



ECONOMIC IMPACT TOOL

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DISCLAIMER

The findings of this report are not to be construed as an official Department of the Army position, policy, or decision unless so designated by other official documentation. Comments or suggestions should be addressed to:

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Executive Summary

The Department of Defense (DoD) has conducted several rounds of Base Realignment and Closures (BRAC) with the last round conducted in 2005. Since then the US Army has reduced its force size which has created excess infrastructure capacity on many Army installations. Due to budget constraints, DoD has asked Congress to authorize another round of BRAC. During a BRAC round, DoD must consider all of Congress' BRAC criterion which includes the economic impact of a realignment or closure action on the surrounding local community. The Army also takes into account the economic impact for any day-to-day stationing actions that occur outside of a BRAC.

The Center for Army Analysis (CAA) gained extensive experience with stationing analyses from participating in the analysis of prior BRAC rounds. CAA also participated in the analysis in the recent European Infrastructure Consolidation (EIC) effort. CAA developed tools that were used for stationing analysis during BRAC 2005 and modified them for use in EIC. CAA recognizes that its stationing tools must be revised to meet today's challenges and is conducting a focused multi-year effort to do so. As a part of this effort, CAA initiated a project with the George Mason University's Systems Engineering and Operations Research department to develop an Economic Impact Tool (EIT) to determine the economic impact of future stationing actions on surrounding communities.

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1 INTRODUCTION

1.1 Problem Statement

The purpose of this project was to develop an Economic Impact Tool (EIT) that will capture the impact of realigning or closing Army installations on the surrounding communities. Within this paper, the project team will describe an economic impact analysis methodology that can be used to estimate the economic impact of stationing actions on the communities surrounding affected installations. The project team considered factors to estimate this impact and accounted for differences due to the location of the installations.

1.2 Stationing Background

CAA started to reinvigorate their stationing analysis capability to answer tactical stationing decisions while preparing for a possible future Base Realignment and Closure (BRAC) round. During BRAC 2005, the Department of Defense (DoD) used a model to estimate the economic impact of stationing actions on surrounding communities. DoD's method accounted for the employment and population changes to a community as a result of a stationing scenario. This tool utilized commercially-owned software to determine the economic impact of a stationing decision on the local community. Under the current fiscally constrained environment, this may not remain an acceptable methodology. Additionally DoD could improve the methodology to provide more information when assessing the economic impact to a community. Since BRAC 2005, DoD has not updated the tool; as a result, CAA initiated a project with the George Mason University's Systems Engineering and Operations Research department to develop an updated EIT that captured the impact of realigning or closing DoD installations on the communities surrounding the installations for use in future stationing decisions. The project team accounted for differences across Army Installations, considered multiple attributes of economic impact, utilized authoritative databases, and included a documented and verified methodology for the update of the EIT.

1.3 Objectives

This project had five objectives:

1. Conduct a literature review to review previous and current economic impact tools.
2. Designate the economic impact factors that will be used to determine the economic impact of a stationing action.
3. Discover authoritative databases containing data relevant to economic impact factors.
4. Determine relationships between economic impact factors and installation population.
5. Develop a tool that will predict the economic impact of stationing actions on the surrounding community using the designated factors.

1.4 Project Scope

The project team covered all major US Army Installations in the Continental United States (CONUS) plus Alaska and Hawaii for this analysis and the tool. The project team utilized the latest data available from the authoritative databases and considered multiple factors for economic impact to include all major industry employment including government and military employment as well as mean income by region, which was normalized for cost of living differences. In addition to providing the economic impact of a stationing scenario, the team developed the tool to display for the scenario the population changes by region and installation and the main function of the installations involved.

1.5 Assumptions

The project team made several assumptions to complete this analysis and develop the EIT:

- Data sources would be available for future use should the data need to be updated.
- Active duty military population on an installation would be the military employment for that installation.
- Reserve and National Guard are not part of the military employment because they are employed in other industries (Active Guard Reserve numbers are included in active duty numbers).
- The Navy and Air Force active duty personnel assigned to Army installations are small enough that they would not affect the total military employment on the installation (does not apply to joint installations). The team verified this assumption by looking at the Navy population on Army installations which were in fact relatively small.
- The location quotient (LQ) technique utilized in the EIT overestimates employment change, which is assumed appropriate since it would provide an upper bound on the economic impact.
- The LQ technique requires the assumption that local residents have the same demand patterns for goods and services as those at the national level.

1.6 Limitations

The major limitation of this study was the availability of the required data. Since this tool required extensive data collection, the team did not include certain aspects, and made some assumptions as a result. The limitations are listed below:

- The National Guard and Reserve component provides economic value into regions. Since they were counted in other industries (their regular jobs), the team did not include their numbers into the military industry. And since the region that the National Guard and Reserves are accounted for in may not be the same region as the reserve installation, the team considered this as a limiting factor for the tool.
- U.S. Coast Guard active duty numbers were not collected and not included in the military industry.
- The project team did not account for the other services' military population on Army installations. The team assumed this number to be small enough to not have a large impact, however including this data would have increased accuracy of the tool.

- Since the dates of the data collected were not consistent and some data sources were several years old, the team considered this as another limitation to the updated tool. The team would have preferred to have current data for the tool.
- Since the LQ technique is sensitive to fast growing and declining areas which may produce larger multipliers, the team also noted this limitation of the updated tool.

1.7 Literature Review and Findings

For the first objective of this study, the team conducted a literature review. Extensive literature exists on the impact a local economy experiences when a base faces reductions due to a realignment or closure and how these impacts may be measured. The team reviewed the BRAC 2005 Economic Impact Joint Process Action Team (JPAT) report that describes the EIT developed for use in BRAC 2005 and the Construction Engineering Research Laboratories Economic Impact Forecast System tool to understand how to possibly replicate prior validated methodologies. Through the review of these economic impact tools, the team discovered the economic base analysis methodology. The team conducted further research on economic base analysis, which is a methodology used to forecast the indirect employment change to a region as a result of population change in that area. The team reviewed several papers on the economic base analysis and the LQ. Economic base analysis uses the LQ as a technique to determine which industries in a region are considered basic. Basic industries bring additional employment and revenue into their region. By using basic industries, one can calculate a basic multiplier to forecast total employment change in a region.

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2 METHODOLOGY

2.1 Data Collection and Processing

The team input data into the tool for 79 major Army installations. The team mapped each installation to the closest metropolitan statistical area, as defined by the Office of Management and Budget. The team designated this area as the installation's region. The list of the Army installations and their regions can be found in Appendix B.

The team collected the following data for the tool:

- The active duty military population for all installations in CONUS plus Alaska and Hawaii for all the military services except for the US Coast Guard, but the team did include a placeholder for the data to be collected and input at a later date.
- The civilian and contractor population data for all Army installations.
- Employment data by industry and real personal income data by major region in the U.S.

For the tool, the team accounted for all of the 53 Navy, 68 Air Force, 20 Marine Corps installations that were in regions with an Army installation and mapped all the military installations to a region. The team mapped the employment data and real personal income for all 381 major regions to the Army installation regions to account for all employment and income in the regions. Figure D-4 contains specific information on each data source, including the date of the data.

2.2 Economic Base Analysis

One can use economic base analysis as a method to identify the major current sources of income and employment in a region, and then can use this to anticipate the changes in a region's economy. Significant population changes to a region such as a BRAC or major stationing action will not only affect the economy of that region due to the direct jobs gained or lost, but the changes will also result in indirect job changes. The team used the economic base analysis as a method to forecast this indirect job change. To determine the indirect job change as a result of a population change at an installation, there must be a relationship between population and employment. Economic base analysis represents this relationship as a multiplier. The team used the LQ technique to determine an employment multiplier for each region to account for differences in each region's economy. This technique assumes that any industry can be either basic or non-basic depending on its relative concentration in a region compared to the nation. A basic industry is an industry whose goods and services are exported, bringing money into their respective communities. A non-basic industry provides services for people and businesses located within the community and does not generate money from outside sources. The team calculated the LQ for each industry in each region in the US. One derives the LQ number by comparing the percentage of employment in an industry and region with the percentage of employment nationwide. If an industry's LQ is greater than one, then the industry is designated as basic in the region for which it was calculated. Conversely, if it is less than one it is designated as non-basic. If the employment in a basic industry changes, this change will cause

indirect job changes in the non-basic industries. The multiplier drives the magnitude of this indirect job change. One calculates the multiplier by dividing the total employment in a region by the sum of the employment for all the basic industries in the same region. Therefore, the multiplier will always be greater than one. The multiplier accounts for both the indirect and direct job changes as a result of employment changes to an industry. The total job change is the direct job change times the multiplier.

2.3 Income Analysis

By using a possible stationing scenario as the input, the tool calculates the subsequent income changes that would also occur as a result of the stationing action. The magnitude of employment change is far greater in some regions vice others due to other economic factors, and this additional analysis provides further context into the actual impact on affected local communities. The team calculated the income change based on the mean real personal income for each region. The tool multiplies the employment change by the mean real personal income for the region impacted in order to produce the region's income change due to the stationing action.

2.4 Uncertainty

The BRAC 2005 tool provided employment change results as a point estimate. The EIT will provide both a point estimate and a range by incorporating uncertainty into the results. This addition is a major improvement from the BRAC 2005 tool. The Bureau of Labor Statistics (BLS) employment source data has a 90 percent confidence level, which the team used to create a range on both employment and income changes. The tool will calculate the upper and lower bound for each scenario and show it in the output report. This interval allows the user to have increased knowledge and confidence that the true economic impact lies somewhere in the generated range.

3 ECONOMIC IMPACT TOOL

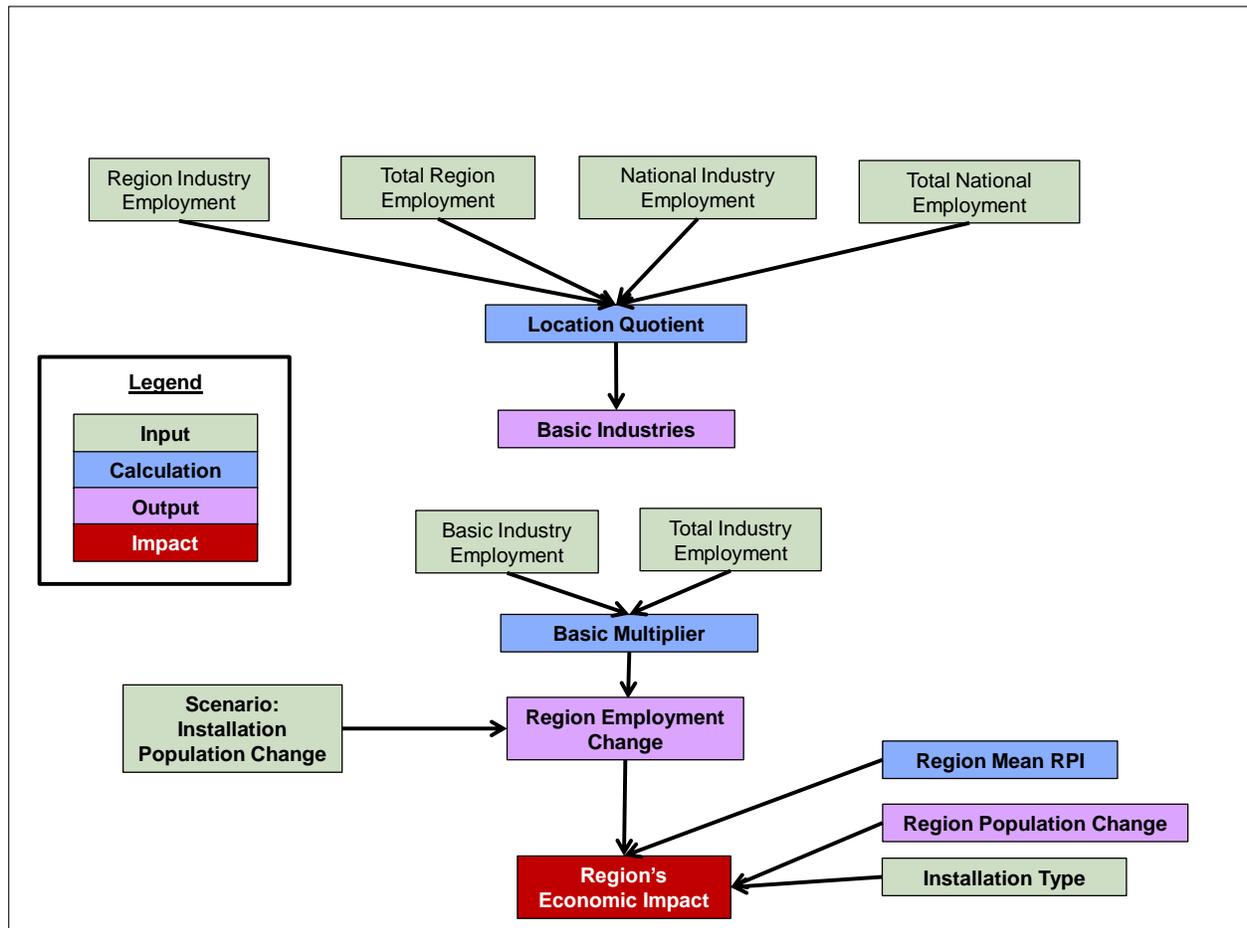


Figure 1. Economic Impact Tool

Figure 1 above describes the EIT components. The EIT uses the collected employment, population and income data, maps the installations and data to their respective regions and performs all of the necessary calculations to produce the outputs. The team calculated the LQ for each region and industry, and used the results to calculate a multiplier for each region. When one runs a scenario through the tool, the EIT displays the results by installation and by region. In the installation section, the EIT displays the installation type, population change, and percent of total population. In the region section, the EIT calculates and displays the population change, percent population change, employment change, percent employment change, income change, and percent income change. EIT results also include an interval for the indirect employment and income changes. The EIT produces this output which is the economic impact for each region affected by a given stationing scenario.

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4 VERIFICATION AND VALIDATION

Validation of the EIT was a critical step in the tool development process. The team evaluated how the EIT results compared to those generated during BRAC 2005. The BRAC 2005 JPAT Report contains 179 scenarios and the associated indirect job loss projections. Each scenario listed the installation or location affected, number of military personnel moving to or from that location, and the net mission contractor job change. The team mapped each of the BRAC 2005 scenario locations to an EIT region. Using the direct and indirect job changes listed for each BRAC 2005 scenario, the team calculated the multiplier for each region that was used and then compared that to the multipliers generated by the EIT. The sets of multipliers have similar means, standard deviations, medians, and ranges.

The team then used the BRAC 2005 scenario inputs and ran them through the EIT which generated the results for each scenario. The team calculated the difference between the indirect job changes found by the EIT and by the BRAC 2005 tool for all 179 data pairs. The team used a large sample approximation of the Signed Rank Test as a hypothesis test on these differences, because it is robust to non-normality and outliers. The null hypothesis is the median of the difference is zero, i.e. the median for the EIT indirect job changes and for the BRAC 2005 indirect job changes are the same. The alternative is that they are not the same, a two-tail test. Also, the team utilized the large sample approximation, as there were a large number of data pairs. The team determined the absolute value of the difference, and then ranked the new values in ascending order. Next, the team summed the ranks for all positive differences (before the absolute value function was used) to find the Signed Rank test statistic. Finally, the team calculated the Z test statistic based on Signed Rank test statistic, n' (the number of differences that are not equal to zero), and V . V is a value based on n' , the number of ties, and the number of values in each tie. The team found that the Z test statistic was approximately 0.25, which is less than 1.96 ($Z_{\alpha/2}$). Therefore, we cannot reject the null hypothesis. Additionally, the team calculated the p-value which was 0.5987, which is not less than $\alpha = 0.05$. This result further supports that we cannot reject the null hypothesis. Thus, the EIT indirect job change median cannot be said to be different from the BRAC 2005 indirect job change median. Therefore, since the two sets of multipliers and results are similar, the team concluded that the EIT and results were valid. Figure 2 below summarizes the results of the analysis.

	Multiplier		Indirect Job Change	
	BRAC05 Tool	EIT	BRAC05 Tool	EIT
Mean	1.69	1.95	-76	16
Std Dev	0.338	0.642	1,693	1,627
Median	1.70	1.79	-8	-21
P-Value	-		0.60	

Figure 2. Validation Analysis Results.

APPENDIX A KEY ACRONYMS AND DEFINITIONS

- **BEA** – Bureau of Economic Analysis
- **BLS** – Bureau of Labor Statistics
- **BRAC** – Base Realignment and Closure
- **CONUS** – Continental United States
- **DoD** – Department of Defense
- **EIFS** – Economic Impact Forecast System
- **EIT** – Economic Impact Tool
- **LQ** – Location Quotient
- **RPI** – Real Personal Income
- **Basic Industry**: an industry whose goods and services are exported bringing money into their respective communities
- **Direct Job Change**: number of authorizations for DoD military personnel, military trainees, civilian employees to be gained, eliminated, or relocated as a result of stationing actions
- **Economic Base Analysis**: a methodology to determine the impact of a specified industry on all other industries in a given region
- **Indirect Job Change**: jobs in a region gained or lost as a result of the direct job change
- **Location Quotient**: a number derived by comparing the percentage of employment in an industry and region with the percentage of employment nationwide
- **Non-basic Industry**: provides services for people and businesses located within the community; does not generate money from outside sources
- **Price Parity**: regional price levels expressed as a percentage of the overall national price level for a given year
- **Real Personal Income**: current-dollar personal income divided by the price parity for a given year and region
- **Stationing Scenario**: the movement of some portion of the active duty, civilian, or contractors assigned from one installation to another

Figure A-1. Key Acronyms and Definitions.

APPENDIX B INSTALLATION LIST

Installation Name	Region	Installation Name	Region
Altus AFB	Lawton	Lackland AFB (part of JB San Antonio)	San Antonio-New Braunfels
Arnold AFB	Chattanooga	Laughlin AFB	San Antonio-New Braunfels
Barksdale AFB	Shreveport-Bossier City	Little Rock AFB	Little Rock-North Little Rock-Conway
Beale AFB	Yuba City	Los Angeles AFB	Los Angeles-Long Beach-Santa Ana
Buckley AFB	Denver-Aurora-Broomfield	Luke AFB	Phoenix-Mesa-Glendale
Cannon AFB	Lubbock	MacDill AFB	Tampa-St. Petersburg-Clearwater
Cape Canaveral AFS	Palm Bay-Melbourne-Titusville	Malmstrom AFB	Great Falls
Cape Cod AFS	Manchester	Maxwell AFB	Montgomery
Charleston AFB (part of JB C/NAS)	Charleston-North Charleston-Summerville	McChord AFB (JB Army)	Seattle-Tacoma-Bellevue
Cheyenne Mountain AFS	Colorado Springs	McConnell AFB	Wichita
Clear AFS	Fairbanks	McGuire AFB (part of JB MDL)	Philadelphia-Camden-Wilmington
Columbus AFB	Jackson-MS	Minot AFB	Bismarck
Creech AFB	Las Vegas-Paradise	Moody AFB	Valdosta
Davis Monthan AFB	Tucson	Mountain Home AFB	Boise City-Nampa
Dover AFB	Dover	Nellis AFB	Las Vegas-Paradise
Dyess AFB	Abilene	New Boston AFS	Manchester
Edwards AFB	Bakersfield-Delano	Offutt AFB	Omaha-Council Bluffs
Eglin AFB Main Base	Crestview-Fort Walton Beach-Destin	Patrick AFB	Palm Bay-Melbourne-Titusville
Eielson AFB	Fairbanks	Peterson AFB	Colorado Springs
Ellsworth AFB	Rapid City	Randolph AFB (part of JB San Antonio)	San Antonio-New Braunfels
Elmendorf AFB (part of JBER)	Anchorage	Robins AFB	Warner Robins
Fairchild AFB	Spokane	Schriever AFB	Colorado Springs
FE Warren AFB	Cheyenne	Scott AFB	St. Louis
Goodfellow AFB	San Angelo	Seymour-Johnson AFB	Goldsboro
Grand Forks AFB	Grand Forks	Shaw AFB	Sumter
Hanscom AFB	Boston-Cambridge-Quincy	Sheppard AFB	Wichita Falls
Hickam (JB Navy)	Honolulu	Tinker AFB	Oklahoma City
Hill AFB	Ogden-Clearfield	Tyndall AFB	Panama City-Lynn Haven-Panama City Beach
Holloman AFB	Las Cruces	USAF Academy	Colorado Springs
Hurlburt Field	Crestview-Fort Walton Beach-Destin	Vance AFB	Oklahoma City
Joint Base (JB) Langley/Eustis AFB	Virginia Beach-Norfolk-Newport News	Vandenberg AFB	Santa Barbara-Santa Maria-Goleta
Joint Base Andrews	Washington-Arlington-Alexandria	Whiteman AFB	Kansas City
Keesler AFB	Gulfport-Biloxi	Wright-Patterson AFB	Dayton

Figure B-1. Air Force Installations.

Installation Name	Region	Installation Name	Region
Aberdeen Proving Ground	Baltimore-Towson	Fort Wainwright	Fairbanks
Adelphi Laboratory	Washington-Arlington-Alexandria	Hawthorne AAP	Carson City
Anniston AD	Anniston-Oxford	Holston AAP	Kingsport-Bristol-Bristol
Bluegrass AD	Lexington-Fayette	Iowa Army Ammunition Plant	Iowa City
Carlisle Barracks	Harrisburg-Carlisle	JAG	Charlottesville
Corpus Christi NAS	Corpus Christi	Joint base Elmendorf-Richardson	Anchorage
Crane AAP	Bloomington	Joint base Langley-Eustis	Virginia Beach-Norfolk-Newport News
Detroit Arsenal	Detroit-Warren-Livonia	Joint base Lewis-McChord	Seattle-Tacoma-Bellevue
Dugway Proving Ground	Salt Lake City	Joint base Myer-Henderson	Washington-Arlington-Alexandria
Fort A. P. Hill	Richmond	Joint Lima Army Tank Center	Lima
Fort Belvoir	Washington-Arlington-Alexandria	Lake City Army Ammunition Plant	Kansas City
Fort Benning	Columbus-GA	Letterkenny AD	Harrisburg-Carlisle
Fort Bliss	El Paso	Longhorn AAP	Shreveport-Bossier City
Fort Bragg	Fayetteville	McAlester AAP	Tulsa
Fort Campbell	Clarksville	Military Ocean Terminal Concord	San Francisco-Oakland-Fremont
Fort Carson	Colorado Springs	Military Ocean Terminal Sunny Point	Myrtle Beach-North Myrtle Beach-Conway
Fort Detrick	Washington-Arlington-Alexandria	NTC and Fort Irwin	Riverside-San Bernardino-Ontario
Fort Drum	Utica-Rome	Picatinny Arsenal	Trenton-Ewing
Fort Gordon	Augusta-Richmond County	Pine Bluff Arsenal	Pine Bluff
Fort Greely	Fairbanks	Presidio of Monterey	Salinas
Fort Hamilton	New York-Northern New Jersey-Long Island	Pueblo Army Depot	Pueblo
Fort Hood	Killeen-Temple-Fort Hood	Radford Army Ammunition Plant	Blacksburg-Christiansburg-Radford
Fort Huachuca	Tucson	Red River AD	Shreveport-Bossier City
Fort Jackson	Columbia-SC	Redstone Arsenal	Huntsville
Fort Knox	Elizabethtown	Rock Island Arsenal	Davenport-Moline-Rock Island
Fort Leavenworth	Kansas City	Schofield Barracks	Honolulu
Fort Lee	Richmond	Scranton Army Ammunition Plant	Scranton--Wilkes-Barre
Fort Leonard Wood	Jefferson City	Sierra Army Depot	Reno-Sparks
Fort McNair	Washington-Arlington-Alexandria	Soldiers System Center Natick	Boston-Cambridge-Quincy
Fort Meade	Baltimore-Towson	Tobyhanna Army Depot	Scranton--Wilkes-Barre
Fort Polk	Alexandria	Tooele AD	Salt Lake City
Fort Riley	Manhattan	Tripler Army Medical Center	Honolulu
Fort Rucker	Dothan	United States Military Academy	New York-Northern New Jersey-Long Island
Fort Sam Houston	San Antonio-New Braunfels	Walter Reed Army Medical Center	Washington-Arlington-Alexandria
Fort Shafter	Honolulu	Watervliet Arsenal	Albany-Schenectady-Troy
Fort Sill	Lawton	White Sands Missile Complex	Las Cruces
Fort Stewart	Hinesville-Fort Stewart	Yuma Proving Ground	Yuma

Figure B-2. Army Installations.

Installation Name	Region
MCLB Albany GA	Albany
MCB Camp Allen VA	Virginia Beach-Norfolk-Newport News
MCLB Barstow CA	Riverside-San Bernardino-Ontario
MCAS Beaufort SC	Charleston-North Charleston-Summerville
Blount Island FL	Jacksonville-FL
MWTC Bridgeport CA	Carson City
MCB Lejeune NC	Jacksonville-NC
MCB Pendleton CA	San Diego-Carlsbad-San Marcos
MCAS Cherry Point NC	Jacksonville-NC
MCB Hawaii	Honolulu
Marine Barracks DC	Washington-Arlington-Alexandria
Marine Forces Reserve LA	Los Angeles-Long Beach-Santa Ana
HQBN Henderson Hall VA	Washington-Arlington-Alexandria
MCAS Miramar CA	San Diego-Carlsbad-San Marcos
MCAS New River NC	Jacksonville-NC
MCRD Parris Island SC	Charleston-North Charleston-Summerville
MCB Quantico VA	Washington-Arlington-Alexandria
MCRD San Diego CA	San Diego-Carlsbad-San Marcos
MCAGCC 29 Palms CA	Riverside-San Bernardino-Ontario
MCAS Yuma AZ	Yuma

Figure B-3. Marine Corps Installations.

Installation Name	Region	Installation Name	Region
NAS Whidbey Island	Mount Vernon-Anacortes	NAVSTA Newport	Providence-Fall River-Warwick
NAVMAG Indian Island	Bremerton-Silverdale	NSA Mechanicsburg	Harrisburg-Carlisle
NAVBASE Kitsap	Bremerton-Silverdale	NSS Norfolk Naval Shipyard	Virginia Beach-Norfolk-Newport News
NAVSTA Everett	Mount Vernon-Anacortes	NSY BOS Portsmouth	Portland-South Portland-Biddeford
PMRF Barking Sands	Honolulu	JEB Little Creek-Fort Story	Virginia Beach-Norfolk-Newport News
JB Pearl Harbor Hickam	Honolulu	NSA Hampton Roads	Virginia Beach-Norfolk-Newport News
AVSTA Great Lakes	Chicago-Joliet-Naperville	NAS Oceana	Virginia Beach-Norfolk-Newport News
NSA Mid South	Memphis	NSA Saratoga Springs	Glens Falls
NSA Crane	Bloomington	NAVSTA Norfolk	Virginia Beach-Norfolk-Newport News
NAVBASE San Diego	San Diego-Carlsbad-San Marcos	WPNSTA Yorktown	Virginia Beach-Norfolk-Newport News
NAVBASE Coronado	San Diego-Carlsbad-San Marcos	WPNSTA Earle Colts Neck	Trenton-Ewing
NAWS China Lake	Bakersfield-Delano	NAS Kingsville	Corpus Christi
NAF El Centro	El Centro	NAS Whiting Field	Crestview-Fort Walton Beach-Destin
NAS Fallon	Reno-Sparks	NSA Orlando	Orlando-Kissimmee-Sanford
NSA Monterey	Santa Cruz-Watsonville	NSA Panama City	Panama City
WPNSTA Seal Beach	Los Angeles-Long Beach-Santa Ana	CBC Gulfport	Gulfport-Biloxi
NAS Lemoore	Fresno	NAS Meridian	Hattiesburg
NAVBASE Point Loma	San Diego-Carlsbad-San Marcos	NAS/JRB Fort Worth	Dallas-Fort Worth-Arlington
NAVBASE Ventura County Pt Mugu	Santa Barbara-Santa Maria-Goleta	NAS Pensacola	Pensacola-Ferry Pass-Brent
NSA Bethesda	Washington-Arlington-Alexandria	NAS/JRB New Orleans	New Orleans-Metairie-Kenner
NAS Patuxent River	Washington-Arlington-Alexandria	NAS Jacksonville	Jacksonville-FL
JB Anacostia Bolling	Washington-Arlington-Alexandria	NAS Key West	Miami-Fort Lauderdale-Pompano Beach
NSA South Potomac	Washington-Arlington-Alexandria	NAS Corpus Christi	Corpus Christi
NSA Annapolis	Baltimore-Towson	SUBASE Kings Bay	Brunswick
NSA Washington	Washington-Arlington-Alexandria	NSF Beaufort	Charleston-North Charleston-Summerville
SUBASE New London	Norwich-New London	NAVSTA Mayport	Jacksonville-FL

Figure B-4. Navy Installations.

APPENDIX C REFERENCES

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APPENDIX D TOOL MANUAL

The Economic Impact Tool is broken into the following sections:

- User Guide
- Interface
- Calculations
- Output
- Raw Data
- Mapped Data
- Analysis
- Resources

D-1 Interface

The “Interface” tab is where the user inputs the scenario details. The user begins by entering a name for the scenario in the “Scenario Name” box. Then the user inputs the military service by selecting from the drop-down list, and manually enters the base year dollar. The user utilizes the “Add Installation” and “Remove Installation” buttons to adjust the number of columns in the Installation Inputs table. When the table is adjusted for the appropriate number of installations in the stationing scenario, the user manually inputs the number of active duty military, civilian, and contractors moving to and from each installation in the scenario. The user can then save the scenario and/or run it. Additionally, the user can load a previously saved scenario, and reset or exit the tool. All light-green shaded boxes are a user input.

D-2 Calculations

The “Calculations” tab pulls in the inputs from the interface tab and performs all calculations necessary for the results in the output report and output tab.

D-3 Output

When the user chooses the button, “Run Scenario”, VBA code generates a report in the “Output” tab.

D-4 Raw Data

The user will need to verify that all raw data is the most current available from the sources prior to running the tool. Figure D-1 below details the data source by workbook tab. In each tab, a light blue-colored cell indicates a data input. Only cells with this shade should be changed; no labels or names should be altered.

CAA-GMU

The Employment data contained in the “Employment” tab can be found on the BLS website, in the BLS Table D-2. This table contains three data points in time: December 2012, November 2014, and December 2014. As the December 2014 data was noted as preliminary, the team chose to use the November 2014 data. To update, locate the D-2 table on the website and download the latest version in an Excel workbook format. Copy and paste the numbers onto the “Employment” tab in the raw data section, ensuring you are not changing any of the region names.

Tab	Data	Data Source	Data Date
Employment	Employment data by region and industry	Bureau of Labor Statistics (BLS.gov) (Table D-2)	Nov-14
Army Installations	Army installations with associated installation type, active duty, civilian, and contractor personnel population	Army Stationing Installation Plan (ASIP)	Oct-14
AF Installations	Air Force installations with associated installation type and active duty personnel population	USAF Manpower Database System (MPES) (Unit Manning Document filtered by funded active duty positions)	Feb-15
Navy Installations	Navy installations with associated installation type and active duty personnel population	N/A	Sep-14
Navy Population	Contains regions with associated duty personnel population.	Total Force Manpower Management System (TFMMS)	Sep-14
MC Installations	Active duty personnel population by installation	Marine Corps Community Services	Jun-14
Income Data	Contains real per capita personal income and real personal income by region.	Bureau of Economic Analysis (BEA.gov)	2012

Figure D-1. Data Sources.

All population data was converted to thousands of people to maintain consistency across the remaining data sources. To update, consult the above table and pull the current population data from the listed source, entering all population values in thousands.

To update the income data, click the following link, which will take the user to the “Regional Data” page on the BEA website:

<http://bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrnd=6#reqid=70&step=1&isuri=1&7022=100&7023=8&7033=-1&7024=non-industry&7025=5&7026=xx&7027=2012&7001=8100&7028=-1&7031=5&7040=-1&7083=levels&7029=100&7090=70>

Select “Real Personal Income and Regional Price Parities”, then “Real Personal Income (RPI1)”. From the “Major Area” options, select “Metropolitan Statistical Area” and “Next Step”.

Choose “All Areas” and “Next Step”. The next option is time period of the data. Choose the most current year and move on to the next step. Lastly, the user can download a XLS or CSV file to his or her computer and copy and paste the new cost information into the raw data table “Income Data”. Be sure to copy in the cost values only and do not replace the names.

D-5 Mapped Data

The first tab in this section, “Installations”, contains a master list of all Army, Navy, Air Force, and Marine installations. The table lists the installation name, service, and installation type for each installation. Because the regions are not consistent for each data source, they must be matched to each other and the installations must then be mapped to those regions. All regions were mapped to the BLS regions, which is the employment data source. Note that GeoName is the BEA income data region. Lastly, the active duty, civilian, and contractor population data for each installation are pulled in from the raw data tabs. No changes to this tab need to be made directly.

The “Employment Data” tab pulls in personnel employed, in thousands, by region. Data is divided into the eleven different industries provided in the employment data from BLS, and pulls from the “Employment” tab in the raw data section. The “Employment Data” tab will be automatically updated as new data is copied into the raw data tab. The last column of the table sums all employment in the region. Note that summing each state’s individual region’s employment count by region does not always equal the total for that state. Some smaller region data may be unavailable for a particular state. No changes to this tab need to be made directly.

The “Income and Population” tab converts the raw income data into a dynamic format, and computes the base year dollar for each item. Columns A (the GeoName) and B (Linecode) are copied directly from the “Employment” tab raw data table. The third column, “Tag”, concatenates the first two columns, allowing the data to be recognized as either real personal income or real per capita personal income. Column D further describes the linecode. Column E pulls the income directly in from the raw data tab “Income Data” and will automatically update as new income data is copied into the raw data tab. These costs are all provided in chained 2008 dollars, with real personal income data in thousands, and real per capita personal income in real dollars. On the “Interface” tab, the user indicates the desired base year dollar output. In column F, the data is converted into thousands of dollars and inflated to the base year chosen by the user in the interface. The column header changes to indicate the chosen year. Inflation indices used can be found in the Resources’ tab “Inflation.” The data was inflated to the desired dollars by multiplying the 2008 dollars by the raw index of the desired year. For more information on inflation, see section D-7.

The second table in the “Income and Population” tab organizes the data in a format usable for the calculation portion of the tool. It first removes duplicate names so that each GeoName is listed only once. Columns I and J pull in the normalized real personal income and real per capita personal income for each region. The last column, population, derives the population for each region by dividing the RPI by the real per capita personal income. No updates or changes are required to be made directly to this tab.

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The “Region Summary” tab first maps the regions from the BLS data to the regions from the BEA data. Then real personal income, real per capita personal income, and population data are pulled in from either raw data or mapped data tabs. No updates or changes are required to be made directly to this tab.

D-6 Analysis

There are two major calculations required in Economic Base Analysis. The first is the location quotient, found in the “LQ Calc” tab. This tab pulls in all of the employment data from the “Employment Data” tab, which is then utilized to calculate the LQ for each region and industry. In each LQ column of the table, the formula is as follows:

$$\text{Location Quotient} = \frac{\frac{\text{Local employment in industry } i}{\text{Total Local Employment}}}{\frac{\text{National employment in industry } i}{\text{Total National employment}}}$$

All data inputs required for the above formulation are found within this tab. Once the location quotient is calculated, the subsequent column, “BASIC?”, utilizes a formula to tag each industry in each region as basic or non-basic, depending on the value of the LQ (if LQ is greater than 1.0, the industry is basic). For more information regarding this methodology, see section 2 Methodology.

The “Total” column represents the total persons employed, not including military personnel. The next column, “Total + Mil”, adds in all active duty service members. The last two columns of the table calculate both the number of people employed in a basic region as well as how many industries (out of the total 11) in that region are considered basic.

Next, the “Multiplier” tab serves the purpose of calculating an employment multiplier for each region. The multiplier is calculated using the following formula:

$$\text{Multiplier} = \frac{\text{Total Local Employment}}{\text{Total Basic Employment}}$$

The table in this tab maps the total local employment and total basic employment to each region. The last column, “Multiplier”, uses the above formula to compute the multiplier for each region. No updates or changes are required to be made directly to these tabs.

D-7 Resources

The “Inflation” tab contains a table generated from the FY15 Joint Inflation Calculator for the President’s Budget (PB) for 2016. The inflation calculator is updated and released each year along with the new PB. As the raw income data is provided in 2008 dollars, base year 2008 was chosen. To update the inflation indices in the tool, open the joint inflation calculator on the following website: <http://asafm.army.mil/offices/office.aspx?officecode=1400>. Make sure

contents are enabled. Select the Query option, which takes the user to the “Inflation Query Sheet”. At the top of the sheet, select the purple box “DoD Wide” to indicate the desired Service. Next, from the dropdown list, select “Civ Pay = Civilian Payroll for all services (OSD Cost Element). In step three, indicate the input year, which will be the year of the raw data pulled from BEA. In this version of the tool, the data was provided in 2008 dollars. Once these inputs are complete, click the “Generate Inflation Table” button. Lastly, copy and paste this inflation table onto the table in the “Inflation” tab. The raw index is utilized when converting one constant/fiscal year dollar to another.

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APPENDIX E USER GUIDE

E-1 Using the Interface

Service		Scenario Name		
Army		New Example		
Base Year \$ (XXXX)				
2015				
Installations Affected	4	Add Installation	Remove Installation	
Installation Inputs	1	2	3	4
Installation	Fort Gordon	Fort Campbell	Fort Hood	Fort Leonard Wood
Leaving Installation: Active Duty	4000	2000	10000	0
Leaving Installation: Civilians	2000	1000	8000	0
Leaving Installation: Contractors	0	0	0	0
Moving to Installation: Active Duty	0	0	0	6000
Moving to Installation: Civilians	0	8000	0	2000
Moving to Installation: Contractors	0	0	0	0
Load Scenario		Run Scenario		
Save Scenario		Reset Tool		
Quit Tool				

Figure E-1. EIT Input Screen.

Open the “Economic Impact Tool” Excel Workbook and select the tab “Interface”. This tab contains all of the input fields required in order to generate the economic impact of a given stationing scenario. Follow the procedure below to use the tool and produce desired results. Note light green cells indicate inputs required by user. See Figure E-1 above for a visualization of the interface.

1. Select military service branch from drop down list in the box labeled “Service”. Options include Army, Navy, Air Force, or Marine Corps.
2. In the box labeled “Scenario Name”, type in a unique name for the scenario that will be used as the name for the output file.
3. In the “Base Year \$ (XXXX)” input box, type in the base year dollars desired for cost output. Possible year inputs range from 1970 to 2060, entered in the format XXXX.

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4. Determine the number of installations affected in the given scenario. Utilize the “Add Installation” button to add columns to the table described below, which will be populated for each affected installation. If at any point too many columns have been added, select the “Remove Installation” box until the table is condensed to the desired columns. A prompt will ensure this was chosen intentionally.
5. Populate the “Installation Inputs” table.
 - a. Select the names of the installations impacted by using the drop down lists in the first row of each installation column. Select each installation only once.
 - b. Fill in the number of active duty, civilians, and contractors moving to or from that installation. All number inputs should be positive numbers. There is error trapping built-in, so the user cannot move more people than an installation has.
6. Click the “Save Scenario” button to save the scenario in a subfolder of the current folder entitled “Scenarios” for future reference. A message box will confirm the name of the scenario to be saved.
7. Once all data is input into the correct cells, select the “Run Scenario” button, which will generate a report with all outputs based on the selected scenario. Additionally, a Windows Explorer window will open containing the location of the charts generated by the tool.
8. Reset the tool by clicking the “Reset Tool” button. This will clear all inputs from the cells and allow the user to start a new scenario.
9. Exit the tool by clicking the “Quit Tool” button. A message box will open to confirm this action. The tool will reset, and then Excel will close.

To open an existing file, click the “Load Scenario” button and select the desired file. Reference the above steps to make any updates or changes.

E-2 Interpreting the Output Reports

Scenario Output

The tables below display the resulting economic impact by installation and region for the current scenario. The three graphs provided show the scenario impact on the population of each installation, the income of each region, and the employment of each region.

Installation Impact

	1	2	3	4
Installation	Fort Gordon	Fort Campbell	Fort Hood	Fort Leonard Wood
Region	Augusta-Richmond County	Clarksville	Killeen-Temple-Fort Hood	Jefferson City
Installation Type	Training School	Maneuver Installation	Maneuver Installation	Training School
Total Population Change	-6000	5000	-18000	8000
Active Duty Population Change	-4000	-2000	-10000	6000
Civilian Population Change	-2000	7000	-8000	2000
Contractor Population Change	0	0	0	0

Region Impact

	1	2	3	4
Region	Augusta-Richmond County	Clarksville	Killeen-Temple-Fort Hood	Jefferson City
Total Population Change	-6,000	5,000	-18,000	8,000
Active Duty	-4,000	-2,000	-10,000	6,000
Civilian	-2,000	7,000	-8,000	2,000
Contractor	0	0	0	0
Total Employment change	-14,478	11,885	-40,927	16,539
Direct Job Change	-6,000	5,000	-18,000	8,000
Indirect Job Change	-8,478	6,885	-22,927	8,539
Lower Bound	-8,054	6,541	-21,781	8,112
Upper Bound	-8,902	7,230	-24,074	8,966
Total Income Change (CY15 \$K)	-\$598,114	\$525,172	-\$1,803,386	\$772,192
Lower Bound	-\$580,602	\$509,960	-\$1,752,874	\$752,258
Upper Bound	-\$615,626	\$540,384	-\$1,853,899	\$792,127
Percent Population Change of Region	-1.042%	1.623%	-4.282%	5.328%
Percent Employment Change of Region	-6.030%	10.081%	-23.324%	16.909%
Percent Income Change of Region	-2.514%	4.332%	-9.736%	11.015%

Figure E-2. EIT Output Screen.

Installation Impact

The first table provides details for each installation impacted in the given scenario. Information provided includes the region, installation type, and total population change, further broken down into active duty, civilian, and contractors. Installation type provides insight into the type of facility and main functions performed at that installation. For an example, reference the Installation Impact table in Figure E-2 above.

Region Impact

The Region table lists each region affected in the given scenario. Total population change and employment change, each broken down into active duty, civilian and contractors, are shown. Total income change is the mean average income for a given region multiplied by the population change. Dollars are in the base year indicated on the "Interface" tab. An upper and lower bound, producing a range estimate, are provided for both the Indirect Job Change and consequently the Total Income Change. For further details on the genesis of this range estimate, please refer to section 2.4 Uncertainty. The last three rows depict the region's population change, employment

change, and Income change point estimate as a percent change. For an example, reference the Region Impact table in Figure E-2 above.

Graphics

The first graph, titled “Population Impact by Installation,” displays the population of the current active duty, civilian, and contractor population as well as the new population due to the scenario. If multiple installations are chosen, the names will be shown on the x-axis. See Figure E-3 below for an example.

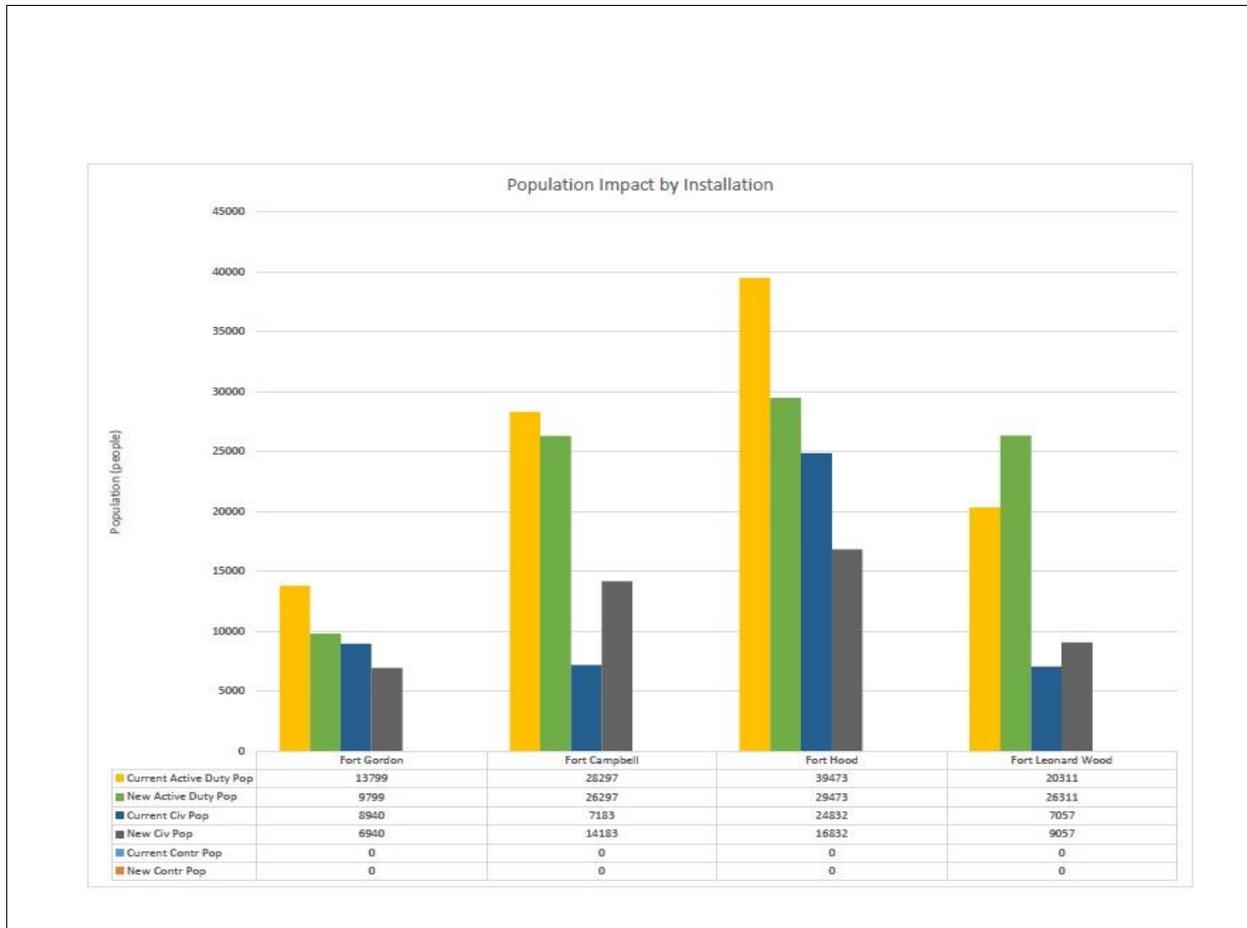


Figure E-3. Results: Population Impact by Installation.

The second graph, titled “Employment Impact by Region” displays a comparison of the current population employed and the scenario predicted population employed for each Region influenced by the chosen scenario. Region names will be shown below the x-axis. See Figure E-4 below for an example.

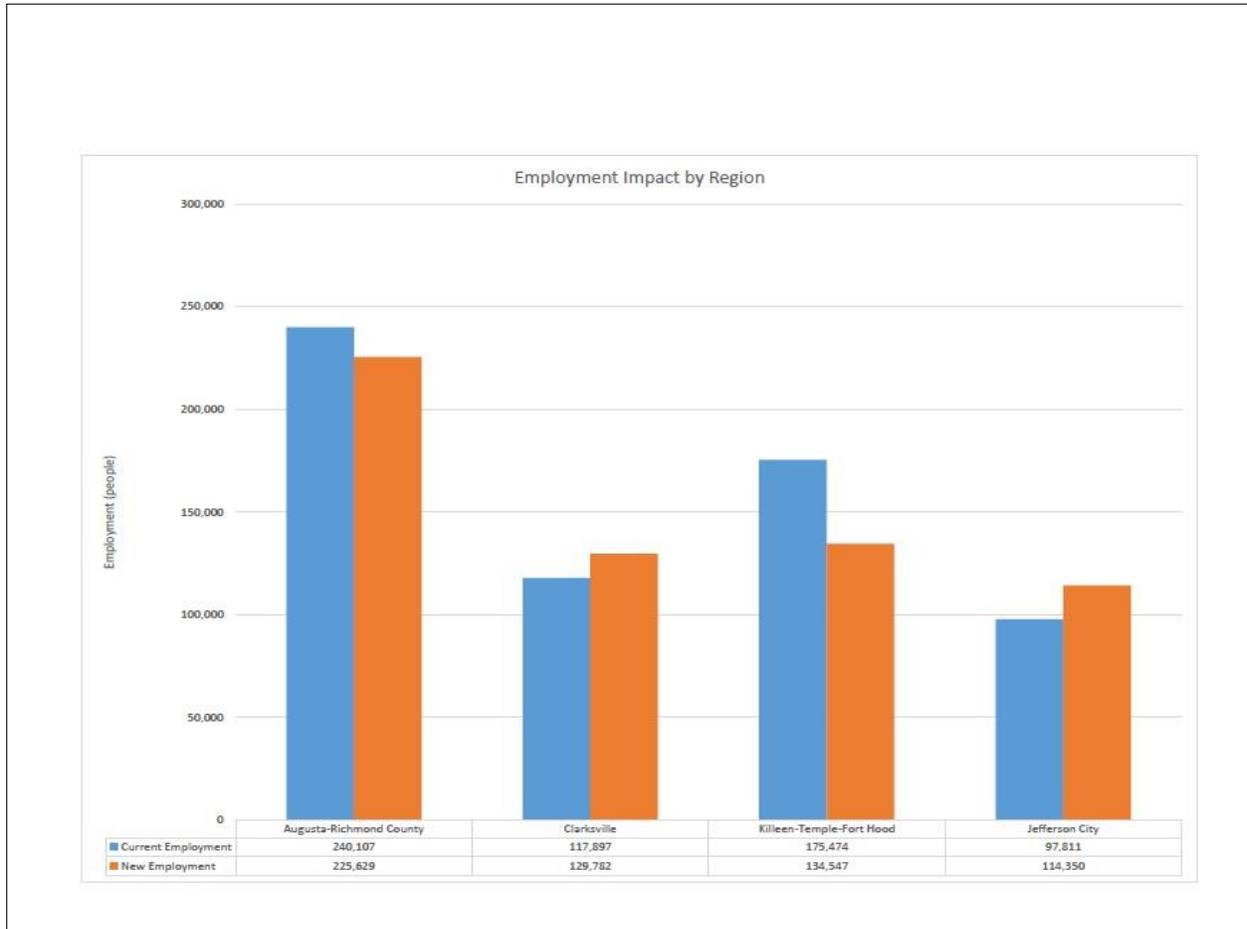


Figure E-4. Results: Employment Impact by Region.

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The third graph, titled “Income Impact by Region” displays a comparison of the current income against the scenario predicted income for each region influenced by the chosen scenario. Costs seen on the y-axis are presented in the base year chosen on the interface tab. Region names will be shown below the x-axis. See Figure E-5 below for an example.

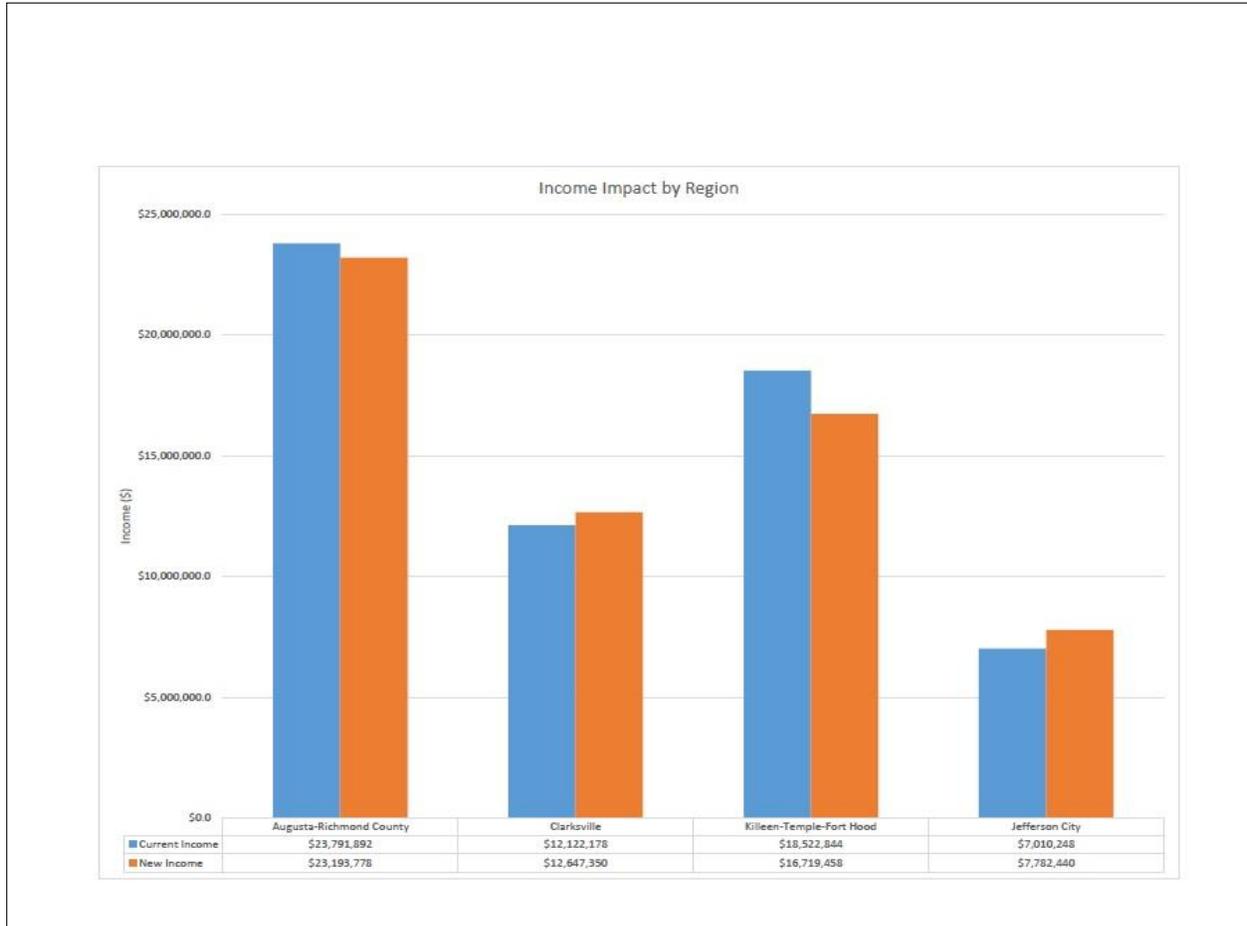


Figure E-5. Results: Income Impact by Region.