Labovitz School
OF BUSINESS AND ECONOMICS
Bureau of Business and
Economic Research

Consulting Report

NorthMet Economic Impact 2011 Update:

Economic Impact of PolyMet's NorthMet Project on St. Louis County, Minnesota

Revised April 2012

For

PolyMet Mining Inc

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Executive Summary

The economic impact on St. Louis County from a typical year of NorthMet mining activity is estimated to include:

- **360 direct mining jobs as well as another 330 jobs in related, dependent industries, and 301 jobs dependent on household spending related to these direct and indirect jobs, for a total impact of 991 jobs in the county.**
- **In the typical year of operations, the impact of NorthMet payroll spending is expected to have a total impact of almost $330 million.**
- **Also, the impact of mining output, or sales, on St. Louis County is expected to have a total economic impact of almost $515 million.**

Peak year construction activity is expected to have a total economic impact in St. Louis County of:

- **832 jobs,**
- **almost $247 million in payroll impact,**
- **and almost $489 million in sales impact.**

The University of Minnesota Duluth Labovitz School's Bureau of Business and Economic Research (BBER) studied and estimated the economic impacts of construction and operations of activity from the NorthMet Project. This project is part of the non-ferrous mining industry. The impact study region consists of St. Louis County, Minnesota. The economic modeling data and software used for the impact analysis was IMPLAN. The study used IMPLAN's economic multiplier analysis and input-output modeling, Version 3.0, created by MIG, Inc. (formerly Minnesota IMPLAN Group, Inc.). Data were for year 2009. The multiplier was calculated by dividing total impact by direct impact.

Regional data for the impact models for value added, employment, and output measures were supplied by IMPLAN for this impact. 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. BBER worked closely with PolyMet Mining Inc cooperating and participating agencies[1] to gather the most accurate input data for modeling as well as checking and review of modeling results. The following table sums direct, indirect, and induced impacts for total impact values. As a comparison from the IMPLAN model for St. Louis County, 2009 employment was 118,089 employees and a total output of $14.9 billion. Mining iron ore had an employment average of 2,884 employees and $1.8 billion in output.

[1] Co-Lead Agencies: US Army Corps of Engineers, US Forest Service, Minnesota Department of Natural Resources. Cooperating Agencies: Fond du Lac Band of Lake Superior Chippewa, Grand Portage Band of Lake Superior Chippewa, and the Bois Forte Band of Chippewa, and the US Environmental Protection Agency. Participating Agencies: The Great Lakes Indian Fish & Wildlife Commission, The 1854 Treaty Authority.

Table 1. Summary: NorthMet Project Construction And Operations Total Impacts on St. Louis County, MN

Source: IMPLAN	*Value Added Totals*	*Output Totals*	*Employment Totals**
Construction			
Phase I	$246,532,357	$488,543,900	832
Phase II	$129,587,522	$256,798,717	439
Total	$376,119,879	$745,342,617	NA**
Operations			
Start up	$63,603,068	$99,311,032	826
Typical Year	$329,728,765	$514,844,706	991

*Estimates are in terms of full-time equivalent employees, as provided by NorthMet ** Note, employment **here** should not be summed. Although the construction investment adds up over time, employment does not; consider, for example, that a construction project truck driver employed during 2013 may be continuing in the same job in 2015.

Construction Impacts Detail: The IMPLAN model used in this study estimates that during Phase I and Phase II of construction, for every job created in the construction sector, another 0.7 job will be created in other sectors of the St. Louis County economy. In the same way, for Phase I and Phase II of NorthMet construction, for every dollar of construction expenditure (output), another $0.57 will be created in other sectors of the county economy. Multipliers for value added, output, and employment measures for both construction phases range from 1.57 to 1.72, as seen in the following table.

TABLE 2. NORTHMET PROJECT CONSTRUCTION IMPACTS, PHASE I AND PHASE II

Source: IMPLAN	*Direct Effect*	*Indirect Effect*	*Induced Effect*	*Total*
Construction Phase I				
Value Added	$143,637,243	$41,774,260	$61,120,854	$246,532,357
Output	$312,000,009	$75,343,964	$101,199,927	$488,543,900
Employment	500*	128	204	832
Construction Phase II				
Value Added	$75,501,628	$21,958,266	$32,127,628	$129,587,522
Output	$164,000,005	$39,603,879	$53,194,833	$256,798,717
Employment	264*	68	107	439

*Direct Effect estimates are in terms of full-time equivalent employees, as provided by NorthMet. Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long - term or short-term jobs, as IMPLAN does not differentiate between these.
Note: Employment impacts from construction cannot be summed for a total over the two phase construction periods as this employment may be from recurring jobs.

Operations Impacts Detail: The model also estimates that for every job created during the start up and typical year of operations, 1.75 jobs will be created in other sectors of the economy of the county. In the

same way, multipliers for value added, output, and employment measures, during years of operation, range from 1.43 to 2.75, as seen in the following table. These numbers do provide accurate detail as output production has not reached maximum capacity. The lower value at the startup reflects the optimization of the process. Therefore, lower production is expected during this timeframe.

TABLE 3. NORTHMET PROJECT OPERATIONS IMPACTS, STARTUP AND TYPICAL YEAR

Source: IMPLAN	*Direct Effect*	*Indirect Effect*	*Induced Effect*	*Total*
Start up Operations				
Value Added	$44,619,571	$12,117,664	$6,865,833	$63,603,068
Output	$64,122,003	$23,821,174	$11,367,855	$99,311,032
Employment	300*	275	251	826
Typical Year (Continuing Annual Impact of Operations)				
Value Added	$231,315,193	$62,819,962	$35,593,610	$329,728,765
Output	$332,418,993	$123,492,880	$58,932,833	$514,844,706
Employment	360*	330	301	991

*Direct Effect estimates are in terms of full-time equivalent employees, as provided by NorthMet. Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long - term or short-term jobs, as IMPLAN does not differentiate between these.

The secondary jobs created from typical year operations will be in sectors closely related to the mining industry. IMPLAN identifies the top sectors for secondary employment dependent on NorthMet activity as the following: Custom computer programming services, Food services and drinking places, Architectural-engineering-and related services, Private hospitals, Electric power generation, Real estate establishments, Wholesale trade businesses, Insurance carriers, Individual and family services, Telecommunications, Retail Stores, and more. (See tables in the full report.)

Tax Impacts: In the IMPLAN model, estimates of the additional tax revenue from changes in non-ferrous mining in St. Louis County, Minnesota are based on inputs from the employment in a typical year of operations. These estimates do not include industry occupation or production taxes. (The IMPLAN model does not have the capacity to include occupation or production taxes, therefore the BBER was not able to include them.)Tax impacts tables in this report show that in a typical year of operations, NorthMet activity federal taxes are estimated to total more than $30 million, and state and local taxes are estimated to total almost $39 million. In total, in a typical year, the NorthMet Project is estimated to pay almost $70 million in taxes to federal, and to state and local government.

TABLE 4. NORTHMET OPERATIONS TYPICAL YEAR TAX IMPACTS, ST. LOUIS COUNTY, MN

Source: IMPLAN	*Employee Compensation*	*Proprietor Income*	*Indirect Business Taxes*	*Households*	*Corporations*
Typical Year Operations					
Federal Government Non-Defense	$12,195,944	$1,234,735	$5,485,984	$4,028,711	$7,373,034
State/Local Non-Education	$295,500	$0	$30,644,882	$2,417,645	$5,482,354
Totals	$12,491,444	$1,234,735	$36,130,866	$6,446,356	$12,855,388

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I. Background: NorthMet Economic Impact 2011 Update

BBER was asked to assess the economic impacts of PolyMet's NorthMet Project, both short term through construction and long term through operations for St, Louis County, Minnesota. The results of this study may be incorporated into a required revision of the Environmental Impact Statement (EIS) for NorthMet. This NorthMet impact study updates the initial study from the BBER, "The Economic Impacts of PolyMet's NorthMet Project and Other Industrial Projects of Minnesota's East Range Communities 2006.[2]

BBER's scope of work for this project was proposed as follows: The UMD Labovitz School of Business and Economics' research bureau, the Bureau of Business and Economic Research (BBER), studied and estimated the economic impact of PolyMet's NorthMet Project on St. Louis County, Minnesota. Impacts of construction and operations were modeled. The economic modeling data and software used were IMPLAN version 3.0. The study used IMPLAN's economic multiplier analysis and input-output modeling, Version 3.0, created by MIG, Inc. (formerly Minnesota IMPLAN Group, Inc.).[3] The cumulative impact projects used in this report were evaluated from data obtained from IMPLAN Version 3.0 for year 2009. These data updates 2006 data from the initial impact study using models run with IMPLAN Version 2.0. Results of modeling are presented here in a written report. The research objectives of the study include: To study the impact of economic activity of PolyMet's NorthMet Project in St. Louis County; to model three measures and three effects of mining activity, including employment, output, and value added, and to model direct, indirect, and induced economic effects in the economy of St. Louis County, Minnesota; and to draft the findings into a report that updates the initial impact results from 2006. Readers are cautioned to notice that assumptions for the second-run models are based on revised inputs, new impact years, and new deflators, all of which are different from the previous modeling assumptions.

The worker productivity values generated by the model can be explained by the underlying data related to economy-wide, increased productivity. Worker productivity increased substantially over the past decade. Changes in output per worker (worker productivity) means that for each dollar invested, more worker output is produced, but by fewer employees. Thus equivalent levels of direct investment generate fewer jobs (but more labor income and industry activity). In the same way, it should also be noted that regional labor productivity (measured as dollars of output per worker) has increased dramatically in recent years and since the first run models were developed for NorthMet. Where mining

[2] Readers of this update material are encouraged to read the report of these first-run models at https://lsbe.d.umn.edu/departments/bber/projects/PolyMet/14feb2006.pdf.

[3] IMPLAN is used by other state governments and the USDA Forest Service, among others. See Minnesota IMPLAN Group, Inc., IMPLAN System (data and software), MIG, Inc. 502 2nd St., Ste 301, PO Box 837, Hudson, WI 54016-1543. Also see appendix material in this report in support of peer reviewed use of this model.

workers are more productive, investment will generate relatively fewer new jobs, but often at a higher salary level (Business Cycles and Long-Term Growth: Lessons from Minnesota [4]).

Comparing the employment impacts of the two modeling runs we see fewer NorthMet-dependent jobs created than might be projected, but less impact on value added payroll estimates.

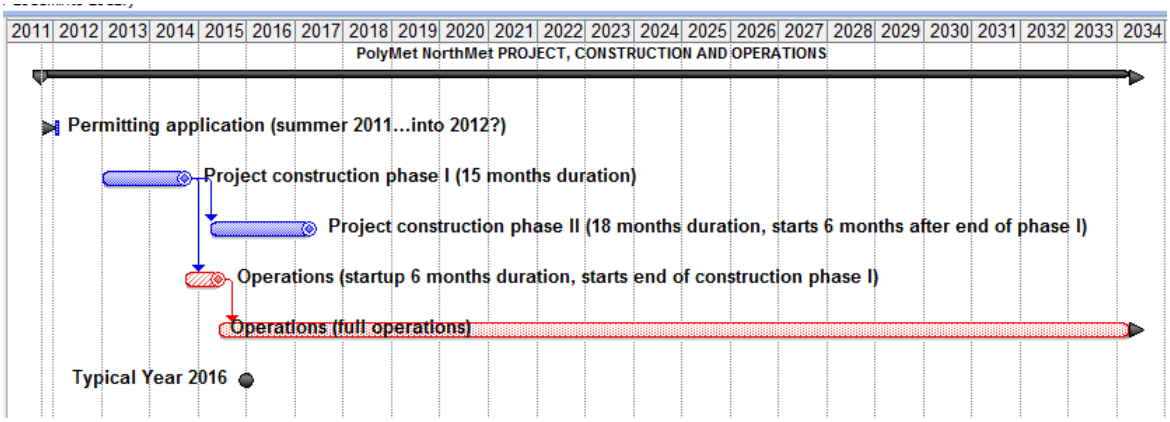


FIGURE 1. NORTHMET CONSTRUCTION AND OPERATIONS TIME LINE

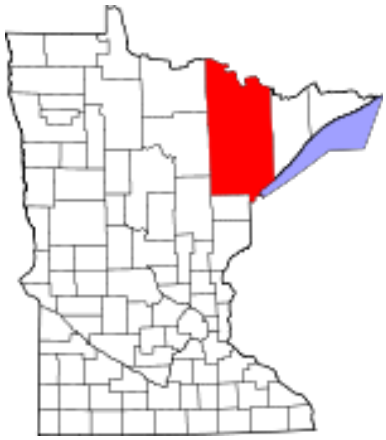


FIGURE 2. ST. LOUIS COUNTY, MINNESOTA

[4] For a more detailed description of job growth as related to worker productivity see http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=3371

II. Impact Procedures and Input Assumptions

IMPLAN Models

There are two components to the IMPLAN system—the software and databases. The databases provide all information to create regional IMPLAN models. The software performs the calculations and provides an interface for the user to make final demand changes. As noted earlier, IMPLAN software Version 3.0 was used in this analysis. Details regarding IMPLAN are included in the report on this page (page 3), as well as on pages 4, 16, A-29, A-30 and A-31. The website for IMPLAN is Implan.com.

IMPLAN provides comprehensive and detailed data coverage of the study areas by county, and the ability to incorporate user-supplied data at each stage of the model building process. IMPLAN also provides a high degree of flexibility, both in terms of geographic coverage and model formulation– in this case definition of St. Louis County, Minnesota—and the definition of specific models for construction and operations. Using the IMPLAN software and data, BBER identified the industry's proposed expenditures in terms of the sectoring scheme for the model, producer prices, historical dollars based on the year of the model, and applied those dollars spent within the study area definition given for the impact analysis.

IMPLAN data files use federal government data sources including:

- US Bureau of Economic Analysis Benchmark I/O Accounts of the US
- US Bureau of Economic Analysis Output Estimates
- US Bureau of Economic Analysis REIS Program
- US Bureau of Labor Statistics County Employment and Wages (CEW) Program
- US Bureau of Labor Statistics Consumer Expenditure Survey
- US Census Bureau County Business Patterns
- US Census Bureau Decennial Census and Population Surveys
- US Census Bureau Economic Censuses and Surveys
- US Department of Agriculture Crop and Livestock Statistics

IMPLAN data files consist of the following components: employment, industry output, value added, institutional demands, national structural matrices and inter-institutional transfers. Impacts for this model use St. Louis County data for the year 2009. The impact is reported in 2011 dollars. Health impacts are beyond the scope of the model's capabilities

Economic impacts are made up of direct, indirect, and induced impacts. The following comments are suggested cautions for accepting the impact model:

- IMPLAN input-output is a production based model.

- Local or export based purchases that represent transfers from other potential local purchases are not counted.
- The numbers (from U.S. Department of Commerce secondary data) treat both full and part-time individuals as being employed.
- Regional indirect and induced effects are driven by assumptions in the model. One problem is that the assumptions can mask the true multiplier. This is especially true of the assumption of constant returns to scale: This assumption most affects induced effects and says that if I drink coffee, and my income increases, I will drink proportionally more than before. The amount of weight placed on the induced effects (the percentage of the total induced effect you would want to use) could be further analyzed with an in-depth impact study, involving much more specific data collection and more detailed analysis. Such detailed analysis is outside of the scope of this impact analysis.
- BBER also suggests caution in regard to the interpretation of the tax impacts from this project: Tax law changes frequently and can be difficult to forecast through the years proposed as operations for NorthMet. (The IMPLAN model does not have the capacity to include occupation or production taxes, therefore the BBER was not able to include them.)
- Although the current economic downturn may affect the estimates of project start dates and other timeline assumptions, BBER assumes in this study that non-ferrous mining is attempting to emerge from the downturn without losing years of momentum. Delays in permitting application and approval can also affect the proposed start dates.
- Construction years are assumed to include activity between 2013 and the beginning of 2016.
- Operation year impacts are projected for a "typical year" (2016 is suggested as the full capacity year). These annual impacts are assumed to continue for the life of the operation of NorthMet.

Definitions Used in This Report

The IMPLAN models for both operations and construction use the following definitions for the three measures and three effects of the impact reports:

Measures

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

Output – Represents the value of local production required to sustain activities.

Employment – Estimates are in terms of jobs, not in terms of full-time equivalent employees. Hence, these may be temporary, part-time or short-term jobs.

Effects

Direct – Initial spending in the study area resulting from the project.

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

Induced – The impact of additional household expenditure resulting from the direct and indirect impact.

Industry Definitions

IMPLAN models for this study used the IMPLAN industrial sector 23 (which includes copper, nickel, lead, and zinc mining) to model the impact of non-ferrous mining. IMPLAN Sector 23 corresponds to NAICS codes 21223, and it captures the specific mining positions found in Table 4.10-13 from the DEIS. Construction impacts are modeled using IMPLAN industrial sector 36.

TABLE 5. INDUSTRY DEFINITIONS

IMPLAN Sector	Description	BEA Equivalent	NAICS Equivalent
23	Copper, nickel, lead, and zinc mining	21223	21223
36	Construct other new nonresidential structures	23	2362

Input assumptions to the models are detailed in Appendix A to this report, including, for construction, start dates and end dates; construction costs, including capital and employment; construction employment, or jobs over the construction period. Input assumptions for operations include, operations time-lines; value of production in start up, and at full production; and employment or jobs in start up and at full production. All assumptions used to calculate the report data have been disclosed.

III. Findings: NorthMet Project Economic Impacts

In this section, BBER reports the direct, indirect, and induced economic impacts of construction and operations activities of the NorthMet Project in St. Louis County, Minnesota. These impacts are measured in terms of employment, output, and value added. A special sub-section of these findings covers the results of modeling non-ferrous mining tax impacts.

Development of the NorthMet IMPLAN model has included discussions suggesting the usefulness of presenting scenarios which might reduce the estimated number of PolyMet copper mining jobs by 5%, 10%, 25%, and 50%, and which might assess the model's sensitivity and predict the extent that reductions in direct mining jobs will have on the number of indirect jobs (created through inter-industry spending) and induced jobs (created through additional household expenditures). The indirect jobs figure is an output or estimate created by the IMPLAN model. Although, BBER has not included in the revised IMPLAN model these four suggested percentage scenarios, BBER has instead modeled perhaps the four most interesting scenarios as the following: Phase I and Phase II of construction, and Start up and Typical Year of operations. BBER suggests that the startup scenario is a way to consider less than typical level operations.

Readers may infer from the Phase I and Phase II scenarios the model's linear relationships: indirect and induced jobs have a mathematical relationship to direct employment. For example, the IMPLAN model used in this study estimates that during Phase I of construction, for every job created in the construction sector, another 0.7 job will be created in other sectors of the St. Louis County economy. In the same way, for Phase I of NorthMet construction, for every dollar of construction expenditure, another $0.57 will be created in other sectors of the county economy. Multipliers for value added and output measures for construction range from 1.57 to 1.72. The multiplier was calculated by dividing total impact by direct impact. The tables below present the detailed results of the multiplier, in terms of indirect and induced effects, for payroll (value added), sales (output) and jobs (employment). Operations for start up and typical year scenarios are also modeled and presented.

These numbers do provide accurate detail as output production has not reached maximum capacity. The lower value at the startup reflects the optimization of the process. Therefore, lower production is expected during this timeframe.

The sensitivity of the model (i.e. the relationship between changes in the direct effect and total impact) can be seen as a mathematical ratio dependent on the multiplier. The IMPLAN model's multipliers, and specifically the estimation of induced effects, have often been reviewed.[5] For impact modeling in the

[5] For example, in Deller S.C., Sumathi N.R., Marcouiller D., 1993, Regional Economic Models for the State of Wisconsin: An Application of the Micro-IMPLAN Modeling System.

mining sector, BBER suggests that although the multiplier isn't very high from the indirect effect, it is larger when we look at the induced effect because of the higher incomes. Also, when considering the indirect and induced impacts, BBER suggests readers bear in mind that although impact analysis estimates the indirect and induced impacts of a direct change, these estimates are based on the assumption that nothing else happens within the local economy to help offset these impacts. "All other things being equal" is a common assumption in economics.

Input-output also tries to take into account "leakages" leaving the region. The construction and mining industry produces goods or services which generate demand for other goods and services, and this demand is multiplied through a particular economy until it dissipates through leakage to economies outside the specified area (in this case outside St. Louis County). IMPLAN models calculate leakage - known in IMPLAN modeling as regional purchase coefficients or RPCs. As defined by MIG, Inc., RPCs are national level data that are adjusted and used in every regional model. They provide an econometric equation for each commodity, which can be used to estimate trade flows. Each supplying industry has its own calculated RPC that determines the mining and construction industries' local purchase from each supplier. Note, since these are national averages, they are more reflective of trends and have been applied to the study area data used here.

For this report, RPCs are calculated from the local, regional, and state economic areas based on workforce configuration, the inputs required by specific types of businesses, and the availability of both inputs in the economic area. One consequence is that economic impacts that accrue to other counties or states as a consequence of a change in demand are not counted as impacts within the economic area. Providing information relevant to a national level impact is not part of this study's scope.

Readers should also bear in mind the cautions listed in the "Impact Procedures and Input Assumptions" section of this report. Specifically related to the multiplier is the following caution: Regional indirect and induced effects are driven by assumptions in the model. One problem is that the assumptions can mask the true multiplier. This is especially true of the assumption of constant returns to scale: This assumption most affects induced effects and says that if I drink coffee, and my income increases, I will drink proportionally more than before. [6]

Construction Impacts

Construction expenditures have been estimated by PolyMet to be almost $312 million in Phase I, and more than $164 million in Phase II. Total construction expenditures are estimated to reach more than $476 million, for all phases of NorthMet construction.

The following table sums direct, indirect, and induced impacts for total impact values.

[6] The amount of weight placed on the induced effects (the percentage of the total induced effect you would want to use) could be further analyzed with an in-depth impact study, involving much more specific data collection and more detailed analysis.

TABLE 6. SUMMARY: TOTAL NORTHMET CONSTRUCTION IMPACTS ON ST. LOUIS COUNTY, MN, PHASE I AND PHASE II

Source: IMPLAN	Value Added Totals	Output Totals	Employment Totals
Construction Phase I	$246,532,357	$488,543,900	832
Construction Phase II	$129,587,522	$256,798,717	439
Total	$376,119,879	$745,342,617	NA*

The following tables report detail impacts for all three economic measures:

TABLE 7. NORTHMET VALUE ADDED IMPACTS FROM CONSTRUCTION, ST. LOUIS COUNTY, MN, PHASE I AND PHASE II

Source: IMPLAN	*Direct*	*Indirect*	*Induced*	*Total*
Construction Phase I	$143,637,243	$41,774,260	$61,120,854	$246,532,357
Construction Phase II	$75,501,628	$21,958,266	$32,127,628	$129,587,522
Total	$219,138,871	$63,732,526	$93,248,482	$376,119,879

TABLE 8. NORTHMET OUTPUT IMPACTS FROM CONSTRUCTION, ST. LOUIS COUNTY, MN, PHASE I AND PHASE II

Source: IMPLAN	*Direct*	*Indirect*	*Induced*	*Total*
Construction Phase I	$312,000,009	$75,343,964	$101,199,927	$488,543,900
Construction Phase II	$164,000,005	$39,603,879	$53,194,833	$256,798,717
Total	$476,000,014	$114,947,843	$154,394,760	$745,342,617

TABLE 9. NORTHMET EMPLOYMENT IMPACTS FROM CONSTRUCTION, ST. LOUIS COUNTY, MN, PHASE I AND PHASE II

Source: IMPLAN	*Direct**	*Indirect*	*Induced*	*Total*
Construction Phase I	500	128	204	832
Construction Phase II	264	68	107	439

*Note, employment should not be summed. Although the construction investment adds up over time, employment does not; consider, for example, that a construction project truck driver employed during 2013 may be continuing in the same job in 2015. Direct Effect estimates are in terms of full-time equivalent employees, as provided by NorthMet. Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long -term or short-term jobs, as IMPLAN does not differentiate between these.

To help readers identify where the jobs projected by the IMPLAN model would likely be created through indirect effects or induced effects, BBER presents the following tables that report employment in the top 25 industries dependent on Phase I and Phase II construction in St. Louis County.

Table 10. NorthMet Dependent INDUSTRIES, Employment Impacts from Phase I Construction, St. Louis County, MN, Top 25 Indirect and Induced Jobs by Industry Sector

Source: IMPLAN	*Projected Employment Impacts*			
IMPLAN Sector**	*Direct**	*Indirect*	*Induced*	*Total*
St. Louis County:				
Construct other new nonresidential structures	500	0	0	500
Architectural- engineering- and related services	0	40	1	41
Food services and drinking places	0	5	26	31
Private hospitals	0	0	14	14
Retail Stores - General merchandise	0	4	8	11
Wholesale trade businesses	0	7	4	11
Offices of physicians- dentists- and other he	0	0	10	10
Retail Stores - Food and beverage	0	3	7	9
Nursing and residential care facilities	0	0	9	9
Retail Nonstores - Direct and electronic sale	0	1	6	8
Civic- social- professional- and similar organ.	0	3	5	7
Real estate establishments	0	2	5	7
Retail Stores - Motor vehicle and parts	0	2	5	7
Retail Stores - Miscellaneous	0	2	5	7
Monetary authorities and depository credit in	0	3	4	7
Automotive repair and maintenance- except car	0	5	2	6
Retail Stores - Clothing and clothing access.	0	1	4	6
Individual and family services	0	0	5	5
Insurance carriers	0	1	4	5
Retail Stores - Health and personal care	0	2	3	4
Services to buildings and dwellings	0	3	2	4
Retail Stores - Building material and garden	0	1	3	4
Legal services	0	3	2	4
Securities- commodity contracts- investments	0	1	3	4
Retail Stores - Gasoline stations	0	1	3	4
Retail Stores - Sporting goods- hobby- book	0	1	2	4
Top 25 Total	500	91	142	729
As well as additional full and part-time jobs in another 107 various sectors of the economy…				
Grand Total	500	128	204	832

**Direct Effect estimates are in terms of full-time equivalent employees, as provided by NorthMet. Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long -term or short-term jobs, as IMPLAN does not differentiate between these.

**At the IMPLAN Web site, readers who want to know more about what is included in these sectors—which can have broad definition—can view IMPLAN Bridge Tables that articulate the BEA sectors that comprise the 440 various IMPLAN sectors. See http://implan.com/.

TABLE 11. NORTHMET DEPENDENT INDUSTRIES, EMPLOYMENT IMPACTS FROM PHASE II CONSTRUCTION, ST. LOUIS COUNTY, MN, TOP 25 INDIRECT AND INDUCED JOBS BY INDUSTRY SECTOR

Source: IMPLAN	*Projected Employment Impacts*			
IMPLAN Sector**	*Direct**	*Indirect*	*Induced*	*Total*
St. Louis County:				
Construct other new nonresidential structures	264	0	0	264
Architectural- engineering- and related services	0	21	0	21
Food services and drinking places	0	2	14	16
Private hospitals	0	0	7	7
Retail Stores - General merchandise	0	2	4	6
Wholesale trade businesses	0	4	2	6
Offices of physicians- dentists- and other he	0	0	5	5
Retail Stores - Food and beverage	0	1	4	5
Nursing and residential care facilities	0	0	5	5
Retail Nonstores - Direct and electronic sale	0	1	3	4
Civic- social- professional- and similar organ.	0	1	3	4
Real estate establishments	0	1	3	4
Retail Stores - Motor vehicle and parts	0	1	3	4
Retail Stores - Miscellaneous	0	1	2	4
Monetary authorities and depository credit in	0	1	2	3
Automotive repair and maintenance- except car	0	3	1	3
Retail Stores - Clothing and clothing access.	0	1	2	3
Individual and family services	0	0	3	3
Insurance carriers	0	0	2	3
Retail Stores - Health and personal care	0	1	2	2
Services to buildings and dwellings	0	1	1	2
Retail Stores - Building material and garden	0	1	2	2
Legal services	0	1	1	2
Securities- commodity contracts- investments	0	1	2	2
Retail Stores - Gasoline stations	0	1	2	2
Top 25 Total	264	46	74	384
As well as additional full and part-time jobs in another 95 various sectors of the economy.				
Grand Total	264	68	107	439

*Direct Effect estimates are in terms of full-time equivalent employees, as provided by NorthMet. Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long -term or short term jobs, as IMPLAN does not differentiate between these.

**At the IMPLAN Web site, readers who want to know more about what is included in these sectors—which can have broad definition—can view IMPLAN Bridge Tables that articulate the BEA sectors that comprise the 440 various IMPLAN sectors. See http://implan.com/.

Operations Impacts

To estimate the on-going impact of mining activity when full operations are reached, BBER has used the term "Typical Year" to reflect a target product number that the company would like to obtain. Thus, a typical year is after full build out of the planned project with nickel hydromet. Year-to-year variances owing to grades mean some years will be a little better, others a little worse. BBER projected the typical year to be 2016. Additionally, the BBER cannot predict high and lows of the industry or nor can it, along with PolyMet, predict years when the mine is in partial operation (except for the startup phase) or shut down completely. It has been estimated by PolyMet that in the typical year, 2016, operations will directly employ 360 workers. The impacts of operations employment and revenue are shown below. As noted before, modeling results for typical year operations are reported in 2011 dollars. The following table sums direct, indirect, and induced impacts for total impact values.

TABLE 12. SUMMARY: NORTHMET OPERATIONS TOTAL IMPACTS, STARTUP AND TYPICAL OPERATIONS YEAR, ST. LOUIS COUNTY, MN

Source: IMPLAN	*Value Added Totals*	*Output Totals*	*Employment* Totals*
Operations			
Start up	$63,603,068	$99,311,032	826
Typical Year	$329,728,765	$514,844,706	991

*Estimates are in terms of full-time equivalent employees.

The following tables report the detail impacts for all three economic measures:

TABLE 13. NORTHMET OPERATIONS VALUE ADDED IMPACTS STARTUP AND TYPICAL OPERATIONS YEAR, ST. LOUIS COUNTY, MN

Source: IMPLAN	*Direct*	*Indirect*	*Induced*	*Total*
Operations				
Start up	$44,619,571	$12,117,664	$6,865,833	$63,603,068
Typical Year	$231,315,193	$62,819,962	$35,593,610	$329,728,765

TABLE 14. NORTHMET OPERATIONS OUTPUT IMPACTS STARTUP AND TYPICAL OPERATIONS YEAR, ST. LOUIS COUNTY, MN

Source: IMPLAN	*Direct*	*Indirect*	*Induced*	*Total*
Operations				
Start up	$64,122,003	$23,821,174	$11,367,855	$99,311,032
Typical Year	$332,418,993	$123,492,880	$58,932,833	$514,844,706

TABLE 15. NORTHMET OPERATIONS EMPLOYMENT IMPACTS STARTUP AND TYPICAL OPERATIONS YEAR, ST. LOUIS COUNTY, MN

Source: IMPLAN	*Direct**	*Indirect*	*Induced*	*Total*
Operations				
Start up	300	275	251	826
Typical Year	360	330	301	991

*Direct Effect estimates are in terms of full-time equivalent employees, as provided by NorthMet.

Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long -term or short-term jobs, as IMPLAN does not differentiate between these.

To help readers identify where the jobs projected by the IMPLAN model would likely be created through indirect and induced effects, BBER presents the following tables that report start-up employment and employment impacts dependent on typical operations in the top 25 industries in St. Louis County.

TABLE 16 NORTHMET INDUSTRIES, START-UP EMPLOYMENT IMPACTS FROM TYPICAL OPERATIONS, ST. LOUIS COUNTY, MN, TOP 25 INDIRECT AND INDUCED JOBS BY INDUSTRY SECTOR

Source: IMPLAN	*Projected Employment Impacts*			
IMPLAN Sector**	*Direct**	*Indirect*	*Induced*	*Total*
St. Louis County:				
Mining copper- nickel- lead- and zinc	300	23	0	323
Custom computer programming services	0	93	0	93
Food services and drinking places	0	7	32	39
Architectural- engineering- and related servi	0	30	1	31
Support activities for other mining	0	26	0	26
Private hospitals	0	0	17	17
Electric power generation- transmission- and	0	14	1	15
Offices of physicians- dentists- and other he	0	0	12	12
Nursing and residential care facilities	0	0	12	12
Real estate establishments	0	4	6	10
Management of companies and enterprises	0	10	1	11
Monetary authorities and depository credit in	0	5	5	10
Civic- social- professional- and similar orga	0	4	6	10
Retail Stores - General merchandise	0	0	9	9
Wholesale trade businesses	0	4	5	9
Retail Stores - Food and beverage	0	0	9	9
Retail Nonstores - Direct and electronic sale	0	0	8	8
Securities- commodity contracts- investments-	0	3	4	7
Insurance carriers	0	2	5	7
Individual and family services	0	0	7	7
Retail Stores - Motor vehicle and parts	0	0	6	6
Services to buildings and dwellings	0	4	2	6
Retail Stores - Miscellaneous	0	0	6	6
Telecommunications	0	4	2	6
Retail Stores – Clothing and clothing accessories	0	0	5	5
Top 25 Total	300	**232**	**160**	**692**
As well as additional full and part-time jobs in another 122 various sectors of the economy.				
Grand Total	300	**275**	**251**	**826**

*Direct Effect estimates are in terms of full-time equivalent employees, as provided by NorthMet. Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long -term or short-term jobs, as IMPLAN does not differentiate between these.
**At the IMPLAN Web site, readers who want to know more about what is included in these sectors—which can have broad definition—can view IMPLAN Bridge Tables that articulate the BEA sectors that comprise the 440 various IMPLAN sectors. See http://implan.com/.
Identifying jobs by function, comparable to the DEIS table 4.10-13, is not possible through the IMPLAN model.

TABLE 17. NORTHMET INDUSTRIES , EMPLOYMENT IMPACTS FROM TYPICAL OPERATIONS, ST. LOUIS COUNTY, MN, TOP 25 INDIRECT AND INDUCED JOBS BY INDUSTRY SECTOR

Source: IMPLAN	*Projected Employment Impacts*			
IMPLAN Sector**	*Direct**	*Indirect*	*Induced*	*Total*
St. Louis County:				
Mining copper- nickel- lead- and zinc	360	28	0	388
Custom computer programming services***	0	112	0	112
Food services and drinking places	0	8	39	47
Architectural- engineering- and related services	0	36	1	37
Support activities for other mining	0	31	0	31
Private hospitals	0	0	20	20
Electric power generation- transmission	0	17	1	18
Offices of physicians- dentists- and other	0	0	15	15
Nursing and residential care facilities	0	0	14	14
Real estate establishments	0	5	8	13
Management of companies and enterprises	0	11	1	12
Monetary authorities and depository credit in	0	6	6	12
Civic- social- professional- and similar organ.	0	5	7	12
Retail Stores - General merchandise	0	0	11	11
Wholesale trade businesses	0	4	6	11
Retail Stores - Food and beverage	0	0	10	10
Retail Nonstores - Direct and electronic sale	0	0	9	9
Securities- commodity contracts- investments	0	4	5	9
Insurance carriers	0	2	7	8
Individual and family services	0	0	8	8
Retail Stores - Motor vehicle and parts	0	0	7	7
Services to buildings and dwellings	0	5	3	7
Retail Stores - Miscellaneous	0	0	7	7
Telecommunications	0	4	2	6
Retail Stores - Clothing and clothing access.	0	0	6	6
Top 25 Total	360	278	192	830
As well as additional full and part-time jobs in another 99 various sectors of the economy.				
Grand Total	360	330	301	991

*Direct Effect estimates are in terms of full-time equivalent employees, as provided by NorthMet. Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long -term or short-term jobs, as IMPLAN does not differentiate between these.

**At the IMPLAN Web site, readers who want to know more about what is included in these sectors—which can have broad definition—can view IMPLAN Bridge Tables that articulate the BEA sectors that comprise the 440 various IMPLAN sectors. See http://implan.com/.
Identifying jobs by function, comparable to the DEIS table 4.10-13, is not possible through the IMPLAN model.
*** The number of indirect jobs was a calculation provided by the IMPLAN model. The IMPLAN model provides employment category names including Custom Computer Programming Service jobs. However, within that category are those positions that utilize computers in general, such as technicians, and are not just those of a programming nature. These indirect jobs are calculated to be within the study region, and they are projected for the entire duration of the studied timeframe.

Tax Impacts

According to the IMPLAN model, the NorthMet impact includes additional tax revenue from changes in economic activities. The tax change can be modeled as follows: Income information can be combined with other social accounts tax information to make estimates of the taxes generated by a change in final demand. Although this is a simple ratio estimate, it gives a good first estimate of tax impact. The IMPLAN model also estimates business tax impacts in this way.

For the NorthMet economic impact study, the IMPLAN model estimates additional tax revenue from changes in non-ferrous mining in St. Louis County, Minnesota. These are based on inputs from the employment in a typical year of operations. These estimates do not include industry occupation or production taxes.

The following estimates of the additional tax revenue from changes in non-ferrous mining in St. Louis County, Minnesota are based on inputs from the employment in a typical year of operations. These estimates do not include industry taxes. The impacts are summarized in the following tables as federal, and state and local taxes.

Tax revenue tables in this report show details of construction and operations tax revenue. Tables below also show that in a typical year of operations, NorthMet federal taxes are estimated to total more than $30 million, and state and local taxes are estimated to total almost $39 million. In total, in a typical year, NorthMet is estimated to pay almost $70 million in taxes to federal, and to state and local government.

TABLE 18. NORTHMET CONSTRUCTION TAX REVENUE, PHASE I AND PHASE II, ST. LOUIS COUNTY, MN

Source: IMPLAN	*Employee Compensation*	*Proprietor Income*	*Indirect Business Taxes*	*Households*	*Corporations*
Construction Phase I					
Federal Government Non-Defense	$20,998,344	$2,094,341	$1,714,334	$6,917,985	$1,768,031
State/Local Non-Education	$508,776	$0	$9,576,325	$4,151,509	$1,314,652
Totals	$21,507,120	$2,094,341	$11,290,659	$11,069,494	$3,082,683
Construction Phase II					
Federal Government Non-Defense	$11,037,591	$1,100,872	$901,124	$3,636,377	$929,349
State/Local Non-Education	$267,433	$0	$5,033,709	$2,182,203	$691,035
Totals	$11,305,024	$1,100,872	$5,934,833	$5,818,580	$1,620,384

TABLE 19. NORTHMET OPERATIONS TAX REVENUE, STARTUP AND TYPICAL YEAR, ST. LOUIS COUNTY, MN

Source: IMPLAN	*Employee Compensation*	*Proprietor Income*	*Indirect Business Taxes*	*Households*	*Corporations*
Operations Startup					
Federal Government Non-Defense	$2,352,538	$238,174	$1,058,220	$777,119	$1,422,222
State/Local Non-Education	$57,000	$0	$5,911,247	$466,352	$1,057,519
Totals	$2,409,538	$238,174	$6,969,467	$1,243,471	$2,479,741
Operations Typical Year					
Federal Government Non-Defense	$12,195,944	$1,234,735	$5,485,984	$4,028,711	$7,373,034
State/Local Non-Education	$295,500	$0	$30,644,882	$2,417,645	$5,482,354
Totals	$12,491,444	$1,234,735	$36,130,866	$6,446,356	$12,855,388

■

References

For more on the NorthMet Project and estimates on construction and operations activity, see:

"The NorthMet Deposit" at http://www.polymetmining.com/inside-polymet-northmet.php

For discussion of IMPLAN and input-output modeling, see:

Maki, Wilbur R., and Richard W. Lichty. Urban Regional Economics: Concepts, Tools, Applications. February 2000. Iowa State Press.

Miernyk , Willam. Elements of Input Output Analysis, New York, Random House, 1966.

Miller, Ronald E., and Peter D. Blair. Input-output Analysis: Foundations and Extensions, Englewood Cliffs, N.J. PrenticeHall, 1985 (out of print).

Olson, Doug and Scott Lindall, "IMPLAN Professional Software, Analysis, and Data Guide," www.implan.com.

For previous BBER impact reports referred to in this document, see at https://lsbe.d.umn.edu/bber/bber_projects.php:

The Economic Impact of Constructing and Operating an Integrated Gasification Combined-Cycle Power-Generation Facility on the Iron Range, UPDATE 2006: Mesaba One Impacts, Including Appendix A: Mesaba Two Impacts, Excelsior Energy.

The Economic Impact of Constructing and Operating An Integrated Gasification Combined-Cycle Power-Generation Facility on Itasca County, Itasca Development Corporation.

The Economic Impact of Constructing and Operating Minnesota Steel Industries LLC in Itasca County, Minnesota, with Appendix Material on Itasca and St. Louis County Impacts, 2006, Itasca Development Corporation.

Economic Impacts of PolyMet's NorthMet Project and Other Industrial Projects of Minnesota's East Range Communities 2006, Short Elliot Hendrickson

Economic Impact of U.S. Steel's Keetac Mine Expansion Project on the State of Minnesota and the Arrowhead Region, for Barr Engineering, 2009 (upon request).

Also of interest:

The Economic Impact of Ferrous and Non-Ferrous Mining on the State of Minnesota, and on the Arrowhead Region and Douglas County, WI.

Appendix A: Modeling Input Assumptions

For construction:

Construction time-lines. Start date and end.

The IMPLAN model requires that BBER assign a start year for modeling construction. BBER assumes that the most likely start year for construction will be 2013. PolyMet provided the following detail on start times and durations: Construction of Phase 1 starts 3 months after permits are issued (currently estimated latter 2012). Construction finishes (Phase 1) 15 months after start date. Construction of Phase 2 starts 6 months after completion of Phase I. Construction of Phase II finishes 18 months after start date.

Construction costs including capital and employment.

BBER assumes that "owner's cost" is not related to construction activity. PolyMet estimated the project's total construction cost as: Phase I construction is $312 million and Phase 2 is $164 million.

Construction employment or jobs over the construction period.

BBER assumes a ramp up phase. PolyMet estimated the following employment for Phase I and Phase 2 of construction activity. Construction hours have been estimated for Phase I and Phase 2 as follows: 1.25 million direct field hours for both phases; and peak construction workforce of around 500 during Phase I at month 10 into 15-month construction period. Assume an S curve for ramp up and ramp down and use 200 hours per person month. Phase I employment typical year equals 500. Phase II typical year employment equals 264.

For operations:

Operations time-lines.

BBER assumes a startup phase until NorthMet reaches full production. BBER notes that the 2005 report used separate impacts scenarios for the startup phase and for the typical year production phase. PolyMet estimates the operations time line: Allow 6 months for ramping to full production from construction completion of Phase I. BBER assumes typical year full operations to be year 2016.

Value of production in start up and at full production.

BBER assumes output is the value of the metals produced. BBER included consideration of possible changes in production processes, which might affect these estimates.

May 20, 2008 PolyMet released to the public updated capital and operating costs. The economic analysis is based on SEC-reserve standards, namely the three-year trailing average, which PolyMet calculated at April 30, 2008 (the end of their first fiscal quarter.) This price deck is: copper - $2.90/lb, nickel - $12.20/lb, cobalt - $23.50/lb, palladium - $320/oz, platinum - $1,230/oz, and gold - $635/oz. Note that metal prices are highly variable. Phase 1 (Startup) average annual revenue will be 25% of $256.488 million, and Phase 2 (Typical Year) annual revenue will be $332.419 million. PolyMet does not expect a significant ramp up phase associated with Phase 2.

Employment or jobs in start up and at full production.

PolyMet employment numbers during startup phase and full production will be similar; that is, about 300 employees for Phase I (Startup) and 360 total once Phase 2 (Typical Year) is completed.

Appendix B: Cumulative Effects of Other Projects

In this appendix:

- Review of previous impact estimates
- Estimates of new and additional expansion impacts (Keetac Expansion, Essar Steel)
- Mesaba One Energy Power Generation Plant
- Cumulative impacts by year

Review of Previous Impact Estimates

Previous IMPLAN modeling for PolyMet's initial EIS included an estimation of cumulative projects that were reasonably foreseeable as of 2006. In addition to the impact findings for PolyMet's NorthMet Project as reported in the main body of this report, PolyMet's Supplemental NorthMet EIS's cumulative effects analysis for St. Louis County could also consider the most recent Essar SDEIS and the KEETAC Expansion EIS. In addition, the estimated impact of the proposed facility of the Mesaba Energy Power Generation Plant in Itasca County is of interest. Updates to the initial estimation (2006) are as follows.

Estimates of New and Additional Impacts

Keetac Expansion Update

The BBER modeled "The Economic Impact of U.S. Steel's Keetac Mine Expansion on the State of Minnesota and on the Arrowhead Region" in March 2009. At the time of that study, this expansion project was projected to begin with construction in 2010 and begin full operations in 2013. The results of that study, provided here, show an additional impact from the Keetac expansion on the Arrowhead Region and the State of Minnesota (in 2007 dollars). Construction and operations impacts include the following estimates:

TABLE 20. SUMMARY: KEETAC EXPANSION PROJECT CONSTRUCTION IMPACTS ON THE STATE OF MINNESOTA AND ON THE ARROWHEAD REGION 2010-2013 (IN 2007 DOLLARS)

Years	*Value Added Totals*		*Employment Totals*		*Output Totals*	
	Minnesota	Arrowhead	Minnesota	Arrowhead	Minnesota	Arrowhead
2010	$93,316,089	$67,841,741	342	304	$190,971,097	$147,038,094
2011	$134,090,543	$95,166,731	513	456	$274,415,905	$206,261,435
2012	$132,487,849	$91,779,532	513	456	$271,135,992	$198,920,126
2013	$220,932,603	$149,365,567	856	760	$452,137,915	$323,730,313
Total	$580,827,084	$404,153,571			$1,188,660,909	$875,949,968

TABLE 21. SUMMARY: KEETAC EXPANSION PROJECT OPERATION IMPACTS ON THE STATE OF MINNESOTA AND ON THE ARROWHEAD REGION, FULL OPERATION YEAR, 2013 (IN 2007 DOLLARS)

Year	*Value Added Totals*		*Employment Totals*		*Output Totals*	
	Minnesota	Arrowhead	Minnesota	Arrowhead	Minnesota	Arrowhead
2013	$315,402,163	$272,683,542	479	398	$653,488,756	$570,489,496

Essar Steel Minnesota Update

Minnesota Steel, now Essar Steel Minnesota LLC, has been reconfigured. The firm provided new assumptions for direct spending and employment for the new modeling. Construction and operations impacts include the following estimates for the economic impact of Essar Steel's project on Itasca County, and on Itasca and St. Louis Counties in Minnesota:

Construction Impacts

SUMMARY: ESSAR STEEL MINNESOTA LLC, CONSTRUCTION IMPACTS ON ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN, 2011-2015

Years	*Value Added Totals*	*Output Totals*	*Employment Totals*
Itasca County:			
2011	$216,523,392	$529,350,784	2,896
2012	$216,523,392	$529,350,784	2,896
2013	$216,523,392	$529,350,784	1,448
2014	$162,392,512	$397,012,352	1,738
2015	$162,392,512	$397,012,352	1,738
Total	$974,355,200	$2,382,077,056	*
Itasca and St. Louis Counties:			
2011	$263,418,752	$606,328,832	3,286
2012	$263,418,752	$606,328,832	3,286
2013	$263,418,752	$606,328,832	1,643
2014	$197,564,160	$454,745,856	1,972
2015	$197,564,160	$454,745,856	1,972
Total	$1,185,384,576	$2,728,478,208	*

Source: IMPLAN

*Note - employment should not be summed. Although the construction investment adds up over time, employment does not; consider, for instance, that a construction project truck driver employed during 2011 may be continuing in the same job in 2012.

TABLE 22. ESSAR STEEL MINNESOTA LLC, VALUE ADDED IMPACTS FROM CONSTRUCTION, ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN, 2011-2015

Years	*Direct*	*Indirect*	*Induced*	*Total*
Itasca County:				
2011	$141,087,232	$32,260,864	$43,175,296	$216,523,392
2012	$141,087,232	$32,260,864	$43,175,296	$216,523,392
2013	$141,087,232	$32,260,864	$43,175,296	$216,523,392
2014	$105,815,296	$24,195,648	$32,381,568	$162,392,512
2015	$105,815,296	$24,195,648	$32,381,568	$162,392,512
Total	$634,892,288	$145,173,888	$194,289,024	$974,355,200
Itasca and St. Louis Counties:				
2011	$149,302,784	$54,443,392	$59,672,576	$263,418,752
2012	$149,302,784	$54,443,392	$59,672,576	$263,418,752
2013	$149,302,784	$54,443,392	$59,672,576	$263,418,752
2014	$111,977,216	$40,832,512	$44,754,432	$197,564,160
2015	$111,977,216	$40,832,512	$44,754,432	$197,564,160
Total	$671,862,784	$244,995,200	$268,526,592	$1,185,384,576

Source: IMPLAN

ESSAR STEEL MINNESOTA LLC, OUTPUT IMPACTS FROM CONSTRUCTION, ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN, 2011-2015

Years	*Direct*	*Indirect*	*Induced*	*Total*
Itasca County:				
2011	$400,000,000	$56,890,240	$72,460,544	$529,350,784
2012	$400,000,000	$56,890,240	$72,460,544	$529,350,784
2013	$400,000,000	$56,890,240	$72,460,544	$529,350,784
2014	$299,999,232	$42,667,648	$54,345,472	$397,012,352
2015	$299,999,232	$42,667,648	$54,345,472	$397,012,352
Total	$1,799,998,464	$256,006,016	$326,072,576	$2,382,077,056
Itasca and St. Louis Counties:				
2011	$400,000,000	$103,627,776	$102,701,056	$606,328,832
2012	$400,000,000	$103,627,776	$102,701,056	$606,328,832
2013	$400,000,000	$103,627,776	$102,701,056	$606,328,832
2014	$299,999,232	$77,720,832	$77,025,792	$454,745,856
2015	$299,999,232	$77,720,832	$77,025,792	$454,745,856
Total	$1,799,998,464	$466,324,992	$462,154,752	$2,728,478,208

Source: IMPLAN

ESSAR STEEL MINNESOTA LLC, EMPLOYMENT IMPACTS FROM CONSTRUCTION, ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN, 2011-2015

Years	*Direct*	*Indirect*	*Induced*	*Total*
Itasca County:				
2011	2,000	370	526	2,896
2012	2,000	370	526	2,896
2013	1,000	185	263	1,448
2014	1,200	222	316	1,738
2015	1,200	222	316	1,738
				*

Itasca and St. Louis Counties:				
2011	2,000	586	700	3,286
2012	2,000	586	700	3,286
2013	1,000	293	350	1,643
2014	1,200	352	420	1,972
2015	1,200	352	420	1,972
				*

Source: IMPLAN
*Note, employment should not be summed. Although the construction investment adds up over time, employment does not; consider, for instance that a construction project truck driver employed during 2011 may be continuing in the same job in 2012.

Operations Impacts

SUMMARY: ESSAR STEEL MINNESOTA LLC, OPERATIONS IMPACTS 2012 AND FULL OPERATIONS YEAR, 2015, ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN

Years	*Value Added Totals*	*Output Totals*	*Employment Totals*
Itasca County:			
2012	$94,246,144	$393,950,592	844
2015	$188,492,288	$787,901,184	1,688
Itasca and St. Louis Counties:			
2012	$107,668,064	$431,963,008	967
2015	$215,336,128	$863,926,016	1,935

Source: IMPLAN

ESSAR STEEL MINNESOTA LLC, VALUE ADDED IMPACTS FROM OPERATIONS, ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN, 2012 AND 2015

Years	*Direct*	*Indirect*	*Induced*	*Total*
Itasca County:				
2012	$45,753,984	$35,934,336	$12,557,824	$94,246,144
2015	$91,507,968	$71,868,672	$25,115,648	$188,492,288
Itasca and St. Louis Counties:				
2012	$42,353,408	$49,268,608	$16,046,048	$107,668,064
2015	$84,706,816	$98,537,216	$32,092,096	$215,336,128

Source: IMPLAN

ESSAR STEEL MINNESOTA LLC, OUTPUT IMPACTS FROM OPERATIONS, ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN, 2012 AND 2015

Years	*Direct*	*Indirect*	*Induced*	*Total*
Itasca County:				
2012	$313,091,072	$59,773,184	$21,086,336	$393,950,592
2015	$626,182,144	$119,546,368	$42,172,672	$787,901,184
Itasca and St. Louis Counties:				
2012	$313,138,176	$91,209,472	$27,615,360	$431,963,008
2015	$626,276,352	$182,418,944	$55,230,720	$863,926,016

Source: IMPLAN

ESSAR STEEL MINNESOTA LLC, EMPLOYMENT IMPACTS FROM OPERATIONS, ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN, 2012 AND 2015

Years	*Direct*	*Indirect*	*Induced*	*Total*
Itasca County:				
2012	250	374	220	844
2015	500	747	440	1,687
Itasca and St. Louis Counties:				
2012	250	458	259	967
2015	500	916	518	1,934

Source: IMPLAN

Tax Impacts

ESSAR STEEL MINNESOTA LLC, OPERATIONS TAX IMPACTS, ITASCA, AND ITASCA AND ST. LOUIS COUNTIES, MN, 2012, 2015

	Source: IMPLAN	*Employee Compensation*	*Proprietor Income*	*Indirect Business Taxes*	*Households*	*Corporations*
OPERATIONS						
Itasca:						
2012	Federal Gov. Non-Defense	$5,722,603	$635,386	$929,967	$2,229,401	$1,562,807
	State/Local Non-Education	$193,452	$0	$6,537,032	$1,276,403	$1,060,321
Peak year 2015	Federal Gov. Non-Defense	$11,445,210	$1,270,772	$1,859,934	$4,458,803	$3,125,613
	State/Local Non-Education	$386,903	$0	$13,074,060	$2,552,806	$2,120,643
	Federal Sub-Total	$17,167,813	$1,906,158	$2,789,901	$6,688,204	$4,688,420
	State/Local Sub-Total	$580,355	$0	$19,611,092	$3,829,209	$3,180,964
	Grand Total	$17,748,168	$1,906,158	$22,400,993	$10,517,413	$7,869,384
Itasca and St. Louis:						
2012	Federal Gov. Non-Defense	$6,632,411	$327,255	$1,247,360	$2,467,692	$1,855,151
	State/Local Non-Education	$192,918	$0	$7,566,350	$1,371,971	$1,258,669
Peak year 2015	Federal Gov. Non-Defense	$13,264,820	$654,509	$2,494,720	$4,935,385	$3,710,301
	State/Local Non-Education	$385,836	$0	$15,132,700	$2,743,941	$2,517,338
	Federal Sub-Total	$19,897,231	$981,764	$3,742,080	$7,403,077	$5,565,452
	State/Local Sub-Total	$578,754	$0	$22,699,050	$4,115,912	$3,776,007
	Grand Total	$20,475,985	$981,764	$26,441,130	$11,518,989	$9,341,459

Mesaba One Energy Power Generation Plant

In September 2006, BBER studied and reported an update on a previous report on the economic impact of the Mesaba Energy project on the State of Minnesota and on the Arrowhead Region. Although the construction and operations schedules projected at that time have been delayed, when Excelsior Energy was recently contacted, Excelsior indicated that their plans for Mesaba Energy One have not changed, that their EIS was approved March 2010, and that they are pursuing other permits. The following construction and operations impacts were reported previously by the BBER.

TABLE 23. SUMMARY: ARROWHEAD CONSTRUCTION IMPACTS, MESABA ONE, 2008–2011 (2005 DOLLARS)

Years	*Value Added Totals $*	*Employment Totals*	*Output Totals $*
2008	$135,141,055	1,746	$477,749,810
2009	$276,740,596	3,521	$915,863,165
2010	$149,304,573	1,873	$464,076,598
2011	$25,977,172	344	$102,039,831
Total	$587,163,396	N/A	$1,959,729,404

TABLE 24. SUMMARY: ARROWHEAD OPERATIONS IMPACTS, MESABA ONE, 2011, 2012 AND TYPICAL YEAR(2005 DOLLARS)

Years	*Value Added Totals $*	*Employment Totals*	*Output Totals $*
2011	$84,749,275	65	$122,379,672
2012	$257,723,155	185	$372,157,528
Typical	$370,182,128	250	$534,550,504

Cumulative Impacts by Year

The economic impact of reasonably foreseeable projects is listed below. It includes BBER's assumptions about the timeline for accomplishment of the phases of projects. Year-by-year reporting of impacts from the activities of those projects on St. Louis County is also included.

These timelines include completed and projected project phases. However, changes and delays to BBER's initial information have been noted. To our best knowledge, the cumulative construction phases and operation phases for proposed projects are below.

Note - Because impact results listed in the two cumulative tables are derived from IMPLAN models run at different times for different impact studies, deflators for inflation have changed for various results, and therefore the results should not be considered strictly comparable. Deflators for these models range from 2004 dollars to 2010 dollars.

FIGURE 3. TIMELINE FOR CUMULATIVE CONSTRUCTION IMPACTS, 2006 TO 2015

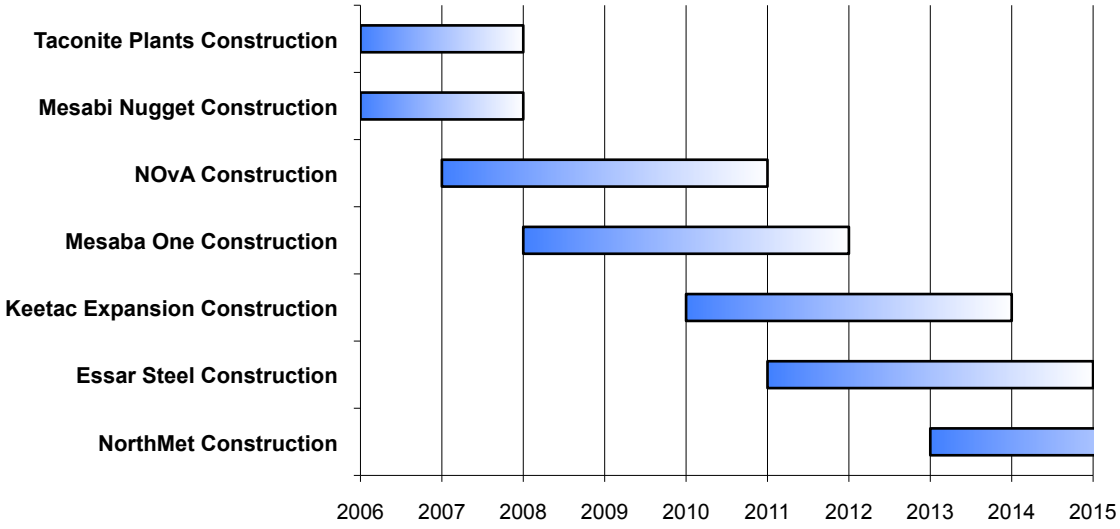
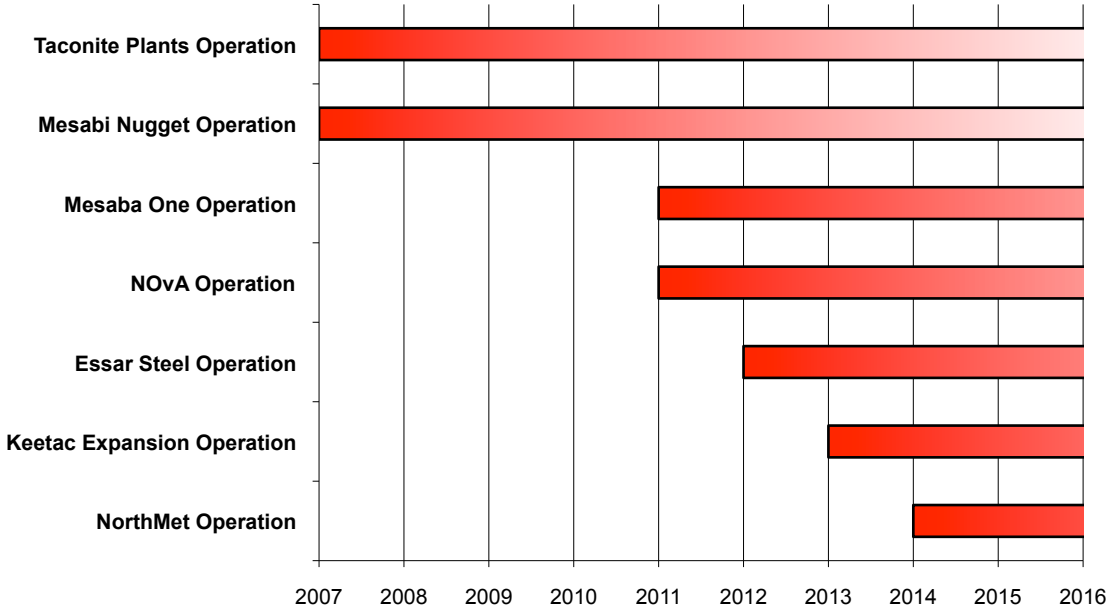


FIGURE 4. TIMELINE FOR CUMULATIVE OPERATIONS IMPACTS, 2007 TO 2016



Assumptions for combining cumulative impacts by year include:

1. We assume that the previous BBER Keetac expansion plant impact study, as configured for the Arrowhead Region, and expressed in 2007 dollars, remains a useful estimation of total impact, although it does not compare directly with the 2010 dollars and St. Louis region of the NorthMet impact estimated for the present study.
2. We also note that the Keetac construction and operations were delayed several years from the (2005) estimated start dates. Therefore, in the following table, we use impact results from the previous BBER study to adjust the total impact of the Expansion Plants by year, subtracting the Keetac impact for years 2006 through 2009, and adding Keetac impact numbers to years 2010 through 2013. The adjustment (subtraction) is an estimate using the ratio of the employment in the expansion sector with Keetac (926) vs. employment without Keetac (622). This ratio is used for both construction and operations.
3. The Expansion Plants impact estimates in these tables include previous results from BBER's 2006 impact study for Mintac, [Keewatin,] Minorca, United Taconite, North Shore Mining, and Hibbing Taconite.
4. For the Essar impact, Itasca County is used as a single-county proxy for St. Louis County, using impact estimates from BBER's previous impact study for Essar, done in 2009.
5. Mesaba One is included in these tables but Mesaba Two has been dropped from development and therefore does not appear in the tables.

TABLE 25. CUMULATIVE IMPACTS FROM CONSTRUCTION, BY YEAR, BY PROJECT, BY MEASURE

Year	*Project Phase*	*Project*	*Value Added*	*Employment*	*Output*	*Deflator*
2006	Construction	Mesabi Nugget	$14,043,872	299	$26,065,250	(in 2004 $)
	Construction	Expansion Plants w/o Keetac*	$29,184,448	622	$54,165,967	(in 2004 $)
		TOTAL	$43,228,320	921	$80,231,217	(in 2004 $)
2007	Construction	Mesabi Nugget	$14,043,872	299	$26,065,250	(in 2004 $)
		NOvA	$17,554,842	374	$32,581,562	(in 2004 $)
	Construction	Expansion Plants w/o Keetac*	$14,150,036	302	$26,262,288	(in 2004 $)
		TOTAL	$45,748,750	975	$84,909,100	(in 2004 $)
2008	Construction	NOvA	$17,554,842	374	$32,581,562	(in 2004 $)
	Construction	Mesaba One	$135,141,055	1,746	$477,749,810	(in 2005 $)
		TOTAL	$152,695,897	2,120	$510,331,372	(various $)
2009	Installation	NOvA	$5,935,709	128	$10,738,907	(in 2005 $)
	Construction	Mesaba One	$276,740,596	3,521	$915,863,165	(in 2004 $)
		TOTAL	$282,676,305	3,649	$926,602,072	(various $)
2010	Installation	NOvA	$5,935,709	128	$10,738,907	(in 2004 $)
	Construction	Mesaba One	$149,304,573	1,873	$464,076,598	(in 2005 $)
	Construction	Keetac Expansion	$67,841,741	304	$147,038,094	(in 2007 $)
		TOTAL	$223,082,023	2,305	$621,853,599	(various $)
2011	Construction	Keetac Expansion	$95,166,731	456	$206,261,435	(in 2007 $)
	Construction	Mesaba One	$25,977,172	344	$102,039,831	(in 2005 $)
	Construction	Essar Steel	$216,523,392	2,896	$529,350,784	(in 2010 $)
		TOTAL	$337,667,295	3,696	$837,652,050	(various $)
2012	Construction	Keetac Expansion	$91,779,532	456	$198,920,126	(in 2007 $)
	Construction	Essar Steel	$216,523,392	2,896	$529,350,784	(in 2010 $)
		TOTAL	$308,302,924	3,352	$728,270,910	(various $)
2013	Construction Phase I (50%)	NorthMet	$123,266,179	416	$244,271,950	(in 2010 $)
	Construction	Essar Steel	$216,523,392	1,448	$529,350,784	(in 2010 $)
	Construction	Keetac Expansion	$149,365,567	760	$323,730,313	(in 2007 $)
		TOTAL	$489,155,138	2,624	$1,097,353,047	(various $)
2014	Construction Phase I (50%)	NorthMet	$123,266,179	416	$244,271,950	(in 2010 $)
	Construction	Essar Steel	$162,392,512	1,738	$397,012,352	(in 2010 $)
		TOTAL	$285,658,691	2,154	$641,284,302	(in 2010 $)
2015	Construction Phase II	NorthMet	$129,587,522	439	$256,798,718	(in 2010 $)
	Construction	Essar Steel	$162,392,512	1,738	$397,012,352	(in 2010 $)
		TOTAL	$291,980,034	2,177	$653,811,070	(in 2010 $)

Source: IMPLAN, BBER

*This Expansion Plants impact includes estimates from BBER's 2006 impact study for Mintac, [Keewatin,] Minorca, United Taconite, North Shore Mining, and Hibbing Taconite. Keewatin has been factored out and the Keetac expansion is listed separately.

TABLE 26. CUMULATIVE IMPACTS FROM OPERATIONS, BY YEAR, BY PROJECT, BY MEASURE

Year	Project Phase	Project	Value Added	Employment	Output	Deflator
2007	Start Up	Expansion Plants w/o Keetac*	$9,381,342	119	$24,646,333	(in 2004 $)
	Operation	Mesabi Nugget	$6,225,292	83	$18,912,225	(in 2004 $)
		TOTAL	$15,606,634	202	$43,558,558	(in 2004 $)
2008	Operation	Expansion Plants w/o Keetac*	$21,889,795	159	$57,508,108	(in 2004 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
		TOTAL	$59,241,544	317	$170,981,459	(in 2004 $)
2009	Operation	Expansion Plants w/o Keetac*	$21,889,795	159	$57,508,108	(in 2004 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
		TOTAL	$59,241,544	317	$170,981,459	(in 2004 $)
2010	Operation	Expansion Plants w/o Keetac*	$32,588,345	236	$85,614,965	(in 2004 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
		TOTAL	$69,940,094	394	$199,088,316	(in 2004 $)
2011	Operation	Expansion Plants w/o Keetac*	$21,889,795	159	$57,508,108	(in 2004 $)
	Operation	Mesaba One	$84,749,275	65	$122,379,672	(in 2005 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
	Operation	NOvA	$960,452	12	$1,704,151	(in 2004 $)
		TOTAL	$144,951,271	394	$295,065,282	(various $)
2012	Operation	Essar Steel	$94,246,144	844	$393,950,592	(in 2010 $)
	Operation	Mesaba One	$257,723,155	185	$372,157,528	(in 2005 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
	Operation	NOvA	$960,452	12	$1,704,151	(in 2004 $)
		TOTAL	$390,281,500	1,199	$881,285,622	(various $)
2013	Start Up	Essar Steel	$94,246,144	844	$393,950,592	(in 2010 $)
	Operation	Expansion Plants w/o Keetac*	$21,889,795	159	$57,508,108	(in 2004 $)
	Operation	Keetac	$272,683,542	398	$570,489,496	(in 2007 $)
	Operation	Mesaba One	$370,182,128	250	$534,550,504	(in 2005 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
	Operation	NOvA	$960,452	12	$1,704,151	(in 2004 $)
		TOTAL	$797,313,810	1,821	$1,671,676,202	(various $)
2014	Operation	Essar Steel	$188,492,288	1,688	$787,901,184	(in 2010 $)
	Operation	Expansion Plants w/o Keetac*	$21,889,795	159	$57,508,108	(in 2004 $)
	Operation	Keetac	$272,683,542	398	$570,489,496	(in 2007 $)
	Operation	Mesaba One	$370,182,128	250	$534,550,504	(in 2005 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
	Start Up	NorthMet Startup 50%	$31,801,534	413	$49,655,516	(in 2010 $)
	Operation	NOvA	$960,452	12	$1,704,151	(in 2004 $)
		TOTAL	$923,361,488	3,078	$2,115,282,310	(various $)

2015	Operation	Essar Steel	$188,492,288	1,688	$787,901,184	(in 2010 $)
	Operation	Expansion Plants w/o Keetac*	$21,889,795	159	$57,508,108	(in 2004 $)
	Operation	Keetac	$272,683,542	398	$570,489,496	(in 2007 $)
	Operation	Mesaba One	$370,182,128	250	$534,550,504	(in 2005 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
	Start Up	NorthMet Startup 50%	$31,801,534	413	$49,655,516	(in 2010 $)
	Operation	NOvA	$960,452	12	$1,704,151	(in 2010 $)
		TOTAL	$923,361,488	3,078	$2,115,282,310	(various $)
2016	Operation	Essar Steel	$188,492,288	1,688	$787,901,184	(in 2010 $)
	Operation	Expansion Plants w/o Keetac*	$21,889,795	159	$57,508,108	(in 2004 $)
	Operation	Keetac	$272,683,542	398	$570,489,496	(in 2007 $)
	Operation	Mesaba One	$370,182,128	250	$534,550,504	(in 2005 $)
	Operation	Mesabi Nugget	$37,351,749	158	$113,473,351	(in 2004 $)
	Operation	NorthMet Typical Year	$329,728,765	991	$514,844,706	(in 2010 $)
	Operation	NOvA	$960,452	12	$1,704,151	(in 2004 $)
		TOTAL	$1,221,288,719	3,656	$2,580,471,500	(various $)

Source: IMPLAN, BBER

*This Expansion Plants impact includes estimates from BBER's 2006 impact study for Mintac, [Keewatin,] Minorca, United Taconite, North Shore Mining, and Hibbing Taconite. Keewatin has been factored out and the Keetac expansion is listed separately.

These tables show details of construction and operations by project and by individual years. As noted above, the start dates and inputs for modeling construction and operations have been subject to change. Also noted above, assumptions for listing these estimates and summing by year indicate caution when making comparisons.

Appendix C: Documentation of Peer Review of IMPLAN Model Version 3

IMPLAN Applied by state, academic, and private institutions in the U.S include the following examples:

Leonard, D. (2010). Estimating the impact of Unemployment Insurance benefit payments on Wyoming's economy. Wyoming Labor Force Trends 47(8).

Mulkey, D., & Hodges, A.W. (2009). Using IMPLAN to assess local economic impacts.

Hanagriff, R., Beverly, M. & Lau, M. (2009). Can a State Funded Rural Economic Development Program Positively Impact the State's Economy? A Case Study Application using 2007 Texas Department of Agriculture's Rural Tourism Economic Development Program, *The Business Review, Cambridge, 12 (2), 72-77.*

Hansen E, Collins A, Hendryx M, Boettner F, Hereford A. The Long-Term Economic Benefits of Wind Versus Mountaintop Removal Coal on Coal River Mountain, West Virginia. Downstream Strategies, Morgantown, WV, December 2008.

Rose, A. and O. Frias. 1994. "The Impact of Coal on the U.S. Economy," Report to the National Coal Association, Department of Mineral Economics, The Pennsylvania State University.

Specific use of The IMPLAN Model Applied by federal institutions in the U.S includes

U.S. Department of Agriculture Forestry Service and recent USDA the use of IMPLAN as their selected method for calculating job impacts for the American Recovery and Reinvestment Act (ARRA). Readers may be interested to note the following endorsement in a letter to IMPLAN: “The agencies in USDA have elected to use the concepts and techniques embodied in your firm's IMPLAN model. It is one of the most credible regional impact models used for regional economic impact analysis.” (at IMPLAN.com see USDA_ARRA_Letter_040909.pdf)

BBER's experience with the IMPLAN model includes the following selected recent IMPLAN studies from the UMD Labovitz School’s research bureau (at https://lsbe.d.umn.edu/bber/bber_ projects.php):

Modeled Prospective Regional Socio-Economic Impacts of the Back Forty Project, Menominee County, Michigan, Aquila Resources, Inc. 2010.

Economic Impact of Constructing Four Electric Power Lines in Minnesota, South Dakota, and Wisconsin, CapX2020, 2010.

Economic Impact of Minnesota's Forest Industries, MN DNR, 2010.

Essar Steel Minnesota LLC Economic Impact UPDATE: 2010.

Economic Impact of U.S. Steel’s Keetac Mine Expansion Project on the State of Minnesota and the Arrowhead Region, for Barr Engineering, 2009.

The Economic Impact of Ferrous and Non-Ferrous Mining on the State of Minnesota, and on the Arrowhead Region and Douglas County, WI.

The Economic Impact of Declines in Forestry-Related Industries in Minnesota, Wisconsin, and a Three-State Region, 2006.

The Economic Impact of Constructing and Operating an Integrated Gasification Combined-Cycle Power-Generation Facility on the Iron Range, 2006, Excelsior Energy.

The Economic Impact of Constructing and Operating Minnesota Steel Industries LLC in Itasca County, Minnesota, with Appendix Material on Itasca and St. Louis County Impacts, 2006, Itasca Development Corporation.

Appendix D: IMPLAN Data Sources

The 2009 St. Louis County data file used in this analysis is comprised of six main components. These are:

1. Employment
2. Value Added (Factors)
3. Output
4. Final (Institutional) Demand
5. Inter-Institutional Transfers
6. National Structural Matrices

All Value Added, Output, and Employment information are on an Industry basis.
Sub-components of Value Added are:

1. Employee Compensation
2. Proprietary Income
3. Other Property Type Income (OPTI)
4. Indirect Business Taxes (IBT)

Final Demand, referred to also as Institution Demand, consists of Households and Governments purchasing goods and services for consumption. Exports are also tracked in these calculations because they are removed from the Study Area by their purchase; thereby functioning as final consumption. Final Demand has 13 Institutional sub-components:

1. Household Personal Consumption Expenditures (PCE)
2. Federal Government Defense Purchases
3. Federal Government Non-Defense Purchases
4. Federal Government Non-Defense Investment
5. State and Local Government Non-Education Purchases
6. State and Local Government Education Purchases
7. State and Local Government Investment
8. Inventory Purchases
9. Capital
10. Foreign Exports
11. State and Local Government Sales
12. Federal Government Sales
13. Inventory Sales

All Institution demand in the original data is measured on a Commodity basis.

Associated with the geographic data files for each year of the data is the annual National Structural matrices file, including the following National I/O Matrices:

Use
Make
Absorption
By-Products
Market Shares
In addition to these National I/O matrices, IMPLAN data files include:
Margins
440 Sectoring Scheme
Deflators
Parameters for Econometric estimation of Trade Flows
Trade Flow Data Files, which include estimates of all Commodity flows between counties and states, from our double constrained gravity model.

IMPLAN provides hundreds of glossary notes on these data sources, which include many notes on sourcing, dates, adjustments and uses of these data as well as further explanations. For more detail on these data please see "Components Included in IMPLAN Data Files" at IMPLAN.COM.

The IMPLAN users' forum recently posted a request for peer reviewed sources which discuss the accuracy of IMPLAN employment calculations. IMPLAN responded, "A lot of confusion and concern arises when users compare IMPLAN employment figures to the BLS' CEW (also known as ES-202) employment figures. BLS CEW data is not complete coverage of employment. It only covers wage and salary employment covered by UI and federal civilian jobs covered by UCFE. It does not include proprietors, military, elected officials, railroads, religious organizations, small farms, and some private elementary school employment. At IMPLAN, we control to BEA REA datasets and ultimately to the BEA's U.S. NIPA employment, since these data sets attempt to capture all employment. This webpage contains links to number of articles describing our process for developing employment data: implan.com/v4/index.php?option=com_multi...ntdata&Itemid=10. We're not aware of any studies designed specifically to analyze the accuracy of IMPLAN data - please let us know if you come across one. Thanks!"

Note also the update of IMPLAN's equations as described in "Updating and Enhancing IMPLAN's Econometric Regional Purchase Coefficients," by Jennifer Thorvaldson, Doug Olson, and Greg Alward of MIG, Inc. The abstract summarizes MIG's updating of the social accounts matrix as follows:

> Determining commodity import and export flows are fundamentally important to deriving regional social accounting matrices. Regional purchase coefficients (RPCs) describe the proportion of each dollar of local demand for a given commodity is purchased from local producers. In IMPLAN, RPCs are estimated using econometric methods or a gravity model. The econometric model currently used in IMPLAN was estimated in 1988 using 1977 data for 51 regions and 84 commodities. The availability of more recent data and additional data not previously available allow for updated and improved econometric equations (and resulting RPC estimates). A new set of econometric equations has been estimated using 2009 data

for 3,142 regions and 425 commodities and an enhanced econometric equation. This paper describes the process and results. (At http://www.mcrsa.org/conferenceproceedingspresentations.)