic to and from aggregate sites is often a serious hazard and nuisance affecting people over wider areas, and is a significant source of air pollution itself.*

The quality of life sought by rural residents reflects the sum total of the many desirable attributes of rural settings including peace, solitude, proximity to nature, etc.

It is impossible to measure with financial precision the value rural residents place on each individual quality of life attribute. It is possible, however, to measure with financial precision the extent to which an area threatened by a new quarry has been rendered less attractive to existing and potential future residents. This can be done by observing the impact a new quarry has on property values in the area. The loss in value of nearby properties quantifies the impact of a new quarry on the deterioration in the quality of life of its nearby residents. The price reduction of properties reflects the incentive owners must offer to induce new buyers to purchase their property. Irrespective of whether a local resident actually sells his or her property, the reduction in the value of a person's property measures the adverse effects on the quality of life perceived by new purchasers associated with the disamenities introduced into the area by the new quarry.<sup>5</sup>

#### **Section 5**

### **THE IMPACT OF QUARRIES ON PROPERTY VALUES**

Many factors influence house prices including the characteristics of the unit itself (house age, size, lot size, number of bedrooms, number of bathrooms, quality of construction and upkeep, etc.). Other factors can also play a significant role, including proximity to amenities (a lake, pleasant neighbourhoods, major employment centres, urban services, etc.) or to disamenities (landfill sites, pollution sites, quarries, etc.).

Professor Diane Hite of Auburn University in Alabama is an economist that has published widely in the area of property value impact analysis. Using a hedonic pricing model procedure which separately accounts for the relative impacts on house values of the variety of attributes described above, Professor Hite examined the effects of distance from a gravel mine in Delaware County, Ohio on the sale price of more than 2,500 residential properties in the late 1990s.<sup>6</sup>

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<sup>4</sup> Pembina Institute, "Rebalancing the Load: The need for an aggregates conservation strategy for Ontario (January 25, 2005).

<sup>5</sup> George A. Erickcek, 2006. "An Assessment of the Economic Impact of the Proposed Stoneco Gravel Mine Operation on Richland Township," W.E. Upjohn Institute for Employment Research. A copy of this report is appended.

<sup>6</sup> Diane Hite, 2006. "Summary Analysis: Impact of Operational Gravel Pit on House Values, Delaware County, Ohio," Auburn University.

Her model controls for a large set of other unit and location specific factors so that she can focus solely on the effect of the proximity of the gravel mine on home sale price.

George E. Erickcek of the W.E. Upjohn Institute for Employment Research recently used Professor Hite's model to assess the potential impacts of the proposed Stoneco Gravel Mine in Richland Township, Michigan on property values in the area.<sup>7</sup> Exhibit 6 (below) recreates a chart contained in Erickcek's assessment based on Hite's model. Exhibit 6 relates the impact of distance from the gravel pit on property values. The chart below differs from that in the original publication in that distance in Exhibit 6 is measured in kilometres as opposed to being measured in miles in the original.

Exhibit 6 (below) reveals that properties closest to the gravel mine faced the largest value declines, and that property value declines diminished with distance from the mine:

- Properties within 0.5 kilometres of the mine dropped in value by 25 percent or more.
- The decline 1.0 kilometre away was between 15 and 20 percent.
- The decline 1.5 kilometres away was just under 15 percent.
- The decline 2.0 kilometres away was just over 10 percent.
- The decline 3.0 kilometres away was just under 10 percent.
- The decline 4.0 to 5.0 kilometres away was between 5 and 7 percent.

It is important to note that these impacts are permanent. While it is true that properties within a 2 kilometre or 5 kilometre radius of the proposed site will increase in value in the future in line with increases in average property values in general in the broader area, it is equally true that the gap in values resulting from the negative impact of the quarry persists over time.

The average negative impact on property values within a 2 kilometre radius of the site was 19 percent.

The average impact within a 5 kilometre radius was 8 percent.

The Erickcek report notes the following:

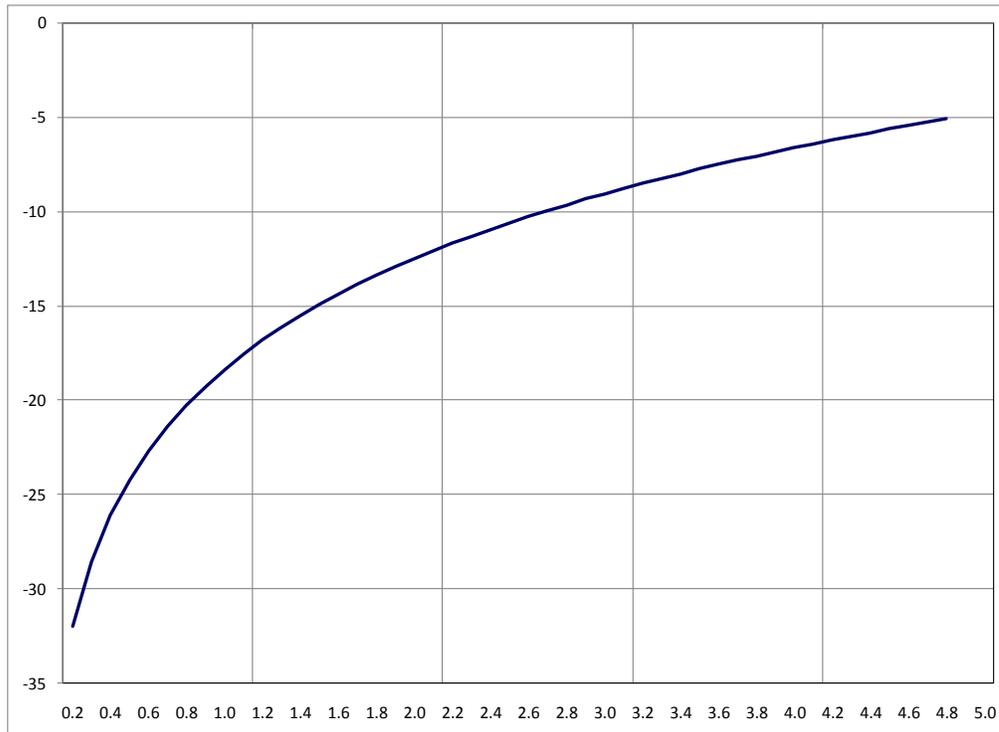
*There is an extensive literature applying hedonic models to study the effects of environmental disamenities on residential property values. These studies generally show that proximity to landfills, hazardous waste sites, and the like has a significant negative effect on the price of a residential property.*

Erickcek applied Hite's Ohio-based model results to the proposed new site in Michigan. The following section applies Hite's results to the properties in the Rockfort Quarry study area.

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<sup>7</sup> George A. Erickcek, 2006. "An Assessment of the Economic Impact of the Proposed Stoneco Gravel Mine Operation on Richland Township," W.E. Upjohn Institute for Employment Research.

**Exhibit 6**  
**Impact of Gravel Pit on Residential Property Values**  
**Percent Reduction (Vertical Axis) by Distance in Kilometres from Gravel Pit (Horizontal Axis)**



Source: C4SE based on Erickcek

**Section 6**  
**THE IMPACT OF ROCKFORT QUARRY ON STUDY AREA PROPERTY VALUES**

According to Exhibit 6 the average impact on property values within a 2 kilometre radius of the quarry averaged 19 percent. Exhibit 5 reveals that the average value of a property occupied by people in the Rockfort Quarry primary study area (in both Caledon and Erin) in 2007 was estimated at \$526,000. The model above suggests that, if the Rockfort Quarry had been in operation in 2007, the average value of residential properties in the primary study area would have been lower by 19 percent – or lower by \$100,000 – at just \$426,000. In other words property owners residing within 2 kilometres of the site would have had to accept a price \$100,000 lower from potential purchasers in the presence of the quarry than would have been the case in the absence of the quarry.

These estimates indicate that people consider the quality of life provided to them by the area to be worth \$100,000.

The average value of a property on which no residence can be found in the primary study area was almost \$227,000 in 2007. Any of these properties could be developed in the future for residential purposes offering the same quality of life enjoyed by those already residing there. The existence of the quarry, therefore, would also negatively impact the value of these properties by 19 percent. The existence of the quarry in 2007 would have reduced the value of these properties on average by \$43,000, to \$184,000.

Exhibit 5 reveals that all the properties in the primary study area had a total value of \$89.0 million in 2007. The existence of the Rockfort Quarry would have reduced that value by \$16.9 million to \$72.0 million.

It was earlier noted that all the properties in the Caledon portion of the primary study area had a total value of \$54.0 million. The existence of a quarry would reduce their value to \$43.7 million. The total property taxes collected within the Caledon portion would therefore drop from just over \$472,000 to about \$382,000, or by almost \$90,000. The \$90,000 reduction would be greatest felt by Peel Region (down \$39,000) and the Town of Caledon (down \$28,000) with the school boards accounting for the remainder (down \$24,000).

This tax revenue impact analysis could be extended in the next draft of this report to the Erin portion of the study area if appropriate data can be obtained about the assessment values and taxes collected on the study area properties in Erin.

Exhibit 6 suggests that property values are negatively impacted beyond a radius of 2 kilometres, though at a diminishing rate. According to Exhibit 6 the average property value impact in the area 2 kilometres to 5 kilometres from the quarry would be 8 percent.

It was estimated in Exhibit 5 that the total value of properties in both the Caledon and Erin portions of the secondary area is about \$331.4 million. Thus the presence of the quarry would reduce the value of these properties by \$26.5 million. The property taxes collected in the Caledon portion of the secondary area total \$1.74 million. They would be reduced by 8 percent as a result of the quarry, or by \$139,000 (\$58,000 for the Region, \$42,000 for Caledon and \$39,000 for the school boards). These property tax losses in Caledon are in addition to the losses on properties in the Caledon portion of the primary area.

Adding the two Caledon areas together (primary and secondary) means a total property value loss of about \$26.4 million (\$10.3 million in the primary study area and \$16.1 million in the secondary study area) and therefore total annual property tax losses in the Caledon portion of both totalling \$228,000 (\$96,000 for the Region, \$69,000 for Caledon and \$63,000 for the school boards).

The above property tax impacts do not take account of the property tax impacts in the Erin portion of the two study areas.

## **Section 7**

### **THE FINANCIAL IMPACT OF THE ROCKFORT QUARRY ON THE STUDY AREA**

Municipal officials have raised concerns with respect to the extra costs they will incur in providing the quarry with additional infrastructure, services, oversight, etc. should the facility become operational and succeed in achieving its operational expectations over the 30 year operational horizon, and in providing oversight over the 50 year rehabilitation period. They would like to know the extent to which these additional costs might be offset by additional revenues flowing to them stemming from the creation of the quarry.

Estimates of the financial assurance that will be required to ensure municipal and agency intervention in the case of the failure of the site's mitigation measures will be assessed in Section 8.

#### ***Additional Revenues Related to the Rockfort Quarry***

Property tax information provided to C4SE by the Town of Caledon indicates that the 32 quarries and pits currently operating in Caledon paid property taxes in 2007 totalling \$1.7 million of which the school boards received \$926,000, Peel Region \$469,000 and Caledon \$339,000. (Note that of the \$1.7 million, \$1.3 million represents industrial property taxes, with the remaining \$400,000 representing a combination of residential and farm property taxes.)

The Ontario Aggregate Resources Corporation reports in its publication *Mineral Aggregates in Ontario: Statistical Update 2007* that total licence and wayside permit production in Caledon in 2007 was 4.7 million metric tonnes.

These two data sources suggest that the Region receives \$99,800 in property taxes for each million tonnes of production in Caledon and that the Town receives \$72,100 for each million tonnes of production.

Assuming that the value of the property required to produce the output expected at Rockfort over its 30 years of operating resembles on a per million tonnes basis the value prevailing across the existing producers in Caledon, and assuming the Rockfort structures will be phased in over time to reflect the proposed annual rates of output, it can be expected the Rockfort site will generate property taxes each year that will rise gradually in line with the site's production capacity.

Exhibit 7 presents estimates of the property tax revenues that can be expected by Peel and Caledon over the production life of the Rockfort site if property taxes in constant 2007 dollar terms rise and fall in line with the proposed production schedule. Note that Exhibit 7 assumes that the structures required in the final phase will be reduced in size along with the expected decline over that period in production.

Exhibit 7 suggests that Peel Region will receive total property taxes from the Rockfort facility over its 30 year period of operations equal to \$3.9 million in constant 2007 dollar terms, and that the Town of Caledon will receive \$2.8 million. On an annual basis the Region's revenues from the site can be expected to begin in the first phase at about \$44,900 per year peaking in the third phase at \$180,600 per year. The figures for Caledon for the first and third phases are \$32,400 and \$130,500 per year respectively.

Not shown in Exhibit 7 is the fact that the education system will receive a total of \$7.8 million from the quarry over its 30 years of operating.

In addition to property taxes Peel and Caledon will also receive 7.5 cents for each tonne that leaves the Rockfort site, with Caledon receiving 6.0 cents and the Region 1.5 cents. Exhibit 7 reveals that the Region will receive a total of almost \$583,000 from this revenue source over the 30 year period while Caledon will receive \$2.3 million.

Over the 30 year period the Region will receive a total of almost \$4.5 million from these two revenue sources – an average of \$148,700 per year – while Caledon will receive a total of \$5.1 million – an average of \$171,100 per year.

Beyond the operational period it can be expected the site will generate property taxes reflecting its remediated status. At the time of writing a property tax estimate for that period had not yet been established.

No other municipal revenues except application processing fees under the Ontario building code act and site plan control bylaw will result from the development of the proposed site and it is unclear if development charges can be collected for the grout wall.

It was noted above that, due to the negative impacts of the quarry on property values in the primary and secondary study areas, annual property tax revenues for Peel will fall by \$96,000 while those for Caledon will fall by \$69,000, thus offsetting to a significant extent the gains suggested here. The impact of this offset will be addressed in Section 8 of this report.

**Exhibit 7**  
**Projected Rockfort Quarry Property Taxes by Year**

Year	Property Taxes			Fee per Tonne	
	Rockfort Production (Tonnes)	Peel Revenues (\$ Thousands)	Caledon Revenues (\$ Thousands)	Peel Revenues (\$ Thousands)	Caledon Revenues (\$ Thousands)
1	0.5	44.9	32.4	6.8	27.0
2	0.5	44.9	32.4	6.8	27.0
3	0.5	44.9	32.4	6.8	27.0
4	0.7	69.9	50.5	10.5	42.0
5	0.7	69.9	50.5	10.5	42.0
6	0.7	69.9	50.5	10.5	42.0
7	1.8	177.1	128.0	26.6	106.5
8	1.8	177.1	128.0	26.6	106.5
9	1.8	177.1	128.0	26.6	106.5
10	1.8	177.1	128.0	26.6	106.5
11	1.8	180.6	130.5	27.2	108.6
12	1.8	180.6	130.5	27.2	108.6
13	1.8	180.6	130.5	27.2	108.6
14	1.8	180.6	130.5	27.2	108.6
15	1.8	180.6	130.5	27.2	108.6
16	1.8	180.6	130.5	27.2	108.6
17	1.8	180.6	130.5	27.2	108.6
18	1.8	180.6	130.5	27.2	108.6
19	1.8	180.6	130.5	27.2	108.6
20	1.8	180.6	130.5	27.2	108.6
21	1.0	101.8	73.5	15.3	61.2
22	1.0	101.8	73.5	15.3	61.2
23	1.0	101.8	73.5	15.3	61.2
24	1.0	101.8	73.5	15.3	61.2
25	1.0	101.8	73.5	15.3	61.2
26	1.0	101.8	73.5	15.3	61.2
27	1.0	101.8	73.5	15.3	61.2
28	1.0	101.8	73.5	15.3	61.2
29	1.0	101.8	73.5	15.3	61.2
30	1.0	101.8	73.5	15.3	61.2
Total	38.9	3,877.2	2,801.1	582.8	2,331.0

Source: C4SE

***Additional Costs Related to the Rockfort Quarry***

Considerable additional costs face the Town and Region if the Rockfort Quarry is established and becomes operational. These additional costs are considered in turn and are tabulated in Exhibit 8. It is assumed that 2012 is the first year of operations of the proposed quarry, that the final year of operations is 2042, and that the final year of remediation is 2092. All values in Exhibit 8 are in thousands of constant 2009 dollars.

The Town of Caledon estimates that between 1998 and 2008 it incurred costs totaling \$875,000 in legal and consulting costs related to the proponent's application. The town estimates it incurred staff salaries totaling \$132,000 over that period to deal with all the various ways this issue required (that is equivalent to 15 percent of the cost of a senior staff member over 11 years at \$80,000 per year). So to date it has spent \$1,007,000 dealing with this issue. The Town has budgeted \$1.2 million for legal and planning costs related to the site application in 2009. These costs are limited to the OMB hearing.

Credit Valley Conservation estimates it incurred staff costs totaling \$50,000 between 1998 and 2002 in dealing with this issue, and related staff costs of \$1.2 million from 2003 to 2008. It incurred \$25,000 in legal costs (from 2006 to date) and costs of \$60,000 to retain a hydrogeological consultant from 2003 to 2008. So CVC to date has spent a total of \$1,335,000. CVC estimates it will incur \$225,000 in costs associated with the OMB hearing this year.

Senior staff of the Ontario Provincial Police Caledon attachment declined to speculate on additional policing costs that might arise from establishment of the Rockfort Quarry. However Brad Bigrigg, Fire Chief in Caledon, made several of observations:

- Caledon fire and emergency services receives calls about 4 times per year to deal with on site incidents at the various quarries and pits currently in existence. The calls always relate to accidents, not fires.
- Accidents are no more frequent per truck than per passenger vehicle, but incidents involving trucks are either minor or severe, with nothing in between; when severe they often involve serious injuries or fatalities. As the number of trucks in the area increases stemming from the new quarry the number of severe accidents will increase even with appropriate road upgrades, etc.
- Fire fighters in the area of the new site are voluntary. The department faces increased costs to train them properly if the quarry is established.
- On average each answered call costs the department \$1,000. The nature and severity of accidents in the area will increase in the future.
- Truck drivers are good and trucking is necessary – but there will be an impact on the fire and emergency resources required.

The Town of Caledon spent \$7.5 million in 2007 on protection services. Quarry activities in Caledon will be 50 percent greater than today from year 7 through 20 in the Rockfort Quarry's operational period. If protection services today are split 80 percent-20 percent between residents and businesses, and if one-twentieth of Caledon's non-residential protection service is accounted for by quarries and pits, protective services will cost 1 percent more in total than currently if the Rockfort Quarry becomes operational (or about \$75,000 per year). Exhibit 8 reflects that additional cost in the peak years and a portion of it in all other years. In the remediation period it is assumed these costs drop to \$10,000 per year.

The Region of Peel will be required to provide capital improvement costs of \$5.4 million to upgrade area roads beyond the upgrades already planned in order to accommodate the increased traffic stemming from the new quarry. It is assumed here that to date Peel has incurred additional legal, consulting and staff costs equal to those of the Town. It is assumed that each of Caledon and Peel will incur annual costs of \$80,000 per year over the operating years of the site to handle inquiries from the public, etc. relating to the existence of the quarry, falling to \$10,000 per year during the remediation period.

The Town of Caledon, Peel Region and CVC will jointly need to establish a procedure to oversee the effectiveness of the proponent's adaptive management plan mitigation procedures during the operational and remediation periods. CVC estimates that minimal surveillance will incur annual costs of between \$40,000 and \$60,000 plus \$40,000 to \$60,000 to retain a consultant to investigate residential well complaints. At a minimum, therefore, it is estimated that these activities will cost the Town, Region and CVC collectively about \$100,000 per year during the years in which the quarry is fully operational and during the remediation years, but a portion of that amount during the first 7 years of operation.

CVC estimates that a system involving full monitoring by CVC – including multi-disciplinary monitoring, data analysis, reporting and reviewing the proponent's monitoring data and reports – could cost \$500,000 to \$600,000 per year.

For the purposes of this report the more thorough monitoring is assumed to cost \$600,000 per year during the years in which the quarry is fully operational and during the remediation years, but a portion of that amount during the first 7 years of operation.

Property values in the primary and secondary study areas, combined, will drop in Caledon by \$26.3 million and in Erin by \$17.1 million for an overall total decline of \$43.4 million. Property owners are not likely to take these declines in their net worth readily. They can be expected seek retribution from the Town and Region if the Rockfort Quarry goes forward.

Exhibit 8 calculates the present value as of 2009 of the future stream of additional costs through to 2092 using a discount rate of 3 percent per year, the real (after inflation) rate of interest that can be expected to be earned on long-term government bonds, the safest investment instrument. The real interest rate is used because all costs are expressed in Exhibit 8 in constant 2009 dollars. If the future rate of inflation should average 2 percent per year the nominal interest rate will average 5 percent and all costs in Exhibit 8 will increase on average each year by 2 percent. Expressing all values in current dollars and using a discount rate of 5 percent would generate the same present values indicated in Exhibit 8.

Exhibit 8 reveals the following:

- The costs of the quarry to the Town of Caledon so far total more than \$1.0 million and the present value of future costs total \$2.8 million for administrative matters<sup>8</sup> and more than \$1.0 million for protection, for an overall total of \$4.8 million.
- The costs of the quarry to Peel Region to date total just over \$1.0 million while the present value of all future additional costs total \$7.9 million, for a total of \$8.9 million.
- The costs of the quarry to date for CVC total \$1.3 million while the present value of all future costs is estimated at \$0.2 million for a total cost of \$1.5 million.
- Collectively the Town, Region and CVC will need to cover the oversight and well complaint costs with a total present value estimated at a minimum of \$2.7 million and a maximum of \$15.9 million.

To-date costs for the Town, Region and CVC total \$3.3 million while the present value of their collective future costs totals at least \$14.6 million, and possibly \$27.9 million, for an overall total of between \$17.9 million and \$31.2 million.

Exhibit 8 also notes that property owners in the area can expect reductions in their property values of \$43.4 million should the quarry begin operations in 2012. The present value of that amount is \$38.6 million.

If the proponent was to be required to offset all of these costs at this point in time the total amount it would be between \$56.5 million and \$69.8 million.

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<sup>8</sup> If the Town of Caledon was to receive \$2.8 million today in compensation for the expected additional costs it will incur through to 2092 as a result of the creation of the proposed quarry, and if it invested that amount in long-term government bonds, that investment would generate a future income stream that would cover these costs through to 2092.

**Exhibit 8**  
**Municipal and Other Costs Associated with the Rockfort Quarry**  
**Thousands of Constant 2009 Dollars per Year**

	Town	Region	CVC	Protection	Joint Oversight		Property Value
					Opt 1	Opt 2	Remuneration
So Far	\$1,007	\$1,007	\$1,335	\$0	\$0	\$0	\$0
PV Future	\$2,846	\$7,862	\$218	\$1,046	\$2,652	\$15,911	\$38,560
2009	\$1,200	\$1,200	\$225	\$0	\$0	\$0	\$0
2010	\$80	\$2,780	\$0	\$0	\$0	\$0	\$0
2011	\$80	\$2,780	\$0	\$0	\$0	\$0	\$0
2012	\$80	\$80	\$0	\$19	\$25	\$149	\$43,400
2013	\$80	\$80	\$0	\$19	\$25	\$149	\$0
2014	\$80	\$80	\$0	\$19	\$25	\$149	\$0
2015	\$80	\$80	\$0	\$29	\$39	\$232	\$0
2016	\$80	\$80	\$0	\$29	\$39	\$232	\$0
2017	\$80	\$80	\$0	\$29	\$39	\$232	\$0
2018	\$80	\$80	\$0	\$74	\$98	\$588	\$0
2019	\$80	\$80	\$0	\$74	\$98	\$588	\$0
2020	\$80	\$80	\$0	\$74	\$98	\$588	\$0
2021	\$80	\$80	\$0	\$74	\$98	\$588	\$0
2022	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2023	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2024	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2025	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2026	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2027	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2028	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2029	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2030	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2031	\$80	\$80	\$0	\$75	\$100	\$600	\$0
2032	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2033	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2034	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2035	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2036	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2037	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2038	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2039	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2040	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2041	\$80	\$80	\$0	\$42	\$100	\$600	\$0
2042	\$10	\$10	\$0	\$10	\$100	\$600	\$0
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2092	\$10	\$10	\$0	\$10	\$100	\$600	\$0

Source: C4SE based on various agency estimates.

### ***Net Financial Implications Related to the Rockfort Quarry***

It was noted above that, to date, Rockfort Quarry related additional costs for the Town, Region and CVC total \$3.3 million while the present value of their collective future additional costs totals between \$14.6 million and \$27.9 million, for an overall total of between \$17.9 million and \$31.2 million.

The present value of the additional property tax *and* production fee revenues that the Town and Region can expect to receive during the operational phase totals \$6.1 million, \$2.9 million for Peel and \$3.3 million for Caledon. However, because of the decline in property values in the area due to the quarry, property tax revenues received by Peel and Caledon will fall. The present value of the decline for Peel is \$1.9 million while the present value of the decline for Caledon is \$1.4 million.

As a result of the gains and losses Peel ends up with a net gain of just under \$1.0 million while Caledon ends up with a net gain of about \$1.9 million.

The net position of Peel and Caledon together, however, falls well short of the present value of between \$17.9 million and \$31.2 million of additional costs related to the quarry to be borne by municipal agencies in the area.

Over and above these impacts it should be remembered that, in the absence of any offsetting compensation, property owners within a 5 mile radius of the quarry face property value declines totaling \$43.4 million once the quarry becomes operational.

### ***Section 8*** **THE FINANCIAL IMPACT IF THE MITIGATION MEASURES FAIL**

This section of the report provides estimates of the financial impacts on the people and businesses operating in the area, and on the municipal governments providing services in the area, in the event that the proponent's groundwater impact mitigation measures fail. The financial impacts described in this section are over and above all of those described in Section 7.

If the mitigation measures fail there would be a significant impact within up to a two kilometre radius of the site on the vegetation, topsoil and subsoil in the area, on all natural habitat within that radius, on stream flows and water drainage patterns, impacts that could extend for decades well into the future. The property value declines described earlier occur because the quarry is built and reflect the prices new owners in the area would be willing to pay to live in the area in the presence of the quarry. These new prices are based on the assumption that the area remains habitable by people, but that the quality of life the area offers is negatively impacted by the existence of the quarry. If, as is suggested here, the grout curtain procedure fails, it could be expected that property values might decline even further in relative terms by an indeterminable amount.

Furthermore, the costs of remediating the environmental degradation stemming from failure of the mitigation procedures are also indeterminable.

Though it is impossible to put a value of these impacts, they should not be ignored.

If the mitigation measures were to fail it is likely that the water supply of the people living within the impacted area would be rendered unsafe. It would be necessary, therefore, if these properties are to remain suitable for human inhabitancy, either to drill new wells or establish holding tank capacities at each dwelling and truck in fresh water supplies on a regular basis.

An assessment provided by a very helpful local water well contracting firm suggested that if the existing wells had to be replaced with even deeper wells they would likely need to reach a depth of about 150 feet on average. The well contractor suggested his preliminary assessment should be reviewed by hydrological experts. He pointed out that the cost of drilling a well is between \$40 and \$45 per foot in that area, that each new well would require new pumping equipment (at anywhere from \$2,000 to \$3,500 per unit) and other charges (\$1,200 for a complete well package including grouting, plus a \$500 development charge). In other words the per-unit cost could be anywhere from \$9,700 to \$11,950.

If all 155 residential units in the primary area needed a new well in the event of mitigation failure the total bill could range between \$1.5 million and \$1.9 million.

## **Section 9**

### **CONCLUSION**

Scenario 1, which assumes the site is economically viable and the mitigation procedures are successful, suggests the following:

- To-date costs for the Town, Region and CVC total \$3.3 million while the present value of their collective future costs totals at least \$14.6 million, and possibly \$27.9 million, for an overall total of between \$17.9 million and \$31.2 million.
- The present value of the additional property tax *and* production fee revenues that the Town and Region can expect to receive during the operational phase totals \$6.1 million, \$2.9 million for Peel and \$3.3 million for Caledon. However, because of the decline in property values in the area due to the quarry, property tax revenues received by Peel and Region will fall. The present value of the decline for Peel is \$1.9 million while the present value of the decline for Caledon is \$1.4 million.
- The net position of Peel and Caledon together, however, falls well short of the present value of between \$17.9 million and \$31.2 million of additional costs related to the quarry to be borne by municipal agencies in the area.
- Thus the two municipalities require a financial assurance of between \$17.9 million and \$31.2 million.

Over and above these impacts it should be remembered that, in the absence of any offsetting compensation, property owners within a 5 mile radius of the quarry face property value declines totaling \$43.4 million once the quarry becomes operational. The present value of that amount is \$38.6 million.

Scenario 2 – which considers the possibility that the mitigation procedures could fail – incorporates the additional costs of providing water supplies to the residents of the primary study area. This consideration raises the amount of financial assurance required by all residents of the primary study area (that is, those in both Caledon and Erin) by an amount equal to between \$1.5 million and \$1.9 million. The amount of financial assurance required for the residents of the Caledon portion alone is between \$0.9 million and \$1.1 million.

The section describing Scenario 2 also notes that – in the event of the failure of the mitigation procedures – additional costs would be incurred by local municipalities to repair the environmental degradation that would occur within the primary study area, and that – in that event – property owners in the area would likely face further declines in the relative values of their properties. These costs are likely to be significant, but they are indeterminable at this point in time.

**An Assessment of the Economic Impact of the  
Proposed Stoneco Gravel Mine Operation on  
Richland Township**

**August 15, 2006**

George A. Erickcek  
Senior Regional Analyst  
W.E. Upjohn Institute for Employment Research

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### **An Assessment of the Economic Impact of the Proposed Stoneco Gravel Mine Operation on Richland Township**

George A. Erickcek  
Senior Regional Analyst  
W.E. Upjohn Institute for Employment Research

#### **Executive Summary/Introduction**

This report, which was completed at the request of the Richland Township Planning Commission, provides an estimation of the economic impact of the proposed Stoneco Gravel Mine Operation on Richland Township.<sup>1</sup> The following impacts are assessed in this study:

1. The potential impact on residential property values in Richland Township.
2. The potential employment impact of the proposed gravel mine on the area's economy.

In addition, we carefully reviewed the economic impact reports provided by Stoneco for consideration.

In the preparation of this impact analysis we used nationally-recognized modeling techniques that are the standard for academic research.

We estimate that the proposed gravel mine will have a significant negative impact on housing values in Richland Township. Once in full operation, the gravel mine will reduce residential property values in Richland and Richland Township by \$31.5 million dollars, adversely impacting the values of over 1,400 homes, which represent over 60 percent of the Richland residences.

In addition, the mining operation will have an insignificant impact on area employment and personal income. At most, we estimate that only 2 additional jobs will be created in Kalamazoo County due to the mining operation. The mining operation serves the local market, and analysis based on the Institute's econometric regional model for the Kalamazoo region shows that it will bring in an insignificant amount of new income into the area's economy, \$58,000. Although the mine will employ an estimated 5 to 10 workers and require drivers to haul an estimated 115 to 120 truck loads of gravel per day,

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<sup>1</sup> The report was completed without charge as part of the W.E. Upjohn Institute's community service commitment. The Institute has prepared requested reports and analyses for the City of Kalamazoo, the City of Hastings, the City of Battle Creek, the City of Grand Rapids as well as other local governmental units and school districts.

Stoneco has not established a need for new aggregate capacity. Kalamazoo County is currently serviced by 15 gravel operations, and in recent years, employment in the county has been shrinking and the population has been stagnant. Consequently, there is no *prima facie* case that new capacity is needed. To definitively determine whether such a need exists, we would need to have information on projected demand for aggregated material in the county and capacity of the gravel pits currently servicing the county.

Finally, a careful evaluation of the five impact studies presented by the Stoneco finds that their methodologies are seriously flawed, and thus conclusions drawn from the analyses are invalid.

### **Qualifications**

The W.E. Upjohn Institute for Employment Research is an internationally-recognized independent, non-profit economic research organization established in 1945 for the sole purpose of conducting research into the causes and effects of unemployment and measures for the alleviation of unemployment. The Institute currently has a staff of 60 including 10 senior-level economists, and its research agenda includes issues on the international, national, state, and local levels.

For the past 20 years the W.E. Upjohn Institute has maintained a strong research focus on west Michigan which includes

- o The publication of its quarterly economic report: *Business Outlook for West Michigan*.
- o The preparation of short- and long-term employment forecasts for all of the metropolitan areas in west Michigan including Kalamazoo, Battle Creek, Grand Rapids, Muskegon, and Holland.
- o The completion of numerous economic impact reports and economic development strategies for communities in Michigan.

George Erickcek, the Institute’s Senior Regional Analyst, was the lead researcher for this study. He received his Masters of Economics at the University of Pittsburgh and has been with the Institute since 1987. George has prepared numerous economic impact, benchmarking, and forecasting studies for the west Michigan region, and has conducted research on the national and international level.

Many factors influence housing prices. These include, of course, the characteristics of the house or dwelling unit, such as size, age, lot size, number of bedrooms and bathrooms, as well as its upkeep. In addition, the house's proximity to amenities such as a lake or pleasing neighborhood or "disamenities" (e.g. landfills, pollution sites) can have a substantial impact on its price.<sup>2</sup>

Economists have found that "hedonic pricing models" are extremely useful in isolating the contribution of specific factors on the price of housing, as well as other goods. First developed by University of Chicago economist Sherwin Rosen in 1974, hedonic pricing models use a statistical regression technique that allows the researcher to estimate the impact of one factor, e.g. the proximity of a neighborhood park, on the value of a house while holding all of the other factors impacting the house's value constant. There is an extensive literature applying hedonic pricing models to study the effects of environmental disamenities on residential property values. These studies generally show that proximity to landfills, hazardous waste sites, and the like has a significant negative effect on the price of a residential property.<sup>3</sup>

Professor Diane Hite, an economist who has published widely in the area of property value impact analysis, has recently applied hedonic pricing methodology to study the effects of a gravel mine on nearby residential values. This appears to be the only rigorous study to date of gravel mine impacts on property values.<sup>4</sup> Her study is based on detailed data from Delaware County, Ohio that were collected by the Ohio State University for the purposes of studying land use planning.

Hite examines the effects of distance from a 250-acre gravel mine on the sale price of 2,552 residential properties from 1996 to 1998. Her model controls for a large set of other factors that determine a house's sale price, including number of rooms, number of bathrooms, square footage, lot size, age of home, sale date, and other factors specific to the locality, so that she can focus solely on the effect of proximity to the gravel mine on house values. She finds a large, statistically significant effect of distance from a gravel mine on home sale price: controlling for other determinants of residential value, proximity to a gravel mine reduces sale price. Specifically, Hite reports that the elasticity of house price with respect to distance from a gravel mine is .097, implying that a 10 percent increase in distance from the gravel mine is associated with slightly less than a 1 percent increase in home value, all else the same (Appendix A).<sup>5</sup> Conversely, the closer the house to the proximity to the mine, the greater the loss in house value.

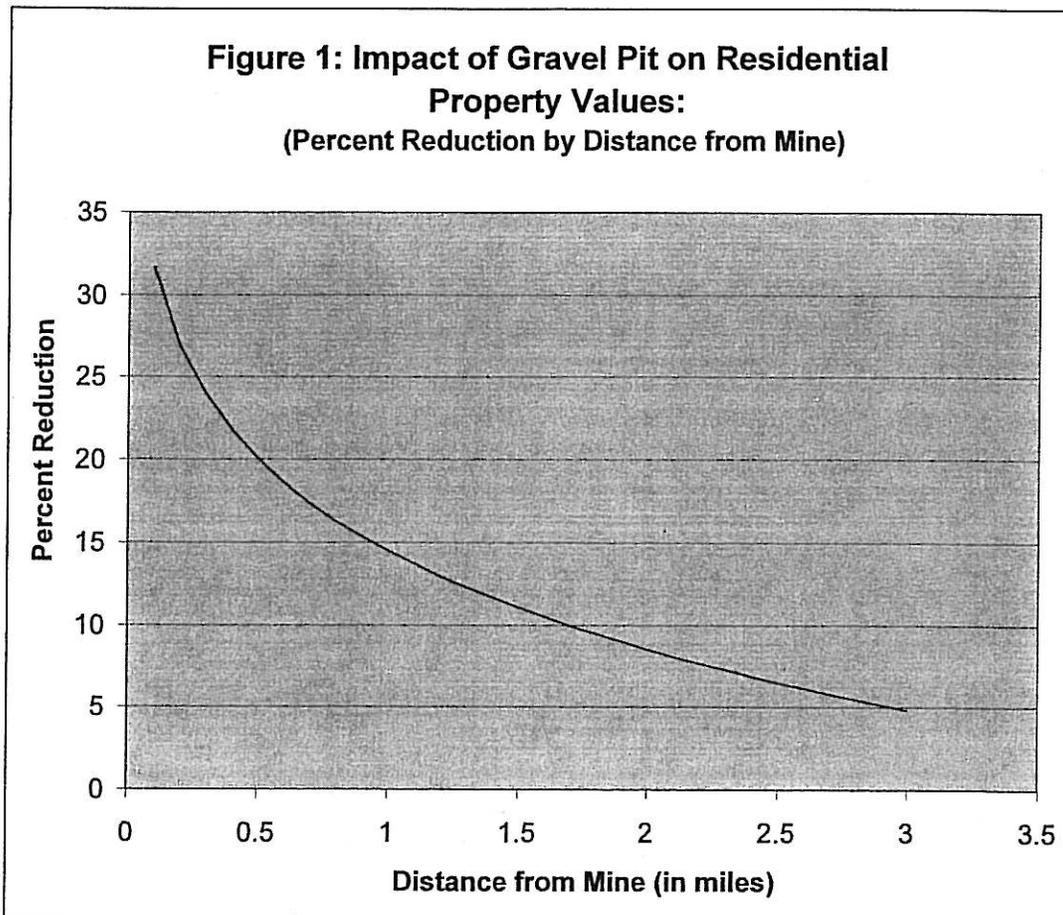
<sup>2</sup> In a recent study of the impact of housing programs in the City of Kalamazoo, we found that moving a house from one neighborhood to another can add or subtract as much as \$20,000 from its value.

<sup>3</sup> For reviews of some of this literature, see Arthur C. Nelson, John Genereux, and Michelle Genereux, "Price Effects of Landfills on House Values," *Land Economics*, 1992 68(4): 359-365 and Diane Hite, Wen Chern, Fred Hitzhusen, and Alan Randall, "Property-Value Impacts of an Environmental Disamenity: The Case of Landfills," *The Journal of Real Estate Finance and Economics* 22, no. 2/3 (2001): 185-202

<sup>4</sup> Diane Hite, 2006. "Summary Analysis: Impact of Operational Gravel Pit on House Values, Delaware County, Ohio," Auburn University.

<sup>5</sup> This estimate is based on a constant elasticity model specification. At the Upjohn Institute's request, Professor Hite tested the sensitivity of these findings to model specification, and in all specifications finds a large, statistically significant negative effect of proximity to gravel pit on house prices. The simulations for Richland Township reported below are based on the estimates from the constant elasticity specification and yield slightly lower estimated negative property value impacts than those based on models using other functional forms. We consider this number to be a conservative estimate.

Figure 1 displays the estimated effects of distance from the gravel pit on house price. A residential property located a half mile from the gravel mine would experience an estimated 20 percent reduction in value; one mile from the mine, a 14.5 percent reduction; 2 miles from the mine, an 8.9 percent reduction; and 3 miles from the mine, a 4.9 percent reduction. These estimates are similar to estimates published in academic journals on the effects of landfills on nearby property values.



The loss in property value results from the negative consequences of the mining operation and reflects the deterioration in the area's quality of life due solely to the operation of the gravel mine. In other words, the loss in house value is a way to quantify in dollars the deterioration in quality of life, as capitalized in the price of the house. It captures the price reduction the homeowner would have to offer to induce a new buyer to purchase the property. Even if homeowners do not move as a result of the gravel mine, they will lose homeowner equity as the potential sale price of their house is less.<sup>6</sup> Therefore, regardless of whether or not a person actually sells their property, it measures

<sup>6</sup> Only those owning property at the time of the establishment of the gravel mine would experience a loss in equity. Those purchasing property near an established mine would not experience an equity loss because any negative effects from the mine's operation would have been incorporated into the purchase price. By implication, few property owners near long-established mines could claim loss of property value from the mine because few would have owned the properties at the time the mine went into operation.

The policy implications of Hite's study are clear: because property value losses are higher the closer to the gravel mine, all else the same, new sites should be located far from existing residences so as to minimize adverse consequences for homeowners.

**Simulation of Gravel Mine on Residential Property Values in Richland**

Utilizing the estimates from the Hite study and data on 2006 assessed values provided by Richland Township, the Upjohn Institute simulated the effects of the proposed gravel mine on residential property values in Richland Village and Richland Township. Our analysis is based on 2005 assessed values of single-family homes in Richland Township and Richland Village obtained from the Township's assessor office in June and July. In total 2,319 single-family homes, 88.7 percent of all single-family residences in the township and village, were geo-coded using the ArcView© mapping program, manually matched using Yahoo© maps and, finally, through drive-by inspection of addresses. Once all of the homes were mapped, the distance between each of the residences and the closest boundary of proposal Stoneco gravel mine was determined.

As shown in Table 1, more than 1,400 homes will be negatively impacted by the proposed gravel mine with the total cost reaching \$31.5 million dollars.

Distance (miles from Stoneco Site)	Number of Houses Affected	Estimated Loss in Value	Distance (miles from Stoneco Site)	Number of Houses Affected	Estimated Loss in Value
0.1	2	\$211,703	1.6	73	\$1,207,011
0.2	3	\$106,428	1.7	128	\$2,500,456
0.3	2	\$134,894	1.8	99	\$1,630,149
0.4	9	\$522,981	1.9	70	\$1,146,761
0.5	3	\$389,319	2	34	\$633,720
0.6	8	\$598,518	2.1	105	\$952,068
0.7	24	\$831,338	2.2	98	\$1,311,040
0.8	25	\$798,108	2.3	99	\$2,843,845
0.9	27	\$1,085,190	2.4	72	\$2,699,584
1	22	\$918,374	2.5	34	\$912,133
1.1	75	\$2,428,602	2.6	12	\$377,548
1.2	62	\$1,688,031	2.7	23	\$373,873
1.3	45	\$1,146,920	2.8	80	\$939,861
1.4	32	\$824,928	2.9	55	\$944,061
1.5	30	\$712,731	3	70	\$655,846
<b>Total</b>				<b>1,421</b>	<b>\$31,526,020</b>

While Hite's original study covered a 5-mile radius from the gravel mine in Ohio, we chose to examine only a 3-mile area from the boundaries of the proposed Stoneco site. Only properties located in Richland and Richland Township are included. Property values in other townships, notably Prairieville Township, also could be adversely affected by the location of a gravel mine near its border with Richland Township but were not included in the study. In addition, the analysis does not consider possible effects on commercial property. Our estimates do not factor in the likely negative impact on property values along the truck routes used for the mine. Finally, although Stoneco has proposed to reclaim some of the land for a lake and residential development, its proposed timeframe for this development would occur too far into the future to mitigate adverse property value impacts for current Richland area residents.

### **Employment and Personal Income Impact**

Stoneco estimates that 5 to 10 permanent jobs will be created at the proposed mine. In addition, truck drivers will be required for the 115 to 120 truck loads of gravel that will be hauled from the mine daily.

To measure the potential employment and income impact of the gravel mine, we used the Institute's econometric regional model of the Kalamazoo area.<sup>8</sup> Because of its weight and low-value, gravel is hauled for only short distances. It is not a part of the area's economic base that brings new monies into the area. Therefore, it is an activity that does not generate any significant new income or employment opportunities. We estimate that only 2 additional new jobs will be created in Kalamazoo County due to the gravel mine and personal income in the county will increase by only \$58,000. In short, the jobs created at the gravel mine will displace jobs elsewhere in Kalamazoo County or the immediate region. The proposed mine would not result in any significant net benefit to the area from job or income creation.

### **Need for the Proposed Mine**

Adverse economic effects of the proposed gravel mine to the Richland community must be balanced against the county's broader needs for aggregate material for road construction. Currently, 15 gravel mines operate in Kalamazoo County according to the Kalamazoo County Planning Department (Table 2). Stoneco's application materials do not provide any evidence for the need for additional capacity. Statistics were cited on projected needs, but no evidence was presented as to whether existing capacity could cover anticipated needs.

The need for additional capacity of gravel production is not supported by current and projected population or employment trends in Kalamazoo County. Population growth in Kalamazoo County has been modest during the past five years, and well below the national rate. From 2000 to 2005, population in the county increased annually at a rate of

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<sup>7</sup>Hite's statistical analysis intentionally includes homes at a distance deemed unaffected by the gravel operation. Our choice to study the impacts up to 3 miles is based on Nelson, et al. (1992) and the fact that estimated impacts for individual homeowners are still relatively large out to three miles in all of Hite's models.

<sup>8</sup>The Upjohn Institute maintains a regional economic impact and forecasting model for the Kalamazoo metropolitan area which was built by Regional Economic Models Incorporated (REMI) especially for the Upjohn Institute. The REMI modeling approach, which incorporates an input-output model with a forecasting model and a relative cost of production model, has been repeatedly reviewed and upheld as the industry standard.

below 0.2 percent, compared to 0.9 percent nationwide.<sup>9</sup> An analysis of the individual components of population change—births, deaths, net migration—shows that individuals and households, on net, are leaving the county. From 2000 to 2005, the county's population increased by 6,342 individuals due to number of births surpassing the number of deaths. However, on net, 4,150 individuals moved out of the county.<sup>10</sup>

Table 2

Kalamazoo County Gravel Pits		
Owner Name	Site Address	Site Township
Aggregate Industries	C Ave. Near 6th St	Alamo
Art Austin	6287 K Avenue	Comstock
Triple B Aggregates	2702 Ravine Rd.	Kalamazoo
Thompson McCully Co	3800 Ravine Rd.	Kalamazoo
Byholt, Inc.	1600 Sprinkle Rd.	Brady
Byholt, Inc.	4th St	Prairie Ronde
Fulton Brothers Gravel	4th St	Prairie Ronde
Balkema Excavating	8964 Paw Paw Lk.	Prairie Ronde
Balkema Excavating	6581 E. K Ave	Comstock
Balkema Excavating	4274 Ravine Rd	Kalamazoo
Balkema Excavating	40th St. & I-94	Charleston
Balkema Excavating	14500 E. Michigan	Charleston
Balkema Excavating	15600 E. Michigan	Charleston
Consumer Concrete	10328 East M-89	Richland
Consumer Concrete	700 Nazareth Rd	Kalamazoo

Source: Kalamazoo County Planning Department July 2006

During the same time period, employment declined by 3.4 percent, a loss of 5,000 jobs. The Michigan Department of Labor and Economic Growth estimates that from 2002 to 2012, total employment in Kalamazoo and St. Joseph counties will increase at a rate of 0.8 percent—substantially below the 1.3 percent rate of growth projected for the nation as a whole. If this rate of employment growth holds true for the future, it will be not until 2010 that the county will reach its 2000 employment level.

Thus, economic projections do not, in and of themselves, indicate a need for expanded aggregate capacity. However, we emphasize that any definitive determination of need would require information on the capacity and life expectancy of existing area gravel pits, to which the Institute does not have access.<sup>11</sup>

### Review of Stoneco's Property Value Impact Analysis

The Environmental Study submitted by Stoneco in connection with its special use permit application concludes that gravel mining operations have no adverse impact on the value of nearby properties. This conclusion is based on five reports included in Appendix J of Stoneco's Environment Study:

<sup>9</sup> U.S. Census Bureau.

<sup>10</sup> U.S. Census Bureau. Furthermore, Internal Revenue Service (IRS) data from 2000 to 2004 shows that the majority of the individuals leaving the county are moving outside the greater Kalamazoo region.

<sup>11</sup> Note that whether there is a public need for additional capacity and whether it is in Stoneco's interest to develop a new mine are distinctly different issues. Stoneco has indicated that it would reduce its transportation costs by operating at the proposed Richland location. The degree to which any lower transportation costs translate into lower prices of aggregate material—and hence broadly benefit the public—versus increased company profits will depend on the competitive structure of the industry in this region.

1. "Impacts of Aggregate Mine Operations: Perception or Reality," Anthony Bauer, 2001.<sup>12</sup>
2. "Social, Economic, and Legal Consequences of Blasting in Strip Mines and Quarries," Bureau of Mines, 1981.
3. "Impact of Rock Quarry Operations on Value of Nearby Housing," Joseph Rabianski and Neil Carn, 1987.
4. "Impacts of Rock Quarries on Residential Property Values, Jefferson County, Colorado," Banks and Gesso, 1998.
5. "Proposed Fuquay-Varina Quarry: Analysis of Effect on Real Estate Values," Shlaes & Co., 1998.

These reports, in fact, fail to show that mining operations have no adverse impact on property values. None uses the standard methodology (the hedonic pricing model, described above) for evaluating property value impacts. Four of the five reports are based on flawed logic (as explained below) and hence cannot be used to draw any conclusions about property value effects. Only one report, commissioned by the U.S. Bureau of Mines, used a defensible methodology, although this report also suffers from serious limitations. Notably, this study found some evidence of adverse impacts of gravel mining operations on property values in six out of the seven sites examined.

The Bauer, Rabianski and Carn, Banks and Gesso, and Shlaes & Co. reports rely on one or both of the following types of observations to argue that gravel mining operations have minimal adverse impact on nearby property values:

- Over time, housing and commercial developments have moved closer to and sometimes adjacent to aggregate mine operations.
- For property values in the vicinity of mining operations that have existed for many decades, the rate of growth in property values does not increase with distance from the mining site.

In neither case do such observations have any bearing on the impact of aggregate mine operations on nearby property values.

1. Residential and commercial developments have located closer to and sometimes adjacent to mines over time.

Economic or real estate analysis does not predict that properties near mines have no value or no development potential. Rather, one would expect that nearby property values would be lower to compensate for any costs (e.g. noise, pollution, unsightly landscapes, and traffic congestion) associated with the mine. This reflects the common sense observation that property that is near sources of noise, pollution, traffic congestion, and blight will (all other things being equal) be less valuable. Of course, these lower property values, in turn, will help lure development, especially

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<sup>12</sup>Bauer (2001) is a two-page statement that in large part summarizes the results of a 1984 study by a Michigan State University student.

Two studies (Bauer 2001; Banks and Gesso 1998) examined aerial photographs taken over the course of several decades that showed housing and commercial developments moving closer to mining operations. As the population has expanded, land values near central cities have increased, and transportation infrastructures have improved, development has fanned out all across the country. Any study would inevitably find that over the course of the last 20, 30, or 40 years, housing developments have moved closer to mines (and any other less desirable location), and such observations have no relevance to the question posed by Stoneco's application—whether the establishment of mining operations will lower nearby property values.

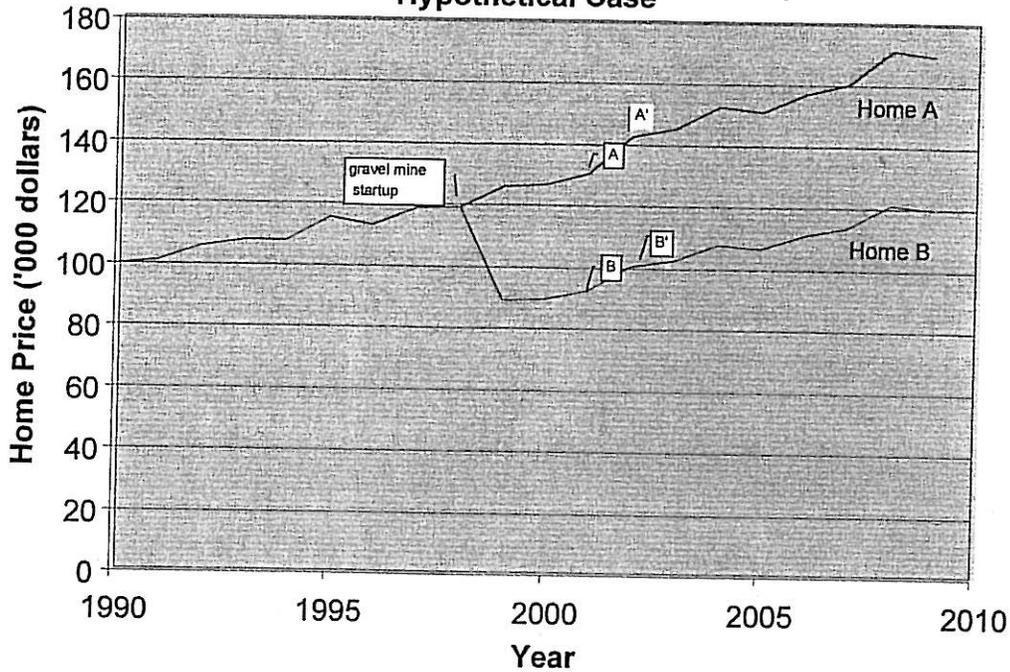
2. Near well-established mines, the year-to-year change of property values is no less for properties located close to mines than for those located somewhat farther from mines.

The adverse impact that a mine will have on nearby property values will occur within a short period of time following the establishment or announcement of the mine. After the adverse effects of being located near a mine have been capitalized into the property value—that is, after the negative effects of being close to a mine operation has resulted in a decrease in property values—we would not expect the future rate of change of nearby properties to be different from those of other properties, all else the same.

The analyses in Rabianski and Carn (1987), Shlaes & Co. (1988), and Banks and Gesso (1998) look at whether the relative difference in property values between properties close to and farther from a mine continue to widen 30, 50, even 100 or more years after the mine was established. All of these studies conclude that because we do not see continued widening of these differentials many decades after the establishment of mines, mines have no adverse effect on property values. This argument makes no sense: the adverse impact on property values would have occurred decades before. These studies shed no light on possible adverse impacts of mining operations on property values.

Figure 2 illustrates this point. This figure depicts the prices of two hypothetical homes over a 20-year period. Home B is affected by the opening of a gravel mine in the middle of the time period; otherwise the homes are identical. Except in the year when the gravel mine is introduced, the annual *percentage changes* in the prices of the two homes are the same. The methodology used in the reports cited in the Stoneco environmental study compared the percentage change of homes near the gravel mine (percent change from B to B' in Figure 2) to the percentage change in home prices farther from the gravel pit (percent change from A to A' in Figure 2). But even with adverse property value effects, these percentage differences should be approximately equal. To capture any adverse impact, one must measure the difference in values of otherwise comparable properties close to and farther from the gravel mine at a point in time. In Figure 2, the difference between points A and B or between A' and B' measure the true property value impact, which conceptually is what is measured in the hedonic pricing model used in the analysis reported above.

**Figure 2: Methodology for Evaluating Gravel Mine Impact on House Prices.  
Hypothetical Case**



Only the study commissioned by the U.S. Bureau of Mines attempted to assess how the value of comparable homes varied with distance from the mine. However, the Bureau of Mines study suffered from several serious shortcomings:

- The sample size at each of seven sites was very small, and hence no statistically valid conclusions could be drawn.
- Homes were classified into rough typologies, and hence controls for other factors affecting home prices were crude.
- The study was based on assessed values rather than on more accurate sale price data.
- The study only examined potential property value impacts within approximately a half mile of the mine site. More recent research shows that property value effects may be significant up to two or three miles from such sites.<sup>13</sup> Limiting analysis to properties within a half mile of the mine site could lead to a significant understatement of any property value impacts.
- Researchers used subjective assessments to discount findings of adverse impacts on property values.

With these shortcomings in mind, the Bureau of Mines study found some evidence that the value of comparable homes increased with distance from the mine site in six of the report's seven case-study sites. In some cases, the differences in values were described as large.

<sup>13</sup> See, for example, Arthur C. Nelson, John Genereux, and Michelle Genereux, "Price Effects of Landfills on House Values," *Land Economics*, 1992 68(4): 359-365.

*Appendix A*

This report's estimation of the potential impact on residential property values in Richland Township of a proposed gravel mine is based on the following regression model developed by Diane Hite, Professor of Economics, Auburn University. The model is based on a study of 2,552 homes in Delaware County, Ohio.

The results of the model are shown below. It is important to note that the model controls for house characteristics—bath, rooms and age, as well as location from the gravel pit.

*Effect of Gravel Mine Operation on House Values Less than 5 Miles  
 Delaware County, OH 1998—Log Distance Specification*

Nonlinear OLS Summary of Residual Errors								
Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj R-Sq	Label
PRICE	8	2544	25816929	10148.2	100.7	0.2564	0.2544	PRICE

Nonlinear OLS Parameter Estimates					
Parameter	Estimate	Approx Std Err	t Value	Approx Pr >  t	Label
a0	4.981671	2.2279	2.24	0.0254	Intercept
a1	0.097358	0.0162	6.00	<.0001	log(Miles from Gravel Pit)
a2	0.00045	0.000056	8.00	<.0001	Sale Date
a3	0.03527	0.00594	5.94	<.0001	Distance to Delaware City
a4	-4.67E-6	4.204E-6	-1.11	0.2664	FAR (House Size/Lot Size)
a6	0.248225	0.0384	6.47	<.0001	Total Baths
a7	0.078881	0.0139	5.69	<.0001	Total Rooms
a9	-0.00376	0.00110	-3.43	0.0006	Year Built

Number of Observations		Statistics for System	
Used	2552	Objective	10116
Missing	0	Objective*N	25816929

The key finding of the model is a1 which can be interpreted as showing that a 10 percent increase in distance from the gravel mine is associated with slightly less than a 1 percent (0.97358) increase in home value, all else the same. Moreover the parameter is highly statistically significant. In other words, the chance of the gravel mine not having an adverse effect on housing values is one in a thousand.