

PM3 Travel Time Performance Measures and Target Setting for TEMPO

November 9, 2017

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Overview

- PM3 reporting requirements
- Mobility monitoring
- NPMRDS speed data
- Setting targets with each PM3 measure
- Target setting process

PM3 Reporting Requirements

- Timing:
 - May 20, 2018 preliminary measures and targets
- Measures:
 - Travel Time Reliability Measure
 - Metric: Level of Travel Time Reliability (LOTTR)
 - Freight Reliability Measure
 - Metric: Level of Truck Travel Time Reliability (TTTR)
 - Annual Hours of Peak Hour Excessive Delay per Capita Measure (over 1 million popns)
 - Metric: Total Peak Hour Excess Delay (PHED)

A Quick Summary Table...

1M then
200k
Population
In 4 yrs

	DOT/MPO Input (excl. Targets)	Metric	Measure	Volume Component	Occupancy Factor
LOTTR-IH	Avg Occupancy AADT	P80/P50	% Reliable PMT (4 time periods)	Yes	Yes
LOTTR-Non-IH	Avg Occupancy AADT	P80/P50	% Reliable PMT (4 time periods)	Yes	Yes
TTTR-IH	None	P95/P50	Length-Weighted (5 time periods)	No	No
Peak Hour Excess Delay	-Speed Limit -8 Hours of Peak Periods -Avg Occupancy -Hourly Volume Estimate -Urban Area	Annual Hours of Peak Hour Excessive Delay	Annual Hours per Capita During Peak	Yes	Volume Weighted Average Occupancy Factor (cars,buses, trucks)

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What
should we
do with
these?

1. Get them in! (Box checking)
2. What measures work for you? Others?
3. (Incite!) Connect *your* measures & targets with *your* decisions.

PM3 Implications in Texas

- PM3 FHWA requirements
 - May or may not be in the long term plans for TxDOT and MPOs
- TxDOT and MPO long term monitoring
 - TX100 and TxDOT Key Performance Measures
 - Hours of Delay
 - Travel Time Index
 - Planning Time Index

NPMRDS versus NPMRDS II

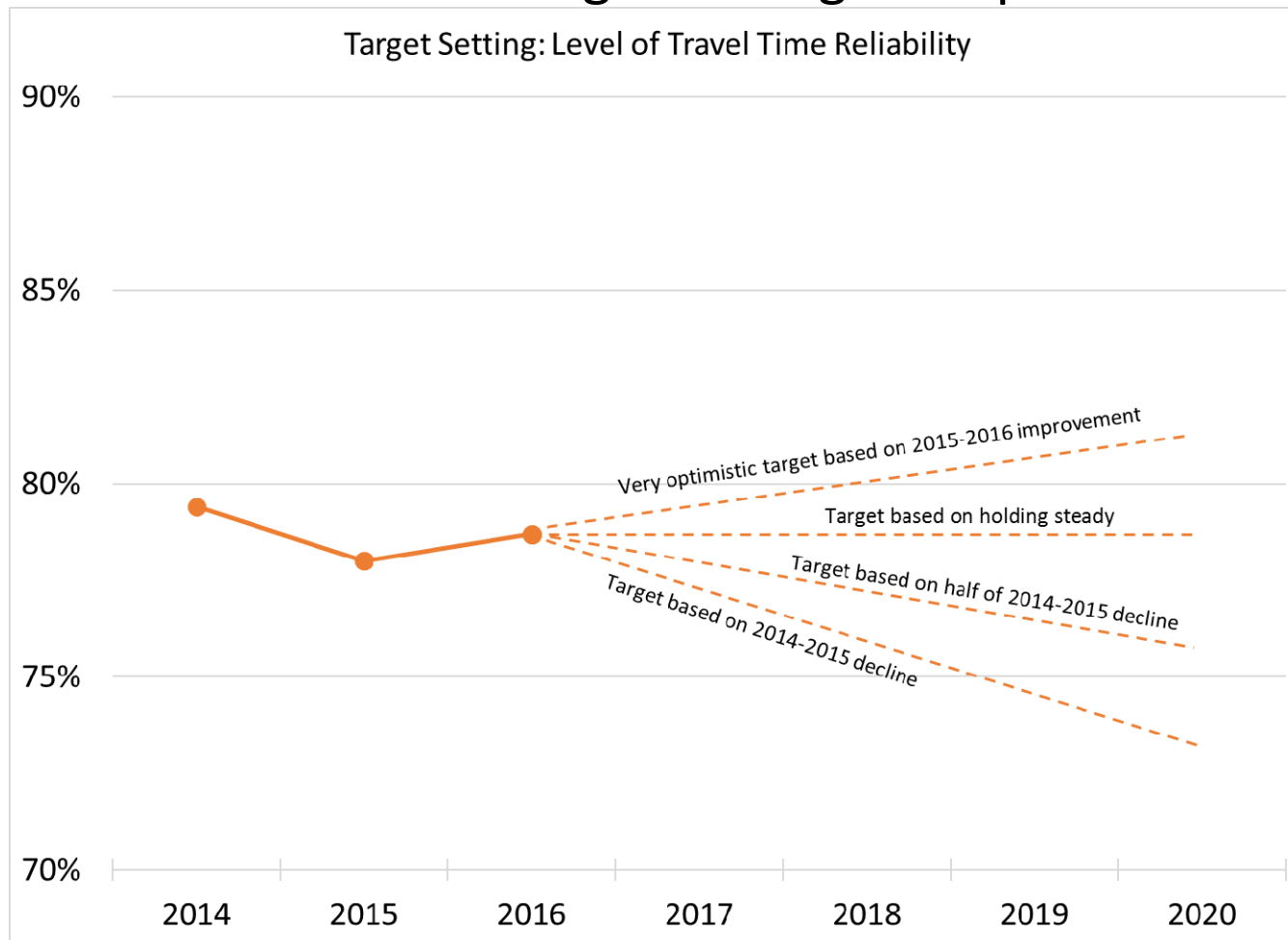
- 2014-2016 = NPMRDS; 2017 & later = NPMRDS II
- New for NPMRDS II
 - Path Processing is new
 - Combined TMCs will now be External/Internal TMCs
 - Excess Mileage (non-NHS) will be reduced
 - Additional Fields will be added (AADT, Urban Code, NHS, Functional Class, & many more)
 - NHS or Non NHS field
 - Previously, adding TMCs to NPMRDS faster than HPMS

How PM3 measures are developed

- NHS only (where NPMRDS speed is available)
- TMC segments – directional road sections
- Divide TMC segments into:
 - IH or non-IH
 - MPO region or not (county boundaries for now except Harlingen)
- 2014-2016 (NPMRDS v1)
- Adding 2017 (NPMRDS v2), first six months

What have we done...and why...

- Measures calculated using three years of data
- General trendlines and target setting examples



Assumptions for the Calculations

- Occupancy factors are the same for a state for LOTTR and PHED, but could be changed
- PHED - Estimated speed limits are 85th percentile of M-F 9am-4pm and S-S 6am-8pm over the year
- PHED – used 4pm-8pm (not the 3pm-7pm option) for PM Peak; AM Peak is 6am-9am
- TTTR, LOTTR
 - Very Good <1.25
 - Good 1.25 – 1.40
 - Barely Good 1.40 – 1.50
 - Barely Bad 1.50 – 1.60
 - Bad 1.60-1.75
 - Very Bad >1.75

Level of Travel Time Reliability (LOTTTR)

- Level of Travel Time Reliability (LOTTTR) Metric
 - Evaluated across **four time periods** using 15 minute data for the year
 - 6am to 10am Monday-Friday (AM Peak)
 - 10am to 4pm Monday-Friday (Mid Day)
 - 4pm to 8pm Monday-Friday (PM Peak)
 - 6am to 8pm Saturday and Sunday (Weekend)
 - $\frac{P80 \text{ Travel Time}}{P50 \text{ Travel Time}} < 1.50$ for all four time periods is a reliable segment

$$100 \times \frac{\sum_{i=1}^R \text{Segment Length}_i \times \text{Annual Volume}_i \times \text{Occupancy Factor}_j}{\sum_{i=1}^T \text{Segment Length}_i \times \text{Annual Volume}_i \times \text{Occupancy Factor}_j}$$

- Percent of Person Miles Traveled that are Reliable Measure

Input Values for LOTTR

Region	Reliable PMT	Reliable PMT Percentage	Non-Reliable PMT	Non-Reliable PMT Percentage	Total PMT	Reliable PMT
Abilene	1,391,294	95.4%	67,737	4.6%	1,459,031	1,391,294
Amarillo	3,309,258	96.0%	136,610	4.0%	3,445,868	3,309,258
Austin	11,602,341	68.7%	5,291,549	31.3%	16,893,890	11,602,341
Beaumont – Port Arthur	4,779,857	99.4%	27,405	0.6%	4,807,263	4,779,857
Brownsville						
Bryan-College Station						
Corpus Christi	2,348,469	98.4%	39,373	1.6%	2,387,842	2,348,469
Dallas-Fort Worth	65,766,114	71.7%	25,925,089	28.3%	91,691,203	65,766,114

- Control the overall regional PMT growth (or use TxDOT default)
- Control the amount of PMT considered reliable (or grow this at TxDOT default rate)

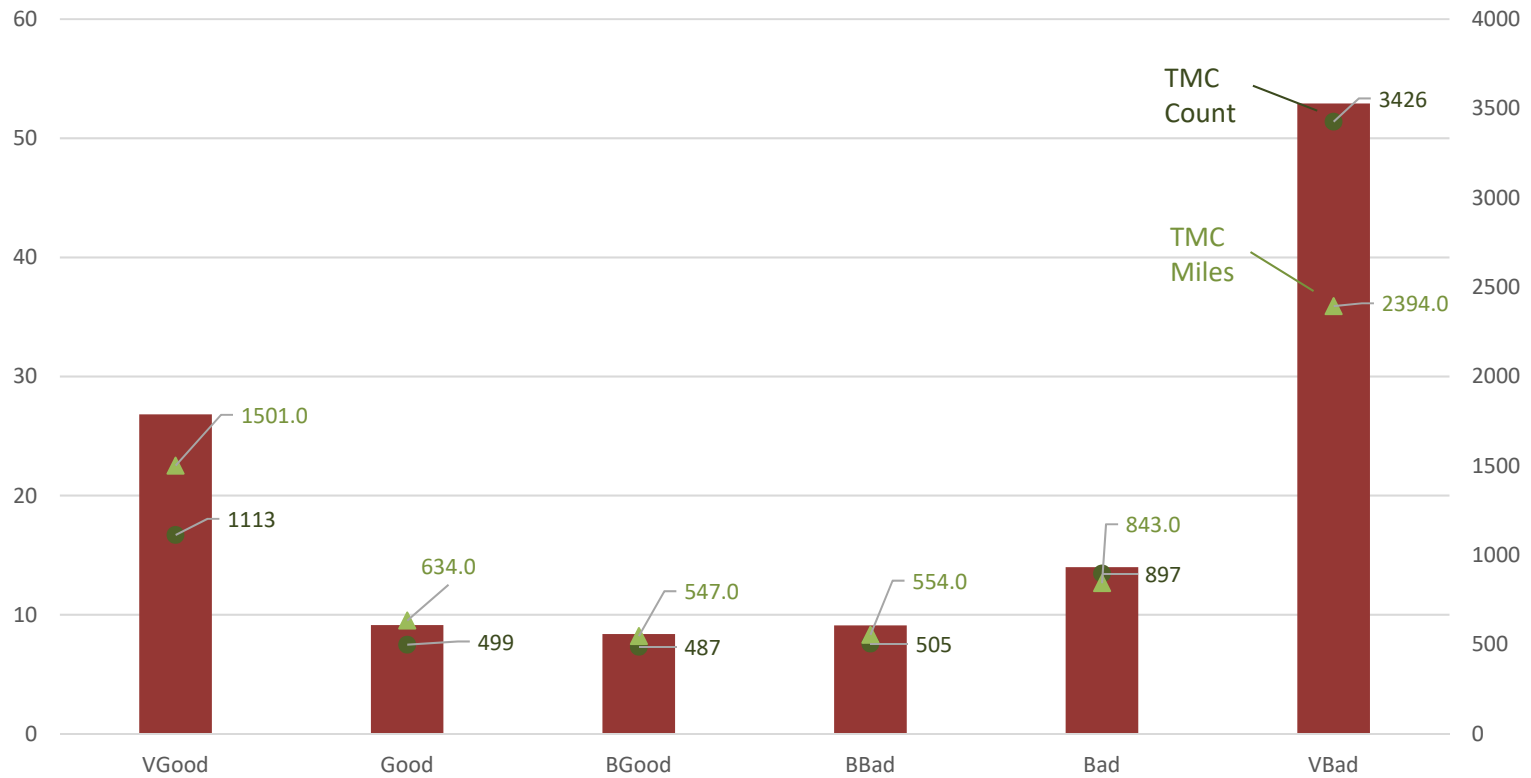
LOTTR Values by Time Period

TMC	TMC 2016	Roadtype	DISTANCE	AM_peak_LOTT	Midday_LOTT	PM_peak_LOTT	WE_Day_LOTT	AADT_2016	OCC_Facto
111N04098	111N04098	OtherNHS	1.23967	1.038834951	1.033816425	1.038834951	1.049019608	14920	1.74
111N04099	111N04099	OtherNHS	1.47013	1.036734694	1.036290323	1.040322581	1.053278689	22430	1.74
111N04100	111N04100	OtherNHS	1.3466	1.040723982	1.040358744	1.053333333	1.054794521	30220	1.74
111N04101	111N04101	OtherNHS	1.02137	1.041916168	1.041666667	1.047058824	1.063636364	32440	1.74
111N04102	111N04102	OtherNHS	0.97913	1.037974684	1.031446541	1.04375	1.057692308	32820	1.74
111N04103	111N04103	OtherNHS	0.71092	1.051282051	1.042372881	1.0625	1.060344828	36210	1.74
111N04104	111N04104	OtherNHS	1.73377	1.038327526	1.034482759	1.306188925	1.045774648	39390	1.74
111N04105	111N04105	OtherNHS	0.32786	1.055555556	1.054545455	2.466666667	1.055555556	28000	1.74
111N04106	111N04106	OtherNHS	0.94196	1.048484848	1.036144578	1.537142857	1.055214724	32000	1.74
111N04107	111N04107	OtherNHS	0.25555	1.071428571	1.071428571	1.071428571	1.071428571	20480	1.74
111N04108	111N04108	OtherNHS	0.45242	1.058823529	1.045751634	1.04	1.06	21830	1.74
111N04109	111N04109	OtherNHS	0.85975	1.047619048	1.040816327	1.041666667	1.051546392	22910	1.74
111N04110	111N04110	OtherNHS	0.60576	1.042857143	1.038095238	1.058823529	1.058823529	20430	1.74
111N04111	111N04111	OtherNHS	0.69062	1.034188034	1.038461538	1.052173913	1.052173913	17910	1.74
111N04112	111N04112	OtherNHS	0.64097	1.05	1.045454545	1.055045872	1.069444444	17910	1.74
111N04113	111N04113	OtherNHS	0.96927	1.042682927	1.036585366	1.049079755	1.055555556	38030	1.74

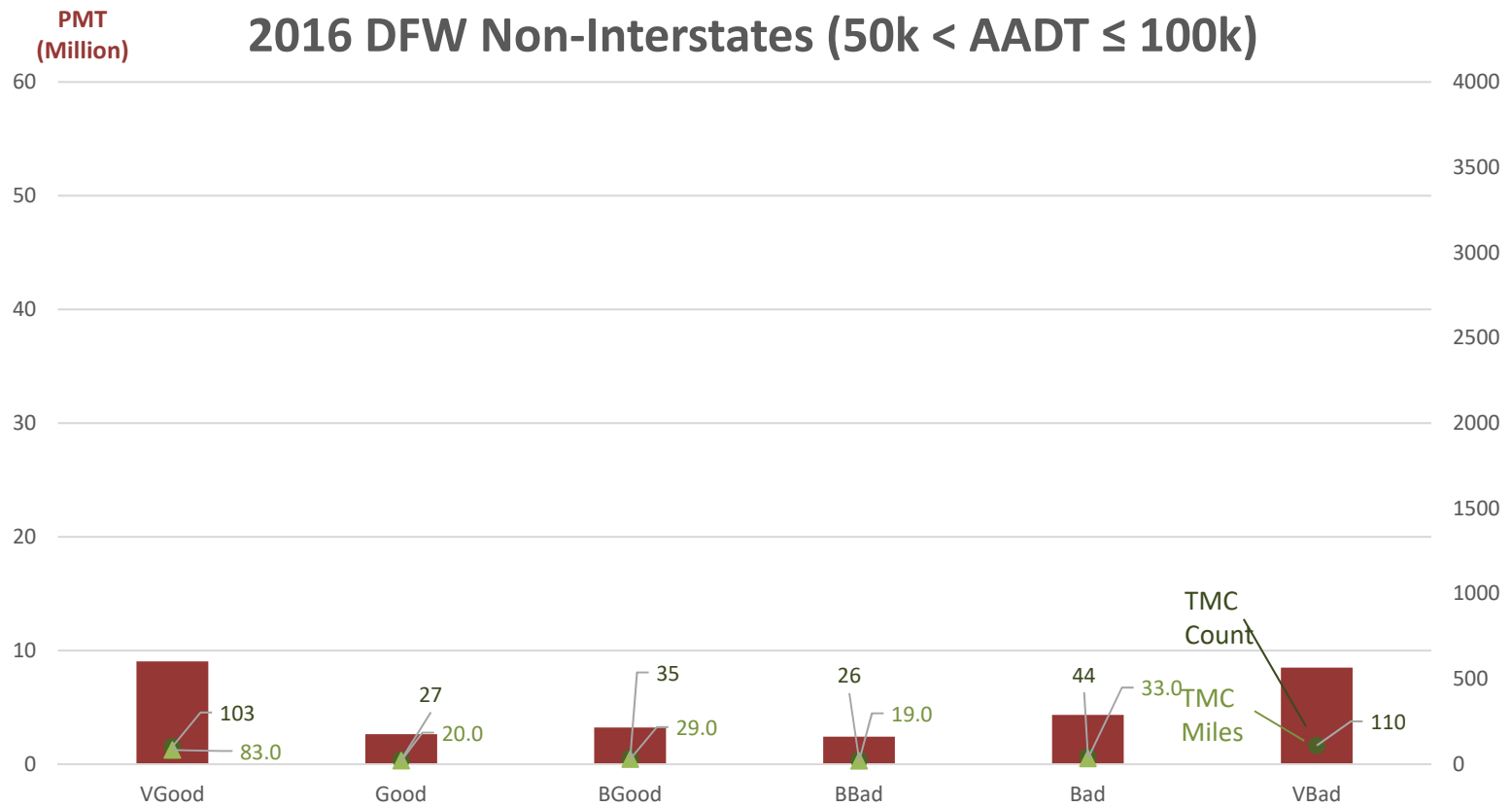
- Each Traffic Message Channel (road section)
- 4 time periods
- Person-Miles of Travel weighting

PMT
(Million)

2016 DFW Non-Interstates (AADT ≤ 50k)

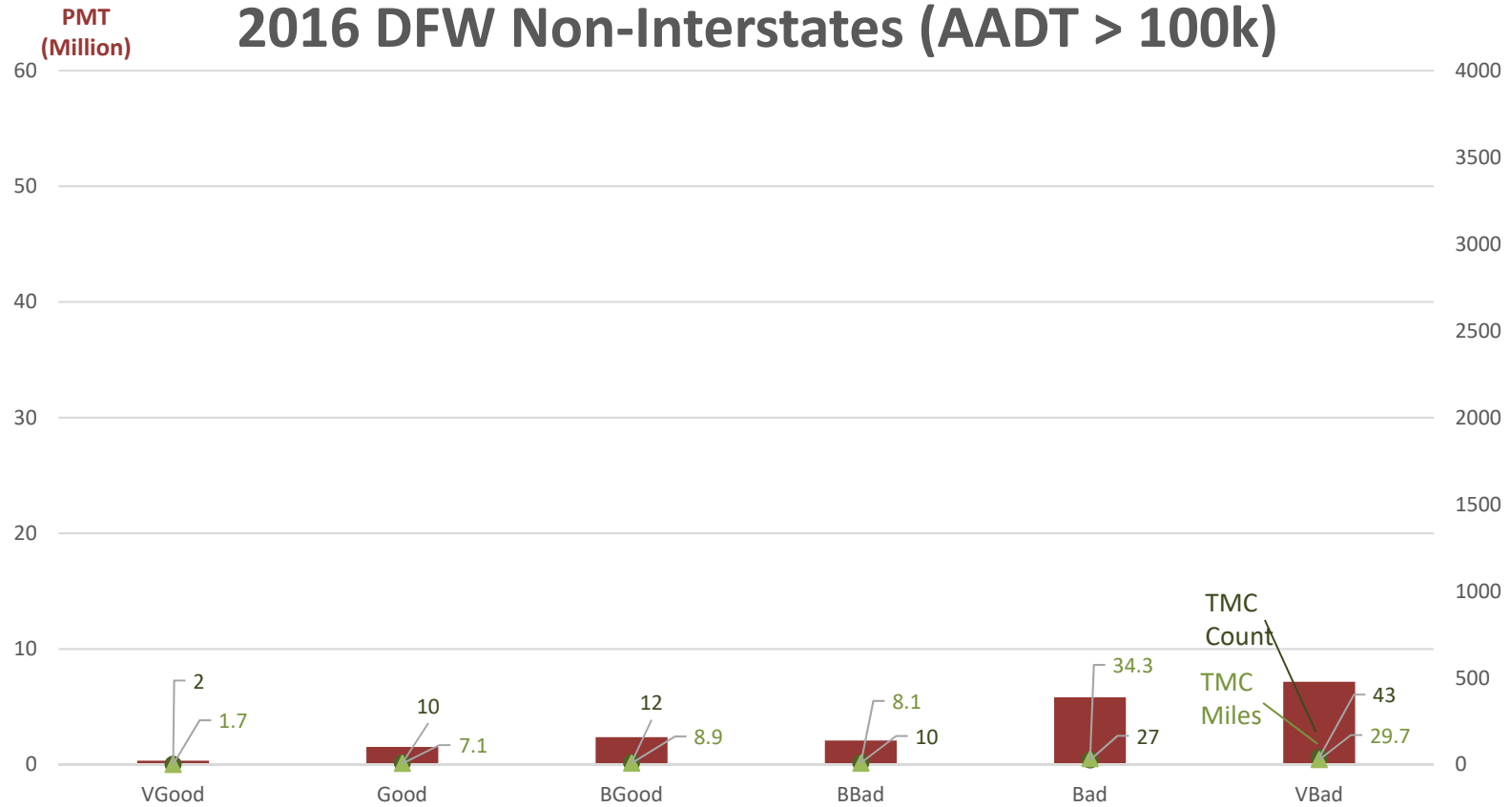


VGood - Very Good; BGood - Barely Good; BBad - Barely Bad; VBad - Very Bad

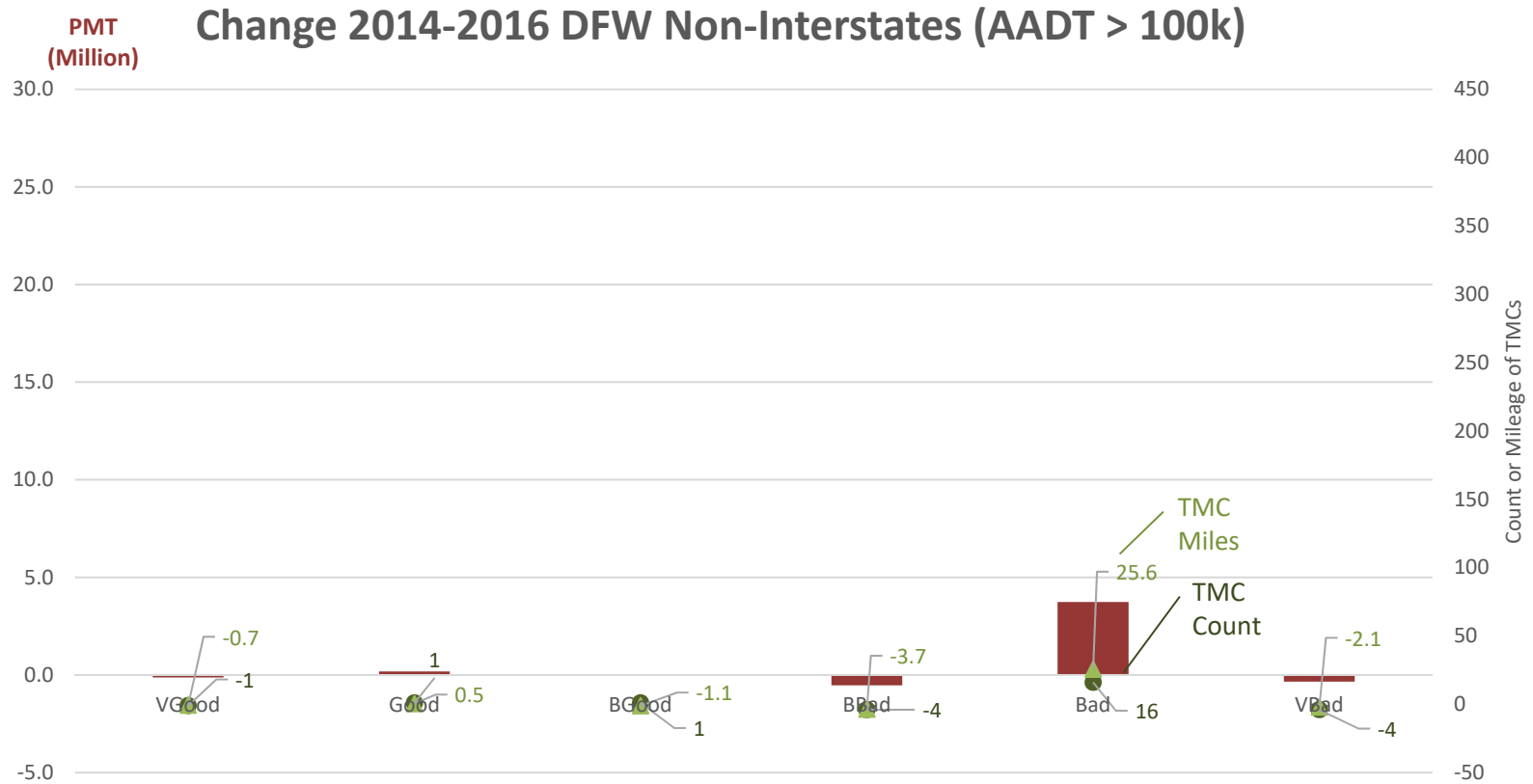


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2016 DFW Non-Interstates (AADT > 100k)

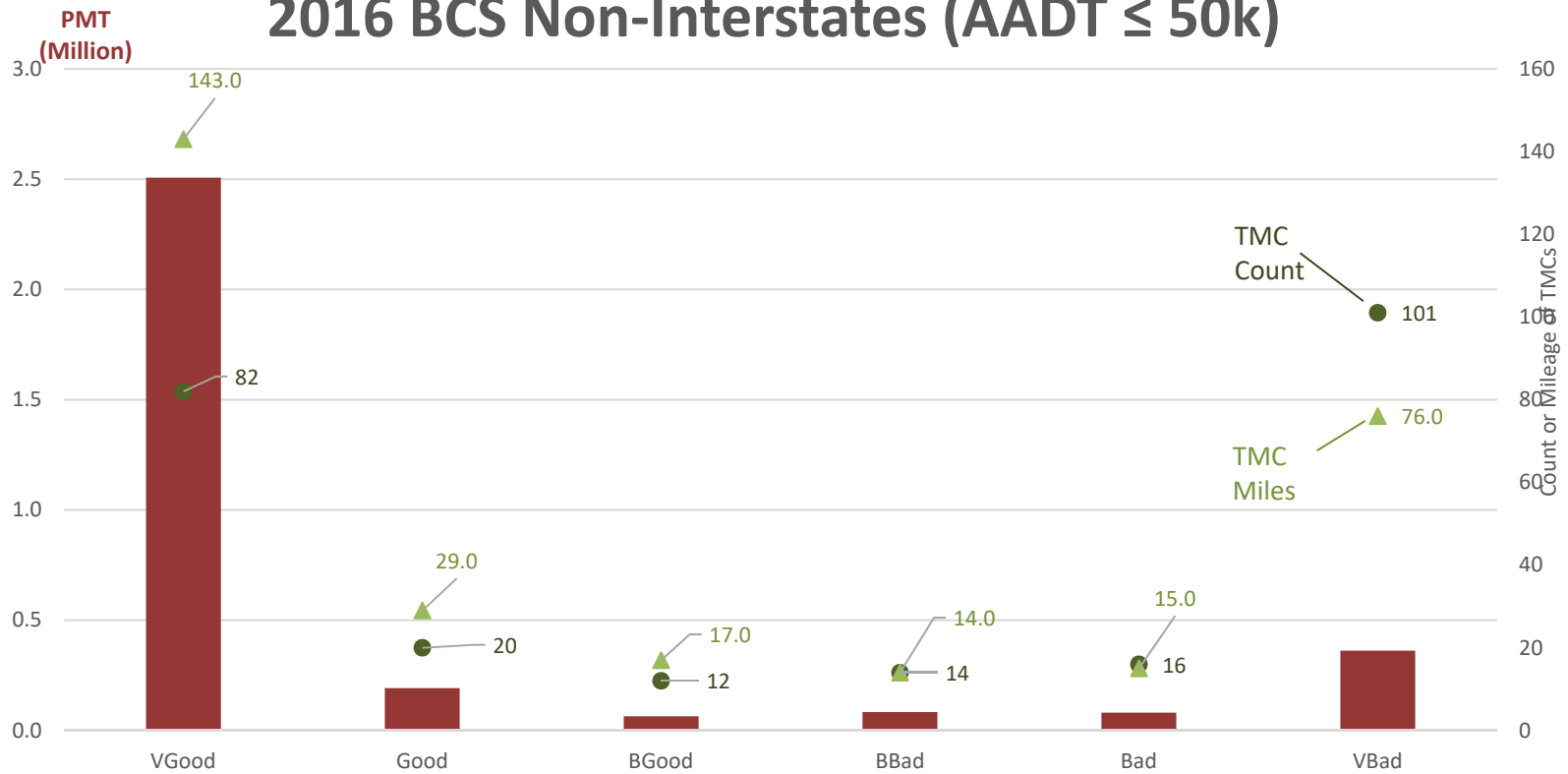


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2016 BCS Non-Interstates (AADT ≤ 50k)



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Output Page for LOTTR to TxDOT

Region	Target LOTTR for Region			Growth Rate of Target Value	
	Interstate Reliable PMT Percentage	Non-Interstate Reliable PMT Percentage	Overall Reliable PMT Percentage	Interstate	Non-Interstate
Abilene	95.4%	93.8%	94.5%	0.0%	0.0%
Amarillo	96.0%	72.8%	86.0%	0.0%	0.0%
Austin	68.7%	56.1%	59.8%	0.0%	0.0%
Beaumont – Port Arthur	99.4%	69.1%	79.8%	0.0%	0.0%
Brownsville	0.0%	44.2%	44.2%	0.0%	0.0%
Bryan-College Station	0.0%	84.0%	84.0%	0.0%	0.0%
Corpus Christi	98.4%	94.4%	95.4%	0.0%	0.0%
Dallas-Fort Worth	71.7%	42.9%	53.9%	0.0%	0.0%
El Paso	87.2%	43.0%	60.7%	0.0%	0.0%
Harlingen	0.0%	53.4%	53.4%	0.0%	0.0%

- LOTTR values weighted by PMT within region and across Texas
- Up to 26 lines in Texas, 25 MPO plus TxDOT non-MPO

Truck Travel Time Reliability (TTTR)

- Truck Travel Time Reliability metric

- $$\frac{P95 \text{ Travel Time}}{P50 \text{ Travel Time}}$$

- Freight Reliability Measure

- $$\frac{\sum_{i=1}^T (\text{Segment Length}_i \times \text{maxTruckTravelTimeRatio}_i)}{\sum_{i=1}^T \text{Segment Length}_i}$$

- Evaluated across **five time periods** using 15 minute data for the year
 - 6am to 10am Monday-Friday (AM Peak)
 - 10am to 4pm Monday-Friday (Mid Day)
 - 4pm to 8pm Monday-Friday (PM Peak)
 - 6am to 8pm Saturday and Sunday (Weekend)
 - 8pm to 6am Everyday (Overnight)

Input values for TTTR

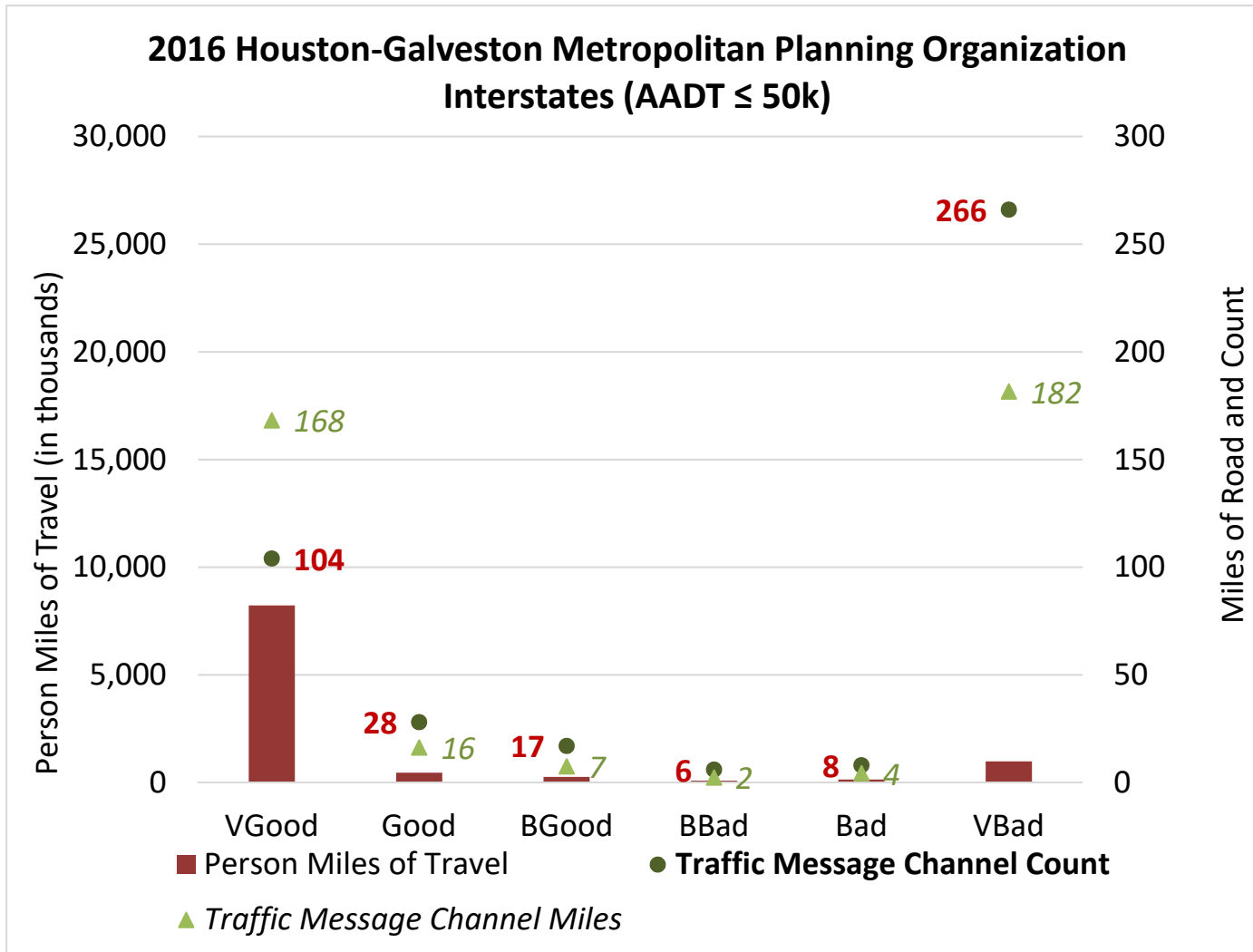
Region	Target TTTR for Region			Growth Rate of Target Value
Abilene	262.67	100.92	2.6	
Amarillo	252.80	147.75	1.7	
Austin	507.51	192.21	2.6	
Beaumont – Port Arthur	123.38	98.94	1.2	
Brownsville				
Bryan-College Station				
Corpus Christi	105.83	86.52	1.2	
Dallas-Fort Worth	6,241.67	1,713.57	3.6	
El Paso	268.46	131.24	2.0	
Harlingen				

- Control facility growth rate
- Control the amount of facilities that are considered reliable

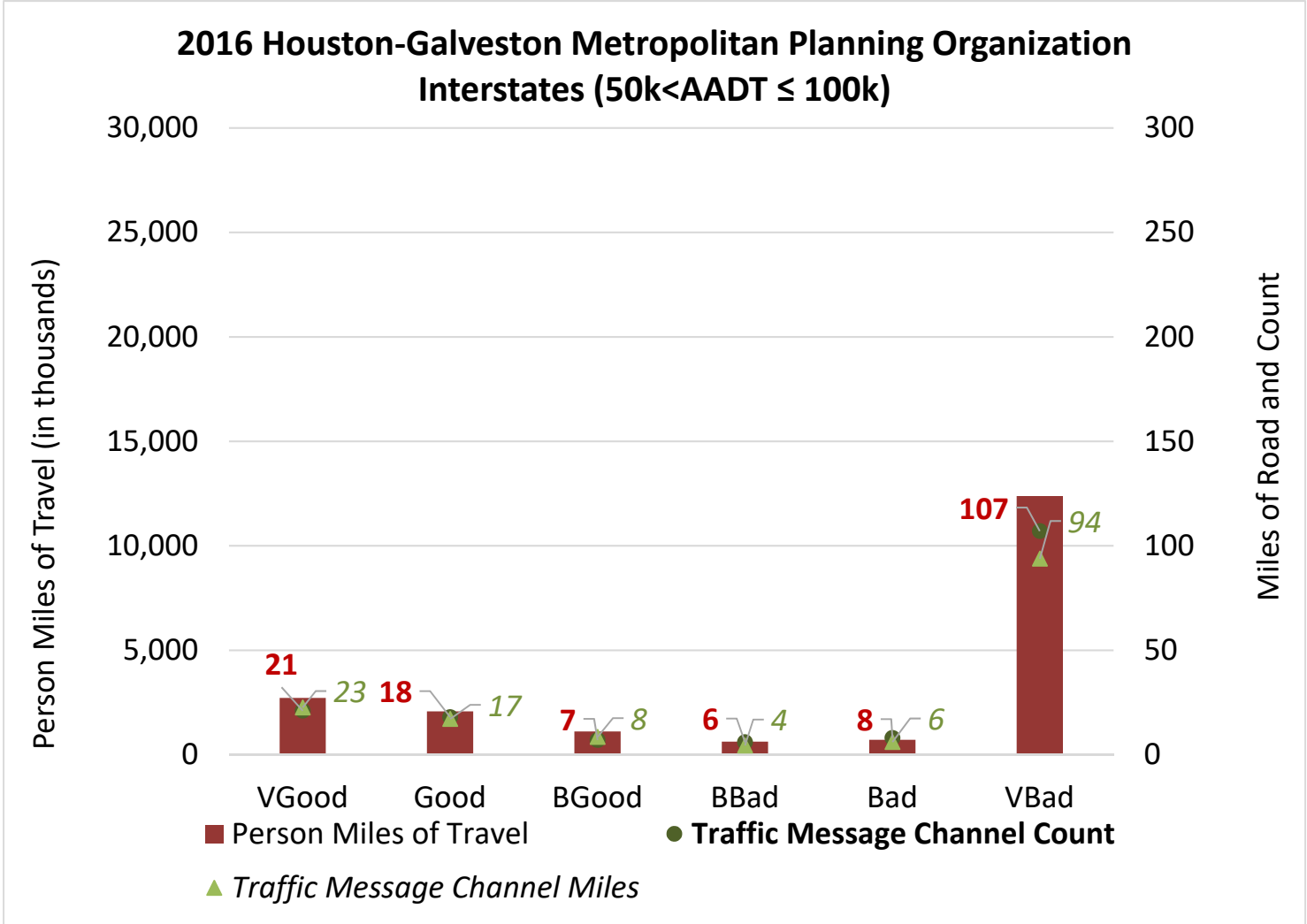
TTR Values by Time Period

TMC	MPO	DISTANCE	LR_Midday_	R_AM_peak	R_PM_peak	R_WE_Day_	R_Overnite_	TLR_MAX
112N04098	ouston-Galvest	1.15102	1.287	1.491	1.284	1.425	1.307	1.491
112N04099	ouston-Galvest	3.2855	1.142	1.140	1.148	1.154	1.190	1.190
112N04100	ouston-Galvest	0.79218	1.152	1.152	1.156	1.176	1.200	1.200
112N04101	ouston-Galvest	0.99062	1.125	1.137	1.138	1.148	1.171	1.171
112N04102	ouston-Galvest	1.16305	1.173	1.182	1.200	1.203	1.293	1.293
112N04103	ouston-Galvest	1.52693	1.112	1.128	1.131	1.157	1.182	1.182
112N04104	ouston-Galvest	1.24597	1.114	1.115	1.132	1.149	1.176	1.176
112N04105	ouston-Galvest	0.96247	1.130	1.111	1.143	1.155	1.170	1.170

- Each individual TMC
- 5 time periods
- Distance weighting

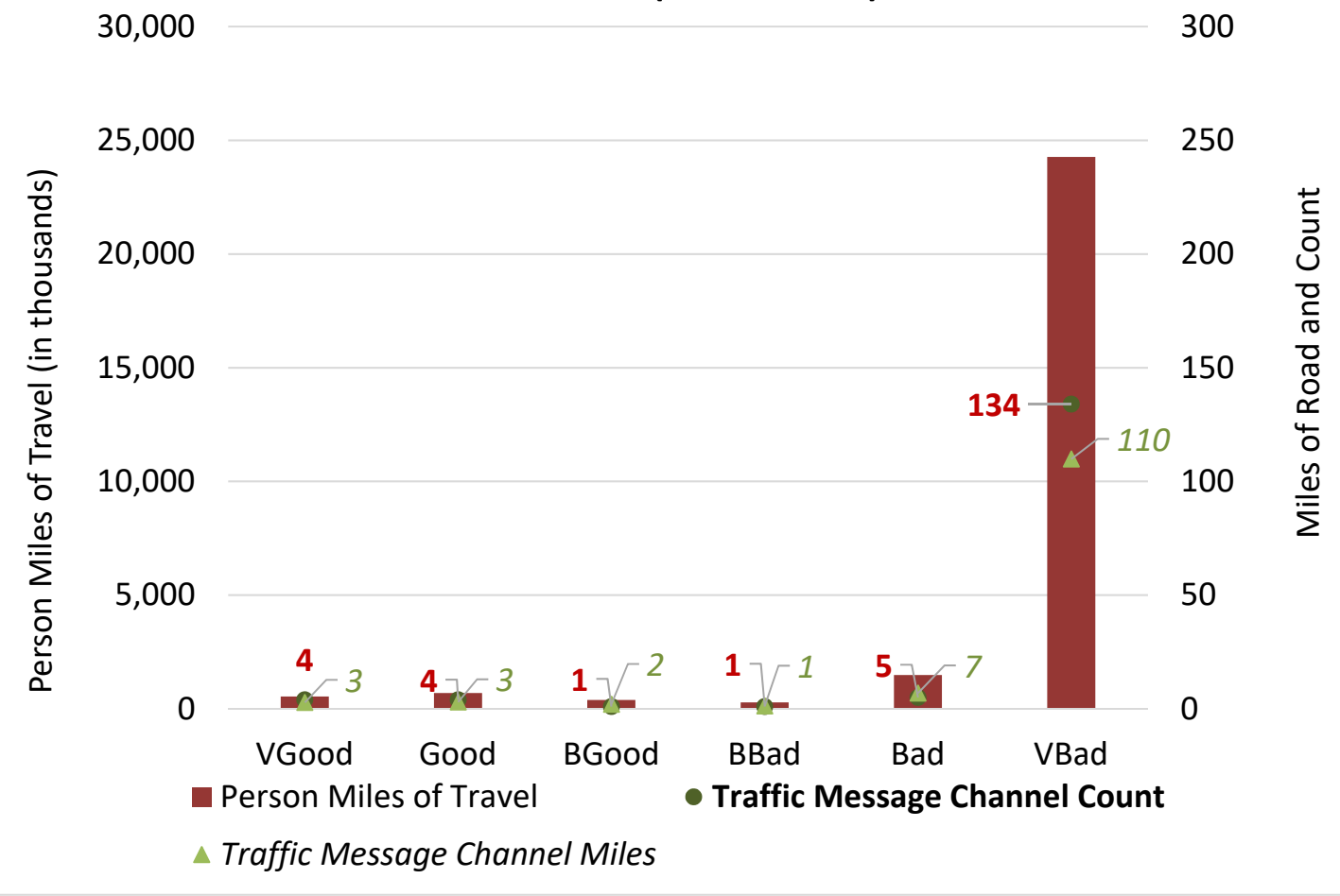


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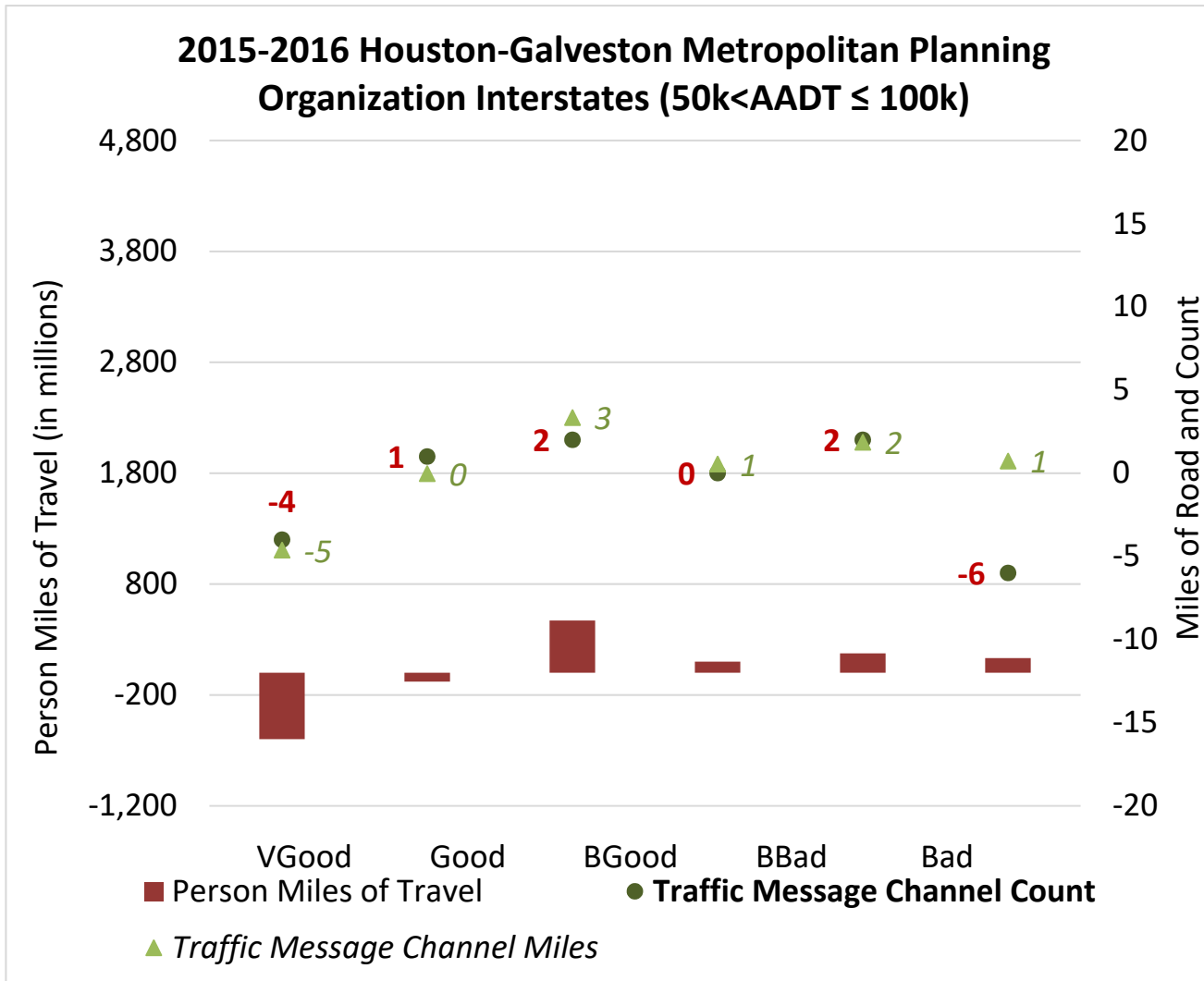


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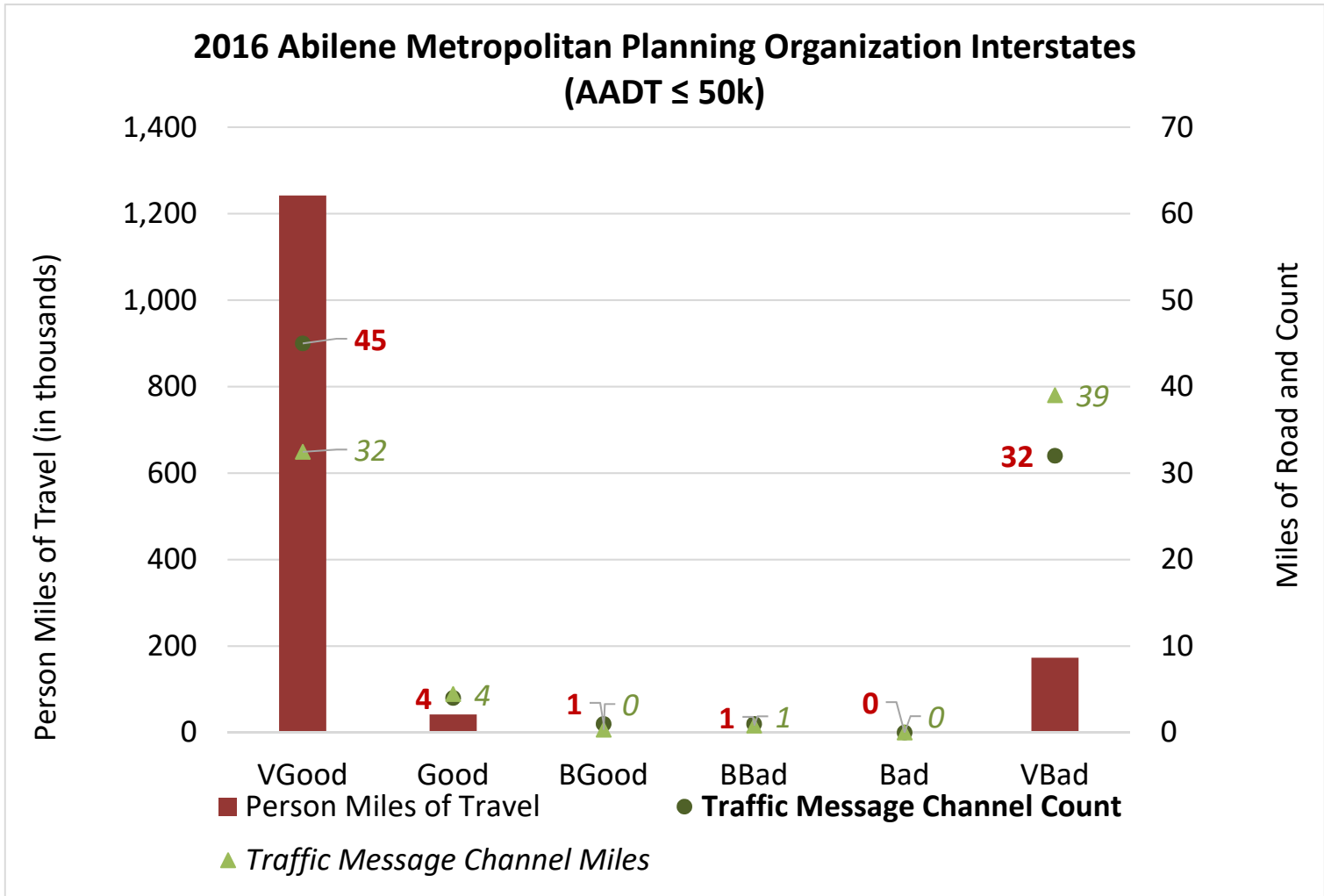
2016 Houston-Galveston Metropolitan Planning Organization Interstates (AADT >100k)



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Output Page for TTTR to TxDOT

Region	Target TTTR for Region	Growth Rate of Target Value	2016 TTTR	2015 TTTR	2014 TTTR
Abilene	2.6	0%	2.6	2.9	2.1
Amarillo	1.7	0%	1.7	1.7	1.7
Austin	2.6	0%	2.6	2.6	2.2
Beaumont – Port Arthur	1.2	0%	1.2	1.6	1.6
Brownsville					
Bryan-College Station					
Corpus Christi	1.2	0%	1.2	1.2	1.2
Dallas-Fort Worth	3.6	0%	3.6	3.4	3.7
El Paso	2.0	0%	2.0	2.1	2.2
Harlingen					

- TTTR values weighted by miles within region and across Texas
- Up to 26 lines in Texas, 25 MPO plus TxDOT non-MPO, many areas don't have IH

Peak Hour Excessive Delay (PHED)

- Peak Hour Excessive Delay metric
 - Total excessive delay (person-hours) for each reporting segment
- Annual Hours of PHED per Capita Measure
 - Summed hours of delay across peak period periods for the year / Population

Total Excessive Delay_s

$$\begin{aligned}
 &= AVO \\
 &\times \sum_{d=1}^{TD} \left\{ \sum_{h=1}^{TH} \left[\sum_{b=1}^{TB} \left(Excessive\ Delay_{s,b,h,d} \right. \right. \right. \\
 &\times \left. \left. \left. \left(\frac{\text{hourly volume}}{4} \right)_{s,h,d} \right) \right] \right\}_d
 \end{aligned}$$

Annual Hours of Peak Hour Excessive Delay per Capita

$$= \frac{\sum_{s=1}^T Total\ Excessive\ Delay_s}{Total\ Population}$$

Output Page for PHED

Region	Target PHED for Region	Example Calculation - Target PHED	Growth Rate of Target Value	2016 PHED
Austin		28,806,718	2%	28,241,880
Dallas-Fort Worth		120,577,085	2%	118,212,828
Houston-Galveston		75,428,793	2%	73,949,797
San Antonio Alamo Area		22,832,698	2%	22,384,998
Summary Measures	0	247,645,293		242,789,503

- Only >1 million popn and non-attainment area
- Over 200,000 popn four years from now

So how do we set Texas targets?

- MPOs fill in target setting spreadsheet for TPP.
 - Look at historical VMT/PMT growth in the region
 - Look at scheduled projects, the facilities they affect, and how much effect those projects may have
 - Discuss with PAC and TAC
 - How develop a regional target to be ready once the 2017 final speed data is downloaded
- TxDOT will obtain the 2017 final values for the measures and distribute to MPOs. MPOs apply this process and provide targets to TPP. TPP compiles these at state level (hopefully expedited by this process)
- TPP compiles input from 25 MPOs plus their non-MPO contribution and reports to FHWA