

Project 0-6658

## PRODUCT 0-6658-P5

# Data Collection and Population of the Database (The DSS and RDSSP)



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by

Lubinda F. Walubita, Raenita Hassan, Sang I. Lee, Abu NM Faruk,  
Maria Flores, Tom Scullion, Imad Abdallah, and Soheil Nazarian

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(THE DSS AND RDSSP)**

by

Lubinda F. Walubita  
Research Scientist  
Texas A&M Transportation Institute

Maria Flores  
Student Worker  
Texas A&M Transportation Institute

Raenita Hassan  
Student Worker  
Texas A&M Transportation Institute

Tom Scullion  
Senior Research Engineer  
Texas Transportation Institute

Sang Ick Lee  
Assistant Transportation Researcher  
Texas A&M Transportation Institute

Imad Abdallah  
Associate Director  
Center for Transportation Infrastructure Systems  
and

Abu NM Faruk  
Research Associate  
Texas A&M Transportation Institute

Soheil Nazarian  
Center Director  
Center for Transportation Infrastructure Systems

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TEXAS TRANSPORTATION INSTITUTE  
The Texas A&M University System  
College Station, Texas 77843-3135

CENTER FOR TRANSPORTATION  
INFRASTRUCTURE SYSTEMS  
University of Texas at El Paso  
El Paso, Texas 79968-0582



## **DISCLAIMER**

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT.

This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. The United States Government and the State of Texas do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report. The researcher in charge of this project was Lubinda F. Walubita, Ph.D.

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## SECTION 1 INTRODUCTION

This study was initiated to collect materials and pavement performance data on a minimum of 100 highway test sections around the state of Texas, incorporating both flexible pavements and overlays. Besides being used to calibrate and validate mechanistic-empirical (M-E) design models, the data collected will also serve as an ongoing reference data source and/or diagnostic tool for TxDOT engineers and other transportation professionals.

Toward this goal, this product provides an itemized documentation of the data collection and population that is being conducted, namely:

- Number of test sections to date.
- The MS Access® Data Storage System (DSS).
- The Raw Data Storage System (RDSSP) for raw data storage.
- The types of data being collected.
- The data requirements and input parameters for M-E models and design software.
- The specifications and methods used for both lab and field testing.
- The field data collection forms.
- Demonstration examples of how to access and navigate through the databases.

Detailed documentation of the data collection and population process can be found in:

Walubita, L.F., G. Das, E.M. Espinoza, J.H. Oh, T. Scullion, J.L. Garibay, S. Nazarian, I. Abdallah, and S. Lee (2012). [Texas Flexible Pavements and Overlays: Year 1 Report – Test Sections, Data Collection, Analyses, and Data Storage System](#). Technical Research Report #0-6658-1. TTI, College Station, TX, USA.

Website Link: <http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/0-6658-1.pdf>.



## SECTION 2      NUMBER OF TEST SECTIONS

As of summer 2014, 107 test sections had been identified on various highways across Texas. As listed in [Table 2-1](#), these test sections comprise conventional thin (< 3-inch thick hot mix asphalt [HMA]), regular/intermediate, and thick (> 6-inch thick HMA) pavement structures encompassing surface treated pavements, overlays, new construction, and perpetual pavements.

**Table 2-1. Number of Test Sections as of August 2014.**

#	PVMNT Type	Number
1	Perpetual	10
2	Overlay with CTB	6
3	Overlay with flex base	12
4	Overlay with LTB	7
5	Overlay over PCC	3
6	Overlay over treated base	12
7	Overlay with TOM	5
8	Overlay with WMA	1
9	Seal coat over flex base	4
10	Seal coat over treated base	4
11	HMA new construction or Rehab with CTB	12
12	HMA new construction with flex base	12
13	HMA new construction with lime/fly-ash base	2
14	HMA new construction with treated base	12
15	HMA new construction with WMA	5
Total		107

A location map of some of these test sections is shown in [Figure 2-1](#); it covers all Texas climatic zones illustrated in [Figure 2-2](#). Detailed tabulation of these test sections can be found in [Appendix I](#). As of October 2014, about 25 percent of these test sections are still under various stages of construction such as surfacing layer placement, etc. Approximately 30 percent of the test sections have at least three years' worth of field performance data. Note that both test section solicitation and field performance monitoring (twice per year) are ongoing processes throughout the course of the study.

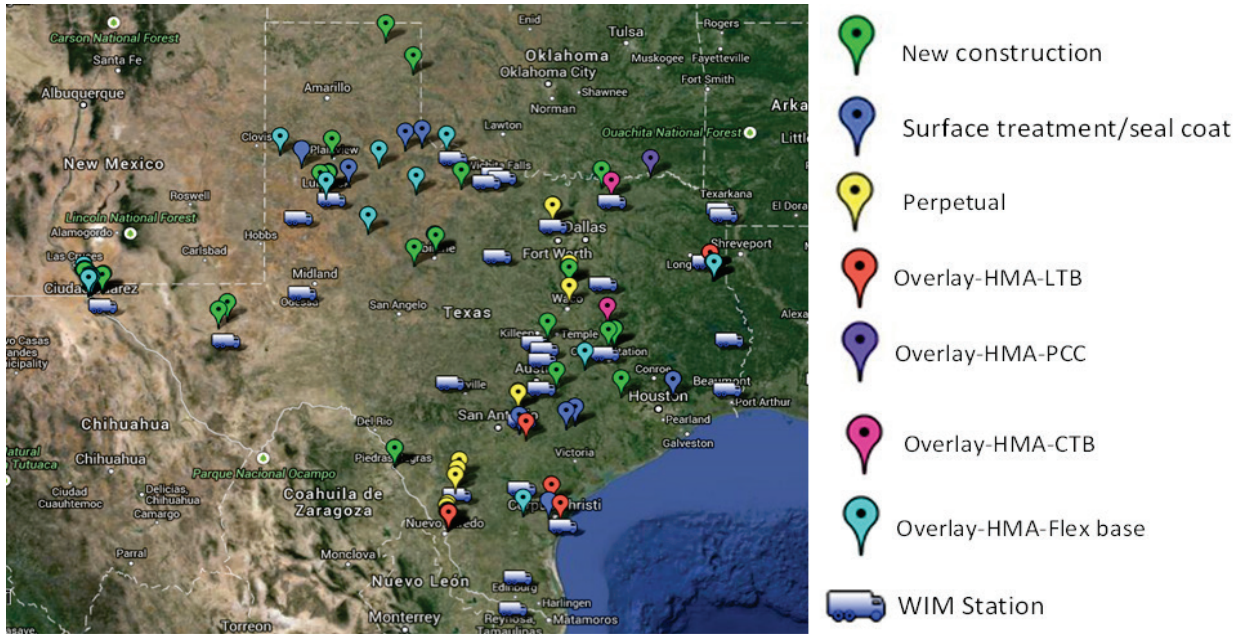


Figure 2-1. Example Location of Selected Test Sections.

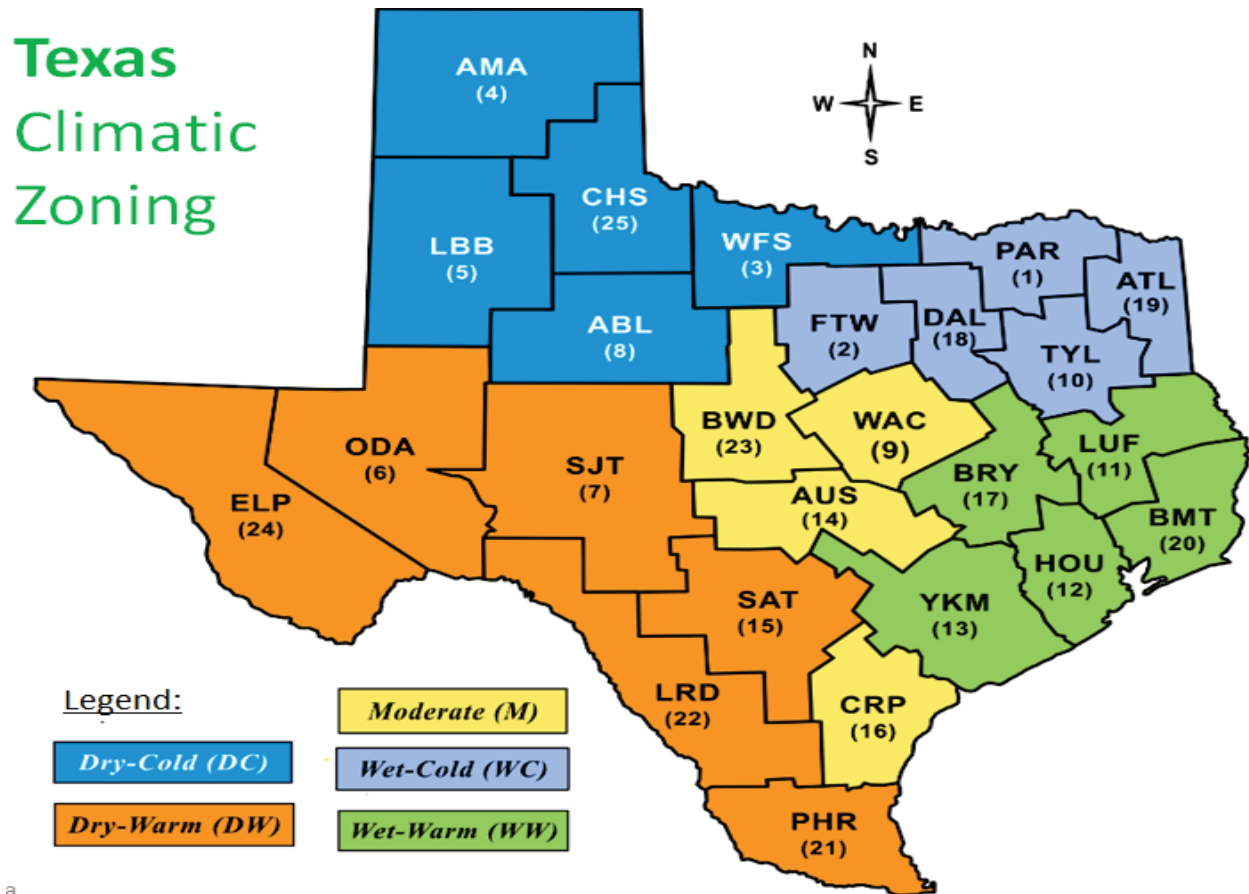


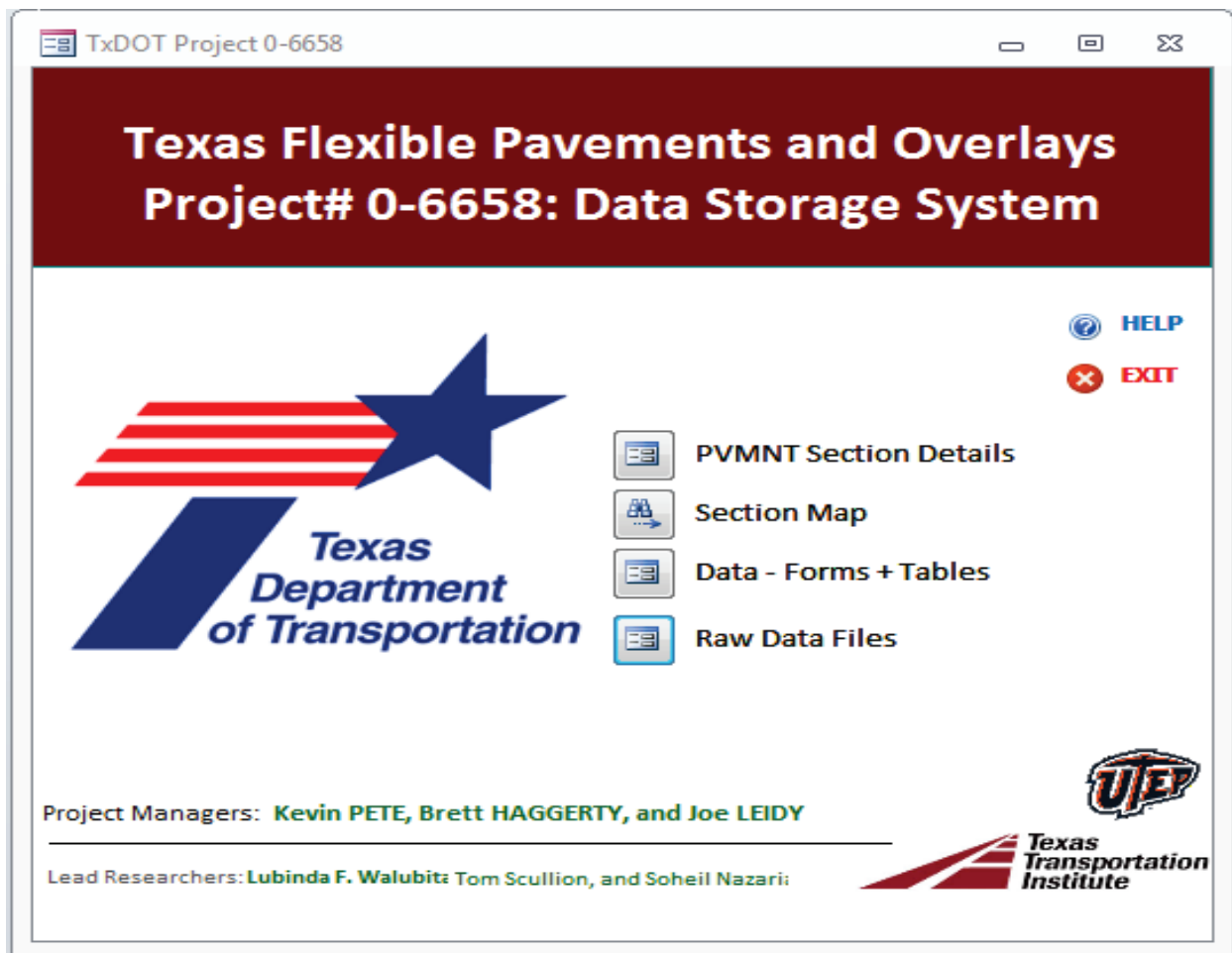
Figure 2-2. Texas Climatic-Environmental Zones.

## SECTION 3 THE DATABASE AND REPOSITORY SYSTEM

The data storage system for this study consists of two repositories, one for the processed data and one for the unprocessed raw data, namely:































- The Microsoft (MS) Access DSS for the processed data.
- The RDSSP for the unprocessed raw data.

For the processed data, MS Access was selected as the database (the DSS) platform due to its commercial availability, familiarity, user-friendliness, and easy access to TxDOT engineers and the general stakeholders. [Figure 3-1](#) shows the DSS main menu screenshot.



**Figure 3-1. The DSS – Main Menu Screenshot.**

As a backup and to provide opportunities for data verification and future analyses as the users may deem necessary, the raw data files for all the data measured and collected in this study are concurrently kept in the RDSSP. [Figure 3-2](#) shows an example of the RDSSP structure for some selected test sections. For easy accessibility, the RDSSP is linked to the DSS via a “Raw Data Files” function on the DSS main screen shown in [Figure 3-1](#).

Type	Name	Modified
	TxDOT_TTI-00001_US 59 ATLANTA	12/12/2012 10:27 AM
	TxDOT_TTI-00002_SH 114 FORT WORTH	1/3/2013 9:37 AM
	TxDOT_TTI-00003_SH 114 FORT WORTH	1/3/2013 9:37 AM
	TxDOT_TTI-00004_IH 35 (NB) WACO	5/16/2014 11:49 AM
	TxDOT_TTI-00005_LOOP 480 (SB) LAREDO	6/7/2014 2:20 PM
	TxDOT_TTI-00006_SH 121 PARIS	12/17/2012 3:17 PM
	TxDOT_TTI-00007_US 271 PARIS	12/17/2012 3:20 PM
	TxDOT_TTI-00008_US 82_PARIS	1/3/2013 1:14 PM
	TxDOT_TTI-00009_IH 35 WACO	12/6/2012 11:46 AM
	TxDOT_TTI-00010_IH 35 LAREDO	1/3/2013 1:19 PM
	TxDOT_TTI-00011_IH 35 LAREDO	1/3/2013 1:20 PM
	TxDOT_TTI-00012_IH 35 LAREDO	1/3/2013 1:21 PM
	TxDOT_TTI-00013_US 59 ATLANTA	1/23/2013 12:04 PM
	TxDOT_TTI-00014_US 59 ATLANTA	1/23/2013 12:04 PM
	TxDOT_TTI-00015_SH 21 BRYAN	1/23/2013 11:31 AM
	TxDOT_TTI-00016_FM 2100 HOUSTON	9/15/2013 10:33 AM
	TxDOT_TTI-00017_FM 1887 HOUSTON	9/15/2013 10:34 AM
	TxDOT_TTI-00018_IH 35 LAREDO	1/23/2013 12:02 PM
	TxDOT_TTI-00019_IH 35 SAN ANTONIO	1/23/2013 12:02 PM
	TxDOT_TTI-00020_IH 35 SAN ANTONIO	1/23/2013 12:03 PM
	TxDOT_TTI-00021_IH 35 WACO	1/23/2013 12:03 PM
	TxDOT_TTI-00022_IH 35 (NB) WACO	5/16/2014 11:49 AM
	TxDOT_TTI-00023_US 77A YOAKUM	9/26/2013 10:40 AM
	TxDOT_TTI-00024_SH 95 YOAKUM	9/26/2013 10:41 AM
	TxDOT_TTI-00025_US 181 CORPUS CHRISTI	12/4/2012 12:50 PM
	TxDOT_TTI-00026_SH 358 CORPUS CHRISTI	12/4/2012 1:42 PM
	TxDOT_TTI-00027_FM 763 (SB) CORPUS CHRISTI	5/16/2014 11:53 AM
	TxDOT_TTI-00028_US 67 (SB) FORT WORTH	5/16/2014 12:54 PM
	TxDOT_TTI-00029_SH 7 BRYAN	10/18/2013 12:13 PM
	TxDOT_TTI-00030_US 83 PHARR	1/4/2014 9:10 AM

**Figure 3-2. The RDSSP – Selected Test Sections from #01 to #30.**

As an integral part of this product documentation and for demonstration purposes, a CD/USB flash disk is also included and comprises the following contents:

- a) The DSS in MS Access format (processed data).
- b) The RDSSP (raw data with example folders and files for some selected test sections).



## SECTION 4 DATA COLLECTION AND POPULATION

In general, a database should be multi-functional. While focusing on the data requirements for the Texas M-E models and related software, significant efforts were also made to collect, as much as possible, related pavement section data that could serve as an ongoing reference data source and/or general diagnostic tool for TxDOT engineers and other transportation professionals.

A database is considered useful only if it is populated with sufficient data, both in terms of quantity and accuracy. Accordingly, these researchers are collecting a variety of both laboratory and field data, including but not limited to the following:

- Design data and drawings including pavement cross sections.
- Construction data, quality control/quality assurance (QC/QA) charts, and coring.
- Material properties of each pavement layer (through both lab and field testing).
- Field testing and pavement performance data (including ground penetrating radar [GPR], falling weight deflectometer [FWD], dynamic cone penetrometer [DCP], profiles, rutting, cracking, aggregate loss, bleeding, coring, etc.).
- Traffic data including volume, classification, vehicle speeds, and load spectra (axle weights, truck distributions, adjustment factors, etc.).
- Climatic data including temperature and precipitation in Texas' five climatic zones.

Tables 4-1 through 4-10 itemize the data that are currently being collected, processed/analyzed and stored in the DSS. These data are being cataloged by means of entry forms located under the drop down menu item “Project 0-6658: Forms”, or in tables under “Material Properties,” accessed by the selection menu on the left side of the main menu screen; see Figure 4-1. As of October 2014, the databases are comprised of data with the following volumes:

- a) 538 MB for the DSS (processed data in MS Access platform)
- b) 15 GB for the RDSSP (raw data/files)

Data collection methods and measurement procedures, including test specifications, test sequence, replicates, etc., are discussed in Section 6. Demonstration examples for data access and navigation of the databases are given in Section 7 and Appendix IV through to VI.

Note however that Table 4-10 comprises of a list of supplementary lab test data that the researchers collected from their own extra effort for research informational purposes only and other engineering analyses. These data collection are optional, they are not required as M-E input parameters nor are they mandated under Study 0-6658.

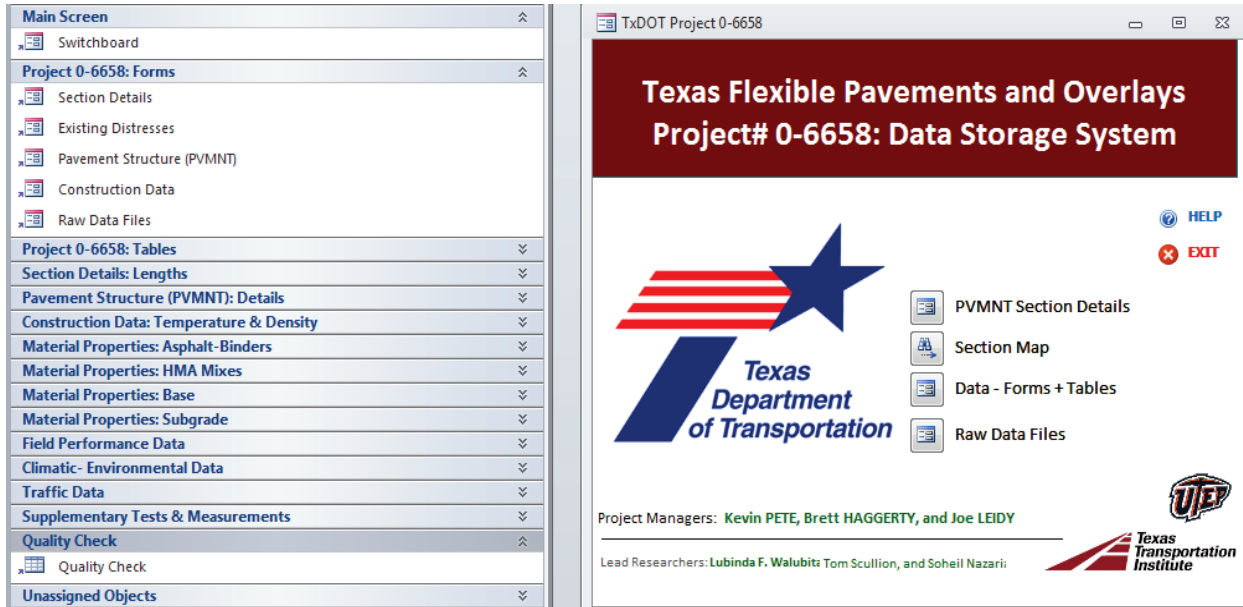


Figure 4-1. The DSS – Main Menu Screenshot with the Forms and Tables.

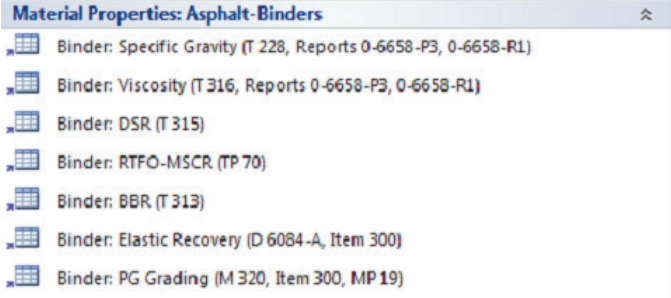

Table 4-1. Example of Design Data.

#	Data Item	DSS and RDSSP Views																																				
1	Design reports	DSS View																																				
2	Drawings	Pavement Structure (PVMNT)																																				
3	Mix-design sheets, etc.	<p>PVMNT_ID: PVMNT_TTI-00005      Picture: </p> <p>Section_ID: TxDOT_TTI-00005</p> <p>CSJR: 0299-14-013      PVMNT X-Cross Section: </p> <p>HWY: LOOP 480</p> <p>District: LAREDO</p> <p>County: MAVERICK</p> <p>PVMNT Type: New Construction</p> <p>Total Number Layers: 3</p> <table border="1"> <thead> <tr> <th>Layer#</th> <th>LayerID</th> <th>DateOfConstruction</th> <th>Thickness (in)</th> <th>MaterialType</th> <th>MixDesign</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>HMA (Type C)</td> <td>2012</td> <td>4</td> <td>Type C</td> <td>PG 64-22 + 20% RAP</td> </tr> <tr> <td>2</td> <td>Base</td> <td>2011</td> <td>10</td> <td>Flex</td> <td>Grade 4</td> </tr> <tr> <td>1</td> <td>Treated subgrade</td> <td>2011</td> <td>6</td> <td>4% cement</td> <td>4% cement treated subgrade</td> </tr> <tr> <td>0</td> <td>Subgrade</td> <td>2011</td> <td></td> <td>Compacted natural soil</td> <td></td> </tr> <tr> <td>0</td> <td></td> <td></td> <td>0</td> <td></td> <td></td> </tr> </tbody> </table> <p>Pavement Structure Details</p> <p>RDSSP View</p> <ul style="list-style-type: none"> <li> 1.01 Plans + X-Sections</li> <li> 1.02 HMA Mix-Design Sheets</li> <li> 1.03 Design Reports</li> <li> 1.04 Miscellaneous Items</li> </ul>	Layer#	LayerID	DateOfConstruction	Thickness (in)	MaterialType	MixDesign	3	HMA (Type C)	2012	4	Type C	PG 64-22 + 20% RAP	2	Base	2011	10	Flex	Grade 4	1	Treated subgrade	2011	6	4% cement	4% cement treated subgrade	0	Subgrade	2011		Compacted natural soil		0			0		
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1	Treated subgrade	2011	6	4% cement	4% cement treated subgrade																																	
0	Subgrade	2011		Compacted natural soil																																		
0			0																																			

**Table 4-2. Example of Construction Data.**

#	Data Item	DSS and RDSSP Views																	
1	Pre-construction site meeting minutes	<p><b>DSS View</b></p> <div style="border: 1px solid gray; padding: 5px;"> <p style="text-align: center; background-color: #e0e0e0; margin: -1px -1px 1px -1px;"> <b>Construction Data</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>ConstructionData_ID: <input type="text" value="CD_TTI-000005"/></p> <p>Section_ID: <input type="text" value="TxDOT_TTI-00005"/></p> <p>CSJ#: <input type="text" value="0299-14-013"/></p> <p>HWY: <input type="text" value="LOOP 480"/></p> <p>District: <input type="text" value="LAREDO"/></p> <p>County: <input type="text" value="MAVERICK"/></p> <p>ConstructionDate: <input type="text" value="6/18/2012"/></p> <p>Contractor_Contact: <input type="text" value="Columbia"/></p> <p>TxDOT_Contact_ID: <input type="text" value=""/></p> <p>Contractor: <input type="text" value="Anderson"/></p> <p>LayerLocation: <input type="text" value=""/></p> <p>LayerType: <input type="text" value=""/></p> <p>Material/MixType: <input type="text" value="Type C"/></p> <p>Milling: <input type="text" value=""/></p> <p>MillingDepth (in): <input type="text" value=""/></p> <p>HMA_TruckType: <input type="text" value="Belly Dump"/></p> <p>MaterialTransferDevice: <input type="text" value="Hopper"/></p> <p>InfraredBar: <input type="text" value="No"/></p> <p>JointRoller: <input type="text" value="No"/></p> <p>BreakdownRoller: <input type="text" value="2 steel vibration"/></p> <p>SecondRoller: <input type="text" value="pneumatic 4 passes (24000kg)"/></p> </td> <td style="width: 50%; vertical-align: top;"> <p>FinishingRoller: <input type="text" value="2 passes static"/></p> <p>HMA_MatThickness: <input type="text" value="2 + 2 = 4 inches"/></p> <p>TargetDensity: <input type="text" value="93.00%"/></p> <p>OtherObservations: <input type="text" value="Tack coat= SS1"/></p> <p>QC/QA_Charts: <input type="text" value=""/></p> <p>Picture: <input type="text" value=""/></p> </td> </tr> </table> </div> <p><b>RDSSP View</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><input type="checkbox"/> Type</th> <th style="text-align: left;">Name</th> <th style="text-align: left;">Modified</th> </tr> </thead> <tbody> <tr> <td></td> <td>2.01 Pre-Construction Meetings</td> <td>12/12/2012 10:44 AM</td> </tr> <tr> <td></td> <td>2.03 QC-QA Charts</td> <td>12/12/2012 10:33 AM</td> </tr> <tr> <td></td> <td>2.04 Record Reports</td> <td>12/12/2012 10:34 AM</td> </tr> <tr> <td></td> <td>2.05 Miscellaneous Items</td> <td>12/12/2012 10:34 AM</td> </tr> </tbody> </table>	<p>ConstructionData_ID: <input type="text" value="CD_TTI-000005"/></p> <p>Section_ID: <input type="text" value="TxDOT_TTI-00005"/></p> <p>CSJ#: <input type="text" value="0299-14-013"/></p> <p>HWY: <input type="text" value="LOOP 480"/></p> <p>District: <input type="text" value="LAREDO"/></p> <p>County: <input type="text" value="MAVERICK"/></p> <p>ConstructionDate: <input type="text" value="6/18/2012"/></p> <p>Contractor_Contact: <input type="text" value="Columbia"/></p> <p>TxDOT_Contact_ID: <input type="text" value=""/></p> <p>Contractor: <input type="text" value="Anderson"/></p> <p>LayerLocation: <input type="text" value=""/></p> <p>LayerType: <input type="text" value=""/></p> <p>Material/MixType: <input type="text" value="Type C"/></p> <p>Milling: <input type="text" value=""/></p> <p>MillingDepth (in): <input type="text" value=""/></p> <p>HMA_TruckType: <input type="text" value="Belly Dump"/></p> <p>MaterialTransferDevice: <input type="text" value="Hopper"/></p> <p>InfraredBar: <input type="text" value="No"/></p> <p>JointRoller: <input type="text" value="No"/></p> <p>BreakdownRoller: <input type="text" value="2 steel vibration"/></p> <p>SecondRoller: <input type="text" value="pneumatic 4 passes (24000kg)"/></p>	<p>FinishingRoller: <input type="text" value="2 passes static"/></p> <p>HMA_MatThickness: <input type="text" value="2 + 2 = 4 inches"/></p> <p>TargetDensity: <input type="text" value="93.00%"/></p> <p>OtherObservations: <input type="text" value="Tack coat= SS1"/></p> <p>QC/QA_Charts: <input type="text" value=""/></p> <p>Picture: <input type="text" value=""/></p>	<input type="checkbox"/> Type	Name	Modified		2.01 Pre-Construction Meetings	12/12/2012 10:44 AM		2.03 QC-QA Charts	12/12/2012 10:33 AM		2.04 Record Reports	12/12/2012 10:34 AM		2.05 Miscellaneous Items	12/12/2012 10:34 AM
<p>ConstructionData_ID: <input type="text" value="CD_TTI-000005"/></p> <p>Section_ID: <input type="text" value="TxDOT_TTI-00005"/></p> <p>CSJ#: <input type="text" value="0299-14-013"/></p> <p>HWY: <input type="text" value="LOOP 480"/></p> <p>District: <input type="text" value="LAREDO"/></p> <p>County: <input type="text" value="MAVERICK"/></p> <p>ConstructionDate: <input type="text" value="6/18/2012"/></p> <p>Contractor_Contact: <input type="text" value="Columbia"/></p> <p>TxDOT_Contact_ID: <input type="text" value=""/></p> <p>Contractor: <input type="text" value="Anderson"/></p> <p>LayerLocation: <input type="text" value=""/></p> <p>LayerType: <input type="text" value=""/></p> <p>Material/MixType: <input type="text" value="Type C"/></p> <p>Milling: <input type="text" value=""/></p> <p>MillingDepth (in): <input type="text" value=""/></p> <p>HMA_TruckType: <input type="text" value="Belly Dump"/></p> <p>MaterialTransferDevice: <input type="text" value="Hopper"/></p> <p>InfraredBar: <input type="text" value="No"/></p> <p>JointRoller: <input type="text" value="No"/></p> <p>BreakdownRoller: <input type="text" value="2 steel vibration"/></p> <p>SecondRoller: <input type="text" value="pneumatic 4 passes (24000kg)"/></p>	<p>FinishingRoller: <input type="text" value="2 passes static"/></p> <p>HMA_MatThickness: <input type="text" value="2 + 2 = 4 inches"/></p> <p>TargetDensity: <input type="text" value="93.00%"/></p> <p>OtherObservations: <input type="text" value="Tack coat= SS1"/></p> <p>QC/QA_Charts: <input type="text" value=""/></p> <p>Picture: <input type="text" value=""/></p>																		
<input type="checkbox"/> Type	Name		Modified																
	2.01 Pre-Construction Meetings		12/12/2012 10:44 AM																
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	2.04 Record Reports		12/12/2012 10:34 AM																
	2.05 Miscellaneous Items		12/12/2012 10:34 AM																
2	Compaction patterns (number of passes, weight of compactors, etc.)																		
3	Material type																		
4	Layer/mat thicknesses																		
5	Density and temperatures																		
6	MTD																		
7	QC/QA data/charts																		
8	Coring																		
9	Name of contractor and contacts, etc.																		































**Table 4-3. Material Properties (Example of Asphalt-Binder Data).**

#	Data Item	DSS and RDSSP Views	
1	Specific Gravity	DSS View	
2	Viscosity		
3	DSR		
4	RTFO-MSCR		
5	BBR		
6	Elastic Recovery		
7	PG Grading		RDSSP View  

**Table 4-4. Material Properties (Example of HMA Mix Data).**

#	Data Item	DSS and RDSSP Views
1	Volumetrics	<p>DSS View</p> <div style="border: 1px solid gray; padding: 5px;"> <p><b>Material Properties: HMA Mixes</b> <span style="float: right;">⤴</span></p> <ul style="list-style-type: none"> <li> HMA: Volumetrics (Mix design sheets, QC/QA charts)</li> <li> HMA: AC Extractions (Tex-210-F)</li> <li> HMA: Gradation Extractions (Tex-200-F) (%Passing)</li> <li> HMA: Repeated Loading (RLPD) (Reports 0-6658-P3, 0-5798)</li> <li> HMA: Hamburg (Tex-242-F) (Rut Depth in mm)</li> <li> HMA: Dynamic Modulus (DM) (AASHTO TP 62-03) (Modulus in ksi)</li> <li> HMA: Overlay (OT) (Tex-248-F   <math>\leq 1000</math> cycles)</li> <li> HMA: Indirect Tension (IDT) (Tex-226-F   85-200psi)</li> <li> HMA: OT Fracture Properties (Reports 0-6658-P3, 0-5798-2)</li> <li> HMA: Thermal Coefficient (Report 0-6658-P3, Tex-428-A)</li> </ul> </div>
2	AC Extractions	
3	Gradation Extractions	
4	Repeated Loading (RLPD)	
5	Hamburg (HWTT)	
6	Dynamic Modulus (DM)	
7	Overlay (OT)	
8	Indirect Tension (IDT)	<p>RDSSP View</p> <ul style="list-style-type: none"> <li> <b>3.2.01 AC + Gradation Extractions</b></li> <li> <b>3.2.02 Molding Parameters</b></li> <li> <b>3.2.03 Hamburg</b></li> <li> <b>3.2.04 Repeated Load</b></li> <li> <b>3.2.05 Dynamic Modulus</b></li> <li> <b>3.2.06 OT_Tex-248-F</b></li> <li> <b>3.2.07 IDT_Tex-226-F</b></li> <li> <b>3.2.09 Thermal Coefficient</b></li> <li> <b>3.2.10 Flow Number</b></li> </ul>
9	OT Fracture Properties	
10	Thermal Coefficient	

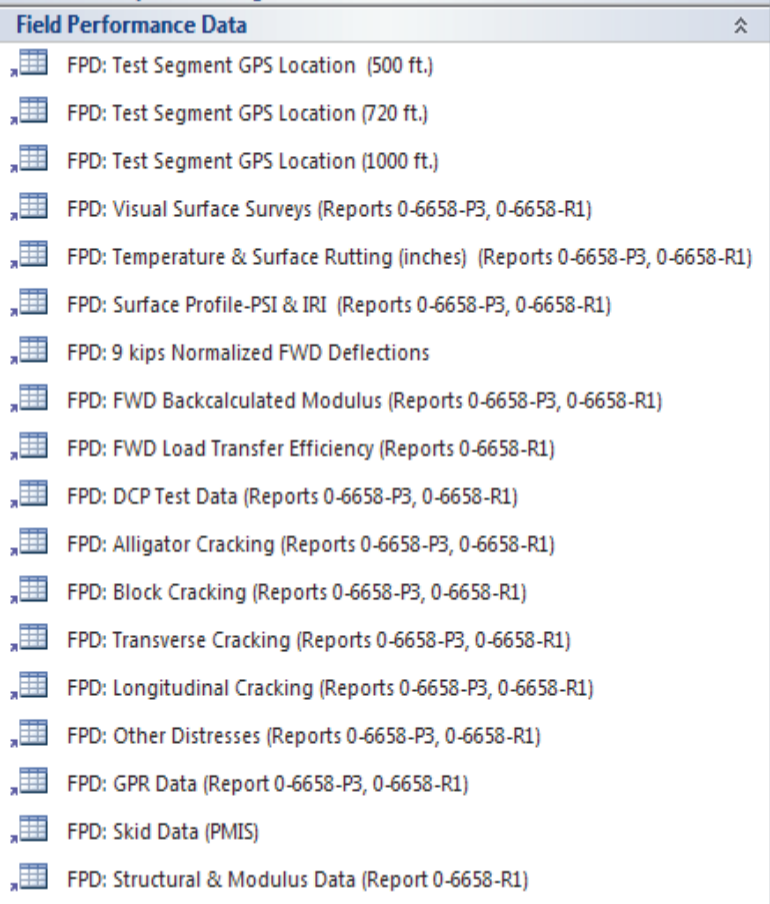
**Table 4-5. Material Properties (Example of Base Data).**

#	Data Item	DSS and RDSSP Views
1	FLEXBASE: Sieve Analysis	<p>DSS View</p> <p><b>Material Properties: Base</b> </p> <ul style="list-style-type: none"> <li> FLEXBASE: Sieve Analysis (Tex-110-E)(%Passing)</li> <li> FLEXBASE: Atterberg Limits (Tex-104-E, 105-E, 106-E)</li> <li> FLEXBASE: Specific Gravity (ASTM C-127, 128)</li> <li> FLEXBASE: MDD Curve (Tex-113-E)</li> <li> FLEXBASE: Texas Triaxial (Tex-117-E)</li> <li> FLEXBASE: Shear Strength (Tex-143)</li> <li> FLEXBASE: Resilient Modulus (Tech Memo: 1-28A)</li> <li> FLEXBASE: Permanent Deformation (Tech Memo: 1-28A)</li> <li> FLEXBASE: Soil Classification</li> <li> FLEXBASE: Free-Free Resonance Column Test (FFRC)</li> <li> TREATEDBASE: Sieve Analysis (Tex-110-E)</li> <li> TREATEDBASE: Atterberg Limits (Tex-104-E, 105-E, 106-E)</li> <li> TREATEDBASE: MDD Curve (Tex-113-E)</li> <li> TREATEDBASE: Unconfined Compressive Strength (UCS) (Tex-120-E etc)</li> <li> TREATEDBASE: Resilient Modulus (Zero Confinement)</li> <li> TREATEDBASE: Permanent Deformation (Zero Confinement)</li> <li> TREATEDBASE: Modulus of Rupture (MoR) (Tex-448-A)</li> <li> TREATEDBASE: Soil Classification</li> <li> TREATEDBASE: Free-Free Resonance Column Test (FFRC)</li> </ul> <hr/> <p>RDSSP View</p> <ul style="list-style-type: none"> <li> <a href="#">FlexBase_Atterberg Limits_Loop 480 Laredo</a></li> <li> <a href="#">FlexBase_MD Curve_Loop 480 Laredo</a></li> <li> <a href="#">FlexBase_Permanent Deformation_Loop 480 Laredo</a></li> <li> <a href="#">FlexBase_Resilient Modulus_Loop 480 Laredo</a></li> <li> <a href="#">FlexBase_Shear Strength 1_Loop 480 Laredo</a></li> <li> <a href="#">FlexBase_Shear Strength 2_Loop 480 Laredo</a></li> <li> <a href="#">FlexBase_Sieve Analysis_Loop 480 Laredo</a></li> <li> <a href="#">FlexBase_Specific Gravity_Loop 480 Laredo</a></li> <li> <a href="#">FlexBase_Texas Triaxial_Loop 480 Laredo</a></li> <li> <a href="#">Soil Classification_LP480 Base</a></li> </ul>
2	FLEXBASE: Atterberg Limits	
3	FLEXBASE: Specific Gravity	
4	FLEXBASE: MDD Curve	
5	FLEXBASE: Texas Triaxial	
6	FLEXBASE: Shear Strength	
7	FLEXBASE: Resilient Modulus	
8	FLEXBASE: Permanent Deformation	
9	FLEXBASE: Soil Classification	
10	FLEXBASE: Free-Free Resonance Column Test	
11	TREATEDBASE: Sieve Analysis	
12	TREATEDBASE: Atterberg Limits	
13	TREATEDBASE: MDD Curve	
14	TREATEDBASE: Unconfined Compressive Strength	
15	TREATEDBASE: Resilient Modulus	
16	TREATEDBASE: Permanent Deformation	
17	TREATEDBASE: Modulus of Rupture	
18	TREATEDBASE: Soil Classification	
19	TREATEDBASE: Free-Free Resonance Column Test	

**Table 4-6. Material Properties (Example of Subgrade Data).**

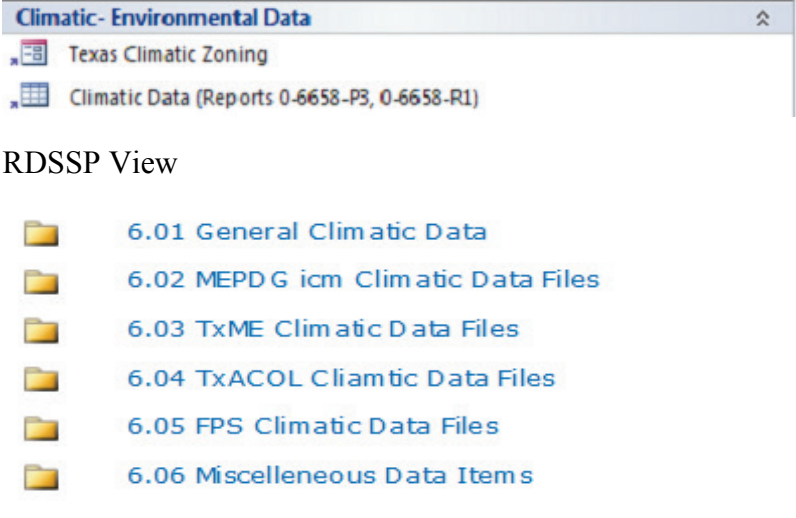









#	Data Item	DSS and RDSSP View
1	RAWSUBGRD: Sieve Analysis	<p>DSS View</p> <div style="border: 1px solid gray; padding: 5px;"> <p><b>Material Properties: Subgrade</b> <span style="float: right;">^</span></p> <ul style="list-style-type: none"> <li> RAWSUBGRD: Sieve Analysis (Tex-110-E)(%Passing)</li> <li> RAWSUBGRD: Atterberg Limits (Tex-104-E, 105-E, 106-E)</li> <li> RAWSUBGRD: Specific Gravity (Tex-108-E)</li> <li> RAWSUBGRD: MDD Curve (Tex-114-E)</li> <li> RAWSUBGRD: Texas Triaxial (Tex-117-E)</li> <li> RAWSUBGRD: Shear Strength (Tex-143)</li> <li> RAWSUBGRD: Resilient Modulus (Tech Memo: 1-28A)</li> <li> RAWSUBGRD: Permanent Deformation (Tech Memo: 1-28A)</li> <li> RAWSUBGRD: Soil Classification</li> <li> RAWSUBGRD: Free-Free Resonance Column Test (FFRC)</li> <li> TREATEDSUBGRD: Gradation (Tex-110-E)</li> <li> TREATEDSUBGRD: Atterberg Limits (Tex-104-E, 105-E, 106-E)</li> <li> TREATEDSUBGRD: Sulfate Content (Tex-145-E)</li> <li> TREATEDSUBGRD: MDD Curve (Tex-114-E)</li> <li> TREATEDSUBGRD: Unconfined Compressive Strength (Tex-121-E)</li> <li> TREATEDSUBGRD: Resilient Modulus (Zero Confinement)</li> <li> TREATEDSUBGRD: Permanent Deformation (Zero Confinement)</li> <li> TREATEDSUBGRD: Soil Classification</li> <li> TREATEDSUBGRD: Free-Free Resonance Column Test (FFRC)</li> </ul> </div> <p>RDSSP View</p> <ul style="list-style-type: none"> <li> RAWSUBGRD_Atterberg Limits_Loop 480 Laredo</li> <li> RAWSUBGRD_MD Curve_LP480 Laredo</li> <li> RAWSUBGRD_Shear Strength 1_Loop480 Laredo</li> <li> RAWSUBGRD_Shear Strength 2_Loop480 Laredo</li> <li> RAWSUBGRD_Sieve Anaysis_Loop 480 Laredo</li> <li> RAWSUBGRD_Specific gravity_LP480 Subgrade</li> <li> RAWSUBGRD_Texas Triaxial 1_Loop480 Laredo</li> <li> RAWSUBGRD_Texas Triaxial 2_Loop480 Laredo</li> </ul>
2	RAWSUBGRD: Atterberg Limits	
3	RAWSUBGRD: Specific Gravity	
4	RAWSUBGRD: MDD Curve	
5	RAWSUBGRD: Texas Triaxial	
6	RAWSUBGRD: Shear Strength	
7	RAWSUBGRD: Resilient Modulus	
8	RAWSUBGRD: Permanent Deformation	
9	RAWSUBGRD: Soil Classification	
10	RAWSUBGRD: Free-Free Resonance Column Test	
11	TREATEDSUBGRD: Gradation	
12	TREATEDSUBGRD: Atterberg Limits	
13	TREATEDSUBGRD: Sulfate Content	
14	TREATEDSUBGRD: MDD Curve	
15	TREATEDSUBGRD: Unconfined Compressive Strength	
16	TREATEDSUBGRD: Resilient Modulus	
17	TREATEDSUBGRD: Permanent Deformation	
18	TREATEDSUBGRD: Soil Classification	
19	TREATEDSUBGRD: Free-Free Resonance Column Test	

**Table 4-7. Example of Field Performance Data.**

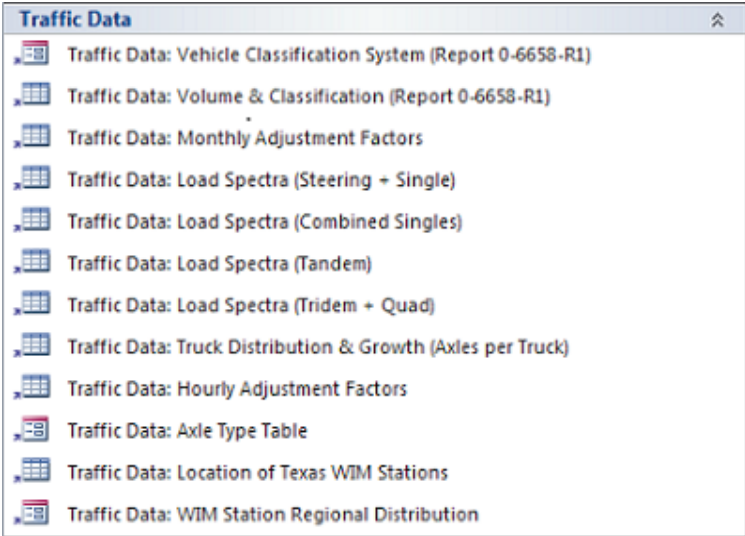
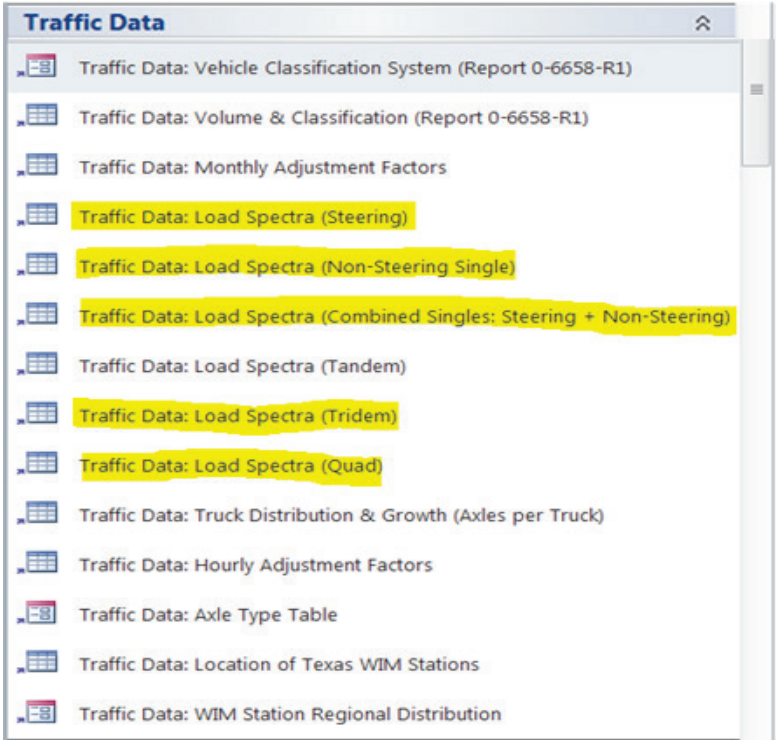



#	Data Item	DSS and RDSSP Views
1	Test Segment GPS Location (500 ft)	<p>DSS View</p>  <p>The screenshot shows a window titled "Field Performance Data" with a list of 15 items, each preceded by a small expandable icon (a square with a right-pointing arrow). The items are:</p> <ul style="list-style-type: none"> <li>FPD: Test Segment GPS Location (500 ft.)</li> <li>FPD: Test Segment GPS Location (720 ft.)</li> <li>FPD: Test Segment GPS Location (1000 ft.)</li> <li>FPD: Visual Surface Surveys (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: Temperature &amp; Surface Rutting (inches) (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: Surface Profile-PSI &amp; IRI (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: 9 kips Normalized FWD Deflections</li> <li>FPD: FWD Backcalculated Modulus (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: FWD Load Transfer Efficiency (Reports 0-6658-R1)</li> <li>FPD: DCP Test Data (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: Alligator Cracking (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: Block Cracking (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: Transverse Cracking (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: Longitudinal Cracking (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: Other Distresses (Reports 0-6658-P3, 0-6658-R1)</li> <li>FPD: GPR Data (Report 0-6658-P3, 0-6658-R1)</li> <li>FPD: Skid Data (PMIS)</li> <li>FPD: Structural &amp; Modulus Data (Report 0-6658-R1)</li> </ul>
2	Test Segment GPS Location (720 ft)	
3	Test Segment GPS Location (1000 ft)	
4	Visual Surface Surveys	
5	Temperature and Surface Rutting	
6	Surface Profiles - PSI and IRI	
7	9 kips Normalized FWD Deflections	
8	FWD Back-calculated Modulus	
9	FWD Load Transfer Efficiency	
10	DCP Test Data	
11	Alligator Cracking	
12	Block Cracking	
13	Transverse Cracking	
14	Longitudinal Cracking	
15	Other Distresses	
16	GPR Data	<ul style="list-style-type: none"> <li>4.01 Pictures</li> </ul>
17	Skid Data	<ul style="list-style-type: none"> <li>4.02 Visual-Walking Crack Surveys</li> </ul>
18	Structural and Modulus Data	<ul style="list-style-type: none"> <li>4.03 Surface Rutting and Temp Measurements</li> <li>4.04 High-Speed Surface Profiles</li> <li>4.05 FWD Testing</li> <li>4.06 PSPA Measurements</li> <li>4.07 DCP Measurements + Coring</li> <li>4.08 GPR Data</li> <li>4.09 Forensic Evaluations</li> <li>4.10 Miscellaneous Items</li> </ul>











**Table 4-8. Example of Climatic-Environmental Data.**

#	Data Item	DSS and RDSSP Views
1	Texas Climatic Zoning	DSS View
2	Climatic Data (temperature, precipitation, GPS, elevation, etc.)	 <p>DSS View</p> <ul style="list-style-type: none"> <li> Climatic- Environmental Data</li> <li> Texas Climatic Zoning</li> <li> Climatic Data (Reports 0-6658-P3, 0-6658-R1)</li> </ul> <p>RDSSP View</p> <ul style="list-style-type: none"> <li> 6.01 General Climatic Data</li> <li> 6.02 MEPDG icm Climatic Data Files</li> <li> 6.03 TxME Climatic Data Files</li> <li> 6.04 TxACOL Cliamtic Data Files</li> <li> 6.05 FPS Climatic Data Files</li> <li> 6.06 Miscellaneous Data Items</li> </ul>

**Table 4-9. Traffic Data (Example of Volume and Load Spectra Data).**

#	Data Item	DSS and RDSSP Views
1	Vehicle Classification System	<p><b>DSS View</b></p>  <p><b>Proposed Modified Arrangement of Traffic Data Tables</b></p>  <p><b>RDSSP View</b></p> <ul style="list-style-type: none"> <li> 5.01 Volume + Classification</li> <li> 5.02 Load Spectra Data</li> <li> 5.03 Miscellaneous Items</li> </ul>
2	Volume and Classification	
3	Monthly Adjustment Factors	
4	Load Spectra (Steering + Single)	
5	Load Spectra (Combined Singles)	
6	Load Spectra (Tandem)	
7	Load Spectra (Tridem + Quad)	
8	Truck Distribution and Growth (Axles per Truck)	
9	Hourly Adjustment Factors	
10	Axle Type Table	
11	Location of Texas WIM Stations	
12	WIM Station Regional Distribution	

**Table 4-10. Example of Supplementary Tests and Measurements.**

#	Data Item	DSS and RDSSP Views
1	HMA: Flow Number (FN)	<p>DSS View</p> <div data-bbox="634 359 1360 779" style="border: 1px solid gray; padding: 5px;"> <p><b>Supplementary Tests &amp; Measurements</b></p> <ul style="list-style-type: none"> <li> HMA: Flow Number (FN) (Reports 0-6658-P3, 0-6658-R1)</li> <li> HMA: Overlay (OT) Monotonic (Reports 0-6607-1, 0-6607-2)</li> <li> HMA: Shear Properties (SPST) (Report 0-6744-2)</li> <li> TREATEDBASE: Sulfate Content (SC) (Tex-145-E)</li> <li> FLEXBASE_LabTreated_UCS (Tex-120-E etc)</li> <li> FLEXBASE_LabTreated_MoR (Tex-448-A)</li> <li> FLEXBASE_LabTreated FFRC</li> <li> FLEXBASE_LabTreated_IDT (Tex-120-E Reports 0-6271-2 etc)</li> </ul> </div>
2	HMA: Overlay (OT) Monotonic	
3	HMA: Shear Properties (SPST)	
4	TREATEDBASE: Sulfate Content (SC)	
5	FLEXBASE_LabTreated_UCS	
6	FLEXBASE_LabTreated_MoR	
7	FLEXBASE_LabTreated FFRC	
8	FLEXBASE_LabTreated_IDT	



## SECTION 5 M-E DATA REQUIREMENTS

As stated in the introductory section of this submission, one of the primary goals of this study is to collect sufficient data to aid in the calibration and validation of the M-E models and the related software, namely:

- The Flexible Pavement Design System (FPS) design procedure.
- The Texas Overlay design system (TxACOL).
- The Texas M-E (Tx-ME).
- The Mechanistic-Empirical Pavement Design Guide (M-E PDG).

Significant efforts were made in this study to ensure that the data requirements of these M-E models and related software were adequately addressed in the data collection plans and in both the DSS and RDSSP. [Appendix II](#) contains the itemized list of the various M-E data requirements and input parameters, along with their source locations in the DSS. [Figures 5-1 to 5-4](#) show screenshots of the corresponding M-E software.



**Figure 5-1. Main Menu Screenshot of the FPS Software.**



Figure 5-2. Main Menu Screenshot of the TxACOL Software.

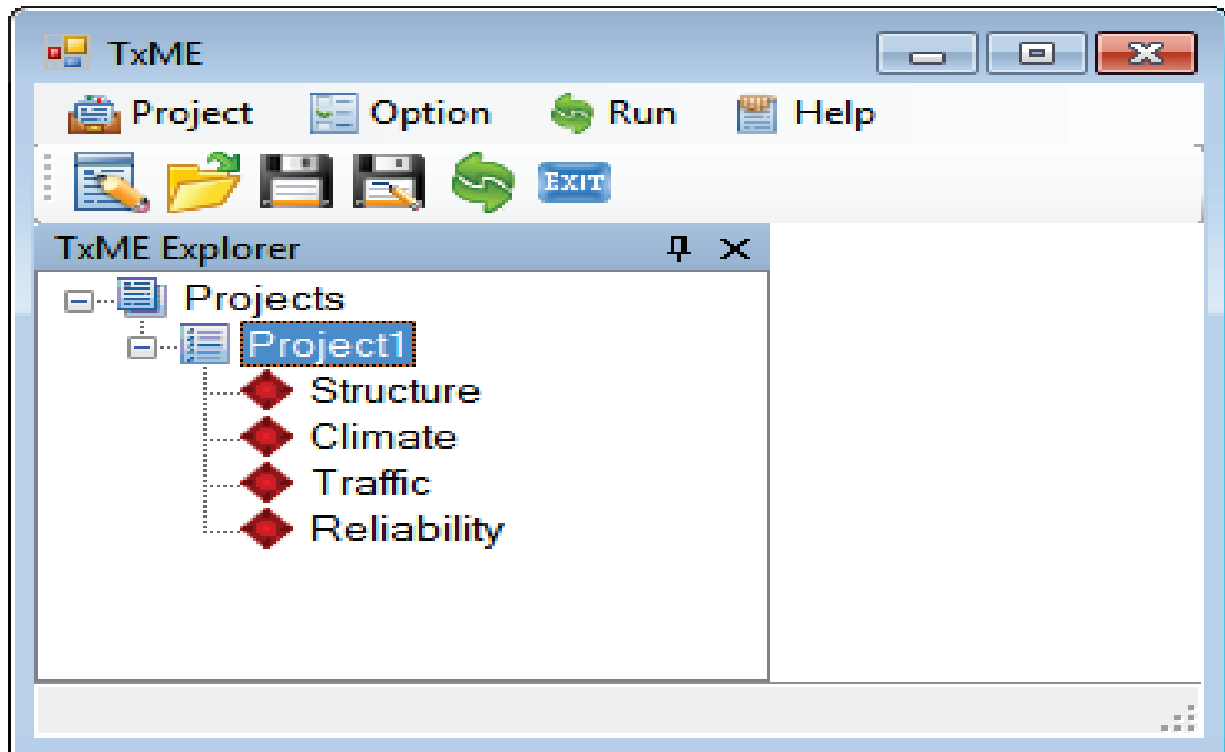


Figure 5-3. Main Menu Screenshot of the TxM-E Software.



Figure 5-4. Opening Screenshot of the M-E PDG Software (Version 1.1).





## SECTION 6 TEST SPECIFICATIONS AND GUIDELINES

To ensure quality and data consistency, the researchers adhere to a set of stipulated test specifications and guidelines when collecting, processing, and analyzing the data. These specifications, guidelines, and data collection forms are listed in [Appendix III](#) and include the following:

- Asphalt-binder testing and material characterization.
- HMA testing and data analysis and material characterization.
- Base and soil material testing and material characterization.
- Field testing and data collection.
- Pre-construction distress survey sheets.
- Construction data collection sheets.
- Field data collection sheets.

Detailed documentation of these test specifications, guidelines, data collection forms, and data analysis methods can be found in:

Walubita, L.F., G. Das, E.M. Espinoza, J.H. Oh, T. Scullion, J.L. Garibay, S. Nazarian, I. Abdallah, and S. Lee (2012). [Texas Flexible Pavements and Overlays: Year 1 Report – Test Sections, Data Collection, Analyses, and Data Storage System](#). Technical Research Report #0-6658-1. TTI, College Station, TX, USA.

Website Link: <http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/0-6658-1.pdf>.



## SECTION 7 DATABASE ACCESS AND NAVIGATION DEMO

All laboratory and field data can be accessed and navigated via the database system developed in Project 0-6658 as the following:

- 1) Unprocessed raw data from the RDSSP.
- 2) Processed data from the MS Access DSS.

Both data types can be downloaded, exported, and emailed directly from each of these database systems. These aspects are discussed and demonstrated in the subsequent subsections and [Appendices IV](#) thru [VI](#), with full details to be documented in Product 0-6658-P2 (User's Manual). Prototype databases for demonstration purposes have been included in the accompanying external drive (CD/USB flash disk).

### THE RDSSP – ACCESSING AND DOWNLOADING DATA

All the unprocessed raw data measured and collected in this study are available in the RDSSP and can be accessed and downloaded for data verification and future analysis. The RDSSP is linked to the DSS via a **Raw Data Files** function on the DSS main screen shown in [Figure 7-1](#). In response to the user clicking on **Raw Data Files** in the DSS main menu, the **Raw Data Prompt** dialog box will appear, asking for the destination of the raw data collected.

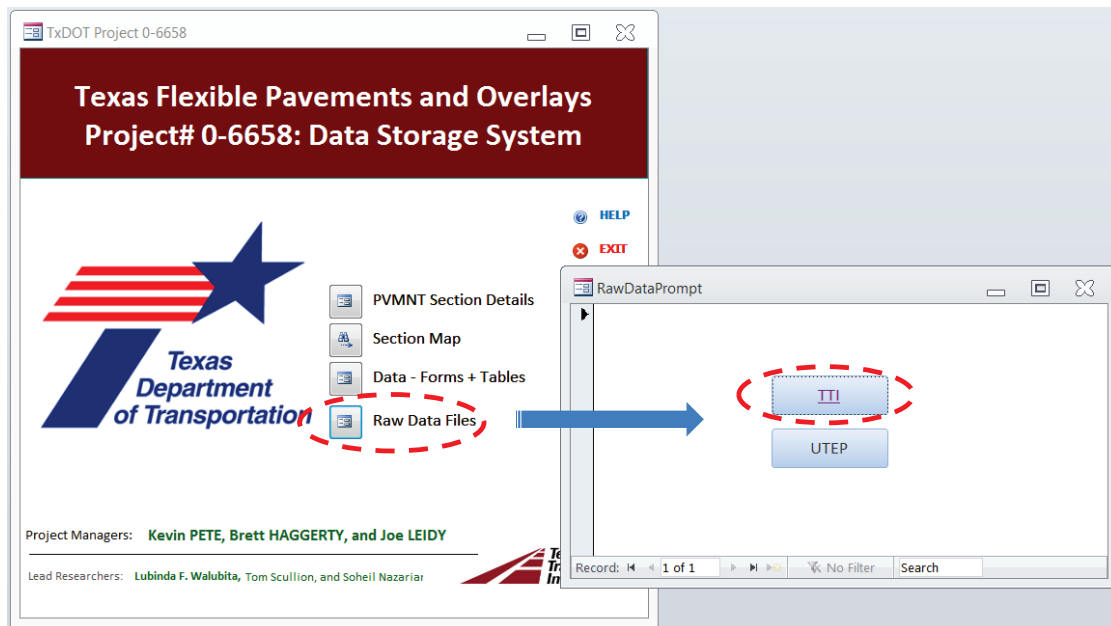


Figure 7-1. DSS Main Menu and Raw Data Prompt in DSS.

When the user specifies a destination, the linked website will open in a web browser as shown in Figure 7-2. Upon clicking a test section and selecting a data folder to be accessed, the user can access, download, and email the data file as exemplified in Figure 7-3.

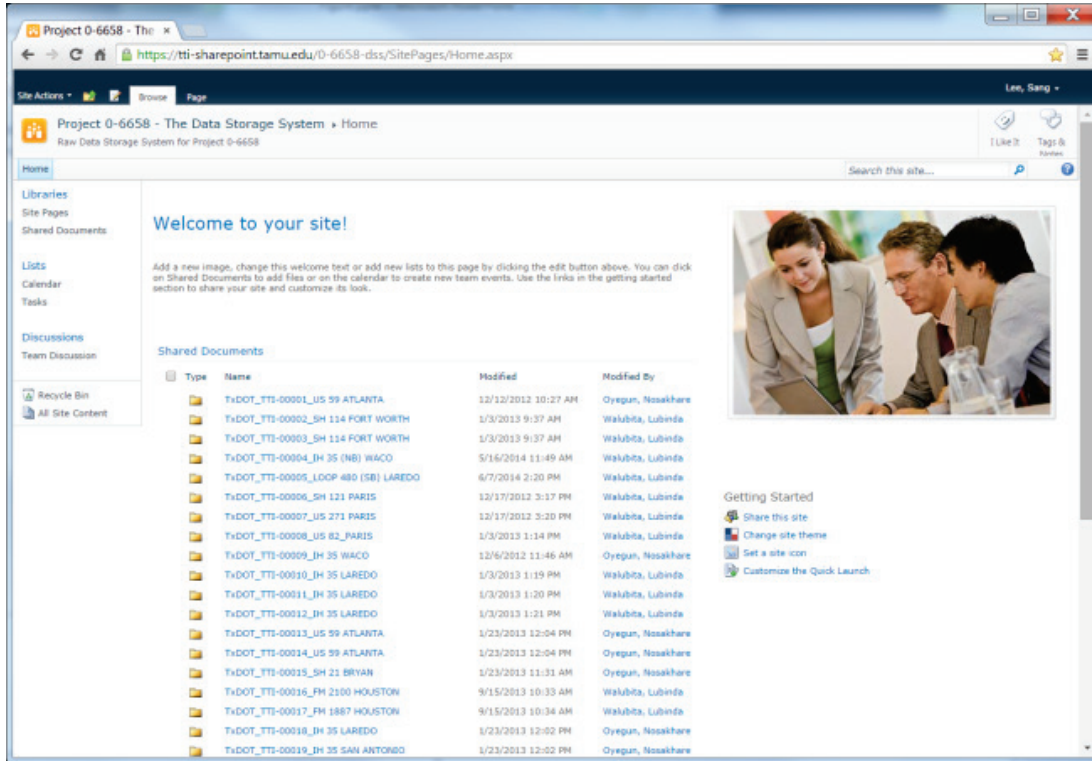


Figure 7-2. The RDSSP Website.

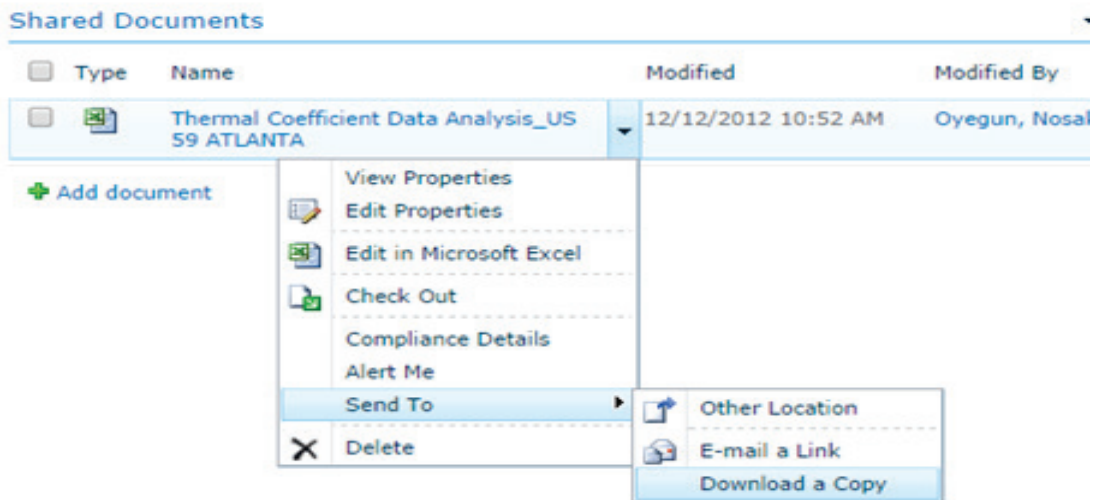
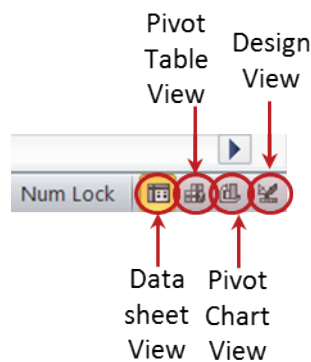


Figure 7-3. Downloading and Emailing Data in RDSSP.

In the current setup, a user ID and password that can be obtained from TTI are required to access the RDSSP. Thus, for demonstration purposes and size considerations, an extract of the RDSSP with some three selected test sections (1.68 GB) has been included in the CD/USB flash disk accompanying this documentation.

## THE DSS – ACCESSING, ANALYZING, AND DISPLAYING DATA

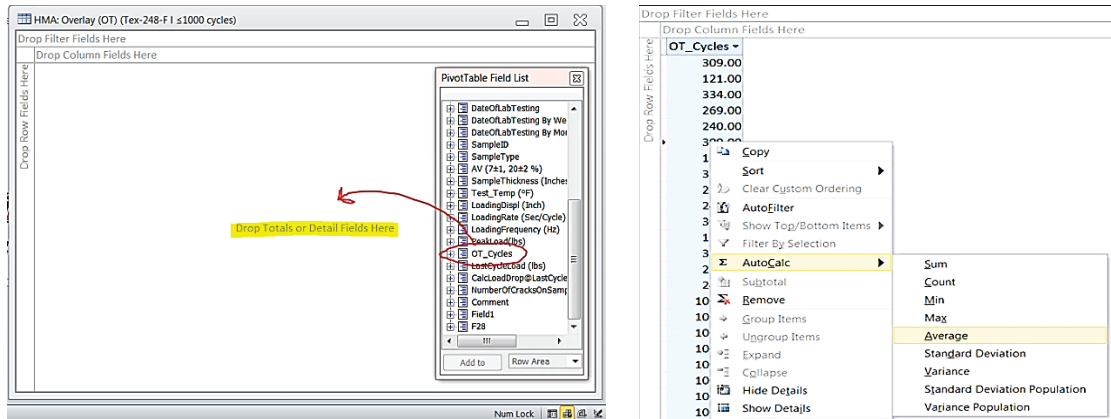
The DSS allows users to conveniently assess, analyze, and display the stored data (refer to the accompanying CD/USB flash disk for access to the DSS). The four view options at the bottom right corner of MS Access, namely the Datasheet view, the Pivot Table view, the Pivot Chart view, and the Design view are useful for these purposes (Figure 7-4).



**Figure 7-4. View Options in the MS Access for Analyzing and Displaying Data.**

### Showing Average, Maximum, Minimum, and Standard Deviation of Data in a Table

Mathematical operations such as average, maximum, minimum, standard deviation (Stdev), etc., can be performed on the stored DSS data in the **Pivot Table View**. The detailed step-by-step procedure is presented in Table IV-1 in [Appendix IV](#). In the Pivot Table view, the user can select the data set to be analyzed from a **Pivot Table Field List** and drag it to the desired position in the Pivot Table ([Figure 7-5](#)). The desired analyses can be performed by right clicking on the data table and selecting **AutoCalc** followed by the appropriate analysis option (e.g., average, maximum, minimum, standard deviation).



**Figure 7-5. Calculating Average, Maximum, Minimum, and Stdev in Pivot Table View.**

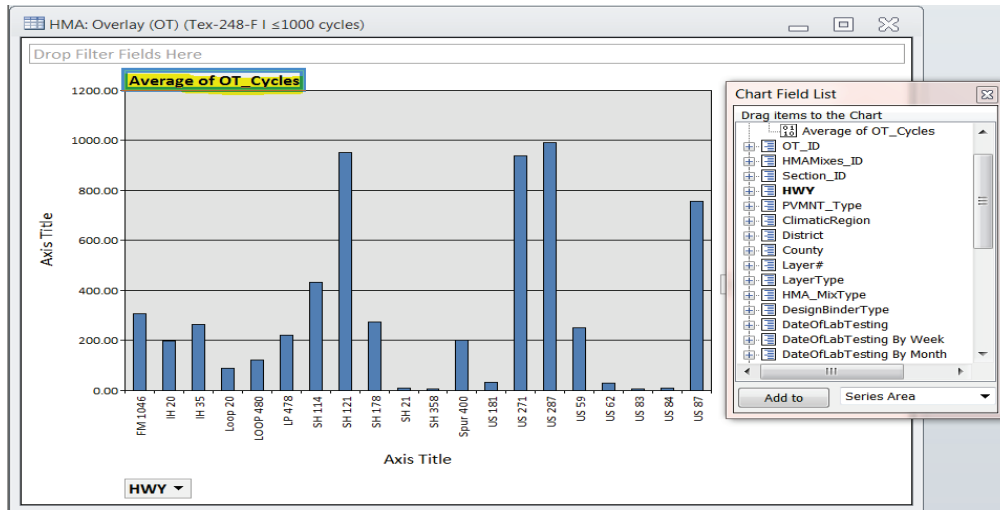
The desired analysis result/results for all the data in the column will be presented at the end of the data column as exemplified in [Figure 7-6](#).

Drop Filter Fields Here	Drop Column Fields Here		
Drop Row Fields Here	Section_ID	HWY	OT_Cycles
	TxDOT_TTI-00073	US 59	334.00
	TxDOT_TTI-00074	US 59	240.00
	TxDOT_TTI-00074	US 59	334.00
	TxDOT_TTI-00074	US 59	121.00
	TxDOT_TTI-00074	US 59	309.00
	TxDOT_TTI-00074	US 59	269.00
	TxDOT_TTI-00075	US 59	240.00
	TxDOT_TTI-00075	US 59	309.00
	TxDOT_TTI-00075	US 59	121.00
	TxDOT_TTI-00075	US 59	334.00
	TxDOT_TTI-00075	US 59	269.00
	Average of OT_Cycles		252.25
	Min of OT_Cycles		0.00
	Max of OT_Cycles		1000.00
	Standard Deviation of OT_Cycles		298.89

**Figure 7-6. Calculating Average, Maximum, Minimum, and Stdev in Pivot Table.**

### Generating Graphs from Data in a Table

Graphs can be generated from the stored DSS data in the **Pivot Chart View**. The data to be presented in the chart can be dragged and dropped to their appropriate axes from a **Chart Field List** as shown in [Figure 7-7](#).

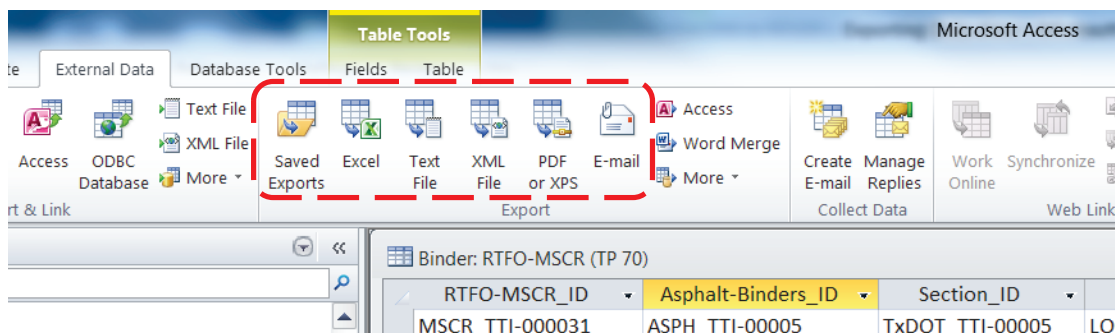


**Figure 7-7. Generating Data Charts in Pivot Chart View in MS Access.**

Multiple data sets can be presented in this procedure by simply adding the desired data to the appropriate axes. The detailed step-by-step procedure is presented in [Table IV-2](#) in [Appendix IV](#).

## THE DSS – EXPORTING AND EMAILING DATA

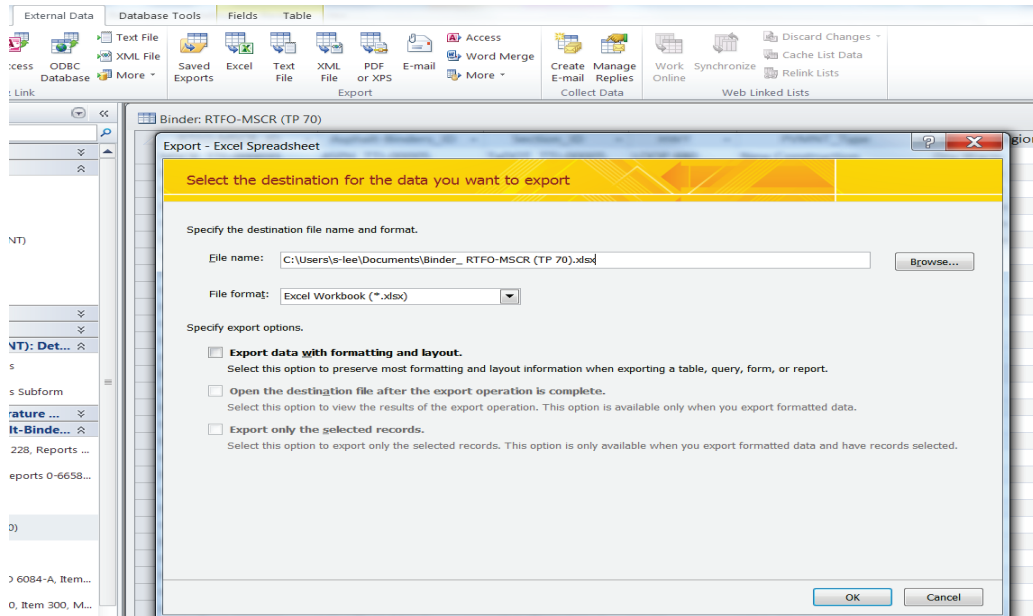
All tables in the MS Access DSS can be exported or emailed as a specific file type such as an Excel or PDF file directly from MS Access. This can be done by clicking on the **Export** group in the **External Data** tab, and then clicking on **Excel**, **PDF** or **XPS** or **E-mail** on the export category as shown in [Figure 7-8](#).



**Figure 7-8. Exporting and Emailing Tables.**

### Exporting a Table to Excel File

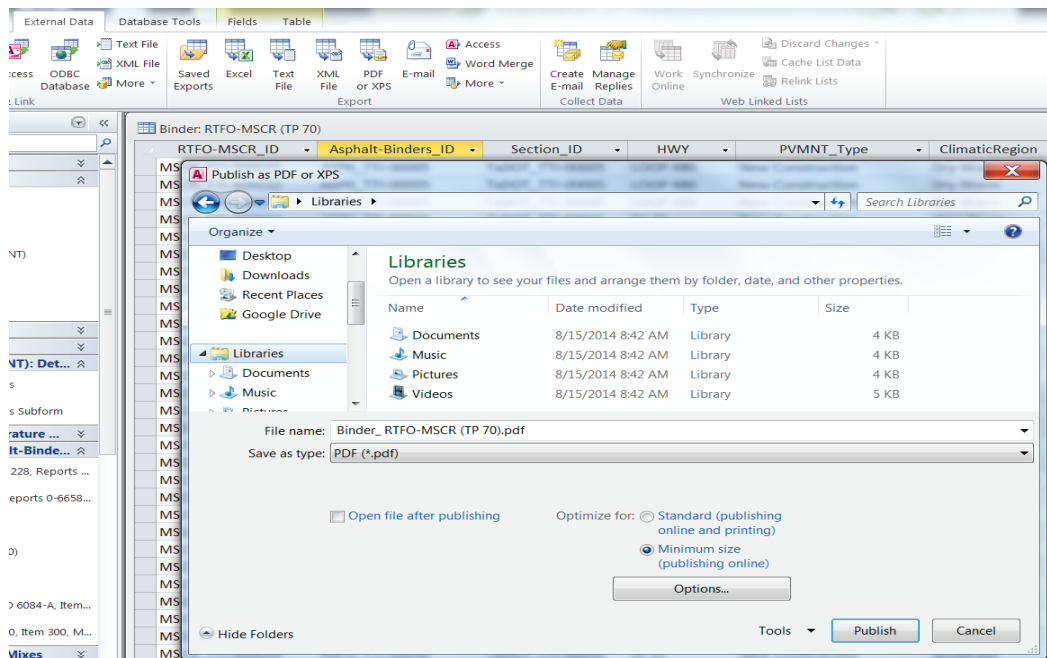
In response to clicking on the **Excel** option, a menu will appear asking for a destination file name and format as shown in [Figure 7-9](#). By specifying a folder location for the table and clicking **OK**, the Excel file can be found in the destination folder. In order to preserve the formatting of the table, check the option of “**Export data with formatting and layout.**”



**Figure 7-9. Excel Exporting Option Menu.**

## Exporting a Table to PDF

The DSS tables can be published as PDF to be used for documentation. In response to clicking on the **PDF or XPS** option in the **Export** group, a menu will appear selecting a destination and typing a name for the table as shown in [Figure 7-10](#). By clicking **Publish**, the PDF file can be found in the destination folder.

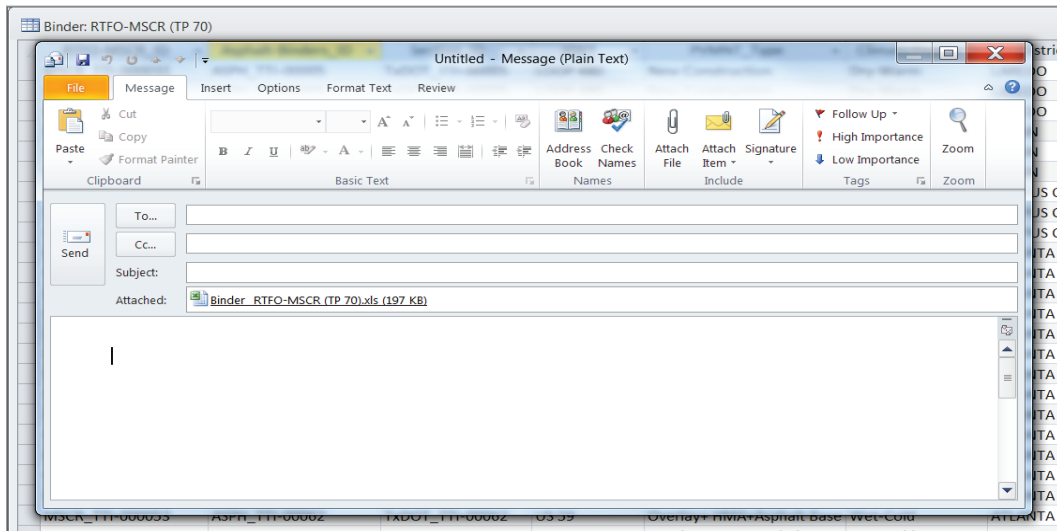


**Figure 7-10. PDF Exporting Option Menu.**



## Emailing a Data Table

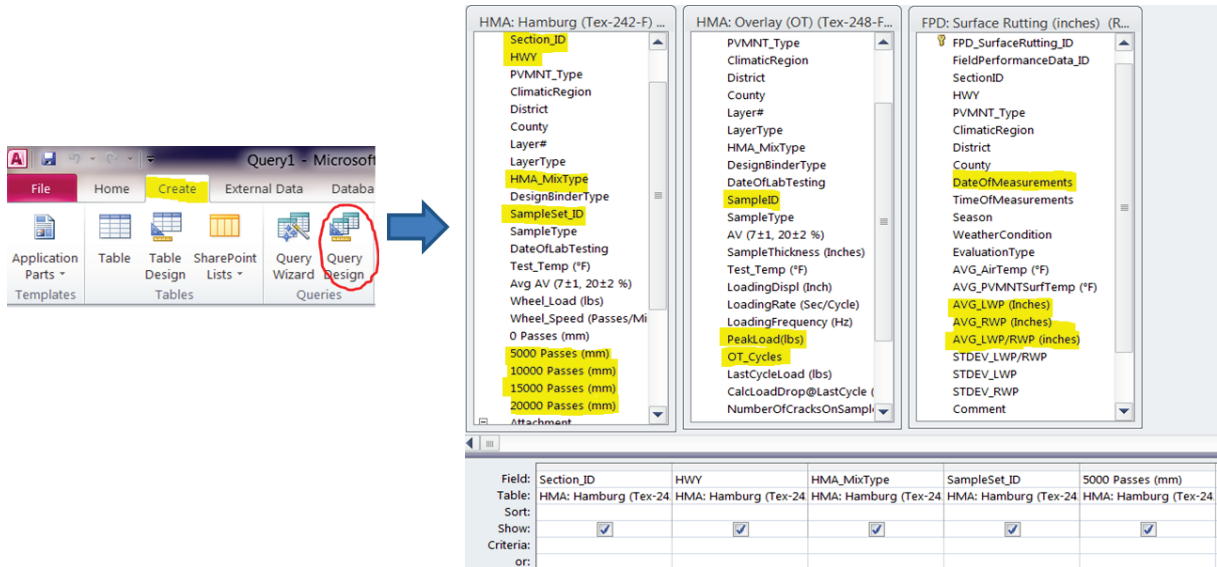
Clicking the **Email** option in the **Export** group opens a pop-up menu asking to specify the file format. Once the file format has been selected, Microsoft Outlook will open a new message window with the file as an attachment, as shown in [Figure 7-11](#). It is noted that the email option to export tables will not work if the user is disconnected from Microsoft Outlook. [Appendix V](#) contains step-by-step examples for exporting and emailing the DSS data tables.



**Figure 7-11. Microsoft Outlook Email Draft with Attachment.**

## THE DSS – ACCESSING MULTIPLE DATA

Multiple data columns from different tables can be accessed and presented together in MS Access by creating a **Query Table** (see [Figure 7-12](#)). The user can select the desired data fields from their respective tables in the **Query Design** and select the order in which the data fields are to be presented and displayed. The data in the Tables can also be filtered by declaring the **Criteria** for each field. The detailed step-by-step procedure is presented in [Appendix VI](#).



**Figure 7-12. Accessing Multiple Data in MS Access.**

# APPENDIX I. TABULATION OF TEST SECTIONS

## Table I-1. Example Test Section Summary by District.

District #	Abbrev.	Full Name	#	Climatic Region	Hwy	Section ID#	PVMNT Type	Layer Material Type							
								0	1	2	3	4	5	6	
1	ABL	Abilene	8	Dry-Cold	US 84	UTEF7	Overlay-HMA-FlexBase	Subgrade	Existing Base	Existing HMA	HMA	PFC			
	ABL	Abilene	8	Dry-Cold	FM 2833	UTEF11	New Construction	Subgrade	3% Lime Treated Subgrade	so RBL	1" SFHMA (RRL)	3/4" SFHMA	SMA	Overlay	
	ABL	Abilene	8	Dry-Cold	FM 600	UTEF21	Overlay	Subgrade	Treated Subgrade	RBL	1" SFHMA (RRL)	3/4" SFHMA	SMA	PFC	
	ATL	Atlanta	19	Wet-Cold	US 59	TTL1	Overlay-HMA-LTB	Subgrade	LFA Base	LFA Base	HMA (Existing)	HMA (Existing)	HMA (Existing)	HMA (Existing)	HMA (Existing)
2	ATL	Atlanta	19	Wet-Cold	US 59	TTL13	Overlay-HMA-LTB	Subgrade	LFA Base	LFA Base	HMA (Existing)	HMA (Existing)	HMA (Existing)	HMA (Existing)	HMA (Existing)
	ATL	Atlanta	19	Wet-Cold	US 59	TTL14	Overlay-HMA-LTB	Subgrade	LFA Base	LFA Base	HMA (Existing)	HMA (Existing)	HMA (Existing)	HMA (Existing)	HMA (Existing)
	ATL	Atlanta	19	Wet-Cold	US 59	TTL16	Overlay-HMA+Asphalt	Subgrade	Overlay+HMA+Asphalt	Subgrade	Asphalt Stabiliz	HMA (Existing)	Type D		
	ATL	Atlanta	19	Wet-Cold	US 59	TTL62	Overlay+HMA+Asphalt	Subgrade	Treated Subgrade	Treated Subgrade	Asphalt Stabiliz	HMA (Existing)	Type D		
3	AMA	Amarillo	4	Dry-Cold	US 83	UTEF16	New Construction	Fly ash Subgrade	Subbase	Base	HMA				
	AUS	Austin	14	Moderate	SH 304	TTL71	New Construction	Subgrade	Flex Base	(To start 2014)	Rehab (To start 2014)				
	BMT	Beaumont	20	Wet-Warm	FM 770	TTL34	Overlay	In Progress							
	BMT	Beaumont	20	Wet-Warm	FM 565	TTL36	Reconstruction	In Progress							
4	BRY	Bryan	17	Wet-Warm	SH 21	TTL15	New Construction	Subgrade	Treated Subgrade	Flex Base	Type C (Coarse)	Type C (Surface)			
	BRY	Bryan	17	Wet-Warm	SH 7	TTL29	Overlay-HMA-CTB	Subgrade	Flex Base	CTB	HMA (Existing)	Type C			
	BRY	Bryan	17	Wet-Warm	FM 974	TTL35	Seal Coat (FDR-Rehab)	Subgrade	Existing Base	Flex Base	HMA (Existing)	Type C			
	BRY	Bryan	17	Wet-Warm	SH 21	TTL42	Overlay-HMA-FlexBase	Subgrade	Flex Base	Flex Base	HMA (Existing)	Type C			
5	CHS	Childress	25	Dry-Cold	FM 1046	TTL49	Overlay	Subgrade	Base	Base	HMA (Existing)	Type C			
	CHS	Childress	25	Dry-Cold	US 287	UTEF6	New Construction	Subgrade	Treated Base	Type D	Type C				
	CHS	Childress	25	Dry-Cold	US 62	UTEF10	Overlay-HMA-FlexBase	Subgrade	Existing Base	HMA (Existing)	SMA				
	CHS	Childress	25	Dry-Cold	US 82	UTEF23	Overlay	Subgrade	SMA	SMA	HMA (Existing)				
6	CHS	Childress	25	Dry-Cold	US 287	UTEF24	Overlay	Subgrade	Existing Base	HMA					
	CHS	Childress	25	Dry-Cold	US 287	UTEF31	Seal Coat	Subgrade	Existing Base	HMA (Existing)	HMA				
	CHS	Childress	25	Dry-Cold	US 62	UTEF32	Seal Coat	Subgrade	Existing Base	Flex Base	HMA				
	CRP	Corpus Christi	16	Moderate	US 181	TTL25	Overlay-HMA-LTB	Subgrade	Subgrade	Base	HMA	Type C			
7	CRP	Corpus Christi	16	Moderate	SH 358	TTL26	Overlay-HMA-LTB	Subgrade	Subgrade	Base	HMA	Type C			
	CRP	Corpus Christi	16	Moderate	FM 763	TTL27	Seal Coat (FDR-Rehab)	Subgrade	Treated Reclaimed Material	Flex Base	HMA	Grade 5 Seal Coat	Grade 3 Seal Coat	Grade 4 Seal Coat	
	ELP	El Paso	24	Dry-Warm	SH 178	UTEF1	New Construction	Subgrade	Treated Base	Type C WMA					
	ELP	El Paso	24	Dry-Warm	US 62	UTEF2	New Construction	Subgrade	Treated Base	WMA	WMA				
8	ELP	El Paso	24	Dry-Warm	US 62	UTEF3	New Construction	Subgrade	Treated Base	WMA	WMA				
	ELP	El Paso	24	Dry-Warm	LP 478 (Dyer)	UTEF15	Overlay-HMA-FlexBase	Subgrade	Existing Base	Existing WMA	New WMA				
	ELP	El Paso	24	Dry-Warm	Loop 375 TM	UTEF13	New Construction	Subgrade	Treated Base	WMA					
	ELP	El Paso	24	Dry-Warm	Loop 375 TM	UTEF14	New Construction	Subgrade	Treated Base	WMA					
9	ELP	El Paso	24	Dry-Warm	IH10 frontage	UTEF25	Overlay	Subgrade	Existing Base	Existing WMA	WMA				
	ELP	El Paso	24	Dry-Warm	IH10 frontage	UTEF29	Overlay	Subgrade	Existing Base	Existing WMA	WMA				
	ELP	El Paso	24	Dry-Warm	IH10 frontage	UTEF30	Overlay	Subgrade	Existing Base	Existing WMA	WMA				
	ELP	El Paso	24	Dry-Warm	US 85	UTEF26	Overlay	Subgrade	Existing Base	Existing WMA	WMA				
10	ELP	El Paso	24	Dry-Warm	US 85	UTEF27	Overlay	Subgrade	Existing Base	Existing WMA	WMA				
	ELP	El Paso	24	Dry-Warm	SP.16	UTEF28	New Construction	Subgrade	Existing Base	Treated Base	WMA				

**Table I-1. Example Test Section Summary by District (Continued).**

FTW	Fort Worth	2	Wet-Cold	SH 114	TH12	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA (RRL)	SMA
10 FTW	Fort Worth	2	Wet-Cold	SH 114	TH13	Perpetual	Subgrade	Treated Sub RBL (Type C)	Type B (RRL)	SMA
FTW	Fort Worth	2	Wet-Cold	SH 2135	TH130	Overlay	Subgrade	<i>In Progress</i>		
FTW	Fort Worth	2	Wet-Cold	SH 267	TH177	Reconstruction	Subgrade	<i>In Progress</i>		
LBB	Lubbock	5	Dry-Cold	US 62	UTEP 4	New Construction	Subgrade	Treated Bas HMA	SMA	
LBB	Lubbock	5	Dry-Cold	US 70	UTEP 5	New Construction	Subgrade	Existing Bas WMA	HMA	
LBB	Lubbock	5	Dry-Cold	FM 2255	UTEP 9	New Construction	Subgrade	Treated Bas Base HMA	HMA	
LBB	Lubbock	5	Dry-Cold	US 87	UTEP 19	Overlay-HMA-FlexBase	Subgrade	HMA (Existing) FlexBase	HMA	
LBB	Lubbock	5	Dry-Cold	US 70	UTEP 20	Overlay	Subgrade	Treated Bas Base HMA	HMA	
LBB	Lubbock	5	Dry-Cold	US 62	UTEP 18	Overlay-HMA-FlexBase	Subgrade	Existing Bas HMA (Existing)	HMA	
LBB	Lubbock	5	Dry-Cold	FM 37	UTEP 22	Reconstruction/FDR	Subgrade	Treated Base		
LRD	Laredo	22	Dry-Warm	LOOP 480	TH15	New Construction	Subgrade	Treated Sub RBL	Type C	
LRD	Laredo	22	Dry-Warm	IH 35	TH110	Perpetual	Subgrade	CTB	1" SFHMA	SMA
LRD	Laredo	22	Dry-Warm	IH 35	TH111	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA	SMA
LRD	Laredo	22	Dry-Warm	IH 35	TH112	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA	SMA
LRD	Laredo	22	Dry-Warm	IH 35	TH118	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA	SMA
12 LRD	Laredo	22	Dry-Warm	SS 260	TH140	Overlay-HMA-LTB	Subgrade	Flex Base	HMA (Existing)	Type D
LRD	Laredo	22	Dry-Warm	US 83	TH141	Overlay-HMA-CTB	Subgrade	CTB	HMA (Existing)	Type C
LRD	Laredo	22	Dry-Warm	US 59	TH154	Overlay-HMA-FlexBase	Subgrade	Flex Base T	HMA (Existing)	Type C
LRD	Laredo	22	Dry-Warm	SP UR 400	TH155	Overlay-HMA-FlexBase	Subgrade	Flex Base T	HMA (Existing)	Type C
LRD	Laredo	22	Dry-Warm	Loop 20	TH156	Overlay-HMA-FlexBase	Subgrade	Flex Base T	HMA (Existing)	Type C
LRD	Laredo	22	Dry-Warm	FM 469	TH157	Reconstruction	Subgrade	<i>In Progress</i>		
LRD	Laredo	22	Dry-Warm	IH 35	TH167	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA	SMA
13 LFK	Lufkin	11	Wet-Warm	LOOP 500	TH152	New Construction	Subgrade	<i>In Progress</i>		
PAR	Paris	1	Wet-Cold	SH 121	TH16	Overlay-HMA-CTB	Subgrade	CTB	HMA (Existing)	PFC
14 PAR	Paris	1	Wet-Cold	US 271	TH17	Overlay-HMA-PCC	Subgrade	PCC	HMA (Existing)	PetroMat
PAR	Paris	1	Wet-Cold	US 82	TH18	New Construction	Subgrade	Treated Sub RBL	Type B	PFC
PAR	Paris	1	Wet-Cold	US 82	TH145	Overlay-HMA-CTB	Subgrade	Existing Sub	Existing HMA	New HMA Overlay
15 PHR	Paris	1	Dry-Warm	SH 107	TH117	Overlay-HMA-LTB	Subgrade	<i>In Progress</i>		
ODA	Odessa	6	Dry-Warm	IH 20	UTEP 8	HMA Replacement	Subgrade	Existing Bas HMA PG 70-22	HMA PG 64-22	
16 ODA	Odessa	6	Dry-Warm	IH 20	UTEP 17	HMA Replacement	Subgrade	Flex Base HMA		
17 SJT	San Antonio	15	Dry-Warm	US 87	TH116	Overlay-HMA-LTB	Subgrade	<i>In Progress</i>		
SAT	San Antonio	15	Dry-Warm	IH 35	TH119	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA	SMA
SAT	San Antonio	15	Dry-Warm	IH 35	TH120	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA	SMA
SAT	San Antonio	15	Dry-Warm	SH 123	TH139	Reconstruction	<i>In Progress</i>			
18 SAT	San Antonio	15	Dry-Warm	US 87	TH144	Seal Coat	Subgrade	Base	HMA (Existing)	
SAT	San Antonio	15	Dry-Warm	SH 123	TH148	Overlay	Subgrade	Base	HMA (Existing)	
TYL	Tyler	10	Wet-Cold	SH 64	TH150	<i>In Progress</i>				
19 TYL	Tyler	10	Wet-Cold	US 79	TH151	<i>In Progress</i>				
TYL	Tyler	10	Wet-Cold	FM 2658	TH158	<i>In Progress</i>				
WAC	Waco	9	Moderate	IH 35	TH14	New Construction	Subgrade	Treated Sub Flex Base	Type B	SMA
20 WAC	Waco	9	Moderate	IH 35	TH19	New Construction	Subgrade	Flex Base	Type C	
WAC	Waco	9	Moderate	IH 35	TH121	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA	SMA
WAC	Waco	9	Moderate	IH 35	TH122	Perpetual	Subgrade	Treated Sub RBL	1" SFHMA	SMA
WAC	Waco	9	Moderate	IH 35	TH146	New Construction	Subgrade	Treated Sub Flex Base	Type B	SMA
WAC	Waco	9	Moderate	IH 35	TH147	New Construction	<i>In Progress</i>			
21 WFS	Wichita Falls	3	Dry-Cold	US 277	TH131	Seal Coat	Subgrade	Seal Coat		
WFS	Wichita Falls	3	Dry-Cold	US 277	TH132	New Construction	Subgrade	Treated Sub Type A	HMA	Type D
WFS	Wichita Falls	3	Dry-Cold	FM 455	TH157	FDR/Overlay	<i>In Progress</i>			
WFS	Wichita Falls	3	Dry-Cold	US 277	TH168	New Construction	Subgrade	<i>In Progress</i>		
YKM	Yoakum	13	Wet-Warm	US 77A	TH123	Overlay-HMA-PCC	Subgrade	Base	Concrete Pave HMA (Existing)	Type C
22 YKM	Yoakum	13	Wet-Warm	SH 95	TH124	Overlay-HMA-PCC	Subgrade	Base	Concrete Pave HMA (Existing)	Type D

**Table I-2. Example Summary by Material Type for Selected Test Sections and Selected Districts.**

Material Type	Abilene	Amarillo	Atlanta	Austin	Beaumont	Bryan	Childress	Corpus Christi	Dallas	El Paso	Fort Worth	Laredo	Lubbock	Lufkin	Odessa	Paris	Pharr	San Angelo	San Antonio	Taylor	Waco	Wichita Falls	Materials Totals
Existing HMA	1	1	3		1	2	3	2	3			5	3	1	3	2	1	2	4	1		1	40
Type D			3		2	1					1	1				2							9
Type B											2	5				1			2		4		6
RBL											2	5				1			2		2		11
Type F																1							1
Type C					2	2		2			1	6								2	2		17
SMA	1	1		1			1				2	5	5		1				2		4		23
SFHMA										1	5								2		2		10
WMA										4	1	1	1										6
CAM																1							1
PFC	1				2											2			2		2		9
PCC					1											1							2
CMHB-F										2													2
TOM										5													5
TruePave			1																				1
PetroMat			1																				1
Seal Coat	2							1				1	1						1			1	7
Treated Base	2	1					1			5			5	1									15
CTB					1				3		1	2				3			2				12
LTB						1																	1
Existing Base								2											2				4
LFA Base			3																				3
Flex Base		1			2	2		1				5				1	1	2		2	4	1	22
Subgrade	1		3		1	3		3		5	2	11	4			2			4	1	6	1	47
Treated Subgrade																							
Subgrade		1			2	1		1			2	5				2			2	1	4	1	22
<b>District Totals</b>	<b>8</b>	<b>5</b>	<b>14</b>		<b>15</b>	<b>12</b>	<b>5</b>	<b>12</b>	<b>6</b>	<b>21</b>	<b>12</b>	<b>52</b>	<b>19</b>	<b>2</b>	<b>4</b>	<b>19</b>	<b>2</b>	<b>4</b>	<b>23</b>	<b>7</b>	<b>30</b>	<b>5</b>	<b>277</b>



## APPENDIX II. LIST OF DESIGN SOFTWARE INPUT PARAMETERS

**Table II-1. List of Basic Input Parameters for the FPS Software.**

#	Item	#	Description	Data Source/Location in the DSS
1	General Information	a.	Problem #	User Input
		b.	Highway, district, county	DSS: PVMNT Section Details
		c.	Control, section, and job #	DSS: PVMNT Section Details (CSJ #)
		d.	Date	Automatically generated (editable)
2	Basic Design Criteria	a.	Length of analysis period (yrs)	User Input
		b.	Min. time to first overlay (yrs)	User Input
		c.	Min. time between overlays (yrs)	User Input
		d.	Design confidence level	User input based on help file guidelines
		e.	Initial and final serviceability index	DSS: Field Performance Data\FPD: Surface Profiles-PSI and IRI
		f.	Serviceability index after overlay	DSS: Field Performance Data\FPD: Surface Profiles-PSI and IRI
		g.	District temperature constant	Automatically generated
		h.	Interest rate (%)	User Input
3	Program Controls	a.	Max. funds/sq. yd, init. const.	User Input
		b.	Max. thickness, init. const.	User Input
		c.	Max. thickness, all overlays	User Input
4	Traffic Data	a.	ADT begin (veh/day)	DSS: Traffic Data\Volume and Classification, (and Excel Macro)
		b.	ADT end 20 yr (veh/day)	
		c.	18 kip ESALs 20 yr – 1 direction (millions)	
		d.	Avg. app. speed to OV zone	User Input based on help file guidelines
		e.	Avg. speed OV and non-OV direction	User Input based on help file guidelines
		f.	Percent ADT/HR construction	User Input based on help file guidelines
		g.	Percent trucks in ADT	DSS: Traffic Data\Volume and Classification
5	Const. and Maint. Data	a.	Min. overlay thickness (in)	User Input
		b.	Overlay const. time, hr/day	User Input
		c.	ACP comp. density, tons/CY	User Input
		d.	ACP production rate, tons/hr	User Input
		e.	Width of each lane, ft	DSS: PVMNT Section Details
		f.	First year cost, RTN maint.	User Input
		g.	Annual, inc. incr. in maint. cost	User Input
6	Detour Design for Overlays	a.	Detour model during overlays	User Input
		b.	Total number of lanes	DSS: PVMNT Section Details
		c.	Num. open lanes, overlay direction	User Input
		d.	Num. open lanes, non-OV direction	User Input
		e.	Dist. traffic slowed, OV direction	User Input
		f.	Dist. traffic slowed, non-OV direction	User Input
		g.	Detour distance, overlay zone	User Input
7	Structure and Material Properties	a.	Layer and material name	DSS: PVMNT Structure Details
		b.	Cost per CY	User Input
		c.	Modulus E (ksi)	DSS: Field Performance Data\FWD Back-Calculated Modulus
		d.	Min and Max Depth	DSS: PVMNT Structure Details
		e.	Salvage PCT and Poisson's ratio	User Input or default value.

**Table II-2. List of Basic M-E Input Parameters Required for the TxACOL Software (General, Traffic, and Climatic Information).**

Item	Description	Location in the DSS		Comment
		Group	Table	
<b>General Information</b>	Type of AC overlay design	Tables	Section Details	
	Analysis/design life (yrs)	PVMNT: Details	PVMNT Structure Details	
	Pavement overlay construction month and year	N/A		User input
	Traffic open month and year	Tables	Construction Data	
<b>Project Identification</b>	District, county, CSJ	PVMNT: Details	PVMNT Structure Details	
	Functional class	Tables	Section Details	
	Date	Traffic Data	Traffic Data: Classification	
	Reference mark format (lat/long) Reference mark (start-end)	User input		
<b>Analysis Parameters and Performance Criteria</b>	Reflective cracking rate (%)	Tables	Section Details	
	AC rutting (in)	N/A		User input
<b>Traffic</b>	ADT begin (veh/day)	N/A		User input
	ADT end 20 yr (veh/day)			
	18 kip ESALs 20 yr – 1 direction (millions) Operation speed (mph)	Traffic Data	Volume and Classification	
<b>Climate</b>	EICM weather station data	Attachment	Raw data files (EICM files stored in DSS and Raw Data Files)	Can also be user input
	Latitude and longitude (degrees.minutes) Elevation (ft)	Climatic-Environmental Data	Climatic Data	



**Table II-3. List of Basic M-E Input Parameters Required for the TxACOL Software (Structural and Material Information).**

Layer	Material	Description	Location in the DSS		Comment
			Group	Table	
Overlay	HMA	Layer thickness (inches)	PVMNT: Details	PVMNT Structure Details	
		Material type	PVMNT: Details	PVMNT Structure Details	
		Thermal coefficient of expansion	Material Properties HMA Mixes	HMA: Thermal Coefficient	
		Poisson's ratio	N/A		Default value
		Superpave PG binder grading	PVMNT: Details	PVMNT Structure Details	
		Dynamic modulus by temperature and frequency	Material Properties HMA Mixes	HMA: Dynamic Modulus (DM)	Export from raw data file (*.dm)
		Fracture property data: temperature, A and n	Material Properties HMA Mixes	HMA: OT Fracture Properties	
		Rutting property data: temperature, $\alpha$ and $\mu$	Material Properties HMA Mixes	HMA: Repeated Loading (RLPD)	
		Layer thickness (inches)	PVMNT: Details	PVMNT Structure Details	
		Material type	PVMNT: Details	PVMNT Structure Details	
Existing Surface	HMA	Thermal coefficient of expansion	N/A		Default value
		Poisson's ratio	N/A		Default value
		Main cracking pattern			
		1) Alligator/longitudinal/block cracking			
		a) Severity level (low/medium/high)	Form	Existing Distress	
		b) FWD temperature (°F) and modulus (ksi)	Field Performance Data	FWD Back-calculated Modulus	
		2) Transverse cracking			
		a) Crack spacing (ft), severity level, LTE	Form	Existing Distress	
		b) FWD temperature (°F) and modulus (ksi)	Field Performance Data	FWD Back-calculated Modulus	
		Layer thickness (inches)	PVMNT: Details	PVMNT Structure Details	
JPCP/ CRCP	JPCP/ CRCP	Material type	PVMNT: Details	PVMNT Structure Details	
		Thermal coefficient of expansion	N/A		Default value
		Poisson's ratio	N/A		Default value
		Joint/crack spacing (ft)	Existing Distresses and Field Performance Data	Transverse Cracking	
		PCC modulus (ksi)	Field Performance Data	FWD Back-calculated Modulus	
		LTE (%) and LTE standard deviation	Field Performance Data	FWD Load Transfer Efficiency	

**Table II-3. List of Basic M-E Input Parameters Required for the TxACOL Software  
(Structural and Material Information) (Continued).**

Layer	Materials	Description	Location in the DSS		Comment	
			Group	Table		
Existing Subsurface	<b>Granular Base</b>	Layer thickness (inches)	PVMNT: Details	PVMNT Structure Details		
		Material type	PVMNT: Details	PVMNT Structure Details		
		Poisson's ratio	N/A		Default value	
	<b>Stabilized Base/ Subbase</b>	Modulus (ksi)	Field Performance Data		FWD Back-calculated Modulus	
		Layer thickness (inches)	PVMNT: Details		PVMNT Structure Details	
		Material type	PVMNT: Details		PVMNT Structure Details	
		Poisson's ratio	N/A			Default value
		Thermal coefficient of expansion	N/A			Default value
		Modulus (ksi)	Field Performance Data		FWD Back-calculated Modulus	
		Layer thickness (inches)	PVMNT: Details		PVMNT Structure Details	
<b>Subgrade</b>	Material type	PVMNT: Details		PVMNT Structure Details		
	Poisson's ratio	N/A			Default value	
	Modulus (ksi)	Field Performance Data		FWD Back-calculated Modulus		

**Table II-4. List of Basic M-E Input Parameters Required for the TxM-E Software.**

Item	Description	Location in the DSS		Comment1	Example Values from The DSS			Comment2
		Group	Table		Min	Avg	Max	
1) Structure	Pavement type	Tables	Section Details					
	Design/Analysis Life	User defined						
	Project Location (District/County)	Tables	Tables					
	Optional Project							
	Construction and Traffic Open Time	PVMNT: Details	PVMNT Structure Details					
	Reference Mark Begin/End	Tables	Section Details					
	CSJ	Tables	Section Details					
	Functional Class	Traffic Data	Traffic Data: Volume and Class.					
	Date	User defined						
	AC Layer Material Information							
	Material Type	PVMNT: Details	PVMNT Structure Details					
	Layer Thickness	PVMNT: Details	PVMNT Structure Details					
	Binder Type	PVMNT: Details	PVMNT Structure Details					
	Gradation	PVMNT: Details	PVMNT Structure Details					
	RAP %	PVMNT: Details	PVMNT Structure Details					
RAS %	PVMNT: Details	PVMNT Structure Details						
Dynamic Modulus (ksi)	Material Properties HMA Mixes	HMA: Dynamic Modulus (DM)		335	973	2604	139	70 F, 10 Hz
Fracture Property ( $A$ and $n$ )	Material Properties HMA Mixes	HMA: OT Fracture Properties		$A = 1.67E-08$ $n = 4.16$	$A = 5.72E-07$ $n = 5.11$	$A = 9.07E-06$ $n = 5.46$	18	
Rutting Properties ( $\alpha$ and $\mu$ ) 40 °C	Material Properties HMA Mixes	HMA: Repeated Loading (RLPD)		$\alpha = 0.5300$ $\mu = 0.1200$	$\alpha = 0.7179$ $\mu = 0.4778$	$\alpha = 0.8828$ $\mu = 0.9980$	51	
Rutting Properties ( $\alpha$ and $\mu$ ) 50 °C	Material Properties HMA Mixes	HMA: Repeated Loading (RLPD)		$\alpha = 0.0000$ $\mu = 0.1210$	$\alpha = 0.6707$ $\mu = 0.1210$	$\alpha = 0.9184$ $\mu = 0.9980$	51	
Poisson Ratio	N/A		Default value					
Thermal Coefficient of Expansion (alpha)	Material Properties HMA Mixes	HMA: Thermal Coefficient		5.94E-06	1.85E-05	4.90E-05	54	
Base and Subbase Material Information								
Material Type	PVMNT: Details							
Layer Thickness	PVMNT: Details							
Modulus	Field Performance							
Rutting Properties ( $\alpha$ and $\mu$ )	Material Properties Base	Material Properties Base	Flexible or asphalt treated					
Modulus of Rupture	Material Properties Base	Material Properties Base	FA, LFA, lime, or cement stabilized					
Fatigue Cracking Parameter B1 and B2								
Poisson Ratio	N/A		Default value			Default value		

**Table II-4. List of Basic M-E Input Parameters Required for the TxM-E Software (Continued).**

Item	Description	Location in the DSS		Comment1	
		Group	Table		
Structure	Subgrade Material Information				
	Modulus	Field Performance Data	FWD Back-calculated Modulus		
	Rutting Properties ( $\alpha$ and $\mu$ )	Material Properties Base	Permanent Deformation		
2) Climate	Poisson Ratio	N/A		Default value	
	EICM weather station data	Attachment	Raw data files (EICM files stored in DSS and Raw Data Files)		
	Latitude, Longitude, Elevation	Climatic-Environmental Data	Climatic Data		
	Tire Pressure			User defined or default value	
	ADT Beginning	Traffic Data	Volume and Classification		
	ADT-End 20 YR				
	18kip ESALs 20 YR (1 DIR, millions)				
	Operation Speed				
	Lev. 2 3)Traffic	General Traffic Information			
		Traffic Two-way AADTT	Traffic Data	Volume and Classification	
No. of Lanes in Design Direction		Traffic Data	Volume and Classification		
% of Trucks in Design Direction		Traffic Data	Volume and Classification		
% of Trucks in Design Lane		Traffic Data	Volume and Classification		
Operation Speed		Traffic Data	Volume and Classification		
Axle Configuration					
Lev. 1	Axle Tire (Single and Dual Tire Pressure)			User defined or default value	
	Axle Spacing (Tandem, Tridem, and Quad)			User defined or default value	
4) Reliability	Monthly Adjustment	Traffic Data	Monthly Adjustment Factors		
	Axle Load Distribution	Traffic Data	Load Spectra		
	Vehicle Class Distribution and Growth	Traffic Data	Volume and Classification		
	Axle Per Truck	Traffic Data	Vehicle Classification System		
	Performance Criteria	User defined			
	Variability of Input Parameters	User defined			

**Table II-5. List of Basic M-E Input Parameters Required for the M-E PDG Software.**

#	Item	#	Description	Location in the DSS
1	General Information	a.	Project name	User input
		b.	Design life (yrs.)	Construction data
		c.	Base/Subgrade construction month/year	Construction data
		d.	Pavement construction month/year	Construction data
		e.	Traffic open month/year	Section details
		f.	Section	Section details
		g.	Date	Section details
		h.	Job	Section details
		i.	Type of design	Section details
2	Site/Project Identification	a.	Location	Section details
		b.	Project ID	Section details
		c.	Section ID	Section details
		d.	Date	Section details
		e.	Station/milepost format	Section details
		f.	Station/milepost begin	Section details
		g.	Station/milepost end	Section details
		h.	Traffic direction	Section details
3	Analysis Parameters	a.	Project name	Section details
		b.	Initial IRI (inches/mi)	Field performance data: Surface profiles – PSI and IRI
		c.	Terminal IRI (inches/mi)	User defined or default values
		d.	AC surface down cracking long. Cracking (ft/mi)	User defined or default values
		e.	AC bottom up cracking. Alligator cracking (%)	User defined or default values
		f.	AC thermal fracture (ft/mi)	User defined or default values
		g.	Chemically stabilized layer fatigue fracture (%)	User defined or default values
		h.	Permanent deformation – total pavement (inches)	User defined or default values
		i.	Permanent deformation – AC only (inches)	User defined or default values

**Table II-5. List of Basic M-E Input Parameters Required for the M-E PDG Software (Continued).**

#	Item	#	Description	Location in the DSS
4	Traffic	a.	Design life (yrs.)	User defined
		b.	Opening date	Construction data
		c.	Initial two-way AADTT	Traffic data – volume and classification
		d.	Number of lanes in design direction	Traffic data – volume and classification
		e.	Percent of trucks in design direction (%)	Traffic data – volume and classification
		f.	Percent of trucks in design lane (%)	Traffic data – volume and classification
		g.	Operational speed (mph)	Traffic data – volume and classification
		4.1	Traffic Volume Adjustment Factors	a.
		b.	4.1.2. Vehicle class distribution	Traffic data – volume and classification
		c.	4.1.3. Hourly distribution	Traffic data – hourly adjustment factors
		d.	4.1.4. Traffic growth factors	Traffic data – volume and classification
4.2	Axle Load Distribution Factors	a.	Single axle	Traffic data – load spectra
		b.	Tandem axle	
		c.	Tridem axle	
		d.	Quad axle	
4.3	General Traffic Inputs	a.	Mean wheel location (inches from the lane marking)	User defined or default
		b.	Traffic wander standard deviation (inches)	User defined or default
		c.	Design lane width (ft) (Note: Not slab width)	PVMNT section details, user defined or default
4.3.1	Number Axles/Truck		Single, tandem, tridem, and quad (Class 4 to 13)	Data currently being processed for inclusion in the DSS
4.3.2	Axle Configuration	a.	Average Axle width (edge to edge) outside dimensions, ft	User defined or default
		b.	Dual tire spacing (inches)	
		c.	Tire Pressure (psi)	
		d.	Tandem Axle spacing (inches)	
		e.	Tridem Axle spacing (inches)	
		f.	Quad Axle spacing (inches)	
4.3.3	Wheelbase	a.	Average Axle spacing (ft)	Traffic data – volume and classification
		b.	Percent of trucks (%)	

**Table II-5. List of Basic M-E Input Parameters Required for the M-E PDG Software (Continued).**

#	Item	#	Description	Location in the DSS
5	Climate	a.	Latitude (degrees.minutes)	Climatic data
		b.	Longitude (degrees.minutes)	Climatic data
		c.	Elevation (ft)	Climatic data
		d.	Depth of water table (ft) (Spring, Summer, Fall, Winter)	Climatic data
6	Structure	a.	Surface shortwave absorptivity	User defined or default value
		b.	Layer	PVMNT structure details
		c.	Type	PVMNT structure details
		d.	Material	PVMNT structure details
		e.	Thickness	PVMNT structure details
		f.	Interface	PVMNT structure details
		g.	For overlay design:	PVMNT structure details
		h.	Level 1: existing rutting and milled thickness	Construction data
		i.	Level 2: existing rutting, crack (%) in existing AC, and milled thickness	Existing distresses and/or field performance data
		j.	Level 3: milled thickness, total rutting, and pavement rating (Excellent, Good, Fair, Poor, and Very Poor)	Construction data
		k.	Fatigue analysis endurance limit (national calibration based on no endurance limit)	User defined or default value

**Table II-5. List of Basic M-E Input Parameters Required for the M-E PDG Software (Continued).**

#	Item	#	Description	Location in the DSS
7	HMA (Use Level 3 if most data are unavailable)	a.	Dynamic modulus—Level 1	Material properties - HMA
b.		DSR—Level 1 ~3	Material properties – Binders	
c.		Gradation—Level 2 and 3	Material properties – HMA	
d.		Effective binder content	Material properties – HMA	
e.		Air void	Material properties – HMA	
f.		Total unit weight	Material properties – HMA	
g.		Poisson's ratio	User defined or default value	
h.		Thermal conductivity		
i.		Shear capacity asphalt		
j.		Tensile strength and creep compliance		
a.		Resilient modulus	Material properties – Base and Subgrade	
8		Base and Subgrade (Use Level 3 if most data are unavailable)	b.	Soil classification
c.	Gradation		Material properties – Base and Subgrade	
d.	Atterberg limits		Material properties – Base and Subgrade	
e.	Maximum dry unit weight		Material properties – Base and Subgrade	
f.	Specific gravity (calculated or tested)		Material properties – Base and Subgrade	
g.	Optimum gravimetric moisture content		Material properties – Base and Subgrade	
h.	Saturated hydraulic conductivity (calculated)		User defined or default values	
i.	Degree of saturation at optimum (calculated)			
j.	Coefficient of later pressure			
k.	Soil suction coefficients (tested or calculated)		User defined or default values	
l.	DCP data			



## APPENDIX III. TEST SPECIFICATIONS AND DATA COLLECTION FORMS

**Table III-1. Asphalt-Binder Tests (Extracted Asphalt-Binders Only).**

#	Test	Spec	Test Parameters	Output Data	Sample Replicates			Comment
					TTI	UTEF	TxDOT Recommendation	
1	AC extraction	<a href="#">Tex-210-F<sup>a</sup></a>	As per spec	N/A – just binder	≥ 65 lbs		≥ 65 lbs	Extract enough to run all the necessary tests (i.e., about 100 lbs)
2	Specific gravity (SG)	T 228	As per spec	Specific gravity	3		1 <sup>a</sup>	<a href="#">Report 0-6658-1</a>
3	Viscosity	T 316	135 °C	Viscosity	3		1 <sup>a</sup>	<a href="#">Report 0-6658-1</a>
4	<a href="#">DSR<sup>c</sup></a>	T 315	As per spec	True grade, G*, & G*/Sin(δ)	3		1 <sup>a</sup>	<a href="#">Report 0-6658-1</a>
5	<a href="#">DSR – RTFO</a>	T 240	As per spec	True grade, G*, & G*/Sin(δ)	3		0 <sup>b</sup>	<a href="#">Report 0-6658-1</a>
6	<a href="#">DSR_PAV</a>	R 28	As per spec	G*, G*/Sin(δ), & true grade	3		0 <sup>b</sup>	<a href="#">Report 0-6658-1</a>
7	<a href="#">MSCR</a>	TP 70	As per spec; min 3 test temperatures per binder	R 100, R3200, R <sub>diff</sub> , J <sub>mr</sub> 100, J <sub>mr</sub> 3200, & J <sub>nr-diff</sub>	9		9 (3 × 3 temps)	<a href="#">Report 0-6658-1</a>
8	<a href="#">BBR<sup>l</sup></a>	T 313, R 28	As per spec; min 2 temps	Stiffness, m-value	6 (3 × 2 temps)		2 <sup>a</sup> (1 × 2 temps)	<a href="#">Report 0-6658-1</a>
9	Elastic recovery (ductility)	(D 6084-A)	As per TxDOT spec @ 50 °F	Elastic recovery	3		3	<a href="#">Report 0-6658-1</a>
10	Binder PG grading	M 320, Item 300, MP 19	As per spec	PG grade	-	-	-	<a href="#">Report 0-6658-1</a>
Total number of replicates					33		17	
Approximate material requirement ≥ 65 lbs of plant-mix (better to target 100 lbs)								

Note: *a* – results for first test sections were very repeatable with coefficient of variation less than 5%, so no need for 3 or more replicates; *b* – tests will be done on extracted binders only and treated as RTFO residue, so no need for RTFO or PAV; *c* – also run the intermediate temperature DSR and BBR on the extracted binders as it is (with no PAV) for mixes with RAP or RAS.

**Table III-2. HMA Mix Tests (Plant-Mix and Cores Only).**

#	Test	Spec	Test Parameters	Output Data	Sample Replicates			Comment
					TTI	UTEF	TxDOT Recommendation	
1	AC extraction	<a href="#">Tex-210-F<sup>a</sup></a>	As per spec	AC % (by weight)	3		3	
		<a href="#">Tex-236-F</a>	As per spec	AC %	3		$\phi^b$	
2	Aggregate gradation	<a href="#">Tex-200-F</a>	As per spec	Particle size distribution	3		3	Use aggregates from Tex-210-F
3	Hamburg	<a href="#">Tex-242-F</a>	As per spec, but run all samples to 20000 load passes	Test temp., rut depth and number of wheel passes (i.e., 0, 5000, 10000, 15000, & 20000)	3 (3 sets of 2)		$I^c$ (1 set of 2)	During testing, it is recommended to set the maximum rut depth to about 25 mm (instead of 12.5 mm)
4	Overlay	<a href="#">Tex-248-F</a>	0.025 inch, 93% load drop, 77 °F	Test temperature, max load, & cycles to failure	5		5	
5	OT fracture properties		0.017 inch @ 77 °F for 100 cycles	Test temp., $E(OT)$ , $A$ , & $n$	5		5	Test parameters recommended from Study 0-6622
6	Dynamic modulus (DM)	<a href="#">AASHIO TP 62-03</a>	As per spec; 5 temps; 6 frequencies	Dynamic modulus ( $ E $ ), temperature, & frequency	3		3	<a href="#">Report 0-6658-1</a>
7	Permanent deformation (RLPD)	Reports <a href="#">0-6658-P3</a> & <a href="#">0-6658-1</a>	(a) 104 °F, 20 psi, & 10000 cycles, & (b) 122 °F, 10 psi, & 10000 cycles,	Test temperatures, $\alpha$ , $\mu$ , & microstrains	6 (3 x 2 temps)		6 (3 x 2 temps)	<a href="#">Report 0-6658-1</a>
8	Indirect tension (IDT)	<a href="#">Tex-226-F</a>	As per spec	Test temp., IDT strength, & displacement @ peak load	3	-	3	<a href="#">Report 0-6658-1</a>
9	Thermal coefficient	Reports <a href="#">0-6658-P3</a> & <a href="#">0-6658-1</a>	14–104 °F	Thermal coefficient ( $\alpha$ )	3		3	<a href="#">Report 0-6658-1</a>
10	Flow number ( $F_N$ )	Reports <a href="#">0-6658-P3</a> & <a href="#">0-6658-1</a>	50 °C, 30 psi	Test temp., $F_N$ , Time to $F_N$ , accumulated microstrain @ $F_N(\epsilon_P)$ , & $\epsilon_P/F_N$	3		-	<a href="#">Report 0-6658-1</a>
11	OT monotonic	Report 0-6607-2	0.125 inch/min @ 77 °F	Peak load, HMA tensile strength, strain, FE, FE index, etc	5	-	-	Report 0-6607-2
Total number of replicates					45		32	
Approximate material requirement $\geq$ <b>405 lbs</b> of plant-mix (better to target 450 lbs)								

Note: *a* – test to be performed only if data cannot be obtained from QC/QA records; *b* – no need to do Tex-236-F if Tex-210-F is being conducted, though time consuming and costly; TxDOT prefers Tex-210 because it is more accurate; *c* – results for first test sections were very repeatable with coefficient of variation less than 5%, so no need for 3 replicate sets.

**Table III-3. Base Tests (Flex).**

#	Test	Spec	Test Parameters	Output Data	Sample Replicates			Comments
					TTI	UTEF	TxDOT Recom.	
1	Sieve analysis <sup>a,b</sup>	<a href="#">Tex-110-E</a>	As per spec	Gradation	3	Stock	Stock (Tex-110-E, for +#40 & Tex-111-E, for -#40)	<a href="#">Report 0-6658-1</a>
2	Atterberg limits <sup>a</sup>	<a href="#">Tex-104-E</a> , <a href="#">Tex-105-E</a> , <a href="#">Tex-106-E</a>	As per spec	PI, LL, & PL	3	2 <sup>d</sup>	1+	<a href="#">Report 0-6658-1</a>
3	Specific gravity	<a href="#">ASTM C-127</a> , <a href="#">128</a>	As per spec	SG value	3	2 <sup>d</sup>	<sup>c</sup> 2	<a href="#">Report 0-6658-1</a>
4	Wet Ball Mill <sup>a,d</sup>	<a href="#">Tex-116-E</a>	As per spec	Wet Ball Mill value	3	2 <sup>d</sup>	0	<a href="#">Report 0-6658-1</a>
5	MD Curve <sup>a</sup>	<a href="#">Tex-113-E</a>	6" × 8"	MDD, OMC	3	2 <sup>d</sup>	1+	<a href="#">Report 0-6658-1</a>
6	Texas Triaxial	<a href="#">Tex-117-E</a>	6" × 8"	Classification, C, & φ	3	2 <sup>d</sup>	1 <sup>e</sup>	<a href="#">Report 0-6658-1</a>
7	Resilient modulus	<a href="#">NCHRP 1-28A</a>	6" × 12" OMC	k-parameters	3	2 <sup>d</sup>	<sup>c</sup> 2	<a href="#">Report 0-6658-1</a>
8	Permanent deformation	<a href="#">NCHRP 1-28A</a>	6" × 12" OMC	α & μ	3	2 <sup>d</sup>	<sup>c</sup> 2	<a href="#">Report 0-6658-1</a>
9	Shear strength	<a href="#">Tex-143</a>	6" × 8"	C and φ	3	2 <sup>d</sup>	<sup>c</sup> 2	<a href="#">Report 0-6658-1</a>
10	Soil suction	<a href="#">Filter paper</a>		Suction coefficient	3	-	0	<a href="#">Report 0-6658-1</a>
Total material to sample from the field					33		11	
Approximate material requirement ≥ 700 lbs (better to target 800 lbs or more)								

**Note:** \* – Time in parentheses refers to wait (cure) time; a – Perform sieve analysis and compare gradation to TXDOT. If gradation matches, then use TXDOT QC data; otherwise, run test; b – Include sieves #100 and #200, which will be washed; c – A third test is performed if the duplicate results vary by a wide margin; d – If available, use from TXDOT QC 1+ – Researchers to run one test, if the results match the districts, they can use district results; if not, the researchers will run two samples; e – One sample at each confining pressure.

Table III-4. Base Tests (Treated – CTB).

#	Test	Spec	Test Parameters	Output Data	Sample Replicates			Comments
					TTI	UTE <sup>P</sup>	TxDOT Recom.	
1	Sieve analysis <sup>a,b</sup>	<a href="#">Tex-110-E</a>	As per spec	Gradation	3	Stock	Stock	<a href="#">Report 0-6658-1</a>
2	Atterberg limit <sup>d</sup>	<a href="#">Tex-104-E</a> , <a href="#">Tex-105-E</a> , <a href="#">Tex-106-E</a>	As per spec	PI, LL, & PL	3	2 <sup>f</sup>	1+	<a href="#">Report 0-6658-1</a>
3	Sulfate content <sup>e</sup>	<a href="#">Tex-145-E</a>	As per spec	Sulfate content	3	2 <sup>f</sup>	0	<a href="#">Report 0-6658-1</a>
4	Wet Ball Mill <sup>c</sup>	<a href="#">Tex-116-E</a>	As per spec	Wet Ball Mill value	3	2 <sup>f</sup>	0	<a href="#">Report 0-6658-1</a>
5	MD Curve <sup>d</sup>	<a href="#">Tex-113-E</a>	As per spec	MDD & OMC	3	2 <sup>f</sup>	1+	<a href="#">Report 0-6658-1</a>
6	Unconfined compressive strength <sup>d</sup>	<a href="#">Tex-120-E</a> , <a href="#">Tex-121-E</a>	As per spec	UCS	3	2 <sup>f</sup>	1 <sup>h</sup>	<a href="#">Report 0-6658-1</a>
7	Resilient modulus <sup>d,g</sup>	<a href="#">NCHRP 1-28A</a>	6" × 12" OMC	k-parameters	3	2 <sup>f</sup>	2 <sup>e</sup>	Zero confinement, <a href="#">Report 0-6658-1</a>
8	Modulus of rupture <sup>d,f</sup>		Beam 6" × 6" × 12" OMC	Modulus of Rupture	3	2 <sup>f</sup>	2 <sup>e</sup>	<a href="#">Report 0-6658-1</a>
Total material to sample from the field					24		7	
Approximate material requirement ≥ 550 lbs (better to target 600 lbs or more)								

Note: \* – Time in parentheses refers to wait (cure) time; a – Perform sieve analysis and compare gradation to TXDOT. If gradation matches then use TXDOT QC data; otherwise; run test; b – Include sieves #100 and #200; c – Test is performed before treatment; d – Test is performed after treatment; e – A third test is performed if the duplicate results vary by a wide margin; f – Test only for cement treated (>2%); g – Run FFRC instead of RM at zero confinement; h – Includes running three samples at the cement content.

Item #8 (Modulus of Rupture Testing) – When the cement stabilization content is 2% or less, reclassify the material as “Untreated Base” and test according to that protocol, i.e., the tests listed on page 1 of this document. For all other materials that have more than 2% stabilization content, leave it as a treated material, and if the modulus of rupture specimens cannot be fabricated, make a note in the DSS under the “comments field.”

**Table III-5. Base Tests (Treated – Asphalt/Low Stabilizers).**

#	Test	Spec	Test Parameters	Output Data	Sample Replicates			Comments
					TTI	UTE <sup>P</sup>	TxDOT Recom.	
1	Sieve analysis <sup>a,b</sup>	<a href="#">Tex-110-E</a>	As per spec	Gradation	3	Stock	Stock	<a href="#">Report 0-6658-1</a>
2	Atterberg limit <sup>c</sup>	<a href="#">Tex-104-E</a> , <a href="#">Tex-105-E</a> , <a href="#">Tex-106-E</a>	As per spec	PI, LL, & PL	3	2 <sup>†</sup>	1+	<a href="#">Report 0-6658-1</a>
3	Sulfate content <sup>e</sup>	<a href="#">Tex-145-E</a>	As per spec	Sulfate content	3	2 <sup>†</sup>	0	<a href="#">Report 0-6658-1</a>
4	Wet Ball Mill <sup>c</sup>	<a href="#">Tex-116-E</a>	As per spec	Wet Ball Mill value	3	2 <sup>†</sup>	0	<a href="#">Report 0-6658-1</a>
5	MD Curve <sup>d</sup>	<a href="#">Tex-113-E</a>	As per spec	MDD & OMC	3	2 <sup>†</sup>	1+	<a href="#">Report 0-6658-1</a>
6	Unconfined compressive strength <sup>d</sup>	<a href="#">Tex-120-E</a> , <a href="#">Tex-121-E</a>	As per spec	UCS	3	2 <sup>†</sup>	1 <sup>†</sup>	<a href="#">Report 0-6658-1</a>
7	Resilient modulus <sup>d,g</sup>	<a href="#">NCHRP 1-28A</a>	6" × 12" OMC	k-parameters	3	2 <sup>†</sup>	2 <sup>e</sup>	Zero confinement, <a href="#">Report 0-6658-1</a>
8	Permanent deformation <sup>d,f</sup>	<a href="#">NCHRP 1-28A</a>	6" × 12" OMC	α & μ	3	2 <sup>†</sup>	2 <sup>e</sup>	Zero confinement, <a href="#">Report 0-6658-1</a>
Total material to sample from the field					24		9	
Approximate material requirement ≥ 550 lbs (better to target 600 lbs or more)								

Note: \* – Time in parentheses refers to wait (cure) time; a – Perform sieve analysis and compare gradation to TXDOT. If gradation matches then use TXDOT QC data, otherwise run test; b – Include sieves #100 and #200; c – Test is performed before treatment; d – Test is performed after treatment; e – A third test is performed if the duplicate results vary by a wide margin; f – Test only for asphalt treated & low stabilizer content (< 2%); g – Run FFRC instead of RM at zero confinement.

Table III-6. Subgrade Soil Tests (Raw).

#	Test	Spec	Test Parameters	Output Data	Sample Replicates			Comment
					TTI	UTEP	TxDOT Recom.	
1	Sieve Analysis <sup>a,b</sup>	<a href="#">Tex-110-E</a>	As per spec	Gradation	3	Stock	Stock (Tex-110-E, Part I for +#40 and Part II for -#40 [hydrometer])	<a href="#">Report 0-6658-1</a>
2	Atterberg limits	<a href="#">Tex-104-E</a> , <a href="#">Tex-105-E</a> , <a href="#">Tex-106-E</a>	As per spec	PI, LL, & PL	3	2 <sup>d</sup>	1+	<a href="#">Report 0-6658-1</a>
3	Specific gravity	<a href="#">Tex-108-E</a>	As per spec	SG value	3	2 <sup>d</sup>	2 <sup>c</sup>	<a href="#">Report 0-6658-1</a>
4	Sulfate content	<a href="#">Tex-145-E</a>	As per spec	Sulfate content	3	2 <sup>d</sup>	0	<a href="#">Report 0-6658-1</a>
5	Organic content	<a href="#">Tex-408-A</a>	As per spec	Organic content	3	2 <sup>d</sup>	0	<a href="#">Report 0-6658-1</a>
6	MD curve	<a href="#">Tex-114-E</a>	As per spec	MDD & OMC	3	2 <sup>d</sup>	1+	<a href="#">Report 0-6658-1</a>
7	Texas Triaxial	<a href="#">Tex-117-E</a>	As per spec	Classification, C, & φ	3	2 <sup>d</sup>	1	<a href="#">Report 0-6658-1</a>
8	Resilient modulus	<a href="#">NCHRP 1-28A</a>	4" × 8" OMC	k-parameters	3	2 <sup>d</sup>	2 <sup>c</sup>	<a href="#">Report 0-6658-1</a>
9	Permanent deformation	<a href="#">NCHRP 1-28A</a>	4" × 8" OMC	α & μ	3	2 <sup>d</sup>	2 <sup>c</sup>	<a href="#">Report 0-6658-1</a>
10	Shear strength	<a href="#">Tex-143</a>	As per spec	C & φ	3	2 <sup>d</sup>	2 <sup>c</sup>	<a href="#">Report 0-6658-1</a>
11	Soil suction	<a href="#">Filter paper</a>		Suction coefficient	3	-	0	<a href="#">Report 0-6658-1</a>
Total material to sample from the field					33		11	
Approximate material requirement ≥ 350 lbs (better to target 400 lbs or more)								

Note: \* – Time in parentheses refers to wait (cure) time; a – Perform sieve analysis and compare gradation to TXDOT. If gradation matches then use TXDOT QC data; otherwise, run test; b – Include sieves #100 and #200; c – A third test is performed if the duplicate results vary by a wide margin; d – plus one sample for every change in material.

Table III-7. Subgrade Soil Tests (Treated).

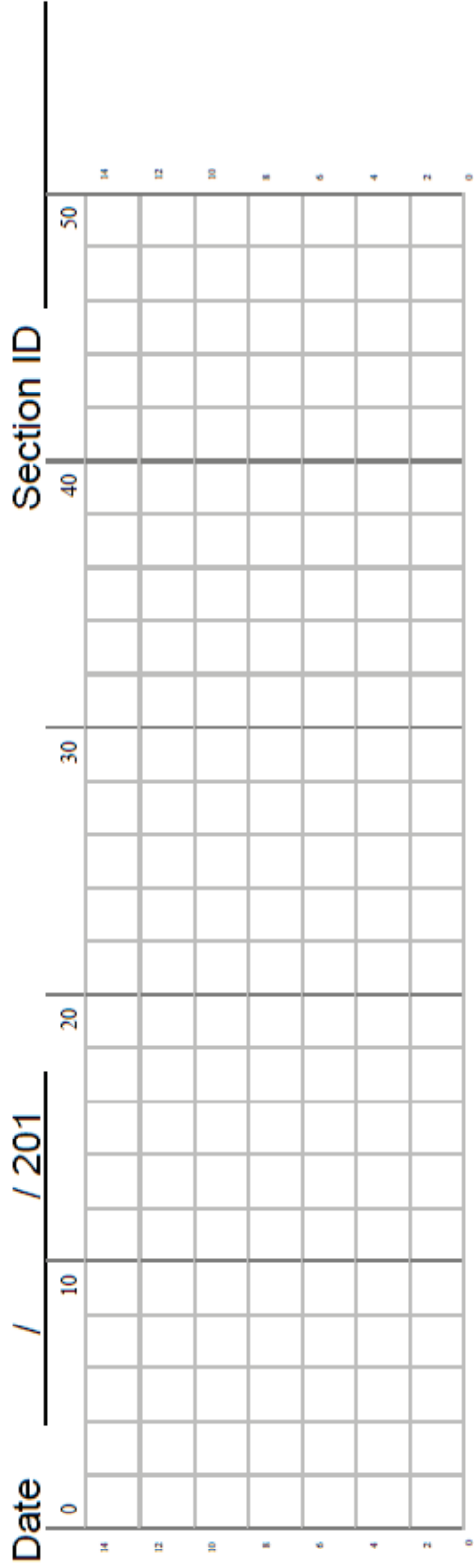
#	Test	Spec	Test Parameters	Output Data	Sample Replicates			Comment
					TTI	UTE <sup>P</sup>	TxDOT Recom.	
1	Sieve analysis <sup>a,b</sup>	<a href="#">Tex-110-E</a>	As per spec	Gradation	3	Stock	Stock (Tex-110-E, Part I for + #40 and Part II for - #40 [hydrometer])	<a href="#">Report 0-6658-1</a>
2	Atterberg limits <sup>c,d</sup>	<a href="#">Tex-104-E</a> , <a href="#">Tex-105-E</a> , <a href="#">Tex-106-E</a>	As per spec	PI, LL, & PL	3	1 <sup>f</sup> 2	1+ <sup>g</sup>	<a href="#">Report 0-6658-1</a>
3	Sulfate content <sup>d</sup>	<a href="#">Tex-145-E</a>	As per spec	Sulfate content	3	1 <sup>f</sup> 2	e <sup>e</sup> 2	<a href="#">Report 0-6658-1</a>
4	Organic content <sup>d</sup>	<a href="#">Tex-408-A</a>	As per spec	Organic content	3	1 <sup>f</sup> 2	0	<a href="#">Report 0-6658-1</a>
5	MD Curve <sup>d</sup>	<a href="#">Tex-114-E</a>	As per spec	MDD & OMC	3	1 <sup>f</sup> 2	0	<a href="#">Report 0-6658-1</a>
6	Unconfined compressive strength <sup>d</sup>	<a href="#">Tex-120-E</a> , <a href="#">Tex-121-E</a>	As per spec	UCS	3	1 <sup>f</sup> 2	1+	<a href="#">Report 0-6658-1</a>
7	Resilient modulus <sup>d,f</sup>	<a href="#">NCHRP 1-28A</a>	4" x 8" OMC	k-parameters	3	1 <sup>f</sup> 2	d <sup>d</sup> 2	<a href="#">Report 0-6658-1</a>
8	Permanent deformation <sup>d</sup>	<a href="#">NCHRP 1-28A</a>	4" x 8" OMC	α & μ	3	1 <sup>f</sup> 2	d <sup>d</sup> 2	<a href="#">Report 0-6658-1</a>
Total material to sample from the field					24		8	
Approximate material requirement ≥ 150 lbs (better to target 200 lbs or more)								

Note: \* – Time in parentheses refers to wait (cure) time; a – Perform sieve analysis and compare gradation to TXDOT. If gradation matches then use TXDOT QC data, otherwise run test; b – Include sieves #100 and #200; c – Test is performed before treatment; d – Test is performed after treatment; e – A third test is performed if the duplicate results vary by a wide margin; f – Run FFRC instead of RM at zero confinement; g – Plus 1 sample for every change in material.

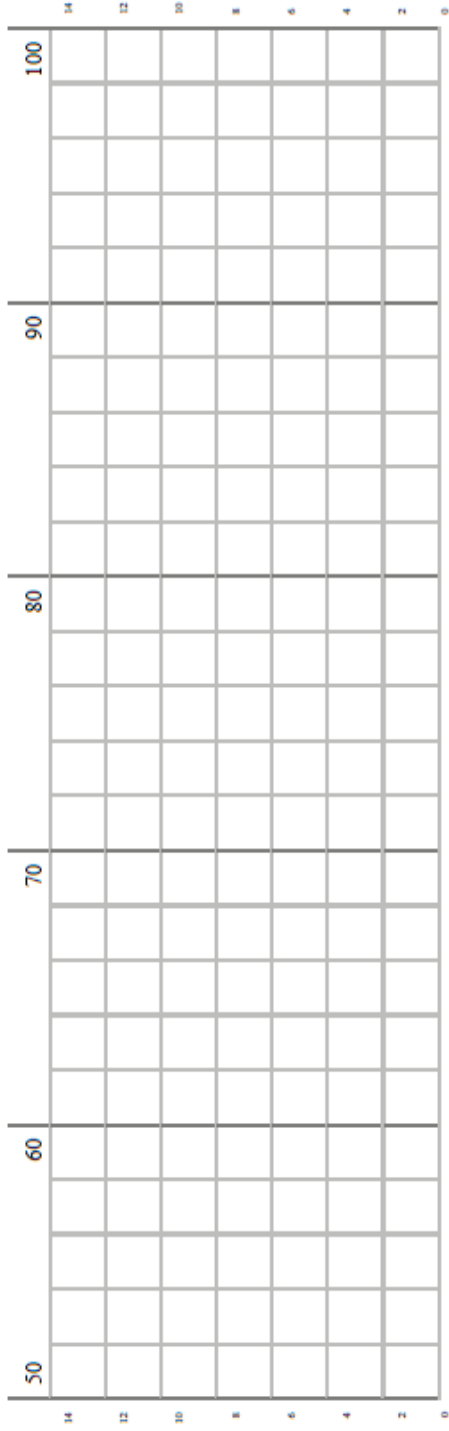
**Table III-8. Lab Tests (Neat Asphalt-Binders: Obtained Directly from the Plant or Truck [Onsite during Construction]).**

#	Test	Spec	Parameters	Sample Replicates			Comments/Reference
				TTI	UTEF	TxDOT Recommendation	
1	Residual recovery (Emulsions only)	Texas Oven (6 hr @ 60 °C)	Residual recovery	3 (60 g)		3	Silicon sheets may be obtained from Bed, Bath & Beyond <a href="#">Report 0-6658-1</a>
2	Viscosity	T 316	Viscosity	1 (40 g)		1	<a href="#">Report 0-6658-1</a>
3	Specific gravity	T 228	SG	1 (40 g)		1	<a href="#">Report 0-6658-1</a>
4	RTFO & PAV	T 240, R 28		1 (60 g)		1	<a href="#">Report 0-6658-1</a>
5	DSR	T 315	G* & G*/Sin(δ)	1 (60 g)		1	<a href="#">Report 0-6658-1</a>
6	MSCR	TP 70	Jnr, Jnr ratio % recoverable strain	9 (3 × 3 temps) (60 g)		9 (3 × 3 temps)	<a href="#">Report 0-6658-1</a>
7	BBR	T 313	S & m-values	2 (1 × 2 temps) (60 g)		2 (1 × 2 temps)	<a href="#">Report 0-6658-1</a>
8	Elastic recovery	D 6084	% recovery	3 (100 g)		3	<a href="#">Report 0-6658-1</a>
9	SPG grading	<a href="#">Report 0-1710-2</a>	SPG binder grade	-		-	1) <a href="#">Report 0-1710-2</a> 2) <a href="#">Report 0-6658-1</a>
Total number of replicates				21		21	
Approximate material requirement = One 5-gallon (≅ 38 lbs) bucket of neat binder obtained either from the plant or directly from the truck onsite during construction.							





Comment



Comment

**Figure III-1-1. Example Preconstruction Distress Survey Sheet for 100 Ft Length.**

PROJECT 0-6658: CONSTRUCTION DATA COLLECTION SHEET

Construction Data ID#	
Section ID#	
Highway	
Sampling Location (GPS)	
Material/Mix type	
Tack Coat	
Construction Date	
Contractor Contact	
TxDOT Contact	
Contractor	
HMA Truck Type	
Material Transfer Device	
Infrared Bar	
Joint Roller	

**Figure III-2. Construction Data Collection Sheet.**

PROJECT 0-6658: CONSTRUCTION DATA COLLECTION SHEET

Breakdown Roller							
Second Roller							
Finishing Roller							
HMA Mat Thickness							
Target Density							
Other Observations							
HMA Mix Temp (°F)	Temp 1	Temp 2	Temp 3	Temp 4	Temp 5	Avg.	COV %
Pavement Surface Temp (°F) (After Paving, Before Compaction)	Temp 1	Temp 2	Temp 3	Temp 4	Temp 5	Avg.	COV %
Air Temp (°F)	Temp 1	Temp 2	Temp 3	Temp 4	Temp 5	Avg.	COV %
PVMNT Surface Temp Prior to Paving (°F)	Temp 1	Temp 2	Temp 3	Temp 4	Temp 5	Avg.	COV %
Core Density	Core 1	Core 2	Core 3	Core 4	Core 5	Avg.	COV %
Nuclear Density	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Avg.	COV %
Pavement Quality Indicator	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Avg.	COV %

\*Also take pictures and videos (during construction & post construction if possible) \*Request TxDOT for QC/QA sheets, HMA mix-design sheets, & QC/QA cores

Figure III-2. Construction Data Collection Sheet (Continued).

**Test Section ID#**

Hwy: \_\_\_\_\_ Direction: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Material/Mix Type: \_\_\_\_\_ Weather Condition: \_\_\_\_\_  
 Lane: \_\_\_\_\_ District: \_\_\_\_\_ County: \_\_\_\_\_

Distance	0 ft	100 ft	200 ft	300 ft	400 ft	500 ft
Mile Marker						
GPS Coordinates	N					
	W					
Elevation (ft)						
Rut Depth (in)	LWP*					
	RWP					
Cracking						
Other Distresses						
Air temperature (°F)						
PVMNT Surface temp. (°F)						
Comments						

\*LWP= Left Wheel Path, RWP= Right Wheel Path

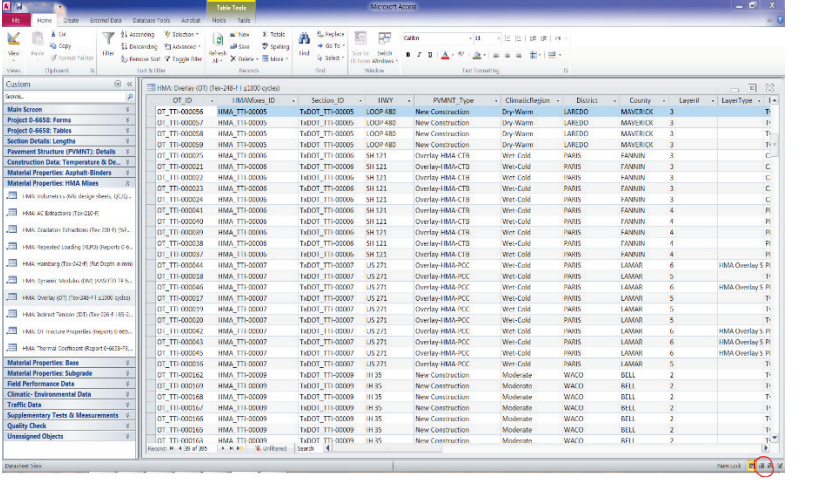
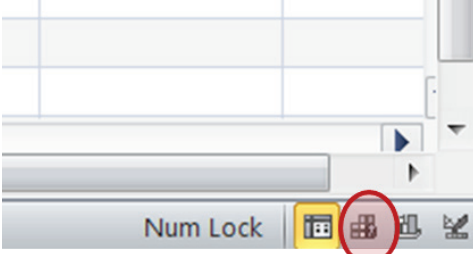
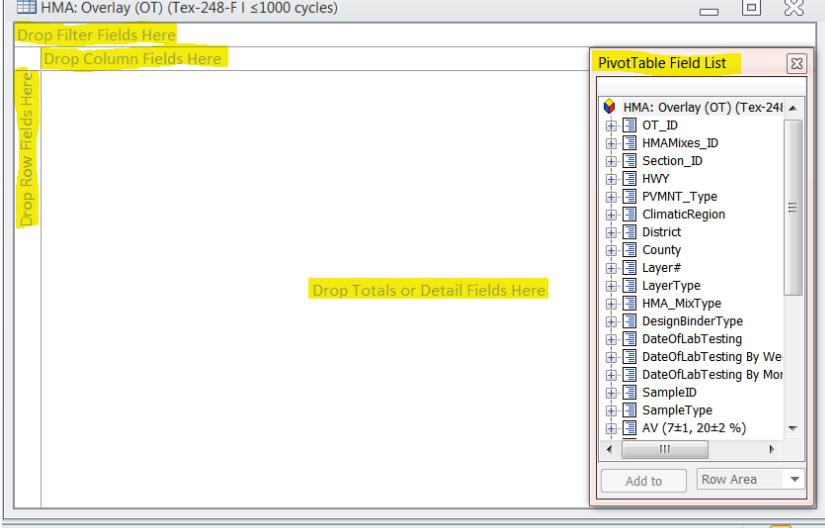
(Refer to Report 0-6658-1 for detailed list of field tests or the "Help" function on the MS Access Data Storage System)

Surveyed by:

**Figure III-3. Field Performance Data Collection Sheet.**

# APPENDIX IV. EXAMPLES OF ANALYZING AND DISPLAYING DSS DATA

**Table IV-1. Accessing and Analyzing the DSS Data: Showing Average, Maximum, Minimum, etc. of Data in a Table.**

<p>1. Open a data table that you want to analyze for maximum, minimum, average, standard deviation, etc. For this example, we are using the DSS table: <b>“HMA: Overlay (OT) (Tex-248-F   ≤ 1000 cycles)”</b></p>	
<p>2. Open the table in the <b>Pivot Table View</b> by clicking the icon in the bottom right corner.</p>	
<p>3. The pivot table includes a <b>Pivot Table Field List</b> that lists all the data fields in the table and four areas/zones, namely the <b>Filter</b> field, <b>Column</b> field, <b>Row</b> field, and <b>Totals or Detail</b> field. Any data field from the <b>Pivot Table Field List</b> can be dragged and dropped to one of these four zones.</p>	

**Table IV-1. Accessing and Analyzing the DSS Data: Showing Average, Maximum, Minimum, etc. of Data in a Table (Continued).**

<p>4. From the <b>PivotTable Field List</b> in the Pivot Table View, drag and drop the desired data field into the empty space in the middle of the pivot table marked as: <b>Drop Totals or Detail Fields Here</b>. For this example, we are using the <b>Section_ID</b>, <b>HWY</b>, and <b>OT_Cycles</b> data fields.</p>																																																	
<p>5. Select the data column, click the right mouse button, and select analysis types in <b>AutoCalc</b>, e.g., summation, maximum, minimum, average, standard deviation, etc.</p>																																																	
<p>6. The desired analysis result/results for all the data in the column will be presented at the end of the data column.</p>	<table border="1" data-bbox="617 1281 1282 1848"> <thead> <tr> <th>Section_ID</th> <th>HWY</th> <th>OT_Cycles</th> </tr> </thead> <tbody> <tr><td>TxDOT_TTI-00073</td><td>US 59</td><td>334.00</td></tr> <tr><td>TxDOT_TTI-00074</td><td>US 59</td><td>240.00</td></tr> <tr><td>TxDOT_TTI-00074</td><td>US 59</td><td>334.00</td></tr> <tr><td>TxDOT_TTI-00074</td><td>US 59</td><td>121.00</td></tr> <tr><td>TxDOT_TTI-00074</td><td>US 59</td><td>309.00</td></tr> <tr><td>TxDOT_TTI-00074</td><td>US 59</td><td>269.00</td></tr> <tr><td>TxDOT_TTI-00075</td><td>US 59</td><td>240.00</td></tr> <tr><td>TxDOT_TTI-00075</td><td>US 59</td><td>309.00</td></tr> <tr><td>TxDOT_TTI-00075</td><td>US 59</td><td>121.00</td></tr> <tr><td>TxDOT_TTI-00075</td><td>US 59</td><td>334.00</td></tr> <tr><td>TxDOT_TTI-00075</td><td>US 59</td><td>269.00</td></tr> <tr><td colspan="2">Average of OT_Cycles</td><td>252.25</td></tr> <tr><td colspan="2">Min of OT_Cycles</td><td>0.00</td></tr> <tr><td colspan="2">Max of OT_Cycles</td><td>1000.00</td></tr> <tr><td colspan="2">Standard Deviation of OT_Cycles</td><td>298.89</td></tr> </tbody> </table>	Section_ID	HWY	OT_Cycles	TxDOT_TTI-00073	US 59	334.00	TxDOT_TTI-00074	US 59	240.00	TxDOT_TTI-00074	US 59	334.00	TxDOT_TTI-00074	US 59	121.00	TxDOT_TTI-00074	US 59	309.00	TxDOT_TTI-00074	US 59	269.00	TxDOT_TTI-00075	US 59	240.00	TxDOT_TTI-00075	US 59	309.00	TxDOT_TTI-00075	US 59	121.00	TxDOT_TTI-00075	US 59	334.00	TxDOT_TTI-00075	US 59	269.00	Average of OT_Cycles		252.25	Min of OT_Cycles		0.00	Max of OT_Cycles		1000.00	Standard Deviation of OT_Cycles		298.89
Section_ID	HWY	OT_Cycles																																															
TxDOT_TTI-00073	US 59	334.00																																															
TxDOT_TTI-00074	US 59	240.00																																															
TxDOT_TTI-00074	US 59	334.00																																															
TxDOT_TTI-00074	US 59	121.00																																															
TxDOT_TTI-00074	US 59	309.00																																															
TxDOT_TTI-00074	US 59	269.00																																															
TxDOT_TTI-00075	US 59	240.00																																															
TxDOT_TTI-00075	US 59	309.00																																															
TxDOT_TTI-00075	US 59	121.00																																															
TxDOT_TTI-00075	US 59	334.00																																															
TxDOT_TTI-00075	US 59	269.00																																															
Average of OT_Cycles		252.25																																															
Min of OT_Cycles		0.00																																															
Max of OT_Cycles		1000.00																																															
Standard Deviation of OT_Cycles		298.89																																															

**Table IV-1. Accessing and Analyzing the DSS Data: Showing Average, Maximum, Minimum, etc., of Data in a Table (Continued).**

7. You can also add other fields (e.g., PVMNT\_Type, SampleID, etc.) to the pivot table following the same “drag and drop” procedure as described in Item #3 in this table.

The screenshot shows the Excel PivotTable Field List task pane. The 'PivotTable Field List' pane is open, and the fields 'Section\_ID' and 'PVMNT\_Type' are circled in red. A red arrow points from the 'PVMNT\_Type' field towards the PivotTable area. The background shows a PivotTable with columns for Section\_ID, HWY, SampleID, and OT\_Cycles.

8. The average OT\_Cycles for each Section can be calculated by moving the Section\_ID field to the Row Field (drag and drop). Similarly, the average for each HMA\_MixType, PVMNT\_Type, climatic region, etc., can be obtained by simply dropping the desired Field to the Row Fields area.

The screenshot shows the Excel PivotTable Field List task pane. The 'Section\_ID' field has been moved from the Column Fields area to the Row Fields area, as indicated by a red box and a yellow arrow. The background shows a PivotTable with rows grouped by Section\_ID.

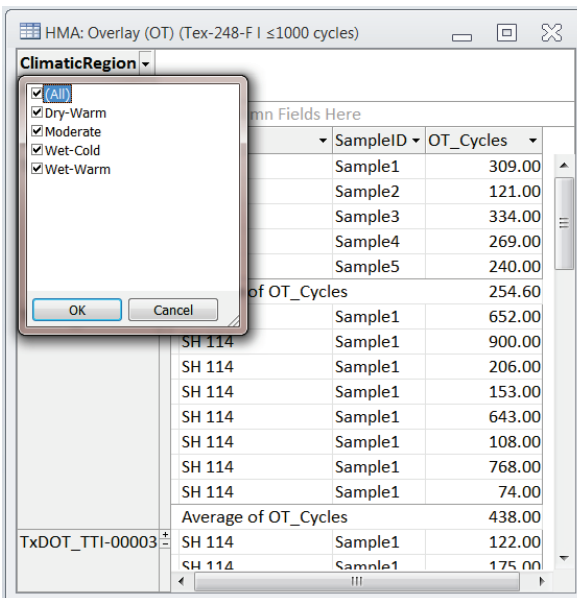
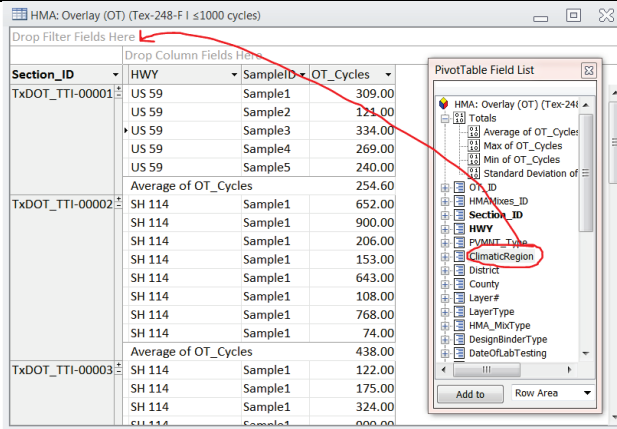


The screenshot shows the final PivotTable in Excel. The 'Section\_ID' field is in the Row Fields area. The PivotTable displays data grouped by Section\_ID, with an 'Average of OT\_Cycles' row highlighted in yellow for each group.

Section_ID	HWY	Layer#	SampleID	OT_Cycles
TxDOT_TTI-00001	US 59	7	Sample1	309.00
	US 59	7	Sample2	121.00
	US 59	7	Sample3	334.00
	US 59	7	Sample4	269.00
	US 59	7	Sample5	240.00
Average of OT_Cycles				254.60
TxDOT_TTI-00002	SH 114	2	Sample1	652.00
	SH 114	4	Sample1	153.00
	SH 114	5	Sample1	643.00
	SH 114	5	Sample1	900.00
	SH 114	4	Sample1	206.00
	SH 114	3	Sample1	108.00
Average of OT_Cycles				438.00

**Table IV-1. Accessing and Analyzing the DSS Data: Showing Average, Maximum, Minimum, etc. of Data in a Table (Continued).**

9. You can also filter the data by dropping the filter criteria from the **Pivot Table Field List** to the **Filter Field**. In this example, we'll filter the data by **Climatic Region**.





**Table IV-2. Accessing and Analyzing the DSS Data: Generating Graphs from Data in a Table.**

1. Open a DSS table that contains the data for drawing graphs. For this example, we are using the DSS Table: “**HMA: Overlay (OT) (Tex-248-F | ≤ 1000 cycles)**”

OT_ID	HMA_Mixes_ID	Section_ID	HWY	PVMNT_Type	ClimaticRegion	District	County	Layer#	LayerType
OT_TI-000556	HMA_TTI-00005	TADOT_TTI-00005	LOOP 482	New Construction	Dry-Warm	LAREDO	MAVERICK	3	T
OT_TI-000557	HMA_TTI-00005	HADOT_TTI-00005	LOOP 482	New Construction	Dry-Warm	LAREDO	MAVERICK	3	T
OT_TI-000558	HMA_TTI-00005	TADOT_TTI-00005	LOOP 482	New Construction	Dry-Warm	LAREDO	MAVERICK	3	T
OT_TI-000559	HMA_TTI-00005	TADOT_TTI-00005	LOOP 482	New Construction	Dry-Warm	LAREDO	MAVERICK	3	T
OT_TI-000575	HMA_TTI-00006	HADOT_TTI-00006	SH 121	Overlay HMA-CTB	Wet-Cold	PARIS	FANNIN	3	C
OT_TI-000521	HMA_TTI-00009	TADOT_TTI-00009	SH 121	Overlay HMA-CTD	Wet-Cold	PARIS	FANNIN	3	C
OT_TI-000522	HMA_TTI-00006	HADOT_TTI-00006	SH 121	Overlay HMA-CTB	Wet-Cold	PARIS	FANNIN	3	C
OT_TI-000523	HMA_TTI-00006	TADOT_TTI-00006	SH 121	Overlay HMA-CTB	Wet-Cold	PARIS	FANNIN	3	C
OT_TI-000524	HMA_TTI-00009	HADOT_TTI-00009	SH 121	Overlay HMA-CTB	Wet-Cold	PARIS	FANNIN	3	C
OT_TI-000541	HMA_TTI-00006	TADOT_TTI-00006	SH 121	Overlay HMA-CTB	Wet-Cold	PARIS	FANNIN	4	PI
OT_TI-000540	HMA_TTI-00009	HADOT_TTI-00009	SH 121	Overlay HMA-CTB	Wet-Cold	PARIS	FANNIN	4	PI
OT_TI-000539	HMA_TTI-00006	TADOT_TTI-00006	SH 121	Overlay HMA-CTB	Wet-Cold	PARIS	FANNIN	4	PI
OT_TI-000538	HMA_TTI-00009	HADOT_TTI-00009	SH 121	Overlay HMA-CTD	Wet-Cold	PARIS	FANNIN	4	PI
OT_TI-000587	HMA_TTI-00006	HADOT_TTI-00006	SH 121	Overlay HMA-CTB	Wet-Cold	PARIS	FANNIN	4	PI
OT_TI-000544	HMA_TTI-00007	TADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	6	HMA Overlay S
OT_TI-000535	HMA_TTI-00007	HADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	5	HMA Overlay S
OT_TI-000545	HMA_TTI-00007	TADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	6	HMA Overlay S
OT_TI-000527	HMA_TTI-00007	HADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	5	HMA Overlay S
OT_TI-000519	HMA_TTI-00007	HADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	5	HMA Overlay S
OT_TI-000520	HMA_TTI-00007	TADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	5	HMA Overlay S
OT_TI-000542	HMA_TTI-00007	HADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	6	HMA Overlay S
OT_TI-000543	HMA_TTI-00007	TADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	6	HMA Overlay S
OT_TI-000545	HMA_TTI-00007	HADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	6	HMA Overlay S
OT_TI-000576	HMA_TTI-00007	TADOT_TTI-00007	US 271	Overlay HMA-PCC	Wet-Cold	PARIS	LAMAR	5	HMA Overlay S
OT_TI-000524	HMA_TTI-00009	HADOT_TTI-00009	H 35	New Construction	Moderate	WALCO	BELL	2	T
OT_TI-000510	HMA_TTI-00009	HADOT_TTI-00009	H 35	New Construction	Moderate	WALCO	BELL	2	T
OT_TI-000516	HMA_TTI-00009	HADOT_TTI-00009	H 35	New Construction	Moderate	WALCO	BELL	2	T
OT_TI-000518	HMA_TTI-00009	TADOT_TTI-00009	H 35	New Construction	Moderate	WALCO	BELL	2	T
OT_TI-000519	HMA_TTI-00009	HADOT_TTI-00009	H 35	New Construction	Moderate	WALCO	BELL	2	T
OT_TI-000516	HMA_TTI-00009	HADOT_TTI-00009	H 35	New Construction	Moderate	WALCO	BELL	2	T
OT_TI-000518	HMA_TTI-00009	TADOT_TTI-00009	H 35	New Construction	Moderate	WALCO	BELL	2	T

2. Click the **Pivot Chart View** icon in the bottom right corner.

The **Chart Field List** appears and lists all the data fields in the DSS table.

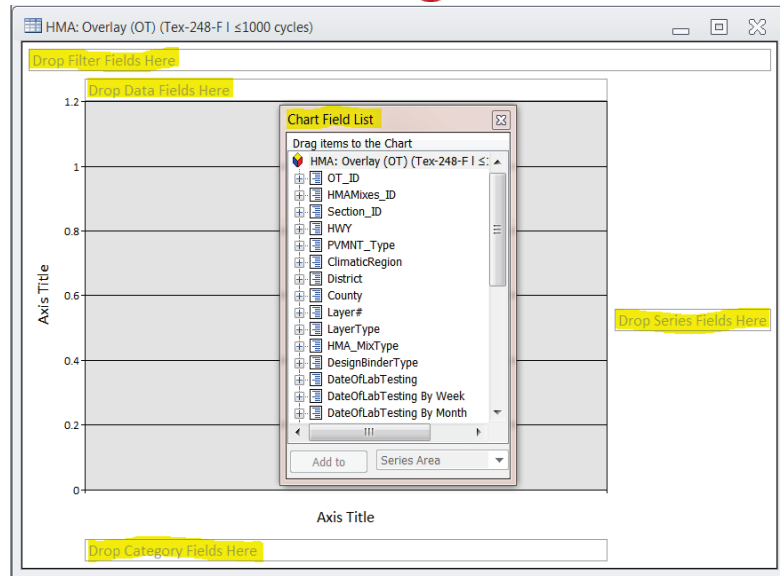
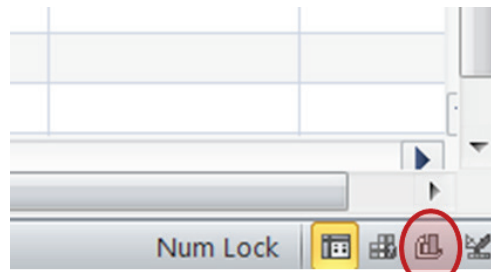
The Pivot Chart includes four fields:

- **Filter Field.**
- **Data Field.**
- **Series Field.**
- **Category Field.**

The **Filter Field** can be used to filter the presented data.

The **Category Field** and the **Data Field** comprise the x- and y-axes of the chart, respectively.

Any data field from the **Pivot Table Field List** can be dragged and dropped to one of these four zones.

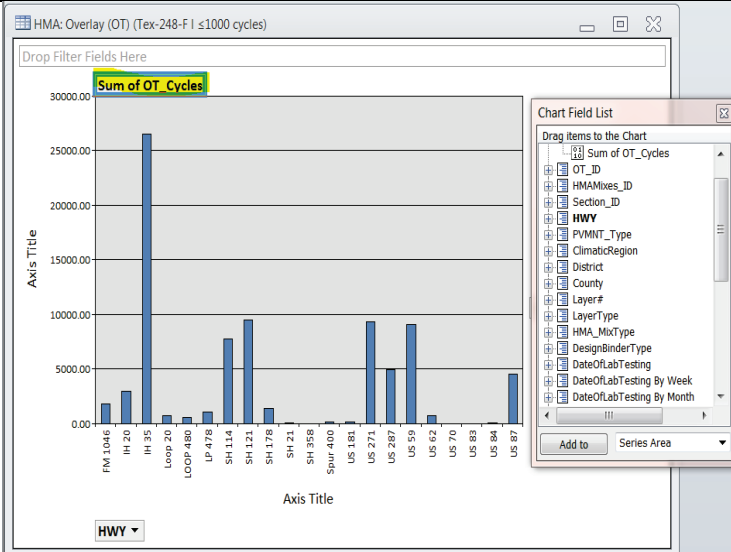


**Table IV-2. Accessing and Analyzing the DSS Data: Generating Graphs from Data in a Table (Continued).**

3. From the **Chart Field List**, drag and drop an item to the **Category Field** for the x-axis of the chart. Similarly, drag and drop another item to the **Data Field** for the y-axis data.

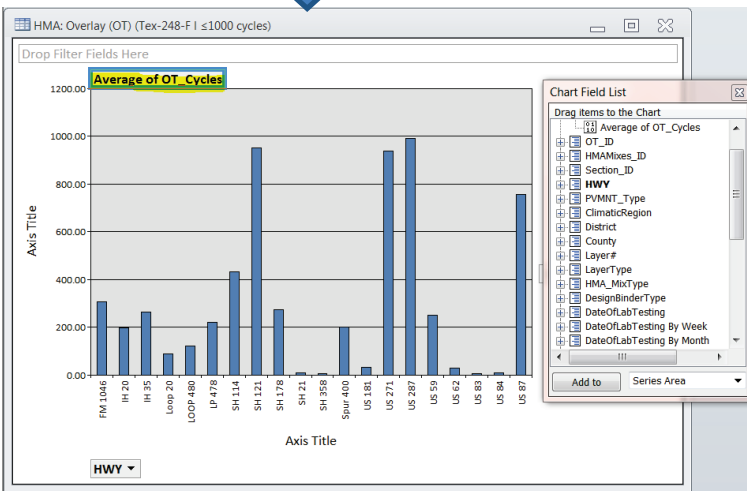
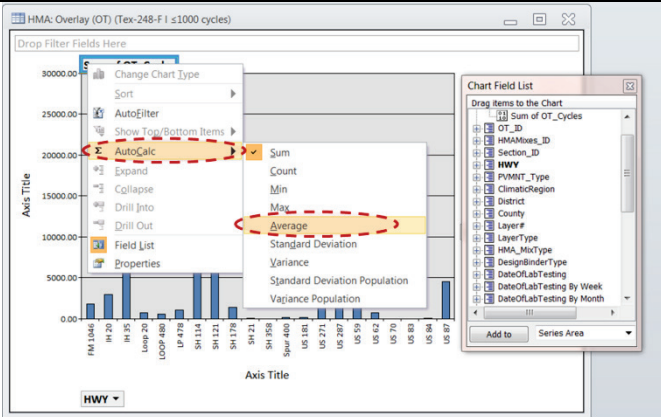
For example, the following items were dragged and dropped for a bar chart as:

- **HWY** to **Category Field**
- **OT\_Cycles** to **Data Field**



4. Note that the chart automatically shows the **Sum of OT Cycles** in the y-axis since there are multiple data points for each Hwy section.

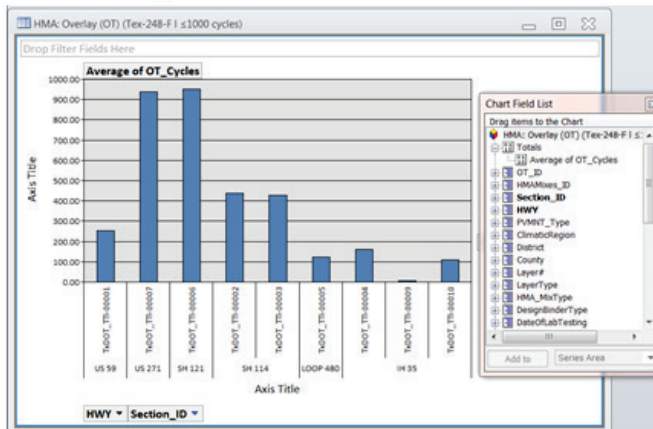
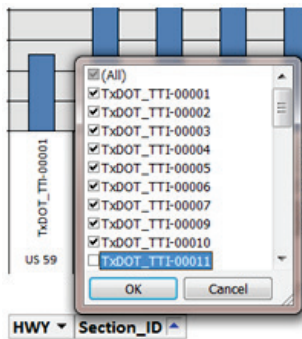
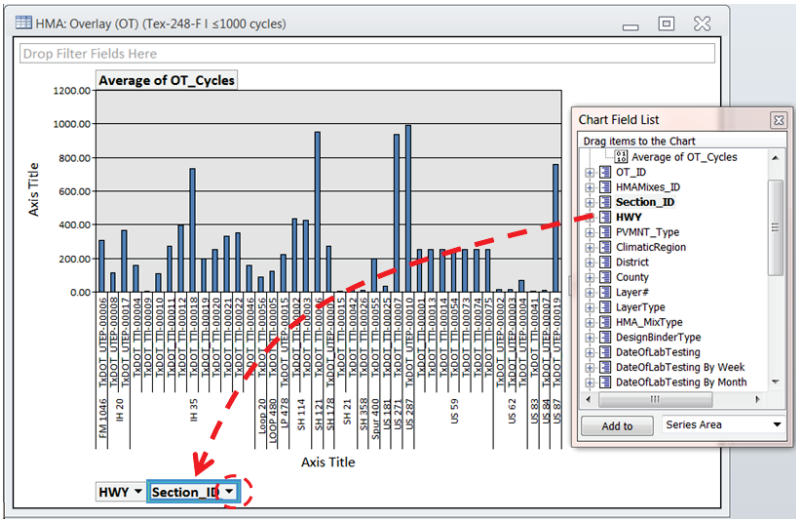
To use the **Average of OT\_Cycles** as the y-axis, you can right click on the **Sum of OT\_Cycles**, and select **Average** in **AutoCalc**.



**Table IV-2. Accessing and Analyzing the DSS Data: Generating Graphs from Data in a Table (Continued).**

5. By adding the **Section\_ID** field to the **Category Field**, you can see the information of some test sections you want to see:

- Add the **Section\_ID** field next to the **HWY** (in the **Category Field**).
- Click the down arrow at **Section\_ID**.
- Select the section number(s) to be included in the chart.

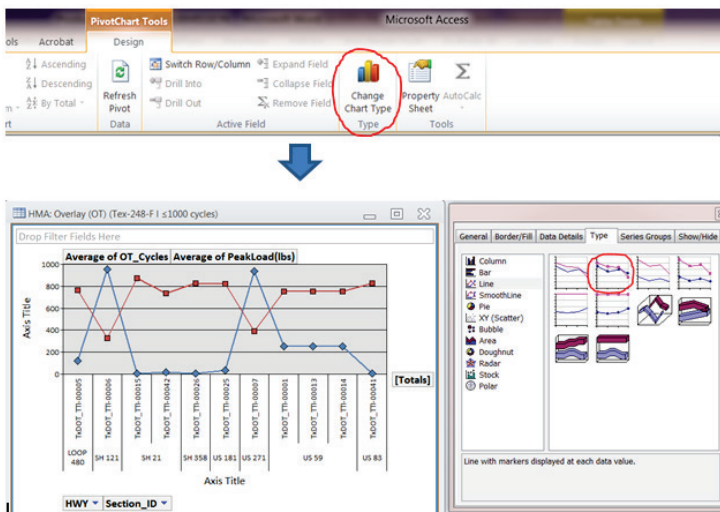


**Table IV-2. Accessing and Analyzing the DSS Data: Generating Graphs from Data in a Table (Continued).**

6. You can add more Fields to the **Data Field** to present multiple data sets together in one chart by using the drag and drop function.



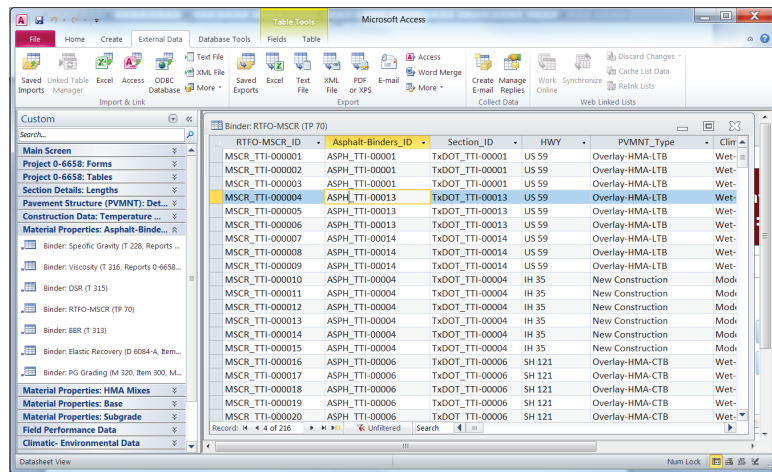
7. To change the Chart type, select a desired chart type from the **Change Chart Type**. The line chart is presented here as an example.



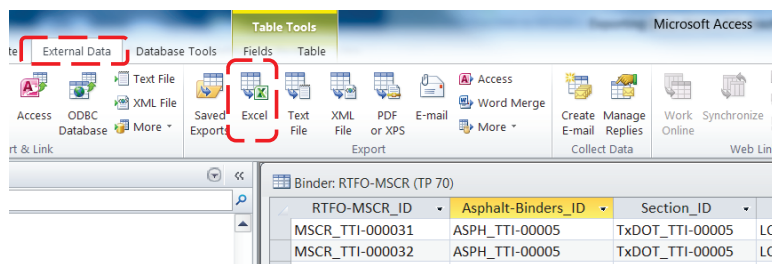
# APPENDIX V. EXAMPLES OF EXPORTING AND EMAILING DSS DATA

**Table V-1. Exporting a DSS Table to Excel Workbook.**

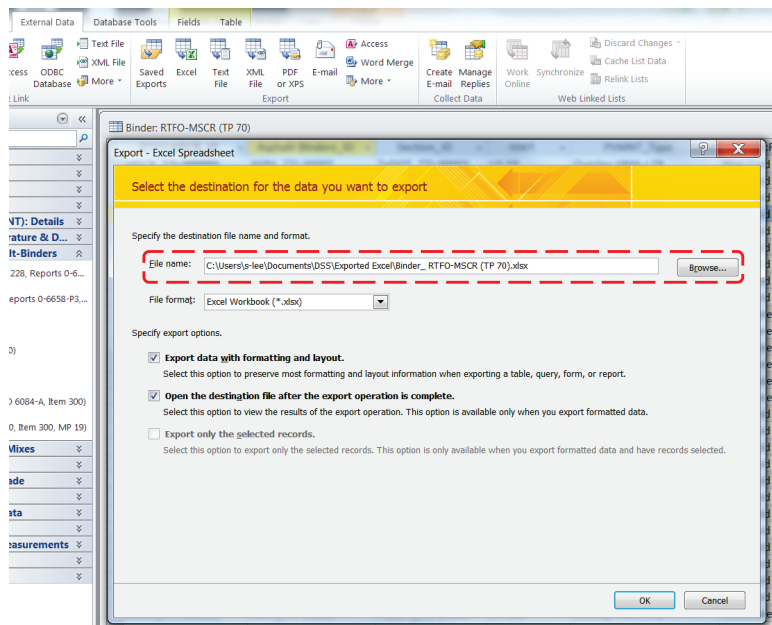
1. Open a data table that you want to export.



2. On the **External Data** tab, in the **Export** group, click **Excel**.



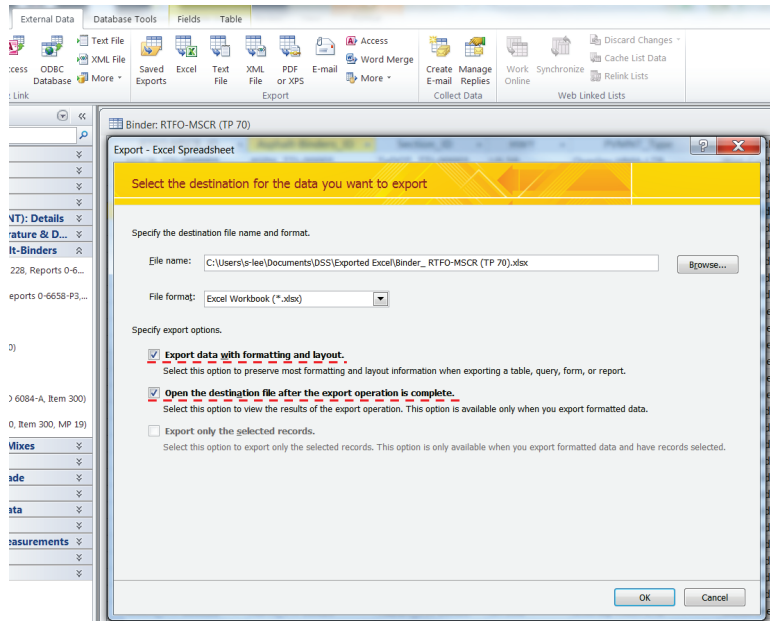
3. In the **Export - Excel Spreadsheet** dialog box, specify the destination of the Excel workbook. You can change the file name if you want to.



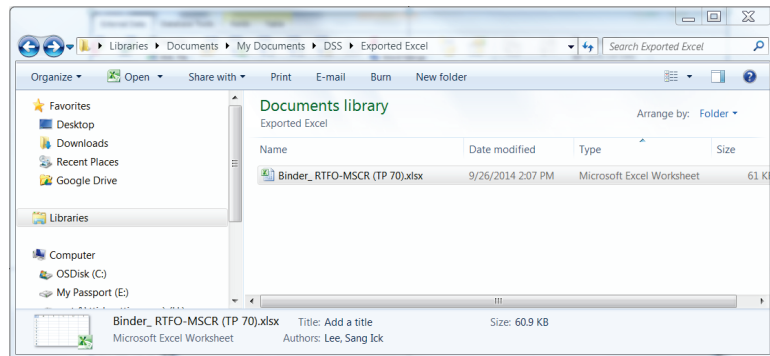
**Table V-1. Exporting a DSS Table to Excel Workbook (Continued).**

4. If you want to export the formatted data, select the **Export data with formatting and layout** check box.

To view the Excel workbook after the export operation is complete, select the **Open the destination file after the export operation is complete** check box.



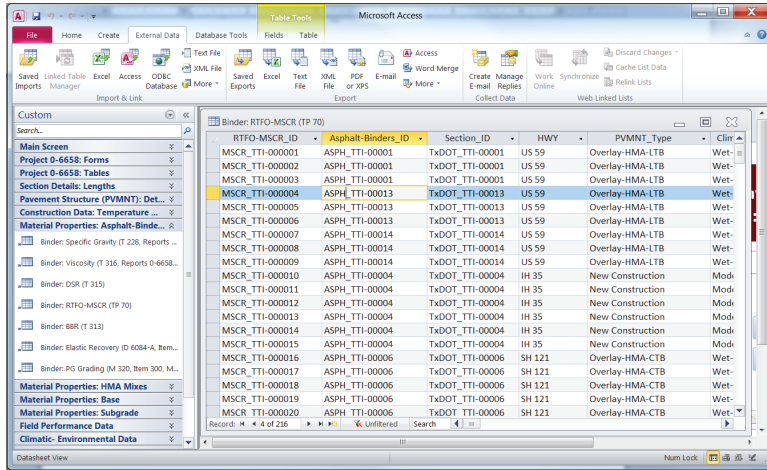
5. Go to the destination folder and find the exported Excel workbook.



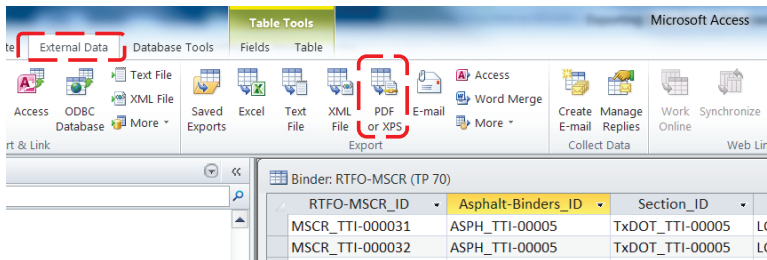
RTFO-MSCR_ID	Asphalt-Binders_ID	Section_ID	HWY	PVMNT_Type	Climatic/Region	District	County	Layer	LayerType	Designation
MSCR_TTI-000001	ASPH_TTI-00001	TxDOT_TTI-00001	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	7	HMA Overlay	PG 64-2
MSCR_TTI-000002	ASPH_TTI-00001	TxDOT_TTI-00001	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	7	HMA Overlay	PG 64-2
MSCR_TTI-000003	ASPH_TTI-00001	TxDOT_TTI-00001	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	7	HMA Overlay	PG 64-2
MSCR_TTI-000004	ASPH_TTI-00013	TxDOT_TTI-00013	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	8	HMA Overlay	PG 64-2
MSCR_TTI-000005	ASPH_TTI-00013	TxDOT_TTI-00013	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	8	HMA Overlay	PG 64-2
MSCR_TTI-000006	ASPH_TTI-00013	TxDOT_TTI-00013	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	8	HMA Overlay	PG 64-2
MSCR_TTI-000007	ASPH_TTI-00014	TxDOT_TTI-00014	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	8	HMA Overlay	PG 64-2
MSCR_TTI-000008	ASPH_TTI-00014	TxDOT_TTI-00014	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	8	HMA Overlay	PG 64-2
MSCR_TTI-000009	ASPH_TTI-00014	TxDOT_TTI-00014	US 59	Overlay-HMA-LTB	Wet-Cold	ATLANTA	PANOLA	8	HMA Overlay	PG 64-2
MSCR_TTI-000010	ASPH_TTI-00004	TxDOT_TTI-00004	IH 35	New Construction	Moderate	WACO	HILL	3		PG 64-2
MSCR_TTI-000011	ASPH_TTI-00004	TxDOT_TTI-00004	IH 35	New Construction	Moderate	WACO	HILL	3		PG 64-2
MSCR_TTI-000012	ASPH_TTI-00004	TxDOT_TTI-00004	IH 35	New Construction	Moderate	WACO	HILL	3		PG 64-2
MSCR_TTI-000013	ASPH_TTI-00004	TxDOT_TTI-00004	IH 35	New Construction	Moderate	WACO	HILL	4		PG 76-2
MSCR_TTI-000014	ASPH_TTI-00004	TxDOT_TTI-00004	IH 35	New Construction	Moderate	WACO	HILL	4		PG 76-2

**Table V-2. Exporting a DSS Table to PDF.**

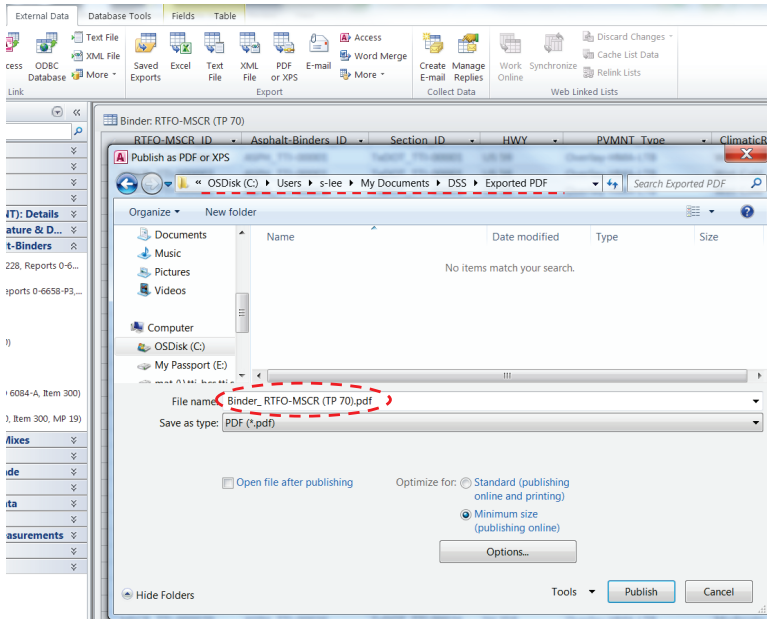
1. Open a data table in the DSS that you want to export.



2. On the **External Data** tab, in the **Export** group, click **PDF** or **XPS**.



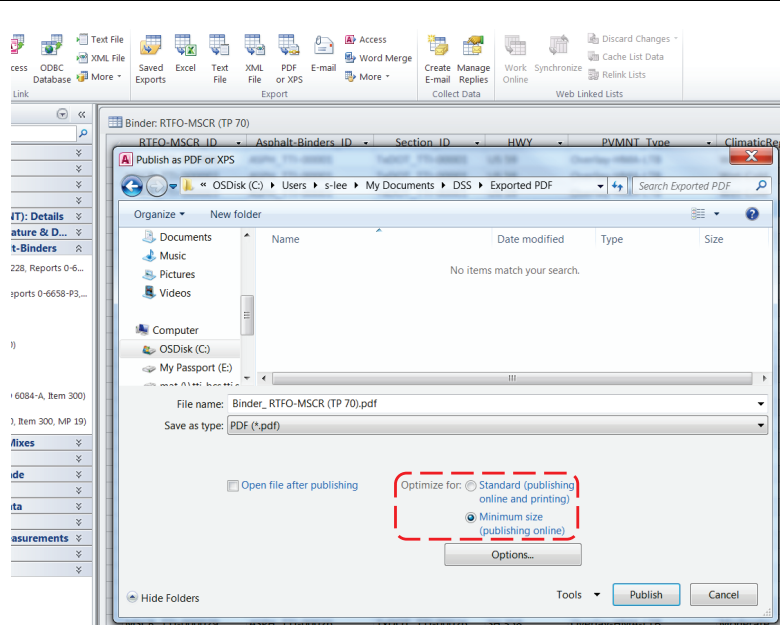
3. In the **Publish as PDF or XPS** dialog box, specify the destination of the PDF file and/or select a file name.



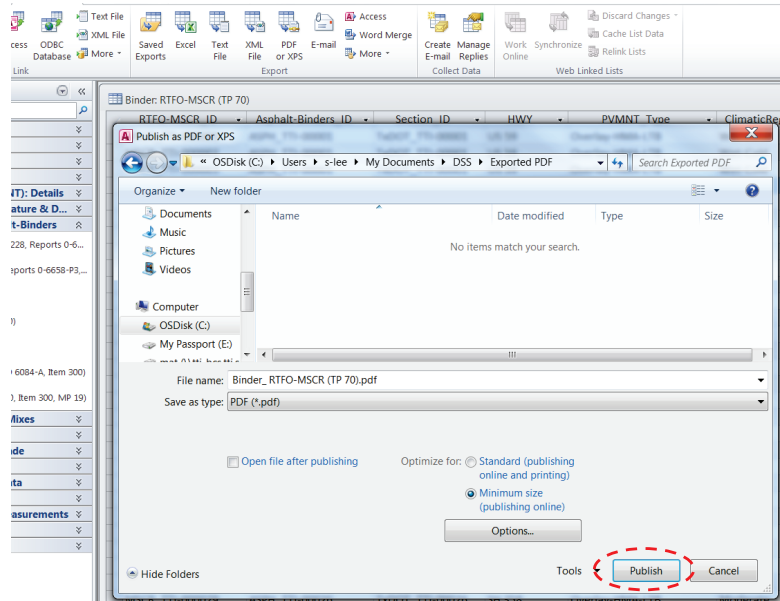
**Table V-2. Exporting a DSS Table to PDF (Continued).**

4. In the **Publish as PDF or XPS** dialog box, select one of the **Optimize for** options:

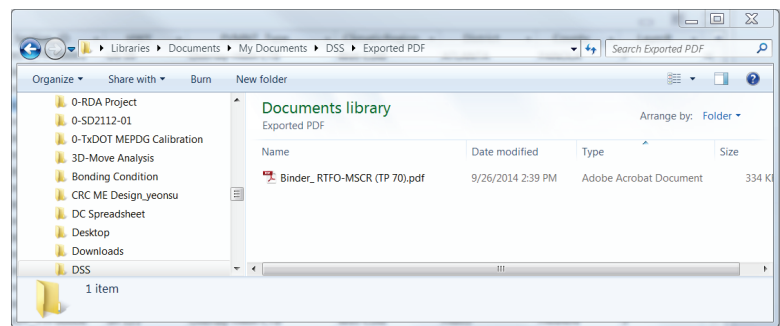
- a. If the document requires high print quality, click **Standard (publishing online and printing)**.
- b. If file size is more important than print quality, click **Minimum size (publishing online)**.



5. Click the **Publish** button.



5. Go to the destination folder and find the exported PDF file.

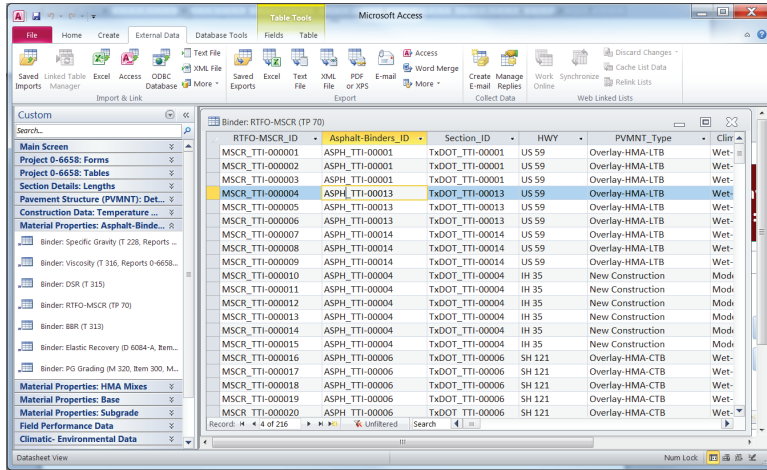




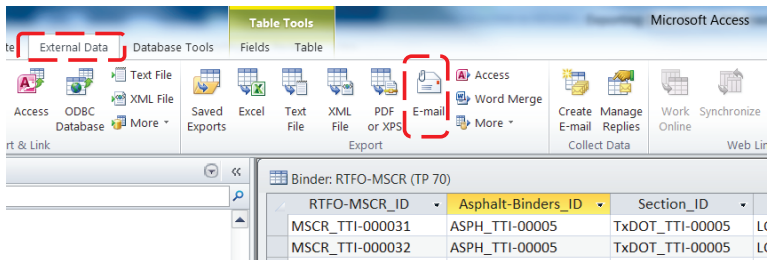
**Table V-3. Emailing a DSS Table.\***

1. Open a data table in the DSS that you want to email.

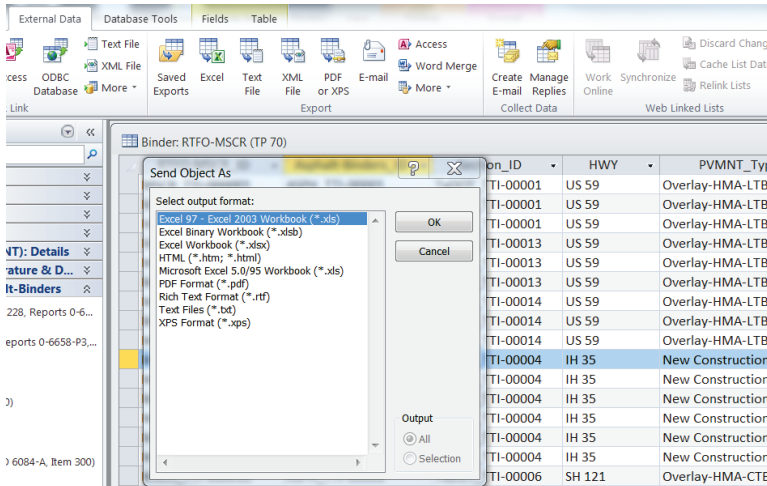
Note that the current MS Access emailing option works only with MS Outlook.



2. On the **External Data** tab, in the **Export** group, click **E-mail**.

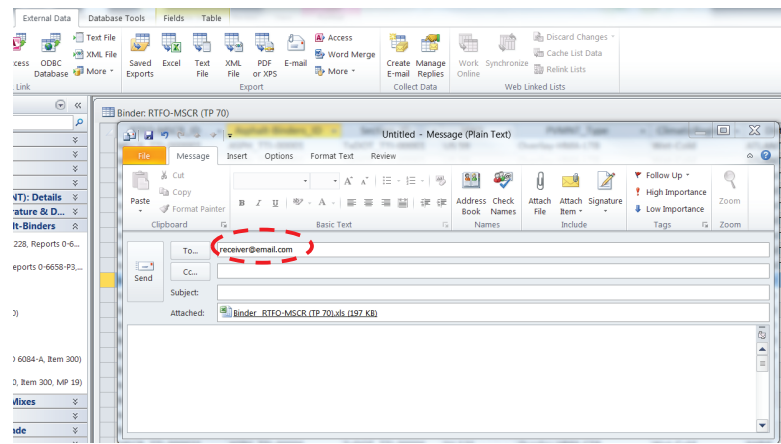


3. In the **Send Object As** dialog box, select one **output format** and click **OK**.



**Table V-3. Emailing a DSS Table (Continued).\***

4. Add the email address(es) to which you want to send the data and click send.

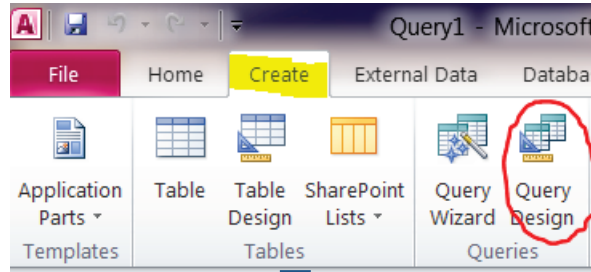


\* To email a DSS table, users must have Outlook installed and configured on their computer.

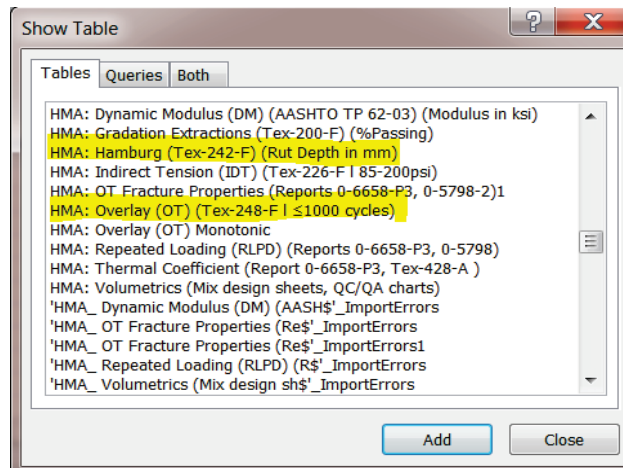
# APPENDIX VI. EXAMPLE OF ACCESSING MULTIPLE DSS DATA

**Table VI-1. Accessing Multiple Data.**

1. To create a Query Table with multiple data columns from different DSS tables, select **Query Design** in the **Create** tab. The **Show Table** dialog box will open. Select the tables where the desired data are stored.

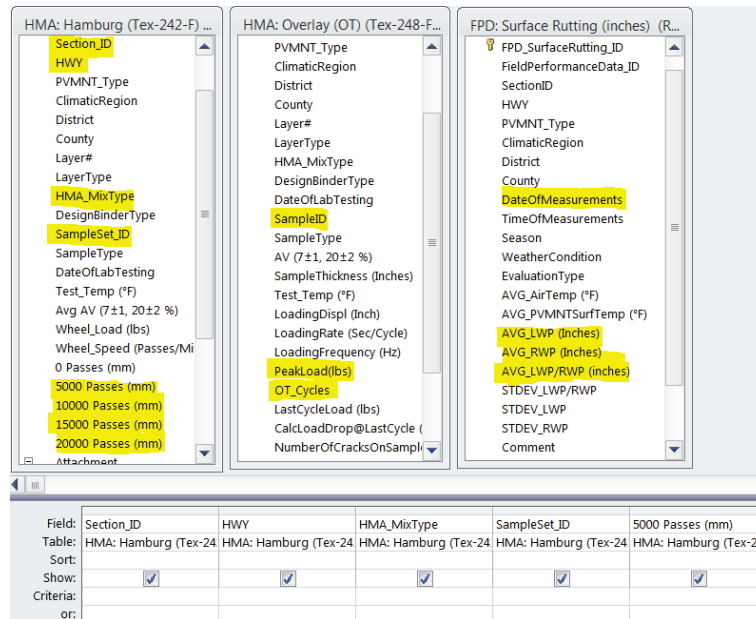


In the example, we'll open the following tables to compare the HWTT, OT, and field rutting data from the DSS:



1. HMA: Hamburg (Tex-242-F) (Rut Depth in mm).
2. HMA: Overlay (OT) (Tex-248-F 1 ≤1000 cycles).
3. FPD: Surface Rutting (inches).

2. From each table, double click on the desired fields to add them to the query. The order of the columns can be adjusted by simply selecting the column and dragging to its desired position.



In the example, the following Data columns were included: Section ID; Hwy; HMA\_Mix Type; Sample\_ID; HWTT rut depth at 5000, 10000, 15000, and 20000 cycles; OT\_Cycles; Peak Load(lbs); AVG field rutting at LWP, RWP, and LWP/RWP.

