

TREDIS[®] Technical Webinar

Bridge and Pavement Preservation Programs: An Economic Perspective

June 14, 2016

Agenda

- **Demonstration and Discussion**
 - ✓ Adam Winston: Pavement
 - ✓ Kyle Schroeckenthaler: Bridges
- **Questions & Answers**

Pavement Preservation

TREDIS enables the ability to evaluate:

- How efficiently resources are being used within a Preservation Program
- The economic contribution supported by preservation
- Profile of Industries most responsive to improvements in pavement conditions



Example: Current and Future Conditions

- **VMT: 100M (2016); 200M (2045):**
90% Passenger Car, 10% Truck
- **Pavement Conditions (2016):**
Good-50%, Poor-50%
- **Study Region:** Suffolk County, MA
- **Pavement Preservation Program:**
\$750K annually from 2016 to 2045

2045	% Good	% Poor
Base Scenario	30%	70%
Project Scenario	80%	20%

Pavement Condition Rating Scales

Condition Term Categories	PSR Rating		IRI Rating (inches/mile)		Interstate & NHS Ride Quality
	Interstate	Other	Interstate	Other	
Very Good	≥ 4.0	≥ 4.0	< 60	< 60	Acceptable 0 - 170
Good	3.5 - 3.9	3.5 - 3.9	60 - 94	60 - 94	
Fair	3.1 - 3.4	2.6 - 3.4	95 - 119	95 - 170	
Mediocre	2.6 - 3.0	2.1 - 2.5	120 - 170	171 - 220	Less than Acceptable > 170
Poor	≤ 2.5	≤ 2.0	> 170	> 220	

Source: FHWA

Vehicle Operating Costs Increase as Pavement Conditions Deteriorate

Studies with Sources of Values:

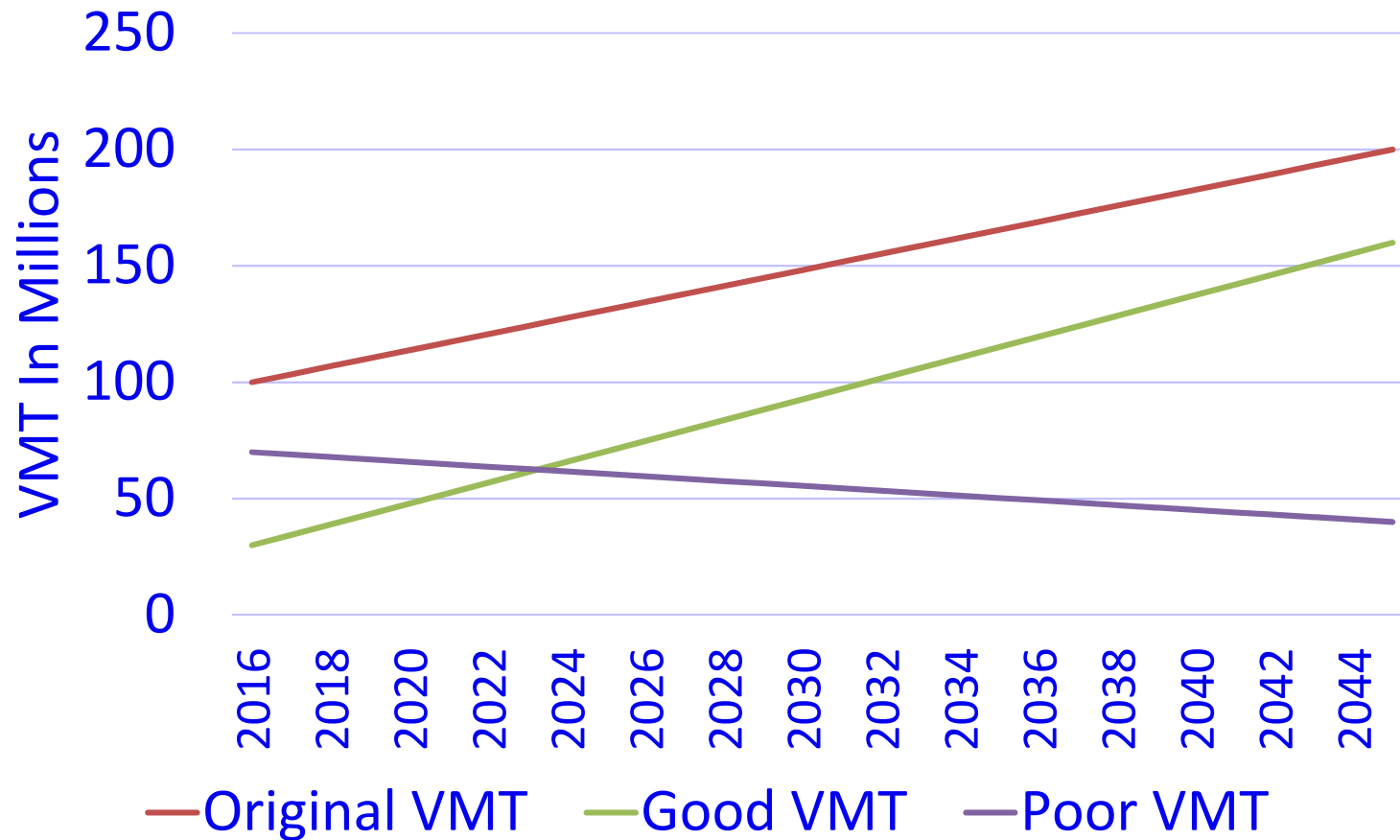
- Gary Barnes, Peter Langworthy (2003). “The Per-mile Costs of Operating Automobiles and Trucks.”
- Papagiannakis and Delwar (2001) . “Computer Model for Life-Cycle Cost Analysis of Roadway Pavements.”
- U.S. DOT: FHWA (1982). “Vehicle operating costs, fuel consumption, and pavement type and conditions factors.”
- U.S. DOT: FHWA (2002): “HERS-ST v.2.0. Highway Economic Requirements System – State Version. Technical Report.”

A 20% increase in Vehicle Operating Costs for Poor Pavement conditions was assumed for this example

Custom Mode Purpose In TREDIS

Mode – Pavement Type	Vehicle Operating Cost (Non-Fuel)
Passenger Car – Good Pavement	\$.14 per Mile
Passenger Car – Poor Pavement	\$.17 per Mile
Truck Freight – Good Pavement	\$.45 per mile
Truck Freight – Poor Pavement	\$.54 per mile

Straight-line Growth Rate

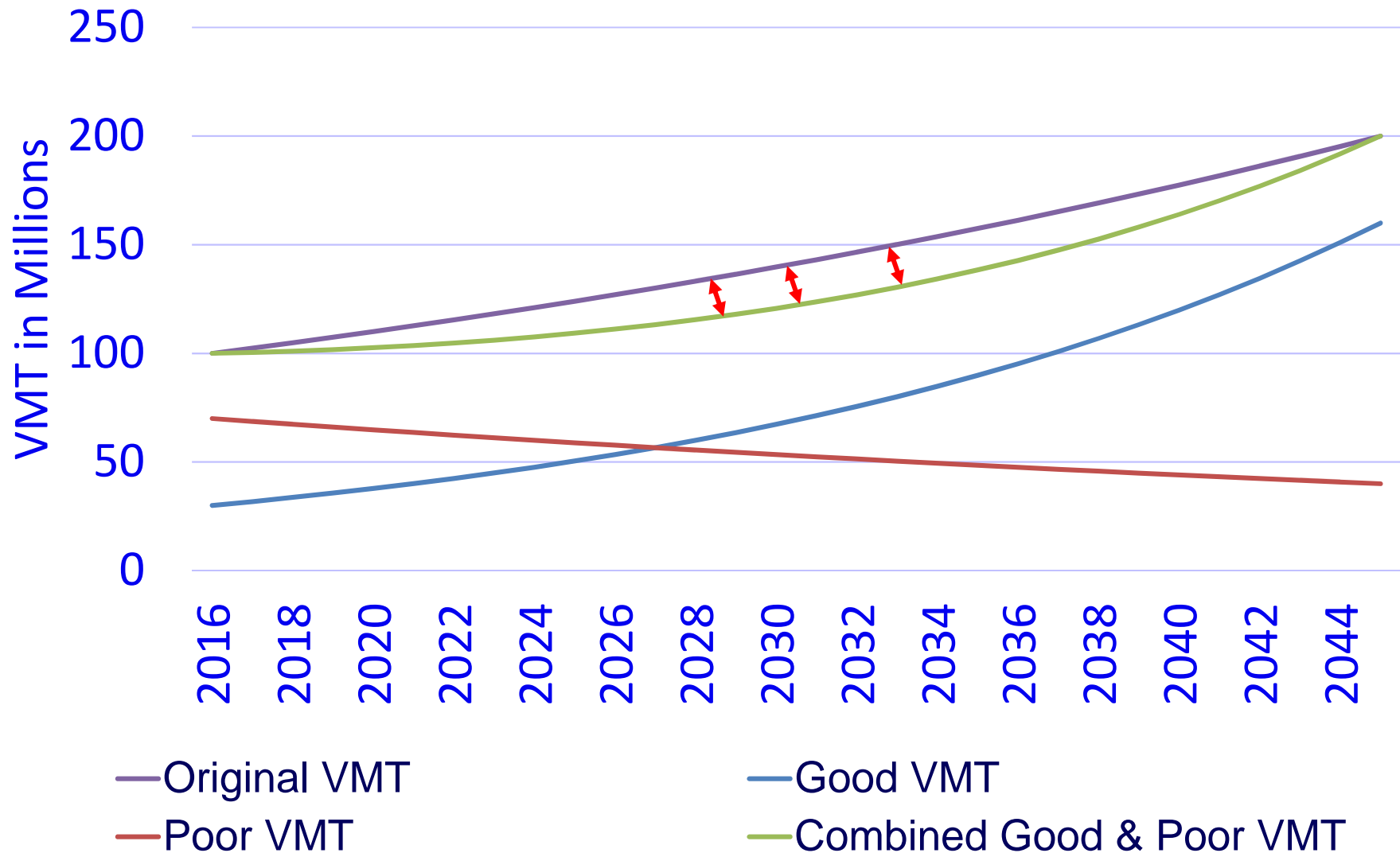


Methodology for Growth Rate

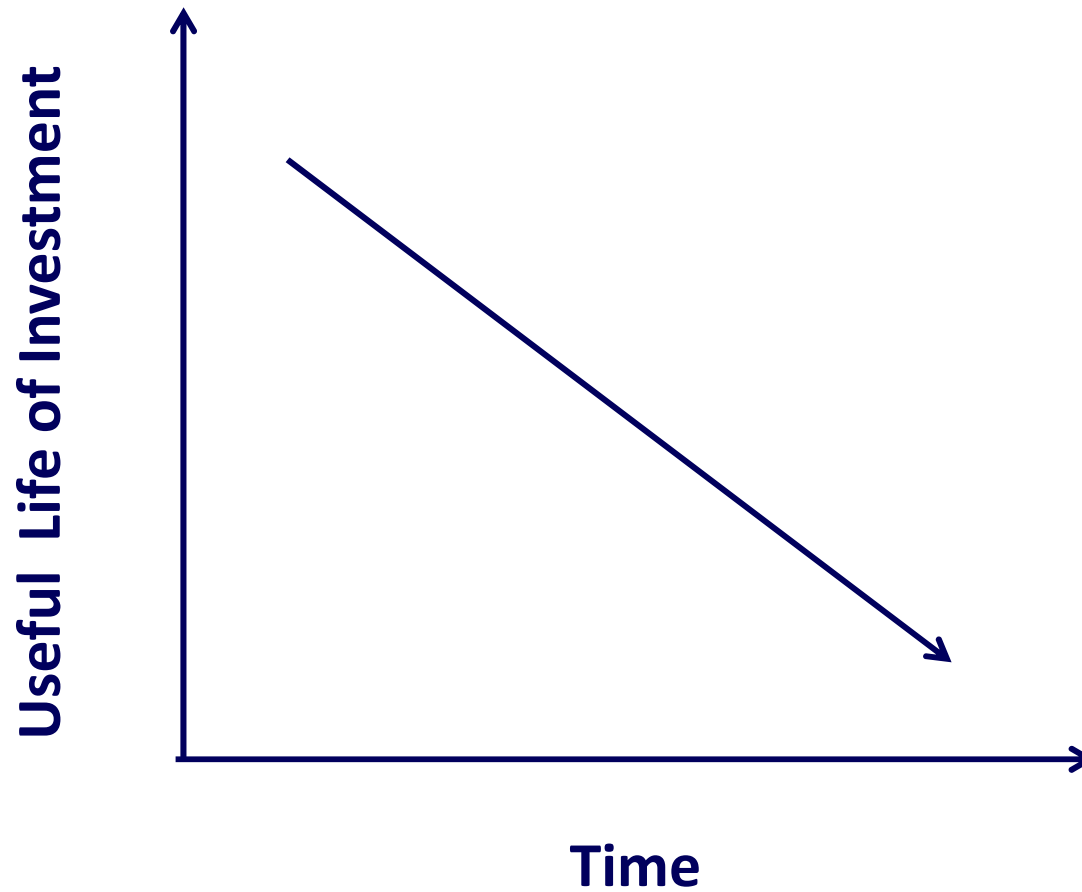
Year	Original VMT	Good VMT	Poor VMT	% Good	% Poor
2016	100	30	70	30%	70%
2045	200	160	40	80%	20%

Year	Original VMT	Good VMT	Poor VMT	Good + Poor VMT	% Diff.
2020	110	38	65	103	-7%
2021	113	40	64	104	-8%
2022	115	42	62	105	-9%
2023	118	45	61	106	-10%
2024	121	48	60	108	-11%
2025	124	50	59	109	-12%

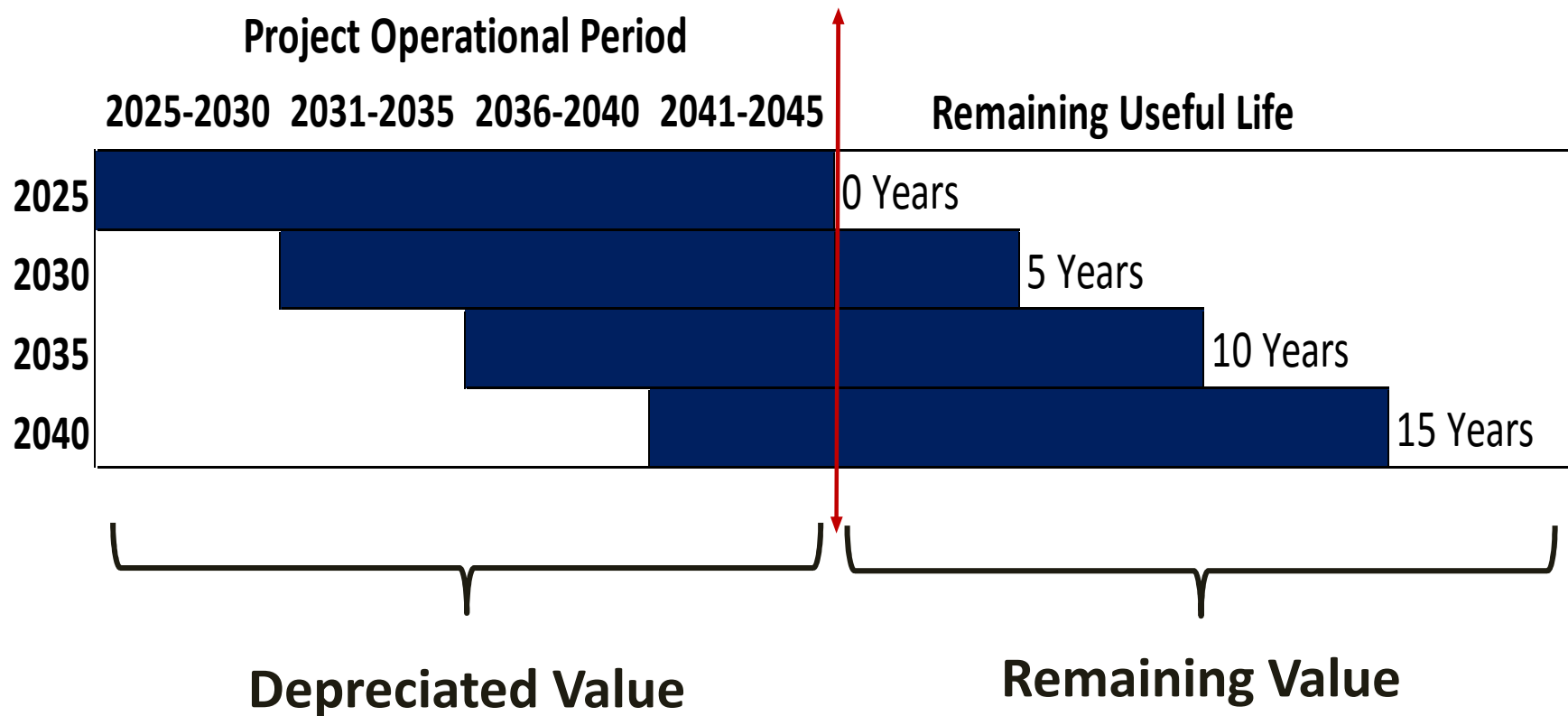
Settings for Analysis: Growth Rate (C.A.G.R.)



Residual Value



Residual Value



Pavement Preservation

Live Demonstration

Summary Results

- Net Present Value: \$10.6M, B/C ratio: 1.9

Economic Contribution:

- \$47M in Output, \$23M in Wages 2016-2045
- 19 Jobs in 2045

Industries most responsive to cost reductions:

- Leisure & Hospitality (35%),
- Professional & Business Services, (24%)
- Retail (24%) & Financial Activities (12%)
- Rest of Others (6%)

Bridge Preservation or Replacement

The Transportation Value of Bridge Programs

- Weight-posting or closing facilities leads to detours of passengers and freight



Methods

- **Baseline volumes, VMT and VHT**
- **Asset management systems provide potential years of posting or closure**
 - Different program funding levels
- **Add detour distances to the baseline**



Data Needs

- AMS rating forecast data that could drive posting or closure decisions (condition, capacity, etc.)
- AADT
- Percent truck or AADTT
- Detour Length



$f(x)$



Stylized Example

- Compare to fully funded program
- Identify diverted VMT and VHT

Bridge	Year Posted	Year Closed	2015	% Truck	Div Dist	Div Speed	Total 2015 DivVMT		Total 2015 DivVHT	
			Ann Vol				Pass	Truck	Pass	Truck
1	2025	2035	123,200	5%	10	45	1,170,400	61,600	26,009	1,369
2	2018	2027	80,000	12%	5	55	352,000	48,000	6,400	873
3	2030	2035	240,000	9%	2.7	65	589,680	58,320	9,072	897
4	2027	2040	41,600	17%	12	55	414,336	84,864	7,533	1,543
5	2030	2040	313,200	2%	1.3	55	399,017	8,143	7,255	148
6	2025	2030	70,450	8%	4.3	55	278,700	24,235	5,067	441
7	2035		172,000	25%	8	40	1,032,000	344,000	25,800	8,600
8	2040		91,000	11%	1.3	45	105,287	13,013	2,340	289
9	2027	2035	53,000	4%	5	65	254,400	10,600	3,914	163
10	2018	2027	410,000	13%	4.3	55	1,533,810	229,190	27,887	4,167

Preparing Inputs

Year	2015 CumDivVMT		2015 CumDivVHT	
	Passenger	Truck	Passenger	Truck
2016	0	0	0	0
2018	0	277,190	0	5,040
2025	0	363,025	0	6,849
2027	1,885,810	458,489	34,287	8,555
2030	2,164,510	524,952	39,355	9,601
2035	4,178,990	868,952	78,349	18,201
2040	4,992,343	881,965	93,138	18,490

Case	Year	Mode-Purpose	Volume	VMT	VHT
Base - MinFund	2016	Truck	651,000	13,020,000	289,333
Base - MinFund	2016	Passenger	12,500,000	150,000,000	3,333,333
Proj -ProgFund	2016	Truck	651,000	13,020,000	289,333
Proj -ProgFund	2016	Passenger	12,500,000	150,000,000	3,333,333
Base - MinFund	2017	Truck	659,463	13,189,260	293,095
Base - MinFund	2017	Passenger	12,625,000	151,500,000	3,366,667
Proj -ProgFund	2017	Truck	659,463	13,189,260	293,095
Proj -ProgFund	2017	Passenger	12,625,000	151,500,000	3,366,667
Base - MinFund	2018	Truck	668,036	13,648,862	302,144
Base - MinFund	2018	Passenger	12,751,250	153,015,000	3,400,333
Proj -ProgFund	2018	Truck	668,036	13,360,720	296,905
Proj -ProgFund	2018	Passenger	12,751,250	153,015,000	3,400,333
Base - MinFund	2019	Truck	676,720	13,826,297	306,072
Base - MinFund	2019	Passenger	12,878,763	154,545,150	3,434,337
Proj -ProgFund	2019	Truck	676,720	13,534,410	300,765
Proj -ProgFund	2019	Passenger	12,878,763	154,545,150	3,434,337

Upload Spreadsheet



Bridge Preservation or Replacement

Live Demonstration

The Value of Maintenance

- **Measures of societal benefit and economic impact**
- **Resource efficiency of preservation programs**
 - 1.15 BCR and \$7M NPV
- **Importance of both the construction activity and savings in time and money**
 - 42 and 42 in this scenario
- **These measures may complement other justifications for preservation programs**

Adding More Detail

- **Posting/closures in both analysis cases**
- **Could add in additional network modeling**
- **Could use facility-specific travel growth rates**
- **Could improve calculation of remaining value**

Learn More about TREDIS at www.tredis.com/webcasts

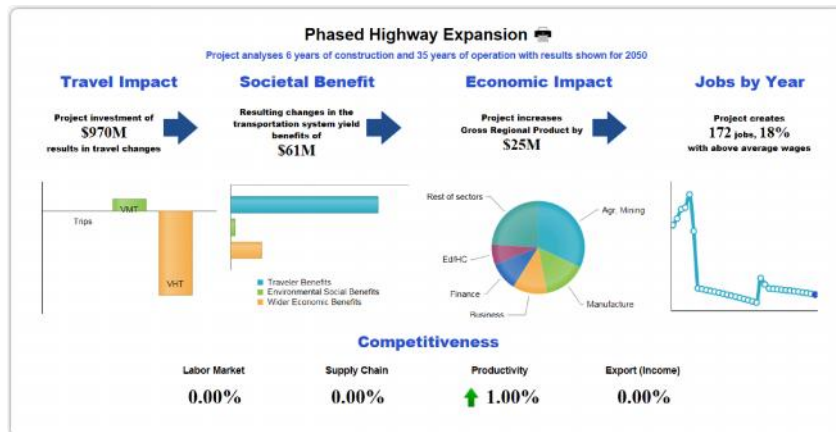
TREDIS® is a **decision support system** that helps tell the economic impact story for your transportation project.



Provides **insights** to help you **make decisions, plan, and communicate** the

- economic impact,
- benefit-cost,
- financial impact, and
- freight implications

of your project or program.





Questions?

For More Information...

TREDIS Software Group
155 Federal Street, Suite 600
Boston, MA 02110
(617) 303-0424

www.tredis.com
info@tredis.com
sales@tredis.com

Free Trial: www.tredis.com/trial