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APPENDIX C:
Detailed Benefit-Cost Analysis (BCA)

June 3, 2013

Submitted by:
Florida's Turnpike Enterprise
for Lake County, FL

TIGER ID#:
DTOS59-13-RA-TIGER5

PREPARED BY:
FLORIDA DEPARTMENT OF TRANSPORTATION, CENTRAL OFFICE

PREPARED FOR:
MINNEOLA AREA ECONOMIC DEVELOPMENT FACILITY
TIGER V DISCRETIONARY GRANT PROGRAM

ECONOMIC ANALYSIS SUPPLEMENTARY DOCUMENTATION

MAY 31, 2013

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1. Executive Summary

The project being assessed consists of constructing a new interchange in the City of Minneola (Lake County, FL) at Milepost 279 on the Florida Turnpike and extending an existing four-lane roadway (North Hancock Road) to connect the new interchange to local county roads (CR 561A to the North and CR 50 to the South). A table summarizing the changes expected from the project and the associated benefits is provided below.

Table ES-1: Summary of Infrastructure Improvements and Associated Benefits

Current Status or Baseline & Problems to be Addressed	Changes to Baseline / Alternatives	Type of Impacts	Population Affected by Impacts	Benefits	Summary of Results (millions of $2012)	Page #
Existing arterials (SR 50, US 27) operate near capacity	Extension of North Hancock Road provides new parallel reliever	Congestion relief and changes in vehicle miles traveled	Local residents and businesses, freight carriers, travelers passing through the area	Travel time savings; Changes in vehicle operating costs; Economic value of induced travel	$392.1 M	11-13
					-$95.7 M	11-13
					$2.0 M	11-13
Florida's Turnpike bisects vacant land located in prime area for housing and commercial development	Construction of new interchange at Milepost 279 and extension of North Hancock Road unlock development	Mixed-use development; increase in land value; creation of employment opportunities	Existing and potential residents and businesses, land owners and developers, public agencies in City of Minneola and Central Lake County	"Planning gains", measured through one-time uplift in assessed land value	$36.6 M	16
Growing delays across local road network generate excessive air emissions	Project alleviates delays by redistributing traffic to new facility	Changes in volume of air emissions	All residents (criteria air contaminants); global impacts (CO2)	Reduced emission costs	$2.8 M	17

Note: Not all benefits estimated for this analysis are shown in the above table.

The period of analysis used in the estimation of benefits and costs starts in 2012 and ends in 2036. It includes 20 years of operations, after project opening in 2017. The total project costs are $65.3 million and are expected to be financed by Federal, State, local and private funds according to the distribution shown in Table ES-2.

Table ES-2: Summary of Project Costs and Anticipated Funding Sources, in Millions of Dollars of 2012

Funding Source	Capital Costs	Operation & Maintenance Costs*	Total Project Costs	Percent of Total Cost Financed by Source
Federal (TIGER V Grant)	$19.0	$0.0	$19.0	29%
State (Florida DOT)	$31.0	$3.8	$34.8	53%
Local (Lake County)	$8.0	$0.0	$8.0	12%
Private (Property Owner)	$7.3	$0.0	$7.3	11%
TOTAL	$65.3	$3.8	$69.1	100%

** Note: Total over 20 years of operations, discounted at 7 percent*

A summary of the relevant data used in the estimation of total benefits and costs are shown in Table ES-3 (in dollars of 2012).

Based on the Benefit-Cost Analysis presented in the rest of this document, the project is expected to generate $981.7 million in total undiscounted benefits and $75.5 million in undiscounted costs. Using a 7 percent real discount rate, the project is expected to generate a Net Present Value of $243.2 million and a Benefit/Cost Ratio of 5.10.

Table ES-3: Summary of Pertinent Data, Quantifiable Benefits and Costs, in Millions of Dollars of 2012*

Calendar Year	Project Year	Total Capital Costs	Incremental O&M Costs	Total Project Costs	Total Project Benefits	Net Benefits	Net Benefits Discounted at 7 Percent
2012	1	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2013	2	$12.6	$0.0	$12.6	$0.0	-$12.6	-$11.8
2014	3	$11.9	$0.0	$11.9	$0.0	-$11.9	-$10.4
2015	4	$34.4	$0.0	$34.4	$0.0	-$34.4	-$28.1
2016	5	$6.3	$0.0	$6.3	$0.0	-$6.3	-$4.8
2017	6	$0.0	$0.4	$0.4	$7.1	$6.7	$4.8
2018	7	$0.0	$0.4	$0.4	$9.6	$9.2	$6.2
2019	8	$0.0	$0.4	$0.4	$11.9	$11.5	$7.2
2020	9	$0.0	$0.4	$0.4	$15.1	$14.7	$8.6
2021	10	$0.0	$0.4	$0.4	$18.0	$17.6	$9.6
2022	11	$0.0	$0.4	$0.4	$21.6	$21.2	$10.8
2023	12	$0.0	$0.4	$0.4	$26.0	$25.5	$12.2
2024	13	$0.0	$0.5	$0.5	$30.1	$29.6	$13.2
2025	14	$0.0	$0.5	$0.5	$34.6	$34.1	$14.2
2026	15	$0.0	$0.5	$0.5	$39.8	$39.3	$15.3
2027	16	$0.0	$0.5	$0.5	$45.6	$45.1	$16.5
2028	17	$0.0	$0.5	$0.5	$51.4	$50.9	$17.2
2029	18	$0.0	$0.5	$0.5	$58.2	$57.6	$18.2
2030	19	$0.0	$0.6	$0.6	$60.1	$59.5	$17.6
2031	20	$0.0	$0.6	$0.6	$68.4	$67.8	$18.8
2032	21	$0.0	$0.6	$0.6	$76.9	$76.3	$19.8
2033	22	$0.0	$0.6	$0.6	$86.1	$85.5	$20.7
2034	23	$0.0	$0.7	$0.7	$96.4	$95.7	$21.7
2035	24	$0.0	$0.7	$0.7	$106.9	$106.2	$22.5
2036	25	$0.0	$0.7	$0.7	$118.0	$117.3	$23.2
Total		**$65.3**	**$10.3**	**$75.5**	**$981.7**	**$906.3**	**$243.2**

Note: Not discounted, unless specified otherwise in the column header

In addition to the monetized benefits presented in Table ES-3, the project would generate benefits that are difficult to quantify. A brief description of those benefits is provided below.

State of Good Repair

- Currently, burgeoning sections of central Lake County rely predominantly on two regional roadways: SR 50 and US 27. The construction of the interchange and extension of North Hancock Road would provide a new parallel reliever, facilitating the new travel demand in the area. Lower traffic volumes on SR 50 and US 27 would reduce the life-cycle costs of these facilities and improve the resiliency of the transportation system.

Livability

- The project is expected to open-up land for development, unlocking a number of residential, commercial and industrial investment projects. This multi-use development would promote quality of life by reducing trip lengths and emissions by motor vehicles, and by providing more opportunities for trip-making by non-motorized modes (walking, biking).

2. Introduction

This document provides technical information on the economic analysis conducted in support of the TIGER V Grant Application for the **Minneola Area Economic Development Facility** project. Section 3 introduces the conceptual framework used in the Benefit-Cost Analysis (BCA). Section 4 provides an overview of the project. Section 5 summarizes the general assumptions used in the estimation of benefits and costs, while estimates of travel demand and traffic growth can be found in Section 6. Specific data elements and assumptions pertaining to the long-term outcome selection criteria are presented in Section 7, along with associated benefit estimates. Estimates of the project's Net Present Value (NPV), its Benefit/Cost ratio (BCR) and other project evaluation metrics are introduced in Section 8. Next, Section 9 provides the outcomes of the sensitivity analysis. Additional data tables are provided in Section 10, including annual estimates of benefits and costs, as well as intermediate values to assist US DOT in its review of the application.[1]

3. Methodological Framework

Benefit-Cost Analysis (BCA) is a conceptual framework that quantifies in monetary terms as many of the costs and benefits of a project as possible. Benefits are broadly defined. They represent the extent to which people impacted by the project are made better-off, as measured by their own willingness-to-pay. In other words, central to BCA is the idea that people are best able to judge what is "good" for them, what improves their well-being or welfare. BCA also adopts the view that a net increase in welfare (as measured by the summation of individual welfare changes) is a good thing, even if some groups within society are made worse-off. A project or proposal would be rated positively if the benefits to some are large enough to compensate the losses of others. Finally, BCA is typically a forward-looking exercise, seeking to anticipate the welfare impacts of a project or proposal over its entire life-cycle. Future welfare changes are weighted against today's changes through discounting, which is meant to reflect society's general preference for the present, as well as broader inter-generational concerns.

The specific methodology developed for this application was developed using the above BCA principles and is consistent with the TIGER guidelines. In particular, the methodology involves:

- Establishing existing and future conditions under a Base Case (No-Build) and Build scenario;

[1] While the computerized model used in the analysis is not included in this technical appendix, additional detail can be provided, including Excel spreadsheets with interim calculations, and discussions on model mechanics and coding, if requested.

- Assessing benefits with respect to each of the five long-term outcomes identified in the Notice of Funding Availability (NOFA) for TIGER V;
- Measuring benefits in dollar terms, whenever possible, and expressing benefits and costs in a common unit of measurement;
- Using DOT guidance for the valuation of travel time savings, safety benefits and reductions in air emissions, while relying on industry best practices for the valuation of other effects;
- Discounting future benefits and costs with the real discount rates recommended by the US DOT (7 percent, and 3 percent for sensitivity analysis); and
- Conducting a sensitivity analysis to assess the impacts of changes in key estimating assumptions.

4. Project Overview

The project being assessed consists of constructing a new interchange in the City of Minneola (Lake County, FL) at Milepost 279 on the Florida Turnpike and extending an existing four-lane roadway (North Hancock Road) to connect the new interchange to local county roads (CR 561A to the North and CR 50 to the South).

Please refer to the main body of the application for additional information on the project.

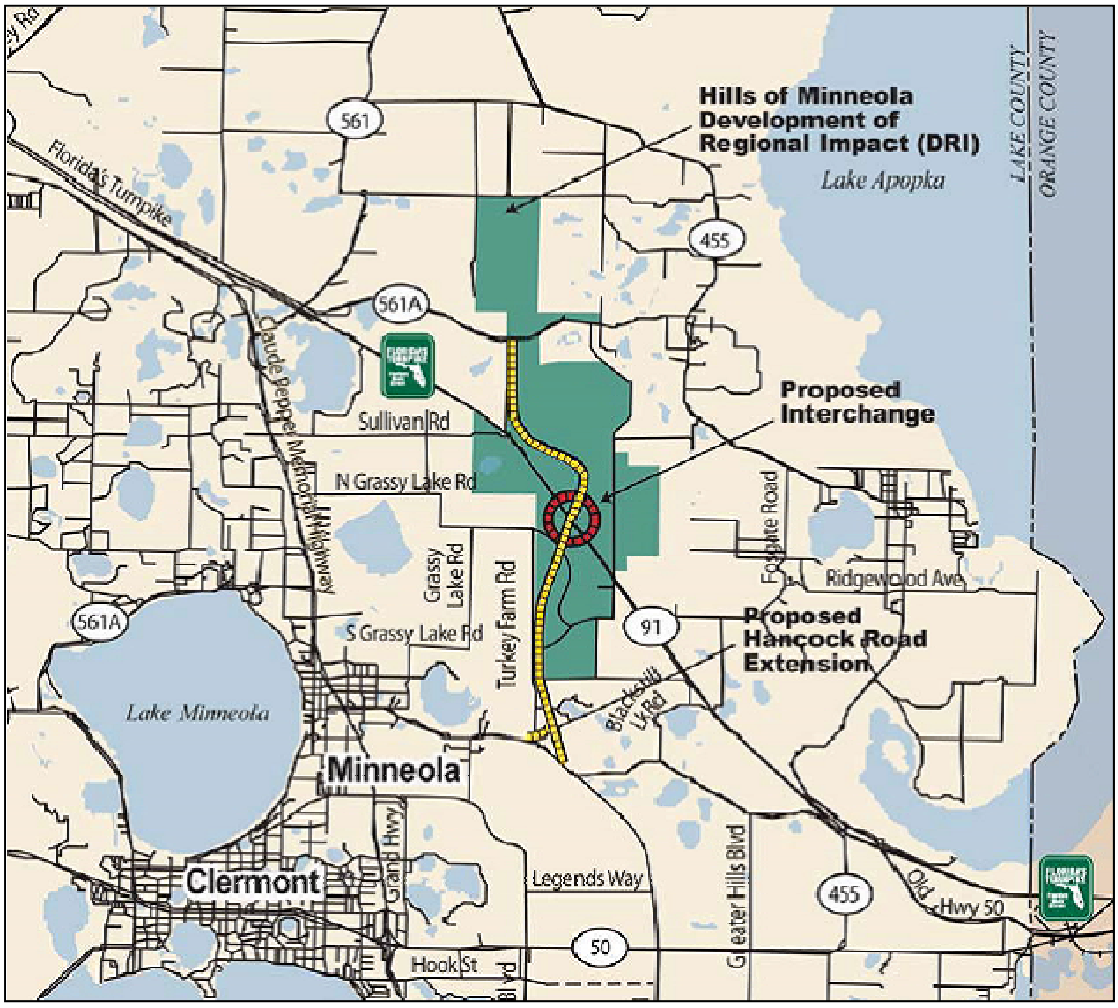
4.1 Base Case and Alternatives

The Base Case or No-Build scenario includes all ongoing and previously committed projects, as well as all maintenance work required to keep existing facilities in a state of good repair.

The Alternative or Build scenario includes the construction of a new interchange at Milepost 279 on the Florida Turnpike and the extension of North Hancock Road, as described above.

The figure below provides an overview of the study area under the Build scenario.

Figure 1: Project Location Map



Source: Project Development Summary Report for the Minneola Interchange at Florida's Turnpike Milepost 279, October 2011, page 3

4.2 Project Cost and Schedule

Project Funds

The table below provides a summary of project costs by cost category, as well as a breakdown of total funding sources between Federal, State, local and private contributions.

The Florida Department of Transportation is requesting $19.0 million under the TIGER V Discretionary Grant program to provide for the remaining design of and all the construction work associated with the North Hancock Road extension.

Table 1: Total Amount of TIGER V Funding requested, in Millions of Dollars of 2012

Category	TIGER Funding Request	Florida's Turnpike Enterprise	Lake County	Private Property Owner	Total From All Sources
Preliminary Engineering	$0.0	$0.0	$0.0	$1.0	$1.0
Product Development and Environment	$0.0	$0.0	$0.7	$0.0	$0.7
Design	$0.0	$0.0	$1.9	$0.0	$1.9
Right of Way	$0.0	$0.0	$1.8	$7.3	$9.1
Construction	$17.1	$30.0	$3.6	$0.0	$50.7
Contingency	$1.9	$0.0	$0.0	$0.0	$1.9
Total	**$19.0**	**$30.0**	**$8.0**	**$8.3**	**$65.3**

Project Schedule

The construction of the project is expected to start in **June 2014**. The construction of the new interchange is anticipated to last 24 months, while the construction of the two segments of North Hancock Road (North and South of the new interchange) would be completed in 18 months. Expected quarterly project spending is shown in the table below.

Table 2: Expected Construction Spending by Quarter, in Millions of Dollars of 2012

Quarter	New Interchange	Extension of North Hancock Road NORTH of the Interchange	Extension of North Hancock Road SOUTH of the Interchange	Total Construction Spending
2014 - Q3	$2.4	$1.1	$1.6	$5.1
2014 - Q4	$5.6	$1.6	$2.4	$9.6
2015 - Q1	$5.6	$2.1	$3.3	$11.0
2015 - Q2	$5.6	$2.1	$3.3	$11.0
2015 - Q3	$5.6	$2.1	$3.3	$11.0
2015 - Q4	$5.6	$1.6	$2.4	$9.6
2016 - Q1	$5.6	$0.0	$0.0	$5.6
2016 - Q2	$2.4	$0.0	$0.0	$2.4
Total	**$38.3**	**$10.6**	**$16.3**	**$65.3**

4.3 Effects on Long-Term Outcomes

The project is expected to generate long-term benefits to multiple stakeholder groups within the region including: i) local businesses and residents (improved accessibility and reduced travel times; reduction in intersection delays; increased housing and employment opportunities); ii) travelers passing through the region (congestion relief along US 27 and SR 50); iii) transportation agencies (reduced SR 50 and US 27 life-cycle costs); and iv) land owners and private developers (increase in the value of land). The long-term benefits considered in this analysis are described in the table below.

Table 3: Expected Effects on Long Term Outcomes and Benefit Categories

Long-Term Outcome Criteria	Benefit Categories	Description	Monetized?
State of Good Repair	Life-Cycle Cost Savings	Reduction in the life-cycle costs of existing arterials (US 27 and SR 50)	No
	Residual Value	Residual value of the investment at the end of the period of analysis	Yes
Economic Competitiveness	Congestion Relief and Travel Time Savings	Travel time saving to users of the roadway network	Yes
	Vehicle Operating Cost Savings	Reduction in out-of-pocket costs born by roadway users, due to changes in average vehicle speed and trip making (vehicle miles traveled)	Yes
	Short-Term Employment Impacts	Number of short-term jobs created as a result of construction activities	Quantified, Not Included as Benefit
Livability	Net Economic Value of Land Development	Increase in the productivity of land due to improved access	Yes
	Health Benefits from Use of Non-Motorized Modes	Increased opportunities for walking or biking in mixed-use community developed as a result of project (Hills of Minneola)	No
Environmental Sustainability	Change in Air Emissions	Change in the volume of air pollutants and CO2 due to changes in average vehicle speed and trip making (vehicle miles traveled)	Yes
Safety	Change in Accident Costs	Changes in the number of property losses, injuries and deaths due to changes in vehicle use (vehicle miles traveled)	Yes

5. General Assumptions

The BCA measures benefits against costs throughout a period of analysis starting in 2012 and including 20 years of operations after project opening.

The monetized benefits and costs are estimated in 2012 dollars with future dollars discounted in compliance with TIGER requirements using a 7 percent real rate, and sensitivity testing at 3 percent.

The methodology makes several important assumptions and seeks to avoid overestimation of benefits and underestimation of costs. Specifically:

- Projected growth rates in traffic volumes between the two modeled years (2020 and 2035) are assumed to apply throughout the period of analysis;

- An annualization factor of 300 was used to extrapolate daily Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) estimates to annual figures;
- All benefit and cost estimates are held constant in real terms, and expressed in dollars of 2012; and
- Unless specified otherwise, the results shown in this appendix correspond to the effects of the Build scenario relative to the Base Case.

6. Demand Projections

The traffic forecasts for the Base Case and the Build scenario were developed by the Project Team through a Four-Step Travel Demand Model. The results of this travel demand modeling exercise are summarized in the table below.

Table 4: Summary Statistics from the Travel Demand Model Output

Statistic	2020			2035		
	No-Build	Build	Difference	No-Build	Build	Difference
Vehicle Miles Traveled (VMT)	3,371,852	3,464,863	+2.8%	4,468,877	4,488,838	+0.4%
Vehicle Hours Traveled (VHT)	69,167	66,891	-3.3%	108,827	92,995	-14.5%
Free-Flow Speed (mph)	54.2	55.8	+3.0%	53.9	55.7	+3.3%
Congested Speed (mph)	48.7	51.8	+6.3%	41.1	48.3	+17.5%
Hours of Delay (hours)	6,985	4,830	-30.9%	25,878	12,373	-52.2%

The percentage of total VMT (and VHT) by truck was derived from the Florida DOT traffic count system (see table below). A conservative estimate of 10 percent was used in the calculations.

Table 5: Percentage of Heavy Vehicles (Trucks) in Study Area

Facility and Location	Percent of Trucks in Total Traffic
SR 50 (east of CR 455)	4.5%
SR 50 (east of Hancock)	5.5%
SR 50 (west of Hancock)	6.4%
SR 50 (east of Citrus Tower)	5.2%
SR 50 (west of US 27)	5.8%
US 27 (south of SR 50)	10.4%
US 27 (north of SR 50)	10.4%
US 27 (south of Old Hwy 50)	10.4%
US 27 (south of CR 561S)	10.4%
US 27 (north of CR 561S)	10.4%
Florida's Turnpike	**14.8%**
All Local Facilities	**11.0%**

7. Benefits Measurement, Data and Assumptions

This section of the appendix describes the measurement approach used for each benefit category identified in Table 3 (Expected Effects on Long-Term Outcomes and Benefit Categories) and provides an overview of the associated methodology, assumptions, and estimates.

7.1 State of Good Repair

The potential life-cycle cost savings on "competing" arterials (SR 50 and US 27) were not estimated for this Benefit-Cost Analysis. Only the incremental life-cycle costs associated with the new interchange (including the operation of the toll collection system) and North Hancock Road Extension have been considered. They are included as a project cost in this analysis.

The residual value of the investment was estimated by assuming, conservatively, that all project components would be fully depreciated after 20 years of operations, except land or right-of-way. Estimates are shown in the table below.

Table 6: Project Residual Value

	Undiscounted Benefits (Millions of $2012)	Discounted at 7% (Millions of $2012)	Discounted at 3% (Millions of $2012)
Residual Value of Land after 2036	$9.1	$1.8	$4.5

7.2 Economic Competitiveness

Travel time savings and changes in vehicle operating costs were estimated under this criterion. The estimates were derived from the VMT and VHT statistics developed by the Project Team. Speed-varying unit consumption rates from the FHWA HERS' model were used to estimate vehicle operating costs in the Base Case and Build scenarios.

A Consumer Surplus approach was used to account for the economic value of induced travel (i.e., increase in VMT). This is explained below.

Methodology

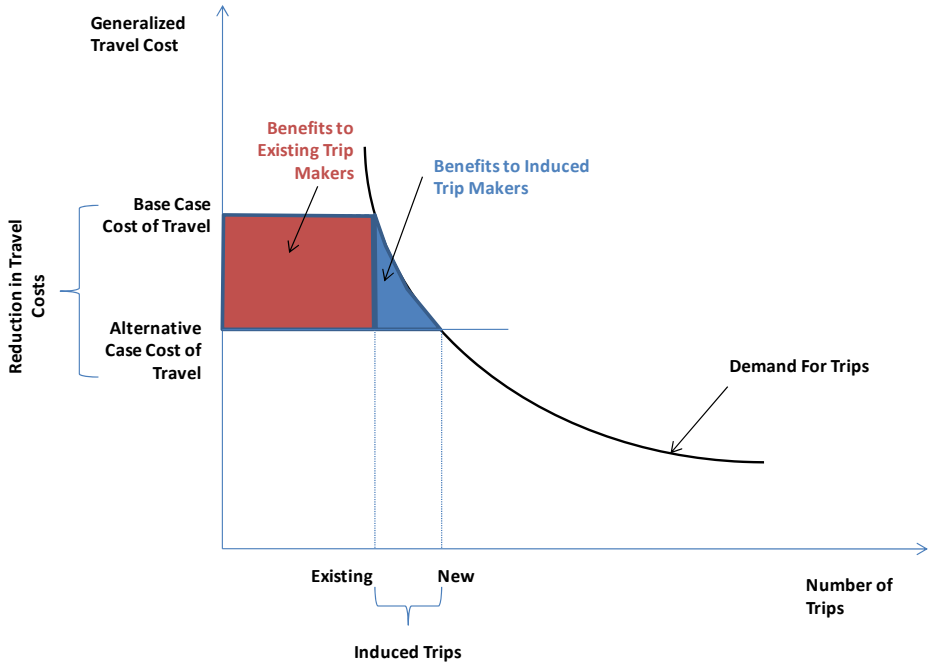
The framework used in the estimation of user benefits is based upon the theory of demand, and involves the estimation of changes in consumer surplus.

The demand for travel is an inverse relationship between the number of trips "demanded" and the generalized cost of travel, which includes both travel time and out-of-pocket costs (such as vehicle operating and parking costs for auto users, or fare payments for transit riders). That relationship is depicted in Figure 2 below. The term "consumer surplus" refers to the area between the demand curve and the actual cost of travel at any point in time. It is a measure of welfare to the extent that people who are traveling at that cost are "paying" less than what they would be willing to pay; in other words the value they are placing on a trip (as measured

by their willingness-to-pay along the demand curve) is higher than what they are actually paying.

The project would reduce the general cost of travel and result in benefits to both exiting and new trip-makers. Benefits to existing trip-makers are represented by the red rectangle in Figure 2. They are estimated as the difference between the generalized cost of travel in the base case and the generalized cost of travel in the build scenario times the number of existing trips. In addition, as the generalized cost of travel is being reduced, additional trips (beyond those diverted from other modes) are expected. These induced trip-makers represent a portion of all potential trip-makers who did not make a trip (or as many trips) in the no-build scenario, but are now "attracted" to the lower generalized cost allowed by the investment. User benefits resulting from new trips are depicted by the blue triangle in Figure 2. They are estimated using the "rule-of-half".

Figure 2: Framework for the Estimation of User Benefits



Assumptions

The main assumptions used in the estimation of travel time savings and out-of-pocket cost savings are summarized in the table below.

Table 7: Assumptions used in the Estimation of User Benefits

	Value	Source
Value of Time per Person, Local Travel, Auto	$13.0	US Department of Transportation - Valuation of Travel Time in Economic Analysis
Value of Time per Person, Local Travel, Truck	$24.9	US Department of Transportation - Valuation of Travel Time in Economic Analysis
Average Occupancy per Vehicle, Auto	1.25	Texas Transportation Institute, 2011 Urban Mobility Report, page A-13
Average Occupancy per Vehicle, Truck	1.0	HDR assumption
Cost Per Gallon of Fuel, Auto	$3.7	Average Real Fuel Price 2013-2035 from the Annual

	Value	Source
		Energy Outlook 2013 forecasts from the US Energy Information Administration.
Cost Per Gallon of Fuel, Truck	$4.1	Average Real Fuel Price 2013-2035 from the Annual Energy Outlook 2013 forecasts from the US Energy Information Administration.
Cost Per Quart of Oil, Auto	$9.8	HERS Technical Report 2002, inflated to 2012 dollars
Cost Per Quart of Oil, Truck	$3.9	
Cost Per Tire, Auto	$96.5	
Cost Per Tire, Truck	$634.8	
Average M&R Cost per 1,000 Miles, Auto	$161.6	
Average M&R Cost per 1,000 Miles, Truck	$543.8	
Average Depreciable Value, Auto	$19,640	
Average Depreciable Value, Truck	$74,698	

Benefit Estimates

The table below shows that the project is expected to generate approximately $392 million in travel time savings discounted at 7 percent, ($741 with a 3 percent real discount rate) and $96 million in additional vehicle operating cost savings.

Table 8: Travel Time and Vehicle Operating Costs Savings

	Undiscounted Benefits (Millions of $2012)	Discounted at 7% (Millions of $2012)	Discounted at 3% (Millions of $2012)
Travel Time Savings	$1,246.6	$392.1	$741.4
Vehicle Operating Costs Savings	-$270.5	-$95.7	-$169.1
Economic Value of Induced Travel	$5.6	$2.0	$3.5

Short-Term Employment Impacts

Estimates from the Council of Economic Advisor (CEA) were used to calculate the short-term employment impacts of constructing the interchange and roadway extension.

This approach assumes that one job-year is created for every $76,923 of government spending [2]. Of all job-years created by a project, 64 percent represent direct and indirect effects, while the rest (36 percent) represent induced effects.

To estimate short-term job creation, only project construction costs were considered.

Overall, the project construction is expected to generate **684 job-years**, including 438 resulting from direct and indirect spending. A breakdown by quarter can be found in the table below.

[2] Executive Office of the President, Council of Economic Advisers, "Estimates of Job Creation from the American Recovery and Reinvestment Act of 2009," Washington, D.C., May 11, 2009; and September 2011 Update.

Table 9: Direct, Indirect and Induced Impacts during Project Development Phase

Quarter	Total Job-Year Equivalents	Direct & Indirect Job-Year Equivalents	Induced Job-Year Equivalents
2014 - Q3	54	34	19
2014 - Q4	101	65	36
2015 - Q1	116	74	42
2015 - Q2	116	74	42
2015 - Q3	116	74	42
2015 - Q4	101	65	36
2016 - Q1	57	36	20
2016 - Q2	24	16	9
Project Total	**684**	**438**	**246**

7.3 Livability

Livability benefits were estimated by considering that the proposed transportation investment would "unlock" housing and commercial development. Indeed, as highlighted in the main body of the application, development of the "Hills of Minneola" depends directly upon completion of the interchange and North Hancock Road extension. The benefits of the "dependent" new development were estimated following the general methodology outlined in a guidance document prepared by the UK Department for Transport[3].

Methodology and Assumptions

The economic value of the change in land use made possible by the project was calculated as the difference between the value of the land in its new use (residential, commercial or industrial) minus the value of the land in its current use (vacant). Tax assessed value for the vacant parcels directly impacted by the project were obtained from the Lake County Property Appraiser. The average value of the land for these parcels is about **$0.035** per square foot. To estimate the average expected value of the land in its new use, a sample of over 4,000 properties located in Minneola were obtained from the same source. This information is summarized in the table below.

Table 10: Average Land Value of Properties in Minneola, Lake County

Property Type	Count	Average of Acres	Average of Land Value	Average of Building Value	Average Land Value per Sq. Ft.
CONDOMINIUM	40	0.04	$18,032	$89,077	$10.480
DEPARTMENT STORES	2	2.02	$703,584	$797,795	$7.996
DRIVE- IN RESTAURANT	1	1.32	$456,520	$221,279	$7.940
HOTELS & MOTELS	3	0.62	$70,790	$69,600	$2.621
LIGHT MANUFACTURING	7	1.62	$62,921	$57,349	$0.890
MULTI FAMILY <10 UNITS	78	0.32	$19,014	$78,849	$1.378
MULTI FAMILY >10 UNITS	1	2.41	$40,800	$520,747	$0.389
OFFICE 1 STORY	21	0.46	$70,238	$115,686	$3.516
OFFICE MULTI STORY	2	0.44	$47,438	$116,370	$2.503
PROFESSIONAL BLDG.	1	0.68	$141,750	$351,324	$4.785
RESTAURANTS	6	0.54	$111,157	$156,785	$4.726
SERVICE SHOPS	8	1.02	$129,563	$95,240	$2.909
SHOPPING CENTER REG.	5	0.68	$175,627	$220,278	$5.964

[3] Available at http://www.dft.gov.uk/webtag/documents/expert/unit3.16d.php

Property Type	Count	Average of Acres	Average of Land Value	Average of Building Value	Average Land Value per Sq. Ft.
SINGLE FAMILY RESIDENCE	3,489	0.33	$22,169	$81,919	$1.536
STORES / RES. COMBO	4	1.36	$152,807	$107,002	$2.579
STORES 1 STORY	19	0.79	$203,752	$162,425	$5.901
VACANT COMMERCIAL	51	3.38	$176,651		$1.201
VACANT INSTITUTIONAL	7	2.86	$140,197		$1.125
VACANT RESIDENTIAL	353	1.03	$20,455		$0.455
Grand Total	**4,091**	**0.44**	**$26,301**	**$83,535**	**$1.376**

Source: Lake County Property Appraiser, http://www.lakecopropappr.com

Data on land values were combined with development projections from a 2006 report prepared by Real Estate Research Consultants. These projections are summarized in the table below.

Table 11: Projected Development Attributable to the Project

Land Use	Unit of Measure	Number of Units			
		Phase 1	Phase 2	Phase 3	Total Units
Single Family	Dwelling Units	724	1,123	1,068	**2,915**
Multi Family	Dwelling Units	276	780	0	**1,056**
Hotel	Rooms			300	**300**
Retail	Sq. Ft.	25,000	250,000	335,000	**610,000**
Office	Sq. Ft.	25,000	400,000	425,000	**850,000**
Industrial	Sq. Ft.	10,000	700,000	690,000	**1,400,000**

Source: Real Estate Research Consultant, Fiscal Impact Analysis Hills of Minneola DRI, August 8, 2006, based on Hills of Minneola Master Development Plan

The land area used for residential development in the Build scenario was derived from the number of dwelling units and the following assumptions (derived from Lake County Property Appraiser data): 14,430 sq. ft. per dwelling unit for Single Family properties and 2,760 sq. ft. per dwelling unit for Multi Family.

Benefit Estimates

As can be seen in the table below, the overall increase in the value (and productivity) of the land (note that the estimates do not reflect any additional building value) amounts to $74.2 million, in dollars of 2012, before discounting.

Table 12: Estimates of Net Economic Value of Land Development

	Total Square Footage of Land Developed	Land Assessed Value in No Build ($/sq. ft.)	Land Assessed Value in Build ($/sq. ft.)	Overall Increase in Land Value	Phase 1	Phase 2	Phase 3
Single Family	42,067,000	$0.035	$1.536	$63.2	$15.7	$24.3	$23.1
Multifamily	2,914,000	$0.035	$1.378	$3.9	$1.0	$2.9	$0.0
Hotel	27,000	$0.035	$2.621	$0.1	$0.0	$0.0	$0.1
Retail	610,000	$0.035	$5.431	$3.3	$0.1	$1.3	$1.8
Office	850,000	$0.035	$3.010	$2.5	$0.1	$1.2	$1.3
Industrial	1,400,000	$0.035	$0.890	$1.2	$0.0	$0.6	$0.6
Total Residential		**$1.6**	**$68.6**	**$67.1**	**$16.7**	**$27.2**	**$23.1**
Total Commercial		**$0.1**	**$7.2**	**$7.1**	**$0.2**	**$3.1**	**$3.7**
Grand Total		**$1.7**	**$75.8**	**$74.2**	**$16.9**	**$30.4**	**$26.9**

In the estimation of total benefits and costs, the uplifts were treated as a one-time increase or "benefit" occurring in any of the three phases[4].

Table 13: Estimates of Livability Benefits

	Undiscounted Benefits (Millions of $2012)	Discounted at 7% (Millions of $2012)	Discounted at 3% (Millions of $2012)
Net Economic Value of Land Development for Residential Purpose	$67.1	$33.5	$49.1
Net Economic Value of Land Development for Commercial or Industrial Purpose	$7.1	$3.1	$4.9
Total Net Economic Value of Land Development	**$74.2**	**$36.6**	**$54.0**

7.4 Environmental Sustainability

The proposed project would contribute to environmental sustainability through changes in auto and truck emissions.

Methodology

Changes in emission volumes between the Base Case and Build Scenario depend on the change in vehicle use (VMT) and average vehicle speed.

Estimates of VMT and average vehicle speeds were obtained directly from the Travel Demand Model output. The emission rates (tons of pollutants per VMT) were derived from the Environmental Protection Agency's Motor Vehicle Emission Simulator (MOVES). Average emission rates for the State of Florida were used.

Assumptions

The assumptions used in the monetization of changes in emission volumes are summarized in the table below.

Table 14: Assumptions used in the Estimation of Emission Benefits

Pollutant	Emission Cost (Dollars of 2012)	Source
Carbon Monoxide (CO)	Negligible	Corporate Average Fuel Economy for MY2012-MY2016 Passenger Cars and Light Trucks (March 2010), page 403, Table VIII-8, "Economic Values for Benefits Computations (2007 Dollars)"
Volatile Organic Compounds (VOC)	$1,440	
Nitrogen Oxides (NOx)	$5,870	
Fine Particulate Matter (PM2.5)	$321,120	
Sulfur Dioxide (SO2)	$34,330	

[4] The three phases were defined as follows in the original document prepared by Real Estate Research Consultant: Phase 1: 2008-2010; Phase 2: 2011-2015 and Phase 3: 2016-2020. For the purpose of this analysis, they were redefined as follows: Phase 1: 2017-2019; Phase 2: 2020-2024 and Phase 3: 2025-2029.

Pollutant	Emission Cost (Dollars of 2012)	Source
Carbon Dioxide CO_2	$23.7[5]	Interagency Working Group on the Social Cost of Carbon (IWGSCC) for Regulatory Impact Analysis Under Executive Order 12866

Benefit Estimates

The table below provides estimates of the monetized emission cost savings. As can be seen, the project is estimated to save $2.8 million in emission costs (discounted at a 7 percent discount rate) and $3.1 million (3% discount) over the period of analysis.

Table 15: Emission Cost Savings

	Undiscounted Benefits (Millions of $2012)	Discounted at 7% (Millions of $2012)	Discounted at 3% (Millions of $2012)
Emission Cost Savings	$4.6	$2.8	$3.1

Estimates of changes in total emission volumes (estimated over the period of analysis) can be found in the table below.

Table 16: Reductions in the Volume of Emissions

Pollutant	Total Reduction in Emission Volumes (in long tons)*
Volatile Organic Compounds (VOC)	-13.0
Carbon Monoxide (CO)	-2,570.6
Nitrogen Oxides (NOX)	-21.2
Particulate Matter (PM)	4.0
Carbon Dioxide (CO2)	100,583.3

** A negative value represents an increase in emissions; all estimates are in long tons except CO2 in metric tons*

7.5 Safety

The construction of the project is expected to provide additional accommodations for heavy truck traffic and relief to the area's arterials (SR 50 and US 27). Through traffic shifts, the project would result in safer passage for road users in the study area.

Due to data limitations, however, these potential safety benefits could not be estimated. Rather, the change in the number of accidents was estimated from projected changes in total Vehicle Miles Traveled in combination with historical accident rates for the region (District 5 of the Florida DOT).

Methodology

As stated above, changes in accident costs were calculated from historical crash data and projected changes in VMT.

[5] The social cost of carbon was grown over time using the recommendations laid out in the IWGSCC report (2.1%, in 2010-2020; 2.2%, in 2020-2030; 1.8%, in 2030-2040; and 1.4%, in 2040-2050).

Assumptions

The assumptions used in the monetization of safety benefits are summarized in the table below.

Table 17: Accident Cost Assumptions

	Accident Costs (Dollars of 2012)	Source
Fatal Accident Cost (K)	$9,100,000	US DOT, Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses (2013)
Severe Injury Accident Cost (A)	$435,208	
Moderate Injury Accident Cost (B)	$118,537	
Minor Injury Accident Cost (C)	$60,529	
Severity Unknown	$164,965	
Property Damage Only Accident Cost	$3,376	
Annual Increase in Real Accident Costs	+1.07%	

The accident rates used in estimating the number of accidents by severity level are shown below.

Table 18: 2006-2010 Crash Rates per Million Vehicle Miles Traveled, Urban Areas in District 5

	Per Million VMT	Source
Fatalities (K)	0.015201	Florida Department of Transportation
Severe Injury Accidents (A)	0.084234	
Moderate Injury Accidents (B)	0.273074	
Minor Injury Accidents (C)	0.324267	
Property Damage Only Accidents	0.540081	

Benefit Estimates

Over the period of analysis, the project is expected to result in $37.6 million in additional accident costs (7% discount rate).

Table 19: Accident Cost Savings

	Undiscounted Benefits (Millions of $2012)	Discounted at 7% (Millions of $2012)	Discounted at 3% (Millions of $2012)
Accident Cost Savings	-$87.8	-$37.6	-$59.8

This represents 0.3 additional fatalities, 11.4 additional injuries (of any severity) and 9.0 additional property damage only accidents on average per year.

8. Summary of Findings and BCA Outcomes

The tables below summarize the BCA findings. Annual costs and benefits are computed over the period 2012-2036. As stated earlier, construction is expected to be completed by 2017. Benefits accrue during the full operation of the project.

Table 20: Overall Results of the Benefit Cost Analysis

Category	7% Discount Rate	3% Discount Rate
Total Discounted Benefits ($ millions)	$302.1	$577.6
Total Discounted Costs ($ millions)	$58.9	$67.1
Benefit / Cost Ratio	5.13	8.61
Net Present Value ($ millions)	$243.2	$510.5
Internal Rate of Return (%)	22.9%	

Considering all monetized benefits and costs, the estimated internal rate of return of the project is 22.9 percent.

With a 7 percent real discount rate, the $58.9 million investment would result in $302.1 million in total benefits and a Benefit/Cost ratio of approximately 5.1.

With a 3 percent real discount rate, the Net Present Value of the project would increase to $510.5 million, for a Benefit/Cost ratio of 8.6.

Table 21: Benefit Estimates by Long-Term Outcome, in Millions of Dollars of 2012

Long-Term Outcomes	Benefit Categories	7% Discount Rate	3% Discount Rate
State of Good Repair	Life-Cycle Cost Savings	Not Quantified	Not Quantified
	Residual Value	$1.8	$4.5
Economic Competitiveness	Congestion Relief and Travel Time Savings	$392.1	$741.4
	Vehicle Operating Cost Savings	-$95.7	-$169.1
	Economic Value of Induced Travel	$2.0	$3.5
	Short-Term Employment Impacts	684 job-year equivalents	
Livability	Net Economic Value of Land Development	$36.6	$54.0
	Health Benefits from Use of Non-Motorized Modes	Not Quantified	Not Quantified
Environmental Sustainability	Change in Air Emissions	$2.8	$3.1
Safety	Change in Accident Costs	-$37.6	-$59.8
Total Benefit Estimates		**$302.1**	**$577.6**

9. BCA Sensitivity Analysis

The BCA outcomes presented in the previous sections rely on a large number of assumptions and long-term projections; all of which are subject to considerable uncertainty.

The primary purpose of the sensitivity analysis is to help identify the variables and model parameters whose variations have the greatest impact on the BCA outcomes, i.e., the "critical variables." The sensitivity analysis can also be used to:

- Evaluate the impact of changes in the critical variables, of reasonable departures from their "preferred" values; and
- Assess the robustness of the BCA and evaluate, in particular, whether the conclusions reached under the "preferred" set of input values are significantly altered by reasonable departures from those values.

The outcomes of the quantitative analysis for the **Minneola Area Economic Development Facility** using a 7 percent discount rate are summarized in the table below. The table provides the percentage changes in project NPV associated with variations in variables or parameters (listed in row), as indicated in the column headers.

For example, a 30 percent reduction in the value of time leads to a decrease of $98.0 million in the project NPV. A 20 percent increase in value of time raises the project NPV by $64.6 million.

Table 22: Quantitative Assessment of Sensitivity, Summary

Parameters	Change in Parameter Value	New NPV	Change in NPV	New B/C Ratio
Period of Analysis	30 years of operations (instead of 20 years)	$407.4	$164.2	7.8
Value of Travel Time	Lower Bound of Range Recommended by US DOT	$145.3	-$98.0	3.5
	Upper Bound of Range Recommended by US DOT	$307.9	$64.6	6.2
Value of Statistical Life	Lower Bound of Range Recommended by US DOT ($5.2 million)	$259.2	$16.0	5.4
	Upper Bound of Range Recommended by US DOT ($12.9 million)	$227.7	-$15.6	4.9
Capital Cost Estimate	20% Increase	$232.2	-$11.0	4.3

10. Supplementary Data Tables

This section provides intermediate output variables and calculations to facilitate US DOT's review of this Benefit-Cost Analysis.

Additional information can be provided upon request.

Table 23: Benefit-Cost Analysis Results by Calendar Year

Calendar Year	Project Year	Total Benefits in 2012 Dollars	Total Costs in 2012 Dollars	Undiscounted Net Benefits	Discounted Net Benefit at 7%	Discounted Net Benefit at 3%
2012	1	$0	$0	$0	$0	$0
2013	2	$0	$12,595,000	-$12,595,000	-$11,771,028	-$12,228,155
2014	3	$0	$11,897,598	-$11,897,598	-$10,391,822	-$11,214,627
2015	4	$0	$34,442,793	-$34,442,793	-$28,115,578	-$31,520,034
2016	5	$0	$6,250,000	-$6,250,000	-$4,768,095	-$5,553,044
2017 (Opening)	6	$7,089,472	$358,000	$6,731,472	$4,786,638	$5,806,626
2018	7	$9,600,882	$370,081	$9,230,800	$6,195,957	$7,730,650
2019	8	$11,894,527	$382,747	$11,511,780	$7,203,222	$9,360,131
2020	9	$15,062,374	$396,024	$14,666,350	$8,554,768	$11,577,752
2021	10	$18,036,426	$409,943	$17,626,483	$9,613,601	$13,509,231
2022	11	$21,597,782	$424,534	$21,173,248	$10,797,355	$15,754,885
2023	12	$25,972,020	$439,831	$25,532,189	$12,173,089	$18,444,997
2024	13	$30,098,324	$455,867	$29,642,458	$13,214,185	$20,790,623
2025	14	$34,565,510	$472,677	$34,092,833	$14,210,595	$23,215,560
2026	15	$39,801,544	$490,301	$39,311,244	$15,320,118	$25,989,363
2027	16	$45,595,738	$508,775	$45,086,962	$16,505,456	$28,939,605
2028	17	$51,439,000	$528,143	$50,910,857	$17,245,386	$31,725,963
2029	18	$58,166,233	$548,447	$57,617,787	$18,249,040	$34,859,709
2030	19	$60,088,622	$569,731	$59,518,891	$17,627,666	$34,961,076
2031	20	$68,387,078	$592,045	$67,795,033	$18,774,298	$38,662,560
2032	21	$76,892,151	$615,436	$76,276,714	$19,750,850	$42,232,567
2033	22	$86,149,110	$639,958	$85,509,151	$20,702,790	$45,965,382
2034	23	$96,378,586	$665,666	$95,712,921	$21,667,497	$49,951,856
2035	24	$106,931,181	$692,615	$106,238,566	$22,487,652	$53,830,205
2036	25	$117,990,111	$720,867	$117,269,244	$23,197,395	$57,688,697
Total		**$981,736,671**	**$75,467,077**	**$906,269,593**	**$243,231,034**	**$510,481,579**

Table 24: Summary of Travel Demand Projections by Calendar Year

Calendar Year	Project Year	Daily VMT in No-Build	Daily VMT in Build	Daily VHT in No-Build	Daily VHT in Build	Average Vehicle Speed in No-Build (MPH)	Average Vehicle Speed in Build (MPH)
2012	1	0	0	0	0	0.0	0.0
2013	2	0	0	0	0	0.0	0.0
2014	3	0	0	0	0	0.0	0.0
2015	4	0	0	0	0	0.0	0.0
2016	5	0	0	0	0	0.0	0.0
2017 (Opening)	6	3,127,860	3,127,860	61,293	61,293	51.0	51.0
2018	7	3,187,150	3,208,906	63,173	62,647	50.5	51.2
2019	8	3,247,565	3,292,052	65,111	64,031	49.9	51.4
2020	9	3,309,125	3,377,352	67,109	65,446	49.3	51.6
2021	10	3,371,852	3,464,863	69,167	66,891	48.7	51.8
2022	11	3,435,768	3,525,190	71,289	68,377	48.2	51.6
2023	12	3,500,896	3,586,568	73,476	69,895	47.6	51.3
2024	13	3,567,258	3,649,015	75,730	71,448	47.1	51.1
2025	14	3,634,878	3,712,549	78,053	73,034	46.6	50.8
2026	15	3,703,780	3,777,189	80,448	74,656	46.0	50.6
2027	16	3,773,988	3,842,954	82,916	76,314	45.5	50.4
2028	17	3,845,527	3,909,865	85,459	78,009	45.0	50.1
2029	18	3,918,421	3,977,940	88,081	79,742	44.5	49.9
2030	19	3,992,698	4,047,201	90,783	81,512	44.0	49.7
2031	20	4,068,383	4,117,668	93,568	83,323	43.5	49.4
2032	21	4,145,502	4,189,361	96,438	85,173	43.0	49.2
2033	22	4,224,083	4,262,303	99,396	87,065	42.5	49.0
2034	23	4,304,154	4,336,515	102,445	88,998	42.0	48.7
2035	24	4,385,742	4,412,019	105,588	90,975	41.5	48.5
2036	25	4,468,877	4,488,838	108,827	92,995	41.1	48.3
Total		**75,213,506**	**76,306,205**	**1,658,351**	**1,521,825**	**45.4**	**50.1**

Table 25: Summary of Project Benefits by Calendar Year and Benefit Category, Non-Discounted

Calendar Year	Project Year	Travel Time Benefits	Vehicle Operating Cost Savings	Value of Induced Travel	Net Economic Value of Land Development	Safety Benefits	Emission Cost Savings	Residual Value
2012	1	$0	$0	$0	$0	$0	$0	$0
2013	2	$0	$0	$0	$0	$0	$0	$0
2014	3	$0	$0	$0	$0	$0	$0	$0
2015	4	$0	$0	$0	$0	$0	$0	$0
2016	5	$0	$0	$0	$0	$0	$0	$0
2017 (Opening)	6	$5,552,666	-$2,410,828	$10,723	$5,641,805	-$1,574,306	-$130,590	$0
2018	7	$11,541,610	-$4,896,369	$45,515	$5,641,805	-$3,253,431	$521,753	$0
2019	8	$17,992,884	-$7,184,625	$111,421	$5,641,805	-$5,042,634	$375,675	$0
2020	9	$24,933,944	-$9,438,417	$213,718	$6,071,326	-$6,947,408	$229,210	$0
2021	10	$28,911,097	-$10,674,181	$237,324	$6,071,326	-$6,750,311	$241,170	$0
2022	11	$33,188,277	-$11,650,576	$263,531	$6,071,326	-$6,535,952	$261,175	$0
2023	12	$37,784,150	-$12,155,611	$293,686	$6,071,326	-$6,303,492	$281,960	$0
2024	13	$42,718,441	-$13,256,517	$314,773	$6,071,326	-$6,052,061	$302,362	$0
2025	14	$48,011,996	-$13,710,309	$339,929	$5,373,809	-$5,780,754	$330,840	$0
2026	15	$53,686,838	-$14,488,220	$358,160	$5,373,809	-$5,488,629	$359,586	$0
2027	16	$59,766,236	-$15,435,012	$370,844	$5,373,809	-$5,174,703	$694,563	$0
2028	17	$66,274,765	-$15,734,079	$383,843	$5,373,809	-$4,837,958	-$21,380	$0
2029	18	$73,238,381	-$16,366,829	$388,166	$5,373,809	-$4,477,333	$10,038	$0
2030	19	$80,684,496	-$16,933,630	$386,144	$0	-$4,091,723	$43,336	$0
2031	20	$88,642,049	-$17,033,660	$378,808	$0	-$3,679,983	$79,865	$0
2032	21	$97,141,595	-$17,487,869	$360,359	$0	-$3,240,919	$118,984	$0
2033	22	$106,215,389	-$17,785,521	$332,436	$0	-$2,773,291	$160,096	$0
2034	23	$115,897,475	-$17,742,446	$294,045	$0	-$2,275,810	$205,321	$0
2035	24	$126,223,782	-$18,039,802	$241,605	$0	-$1,747,135	$252,732	$0
2036	25	$128,243,362	-$18,039,802	$246,116	$0	-$1,765,713	$256,148	$9,050,000
Total		**$1,246,649,433**	**-$270,464,303**	**$5,571,146**	**$74,151,094**	**-$87,793,546**	**$4,572,846**	**$9,050,000**