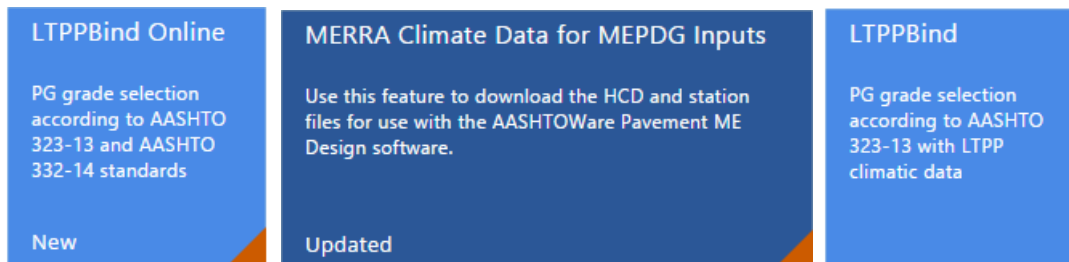**iENGINEERING**

Memorandum

Date: April 21, 2016

To: Larry Wiser, FHWA

From: Riaz Ahmad and Faizan Haq, iENGINEERING Corporation

Subject: LTPP Climate Tool/LTPPBind Online – Beta Release

Project: FHWA Contract DTFH61-14-C-00034

This memorandum provides highlights of the LTPP Climate Tool and LTPPBind that are now available for review for Beta testing. It includes information on new features and improvements to existing features that are integrated in the LTPP InfoPave website. New and updated features have been identified with a tab/label on the feature tile as follows:

LTPPBind Online	MERRA Climate Data for MEPDG Inputs	LTPPBind
PG grade selection according to AASHTO 323-13 and AASHTO 332-14 standards	Use this feature to download the HCD and station files for use with the AASHTOWare Pavement ME Design software.	PG grade selection according to AASHTO 323-13 with LTPP climatic data
New	Updated	

Where:

- **New** – are new features included in this Beta release

- **Updated** – are existing features that have been enhanced and are included in this Beta release

- **No Tab/Label** – are existing features that are available in LTPP InfoPave

Please visit http://dev.www.infopave.com to access the Beta release for testing. The LTPP InfoPave notification bar at the top of the screen shows the release status of the website and contains a link to bug reporting as shown below:

Status: This feature/page is currently in Beta Release mode.   **Bug Report ✕**

All the questions and bug reports can be submitted using this "Bug Report" feature. Please note that all the bugs should be reported by May 6, 2016. Please use Google Chrome as your primary browser for Beta testing. Certification of other desktop browsers is in progress.

Please note that LTPP InfoPave is not supported on mobile browsers.

Following is a brief summary of new and updated features available for Beta testing:

Data:

LTPP Climate Tool `NEW` – A new feature has been implemented on the LTPP InfoPave data hub which utilizes multiple data presentation options including climatic maps and graphs. A climatic map is presented on the user interface to visualize MERRA climatic data for temperature, precipitation, humidity, solar, and wind.
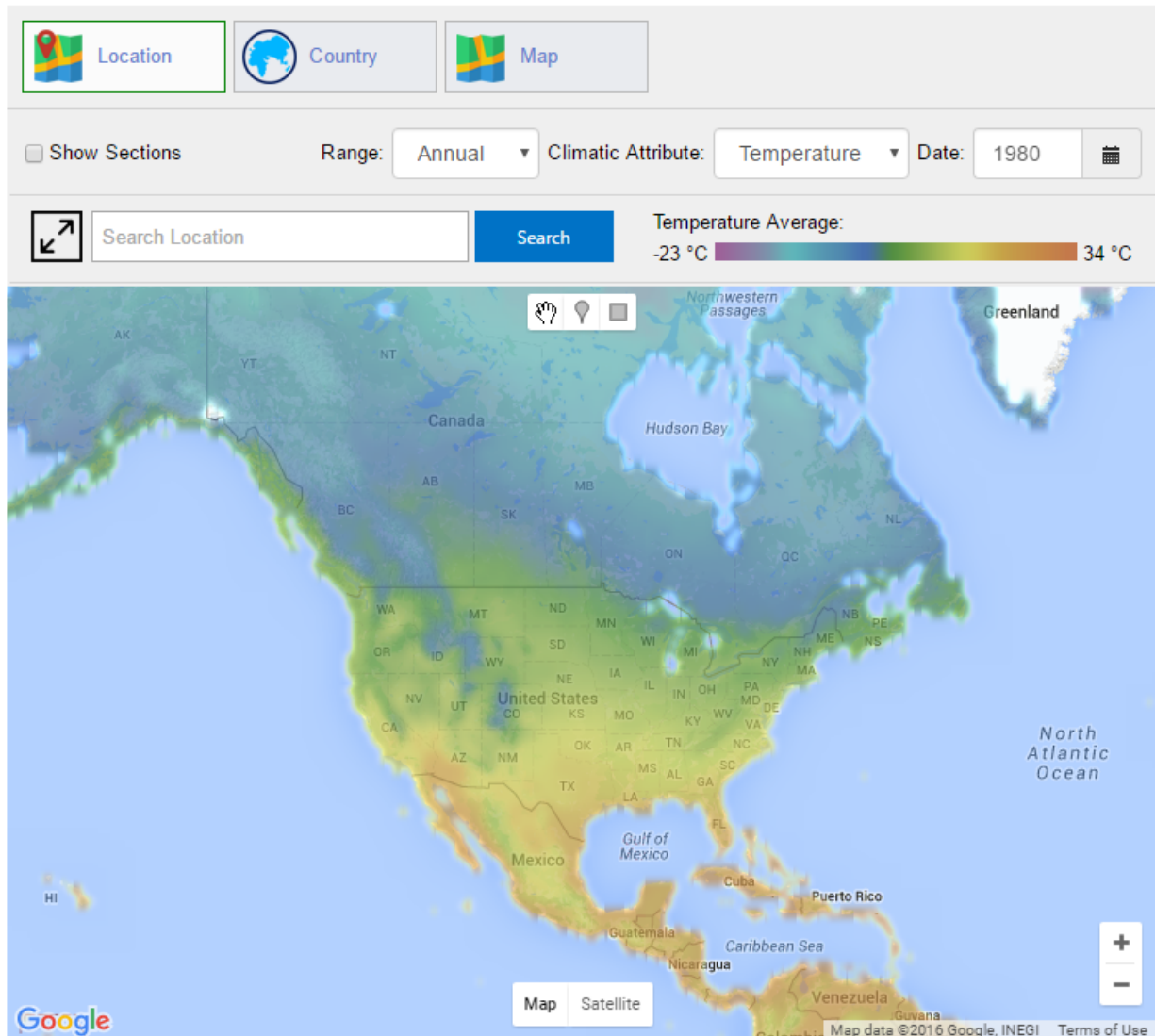
The LTPP Climate Tool provides three options to access MERRA climatic data. These three options are as follows:

- **Data By Location** – MERRA cells can be selected using single point and area selection from the map

- **Data By Country** – Collections of MERRA cells grouped by country or state of a country can be selected using dropdown lists

- **Data By Map** – Download MERRA climatic data displayed on the Isotherm map in ESRI Shape File (.SHP) and Keyhole Markup Language (.KML) file formats

The LTPP Climate Tool also helps users to select MERRA Climatic data using a logical data classification.
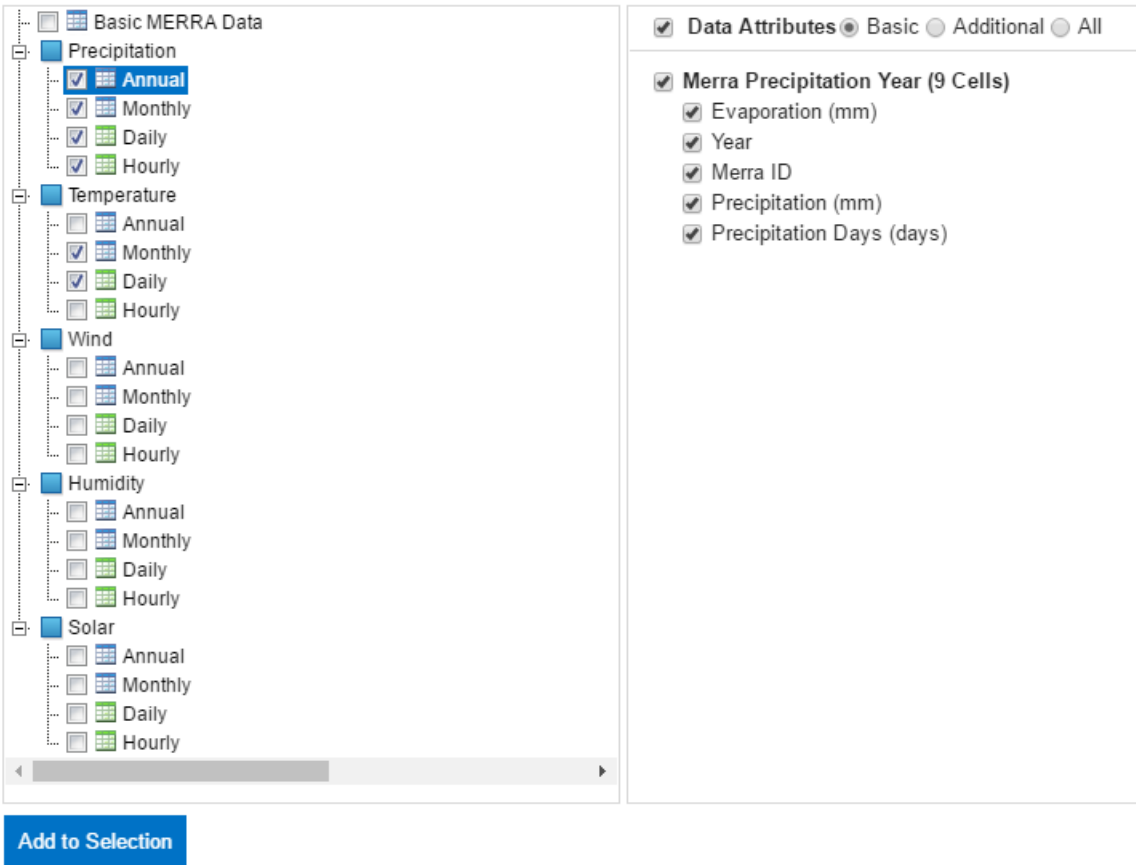
Selected MERRA data can be submitted for data extraction using the existing LTPP InfoPave Data Bucket for the selected MERRA cells.

Data Bucket `UPDATED` – The existing LTPP Data Bucket feature has been enhanced to allow selection of MERRA data from the LTPP Climate Tool and submit it for data extraction. The Data Bucket also shows a summary of selected MERRA data under the "Selected Data Summary" section. This information also includes approximate size of the selected data set in number of records and file size.

| Data | | Data Bucket | | | ⚙ Options | ◂ Help? |

Data

Data Bucket (3)

Data (1)
Ancillary Data (0)
Library (0)
SQL Query (0)
MERRA (2)

Selected Data Summary

Data: 35,425 Records
Est. Data Volume: 5.01 MB

MERRA Data: 82,350 Records
Est. MERRA Data Volume: 5.67 MB

Data Bucket   ⚙ Options   ◂ Help?

Selected Data (1)

Structure ► Material - Layer Properties and Field Sampling (Test, M&R, Inventory) ► AC ► AC Binder (Test Results - Penetration, Viscosity, Specific Gravity): 462 Sections, 35425 Records, 81 Attributes   ✕

Selected MERRA (2)

Precipitation ► Daily: 9 Cells, 3294 Records, 10 Attributes   ✕

Precipitation ► Hourly: 9 Cells, 79056 Records, 9 Attributes   ✕

Export File Format

Please select file format for data export and submit Data Bucket for extraction. You will recieve an e-mail notification when your data bucket is ready for download or you can check the status of your Data Bucket from My Data Extractions page in My LTPP.

Export File Format: Microsoft Excel ▼
Unit System: ◉ As-Collected   ○ Metric   ○ US Customary
☑ Include values of coded data elements.

[Submit for Data Extraction]   [Save]   [Clear]   [Continue to Select Data]

MERRA Data Extraction Service `NEW` – A new Windows service has been developed to process MERRA climatic data that is submitted for extraction through the Data Bucket. This service also creates a separate ZIP file package for download. As the volume of MERRA climatic data is huge, this new service is dedicated to process only MERRA data in an optimized way to improve the service throughput and prevent performance degradation issues.

The MERRA Data Extraction Service also communicates and integrates with the existing Data Extraction Service and Notification Processor. Functionality to cancel a submitted MERRA data extraction request is also implemented. This allows the users to cancel their MERRA data extraction request using My LTPP section on the LTPP InfoPave website.

Data Extraction Service `UPDATED` – The existing LTPP Data Extraction Service has been updated to communicate and integrate with the MERRA data extraction service.

Tools:

LTPPBind Online `NEW` – LTPPBind Online is a web-based tool to help highway agencies select the asphalt binder Performance Grade (PG) for a particular site based on the AASHTO M323-13 standard. Algorithms for high and low temperature are the same as LTPPBind 3.0/3.1 release. LTPPBind Online allows use of MERRA climatic data, LTPP climatic data, or user data for asphalt binder grade calculations. This feature allows the LTPP InfoPave users to perform the following tasks:

- Create a new project

- Select climatic conditions at their site

- Define the desired reliability level

- Adjust PG selection for different levels of traffic loading and speed

- Low-temperature binder selection based on original LTPP pavement temperature models

- High-temperature binder selection based on rutting damage

- Perform calculation and save the project

New Project		
Project Number	**Project Title**	**Actions**
PG-001	Performance Grade 001	Open · Delete
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Selecting "New Project" will allow to create a new project to perform binder grade calculations which is designed as a six step wizard as shown below:

General Project Information

Project Number: PG-001
Project Title: Performance Grade 001
Project Description:

Climatic Data Source

Latitude, Degree:
Longitude, Degree:

Climatic Data

Lowest Yearly Air Temperature, °C:
Low Air Temp Standard Deviation, °C:
Yearly Degree-Days > 10 Deg. °C:
High Air Temperature of high 7 days:
Standard Dev. of the high 7 days:

Target Rutting Depth

Target Rutting Depth (mm):

Temperature Adjustments

Desire Reliability, %:
Depth of Layer, mm:
Base HT PG:

Traffic Adjustments

Traffic Loading ESAL, Millions:
Traffic Speed (Fast: >70 km/h, Slow: 20-70 km/h):

General Project Information (Step 1 of 6)

Project Number: ❓   PG-001

Project Title: ❓   Performance Grade 001

Project Description: ❓

Next

Steps of the LTPPBind Online wizard are as follows:

1. General Project Information
2. Climatic Data Source
3. Climatic Data
4. Target Rutting Depth
5. Temperature Adjustments
6. Traffic Adjustments

Step 2 of the LTPPBind Online wizard allows users to select the climatic data source from four different options, i.e., MERRA, LTPP (Virtual Weather Station), LTPP (Automated Weather Station), and Manual as shown in the screenshot below:

Climatic Data Source (Step 2 of 6)

Please select the data source from option below:

- ⦿ MERRA ❓
- ◯ LTPP (Virtual Weather Station) ❓
- ◯ LTPP (Automated Weather Station) ❓
- ◯ Manual ❓

[Select Location]

Latitude, Degree: ❓ | 44.45535 |

Longitude, Degree: ❓ | -95.07843 |

[Previous]   [Next]

Selecting the "MERRA" option allows the user to select latitude and longitude of a MERRA cell/location from a geographic map as shown in the screenshot below:

Select Location

Please select the location from map or type the address in search box below:

[Search Location]   [Search]

Selected Location

Latitude: 40.43649540640561, **Longitude:** -94.19952392578125

Location: 19365 W 120th Ave, Martinsville, MO 64467, USA

[Select]   [Cancel]

Similarly, the "LTPP (Virtual Weather Station)" option opens a pop-up dialog letting the user select the LTPP section from the available dropdown list as shown below. In this case LTPP sections are linked with Virtual Weather Stations.

Selecting the "LTPP (Automated Weather Station)" option allows the users to select the automated weather station from the geographic map as shown below:

Step 3 of LTPPBind Online retrieves and calculates the following climatic attributes/variables with the help of the selected data source:

- Lowest Yearly Air Temperature, ºC
- Low Air Temp Standard Deviation, ºC
- Yearly Degree-Days > 10 ºC
- High Air Temperature of the high 7 days
- Standard Dev. of the high 7 days

The following screenshot shows step 3 pre-population of the above mentioned climatic variables:

Climatic Data (Step 3 of 6)	
Lowest Yearly Air Temperature, ºC:	-29.19
Low Air Temp Standard Deviation, ºC:	4.79
Yearly Degree-Days > 10 Deg. ºC:	1704.04
High Air Temperature of high 7 days:	32.19
Standard Dev. of the high 7 days:	2.65
	Previous Next

Please note that using the "Manual" option does not retrieve and perform any calculations of the above mentioned climatic attributes for step 3.

This tool provides two procedures to calculate the PG grade, i.e., AASHTO M323-13 and AASHTO M332-14. After providing the required fields on the project setup wizard, the calculation can be performed. Results of the performed calculations are shown in the "Performance Grade" section and can be saved as a project.

Performance Grade

AASHTO M323-13

PG Temperature	High	Low
Performance Grade Temperature at 50% Reliability	58.7	-2.3
Performance Grade Temperature at Desired Reliability	60.3	-7.8
Adjustment for Traffic	0.0	
Adjustment for Depth	0.0	-0.0
Adjusted Performance Grade Temperature	60.3	-7.8
Selected PG Grade	64	-10
PG Grade	M323, PG 64-10	

AASHTO M332-14

PG Temperature	High	Low
NPerformance Grade Temperature at 50% Reliability	58.7	-2.3
NPerformance Grade Temperature at Desired Reliability	60.3	-7.8
Grade for expected traffic level and traffic load rate	S	
Selected PG Grade	64	-10
PG Grade	M332, PG 64S-10	

Print   Save

A print friendly report can be generated using the "Print" button.

MERRA Climate Data for MEPDG Input UPDATED – Existing MERRA Climate Data for the MEPDG Input feature has been enhanced to download MERRA climate data in a format that is being used as an input for the AASHTOWare Pavement ME Design Software. This feature is updated to allow the users to download the Historical Climatic Database (*.HCD) and Station files using the following two options:

- **By Section** – This options allows users to select an LTPP section and download the corresponding HCD file.

- **By Map** – This new option allows users to select any MERRA cells from the geographic map and download the corresponding HCD file.

This feature also provides an option to choose the unit system (US Customary, Metric) before data download.

My LTPP:

My Data Extractions `UPDATED` – This feature has been enhanced to handle the MERRA data extraction requests that are submitted from the LTPP InfoPave Data Bucket.

Extraction Number	Date	Extraction Status	
010794	4/9/2016 5:13:55 PM	Completed	Download LTPP IMS Package Download LTPP MERRA Package
010720	4/8/2016 7:13:26 AM	Completed	Download LTPP IMS Package Download LTPP MERRA Package
010634	4/6/2016 9:50:40 AM	Completed	Download LTPP MERRA Package
010630	4/5/2016 9:35:34 AM	Completed	Download LTPP IMS Package
010623	4/5/2016 6:48:56 AM	Completed	Download LTPP IMS Package Download LTPP MERRA Package

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Since the LTPP Data Bucket feature can now contain both LTPP IMS data and MERRA data extraction items, the "My Data Extractions" feature has also been updated to show separate download links for LTPP IMS and LTPP MERRA packages.