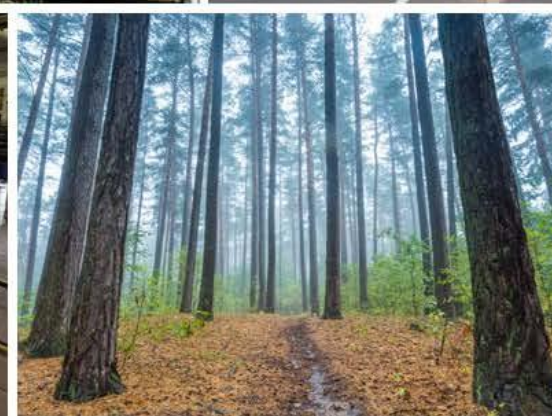


ECONOMIC IMPACT OF FERROUS AND NONFERROUS MINING

on Minnesota and the Arrowhead Region
including Douglas County, Wisconsin

June 3, 2020



BUREAU OF BUSINESS AND
ECONOMIC RESEARCH

Research Team

UMD Labovitz School of Business and Economics

Bureau of Business and Economic Research

Monica Haynes, Director
Gina Chiodi Gensing, Editor/Writer
Megan Badger, Undergraduate Research Assistant
Nathan Brand, Undergraduate Research Assistant
Matthew Hockert, Undergraduate Research Assistant
Haakan Thorsgard, Undergraduate Research Assistant
Bureau of Business and Economic Research
11 East Superior Street, Suite 210
Duluth, MN 55802
(218) 726-7895
z.umn.edu/bber

Project Contact

Kelsey Johnson, President
Iron Mining Association of Minnesota
324 West Superior Street
Suite 502
Duluth, MN 55802
218-722-7724
kjohnson@taconite.org

The Bureau of Business and Economic Research extends a thank you to industry representatives from ArcelorMittal Minorca; Hibbing Taconite Company; Keewatin Taconite; Mesabi Nugget Delaware, LLC; Mining Resources, LLC; Minntac; Northshore Mining; United Taconite, LLC; PolyMet Mining, Inc.; Teck American, Inc.; Twin Metals, LLC; Vermillion Gold, Inc.; and others for their willingness to provide information. The BBER also thanks representatives from the Minnesota Department of Revenue for their assistance with fact-finding and background information.

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

Table of Contents

Executive Summary.....	vii
I. Project Description.....	1
Study Area	2
II. Ferrous and Nonferrous Mining Industry Trends	4
III. Economic Impacts	9
Inputs Used for Modeling.....	9
Ferrous Mining Impacts	13
Arrowhead Region and Douglas County, Wisconsin.....	13
State of Minnesota.....	18
Nonferrous Mining Impacts	19
Arrowhead Region and Douglas County, Wisconsin.....	19
State of Minnesota.....	22
Ferrous and Nonferrous Mining Impacts	24
Arrowhead Region and Douglas County, Wisconsin.....	24
State of Minnesota.....	27
IV. Tax Impacts.....	30
Ferrous Mining Tax Impacts	30
Nonferrous Mining Tax Impacts.....	32
V. Survey of Mining Related Firms	33
VI. Conclusions	42
Appendix A. Definitions Used in this Report.....	43
Appendix B. Input-Output Modeling.....	45
Data Sources	45
Modeling Assumptions.....	45
Appendix C. Taxes, School Support, and Minnesota’s Mineral Revenue	47

Table of Figures

Figure 1. Location of Mines on the Iron Range in the Arrowhead Region.....	1
Figure 2. Counties of Minnesota’s Arrowhead Region and Douglas County, Wisconsin	2
Figure 3. Top 25 Industries in Study Area by Value Added on the Arrowhead Region (2018)	3
Figure 4. Production Estimates of Taconite on the Arrowhead Region.....	4
Figure 5. Comparison of Duluth-Superior MSA GRP to Local Industries’ GRPs	5
Figure 6. Ferrous and Nonferrous Annual Operating Budget on the Arrowhead Region (2019-2024),	11
Figure 7: Proposed Capital and Construction Spending on the Arrowhead Region (2020-2024) Millions of Dollars	12
Figure 8. Top 20 Industries Impacted by Ferrous Mining Operations	15
Figure 9. Top 20 Industries Impacted by Ferrous Mining Operations on the Arrowhead Region by Value Added (2019), Millions of Dollars	16
Figure 10. Ferrous Mining Sensitivity Analysis of Projected Employment on the Arrowhead Region	17
Figure 11. Ferrous Mining Sensitivity Analysis of Projected Employment on the State of Minnesota	19
Figure 12. Top 20 Industries Impacted by Nonferrous Mining Operations, by Value Added (2019) Millions of Dollars on the Arrowhead Region	21
Figure 13. Nonferrous Mining Sensitivity Analysis of Projected Employment on the Arrowhead Region ..	22
Figure 14. Nonferrous Mining Sensitivity Analysis of Projected Employment on the State of Minnesota	24
Figure 15. Capital Expenditure and Construction Spending’s Sensitivity Analysis of Projected Employment.....	26
Figure 16. Capital Expenditure and Construction Spending’s Sensitivity Analysis of Projected Employment.....	29
Figure 17. What sector is your business in? (n=60)	33
Figure 18. How many employees does your business have at your specific location? (n=59)	34
Figure 19. What is the average hourly starting wage paid to employees in each category? (n=48).....	35
Figure 20. Of all positions at your company, what percentage of positions requires the following degrees (as a final degree completed)? Total should sum to 100% (n=47)	36
Figure 21. What portion of your company’s annual revenue can be attributed to the mining industry? (n=52)	36
Figure 22. How did the following factors change, if at all, for your business in the past six months? (n=52)	37

Figure 23. How will the following factors change, if at all, for your business in the next six months? (n=51)	38
Figure 24. How did the general business conditions change, if at all, for	38
Figure 25. How will the general business conditions change, if at all, for	39
Figure 26. How much of the change in business activity over the past six months	40
Figure 27. How much does your general business outlook for the next six months depend on your expectations for the region’s mining industry? (n=50)	40
Figure 28. What factors, if any, are limiting your ability to increase business activity? Select all that apply (n=59)	41

Table of Tables

Table 1. Percentage Change in Employment on the Arrowhead Region (2009-2018) and Location Quotient by Super Sector	7
Table 2. Participating Ferrous and Nonferrous Mines	9
Table 3. Inputs Used in Modeling Ferrous Mining Impacts on the Arrowhead Region (2019-2024), Millions of Dollars	10
Table 4. Inputs Used in Modeling Nonferrous Mining Impacts on the Arrowhead Region (2019-2024), Millions of Dollars	10
Table 5. Sectors Used in Modeling Ferrous and Nonferrous Mining Operations in the Arrowhead Region (2019-2024)	12
Table 6. Sectors Used in Modeling Capital and Construction Expenditures in the Arrowhead Region (2020-2024)	12
Table 7. Economic Impacts from Ferrous Mining Operations on the Arrowhead Region (2019), Millions of Dollars	13
Table 8. Projected Economic Impacts from Ferrous Mining Operations on the Arrowhead Region (2019-2024), Millions of Dollars	14
Table 9. Projected Ferrous Mining Sensitivity Analysis on the Arrowhead Region (2024), Millions of Dollars	17
Table 10. Economic Impacts from Ferrous Mining Operations	18
Table 11. Projected Economic Impacts from Ferrous Mining Operations	18
Table 12. Projected Ferrous Mining Sensitivity Analysis for the State of Minnesota (2024), Millions of Dollars	19
Table 13. Economic Impacts from Nonferrous Mines Operations on the Arrowhead Region (2019), Millions of Dollars	20
Table 14. Projected Economic Impacts from Nonferrous Mining Operations on the Arrowhead Region	

(2019-2024), Millions of Dollars.....	20
Table 15. Projected Nonferrous Mining Sensitivity Analysis on the Arrowhead Region (2024), Millions of Dollars	21
Table 16. Economic Impacts from Nonferrous Mining Operations	23
Table 17. Projected Economic Impacts from Nonferrous Mining Operations.....	23
Table 18. Projected Nonferrous Mining Sensitivity Analysis on the State of Minnesota (2024), Millions of Dollars	23
Table 19. Economic Impacts from Ferrous and Nonferrous	24
Table 20. Projected Economic Impacts from Ferrous and Nonferrous.....	25
Table 21. Projected Ferrous and Nonferrous Mining Sensitivity Analysis on the Arrowhead Region (2024), Millions of Dollars	25
Table 22. Projected Economic Impacts from Ferrous and Nonferrous.....	26
Table 23. Projected Construction and Capital Expenditure Sensitivity Analysis on the Arrowhead Region (2021), Millions of Dollars	26
Table 24. Top 25 Industries Impacted by Ferrous and Nonferrous Mining	27
Table 25. Economic Impact Modelling for Combined Mining Operations.....	28
Table 26. Total Projected Economic Impacts from Combined Mining Operations.....	28
Table 27. Total Projected Impacts from Capital Expenditure and Construction on the State of Minnesota	28
Table 28. Minnesota's Iron Mines Direct Support for the State of Minnesota, 2019.....	30
Table 29. Minnesota's Iron Mining Industry Support for Education, 2018, in Millions	31
Table 30. Minnesota Ferrous Mineral Royalties and Rentals Receipts, 2017 and 2018, in Millions of Dollars	31
Table 31. Minnesota Nonferrous Mineral Royalties and Rentals Receipts, 2017 and 2018 in Thousands of Dollars.....	32

DISCLAIMER –The Bureau of Business and Economic Research (BBER) at the University of Minnesota Duluth’s (UMD) Labovitz School was contacted by the Iron Mining Association (IMA) and Mining Minnesota as an unbiased research entity. Publication and dissemination of this report, or any of its data, is not an endorsement by the BBER/UMD of the IMA/Mining Minnesota or their projects. The BBER was asked to supply an economic impact analysis only. This analysis does not consider the social or environmental impacts of the project and should not be viewed as a cost benefit analysis or environmental impact assessment.

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

Executive Summary

The northeast region of Minnesota, often referred to as the Iron Range, has a history of iron ore mining dating back to the 1880s. While the focus of mining to date has been iron deposits (known as ferrous mining), the ores also contain a variety of base and precious metals including copper and nickel. Minnesota currently has six operating taconite plants, all located on the Mesabi Range. In addition, a number of companies are pursuing copper-nickel mining in the same area.

The UMD Labovitz School of Business and Economics' research bureau, the Bureau of Business and Economic Research (BBER), was contacted by the Iron Mining Association of Minnesota and Mining Minnesota to study and estimate the economic impacts of construction and operations for ferrous and nonferrous mining on Minnesota and the Arrowhead Region including Douglas County, Wisconsin.

The objectives of the study include:

- To study the recent economic trends of the ferrous and nonferrous mining industries and describe the size of the mining industry relative to the economic base of the study area.
- To model the economic impacts of the ferrous and nonferrous mining industry, including the current and projected impacts of the industry's operations and projected capital expenditures.
- To report on Minnesota mining-related taxes paid by the mining industry.
- To report on the business confidence of mining-related firms in the study area.

According to 2018 data from the Quarterly Census of Employment and Wages (QCEW), the mining industry grew by 37% between 2009 and 2018, adding 1,138 jobs. This growth rate was significantly higher than any of the other top 20 industries in the Arrowhead Region. Relative to the size of the area's economy, mining also employs a

significant number of workers. In the past ten years, the industry has seen a significant growth in production and GDP levels, with much of that growth during the most recent three-year period. In 2018, the mining industry directly contributed more than \$2.0 billion to the economy of the Arrowhead Region.

To estimate the current and projected economic impacts of the ferrous and nonferrous mining industry, the research team developed a survey that asked representatives from each of the mines in the study area to estimate the current and projected number of employees, wages/benefits, annual operation expenditures, and investment projections at their location. Of the 13 existing and planned mine locations in the study area (eight ferrous and five nonferrous), 12 mines participated in the survey, for a 92% response rate.

According to company expectations, the number of employees at the ferrous mines is not expected to increase, but annual operating expenses are expected to increase at a rate of 1% annually.

In 2019, there were 46 people directly employed by the nonferrous mining companies within the study area and operating expenses for the industry were more than \$63 million. By the year 2024, one of the four nonferrous mines is expected to be operational, and an additional one to two will have proposed mine projects in environmental review. By that time, the nonferrous mines are expecting to have employed 436 workers, an increase of roughly 950% over the 2019 baseline. Similarly, by 2024, operating expenses are projected to quadruple in size in comparison to the baseline year. The nonferrous mines predict sizable construction and capital projects as they become operational, with construction spending expected to peak in 2022.

According to the results of modeling, in 2019 ferrous mining contributed nearly 8,800 jobs in the Arrowhead Region. Nearly 4,000 of those were

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

employed directly in the mining industry, while an additional 4,960 were created in other parts of the regional economy through indirect and induced effects. The employment multiplier of 2.25 suggests that for every individual job created within the mining industry an additional 1.25 jobs were created in other industries within the region. It is projected that in 2024 the ferrous mining industry will support more than 8,350 jobs in the Arrowhead Region and contribute nearly \$790 million in labor income (wages), \$1.5 billion in value added, and \$3.29 billion in output to the region's economy.

In 2019, 46 jobs were supported directly by nonferrous mining and 71 additional jobs were indirectly supported by the nonferrous mining industry in the region for a total employment effect of 117 jobs in 2019 (2.55 multiplier). In total, the nonferrous mining industry added more than \$10 million in labor income, \$62 million in value added spending, and more than \$77 million in output to the Arrowhead Region's economy in 2019. By 2024, it is projected that the nonferrous mining industry could contribute \$45 million in labor income, \$210 million in value added, and \$307 million in output to the study area's economy.

Economic impacts from ferrous and nonferrous mining are even greater when using the state of Minnesota as the study area, as the initial round of spending from the mines' operations has a larger ripple effect in a larger study area.

For example, when the mines purchase goods and services from companies that are located beyond the Arrowhead Region but within the state, those purchases are included in the economic impacts for the state.

In 2019, ferrous and nonferrous mining combined contributed more than 11,600 jobs, \$1.0 billion labor income, \$2.1 billion in value added spending, and more than \$4.0 billion to the state's economy. By 2024, the ferrous and nonferrous mining industry combined is expected to support roughly 11,200 jobs, \$1.1 billion in labor income, and \$4.1 billion in output statewide.

Impacts from the mines' capital and construction spending are projected to peak in 2022. In that year alone, construction and capital spending on the part of the ferrous and nonferrous mines is expected to add more than 12,000 jobs, \$815 million in labor income, \$776 million in value added spending, and \$1.5 billion in total output to the state of Minnesota.

In addition, Minnesota's iron mines paid \$158.7 million in production tax, occupation tax, sales and use tax, income tax, various Ad Valorem and property taxes and royalties and rentals on state minerals in 2018. Nearly \$53 million of that total went directly to fund the state's education system, \$7 million to university-related expenses and \$46 million to public schools.

Finally, a survey of mining-related businesses found that businesses that depend upon and support the mining industry tend to have higher-than-average wages than the average for the state. In addition, nearly 40% of occupations at mining-related firms required only a high school diploma as a final degree completed. Surveyed businesses were very positive about recent business performance but cautious about the future. The most common reason given for factors limiting companies' ability to increase business activity included lack of demand, competition, and uncertainty about the performance of the mining industry.

★ ★ ★

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

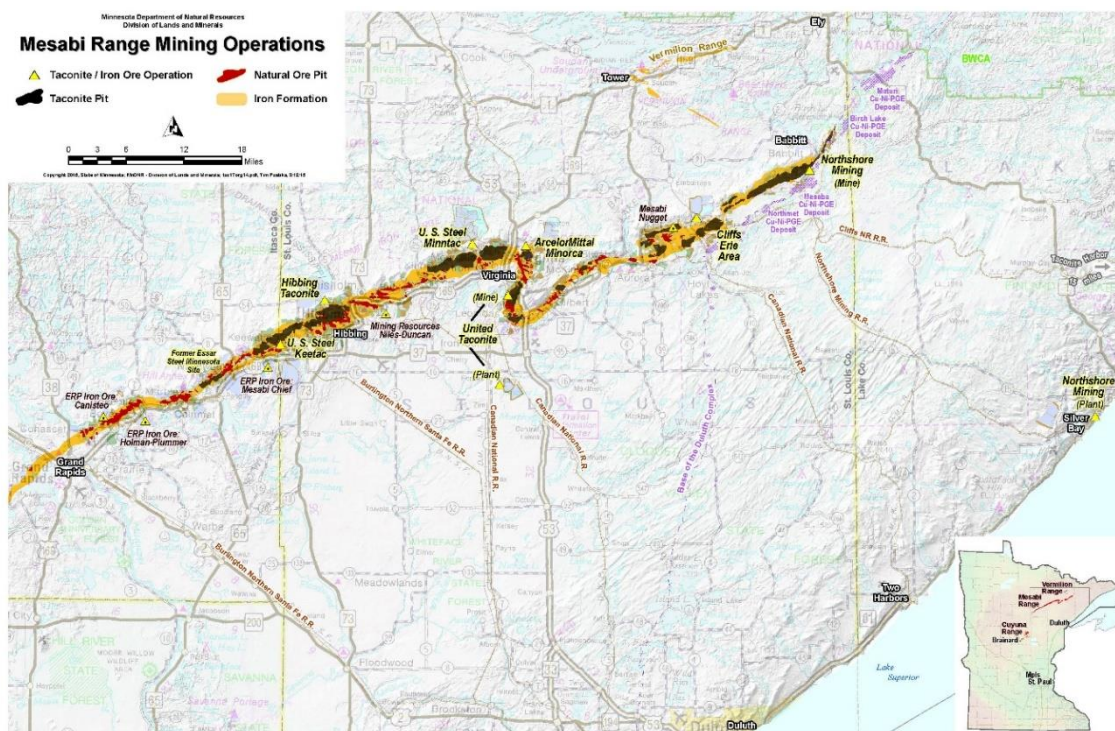
Economic Impact of Ferrous and Nonferrous Mining on Minnesota and the Arrowhead Region with Douglas County, Wisconsin

I. Project Description

The northeast region of Minnesota, often referred to as the "Iron Range," has a history of iron ore mining dating back to the 1880s. While the focus of mining to date has been iron deposits (known as ferrous mining), the ores also contain a variety of base and precious metals including copper, nickel, platinum, palladium, cobalt, and gold.¹ Minnesota currently has six operating taconite plants, all located on the Mesabi Range. In addition, a number of companies are pursuing copper-nickel mining in the same area.² The locations of current mines are shown in Figure 1.

The mining industry is an integral part of the state's economy, especially in Northern Minnesota. According to Minnesota's Department of Employment and Economic Development (DEED), the industry paid more than \$500 million in wages to nearly 6,000 workers in 2018; nearly all of those workers were employed in Minnesota's Arrowhead Region.

Figure 1. Location of Mines on the Iron Range in the Arrowhead Region



SOURCE: IRON MINING ASSOCIATION OF MINNESOTA

¹ <https://www.leg.state.mn.us/lrl/guides/guides?issue=coppennickel>

² <https://www.dnr.state.mn.us/education/geology/digging/mining.html>

The UMD Labovitz School of Business and Economics’ research bureau, the Bureau of Business and Economic Research (BBER), was contacted by the Iron Mining Association of Minnesota and Mining Minnesota to study and estimate the economic impacts³ of construction and operations for ferrous and nonferrous mining on Minnesota and the Arrowhead Region including Douglas County, Wisconsin. The BBER completed a similar study in 2012.

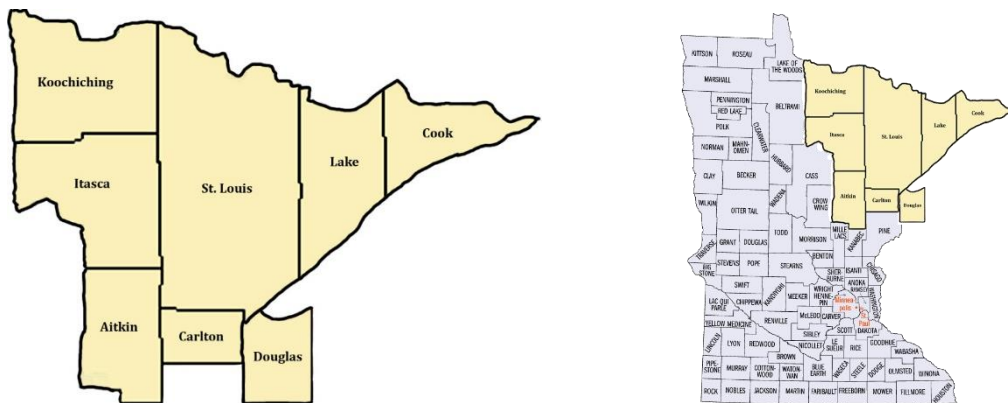
The objectives of the study are:

- To study the recent economic trends of the ferrous and nonferrous mining industries and describe the size of the mining industry relative to the economic base of the study area.
- To model the economic impacts of the ferrous and nonferrous mining industry, including the current and projected impacts of the industry’s operations and projected capital expenditures.
- To report on Minnesota mining-related taxes paid by the mining industry.
- To report on the business confidence of mining-related firms in the study area.

Study Area

There are two geographic scopes for this economic impact analysis. The first study area is the Arrowhead Region of Minnesota— Aitkin, Cook, Itasca, Koochiching, Lake, St. Louis, and Carlton Counties along with Douglas County in Wisconsin. The second study area includes the state of Minnesota. The figures below and on the following page provide insight on the regional economy of both study areas as background information for the results of the report.

Figure 2. Counties of Minnesota’s Arrowhead Region and Douglas County, Wisconsin

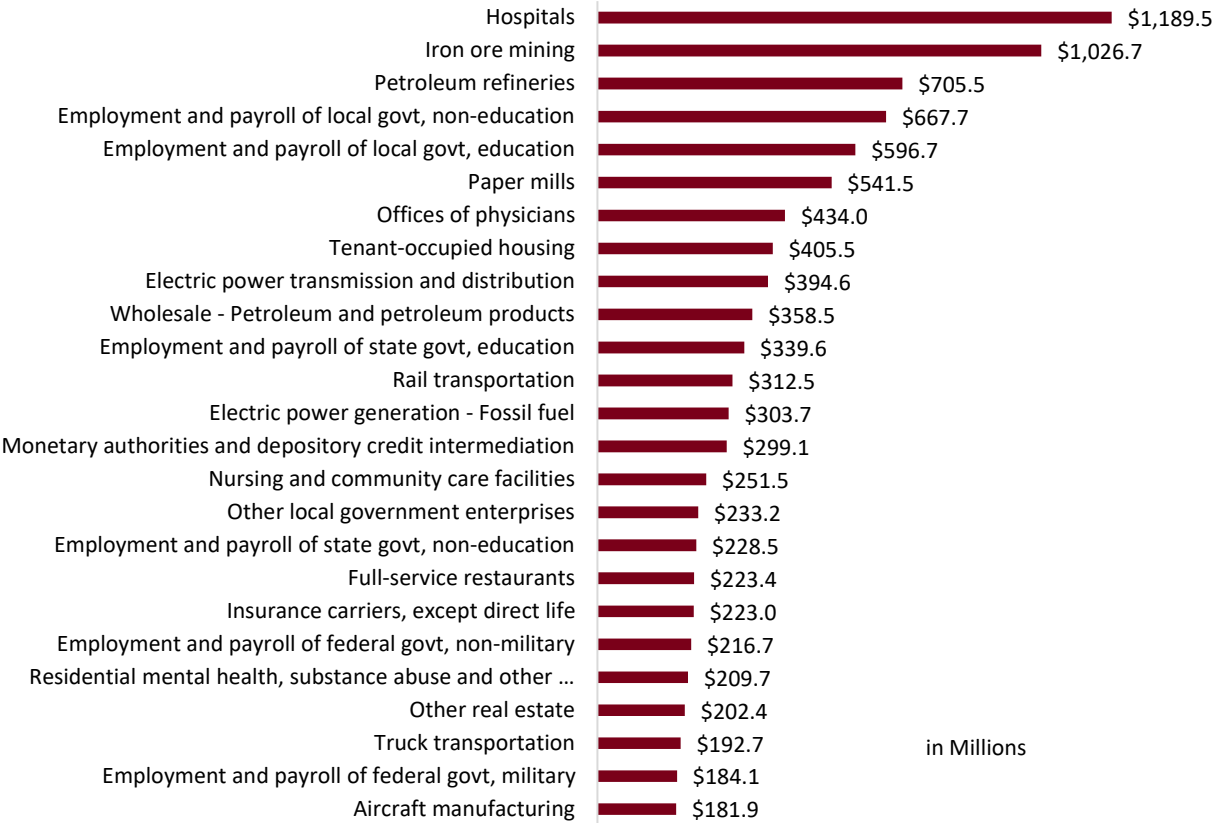


SOURCE: WIKIPEDIA

³ For a full list of definitions, please see Appendix A.

Figure 3 provides the top 25 industries in the Arrowhead/Douglas County study area ranked by value added. The figure shows the amount of value added each industry directly contributes to the gross regional product of the study area.⁴ The graph includes a mix of public and not-for-profit industries. The iron ore mining industry was the second largest contributor to value added in the study area’s economy, and the largest contributor among the private industries. In 2018, iron ore mining contributed over \$1 billion in value added to the study area, behind hospitals at nearly \$1.2 billion. The third largest contributing industry was petroleum refineries, which contributed \$705 million to the study area’s GRP in 2018.

Figure 3. Top 25 Industries in Study Area by Value Added on the Arrowhead Region (2018)



SOURCE: IMPLAN

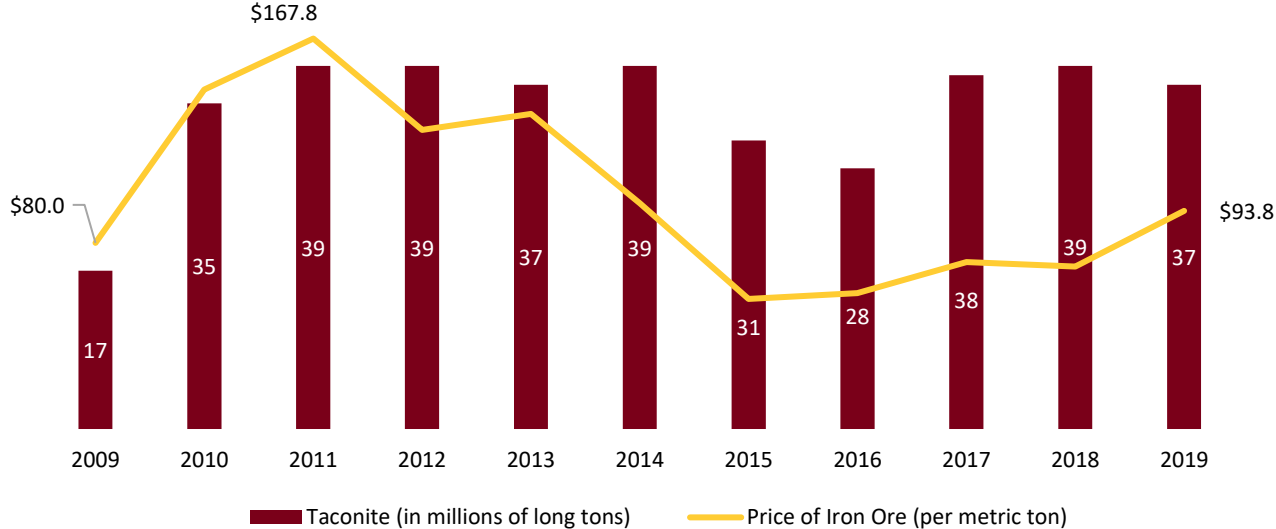
⁴ Values shown reflect each industry’s direct contribution and do not include indirect or induced effects.

II. Ferrous and Nonferrous Mining Industry Trends

This chapter examines recent economic trends of the ferrous and nonferrous mining industry, including the industry’s contribution to gross regional product (GRP), taconite production estimates, and iron ore prices.

Figure 4 shows the taconite production estimates compared to the price of iron ore⁵ (measured by U.S. dollars per metric ton).⁶ Production values are for all operational taconite mines in the state of Minnesota, which include ArcelorMittal Minorca, Hibbing Taconite, Northshore Mining, U.S. Steel–Keewatin Taconite, U.S. Steel–Minntac, and United Taconite. The price of iron ore represents the average annual commodity price as estimated by Index Mundi.

Figure 4. Production Estimates of Taconite on the Arrowhead Region



SOURCE: MINNESOTA MINING TAX GUIDE, INDEX MUNDI

The graph shows that the mining sector went from producing roughly 17 million long tons in 2009 to nearly 40 million in 2019. However, most of the growth in production happened immediately following the Great Recession and coincided with significant increases in the price of iron ore. In the two years following the Great Recession, the price of iron ore doubled (from \$80 to \$168 per metric ton) then fell to less than \$60 per metric ton in 2015, before gradually recovering to \$93.8 per metric ton in 2019.

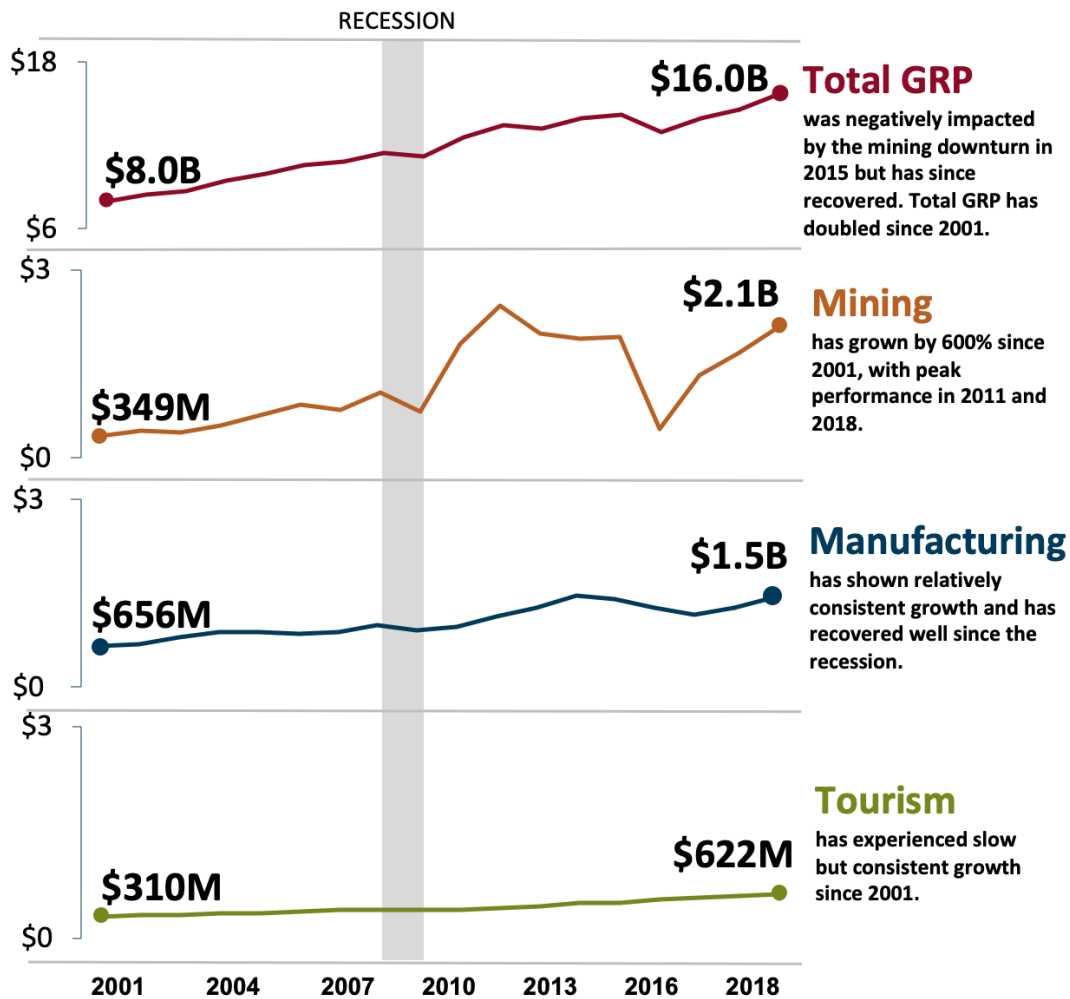
Since 2010, taconite production levels have been stable, with the exception of a two-year dip in 2015-2016. The decrease in production between 2015 and 2016 was due partially to the decrease in the price of iron ore but also to illegal steel dumping by China. In response, the U.S. Commerce Department imposed duties on Chinese and Mexican structural steel in 2019 after determining that producers in both countries had dumped

⁵ In Minnesota, nearly all high-grade iron ore has been mined, but advancements in technology have made usage of taconite feasible. Taconite is a low-grade iron ore that can be processed into hard, marble-sized pellets that are melted in blast furnaces and blown with oxygen to make steel.

⁶ The price of iron ore is measured in metric tons, and taconite production is measured in long tons. A metric ton is 2,205 pounds, whereas a long ton is 2,240 pounds.

fabricated structural steel on the U.S. market at prices below fair market value.⁷ After 2016, the price of iron ore remained low, but taconite production rebounded to pre-2015 production.

Figure 5. Comparison of Duluth-Superior MSA GRP to Local Industries' GRPs



SOURCE: BEA, STORYTELLING WITH DATA, BBER

Figure 5 shows total GRP growth for the Duluth-Superior MSA⁸ from 2001-2018 along with the GRP contribution of three local industries of mining (both ferrous and nonferrous), manufacturing, and tourism. The longer time period allows us to see the impacts of the Great Recession on the economy of the region and each of the three industries. These three industries were selected as they are all relatively similar in size and

⁷ Beech, Eric and David Lawder, "U.S. imposes duties on structural steel from China, Mexico" Reuters <https://www.reuters.com/article/us-usa-trade-steel/us-imposes-duties-on-structural-steel-from-china-mexico-idUSKCN1VP2R7>

⁸ GRP for the MSA is shown rather than for the eight-county study area as GRP estimates are not available by county. The Duluth/Superior MSA is comprised of St. Louis and Carlton Counties in Minnesota and Douglas County in Wisconsin. However, based on IMPLAN estimates for GRP in 2018, the GRP for the Duluth-Superior MSA represented nearly 90% of the GRP for the eight-county study area.

have both economic and cultural significance to the Arrowhead Region. Each graph inside the figure has its own vertical axis, while all graphs share a horizontal axis. This allows us to compare fluctuations in industry trends with trends in the broader economy.

As shown in the figure, the total GRP of the Duluth-Superior MSA has doubled since 2001, from \$8 billion to \$16 billion (200% growth). Of the industries shown, mining experienced the largest amount of growth over the past two decades. In 2001, the mining industry's contribution to the region's GRP was roughly \$349 million. By 2018 that value had increased to \$2.1 billion, a growth rate of roughly 600%. The mining industry's contribution to GRP peaked in 2011 at \$2.4 billion, but it has been able to recover well after a decline in output in 2015. Notably, the mining sector represents 13% of the total GRP in the MSA, the largest percentage of the three sectors shown in the figure.

By comparison, the manufacturing industry saw consistent but relatively slower growth during the same time period. In 2001, the manufacturing industry contributed roughly \$656 million to the region's GRP, and in 2018, it produced roughly \$1.5 billion in output, a 228% increase. Of the three industries shown, the tourism industry experienced the slowest level of growth during the time period consistently, increasing from \$310 million in 2001 to \$622 million in 2018.

The Great Recession, which strongly affected the global economy, is shown in Figure 5 as a vertical bar. Total GRP, mining, and manufacturing all declined during the Great Recession but were able to recover. The mining industry went on to increase production rapidly with a peak in 2011, contributing roughly \$2.4 billion to the region's GRP. Meanwhile, the tourism industry maintained stable but slow growth during the recession and subsequent several years.

Finally, Table 1 shows the percentage change in employment between 2009 and 2018 and location quotients for the 20 economic super sectors that are defined by the North American Industry Classification System (NAICS). The 20 super sectors (or sectors) are the main categories identified by NAICS. They are then broken down into sub-sectors and then industries. The percentage change in employment measures the growth in each sector's employment between 2009 and 2018. A location quotient is used as a way to quantify a region's industrial specialization relative to a larger geographic area (e.g. the respective state or nation). In this case, the table compares the level of employment in Minnesota's Arrowhead Region in 2018 to the state of Minnesota as a whole. A location quotient of 1.0 means that the specialization of the industry in the Arrowhead Region is equal to the state's. A location quotient greater than 1.0 suggests that the Arrowhead Region has a higher concentration in that industry than the state. And a location quotient less than 1.0 indicates that the Arrowhead Region has a lower concentration in that industry than the state.

Table 1. Percentage Change in Employment on the Arrowhead Region (2009-2018) and Location Quotient by Super Sector

NAICS Sector	% Change in Employment (2009-2018)	Employment Location Quotient**
Mining	37%	14.28
Utilities	-6%	2.27
Public administration	6%	1.65
Arts, entertainment, and recreation	3%	1.42
Health care and social assistance	8%	1.39
Accommodation and food services	7%	1.30
Retail trade	1%	1.17
Other services	20%	1.15
Educational services	4%	1.05
Construction	12%	1.04
Real estate and rental and leasing	14%	0.75
Transportation and warehousing	15%	0.74
Finance and insurance	-9%	0.63
Agriculture, forestry, fishing and hunting	0%	0.55
Manufacturing	1%	0.54
Information***	-19%	0.54
Waste management and remediation services	-7%	0.52
Professional, scientific, and technical services	12%	0.52
Wholesale trade	-1%	0.46
Management of companies and enterprises	-19%	0.18
Total, all industries	5%	

* Northeast Minnesota considers seven counties including Cook, Lake, St. Louis, Koochiching, Itasca, Aitkin, and Carlton.

**Location Quotient = (NE MN Sector Employment / NE MN Total Employment) / (MN Sector Employment / MN Total Employment).

*** Information sector data for 2009 was unavailable, so percentage change in employment for that sector is 2013-2018, the first year in which data was available for the sector.

SOURCE: QWEC

As shown in Table 1, the mining sector has a location quotient of 14.28, considerably larger than all of the other sector's location quotients. This demonstrates that mining has a higher concentration in northeastern Minnesota than in the State of Minnesota, and that within Northeast Minnesota mining is the dominant

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

sector relative to the size of the local economy. Also, according to 2018 quarterly census of employment and wages, the mining sector grew by 37% between 2009 and 2018, adding 1,138 jobs. This growth rate was significantly higher than any of the other top 20 sectors in the region.

As shown in this chapter, Minnesota's Arrowhead Region is heavily dependent on the mining sector. Relative to the size of the region's economy, mining employs a significant number of workers and has shown significant employment growth. The industry also saw significant growth in production and GDP levels over the past ten years, with much of that growth during the most recent three-year period. In 2018, the mining sector contributed more than \$2.0 billion to the region's economy.

III. Economic Impacts

The second objective of the research project is the modeling of the economic impacts of the ferrous and nonferrous mining industry, including the current and projected impacts of the industry’s operations and projected construction and capital expenditures. This chapter includes a description of inputs used for modeling and the estimated economic impacts of the ferrous and nonferrous mining industries, shown in terms of employment, labor income, value added, and output. The research team used IMPLAN software version 3.1 to estimate economic impacts. All operational scenarios were modeled using IMPLAN’s 2018 dataset, the most recent data available. All operations and capital expenditures were modeled in the year of the incurred expenses. All results are adjusted for inflation, so dollar amounts reflect the year in which the activities were modeled.

Inputs Used for Modeling

Inputs required for modeling included the current and projected number of employees, employee compensation, proprietor income, and industry sales for both the ferrous and nonferrous mining industries. These inputs were used to create a baseline model for mining operations. Further models were built to estimate the predicted impact over the next five years and the additional impact of proposed capital and construction investment over the next five years (2020-2024).

The research team developed a survey that asked representatives from each of the study area mines to estimate the current and projected number of employees, wages/benefits, annual operation expenditures, and investment estimates at their location. The survey was distributed to 11 representatives at 13 existing and planned mine locations. Of the 13 mine locations in the study area (eight ferrous and five nonferrous), 12 mines participated in the survey, for a 92% response rate. Table 2 shows the mines that participated in the survey.

Table 2. Participating Ferrous and Nonferrous Mines

	<i>Participating Mines</i>	<i>Owner</i>	<i>Mine Location in MN</i>	<i>Headquarters</i>
Ferrous	ArcelorMittal Minorca	ArcelorMittal USA	Virginia	Chicago, IL
	Hibbing Taconite Company*	ArcelorMittal USA	Hibbing	Chicago, IL
	Keewatin Taconite	U.S. Steel Corp.	Keewatin	Pittsburgh, PA
	Mesabi Nugget Delaware, LLC**	Steel Dynamics, Inc. †	Aurora	Fort Wayne, IN
	Mining Resources, LLC	Steel Dynamics, Inc. †	Chisholm	Fort Wayne, IN
	Minntac	U.S. Steel Corp.	Mountain Iron	Pittsburgh, PA
	Northshore Mining	Cleveland Cliffs, Inc.	Silver Bay	Cleveland, OH
	United Taconite, LLC	Cleveland Cliffs, Inc.	Eveleth	Cleveland, OH
Nonferrous	PolyMet Mining, Inc.	PolyMet Mining Corp.	Hoyt Lakes	St. Paul, MN
	Teck American, Inc.	Teck Resources Limited	Babbitt	Spokane, WA
	Twin Metals, LLC	Antofagasta, PLC	Ely	St. Paul, MN
	Vermillion Gold, Inc.	Vermillion Gold, Inc.	Vermillion Greenstone Belt	Minneapolis, MN

*According to the Mining Tax Guide 2019, Hibbing Taconite Company is owned by ArcelorMittal USA (62.3%), Cleveland Cliffs, Inc. (23%), and U.S. Steel (14.7%).

**Mesabi Nugget Delaware, LLC is owned by Steel Dynamics, Inc. (81%) and Kobe Steel, Ltd (19%).

†Mesabi Nugget Delaware, LLC and Mining Resources, LLC, both owned by Steel Dynamics, Inc., are not currently operational.

SOURCE BBER MINING IMPACT SURVEY

The data provided by the mines' representatives was used to model the current and projected operation impacts as well as impacts from proposed construction and capital investment. The research team assumed that each company provided good-faith estimates. In instances where data was not provided by the client and the mines, the research team relied on IMPLAN estimates and secondary data sources⁹ as inputs.

Table 3 shows the estimated number of employees, wages and benefits, and annual operating expenses for each year for the ferrous mines that participated in the survey. These values are based on the previous year's employment and spending as well as the companies' projected operation activity for the next five years.

Table 3. Inputs Used in Modeling Ferrous Mining Impacts (Total Effects) on the Arrowhead Region (2019-2024), Millions of Dollars

	<i># of Employees</i>	<i>Wages/Benefits</i>	<i>Annual Operating Budget</i>
Current (2019 Baseline)	3,982	\$543.4	\$2,294.8
2020 (Projected)	3,982	\$548.7	\$2,296.4
2021	3,982	\$554.1	\$2,297.9
2022	3,982	\$559.7	\$2,299.4
2023	3,982	\$565.4	\$2,301.0
2024	3,982	\$571.3	\$2,302.6

SOURCE: BBER MINING IMPACT SURVEY

According to company expectations, the number of employees is not expected to increase, but wages and benefits are expected to grow by roughly 1% annually, from \$543 million in 2019 to over \$570 million in 2024. Annual operating expenses are expected to increase at a rate of 1% annually as well.

Table 4 shows the same estimates for the nonferrous mines that participated in the survey. In 2019, there were 46 people employed by the nonferrous mining industry within the study area and operating expenses for the industry were more than \$63 million. By the year 2024, one of the four non-ferrous mines are expected to be operational, and an additional one to two more will have proposed mine projects in the environmental review phase. By that time, employment is expected to grow to more than 400 employees, an increase of 800% over the baseline. Similarly, by 2024, operating expenses are projected to quadruple in size in comparison to the baseline year.

Table 4. Inputs Used in Modeling Nonferrous Mining Impacts (Total effects) on the Arrowhead Region (2019-2024), Millions of Dollars

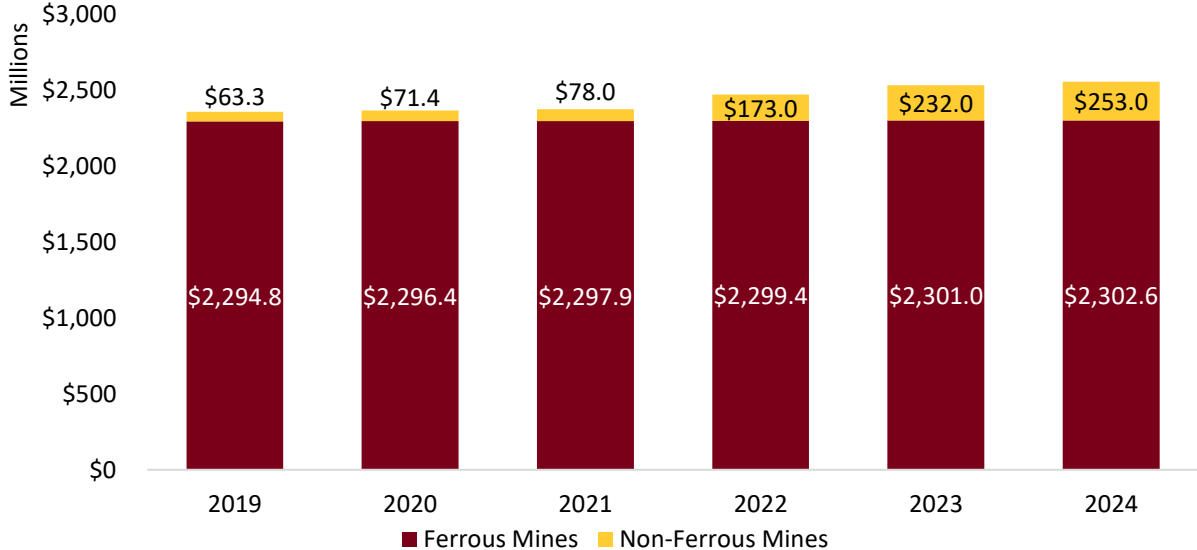
	<i># of Employees</i>	<i>Wages/Benefits</i>	<i>Annual Operating Expenses</i>
Current (2019 Baseline)	46	\$8.5	\$63.3
2020 (Projected)	47	\$9.3	\$71.4
2021	76	\$10.4	\$78.0
2022	133	\$16.7	\$173.0
2023	336	\$34.4	\$232.0
2024	436	\$38.7	\$253.0

SOURCE: BBER MINING IMPACT SURVEY

⁹ Secondary data sources included company 10-K reports in which some companies included predicted capital expenditures.

Figure 6 below shows the current and projected annual operating expenses for both the ferrous and nonferrous mines in the study area. The purpose of the figure is to compare the size and anticipated growth for both types of mines in the study area over the coming years. In 2019, the eight ferrous mines had operating expenses of nearly \$2.3 billion combined. Meanwhile, the four nonferrous mines had combined operating budgets of roughly \$63 million. Based on the survey data received, there is expected growth for both the ferrous and nonferrous mining industries within the study area. However, the nonferrous mines are anticipating growth of nearly 400%, compared with 5% for the ferrous mines. Therefore, by 2024, nonferrous mines in the study area estimate that they could see operating expenses of roughly \$253 million or nearly 10% of the region’s mining industry overall.

Figure 6. Ferrous and Nonferrous Annual Operating Budget (2019-2024), Millions of Dollars

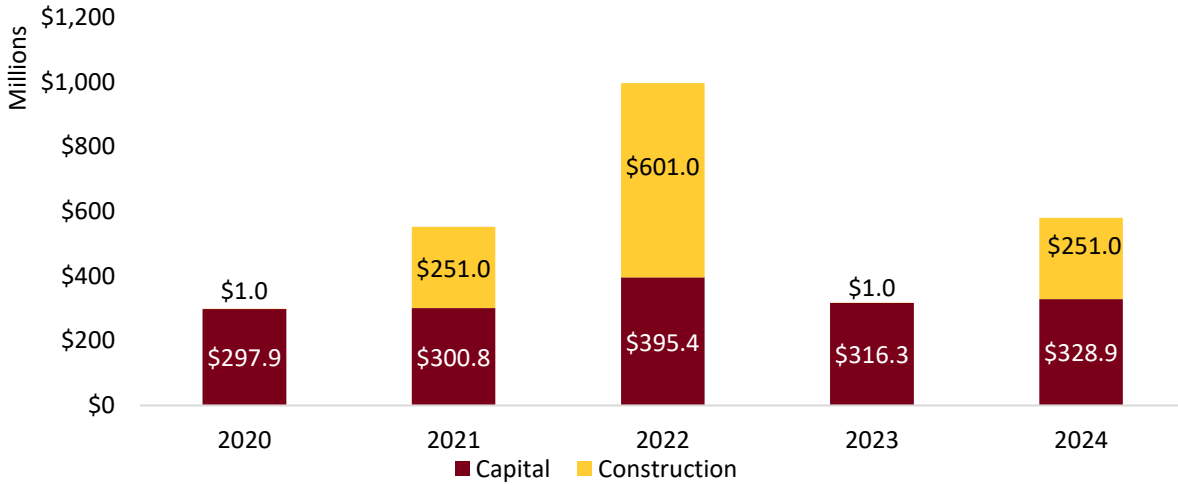


SOURCE: BBER MINING IMPACT SURVEY

Figure 7 on the following page illustrates the breakout of capital and construction expenditures for the ferrous and nonferrous mines.¹⁰ The data was self-reported by each mining company and aggregated by year. The year 2022 is projected to be the peak spending year with \$996 million projected (\$601 million in construction spending and \$395 million in other capital expenditures). Over the five-year span of 2020-2024, construction spending is projected to total \$1.11 billion overall, and other capital expenditures are projected to total \$1.64 billion, resulting in \$2.74 billion of investments overall. The nonferrous mines in particular are predicting sizable construction and capital projects as the mines become operational.

¹⁰ Capital and construction spending was aggregated for all ferrous and nonferrous mines to preserve confidentiality of individual mines’ responses.

Figure 7: Proposed Ferrous and Nonferrous Capital and Construction Spending (2020-2024), Millions of Dollars



SOURCE: BBER MINING IMPACT SURVEY

Table 5 shows the IMPLAN sectors used in modeling the current and projected operations of the ferrous and nonferrous mines in the study area. The two sectors included iron ore mining and copper, nickel, lead, and zinc mining.

Table 5. Sectors Used in Modeling Ferrous and Nonferrous Mining Operations in the Arrowhead Region (2019-2024)

Sector
Iron ore mining
Copper, nickel, lead, and zinc mining

SOURCE: IMPLAN

Table 6 below shows the IMPLAN sectors used in modeling all capital and construction expenditures for the ferrous and nonferrous mines in the study area.

Table 6. Sectors Used in Modeling Capital and Construction Expenditures in the Arrowhead Region (2020-2024)

Sector
Construction of other new nonresidential structures
Maintenance and repair construction of nonresidential structures
Construction machinery manufacturing
Mining machinery and equipment manufacturing
Industrial process variable instruments manufacturing
Wholesale - Machinery, equipment, and supplies
Wholesale - Grocery and related product wholesalers
Wholesale - Petroleum and petroleum products
Retail - Gasoline stores
Retail - Clothing and clothing accessories stores
Retail - General merchandise stores

SOURCE: IMPLAN

In cases where the mine provided a description of the capital spending, the research team selected the IMPLAN sector that most closely aligned with the description and then distributed the specified spending amount based on IMPLAN margins.¹¹ In cases where there was no specific description of the item, the research team distributed funds to the mining machinery and manufacturing sector, again using IMPLAN margins. All construction spending was attributed to the sector of construction of other new nonresidential structures. Capital and construction spending was modeled for ferrous and nonferrous mines combined with the proposed construction spending and modeled by year for years 2020 through 2024.

Ferrous Mining Impacts

Arrowhead Region and Douglas County, Wisconsin

This section provides the direct, indirect, and induced economic impacts¹² for the ferrous mining industry on the Arrowhead Region and Douglas County, Wisconsin.¹³ Results first highlight the baseline impacts of the industry’s operations. Baseline results are based on the industry’s annual sales and production estimates for the most recent year available (2019). Next, the results show projected operational impacts based on estimates provided by the mines, looking forward over the next five years (2020-2024). For all projected impacts, a range of estimates (i.e. sensitivity analysis) is provided to show the possible range of impacts that could occur given the uncertainty surrounding the projections.

Table 7 shows the detailed economic impacts of the ferrous mines in the study area for the most recent year (2019). Each row in the table shows the direct, indirect, induced, and total effects of the mining operations. The columns in the table represent employment,¹⁴ labor income, value added, and output. All results are shown in 2019 dollars.

Table 7. Economic Impacts from Ferrous Mining Operations on the Arrowhead Region (2019), Millions of Dollars

<i>Impact Type</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Direct Effect	3,982	\$537.1	\$1,190.7	\$2,294.8
Indirect Effect	1,637	\$104.8	\$251.0	\$623.7
Induced Effect	3,323	\$138.8	\$253.0	\$467.5
Total Effect	8,942	\$780.7	\$1,694.7	\$3,386.0
Multiplier	2.25	1.45	1.42	1.48

*Totals may not sum due to rounding

SOURCE: IMPLAN

The first row of Table 7, labeled direct effects, represents the employment and spending coming from the mines themselves on wages, equipment, and supplies. These estimates are based on the estimates from the BBER Mining Impact Survey. Indirect effects measure increased inter-industry spending on the part of regional businesses and suppliers as a result of the mines’ direct spending. Induced effects reflect an increase

¹¹ Margins allow for business and consumer expenditures to be traced through retail, wholesale, and transportation industries back to the industries that manufactured the product, allowing the appropriate allocation to the producing industries (IMPLAN, 2020).

¹² For data sources and assumptions used in accepting IMPLAN’s input-output model, please see Appendix B.

¹³ When describing the results of modeling, the eight-county study area is referred to throughout the report simply as the Arrowhead Region.

¹⁴ Employment is measured in terms of headcount, not full-time equivalent.

in household spending by mining employees as well as the employees of businesses that support the mines. Total effects are the sum of direct, indirect, and induced. The last row in the table is the impact multiplier associated with each effect and is calculated by dividing the total effect by the direct effect. A multiplier indicates how much additional spending is added to the study area's economy for each dollar generated by the direct spending of the industry.

According to the results of modeling, nearly 4,000 jobs were directly supported by the mining industry in 2019. Employment estimates are in terms of jobs, not in terms of full-time equivalent employees. In addition to the 4,000 direct jobs, an additional 1,637 jobs were created in other industries as a result of the mines' operational spending, and more than 3,300 jobs were created as a result of mining employees' spending on goods and services. The employment multiplier of 2.25 suggests that for every individual job created within the mining industry, an additional 1.25 jobs were created elsewhere in the economy. In total, the ferrous mining industry supported over 8,900 jobs in 2019 through the direct, indirect, and induced spending.

The second column, labor income, is an estimate of all employee compensation, including wages, benefits, and proprietor income. The mining industry pays roughly \$537 million in wages and benefits to its employees, generating an additional \$243 million in income to individuals employed by businesses supported by the mining industry (through indirect and induced impacts). The value added column represents the contribution to the GDP made by an individual producer, industry, or sector. In 2019, mining had a total effect of nearly \$1.7 billion in value added to the local economy through direct, indirect, and induced effects. The last column, output, is the value of all local production required to sustain activities. In 2019, it is estimated that operational spending (roughly \$2.3 billion in the study area) led to a total output impact of roughly \$3.4 billion in the study area.

Table 8 shows the total effects of the ferrous mining industry on the region in terms of employment, labor income, value added, and output from 2019 to 2024. The total effects represent the sum of the direct, indirect, and induced effects.

Table 8. Projected Economic Impacts (Total Effects) from Ferrous Mining Operations on the Arrowhead Region (2019-2024), Millions of Dollars

<i>Impact Year</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
2019 (Baseline)	8,942	\$780.7	\$1,694.7	\$3,386.0
2020	8,809	\$781.3	\$1,659.2	\$3,365.1
2021	8,684	\$782.4	\$1,625.8	\$3,345.5
2022	8,566	\$783.9	\$1,594.5	\$3,327.1
2023	8,455	\$785.8	\$1,565.2	\$3,309.8
2024	8,351	\$788.2	\$1,537.8	\$3,293.6

SOURCE: IMPLAN

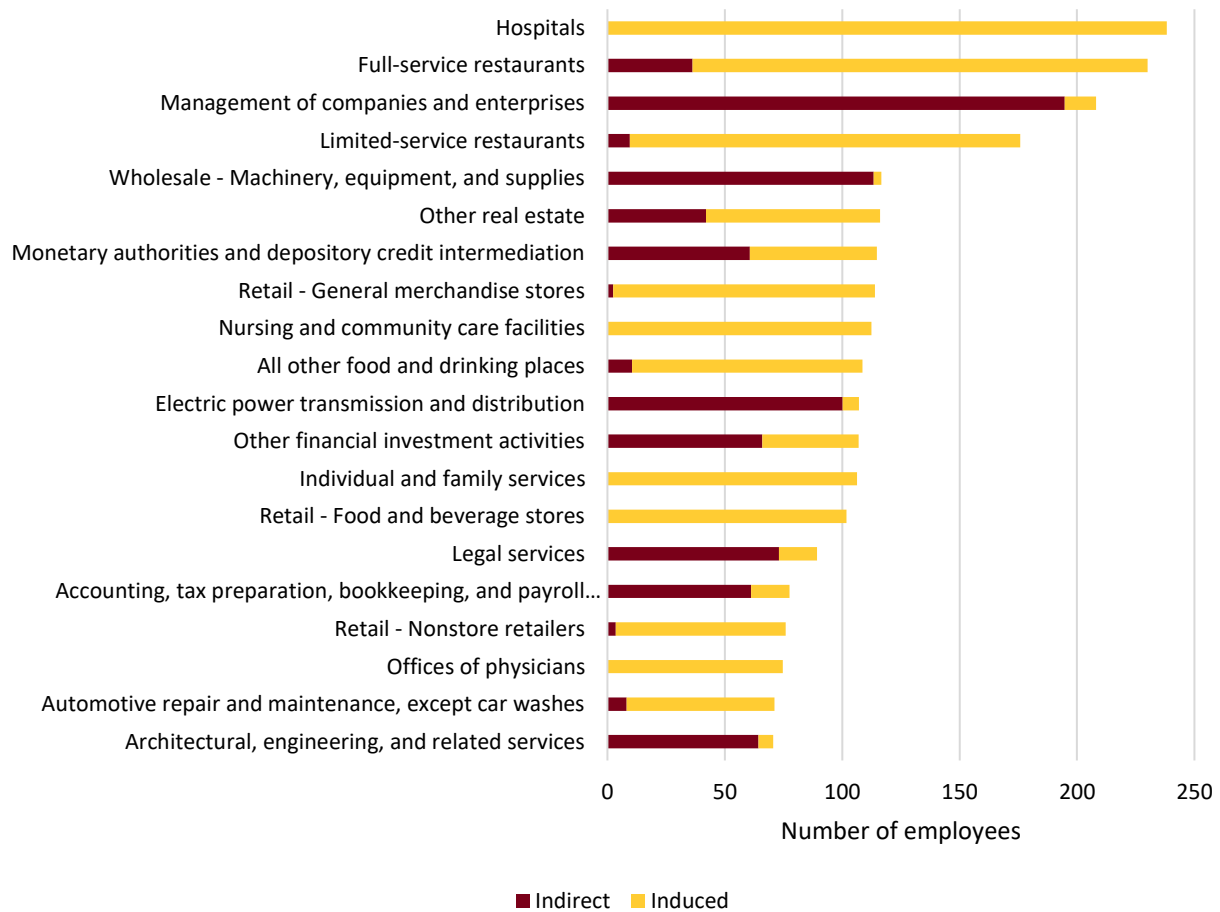
In 2019, ferrous mining resulted in more than 8,900 jobs, \$780 million in labor income, nearly \$1.7 billion in value added, and nearly \$3.4 billion in output to the eight-county study area. Over the next five years, total employment effects of ferrous mining operations are projected to decrease slightly,¹⁵ while labor income will increase by 0.9% and value added by 9.3%. It is projected that in 2024 the ferrous mining industry will support 8,351 jobs in the study area (through direct, indirect, and induced effects), contributing nearly \$800

¹⁵ In its projections, the IMPLAN database assumes increases in worker productivity, and therefore predicts a small reduction in the number of workers required for every unit of output. This is why, for all models, projected employment is slightly lower than in the baseline.

million in labor income (wages) to the region, \$1.5 billion in value added, and \$3.33 billion in output.

Figure 8 shows the estimated employment impacts in the top twenty most impacted industries as measured by number of employees. Only indirect and induced impacts are shown in the chart as all direct effects are felt only within the iron mining industry. Heavily impacted industries include hospitals (n=238), full-service restaurants (n=230), management of companies and enterprises (n=208) and limited-service restaurants (n=176). Industries that are affected by ferrous mining’s indirect effects (through business to business spending) include management of companies and enterprises, monetary authorities and depository credit intermediation, and machinery, equipment, and supplies wholesale industries. Industries affected by the induced effects (from employee household spending) include hospitals, full and limited service restaurants, real estate, and general retail industries.

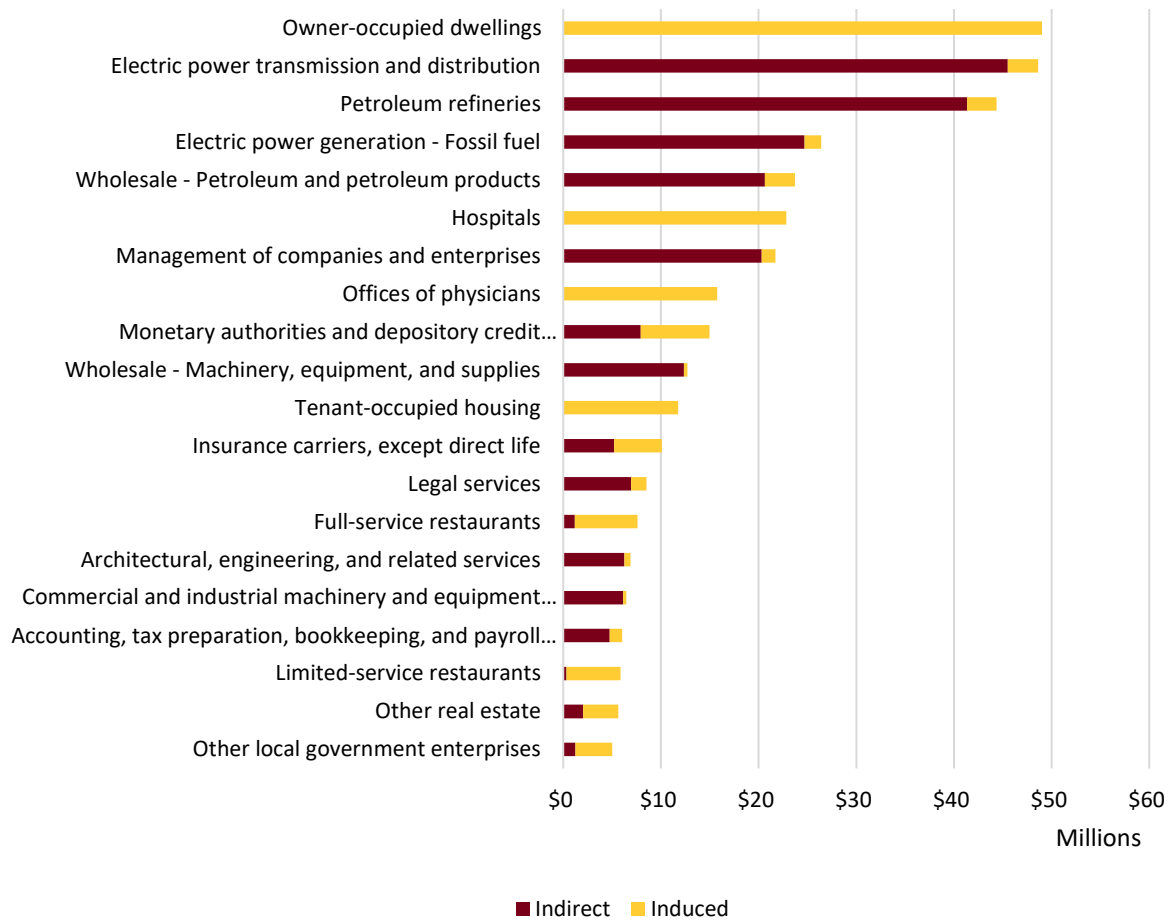
Figure 8. Top 20 Industries Impacted by Ferrous Mining Operations on the Arrowhead Region, by Employment (2019)



SOURCE: IMPLAN

Figure 9 shows the top 20 industries impacted by the ferrous mining industry in terms of value-added spending within the study area. Owner-occupied dwellings is a sector that is unique to IMPLAN’s accounting model and represents the amount homeowners would pay if they rented rather than owned their homes. Industries impacted by indirect effects include electric power transmission and distribution, petroleum refineries, petroleum and petroleum products wholesale, management of companies and enterprises, and more. The induced effects of value added to the economy from the ferrous mining operations are seen in many industries including owner occupied dwellings, hospitals, offices of physicians, and tenant-occupied housing. In fact, the region’s hospitals benefitted from more than \$22 million in value added spending from mining’s induced effects (i.e. household spending).

Figure 9. Top 20 Industries Impacted by Ferrous Mining Operations on the Arrowhead Region, by Value Added (2019), Millions of Dollars



SOURCE: IMPLAN

The research team used survey responses provided by representatives of the participating mines as inputs in IMPLAN to model the projected economic impacts of the mining industry on the study area. Due to the uncertainty surrounding the projected impacts, the research team created a sensitivity analysis to depict how varying levels of operations could impact the results. The research team modeled 100% (full impacts), 75% (partial), and 50% (half) impacts for the ferrous and nonferrous mines.

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

Table 9 shows the results of the sensitivity analysis. By 2024, it is projected that the ferrous mining industry could contribute \$788 million in labor income, \$1.54 billion in value added, and \$3.29 billion in output to the economy at the full impact level. By comparison, a 75% impact would result in nearly \$600 million in labor income, \$1.15 billion in value added, and nearly \$2.5 billion in output to the economy. A 50% impact would result in \$394 million in labor income, \$769 million in value added spending, and \$1.65 billion in output.

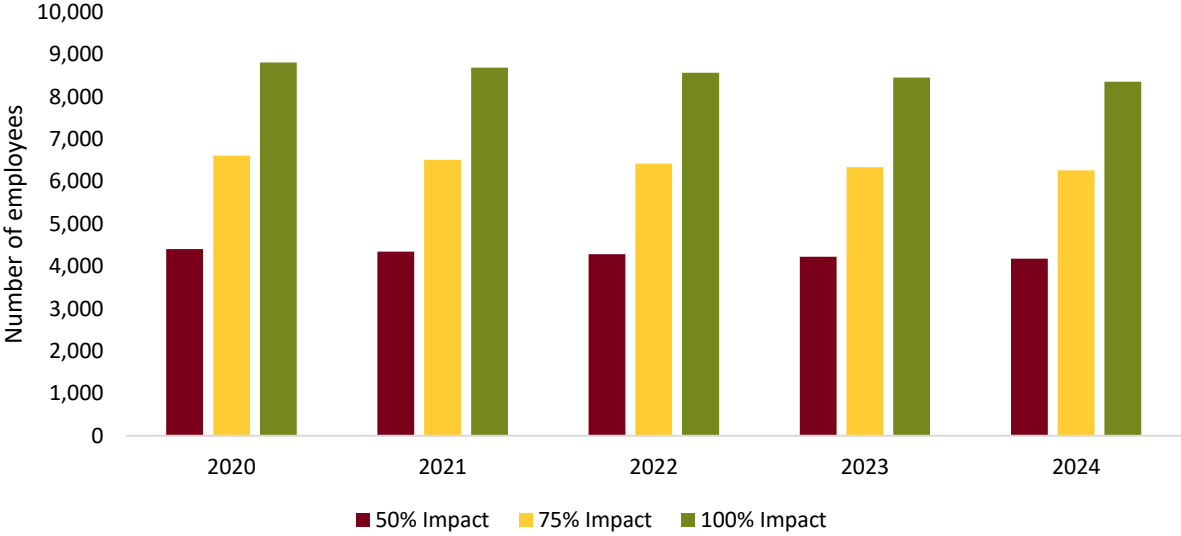
Table 9. Projected Ferrous Mining Sensitivity Analysis on the Arrowhead Region (2024), Millions of Dollars

Total Effect Level	Employment	Labor Income	Value Added	Output
100%	8,351	\$788.2	\$1,537.8	\$3,293.6
75%	6,263	\$591.1	\$1,153.3	\$2,470.2
50%	4,175	\$394.1	\$768.9	\$1,646.8

SOURCE: IMPLAN

Figure 10 below visually depicts the results of the sensitivity analysis on projected employment for the years 2020 through 2024. In 2020, the ferrous mining industry operations are projected to have a full impact of 8,809 jobs within the study area. By comparison, a 75% impact would result in 6,607 jobs to the economy and a 50% impact would result in 4,405 jobs. In five years, the projected impact of ferrous mining operations on employment within the study area is 8,351 jobs for the full impact, 6,263 jobs for a 75% impact, and 4,175 jobs for a 50% impact.

Figure 10. Ferrous Mining Sensitivity Analysis of Projected Employment on the Arrowhead Region



SOURCE: IMPLAN

State of Minnesota

This section provides the direct, indirect, and induced economic impacts for the ferrous mining industry on the state of Minnesota. Results first highlight the baseline (2019) impacts of the industry's operations. Next, the results show projected operational impacts based on estimates provided by the mines, looking forward over the next five years (2020-2024). For all projected impacts, a range of estimates (i.e. sensitivity analysis) show the possible range of impacts that could occur given the uncertainty surrounding the projections.

Table 10 shows the detailed economic impacts of the ferrous mines in the study area for the most recent year (2019). All results are shown in the dollar amount that they occur. As shown in the table, the direct effects from ferrous mining are nearly identical when modeled statewide as compared to the study area of the Arrowhead Region and Douglas County, Wisconsin. However, indirect and induced effects are larger than those for the eight-county study area, since the initial round of spending from the mines' operations has a larger ripple effect when using a larger study area. For example, when mines purchase goods and services from companies that are located beyond the Arrowhead Region but within the state, those purchases would be included in the effects shown in Table 10. In total, ferrous mines contributed more than 11,000 jobs, \$1.0 billion in labor income, over \$2.0 billion in value added, and \$3.9 billion in output to the state's economy in 2019. Also, the jobs multiplier for ferrous mining at the state level is 2.88, meaning that, for every job added in the mining industry, another 1.88 jobs are created elsewhere in the state, in other related industries.

Table 10. Economic Impacts from Ferrous Mining Operations on the State of Minnesota (2019), Millions of Dollars

<i>Impact Type</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Direct Effect	3,982	\$537.1	\$1,190.7	\$2,294.8
Indirect Effect	2,640	\$247.3	\$428.9	\$888.8
Induced Effect	4,841	\$259.1	\$433.9	\$756.6
Total Effect	11,464	\$1,043.5	\$2,053.5	\$3,940.2
Multiplier	2.88	1.94	1.72	1.72

*Totals may not sum due to rounding

SOURCE: IMPLAN

Table 11 shows the total effects from ferrous mining operations for each year in the study (2019-2024). The total employment effects from ferrous mining are expected to see a slight decline over the six-year period from 11,464 jobs in 2019 to 10,357 jobs in 2024. Total effects from labor income, value added, and output on the state's economy are expected to see slight growth over the time period.

Table 11. Projected Economic Impacts (Total Effects) from Ferrous Mining Operations on the State of Minnesota (2019-2024), Millions of Dollars

<i>Year</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
2019 (Baseline)	11,464	\$1,043.5	\$2,053.5	\$3,940.2
2020	11,215	\$1,035.6	\$2,006.4	\$3,900.8
2021	10,981	\$1,028.5	\$1,962.1	\$3,863.5
2022	10,761	\$1,022.4	\$1,920.3	\$3,828.4
2023	10,553	\$1,017.0	\$1,881.1	\$3,795.3
2024	10,357	\$1,012.4	\$1,844.4	\$3,764.2

SOURCE: IMPLAN

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

Table 12 below shows the results of the sensitivity analysis. By 2024, it is projected that ferrous mines could contribute over \$1.0 billion in labor income, \$1.84 billion in value added, and nearly \$3.76 billion in output to the state’s economy at the full impact level. By comparison, a 50% impact would result in roughly \$506 million in labor income, \$922 million in value added spending, and \$1.88 billion in output.

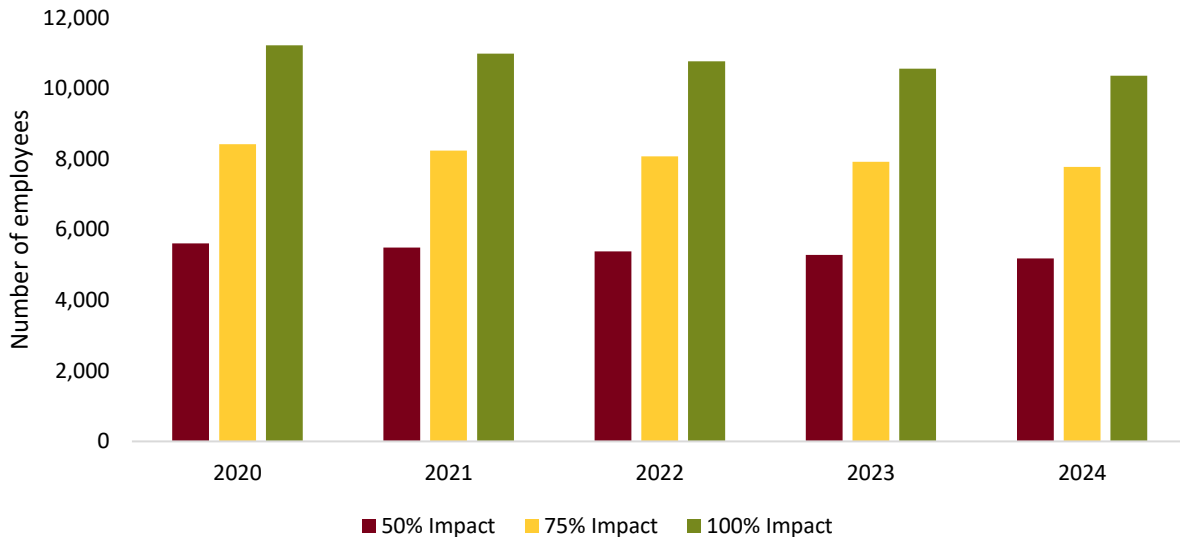
Table 12. Projected Ferrous Mining Sensitivity Analysis for the State of Minnesota (2024), Millions of Dollars

<i>Total Effects Level</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
100%	10,357	\$1,012.4	\$1,844.4	\$3,764.2
75%	7,768	\$759.3	\$1,383.3	\$2,823.1
50%	5,179	\$506.2	\$922.2	\$1,882.1

SOURCE: IMPLAN

Figure 11 below shows the results of the sensitivity analysis for employment for each year included in the analysis. The anticipated operations for the ferrous mining industry are expected to be relatively steady over the coming years, and that is reflected in the results of the sensitivity analysis. The true employment impacts of the ferrous mining industry on the state’s economy are likely to fall somewhere between the maroon (50%) and green bars (100%).

Figure 11. Ferrous Mining Sensitivity Analysis of Projected Employment on the State of Minnesota



SOURCE: IMPLAN

Nonferrous Mining Impacts

Arrowhead Region and Douglas County, Wisconsin

This section provides the direct, indirect, and induced economic impacts for the nonferrous mining industry on the Arrowhead Region and Douglas County, Wisconsin. Results first highlight the baseline (2019) impacts of the industry’s operations. Next, the results show projected operational impacts over the next five years (2020-2024). For all projected impacts, a range of estimates (i.e. sensitivity analysis) is provided to show the possible range of impacts that could occur, given the uncertainty surrounding the projections.

Table 13 shows the detailed economic impacts of the nonferrous mining industry in terms of employment,

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

labor income, value added, and output. Results are based on 2019 operations estimates and are shown in 2019 dollars.

Table 13. Economic Impacts from Nonferrous Mines Operations on the Arrowhead Region (2019), Millions of Dollars

<i>Impact Type</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Direct Effect	46	\$6.8	\$54.9	\$63.2
Indirect Effect	28	\$1.6	\$3.9	\$8.2
Induced Effect	43	\$1.8	\$3.3	\$6.1
Total Effect	117	\$10.2	\$62.0	\$77.5
Multiplier	2.55	1.50	1.13	1.23

*Totals may not sum due to rounding

SOURCE: IMPLAN

In 2019, 46 jobs were supported directly by nonferrous mining, and 71 additional jobs were indirectly supported by the nonferrous mining industry in the region for a total employment effect of 117 jobs in 2019 (2.55 multiplier). In total, the nonferrous mining industry added more than \$10 million in labor income, \$62 million in value added spending, and more than \$77 million in output to the study area's economy in 2019.

Table 14 shows the total effect of the nonferrous mining industry on the region in terms of employment, labor income, value added, and output from 2019 to 2024. Over the next five years, employment is expected to increase by almost 500%, and value added is anticipated to increase by over 200% to just over \$210 million. Total output is expected to grow to more than \$300 million by 2024.

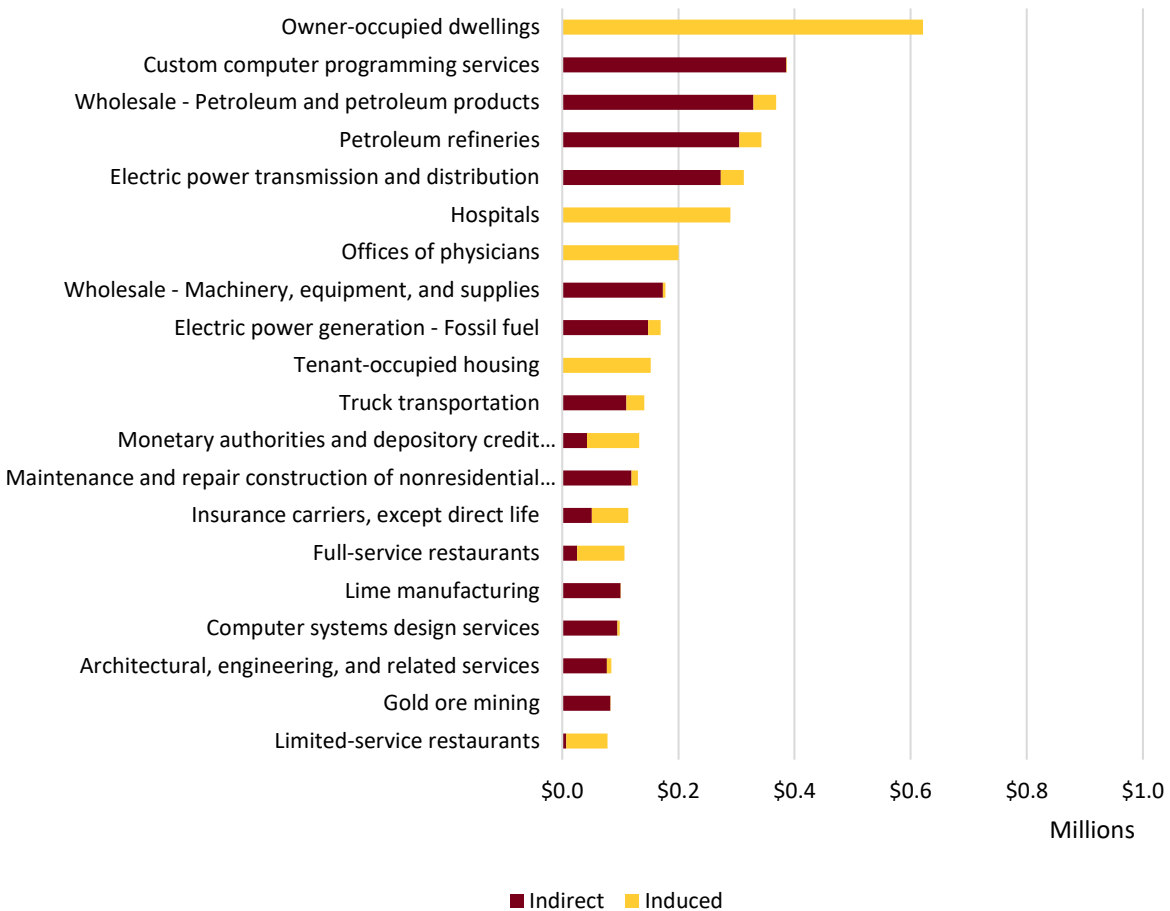
Table 14. Projected Economic Impacts (Total Effects) from Nonferrous Mining Operations on the Arrowhead Region (2019-2024), Millions of Dollars

<i>Year</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
2019 (Baseline)	117	\$10.2	\$62.0	\$77.5
2020	123	\$11.1	\$66.9	\$86.9
2021	164	\$13.8	\$72.4	\$95.7
2022	290	\$22.7	\$145.6	\$206.8
2023	598	\$44.8	\$204.3	\$285.0
2024	698	\$45.0	\$210.6	\$307.4

SOURCE: IMPLAN

Figure 12, on the following page, shows the top 20 industries impacted by nonferrous mining operations in 2019. Only indirect and induced impacts are shown in the chart as all direct effects are felt only within the nonferrous mining industry. After owner-occupied dwellings, the most impacted industries in the study area are custom computer programming services (\$387,000 in value added impacts), wholesale – petroleum and petroleum products (\$369,000), and petroleum refineries (\$343,000).

Figure 12. Top 20 Industries Impacted by Nonferrous Mining Operations, by Value Added (2019), Millions of Dollars on the Arrowhead Region



SOURCE: IMPLAN

Table 15 below shows the results of the sensitivity analysis. By 2024, it is projected that the nonferrous mining industry could contribute almost \$45 million in labor income, \$211 million in value added, and \$307 million in output to the economy at the full impact level. By comparison, a 75% impact would result in over \$34 million in labor income, \$158 million in value added, and \$231 million in output to the economy. Additionally, a 50% impact would result in roughly \$23 million in labor income, \$105 million in value added spending, and \$154 million in output.

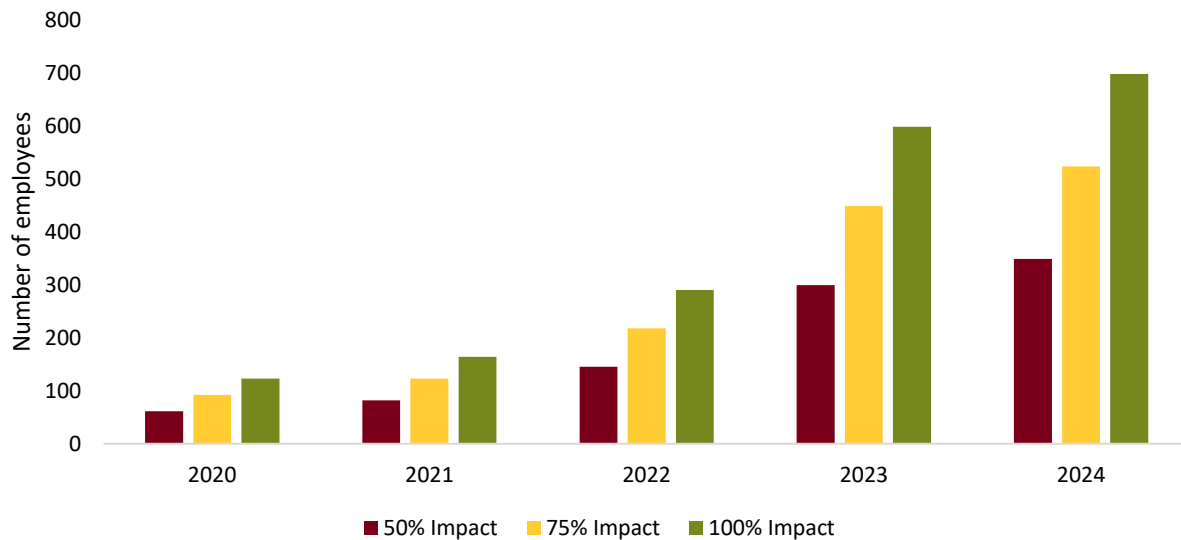
Table 15. Projected Nonferrous Mining Sensitivity Analysis on the Arrowhead Region (2024), Millions of Dollars

Total Effects Level	Employment	Labor Income	Value Added	Output
100%	698	\$45.0	\$210.6	\$307.4
75%	524	\$33.7	\$158.0	\$230.6
50%	349	\$22.5	\$105.3	\$153.7

SOURCE: IMPLAN

Figure 13 below shows the sensitivity analysis of projected employment within the study area as a result of the nonferrous mines for the years 2020 through 2024. In 2020, the full impact of nonferrous mining operations on employment is projected to be 123 jobs within the study area. By comparison, a 50% impact would result in 62 jobs, and a 75% impact would result in 92 jobs to the economy. In five years, the projected impact of nonferrous mining operations on employment within the study area is anticipated to be 698 jobs for the full impact, 349 jobs for a 50% impact, and 524 jobs for a 75% impact.

Figure 13. Nonferrous Mining Sensitivity Analysis of Projected Employment on the Arrowhead Region



SOURCE: IMPLAN

State of Minnesota

Table 16 on the next page shows the economic impacts from nonferrous mining on the state of Minnesota. As shown in the table, the direct effects from nonferrous mining are nearly identical when modeled statewide as compared to the study area. However, indirect and induced effects are quite a bit larger since the initial round of spending from the mines' operations has a larger ripple effect when using a larger study area. For example, if the mines are purchasing goods and services from companies that are located beyond the Arrowhead Region and Douglas County, Wisconsin, but within the state, those purchases would be included in the effects shown in Table 16. In total, nonferrous mining operations contributed nearly 174 jobs, \$15.6 million in labor income, \$64.7 million in value added,¹⁶ and \$89.2 million in output to the state's economy in 2019.

¹⁶ Value added is a measure of the impacting industry's contribution to the local community; it includes wages, rents, interest, and proprietor income (i.e. profits). In most cases, value added is larger when modeled in a larger study area. However, it is possible for value added to be smaller if one of the components is negative. In this case, proprietor income was negative for the nonferrous mining industry for the state. For this reason, the value added direct effects shown in Table 16 are actually smaller than those for the Arrowhead Region.

**Table 16. Economic Impacts from Nonferrous Mining Operations
on the State of Minnesota (2019), Millions of Dollars**

<i>Impact Type</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Direct Effect	46	\$6.8	\$50.1	\$63.2
Indirect Effect	56	\$5.0	\$8.1	\$14.7
Induced Effect	72	\$3.9	\$6.5	\$11.3
Total Effect	174	\$15.6	\$64.7	\$89.2
Multiplier	3.79	2.30	1.29	1.41

*Totals may not sum due to rounding

SOURCE: IMPLAN

Table 17 shows the total effects from nonferrous mining operations for each year in the study (2019-2024). The surveyed mines predict growth over the coming years, and the economic effects reflect that growth. The total employment effects from nonferrous mining, for example, are expected to grow from 174 jobs in 2019 to more than 877 jobs in 2024. Similarly, total output is expected to increase from \$89.2 million in 2019 to almost than \$350 million in 2024.

**Table 17. Projected Economic Impacts (Total Effects) from Nonferrous Mining Operations
on the State of Minnesota (2019-2024), Millions of Dollars**

<i>Year</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
2019 (Baseline)	174	\$15.6	\$64.7	\$89.2
2020	184	\$16.9	\$69.8	\$99.5
2021	228	\$20.1	\$75.7	\$109.2
2022	420	\$35.4	\$151.7	\$234.1
2023	774	\$62.5	\$214.2	\$322.9
2024	877	\$63.2	\$220.7	\$346.4

SOURCE: IMPLAN

Table 18 below shows the results of the sensitivity analysis. By 2024, it is projected that the nonferrous mining industry could contribute over \$63.0 million in labor income, \$220.7 million in value added, and \$346 million in output to the state’s economy at the full impact level. By comparison, a 50% impact would result in roughly \$32 million in labor income, \$110 million in value added spending, and \$173 million in output.

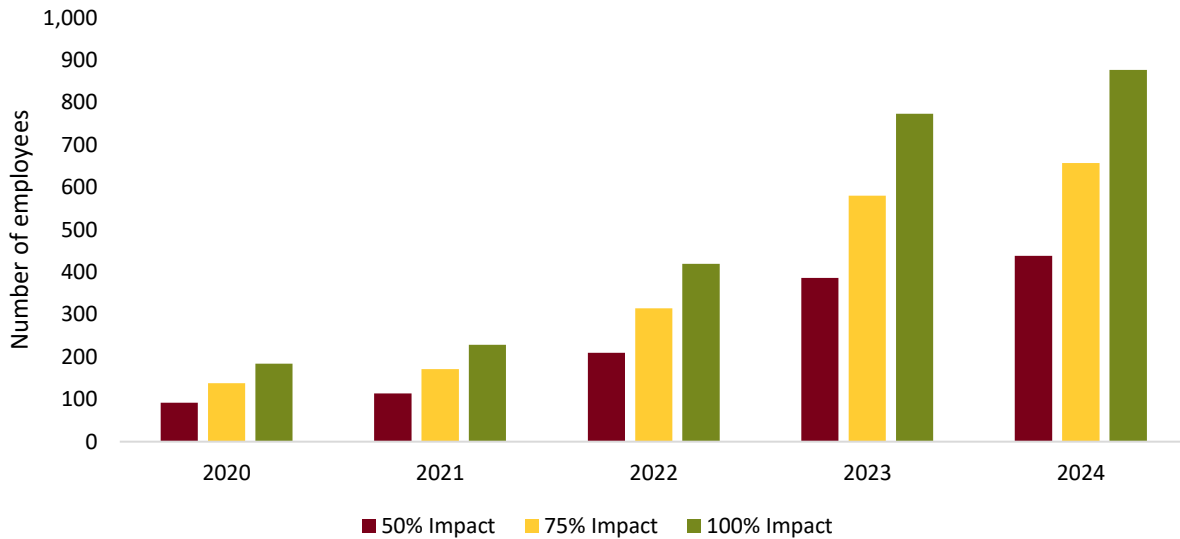
Table 18. Projected Nonferrous Mining Sensitivity Analysis on the State of Minnesota (2024), Millions of Dollars

<i>Total Effects Level</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
100%	877	\$63.2	\$220.7	\$346.4
75%	658	\$47.4	\$165.5	\$259.8
50%	438	\$31.6	\$110.4	\$173.2

SOURCE: IMPLAN

Figure 14 on the next page shows the results of the sensitivity analysis on employment (2020-2024) for the state of Minnesota. The results show not only the predicted growth based on surveyed mines’ projections (green bars) but also what employment would be if true impacts were 75% (gold) or 50% (maroon) of the companies’ projections. Even by conservative estimates (i.e. 50% level), it is estimated that the nonferrous mines will contribute roughly 430 new jobs to the state’s economy by 2024.

Figure 14. Nonferrous Mining Sensitivity Analysis of Projected Employment on the State of Minnesota



SOURCE: IMPLAN

Ferrous and Nonferrous Mining Impacts

Arrowhead Region and Douglas County, Wisconsin

This section provides the direct, indirect, and induced economic impacts for the combined ferrous and nonferrous mining industry on the Arrowhead Region and Douglas County, Wisconsin. Results first highlight the baseline impacts of the industry’s operations, followed by projected operational impacts for the next five years (2020-2024). For all projected impacts, a range of estimates (i.e. sensitivity analysis) is provided to show the possible range of impacts that could occur, given the uncertainty surrounding the projections. Finally, this section also includes projected impacts for capital and construction spending in the coming years.

Table 19 shows the combined impacts of the ferrous and nonferrous industry for the baseline (2019) year. As shown in the table, the ferrous and nonferrous industry combined added more than 9,000 jobs, nearly \$791 million in labor income, over \$1.75 billion in value added spending, and over \$3.46 billion in output to the Arrowhead Region in 2019. The industry had an employment multiplier of 2.25, meaning that for every one job created directly by the industry, another 1.25 jobs were added in other parts of the economy.

Table 19. Economic Impacts from Ferrous and Nonferrous Mining Operations on the Arrowhead Region (2019), Millions of Dollars

<i>Impact Type</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Direct Effect	4,028	\$543.9	\$1,245.6	\$2,358.1
Indirect Effect	1,665	\$106.5	\$254.8	\$631.9
Induced Effect	3,367	\$140.6	\$256.3	\$473.6
Total Effect	9,060	\$790.9	\$1,756.7	\$3,463.6
Multiplier	2.25	1.45	1.41	1.47

*Totals may not sum due to rounding

SOURCE: IMPLAN

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

Table 20 shows the projected impacts over the coming five years. Employment effects from ferrous and nonferrous mining are projected to be relatively stable from 2019-2024, as are the projected value added effects. Total output and labor income effects are projected to increase slightly over the period, with output predicted to exceed \$3.6 billion by 2024.

Table 20. Projected Economic Impacts (Total Effects) from Ferrous and Nonferrous Mining Operations on the Arrowhead Region (2020-2024), Millions of Dollars

<i>Year</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
2019 (Baseline)	9,060	\$790.9	\$1,756.7	\$3,463.6
2020	8,932	\$792.4	\$1,726.0	\$3,452.1
2021	8,848	\$796.2	\$1,698.1	\$3,441.2
2022	8,857	\$806.6	\$1,740.0	\$3,533.8
2023	9,054	\$830.6	\$1,769.4	\$3,594.8
2024	9,049	\$833.2	\$1,748.4	\$3,601.1

SOURCE: IMPLAN

Table 21 shows the sensitivity analysis for ferrous and nonferrous mining. Three levels of impacts (100%, 75%, and 50%) are provided to show the possible range of impacts that could occur given the uncertainty surrounding the mine’s projections.

Table 21. Projected Ferrous and Nonferrous Mining Sensitivity Analysis on the Arrowhead Region (2024), Millions of Dollars

<i>Total Effects Level</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
100%	9,049	\$833.2	\$1,748.4	\$3,601.1
75%	6,787	\$624.9	\$1,311.3	\$2,700.8
50%	4,524	\$416.6	\$874.2	\$1,800.5

SOURCE: IMPLAN

Further models were developed to estimate the predicted economic impacts of proposed capital and construction investment over the next five years. These results are shown in Table 22 on the following page. The year 2022 is projected to be the highest level of investment and, therefore, have the highest economic impacts. In that year alone, construction and capital spending on the part of the ferrous and nonferrous mines is expected to add roughly 11,500 jobs to the study area, more than \$640 million in labor income, \$545 million in value added spending, and \$1.24 billion in total output.¹⁷ Over the course of the five-year period, it is predicted that the combined capital and construction spending for the ferrous and nonferrous mines will contribute more than \$1.2 billion in labor income, \$1.1 billion in value added spending, and \$2.4 billion in total output. It is important to note that the employment effects from the construction and capital spending are temporary and will only be felt in the study area for the year in question. Therefore, employment cannot be summed.

¹⁷ In most cases, value added is larger than labor income. However, it is possible for value added to be smaller than labor income. This can occur if “other property type income” (OPTI) is negative. Negative OPTI means that the sector spent more than in brought in as revenues (i.e., ran a deficit) that year. This was the case for the construction of other nonresidential structures sector in the study area in 2018, which is the reason why labor income effects are larger than value added in 2020, 2021, and 2023.

Table 22. Projected Economic Impacts (Total Effects) from Ferrous and Nonferrous Capital and Construction Expenditures on the Arrowhead Region (2020-2024), Millions of Dollars

<i>Year</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
2020	194	\$11.8	\$22.0	\$42.6
2021	4,990	\$276.8	\$241.0	\$540.8
2022	11,487	\$643.7	\$544.6	\$1,237.3
2023	189	\$11.9	\$22.3	\$43.6
2024	4,713	\$268.1	\$233.9	\$529.3
Total	--	\$1,212.3	\$1,063.8	\$2,393.7

SOURCE: IMPLAN

Table 23 shows the sensitivity analysis for the capital and construction impacts for the year 2022. If the nonferrous mines’ projections are accurate, impacts from the proposed construction projects could reach nearly 11,500 jobs, \$644 million in labor income, and over \$1.2 billion in output in 2022. By comparison, a 75% impact would result in over 8,600 jobs and \$928 million in output to the economy, while a 50% impact would result in roughly 5,700 jobs and \$619 million in output. The impacts shown, however, represent the peak year for spending, and impacts would be temporary, ending once the construction project is complete.

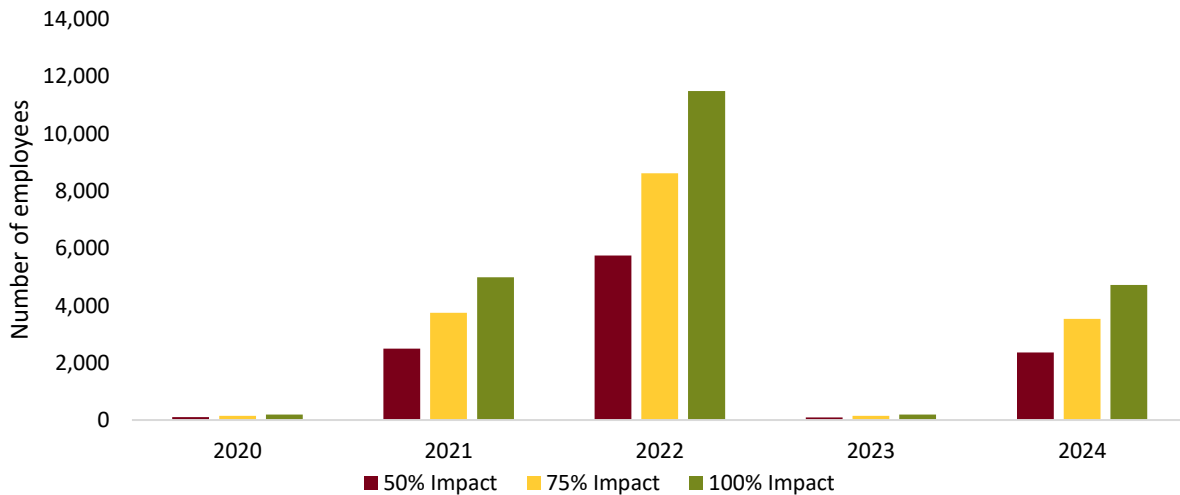
Table 23. Projected Construction and Capital Expenditure Sensitivity Analysis on the Arrowhead Region (2022), Millions of Dollars

<i>Total Effects Level</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
100%	11,487	\$643.7	\$544.6	\$1,237.3
75%	8,615	\$482.8	\$408.5	\$928.0
50%	5,743	\$321.9	\$272.3	\$618.7

SOURCE: IMPLAN

Figure 15 shows further details of the sensitivity analysis. In the figure, the full employment impacts, along with the 75% and 50% levels are shown for each year.

Figure 15. Capital Expenditure and Construction Spending’s Sensitivity Analysis of Projected Employment on the Arrowhead Region



SOURCE: IMPLAN

Table 24 depicts the 25 most impacted sectors by mining capital and construction expenditures forecasted for 2022 (the peak year for spending). Construction of other new nonresidential structures, owner-occupied dwellings, and hospitals are the three most impacted industries. These industries could see \$212 million, \$40 million, and \$18 million of value added spending respectively as a result of capital and construction spending from ferrous and nonferrous mines. Impacts to the construction of other new nonresidential structures industry would be due to direct spending on the part of the mines, while most of the other top impacted industries would see large indirect and induced effects from increased wages and inter-industry spending.

Table 24. Top 25 Industries Impacted by Ferrous and Nonferrous Mining Capital and Construction Expenditures on the Arrowhead Region (2022), Millions of Dollars

Sector	Direct	Indirect	Induced	Total
Construction of other new nonresidential structures	\$211.8	\$0.0	\$0.0	\$211.8
Owner-occupied dwellings	\$0.0	\$0.0	\$39.5	\$39.5
Hospitals	\$0.0	\$0.0	\$18.4	\$18.4
Retail - Building material and supplies stores	\$0.0	\$13.5	\$1.3	\$14.8
Wholesale - Petroleum and petroleum products	\$4.4	\$6.2	\$2.5	\$13.0
Offices of physicians	\$0.0	\$0.0	\$12.6	\$12.6
Architectural, engineering, and related services	\$0.0	\$9.4	\$0.5	\$9.9
Tenant-occupied housing	\$0.0	\$0.0	\$9.2	\$9.2
Truck transportation	\$0.0	\$7.0	\$1.9	\$8.9
Wholesale - Machinery, equipment, and supplies	\$4.3	\$4.2	\$0.3	\$8.8
Monetary authorities and depository credit intermediation	\$0.0	\$2.5	\$5.7	\$8.2
Petroleum refineries	\$0.0	\$5.5	\$2.4	\$7.9
Full-service restaurants	\$0.0	\$0.5	\$5.1	\$5.6
Wholesale - Other durable goods merchant wholesalers	\$0.0	\$4.9	\$0.6	\$5.5
Other real estate	\$0.0	\$2.4	\$2.9	\$5.2
Mining machinery and equipment manufacturing	\$5.1	\$0.0	\$0.0	\$5.1
Retail - General merchandise stores	\$0.6	\$0.4	\$3.9	\$4.9
Limited-service restaurants	\$0.0	\$0.1	\$4.4	\$4.5
Insurance carriers, except direct life	\$0.0	\$0.5	\$3.9	\$4.4
Automotive repair and maintenance, except car washes	\$0.0	\$1.2	\$3.1	\$4.3
Ready-mix concrete manufacturing	\$0.0	\$3.9	\$0.1	\$4.0
Nursing and community care facilities	\$0.0	\$0.0	\$3.8	\$3.8
Electric power transmission and distribution	\$0.0	\$1.3	\$2.5	\$3.8
Retail - Food and beverage stores	\$0.0	\$0.0	\$3.7	\$3.7
Other local government enterprises	\$0.0	\$0.7	\$3.0	\$3.7

SOURCE: IMPLAN

State of Minnesota

This section provides the direct, indirect, and induced economic impacts for the combined ferrous and nonferrous mining industry on the state of Minnesota. Table 25 on the following page shows the combined economic impacts of the ferrous and nonferrous industry for baseline (2019) year. As shown in the table, the ferrous and nonferrous industry combined added over 11,600 jobs, almost \$1.1 billion in labor income, more than \$2.1 billion in value added spending, and over \$4.0 billion in output to the state's economy in 2019. The

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

industry had an employment multiplier of 2.89, meaning that for every one job created directly by the industry, another 1.89 jobs were added in other parts of the economy.

Table 25. Economic Impact Modelling for Combined Mining Operations on the State of Minnesota (2019 Baseline), in Millions of Dollars

<i>Impact Type</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Direct Effect	4,028	\$543.9	\$1,240.8	\$2,358.1
Indirect Effect	2,697	\$252.3	\$437.1	\$903.5
Induced Effect	4,914	\$263.0	\$440.4	\$767.9
Total Effect	11,638	\$1,059.1	\$2,118.3	\$4,029.4
Multiplier	2.89	1.95	1.71	1.71

*Totals may not sum due to rounding

SOURCE: IMPLAN

Table 26 shows the total effects of the ferrous and nonferrous mines for the years 2019-2024. Total effects are expected to remain stable over the period, while employment effects will reach almost 11,250 by 2024.

Table 26. Total Projected Economic Impacts (Total Effects) from Combined Mining Operations on the State of Minnesota (2019-2024), in Millions of Dollars

<i>Year</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
2019 (Baseline)	11,638	\$1,059.1	\$2,118.3	\$4,029.4
2020	11,399	\$1,052.5	\$2,076.2	\$4,000.3
2021	11,210	\$1,048.7	\$2,037.7	\$3,972.7
2022	11,180	\$1,057.8	\$2,072.1	\$4,062.4
2023	11,327	\$1,079.5	\$2,095.3	\$4,118.2
2024	11,234	\$1,075.7	\$2,065.1	\$4,110.6

SOURCE: IMPLAN

Table 27 outlines the economic impacts that capital expenditure and construction projects will have on the state of Minnesota in terms of employment, labor income, value added, and output (total economic impacts) for the years 2020-2024. The wide range in estimated outputs comes from the wide range of construction and capital expenditure estimates reported by the mining companies. The most impactful year is 2022 with an estimated \$1.55 billion of total economic impact and 12,018 jobs. The \$1.55 billion of impact on the state of Minnesota in the year 2021 is \$308.7 million larger than the impacts specific to the Arrowhead Region.

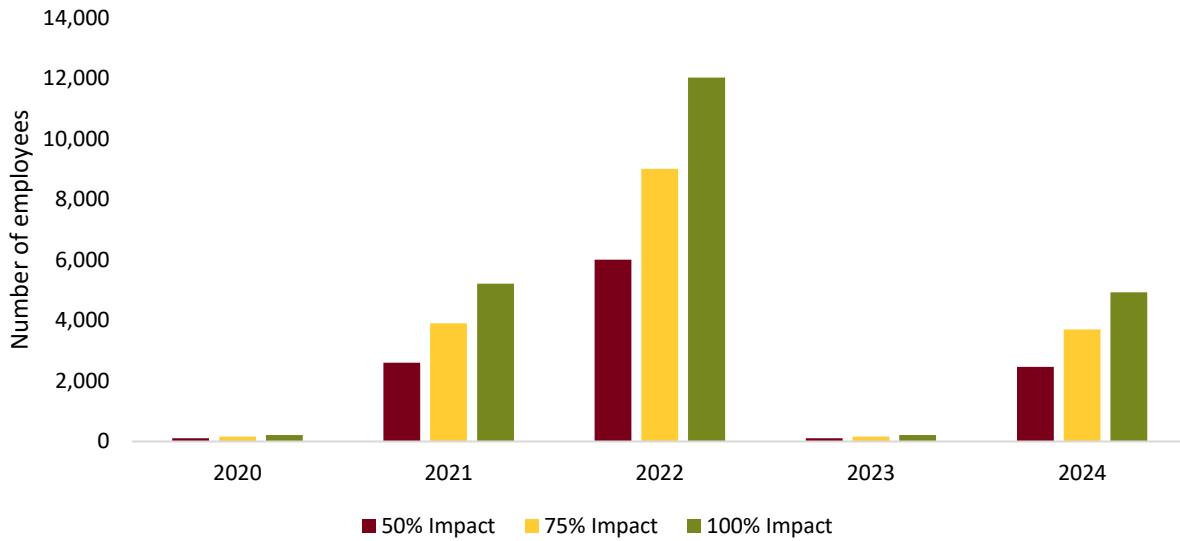
Table 27. Total Projected Impacts (Total Effects) from Capital Expenditure and Construction on the State of Minnesota (2020-2024), in Millions of Dollars

<i>Year</i>	<i>Employment</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
2020	212	\$15.5	\$26.2	\$46.8
2021	5,209	\$349.7	\$338.5	\$667.2
2022	12,018	\$815.5	\$776.4	\$1,546.0
2023	213	\$16.2	\$27.4	\$49.9
2024	213	\$16.5	\$27.8	\$50.6
Total		\$1,213.4	\$1,196.1	\$2,360.4

SOURCE: IMPLAN

Finally, Figure 16 shows the sensitivity analysis for the employment impacts from capital and construction spending for the ferrous and nonferrous mines. Employment is expected to peak in 2022, with moderate activity predicted for 2021 and 2024 and very little occurring in 2020 or 2023. In 2022, employment could reach more than 12,000 jobs due to large construction spending. However, these impacts would be temporary and would cease to be felt after the construction was completed. Even at 50% level (maroon), employment in 2021 could reach more than 6,000 statewide as a result of mining construction projects and capital spending.

Figure 16. Capital Expenditure and Construction Spending’s Sensitivity Analysis of Projected Employment on the State of Minnesota



SOURCE: IMPLAN

IV. Tax Impacts

The third objective of the study is to describe Minnesota mining-related taxes paid by the mining industry. In order to interpret tax tables in this report, readers should note that taxes are distributed between the State of Minnesota's General Fund, local units of government, and education. Taxes employed by the government come in the forms of production taxes, occupation taxes, state and county taxes, and other various taxes.

Ferrous Mining Tax Impacts

During 2018 (calendar year) Minnesota's iron mines paid \$158.7 million in production tax, occupation tax, sales and use tax, income tax, various Ad Valorem and property taxes and royalties and rentals on state minerals.

The 2018 taconite production tax of more than \$103 million is payable the following year. As we note below, and in order to reconcile totals for subsequent tax impacts, readers must note that \$113.3 million in production, sales and use, income and various Ad Valorem taxes were accrued in 2018. These taxes are spread between the State of Minnesota's General Fund, local units of government and schools. Approximately \$8.7 million of this was support to local school districts. (See Table 28.) A further detail on interpreting the occupation tax is to note that the occupation tax is split according to 10% for the University of Minnesota, 40% to elementary and secondary education, and 50% to the State of Minnesota's General Fund. A further breakdown of this \$79 million is found in Appendix C.

Table 28. Minnesota's Iron Mines Direct Support for the State of Minnesota, 2019

<i>Tax</i>	<i>Mining Industry Contribution</i>
Taconite Production Tax**	\$103,789,847
Occupation Tax*	\$19,082,000
Sales and Use Tax	\$8,664,249
Various Ad Valorem and Property taxes	\$890,644
Royalties and Rentals on State Iron Ore	
School Trust Lands	\$15,276,000
University Trust Lands	\$4,411,000
Tax Forfeit	\$6,177,000
Other state accounts	\$371,000
Total	\$158,661,740

*All taxes are according to the Department of Revenue's *Minnesota Mining Tax Guide, 2019* (based on 2018 production year).

**Production and other taxes: \$113.3 million in production, sales and use, and various Ad Valorem and property taxes were paid in 2018. Approximately \$19.7 million of the \$113.3 million was used to support the local school districts.

SOURCE: MN DEPARTMENT OF REVENUE, MN DNR

Table 29 shows Minnesota's iron mining industry's support for the state's education. During 2018, iron mining paid nearly \$53 million towards education, with over \$7 million on university-related expenses and almost \$46 million on public schooling.

Table 29. Minnesota's Iron Mining Industry Support for Education, 2018, in Millions

<i>Account</i>	<i>School</i>	<i>University</i>	<i>Total Education</i>
School district component of production tax*	\$19.7		\$19.7
State iron ore royalties and rent**	\$18.3	\$5.3	\$23.6
Occupation tax***	\$7.6	\$1.9	\$9.5
Totals	\$45.7	\$7.2	\$52.9

*School district component of production tax is according to the Department of Revenue's *Minnesota Mining Tax Guide*, 2019.

**School trust and university royalties are from Department of Natural Resources Mineral receipts by account for calendar year 2011. Iron ore and taconite income is 97% of the state's total mineral receipts.

*** Occupation tax is according to the Department of Revenue's *Minnesota Mining Tax Guide*, November 2011. Total tax is \$12,617,000 of which 40% went to elementary and secondary education and 10% went to the University of Minnesota.

SOURCE: MN DEPARTMENT OF REVENUE, MN DNR

Table 30 shows royalties and rental receipts to the state from ferrous mining as reported from the Department of Natural Resources mineral receipts by account for calendar years 2017 and 2018. Royalties and rental receipts are payments by the mining companies for the use of the state's non-renewable mineral resources.

Table 30. Minnesota Ferrous Mineral Royalties and Rentals Receipts, 2017 and 2018, in Millions of Dollars

<i>Account</i>	<i>2017 Iron-Ore Taconite</i>	<i>2018 Iron Ore Taconite</i>
School trust fund	\$12.3	\$15.3
School trust fund (minerals mgmt)	\$2.4	\$3.0
University trust fund	\$0.3	\$4.4
University trust fund (minerals mgmt)	\$0.0	\$0.9
Tax forfeit	\$3.8	\$6.2
Tax forfeit (minerals mgmt)	\$0.8	\$1.2
Advanced royalty account	\$0.2	\$0.2
Totals	\$19.8	\$31.2

SOURCE: MN DEPARTMENT OF REVENUE

Nonferrous Mining Tax Impacts

In order to estimate nonferrous tax impacts on Minnesota, the BBER followed the Minnesota DNR's mineral receipts by account for 2017 and 2018. A more detailed table on the royalties and rental receipts can be found in Appendix C. Compared to ferrous mining, nonferrous mining contributes much less to the state. Table 31 shows that the nonferrous sector contributed over \$1.64 million in 2017 and almost \$1.97 million in 2018.

Table 31. Minnesota Nonferrous Mineral Royalties and Rentals Receipts, 2017 and 2018, in Thousands of Dollars

<i>Account</i>	<i>2017 Nonferrous Metallic Minerals</i>	<i>2018 Nonferrous Metallic Minerals</i>
School trust fund	\$528.2	\$592.7
School trust fund (minerals mgmt)	\$105.7	\$118.5
Tax forfeit	\$602.3	\$719.7
Tax forfeit (minerals mgmt)	\$120.5	\$143.9
Consolidated conservation	\$238.1	\$302.0
Consolidated conservation (minerals mgmt)	\$47.6	\$60.4
Other land classes	\$1.7	\$32.2
Other land classes (minerals mgmt)	\$0.3	\$0.3
Totals	\$1,644.4	\$1,969.7

SOURCE: MN DEPARTMENT OF REVENUE, MN DNR

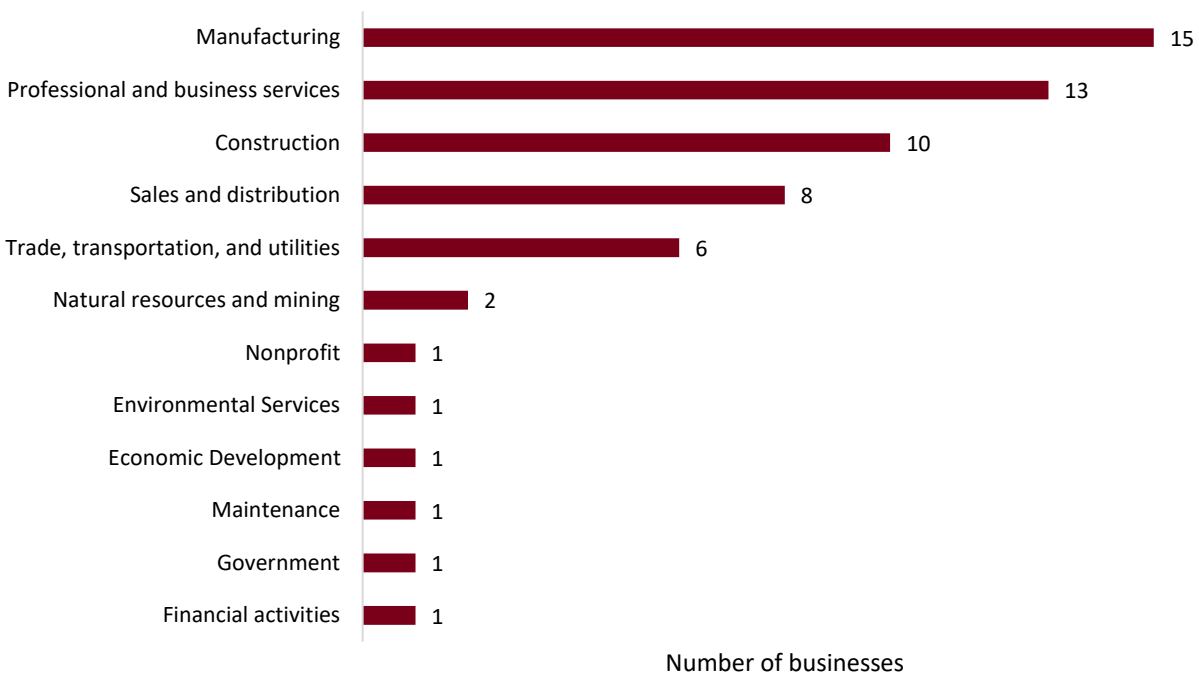
V. Survey of Mining Related Firms

The results of a survey distributed to mining-related businesses are provided in this section. The BBER produced the survey to understand how the mining industry has impacted the economic performance of mining-related firms in the region and to gauge the confidence of businesses that support the industry locally.

In total, 82 businesses responded to the survey. However, not all businesses completed each question. Any respondent who answered at least one question related to their business performance was included in the analysis, which in total includes 60 businesses. For each question shown, the number of respondents is provided in parentheses following the caption. (These are not always 60.)

Respondents were asked to identify the sector in which their business was classified (Figure 17). Manufacturing (n=15), professional and business services (n=13), and construction (n=10) were the most common responses. It is interesting to note that many sectors which aren't normally associated with the mining industry were represented among survey respondents, including government, nonprofit, and financial activities.

Figure 17. What sector is your business in? (n=60)



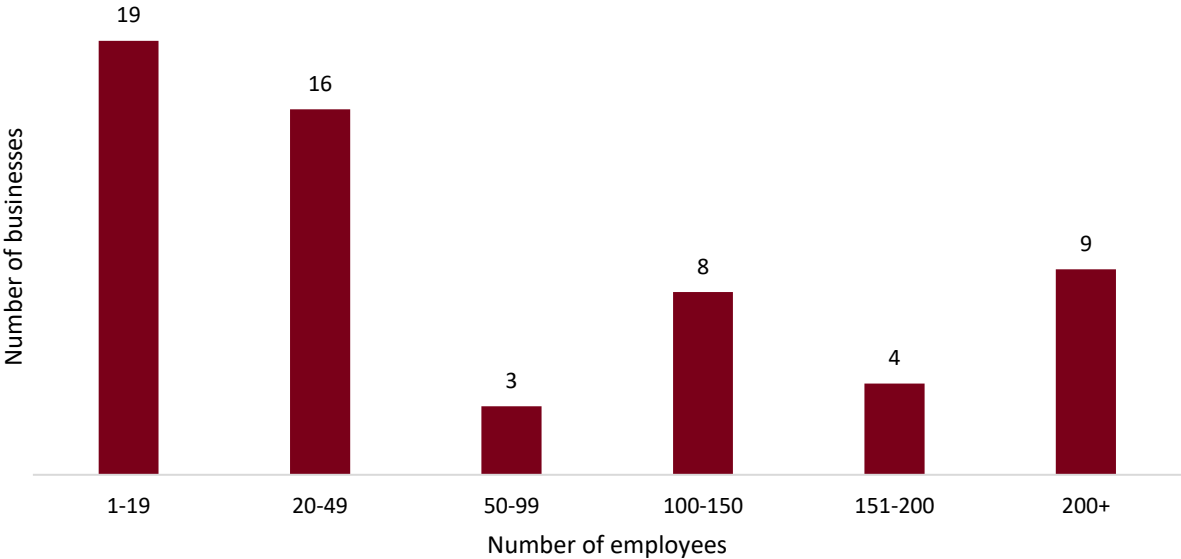
SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

Respondents were then asked if their company was the headquarters or a branch location. Of the 59 respondents, 63% (n=38) indicated that their location was the headquarters, while 37% (n=22) stated it was a branch location. For those who stated that their business was a branch location, they were asked to specify the location of their headquarters. Some of the most common locations were in the Twin Cities metro area (n=9) or in the Twin Ports (n=3). Another five businesses indicated their headquarters was located somewhere on the Iron Range (Virginia, Eveleth, Chiselm, or Hibbing). And nine businesses had a headquarters located in another state or country.

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

Businesses were also asked how many employees they currently have at their specific location. Figure 18 shows that more than half of all surveyed businesses have fewer than 50 employees, with 19 businesses reporting fewer than 20 employees at their specific location, and 16 businesses reporting 20-49 employees. The third most common response was 200+ employees, with nine businesses selecting that option.

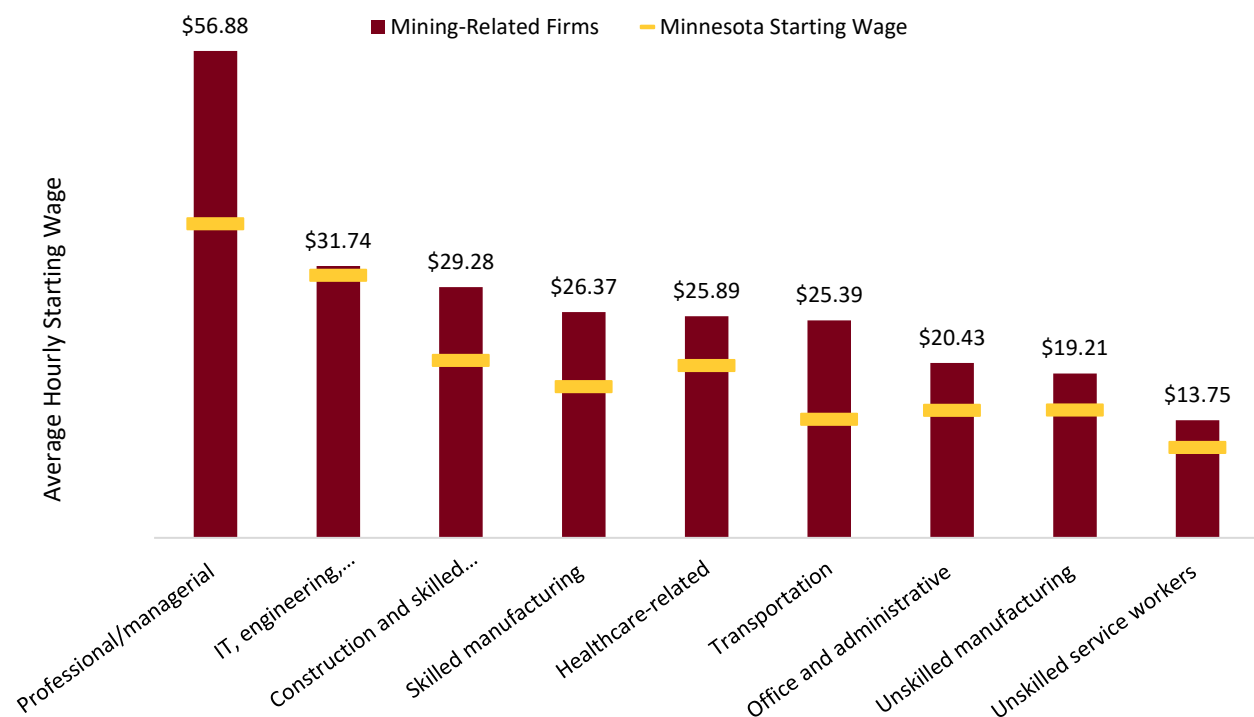
Figure 18. How many employees does your business have at your specific location? (n=59)



SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

Next, the survey asked businesses to provide the average hourly starting wage they pay to employees by specific type of occupation. Figure 19 below shows the average wage for each occupation for all businesses that provided a response. In addition, the graph shows the average hourly wage for the equivalent occupation statewide, taken from the Occupational Employment Statistics (OES) database.¹⁸ The average wage for the 25th percentile of workers was used to represent a typical starting wage in that occupation. Among surveyed businesses, the highest paid occupations are professional/managerial (\$57/hour); IT, engineering, scientists, and technicians (\$32); and construction and skilled maintenance (\$29).¹⁹ It is notable that, for every occupation, the average hourly starting wage reported by survey respondents was higher than the 25th percentile hourly wage for the same position statewide. In many cases, the difference was significant. For example, the average hourly starting wage for transportation workers employed by surveyed businesses was \$25.39, while the average wage for the 25th percentile of workers statewide in that occupation was only \$13.85.

Figure 19. What is the average hourly starting wage paid to employees in each category? (n=48)



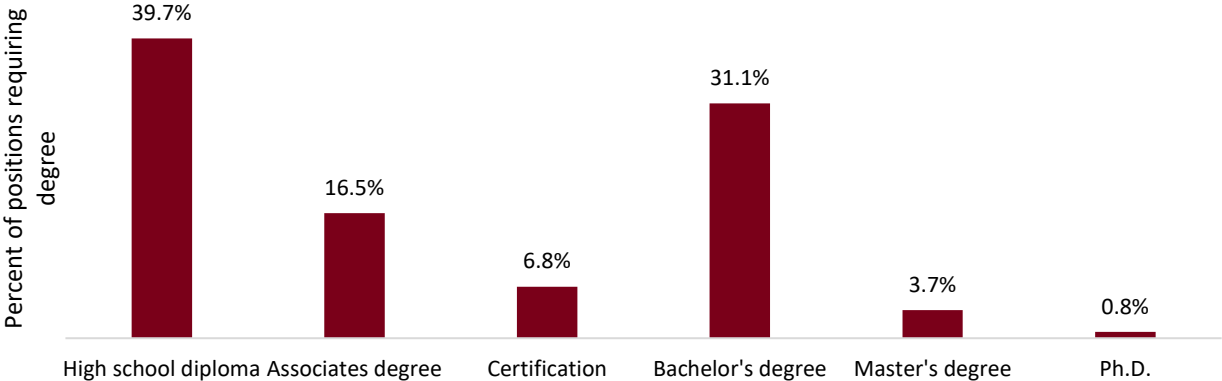
SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

¹⁸ <https://mn.gov/deed/data/data-tools/oes/>

¹⁹ Equivalent positions used for comparison are as follows: Management Occupations (used as equivalent position for Professional/managerial); Computer and Mathematical Occupations (IT, engineering, scientists, and technicians); Construction and Extraction Occupations (Construction and skilled maintenance); Installation, Maintenance, and Repair Occupations (Skilled manufacturing); Healthcare Practitioners and technical Occupations/Healthcare Service Occupations (Healthcare-related); Transportation and Material Moving Occupations (Transportation); Office and Administrative Support Occupations (Office and administrative); Production Occupations (Unskilled manufacturing); Food Preparation and Serving Related Occupations (Unskilled service workers)

Respondents were then asked to provide a percentage of the positions that require a specific degree as a final degree completed (see Figure 20). To avoid double counting, the survey provided an example for respondents: “If half of the positions at your company have a minimum education requirement of a high school diploma, while the other half requires a minimum of a bachelor's degree, you would type ‘50’ in both of those categories.”

Figure 20. Of all positions at your company, what percentage of positions requires the following degrees (as a final degree completed)? Total should sum to 100% (n=47)

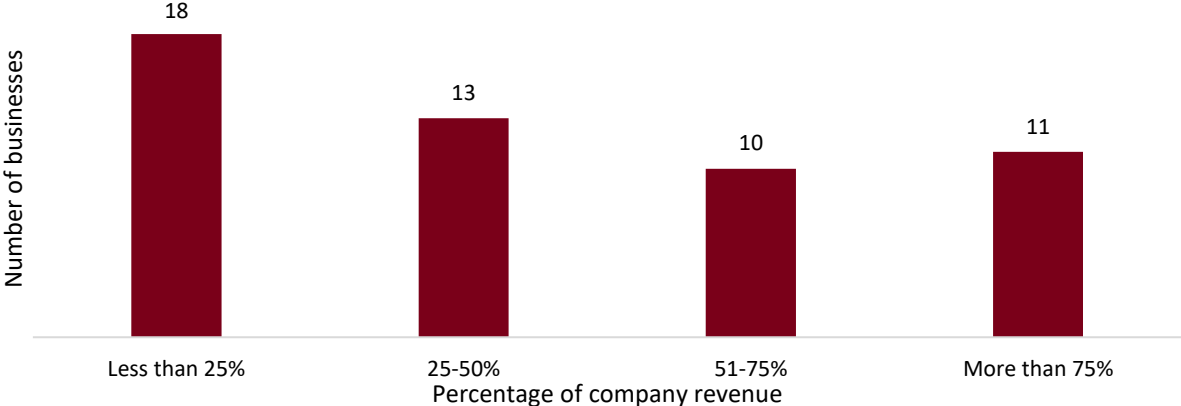


SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

Figure 20 shows the percentage of positions requiring each degree. As shown in the figure, roughly 40% of all the positions at the surveyed businesses require a high school diploma/GED as a final degree completed. Just over 30% of all positions require a bachelor’s degree. Less than 5% of all positions require a master’s or Ph.D.

Respondents were also asked what portion of their company’s annual revenue can be attributed to the mining industry (see Figure 21). While the largest number of respondents (n=18) stated that less than 25% of their annual revenue could be attributed to the mining industry, it is notable that more than 40% of respondents (21 of 52) stated that more than half of their annual revenue was directly attributable to the mining industry. These companies were categorized as having “more than 50% revenue from mining.” Later in the chapter, results for this group are compared with those having less than 50% revenue from mining to see if there are significant differences in company outlook and business confidence.

Figure 21. What portion of your company’s annual revenue can be attributed to the mining industry? (n=52)



SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

Next, respondents were asked a series of questions relating to how certain factors were affected in the past six months and how those same factors will be affected in the next six months. The factors include average hours worked, number of employees, selling prices, profits, and taxes. The level at which these factors were affected was scaled from “significantly decreased,” “moderately decreased,” “no change,” “moderately” “increased,” and “significantly increased.” Each respondent was asked to state the level at which the factor changed.

Figure 22. How did the following factors change, if at all, for your business in the past six months? (n=52)

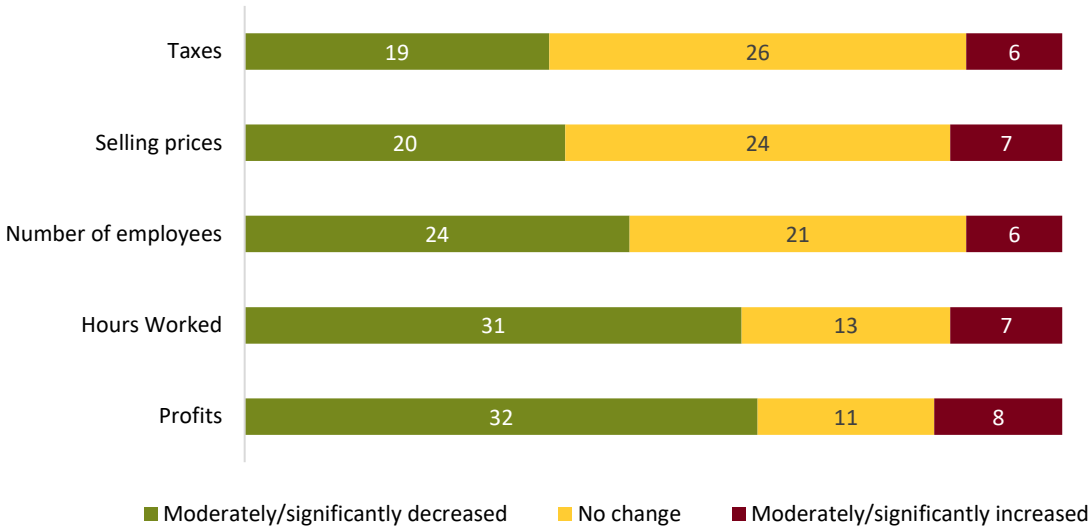


SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

Figure 22 shows how those factors have changed for businesses over the past six months. For ease of interpretation, “moderately increased” and “significantly increased” responses were grouped, as were “moderately decreased” and “significantly decreased.” According to the results, the majority of respondents reported no change for all of the factors over the past six months. For example, 33 respondents stated that taxes had not changed in the past six months, while 24 respondents stated that their profits had not changed. For those who reported some type of change in their businesses, most indicated that the factors had moderately or significantly increased over the past six months, with selling prices (n=16) and number of employees (n=16) having the highest number of positive responses. Fewer businesses reported negative changes over the past six months, although 12 businesses did report a moderate or significant decrease in profits.

Figure 23 on the following page provides the responses for how those factors are expected to change over the next six months. As shown in the figure, many businesses are feeling pessimistic about the coming business conditions. The majority of respondents are expecting moderate or significant decreases in profits (n=32), hours worked (n=31), and number of employees (n=24) in the coming months. Fewer than ten businesses expect moderate or significant increases in any of the five business factors listed.

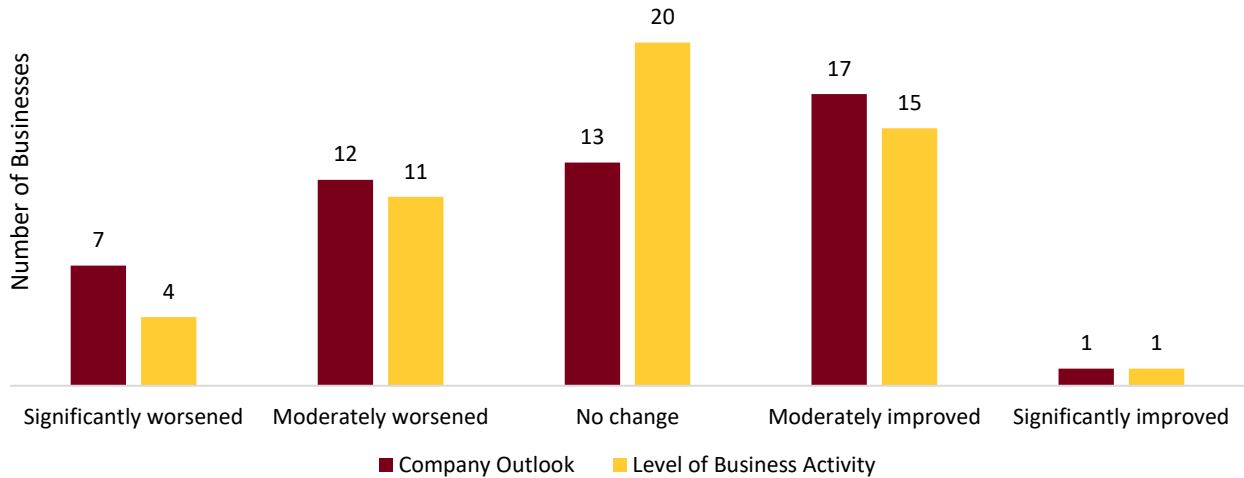
Figure 23. How will the following factors change, if at all, for your business in the next six months? (n=51)



SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

Respondents were then asked how general business conditions had changed in the last six months pertaining to company outlook and level of business activity. Figure 24 has a total of 50 responses. In terms of company outlook, 17 businesses stated that their company outlook had moderately improved over the past six months, 13 indicated no change, and 12 reported a moderate decrease in their company outlook. In terms of the level of business activity over the past six months, 20 businesses indicated no change, while 15 stated that their business activity had moderately improved, and 11 reported that it had moderately worsened.

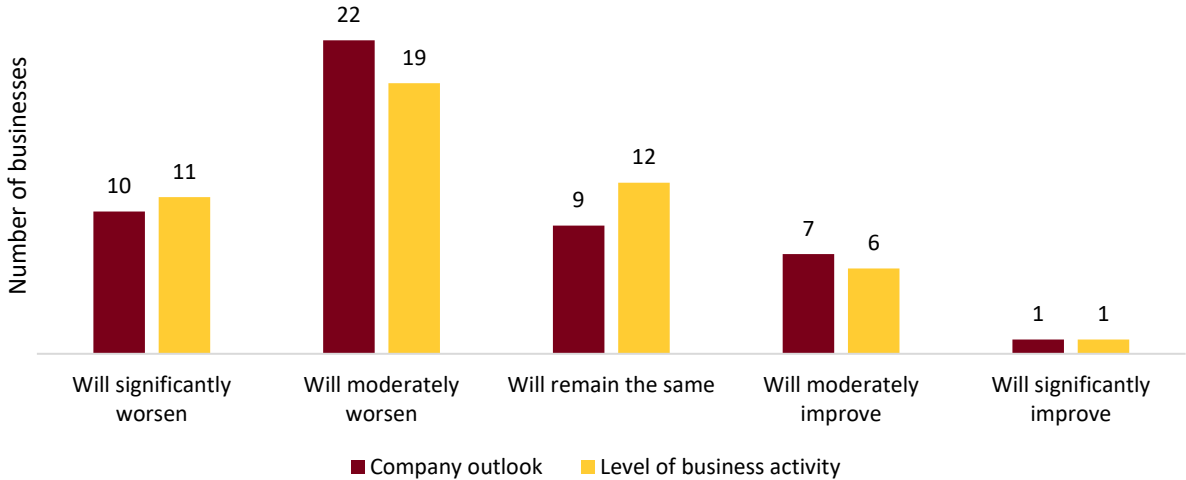
Figure 24. How did the general business conditions change, if at all, for your business in the last six months? (n=50)



SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

Respondents were also asked to predict changes in their company’s general business conditions over the coming six months (Figure 25). Again, many businesses reported feeling pessimistic about future conditions. Of the 50 businesses who responded to the question, 22 respondents predicted their company outlook would moderately worsen, while 10 businesses predicted it would significantly worsen. When asked about their level of business activity, 19 respondents predicted it would moderately worsen, 11 said significantly worsen, and 12 predicted no change. For both questions, only one business predicts a “significant improvement” in business conditions and company outlook.

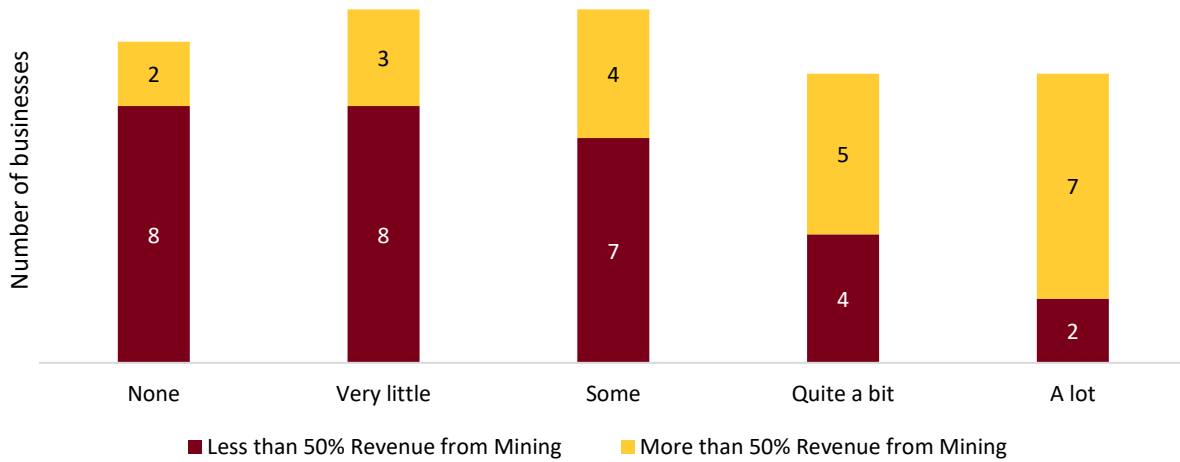
Figure 25. How will the general business conditions change, if at all, for your business in the next six months? (n=50)



SOURCE: *BBER SURVEY OF MINING-RELATED BUSINESSES*

Respondents were then asked how much of the change in their business activity in the past six months was the result of region’s mining industry. Figure 26 shows the results of that question with responses broken out by whether the businesses receive more than 50% of their annual revenue from the mining industry. In general, responses were distributed fairly evenly among the possible choices. However, it is not surprising that businesses that are more heavily dependent on the mining industry were more likely to report that “quite a bit” or “a lot” of the change in their business activity was due to the region’s mining industry.

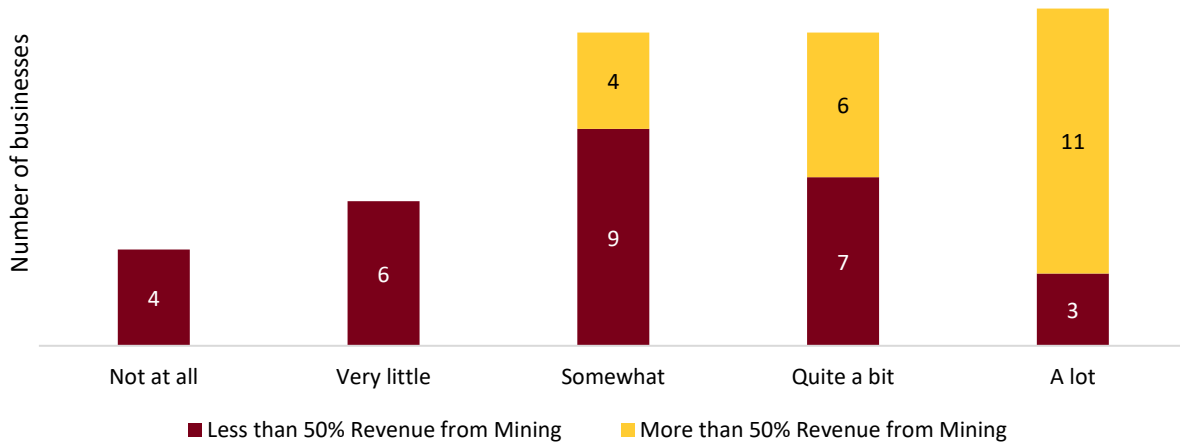
Figure 26. How much of the change in business activity over the past six months was the result of the region’s mining industry? (n=50)



SOURCE: *BBER SURVEY OF MINING-RELATED BUSINESSES*

Next, respondents were asked to evaluate how much of their business outlook depends on their expectations for the region’s mining industry. Figure 27 shows that, not surprisingly, businesses that receive more than 50% of their annual revenue from the region’s mining industry were much more likely to base their future business outlook on their expectations for the region’s mining industry.

Figure 27. How much does your general business outlook for the next six months depend on your expectations for the region’s mining industry? (n=50)



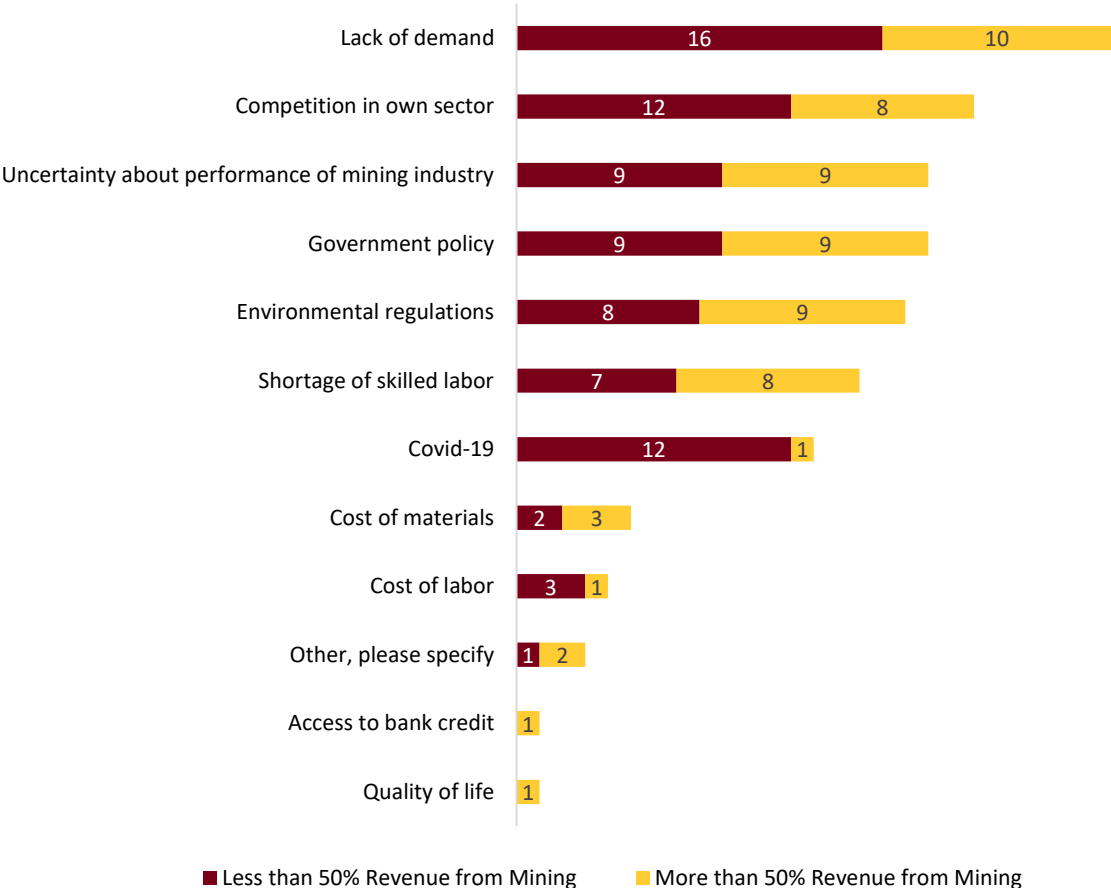
SOURCE: *BBER SURVEY OF MINING-RELATED BUSINESSES*

Lastly, respondents were asked what factors may be limiting their ability to increase business activity. Businesses were allowed to select multiple factors. Figure 28 shows that a “lack of demand” (n=26), “competition” (n=20), “uncertainty about the performance of the mining industry” (n=18), and “government policy” (n=18) were top concerns among surveyed businesses. Businesses were also given the option to write

in other concerns in the survey. Of those that wrote in a specific concern, 13 mentioned the covid-19 pandemic as a factor they felt was limiting their ability to increase business activity. Since there were a significant amount of those answers, covid-19 was added to the chart as an additional category.

The figure also shows the differences in responses between businesses that receive more than 50% of their revenue from the mining industry versus those that do not. Interestingly, businesses that are heavily dependent on the mining industry were less likely to mention covid-19 as a factor in their response. This could be due to the timing of the survey, which was distributed during the early stages of the outbreak, when news was still just emerging on the impacts of the virus. Or, it could be that businesses that are heavily dependent on mining were deemed “essential” and are therefore less concerned about the long-term effects of the virus on that industry in particular.

Figure 28. What factors, if any, are limiting your ability to increase business activity? Select all that apply (n=59)



SOURCE: BBER SURVEY OF MINING-RELATED BUSINESSES

VI. Conclusions

The ferrous and nonferrous mining firms have provided significant economic growth for the study areas of the Arrowhead Region with Douglas County, Wisconsin, and the state of Minnesota.

For this study, representatives from 12 of the 13 surveyed mines provided data. The year 2019 was used as the baseline with the study estimating outcomes of the next five years (2020-2024).

FERROUS: In 2019, nearly 4,000 jobs were directly attributable to ferrous mining, while an additional 4,960 were created in other parts of the regional economy through indirect and induced effects in the Arrowhead Region. Over the five-year study period, ferrous mines report that the number of jobs is expected to remain stable.

The study shows that these mines should experience a 1% annual increase in capital and construction spending, progressing from \$113 million to \$119 million, as well as an annual increase in operating expenses of 1%. It is projected that in 2024, the ferrous mining industry will contribute \$788 million in labor income (wages and benefits), roughly \$1.5 billion in value added, and \$3.29 billion in output to the region's economy.

NONFERROUS: Nonferrous mining operations employed 46 people directly in 2019, with 71 additional jobs indirectly supported. Operating expenses for the industry were more than \$63 million. In total, the non-ferrous mining industry added more than \$10 million in labor income, \$62 million in value added spending, and \$77.5 million in output to the study area's economy in 2019.

By the year 2024, one of the four non-ferrous mines is expected to be operational, and one to two more will have proposed projects in the environmental review phase. This growth is anticipated to produce a 950% increase in direct employment (436 jobs) by 2024, \$253 million in operating expenses, and \$38 million in wages and benefits. By 2024, it is projected that the nonferrous mining industry could contribute \$45 million in labor income, \$210 million in value added, and more than \$300 million in output to the eight-county study area's economy.

MINNESOTA: Economic impacts from ferrous and nonferrous mining are greater when using the state of Minnesota as the study area

In 2019, the baseline year, ferrous and nonferrous mining combined contributed more than 11,600 jobs, \$1.0 billion labor income, \$2.1 billion in value added spending, and nearly \$4.0 billion to the state's economy. By 2024, this study shows that the impacts from the ferrous and nonferrous mining industry are anticipated to support 11,200 jobs, \$1.1 billion in labor income, and \$4.1 billion in output statewide.

Additionally, this study included a survey of businesses that depend upon and support the mining industry. Results show that these businesses tend to have higher-than-average wages as compared to the state's average wage. Surveyed businesses were very positive about recent business performance but cautious about the future.

Appendix A. Definitions Used in this Report

Ferrous: Of, relating to, or containing iron.

Nonferrous: Not containing, including, or relating to iron.

Capital expenditures: An amount paid out that creates a long-term benefit (as one lasting beyond the taxable year).

Proprietor income: The current-production income of sole proprietorships, partnerships, and tax -exempt cooperatives. Excludes dividends, monetary interest received by nonfinancial business, and rental income received by persons not primarily engaged in the real estate business.

Taconite: A flint-like rock high enough in iron content to constitute a low-grade iron ore.

Ore: A naturally occurring mineral containing a valuable constituent (such as metal) for which it is mined and worked.

Long ton: A unit of weight equal to 2,240 pounds.

Ad Valorem: Imposed at a rate percentage of value.

Royalties: A share of the product or profit reserved by the grantor especially of an oil or mining lease.

Metric ton: A unit of mass equal to 1,000 kilograms or 2,205 pounds.

Economic super sectors: One of the 20 major areas of economic activity in North American Industry Classification System (NAICS).

Sensitivity analysis: This model is also referred to as “what-if” or simulation analysis. It is a way to predict the outcome of a decision given a certain range of variables.

Employee compensation: Total payroll cost of the employee including wages and salaries, all benefits (e.g., health, retirement) and payroll taxes.

Labor income: All forms of employment income, including employee compensation (wages and benefits) and proprietor income.

Direct effect: Initial new spending in the study area resulting from the project.

Economic impact: The effect of an event on the economy in a specified area, ranging from a single neighborhood to the entire globe. It usually measures changes in business revenue, business profits, personal wages, and/or jobs.

Employment: Estimates (from U.S. Department of Commerce secondary data) are in terms of jobs, or headcount, not in terms of full-time equivalent employees. Therefore, these jobs may be temporary, part-time, or short-term.

Gross Domestic Product (GDP): The market value of all goods and services produced in a nation in a certain time frame (typically a year)

Gross output: The value of local production required to sustain activities.

Gross Regional Product (GRP): The market value of all goods and services produced in a region in a certain time frame (typically a year)

Growth rates: The change in the measure of a variable, over time, compared to a previous measure of the variable

Indirect effect: The additional inter-industry spending from the direct impact. For example, increased sales in linen supply firms resulting from more motel sales would be an indirect effect of visitor spending.

Induced effect: The impact of additional household expenditures resulting from the direct and indirect impact. For example, motel employees spend the income they earn from increased tourism on housing, utilities, groceries, and other consumer goods.

Industry: A group of businesses based on their related primary business activities

Labor income: All forms of employment income, including employee compensation (wages and benefits) and proprietor income.

Leakages: Any payments made to imports or value added sectors that do not in turn re-spend the dollars within the region.

Location Quotient (LQ): A measure industry concentration compared to another geographic location (e.g. the nation). A LQ of less than 1 indicates that the industry is less concentrated in a region as compared to the national economy, and a LQ higher than 1 means that it is more concentrated

Margins: The value of wholesale and retail trade services provided in delivering commodities from producers' establishments to purchasers. Margin is calculated as sales receipts less the cost of the goods sold. It consists of the trade margin plus sales taxes and excise taxes that are collected by the trade establishment. (BEA)

Metropolitan Statistical Area (MSA): A geographical region with a relatively high population density at its core and close economic ties throughout the area. MSAs are defined by the U.S. Census Bureau

Multipliers: Total production requirements within the Study Area for every unit of production sold to Final Demand. Total production will vary depending on whether Induced Effects are included and the method of inclusion. Multipliers may be constructed for output, employment, and every component of value added.

Owner-occupied dwellings: An IMPLAN industry that represents imputed rental activity by homeowners. In this case, market rents are used to estimate the value to the property owner.

Value added: A measure of the impacting industry's contribution to the local community; it includes wages, rents, interest, and profits.

Appendix B. Input-Output Modeling

Data Sources

This study uses the IMPLAN Group's input-output modeling data and software (IMPLAN version 3.1). The IMPLAN database contains county, state, zip code, and federal economic statistics, which are specialized by region, not estimated from national averages. Using classic input-output analysis in combination with region-specific Social Accounting Matrices and Multiplier Models, IMPLAN provides a highly accurate and adaptable model for its users. IMPLAN data files use the following federal government data sources:

- U.S. Bureau of Economic Analysis Benchmark Input-Output Accounts of the U.S.
- U.S. Bureau of Economic Analysis Output Estimates
- U.S. Bureau of Economic Analysis Regional Economic Information Systems (REIS) Program
- U.S. Bureau of Labor Statistics Covered Employment and Wages (CEW) Program
- U.S. Bureau of Labor Statistics Consumer Expenditure Survey
- U.S. Census Bureau County Business Patterns
- U.S. Census Bureau Decennial Census and Population Surveys
- U.S. Census Bureau Economic Censuses and Surveys
- U.S. Department of Agriculture Census

IMPLAN data files consist of the following components: employment, industry output, value added, institutional demands, national structural matrices, and inter-institutional transfers. Economic impacts are made up of direct, indirect, and induced impacts. The data used was the most recent IMPLAN data available, which is for the year 2017. All data are reported in 2018 dollars.

Economic impacts are made up of direct, indirect, and induced impacts. The following are suggested assumptions for accepting the impact model: IMPLAN input/output is a production-based model, and employment numbers (from U.S. Department of Commerce secondary data) treat both full- and part-time individuals as being employed.

Regional data for the impact models for value added, employment, and output are supplied by IMPLAN for this impact. Employment assumptions were provided to the model to enable construction of the impact model. From these data, social accounts, production, absorption, and byproducts information were generated from the national level data and were incorporated into the model. All region study definitions and impact model assumptions were agreed on before work with the models began.

Modeling Assumptions

The following are suggested assumptions for accepting the impact model:²⁰

Backward-Linkages: IMPLAN is a backward-linkage model, meaning that it measures the increased demand on industries that produce intermediate inputs as a result of increases in production. However, if an industry increases production, there will also be an increased supply of output for other industries to use in their production. Models that measure this type of relationship are called forward-linkage models. To highlight this

²⁰ Bureau of Economic Analysis https://www.bea.gov/papers/pdf/WP_IOMIA_RIMSII_020612.pdf

concept, consider the example of a new sawmill beginning its operations in a state. The increased production as a result of the sawmill's operations will increase the demand for lumber, creating an increase in activity in the logging industry, as well as other supporting industries such as electric transmission and distribution. IMPLAN's results will include those impacts, but will exclude effects on any wood product manufacturers located nearby that might be impacted by the newly available supply of lumber.

Employment: IMPLAN input-output is a production-based model, and employment numbers (from U.S. Department of Commerce secondary data) treat both full- and part-time individuals as being employed.

Fixed prices and no supply constraints: IMPLAN is a fixed-price model. This means that the modeling software assumes no price adjustment in response to supply constraints or other factors. In other words, the model assumes that firms can increase their production as needed and are not limited by availability of labor or inputs and that firms in the local economy are not operating at full capacity.

Fixed production patterns: Input-output (I-O) models assume inputs are used in fixed proportion, without any substitution of inputs, across a wide range of production levels. This assumption assumes that an industry must double its inputs (including both purchases and employment) to double its output. In many instances, an industry will increase output by offering overtime, improving productivity, or improvements in technology.

Industry homogeneity: I-O models typically assume that all firms within an industry have similar production processes. Any industries that fall outside the typical spending pattern for an industry should be adjusted using IMPLAN's Analysis-by-Parts technique.

Leakages: A small area can have a high level of leakage. Leakages are any payments made to imports or value added sectors, which do not in turn re-spend the dollars within the region. What's more, a study area that is actually part of a larger functional economic region will likely miss some important linkages. For example, workers who live and spend outside the study area may actually hold local jobs.

Appendix C. Taxes, School Support, and Minnesota’s Mineral Revenue

This appendix reproduces secondary data sources for tax impact findings presented in the report, including sources for:

1. Taconite Production Tax

A severance tax paid on concentrates or pellets produced by the taconite companies. The rate is determined by multiplying the prior year’s rate by the percent change in the Gross Domestic Product Implicit Price Deflator from the fourth quarter of the second preceding year to the fourth quarter of the preceding year. The rate for 2018 production was \$2.751 per taxable ton. The tax revenue is distributed to various cities, townships, counties, and school districts within taconite mining areas.

2. Occupation Tax

All mining companies, ferrous or nonferrous, are subject to the Minnesota Occupation tax. This is similar to a corporate income tax. The tax revenue is credited to the general fund.

3. Minnesota taxes levied on mining related activity

4. School district component of production tax

5. Various Ad Valorem and property taxes

Lands that include un-mined taconite and iron ore are subject to the ad valorem and property taxes.

Lands and structures actively used for taconite production are exempt from the ad valorem tax and are subject to the production tax instead of the property tax.

1. Taconite Production Tax

Distribution by Fund/Recipient*

Production Year	2014	2015	2016	2017	2018
City and Township (Mining/Concentrating)	\$2,125,786	\$2,062,198	\$1,940,927	\$1,867,524	\$1,958,947
Cities and Towns (Mining Effects)	1,789,718	1,699,835	1,634,030	1,614,524	1,692,584
Taconite Municipal Aid Account	6,589,995	6,475,364	5,952,563	5,707,956	5,997,930
Taconite Municipal Aid — Special City/ Township Fund	157,055	157,055	157,055	157,055	157,055
Township Fund	1,281,952	1,220,270	1,089,757	1,060,065	1,174,750
County Fund	7,114,672	7,313,951	7,364,487	7,267,637	7,133,755
County Road and Bridge Fund	4,605,134	4,405,415	3,982,835	3,833,944	4,131,231
Regular School Fund	10,634,759	10,165,680	9,173,173	8,823,468	9,521,706
Taconite School Fund (Mining/Concentrating)	1,604,891	1,539,803	1,423,998	1,382,880	1,450,450
School Building Maintenance Fund	1,531,417	1,420,003	1,296,839	1,284,390	1,397,372
Taconite Levy Shortfall Payment	–	–	369,785	284,267	0
Taconite Referendum Fund	6,178,596	6,178,596	6,178,596	6,178,596	6,178,596
School Bond Payments	2,608,285	2,606,617	2,513,481	1,379,870	773,388
Taconite Railroad Aid (total for cities, towns, counties, schools)	2,482,454	2,482,454	2,482,454	2,482,454	2,482,454
Taconite Property Tax Relief Fund	13,724,064	13,063,708	11,296,703	11,064,355	12,576,381
Iron Range Resources & Rehabilitation (IRRR) (Indexed)	3,803,209	3,623,063	3,241,899	3,151,470	3,481,195
IRRR (Fixed)	1,252,520	1,252,520	1,252,520	1,252,520	1,252,520
Taconite Economic Development Fund (TEDF)	10,598,678	10,122,388	700,000	8,430,530	9,224,587
Taconite Environmental Protection Fund (TEPF)	12,993,550	11,392,335	13,619,534	7,508,487	10,937,237
TEPF Producer Grants and Loans	3,232,931	3,138,053	2,937,302	2,866,569	3,007,800
Douglas J. Johnson Economic Protection Trust Fund (DJJ)	5,633,213	5,036,933	6,189,981	2,962,180	4,949,847
Iron Range Higher Education Account	1,971,848	1,876,970	1,676,219	1,605,486	1,746,717
IRRR Educational Revenue Bonds	3,993,464	3,990,434	3,992,134	3,990,034	3,990,384
Iron Range School Consolidation...Acct-	4,916,476	5,552,584	5,860,104	7,453,570	8,377,087
Hockey Hall of Fame	78,874	75,079	67,048	64,218	69,868
Range Association of Municipalities and Schools (RAMS)	142,200	135,963	123,303	118,494	126,006
Excess School Levy Replacement Money**	(633,976)	(97,157)	0	0	(681,480)
Levy Replacement Money to Cities/Townships**	633,976	97,157	0	0	681,480
Unallocated School Levy Replacement Money***	–	–	(255,023)	0	0
School Money to Cities and Towns for Pay 2018 Levy Reduction***	–	–	255,023	0	0
Total	\$111,045,741	\$106,987,271	\$96,516,727	\$93,792,543	\$103,789,847

Dash indicates not eligible.

* The Production Tax is collected and distributed in the year following production. For example, the 2018 Production Tax was collected and distributed during 2019.

** If the combined total of the School District Fund, Regular School Fund and Taconite Railroad exceeds the levy replacement amount, the excess is transferred to cities and townships within the district.

*** If a school district does not allocate all of its eligible levy replacement amount, the unallocated amount is used to reduce the following year's levy for cities and towns within the district.

SOURCE: MINNESOTA MINING TAX GUIDE, 2019, PG 12

Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth

2. Occupation Tax

Occupation Tax by Company*

	2011 (000s)	2012 (000s)	2013 (000s)	2014 (000s)	2015 (000s)	2016 (000s)	2017 (000s)	2018 (000s)
ArcelorMittal	\$50	\$700	\$250	\$460	\$0	\$0	\$0	\$500
Hibbing Taconite	4,550	4,360	3,165	2,320	2,300	2,170	2,030	3,400
Northshore	2,015	1,545	360	1,350	490	600	1,260	1,770
U.S. Steel	13,400	12,187	9,320	10,622	3,150	1,829	9,186	11,732
United Taconite	2,040	3,000	2,000	1,650	430	0	575	1,680
Total – Taconite	\$22,055	\$21,792	\$15,095	\$16,402	\$6,370	\$4,599	\$13,051	\$19,082
Mesabi Nugget	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total – DRI	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Magnetation	\$0	\$25	\$682	\$0	\$0	\$0	\$0	\$0
Mining Resources	0	0	0	0	0	0	0	0
Total – Natural Ore	\$0	\$25	\$682	\$0	\$0	\$0	\$0	\$0
Total	\$22,055	\$21,817	\$15,777	\$16,402	\$6,370	\$4,599	\$13,051	\$19,082

* Amount paid by May 1 each year. Does not include adjustments.

** The Occupation Tax by Company total shown for 2016 in the 2017 Mining Tax Guide was incorrect. See breakdown above for correct totals.

SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 25

3. Minnesota taxes levied on mining related activity

Minnesota Taxes Levied on Mining-Related Activity

Production Years	Unmined Taconite Tax	Use Tax (net)	Production Tax	Occupation Tax ¹	Railroad Gross Earnings Tax ²	Total Taxes	Total Tons Produced ³	Total Taxes per Ton
2009	238,274	(2,835,766)	74,255,473	340,000	9,612	72,007,593	17,079,106	4.22
2010	239,518	17,101,895	72,441,708	12,617,000	10,137	102,410,258	35,122,570*	2.92
2011	228,517	24,673,718	73,287,396	22,055,000	10,725	120,255,356	39,120,810*	3.07
2012	297,390	2,579,876	94,204,746	21,817,000	13,632	118,912,644	39,680,723	3.00
2013	279,594	24,636,760	101,214,301	15,776,560	34,082	141,941,297	38,481,228	3.69
2014	291,298	10,873,758	102,369,609	16,401,555	30,352	129,966,572	39,835,029	3.26
2015	299,722	(11,104,636)**	98,728,605	6,370,000	26,466	94,320,157	32,664,481	2.89
2016	296,597	(13,958,786)**	89,141,361	4,599,000	20,600	80,558,968	29,087,625	2.77
2017	281,460	4,857,150	86,728,401	13,051,000	15,394	104,933,405	37,719,847	2.78
2018	288,758	8,664,249	96,104,298	19,082,000	11,000	124,150,305	39,098,876	3.18

Note:

Historical data is available on our website.

Taxes often levied (assessed) for one year and paid in the following year.

1 Amount paid (unaudited). Does not include adjustments.

2 Taconite railroads are taxed on an ad valorem basis.

3 Tons are dry without flux .

* Includes tonnage produced by Mesabi Nugget but not taxed under Production Tax.

** The Use Tax law changed mid 2015. Manufacturers no longer pay Use Tax on equipment used in the production process. As a result, more tax was refunded than collected.

SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 26

4. School district component of production tax

2019 Distributions by Fund to School Districts

(Based on 2018 production year tax revenues)

School Districts	Taconite School Fund \$0.0343	Regular School Fund \$0.2472	Taconite Railroad Aid	School Bldg. Maintenance Fund \$0.04	Taconite Referendum \$0.213	Less Excess Money Transferred to Cities and Townships	Total by School District
001 Aitkin	---	\$265,570	---	---	\$62,694	(\$8,226)	\$320,038
166 Cook County	\$21,087	\$71,708	\$264,977	---	\$91,498	(\$38,751)	\$410,519
182 Crosby-Ironton	---	\$278,307	---	---	\$222,602	\$0	\$500,909
316 Greenway	\$33,373	\$972,786	---	\$91,640	\$372,009	(\$45,283)	\$1,424,525
318 Grand Rapids	\$0	\$1,090,251	---	---	\$428,400	(\$26,340)	\$1,492,311
319 Nashwauk-Keewatin	\$84,208	\$330,786	---	\$38,131	\$268,675	(\$17,682)	\$704,118
381 Lake Superior	\$75,510	\$433,968	\$342,720	\$81,983	\$244,417	(\$46,701)	\$1,131,897
695 Chisholm	---	\$913,866	---	\$79,500	\$469,527	(\$67,438)	\$1,395,455
696 Ely	---	\$107,046	---	---	\$213,624	(\$11,915)	\$308,755
701 Hibbing	\$302,919	\$1,826,867	---	\$225,389	\$1,219,547	(\$140,133)	\$3,434,589
706 Virginia	\$74,754	\$1,046,174	---	\$212,878	\$728,472	(\$135,063)	\$1,927,215
712 Mtn. Iron-Buhl	\$447,057	\$390,608	---	\$91,638	\$349,776	(\$31,372)	\$1,247,707
2142 St. Louis County	\$141,307	\$558,468	\$284,841	\$200,655	\$429,452	(\$73,418)	\$1,541,305
2154 Eveleth-Gilbert	\$86,898	\$664,562	---	\$219,905	\$652,570	(\$2,619)	\$1,621,316
2711 Mesabi East	\$183,337	\$570,739	\$214,397	\$155,653	\$425,333	(\$36,539)	\$1,512,920
Total	\$1,450,450	\$9,521,706	\$1,106,935	\$1,397,372	\$6,178,596	(\$681,480)	\$18,973,579

Dashes indicate not eligible. \$0 indicates eligible, but no payment at current valuation and production.

SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 17

School Bond Payments

School Districts	Year Authorized ¹	Final Payment Year ²	Payment ³	Outstanding Balance ⁴
316 Greenway	2000	2019	\$144,280	\$175,000
381 Lake Superior	2000	2022	355,147	1,126,839
695 Chisholm	2000	2020	273,961	533,400
Total			\$773,388	\$1,855,239

- 1 Legislative year in which taconite funding was enacted.
- 2 Production year from which final bond payment will be deducted.
- 3 Payments made from 2018 pay 2019 tax distribution.
- 4 Estimated portion of outstanding bond balance to be paid by taconite funds (not including interest).

SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 18

Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth

5. Various Ad Valorem and property taxes

Ad Valorem Tax Payable on Unmined Natural Iron Ore

Year Assessed	Market Value	Payable Year	Estimated Tax Payable			Total
			Crow Wing	Itasca	St. Louis	
2009	2,347,000	2010	2,200	12,200	71,500	85,900
2010	2,345,500	2011	2,400	12,700	76,400	91,500
2011	2,341,600	2012	2,600	14,300	87,400	104,300
2012	2,485,800	2013	2,700	13,900	93,200	109,800
2013	2,492,600	2014	2,800	14,100	93,900	110,800
2014	2,501,400	2015	2,800	14,100	95,200	112,100
2015	2,490,700	2016	2,600	14,200	96,600	113,400
2016	2,476,700	2017	2,500	14,300	86,500	103,300
2017	2,495,100	2018	2,500	14,400	92,600	109,500
2018	2,495,100	2019	2,500	14,800	90,900	107,300

SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 30

Ad Valorem Tax Assessed on Taconite Railroads

Year Payable	Assessed	St. Louis County	Lake County	Total Tax
2009	2008	2,562	6,415	8,977
2010	2009	2,319	7,293	9,612
2011	2010	2,514	7,623	10,137
2012	2011	2,460	8,265	10,725
2013	2012	2,981	10,651	13,632
2014	2013	7,286	26,796	34,082
2015	2014	6,462	23,890	30,352
2016	2015	5,770	20,696	26,466
2017	2016	4,376	16,224	20,600
2018	2017	3,086	12,308	15,394
2019	2018	2,436	8,564	11,000

SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 31

Ad Valorem Tax on Severed Mineral Interests: Collection and Distribution

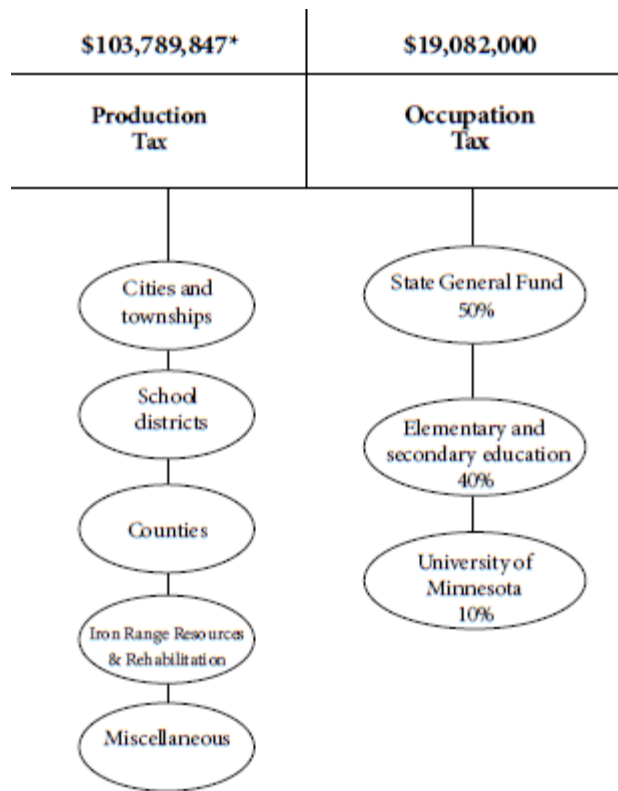
Period ending	80% retained by local government	20% payment to Indian Business Loan Account	Total collections of affected counties
Dec. 31, 2011	\$444,016	\$111,004	\$555,020
Dec. 31, 2012	487,096	121,774	608,870
Dec. 31, 2013	452,376	113,094	565,470
Dec. 31, 2014	436,704	109,176	545,880
Dec. 31, 2015	427,756	106,939	534,695
Dec. 31, 2016	417,991	104,498	522,489
Dec. 31, 2017	513,528	128,382	641,910
Dec. 31, 2018	386,876	96,719	483,595

SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 32

Ad Valorem Tax on Unmined Taconite (Year payable)

County	2012	2013	2014	2015	2016	2017	2018	2019
Itasca	\$ 0	\$ 32,283	\$ 32,468	\$ 31,498	\$ 43,838	\$ 41,697	\$ 45,283	\$ 41,465
St. Louis	228,517	265,107	247,126	259,800	255,884	254,900	236,177	247,293
Total	\$228,517	\$297,390	\$279,594	\$291,298	\$299,722	\$296,597	\$281,460	\$288,758

SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 28



SOURCE: MINNESOTA MINING TAX GUIDE, MINNESOTA DEPARTMENT OF REVENUE, 2019, PG. 42

Mineral Revenue (in thousands), FY 2007-2018 (with bar chart).

FY	School Trust Lands	University Trust Lands	Tax-Forfeited Lands and Minerals	Other Land Classes	Special Advance Royalties	Total Revenue
2009	\$16,792	\$8,268	\$760	\$128	\$324	\$26,272
2010	\$10,487	\$2,270	\$729	\$252	\$389	\$14,127
2011	\$21,448	\$12,526	\$859	\$286	\$389	\$35,508
2012	\$33,383	\$12,496	\$4,481	\$245	\$389	\$50,994
2013	\$32,176	\$12,063	\$4,763	\$198	-\$109	\$49,090
2014	\$53,578	\$15,379	\$4,418	\$287	\$366	\$74,028
2015	\$30,515	\$5,937	\$4,640	\$228	\$206	\$41,526
2016	\$16,429	\$678	\$4,862	\$273	\$258	\$22,499
2017	\$12,339	\$291	\$3,822	\$318	\$186	\$16,956
2018	\$15,276	\$4,411	\$6,177	\$371	\$190	\$26,426
Total	\$242,423	\$74,319	\$35,512	\$2,585	\$2,587	\$357,426

Notes: These values include all revenue from iron ore/taconite, metallic minerals, peat, industrial minerals, M-Leases, stockpile leases, and interest. "Other land classes" include Game & Fish Fund, Volstead Lands, General Fund, Consolidated Conservation (Con-Con) lands, and Professional Services Account.

Bureau of Business and Economic Research
 Labovitz School of Business and Economics
 University of Minnesota Duluth

Minerals Management Account Revenue, FY2006-2018.

FY	School Trust Lands	University Trust Lands	Tax-Forfeited Lands and Minerals	Consolidated Conservation	Other	Total Revenue
2006	\$2,165,778	\$1,417,795	\$255,107	\$10,130	\$1,211	\$3,850,021
2007	\$3,254,288	\$1,991,639	\$314,992	\$12,562	\$2,641	\$5,576,122
2008	\$4,154,194	\$1,876,064	\$104,359	\$9,874	\$4,495	\$6,148,985
2009	\$3,254,808	\$1,648,862	\$145,909	\$13,895	\$6,698	\$5,070,172
2010	\$2,071,993	\$451,195	\$136,194	\$30,241	\$10,124	\$2,699,747
2011	\$4,248,263	\$2,503,345	\$162,737	\$23,971	\$18,578	\$6,956,894
2012	\$6,639,050	\$2,494,469	\$889,380	\$25,620	\$19,150	\$10,067,669
2013	\$6,381,052	\$2,408,773	\$941,740	\$24,896	\$25	\$9,756,486
2014	\$10,672,739	\$3,074,198	\$872,350	\$38,375	\$10,161	\$14,667,823
2015	\$6,097,488	\$1,186,652	\$927,400	\$41,685	\$734	\$8,253,958
2016	\$3,261,192	\$134,401	\$966,184	\$44,701	\$331	\$4,406,809
2017	\$2,371,814	\$53,885	\$756,641	\$54,725	\$299	\$3,237,364
2018	\$3,028,637	\$881,952	\$1,231,268	\$67,496	\$354	\$5,209,707
	\$57,601,296	\$20,123,230	\$7,704,261	\$398,171	\$74,801	\$85,901,757

(*)MS 93.2236: Balance above \$3,000,000 in the account at FY2007 closing is returned to Trust Funds.