Madison Beltline
Dynamic Part-Time Shoulder Use

Madison Area Transportation Planning Board

October 2, 2019
Agenda

- Beltline Study Background
- Beltline Project Purpose and Need
- Project Alternatives
  - Alt 1: Resurfacing
  - Alt 2: Resurfacing w/ Dynamic Part-Time Shoulder Use (DPTSU)
- DPTSU Concept
- Project Schedule
- Questions
Beltline Study Background

*WisDOT Study / Engineering*

Beltline PEL
Focus =
Long-Term Solutions

2012 - 2018
Beltline is vital for Dane County

- Beltline provides access to homes, schools, jobs, businesses.
- Beltline supports the local economy.
- Beltline has been affected by area growth.
Beltline Study Limits

(Beltline Study Limits: University Avenue/US 14 to County N)
Why is the Beltline being studied?

- Motor vehicle congestion
- Too many crashes
- Complex Regional traffic patterns
- Bike/ped accommodations needs
- Transit needs
- Few alternate routes
- Deteriorating physical conditions
Beltline supports employment centers

Destinations of Beltline Traffic During the AM Peak Hour

- 48% in the central area
- 24% in the west region
- 15% in the north region
- 2% in the southeast region
- 11% in the northeast region
Madison transportation is different

Beltline has to be used
Beltline carries more people than any other roadway combination in Dane County
1956
Dane County Population  201,000
Beltline Volume  10,550 vpd
Where household growth will occur

2050

81,000 more homes
150,000 more people

Legend
- Dane County
- Water
- Household Change per Acre
  - 0 - 5
  - 0.6 - 2
  - 2.1 - 5
  - 5.1 - 10
  - 10.1 - 25
  - 25.1 - 35
  - 35.1 - 70

Madison
- 37,600

Fitchburg
- 4,700

Verona
- 3,400

Sun Prairie
- 8,500

Waunakee
- 3,000

Deforest
- 2,600

Stoughton
- 700

Isthmus
- 11,100
Where employment growth will occur
Much of 2050 employment growth likely to occur in areas served by the Beltline.
Beltline Maintenance Projects 2012 - Present

WisDOT Study / Engineering

2012 - 2018

Beltline PEL
Focus = Long-Term Solutions

2019 - 2021

Overlay Projects

2019: Seminole to I-39/90 Pavement
2020: South Towne Bridge
   - Alt 1: Resurfacing
   - Alt 2: Resurfacing with DPTSU
Note: Alts each include barrier and drainage improvements

Ongoing Pavement & Bridge Preventative Maintenance Projects

```plaintext
<table>
<thead>
<tr>
<th>Year</th>
<th>Project Description</th>
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<tbody>
<tr>
<td>2012</td>
<td>Fish Hatchery Rd Joints</td>
</tr>
<tr>
<td>2013</td>
<td>Gammon to Whitney</td>
</tr>
<tr>
<td>2014</td>
<td>Fish Hatchery Rd to I-39/90 Overlay</td>
</tr>
<tr>
<td>2015</td>
<td>Yahara Bridge Polymer Overlay</td>
</tr>
<tr>
<td>2016</td>
<td>Yahara Bridge Pile Protection</td>
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<td>2017</td>
<td>Bridge Painting</td>
</tr>
<tr>
<td>2018</td>
<td>Fish Hatchery Rd to I-39/90 Pavement Patches</td>
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Project Purpose and Need

**Project Purpose:**

- Address deteriorating infrastructure needs in the pavement structure and median areas
- Address operational issues during weekday peak periods and unexpected congestion
Project Purpose and Need

Project Needs:

- Existing Pavement Condition
- Median Barrier Condition
- Roadway Drainage System
- Operational Issues
  - Crashes
  - Travel Time and Level of Service
- Travel Time Reliability
Project Location

About 10 miles and 12 interchanges
Project Alternatives

Alt 1: Resurfacing

Seminole Highway to I-39/90:
- Resurfacing
- Median Barrier Improvements
- Drainage Improvements

Alt 2: Resurfacing with DPTSU

Seminole Highway to I-39/90:
- Resurfacing
- Median Barrier Improvements
- Drainage Improvements

Whitney Way to I-39/90:
- DPTSU Infrastructure and Pavement Restriping
Lane-Usage and Drainage

No-Build Alternative

Alt 1: Resurfacing

Alt 2: Resurfacing w/ DPTSU

Removing Rumble Strips

Median Barrier & Drainage Modifications

Median Barrier & Drainage Modifications
Cross Section

Typical Existing (No-Build) and Resurfacing (Alt 1) Beltline Cross Section

Westbound

Outside Shoulder  GP Lane  GP Lane  GP Lane  Median Shoulder  Median Shoulder  GP Lane  GP Lane  GP Lane  Outside Shoulder

Eastbound

Overlay

Existing Pavement / Joints
Proposed Pavement Marking

GP = General Purpose
Cross Section

Typical Existing (No-Build) and Resurfacing (Alt 1) Beltline Cross Section

Westbound
Outside Shoulder  GP Lane  GP Lane  GP Lane  Median Shoulder  Median Shoulder  GP Lane  GP Lane  GP Lane  Outside Shoulder

Eastbound

Typical Resurfacing with Dynamic Part-time Shoulder Use (Alt 2) Beltline Cross Section

Westbound
Outside Shoulder  GP Lane  GP Lane  GP Lane  Part-time Shoulder Use  Part-time Shoulder Use  GP Lane  GP Lane  GP Lane  Outside Shoulder

Eastbound

Cross section fits within the existing width (each direction)
Dynamic Part-Time Shoulder Use Nationally

Part-time shoulder use is being used effectively around the country, including the Midwest, to address recurring congestion.

Image: I-35W in Minnesota
Part-time Shoulder Use in the United States

States with Part-Time Shoulder Use in 2018
What is DPTSU?

DPTSU stands for “Dynamic Part-time Shoulder Use”
- Also known as “Hard Shoulder Running”
- Use of shoulders part-time for travel during busiest hours
- Cost-effective interim solution to address recurring congestion
- Can be classified as:
  - A Transportation System Management and Operations (TSM&O) Strategy
  - A Performance-Based Practical Design approach, used by FHWA & WisDOT

Reference:
https://ops.fhwa.dot.gov/publications/fhwahop15023/ch1.htm
Static vs. Dynamic Part-time Shoulder Use

**Static**

Example in Massachusetts

No Dynamic (changeable) Signing Component

**Dynamic**

In Operation

Not in Operation

Generally paired with static signing
Safety

- Experience in the U.S. to date has not identified major safety issues with part-time bus, static, or dynamic shoulder use that led to discontinuation.

- The best available predictive crash analysis tool (IHSDM) was used for this project’s safety analysis.

- The relative analysis showed that with the activation of DPTSU, the number of predicted crashes is not anticipated to increase compared to a No-Build condition.
Note: Field-measured travel times may be longer for a variety of reasons (incidents, disabled vehicles, weather, etc.).
Travel Time Reliability

How traffic conditions have been communicated

Annual average

Travel Time Reliability

Travel time reliability measures the extent of this unexpected delay. Example: Getting to Work

Project Feasibility: Travel Time Reliability

Reliability measures capture the benefits of traffic management

Note: This diagram shows a general display of the travel time reliability concept and is not intended to reflect traffic data for the Beltline corridor.

System Overview

Part-time (Median) Shoulder Use

Dynamic Part-time Shoulder Use cross section fits within the existing width (each direction)

SHOULDER USE PERMITTED ON GREEN ARROW ONLY

Shoulder Use Permit on Green Arrow Only

About 1/2 Mile

System Overview

Dynamic Part-time Shoulder Use cross section fits within the existing width (each direction)
Dynamic Signing

Active Management

- In Operation
- Not in Operation
- Approaching lane drop or for use in closure scenarios

Sample DMS Messaging

- LEFT SHOULDER OPEN TO TRAFFIC
- LEFT SHOULDER EMERGENCY STOPPING ONLY

Digital Blank-out Sign indicating lane drop at ends of the system
Dynamic Signing

- Dynamic Shoulder Signing
- Dynamic Message Signing
- Regulatory/Static signing
Dynamic Signing

- Dynamic Shoulder Signing
- Dynamic Message Signing
- Regulatory/Static signing
Operations – Off-Peak

Off-Peak Operation

Median Shoulder

General Purpose

General Purpose

General Purpose

Outside Shoulder
Operations – Closure

Unplanned Closure

Part-time (Median) Shoulder Use

General Purpose

General Purpose

General Purpose

Outside Shoulder

Incident
Operations – Lane Drop
SHOULDER USE PERMITTED ON GREEN ARROW ONLY

General Purpose Lanes Open 24 Hours
Dynamic Part-Time Shoulder Use

General Purpose Lanes Open 24 Hours
Summary: Project Alternatives

Alt 1: Resurfacing
- Resurfacing
- Median Barrier Improvements
- Drainage Improvements
- Addresses Pavement, Barrier, and Drainage. **Does not address** Operational issues

Alt 2: Resurfacing with DPTSU
- Resurfacing
- Median Barrier Improvements
- Drainage Improvements
- DPTSU Infrastructure and Pavement Restriping
- Addresses Pavement, Barrier, and Drainage. **Does address** Operational issues
Alt 1: Resurfacing  
Alt 2: Resurfacing with DPTSU  

Note: Alts each include barrier and drainage improvements
Questions?

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