

Economic Impact of Enbridge Line 3 Replacement Project

Prepared for Area Partnership for Economic Expansion (APEX)

July 2022



**BUREAU OF BUSINESS AND
ECONOMIC RESEARCH**

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Enbridge provided the majority of inputs for this report. Where data was not available from Enbridge, the BBER utilized IMPLAN, industry standards, and other secondary data sources. The BBER relied upon the completeness, accuracy, and fair presentation of all data and information obtained from Enbridge and/or their agents. The report is conditional upon the completeness, accuracy, and fair presentation of that data and information. The BBER does not promise or guarantee the outcome of these results but rather is providing projections based upon inputs and outputs using IMPLAN software.

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.

The following are board members of APEX: UMD Chancellor Lendley Black and Interim Vice Chancellor for Academic Affairs Amy B. Hietapelto.

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Executive Summary

Enbridge Inc.'s Line 3 pipeline was originally installed in the 1960s, and transported crude oil from Edmonton, Alberta in Canada to Enbridge's Superior Station and Terminal Facility near Superior, Wisconsin. In 2015, Enbridge's internal inspection tools prioritized 950 Line 3 maintenance excavations and forecasted that 7,000 excavations would be needed over the next 15 years to keep Line 3 operating safely, even at a reduced capacity. Given this information, Enbridge sought to replace the entire pipeline.

Replacement of the aging pipeline began with the segments located in Canada and Wisconsin in August 2017, then those in North Dakota (August-September 2020), and finally those in Minnesota in December 2020. The pipeline was placed into service on October 1, 2021. At the time of the writing of this report, Enbridge has nearly completed the replacement of Line 3, but the company anticipates that some restoration and monitoring activities will continue through 2023.

APEX, in cooperation with Enbridge, asked the Bureau of Business and Economic Research (BBER), an entity of the University of Minnesota Duluth's Labovitz School of Business and Economics, to assess the economic impact of the construction of the replacement of Line 3 on 16 affected counties (15 in Minnesota and Douglas County, Wisconsin). In addition, this study includes a special focus on the economic impacts to the retail and hospitality industry resulting from per diem spending in the study area.

Economic impact analysis tracks an initial economic activity (like the replacement of Enbridge's Line 3 pipeline) through multiple rounds of industry and consumer spending to show the multiplier or ripple effects through a local economy. The model uses inputs—in this case Enbridge's expenditures on the Line 3 construction project—to model the total economic effects—direct, indirect, and induced—of the project on other supporting local industries.

The initial activity is considered the direct effect, the resulting increase in industry spending is the indirect effect, and the resulting increase in consumer spending is the induced effect.

Inputs and Assumptions

Inputs used to estimate the economic impacts of the Line 3 replacement project included major construction expenditures, employment estimates, the percentage of local labor and equipment purchases, and per diem compensation.

According to Enbridge representatives, by the time the Line 3 replacement is completed in 2023, the company will have invested more than \$4 billion over the seven-year project. Of that, the company estimates that more than \$2.9 billion will have been spent within the 16-county study area.

The replacement of the Line 3 pipeline supported thousands of construction jobs over the seven-year project. In addition to the construction laborers themselves, Enbridge (the company itself or through subcontracts) employed engineers, right-of-way agents, environmental monitors, project managers, and construction supervisors to complete the project. Enbridge representatives estimated that 54% of the workers employed on the project were from outside the study area.

Enbridge representatives estimated that the company paid roughly \$132.1 million in per diem expenses to workers employed on the Line 3 replacement project—to cover expenses such as lodging, meals, and incidentals. The research team estimated that roughly one-third of the per diem would have been spent on lodging (\$46.4 million) and another third on meals (\$44.3 million). Automotive expenses, such as gas and repairs, represented about 21% of the per diem budget (\$28.2 million). Other significant expenses included incidentals such as retail purchases (7% of spending or \$9.6 million), and health care (3% or \$3.6 million).

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Economic Impacts

According to the results of this analysis, it is estimated that the replacement of the Line 3 pipeline has supported, on average, 4,157 jobs per year in the study area during the period, with peak employment reaching more than 14,400 jobs in 2021 (see Table 1). In addition, the project contributed more than \$1.7 billion in employee wages and benefits, over \$2.2 billion in value added spending, and more than \$5.0 billion in new spending over the life of the project, through direct, indirect, and induced effects.

A multiplier indicates how many additional jobs are added to the study area's economy for each job directly supported by the project. For the Line 3 project, an employment multiplier of 1.86 indicates that for every one job directly supported by Line 3, another 0.86 jobs were added in other supporting industries from indirect and induced effects.

A small, but still significant, portion of the impact from the project has come from per diem spending on the part of workers employed on the project. Approximately half of the workforce for the construction project has been sourced from outside of the study area, and much of their income will leave the study area. However, during the project, it is estimated that workers employed on the Line 3 replacement project spent a per diem allowance—totaling \$132.1 million—on expenses such as lodging, meals, and incidentals, which, in turn, benefits the retail and hospitality industry.

The BBER research team estimated that per diem spending in the study area supported roughly 1,059 jobs per year (see total effects in Table 9, page 13) in 2020 and 2021 and contributed \$99.8 million towards the study area's GDP. Other accommodations (e.g., resorts, campgrounds, RV parks) saw the largest GDP gains because of the spending, followed by hotels and motels, automotive repair and maintenance, and all other food and drinking places.

Comparing the economic impact results of this analysis with the 2017 preconstruction study shows that the Line 3 project had a larger impact than what was anticipated. Originally, the project was anticipated to take two years and cost about \$1.9 billion. However, it actually spanned seven years from filing of application to construction end and cost \$4.0 billion.

Similarly, the amount of spending in the study area proved to be significantly higher than originally projected. Enbridge representatives estimated that the company spent roughly \$2.9 billion in the study area compared with the \$1.5 billion in 2017. As a result, the total effects (the sum of direct, indirect, and induced effects) of the Line 3 replacement project were all considerably larger than what had been projected in 2017. Peak employment impacts (2021) were also larger, whereas average annual employment impacts were slightly lower than what had been predicted, due to the project taking seven years compared with two.

Table 1. Line 3 Replacement Economic Impact Summary, Total Effects by Year (in Millions of Dollars)

Total Effects	Employment	Labor Income	Value Added	Output
2017	4,172	\$240.8	\$319.6	\$788.5
2018	1,920	\$109.4	\$145.1	\$355.2
2019	1,625	\$91.6	\$121.4	\$294.0
2020	5,636	\$358.8	\$455.9	\$911.3
2021	14,423	\$843.8	\$1,098.6	\$2,460.8
2022	1,062	\$58.4	\$77.4	\$186.6
2023	264	\$14.4	\$19.1	\$45.9
Total	4,157	\$1,717.2	\$2,237.2	\$5,042.2

*Totals may not sum due to rounding

SOURCE: IMPLAN

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Economic Impact of Enbridge Line 3 Replacement Project

I. Project Description

Originally constructed in the 1960s and put into service in 1968, Enbridge Energy's Line 3 crude oil pipeline was approximately 1,100 miles long, extending from Edmonton, Alberta, to Superior, Wisconsin. Due to issues with the original coating that caused an increased need for maintenance and the continued regional and global need for oil, the original pipeline was replaced. Completed first in Canada, Wisconsin, and North Dakota, the pipeline work then began in Minnesota.

Pre-construction activities related to the replacement of the pipeline began in 2017 with construction activities for the Minnesota portion of the pipeline beginning in December 2020. Placed into service on October 1, 2021, the company anticipates that some restoration and monitoring activities will continue through 2023.

In the United States, the replacement project involved installing a 36-inch diameter pipe in place of the 34-inch pipe through parts of North Dakota (13 miles), Minnesota (337 miles), and Wisconsin (14 miles). The purpose of this study is to estimate the economic impacts of the replacement of the following three segments of Line 3:

- Line 3 mainline, which runs through 15 counties in northern Minnesota
- Segment 18, or the Douglas County, Wisconsin, section of Line 3
- The Superior terminal building, located in Superior, Wisconsin, serves as the hub terminal for Line 3 and nine other Enbridge pipelines.

The Duluth-based economic development organization, APEX, in cooperation with Weber Johnson Public Affairs, asked the Bureau of Business and Economic Research (BBER), an entity of the University of Minnesota Duluth's Labovitz School of Business and Economics, to assess the economic impact of the replacement of Line 3 on the 16 affected counties (15 in Minnesota and Douglas County, Wisconsin), updating a 2017 report on the same topic. Whereas the 2017 report provided projected economic impacts on the proposed pipeline replacement project, this study estimates the actual economic impacts based on Enbridge's final construction costs. Also included in the report is a special focus on the economic impacts from per diem spending on the retail, hospitality, and accommodations industries in the selected region.

The IMPLAN economic modeling data and software, specifically, IMPLAN's economic multiplier analysis and input/output modeling¹ was utilized with the most recent IMPLAN data (year 2020). Results of modeling are reflected in 2022 dollars and are presented in this report.

It should be noted that every part of the country experienced significant economic changes due to the COVID-19 pandemic, including large stimulus payments, unemployment benefits, changes to household spending, PPP loans for small businesses, and significant economic losses in many industries. The 2020 IMPLAN dataset reflects many of these changes. IMPLAN data are not adjusted to be smoother over time, rather, the goal of the software is to publish data that are as accurate as reasonably possible.² Because a majority of spending on the construction project occurred in years that were impacted by COVID-19 (2020

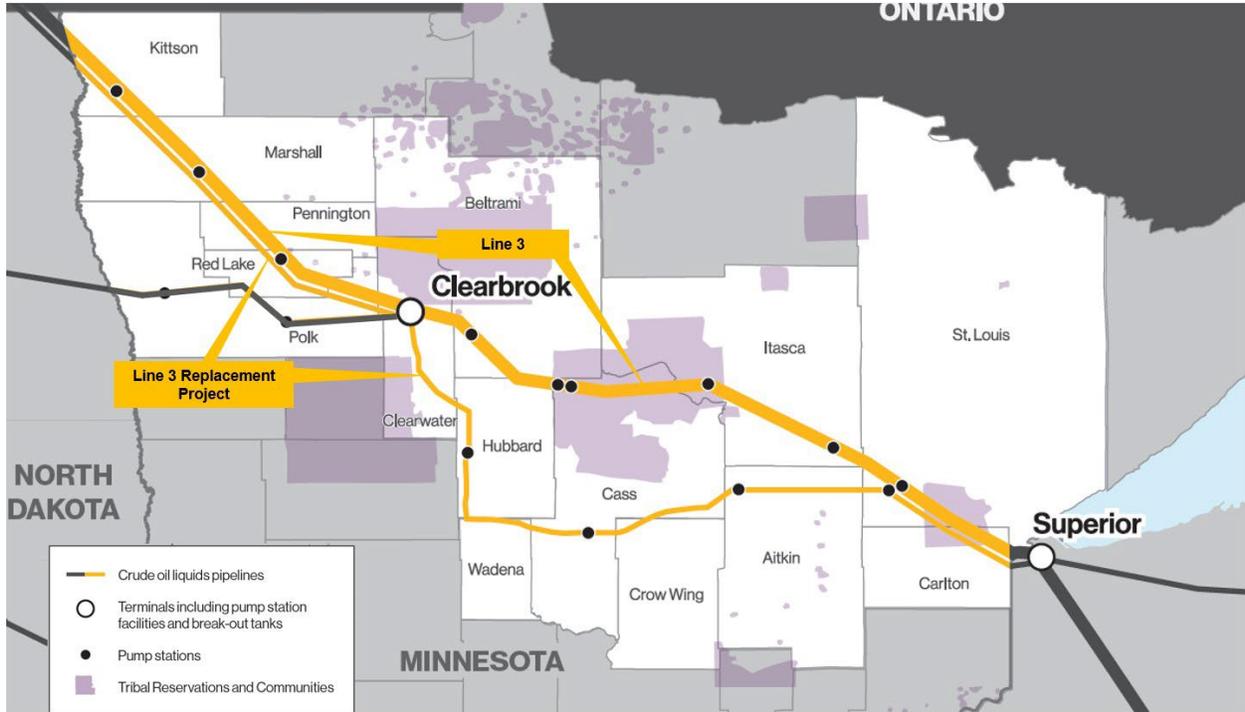
¹ For a complete list of terms and definitions used in this report, see Appendix A.

² IMPLAN (<https://support.implan.com/hc/en-us/articles/4412244641179-2020-Data-Release-Notes>)

and 2021), the research team felt that it would be most accurate to model the project’s impacts using IMPLAN’s 2020 data, despite the unique caveats evident in that year’s dataset.

An economic impact analysis requires the analyst to select a study area—the boundary of what would be considered the local economy. The study area for this economic impact analysis includes the fifteen Minnesota counties of Kittson, Marshall, Pennington, Red Lake, Polk, Clearwater, Beltrami, Hubbard, Wadena, Cass, Crow Wing, Itasca, Aitkin, Carlton, and Saint Louis, as well as Douglas County in Wisconsin. The 16 counties are shown in Figure 1 below. (The city of Superior noted on Figure 1 is in Douglas County.)

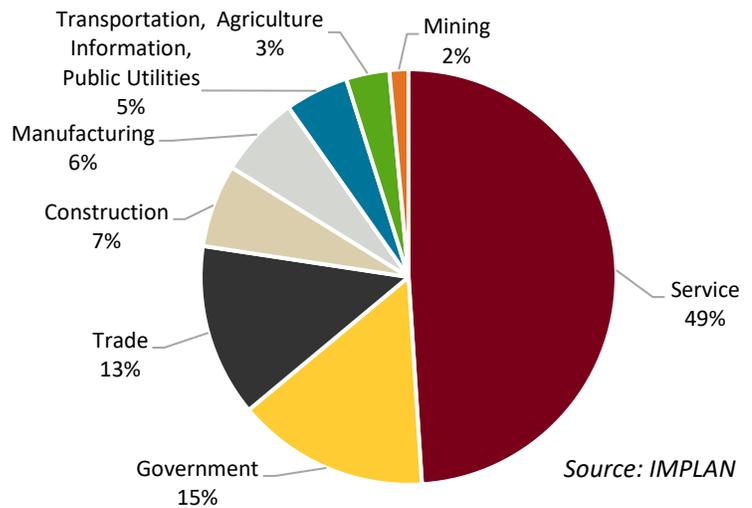
Figure 1. Project Study Area Counties



SOURCE: ENBRIDGE

The new Line 3 traverses most of these counties with several neighboring counties included from which employees, goods, and services were sourced. Additionally, roughly half of the workforce required for the project has come from within this region. The counties included in the study are primarily rural and encompass a significant portion of the northern half of the state of Minnesota. Major cities within the region include Duluth, Hibbing,

Figure 2. Employment by Sector for Study Area (2020)



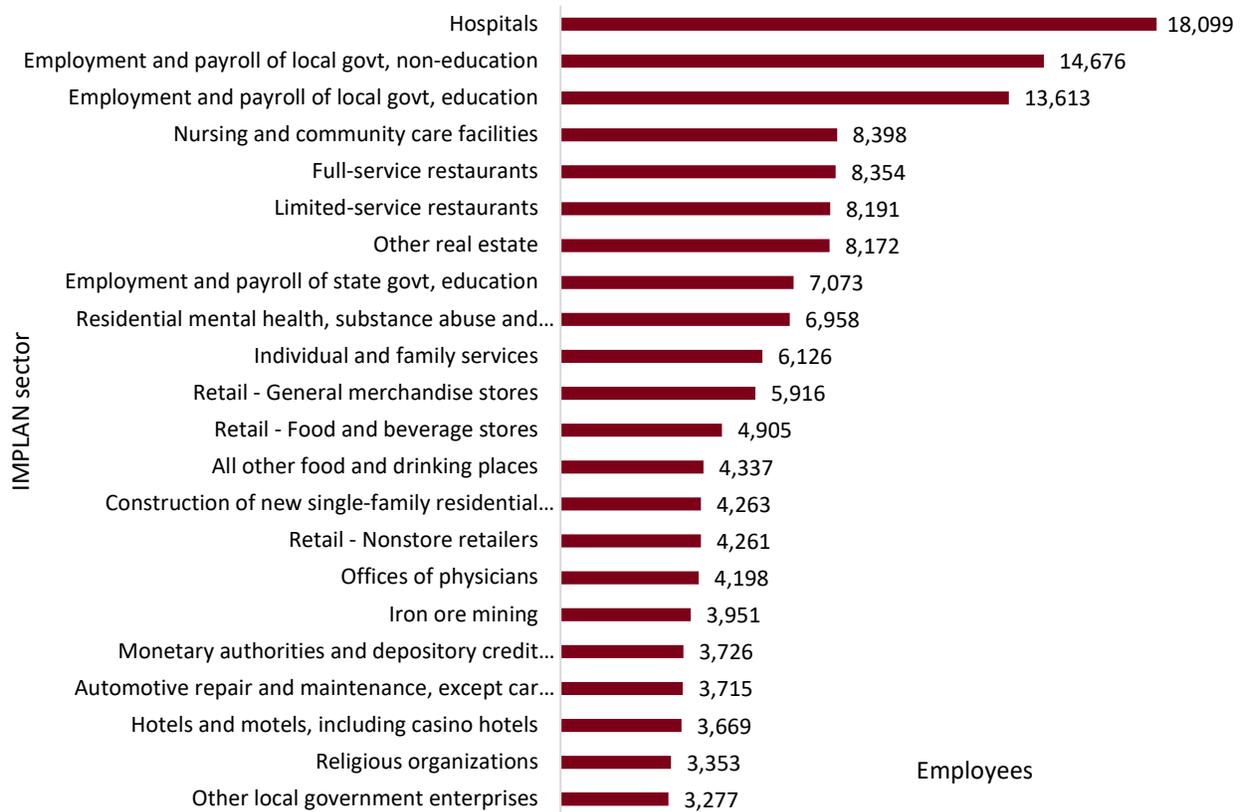
Source: IMPLAN

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Bemidji, Brainerd, Cloquet, and Grand Rapids.

Figures 2 and 3 provide background on the regional economy of the study area as context for the results of the report. Figure 2 (on the previous page) shows employment by sector. In 2020, roughly half of the 318,780 jobs in the study area came from the service sector, which includes health care, education, and hospitality. The other largest sectors in the region, measured in employment, included government (15%), trade (13%), and manufacturing (6%). Construction employment represented approximately 7% of the jobs in the region in 2020, with a little over 20,000 workers in the study area employed in that sector.

Figure 3. Top Industries by Employment for Study Area (2020)



SOURCE: IMPLAN

Figure 3 shows the top industries within the study area (in 2020) as measured by overall employment and provides more detail into the industries that employ the largest numbers. Hospitals, full-service restaurants, nursing and community care facilities, and limited-service restaurants represent a substantial portion of the jobs in the service sector in the study area. The local government industry is another significant local employer.

This study includes a special focus on the impacts of worker spending on the retail and hospitality sectors in the study area. The largest retail and hospitality industries (as shown in Figure 3) include full-service restaurants, limited-service restaurants, retail – general merchandise stores, retail – food and beverage stores, retail – non-store retailers, retail – gasoline stores, and all other food and drinking places. Combined, they provide roughly 60% of the jobs in retail and hospitality throughout the area.

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II. Inputs and Assumptions

The following section describes the inputs required for modeling the impacts of the construction project and per diem spending as well as the assumptions made when developing the models. Inputs used include major construction expenditures, employment estimates, per diem compensation, and the percentage of local labor and equipment purchases. Data were provided by Enbridge representatives. The research team worked under the assumption that the company provided good faith estimates for the project. In instances where data was not provided by Enbridge, the research team relied on IMPLAN estimates and secondary data sources as inputs.³

Effects of Construction

Replacement of Line 3 began in early 2017 and is expected to conclude in 2023. Table 2 below shows a high-level timeline for the project, along with the percentage of the overall project budget that occurred each year. All modeling and results reflect this spending distribution. It should be noted that the economic impact model reflects the full Line 3 project budget, including projected spending for remainder of 2022 and 2023. So, while it is possible that the total amount spent on the project could vary slightly from these estimates, at the time of the completion of this report, more than 95% of project budget had been spent.

Table 2. Line 3 Replacement Project Spending by Year, Primary Activity, and Share of Overall Budget

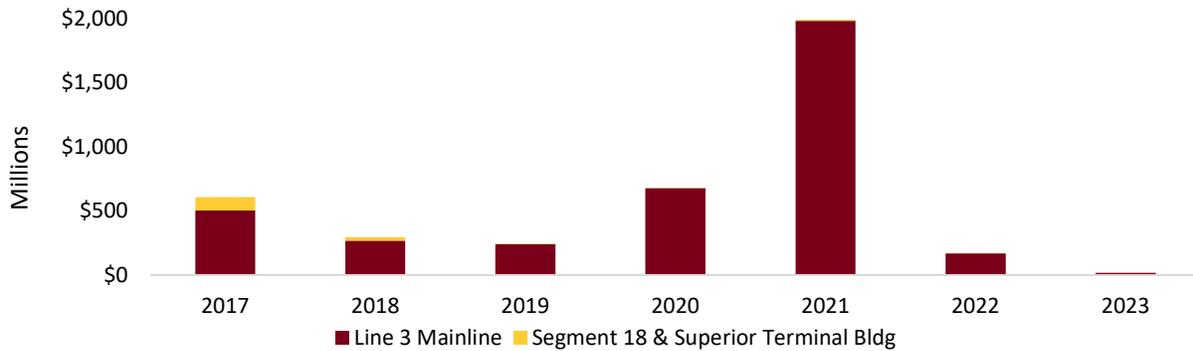
<i>Year</i>	<i>2017</i>	<i>2018</i>	<i>2019</i>	<i>2020</i>	<i>2021</i>	<i>2022</i>	<i>2023</i>
Primary Activities	Pre-Construction (Procurement and Segment 18)			Construction (Line 3 and Superior Terminal)			Restoration/ Monitoring
Spending (in millions)	\$609.2	\$294.7	\$242.4	\$678.9	\$1,990.2	\$170.9	\$18.8
Percentage of budget	15.2%	7.4%	6.1%	17.0%	49.7%	4.3%	0.5%

SOURCE: ENBRIDGE

As shown in the table, the first three years of the project focused primarily on pre-construction activities, including material procurement, land acquisition, engineering, and environmental monitoring. In 2018, Enbridge replaced Segment 18, the portion of the pipeline extending from the Minnesota border east to the terminal end in Superior, Wisconsin. Construction of the pipeline in Minnesota began in December 2020, peaked in 2021, and concluded in early 2022. The project is anticipated to be fully completed in 2023, with some restoration and monitoring activities still occurring through that year. Figure 4 on the next page visually portrays spending by year and distinguishes between spending on Line 3 versus other portions of the construction project (Segment 18 and the Superior Terminal Building).

³ For a summary of all the inputs and assumptions used by the research team in modeling, see Appendix B.

Figure 4. Line 3 Replacement Project Spending by Year (2017-2023)



SOURCE: ENBRIDGE

The bar graph’s maroon segments represent spending on Line 3, and the gold segments represent spending on Segment 18 and the Superior Terminal Building. As shown in the figure, the Minnesota portion of the Line 3 (mainline) replacement represent the bulk of spending for the project overall. By comparison, spending on Segment 18 and the Superior Terminal Building represent a very small portion of the project. Nearly half of the spending on the project—nearly \$2.0 billion—occurred in 2021. Spending was also significant in 2017 and 2020—more than \$600 million in both years. Most of the spending on Segment 18 and the Superior Terminal Building projects—roughly \$100 million—has occurred in 2017.

According to Enbridge representatives, by the time the Line 3 replacement is completed in 2023, the company will have invested more than \$4 billion over the seven-year project. Of that, the company estimates that more than \$2.9 billion will have been spent within the 16-county study area. Table 3 shows expenditures for the Line 3 replacement project by budget category as well as the percentage of each budget item estimated to have been spent within the study area.

Table 3. Line 3 Expenditures (in Millions of Dollars)

<i>Budget Category</i>	<i>Total Spending</i>	<i>% Spent in Study Area⁴</i>	<i>Direct Spending in Study Area</i>
Procurement & construction	\$2,785.8	81%	\$2,253.2
Project management & support	\$305.2	93%	\$283.7
Land	\$147.2	87%	\$127.7
Environment	\$124.5	88%	\$109.1
Construction management	\$217.7	47%	\$102.9
Engineering	\$58.4	95%	\$55.4
Finance charges	\$366.2	0%	\$0.0
Total costs	\$4,005.0		\$2,932.0

*Totals may not sum due to rounding

SOURCE: ENBRIDGE, IMPLAN

⁴ The percentage of spending in the study area only refers to the first round of direct spending. Indirect and induced spending estimates were based on IMPLAN spending patterns.

As shown in the table, procurement and construction represented the largest share of spending on the project, totaling over \$2.2 billion of direct spending (77% of total costs) in the 16-county region. This budget item includes materials purchased, construction laborers, and all on-site activities related to the construction of the pipeline. Project management and support spending totaled almost \$284 million in the study area (8% of total costs). This category included back-office, public affairs and community engagement, and legal support for the project, and other related expenditures. This budget item also included \$24.6 million in spending related to tribal engagement and incentives, all of which went to tribal entities located within the study area. The budget item labeled “land” totaled \$128 million. This category included applications and permits, right-of-way agents, property demolition, and other related expenses.⁵ Environmental consulting (monitoring and inspection) totaled just over \$109 million, construction management (oversight and efficiency) totaled almost \$103 million, and engineering totaled just over \$55 million.

The research team worked closely with Enbridge representatives to determine, within each of these budget categories, which items had been purchased within the study area and which had been purchased from outside of the 16-county region. For example, spending on materials and equipment (i.e., procurement) primarily occurred outside of the study area. Similarly, a significant share of construction management was spent outside of the study area due to contracts with firms located outside the study area.

Table 4. IMPLAN Sectors Used in Modeling

<i>IMPLAN Sector Description</i>
Support activities for oil and gas operations
Construction of new commercial structures
Construction of other new nonresidential structures
Wholesale - nondurable goods
Other real estate
Legal services
Architectural, engineering, and related services
Management consulting services
Environment and other technical consulting services
Advertising, public relations, and related services
Marketing research and other miscellaneous scientific services
Investigation and security services
Landscape and horticultural services
Waste management and remediation services
Local government passenger transit*
Local government utility transit*
Other local government enterprises*
Employment and payroll of other local gov't, non-education*
Employment and payroll of federal gov't, military*
Employment and payroll of federal gov't, non-military*

*Sectors used to model tribal engagement and incentives

SOURCE: IMPLAN

⁵ Included were all expenses except for land acquisition costs, which are not used in economic impact modeling.

Table 4, on the previous page, shows the IMPLAN sectors used in modeling the construction impacts for the Line 3 project. Project expenses were modeled using a method called analysis by parts, which is the process of splitting or parsing an impact analysis issue into smaller and more specific parts. Most of the project expenses were allocated to the sector “construction of other new nonresidential structures,” which includes pipeline construction. The research team then assigned spending on items such as engineering, legal services, public relations, environmental monitoring, project management, tribal payments, and security to the most relevant IMPLAN sectors.⁶

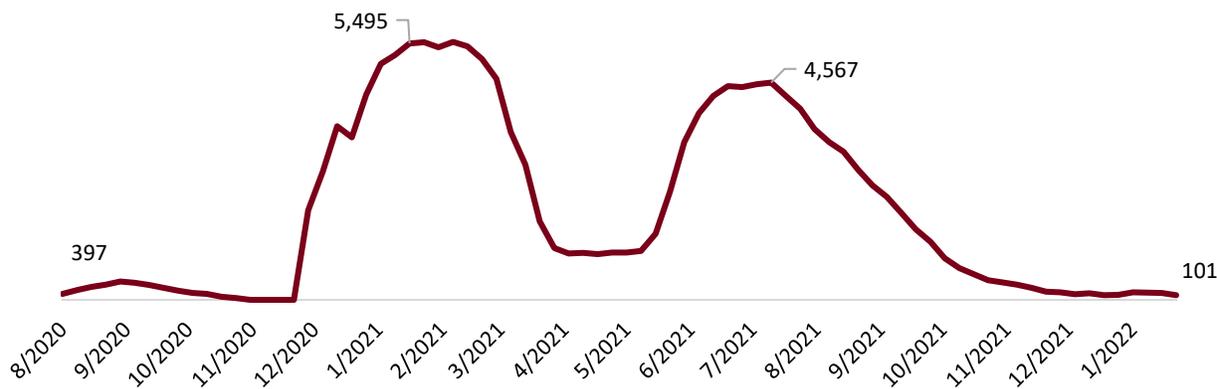
Employment and Compensation

The replacement of the Line 3 pipeline has supported thousands of construction jobs over its seven years. In addition to the construction laborers themselves, Enbridge has employed (either directly or with subcontracts) engineers, right-of-way agents, environmental monitors, project managers, and construction supervisors.

The BBER used a combination of methods to estimate employment and compensation (herein referred to as labor income) for the project. First, Enbridge provided the research team with a weekly headcount of all field workers for the peak construction period between August 2020 and January 2022, using weekly employment data that the company reported to the Minnesota Public Utilities Commission—a matter of public record. The headcount included all workers who performed jobs in construction, environmental monitoring, and inspection.

The employment trend for the period is shown in Figure 5 below. Employment for the project began to accelerate dramatically in December of 2020—when construction officially began—and peaked at nearly 5,500 workers in February 2021. The headcount fell in the spring (construction was paused due to annual spring road restrictions and environmental permitting guidelines) before rising again in summer of 2021. By December 2021, about 100 workers were directly employed on the project.

Figure 5. Line 3 Construction Worker Headcount by Week (August 2020-January 2022)



SOURCE: ENBRIDGE

⁶ According to IMPLAN, the software includes tribal governments in six sectors related to local government. These six sectors are identified in Table 4 with an asterisk. Unfortunately, due to the way the data is collected by the Bureau of Labor Statistics, there is no way to identify the share of each sector that is related to tribal government versus local government. The research team distributed spending related to tribal engagement and incentives according to the share of employment in each sector in the study area.

However, the headcount shown in Figure 5 represents an incomplete estimate of total employment for the project. Excluded from the count are workers in occupations related to engineering, land, project management, and restoration, among others. Many jobs have been directly supported by the project, but the workers have been employed by subcontractors, so the company did not have an accurate estimate for the number of employees or their labor income (including wages and benefits).

To determine reasonable estimates for this additional employment and labor income, the BBER used spending by budget category (Table 3, page 5), estimates of weekly wages (from Enbridge and the Occupational Employment Statistics database) for closely related positions, and assumptions about length of employment and hours worked (provided by Enbridge). These estimates are shown in Table 5. It should be noted that the “total spending” and “labor income” columns in the table reflect all spending for the full project, whereas employment estimates (average weekly wage, average annual employment) are based on annual estimates. This is because many of the jobs supported by the project continue each year. By providing the average, the estimates represent the average number of workers employed by the project per year.

According to the estimates, roughly 2,200 workers have been employed annually with the majority in construction (1,842 employees annually), followed by project management and support (141 annually), and environmental monitoring (101 annually). The research team estimated that more than \$1.4 billion in labor income (wages) has been paid throughout the life of the project, more than \$1.1 billion of which went to workers in construction, specifically construction laborers.

Table 5. Employment and Compensation Estimates by Budget Category, Occupation (Full Project)

<i>Budget Category</i>	<i>Related Occupation (SOC Code)</i>	<i>Avg Weekly Wage⁷</i>	<i>Total Spending (millions)</i>	<i>Labor Income (millions)</i>	<i>Average Annual Employment</i>
Procurement & construction	Construction laborers (47-2061)	\$3,120	\$2,253.2	\$1,126.6	1,842
Project management & support	Architectural and engineering managers (11-9041)	\$3,640	\$283.7	\$93.6	141
Land	Property, real estate, and community association managers (11-9141)	\$2,340	\$127.4	\$42.1	49
Construction management	First-line supervisors of construction trades and extraction workers (47-1011)	\$3,042	\$99.1	\$49.5	60
Engineering	Civil engineers (17-2051)	\$2,340	\$55.4	\$36.4	43
Environment	Environmental engineering technologists and technicians (17-3025)	\$1,950	\$109.1	\$71.8	101
Total (Full Project)			\$2,928.2	\$1,420.1	2,236

*Totals may not sum due to rounding

SOURCES: ENBRIDGE, OCCUPATIONAL EMPLOYMENT STATISTICS, IMPLAN

⁷ All weekly wages were based on the median hourly wage for the related occupation for the state of Minnesota plus a 30% fringe rate, and either a 40-hour or 60-hour workweek, depending on the position. Wages for construction laborers were based on 90th percentile wages for the State of Minnesota.

Project labor agreements for the Line 3 replacement anticipated that at least half of the construction jobs for the Line 3 project would be filled through local union halls and the other half would be union workers hired directly by Enbridge’s contractors. According to Enbridge reports filed with state utility regulators, the company did not attain the goal of 50%, mostly due to a lack of available laborers from the local unions.⁸ In the end, Enbridge representatives estimated that slightly more than half of the workers employed on the project (54%) resided outside the study area. To account for this, labor income for the replacement project was reduced by more than half to account for non-local workers’ spending leaving the study area.⁹ The economic activity generated in the study area because of per diem spending was analyzed separately and is summarized in the following section.

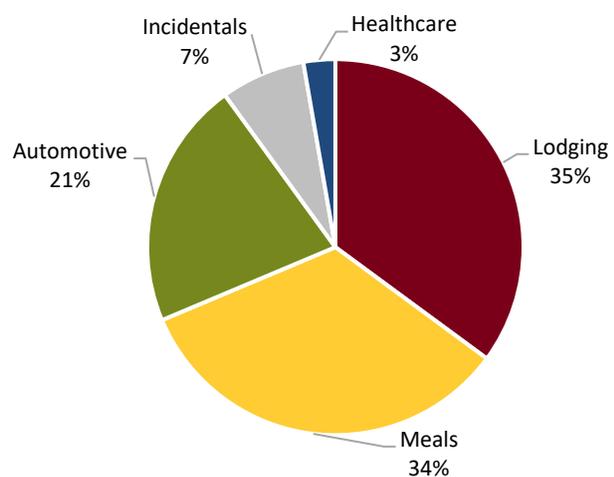
Per Diem Spending

During the project, workers employed by the Line 3 replacement project were given a per diem allowance for expenses such as lodging, meals, and incidentals. The per diem spending budget estimated for the Line 3 Replacement Project totaled \$132.1 million.¹⁰

Labor income paid to workers living within the study area was modeled using IMPLAN’s household spending pattern, which includes expenses like mortgage payments, health care, insurance, and household expenses. However, it was assumed that IMPLAN’s typical household spending pattern would not be appropriate for workers’ per diem spending.

Using FY2021 Per Diem Standard Rates for Minnesota—provided by the General Service Administration (GSA)¹¹—and the Department of Employment and Economic Development (DEED) cost of living estimates for the 16-county study area, the BBER calculated the distribution of spending on meals, lodging, and incidentals.¹² These spending estimates were used to develop a separate spending pattern for per diem spending specifically.

Figure 6. Line 3 Per Diem Spending Pattern



SOURCE: GENERAL SERVICES ADMINISTRATION, MINNESOTA DEPARTMENT OF EMPLOYMENT AND ECONOMIC DEVELOPMENT

⁸ Hughlett, Mike. “Enbridge misses state’s Line 3 hiring goals.” Star Tribune. February 15, 2022.

⁹ Local employee compensation was calculated using the following equation: Local Employee Compensation = Total Employee Compensation * [(1- expected commuting rate)/(1- typical commuting rate)], where expected commuting rate = 54% and typical commuting rate = 0%

¹⁰ The per diem budget of \$132.1 million was calculated in the following manner. First, Enbridge representatives provided detailed data on wages, benefits, and per diems paid to the construction laborers employed on the mainline replacement portion of the project. According to these estimates, the per diems paid to the construction laborers represented 9.3% of all wages and benefits. Using this information, along with the employee compensation values (\$1.4 billion) paid over the course of the full project, the research team estimated that the total per diem value paid to all workers employed on the Line 3 replacement would equal roughly \$132.1. This estimate was then affirmed by Enbridge staff.

¹¹ <http://www.gsa.gov/portal/category/100120>

¹² Based on feedback from Enbridge representatives, the research team used the average of the GSA rates and the DEED cost of living estimates to determine the appropriate per diem allocation.

Figure 6 shows the per diem spending pattern developed for this analysis. The research team estimated that workers spent roughly one-third of their per diem on lodging (\$46.4 million) and another third on meals (\$44.3 million). Automotive expenses, such as gas and repairs, represent about 21% of the per diem budget (\$28.2 million). Other significant expenses include incidentals such as retail purchases (7% of spending or \$9.6 million), and health care (3% or \$3.6 million).

Table 6 contains a complete list of the categories used for modeling the impacts of per diem spending and the spending modeled in each IMPLAN sector. In total, the per diem spending pattern estimates that more than \$132.1 million in direct spending on food, lodging, and other expenses have been added to the study area because of per diem spending from workers employed on the Line 3 project. While the per diem allowance represents a small portion of the overall project budget, it has had a significant impact on retail and hospitality industries in the study area.

Table 6. Sectors and Direct Effects Used in Modeling Per Diem Spending (in Millions of Dollars)

<i>Spending Category</i>	<i>IMPLAN Sector</i>	<i>Direct Effects, in Millions</i>
Meals	Retail - Food and beverage stores	\$11.1
	Full-service restaurants	\$11.1
	Limited-service restaurants	\$11.1
	All other food and drinking places	\$11.1
Lodging	Hotels and motels, including casino hotels	\$23.2
	Other accommodations	\$23.2
Health care	Offices of physicians	\$1.2
	Other ambulatory health care services	\$1.2
	Hospitals	\$1.2
Automotive	Retail - Gasoline stores	\$14.1
	Automotive repair and maintenance	\$14.1
Incidentals	Retail - General merchandise stores	\$4.8
	Dry cleaning and laundry services	\$4.8
Total		\$132.1

*Totals may not sum due to rounding

SOURCE: GSA, DEED, IMPLAN, RELEVANT LITERATURE

III. Economic Impacts

This section summarizes the economic impacts of the Line 3 pipeline replacement project on the 16-county study area.

Economic impact analysis tracks an economic activity (like the replacement of Enbridge’s Line 3 pipeline) through multiple rounds of industry and consumer spending to show the multiplier or ripple effects through a local economy. The inputs described in the previous section were used to model the economic effects—direct, indirect, and induced—of the Line 3 construction project on other supporting local industries. The initial activity is considered the direct effect, the resulting increase in industry spending is the indirect effect, and the resulting increase in consumer spending is the induced effect. Results are measured in employment, output, labor income, and value added.¹³

The total impacts of the project are shown in the section titled “total effects.” In addition, a special section on the industries most impacted by per diem spending is included, to highlight the impacts of the project on the retail and hospitality industry in the 16-county region.

The research team used the IMPLAN input-output modeling data and software for modeling economic impacts. The data used was the most recent IMPLAN data available, which is for the year 2020.¹⁴ Project spending was modeled in the year in which it occurred, based on the spending distribution for the project (see Table 2, page 4). All results are shown in millions of dollars for the year 2022.¹⁵

Total Effects

Since 2017, the replacement of Line 3 has generated a significant, but temporary, increase in economic activity while construction and construction planning work was underway. Throughout the project, increased demand for equipment, labor, and transportation has led to increased economic activity in the affected counties. After the completion of the project, this additional construction activity will cease, and the economic impacts will no longer be felt in the region.

Table 7 shows the total economic impacts of the seven-year project, broken out by project year.¹⁶ The left-most column of Table 7, labeled “employment,” indicates the number of jobs that project is estimated to have supported directly and indirectly. Employment estimates are in terms of jobs, not in terms of full-time equivalent employees. For construction projects, these jobs are typically temporary, meaning the effects will be felt during the project and will cease upon its completion. According to the results of this analysis, it is estimated that the replacement of the Line 3 pipeline has supported, on average, 4,157 jobs per year in the

¹³ For more details on the data sources and assumptions used by IMPLAN’s input-output model, see Appendix C.

¹⁴ As noted on page 1 in the report, 2020 was a unique year due to the economic effects of the COVID-19 pandemic. The research team chose to model the replacement project using IMPLAN’s 2020 dataset despite some of the caveats associated with the data. However, the research team also analyzed selected activities using IMPLAN’s 2019 dataset and compared the results to better understand whether the impacts would be significantly different using a different model year. For all of the activities tested, the difference in total effects modeled in 2019 was fewer than five percentage points from the results shown using the 2020 model year.

¹⁵ Because project spending was modeled in the year in which it occurred, while results are shown 2022 dollars, direct effects appear slightly larger than the project budget shown in the *Inputs and Assumptions* chapter of the report (Table 3, page 5). This is due to IMPLAN’s deflators. Deflators are used by the software whenever the event year is set to a year that differs from the model data year. For more information on deflators, see *Definitions Used in This Report*, on page 17.

¹⁶ Detailed economic impact results by budget category, including per diem spending and tribal payments, can be found in Appendix D.

region during the period,¹⁷ with peak employment reaching more than 14,400 jobs in 2021, which was the peak of the construction activity.¹⁸

Table 7. Line 3 Replacement Impact Summary, Total Effects by Year (in Millions of Dollars)

Total Effects	Employment	Labor Income	Value Added	Output
2017	4,172	\$240.8	\$319.6	\$788.5
2018	1,920	\$109.4	\$145.1	\$355.2
2019	1,625	\$91.6	\$121.4	\$294.0
2020	5,636	\$358.8	\$455.9	\$911.3
2021	14,423	\$843.8	\$1,098.6	\$2,460.8
2022	1,062	\$58.4	\$77.4	\$186.6
2023	264	\$14.4	\$19.1	\$45.9
Total	4,157**	\$1,717.2	\$2,237.2	\$5,042.2

*Totals may not sum due to rounding

**4,157 reflects total project average employment per year for the seven-year project.

SOURCE: IMPLAN

The column labeled “labor income” is the total of all employee compensation. This includes wages, benefits, proprietor income, and payroll taxes for full- and part-time workers. It is estimated that the Line 3 replacement has supported more than \$1.7 billion in employee wages and benefits in the study area over the life of the project.

Column three, labeled “value added,” shows the economic impacts of the expenditures that Line 3 put specifically towards wages, rents, interest, and profits related to its construction. Labor income is a component of value added. Value added represents the contribution to the GDP made by an individual producer, industry, or activity—in this case, the Line 3 project. It is estimated that Line 3 has contributed more than \$2.2 billion in value added spending to the study area during the seven-year period (2017-2023), with roughly half of that (\$1.1 billion) occurring in 2021.

Output, the last column in the table, is the total value of all local production required to sustain activities. Whereas value added is total spending minus the cost of inputs, output represents the sum of all spending. According to the results of modeling, the project has contributed over \$5.0 billion in new spending over the life of the project, through the combined direct, indirect, and induced effects.

Table 8 provides estimates of the total effects for the seven-year Line 3 replacement project broken out by impact type: direct, indirect, and induced effect. The first row of Table 8, labeled “direct effects,” represents the employment and spending coming from the construction project itself on wages, equipment, and supplies. These estimates are based on the production estimates provided by Enbridge and the corresponding employment estimates described in the previous chapter, *Inputs and Assumptions*.

¹⁷ In IMPLAN modeling, employment is defined as “at the site,” so all employees hired for the project were considered part of direct employment, even though we know that some were hired from outside the study area.

¹⁸ From here on, employment estimates for the project are reported as the average of the seven-year project not the sum. Employment numbers cannot be summed because it is assumed that most of the jobs carry over from one year to the next and will be filled by the same individuals.

Table 8. Total Line 3 Replacement Impact Detail, 2017-2023 (in Millions of Dollars)

<i>Impact Type</i>	<i>Employment (Annual Average)</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Direct Effect	2,236	\$1,083.7	\$1,217.9	\$3,054.8
Indirect Effect	790	\$296.0	\$455.1	\$957.0
Induced Effect	1,131	\$337.4	\$564.1	\$1,030.4
Total Effect	4,157	\$1,717.2	\$2,237.2	\$5,042.2
Multiplier	1.86	1.58	1.84	1.65

*Totals may not sum due to rounding

SOURCE: IMPLAN

In total, the project has directly supported roughly \$1.0 billion in wages and benefits (labor income), \$1.2 billion in value-added spending, and \$3.1 billion in output. On average, over 2,200 jobs have been supported each year from 2017 to 2023.

Indirect effects measure increased spending between commercial, government, and service industries located within the study area, while induced effects reflect impacts that are generated by an increase in household spending by Enbridge employees and workers in related industries. According to the results of modeling, the indirect effects from the Line 3 project totaled \$957 million in industry spending over the seven years and 790 jobs annually. The induced effects from the project totaled \$1.0 billion in additional household spending and more than 1,100 supported jobs annually.

Total effects are the sum of direct, indirect, and induced effects. Overall, the project contributed more than \$1.7 billion in employee wages and benefits, over \$2.2 billion in value added spending, and more than \$5.0 billion in new spending. The project also has supported, on average, 4,157 jobs per year in the region.

The last row in the table shows the multipliers associated with each effect. A multiplier indicates how much additional spending is added to the study area's economy for each dollar in direct spending, represented as a ratio of total effects to direct effects. In the case of the Line 3 project, an employment multiplier of 1.86 indicates that for every one job directly supported by Line 3, another 0.86 jobs were added in other supporting industries. The output multiplier suggests that, for every one dollar spent directly on the Line 3 project, another \$0.65 was spent by households and supporting industries throughout the study area as a result of the project.

Per Diem Spending Effects

In total, Enbridge estimates that it has paid \$132.1 million¹⁹ (see Table 6, page 10) to its workers to cover their living expenses, over and above wages and benefits, while they were employed in the study area. While \$132 million represents a small portion of the overall project budget, the per diem spending has had significant economic impacts on retail and hospitality industries located within the study area.

This section provides further detail on the economic impacts resulting from the per diem spending on the 16-county study area, including a summary of the total effects as well as the top-most impacted industries. Per diem spending was modeled for 2020 and 2021 as Enbridge indicated that most of the construction activity

¹⁹ Due to margining, the actual direct effects shown in these tables is somewhat lower than the direct economic benefits shown in Chapter II. Inputs and Assumptions. In the IMPLAN model, retail industries have margins on their goods, and only a portion of each sale is introduced into the local economy. See the full definition of margining in Appendix A for more information.

occurred in those two years.²⁰ The values in the columns labeled “labor income,” “value added,” and “output” represent the total impacts for the full project, while the numbers in the column labeled “employment” represent the average value for the two-year period.

Table 9. Line 3 Per Diem Spending Impact Detail, 2020-2021 (in Millions of Dollars)

<i>Impact Type</i>	<i>Employment (2-year average)</i>	<i>Labor Income</i>	<i>Value Added</i>	<i>Output</i>
Direct Effect	834	\$52.4	\$66.1	\$114.3
Indirect Effect	86	\$7.4	\$11.4	\$26.3
Induced Effect	139	\$12.7	\$22.2	\$40.6
Total Effect	1,059	\$72.5	\$99.8	\$181.2

*Totals may not sum due to rounding

Source: IMPLAN

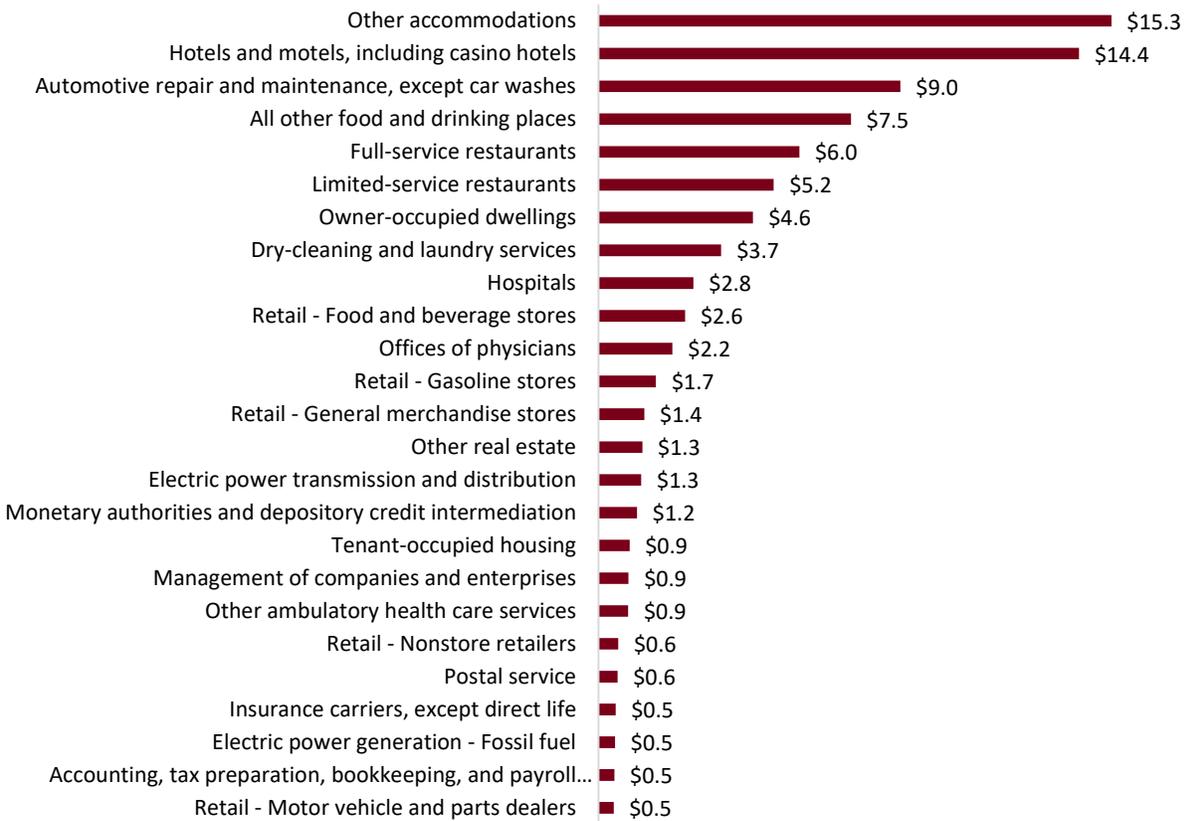
Per diem spending on the part of workers employed by the Line 3 replacement project has provided an injection of spending to the region, as shown in Table 9. Results of modeling show that per diem spending—through direct, indirect, and induced effects—has supported an average of 1,059 jobs each year in 2020 and 2021, has added \$72.5 million in additional wages and benefits to study-area households, and has contributed \$99.8 million in additional value-added spending and \$181.2 million in output.

Throughout the life of the project, various industries in the region have experienced an increase in economic activity because of per diems paid to workers employed by the Line 3 replacement project. Figure 7, on the following page, shows the top 25 industries impacted by per diem spending in the 16-county region. Other accommodations (e.g., resorts, campgrounds, RV parks) have seen the largest increase in value added spending (\$15.3 million) due to employees’ per diems, followed by hotels and motels (\$14.4 million), automotive repair and maintenance (\$9.0 million), and all other food and drinking places (\$7.5 million).²¹

²⁰ While some per diem spending most certainly occurred in years other than 2020 and 2021, the total effects are not significantly different when modeled across seven years versus two. For simplicity, 50% of per diem spending was modeled in 2020 and 50% in 2021. The direct and indirect effects that IMPLAN generated for per diem spending were then reclassified as induced effects and the sum was added to the results of the project overall.

²¹ For more details on IMPLAN’s dataset and the assumptions for accepting the impact model, see Appendix B.

Figure 7. Top 25 Value Added Impacts by Industry from Per Diem Spending (2017-2023)



SOURCE: IMPLAN

Comparison to 2017 Report

The purpose of this study was to assess the economic impact of the replacement of Line 3 on the affected counties (15 in Minnesota and Douglas County, Wisconsin), updating a 2017 report on the same topic. Whereas the 2017 report provided projected economic impacts on the proposed pipeline replacement project, this study estimated the actual economic impacts based on Enbridge’s final construction costs. This section compares the projections developed in the 2017 report with the results of this study to determine the accuracy of the original report and areas where the two diverged.

Table 10 shows a side-by-side comparison of some key inputs and findings from both studies. Inputs included in the table are the project timeline, budget, local spending, per diem estimates, and the percentage of local employment. Economic impacts shown in the table include total effects from employment, labor income, value added, and output.

When comparing the two, it is immediately clear that the project timeline and budget originally estimated in 2017 was much more modest than what actually occurred. The 2017 study projected that the project would take two years and cost about \$1.9 billion. In reality, the project spanned seven years and cost \$4.0 billion. Similarly, the amount of spending in the study area turned out to be significantly higher than what was anticipated—Enbridge representatives estimated that the company spent roughly \$2.9 billion in the study

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area compared with the \$1.5 billion that was predicted in the 2017 report.

The amount of per diem spending paid to workers on the Line 3 replacement project turned out to be slightly higher than what had been predicted in the 2017 report—the company paid \$132.1 million in per diems to its workforce whereas the previous analysis had estimated \$123.0 million in per diem spending. The share of the workforce that came from within the study area (46%) was close to what had been predicted.

Table 10. Comparison between 2017 Report and 2022 Report

	<i>2017 Analysis</i>	<i>2022 Analysis</i>
Inputs		
Project timeline	2019-2020 (2 years)	2017-2023 (7 years)
Total project budget	\$1.9 billion	\$4.0 billion
Spending in study area	\$1.5 billion	\$2.9 billion
Per diem spending	\$123.0 million	\$132.1 million
Percentage of local employment	50%	46%
Economic Impacts (Total Effects)		
Average annual employment	7,199	4,157
Peak Employment	8,670	14,423
Labor income	\$358.4 million	\$1,717.2 million
Value added	\$744.9 million	\$2,237.2 million
Output	\$2,204.8 million	\$5,042.2 million

SOURCE: ENBRIDGE, BBER

In general, the total economic effects (direct, indirect, and induced effects) from the replacement project estimated in the 2022 analysis exceeded what was predicted in the 2017 analysis. Total effects from labor income, value added, and output were all significantly larger than what was projected. Peak employment impacts (2021) were also larger. Average annual employment impacts were slightly lower than what had been predicted, due to the extended length of the project (seven years compared with two years).

IV. Conclusions

Economic impact analysis tracks an initial economic activity (like the replacement of Enbridge's Line 3 pipeline) through multiple rounds of industry and consumer spending to show the multiplier or ripple effects through a local economy.

Since 2017, the replacement of Line 3 has generated a significant, but temporary, increase in economic activity, especially during the peak construction in Minnesota between December 2020 and October 2021. Throughout the project, increased demand for equipment, labor, and transportation has led to increased economic activity in the affected counties. After the project's completion, which is slated for some time in 2023, this additional activity will cease, and the economic impacts of construction will no longer be felt in the region.

In total, Enbridge has spent more than \$3 billion in the study area during the project, leading to a total output impact of more than \$5.0 billion in the study area, in combined direct, indirect, and induced spending effects.

Analysis results show that Line 3 pipeline replacement has supported, on average, 4,157 jobs per year in the region during the seven-year period, with peak employment reaching more than 14,400 jobs in 2021, the peak of the construction activity. Enbridge estimates that roughly half of all project jobs were filled by workers from within the study area. The project's employment multiplier of 1.86 indicates that for every one job supported by the Line 3 project, another 0.86 jobs were added in other supporting industries.

Other economic impacts include more than \$1.7 billion in employee wages and benefits, over \$2.2 billion in value added spending, and more than \$5.0 billion in output, through the combined direct, indirect, and induced effects. Additionally, the output multiplier of 1.65 indicates that for every one dollar spent directly on the Line 3 project, another \$0.65 was spent by households and supporting industries in the study area.

Enbridge estimates that it has paid roughly \$132.1 million in per diems to workers to cover their living expenses while employed in the study area, over and above wages and benefits. While \$132 million represents a small portion of the overall project budget, the per diem spending has had significant economic impacts on retail and hospitality industries within the study area. Per diem spending has supported 1,059 jobs per year during the two-year period throughout the study area and has led to about \$181.2 million in combined direct, indirect, and induced spending.

Various industries in the region have experienced an increase in economic activity due to spending associated with per diems. In total, per diem spending has contributed \$98.9 million towards GDP during the seven-year period. Other accommodations (e.g., resorts, campgrounds, RV parks) have seen the largest GDP gains, followed by hotels and motels, automotive repair and maintenance, and all other food and drinking places.

The BBER compared this analysis with the predicted economic impacts from the 2017 study, prior to the start of the replacement project. The 2017 study projected that the Line 3 replacement would take two years and cost about \$1.9 billion. In reality, the project spanned seven years and cost \$4.0 billion. Similarly, the amount of spending in the study area was significantly higher than what was anticipated—Enbridge representatives estimated that the company spent roughly \$2.9 billion in the study area compared with the \$1.5 billion that was predicted in the 2017 report. As a result, the total effects (the sum of direct, indirect, and induced effects) of the project were all significantly larger than what had been projected in 2017. Peak employment impacts (2021) were also larger, whereas average annual employment impacts were slightly lower than what had been predicted, due to the extended length of the project (seven years compared with two years).

Appendix A. Definitions Used in This Report

Analysis by Parts: The process of splitting or parsing an impact analysis issue into smaller and more specific parts. This technique allows the user to specify the amount of commodity inputs, the proportion of local labor income, and the proportion of local purchases.

Deflators: Deflators are used by the IMPLAN software whenever the event year is set to a year that differs from the model data year. The output deflator converts the industry sales value to the year of the dataset, while the GDP deflator converts the value-added values to the year of the dataset. Output deflators are specific to each industry, while the GDP deflators are the same across industries.

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

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

Indirect Effect: The additional inter-industry spending from the direct impact.

Induced Effect: The impact of additional household expenditures resulting from the direct and indirect impact.

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

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)

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.

Output: The value of local production required to sustain activities.

Per Diem: Allowance for lodging (excluding taxes), meals and incidental expenses

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

Appendix B. Model Assumptions

Construction Activity

1. The IMPLAN industries selected for sectoring these impact activities are:

<i>IMPLAN Sector Description</i>
Support activities for oil and gas operations
Construction of new commercial structures
Construction of other new nonresidential structures
Wholesale - nondurable goods
Other real estate
Legal services
Architectural, engineering, and related services
Management consulting services
Environment and other technical consulting services
Advertising, public relations, and related services
Marketing research and other miscellaneous scientific services
Investigation and security services
Landscape and horticultural services
Waste management and remediation services
Local government passenger transit
Local government Utility transit
Other local government enterprises
Employment and payroll of other local gov't, non-education
Employment and payroll of federal gov't, military
Employment and payroll of federal gov't, non-military

SOURCE: IMPLAN

2. Land acquisition costs (easements), procurement, and other major non-local purchases were excluded from the analysis.
3. Construction years were assumed to be 2017 to 2023. Spending totals were distributed among they project years according to the timeline in the table below.

<i>Year</i>	<i>2017</i>	<i>2018</i>	<i>2019</i>	<i>2020</i>	<i>2021</i>	<i>2022</i>	<i>2023</i>
Primary Activities	Pre-Construction (Procurement and Segment 18)			Construction (Line 3 and Superior Terminal)			Restoration/ Monitoring
Spending (in millions)	\$609.2	\$294.7	\$242.4	\$678.9	\$1,990.2	\$170.9	\$18.8
Percentage of budget	15.2%	7.4%	6.1%	17.0%	49.7%	4.3%	0.5%

SOURCE: ENBRIDGE

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4. Line 3 replacement costs are estimated to be \$2.9 billion in total (direct spending within the study area), distributed as follows:

Budget Category	Total Spending	% Spent in Study Area²²	Direct Spending in Study Area
Procurement & construction	\$2,785.8	81%	\$2,253.2
Project management & support	\$305.2	93%	\$283.7
Land	\$147.2	87%	\$127.7
Environment	\$124.5	88%	\$109.1
Construction management	\$217.7	47%	\$102.9
Engineering	\$58.4	95%	\$55.4
Finance charges	\$366.2	0%	\$0.0
Total costs	\$4,005.0		\$2,932.0

*Totals may not sum due to rounding

SOURCE: ENBRIDGE, IMPLAN

5. It is assumed that approximately 46% of the required workforce for the project were from within the study area. To account for this, labor income for the replacement project was reduced by more than half to account for non-local workers' spending leaving the study area.²³
6. Many jobs have been directly supported by the project, but the workers have been employed by subcontractors, so the company did not have an accurate estimate for the number of employees or their labor income (including wages and benefits). Instead, the BBER used spending by budget category, estimates of weekly wages (from Enbridge and the Occupational Employment Statistics database) for closely related positions, and assumptions about length of employment and hours worked (provided by Enbridge) to determine reasonable estimates for employment and labor income. All weekly wages have been based on the median hourly wage for the related occupation for the state of Minnesota plus a 30% fringe rate, and either a 40-hour or 60-hour work week, depending on the position. Wages for construction laborers have been based on 90th percentile wages for State of Minnesota.

Per Diem Spending

1. The per diem spending budget, provided by Enbridge, totaled \$132.1 million.
2. Using FY2021 Per Diem Standard Rates for Minnesota—provided by the General Service Administration (GSA)—and the Department of Employment and Economic Development (DEED) cost of living estimates for the 16-county study area, the research team calculated the distribution of worker spending on meals, lodging, and incidentals.²⁴ The research team estimated that workers will have spent roughly one-third of their per diem on lodging (\$46.4 million) and another third on meals (\$44.3 million). Automotive expenses, such as gas and repairs, represent about 21% of the per diem

²² The percentage of spending in the study area only refers to the first round of direct spending. Indirect and induced spending estimates were based on IMPLAN spending patterns.

²³ Local employee compensation was calculated using the following equation: Local Employee Compensation = Total Employee Compensation * [(1- expected commuting rate)/(1- typical commuting rate)], where expected commuting rate = 54% and typical commuting rate = 0%

²⁴ Based on feedback from Enbridge representatives, the research team used the average of the GSA rates and the DEED cost of living estimates to determine the appropriate per diem allocation.

budget (\$28.2 million). Other significant expenses include incidentals such as retail purchases (7% of spending or \$9.6 million), and health care (3% or \$3.6 million).

- The IMPLAN industries used for modeling these impacts and the direct effects for the project are shown below.

<i>Spending Category</i>	<i>IMPLAN Sector</i>	<i>Direct Effects, in Millions</i>
Meals	Retail - Food and beverage stores	\$11.1
	Full-service restaurants	\$11.1
	Limited-service restaurants	\$11.1
	All other food and drinking places	\$11.1
Lodging	Hotels and motels, including casino hotels	\$23.2
	Other accommodations	\$23.2
Health care	Offices of physicians	\$1.2
	Other ambulatory health care services	\$1.2
	Hospitals	\$1.2
Automotive	Retail - Gasoline stores	\$14.1
	Automotive repair and maintenance	\$14.1
Incidentals	Retail - General merchandise stores	\$4.8
	Dry cleaning and laundry services	\$4.8
Total		\$132.1

*Totals may not sum due to rounding

SOURCE: GSA, DEED, IMPLAN, RELEVANT LITERATURE

Appendix C. Input-Output Modeling

Data Sources

This study uses IMPLAN's input-output modeling data and software. 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 2020. All data are reported in 2022 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 was 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:²⁵

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 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 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 hold local jobs.

²⁵ <https://www.bea.gov/system/files/papers/WP2012-3.pdf>

Appendix D: Detailed Impacts

Table 11. Economic Impacts by Category of Spending

<i>Budget Category/Effect</i>	<i>Employment (average)</i>	<i>Labor Income (million \$)</i>	<i>Value Added (million \$)</i>	<i>Output (million \$)</i>
Procurement & Construction				
Direct	1,842	\$735.4	\$799.8	\$2,253.2
Indirect	574	\$228.4	\$352.2	\$726.1
Induced	640	\$204.7	\$358.8	\$656.1
Total	3,057	\$1,168.6	\$1,510.8	\$3,635.4
Project Management & Support				
Direct	141	\$70.8	\$120.8	\$283.7
Indirect	80	\$24.3	\$37.6	\$86.5
Induced	63	\$20.2	\$35.3	\$64.6
Total	285	\$115.3	\$193.6	\$434.8
Land				
Direct	49	\$28.9	\$48.7	\$126.5
Indirect	37	\$10.2	\$16.2	\$39.2
Induced	26	\$8.3	\$14.5	\$26.6
Total	112	\$47.4	\$79.4	\$192.3
Environment				
Direct	101	\$22.0	\$20.2	\$109.1
Indirect	27	\$8.0	\$11.2	\$24.6
Induced	20	\$6.4	\$11.2	\$20.4
Total	148	\$36.3	\$42.5	\$154.1
Construction Management				
Direct	60	\$23.8	\$22.2	\$99.1
Indirect	24	\$8.7	\$13.3	\$28.3
Induced	22	\$6.9	\$12.2	\$22.2
Total	106	\$39.5	\$47.7	\$149.6
Engineering				
Direct	43	\$40.2	\$39.4	\$55.4
Indirect	14	\$4.0	\$5.7	\$12.5
Induced	29	\$9.4	\$16.4	\$30.0
Total	86	\$53.6	\$61.5	\$97.9
Per Diem				
Direct	834	\$52.4	\$66.1	\$114.3
Indirect	86	\$7.4	\$11.4	\$26.3
Induced	139	\$12.7	\$22.2	\$40.6
Total	1059	\$72.5	\$99.8	\$181.2
Tribal Payments				
Direct	156	\$13.3	\$19.3	\$24.6
Indirect	12	\$0.7	\$1.0	\$2.4
Induced	65	\$3.0	\$5.2	\$9.5
Total	232	\$16.9	\$23.6	\$36.6

*Tribal payment effects are also included as part of the "Project Management & Support" budget category and Per Diem effects as part of the Procurement and Construction budget category. To avoid double-counting, results should not be summed.

SOURCE: IMPLAN

Results shown in Table 11 are included to provide more detail into which budget categories contributed most greatly to overall impacts. These results are not directly comparable to the total effects by year shown in Table 7 on page 11, due to different methods used in modeling.