MEMORANDUM

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TO: William Knowles, P.E. – TxDOT-TPP
Janie Temple – TxDOT-TPP
Laura Norton – TxDOT-TPP

FROM: Reza Farzaneh, Ph.D., P.E.
Texas A&M Transportation Institute

SUBJECT: **Comparison of MOSERS Spreadsheet Tool and FHWA's CMAQ Toolkit**
Contract No 21853
Deliverable for Subtask 2.2 – Mobile Source Emissions Reduction Strategies Analysis Support

This memorandum summarizes the findings of the work performed by Texas A&M Transportation Institute (TTI) staff under Subtask 2.2 (Transportation Control Measures [TCMs] Analysis Support) of the TTI-TxDOT Air Quality and Conformity Interagency Contract. The focus of this effort was to conduct a high-level comparison of TxDOT's *MOSERS spreadsheet tool* with FHWA's *CMAQ*[1] *Emissions Calculator Toolkit* and summarize the findings. An overview of the MOSERS spreadsheet tool and FHWA's CMAQ Toolkit is provided below, followed by a summary comparison of these tools according to their scopes, intended applications, features, and other characteristics.

MOSERS Spreadsheet Tool

The Texas *Guide to Accepted Mobile Source Emission Reduction Strategies*, also known as the **MOSERS guide**, is a toolkit consisting of guidance documents and a spreadsheet tool developed by TTI for the Texas Department of Transportation (TxDOT). The MOSERS documents provide an introduction to transportation air quality and contain a comprehensive set of emissions calculations methods for evaluation of emissions reductions from a list of mobile source emission reduction strategies. For over 15 years, the MOSERS guide's emissions estimation equations have been the standard approach for estimating emissions benefits of off-model transportation strategies in Texas.

[1] Congestion Mitigation and Air Quality (CMAQ) Improvement Program

As part of an on-going update and upgrade of the MOSERS guide, TTI has developed a MOSERS spreadsheet tool, an MS Excel®-based workbook with built-in equations capable of estimating vehicle activity changes necessary for a select number of strategies recommended by the Texas Technical Working Group for Mobile Source Emissions (TWG). The development of the MOSERS spreadsheet tool was initiated in response to a request from the TWG members for a user-friendly tool that provides a set of standardized methodologies for estimation of vehicle activity parameters needed for calculating emissions benefits using MOSERS guide emissions equations. Figure 1 shows a screenshot of the MOSERS spreadsheet tool and the generated PDF report.

In addition to estimating activity changes, the tool uses regional-specific MOVES emission rates for seven metropolitan areas of Texas[2] to estimate the expected emissions benefits. These emission rates are stored in a web-hosted data table and dynamically downloaded based on users' selection of area, analysis year, and road classification. Using a web-hosted data table, emission rates can be updated with no need for releasing a new version of the spreadsheet tool. The MOSERS spreadsheet tool is available through the Texas Air Quality Portal[3].

FHWA CMAQ Emission Calculator Toolkit

Volpe National Transportation Systems Center (Volpe) has assisted FHWA in developing the CMAQ Toolkit since 2015. The toolkit was initiated in response to a realization that many potential CMAQ project sponsors may not have the technical capacity to develop independent air quality benefit estimates. This toolkit consists of a series of MS Excel-based spreadsheet tools to calculate representative air quality benefits for most common CMAQ projects. Figure 2 shows a screenshot from one of the workbooks. The tool uses *national-level annual-average* MOVES emission rates for emission calculation purposes. These emission rates are embedded in the tool, and any update of emission rates requires the release of a new version of the individual workbooks.

The CMAQ Toolkit spreadsheets are available through a webpage on FHWA's website (https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/). FHWA has stated that the CMAQ toolkit "is only offered as an additional resource to assist DOTs, MPOs, and project sponsors in the project justification process. Agencies and individuals using a preferred methodology to generate air quality benefit information are welcome to continue their current practice."[4]

[2] Austin, Corpus Christi, El Paso, Dallas-Fort Worth, Houston, San Antonio, Waco
[3] https://txaqportal.org/mosers_tools_and_docs#/
[4] Congestion Mitigation and Air Quality Improvement Program Emission Reductions Calculator, https://www.fhwa.dot.gov/ENVIRONMENT/air_quality/conformity/highlights/high1116.cfm (updated 5/17/2017)

Table 1. Comparison of FHWA's CMAQ and TxDOT's MOSERS Spreadsheet Tools.

		FHWA CMAQ Toolkit	MOSERS Spreadsheet Tool
Purpose and Applications	**CMAQ Projects' Eligibility**	✓	✓
	CMAQ Reporting Activities	✓	✓
	CMAQ Performance Measurement	✓	✓
	Transportation Conformity	×	✓*
	State Implementation Plan	×	✓*
Intended Users		DOTs, MPOs, and project sponsors across the U.S.	TxDOT, Texas MPOs, and Texas transportation air quality practitioners undertaking air quality planning and evaluation of mobile source emissions reduction strategies
Scope	**Format**	Multiple macro-enabled MS Excel workbooks. Emission rates embedded inside the tool.	Single macro-enabled MS Excel Workbook. Emission rates downloaded from a web-hosted data table on-demand.
	Strategies	The most frequently encountered CMAQ projects (**18** strategies as of Feb. 2020)	The most frequently encountered Mobile Source Emission Reduction projects -- (**8** Strategies as of Feb. 2020 – two more strategies will be added by June 2020)
	Vehicle Activity Changes	✓	✓
	Emission Changes	✓ (NO_X, VOC, $PM_{2.5}$, PM_{10}, CO, CO_2-eq, Energy)	✓ (NO_X, VOC, PM_{10}, CO, CO_2)
	Emission Rates – Analysis Years	2019 – 2030 (embedded within the tool)	2014 – 2040 ** (dynamically downloaded)
	Emission Rates – Spatial Coverage	National-Level Annual Average ***	Local-Specific ** - Maximum between Summer and Winter
Features and Capabilities	**Default Values**	✓	✓
	Link to User Guide	✓	✓
	Project information input	×	✓
	Users can review all calculations	×	✓
	Generate standardized PDF report	×	✓

***** When vehicle activity results combined with MOSERS guide emissions equations and official local-specific MOVES emissions rates. The capability of loading official local-specific emissions rates is planned for a future release. The emissions result using these official emissions rates will be valid for conformity and SIP purposes.

****** TTI has started work on generating updated MOVES emission rates for analysis years 2020 to 2050. The inclusion of these emission rates into the MOSERS tool is planned for a future release. Local-specific input parameters are from input files used for regulatory inventory analyses by TxDOT and TCEQ.

******* MOVES' default values are used for all inputs.

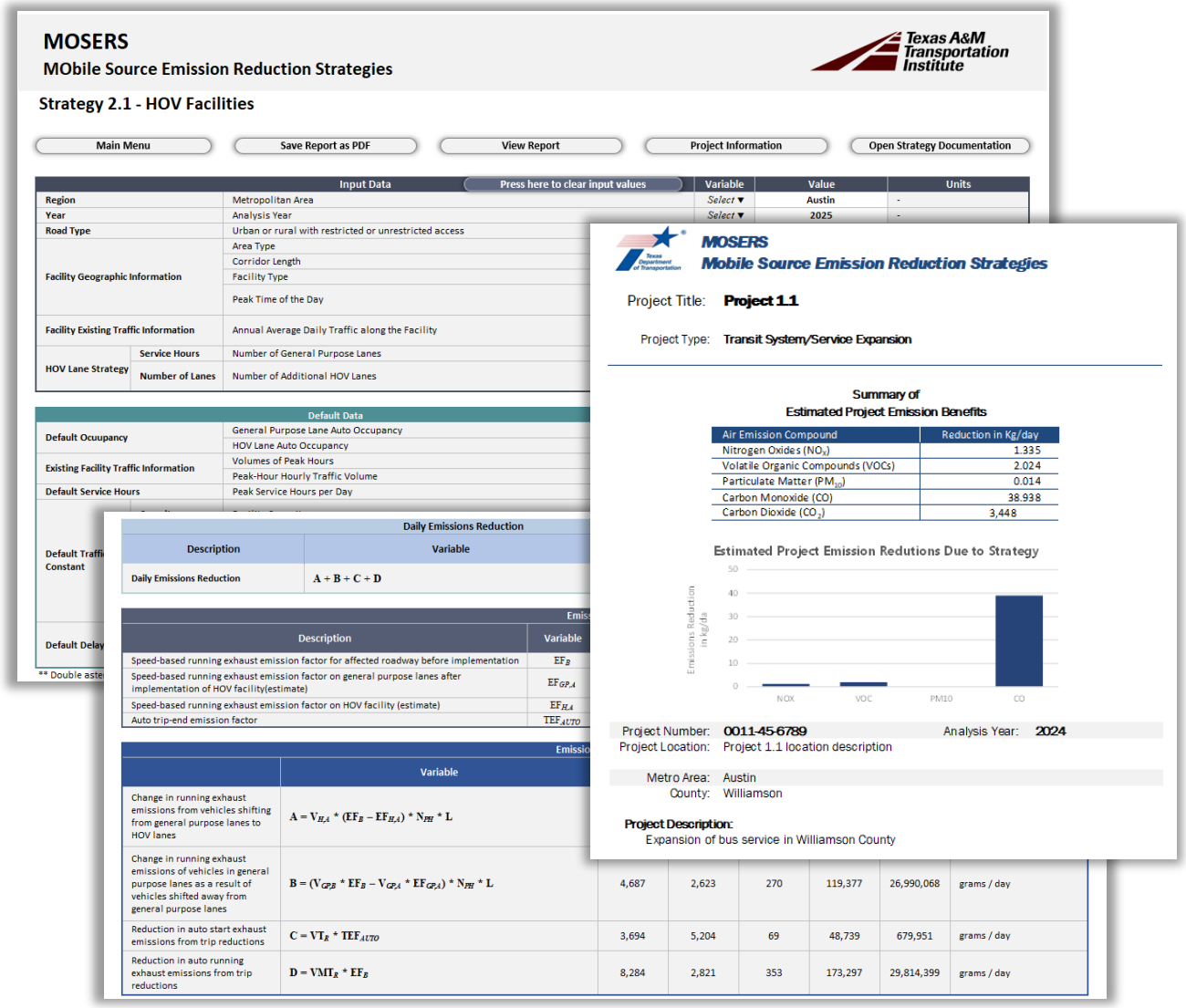

Figure 1. MOSERS Tool - Partial View of a Strategy Page and Title Page of the Generated PDF Report.

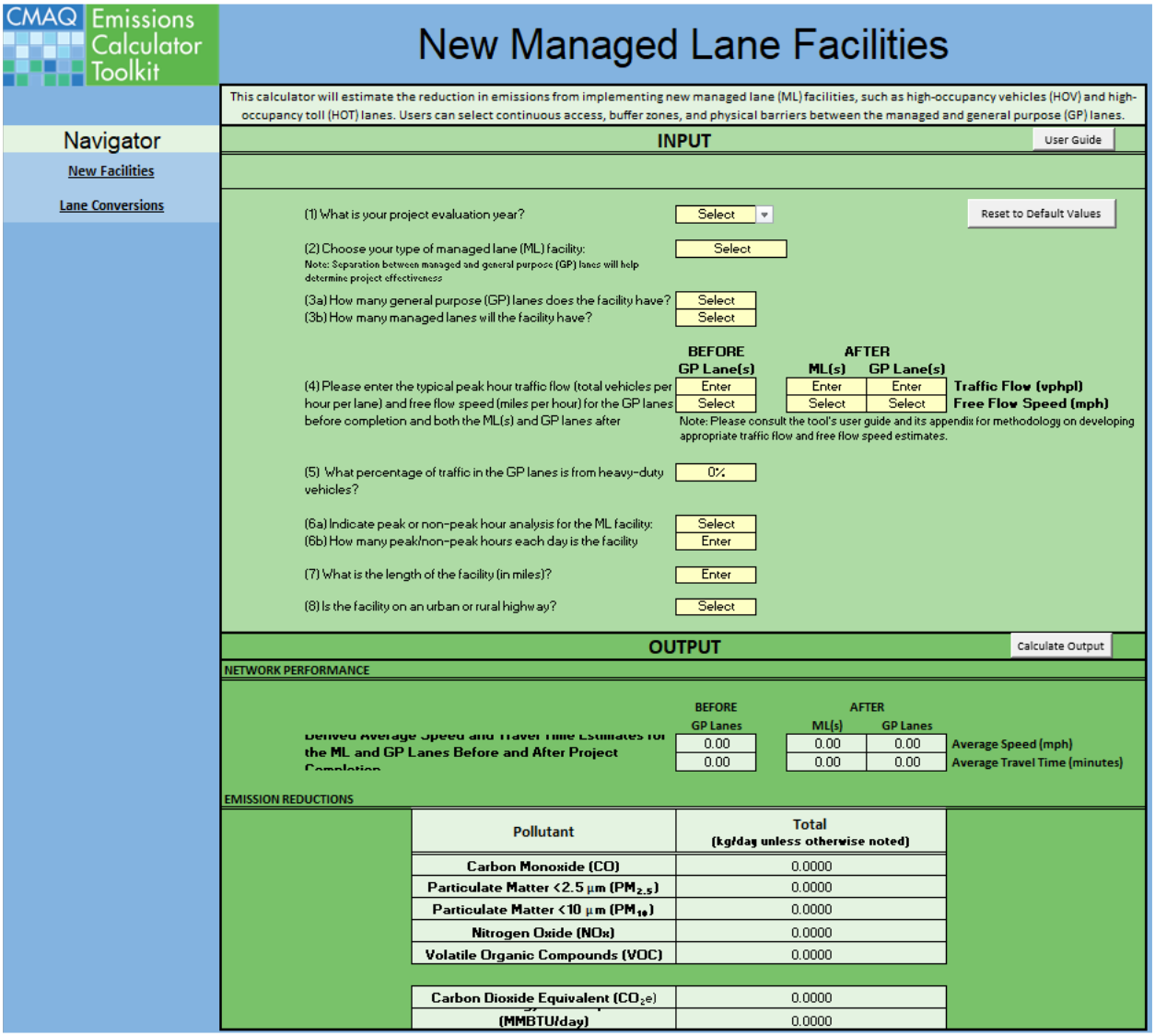

Figure 2. CMAQ Toolkit – View of a Strategy Page.