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W.E. Upjohn Institute for Employment Research

***300 South Westnedge Avenue • Kalamazoo, Michigan 49007-4686 • U.S.A.
Telephone (269) 343-5541 • FAX (269) 342-0672***

Addendum

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**

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INTRODUCTION

This addendum to the W.E. Upjohn Institute's August 15 economic impact report addresses the following issues that have come to our attention:

1. Questions regarding Professor Hite's research, and why the Institute used her research as the basis for its property value assessment.
2. Additional studies and documents that shed light on the potential impact of the proposed Richland Township gravel mine:
 - a. Property value impact analysis of sand and gravel mines in Butler and Hamilton counties, Ohio using standard hedonic pricing methodology.
 - b. Re-assessment of residential properties near Moose Lake Aggregate gravel mine in Howard Township, Cass County, Michigan.
 - c. Great Lakes Appraisal, "Property Value Impact Analysis of Proposed Mining Operation, 6744 Otis Lake Road, Hope Township, Barry County, Michigan"—The Upjohn Institute uses data from this report to reanalyze the impact of gravel mining operations on residential properties along truck hauling routes in Caledonia Township, Kent County, Michigan utilizing correct methodology.
3. Qualifications to August 15 report:
 - a. We discuss differences between aggregate mine operations examined in Professor Hite's study and that proposed for Richland Township and address concerns that the Hite study is not relevant to the situation in Richland.
 - b. We address concerns that homes in Richland Township potentially impacted by the gravel mine were omitted in the Institute's property value impact assessment.

In addition, we offer brief answers to commonly raised questions that we have heard, in the hopes of clarifying both our findings and the methodology that we used. As in our August 15 report, we emphasize the importance of utilizing correct methodology in estimating economic impacts of the gravel mine. Studies based on flawed methodologies often draw inaccurate and misleading conclusions.

As was true with the August 15 report, this addendum was prepared solely by W.E. Upjohn Institute and offers an independent estimation of the economic impact of the proposed gravel mine in Richland Township. As principal author of the August 15 report and this addendum, I assume complete responsibility for any errors or omissions.¹

¹ Susan Houseman, Senior Economist, Brad Watts, Assistant Regional Analyst, and Lillian Vesic-Petrovic, Research Analyst, provided valuable technical assistance to this addendum and the original report.

To recap the conclusions of our August 15 report, we found that the proposed Stoneco gravel mine would generate a negative impact on housing values in the township. In total, once in full operation the gravel mine would reduce residential property values in Richland and Richland Township by an estimated \$31.5 million and adversely impact the values of 1,400 homes. The gravel mine would generate negligible economic impact for the county in terms of jobs or new income. The additional evidence presented in this addendum supports our previous overall assessment of significant negative impacts on area property values.

THE W.E. UPJOHN INSTITUTE'S RELATIONSHIP WITH PROFESSOR HITE OF AUBURN UNIVERSITY.

Process of Identifying Studies that Provide Evidence of Property Value Impacts

We began with studies that were part of the public record for this special use exemption application. These included the studies submitted by Stoneco as part of its application, which were summarized at the April 2006 Planning Commission meeting, and Professor Hite's work, which was summarized at the May 2006 meeting. We are unaware of any other empirical studies on property value impacts that have been presented in the public hearings before the Planning Commission. In addition, we conducted our own review of the literature and spoke with experts to try to identify other studies.

Why the Institute Report Used the Hite Study as the Basis for Assessing Property Value Impacts

The most compelling evidence comes from large-scale empirical studies using statistically valid methodologies. A large body of economic research studies the impacts of various "amenities" and "disamenities" on residential property values. To identify these impacts, studies use multivariate statistical techniques, commonly known as "hedonic pricing" models. Intuitively, these studies make an "apples" to "apples" comparison, asking, in our case, how the price of a house located near a gravel mine would compare to the price of an identical house located far from the gravel mine. Hedonic pricing models have been the standard research technique for evaluating property value impacts for decades. Not only did the studies submitted as part of the Stoneco application fail to use standard acceptable methodology, but the methodology used in most of the studies will yield "false negatives." That is, these methodologies are likely to produce a finding of no negative impact, even in cases where the true impact is negative.

The Upjohn report based its estimates of property value impacts for Richland using model estimates from Professor Hite's research because her research was based on high quality data. In addition, Professor Hite is a well-know researcher in the field, and hers was the only study we knew of at the time that used hedonic pricing models to estimate residential property value impacts of mines. Since conducting the study, we have become aware of another study that uses hedonic pricing models, and we have conducted our own analysis based on data for an area gravel mine supplied in an industry consulting report. Both are discussed below.

Work Performed by Professor Hite for the Upjohn Study

The Upjohn Institute contacted Professor Hite directly and learned that she had collected a large data base in Delaware County, Ohio for the purposes of studying land use planning issues, that the data were of high quality and had been used in academic research, and that information on gravel mine operations had been recently added. She informed us that the analysis we had heard of was an initial look at the impact of gravel operations on residential properties. A colleague of hers had done similar runs, and, in response to a query from a Richland-area realtor, she had run models to confirm her colleague's basic finding of large adverse property value impacts and had quickly written them up.

Although Professor Hite's data set is ideal for studying these property value impacts, we were uncomfortable basing the Upjohn report on her initial analysis. Professor Hite agreed to do additional work for the Institute. As described in her letter to the Commission and included as an attachment to this report, this involved running checks on the data and variable construction, adding control variables, and testing the robustness of her results to model specification. The simulations presented in the Upjohn report were based entirely on new work performed by Hite for the Upjohn Institute and show somewhat lower property value impacts than in her initial report.

We provided Professor Hite with no compensation for her work, despite the fact that it was fairly extensive. This type of cooperation is common among academic researchers in universities and not-for-profit organizations like the Upjohn Institute. Professor Hite's interest in this project is solely to produce high quality research that is publishable in a peer-reviewed, scholarly journal.

ADDITIONAL STUDIES AND DOCUMENTS THAT SHED LIGHT ON THE POTENTIAL IMPACT OF THE PROPOSED STONECO GRAVEL MINE

Since the August 15th submittal to Richland Township of our economic impact report, we have become aware of the following three studies/documents that bear on our findings:

- An Economic Impact Study of the Lower Great Miami River Segment Improvement.
- Property reassessment decisions in Howard Township in Cass County due to the negative impacts of Moose Lake Aggregate.
- Great Lakes Appraisal, Real Estate Consulting Report – Property Value Impact Analysis Proposed Mining Operation 6744 Otis Lake Road, Hope Township, Barry County, Michigan

Sustaining a River: An Economic Impact Study of the Lower Great Miami River Segment Improvements, by Radha Ayalasomayajula, Fred Hitzhusen, and Pierre Wilmer Jeanty.

This study used a hedonic price model similar to that used in Professor Hite's study to estimate the impact of gravel mining operations near the Great Miami River in Butler and Hamilton counties, Ohio. The sample contained sales data on only 119 homes—far fewer than the 2,552 homes Professor Hite had in her sample.

The model used in this study accounted for structural characteristics of the individual homes including number of baths, living area, age, number of bedrooms and whether they had a fireplace. In addition, it included the distance from a gravel mine and distance to the closest urban area.

The study found that, on average, property values increased by \$1,675 per every 1/10th mile the home was away from the mining operation. In other words, the value of a home one mile away from the gravel mine would be worth \$16,725 more than the identical house located at the mouth of the mine. The study's analysis limited its impact to only a one-mile radius.² This report is included as an attachment.

Property reassessment decision in Howard Township, Cass County, Michigan due to the negative impacts of Moose Lake Aggregate.

On August 9, 2006 a public hearing was held in Howard Township in Cass County on Moose Lake Aggregate's Application for Conditional Use Permit. At the meeting, the township assessor confirmed that he found it necessary to lower the property value (SEV) of 13 residences near the Moose Lake Aggregate Gravel Mine by 30 percent based solely on his expertise. This estimated reduction in property value is nearly identical to the estimates in our study for properties right next to the proposed Stoneco Gravel Mine.

Later the township assessor revised the negative impact to only 10 percent; however, upon the protest of two of the owners of the impacted properties, the assessor increased the negative impact of the mining operation back up to 30 percent of the property's original SEV. The two owners had their properties independently appraised and the Township assessor agreed: "I believe that if I had the appraisals before...that I probably would have left everybody's at 70 percent, but I didn't have any knowledge of that."³

Great Lakes Appraisal, Real Estate Consulting Report—Property Value Impact Analysis Proposed Mining Operation 6744 Otis Lake Road, Hope Township, Barry County, Michigan and Upjohn Institute Analysis using Data from this report

This report offers an estimate on the potential impact on surrounding housing values of a proposed gravel operation in Hope Township in Barry County. In the study, the authors identified similar properties in west Michigan: Caledonia Township in Kent County, Georgetown Township in Ottawa County, Wayland Township in Allegan County, and Pennfield Township in Calhoun County.

The study focused its attention on the negative impact of the mines' associated truck traffic. For each of the four mines in the sample, the authors collected data for houses on the mines' truck routes and those not on the mines' truck routes. The study assumed that only homes along the

² The study's analysis was not as sophisticated as Hite's model in that it generated a strictly linear estimate of the negative impact of the mining operation on housing prices. Hite's model generates a more realistic "curved" estimate that declines first at an increasing rate and then at a decreasing rate.

³ Howard Township Planning Commission Meeting Volume IV August 9th, 2006, p. 10.

gravel truck routes would be impacted by the mine's operations, and thus used homes not directly on the truck routes as a comparison group.

The authors compared trends in home sale prices (price per square foot) of impacted houses with those of the non-impacted houses from the late 1980s to the present. They found no large difference in these trends and concluded "that no adverse impact is likely to affect home prices of properties considered potentially impacted by the proposed operation while it is in operation."

The study, however, contains numerous methodological errors that render this conclusion invalid. Below, we elaborate upon some of the errors in the study and, using the study's data, estimate the effects of truck traffic on property values using correct methodology.

Errors in the Great Lakes Appraisal's Real Estate Consulting Report

- 1) The authors limited the potential impact of the gravel operations to truck traffic. While this is a major component of the potential negative impact of gravel operations, it is not the sole impact. Dust and noise from the mining operation are factors as well. Moreover, the mining operations may negatively impact the general attractiveness and reputation of the areas.
- 2) Most important, instead of properly examining the mines' impacts on surrounding property values, it looks at the change in property appreciation *after* the mines' negative impacts on the affected properties have been capitalized into their values. All else the same, appreciation rates of impacted and not impacted properties should not differ once the effects of the gravel mine have been capitalized into the values of the impacted properties. This is a very elementary methodological error that was also committed in several studies submitted by Stoneco to the Richland Planning Commission (see discussion of Stoneco report in Upjohn Institute August 15, 2006 report).
- 3) Even if it were legitimate to examine appreciation rates, the authors do not measure these rates correctly or make valid comparisons of appreciation rates between properties that are impacted and not impacted by gravel truck traffic.
 - a) Most of the report's analysis plots trends in home sale prices (price per square foot) over time for "impacted" and "not impacted" properties. However, no attempt is made to control for key factors that affect the price per square foot that a home sells for—such as acreage, year of construction, number of bathrooms—and hence the trend lines reported will be greatly influenced by the mix of homes sold in a particular time period. This fact is evidenced by the large variation in price per square foot around the trend line in the reported plots. Thus, the trend lines reported are not interpretable: they do not show appreciation rates for impacted and not impacted homes, and they cannot be used to compare one to the other.
 - b) The authors also compare appreciation rates for a small number of impacted and not impacted properties that have sold more than once, suggesting that such a comparison solves the above-mentioned problem. It does not, however. Homes of different quality may have different appreciation rates. Moreover, rates of appreciation will

depend heavily on the real estate market conditions in the years in which the sales occurred, which, given that the data span a 18-year time period, could differ dramatically.

Upjohn Institute's Analysis of Gravel Mine Impacts on Values of Residences along Truck Routes, Using Data from Great Lakes Appraisal Report

To correctly identify the effect on residential property values of being located on a gravel truck route, *one must compare the values of homes in impacted areas to the values of homes in areas that are not impacted—not the rate of appreciation of impacted and not impacted homes.* The methodological challenge of determining this effect is isolating the effect of location on a gravel truck route from the other factors that determine a home's sale price. *In general, isolating this effect—or any other factor's effect—requires the use of multivariate statistical analysis,* such as that used in hedonic pricing models, which are discussed at length in the Upjohn Institute's August 15 report.⁴

We use the data contained in the report for Caledonia Township in Kent County, Michigan to estimate the effects of location on a gravel truck route on residential property values.⁵ The model and estimates are described in the appendix. Based on data on home sales for all years, being on a gravel truck route reduces the value of the home by an estimated 9 percent. Because an unusually large number of home sales occurring in the last few months of the 18-year period were included in the sample and these data are anomalous, we also estimated models that exclude data for 2005.⁶ According to these estimates, being along a gravel truck route reduces residential property values by 11 percent. Both estimates are highly statistically significant and are inconsistent with the report's conclusion of no adverse impact. In a statistical sense, these results indicate that homes values will be negatively impacted by being along a gravel truck route with more than 99 percent certainty.⁷

Even these estimates are likely to understate the true negative impact on a home's value of being located on a gravel truck route. The Great Lakes Appraisal report assumed that only homes along the gravel truck route would be negatively affected by the gravel mine operation, an assumption not supported by other studies. The homes assumed to be not impacted were located within a two mile radius of the gravel mine, many less than a mile, and many were much closer to the gravel mine than those along the truck route. Because the sales prices of homes along the

⁴ The only way to estimate these effects without using statistical analysis involves careful matching of homes in impacted areas with homes in not impacted areas on all factors deemed relevant to the home's sale price, including sale date, the home's amenities (e.g. square footage, number of bathrooms, number of bedrooms), and lot size, and then computing average differences in sale prices on these carefully matched homes. It is extremely difficult to construct a sufficiently large sample of such matched homes to be statistically valid, and even with a large sample it would still be preferable to estimate effects using a statistical model that could control for remaining differences in the matched homes.

⁵ The number of home sales reported for the other locations was small, and key data on these homes were often missing. Thus, it was only possible to estimate the effect for the Caledonia site.

⁶ One "home" sold along the truck route in 2005 turned out to be a church. We excluded this property sale from both runs.

⁷ As was implicitly assumed in the Great Lakes Appraisal report, we assume that this route is not extensively used by other heavy trucks for other industrial uses, which could contribute to the negative property effects, but we have not independently confirmed this fact.

truck route were compared with the sales prices of homes that most likely were also somewhat depressed by the presence of the gravel mine, our estimates likely understate the impact on home value of being located along a gravel truck route. These data cannot be used to estimate the total impact of a gravel mine home values.

QUALIFICATIONS TO AUGUST 15 REPORT

Differences in the Mine Operations in the Hite Study and the One Proposed for Richland

Aggregate material for road construction and concrete is produced from the crushing of stone such as granite, limestone, dolomite, and sandstone where naturally occurring gravel is not present. After submitting the report to the Richland Township Planning Commission, Professor Hite informed us that, as a result of an inquiry from Stoneco, she had learned of some differences in the gravel operation proposed for Richland Township and those included in her study. Specifically, the mines in her study, also known locally as gravel mines, produce aggregate material through the blasting and crushing of limestone, whereas the proposed Richland Township mine would involve the mining of natural gravel and generally do not require blasting.

Some have questioned whether analysis based on the Hite study is pertinent for Richland Township. For the Hite study findings to be irrelevant to the situation in Richland Township, it would need to be the case that these two types of mines differ in factors that might plausibly impact the community—in particular that noise levels are significantly different due to differences in blasting—and that all or most of the negative impacts found in the Hite study resulted from differences in the two types of mines—not from factors that are similar between the two types of mines. The following pieces of evidence suggest that this is not the case.

- ***Data from the Mine Safety and Health Administration (MSHA) indicate that noise exposure is similar for mine workers in sand and gravel mines and in limestone quarries***

In “Noise Exposure in Metal and Nonmetal Mines and Mills” Professor Winthrop F. Watts, Jr. of the Department of Mechanical Engineering at the University of Minnesota uses MSHA data on worker exposure to noise to analyze trends in noise exposure over time at different types of mining operations and to compare noise exposure levels across different types of mines.⁸ Tables 4 and 5 of his paper show that at each point in time during the period covered by the data workers’ exposure to noise in sand and gravel operations is very similar to that of workers in crushed limestone, irrespective of the summary noise measure computed. The MSHA samples of workers in sand and gravel and in limestone are very large—tens of thousands of workers in each industry were sampled—adding credibility to these comparisons. At our request, Richard A. Kolano of Kolano and Saha Engineers, Inc., who serves as the primary consultant to the Richland Planning Commission on noise issues, reviewed this document and concurred with our interpretation. Although neither Mr. Kolano nor the Upjohn Institute would claim that the MSHA data provide definitive evidence of the similarity of noise levels in limestone

⁸This study is included as an attachment to this report.

and sand and gravel mines, these data undermine claims that they are substantially different. Mr. Kolano was unaware of any better evidence comparing noise levels at these two types of mines.

Mr. Kolano also pointed out that Stoneco proposes blasting at the site, although he was unsure why Stoneco would need to blast at a gravel mine. It is unclear that the level of blasting proposed by Stoneco would differ from that at some limestone quarries.

- ***A study submitted by Stoneco to the Richland Township Planning Commission concluded that other factors besides blasting are the major source of complaints by residents near mines with blasting.***

The U.S. Bureau of Mines study, “Social, Economic and Legal Consequences of Blasting in Strip Mines and Quarries,” specifically addressed the impact of blasting on property values. As discussed in the Upjohn Institute August report, that study found some evidence of negative effects of mines on property values. In an analysis of formal and informal complaints at the mines studied, the researchers concluded:

“Blasting per se is not the major issue either for communities near surface mines or for the surface mine companies...(A)nalysis of these complaints (and of other interviewee comments) reveals that non-blasting related complaints are more prevalent than are blasting related complaints” (p. 3).⁹

- ***Blasting at limestone quarries occurs sporadically and would not significantly increase average noise levels at mine.***

Blasting is usually conducted between one and three times per week and thus is by no means a continuous source of noise for the community.¹⁰ Mr. Kolano observed that because any blast would be of very short duration, it would not significantly impact average noise levels at a mine. In addition, Professor Hite observed that it is common for mines to agree to strictly limit blasting to weekdays during times when most individuals would be at work or school, so as to minimize the annoyance to area residents. These facts may explain why the study commissioned by the Bureau of Mines failed to find that blasting is an important source of community complaints.

⁹ Because relevant pages of this report were excluded from the Stoneco submission to the Richland Planning Commission, the Upjohn Institute obtained a full copy of the report from the U.S. Department of the Interior, for whom the study was conducted. The pages containing the analysis of complaints were not included in Stoneco’s submission.

¹⁰ This information comes from John Richards et al. “Stone Crushing,” in *Air Pollution Engineering Manual, Second Edition*,, edited by Wayne T. Davis, Air & Waste Management Association, New York: Wiley, 2000, p. 718.

- *The additional evidence from studies of sand and gravel mines presented above corroborates the Hite findings.*

The study of sand and gravel mines in Butler and Hamilton counties, Ohio and the Upjohn Institute analysis of data for Caledonia Township, Michigan also find large negative impacts of gravel mines on area property values. The reassessment of the properties in Howard Township, Cass County, Michigan as a result of the adverse impacts of a gravel mine almost exactly match the estimated effects on property values in the Hite study.

Possible Errors in Omitting Affected Homes

Bo VanPeenan of Richland Township contacted the W.E. Upjohn Institute in September with his concern that our August report omitted several residential properties and thus underestimated the overall impact. Out of a total of 2,614 addresses provided to us by Richland Township, we were able to match 2,230 houses (85 percent) to geographical locations by using mapping software or by manually plotting the location of newer homes constructed in new residential developments.

In particular, Mr. VanPeenan was concerned about the exclusion of houses in the following range of addresses:

- 7133 through 7474 North 35th Street
- 8613 through 10732 West Gull Lake Drive
- 10737 through 10805 East C Avenue
- 10727 through 10982 East C D Avenue

He also expressed concerns that we neglected to include the houses on

- Fraulin Drive
- Fraulin Circle
- Ricker Street
- Werner Street

After careful examination, we determined that all of the houses' locations in the address ranges listed were identified and plotted by our mapping program. On the other hand, nearly all of these street segments are located just outside of a three-mile radius, according to the map and radius circle generated by the Institute's mapping program.

The sole exceptions are the homes on West Gull Lake Drive. Although these homes were identified and plotted on the map, it appears that the software mapping program made an error in locating them just outside our three-mile radius.

Of course, all research and data errors are regrettable. However, we believe there are strong arguments as to why these data points would not have a significant impact on the results of the study. Even if the addresses on West Gull Lake Drive had been properly located and included in

the analysis data, their location would have still generated minimal impact, given that the proper location would be somewhere in the range of 2.5+ miles away from the gravel mine.

The identification of these omitted data points suggests that our impact estimate is on the low side. In addition, the three-mile radius also could have included some homes located in neighboring Barry County's Prairieville Township; however we limited our study to the economic impacts for Richland and Richland Township.

In a quantitative study such as this, our results depend on multiple factors that are outside our control, including the reliability of the geocoding method used by the GIS software and the accuracy of the available electronic street maps. Thus, we are bound by the reality that random errors will occur; however, as long as they are minimal and truly random, they should not impact the overall findings.

ANSWERS TO COMMONLY ASKED QUESTIONS

1. Studies show that over time residential property values of homes near gravel mines increase at approximately the same rate as those further away. Doesn't this prove that the mines do not impact property values?

No. This question addresses the major conceptual error that, unfortunately, is made in many evaluation studies. The location of a disamenity, like a gravel mine, will impact the asset values of surrounding properties but should not affect their rate of appreciation. The value of residential properties is based on the characteristics of the house itself (quality of construction, size, and features) and the neighborhood amenities it offers. Locating a disamenity such as a gravel mine near a home impacts its value by reducing the quality of neighborhood amenities it offers. Once the impact of the disamenity has been capitalized or factored into the value of the house and after its value has decreased, then it can appreciate at the same rate as unaffected properties.

For example, let's say there are two identical residences, both valued at \$250,000. A gravel mine is sited next to one of them and generates a negative neighborhood amenities impact. The owner of the impacted property sells, but at the reduced price of \$200,000. The other house is not impacted at all. Both houses are actually the same, but the owner of one has to pay the price of being located next to a disamenity.

It is very possible that over the following two years, both houses would appreciate in value due to inflation and market conditions. Let's assume that, on average, housing prices increase by 10 percent in the region. The unaffected house would now be worth \$275,000 and the impacted house, \$220,000. Examining only the rate of appreciation between the two houses would not capture the impact on value that the disamenity inflicted on the impacted home.

This error in methodology is clearly illustrated in the review of the Great Lakes Appraisal report on the impact of a gravel mine in Caledonia Township in Kent County above.

2. Even if the gravel mine does impact property values, these are not “real losses” if the owners do not sell their home.

This is not true. The lower home price owners would receive were they to sell reflects the fact that their home or community is a less pleasant place to live, which affects homeowners even if they do not sell. In addition, even if the owners do not move, they suffer a loss because the potential equity they could draw from their home through a second mortgage or an equity line of credit has been reduced. Take the example of Howard Township in Cass County where the assessor cut property values by 30 percent for homes next to the Moose Lake Aggregate gravel mine. If the owners of a \$250,000 house next to the gravel mine had \$200,000 remaining on their mortgage, they had the potential of taking an equity loan for up to \$50,000 before the opening of the gravel mine. With their home now valued at only \$175,000, the remaining amount on their mortgage is greater than the value of the house, and the opportunity to take \$50,000 out of the house for their children’s college education or other expenditures has vanished. This is clearly a loss.

3. How can there be a negative impact of the gravel mine as far away as three miles from the site?

In the Hite study, homes located three miles from the mines experienced an estimated 5 percent reduction in value. Studies of landfills have found similar impacts on residential property values at such distances. Our estimates for Richland were based on model estimates from the Hite study as applied to actual property values in Richland. The question, then, is whether the estimated impacts at 3 miles in Hite’s and other studies are plausible for Richland.

The clearest negative impacts of the proposed gravel mine are localized to the site itself (noise and dust) and to the resulting truck traffic. Proposed landscape features at the site would alleviate a possible negative visual impact as current site plans call for the mining operation to be hidden from view.

The impact of these negative attributes decline with distance from the mine and its truck routes. However, three other negative aspects of the gravel mine would not necessary decline so quickly with distance—traffic congestion, reputation, and uncertainty.

- a. **Road Congestion:** Still, township residents who do not live along potential truck routes or who reside far enough away from the mine to avoid its dust and noise, will face increased road congestion due to the truck traffic generated by the mine. Gravel trucks can be slow-moving and difficult to pass. Also, due to the lack of sidewalks, the trucks will have to share the road with pedestrians and bicyclists.

In addition, while the proposed truck route for the gravel mine stays clear of the Village of Richland, independent truck contractors would be allowed by state law to drive through the Village on M-43 and/or M-89. For some instances, this could prove to be the low-cost route for the independent haulers. If this occurs, it will have a negative impact on the Village’s environment, which would be shared by most all of the township residents.

- b. **Reputation of the area** – Just as amenities such as a good school system can improve a town’s reputation and improve property values, the introduction of a disamenity such as a gravel mine can harm the reputation of the area, in turn depressing property values.. As George Tolley of the University of Chicago writes “people living away from the area, who are not directly affected by the disamenities, view the area as undesirable.”¹¹
- c. **The operation could also alter future development plans for the township.** In real estate, uncertainty only decreases land values. Once the mining operation is in place, it can ease the allowance of other heavy industry uses to occur in the township. In short, the gravel mine could open the door to other heavy primary industries. This is the “blight-begets-blight” principle. In fact, one argument cited in defense of having trucks use 24th Street is that it was used before for heavy trucks going to a now closed landfill. In short, this will raise uncertainty about the allowance of other noisy, heavy industries into the region.

Of course, these impacts also decline in distance with residents claiming, for instance, that they do not live in Richland but in the Gull Lake community; still these negative disamenities can have a far greater reach than noise and dust.

4. Aren’t you just making the same old “not in my neighborhood” argument, which is socially irresponsible?

We are simply providing our best estimate of the economic impact to Richland Township of the proposed gravel mine. Are there better, less costly, locations for the gravel operation? We honestly do not know. Reason suggests that a location farther away from existing housing and closer to major highways would be a better site; however, our study is limited to estimating the impact of the gravel mine at the proposed site.

Gravel mines, like landfills, airports and freeways, are necessary facilities for urban areas but create disamenities to their surrounding neighborhoods. Site location decisions should take into consideration the indelible fact that they will generate negative impact to their surrounding neighborhood.

Finally, in proposing a disamenity such as a gravel mine, it is important to document the need for such a facility. We assume that locating a gravel mine in Richland Township will improve Stoneco’s competitive position in the Kalamazoo County market for aggregate material, and that Stoneco can make a strong business case for establishing the mine in Richland Township. The relevant issue for County residents, however, is whether the need for aggregate material can be met by existing capacity or whether the development of additional mines in the county is needed in the near future. We have not seen such a study nor does our study offer such an evaluation. According to the Kalamazoo County Planning Department, the county currently houses 15 gravel mines. Moreover, the economic outlook for the county calls for very modest growth in

¹¹ George S. Tolley, *Effects of the Proposed Indeck Facility on Property Values, Land Use and Tax Revenues*. May, 2000 page 6.

the coming years which suggests a low demand for gravel. We were unable to locate publicly available information on projected demand or existing capacity for Kalamazoo County.

5. How can information on adverse impacts from other types of mines in other states be relevant to the situation in Richland?

Ideally, we would like to observe how the Richland area economy would evolve over the coming years with and without the proposed mine, thereby capturing the effects of the mine given the Township's unique economic and social setting. Without a crystal ball, however, this is clearly impossible to do.

This situation requires us, as it does Stoneco., to draw evidence from studies that were conducted in different communities and for other types of mining activity. Stoneco supplied evidence from strip mines and rock quarries (with blasting) across a large number of states, while we based our estimates for Richland using local property value data combined with model estimates of the impact of limestone quarries in Ohio.

The relevance of all of these studies for Richland, regardless of the methodologies used, rests on the fact that individuals and families in all of these communities share similar preferences about their environment. As long as a common perception of what constitutes a good neighborhood, including the lack of noise and traffic congestion generated by nearby disamenities, is shared by residents in the evaluated communities and by Richland residents, then it is valid to draw inferences about the impacts of the proposed mine in Richland from the experiences of other communities in other states.

APPENDIX
Estimates of the Impact on Residential Property Values
of Being Located on a Gravel Truck Route

Using data for Caledonia Township, Kent County, Michigan contained in Great Lakes Appraisal, “Property Value Impact Analysis of Proposed Mining Operation, 6744 Otis Lake Road, Hope Township, Barry County, Michigan,” we estimated the effects on residential property values of being located on a gravel truck route. The report included data for 90 properties in Caledonia Township. We dropped six properties because they were missing information on the characteristics of the homes. We dropped another property because, on further investigation, we discovered that it was a church.

We estimated the following model:

$$\ln(\text{Price}) = b_0 + b_1 * (\text{in the impacted area}) + b_2 * \ln(\text{Acreage}) + b_3 * \ln(\text{Sq ft}) + b_4 * \ln(\text{No. of baths}) + b_5 * \ln(\text{Year built}) + b_6 * \ln(\text{Date of Sale}) + \text{err.}$$

Estimates of this model using data for the entire 1988-2005 time period are as follows:

Regression Analysis of Impact of Gravel Truck Traffic on Residential Sales Prices in Caledonia Township, 1988 to 2005

Dependent variable: $\ln(\text{Sales price})$

Variables	Coefficient	Standard error	t-stats	P> t
in impacted area	-0.091	0.034	-2.7	0.009
$\ln(\text{acreage})$	0.092	0.022	4.15	0.000
$\ln(\text{sq ft of home})$	0.266	0.051	5.25	0.000
$\ln(\# \text{ of baths})$	0.290	0.066	4.37	0.000
$\ln(\text{age of home})$	1.720	1.456	1.18	0.241
$\ln(\text{date of sale})$	83.879	6.164	13.56	0.000
_constant	-638.593	47.883	-13.34	0.000
Adj. R-square	0.878			
No. of observations	83			

Because the natural logarithm of the dependent variable, sales price, was taken, the coefficient on the variable indicating that the home was impacted by gravel truck traffic, when multiplied by 100, represents the percent reduction in sales price as a consequence of being on the gravel truck route. In this case, being on the gravel truck route reduces residential property values by an estimated 9 percent.

We also estimated this model using data for the 1988 to 2004 period, because an unusually large number of home sales along the impacted route were included for the last few months of the 18-

year period and these home sales, taken as a whole, seemed anomalous. The estimated impact in the restricted period is slightly greater: being on a gravel truck route reduces property values by an estimated 11 percent.

Regression Analysis of Impact of Gravel Truck Traffic on Residential Sales Prices in Caledonia Township, 1988 to 2004

Dependent variable: ln(Sales price)

Variables	Coefficient	Standard error	t-stats	P> t
in impacted area	-0.113	0.038	-3.0	0.004
ln(acreage)	0.093	0.026	3.61	0.001
ln(sq ft of home)	0.205	0.061	3.37	0.001
ln(# of baths)	0.287	0.075	3.82	0.000
ln(age of home)	1.193	1.574	0.76	0.451
ln(date of sale)	81.678	7.774	10.51	0.000
_constant	-619.701	59.872	-10.35	0.000
Adj. R-square	0.850			
No. of observations	71			

In both models the statistical significance of the estimated negative effects of location on a gravel truck route on a home's value exceeds 99 percent. This implies that the chances location on a gravel truck route will not reduce a home's value are less than one in one hundred.



COLLEGE OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Memorandum

To: Planning Commission
Richland Township
7401 North 32nd Street
Richland, Michigan 49083
c/o Wanda Hinklin

From: Diane Hite, Associate Professor
Department of Agricultural Economics and Rural Sociology
Auburn University
209B Comer Hall
Auburn, AL 36849

Re: Economic Impact of the proposed gravel mine in Richland Township

Date: November 11, 2006

George Erickcek of the Upjohn Institute has asked me to clarify the work I did for the Institute in support of the report he submitted to Richland Township on the economic impacts of the proposed gravel pit in your community.

First, I would like to fill you in on how I first came to be involved in research on the Richland gravel pit, and how I consequently came to work with the Upjohn Institute. I was initially contacted in a phone call by a gentleman who identified himself to me as a realtor in Richland, Michigan. He found my name while reviewing academic real estate research on the property value effects of certain types of land-based industries. In my case, he was interested in my scholarly journal articles on the negative effect of landfills on house values.

He was curious as to whether or not the price effects of landfills would be similar to those of gravel pits. My response was that much of the negative effect of landfills appears to be associated with noise, dust, and increased truck traffic, and should therefore be somewhat comparable to the effects of gravel pits. I then offered to look at a dataset that I have collected from Delaware County, OH, to try to estimate effects specifically related to gravel pits. (Please note that the data come from the Delaware County planning office GIS project--they were collected from a public, government source). From an academic point of view, I was personally curious to see if the effects from gravel pits are comparable to the effects from landfills.

202 COMER HALL

AUBURN, AL 36849-5406

TELEPHONE:

334-844-4800

FAX:

334-844-5639

www.auburn.edu

Owing much to the past, Auburn's greater debt is ever to the future.

After speaking to him, I did some quick statistical analysis showing that the gravel mining operations have the expected negative effects, and I briefly wrote up and sent him a small report on my findings.

A month or two after I emailed the analysis to the Michigan realtor, I was contacted by economists at the Upjohn Institute. They had heard that I did some work on gravel pits, and asked to see a copy of my report and summaries of data and models I had used in that report. Subsequently, they asked if I would be willing to re-examine my data to provide results for them that could be used in an economic impact report. The analysis for the Upjohn Institute was far more extensive than that done for the Michigan realtor and involved performing basic checks on the data and variable construction, adding an additional control variable to the model, and assessing the robustness of the findings to different model specifications. All of the subsequent runs continued to show large negative effects of these mining operations on residential property values, though the effects were somewhat smaller in the models estimated for the Upjohn Institute than in my original analysis. This is not unusual in my field; we generally try to run a large number of statistical models, finally reporting on those that provide the most realistic results. Thus the Upjohn report that you received, and which I understand was reported on in newspapers in Michigan, used a different model than the one I did for the realtor, and has somewhat different findings, though the qualitative nature of the findings is the same. I would add that one of my coauthors at the Ohio State University has also modeled gravel pit impacts in Delaware county, independently from my research but using the same data, and found a very similar result to mine.

After the report was made public, I was contacted by a Stoneco representative, who wanted a copy of my study and asked me the background for the study. I sent him the original small report I had prepared and gave him the background to that study, but did not offer information on the additional analysis performed for the Upjohn Institute, as I had not written it up in a stand-alone report.

He also requested information on the gravel operations in my study. We determined that these operations produce gravel from the crushing of limestone rather than from the crushing of pea gravel, as would be the case at the proposed Michigan site. These limestone quarries are known as gravel pits locally, and I want to make clear that I had no intention of misrepresenting the nature of the operations in my study to the Upjohn Institute or any other party. The Delaware County planner's office, in fact, uses the 'gravel pit' terminology. Having grown up in rural Ohio, I have been exposed my entire life to operations known locally as gravel pits. When Mr. Doud told me the Ohio operations are limestone operations, it was the first time I had heard them so called.

pits. When Mr. Doud told me the Ohio operations are limestone operations, it was the first time I had heard them so called.

I would like to emphasize that the two types of gravel operations are very similar in that, like landfills, they both involve increased truck traffic, noise, and dust and the destruction of large tracks of land. It is my understanding that the main difference is that gravel produced at limestone quarries requires significantly more blasting. To the extent that blasting results in higher average noise or dust levels for area residents, these operations may have larger adverse effects on nearby property values. The adverse property effects from limestone quarries in my study are very large, however, and I believe it is improbable that all of these adverse property effects are the consequence of blasting. Similar types of operations are done in Auburn, AL, where I now reside, and the reports that I get from citizens is that actual blasting times are restricted to avoid bothering neighboring residents, but that in fact, neighbors are mostly bothered by the significant amount of noise related to truck traffic associated with hauling gravel, and that would occur regardless of whether the gravel pit is limestone or pea gravel.

I hope that you understand that my part in the Upjohn Institute project was non-commercial. I received no compensation from the Institute for any of the work I performed. I continue to work on the property value impacts of mining operations, strictly from an academic viewpoint, and hope to compare limestone and gravel pit effects in different parts of the country for publication in academic journals. I would be more than happy to clarify my role to you further, if you would like. You may feel free to call me anytime, or email me, with any questions you have.

In addition to the study for Upjohn Institute, I would like to share with you some of results related to my many years of analyzing landfill impacts on house values. I have several journal articles related to this topic, and my general findings are that landfills have a very negative impact on the values of nearby houses. I find that house values are depressed by about 15% when they are close to landfills (0.5 miles as compared to 3.25 miles). Perhaps more importantly for the consideration of a local government, I found that landfills decrease property tax revenues by about 7%. These findings are published in the Journal of Real Estate Finance and Economics, if you are interested in more detail. I also found in the same study that even when landfills are closed--and for as long as 11 years--they still have a negative impact on house values and tax revenues. This is probably because people who can afford to move away from the landfill will do so, and people who move in afterwards don't want to pay as much for the house. Thus, any type of land based operation may have a negative effect on property values and tax revenues for many years after they have been closed.