Process Improvement and Streamlining Potential with FHWA TNM 3.0

TRB ADC40 Summer Meeting June 25-27, 2018

Arizona Management System

- *"a modernized and streamlined State government is one that moves at the **speed of business**… State government thinks and does business as one enterprise."*

https://ams.az.gov/

LEAN, *removing **Muda** (waste), **Muri** (overburden) and **Mura** (unevenness)*

In Noise, by removing

- *Squirrels*
- *Bells, and*
- *Whistles*

LEAN & Noise ☑ Customers/Products

- Noise Abatement Policy – for approval
- Noise Wall Inventory

- Scope of works - review
- Instructions and guidance
- Review of Traffic Noise Analysis Report

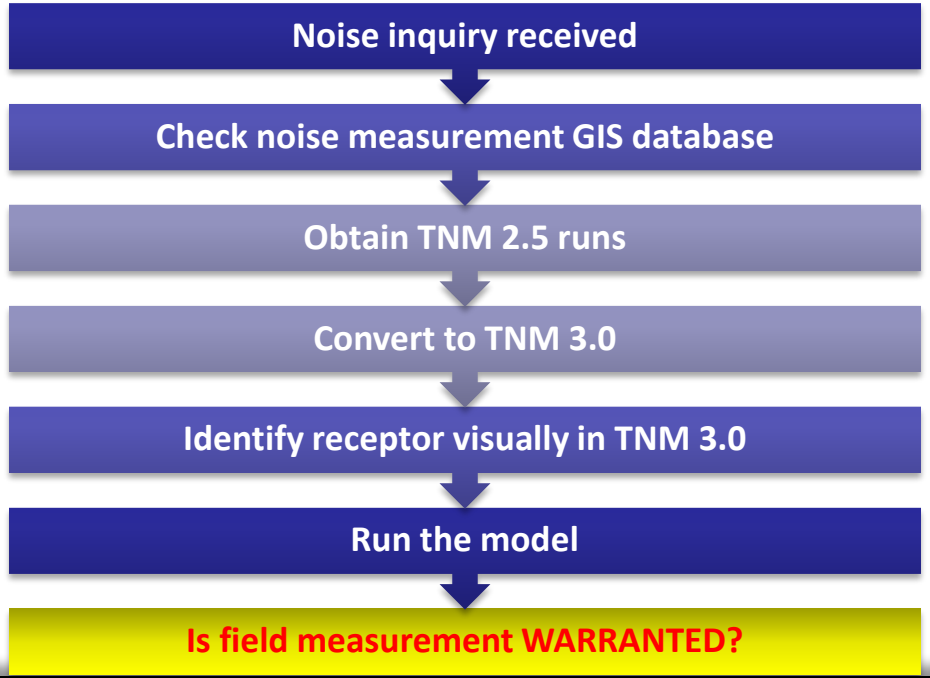
- **Scope of works - review**
- Traffic Noise Analysis
  - **Screening**
  - Reports, **re-evaluations**
  - Construction Noise Analysis
- Public meetings

- Ad hoc impact studies (**fog seal, chip seal**)
- Continuous improvement
- Facts about noise & FAQ
- **Noise inquiries response & measurements**
- Public meetings

Process improvement with FHWA TNM 3.0

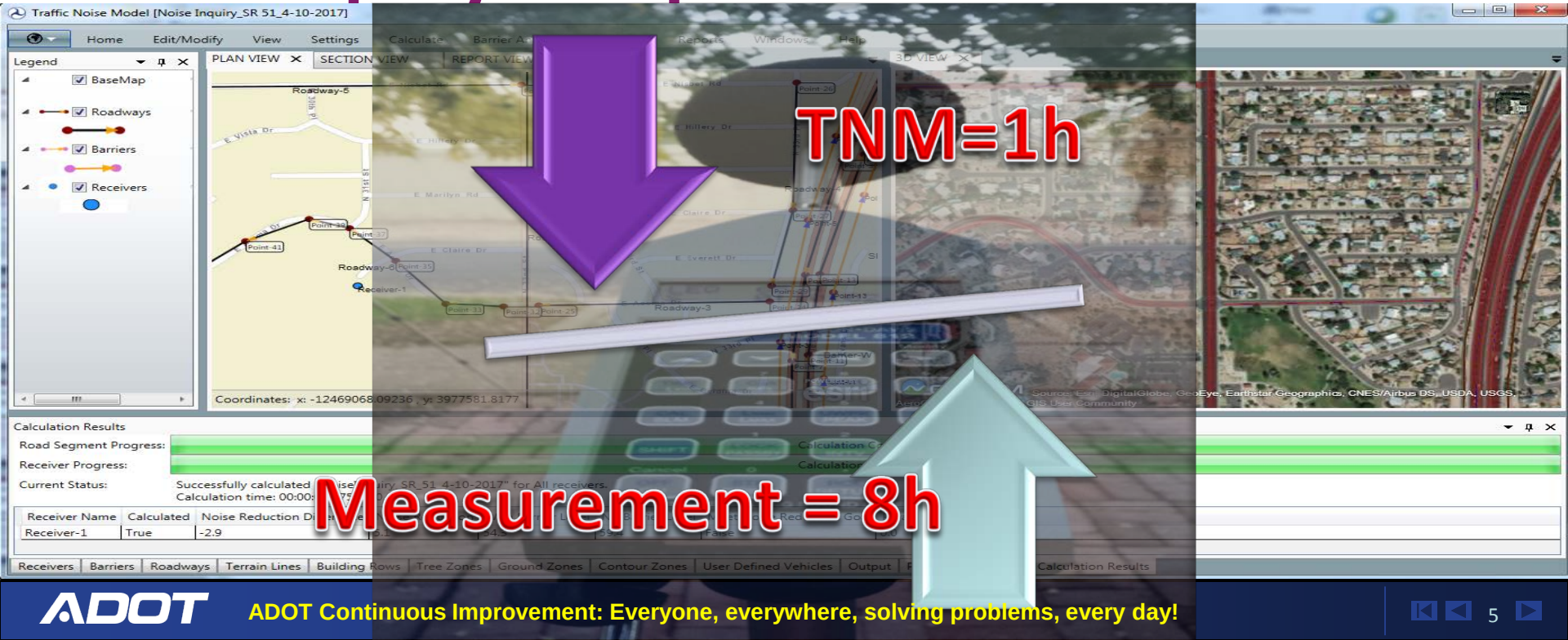
Noise inquiry - response

- Sending team to perform field noise measurements is **costly and time consuming**
- Before sending a team, the site is modeled and assessed if there is a bona-fide concern
- Reduced occurrence of required field noise measurements



Process improvement with FHWA TNM 3.0

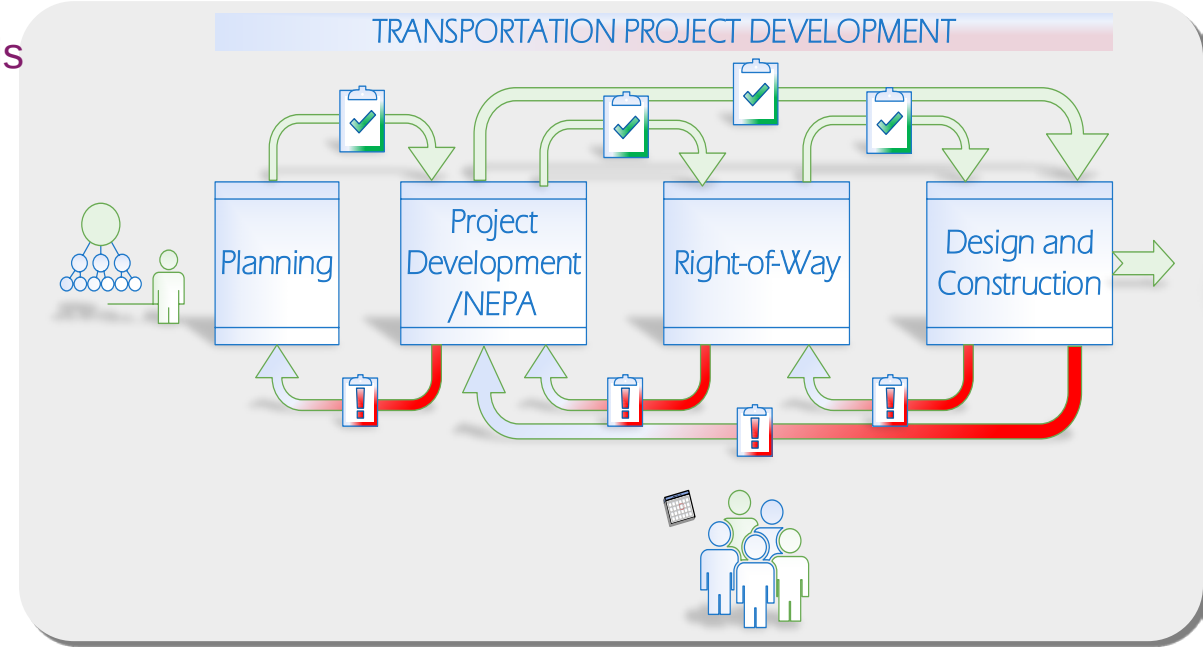
Noise inquiry - response



Noise Analysis in Transportation Project Development

Determining Factors of Noise Analysis

1. *Project Type (I, II, III) under 23 CFR 772*
2. *NEPA & Class of Action*
3. *Projects Design and Construction Status*
4. *Multimodality & Lead*



Work Breakdown Structure - WBS+Time+Budget

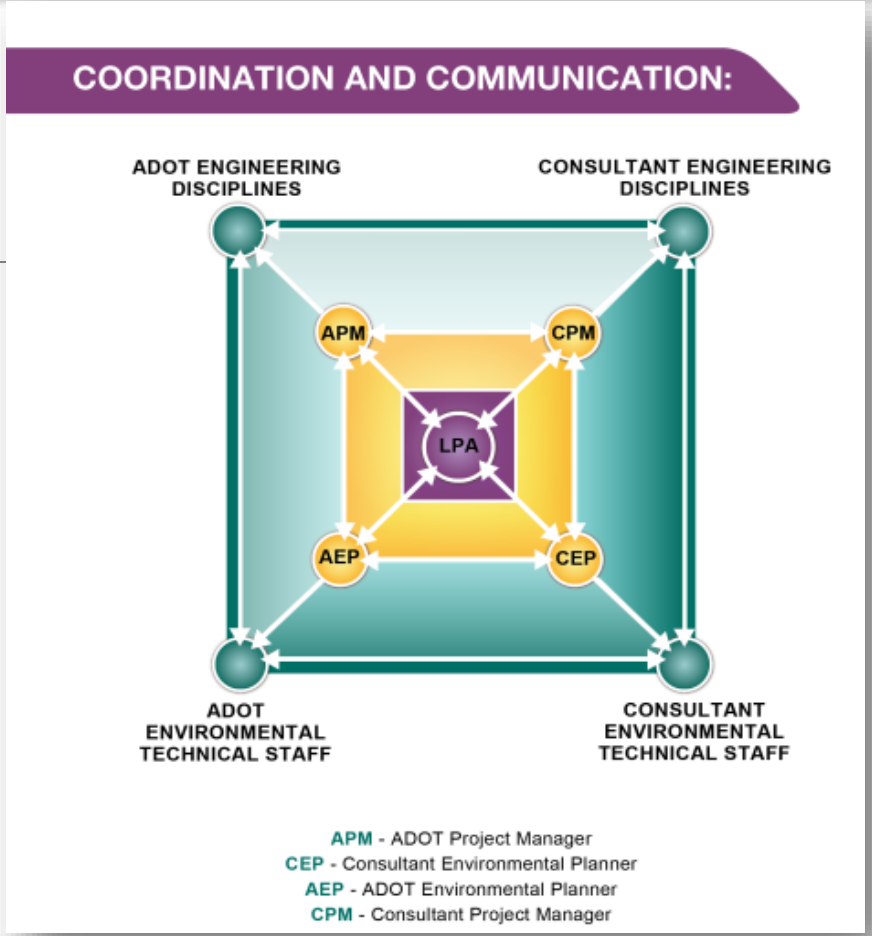
BUDGET STRUCTURE									
DIRECT EXPENSES								INDIRECT EXPENSES	TOTAL EXPENSES
Humans resources			Equipment	Material	Outsourding	Other expenses	TOTAL DIRECT	Overhead	SUM OF DIRECT ANF INDIRECT EXPENSES
HOURS	rate	Total						% of Direct Expenses	
	$/h	In US$					US$	Rate (%) in calc. 0%	US$
								US$	
6.00	115.00	690.00					690.00	0.00	690.00
5.00	115.00	575.00					575.00	0.00	575.00
3.00	115.00	345.00					345.00	0.00	345.00
17.00	95.00	1,615.00					1,615.00	0.00	1,615.00
5.00	95.00	475.00					475.00	0.00	475.00
4.00	95.00	380.00					380.00	0.00	380.00
2.00	140.00	280.00					280.00	0.00	280.00
42		4,360.00							4,360.00


TNM 3.0 improvement
Hours
25
20
15
10
5
0
PROJECT ADMINISTRATION
PROJECT DATA COLLECTION - (all...
Data review and assessment
Noise measurement in the field
Modeling using FHWA TNM 2.5
TNM Model validation
Noise Abatement Measures evaluation
NOISE ANALYSIS REPORT
PUBLIC PRESENTATION OF NOISE...
Assessment of consultants team...

LPA PROJECT SCOPING - PLANNING & PROGRAMMING

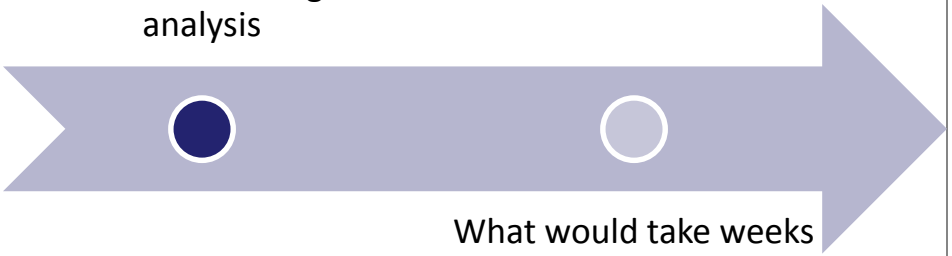
- Identify needs through local programming process
- Be **commensurate with the complexity** of the proposed project
- **Identify any environmental issues that will take time** and funding to address
- Define **project cost and budget** sufficiently to allow the project to be programmed
- **Be sufficient to support** the environmental analysis required during the design phase

LPA - Local Public Agency



LPA – Simplifying analysis for local streets and projects with lower volumes

Administrative process may take weeks if not months to get consultant on board, without starting analysis



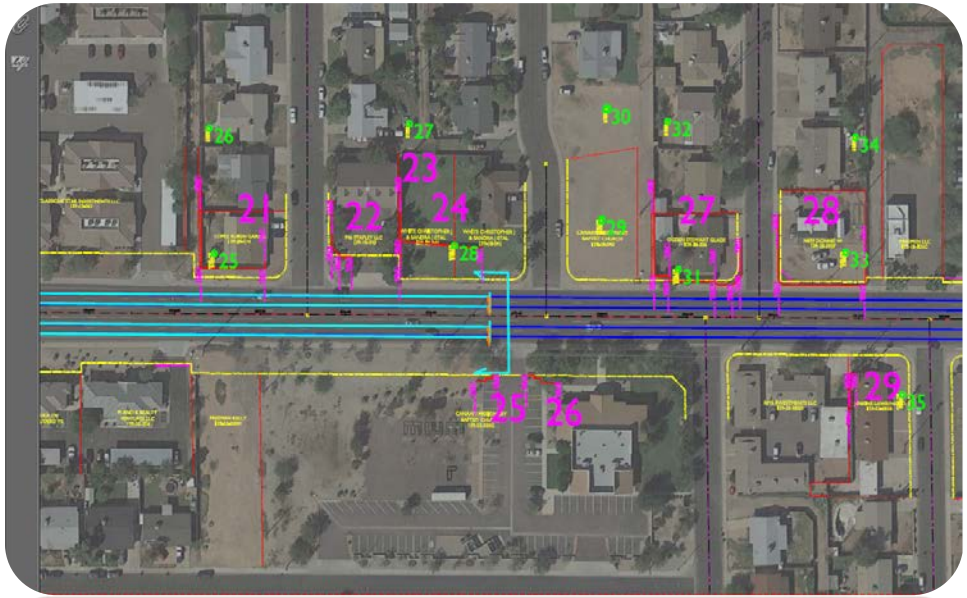
What would take weeks to perform analysis, with TNM 3.0 can be done in 3-5 hours.

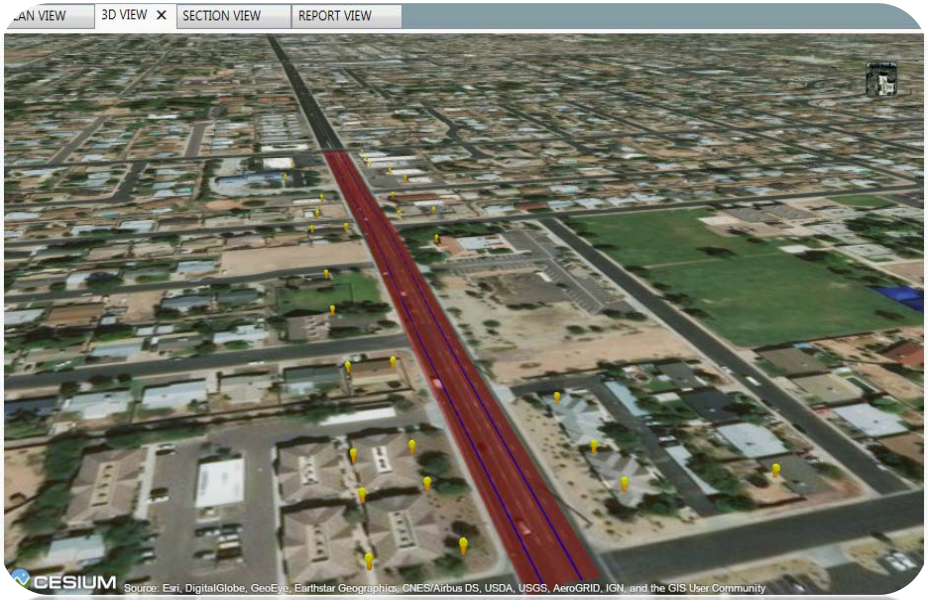
- **March 20**, 2018, Determination: Type I
- **March 26**, consultant sent scope of work to City for approval
- **May 22**, methodology meeting with ADOT
- **May 30**, identification of noise sensitive receptors and field measurements approved by ADOT
- **June 6** – time still ticking, no report yet

LPA – Simplifying analysis for local streets and projects with lower volumes

1. Design is done on MicroStation platform (InRoads)
2. Roads converted to *.dxf with stations, Horizontal and vertical coordinates taken from *.alg and copied into model
3. Receivers, aerial imported in MicroStation to determine coordinates
4. Receivers coordinates copied into model

LPA – Simplifying analysis for local streets and projects with lower volumes





Answer ready in 3 hours?

From planning to EIS Tier 1 analysis - TNM 3.0 screening

Preliminary

- Long-term studies
- Stakeholders inputs

Alternatives Selection Determination

- List of Alternatives with Segments
- Evaluation

Selection of Alternatives

- Alternative 1 (Segments 1, 2, 3)
- Alternative 2 (Segments 4, 5, 6)

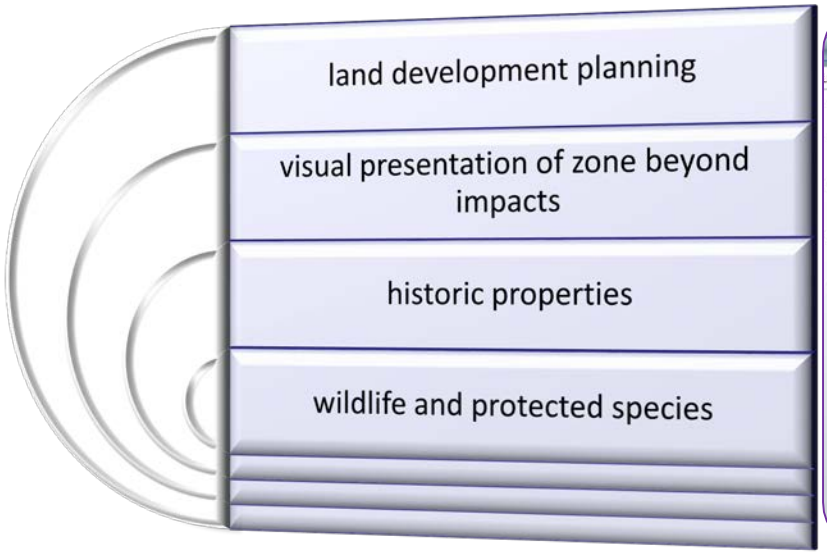
EIS Tier 1

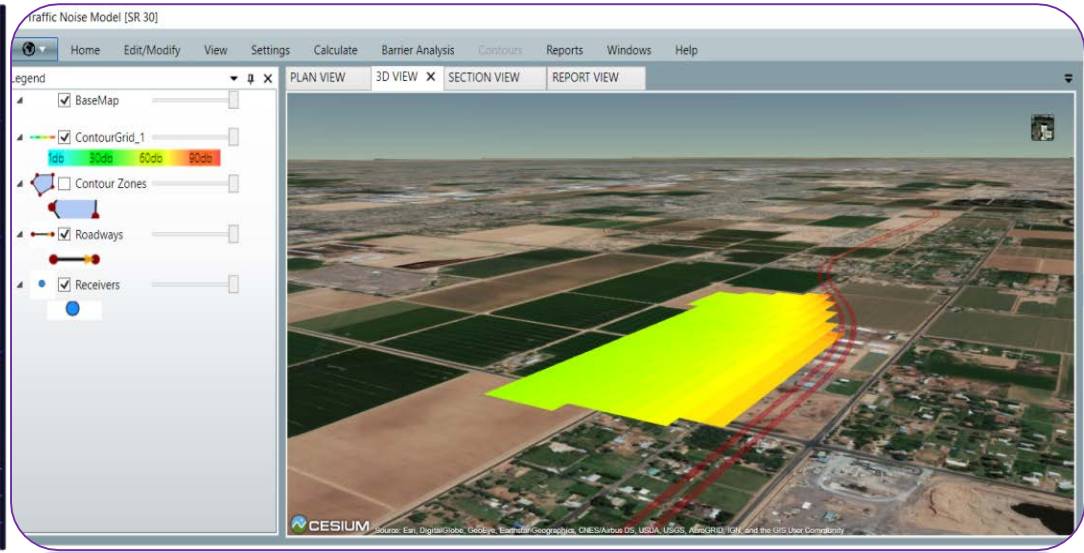
- Qualitative Evaluation of Selected Alternatives

EIS Tier 2

- Quantitative Evaluation of Selected Alternative and Segments

EIS Tier 1 analysis
- TNM 3.0 screening and contours





Multimodal noise source assessment & planning alignment - TNM 3.0 and FTA Noise model - example

- assess the optimal alignment of the roadway
- reduce current noise impacts
- not causing new impacts

EXERCISE 2

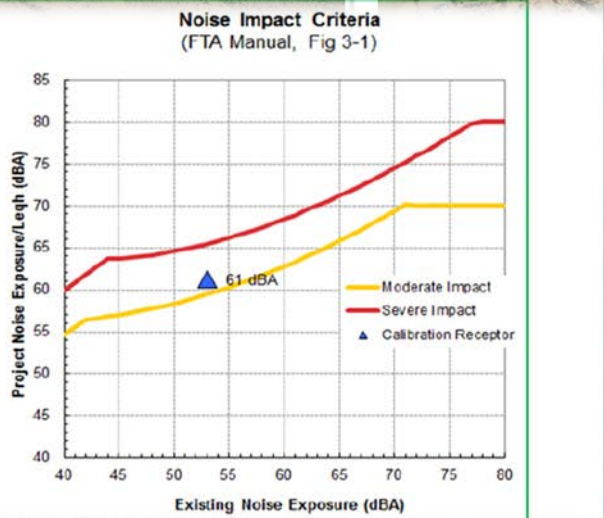
ILLUSTRATION 4—Results

Project Results Summary

Existing Leqh:	53 dBA
Total Project Leqh:	61 dBA
Total Noise Exposure:	62 dBA
Increase:	9 dB
Impact?:	Moderate

Distance to Impact Contours

Dist to Mod. Impact Contour (Sources 1+2):	146 ft
Dist to Sev. Impact Contour (Sources 1+2):	58 ft



ADOT Environmental Planning

Pavement treatment
Site equivalency by TNM 3.0

- Modeling median barrier
- Modeling reflections off median barrier
- Single vs multilane modeling
- Atmospheric conditions temperature and humidity

NOISE LEVELS - MEASURED

Pre-lay	Day after	Week after	Month after	
27-Apr	29-Apr	4-May	25-May	
Location 1 - 3A				**Increase**
14:00	17:52	13:05	12:56	
77.3	78.3	79.3	81.1	
76.9	78.7	78.4	81.7	
76.9		78.9	81.2	
77.0	78.5	78.9	81.3	4.3
Location 2				**Increase**
14:39	18:35		13:37	
76.0	76.4		77.3	
75.5	75.4		77.4	
74.9			76.9	
75.5	75.9		77.2	1.7
Location 3				**Increase**
15:30		13:33	14:15	
77.1		79.3	79.7	
77.6		78.9	79.1	
77.4		79.2	79.3	
77.4		79.1	79.4	2.0
Location 4				**Increase**
16:15	15:29		15:21	
74.2	72.8		74.1	
74.1	73.3		75.2	
73.5	72.6		75.4	
73.9	72.9		74.9	1.0
Location 5				**Increase**
16:54	16:08	14:16	15:57	
76.6	76.4	78.6	79.4	
76.7	77.0	76.6	79.0	
77.0	76.9	75.9	79.7	
76.8	76.8	77.0	79.4	2.6
Location 6				**Increase**
17:54	16:45	15:14	16:43	
76.8	78.7	81.5	79.9	
77.0	78.6	81.1	79.7	
	78.6		80.1	
76.9	78.6	81.3	79.9	3.0
			AVERAGE	2.4
			MEDIAN	2.3

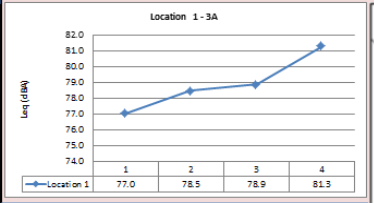
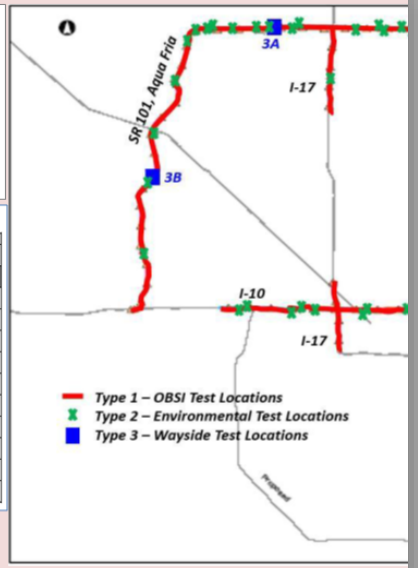


Table 6. Comparison of Average Measured and Modeled Site 3A Wayside Traffic Noise Levels

Testing Period	Average Measured L_{eq} dBA				Average Modeled L_{eq} dBA			
	50ft/ 12ft	50ft/5ft	100ft/ 5ft	175ft/ 5ft	50ft/ 12ft	50ft/5ft	100ft/ 5ft	175ft/ 5ft
Pre-Overlay (Aug 03)	82.5	82.3	76.7	--	79.8	79.9	77.5	74.7
Post-Overlay (Oct 03)	74.6	74.2	--	--	81.1	81.1	--	--
1-Year (Sep 04)	74.8	75.1	71.3	66.9	79.5	79.5	77.3	74.6
1.5-Year (Apr 05)	75.1	75.0	70.4	65.1	79.2	79.2	76.9	74.1
2.5-Year (Mar 06)	75.8	75.7	72.1	67.6	79.8	79.8	77.4	74.6
7-Year (Nov 10)	76.9	77.2	72.1	67.0	79.2	79.2	76.7	73.9
8-Year (Nov 11)	77.0	76.9	71.2	65.2	79.4	79.5	77.0	74.1
9-Year (Oct 12)	77.5	77.6	72.3	66.3	79.7	79.7	77.3	74.4
10-Year (Oct 13)	77.9	77.9	73.1	67.3	79.0	79.1	76.6	73.8
11-Year (Oct 14)	78.2	77.9	73.0	66.9	79.2	79.3	76.8	73.9
12-Year (Oct 15)	78.4	78.4	74.0	68.1	79.2	79.2	76.9	74.0



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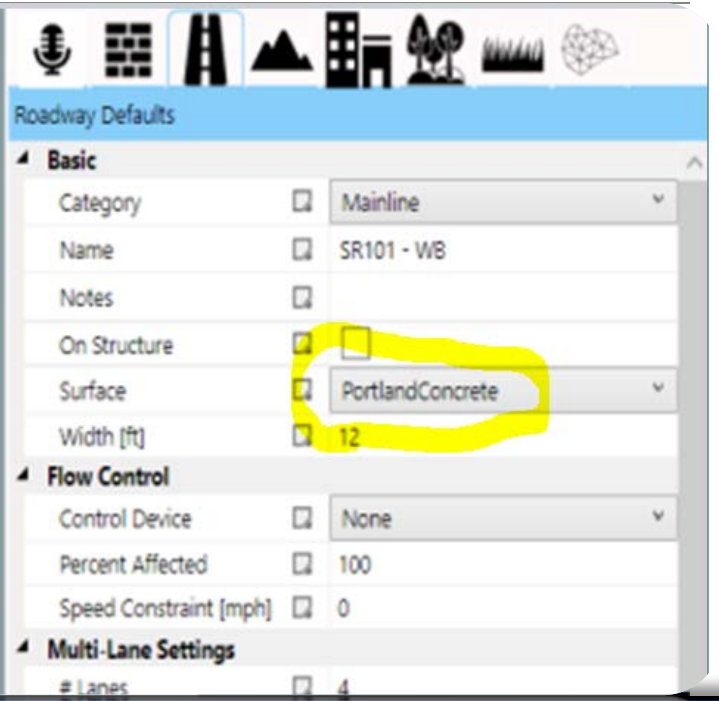

TNM 3.0 - Conclusion

Streamlining the analysis process	Significantly reduced time of data transfer and transition between platforms
	Improved placement of receivers and noise propagation intervening features in model
	Parallel barrier noise reduction degradation simplified and time-reduced consideration
	Improved consideration of different pavement types
	Simplified consideration of reflections off surfaces
	Multilane roadway modeling facilitated
Reduces time of reviews	Visual presentation of the project area, analysis, and results
	Timely consideration of potential impacts early in the development process
	Improves other short-term studies within the department

Departmental Directive 93-16

QUALITY POLICY

The Quality Policy for the Arizona Department of Transportation as shown below is hereby adopted and will be used in conjunction with all activities within the department:

We will consistently provide our customers products and services that meet mutually agreed-upon requirements.

Witness my hand this 1st day of March 1993.

Larry S. Bonine, Director
Arizona Department of Transportation

GUIDING VISION
ADOT - 97

ADOT is recognized and respected as:

- The model of efficient, effective, responsive government.
- The preferred partner of business and industry.
- The employer of choice, attracting and retaining the best and brightest.

Continuous improvement is our way of life!

Beverly Chenausky
Joonwon Joo

Tremaine Wilson
Angie Newton
Joe D'Onofrio

Fred Garcia

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