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# Michigan Aggregates Market Study Phase I Report

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# Section 1

## Project Background, Methodology and Executive Summary

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## **Project Background, Methodology and Executive Summary**

The Michigan Department of Transportation (MDOT) contracted with FMI to evaluate the adequacy of permitted construction aggregate reserves to supply the state's long-term infrastructure needs, and to explain the particular dynamics of aggregate supply that exist in different regions of the state. These dynamics are typically a function of four things: the quality of material in aggregate deposits and their resultant ability to meet various specifications, their location relative to the various submarkets where construction activity is concentrated, the ratio of fine aggregates (sand) to coarse aggregates (stone) that obtain in sand-and-gravel deposits, and preferences of end-users for different types of aggregate.

Annual production and reserve figures are rarely available in public sources, so we used a "bottom-up" approach to establish these. This involved mapping all the significant sources of aggregate supply in the state, meetings and interviews with industry sources, and using satellite images, permitting records and other secondary sources such as MSHA (Mine Safety and Health Administration) hours, which aggregate mines are required to report and which can be used to approximate annual production.

We checked our bottom-up figures against per-capita usage figures FMI has seen in other regions of the country, adjusting for population density, economic health, and the robustness of state and local infrastructure programs. Our basic aim for each region was to arrive at a solid estimate of how many tons per year (tpy) of aggregate it produces, how much it consumes, how much it transports to other regions or states—and based on this—how long current reserves can be expected to last given the current rate of depletion. The project scope did not, in this first phase of our study, include a consideration of how the rate of depletion might accelerate or decelerate in future years.

Due to the bowl-shape structure of Michigan's topography, most areas are more dependent on sand-and-gravel (alluvial) sources than on crushed stone (limestone) quarries. With a few minor exceptions, quarries are only found on a few "edges" of the bowl, namely the southeastern corner, the northeastern part of the lower peninsula, and the upper peninsula.

In evaluating the adequacy of local reserves in a particular region, we considered the difficulty of permitting new reserves. What is adequate in a rural region may not be so in a large metro area where permits can be much more difficult to obtain due to environmental concerns or community opposition to industry and truck traffic; and even where obtained, may face operating constraints imposed by permitting agencies (e.g., limiting hours of operation).

Our conclusions are as follows (see map on p. 4 for summary). Southeast Michigan is the area of greatest concern. It already faces a 9.1-million-tpy shortfall (difference between local production and consumption) that has to be made up by material transported from outside the region. There are ample limestone reserves (34 years at current rates), but sand-and-gravel reserves, which are especially critical to the western and northern suburbs of Detroit, have dwindled to 12.7 years. Even a modest acceleration in construction activity could deplete those

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reserves in as little as a decade, and given how difficult it has been for producers to permit new sources in southeast Michigan, it will be a huge challenge to replace these sources.

“Mid-State” is another area of significant concern. This is the area stretching from east to west across the middle of the state, from Flint in the south to the northern Arenac County line (tip of the thumb). Sand-and-gravel reserves are adequate for local consumption, but given how much of this material is being transported to other regions, these reserves will only last 15 years.

Moving to the South Central region (Lansing south to the Ohio border): While this region produces substantially more than it consumes and has a little over 20 years of reserves, these reserves are concentrated in the lower half of the region (going towards the Ohio border). Sand-and-gravel reserves in the four counties surrounding Lansing will last less than 15 years.

A fourth and final area of moderate concern is Southwest Michigan. This area has no limestone, and its sand-and-gravel reserves are currently at 16 years. Constraints on coarse aggregates are a particular concern in this area, as its pits are more sand-intensive and the increasing demand for higher “crushed count” in spec material has created an imbalance in producer stockpiles (this is a challenge in many areas of the state, but particularly so here). However, new reserves have generally not proved as difficult to permit in the southwest region, so this is not yet an area of critical concern.

The two other regions we analyzed, the Northern Lower Peninsula and the Upper Peninsula, have substantial reserves and are home to a number of mega-quarries that supply deep-water ports in western Michigan, Saginaw/Bay City, and Detroit. Much of the production from these quarries is metallurgical stone that goes into the steel industry, but on average, 45 percent of production goes into construction aggregate. So this is a significant end-use market.

The mega-quarries have at least 40 years of reserves (in all likelihood much more), are not currently operating at capacity, and have the ability to add more capacity if there is enough downstream demand.

Another potential source to supply dwindling local reserves in Michigan would be aggregate rail terminals. This is currently a small market: we estimate somewhere between 900,000 and 1,000,000 tpy shipped to terminals in Grand Rapids, Lansing, Flint, Kawkawlin (near Bay City), and Grayling (in the Northern Lower Peninsula). With the exception of Grayling, all of this railed aggregate comes from out of state.

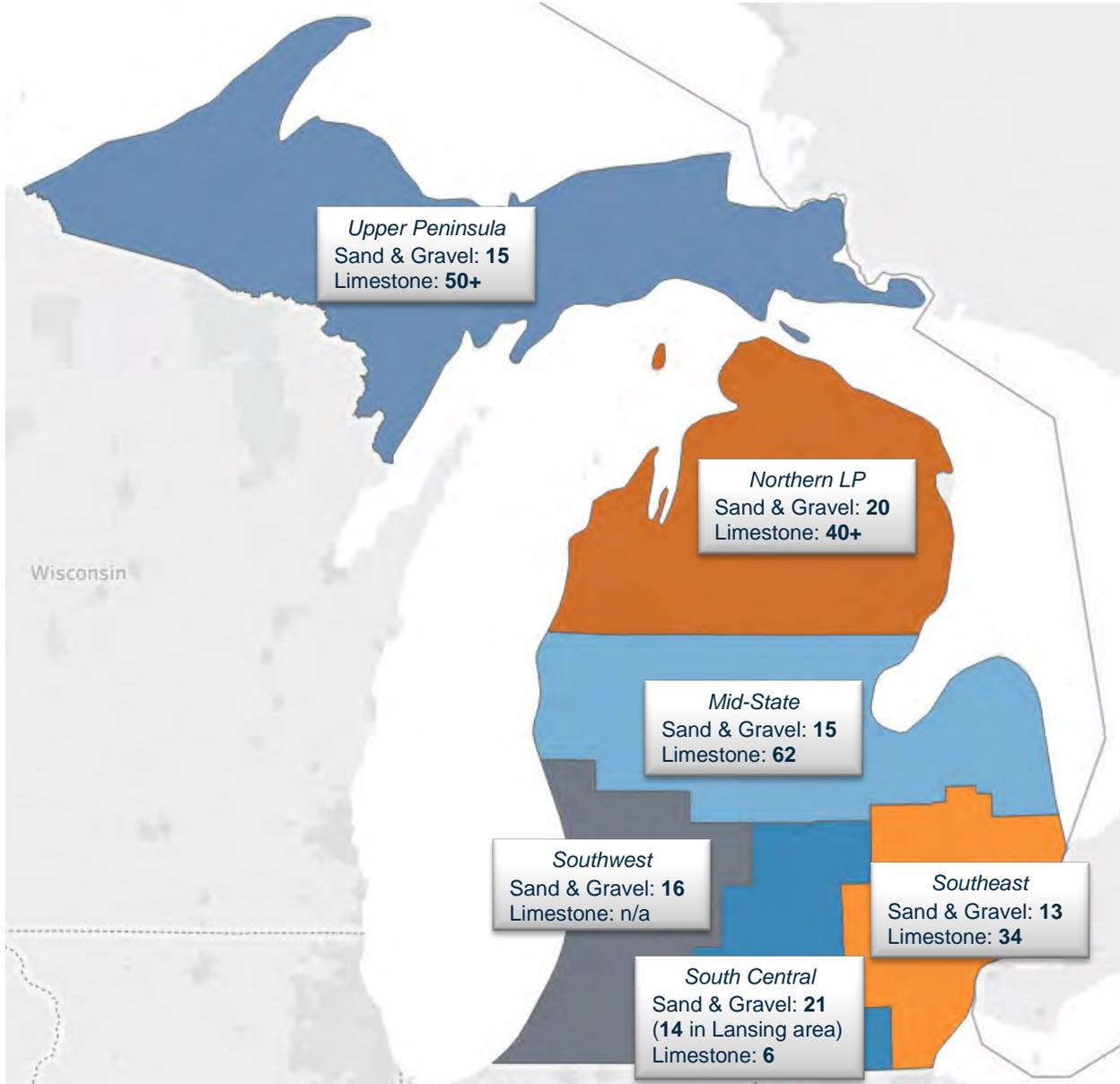
Of course, stone that has to be railed or boated to the market incurs a higher delivered cost once it has to be transported beyond a certain radius from the destination terminal. State and local governments will have to decide if it is worth paying these additional costs, and getting less “bang for each buck” of construction funding, in order to keep aggregate deposits far away. For Phase II of this study, we suggest a detailed investigation of these and other related issues such as changes in truck traffic and environmental impacts, in the specific regions of concern that have been identified in this report. We also recommend projecting whether aggregate usage is likely to increase, decrease, or remain flat in these regions.

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### Years of Aggregate Reserves Remaining by Michigan Aggregate Region



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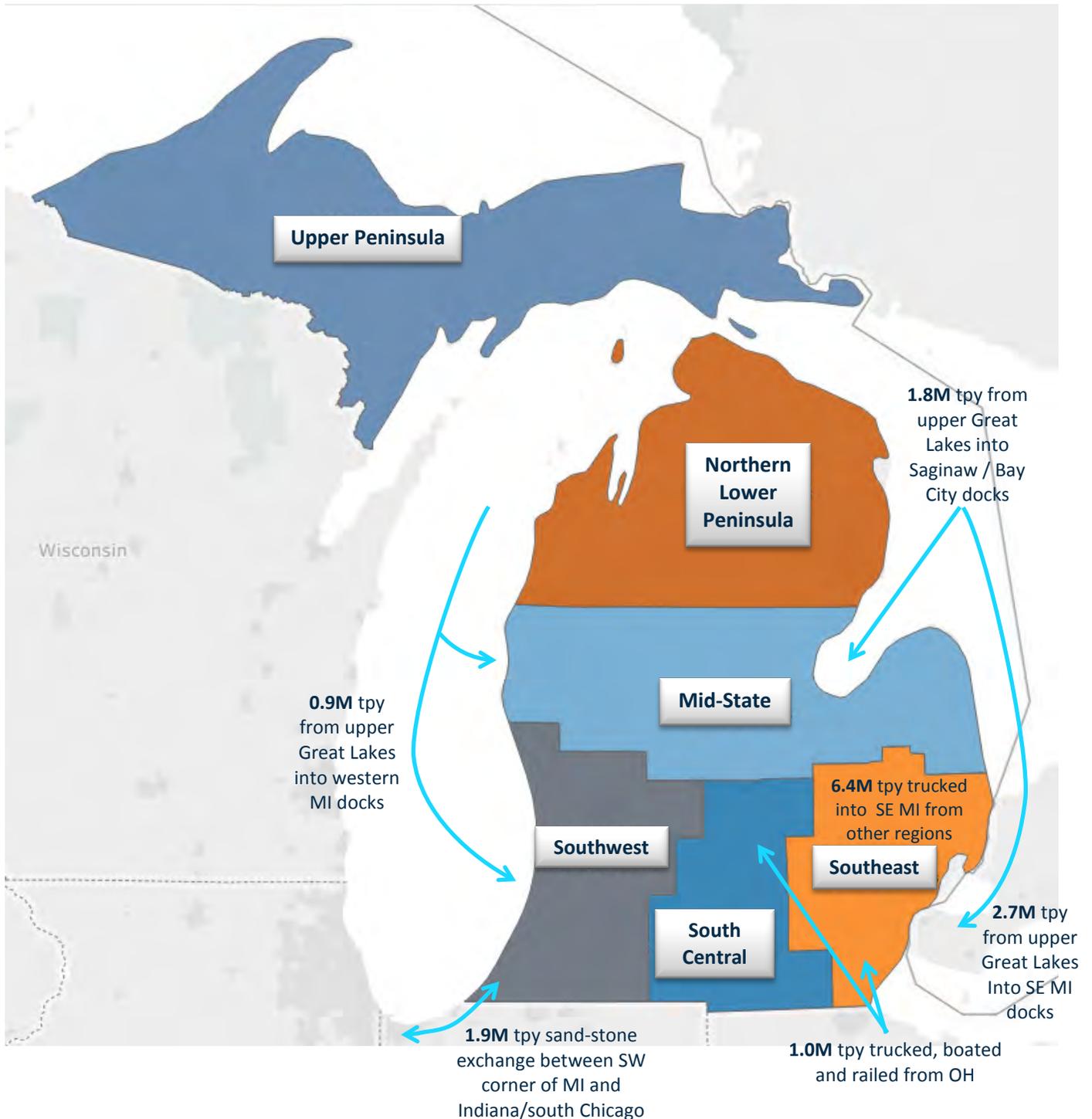
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# Section 2

## Regional Analysis

Michigan Aggregate Regions, Shown with Major Extra-Regional Aggregate Inflows



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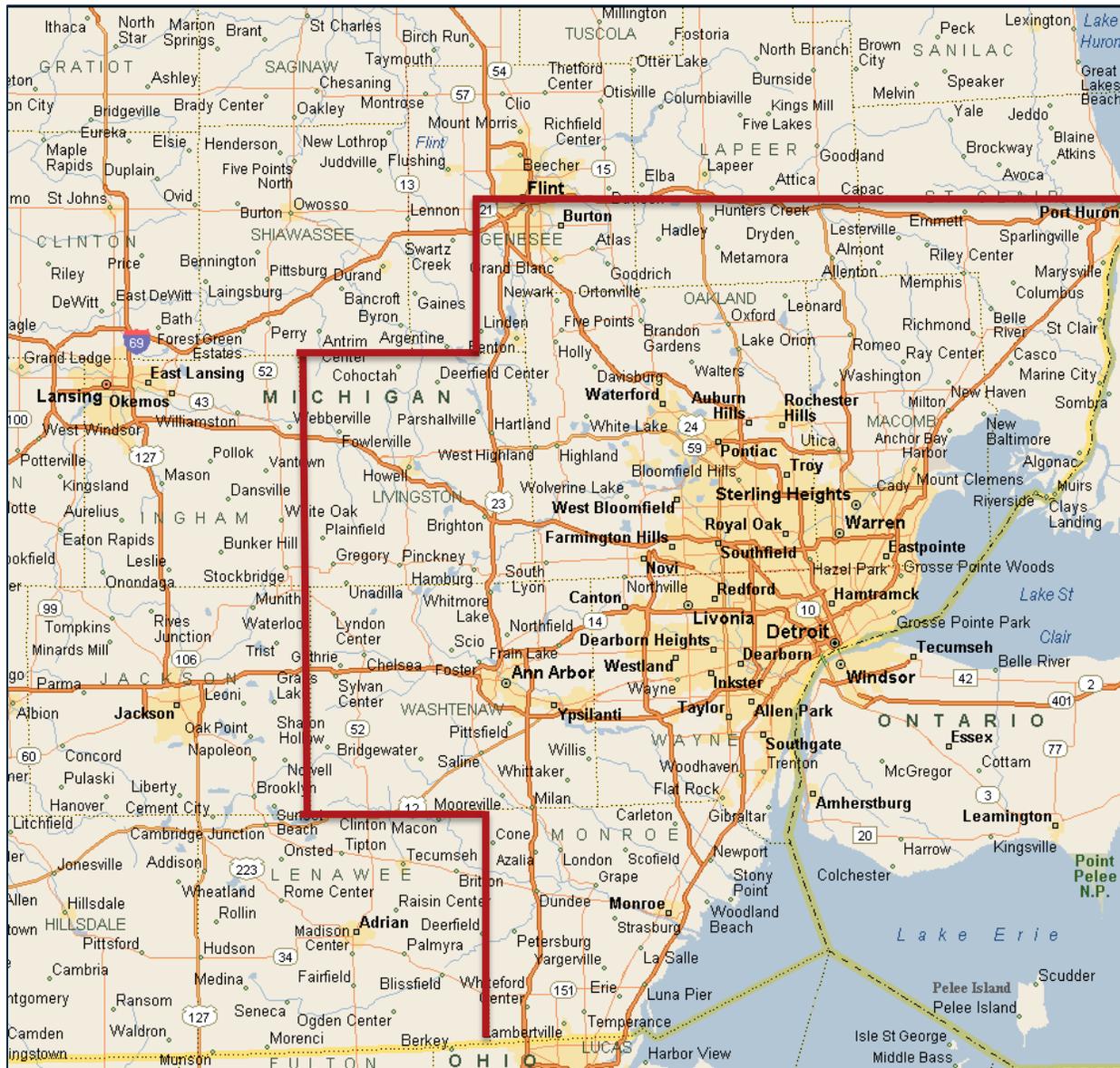
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## Regional Analysis

### Southeast Michigan

The native aggregate sources in this area are limestone quarries located south of the city in Monroe County, slag aggregates produced at steel mills in Detroit and Dearborn, and sand and gravel pits on the western and northern edges of the market.

Southeast Michigan Market Area



As would be expected, Southeast Michigan is the largest aggregates region in the state, with estimated annual consumption of 31.3 million tons. That equates to a per capita consumption rate of roughly 6.0 (6.7 if you include 3.5 million tpy of recycled aggregates). In our industry experience, per capita consumption in similar metro areas elsewhere in the country would typically fall between

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7.5 and 9.0. Detroit’s is presumably lower because its economy has lagged the rest of the U.S. and because Michigan’s highway program has until recently been underfunded.

Local production, including slag aggregates, is only 22.2 million tpy; so the remaining 9.1 million tons has to be made up from outside the region. That shortfall is currently supplied as follows.

About 2.7 million tons is boated from the upper Great Lakes (and a little from Lafarge’s Marblehead Island quarry in Ohio—a softer stone that can only be used for base material) into docks located in Detroit, Dearborn, Marine City and Marysville; and a small amount (roughly 200,000 tpy) is railed into Flint. The remaining 6.4 million tons is trucked in—primarily from sand and gravel pits to the west and north, and a little from out-of-state quarries in the Toledo area.

As indicated in the table to the right, while there are sufficient limestone reserves (34 years), sand and gravel reserves (12.7 years) are running very low for what would be expected in a large metropolitan area. Moreover, of the 146.1 million tons of permitted sand and gravel reserves, 23.5 million is from pits with poorer quality material that can only be used for fill sand.

<b>Southeast Michigan</b>		
Millions of Tons		
<i>Current Annual Rates</i>		
Consumption	31.3	
Production	22.2	
Shortfall	9.1	
<i>Local Reserves at Current Rates</i>		
	Tons	Years
All Aggregate	446.2	20.1
Limestone	300.1	34.1
Sand & Gravel	146.1	12.7

Sand and gravel reserves are diminished because it has become so difficult to permit new sources as the population has expanded. If per-capita consumption rises to the 7.5 – 8.0 range (which is likely to happen with Michigan’s new highway program), existing reserves will last only 10 years.

Not included in the above figures are recycled aggregates, which are about 3.5 million tpy in Southeast Michigan. This production is limited by both the amount and quality of “feed stock” that comes in from construction debris. Only about half of the recycled aggregates produced are suitable for use in highway projects.

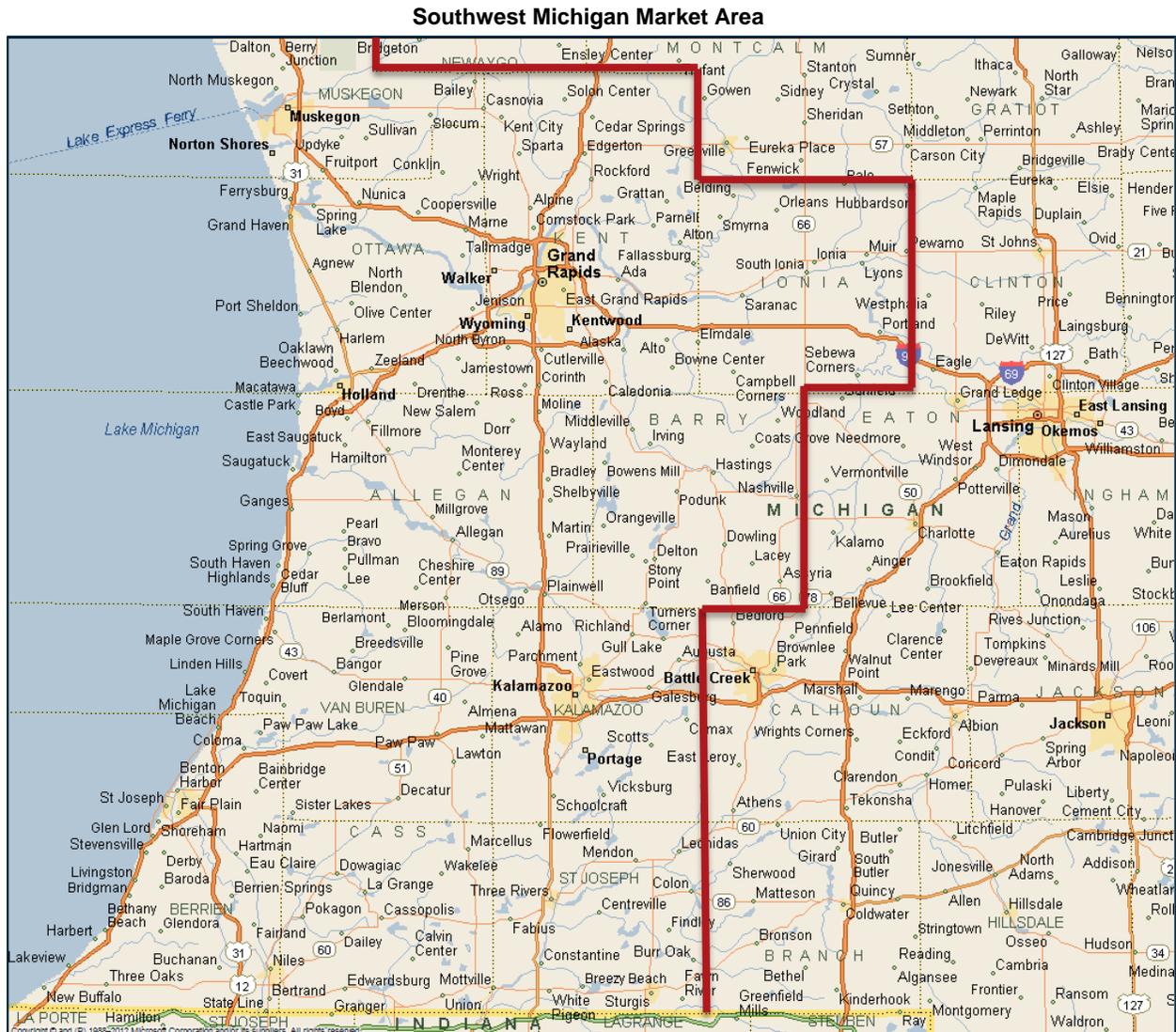
### *Southwest Michigan*

The geology of Southwest Michigan (see definition of market area in the map below) is entirely sand and gravel. There are two small limestone quarries just outside the market area in Eaton County (F.G. Cheney Limestone and Bellevue Limestone, both located in Bellevue), but these sources have limited reserves, and their stone is a softer material that does not meet most MDOT specs. A substantial portion of it goes into the agricultural lime market.

Alluvial deposits in Southwest Michigan generally contains about 70 percent sand and 30 percent gravel if they are located east of U.S. 131. West of that highway, the sand-to-gravel ratio rises to 80

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percent, and approaches 90 percent in the southwest corner near Benton Harbor and Niles. This area (Berrien County and western Cass County) constitutes a distinct submarket: most of its sand is trucked over the border into Indiana and south Chicago, with stone coming on the backhaul. What little stone is in these pits tends to be of poorer quality. The stone brought on the backhaul cannot travel very far (cost-competitively) into Michigan because of the huge discrepancy in weight limits between Indiana (22 tons) and Michigan, which allows 50-ton gravel “trains” (30-ton lead truck and 20-ton “pup” trailer following).



At 14.4 million tpy of consumption, Southwest Michigan’s per-capita figure of 7.8 tons is the highest in the state. Its 1.3 million-tpy shortfall is made up by limestone boated into stone docks in Muskegon, Ferrysburg, Holland and Benton Harbor (an estimated 700,000 tpy), gravel trucked in from south central Michigan and from Mecosta County to the north, limestone trucked all the way from Monroe County in Southeast Michigan, and by limestone railed into Grand Rapids.

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<b>Southwest Michigan</b>		
Millions of Tons		
<i>Current Annual Rates</i>		
Consumption	14.4	
Production	13.1	
Shortfall	<u>1.3</u>	
 <i>Local Reserves at Current Rates</i>		
	<b>Tons</b>	<b>Years</b>
All Aggregate	207.7	15.9
Limestone		
Sand & Gravel	207.7	15.9

<b>South Central Michigan</b>		
Millions of Tons		
<i>Current Annual Rates</i>		
Consumption	5.7	
Production	9.5	
Surplus	<u>3.8</u>	
 <i>Local Reserves at Current Rates</i>		
	<b>Tons</b>	<b>Years</b>
All Aggregate	190.8	20.2
Limestone	1.7	6.3
Sand & Gravel	189.1	20.6

At nearly 16 years, the reserve situation in Southwest Michigan is best categorized as “marginal.” Permitting new reserves is challenging, but with a few exceptions has usually not proved as difficult as it is in Southeast Michigan.

Due to the nature of its aggregate deposits, Southwest Michigan has ample sand supplies but is quite short on stone. The problem has been exacerbated over the last decade as MDOT specs have shifted to require higher crushed counts. The result has been that aggregate mines have been forced to extract stone—which they are already naturally short on due to the nature of the deposits—at an increasingly rapid rate. Southwest Michigan probably has 25 years of sand reserves but only 12 years of the stone it needs.

### *South Central Michigan*

Running from the Lansing MSA (Metropolitan Statistical Area) south to the Ohio state line, this area is a net exporter of aggregates. Its reserves are all sand and gravel, however, so it has to import an estimated 700,000 tpy of limestone, most of that trucked off the stone docks in Saginaw, some railed into Lansing from Ohio, and some trucked from the Monroe County quarries south of Detroit.

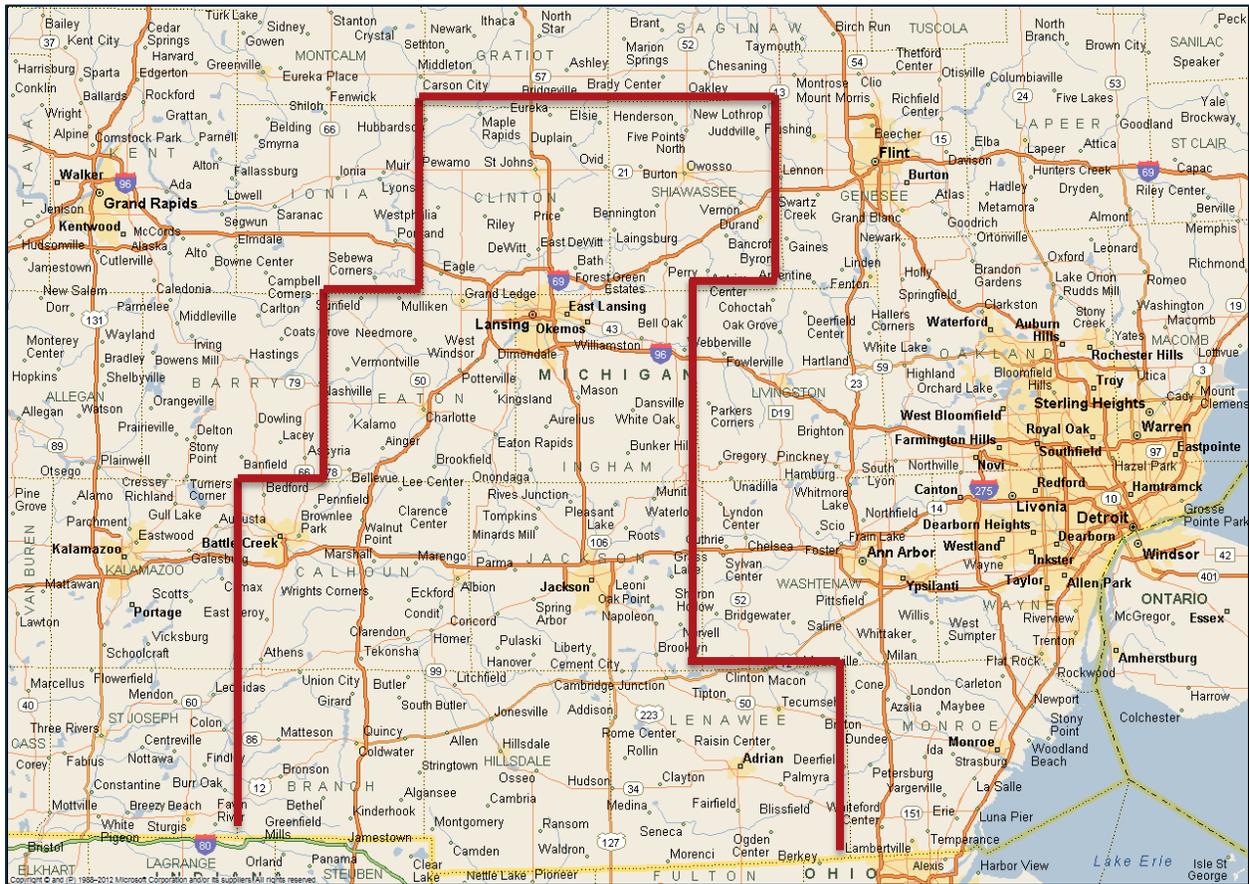
South Central Michigan has 21 years of reserves at current rates of production, but this is a deceptively high figure, as 75 percent of these reserves are located in the lesser populated counties in the southern half of this area (Calhoun, Jackson, Hillsdale and Lenawee). The four counties surrounding Lansing have only 47.0 million tons, which at current rates of production would last 15 years. If Michigan’s new highway program substantially increases the demand for aggregates in the capitol region, that 47.0 million tons of local reserves could be depleted within 10-12 years.

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### South Central Michigan Market Area



### Mid-State Michigan Market Area



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### Mid-State Market

What we are calling the “Mid-State” market cuts across the middle of Michigan’s lower peninsula (see map on previous page). Mid-State’s aggregate reserves, like those of the South Central Region, are all sand and gravel deposits with the exception of two small limestone quarries whose stone does not meet the more stringent MDOT specs.

We estimate total production in this region at 10.4 million tons, 4.5 million of that coming from the “thumb” area east of I-75, the remaining 5.9 million tons originating from pits west of I-75.

The region produces substantially more aggregate than it consumes, but it still has to import 2.0 million tpy of limestone. This is because, as just mentioned, it does not have any high-quality native sources of limestone, and also because many of its pits have a high sand-to-stone ratio and cannot produce enough gravel to satisfy market needs.

Most of the imported limestone is boated into stone docks, concrete plants and hot-mixed asphalt plants on the Saginaw River; the remainder comes into a stone dock at Ludington on the west side of the state, and into a rail terminal in Kawkawlin (near Bay City).

The Saginaw/Bay City area lacks quality sand, so sand pits to the west and east of it can truck their higher quality sand into this area and bring limestone from the docks on the backhaul.

Mid-State does not consume all of its imported limestone. Of the material shipped to the Saginaw River docks, an estimated 650,000 tpy does not stay in the Mid-State region but is trucked into the Lansing and Fleet markets.

A majority of sand and gravel produced in Lapeer, St. Clair and southern Sanilac counties is trucked into southeast Michigan. One of the key sources in this area is the pits located on Deanville Mountain in Lapeer County.

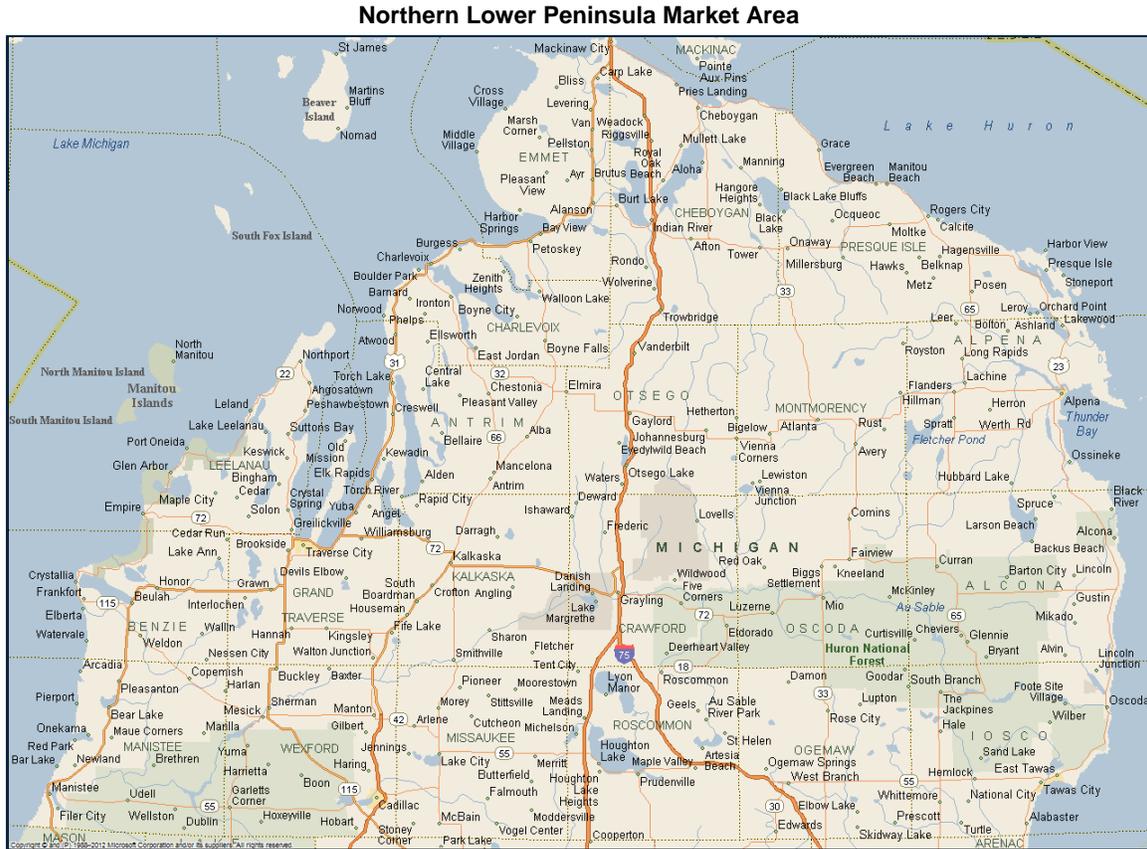
While the Mid-State region’s sand and gravel reserves would be sufficient to satisfy its own aggregate demand for approximately 25 years at current rates of consumption, due to all the material it ships into other regions, especially Southeast Michigan, its current local reserves will only last 15 years—less if demand increases.

<b>Mid-State Michigan</b>		
Millions of Tons		
<i>Current Annual Rates</i>		
Production	10.4	
Boated to Docks	1.9	
Railed	0.1	
Total Agg Shipments	<b>12.4</b>	
Consumption	7.0	
Surplus	5.4	
<i>Local Reserves at Current Rates</i>		
	<b>Tons</b>	<b>Years</b>
All Aggregate	181.2	16.6
Limestone	22.3	61.8
Sand & Gravel	158.9	15.1

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### Northern Lower Peninsula

This area (see map below for definition) has a large surplus of aggregate. It imports very little from other districts and is home to two massive high-calcium limestone quarries on Lake Huron, Carmeuse in Rogers City and LafargeHolcim in Presque Isle, that ship construction aggregate and other limestone products into various destinations on the Great Lakes.



These quarries, along with others on the upper Great Lakes, ship construction aggregate, metallurgical stone to steel mills, and a small amount of material for other uses (e.g., “sugar stone” that goes to sugar plants in Saginaw/Bay City). Michigan is a significant destination for this material, but there are a number of out-of-state destinations as well: Sarnia/Windsor, Ont.; Cleveland (the largest market on the Great Lakes for boated construction aggregate), Erie, Pa., and Chicago.

The proportion between metallurgical stone and construction aggregate (their two main end-uses) varies depending on how active the construction and steel industries are in a given year, but a general rule of thumb is that roughly 45 percent of production goes to construction aggregates.

Most inland production in the Northern Lower Peninsula (NLP) is sand and gravel, and there are no limestone sources west of I-75. There are eight smaller limestone quarries east of I-75. Five of these are located near the coast of Lake Huron in Rogers City and Alpena and are thus not strategically positioned to supply most of the NLP market. Three are more centrally located (in Afton and

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Onaway, five and 18 miles east of I-75, respectively); however, the stone in these more centrally located quarries does not meet MDOT specs for use in structural concrete, so they can only be used for base material and shoulder stone.

Gravel produced in the NLP is of varying quality. In the northwest area surrounding Traverse City, the gravel is of high quality, and the deposits, unlike most in Michigan, have more coarse than fine aggregates or at least a 50/50 balance between the two.

However, gravel deposits in the central part of the NLP (in the vicinity of I-75) have too much shale and chert in them to be used in higher-spec concrete mixes. So most of the concrete market—at least producers who are supplying higher-spec concrete—has converted to limestone, and this limestone has to be sourced from quarries on or near Lake Huron. Accordingly, gravel stone is now primarily used in hot-mixed asphalt and for base material.

The NLP region has one limestone quarry on the rail, Specification Stone in Alpena. It has a small local truck market, but most of its material is railed into Kawkawlin (near Bay City) and Lansing. It also serves as a depot for stone trucked from Lafarge Presque Isle and then railed south to Kawkawlin, then north into Grayling to a terminal owned by a ready-mixed concrete producer.

The table on the right summarizes the NLP’s current production and reserves. Sand and gravel reserves average almost 20 years, which is sufficient for under-populated regions where permitting new sources is not as difficult, and where it doesn’t make sense to permit substantial reserves given that local demand is small, with episodic spikes due to unusual projects.

Traverse City is one area of the NLP that *has* historically been difficult to permit aggregate reserves, and this region was in fact the locale of a landmark case on gravel mining rights, *Kyser v. Kasson Township*, that ultimately led to Michigan’s Public Act 113 (passed in 2011). Kasson Township has set up a designated gravel mining district. Reserves in this area will last 25 years at current production rates.

Limestone reserves are at least 200 million tons, and the true figure is likely double this. Even the smaller inland quarries in Rogers City and Alpena, which have higher quality stone than the inland limestone quarries in Afton and Onaway, are operating well below capacity. So the NLP has an abundance of reserves to satisfy both its own needs and those of other regions that depend on it.

<b>Northern LP of Michigan</b>		
Millions of Tons		
<i>Current Annual Rates</i>		
Limestone Production*	5.9	
S&G Production	2.3	
Total Production	<b>8.2</b>	
Consumption	2.8	
Surplus	5.4	
* Construction Aggregate Only		
<i>Local Reserves at Current Rates</i>		
	<b>Tons</b>	<b>Years</b>
All Aggregate	245.0+	30.0+
Limestone	200.0+	40.0+
Sand & Gravel	45.0	19.6

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## Upper Peninsula

Michigan's Upper Peninsula (UP) has a similar abundance of construction aggregate reserves. Carmeuse has three quarries on the UP: the Port Inland quarry in Gulliver, which is the primary supplier of high-calcium limestone to western Michigan ports, a dolomitic limestone quarry in Cedarville, and a quarry on Drummond Island (acquired from Osborne Materials in April 2016).

There are also two Canadian sources that ship construction aggregate on the Great Lakes: Lafarge's Manitoulin quarry (a dolomitic limestone source on Manitoulin Island), and Ontario Trap Rock in Bruce Mines, Ont. (owned by Canada's Tomlinson Group).

Most inland mines on the UP are smaller due to the limited local demand with episodic spikes from local projects. There are a number of sources that are only mined occasionally when there are significant projects in the area. Graymont is attempting to permit a new quarry in Rexton (also known as the Hendricks Quarry), about 12 miles inland. This would be a very large operation that would have a limited local truck market and would primarily serve the Great Lakes water-shipment market, albeit at a transportation disadvantage, since it would have to truck material 12 miles south to a dock in Moran for transloading onto water vessels.

Even without the Rexton project, we estimate that the aforementioned UP and Canadian quarries have 600 million tons of reserves. Inland sources (Payne & Dolan and Bacco Construction are the primary operators) have not proved especially difficult to permit as needed. So Michigan's upper peninsula, even more so than its lower, is well set to meet projected local demand and the needs of other regions that depend on it.

Upper Peninsula Market Area



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*Regional Depletion of Current Limestone and Sand & Gravel Reserve in MI Over Next 15 Years*

Millions of Tons | Assuming Flat Demand | **Highlighted = Under 10 Years Remaining**

*Southeast*

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
S&G	146.1	134.6	123.2	111.7	100.2	88.7	77.3	65.8	54.3	42.8	31.4	19.9	8.4	0.0	0.0
Limestone	300.1	291.3	282.5	273.7	264.9	256.1	247.3	238.5	229.7	220.9	212.1	203.3	194.5	185.7	176.9
Combined	<b>446.2</b>	<b>425.9</b>	<b>405.7</b>	<b>385.4</b>	<b>365.1</b>	<b>344.8</b>	<b>324.6</b>	<b>304.3</b>	<b>284.0</b>	<b>263.7</b>	<b>243.5</b>	<b>223.2</b>	<b>202.9</b>	<b>185.7</b>	<b>176.9</b>

*South Central*

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
S&G	189.1	179.9	170.7	161.6	152.4	143.2	134.0	124.8	115.7	106.5	97.3	88.1	78.9	69.8	60.6
Limestone	1.7	1.4	1.2	0.9	0.6	0.4	0.1								
Combined	<b>190.8</b>	<b>181.4</b>	<b>171.9</b>	<b>162.5</b>	<b>153.0</b>	<b>143.6</b>	<b>134.1</b>	<b>124.8</b>	<b>115.7</b>	<b>106.5</b>	<b>97.3</b>	<b>88.1</b>	<b>78.9</b>	<b>69.8</b>	<b>60.6</b>

*Breakout of Lansing Area S&G Reserves from South Central Region*

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	47.0	43.8	40.6	37.5	34.3	31.1	27.9	24.7	21.6	18.4	15.2	12.0	8.8	5.7	2.5

*Southwest*

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
S&G	207.7	194.6	181.5	168.4	155.3	142.2	129.1	116.0	103.0	89.9	76.8	63.7	50.6	37.5	24.4
Limestone															
Combined	<b>207.7</b>	<b>194.6</b>	<b>181.5</b>	<b>168.4</b>	<b>155.3</b>	<b>142.2</b>	<b>129.1</b>	<b>116.0</b>	<b>103.0</b>	<b>89.9</b>	<b>76.8</b>	<b>63.7</b>	<b>50.6</b>	<b>37.5</b>	<b>24.4</b>

*Mid-State*

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
S&G	153.9	143.9	133.9	123.9	113.9	103.9	93.9	83.9	73.9	63.9	53.9	43.8	33.8	23.8	13.8
Limestone	22.3	21.94	21.58	21.22	20.86	20.5	20.14	19.78	19.42	19.06	18.7	18.34	17.98	17.62	17.26
Combined	<b>176.2</b>	<b>165.8</b>	<b>155.5</b>	<b>145.1</b>	<b>134.7</b>	<b>124.4</b>	<b>114.0</b>	<b>103.6</b>	<b>93.3</b>	<b>82.9</b>	<b>72.6</b>	<b>62.2</b>	<b>51.8</b>	<b>41.5</b>	<b>31.1</b>

*Northern Lower Peninsula*

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
S&G	49.3	47.1	44.8	42.6	40.3	38.1	35.8	33.6	31.4	29.1	26.9	24.6	22.4	20.2	17.9
Limestone	300.0	287.7	275.5	263.2	250.9	238.7	226.4	214.1	201.8	189.6	177.3	165.0	152.8	140.5	128.2
Combined	<b>349.3</b>	<b>334.8</b>	<b>320.3</b>	<b>305.8</b>	<b>291.3</b>	<b>276.7</b>	<b>262.2</b>	<b>247.7</b>	<b>233.2</b>	<b>218.7</b>	<b>204.2</b>	<b>189.7</b>	<b>175.2</b>	<b>160.6</b>	<b>146.1</b>

*Upper Peninsula*

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
S&G	30.0	29.1	28.1	27.2	26.2	25.3	24.3	23.4	22.4	21.5	20.5	19.6	18.6	17.7	16.7
Limestone	400.0	388.8	377.6	366.4	355.2	344.0	332.8	321.6	310.4	299.2	288.0	276.8	265.6	254.4	243.2
Combined	<b>430.0</b>	<b>417.9</b>	<b>405.7</b>	<b>393.6</b>	<b>381.4</b>	<b>369.3</b>	<b>357.1</b>	<b>345.0</b>	<b>332.8</b>	<b>320.7</b>	<b>308.5</b>	<b>296.4</b>	<b>284.2</b>	<b>272.1</b>	<b>259.9</b>

*Entire State*

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
S&G	776	729	682	635	588	541	494	447	401	354	307	260	213	169	133
Limestone	1024	991	958	925	893	860	827	794	761	729	696	663	631	598	566
Combined	<b>1800</b>	<b>1720</b>	<b>1641</b>	<b>1561</b>	<b>1481</b>	<b>1401</b>	<b>1321</b>	<b>1241</b>	<b>1162</b>	<b>1082</b>	<b>1003</b>	<b>923</b>	<b>844</b>	<b>767</b>	<b>699</b>