

## Grayling Region I-75 Access Project

TIGER Grant Application

Benefit Summary Matrix

Current Status/Baseline & Problem to be Addressed	Changes to Baseline	Type of Impact/Benefit	Population Affected by Impact/Benefit	Economic Benefit	Summary of Results	Page Reference in BCA
Half interchange. Access between North Down River Road and I-75 only to/from north.	Full access interchange. Add access to/from south.	Reduced driving distance and associated reduced time and emissions.	Motorists traveling between north/east portions of Grayling region and areas to the south	Monetized value of reduced vehicle operating costs, travel times, and emissions.	\$35,958,820  28,885 tons of carbon	Tab 4,5
Accidents due to current road conditions and delay in emergency response due to half interchange.	Safer roadways and improved access to accidents.	Reduced number and severity of accidents.	Number of accidents provided by Grayling Transportation Study.	Monetized value of reduced accidents, injuries, and severity of injuries.	\$14,584,050	Tab 6
Half interchange requires patients bound for emergency room from south to drive through city streets.	Full access interchange. Faster access to hospital from south.	Reduced severity/acuity of ER patients' conditions.	Number of ER visits per origin provided by Mercy Hospital Grayling.	Monetized value of reduced severity/acuity for most severe patients.	\$137,883,718	Tab 7

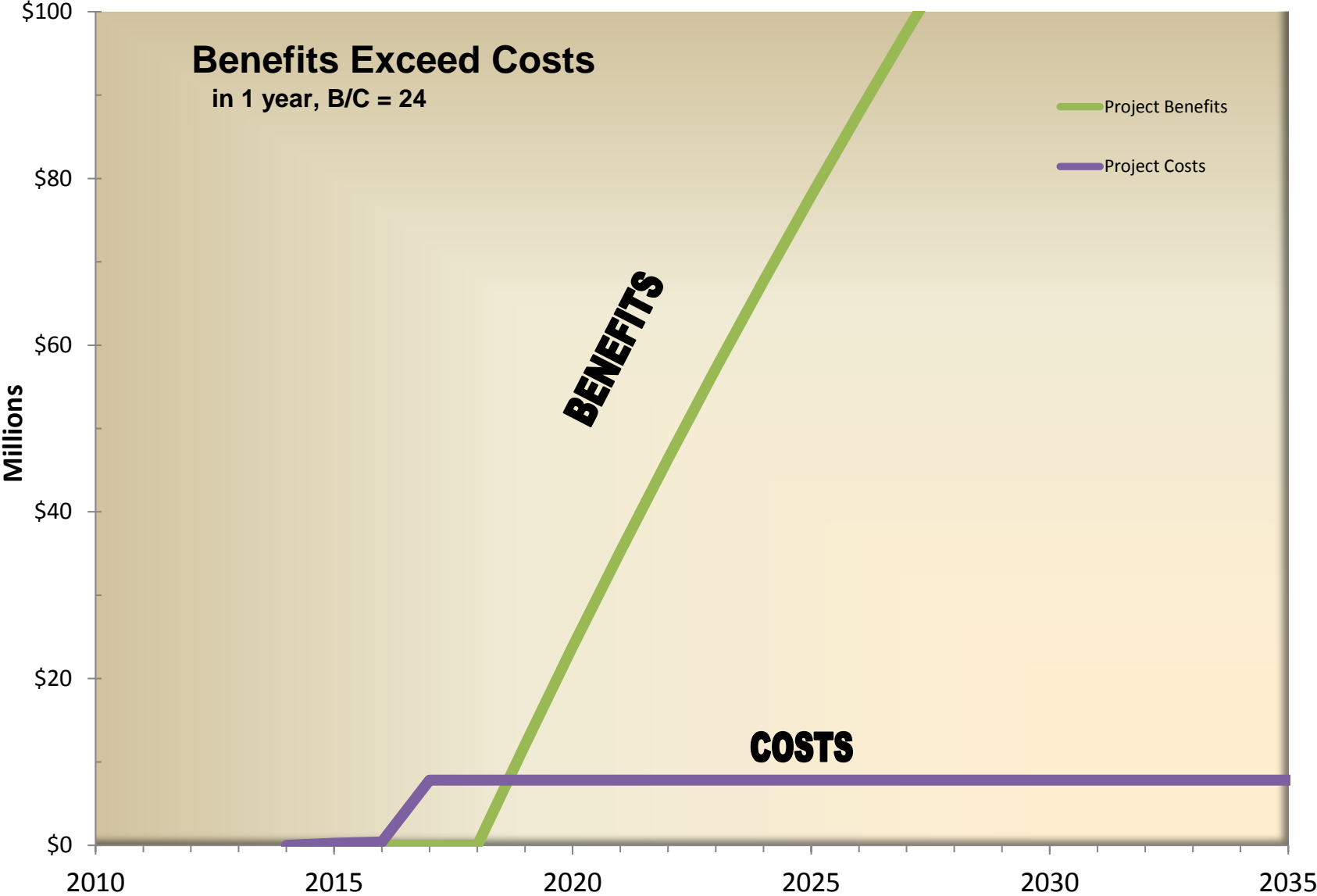
Note:

Present value of benefits over 20 years at 3% discount rate.

**Grayling Region I-75 Access Project**  
**TIGER Grant Application**  
**Summary of Benefits & Costs**

Year	Present Value of Benefits					Costs			
	Distance/Time Reduced by		Emergency Room Travel Time	Total PV Benefits	Cumulative Total PV Benefits	Cost	Present Value (3% Discount Rate)	Cumulative PV of Costs (3%)	Present Value (7% Discount Rate)
	NDRR Interchange	Emergency Response							
2014	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
2015	\$0	\$0	\$0	\$0	\$0	\$246,161	\$238,991	\$230,057	
2016	\$0	\$0	\$0	\$0	\$0	\$176,161	\$166,049	\$153,866	
2017	\$0	\$0	\$0	\$0	\$0	\$8,103,413	\$7,415,771	\$6,614,799	
2018	\$0	\$0	\$0	\$0	\$0	\$0	\$7,820,811	\$0	
2019	\$2,125,149	\$951,725	\$8,998,011	\$12,074,886	\$12,074,886	\$0	\$7,820,811	\$0	
2020	\$2,086,801	\$924,005	\$8,735,933	\$11,746,740	\$23,821,625	\$0	\$7,820,811	\$0	
2021	\$2,049,145	\$897,093	\$8,481,489	\$11,427,726	\$35,249,352	\$0	\$7,820,811	\$0	
2022	\$2,012,401	\$870,964	\$8,234,455	\$11,117,819	\$46,367,171	\$0	\$7,820,811	\$0	
2023	\$1,976,201	\$845,596	\$7,994,617	\$10,816,413	\$57,183,584	\$0	\$7,820,811	\$0	
2024	\$1,940,764	\$820,967	\$7,761,764	\$10,523,494	\$67,707,078	\$0	\$7,820,811	\$0	
2025	\$1,905,852	\$797,055	\$7,535,693	\$10,238,600	\$77,945,678	\$0	\$7,820,811	\$0	
2026	\$1,871,676	\$773,840	\$7,316,207	\$9,961,722	\$87,907,400	\$0	\$7,820,811	\$0	
2027	\$1,838,006	\$751,301	\$7,103,113	\$9,692,420	\$97,599,820	\$0	\$7,820,811	\$0	
2028	\$1,805,046	\$729,418	\$6,896,226	\$9,430,691	\$107,030,511	\$0	\$7,820,811	\$0	
2029	\$1,772,360	\$708,173	\$6,695,365	\$9,175,899	\$116,206,410	\$0	\$7,820,811	\$0	
2030	\$1,740,266	\$687,547	\$6,500,355	\$8,928,168	\$125,134,577	\$0	\$7,820,811	\$0	
2031	\$1,708,851	\$667,521	\$6,311,024	\$8,687,396	\$133,821,973	\$0	\$7,820,811	\$0	
2032	\$1,677,907	\$648,079	\$6,127,208	\$8,453,193	\$142,275,167	\$0	\$7,820,811	\$0	
2033	\$1,647,617	\$629,203	\$5,948,746	\$8,225,565	\$150,500,731	\$0	\$7,820,811	\$0	
2034	\$1,617,781	\$610,876	\$5,775,481	\$8,004,138	\$158,504,870	\$0	\$7,820,811	\$0	
2035	\$1,588,576	\$593,084	\$5,607,263	\$7,788,923	\$166,293,792	\$0	\$7,820,811	\$0	
2036	\$1,559,808	\$575,810	\$5,443,945	\$7,579,563	\$173,873,355	\$0	\$7,820,811	\$0	
2037	\$1,531,035	\$559,038	\$5,285,383	\$7,375,457	\$181,248,812	\$0	\$7,820,811	\$0	
2038	<u>\$1,503,580</u>	<u>\$542,756</u>	<u>\$5,131,440</u>	<u>\$7,177,776</u>	\$188,426,588	<u>\$0</u>	<u>\$0</u>	<u>\$7,820,811</u>	
2038	\$35,958,820	\$14,584,050	\$137,883,718	<b>\$188,426,588</b>		\$8,525,735	<b>\$7,820,811</b>	<b>\$6,998,722</b>	
<b>Benefit</b>					=	<b>\$188,426,588</b>	=	<b>24.1</b>	
<b>Cost</b>						<b>\$7,820,811</b>			

**Grayling Region I-75 Access Project**  
TIGER Grant Application



# Grayling Region I-75 Access Project

## TIGER Grant Application

### Summary of Emissions Benefits

Year	Distance Reduced by NDRR Interchange	
	Metric Tons	Value
2014	0	\$0
2015	0	\$0
2016	0	\$0
2017	0	\$0
2018	0	\$0
2019	1,298	\$35,952
2020	1,312	\$37,070
2021	1,327	\$38,209
2022	1,342	\$39,662
2023	1,357	\$40,994
2024	1,372	\$42,502
2025	1,387	\$43,885
2026	1,402	\$45,448
2027	1,418	\$46,885
2028	1,434	\$48,506
2029	1,450	\$49,991
2030	1,466	\$51,504
2031	1,482	\$53,206
2032	1,498	\$54,775
2033	1,514	\$56,538
2034	1,531	\$58,166
2035	1,548	\$59,992
2036	1,565	\$61,680
2037	1,582	\$62,359
2038	<u>1,600</u>	<u>\$64,644</u>
	<b>28,885</b>	<b>\$991,970</b>

**Grayling Region I-75 Access Project**  
**TIGER Grant Application**  
**Distance/Time Benefit due to New Full Access Interchange**

Year	SB	AADT NB	Total	Miles Saved per Year	Operating Cost Savings	Time Saved (vehicle-hours/year)	Value of Time Saved	Reduced Carbon Emissions (metric ton)	Societal Cost of Carbon (\$/Ton)	Value of Reduced Carbon Emissions	Total Distance/Time Benefit	Present Value (3% Discount Rate)	Present Value (7% Discount Rate)
2014	0	0	0	0	\$0	0	\$0	0	\$24.9610	\$0	\$0	\$0	\$0
2015	0	0	0	0	\$0	0	\$0	0	\$25.5084	\$0	\$0	\$0	\$0
2016	0	0	0	0	\$0	0	\$0	0	\$26.0558	\$0	\$0	\$0	\$0
2017	0	0	0	0	\$0	0	\$0	0	\$26.6032	\$0	\$0	\$0	\$0
2018	0	0	0	0	\$0	0	\$0	0	\$27.1506	\$0	\$0	\$0	\$0
2019	1348	700	2048	2,376,727	\$683,071	89,688	\$1,744,607	1,298	\$27.6980	\$35,952	\$2,463,630	\$2,125,149	\$1,756,534
2020	1363	708	2070	2,403,161	\$690,669	90,685	\$1,764,011	1,312	\$28.2454	\$37,070	\$2,491,750	\$2,086,801	\$1,660,358
2021	1378	716	2093	2,429,890	\$698,350	91,694	\$1,783,631	1,327	\$28.7928	\$38,209	\$2,520,190	\$2,049,145	\$1,569,448
2022	1393	724	2117	2,456,916	\$706,118	92,714	\$1,803,469	1,342	\$29.5591	\$39,662	\$2,549,249	\$2,012,401	\$1,483,686
2023	1408	732	2140	2,484,243	\$713,971	93,745	\$1,823,528	1,357	\$30.2160	\$40,994	\$2,578,494	\$1,976,201	\$1,402,530
2024	1424	740	2164	2,511,873	\$721,912	94,788	\$1,843,810	1,372	\$30.9823	\$42,502	\$2,608,224	\$1,940,764	\$1,325,889
2025	1440	748	2188	2,539,811	\$729,942	95,842	\$1,864,317	1,387	\$31.6392	\$43,885	\$2,638,145	\$1,905,852	\$1,253,363
2026	1456	757	2213	2,568,060	\$738,060	96,908	\$1,885,053	1,402	\$32.4055	\$45,448	\$2,668,562	\$1,871,676	\$1,184,873
2027	1472	765	2237	2,596,623	\$746,269	97,986	\$1,906,019	1,418	\$33.0624	\$46,885	\$2,699,174	\$1,838,006	\$1,120,061
2028	1489	773	2262	2,625,503	\$754,570	99,076	\$1,927,219	1,434	\$33.8288	\$48,506	\$2,730,294	\$1,805,046	\$1,058,855
2029	1505	782	2287	2,654,384	\$762,870	100,165	\$1,948,418	1,450	\$34.4856	\$49,991	\$2,761,279	\$1,772,360	\$1,000,815
2030	1521	791	2312	2,683,582	\$771,262	101,267	\$1,969,851	1,466	\$35.1425	\$51,504	\$2,792,616	\$1,740,266	\$945,956
2031	1538	799	2337	2,713,102	\$779,745	102,381	\$1,991,519	1,482	\$35.9088	\$53,206	\$2,824,470	\$1,708,851	\$894,155
2032	1555	808	2363	2,742,946	\$788,323	103,507	\$2,013,426	1,498	\$36.5657	\$54,775	\$2,856,524	\$1,677,907	\$845,142
2033	1572	817	2389	2,773,118	\$796,994	104,646	\$2,035,573	1,514	\$37.3321	\$56,538	\$2,889,106	\$1,647,617	\$798,862
2034	1590	826	2415	2,803,622	\$805,761	105,797	\$2,057,965	1,531	\$37.9889	\$58,166	\$2,921,892	\$1,617,781	\$755,072
2035	1607	835	2442	2,834,462	\$814,624	106,961	\$2,080,602	1,548	\$38.7553	\$59,992	\$2,955,219	\$1,588,576	\$713,724
2036	1625	844	2469	2,865,641	\$823,585	108,137	\$2,103,489	1,565	\$39.4122	\$61,680	\$2,988,754	\$1,559,808	\$674,601
2037	1643	853	2496	2,897,163	\$832,645	109,327	\$2,126,627	1,582	\$39.4122	\$62,359	\$3,021,631	\$1,531,035	\$637,404
2038	1661	863	2524	2,929,032	\$841,804	110,530	\$2,150,020	<u>1,600</u>	\$40.4122	<u>\$64,644</u>	\$3,056,468	<u>\$1,503,580</u>	<u>\$602,572</u>
								<b>28,885</b>		\$991,970		<b>\$35,958,820</b>	<b>\$21,683,901</b>

Notes & Assumptions:

- 6% Commercial/Military
- Automobile operating cost = \$0.264/mile, Commercial operating cost = \$0.654/mile (MinnDOT Report 2003-19); converted to 2013\$
- Miles saved = 3.18 miles/vehicle (Distance from NDRR/I-75 to I-75BL/I-75 via NDRR & I-75 BL)
- Time saved = 0.12 hours/vehicle
- Assume 1.5 people per non-commercial vehicle
- Value of Personal Time = \$12.76/hour (The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations, Sept 2011; converted to 2013\$)
- Value of Business Time = \$24.34/hour (The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations, Sept 2011; converted to 2013\$)
- Carbon Dioxide Emissions = 8.8 kg/gallon gasoline, 10.1 kg/gallon diesel (Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel. EPA420-F-05-001. 2005)
- Societal Cost of Carbon per Technical Support Document: - Societal Cost of Carbon for Regulatory Impact Analysis, Feb. 2010, converted to 2013\$)
- Fuel Efficiency = 18 mpg non-commercial, 7 mpg commercial (MinnDOT Report 2003-19 / www.fhwa.dot.gov/ohim/onh00/onh2p3.htm)
- \*Traffic based on 1.1 annual growth, based on 2027 estimated values.
- 2027 traffic based on Grayling Area Transportation Study (URS, 2008), reduced by 13%, per 2012 supplemental traffic count data.

## Grayling Region I-75 Access Project

### TIGER Grant Application

#### Safety Benefit Due to Decrease in First Responder Emergency Response Time

Year	Number of Injuries with Reduced Severity	Value of Reduced Severity	Present Value (3% Discount Rate)	Present Value (7% Discount Rate)
2014	0	\$0	\$0	\$0
2015	0	\$0	\$0	\$0
2016	0	\$0	\$0	\$0
2017	0	\$0	\$0	\$0
2018	0	\$0	\$0	\$0
2019	2.99	\$1,103,311	\$951,725	\$786,645
2020	2.99	\$1,103,311	\$924,005	\$735,182
2021	2.99	\$1,103,311	\$897,093	\$687,086
2022	2.99	\$1,103,311	\$870,964	\$642,137
2023	2.99	\$1,103,311	\$845,596	\$600,128
2024	2.99	\$1,103,311	\$820,967	\$560,867
2025	2.99	\$1,103,311	\$797,055	\$524,175
2026	2.99	\$1,103,311	\$773,840	\$489,883
2027	2.99	\$1,103,311	\$751,301	\$457,835
2028	2.99	\$1,103,311	\$729,418	\$427,883
2029	2.99	\$1,103,311	\$708,173	\$399,891
2030	2.99	\$1,103,311	\$687,547	\$373,729
2031	2.99	\$1,103,311	\$667,521	\$349,280
2032	2.99	\$1,103,311	\$648,079	\$326,430
2033	2.99	\$1,103,311	\$629,203	\$305,075
2034	2.99	\$1,103,311	\$610,876	\$285,116
2035	2.99	\$1,103,311	\$593,084	\$266,464
2036	2.99	\$1,103,311	\$575,810	\$249,032
2037	2.99	\$1,103,311	\$559,038	\$232,740
2038	<u>2.99</u>	<u>\$1,103,311</u>	<u>\$542,756</u>	<u>\$217,514</u>
	<b>60</b>	<b>\$21,486,100</b>	<b>\$14,584,050</b>	<b>\$8,917,092</b>

#### Notes & Assumptions:

1. Average injury is Serious (AIS 3); with a value of \$668,557. (*Treatment of the Value of Preventing Fatalities and Injuries in Preparing Economic Analysis*)
2. Response times to incidents will decrease by 5 - 10 minutes, reducing severity of estimated 25% of accidents (remaining after Phase 2) from AIS 3 to /
3. Accident data and LOS estimates per URS, 2008, Grayling Area Transportation Study

## Grayling Region I-75 Access Project

### TIGER Grant Application

#### Safety Benefit Due to Reduced Travel Time to Emergency Room /Reduced Acuity

ER Acuity Level	2011 ER Visits	2011 Visits Affected by Interchange	Approx Equivalent AIS	AIS Unit Value	2011 Values of ER Visits	Future ER Visits Affected by Interchange	Future Values of ER Visits	Benefit
LEVEL 1	43	26.7	-	\$148	\$3,956	26.7	\$3,956	\$0
LEVEL 2	3,679	2281.0	-	\$297	\$676,995	2281.0	\$676,995	\$0
LEVEL 3	5,151	3193.6	1	\$19,102	\$61,005,168	3193.6	\$61,005,168	\$0
LEVEL 4	8,416	5217.9	2	\$299,268	\$1,561,555,439	5246.0	\$1,569,945,831	-\$8,390,392
LEVEL 5	4,522	2803.64	3 - 4	\$668,577	\$1,874,449,220	2775.63	\$1,855,721,309	\$18,727,911
Critical Care	<u>4</u>	<u>2.48</u>	5	\$3,775,868	<u>\$9,364,153</u>	<u>2.46</u>	<u>\$9,270,512</u>	<u>\$93,642</u>
Total:	21,815	13525.3			\$3,507,054,932	13525.3	\$3,496,623,770	<b>\$10,431,161</b>

Year	Value of Reduced Acuity	Present Value (3% Discount Rate)	Present Value (7% Discount Rate)
2014	\$0	\$0	\$0
2015	\$0	\$0	\$0
2016	\$0	\$0	\$0
2017	\$0	\$0	\$0
2018	\$0	\$0	\$0
2019	\$10,431,161	\$8,998,011	\$7,437,274
2020	\$10,431,161	\$8,735,933	\$6,950,723
2021	\$10,431,161	\$8,481,489	\$6,496,003
2022	\$10,431,161	\$8,234,455	\$6,071,031
2023	\$10,431,161	\$7,994,617	\$5,673,861
2024	\$10,431,161	\$7,761,764	\$5,302,673
2025	\$10,431,161	\$7,535,693	\$4,955,770
2026	\$10,431,161	\$7,316,207	\$4,631,560
2027	\$10,431,161	\$7,103,113	\$4,328,561
2028	\$10,431,161	\$6,896,226	\$4,045,384
2029	\$10,431,161	\$6,695,365	\$3,780,733
2030	\$10,431,161	\$6,500,355	\$3,533,395
2031	\$10,431,161	\$6,311,024	\$3,302,239
2032	\$10,431,161	\$6,127,208	\$3,086,204
2033	\$10,431,161	\$5,948,746	\$2,884,303
2034	\$10,431,161	\$5,775,481	\$2,695,610
2035	\$10,431,161	\$5,607,263	\$2,519,262
2036	\$10,431,161	\$5,443,945	\$2,354,450
2037	\$10,431,161	\$5,285,383	\$2,200,421
2038	\$10,431,161	<u>\$5,131,440</u>	<u>\$2,056,468</u>
		<b>\$137,883,718</b>	<b>\$84,305,926</b>

#### Notes & Assumptions:

1. AIS Unit Value of LEVEL 1 assumed based on 4 hours each of personal (\$12.76/hour) and business time (\$24.34)
2. AIS Unit Value of LEVEL 2 assumed based on 8 hours each of personal (\$12.76/hour) and business time (\$24.34)
3. AIS Unit Values per TIGER Benefit-Cost Analysis (BCA) Guide; converted to 2013\$
4. Assume acuity will be decreased by one level for 1% of ER visits LEVEL 5 and up, due to the decrease in travel time to access hospital
5. 2011 emergency room visits data provided by Mercy Hospital Grayling
6. Per hospital data, 62% of ER visits originate from south and are therefore affected by interchange

## Grayling Region I-75 Access Project

### TIGER Grant Application Summary of Job Creation

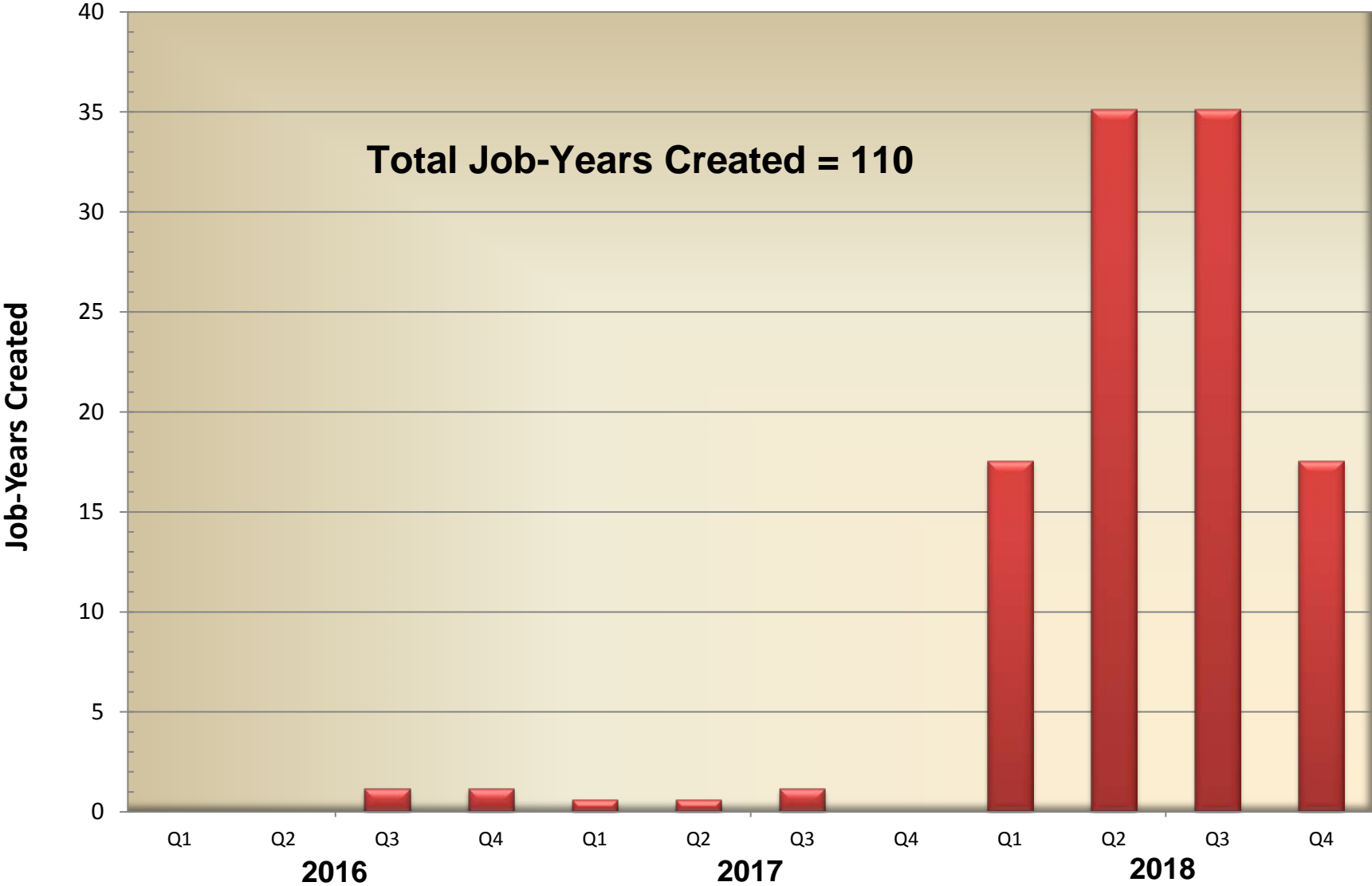
	Year	Quarter	Project Cost	Job-Years
3/31/2016	2016	Q1	\$0	0.0
6/30/2016		Q2	\$0	0.0
9/30/2016		Q3	\$88,081	1.1
12/31/2016		Q4	\$88,081	1.1
3/31/2017	2017	Q1	\$44,040	0.6
6/30/2017		Q2	\$44,040	0.6
9/30/2017		Q3	\$88,081	1.1
12/31/2017		Q4	\$0	0.0
3/31/2018	2018	Q1	\$1,350,569	17.6
6/30/2018		Q2	\$2,701,138	35.1
9/30/2018		Q3	\$2,701,138	35.1
12/31/2018		Q4	<u>\$1,350,569</u>	<u>17.6</u>
			<b>\$8,455,735</b>	<b>110</b>

Based on \$76,923 per job-year, per NOFA. Does not include ROW costs.



# Grayling Region I-75 Access Project

TIGER Grant Application



**Grayling Region I-75 Access Project**  
**TIGER Grant Application**  
**Cost Summary**

			<u>Cost</u>	<u>Duration (Quarters)</u>
ROW:			\$70,000.00	1
Engineering:	Design:	Interchange Ramps & Bridge	\$352,322.30	4
	CE:	Interchange Ramps & Bridge	\$352,322.30	3
		<b>Total:</b>	<b>\$774,644.60</b>	<b>8.0</b>
Construction:		Interchange Ramps:	\$3,045,246.00	3
		Interchange Bridge:	\$4,001,200.00	3
		Contingency	\$704,644.60	
		<b>Total:</b>	<b>\$7,751,090.60</b>	<b>6.0</b>
<b>Total:</b>			<b>\$8,525,735.20</b>	<b>14.0</b>

Quarter	Year	Design/ROW	CE	Interchange Ramps	Interchange Bridge	Total
3/31/2016	Q1					\$0.00
6/30/2016	Q2					\$0.00
9/30/2016	Q3	\$158,080.58				\$158,080.58
12/31/2016	Q4	\$88,080.58				\$88,080.58
3/31/2017	Q1	\$44,040.29				\$44,040.29
6/30/2017	Q2	\$44,040.29				\$44,040.29
9/30/2017	Q3	\$88,080.58				\$88,080.58
12/31/2017	Q4					\$0.00
3/31/2018	Q1		\$58,720.38	\$558,295.10	\$733,553.33	\$1,350,568.82
6/30/2018	Q2		\$117,440.77	\$1,116,590.20	\$1,467,106.67	\$2,701,137.63
9/30/2018	Q3		\$117,440.77	\$1,116,590.20	\$1,467,106.67	\$2,701,137.63
12/31/2018	Q4		\$58,720.38	\$558,295.10	\$733,553.33	\$1,350,568.82
<b>Total:</b>		<b>\$422,322.30</b>	<b>\$352,322.30</b>	<b>\$3,349,770.60</b>	<b>\$4,401,320.00</b>	<b>\$8,525,735.20</b>
		<b>5%</b>	<b>4%</b>	<b>39%</b>	<b>52%</b>	<b>100%</b>