SPIKOWSKI
PLANNING
ASSOCIATES

February 14, 2019

Steven Sarkozy, Village Manager
Village of Estero
9401 Corkscrew Palms Circle
Estero, Florida 33928

Dear Mr. Sarkozy:

Attached please find the peer review you requested of two recent analyses of future limerock demand and supply:

❏ *Southeast Lee County Density Reduction / Groundwater Resource Mining Study*, prepared in 2016 by Waldrop Engineering for the Lee County Department of Community Development

❏ *An Evaluation of SE Lee Co. DR/GR and Regional Lime Rock Mines: A Local and Regional Mine Analysis Using Mine Specific Geotechnical Reports and County Monitoring Reports*, prepared in 2018 by Stuart and Associates for Sakata Seed America, Inc.

My technical conclusions are summarized in Section 2. Section 3 describes the four analytical issues that account for the differing conclusions of these analyses. Section 4 summarizes how the four issues were addressed by each analyst (including the original 2008 study). Sections 5–7 provide more details on each study, concluding with shortcomings identified during this peer review. Section 8 explains the most critical issues in more detail and describes the effects that analytical errors will have on land use and the environment in southeast Lee County.

If you have questions about this peer review, contact me at any time.

Sincerely yours,

William M. Spikowski, FAICP

PEER REVIEW

SOUTHEAST LEE COUNTY DENSITY REDUCTION / GROUNDWATER RESOURCE MINING STUDY

PREPARED IN 2016 BY WALDROP ENGINEERING

AN EVALUATION OF SE LEE CO. DR/GR AND REGIONAL LIME ROCK MINES: A LOCAL AND REGIONAL MINE ANALYSIS USING MINE SPECIFIC GEOTECHNICAL REPORTS AND COUNTY MONITORING REPORTS

PREPARED IN 2018 BY STUART AND ASSOCIATES

February 2019

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1. Introduction

Since 2010, the Lee County Comprehensive Plan (Lee Plan) has required an objective analysis of demand and supply of limerock,[1] an essential construction material made from limestone that is used to make concrete and asphalt and to support roads, parking lots, buried pipes, etc.

The limerock analysis, updated by the county every seven years, is used to determine if the area suitable for mining needs to be expanded:

> *LEE PLAN POLICY 33.1.1: "Limerock mining is a high-disturbance activity whose effects on the surrounding area cannot be completely mitigated. To minimize the impacts of mining on valuable water resources, natural systems, residential areas, and the road system, Map 14 identifies Future Limerock Mining areas that will concentrate limerock mining activity in the traditional Alico Road industrial corridor east of I-75."*

Lee Plan Map 14 – Future Limerock Mining Overlay
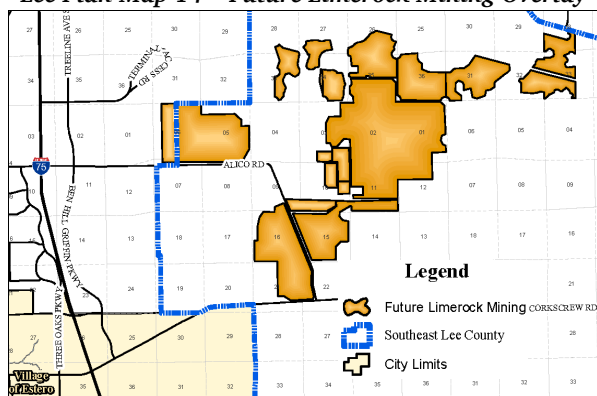
The first limerock analysis was performed for Lee County by Dover, Kohl & Partners in 2008.[2] The author of this peer review was the primary author of the Dover Kohl analysis.

Lee County commissioned the first required update in 2016, which was completed by Waldrop Engineering.[3] A private landowner, Sakata Seed America, Inc., commissioned its own update by Stuart and Associates in 2018.[4]

The Village of Estero commissioned this peer review of the Waldrop and Stuart updates in 2019. The primary conclusions of this peer review are summarized on the next page.

The three limerock analyses have a great deal in common. They all examine the regional demand for limerock for the same seven counties for a 20-year period, and often rely on the same data and methodological assumptions.

This peer review examines the most important differences between the Waldrop and Stuart updates to understand their conflicting conclusions as to whether additional mines will be needed by the year 2040. There are four major analytical issues that account for the conflicting conclusions.

Lee County staff is now recommending that the limerock analysis requirement, and Map 14 itself, be deleted from the Lee Plan based on their contention that the analytical requirement is too difficult and Map 14 is not needed.[5] This is extremely unfortunate because it ignores the myriad reasons that led to the adoption of Map 14 and the related protective measures provided to southeast Lee County in 2010.

It was not obvious in 2008 how a long-term limerock analysis should be performed. With the recent addition of the 2016 and 2018 updates by different professional teams, the proper methodology is becoming evident. This methodology could be standardized by county officials for use in future updates.

The four key differences between these analyses are fairly straightforward. Section 3 of this peer review summarizes two competing approaches to each. Section 4 then compares all three limerock analyses as to each issue.

The way these four issues are addressed has profound implications for the outcome – not just in extent, but in changing the fundamental conclusion as to whether more mines need to be approved soon (and if not soon, about how far into the future they might be needed).

Sections 5, 6, and 7 examine the differences between each prior analysis in more detail. The conclusion in Section 8 explains the most critical issues and identifies refinements that would increase the accuracy of limerock supply and demand analyses.

2. Summary of Technical Conclusions

▸ **Waldrop** overestimated the amount of limerock that will be needed in the region through the year 2040. The state's official population projections show a slowing rate of growth toward 2040, yet Waldrop assumed the demand for limerock will vary only with the (increasing) total population each year, not reflecting in any way the (declining) rate of construction each year (see page 12). The recent recession was the clearest possible demonstration of the relationship between demand for limerock and the rate of construction.

▸ **Waldrop** underestimated the amount of limerock that can be produced from several large mines currently operating in Lee County. Waldrop used the same basic methodology as Dover Kohl used in 2008 to determine remaining capacity, but reduced that capacity by 20% to reflect losses "resulting from blasting, processing, operations, and trucking." A 20% loss reduction is often validly applied in mining analyses, but here it was applied to mine capacities that had already taken most of those losses into account (see pages 6 and 11). In addition, most newer mines have a thicker limestone layer than older mines, which will increase their yields.

▸ **Waldrop** did not consider supply from existing mines in Charlotte County and from at least one major mine in Collier County, even for use within those counties. The Dover Kohl report used one approach to reflect output from Charlotte and Collier mines (see page 5); the Stuart report used a better approach by identifying and analyzing every operating mine in both counties (see page 9).

▸ Due to these shortcomings, the analysis in the **Waldrop** study does not support its conclusion that more mines will be needed in Lee County to meet regional demand through 2040.

▸ **Stuart** overestimated the amount of limerock that will be needed by 2040 by duplicating the Waldrop demand methodology.

▸ **Stuart** overestimated the amount of limerock that can be removed from existing mines by not relying on reliable survey data from all Lee County mines that identifies the actual depth of mining pits after extraction of usable limerock. Instead, Stuart substituted estimates of remaining mine capacity based on pre-mining estimates of rock thickness, minus 20% for anticipated losses during mining. Stuart ignored the Dover Kohl analysis, based on the survey data, that demonstrated actual reductions as much as double Stuart's 20% figure. (See page 11.)

▸ **Stuart** overestimated demand and overestimated supply. If both overestimates were corrected, the Stuart approach would become the most accurate and timely assessment yet prepared. Although Stuart's conclusion about the abundance of supply over demand appears correct, the specific numerical conclusions for future years should not be relied on until the analysis is revised.

3. Major Analytical Issues

This page identifies four analytical issues that account for the differing conclusions in past comparisons of limerock demand and supply. The next page compares the assumptions made in each prior analysis regarding these four issues.

Demand for Limerock

A. Future demand for limerock should be based on our anticipated total population.

B. Future demand for limerock should be based on our anticipated rate of growth.

IMPLICATIONS:

- Choice "A" is the simplest to apply. It assumes that limerock demand is created by existing residents and is not affected by construction that accommodates new residents and businesses.

- Choice "B" is more difficult to apply. It is based on historical observations that the demand for limerock increases and decreases with the level of construction. (Choices "A" and "B" can be combined.)

Supply: Mine Locations

A. Regional supply should come from rock mines in Lee County only.

B. Regional supply should come from rock mines in all counties with rock mines.

IMPLICATIONS:

- Choice "A" is the easiest to apply. Lee County collects the most thorough data on existing and proposed mines.

- Choice "B" is more difficult to apply. For mines outside Lee County, data is available from Florida DEP and from files in those counties. Trucking costs from mines in Collier County make them impractical to meet demand in northern counties in the region.

Supply: Mine Capacity

A. Remaining capacity of mines should be based on pre-mining estimates of the thickness of the rock layer at each mine.

B. Remaining capacity of mines should be based on their recent performance (by measuring the depth of pits at each mine).

IMPLICATIONS:

- Choice "A" is the easiest to apply. Theoretical projections can be based on data submitted by mine applicants during the rezoning process about the thickness of the limestone layer under their property.

- Choice "B" is more difficult to apply. Mines in Lee County must submit actual data on the depth of all mine pits; that data can be used to extrapolate the remaining capacity of that mine. Such data is rarely available for mines outside Lee County.

Supply: Mining Losses

A. Since a considerable percentage of limestone that is attempted to be mined cannot be converted to a salable product, each mine should be examined to determine typical losses for that mine.

B. A fixed percentage should be assumed to reduce the volume of limestone attempted to be mined to reflect expected losses for all mines.

IMPLICATIONS:

- Choice "A" is more difficult to apply because it requires examination of bathymetric surveys for each mine.

- Choice "B" is the simplest to apply; however an inaccurate percentage used to estimate losses will have a major effect on the conclusions of the analysis.

4. Simplified Comparison of Three Limerock Demand/Supply Analyses

DOVER KOHL (2008)	WALDROP (2016)	STUART (2018)
DEMAND FOR LIMEROCK:	**DEMAND FOR LIMEROCK:**	**DEMAND FOR LIMEROCK:**
Dover Kohl assumed that future demand for limerock should be based 1/4 on anticipated total population and 3/4 on anticipated rate of construction.	**Waldrop** assumed that future demand for limerock should be based entirely on anticipated total population.	**Stuart** assumed that future demand for limerock should be based entirely on anticipated total population. *(mirroring Waldrop methodology)*
MINE LOCATIONS:	**MINE LOCATIONS:**	**MINE LOCATIONS:**
Dover Kohl assumed that 80% of regional supply should come from rock mines in Lee County and the remaining 20% from mines in other counties (based on past performance).	**Waldrop** assumed that regional supply would come from rock mines in Lee County; and even if four mines in Collier were considered, there still would be insufficient limerock by 2040.	**Stuart** assumed that regional supply should come from all rock mines in the region, including all mines in Charlotte and Collier County.
MINE CAPACITY:	**MINE CAPACITY:**	**MINE CAPACITY:**
Dover Kohl assumed that remaining capacity of mines should be based on their recent performance (by measuring the depth of pits at each mine).	**Waldrop** assumed that remaining capacity of mines should be based on their recent performance. *(refining Dover Kohl methodology)*	**Stuart** assumed that remaining capacity of mines should be based on pre-mining estimates of the thickness of the rock layer at each mine.
MINING LOSSES:	**MINING LOSSES:**	**MINING LOSSES:**
Dover Kohl did not deduct a fixed percentage for mining losses because its methodology directly accounted for most of those losses.	**Waldrop** reduced Dover Kohl's remaining mine capacity by 20%, apparently anticipating additional losses from blasting, processing, operations, and trucking.	**Stuart** assumed that only 20% of the entire rock layer would be unusable due to losses during mining, processing, and trucking.

5. Summary of Dover Kohl Analysis

DOVER KOHL (2008)

BIBLIOGRAPHY:

- **Report Title:** Limerock Production & Demand (Appendix B of *Prospects for Southeast Lee County: Planning for the Density Reduction / Groundwater Resource Area (DR/GR))*, prepared for Lee County Department of Community Development

- **Publication Date:** July 2008

- **Author:** Team led by Dover, Kohl & Partners

TARGET YEAR (PLANNING PERIOD):

Through the year 2030

DEMAND METHODOLOGY:

Dover Kohl assumed that future demand for limerock should be based 1/4 on anticipated total population and 3/4 on anticipated rate of construction, for Charlotte, Collier, DeSoto, Glades, Lee, and Sarasota Counties.

- **Population:** 9 tons/person/year, for 2,547,600 residents by 2030

- **Growth:** 575,045 additional dwelling units by 2030 *(see Table B-5)*

MINE LOCATIONS GENERALLY:

Dover Kohl assumed that 80% of regional supply would come from rock mines in Lee County and the remaining 20% from mines in other counties. This percentage was based on estimated mine production in Lee County from 1980 through 2006, relative to demand during that period for the entire seven-county region.

MINE LOCATIONS (LEE CO.):

The following approved mines in Lee County were determined to have additional limerock capacity and were analyzed in detail:
- Rinker Materials (now Cemex)
- Rinker Materials (now Wild Blue)
- Florida Rock Greenmeadows & expansion
- Youngquist (University and West Lakes)
- Cemex/RMC
- Bonita Grande Aggregates

The following mines were also examined but were not included in the supply analysis because they had not been approved at that time, or had not been approved for limerock:
- Westwind Corkscrew
- Bell Road
- Bonita Land Resources
- Plumosa Farm
- Florida Rock Mine #2
- Corkscrew Excavation
- Golfrock
- Estero Group
- Schwab 640 and II
- Cypress Bay
- Ibis Lake Estates

MINE LOCATIONS (COLLIER CO.):

Existing limerock mines in northern Collier County were identified in Figure B-1. No data or estimates of remaining capacity were provided for any Collier mines.

MINE LOCATIONS (CHARLOTTE CO):

Existing limerock mines in southern Charlotte County were identified in Figure B-1. No data or estimates of remaining capacity were provided for any Charlotte mines.

MINE CAPACITY METHODOLOGY:

Dover Kohl assumed that remaining capacity of mines should be based on their recent performance. This was done by estimating the average thickness of the limestone layer at each mine.

The amount of usable limestone removed from each pit was assumed to be the remaining space between the top of the limestone and the actual bottom of the completed mining pit (obtained from bathymetric surveys found in county records, which are prepared by each mine operator and submitted in accordance with county monitoring requirements for limerock mines).

Limestone that could not be recovered from the pit settles at the bottom, as does unusable material that is removed during processing and washed back into the pit.

The thickness of limestone in the remainder of the mine was assumed to be the same the thickness previously removed from the existing pit(s).

This thickness was multiplied by the remaining acreage that had been approved for each pit, with the volume then converted to tons and to cubic yards.

MINING LOSSES:

Dover Kohl did not deduct a fixed percentage for mining losses because its methodology capacity methodology, as described above, directly accounted for most of those losses.

CONCLUSIONS OF THIS ANALYSIS:

"... 4,397 additional [acres] will need to be mined from 2007 through 2030. This equals about 183 acres per year averaged over this planning period — in total, about 22% more land than the 3,576 acres that have already been permitted by Lee County."

> *[NOTE: This conclusion did not include Florida Rock Mine #2, which hadn't been approved by Lee County. Dover Kohl estimated the minable acreage of that mine, if later approved, would be 2,471 additional acres.]*

SHORTCOMINGS IDENTIFIED IN THIS PEER REVIEW:

- *Collier and Charlotte limerock mines were assumed to continue supplying 20% of regional demand. A better approach was used in the Stuart analysis, where mines in those counties were analyzed for remaining capacity the same as Lee County mines. (The result may be an increase or decrease in the 20% that Dover Kohl assumed would be supplied by mines outside Lee County.)*

- *The depth of overburden was estimated from regional data sources. A better approach was used by Stuart by relying on soil profiles for each mine to estimate the average depth where the limestone layer begins. The results would vary, but would generally increase the remaining mine capacity, especially in newer mines where the limestone layer is considerably thicker than in older mines.*

6. Summary of Waldrop Analysis

WALDROP (2016)

BIBLIOGRAPHY:

- **Report Title:** *Southeast Lee County Density Reduction / Groundwater Resource Mining Study*, prepared for the Lee County Department of Community Development.
- **Publication Date:** September 2016
- **Author:** Waldrop Engineering

TARGET YEAR (PLANNING PERIOD):

Through the year 2040

DEMAND METHODOLOGY:

Waldrop assumed that future demand for limerock should be based entirely on anticipated total population (for Charlotte, Collier, DeSoto, Glades, Lee, and Sarasota Counties).

- **Population:** 9 tons/person/year, for 2,319,600 residents by 2040

MINE LOCATIONS GENERALLY:

Waldrop assumed that regional supply would come from rock mines in Lee County; and even if four mines in Collier were considered, there still would be insufficient limerock by 2040.

MINE LOCATIONS (LEE CO.):

The following mines in Lee County were determined to have additional limerock capacity and were analyzed in detail:

- Rinker Materials 3A & 3B (now Cemex)
- Greenmeadows
- Greenmeadows expansion
- Florida Rock Mine #2
- West Lakes
- Westwind Corkscrew
- Cemex/RMC
- Bonita Grande Mine
- Plumosa Farms
- Bell Road
- Cemex North Quarry 3

MINE LOCATIONS (COLLIER CO.):

Five existing limerock mines in northern Collier County were identified. Data and estimates of remaining capacity was included for four mines, as provided by Collier County officials. No data was available for the fifth mine.

MINE LOCATIONS (CHARLOTTE CO):

Charlotte County mines were assumed to have only minor reserves of limerock, or none at all, and therefore would not contribute to local or regional supply.

MINE CAPACITY METHODOLOGY:

Waldrop assumed that remaining capacity of mines should be based on their recent performance, updating the Dover Kohl methodology slightly. (See description of the Dover Kohl methodology two pages earlier.)

MINING LOSSES:

Waldrop reduced Dover Kohl's remaining mine capacity by 20%, apparently anticipating additional losses from blasting, processing, operations, and trucking.

CONCLUSIONS OF THIS ANALYSIS:

"… Lee County has sufficient limerock supply to meet the regional demand through the 2030 planning horizon. However, there is a deficit of approximately 84 million cubic yards of limerock to meet the regional needs through the 2040 planning horizon …"

SHORTCOMINGS IDENTIFIED IN THIS PEER REVIEW:

▸ *Waldrop overestimated the amount of limerock that will be needed in the region through the year 2040. The state's official population projections show a slowing rate of growth toward 2040, yet Waldrop assumed the demand for limerock will vary only with the (increasing) total population each year, not reflecting in any way the (declining) rate of construction each year.*

▸ *Waldrop underestimated the amount of limerock that can be produced from several large mines currently operating in Lee County. Waldrop used the same basic methodology as Dover Kohl used in 2008, but reduced that capacity by 20% to reflect losses "resulting from blasting, processing, operations, and trucking." A 20% loss reduction is often validly applied in mining analyses, but here it was applied to mine capacities that had already taken most of those losses into account. In addition, newer mines have a thicker limestone layer than older mines, which will increase their yields.*

▸ *Waldrop did not consider supply from existing mines in Charlotte County and from at least one major mine in Collier County, even for use within those counties.*

▸ *Due to these shortcomings, the analysis in the Waldrop study does not support its conclusion that more mines will be needed in Lee County to meet regional demand through the year 2040.*

7. Summary of Stuart Analysis

STUART (2018)

BIBLIOGRAPHY:

- **Report Title:** *An Evaluation of SE Lee Co. DR/GR and Regional Lime Rock Mines: A Local and Regional Mine Analysis Using Mine Specific Geotechnical Reports and County Monitoring Reports*, prepared for Sakata Seed America, Inc.

- **Publication Date:** May 30, 2018

- **Author:** Stuart and Associates

TARGET YEAR (PLANNING PERIOD):

Through the year 2040

DEMAND METHODOLOGY:

Stuart assumed that future demand for limerock should be based entirely on anticipated total population (for Charlotte, Collier, DeSoto, Glades, Lee, and Sarasota Counties).

- **Population:** 9 tons/person/year, for 2,319,600 residents by 2040

MINE LOCATIONS GENERALLY:

Stuart assumed that regional supply should come from all rock mines in the region, including all mines in Charlotte and Collier Counties.

MINE LOCATIONS (LEE CO.):

The following mines in Lee County were determined to have additional limerock capacity and were analyzed in detail:

- Rinker Materials 3A & 3B *(now Cemex)*
- Greenmeadows
- Greenmeadows expansion
- Florida Rock Mine #2
- University Lakes and West Lakes
- Westwind Corkscrew
- Bonita Grande Mine
- Plumosa Farms
- Bell Road
- Cemex North Quarry 3

MINE LOCATIONS (COLLIER CO.):

Stuart used Waldrop data for remaining limerock capacity in four of the five mines in Collier County. Stuart identified five additional mines and estimated remaining capacity for four of them.

MINE LOCATIONS (CHARLOTTE CO):

The following mines in Charlotte County were determined to have additional limerock capacity and were analyzed in the same manner as mines in Lee and Collier Counties:

- Earthsource Babcock Ranch
- Coral Rock Mine
- Jay Rock Mine
- Charlotte County Mine
- Halls Bermont Pit

MINE CAPACITY METHODOLOGY:

Stuart assumed that remaining capacity of mines should be based on pre-mining estimates of the thickness of the rock layer at each mine.

This was done by examining all soil profiles submitted with rezoning applications or otherwise found in government files and using them to determine the average thickness of the limestone layer at each mine.

This average thickness was multiplied by the remaining acreage that had been approved for each pit, with the volume then converted to tons and to cubic yards.

MINING LOSSES:

Stuart assumed that only 20% of the entire rock layer would be unusable due to losses during processing, mining, and trucking. This 20% reduction was applied to all mines in Lee, Collier, and Charlotte Counties.

CONCLUSIONS OF THIS ANALYSIS:

▸ **Permitted mines in Lee, Collier, and Charlotte Counties can meet the regional demand for limerock through the year 2051.**

▸ **Lee County mines alone could meet the regional demand through the year 2042.**

SHORTCOMINGS IDENTIFIED IN THIS PEER REVIEW:

▸ *Stuart overestimated the amount of limerock that will be needed in the region through the year 2040. The state's official population projections show a slowing rate of growth toward 2040, yet Stuart (like Waldrop) assumed the demand for limerock will vary only with the (increasing) total population each year, not reflecting in any way the (declining) rate of construction each year.*

▸ *Stuart overestimated the amount of rock that can be removed from existing mines by not relying on reliable survey data from all Lee County mines that identifies the actual depth of mining pits after extraction of usable limerock. Instead, Stuart substituted estimates of remaining mine capacity based on pre-mining estimates of rock thickness, minus 20% for anticipated losses during mining. Stuart ignored the Dover Kohl analysis, based on the survey data, that demonstrated actual reductions as much as double Stuart's 20% figure. (See page 11.)*

▸ *If the overestimates of both demand and supply were corrected, the Stuart approach would become the most accurate and timely assessment yet prepared. Although Stuart's conclusion about the abundance of supply over demand appears correct, the specific numerical conclusions for future years should not be relied on until the analysis is revised.*

8. Concluding Comments

All three limerock analyses discussed in this peer review generated estimates of the remaining capacity of approved mine pits:
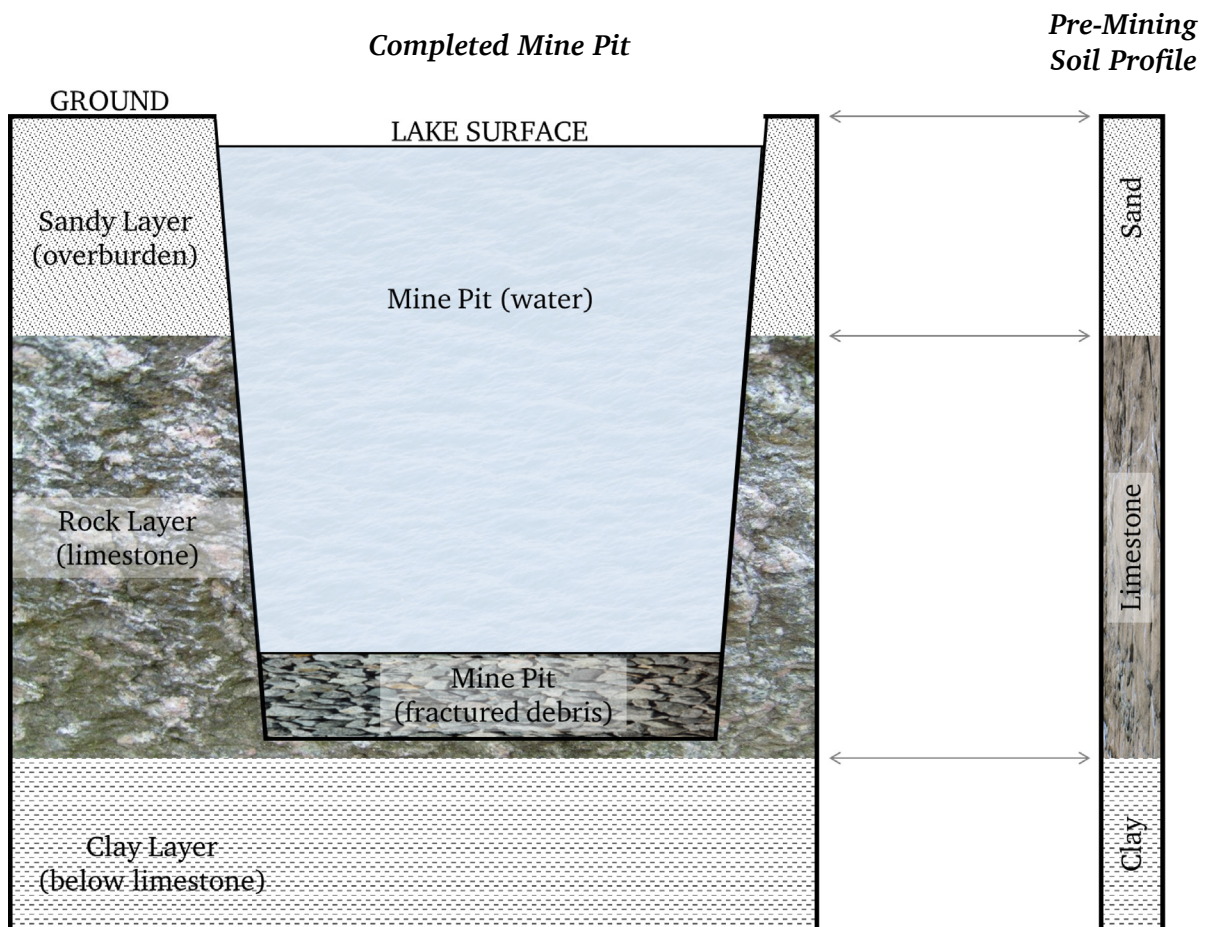
- Dover Kohl measured the thickness of limestone removed from existing pits and assumed the same thickness for future pits.

- Waldrop reduced the Dover Kohl thicknesses by 20% for future pits.

- Stuart did not use the Dover Kohl or Waldrop data; Stuart reduced the limestone thickness from pre-mining soil profiles by 20% for future pits.

The illustrations below help visualize these methodologies. The diagram on the left shows a cross-section of a completed mine pit, which appears from the surface as a large lake but which includes a layer of limestone debris at the

bottom of the lake. This debris is mostly limestone pieces that were not recovered by the draglines that are deployed deep underwater to remove rock after it is fractured by blasting. In mine pits that receive wash water from limerock processing plants, this debris also contains fine material that is discarded during the crushing, sorting, and washing phases.

Waldrop's 20% reduction of limestone thickness was incorrect because the thicknesses computed by Dover Kohl had already deducted the fractured debris at the bottom of mine pits.

Stuart reduced the total thickness of the limestone layer, as delineated in pre-mining soil profiles, by 20% to account for unrecoverable debris. This is below the typical industry reduction factors, which assume an additional 10% loss during processing. It is also lower than data produced by Dover Kohl that indicates total losses approaching 40% for existing Lee County mines.

Completed Mine Pit

Pre-Mining Soil Profile

GROUND

LAKE SURFACE

Sandy Layer (overburden)

Mine Pit (water)

Sand

Rock Layer (limestone)

Limestone

Mine Pit (fractured debris)

Clay Layer (below limestone)

Clay

Waldrop and Stuart used the same methodology to compute future demand for limerock in the seven-county region, assuming demand to be 9 tons per permanent resident each year.

This methodology overstates the demand for limerock in counties which, while continuing to grow, will be growing at declining rates.

The graph below illustrates the anticipated cumulative population of the seven-county region through the year 2040 with the solid upper line. The sequence of dots immediately below shows the (decreasing) number of residents being added during each five-year period through 2040.

The demand for limerock and other building materials is highly sensitive to the construction that is needed to accommodate a growing population, as was demonstrated clearly by suspended mining operations during the recent recession.
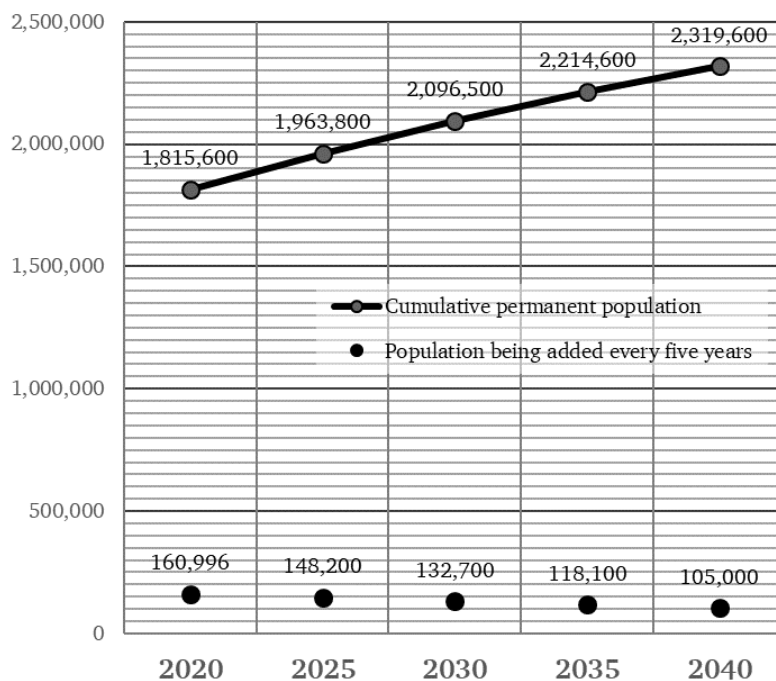
The Dover Kohl analysis demonstrated the relationship between housing starts and aggregate production (limerock and sand) for the entire state during every year between 1976 and 2007 (in Figure B-5).[2] The same pattern was apparent. As a result, the Dover Kohl analysis was not based solely on the total population in future years; it balanced that approach with demand based on anticipated construction to accommodate new residents.

When future demand is overestimated by a large margin, the corresponding conclusion will be that many more mines need to be approved in Lee County than will actually be needed, thus spreading the negative impacts of mining over a much larger area than is necessary.

Analyses of limerock demand and supply are complicated and can be controversial, but they are essential to ensure that regulations neither restrict a competitive mining industry from meeting actual demand, nor authorize an excessive number of mines that unnecessarily harm other legitimate and critical land uses in southeast Lee County such as public water supply, agriculture, wildlife habitat, and rural residential communities.

Anticipated Cumulative Population & Population Being Added
Entire Region, 2020 through 2040

- Cumulative permanent population
- Population being added every five years

	2020	2025	2030	2035	2040
Cumulative permanent population	1,815,600	1,963,800	2,096,500	2,214,600	2,319,600
Population being added every five years	160,996	148,200	132,700	118,100	105,000

Endnotes:

1. Lee Plan Policy 33.1.4 (Lee County Comprehensive Plan)

2. Appendix B ("Limerock Production & Demand") in *Prospects for Southeast Lee County: Planning for the Density Reduction / Groundwater Resource Area (DR/GR)*, prepared for Lee County Department of Community Development in 2008 by a team led by Dover, Kohl & Partners. Available from: *www.spikowski.com/details/ProspectsForSoutheastLeeCounty.html*

3. *Southeast Lee County Density Reduction / Groundwater Resource Mining Study*, prepared for the Lee County Department of Community Development in 2016 by Waldrop Engineering. Available from: *www.spikowski.com/details/ProspectsForSoutheastLeeCounty.html*

4. *An Evaluation of SE Lee Co. DR/GR and Regional Lime Rock Mines: A Local and Regional Mine Analysis Using Mine Specific Geotechnical Reports and County Monitoring Reports*, prepared for Sakata Seed America, Inc. in 2018 by Stuart and Associates. Available from: *www.spikowski.com/details/ProspectsForSoutheastLeeCounty.html*

5. Staff report for Lee County Local Planning Agency public hearing on January 28, 2019. Available from: *www.spikowski.com/details/ProspectsForSoutheastLeeCounty.html*